Environmental Protection Authority

annual report 2013—14

Acknowledgements

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September 2014

Letter to the Minister

Hon Albert Jacob

Minister for Environment

In accordance with s21 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 2014.

Dr Paul Vogel

CHAIRMAN, EPA

18 September 2014

Banksia baxteri, *Fitzgerald River National Park*

Photo: Gary Williams, Office of the EPA

Message from the Chairman

On behalf of the Environmental Protection Authority (EPA), I am pleased to present to the Minister for Environment and the Parliament this Annual Report on our activities and the environment generally.

This report is an important apparatus of accountability to Western Australians about how the environment is faring in the face of a range of pressures.

In this report, the EPA highlights particular areas of concern, outlines challenges it faces in the assessment of development proposals and planning schemes, and shares some environmental success stories in Western Australia.

It provides an opportunity for the EPA to explain how it goes about making its decisions and recommendations.

Every year, the EPA will add to this narrative about the environment with emerging issues or progress on existing issues.

This year, the report puts the spotlight again on the development pressures facing the highly biodiverse Banded Iron Formation ranges of the Yilgarn Craton, but this time with a particular emphasis on the ranges in the Midwest Region of the State.

We have once again drawn attention to the cumulative impacts of development in the Pilbara and the early signs of progress in confronting the challenge of rehabilitation in arid landscapes.

The EPA has raised key issues such as the legacy of mine pit lakes, the importance of preserving significant areas of remnant vegetation, and noted the challenge of protecting the environmental values of Cockburn Sound.

We recognise the success of the Government's Bush Forever policy, the effectiveness of air quality protection measures in and around Kwinana, and the persistence of the critically endangered Western Swamp Tortoise despite the many threats it faces.

The EPA would like to acknowledge its effective working relationship with the Minister for Environment, Albert Jacob MLA, and with the many dedicated people across the scientific, academic, environment and government sectors who provide advice to the EPA to allow it to perform its functions.

Dr Paul Vogel
CHAIRMAN, EPA

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Adenanthos cuneatus *at Fitzgerald River National Park*

Photo: Gary Williams, Office of the EPA

About the EPA

Legislative framework

The Environmental Protection Authority (EPA) was originally established in 1971. It has five members appointed by the Governor on the recommendation of the Minister for Environment.

EPA operations are governed by the *Environmental Protection Act 1986* (EP Act) which stipulates that the objective of the EPA is to:

'use its best endeavours –

a) to protect the environment; and

b) to prevent, control and abate pollution and environmental harm.'

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

Section 8 of the EP Act outlines the independent role of the EPA, that neither the Authority nor the Chairman shall be subject to the direction of the Minister.

The EP Act provides authorisation for the EPA to make an annual report to the Minister by the end of October next following that financial year on 'a) the activities of the Authority during that financial year; and b) environmental matters generally'.

The Minister is required to provide the report to each House of Parliament within nine sitting days of that House after the receipt of the report by the Minister.

Minister for Environment

The EPA's relationship with the Minister for Environment is a crucial one.

Section 17A of the EP Act obliges the Minister to 'ensure that the Authority is provided with such services and facilities as are reasonably necessary to enable it to perform its functions'.

The EP Act also provides opportunity for the Minister to seek the EPA's advice on any matter related to the environment, or to remit proposals to the EPA for assessment.

The EPA's statutory independence can be a challenge for any Minister. However, the system is built on the capacity of the EPA to provide advice about the environment, consistent with the objectives of the EP Act.

Equally, it is an important tenet of our system that the Minister for Environment, in considering the EPA's recommendations, can weigh that advice against the social and economic objectives of Government before making decisions.

The EPA acknowledges the good working relationship it has enjoyed with its Minister, the Hon Albert Jacob MLA.

Reports on development proposals

In 2013–14, the EPA provided the Minister for Environment with reports on 34 development proposals, all of which were considered environmentally acceptable subject to strict conditions.

Planning schemes and scheme amendments

The EPA reviewed 235 planning schemes and scheme amendments and provided advice on 41 of them. None required formal assessment. One environmental review report was transmitted to the Minister.

Changes to proposals

Section 45c of the EP Act allows for changes to approved proposals as long as there are no significant new or additional impacts on the environment. The EPA makes decisions on these matters under delegation from the Minister for Environment.

In 2013–14, the EPA approved 39 changes to proposals. These are published on the EPA's website.

Changes to conditions

The EPA may inquire into requests for changes to Ministerial conditions on approved proposals and report to the Minister for Environment. In 2013–14, the EPA reported to the Minister on 16 requests for changes to conditions.

The EPA also inquired into whether or not the implementation conditions relating to a derived proposal should be changed and recommended that it was appropriate to change the conditions.

Functions of the Authority

The functions of the Authority, as set out in section 16 of the EP Act, are —

(a) to conduct environmental impact assessments; and

(aa) to facilitate the implementation of bilateral agreements; and

b) to consider and initiate the means of protecting the environment and the means of preventing, controlling and abating pollution and environmental harm; and

(c) to encourage and carry out studies, investigations and research into the problems of environmental protection and the prevention, control and abatement of pollution and environmental harm; and

d) to obtain the advice of persons having special knowledge, experience or responsibility in regard to environmental protection and the prevention, control and abatement of pollution and environmental harm; and

(da) to advise the Minister on the making or amendment of regulations when requested by the Minister to do so or on its own initiative; and

(e) to advise the Minister on environmental matters generally and on any matter which he may refer to it for advice, including the environmental protection aspects of any proposal or scheme, and on the evaluation of information relating thereto; and

(f) to prepare, and seek approval for, environmental protection policies; and

(g) to promote environmental awareness within the community and to encourage understanding by the community of the environment; and

(h) to receive representations on environmental matters from members of the public; and

(i) to provide advice on environmental matters to members of the public; and

(j) to publish reports on environmental matters generally; and

(k) to publish for the benefit of planners, builders, engineers or other persons guidelines to assist them in undertaking their activities in such a manner as to minimise the effect on the environment of those activities or the results thereof; and

(l) to keep under review the progress made in the attainment of the objects and purpose of this Act; and

(m) to coordinate all such activities, whether governmental or otherwise, as are necessary to protect, restore or improve the environment in the State; and

(n) to establish and develop criteria for the assessment of the extent of environmental change, pollution and environmental harm; and

(o) to specify standards and criteria, and the methods of sampling and testing to be used for any purpose; and

(p) to promote, encourage, coordinate or carry out planning and projects in environmental management; and

(q) generally, to perform such other functions as are prescribed.

Office of the Environmental Protection Authority

The five member EPA is supported in its work by a Department of state known as the Office of the Environmental Protection Authority (OEPA).

The OEPA was established by the State Government in November 2009 to give the EPA greater administrative independence.

The EPA could not undertake its work without the support of the dedicated public servants in the OEPA, who continue to meet the EPA's expectations for high quality assessments as well as excellent policy, guidelines and strategic advice.

In March 2009, the EPA published its review of environmental impact assessment with a series of recommendations to improve timeliness and achieve better environmental outcomes.

The OEPA was charged with the task of implementing those reforms.

As the reform program gathered momentum, further improvements were identified and implemented. This is as it should be: reform is an ongoing journey of continuous improvement.

In 2011, the EPA took soundings from a series of stakeholders about the progress of the reforms and the operations of the EPA and the OEPA. Stemming from this the OEPA implemented an organisational development program to build the capacity of the Department and improve the service culture.

In April 2012, the results of a client satisfaction survey of EIA clients showed strong support for a stand-alone Department assisting the EPA and marked improvement in its level of service and accessibility. This organisational development program, like the process reforms, is ongoing.

In 2013–14, the OEPA developed a new and clearer set of key performance indicators that better reflect the work of the Department. Importantly, two of the effectiveness indicators for the quality of assessments and policy rely on a confidential rating by EPA board members against best practice principles. This arrangement is working well, driving better levels of service to the EPA in the performance of its functions.

The EPA published a new EPA Strategic Plan in 2013 which sets its strategic directions for three years. The OEPA has responded by aligning its corporate activities to the EPA's Plan. Further, the OEPA has provided high levels of service at each of the EPA's monthly board meetings and in supporting the EPA's quarterly strategic dialogue sessions in which it takes stock of its progress on key issues.

Other departments and agencies

The EPA draws on advice and expertise from a range of sources, including several Government departments which have important statutory responsibilities in relation to aspects of the environment.

Close working relationships with these departments, and a good understanding of their respective roles and responsibilities, ensures the most efficient and effective management of potential environmental impacts and risks.

The EPA would like to acknowledge the important contribution of:

- the Department of Parks and Wildlife
- the Department of Environment Regulation
- the Department of Mines and Petroleum
- the Department of Water
- the Department of Aboriginal Affairs
- the Swan River Trust
- the Botanic Gardens and Parks Authority
- the WA Museum
- the Department of Planning
- the WA Planning Commission
- the Department of State Development
- the Department of Health
- the Radiological Council.

Bilateral agreement with the Commonwealth

The Bilateral Agreement between the Commonwealth of Australia and the State of Western Australia is designed to reduce duplication of environmental assessment. The Bilateral Agreement is made under section 45 of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) relating to environmental impact assessment.

The Bilateral Agreement accredits the EPA's Public Environmental Review level of assessment, which means that the Commonwealth can rely upon the EPA's assessment of a proposal at this level for the purpose of its approval decision under the EPBC Act. A separate assessment by the Commonwealth Department of the Environment is not required.

The EPA has been undertaking assessments on behalf of the Commonwealth under bilateral agreements since 2002. The current Bilateral Agreement was signed in March 2012 and subsequently amended on 16 July 2013 to recognise the EPA's *Environmental Impact Assessment Administrative Procedures 2012*, gazetted in December 2012.

For proposals assessed under the Bilateral Agreement, the EPA is required to ensure that its assessment report contains enough information about the impacts of the proposal on matters of national environmental significance to enable the Commonwealth to make an informed decision whether or not to approve the action under the EPBC Act.

In 2013–14, the EPA finalised the following reports under the Bilateral Agreement:

REPORT	DATE
1489 - Roe Highway Extension *(EPBC 2009/5031)*	13/9/13
1506 - Newmont Boddington Gold Mine Life of Mine Expansion *(EPBC 2012/6370)*	2/4/14
1514 - North Star Magnetite Project *(EPBC 2012/6689)*	23/6/14

The EPA notes with interest the negotiations that are taking place under the terms of the memorandum of understanding signed by the Western Australian and Commonwealth Governments in December 2013 to deliver a one-stop-shop for environmental approvals under Commonwealth and State legislation. It is proposed to accredit State processes to both assess and approve proposals and, in doing so, remove duplication of assessment and approvals. The one-stop-shop is being pursued through the development of a new and expanded assessment bilateral agreement and the development of an approvals bilateral agreement.

The EPA notes that the negotiations reached a key milestone on 20 May 2014 with the release of a draft assessment bilateral agreement for public comment. The draft agreement proposes to accredit both the EPA's levels of assessment – Public Environmental Review and Assessment on Proponent Information. The agreement also

proposes to accredit the clearing permit process administered by the Department of Environment Regulation. The current Bilateral Agreement accredits the EPA's Public Environmental Review process only.

While the new agreements will be broader in scope, the EPA is confident that the environmental impact assessment system in Western Australia is sufficiently robust to undertake any assessment tasks asked of it. The unique features of the assessment system in WA mean it is well positioned to be accredited should negotiations between the Commonwealth and State Government be successful. These features include the independent statutory Environmental Protection Authority reviewing proposals, a high degree of transparency (including public reports to the Minister), opportunities for public participation, and appeal rights.

Reform update

The EPA maintains an ongoing commitment to reviewing its policies and business practices to ensure it is efficient and effective in meeting its statutory obligations.

The Productivity Commission (the Commission) published a report in December 2013 on Major Project Development Assessment Processes in Australia which examines specific regulatory practices and provides recommendations for improving Australia's development assessment and approval processes.

The findings and recommendations in the report highlight and align with the benefits and initiatives that have stemmed from the reforms initiated from the EPA's review of the Western Australian environmental impact assessment (EIA) process that was completed in March 2009.

The Commission found that the WA process for EIA is a leading practice in early public participation and is a 'notable exception' in Australia for providing early opportunities for community input into the environmental scoping document.

Western Australia and the ACT were recognised by the Commission as the only jurisdictions that have a formal mechanism for initiating a 'strategic assessment' (i.e. assessment of a strategic proposal). The Commission recommended that governments should employ this type of tool in circumstances where it reduces regulatory burden and provides for positive environmental outcomes.

The Commission is also supportive of assigning the responsibility for major project assessment arrangements to an independent regulator, such as the EPA, that can be seen as fair and impartial.

Cooperative arrangements between regulators

The Productivity Commission supported cooperative arrangements between regulators, recommending:

> Regulatory agencies should establish cooperative arrangements – for example, memorandums of understanding (MOU) – for joint or substitutable assessment to minimise unnecessary duplication between major project assessment processes within a jurisdiction [p147].

The OEPA was acknowledged in the report as establishing a working group to progress an MOU with the Department of Aboriginal Affairs. The OEPA is also progressing new or updated MOUs with the departments of Environment Regulation, Parks and Wildlife, Planning, Mines and Petroleum, and Water to formalise the extent to which other regulatory processes can manage the environmental impacts of a proposal to meet the EPA's objectives.

The EPA commends this work as an important step in clarifying roles and responsibilities and improving communications to ensure the implementation of the EPA's significance framework and further streamline environmental assessments.

Contemporary policy framework

A critical ingredient in an effective impact assessment and environmental protection framework is contemporary and fit-for-purpose policies, guidelines and strategic advice.

Over the past twelve months, the EPA has focussed on two areas: updating the EPA's suite of policies; and continuing to improve the environmental impact assessment process and to explain these improvements through new guidance materials.

The EPA has a large suite of policy material which includes Environmental Protection Bulletins (EPBs) and Environmental Assessment Guidelines (EAGs), as well as the former EPA policy types of Position Statements and Guidance Statements. The EPA has also published over 50 pieces of strategic advice to the Minister for Environment under section 16(e) of the EP Act over many years. However, until recently many of the policies had rarely been systematically reviewed and did not reflect contemporary legislative and institutional arrangements or the current EPA priorities.

The EPA considers its suite of policies to be key instruments in guiding the community, proponents and decision-making authorities on the environmental impact assessment process. They outline the EPA's expectations and provide guidance, standards, criteria and methodologies to ensure that the EPA's objectives for each of its environmental factors can be met through the EIA process.

The EPA's review has focussed on whether its existing policies are contemporary, fit-for-purpose, clear and concise. As a result, some policies have been withdrawn and others have been updated or replaced. Further updates and replacements will be completed over the coming year. Where withdrawn policies contain valuable reference information, they have been archived on the EPA website.

Some groups and individuals have expressed concern about the withdrawal of policies and guidelines, believing that the EPA is 'vacating the space' on particular topics and issues, thereby weakening environmental protection. This is not the case or the intent of the EPA. The purpose of the EPA's policy and guidelines has changed to focus on guidance for the EPA's environmental factors and the environmental impact assessment process, rather than having policies more generally focussed on environmental values and risks.

It is the EPA's view that there is opportunity to highlight environmental values and risks through other instruments, such as this annual report to Parliament on the environment, or its strategic advice to the Minister for Environment.

In the last year the EPA has published a number of new guidelines including one on Scoping Proposals (Environmental Assessment Guideline 10) and another on Recommending Environmental Conditions (Environmental Assessment Guideline 11). Both these guidelines represent ongoing improvements to the EIA process and aim to give greater certainty and clarity about what is expected by the EPA.

The purpose of EAG 10 is to ensure that information provided to the EPA to support the EIA process is comprehensive, robust and focussed on the key environmental factors. It provides guidance, primarily for proponents and consultants, on the form and content of an environmental scoping document.

EAG 11 was developed to ensure that environmental conditions recommended by the EPA are relevant to and focussed on achieving the EPA's environmental objectives, and are able to be monitored and enforced. The guideline outlines the type of conditions that the EPA will recommend and reaffirms the importance of the assessment process and recommended conditions in providing the EPA with confidence that its objectives will be met. In providing this confidence, it also provides for concise, outcome-based conditions.

Continuous improvement – condition setting

Following the assessment of a proposal, the EPA makes recommendations to the Minister for Environment regarding its suitability which may include a set of conditions. The Minister in turn will make a decision regarding whether the proposal can be implemented, having regard for the EPA's recommendations. If the Minister approves the proposal any conditions are referred to as 'implementation conditions'.

Today, the Office of the EPA monitors compliance on hundreds of implementation statements on behalf of the Minister for Environment.

In 2009, when the Office of the EPA was established to support the work of the EPA, the then Minister for Environment noted:

> Complementing its increased independence, the EPA will now also have not only the ability to recommend conditions for a project, but also responsibility for monitoring the effectiveness of ministerial conditions over the life of the project. This will provide for continuous improvement and currency of the conditions that are recommended for development proposals.[1]

As part of its continuous improvement, the EPA conducts a quarterly review of the implementation conditions on proposals approved by the Minister to see how they differ from those originally recommended, determine the reason for any changes, and decide if the EPA needs to revise its practices or conditions in the future. For example, changes to implementation conditions are sometimes made as a result of new information being made available during the Minister's appeals determination or as a result of consultation with other decision-making authorities in the final decision-making process for a proposal. This formal review process has been in place since August 2012.

