SEAF for Cockburn Sound, Western Australia

Report excerpt from:

A Shared Environmental Analytics Facility (SEAF) Feasibility Study

September 2023

The Western Australian Biodiversity Science Institute

Western Australian Marine Science Institution

Prepared by The Western Australian Biodiversity Science Institute (WABSI) and the Western Australian Marine Science Institution (WAMSI)

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SEAF for Cockburn Sound (Chapter 4) is an excerpt from a larger report and needs to be considered in the context of the full SEAF Feasibility Study published by WABSI and WAMSI.

The SEAF Feasibility Study is part of a suite of work in biodiversity data and information management undertaken by WABSI and WAMSI. More information at www.wabsi.org.au and www.wamsi.org.au

Funded by the Western Australian Government's Department of Jobs, Tourism, Science and Innovation and supported by WABSI and WAMSI partners.

Foreword

A Shared Environmental Analytics Facility (SEAF) Feasibility Study progresses work in biodiversity data and information management undertaken by WABSI and WAMSI to demonstrate how co-ordinated and shared environmental analysis and reporting will support nature positive outcomes.

The study was developed over 8 months from August 2022 to April 2023 in consultation with more than 50 stakeholder groups, through funding from the Department of Jobs, Tourism, Science, and Innovation and with governance provided by a joint WABSI and WAMSI Board Sub-Committee.

Following the publication in 2021 of a high-level SEAF design and roadmap, the Feasibility Study progresses the work through:

1. Further refinement of the quantitative and qualitative value proposition;
2. Demonstration of the products, services and scientific application for SEAF customers;
3. Articulation of the further details for a suitable and scalable technology solution; and
4. Development of a high-level implementation roadmap for priority regions - Cockburn Sound, and the Pilbara, and the supporting SEAF Hub.

We acknowledge the contributions of Microsoft, AECOM and BMT in assistance with developing a creative approach to address the governance, economic, legal, environmental and technical challenges posed in developing a roadmap to progress shared environmental analytics from a project based ‘bespoke’ model, to a shared operational model that is ‘robust, repeatable and sustainable’.

Our thanks to Professor Matthew Tonts, Chair of the SEAF Advisory Committee and Chair of the Western Australian Environmental Protection Authority, and to members of the SEAF Advisory Committee for their continued advice.

Professor Owen T. Nevin, Chief Executive Officer, WABSI and Dr Luke Twomey, Chief Executive Officer, WAMSI

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SEAF for Cockburn Sound

An excerpt from the SEAF Feasibility Study: This document contains Chapter 4 and Chapter 6

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4a.
Cockburn Sound: Executive summary

A SEAF spoke is successfully being implemented in Cockburn Sound through providing regionally specific analytics utilising both shared private and public data

The *why*: Cockburn Sound Regional Context

Cockburn Sound's industries are productive and competitive, contributing billions of dollars to local, state, and national economies.

Cockburn Sound supports vital industrial complexes and trade networks, as well as vital water and waste water utilities. The marine systems are also highly valued by the community for recreation, aesthetics, tourism, fishing and continuing cultural significance for the Traditional Owners of the Land and Sea Country.

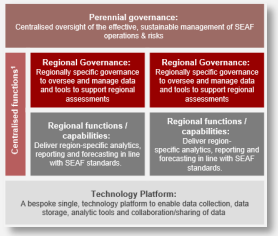
The challenges arising from economic, social and environmental change, including the long-term impacts of climate change, means that ongoing industrial operation and resilience of the ecosystem is increasingly at risk.

The *how*: The SEAF in action

As an independent and objective entity, the Shared Environmental Analytics Facility (SEAF) is being implemented in Cockburn Sound to support the development of regional analytics and assessments.

In the Cockburn Sound context, the SEAF bridges the gap between existing open and shared environmental data sources and privately acquired data (e.g. proponent environmental data) through the introduction of a 'collaboration zone' utilising its bespoke and shared technology platform.

Development of user driven products and science will need to support Cockburn Sound specific environmental challenges, e.g. Hydrodynamic and Sediment Transport Models and Maps.

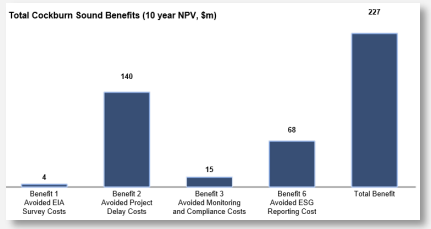


The *outcome*: Benefits for Cockburn Sound

The development of **regionally specific products and science** outcomes including:

- Industry Operation and Growth
- Industrial Area Groundwater Model
- Hydrodynamic and Sediment Transport Models and Maps
- Integrated Marine Ecosystem Biogeochemistry and Ecological Models and Maps
- Terrestrial Emissions Models and Maps
- Cockburn Sound DPSIR Reporting Model

The above products and outputs are expected to realise **$227m NPV** in quantified benefits over 10 years, with significant additional environmental, social and commercial benefits.



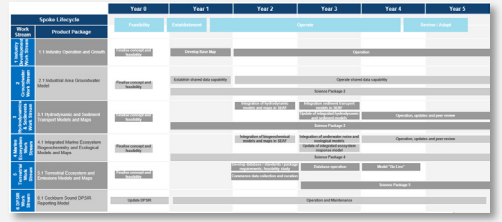
The *when*: Implementation timing and approach

An implementation plan has been established to appropriately sequence the development of the tailored regional products and science enhancements over a 5 year period.

Work packages have been co-developed and validated with stakeholders to ensure the outcomes and timing of each work package meet Cockburn Sound's stakeholder needs.

Indicative costings for the program components across the 5 year implementation plan are:

- Product Packages: ~$13.8m
- Science Packages: ~$24.3m
- **Total: ~$38.1m**



4b.
Cockburn Sound:
Regional background and context

Cockburn Sound's industrial development has been fundamental for trade in WA, but the environment has been impacted

Past

Cockburn Sound industrial development

The site of industrial growth and trade since 1954

Growth in the 70s, 80s and 90s resulted in environmental damage caused by:

- Contaminated waste water discharges
- Contaminated land and groundwater inputs
- Coastal modifications
- Fishing pressure

Major environmental impacts resulted including:

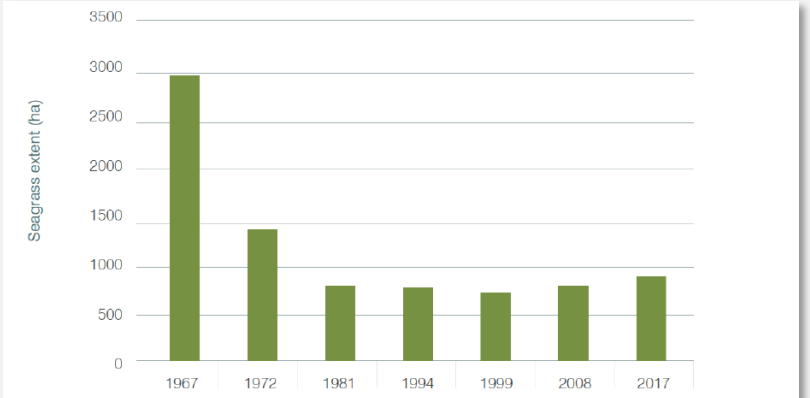
- Decline of water quality
- Loss of more than 75% of seagrass
- Biodiversity loss

Environmental protection and amelioration since the late 80s has improved water quality, but seagrass is slow to recover.

Present

Slow recovery

- Coastal areas are highly modified
- Water quality has improved
- Sediment quality has some localised areas of contamination and high organic enrichment
- Nutrient recycling is the dominant process which leads to high phytoplankton biomass
- Seagrass has been slow to recover, with some health indicators showing signs of continuing decline
- Some commercial and recreational fisheries in decline
- Dolphins and sea lion populations are stable, but little penguins are in decline



Source: Kendrick et al. (2002), Oceanica (2009a), Seagrass data collected in 2017, supplied by CSMC and Fremantle Ports

Future

New pressure may pause or reverse recovery

Multiple and overlapping infrastructure projects will intensify pressure and impact on the environment

- Construction impacts (e.g. dredging)
- Operation impacts (e.g. more ships; emissions)
- Decommissioning (e.g. contamination)

Environmental regulations have changed

- Cumulative Impact added to WA legislation
- Greater scrutiny from regulators (Commonwealth and WA)

Social licence more difficult to achieve

- Public has greater interest and understanding of values, pressures and impacts
- ESG awareness and importance has intensified across industry and government