The EPA has particular regard for any significant changes and considers whether there are important improvements that should be implemented in its assessment of other proposals and in its recommendations for future proposals. It is also beneficial providing a feedback process for continually improving the links between environmental impact assessment and project compliance.

[1] Hon Donna Faragher MLC, Minister for Environment, Hansard, 14 October 2009

What does it mean when the EPA decides not to assess?

Many hundreds of proposals and planning schemes are referred to the EPA every year, but only a small proportion are formally assessed by the EPA.

This is because the EPA is required by law to assess only those proposals and schemes that are likely to have a **significant** effect on the environment.

This is the EPA's judgement to make, having regard to:

- the values, sensitivity, resilience and quality of the receiving environment;
- the extent and consequences of the likely impacts;
- cumulative impacts;
- public concern;
- confidence in the prediction of impacts and proposed mitigation; and
- the presence of other statutory decision-making bodies that can regulate the potential effects on the environment.

Clearly, community views can differ greatly on what is significant.

Importantly, when the EPA decides not to assess a proposal, it is not saying there are no environmental issues at stake. Rather, it is deciding that the likely environmental effects, in its judgement, are not so significant as to warrant a formal environmental impact assessment by the EPA. Often the EPA considers that the environmental issues can be adequately managed through other existing statutory processes.

These are not simple decisions. The EPA considers a wide range of information in making its determination as to whether it should formally assess or not, including the information submitted with the referral of the proposal and submissions made by the public.

If the EPA believes it does not have sufficient information to make a determination it can seek further information from regulatory bodies or other relevant people.

An example of this was the Laurel Formation Tight Gas Pilot Exploration Program (also known as the Buru proposal) which was referred to the EPA by the proponent, Buru Energy Limited. The Buru proposal was to carry out tight gas stimulation using hydraulic fracturing of four existing exploration wells in the Canning Basin area of Western Australia.

In the EPA's consideration of the Buru proposal the following environmental issues were identified: water quality; hydrological processes; and rehabilitation and closure. In its consideration of these issues the EPA sought further information from the departments of Water (DoW) and Mines and Petroleum (DMP).

Taking into account the advice provided by the DoW and the DMP, the referral information submitted by the proponent, and the public submissions that were received, the EPA had confidence to determine that the proposal was not likely to have a significant impact on the environment and decided not to subject the proposal to the formal environmental impact assessment.

On occasion, members of the public may come to a different conclusion, and there is the opportunity to appeal the EPA's decision to the Minister for Environment.[1]

On contentious proposals, the EPA will often publish a detailed statement of reasons explaining why it has decided not to formally assess the proposal.

In 2013–14 the EPA decided not to assess 48 referred proposals. Of these, the EPA provided public advice on 23 proposals, no advice was necessary on eight proposals and 17 proposals were able to be managed under Part V (clearing provisions) of the EP Act.

[1] Except in cases where the proposal is not assessed but is dealt with under the native vegetation clearing provisions of the EP Act.

... when the EPA decides not to assess a proposal, it is not saying there are no environmental issues at stake.

When does the EPA say no?

Every development proposal, like almost every aspect of human endeavour, has a direct or indirect impact on the environment.

The key question for the EPA in assessing the impact of a development proposal is whether the impacts can be brought within the bounds of environmental acceptability so they are no longer significant. This 'acceptability' is expressed through the EPA's environmental objectives, and its judgment is based on whether a proposal can meet those objectives with a range of management measures or strict conditions.

For those who are opposed to a development, the threshold of acceptability may differ from the EPA's view.

The EPA evaluates proposals considering the scientific evidence, the nature and feasibility of management measures proposed, the sensitivity of the environment and the track record of the proponent.

At times, the EPA can form an early view that a proposal cannot be made environmentally acceptable. In doing so, it provides the proponent with a procedural fairness opportunity to provide any further information, or to modify the proposal.

On other occasions, the EPA might consider a proposal requires a full public environmental review (PER) before drawing its conclusions. This does not imply a proposal has tacit approval. In fact, a PER process may also lead to a conclusion that a proposal is unacceptable.

The environmental impact assessment process is iterative. It involves detailed examination of proposals, questioning of assumptions and the science, consideration of advice and public input, and challenging proponents to meet best practice in the management of their proposals. It is a process that works to ensure proposals are brought within the bounds of acceptability. In those cases where the EPA's environmental objectives can't be met, the EPA advises the Minister that the proposal should not be implemented.

The Minister is entitled under State law to consider environmental, economic and social imperatives in making a final decision on whether a proposal may proceed.

Between 2008 and June 2014, the EPA recommended to the Minister that 16 proposals not be implemented. This represents about 10 per cent of all EPA assessment recommendations over the same period.

Table 1: EPA recommendations against implementation of a proposal between 2008 and August 2014, following formal environmental impact assessment.

	YEAR	PROJECT	MINISTER'S DECISION ON EPA RECOMMENDATION
1	2008	Yannarie Solar Salt, East Coast of Exmouth Gulf (July)	Withdrawn by proponent
2	2009	Granite Extraction, Lot 2036 Bird Road, Torbay (February)	Agreed
3	2009	City of Geraldton-Greenough Town Planning Scheme No. 1A Amendment 4 - Brand Highway, Cape Burney	Pending (as of August 2014)
4	2009	Town of Port Hedland Town Planning Scheme No. 5 Amendment No.20 Pretty Pool Stage 3 (July)	Withdrawn by proponent
5	2010	Development Application – Clearing of native vegetation and planting of 1250 olive trees, Lot 1612 Barrett Street Southern River (December)	Agreed
6	2011	Red Hill Quarry Development (January)	Partly Agreed
7	2011	Happy Valley Titanium Minerals Project (February)	Agreed
8	2011	Central West Coal Project (February)	Agreed
9	2011	Vasse Coal Project (May)	Agreed
10	2011	Coastal Walk Trail from Point Ann to Hamersley Inlet – Fitzgerald River National Park (May)	Agreed
11	2011	Proposed Extension to Existing Transport Depot, Lot 14 (No.1527) Great Northern Highway, Upper Swan (May)	Pending (as of August 2014)
12	2011	Rural Subdivision – Lots 1000, 2240, 2275, 2675 and 3045 Preston Beach Road, Lake Clifton (May)	Withdrawn by proponent
13	2012	Subdivision proposal: Lot 504 Lexia Avenue, Upper Swan, City of Swan (October)	Agreed
14	2013	Town of Port Hedland Town Planning Scheme 5 Amendment 59 - Rezoning from Industry to Mixed Business Various Lots, Port Hedland (August)	Withdrawn by proponent
15	2014	Town of Port Hedland Town Planning Scheme 5 Amendment 56 - Rezoning from Parks and Recreation to Marina Development, Part Lot 5751 Athol Street & Part Lots 5550 & 5178 Sutherland Street, Port Hedland (February)	Agreed
16	2014	Keane Road Strategic Link, City of Armadale (June)	Pending (as of August 2014)

Grevillea georgeana

Photo: Office of the EPA

Western Australia's environmental challenge

Western Australia has a remarkable environmental endowment of rich marine and terrestrial ecosystems spread over a vast geographic area, from the tropical north to the temperate south and the arid inland.

These ecosytems have developed in relative isolation over millions of years and are highly specialised for the environments in which they live.

There is the spectacular *Grevillea georgeana*, which grows on the Banded Iron Formation ranges of the Yilgarn but exists nowhere else on the planet. There is the Western Swamp Tortoise (*Pseudemydura umbrina*) – the most endangered tortoise in the world – which persists on our urban fringe despite encroaching development and other threats. These examples are replicated across the length and breadth of our State.

Western Australia is still very much a scientific frontier, with new species being discovered and new understanding being developed about the interaction, resilience and distribution of known species.

It is against this backdrop that the EPA assesses the environmental impacts of development proposals and planning schemes. The EPA has broader functions under the EP Act beyond its consideration of individual proposals - that is, to report on how we are protecting this endowment for present and future generations (s21 EP Act).

There is insufficient data collection and analysis to report on cumulative impacts against every environmental factor across the State.

However, through this annual report, the EPA will provide comment and analysis against the broad themes of Land, Sea, Water, Air and People, which collectively cover the EPA's 15 environmental objectives for Western Australia.

The Western Swamp tortoise breeding program at Perth Zoo began in 1989 and a Recovery Team was established in 1990.

Photo: Perth Zoo

Vegetation of the Blue Hills Range

Photo: Jake Cutler, Office of the EPA

Land

A varanid lizard at Cape Range National Park

Photo: Gary Williams, Office of the EPA

Land

Western Australia spans over 21° of latitude from the rugged Kimberley gorges in the tropical north, to the towering karri forests in the temperate south-west. The vast State occupies a third of the Australian continent, and includes eight of Australia's fifteen biodiversity hotspots.

Western Australia is home to some of the oldest land surfaces on earth from the Kimberley plateau and rugged Pilbara craton in the north which are estimated to be over two billion years old, to the southern Perth Basin formed up to 300 million years ago.

Thousands of unique flora and fauna species, more than 16,000 of which are found nowhere else in the world, have evolved over millions of years adapted to these ancient environments.

Eight of the fifteen Australian biodiversity hotspots are located within Western Australia in recognition of the high number of unique species found in the State, while the south-west is the only global biodiversity hotspot in Australia. Many of these species occur in small, localised populations and this restricted distribution makes them vulnerable to extinction through human disturbance of the environment. In addition, the State has an important role in the conservation of declining species – nine mammal species that were previously widespread in Australia are now restricted to Western Australia.

The productive mining and agriculture industry that generates economic prosperity in Western Australia can cause increased stress on the State's natural environments. In particular, these industries impact arid rangelands in the Midwest, Goldfields and Pilbara regions, which contain areas of high biodiversity.

In the south of the State increased urbanisation, as a result of a boom in population and subsequent residential development, puts pressure on the fragile Swan Coastal Plain surrounding Perth, which supports more plant species than the whole of the British Isles.

It is the responsibility of the EPA to consider these large and complex issues to ensure the environment is protected for the benefit of current and future generations of Western Australians.

EPA objectives

Flora and vegetation – to maintain representation, diversity, viability and ecological function at the species, population and community level.

Landforms – to maintain the variety, integrity, ecological functions and environmental values of landforms and soils.

Subterranean fauna – to maintain representation, diversity, viability and ecological function at the species, population and assemblage level.

Terrestrial environmental quality – to maintain the quality of land and soils so that the environment values, both ecological and social, are protected.

Terrestrial fauna – to maintain representation, diversity, viability and ecological function at the species, population and assemblage level.

Pressure point
Cumulative development pressure on the BIF ranges of the Midwest Region

The EPA has provided advice and recommendations on the values of Banded Iron Formation (BIF) Ranges for over 40 years. These ranges form part of the Yilgarn Craton geological formation that stretches from the southern Pilbara through the Midwest and east to the Goldfields.

In its 2012–13 Annual Report, the EPA focused on the cumulative impacts of development on the BIF Ranges that manifest in the Goldfields, specifically in an area called Mount Manning. This area includes the Helena-Aurora Range, noted for its outstanding environmental values.

This year, the EPA is turning its attention to the BIF Ranges that manifest in the Midwest region of the State, specifically an area called the Mungada/Karara/Koolanooka region, 200 kilometres south-east of Geraldton (Figure 1).

BIF Ranges are isolated ancient ranges, set in a predominantly flat landscape, that provide specialised habitats for plants, animals and ecological communities. These environments have high levels of plant endemism (with plants confined to a particular range) and host rare and geographically restricted species. The ranges were formed through uplifting, and have been undisturbed by seas or glaciers for more than 250 million years.

As high points in the landscape, the ranges are cooler and wetter than the surrounding plains and form island-like refuges for plants and animals not found in the flat, dry plains below. As a consequence each BIF range is biologically distinct, often supporting ecological communities and plant species that only occur on one range.

In 2013-14, the EPA reviewed information about the environmental values and development pressures in the Mungada/Karara/Koolanooka area. It found that while many development proposals had been implemented, the protection of the most important areas from a biodiversity perspective, most notably the Mungada Range, is yet to occur.

The Mungada/Karara/Koolanooka region occurs on the interface between the high and transitional rainfall zone. An analysis of plant diversity on the BIF ranges (Gibson et al. 2012) found that the ranges closest to the boundary between the arid zone (<300 mm rainfall) and the transitional rainfall zone (300-600 mm rainfall) have the highest concentration of specialist plant species. This study also identified the Mt Manning and Mungada/Karara/Koolanooka regions as hotspots of plant diversity within the BIF ranges of the Yilgarn Craton.

The Mungada/Karara/Koolanooka region supports high numbers of different plant species that only occur on BIF ranges, including species that have highly restricted distribution and only occur on one range (range endemics).

Mining on the Koolanooka Hills and Blue Hills ranges started in the 1960s but was mostly restricted to small-scale quarrying. However, in 2006 mining operations on these ranges started to expand to large-scale open pit operations.

The EPA has now formally assessed ten iron ore mining and infrastructure proposals in the Midwest Region (Table 2) and development activities have also been approved through other regulatory processes.

In 2009 the EPA recognised the environmental values of the Mungada/Karara/Koolanooka region in the assessment of three mining proposals. The EPA assessment of the Karara Iron Ore, Mungada Iron Ore and Koolanooka-Blue Hills Direct Shipping Ore proposals (EPA Reports 1321, 1322 and 1328) stated that the cumulative impacts arising from the proposed development could only be acceptable if a large, intact section of the Mungada Ridge was protected as class 'A' nature reserve, and any mining tenements relinquished.

In 2009, in determining the appeals on the Mungada and Karara Iron Ore projects (Appeals Convenor's Report 65-74/09) the then Minister for Environment stated that:

> a critical component with regard to the acceptability of both the Mungada Iron Ore Project and Karara Iron Ore Project proposals will be in ensuring that an adequate and representative portion of the Karara/Blue Hills/Mungada Ridge system is reserved for conservation purposes and protected from development.

In a letter to the Chairman of the EPA in 2009[1], the Minister advised that the final boundaries of the class 'A' nature reserve would be determined through Gindalbie Metals' offer to relinquish its Mungada Ridge tenement and negotiation with another [adjacent] tenement holder.

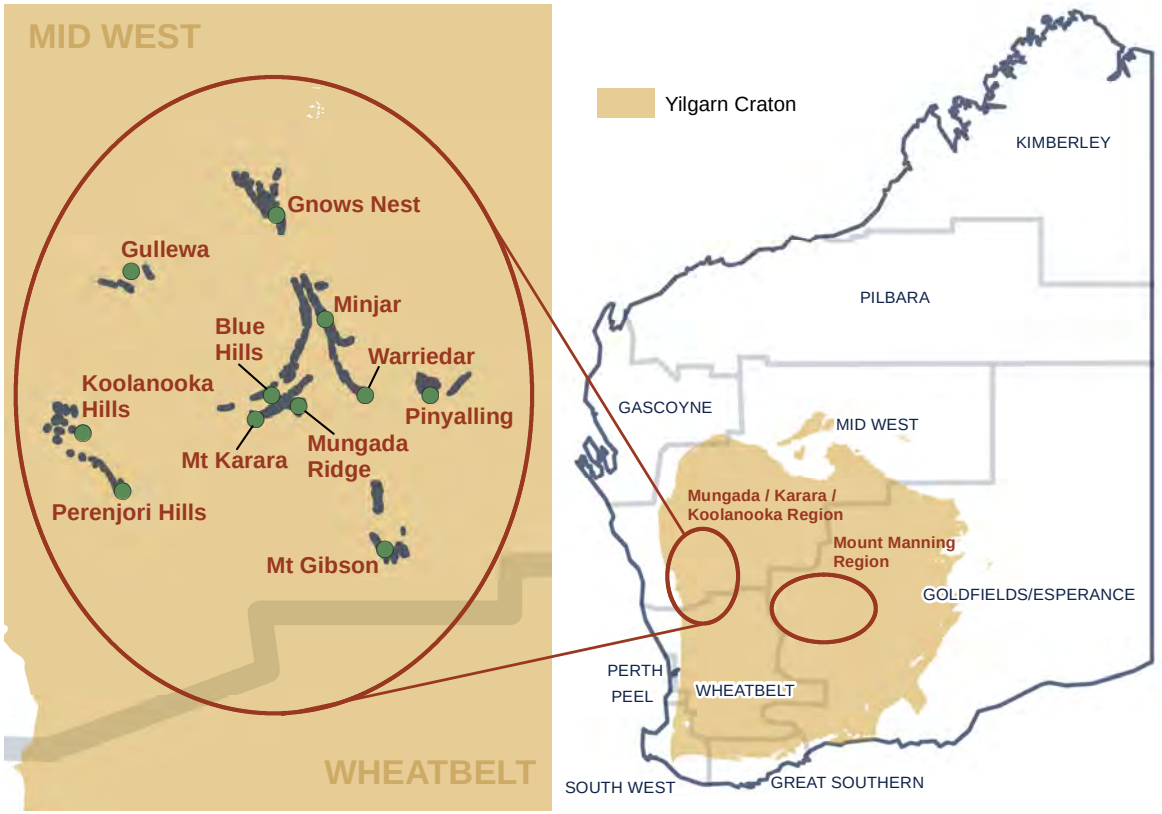

Figure 1: On the left, detail of the Mungada/Karara/Koolanooka region with mining locations (green circles). BIF ranges are marked in dark grey. The regional location of the Mungada/Karara/Koolanooka and Mt Manning regions in the Yilgarn Craton is shown on the right.