Environmental Management: State Environmental (Cockburn Sound) Policy 2015 & Environmental Protection Act 1986

Cockburn Sound specific environmental policy

The State Environmental (Cockburn Sound) Policy 2015 and Environmental Protection Act 1986

The management framework consists of:

- The Cockburn Sound Management Council (CSMC) which includes stakeholders from government, industry and the community, providing an opportunity for regular engagement
- The CSMC provides advice and recommendations to the Minister for Environment on the environmental management of Cockburn Sound
- Defining the environmental values of Cockburn Sound that are of importance to stakeholders and require protection
- Monitoring and managing exceedances of specific environmental quality criteria that are reported by CSMC to the Minister for Environment
- Environmental impact assessment of new projects
- Ongoing regulation of project-specific emissions, monitoring, management and offset conditions.

The Cockburn Sound Management Council (CSMC) and the Kwinana Industry Council have been actively engaged through WAMSI and they are supportive of progressing shared regional environmental analytics and reporting in Cockburn Sound.

Significant change to the Act

Cumulative Impact Assessment

The requirement for proponents to consider their cumulative impacts to Cockburn Sound was legislated in 2020.

Cumulative impact guidance is not drafted yet, but as a minimum must include an understanding of:

- The current state of the environment
- The desired state of the environment
- The important values for protection
- Current pressures and effects on values
- Predicted future pressures and effects on values
- Collaboration by industry and government on existing and predicted pressures and effects
- Methods to monitor and manage progress towards the desired state of the environment
- Tools to assist design, construction, operation and compliance of projects

Cockburn Sound: Global Advance Industry Hub

Intensive Development Pressure

New development pressure on a recovering system

The Department of Jobs, Tourism, Science and Innovation (JTSI) is leading a program of work that will support the transformation of the Western Trade Coast into a Global Advanced Industries Hub

Major infrastructure development proposed in the next decade includes:

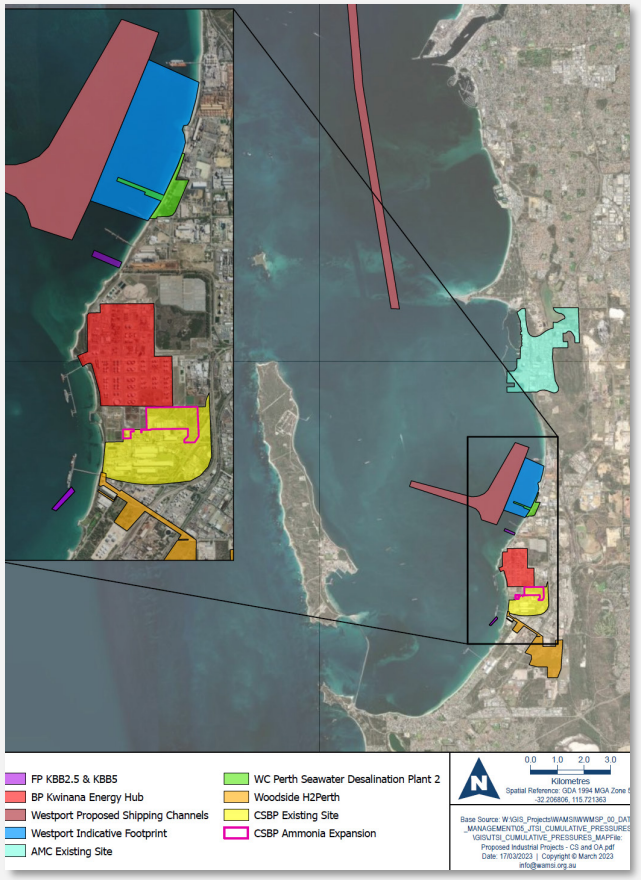
- Port infrastructure - Westport in Kwinana - WA Government.
- Naval Base infrastructure - AUKUS submarine facilities at Garden Island - Dept. Defence
- Doubling capacity of Perth Desalination Project - Kwinana - Water Corporation
- Large Vessel Lifting Dry Dock - Australian Maritime Complex - Dept. Defence
- Bulk Jetty Upgrades - Kwinana - Fremantle Ports
- H2 facilities - Kwinana - Woodside
- H2 facilities - Kwinana – BP
- Ammonia facilities – CSBP