The EPA continues to support the State Government commitment to establish a class 'A' nature reserve on Mungada Ridge in recognition of its high environmental and landscape values and the cumulative impacts of development on the surrounding BIF ranges.

[1] Strategic Review of the Conservation and Resource Values of the Banded Iron Formation of the Yilgarn Craton. Letter to Dr Paul Vogel, EPA Chairman from Hon Donna Faragher, JP MLC, Minister for Environment; Youth. 8 April 2009.

Table 2: Summary of formal EPA assessments in the Mungada/Karara/Koolanooka region (Midwest)

ASSESSMENT STATUS	PROJECT	COMPANY	BIF RANGE	EPA RECOMMENDATION FOR PROPOSAL	GOVERNMENT DECISION ON PROPOSAL
Referrals / Assessments in Progress					
Referred	Blue Hills Expansion	Sinosteel Midwest Corporation Limited	Blue Hills Range (Mungada Ridge)	Level of Assessment in process (September 2014).	N/A
Assessment - PER	Exploration Drilling Perenjori Hills	Hermitage Holdings Pty Ltd	Perenjori Hills	Assessed at PER - Environmental Scoping Document in draft.	N/A
Assessment - PER	Koolanooka South Magnetite DSO	Westralian Iron Pty Ltd	Koolanooka Hills	Assessed at PER – PER document expected first half of 2015.	N/A
Completed assessments					
Report 1505 *March 2014*	Hinge Iron Ore	Karara Mining Limited	Blue Hills Range (north)	Can be managed to meet the EPA's objectives subject to conditions.	Proposal may be implemented. (MS 968)
Report 1472 *April 2013*	Shine Iron Ore	Gindalbie Metals Limited	Minjar/Gnows Nest	Can be managed to meet the EPA's objectives.	Proposal may be implemented. (MS 940)
Report 1441 *June 2012*	Weld Range Iron Ore	Sinosteel Midwest Corporation Limited	Weld Range	Can be managed to meet the EPA's objectives subject to conditions and offsetting.	Proposal may be implemented. (MS 908)
Report 1413 *August 2011*	Jack Hills Expansion	Crossland Resources Limited	Jack Hills	Can be managed to meet the EPA's objectives subject to conditions and offsetting.	Appeals dismissed. Proposal may be implemented. (MS 886)
Report 1328 *June 2009*	Koolanooka/ Blue Hills Direct Shipping Iron Ore	Sinosteel Midwest Corporation Limited	Koolanooka/ Blue Hills Ranges	Mungada East pit (on Mungada Ridge) excluded. Can be managed to meet the EPA's objectives subject to conditions and offsetting. Post assessment changes via s45C.	May be implemented, including mining at Mungada East pit, subject to conditions on rehabilitation, protection of the Threatened Ecological Community and public availability of project related EMPs. Government intends to reserve a large part of the Mungada Ridge. (MS 811)

ASSESSMENT STATUS	PROJECT	COMPANY	BIF RANGE	EPA RECOMMENDATION FOR PROPOSAL	GOVERNMENT DECISION ON PROPOSAL
Report 1322 *April 2009*	Mungada Iron Ore	Karara Mining Limited	Blue Hills Range	Terapod pit (on Mundaga Ridge) excluded. Can be managed to meet the EPA's objectives subject to conditions and offsetting. Post assessment changes via s45C.	May be implemented, including mining at Terapod pit, subject to conditions for protection of significant species, rehabilitation, public availability of project related EMPs. Impacts would be offset with creation of class 'A' nature reserve on relinquished part of Mungada Ridge as agreed by Government. (MS 806 & 896)
Report 1321 *April 2009*	Karara Iron Ore	Karara Mining Limited	Blue Hills Range	Can be managed to meet the EPA's objectives subject to conditions and offsetting. Post assessment changes via s45C.	May be implemented subject to conditions on protection of significant species, rehabilitation, public availability of project related EMPs. Impacts would be offset with creation of class 'A' nature reserve on relinquished part of Mungada Ridge as agreed by Government. (MS 805 & 895)
Report 1296 *July 2008*	Extension Hill Hematite Haulage	Mt Gibson Mining Limited	Mt Gibson Range	Can be managed to meet the EPA's objectives subject to conditions.	Proposal may be implemented. (MS 786)
Report 1242 *November 2006*	Mt Gibson Iron Ore	Mt Gibson Mining Limited	Mt Gibson Range	Can be managed to meet the EPA's objectives subject to conditions and offsetting. Post assessment changes via s45C, change to conditions via s46.	May be implemented subject to conditions and offsets. The Environment and Mines Ministers were also of the view that "...the southern ridges of Mt Gibson and Mt Gibson South require immediate long term protection and should be reserved as a class 'A' nature reserve." (MS 753 & 889)
Report 1220 May 2006	Jack Hills Iron Ore	Crossland Resources Limited	Jack Hills	Can be managed to meet the EPA's objectives subject to conditions.	Appeal allowed in part. Proposal may be implemented subject to conditions on rehabilitation, pest control, undertaking botanical surveys and an annual performance review. (MS 727 & 784

Mason's Darwinnia, Darwinnia masonii

Photo: Rachel Meissner, Department of Parks and Wildlife

BIF ranges of the Midwest Region

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Pressure point
Pilbara cumulative impacts

The EPA has drawn attention to the long-term environmental challenges faced by the Pilbara Region. While the economic values of the region are well described, the environmental impacts from development are less well known.

The EPA has made a series of practical recommendations to the Minister for Environment on the cumulative environmental impact from development in the Pilbara Region and how governments, industry and the community might work together to realise a long term vision that is ecologically sustainable.

The Pilbara Region has many diverse habitats including mangroves, grassland savannahs, mountain ranges, gorges, wetlands, and arid woodlands. It is an area of very high biodiversity possessing high species richness, many endemic plant and animal species, conservation significant plant species, and the highest diversity of lizard groups in Western Australia. Over the last 25 years, the number of known plant species has increased by over 55 per cent to approximately 1,700. Of these, 150 are of conservation significance (likely to be rare), but the majority are poorly known and need further research to fully understand their conservation significance.

The region is identified as one of only fifteen national biodiversity hotspots. In addition to having this high biodiversity value, the Pilbara Region is a mining hotspot, with 92 per cent of the region covered by live or pending mining tenements which produce approximately 95 per cent of the State's iron ore.

Over the past five years the iron ore industry has experienced unprecedented growth. This level of growth has not been matched with a similar increase in environmental knowledge. Despite our knowledge of the diversity of the Pilbara Region in a general sense, it is a large and remote area that suffers from a relative paucity of environmental data. While there have been efforts to gather large amounts of data through major surveys – such as the Pilbara Region Biological Survey undertaken by the then Department of Environment and Conservation – environmental impact assessment of each new proposal reveals species new to science. In many cases, these are only known from a few samples in areas that are identified for mining. There is a lot to be done to develop a clear picture of the environmental resources of the Pilbara as a whole.

Substantial amounts of the biological data have been collected by industry. However, these data require effective storage and collation to make them readily available to be used in environmental impact assessment and conservation planning.

Between 2009 and 2012, the EPA, in collaboration with government agencies, industry bodies and peak environmental groups, reported to the Minister for Environment on the concept of Shared Environmental Assessment Knowledge (SEAK). The purpose of SEAK was to develop a model for delivering improved environmental data management and knowledge-building in relation to the environmental impact assessment process.

In 2013, the WA government committed to the establishment of a publicly available online biodiversity, water and cultural heritage database and virtual library to assist the resources sector in protecting the State's unique biodiversity, natural environment and cultural history. The aim is to capture and aggregate historical and new environmental and heritage information and knowledge state-wide. The EPA believes that the creation of the database and library may assist in addressing the issue of data paucity generally, and that the Pilbara Region offers an opportunity to trial the approach to gauge its value and utility in identifying, understanding, and protecting the biodiversity values of this unique region.

Along with the recommendations associated with improving our knowledge of the environmental values of the Pilbara Region, the EPA has made a number of other recommendations to support the long-term protection of its biodiversity. The EPA believes there is a need for a long-term strategic plan for the Pilbara to identify and balance the environmental, social and economic interests of the region to ensure its long-term viability. The strategic plan should set clear goals and supporting strategies for conservation in the

There is a lot to be done to develop a clear picture of the environmental resources of the Pilbara as a whole.

region, so that development can continue without further impacting on the significant environmental values.

Since mining is so prevalent in the Pilbara, another important aspect of environmental protection is effective rehabilitation. As highlighted in the last Annual Report, a key concern of the EPA is the limited success, to date, in rehabilitating mine pits.

The EPA recognises the need for a coordinating mechanism to protect biodiversity values in the Pilbara. As such, and since 2011, the EPA has recommended offset conditions where appropriate to address the significant residual environmental impacts of development that require proponents to provide a contribution to a strategic conservation initiative fund. This strategic initiative could provide the link between the many different conservation actions by developing an investment framework and a suite of coordinated actions to protect and improve the environmental values and biodiversity of the region. Any decisions on such a proposal is a matter for Government.

The EPA is not alone in identifying the environmental challenges in the Pilbara Region. A recent report from the CSIRO on Priority Threat Management for Pilbara species of conservation significance (2014) suggests that without management intervention there is a 50 per cent chance that 13 (25 per cent) of 53 identified conservation significant plant and animal species are likely to be lost from the Pilbara in the next 20 years. Conservation significant species were defined as species either listed under federal and state legislation, under international agreements, or considered likely to be threatened in the next 20 years.

There is an opportunity for coordinated effort across all levels of government, industry and community to ensure the biodiversity values of the Pilbara are protected in the long term.

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Mulga Downs, Moojari Marsh, Pilbara.

Photo: Office of the EPA

Black Diamond Pool is an old open-cut coal mine near Collie, in the south-west of Western Australia, that has been flooded following closure of the mine in the 1950s and is now used for recreation. Mine closure planning should take into consideration potential future uses as poor water quality may have implications for human and environmental health.

Photo: Clint McCullough, University of Western Australia

Key issue

Mine closure planning

In its 2012–13 Annual Report, the EPA recognised the importance of mine closure planning, specifically relating to the management of mine pit lakes. Subsequently, the EPA has recently released Environmental Protection Bulletin 19 – *EPA involvement in mine closure* (EPB 19). The purpose of EPB 19 is to outline the roles of the DMP and the EPA in mine closure and explain the circumstances when the EPA will assess mine closure.

Under the *Mining Act 1978*, the DMP has powers to assess and enforce mine closure. In many cases, the DMP has the ability to regulate and mitigate the impacts from mine closure activities to meet the EPA's objectives.

The EPA will only assess and regulate mine closure and rehabilitation when a significant impact to the environment may occur. For example, when special or unique habitat is being impacted and needs to be restored post-mining. If the mining proposal is not referred to the EPA, or the EPA decides not to assess the proposal, then mine closure will be regulated by the DMP.

Where the EPA does not assess a proposal, the EPA will provide advice to the DMP on relevant environmental issues.

The EPA will assess all mining projects that are not subject to the Mining Act. Examples include mines that predate the introduction of the Mining Act and projects that are subject to State Agreement Acts (contracts between the Government of WA and proponents of major resource projects which are ratified by an Act of Parliament).

The EPA's expectation is that companies will follow contemporary guidance on mine closure where this is consistent with the project approval conditions.

The EPA makes further comment in relation to mine closure, and specifically the legacy of mine pit lakes, on page 56 of this report.

An eroded pit in the Pilbara

Photo: Office of the EPA

References and further reading

Department of Mines and Petroleum and Environmental Protection Authority 2011, *Guidelines for Preparing Mine Closure Plans*, June 2011, Perth, Western Australia. [Note: these guidelines are currently under revision.]

Key issue
Rehabilitation of disturbed landscapes

In its 2012–13 Annual Report, the EPA identified rehabilitation of disturbed landscapes as a key issue. Many development proposals considered by the EPA require the clearing and subsequent rehabilitation of native vegetation. The EPA's objective in recommending rehabilitation conditions is to return ecological function to a disturbed area.

Rehabilitation outcomes are also an issue in other Australian states and territories. A recent report of the Queensland Audit Office found that rehabilitation does not always occur once mining activities cease. The report found that a lack of rehabilitation actions could be attributed to a number of factors but is mostly related to unachievable rehabilitation requirements and insufficient financial provision. The report also found that while there are a number of reasons why a mine might go into care and maintenance, one may be to avoid commencing closure to circumvent rehabilitation obligations.

The challenges laid out in the 2012–13 Annual Report have raised debate about rehabilitation perceptions, challenges, successes and failures. As a result of the debate, rehabilitation has become a prominent topic of discussion and action within government, industry and the community. For example, in April the Association of Mining and Exploration Companies (AMEC) hosted a conference addressing mine closure and rehabilitation. The conference was described as a knowledge transfer event to find solutions for issues facing the mining industry. Additionally, the DMP is planning to lead a research project to investigate rehabilitation success in the Pilbara. The project aims to define rehabilitation successes and identify any required changes to the regulation and policy framework for rehabilitation.

Rio Tinto Iron Ore (RTIO) and BHP Billiton Iron Ore (BHPBIO) also provided a joint briefing to the EPA in 2014 on their rehabilitation scale, successes and challenges following mining and exploration activities. The presentation was applauded by the EPA as a significant step, being the first time that the companies have given a joint presentation, sharing information and working together on a way forward.

The EPA recognises that it may be difficult to restore ecological function within a development footprint, particularly for large scale mines and that a net environmental benefit may be achieved by applying resources to a wider landscape scale. The EPA encourages companies to discuss options early with regulators, as part of the mine closure planning process.

Recreating the specialised conditions which species require is a critical challenge, especially at the scale required to address the future rehabilitation required, with over 120,000 ha of disturbance in the Pilbara in the last 20 years. Of critical importance is landform design and construction, including soils. Without careful planning of these, onsite rehabilitation is unlikely to be successful.

Further, the cost of scaling up rehabilitation of disturbed landscapes is not fully understood. For example, it has been calculated that restoration of a selection of 88 dominant Pilbara species is approximately $749 per kilogram of seed with a standard seeding rate of 5-7 kilograms per hectare (Merritt & Dixon 2011). Based on this, approximately 840,000 kgs of viable seed would need to be harvested from the natural system, as currently practiced. At present, only 10 per cent of the seed required for rehabilitation programs is harvested annually.

Developing and scaling up current seed technology to meet the challenges of future rehabilitation will require forward planning and development of seed research and technology.

Procurement of seed is one of many components of rehabilitation plans. The recently commenced Western Australian Biodiversity Science Institute (WABSI) is developing a restoration and ex situ conservation research theme. The objectives of the theme are to develop research directions around topics such as low cost, scalable technology, the fundamentals of restoration, skill creation, effective closure standards and improved monitoring programs. While the objectives are currently broad, it is expected that government, academics, researchers and industry will ensure that the specific research topics can deliver the required outcomes.

The EPA welcomes the progress since its last annual report and supports continued investment in research and technology, together with collaboration through the WABSI research theme, to develop solutions to some of Western Australia's greatest rehabilitation challenges.

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Menz M, Dixon K, Hobbs RJ 2013, *Hurdles and Opportunities for Landscape-Scale Restoration,* in Science Vol. 339.

Merritt DJ and Dixon KW 2011, *Restoration Seed Banks – A Matter of Scale*, in Science Vol. 332, pgs 424-425.

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At present, only 10 per cent of the seed required for rehabilitation programs is harvested annually.

Rehabilitation substrate trials

Photo: Office of the EPA

Vegetation at Bush Forever Site 342, Forrestdale

Photo: Kathryn Schell, Office of the EPA

Key issue
Protecting a botanical jewel

Forrestdale is home to one of the most plant-diverse areas on the Swan Coastal Plain, known as the Anstey/Keane Dampland.

The 366 hectare Bush Forever Site 342, 20 km south-east of Perth in the City of Armadale, has high conservation value and in recent years has been encircled by urban and industrial development.

The area meets all of the EPA's criteria for determining regionally significant natural areas (EPA 2006) and has been identified as a conservation category wetland containing one of the largest remaining areas of damplands in the Perth Metropolitan Region, with a portion of the site included on the Directory of Nationally Important Wetlands in Australia.

In 2007, the Keane Road Strategic Link proposal was referred to the EPA and the level of assessment was set at Public Environmental Review. The road alignment proposed to split the Bush Forever site into two smaller areas.

The key environmental issue resulting from the proposed division of the Bush Forever site was increased fragmentation and edge effects, resulting in changes to vegetation composition and degradation of vegetation condition. In addition, the construction of a road through the Anstey/Keane Dampland would create localised interruption to hydrological function which would have significant impact on the biodiversity values and ecological processes.

When all of the environmental impacts were considered, the EPA determined that the proposal could not be managed to meet the EPA's objectives for Flora and Vegetation and Hydrological Processes (EPA 2014).

The EPA also noted the importance of the biodiversity of this site, as evident by the high diversity of vertebrate fauna and the known or likely occurrence of several flora species of conservation significance.

The Jandakot Regional Park Management Plan 2010 (Conservation Commission 2010) recommends that closed road reserves be amalgamated into the adjoining reserves and afforded an appropriate reserve purpose and tenure arrangement consistent with the protection and enhancement of the park values.

The EPA supports the closure of the Keane Road reserve and amalgamation into Bush Forever Site 342 for the greater protection and enhancement of the values of this regionally significant area.

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Success story: Bush Forever

Fourteen years ago, the Western Australian Government acted to protect regionally significant bushland across the metropolitan area, from Two Rocks in the north, east to Darlington and south to Serpentine.

The $100 million policy, known as Bush Forever, aimed to achieve a sustainable balance between conservation and development in Perth.

At the time, the then Planning Minister Graham Kierath said the State had acted to:

> … protect some really significant areas of bushland that otherwise may have been lost to development...
>
> Perth's biodiversity is already one of the highest recorded in any major city in the world and Bush Forever will ensure it would be retained for future generations.[1]

The policy, over a decade in preparation, was the product of multi-agency contributions and was endorsed by the EPA, the Western Australian Planning Commission, the former Water and Rivers Commission and the former National Parks and Nature Conservation Authority.

... around 87 per cent of Bush Forever sites is owned by the WA Government, with only five per cent remaining in private ownership.

Bush Forever remains the primary mechanism for conserving regionally significant bushland and associated wetlands in the Perth area. It aims to protect at least 10 per cent of the original extent of each vegetation complex on the Swan Coastal Plain portion of the Perth Metropolitan Region.

Bush Forever identified 51,200 ha of regionally significant natural areas for protection across 287 sites covering 26 vegetation complexes, which is equivalent to 18 per cent of the original vegetation extent in the study area.

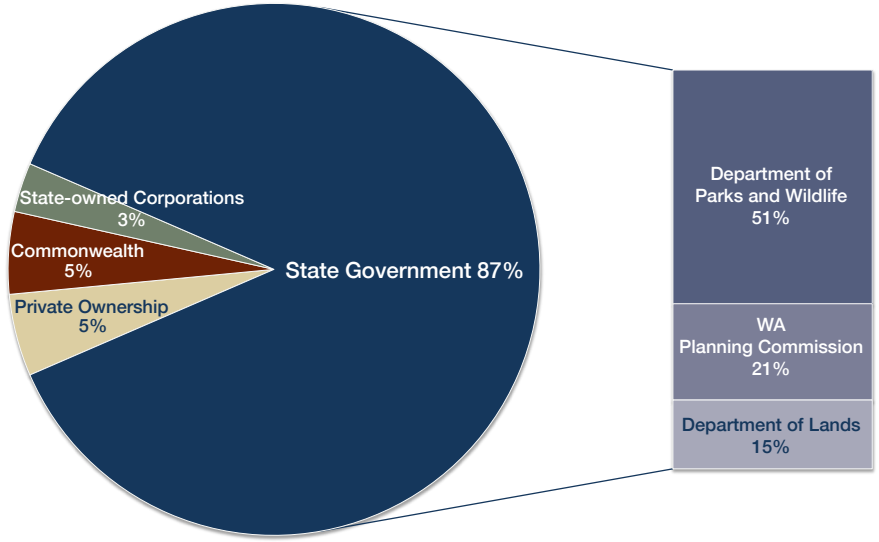

Figure 2: Bush Forever ownership, showing the breakdown of State Government owned sites.

To provide further guidance on the implementation of the Bush Forever policy, State Planning Policy (SPP) 2.8 *Bushland Policy for the Perth Metropolitan Region* was gazetted on 22 June 2010. The SPP was complemented by Metropolitan Region Scheme (MRS) Amendment 1082/33 *Bush Forever and Related Lands* which reserved 94 sites as Parks and Recreation. The gazettal of the SPP and the MRS amendment was seen as finalising the original Bush Forever policy and giving it statutory effect.

When Bush Forever was released, around two-thirds (33,400 ha) of the regionally significant vegetation identified already had some form of protection through reservation for Parks and Recreation in the MRS or as conservation reserves and State forest vested with the authority currently known as the Conservation Commission of Western Australia.

Today around 87 per cent of Bush Forever sites are owned by the WA Government, with only five per cent remaining in private ownership.

To date the WA Government has aquired approximately 1,100 ha of affected private property.

The EPA supports the ongoing security of Bush Forever sites as a key part of the State Government's strategy to protect the Perth-Peel Region's most important biodiversity.

Since 2000 there have been some losses and gains to Bush Forever sites, with an overall

net gain of 407 ha, around the size of Kings Park. While there has been a net gain, the EPA acknowledges that the replacement sites did not always match the values of those lost.

There remain major threats to Bush Forever sites such as development proposals for infrastructure projects, pressure for more active recreational areas, weeds, illegal dumping and improper use of the sites (e.g. dirt bike riding).

While Bush Forever has been successful in retaining the most important areas of remnant vegetation in the metropolitan region, it is an ongoing challenge for State and local government to ensure the sites are properly managed so their values are protected for future generations, consistent with the Government's original policy aspirations.

[1] Kierath, G (Minister for Planning) 2000, *Dianella open space protected under Government plan*, media statement, Perth, 27 December.

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Chromodoridae nudibranchs found on a muck dive off Albany

Photo: Stewart Gartland

Sea

Kimberley coast

Photo: Kevin McAlpine, Office of the EPA

Sea

The coastline of Western Australia is 20,781 kilometres long, and over a third of that (7,892 km) is associated with the state's 3,747 islands. The adjacent coastal waters cover an area of over 117,000 km^2, spanning a range of climatic regimes from wet tropical along the Kimberley coast to temperate along the south coast. The recent discovery by Geosciences Australia of several rocky islands in Commonwealth waters off northern Western Australia will increase the number of islands and the area of coastal waters under State responsibility even further.

The biological communities are shaped by the climatic regime, underlying geological structures and the intensity of, and exposure to, wave and tidal energy. The range of environmental settings, coupled with the relative isolation of Western Australia, has resulted in a diversity of marine life, much of which is found nowhere else in the world. Indeed, recent surveys in the Kimberley Region have identified a diversity of habitats including extensive coral reefs and sponge gardens that were previously unknown. It is expected that more discoveries will be made through the surveys being undertaken as part of the Western Australian Marine Science Institute Kimberley Marine Research Program.

Our coastal waters are considered nutrient poor by world standards, and productivity is dominated by benthic communities (e.g. algae, seagrass, coral and mangroves) compared to other parts of the world where pelagic communities (e.g. phytoplankton) provide the primary energy source to support fisheries and other marine life. Nonetheless these ecosystems support a diverse range of specially protected and culturally and commercially important biota that have adapted to these conditions, including prawns, fish, seabirds, marine turtles, and marine mammals such as sea lions and dolphins. The region between Shark Bay and the Kimberley supports perhaps the largest dugong population in the world. Over 30,000 humpback whales migrate annually along the coast from their summer feeding grounds in Antarctic waters to their calving grounds in the warm tropical waters off the north-western coast.

The cumulative loss of coastal marine habitats and pollution are recognised globally as two of the key threats to marine ecological integrity. With respect to these indicators the marine environment of the state is generally in good condition, however there are localised impacts around some major ports and some significant historical impacts.

Coral cover on a number of reefs in the west Pilbara (off Onslow) has declined by 85 per cent since 2009 and appears to be under continuing stress. This is largely attributed to a combination of higher than normal seawater temperatures and cyclone damage.

Importantly, there are currently no areas within the state's coastal waters that are polluted to the point where harvesting of seafood for human consumption is prohibited. The only

EPA objectives

Benthic communities and habitat – to maintain the structure, function, diversity, distribution and viability of benthic communities and habitats at local and regional scales.

Coastal processes – to maintain the morphology of the subtidal, intertidal and supratidal zones and the local geophysical processes that shape them.

Marine environmental quality – to maintain the quality of water, sediment and biota so that the environmental values, both ecological and social, are protected.

Marine fauna – to maintain the diversity, geographic distribution and viability of fauna at the species and population levels.

places where water quality is such that it is not advisable to swim, or to take seafood, is near treated domestic wastewater (i.e. treated sewage) outlets due to the possibility of human pathogens.

In Western Australia losses of benthic habitats are generally associated with dredging and reclamation for ports and coastal infrastructure developments such as those associated with bulk commodities (such as iron ore) and petroleum (such as LNG export facilities). Reductions in environmental quality are mainly related to discharges of domestic and industrial wastewater (treated sewage, desalination brine), contaminated stormwater and groundwater, and shipping and port operations (product spillages, antifouling paints). Contamination issues can also be exacerbated by breakwaters, canals and other structures that reduce natural flushing.

The main sources of acute pressure on marine fauna are also localised and associated with increasing vessel activity and construction activities such as pile-driving and blasting.

Marine biosecurity remains a significant issue for the marine environment with the threat of Introduced Marine Pests (IMPs) growing with increased coastal development and associated vessel activity. IMPs can have significant impacts on biodiversity, ecological function and the economy. Until recently WA has avoided a serious IMP incursion. However, the invasive colonial ascidian, or sea squirt, *Didemnum perlucidum*, first recorded in the Swan River in 2010, is now confirmed in several locations around the coast of WA, including Cockburn Sound and the waters off Barrow Island. *D. perlucidum* can foul and smother naturally-occurring marine organisms and habitat. It can also colonise artificial structures and is a focus for monitoring, research and management by the State Government.

Coastal structures such as solid breakwaters, can alter the natural processes that shape the coast and cause localised erosion/deposition. A notable example of this is the build-up of large volumes of seagrass wrack that typically occurs on the up-current side of some marina breakwaters and groynes. Left unmanaged, the impact on coastal processes can threaten the integrity of man-made structures and natural uses such as seabird and turtle nesting, and impact on human health and amenity.

Key issue
Protecting marine water quality

Our coastal waters, and the biota they support, are highly valued by the community for their recreational opportunities such as swimming, snorkelling and fishing, and because they provide economic value by supporting commercial fishing and aquaculture, and tourism industries. As such, protection of the marine environment from pollution has been, and continues to be, an issue close to the heart of most Western Australians.

Although the quality of our marine waters is generally high, this has not always been the case. In the past we have had some serious contamination and pollution issues, associated with high levels of contaminant inputs to poorly flushed marine embayments in the south-west of the State. For instance, in Cockburn Sound over 80 per cent of the seagrass meadows were permanently lost to nutrient pollution from domestic and industrial sources, and seafood was contaminated with heavy metals. Similarly in Princess Royal Harbour near Albany, a combination of domestic, industrial and agricultural sources of contamination resulted in significant seagrass loss and contamination of waters and seafood. The contamination reached levels where fishing was banned because the fish were unsafe to consume.

These levels of contamination and pollution were clearly unacceptable to the community.

Following scientific investigations by the EPA to find the cause of the problems and formulate solutions, concerted action was taken by government, industry and other stakeholders to implement those solutions. Water quality subsequently improved and the declines in seagrass halted. We have learnt from these incidents and, through better management and higher reuse and treatment of wastes, these water bodies are now generally free from contamination, safe to swim in and the fish within them are safe to consume. But this has come at significant cost, and arguably the resultant environmental quality falls short of what would have been the case if these pollution events had been prevented in the first instance.

The high quality of our marine environment is often taken for granted in WA, and although the quality of individual discharges and the management of activities are now significantly better than they once were, we cannot afford to be complacent. The escalating number, and in some cases scale and nature, of these discharges and activities means that it is increasingly important to consider the cumulative effects of the discharges and maintain an oversight on the state of the marine environment.

To that end the EPA has prepared a draft Environmental Assessment Guideline for protecting the quality of Western Australia's marine environment.

The guidance sets out a framework for ensuring the environmental values of the State's marine waters are recognised and protected through the construction and operational life of authorised development proposals that involve waste discharges to the marine environment. It helps

managers to identify where problems are likely to emerge and why. It is much better to identify potential problems early and intervene to prevent pollution, rather than to have to implement costly measures to fix a problem once pollution has occurred.

The framework is designed to protect and maintain the quality of the State's marine environment consistent with the community's long-term aspirations. Environmental values form the basis of the framework from which broad environmental quality objectives, including levels of ecological protection, are established and spatially defined. Environmental quality criteria that represent environmental quality thresholds of 'acceptability' are then established based on scientific, social and other imperatives. These thresholds are benchmarks against which environmental monitoring data are compared in order to determine the extent to which environmental quality objectives have been met.

The framework is based on the recommendations of the National Water Quality Management Strategy and has been progressively implemented through the environmental impact assessment process and direct community consultation. It provides a mechanism for allowing seemingly incompatible uses to co-exist and provides a common and agreed environmental quality plan for all to work towards.

In simple terms, the intent of the framework is to prevent pollution. It provides a basis for managing water quality to the best practicable standard and consistent with community expectations. It also recognises those small areas where some marine values will not be protected and/or a lower level of ecological protection might been determined to be acceptable (e.g. the immediate vicinity of a wastewater outfall).

Although the focus is on ensuring the EPA's objective for marine environmental quality is met through the environmental impact assessment of development proposals, it will also be a useful resource for public authorities or others with responsibilities for the regulation of waste discharges or managing areas of the State's marine waters.

References and further reading

Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2000, *National Water Quality Management Strategy Report 4*, ANZECC & ARMCANZ, Canberra, ACT.

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A compound ascidian – Coronation Atoll, Abrolhos Islands

Photo: Hans Kemps, Office of the EPA

Dredge plumes at the Wheatstone LNG facility near Onslow

Photo: Curtin University Remote Sensing and Satellite Research Group using data from the USGS Landsat 8 satellite.

The construction of the Wheatstone LNG processing and export facility near Onslow involves the largest single dredging project in Western Australia to date. Up to 50 million cubic metres of material is being dredged to create a new shipping channel and port.

Information from remote sensing images such as this, coupled with actual measurements in the field, help scientists in the Dredging Science Node to develop the knowledge to better predict and manage the impacts of dredging and spoil disposal.

This satellite image shows sediment plumes from dredging the new shipping channel (bottom), sediment plumes from the spoil disposal site (top) and long thin sediment plumes between these caused by propeller wash from moving vessels.

To gain an appreciation of the scale of the dredging, Thevenard Island in the top left of the image is 5.53 km long.

Key issue
Understanding the impacts of dredging

Dredging has been a key issue for the EPA during its assessment of most recent proposals for coastal developments in Western Australia. Many of these dredging projects are large by world standards and the likely extent, severity and duration of impacts on the marine environment are difficult to predict. The EPA's reports have highlighted this predictive uncertainty as a major consideration and recommended a concerted effort across government, industry and the research sectors to begin to redress these shortcomings.

As such, the EPA is pleased to note that the Dredging Science Node of the Western Australian Marine Science Institution (WAMSI) has commenced and is now 12 months into operation.

The Dredging Science Node has been established to enhance the capacity of government and industry to predict and manage the impacts of dredging and the first phase is a three to four year program of targeted research. The Node is addressing key areas of uncertainty and involves inter-disciplinary research delivered through a combination of reviews, field studies and laboratory experimentation.

The Dredging Science Node is also an example of the strategic use of offsets. The Node is funded from offset requirements of three different proposals and the pooling of these funds has enabled a quantum of work that would not be possible if each offset was implemented independently and in isolation.

The Node is building significant new research capacity in the area of dredging-related science and also provides mechanisms to facilitate the application of research outputs. A total of $7.95M has been allocated from WAMSI for this program of work and, with co-investment, the total value of the proposed research to date is over $17M. This research program has brought together 10 research institutions with 48 scientists, 33 technicians and support staff and nine PhD students.

Literature reviews describing the current state of knowledge have been undertaken and will inform subsequent laboratory studies. Three field programs have also been completed in the vicinity of the Wheatstone Dredging Project off Onslow and these have provided a unique opportunity to conduct applied dredging research in a real-world setting. Over the next two years a range of laboratory experiments on corals, seagrasses and sponges will be undertaken to establish thresholds and indicators of ecological response to dredging related pressures.

Collectively, the knowledge generated through this research program will be freely available and represent a 'compendium of contemporary best practice' for dredging impact prediction, monitoring and management for Western Australia and beyond. The EPA looks forward to seeing the outcomes of this strategic research applied as they become available to improve certainty in the EIA process.

References and further reading

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Environmental Protection Authority 2009, Gorgon Gas Development Revised and Expanded Proposal: Barrow Island Nature Reserve, Report 1323, EPA Perth, WA.

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Environmental Protection Authority 2012, Port Hedland Outer Harbour Development, Report 1427, EPA Perth, WA.

Environmental Protection Authority 2012, Browse Liquified Natural Gas Precinct, Report 1444, EPA Perth, WA.

Environmental Protection Authority 2012, Anketell Point Port Development, Antonymyre, Shire of Roebourne, Report 1445, EPA Perth, WA.

Key issue
Protecting Cockburn Sound

Cockburn Sound is a sheltered marine embayment located approximately 20 kilometres south-west of the Perth CBD. Its calm waters have attracted a wide range of commercial and port-related activities including heavy industry along the eastern shore. These activities must be carefully managed to ensure the recreational and ecological attributes highly valued by the community are maintained. The intensively used waters of Cockburn Sound are also a favourite recreational fishing ground for a range of species and home to iconic species of marine fauna such as Little Blue Penguins (*Eudyptula minor*) and the Indo-Pacific Bottlenose Dolphin (*Tursiops aduncus*).