More than $15B infrastructure investment in the next decade

New channel will lift shipping constraints and further increase trade

Note: projects and spatial representations are indicative designs only and may not progress to development

Proposed industrial projects – CS and OA



Westport is the State Government's long-term program to investigate, plan and build a future port in Kwinana with integrated road and rail transport networks

Future Port Potential Site

Westport

Westport's goals are:

- Better trade outcomes for exporters, importers and the economy
- Local economic growth and jobs creation
- Acceptable impact on the State's finances
- Planning, building and operating the most sustainable port in Australia
- Benefiting the community and Indigenous peoples
- Safety for workers and the community

Westport add significant infrastructure to Cockburn Sound

- Dredging of a new shipping channel
- Development of new port berths and breakwater
- Container lay-down facilities
- Upgraded road and rail networks

Infrastructure construction and operations will increase pressure on the environment by:

- Dredging will directly disturb the seafloor, including benthic habitat, and will increase turbidity and sediment suspension
- Sediment disturbance and groundwater intersection may impact water quality in some areas
- Construction emissions, noise and vessel interactions may impact marine fauna
- Increased shipping traffic will increase sediment suspension and increase risk of fauna strikes

WAMSI Westport Marine Science Program: Major collaborative program on the marine environment in Cockburn Sound

Partnership with State Government

Westport has partnered with WAMSI to deliver a $13.5 million science program. The research outcomes will help Westport make considered, science-based decisions as design progresses, and inform effective, long-term mitigation strategies so that ecosystem health is maintained for future generations.

- The research spans nine key themes, involves 30 research projects and more than 100 researchers
- Research programs include a series of on-ground trials for restoring seagrass meadows and improving knowledge of the marine biodiversity in Cockburn Sound.
- The program has drawn on numerous local experts from physical, biological and social sciences disciplines to understand more about this unique coastal ecosystem.

The three-year science program will help inform a sustainable port design and ensure a robust environmental impact assessment process based on independent and objective science.

Research findings will fill important knowledge gaps about Cockburn Sound and provide stakeholders and the community access to new information needed to manage this environment into the future, and forms a basis of data and science for future participants in the Global Advanced Industries Hub.

Research Themes and Projects

- **Ecosystem modelling** - Develop an ecosystem model to understand how water quality and habitats may change under various possible future scenarios
- **Benthic Habitats and communities** - Improve our understanding of benthic communities and processes, with a focus on seagrass rehabilitation and restoration
- **Water and sediment quality** - Water and sediment quality monitoring
- **Fisheries and aquatic resources** - Understand seasonal movements of key species, the habitats they seek out and the food they rely on
- **Hydrodynamic modelling** - Understand how water quality and circulation in Cockburn Sound may change due to Westport and climate change
- **Social** - Identify and understand the community values connected to Cockburn Sound
- **Noise** - Develop current and future underwater ‘soundscapes’ of Cockburn Sound to understand, and manage, the potential effects of underwater noise
- **Apex predators and iconic species** - Improve our understanding of the distribution and seasonal movements of conservation significant and iconic species, the habitats they seek out and the food sources they rely on
- **Coastal processes** - To better understand patterns and drivers of sediment transport and the processes of beach accretion and erosion in Cockburn Sound and Owen Anchorage

Mitigating dredging pressure is one of many challenges in common to industry proponents

Major capital dredging works are needed to remove trade constraints

Dredging has been accepted by industry and science as the biggest threat to Cockburn Sound's environmental, social and cultural values at a recent WAMSI expert workshop (2023).