Historically Cockburn Sound has received industrial wastewater discharges from a number of sources along the eastern shore and has been subjected to considerable pressure from dredging programs. As a result seagrass meadows have declined by about 80 per cent of their original extent within the Sound.

With growing concerns that environmental quality in Cockburn Sound was not improving and yet pressures from development were increasing the State Government established the Cockburn Sound Management Council (CSMC) to coordinate environmental planning and management in the Sound and its catchment. The EPA also prepared the State Environmental (Cockburn Sound) Policy 2005 to identify the environmental values to be protected, environmental quality objectives to be achieved and the levels of ecological protection to be met at any particular location. This policy has recently been revised and an updated State Environmental (Cockburn Sound) Policy 2014 (the SEP) developed.

The CSMC comprises representatives from a range of stakeholders including government departments, industry, environment groups and the local community, and is supported by the Department of Environment Regulation.

The role of the CSMC is critical to ensuring that the SEP is implemented appropriately by resourcing and coordinating environmental quality monitoring programs and reporting on the health of the Sound to the Minister for Environment, the Western Australian Parliament, and the community – a role it has been carrying out successfully since 2005.

The CSMC has been a useful forum for addressing issues collaboratively, leading to significant reductions in the pressures and some improvement in environmental quality which has in turn eased community concerns.

Recent annual reports on the state of the Sound suggest that most indicators of environmental health are met and that the Sound is in a reasonably stable condition. However, although levels of toxicants appear to be relatively low, seafood is safe to eat and water quality is safe for swimming, there still appear to be some water quality impacts related to excessive nutrients in the southern end of the Sound and this may be impacting on seagrass health in the area. Seagrass health also appears to be compromised adjacent to the Naval facilities on Garden Island where a nutrient-rich groundwater plume intercepts with marine waters. The EPA is also aware there has been a collapse of the crab fishery in Cockburn Sound for a second time in the last eight years. The cause of the collapse is uncertain, but research scientists believe that sea temperature may be one major factor contributing to poor larval recruitment in some years.

Although heartened by the success of the CSMC and the structures established through the SEP, in light of concerns about the nutrient status of the Sound, uncertainty about the reasons for the collapse of the crab fishery, and potential future development, the EPA believes there is cause to be vigilant to ensure the Sound remains in a stable condition.

...the EPA believes there is cause to be vigilant to ensure the Sound remains in a stable condition.

References and further reading

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Photo: Cockburn Sound Management Council

Success story: Protecting Port Hedland mangroves

Port Hedland, in WA's Pilbara Region, is home to one of the world's busiest ports which is located within a mangrove-fringed tidal inlet and creek system. Most of the mangrove communities that were present there over 150 years ago when the ship the 'Mystery' first dropped anchor in the inlet, now known as Port Hedland harbour, are still thriving today. Port Hedland demonstrates how application of the EPA's established policy framework has streamlined the environmental impact assessment (EIA) of development proposals and enabled rapid and significant industrial growth within or adjacent to healthy marine ecosystems, without compromising ecological integrity and biodiversity.

Initially the port serviced the pastoral industry, but it soon began to export significant quantities of natural and mineral resources. In the 1960s the port began exporting iron ore, now the dominant export trade, and in 2005–06 became the first port in Australia to exceed 100 million tonnes per annum. Further development has seen total annual exported tonnage in 2012–13 exceed 288 million tonnes with future modelled capacity reaching 495 million tonnes. This growth and expansion has required significant dredging, shoreline modification, and port facility upgrades to accommodate large bulk ships to export commodities.

The development of the port and other nearby industries (e.g. solar salt production facilities) has resulted in the incremental loss of benthic primary producer habitats (BPPH, e.g. corals, seagrass and mangroves) which play important roles in maintaining the structural and functional integrity of marine ecosystems and the supply of ecological services. Loss of these important habitats is a key consideration of the EPA and recognised globally as one of the key threats to the ecological integrity of the marine environment.

The mangrove forests along the Pilbara coastline are very productive ecosystems and represent the largest single area of relatively undisturbed tropical arid zone habitat in the world. Mangroves are important structurally as well as functionally as they stabilise and protect shorelines from erosion and the severe weather common to the Pilbara. They also maintain marine environmental quality by filtering pollutants originating from the land. Mangroves serve as valuable nursery areas for many marine organisms such as fish, crabs and prawns and including some threatened and endangered species.

The cumulative loss of mangroves and other intertidal habitats (e.g. algal mat communities) associated with development in and around the port are significant issues for the EPA's assessment of development proposals in the area.

In December 2009, the EPA published Environmental Assessment Guideline 3 *Protection of Benthic Primary Producer Habitat in Western Australia's Marine Environment* (EAG 3) which specifically addresses direct human disturbance to BPPH and provides proponents with guidance to evaluate the extent and acceptability of cumulative losses of BPPH associated with development proposals. This cumulative impact is defined as the sum of all irreversible loss of, and serious damage to, BPPH caused by human activities since European habitation. (Note: natural gains and losses of areas vegetated by benthic primary producers are important to understand but are not considered when estimating cumulative loss of BPPH which focusses more on loss of habitat over longer timeframes due to human activity.)

After applying key environmental protection principles within EAG 3, e.g. impact avoidance and minimisation and best practice, if no greater than 10 per cent of the BPPH within a local assessment unit (LAU) for a port area is lost then it is unlikely to pose unacceptable risk to ecological integrity. LAUs are spatially defined areas used by the EPA to assess cumulative loss of BPPH.

By establishing guidance and a standardised LAU for Port Hedland inner harbour the EPA has provided proponents and stakeholders with critical location-specific information to track and account for development-related BPPH loss which in turn can be used to streamline the assessment of development proposals.

Cumulative losses of mangoves in the Port Hedland LAU slightly exceed the cumulative loss guideline of 10 per cent. The EPA has a general expectation that when cumulative loss approaches 10 per cent, efforts are taken to improve levels of understanding about the role and importance of BPPH, and the potential consequences of their loss for maintenance of ecological integrity.

The EPA notes that, consistent with this expectation, the Pilbara Ports Authority (PPA) has undertaken significant research into the mangrove communities within the port, including classifying the existing communities and implementing mangrove health monitoring. The results of these efforts have given the EPA confidence that ecological integrity within the harbour is being maintained.

Furthermore, the EPA notes that the PPA is also researching the potential for rehabilitating degraded mangrove habitats or establishing new mangrove areas in the harbour ecosystem through its mangrove rehabilitation project. This research includes mangrove propagation trials in purpose-built flow-through saltwater nurseries and the creation of additional mangrove habitats in areas away from strategic industrial zones to offset some of the historical losses that have occurred. The EPA acknowledges this ongoing and proactive work by the PPA.

Across a period of significant and rapid expansion Port Hedland is now the biggest bulk export port in the world and yet still has approximately 86 per cent of the mangroves from pre-European settlement levels . This level of mangrove preservation and maintenance of ecosystem integrity is unprecedented globally for a port of this size.

The EPA considers Port Hedland a good example of where its environmental principles, policy and guidance, in relation to BPPH, have been succesfully applied to enable large-scale development to be undertaken in an environmentally sustainable and acceptable approach.

References and further reading

Environmental Protection Authority 2001, *Guidance Statement for protection of tropical arid zone mangroves along the Pilbara coastline* (Guidance Statement No. 1), EPA, Perth, WA.

Environmental Protection Authority 2009, *Environmental Assessment Guideline for the Protection Of Benthic Primary Producer Habitats In Western Australia's Marine Environment* (EAG 3), EPA, Perth, WA.

Environmental Protection Authority 2011, *Environmental Protection Bulletin No.14 Guidance for the assessment of benthic primary producer habitat loss in and around Port Hedland*, EPA, Perth, WA.

Port Hedland is now the biggest bulk export port in the world and yet still has approximately 86 per cent of the mangroves from pre-European settlement levels

Weeli Wolli Creek, central Hamersley Range, east Pilbara, adjacent to Rio Tinto's Hope Downs 1 iron ore mining operation.

Photo: Annarie Boer, Office of the EPA

Water

Estuarine waters at Fitzgerald River National Park

Photo: Gary Williams, Office of the EPA

Water

Western Australia is fortunate to have a diverse range of inland waters including many estuaries, rivers and wetlands, and significant groundwater aquifers. These inland waters support a diverse array of ecological values, environmental features, and spiritual, amenity and recreational values. They also provide significant water supplies to support the wellbeing of the community and the economy of the State.

Western Australia has over 208 major waterways and 171 estuaries, including the Swan-Canning River system. Wetlands occur in all areas of the State, including the dry mid-west and north-west regions where they support unique ecosystems and provide refugia for a range of plant and animal species.

Groundwater is located throughout the State as both superficial aquifers, used broadly by the community, and deeper confined aquifers which primarily support public drinking water supplies, agriculture and industry throughout the State. The most significant groundwater resources are the sedimentary aquifers of the Perth Basin, which stretches from Geraldton to Augusta, and the remote Canning Basin in the West Kimberley.

Fractured rock aquifers occur primarily in the Pilbara, Yilgarn and Kimberley areas. While they support local use primarily for stock water supplies and mining, and maintain important environmental values, they do not provide reliable regional scale water supplies.

Protecting the quality and ensuring sustainable use of these groundwater resources is vital to protect dependent ecosystems and to support long-term use, and is dependent on robust water use and land-use planning and management, based on good science.

Reduced rainfall has impacted significantly on waterways and groundwater, particularly in the south-west areas of the State. This has changed water regimes in rivers and wetlands, and reduced recharge to both superficial and confined aquifer systems. It is occurring alongside continuing growth in water use associated with population growth and economic development. While many south-west water resources are close to or fully allocated, significant future growth is forecast for the Canning Basin and Kimberley surface water systems.

Water use across the State has more than tripled over the past 20 years, and is forecast to continue to increase rapidly with population growth and economic development. While the focus of recent extraction has been the Perth Basin aquifers and Pilbara fractured rock aquifers, there is significant future extraction forecast for the Canning Basin and Kimberley surface water systems.

While hydraulic fracturing to support onshore shale and tight gas extraction is not yet a widespread practice, it has the potential to grow quickly in the northern Perth and Canning Basins. The EPA is actively involved in ensuring that the knowledge-base and regulatory regime are appropriate to ensure that this emerging industry does not adversely impact groundwater quality and quantity, and the values that groundwater systems support.

EPA objectives

Hydrological processes – to maintain the hydrological regimes of groundwater and surface water so that existing and potential uses, including ecosystem maintenance, are protected.

Inland waters environmental quality – to maintain the quality of groundwater and surface water, sediment and biota so that the environmental values, both ecological and social, are protected.

Key issue
Managing the legacy of mine pit lakes

In its 2012–13 Annual Report, the EPA discussed the legacy of mine pit lakes and identified gaps in our understanding of how these lakes will behave over many hundreds of years. The legacy of mine pit lakes is an ongoing issue with advances in current mining technology likely to create larger and deeper mine pit lakes.

Pit lakes form once mining ceases and the mine pit is no longer dewatered, allowing the mine voids to fill with groundwater. To date, the EPA has assessed a number of mining proposals, including iron ore, gold and uranium mines, which will result in the formation of mine pit lakes. The EPA has ensured that the assessments of pit lakes takes into account the level of understanding of how they will behave over time. The EPA has an expectation that proposals for mining consider the risks associated with a range of issues; for example, impacts to birds from changed water quality and the potential for saline plumes of water to move from pit lakes into regional groundwater.

The EPA has been an active participant in a number of research groups on pit lakes and is contributing to ongoing research in this area, and has substantially contributed to the revision of the joint Department of Mines and Petroleum (DMP) and EPA mine closure guidelines to be released in late 2014, particularly in relation to the pit lake risk assessment methodology. The advice is based on the understanding gained from the EPA's recent assessments of pit lakes, as well as contemporary research.

The EPA received a presentation from Dr Mike Trefry, a leading researcher in water resources and mine site environmental impacts from the CSIRO, on contemporary mine pit lake assessment and the research conducted in other jurisdictions across Australia, including modern remedial approaches to mine pit lakes. Dr Trefry noted that pit lakes are an emerging issue across Australia.

The EPA will continue to advance the assessment of mine pit lakes through the environmental impact assessment process, ensuring that current research and management technologies are considered and implemented. These management options could include risk based correction actions, such as further risk assessments or remediation, backfilling the mine pit to above the water table, or treatment of the water in the pit lake. The EPA will also continue to work with the DMP on mine closure issues involving pit lakes and will encourage the development of local expertise in this scientific and environmental management frontier.

References and further reading

Australian National Committee on Large Dams (ANCOLD) 2012, *Guidelines on Tailings Dams – Planning, Design, Construction, Operation and Closure* (May 2012)

A hard rock aggregate quarry in Martin, east of Perth.

Photo: Colin Strickland, Department of Mines and Petroleum

Key issue
Shale and tight gas regulation

The EPA has been working throughout the year to ensure it is well positioned to understand and assess the environmental impacts associated with hydraulic fracturing of onshore gas reserves. Hydraulic fracture stimulation is an oil and gas extraction process used to stimulate the release and flow of oil and gas.

Hydraulic fracturing is a practice of great interest and concern to the community, and the EPA recognises the need to build community confidence in how hydraulic fracturing proposals are considered through the environmental impact assessment process.

During the year, the Chairman attended and the EPA made a written submission to the WA Parliament Inquiry into the Implications for Western Australia of Hydraulic Fracturing for Unconventional Gas, being conducted by the Standing Committee on Environment and Public Affairs. The EPA's submission focussed on building community confidence in decision-making on hydraulic fracturing proposals through:

- transparent and open communication, by both regulators and proponents;
- a robust regulatory framework;
- a sound knowledge base about the target groundwater basins, the receiving environment, and the chemicals and techniques involved; and
- the application of a precautionary approach and best practice management, especially where there is any uncertainty about the potential risks and impacts to the environment.

The EPA looks forward to the findings of Parliamentary inquiry.

To date the EPA has received referrals of six proposals which have involved the practice of hydraulic fracturing (see Table 3).

In each case, the EPA determined that the potential environmental impacts were not so significant as to warrant formal environmental impact assessment by the EPA because:

- they have all been small scale, proof-of-concept proposals;
- the hydraulic fracture stimulation is proposed to occur at significant depths (well below aquifers), ranging from 1,500 m to 3,500 m across the proposals. In each case, there is significant vertical separation with impermeable barriers of rock, shale or other layers that do not transmit water between the fracturing zone and fresh water aquifers;
- it is satisfied with the regulation of well drilling, casing construction, and well rehabilitation and closure by the Department of Mines and Petroleum (DMP). In particular, the EPA is confident that there is a negligible risk of leakage between aquifers, introduction of contaminants to other aquifers, and from abandonment of wells;
- the management, storage and disposal of produced water, which contains contaminants associated with fracking fluid, is appropriate to manage risks, given the quantities involved and toxicity of the materials; and
- through DMP's regulation, each proposal is subject to the approval of Environment Plans that are required to demonstrate that environmental risks of the activity will continuously be reduced to as low as reasonably practicable.

The EPA is preparing for the potential referral within the next few years of larger-scale trials or full production-scale proposals involving hydraulic fracturing. A priority for the EPA is to ensure that the studies undertaken and information provided to the EPA are robust and sufficiently comprehensive to enable a thorough assessment of the environmental impacts and risks.

A key issue for the EPA is the level of understanding about the various groundwater basins and aquifer systems which may be impacted by hydraulic fracturing. There is very good fundamental knowledge about the Perth Basin as a result of many years' investigative work by the Department of Water, the Water Corporation, other agencies and individual developers. This means that the impacts from hydraulic fracturing will be well informed by science, enabling the EPA to have confidence through the assessment process. However the aquifers are also used for public drinking water supplies, agriculture and industry throughout the State and so the consequences of any adverse environmental impacts have the potential to be significant.

Conversely, the Canning Basin is less well understood and investment in science to inform decision-making is required. The EPA considers that there is an important need for baseline

scientific knowledge at a region wide scale to underpin the assessment of any proposals.

While region-wide studies are beyond the capacity of any individual proponent, proponents will be required to provide the EPA with local-scale details of aquifer characteristics with conceptual models, supported by data obtained through proof-of-concept proposals.

The EPA will shortly publish guidance for proponents outlining the EPA's expectations around the studies and information required to support the environmental impact assessment of larger-scale proposals.

References and further reading

Natural Gas from Shale and Tight Rocks: An overview of Western Australia's regulatory framework, Western Australian Department of Mines and Petroleum, February 2013.

Australian Council of Learned Academies report: in 2013, ACOLA published Engineering Energy: Unconventional Gas Production A study of shale gas in Australia.

Initial report on the Independent Review of Coal Seam Gas Activities in NSW, NSW Chief Scientist and Engineer, July 2013

Table 3: Proposals referred to the EPA which involve hydraulic fracturing

DATE RECEIVED	PROPONENT	PROPOSAL
18/08/2011	Arc Energy Limited (Parent company AWE Limited)	Woodada Deep-01 Hydraulic Fracture Stimulation, 10km west of Eneabba, Carnamah
19/08/2011	Norwest Energy NL	Arrowsmith 2 Hydraulic Fracture Stimulation - EP 413, 30 km north of Eneabba, Shire of Irwin
12/10/2011	Latent Petroleum Pty Ltd (Parent company Transerv Energy)	Drilling Program and Hydraulic Fracture Stimulation in EP407, Warro Gas Field, Shire of Dandaragan
28/09/2011	Arc Energy Limited (Parent company AWE Limited)	Senecio 2 Well - Drilling and Hydraulic Fracture Stimulation approximately 22 km north-east of Port Denison Shire of Dongara
13/11/2013	AWE Limited	Drover-01 Exploration Well, North Perth Basin, Shire of Coorow
18/12/2013	Buru Energy Limited	Laurel Formation Tight Gas Pilot Exploration Program, Shire of Broome and Shire of Derby-West Kimberley

A five month old hatchling Western Swamp Tortoise (Perth Zoo bred) at a special event to celebrate 50 years of monitoring at Ellenbrook Nature Reserve, October 2013

Photo: Ruth Clark, Office of the EPA

Success story: Safeguarding Western Swamp Tortoise habitat

The western swamp tortoise, *Pseudemydura umbrina*, is the smallest Australian tortoise and is found only in a few small freshwater swamps north-east of Perth, Western Australia. Thought extinct in the early 1900s, the tortoise was rediscovered by a young boy in 1953.

The tortoise has a specialised habitat, living in the swamps during winter and going underground during summer and autumn to escape the intense summer heat and dehydration from the dry conditions in a process called aestivation. They are long-lived, generally sexually mature at 13 years, and lay one clutch of eggs per year. Add to this that the tortoises are carnivorous and only eat live prey at specific water temperatures, it is no wonder it is the most endangered tortoise in the world, listed internationally and nationally as critically endangered with less than 50 breeding adults in the wild.

Since the 1950s, the population of the tortoises has fluctuated due to reduced rainfall, increased predation, clearing of vegetation, and draining of their original habitat. Over the last 50 years, a range of programs and plans have been put in place to secure the future of the last remaining habitat, establish new habitat, and expand the population numbers.

In 1962 the nature reserves, Ellen Brook and Twin Swamps, were created especially for the preservation of the tortoise. Radio tracking of the tortoises within these reserves began the

following year. One of the original tortoise's to be tracked, a female estimated to be 65 years old, is still reproducing.

The Perth Zoo breeding program, initiated in 1988, has boosted populations in the wild with the release of over 500 juvenile tortoises over a 25-year period into the tortoise nature reserves and, more recently, the newly established habitat areas of Moore River and Lake Wannamal nature reserves.

The EPA has been active in the protection of tortoise habitat since 1983 when it made a recommendation stating protective buffers around the Ellen Brook and Twin Swamps nature reserves should be established.

The first recovery plan was published in 1994 to provide detailed information and management actions for the conservation of the tortoise and its habitat. The recovery plans are modified every few years depending on whether there are new findings, changes in species' status and completion of recovery actions; the latest published in 2010.

In 2003, the EPA recommended the approval of the Western Swamp Tortoise Habitat Environmental Protection Policy covering known habitats within the City of Swan. The Environmental Protection Policy set out a program of protection including the requirements:

- that public authorities and landowners manage land in the policy area in a way that minimises or avoids impacts from activities that might degrade the habitat; and
- that government promote awareness of the policy and provide advice to landowners for the purpose of minimising or avoiding impacts from activities that might degrade the habitat.

The Environmental Protection Policy was formally reviewed and resulted in a substantially unchanged policy released in February 2012. In addition to this State policy, the EPA identified a need for local area plans to specify land uses and control measures to provide greater clarity and certainty for landowners adjacent to the tortoise habitat in the City of Swan and Shire of Gingin regarding any applications for planning approval. This would also provide guidance for local government authorities in making decisions on development applications.

Through the establishment of a working group the EPA developed detailed advice for the City of Swan on appropriate planning measures to meet the needs of the protection of the tortoise habitat. The EPA encourages the planning authorities to now take the lead in overlaying any planning constraints to create the local plans necessary. The EPA is proud to have been a partner in programs that have enabled this critically endangered tortoise, teetering on extinction, to be given a second chance.

References and further reading

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Department of Conservation and Environment 1983, *Conservation Reserves for Western Australia as recommended by the Environmental Protection Authority – 1983. The Darling System – System 6. Part II: Recommendations for Specific Localities.* DCE, Perth, WA..

Government of Western Australia 2003, *Environmental Protection (Western Swamp Tortoise Habitat) Policy 2002*. Government Gazette No 24, 18 February 2003.

Government of Western Australia 2012, *Environmental Protection (Western Swamp Tortoise Habitat) Policy 2011*. Government Gazette No 21, 14 February 2012

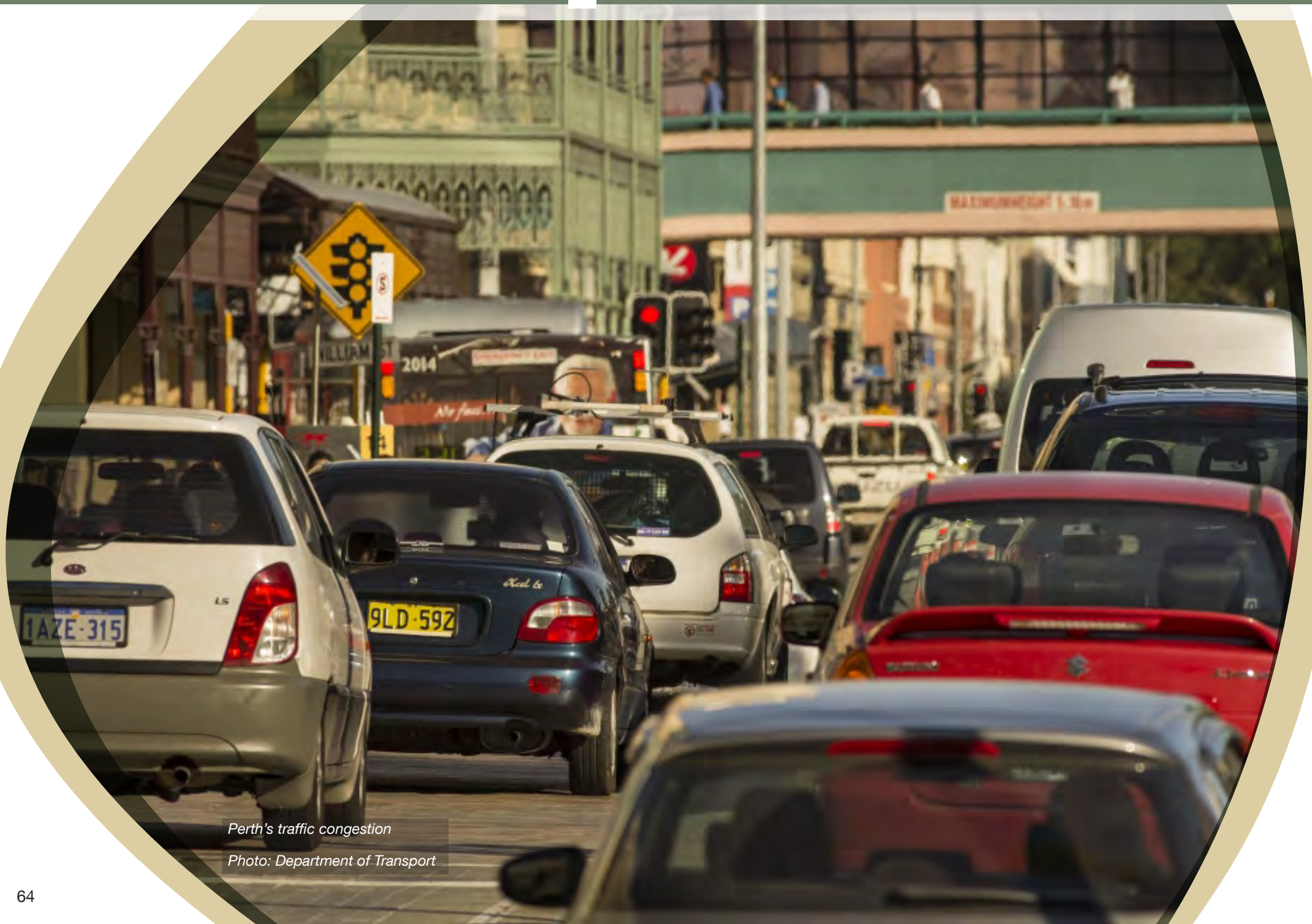
Office of the Environmental Protection Authority 2012, *Western Swamp Tortoise Frequently Asked Questions*, OEPA, Perth, WA.

... it is the most endangered tortoise in the world, listed internationally and nationally as critically endangered with less than 50 breeding adults in the wild.

View of the Kwinana industrial area from Mt Brown

Photo: Office of the EPA

Air



Perth's traffic congestion

Photo: Department of Transport

Air

With a growing population and strong economic growth across the state, the maintenance of air quality remains a high priority for the EPA. Air emissions have both local and regional impacts and the development of a region can influence overall air quality.

Perth has one of the fastest growing populations in Australia and a high proportion of car use. Vehicle emissions from increasing traffic and congestion are a major contributor to poor air quality, particularly on major roads and congestion spots. Over three quarters of Perth commuters still travel to work by private vehicle. A major shift to other forms of transport, including public transport, cycling and walking can significantly improve air quality.

Industry can be a contributor to air pollution and the EPA believes that any industrial expansion should be undertaken with a good understanding of the cumulative impacts of emissions. The establishment of land use planning buffers in high emitting industrial centres would balance and resolve conflicts between industrial development and residential land uses. This will protect human health as well as providing certainty for industrial and economic growth.

Smoke from bushfires can affect air quality for short periods, as the impacts from unplanned fire events are very difficult to predict and manage. Of concern is that the changing climate may increase the risk of bushfire. Smoke from prescribed burning can also impact air quality. The Department of Parks and Wildlife monitors weather conditions to avoid smoke impacts from prescribed burning over population centres. Cumulative impacts from air quality need to consider impacts from bushfires as well as industrial and other sources of air pollution.

The Department of Environment Regulation (DER) has an ambient air quality monitoring network which includes locations in Perth, Bunbury, Busselton, Collie, Albany and Geraldton. The network monitors the state of air quality against National Environment Protection Measure (NEPM) standards. NEPM standards have been established for sulfur dioxide, nitrogen dioxide, ozone, carbon monoxide particles and lead. Air quality data, including annual air monitoring reports, is publicly available from the DER's website.

EPA objectives

Air quality **– to maintain air quality for the protection of the environment and human health and amenity.**

A waste-to-energy plant in Spittelau, Austria - one of the plants included in the review of waste to energy technologies.

Photo: Jeff Whyte@shutterstock

Key issue
Waste to Energy

In 2010 and 2011, the EPA became aware that several companies were exploring the possibility of developing waste to energy facilities as a solution to reducing landfill in Western Australia. Waste to energy is the process of converting waste products (such as scrap timber, nappies and soiled paper) into some form of energy (such as heat, steam or gas). Some plants process a single type of waste, such as wood, while others process a mix of waste, such as household refuse. Modern waste to energy plants are built primarily to capture energy, whereas older (pre-1990s) waste incinerators were designed primarily to reduce the volume of waste going to landfill.

In late 2011, the then Minister for Environment requested the EPA and the Waste Authority to provide advice on the environmental and health impacts of waste to energy technologies. The advice was designed to evaluate the performance of the industry and determine whether modern plants could be operated successfully in Western Australia and to acceptable community standards.

To undertake the review, the EPA and the Waste Authority engaged a consultant to investigate globally the performance of a number of plants, the regulatory regimes in place and the literature available on health and environmental impacts. The review focussed on plants across Europe, Asia and the United States, and investigated various technology types.

The consultant produced three detailed reports that indicated modern waste to energy plants could operate within strict standards and that they are required to meet emissions requirements among the most stringent of any industrial process in the world. Assisted by the review, the EPA and the Waste Authority then provided strategic advice to the Minister for Environment on how a waste to energy industry should be regulated in WA to ensure the safety of the community and the environment. In particular, the advice suggested ground rules for any company wishing to pursue a proposal in Western Australia. This included only allowing proven technology components for use in commercial plants and setting the standards for emissions at best practice with a minimum criteria equivalent to the European Union.

There have now been five proposals referred to the EPA for waste to energy plants. The EPA's advice has helped to ensure that:

- proponents are aware of the expectations of the EPA;
- there are clear criteria against which proposals can be assessed;
- there is clarity on the interaction between the Part IV and Part V processes of the *Environmental Protection Act 1986*; and
- the community has confidence in the approach to regulation of these facilities.

The EPA has concluded its assessments of the Boodarie Waste to Energy plant in Port Hedland, Eastern Metropolitan Regional Council's Resource Recovery Facility in Red Hill and the East Rockingham Waste to Energy and Material Recovery Facility. In all cases, the EPA recommended that the proposal could be implemented as it was confident that its environmental objectives could be met. This in part reflected that the proponents of these facilities addressed the EPA's advice through the design and proposed management of their proposals.

The EPA will maintain a watching brief on this developing industry and notes that there remains a degree of public concern about some proposals.

References and further reading

Environmental Protection Authority and Waste Authority 2013, *Environmental and health performance of waste to energy technologies – Advice of the Environmental Protection Authority to the Minister for Environment under Section 16(e) of the* Environmental Protection Act 1986, EPA and WA, Perth, WA.

WSP 2013, *An Investigation into the Performance (Environmental and Health) of Waste to Energy Technologies Internationally*:

- Summary Report
- Stage One - Review of Legislative and Regulatory Frameworks for Waste to Energy Plants
- Stage Two – Case Studies
- Stage Three - A Review of recent research on the health and environmental impacts of Waste to Energy Plants

Table 4: Waste to energy proposals referred to the EPA

PROPONENT/PROPOSAL	LOCATION	EPA REPORT	DECISION
New Energy Corporation (Port Hedland Waste to Energy and Materials Recovery Facility, Boodarie Industrial Estate)	Port Hedland	1469	Approved by Minister
Eastern Metropolitan Region Council (Resource Recovery Facility)	Red Hill	1487	Approved by Minister
New Energy Corporation (East Rockingham Waste to Energy and Materials Recovery Facility)	East Rockingham	1513	Recommended by EPA; in Appeals process
Kwinana WTE Project Co Pty Ltd (was Phoenix Energy) (Kwinana Waste to Energy Project)	Kwinana	Under assessment by EPA	N/A
Eastern Metropolitan Regional Council (Hazelmere Wood Waste to Energy Plant)	Hazelmere	Under assessment by EPA	N/A

Key issue
Greenhouse gas emissions and our changing climate

Western Australia's climate is changing. This manifests in the form of temperature and sea level rises, increased fire frequency, more intense extreme events and changed rainfall patterns.

The Stage 3 summary report of the Indian Ocean Climate Initiative (IOCI) states that

> the May to July drying trend in south-west Western Australia intensified and expanded over a wide area in the last ten years ....further rainfall reductions may be expected in south-west Western Australia in all months from May to October.

With respect to the north-west of the State, IOCI projections

> suggest that tropical cyclones could increase in size, and that the most intensive tropical cyclones in this region could become still more powerful and destructive.

The EPA remains concerned about the emission of greenhouse gases from electricity generation and industry.

Guided by Guidance Statement 12 Minimising Greenhouse Gas Emissions the EPA has recommended conditions aimed at reducing greenhouse gas emissions on development proposals for over a decade. Whilst specific recommendations varied from proposal to proposal, the EPA has consistently targeted management objectives such as minimising emissions through best practice, benchmarking, continuous improvement, monitoring and reporting of emissions, and offsetting significant residual impacts.

The Commonwealth legislative and policy regime for managing greenhouse gas emissions is continuing to evolve, and the EPA is maintaining a watching brief on the situation to assist in determining its own ongoing role.

It recognises that Guidance Statement 12 is based on scientific information and a policy and regulatory environment that are no longer current. The EPA intends to confirm its policy position in this area once the policy and regulatory context, particularly at Commonwealth level, has been clarified.

In 2012 the Western Australian Government stated that

> the bulk of mitigation policy will occur at the national level. However, the State Government sees a role for 'complementary action' which assists the national mitigation effort.[1]

With this in mind, the EPA will, on a case by case basis, continue to scrutinise greenhouse gas emission intensive proposals that are subject to environmental impact assessment to the extent that the issues are not addressed through other mechanisms. The EPA will be guided by the objectives under the EP Act, the significance framework as set out in Environmental Assessment Guideline No. 9 and its guiding principle of encouraging best practice to minimise emissions as low as reasonably practicable.

The EPA may also, on a case by case basis, take into account the projected impacts of climate change in its assessment of proposals. With the continuing increase in greenhouse gas concentrations in the atmosphere, potentially significant impacts on the environment need to be considered early in the design phase of proposals. Projected climate change impacts on WA and approaches to address these impacts are included in the Western Australian Government's strategy 'Adapting to our changing climate' of October 2012.

In June 2012 the EPA released Environmental Protection Bulletin No.18 which sets out the EPA's expectations for environmental impact assessment with respect to sea level rise, which is one of the projected consequences of a changing climate.

The EPA is cognisant of the uncertainties surrounding climate change projections and impacts. However, the EPA believes that consideration of the impacts of a proposal in light of a changing climate may be required.

[1] Western Australian Government 2012, *Adapting to our changing climate*, Department of Environment and Conservation, Perth, WA.

References and further reading

Environmental Protection Authority 2002, *Guidance Statement No 12 - Minimising Greenhouse Gas Emissions*, EPA, Perth, WA.