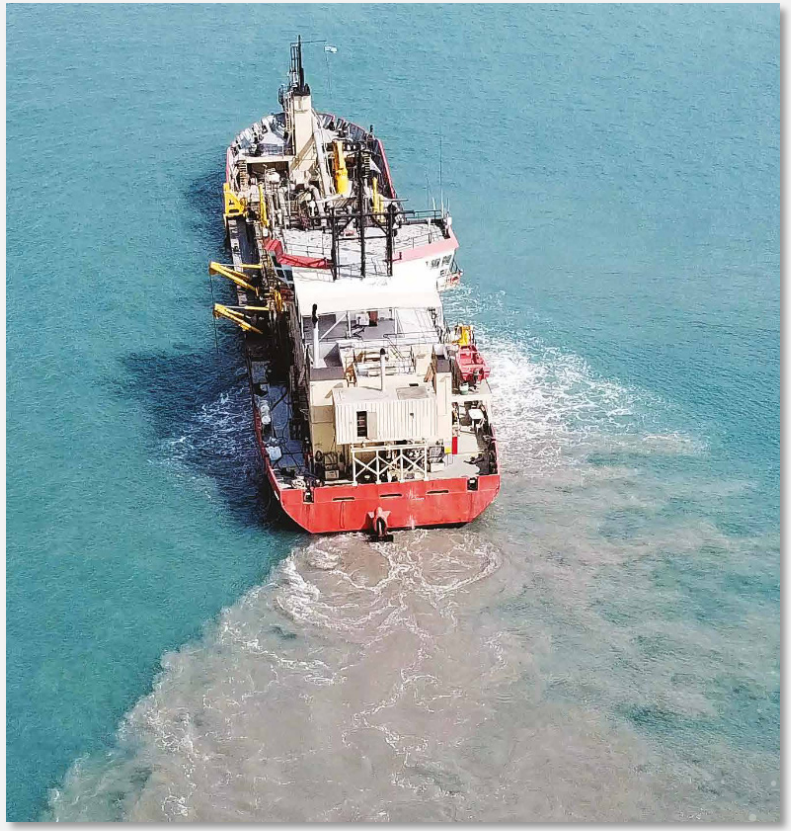
Dredging of a new and deeper shipping channel

- Westport will require major capital dredging to provide large capacity vessels access
- Major capital dredging of around 15 Mm3 is likely over 2-3 years

A new approach to dredging through shared predictive modelling

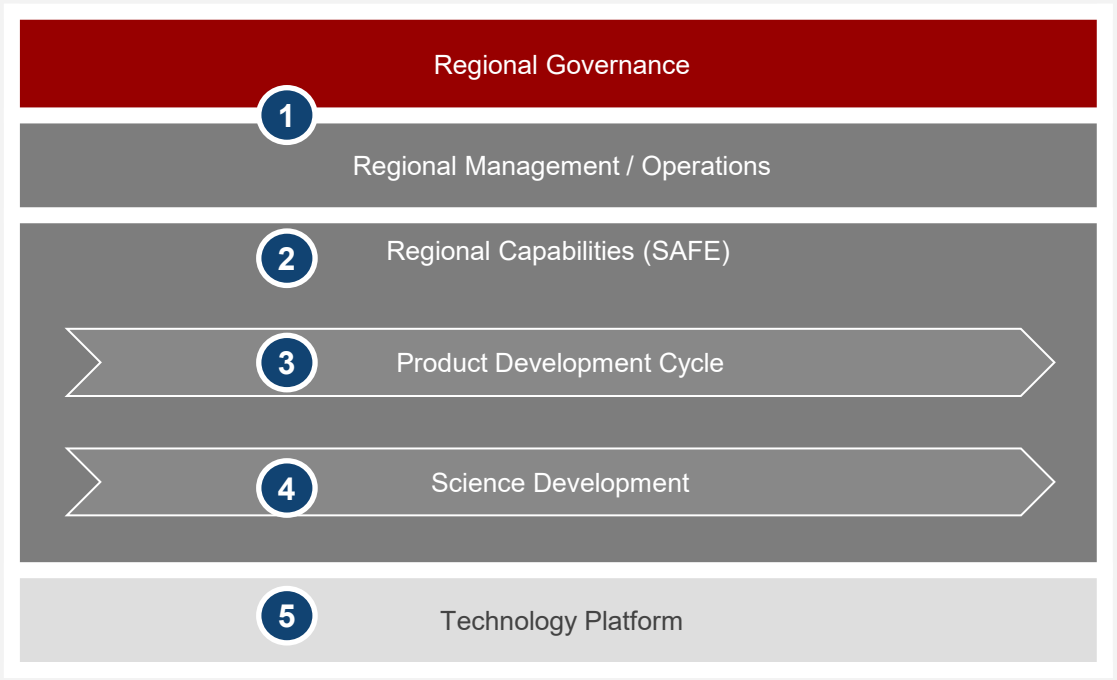
- Current best practice utilises hydrodynamic modelling to predict the impact of dredge plumes on environmental values
- However, current models are "bespoke" focusing on one project in isolation and do not consider the cumulative impacts of existing operations or new projects
- A shared hydrodynamic model has been developed by Westport in the WWMSP to enable multiple proponents to utilise a collaborative "Cockburn Sound Model", with shared data on the Microsoft cloud-based "Planetary Computer." The model is 40x faster than current best practice, and will enable the regulators and proponents to use an accepted, transparent and robust methods to undertake environmental impact scenario testing.
- With support from government and industry, continuous improvement will enable the model to reduce risk and uncertainty for industry development and environmental protection for generations to come.

Capital dredging works



The SEAF is an independent facility to deliver regional environmental reporting and decision support

SEAF: Regional Spoke Conceptual Model



Overview of SEAF components

1. **Management and governance:** Customers, product delivery; policy, legislative standards and requirements; oversight

2. **Data and analytics:**
   - Data from diverse sources
   - Private/ collaborative/ constrained data and analytics
   - Validated analytic tools, improved over time – science feedback loop
   - Robust, repeatable and transparent

3. **Products:**
   - Reporting, decision support, prediction
   - For industry, government, community

4. **Science:**
   - Pipeline from science to operations and back
   - Science underpinning dependencies and impacts, enabling continuous improvement

5. **Platform**: Open source, cloud based, scalable; access controls for diverse users

A SEAF is distinctive because it is:

Shared

- **Open** - to industry, regulators, Traditional Owners, researchers and the community
- **Inclusive** – not competitive – with other data and analytics capabilities
- **Linked** – to national research capability, ensures ongoing continuous improvement

Operational

- Designed through **extensive, ongoing consultation** with industry, government, Indigenous and community groups and scientific experts
- Built to meet user needs - **secure, scalable, robust and sustainable**

Integrated

- Offering all the data and analytics - local, national and international – that users need **in one place**
- Supports decisions, forecasting and diverse reporting – on a **company footprint and regional scale**
- Offers **open, collaborative and private** data and analysis zones – and **dynamic interchange** between zones

Independent

- Includes – but **independent** from – industry, government and research
- It is **regional** – remaining close to stakeholders

Why shared analytics in Cockburn Sound

Data

Cockburn Sound is rich in knowledge in historic data

- **An estimated $65m** of data spanning ~1500 projects has been collected from the marine and coastal environment of Cockburn Sound since 1965 including:
  - Industry
  - Research
  - Government
- WAMSI Westport Marine Science Program is spending another **~$5m on data collection over 2021 - 2024**
- Concurrent industry projects and monitoring **at least another ~$5m over 2021 - 2024**

There are significant efficiencies to be gained in developing a coordinated multi-client approach to data monitoring in Cockburn Sound. This has been shown though the current approach to air quality monitoring.

Analytics

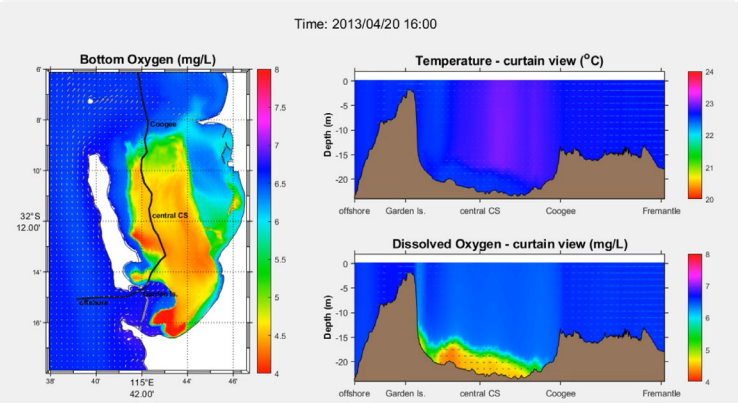
Through recent investments in science and data science, there are innovative and tested analytics that can be used to forecast cumulative impacts in Cockburn Sound

- WAMSI and its partners have developed a shared data and analytics platform to prove the concept and benefits of shared environmental analytics for Cockburn Sound
- The goal of a cloud-based data framework is to allow compatibility, inter-operability between critical data assets, and version control as is required for the development of a more comprehensive platform than has been traditionally possible.
- The platform provides access to secure computing resources – both commercial (Microsoft) and research (PAWSEY)

Secure data sharing, high-performance cloud computing and data and scientific modelling have resulted in 40x modelling speed increases (40 hours per model run to 1 hour) resulting in weeks or months of decision maker time savings.