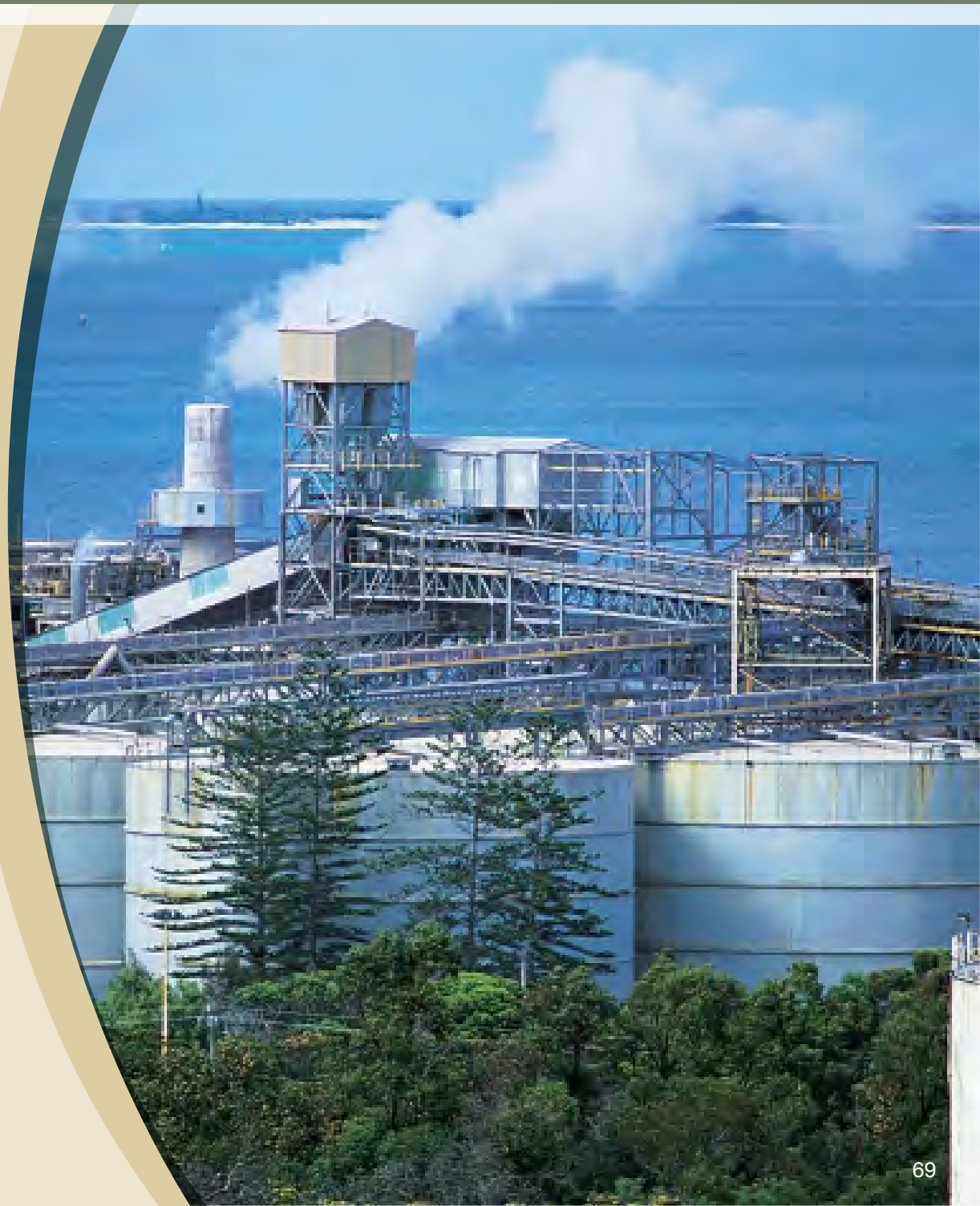
Environmental Protection Authority 2012, *Environmental Protection Bulletin No 18 – Sea Level Rise*, EPA, Perth, WA.

Environmental Protection Authority 2013, *Environmental Assessment Guideline for Application of a significance framework in the environmental impact assessment process – Focusing on key environmental factors* (EAG 9), EPA, Perth, WA.

Indian Ocean Climate Initiative – Western Australia. http://www.ioci.org.au

Western Australian Government 2012, *Adapting to our changing climate*, Department of Environment and Conservation, Perth, WA.

Australian Government Department of the Environment 2014, *Climate Change Impacts in Western Australia*, Intergovernmental Panel on Climate Change, Fifth Assessment Report, working group contributions.



Success story: Kwinana air shed protection

Sulfur dioxide is a colourless, pungent irritating gas which in high concentrations is associated with respiratory illness and lung damage as well as causing leaf damage to plants, reduced crop productivity and corrosion of building materials.

In the late 1970s, emissions of sulfur dioxide from Kwinana industries caused significant pollution in nearby residential areas. In response, the EPA developed the Kwinana Environmental Protection Policy (Kwinana EPP) and Regulations (1992) to ensure that air quality in the region was protected by managing sulfur dioxide and particulate emissions in the Kwinana Industrial Area.

The Kwinana EPP defines three areas (A, B and C) that together make up the policy area, and sets ambient standards and limits for sulfur dioxide and total suspended particulates in each area. The standards increase in stringency from heavy industry (area A) to predominantly residential and rural (area C). The EPP facilitates monitoring of source emissions and ambient air quality, licensing of individual industries, and modelling and assessment of the adequacy of emission limits.

... science alone cannot determine a land use planning boundary.

The Kwinana EPP ensures the ambient air concentrations in area C are suitable for residential land use by setting limits for air emissions in areas A and B.

The Kwinana EPP has undergone a number of reviews since 1992. Both the 1999 and 2009 reviews resulted in the EPP remaining unchanged. Public submissions to the most recent review were supportive of the content and purpose of the EPP.

Air quality monitoring in and around the Kwinana Industrial area is undertaken as part of the DER's ambient air quality monitoring network. The ambient sulfur dioxide levels are currently well below the standards and limits set.

The Kwinana EPP has been an effective air quality management tool and continues to provide assurance that sulfur dioxide levels will not increase to unsafe levels in the future.

For many years, the Kwinana EPP areas have operated as de facto land use planning buffers. The EPA has been critical of local governments allowing urban subdivisions and other developments to encroach into the protection areas, which has been compounded by the absence of a formal land use planning boundary. Often, people look to science to determine such a boundary. Monitoring of emissions provides a snapshot of what is happening today. Modelling of emissions may provide a guide, based on a series of assumptions, as to what may happen in the future - but science alone cannot determine a land use planning boundary. It is for planning authorities to make a judgement on an appropriate buffer, based on available science and current and future land uses, but with a precautionary mindset. The EPA notes the recent Supreme Court judgement[1] in which Martin J observed:

> Avoiding future land use conflicts must surely be a relevant planning consideration. I reject any submission that it is unreasonable, let alone manifestly unreasonable, for a planning authority such as WAPC to have in mind as a consideration future land use conflicts. To proceed otherwise on my assessment would defy logic and common sense, indeed strike at the very rationale for having a planning body assessing proposed subdivisions at all. By its very nature, the statutory function of a 'planning' body must involve a prospective consideration of matters that may arise in the future.

The EPA recognises there have been recent discussions about a legislated buffer zone between industrial and residential land uses in Kwinana. This is a welcome development which, if implemented, will significantly assist the task of providing certainty for industry while at the same time protecting human health and amenity.

[1] Macri -v- Western Australian Planning Commission [2014] WASC 153

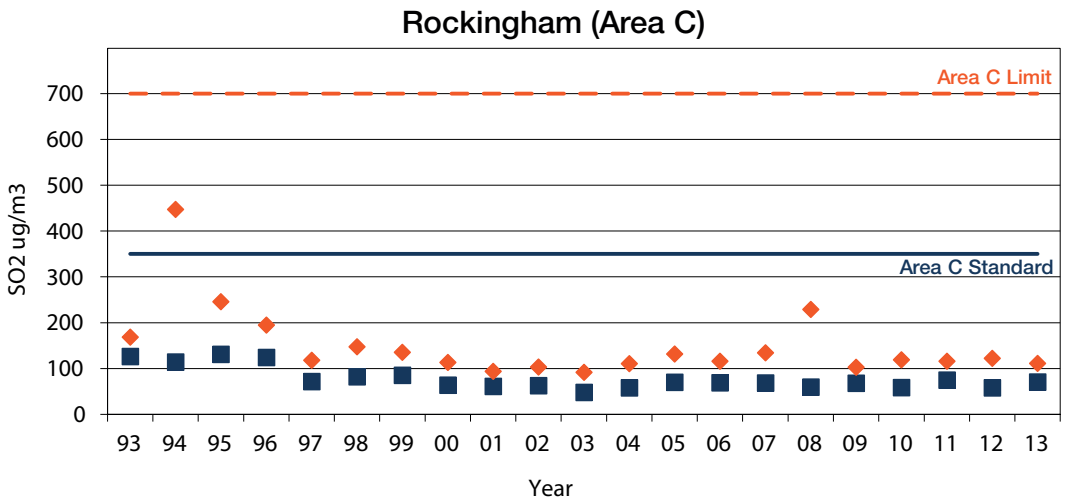


Figure 3: This graph depicts the maximum hourly-averaged (orange diamonds) and 99.9th percentile (blue squares) sulfur dioxide (SO2) concentrations for each year, compared to the EPP limit (dashed line) and EPP standard (solid line) respectively, for the Rockingham air quality monitoring station, one of several in the Kwinana EPP areas.

The graph shows that, since 1995, actual sulfur dioxide concentrations remain well below both the EPP limit and the EPP standard.

References and further reading

Department of Infrastructure and Transport 2013, *State of Australian Cities 2013*, Commonwealth of Australia, Canberra, ACT.

Environmental Protection Authority 2007, *State of the Environment Report: Western Australia*, Department of Environment and Conservation, Perth, WA.

Environmental Protection Authority 2009, *Discussion Paper, Options for the review of the Environmental Protection (Kwinana) (Atmospheric Wastes) Policy 1999*, EPA, Perth, WA.

Western Trade Coast Industries Committee 2014, *Premier protects WA's key industrial zone*, Media Statement, 20 January 2014.

Department of Environment Regulation 2014, *2013 Western Australia Air Monitoring Report*, DER, Perth, WA.

Contour faming near Northam

Photo: Gary Williams, Office of the EPA

People

Kalamina Gorge, Karijini National Park

Photo: Helen Butterworth, Office of the EPA

People

When assessing proposals and considering the overall impacts on the environment, the EPA includes consideration of impacts on people, where those impacts arise from potential changes to people's physical, biological and social surroundings and interactions between all of these.

The definition of environment in the EP Act includes the "social surroundings of man" being "his aesthetic, cultural, economic and social surroundings". This definition enables the EPA to assess the potential impact of a proposal to the extent that those impacts directly affect a person's amenity, heritage or health.

From a public health perspective, EIA was traditionally focused on the human health risks associated with emissions, discharges and waste from proposed development, i.e. what proposed development may put into the environment, not what it may take out or change.

However people's disconnection from nature as a result of development or land use change can have a detrimental effect on their lives and health, while the reverse is also true; that connecting or re-connecting with nature can improve health outcomes. Therefore, while the EPA still considers potential impacts on people such as noise, dust and odour, harmful emissions or the effects of toxic substances, it will also assess the Amenity factor for impacts including adverse changes to the visual landscape and impact on people's comfort and enjoyment from their local and regional environment, where this is a key environmental factor. Impacts on heritage are also considered to ensure that historical and cultural associations are not adversely affected.

EPA objectives

Amenity – to ensure that impacts to amenity are reduced as low as reasonably practicable.

Heritage – to ensure that historical and cultural associations are not adversely affected.

Human health – to ensure that human health is not adversely affected.

Pressure point
Port Hedland air quality

For a number of years, the EPA has expressed its concern about the potential health effects of high dust levels in Port Hedland, particularly in the West End which is close to port operations and iron ore stockpiles.

This issue has continued to be a priority for the EPA during 2013–14. In March 2014, the EPA Chairman travelled to Port Hedland to attend the Port Hedland Dust Taskforce meeting. The Taskforce was briefed on cumulative air quality modelling, the progress of the Port Hedland dust health risk assessment, and the preparation of a new Town Planning Scheme. It was evident from the briefings that a substantial amount of work is underway and the EPA commends this effort.

At the conclusion of its meeting, the Taskforce agreed to establish two new subcommittees on Cumulative Air Quality Modelling and Scenario Planning to oversee important work that will inform the Taskforce's deliberations. This is in addition to the Health Studies Subcommittee, which met frequently during 2013–14 to oversee work on the health risk assessment which is on schedule to be completed in 2014–15.

In May 2014, the National Environment Protection Council (NEPC) gave notice that it intended to make a variation to the National Environment Protection (Ambient Air Quality) Measure (Air Quality NEPM) in relation to, among other things, the standards for fine particles.

The NEPC notice stated that the variation would reflect latest scientific understanding and allow for an adequate level of health protection against the impacts of particle air pollution for the Australian community. The EPA understands that there will be a consultation period before the NEPC makes any final decisions regarding the standards.

The NEPC notice followed a review of the Air Quality NEPM which reported in 2011. With respect to particles, the report stated that health reviews had found there is substantial new evidence on both the short-term and long-term effects for particles and that small particles are associated with increases in mortality and morbidity. These review findings reinforce the EPA's view that a precautionary approach should be taken before approving additional residential development in those areas of Port Hedland subject to high levels of fine particle dust, at least until the health risk assessment is complete.

Against this background, the EPA determined that two town planning scheme amendments – Amendments 56 and 59 – were incapable of being made environmentally acceptable at the time of the determinations, due to the subject land being within the part of Port Hedland that has high levels of dust. The EPA considered that the health risk assessment should be completed prior to any new residential development being allowed in these areas. The EPA published a comprehensive statement of reasons for each of these determinations on its website.

The EPA anticipates that dust in Port Hedland will remain a priority in 2014–15, during which work on the health risk assessment and cumulative air quality modelling will be completed. The EPA will continue to contribute to the work of the Taskforce as it develops options for addressing this challenging land use planning issue.

References and further reading

Port Hedland Air Quality and Noise Management Plan, Port Hedland Dust Taskforce, March 2010.

National Environment Protection (Ambient Air Quality) Measure Review, National Environment Protection Council, May 2011

Port Hedland iron ore stockpiles

Photo: Adwo@shutterstock

Key issue
Community concern about wind farm developments

Wind farms are part of the State's mix of renewable energies now and likely to be into the future. However, the EPA understands that some sections of the community have expressed concern about the development of wind farms, particularly in regard to noise, landscape amenity and biodiversity impacts. Wind farm development proposals can be contentious due to the perceived impacts of noise on human health and potential future aspirations for landholdings surrounding the proposed wind farm site.

Studies have been, and continue to be, conducted in relation to possible adverse effects on human health associated with low frequency noise and infrasound levels generated by wind farms. Results to date have found that wind turbines do not pose a threat to human health if planning guidelines for design and siting are followed. The EPA will maintain a watching brief on the results from on-going studies and any further developments in the health impacts of wind farms.

The EPA is of the view that visual amenity should always be considered in the context of the existing environment, particularly regarding the value that the local community puts on landscape character. Community concerns regarding conflicts in land use and potential limitations on future land use should be addressed during the proponent consultation process and though the land use planning process.

A number of wind farm proposals have been referred to the EPA over the past six years (refer to Table 5). In each case, the EPA resolved that the impacts from the proposals were not so significant as to warrant environmental impact assessment by the EPA. However, the EPA provided public advice as guidance for proposal implementation and for Local Government and other relevant State agencies to consider as part of their assessment and decision-making processes. Such advice included recommending appropriate noise levels and management, implementing monitoring of bird-strike deaths, undertaking dieback and weed management, and conducting field investigations for declared rare and priority flora species.

It is our view that there should be community confidence in the wind farm approval process, which can be achieved through:

- appropriate siting and design during the planning process;
- thorough community consultation;
- compliance with the Environmental Protection (Noise) Regulations 1997; and
- a transparent and independent process for dealing with complaints.

The EPA's Environmental Protection Bulletin 21 - *Guidance for wind farm developments* provides guidance to proponents and the public on the EPA's expectations for developing proposals and when a wind farm proposal should be referred to the EPA.

Table 5: Wind farm proposals referred to the EPA since 2008

PROPOSAL	DATE OF REFERRAL	LOCATION	PUBLIC ADVICE GIVEN
Warradarge wind farm – Verve Energy	18/6/2012	15km north-east of Warradarge	Yes
Sumich wind farm	24/1/2012	Lancelin	No
Dandaragan wind farms	11/8/2011 Referred by Shire of Dandaragan	14.5 km north-east and 4.5 km south of Dandaragan	Yes
Flat Rocks wind farm – Moonies Hill Energy Pty Ltd	4/2/2011	35 km south-east of Kojonup	No
Cowalla Road wind farm – Vincent Tana	18/1/2011 Third Party Referral	Wanerie, Gingin	Yes
Milyeannup wind farm Verve Energy	20/5/2009	20 km east of Augusta	Yes
Nilgen wind farm – Energy Pacific Pty Ltd/ Pacific Hydro	14/10/2008	Gingin	Yes
Grasmere wind farm – additional six turbines	9/7/2008	Albany	Yes
Collgar wind farm	11/8/2008	Merredin	Yes
Badgingarra wind farm – Vincent Tana	2/4/2008	Dandaragan	Yes

References and further reading

Department of Health 2013, *Wind farms, sound and health*, Department of Health, Victoria, May 2013.

Environmental Protection Authority (South Australia) 2013, *Waterloo Wind Farm Environmental Noise Study*, EPASA, Adelaide, SA.

Clean Energy Council 2013, *Best Practice Guidelines for Implementation of Wind Energy Projects in Australia*, CEC, cleanenergycouncil.org.au.

Clean Energy Council 2013, *Community Engagement Guidelines for the Australian Wind Industry*, CEC, cleanenergycouncil.org.au.

Clean Energy Council 2013, *Wind Farms; a guide for communities*, CEC, cleanenergycouncil.org.au.

Western Australian Planning Commission 2004, *Guidelines for Wind Farm Development*. Planning Bulletin 67, WAPC, Perth, WA.

Cape Range National Park

Photo: Gary Willliams, Office of the EPA

Other issues

Cape Range National Park

Photo: Gary Williams, Office of the EPA

Progress on implementation of offset policy and practice

Environmental offsets play an important part in addressing the significant residual impacts of major developments, once all mitigation steps have been exhausted. In 2013–14, the EPA recommended conditions for environmental offsets for eight proposals out of 35 reports released. Three were in the Pilbara, three in the Midwest, one in Perth and one in the South West Region. The EPA has played a role in progressing the use of environmental offsets in environmental impact assessment in Western Australia since the early 2000s.

In 2004, the EPA released its draft Position Statement 9, Environmental Offsets, for public comment. This, for the first time in Western Australia, fully defined the concept, purpose and key principles for the use of environmental offsets. The Position Statement was finalised in 2006 and some of the material went on to be adapted in the international best practice approach to environmental offsets.

The EPA continued its work on offsets with the preparation of Guidance Statement 19, Environmental Offsets – Biodiversity, and Environmental Protection Bulletin 1 in 2008. The Guidance Statement was developed to support industry in designing environmental offset packages and explaining the link between the impact and the offset.

In recent years, the role of environmental offsets has been actively discussed around the world. Public and industry interest in the value of offsets

has increased as their use has become more prevalent.

In 2011, EPA practice in the application of offsets improved by ensuring that all offset requirements were conditioned to ensure enforceability. This also increased the transparency, consistency and accountability of offsets applied in the Part IV EIA process.

In the same year, the WA Government released the WA Environmental Offsets Policy. This Policy recognised, for the first time, the legitimacy of environmental offsets and the need for a rigorous approach to offsets across the state. The position of the WA Government in its Policy builds on the work of the EPA in progressing Western Australia's approach to environmental offsets.

The WA Government has released the WA Environmental Offsets Guidelines. The WA Environmental Offsets Guidelines and the parallel EPA Environmental Protection Bulletin mark the next step in the evolution of offsets in Western Australia. The Guidelines recognise concepts used by the EPA, such as the significance framework, and apply these across all environmental assessment and approvals processes.

In July 2013, the WA Government launched an online, publicly available Environmental Offsets Register with the aim of greatly increasing the transparency in both the determination of offsets and the ongoing implementation. This Register houses all environmental offsets required by the State since the launch, with relevant agencies progressively entering two years' worth of historical data.

The Register provides details of a proposal's significant residual impacts and the offsets applied to counterbalance these. Milestones are also included to track progress with the implementation of an offset. The value of this publicly available register was noted in a recent inquiry by the Senate into environmental offsets required by the Commonwealth Government with several submitters pointing to the WA Register as what is needed nationally.

Since 2011, the EPA has adopted a new approach to addressing significant residual impacts with offsets in the Pilbara Region. Due to the major complexities associated with implementing offsets outside the south-west of Western Australia (the extensive land use zone), the EPA considers the use of a strategic approach to offsets, rather than a proposal-by-proposal approach, to be best. The proposed strategic conservation initiative for the Pilbara Region provides an opportunity to amalgamate offsets funding from development across the region and apply this on a landscape scale to produce the best outcome for environmental protection. The EPA recognises that this is a matter for Government to consider and determine the best approach.

Offsets will continue to be an important part of environmental impact assessment, to counterbalance significant residual environmental impacts, and the EPA will continue to ensure that its approach to the application of offsets is transparent and scientifically based.

References and further reading

Commonwealth of Australia 2014, *Environmental Offsets,* The Senate Environment and Communications References Committee, Senate Printing Unit, Parliament House, Canberra.

Environmental Protection Authority 2014, *Environmental Protection Bulletin No. 1 Environmental Offsets* (EPB1), EPA, Perth, WA.

Government of Western Australia 2011, *WA Environmental Offsets Policy*, September 2011, Perth, WA.

Government of Western Australia 2014, *WA Environmental Offsets Guidelines*, August 2014, Perth, WA.

WA Environmental Offsets Register – www.offsetsregister.wa.gov.au

Environmental data

In its 2012–13 Annual Report the EPA outlined the importance of collating information gathered through the assessment process, to improve environmental knowledge, reduce uncertainty and improve the efficiency of the approvals process. The EPA emphasised its ongoing commitment to better information sharing and identified that the key challenge remained determining how to store, standardise, spatially reference and make this information available to all.

Since the last Annual Report the State Government has allocated an initial $250,000 to the Department of Mines and Petroleum (DMP) to oversee the establishment of a state environmental data library. The EPA supports the development of a consolidated data library which will provide greater access for government, industry and community groups to environmental information. In addition, the Western Australian Biodiversity Science Institute (WABSI) has established an Information Management theme. The theme objective is:

> to create a collaborative environment including a web-based data management platform where biodiversity information is collected once, made freely accessible and able to be used for multiple applications.

To be effective, it is important that the purpose and end use of the information be defined before designing the system. This will ensure that the information can be used to answer some of the challenges presented through environmental impact assessments and management of our biodiversity. Success will also be dependent on the development of common standards and protocols for data collection, having adequate quality assurance and controls in place, addressing intellectual property concerns, and defining the uptake pathway for data to ensure that it is in a usable form to answer key questions, for example understanding the cumulative impacts of clearing on a species or vegetation community.

The EPA welcomes such initiatives as they present rare opportunities to improve our environmental knowledge and to improve the efficiency of the approvals process. The coordination of assessment information will be beneficial as it will reduce uncertainty and risk and therefore improve the ability of the EPA to make predictions with confidence, leading to better outcomes for the environment of Western Australia. The EPA encourages a focus on the end use of the information during the development of these systems to ensure they are fit for purpose.

References and further reading

SEAK Taskforce 2011, *Shared Environmental Knowledge Taskforce Report*. Office of the EPA, Perth, WA.

WA Biodiversity Science Institute information brochures can be downloaded from:

http://www.creatingcommunities.com.au/breaking-down-the-barriers-to-collaboration-in-biodiversity/

Contour faming and hay bales, Northam

Photo: Gary Williams, Office of the EPA

Fitzgerald River National Park

Photo: Gary Williams, Office of the EPA

The Authority

EPA members on a site visit to the Duchess Paradise proposal, July 2014.
L-R, Professor Robert Harvey, Ms Elizabeth Carr, Mr Glen McLeod, Dr Paul Vogel, Dr Rod Lukatelich

Photo: Office of the EPA

The EPA Board

Chairman - Dr Paul Vogel

Dr Vogel has a PhD in chemistry from the University of Western Australia. Prior to his appointment, he was the Chief Executive and Chairman of the South Australian Environmental Protection Authority from November 2002, with responsibilities for environmental regulation, development assessment and radiation protection.

From 2001–2002, Dr Vogel was Director of Environmental Policy with the WA Department of the Premier and Cabinet and Director of Environmental Systems with the then WA Department of Environmental Protection from 1995–2001.

Dr Vogel has worked across the three tiers of government, business and community and has extensive experience and knowledge in organisational and regulatory reform and strategic and collaborative approaches to sustainability, natural resources management, waste management, air and marine quality, site contamination and radiation protection.

He is a Board Director of the Cooperative Research Centre for Contamination and Remediation of the Environment (CRC CARE), Chair of the Advisory Panel to the Environmental Bankers' Association of Australasia, a director of the ATN Research Impact Advisory Board and a member of the Australian Institute of Company Directors.

Dr Vogel's term began in November 2007.

Deputy Chairman - Professor Robert Harvey

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

Professor 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 Professor 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 also volunteers on projects that help in the management of the Swan Estuary Marine Park.

In 2010 Professor Harvey was appointed as a member of the Western Australian Planning Commission. Professor Harvey's term began in November 2012.

Dr Rod Lukatelich

Dr Lukatelich has a Bachelor of Science (Hons) in Botany and a PhD in phytoplankton ecology from UWA.

His career has spanned academia, environmental consulting and industrial environmental management. As a Lecturer / Research Officer (1982–1989) at the Centre for Water Research at UWA his research included studies on the impacts of eutrophication on algae and seagrasses in lakes and estuaries; development of ecological models; and the relationships between hydrodynamics and water quality in reservoirs, rivers and estuaries.

In 1989 Dr Lukatelich joined Kinhill Engineers as Senior Aquatic Ecologist and in 1990 joined BP Refinery Kwinana as Environmental Manager. During his time at BP Rod had two international assignments as a Senior Environmental Technologist at the BP Oil Technology Development Unit (1995–1997) and as Water Technology Advisor in the Refining Technology Group (2004–2006). He retired from BP in February 2014 and now works part–time as an environmental consultant.

Dr Lukatelich has extensive experience in emissions monitoring, waste management, wastewater treatment, environmental impact assessment, soil and groundwater remediation, cleaner production and dangerous goods management. He has broad experience of international environmental regulatory systems

having worked in Asia, Europe, the Americas, the Middle East and Russia.

He is a Board Director of CRC CARE Pty Ltd; member of the Australian Institute of Biology; member of CSIRO's Energy Strategic Advisory Committee and chairs the Great Australian Bight Research Program Management Committee.

Dr Lukatelich's term began in November 2009.

Ms Elizabeth Carr

Ms Elizabeth Carr is a non-executive director with senior management experience in the private, public and not-for-profit sectors. She is currently chair of the Macular Disease Foundation Australia, chair of St Catherine's Aged Care Services Ltd, director of the Kokoda Track Foundation, director of St Mary's Anglican Girls School in Karrinyup, chair of the Audit and Risk Committee for the NSW Department of Family and Community Services, and is a director of the Safety, Return to Work and Support Board (NSW) with oversight of its $18 billion fund.

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

Ms Carr was the 2002 recipient of Rotary's prestigious Paul Harris Fellow Award for services to the community. Ms Carr's term began in October 2011.

Mr Glen McLeod

Mr Glen McLeod is a well-respected lawyer with 36 years of local and international experience in environmental, planning and government law, the climate change and renewable energy sectors, ports, probity and procurement.

Mr McLeod is a member of the Waste Authority and the Botanic Gardens and Parks Authority and has made a significant contribution to the ongoing management of the State's botanic gardens and parks, including the iconic Kings Park.

He plays a leading role the Waste Authority's current process to develop a strategic waste infrastructure plan for the Perth Metropolitan and Peel regions.

Mr McLeod has a Bachelor of Jurisprudence and Bachelor of Law from the University of Western Australia. He is an adjunct professor at Murdoch University where he teaches environmental and town planning law, is a senior vice-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.

Mr McLeod is also the general editor of Planning Law Australia and co-editor of the Australia-wide Local Government Law Journal.

Mr McLeod is a Fellow of the Royal Society of Arts. Mr McLeod's term began in October 2013.

EPA meetings and site visits

In addition to its regular meeting schedule, EPA members may undertake site visits to meet with stakeholders and see first-hand the local environment in which we are assessing proposals.

In August 2013 the EPA visited the proposed Koodaideri Iron Ore Mine and Infrastructure Project located west-north-west of Newman in the Pilbara Region. The members visited a mine adit/cave that is now home to a colony of conservation significant bats, and visited Koodaideri Springs, to gain a better understanding of the likely impacts of the mine on the Pilbara leaf-nosed bat.

In March 2014, the EPA Chairman travelled to Port Hedland to attend the Port Hedland Dust Taskforce meeting at Council Chambers. The Taskforce was briefed on cumulative air quality modelling, progress of the Port Hedland dust health risk assessment, and the preparation of a new Town Planning Scheme.

The Chairman visited the proposed Keane Road Strategic Link with the proponent in March 2014, and EPA Members also met with local environment groups before a second site visit in May. Meeting with the local environment groups provided the EPA with a clear understanding of the issues raised in submissions.

In April 2014, the EPA travelled to the Little Sandy Desert, in the Shire of East Pilbara, to visit the proposed Kintyre Uranium Mine. This proposal is being assessed under the bilateral agreement between the State and the Commonwealth, and the EPA was joined on site by a representative of the Commonwealth Department of the Environment, in addition to the other relevant government agencies. The site visit provided the EPA, and other decision-making authorities with important context in relation to the landscape and values of the site for the proposed mine.

In May and June the EPA Chairman met with a Member of the Legislative Council, community groups and a member of the scientific community in relation to the State Government's proposed Western Australian Shark Hazard Mitigation Drum Line Program 2014—2017. This provided an important opportunity to provide clarification of the EPA's assessment process, and hear community concerns which will be taken into consideration during the EPA assessment process.

Site visits and meetings with stakeholders provide the EPA with an appreciation of the environmental setting and constraints of proposals and community concerns, leading to more informed environmental advice being provided to the Minister for Environment.

Table 6: Meeting attendance by Board members during 2013-2014

DATE	PAUL VOGEL	ROBERT HARVEY	ROD LUKATELICH	ELIZABETH CARR	GLEN MCLEOD
8/7/13					
15/8/13					
19/9/13	—				
17/10/13					
14/11/13	—				
12/12/13					
22/1/14					
20/2/14					
20/3/14					
17/4/14					
5/5/14				—	
15/5/14				—	—
19/6/14					
Meeting participation	11	13	13	11	8

Table 7: Site visits by EPA members during 2013-2014

DATE	DESTINATION	HIGHLIGHTS	EPA ATTENDEES
9/8/13	Newman - Koodaideri Iron Ore Mine and Infrastructure project, Rio Tinto Iron Ore	Accompanied by representatives of Rio Tinto and the OEPA Out of Newman, aerial view of Fortescue Marsh, Koodaideri Spring, Weeli Wolli Creek system, key mine and infrastructure sites On-ground view of ore body	Paul Vogel Robert Harvey Rod Lukatelich Elizabeth Carr
19-20/8/13	Southern Cross - Banded Ironstone Formation Ranges of the Yilgarn Craton	A representative of the Wildflower Society attended as the EPA's guest Accompanied by representatives from the OEPA and the Department of Parks and Wildlife On ground view of Helena and Aurora Range (including Bungalbin Hill) and existing and potential mine sites Aerial view of Mt Manning area	Paul Vogel Robert Harvey Rod Lukatelich Elizabeth Carr
15-16/4/14	Telfer - Kintyre Uranium Mine, Cameco Australia Ltd	Accompanied by representatives from the Department of Mines and Petroleum, Commonwealth Department of the Environment, OEPA and the proponent Tour and briefing on Telfer operations by the proponent On-ground tour of Kintyre site	Paul Vogel Robert Harvey Rod Lukatelich Elizabeth Carr Glen McLeod
5/5/14	Forrestdale - Keane Road Strategic Link	Pre-visit briefing by the Urban Bushland Council on the environmental values of the Anstey-Keane dampland On-ground inspection of native vegetation on the proposed site Accompanied by representatives of the OEPA, City of Armadale and Department of Parks and Wildlife	Paul Vogel Robert Harvey Glen McLeod

Stakeholder relations

The EPA has worked to strengthen its public communications, with support from the OEPA. Through increased awareness of environmental issues, the role of the EPA and its responsibilities, the EPA hopes to enhance the value placed on the environment by the Western Australian community.

Stakeholder Reference Group

The EPA has established a Stakeholder Reference Group (SRG) as an effective means of consultation with key stakeholders and peak industry bodies. The SRG currently meets quarterly to provide input to the EPA on matters of policy, process and performance, including implementation of the review of EIA process.

The core membership of the SRG is:

Association of Mining and Exploration Companies
Australian Petroleum Production and Exploration Association
Chamber of Commerce and Industry
Chamber of Minerals and Energy
Conservation Council of WA
Department of Environment Regulation
Department of Health
Department of Mines and Petroleum
Department of Planning
Department of State Development
Department of Water
Environmental Consultants Association
Environmental Defenders Office
Urban Development Institute of Australia
WA Local Government Association
World Wildlife Fund

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

Student support

Each year a graduating Murdoch University student is presented with the EPA Prize in Conservation Biology, awarded for the best average score in core units of Conservation and Wildlife Biology.

The winner of the prize for 2013 is Laura Bradshaw, who was presented with her award on 15 April 2014. Laura is now undertaking an Honours degree, studying topsoil management techniques and environmental restoration

The EPA has also been a long-term supporter of post-graduate research that falls within the scope of EPA activities.

Cover image

Banded iron formations at Mungada Ridge. The Mungada/Karara/Koolanooka region is located in the Midwest Region of Western Australia, approximately 200 kilometres south-east of Geraldton.

Photo: Kelly Freeman, Office of the EPA