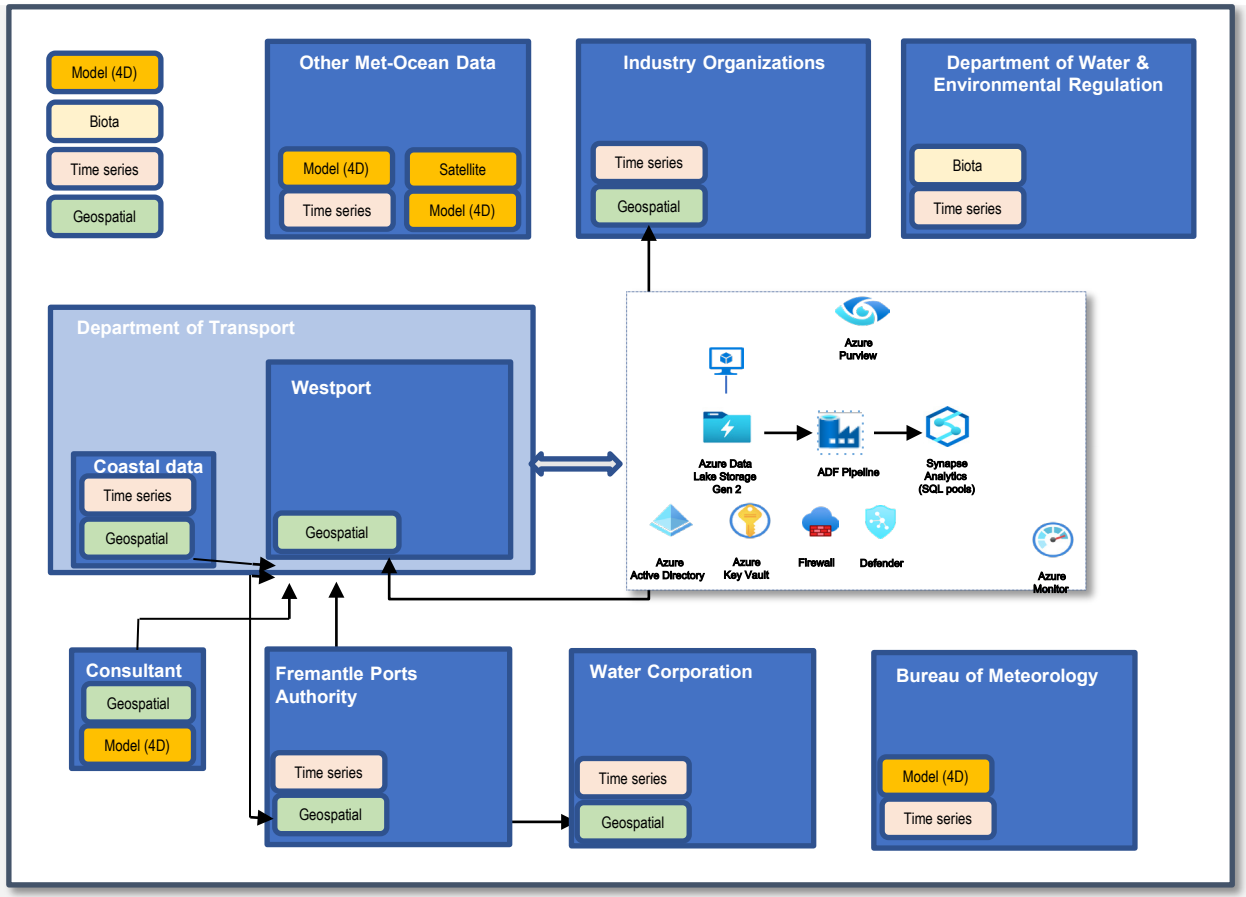
Data Sharing Model

SEAF data sharing model and platform provides a way to encourage and support access to data, while acknowledging the need for proponents and regulators to understand cumulative pressures in a collaborative environment while still in the project planning phases.



Cockburn Sound: Cloud-Based Data Approach

Cloud Architecture Overview



A scalable, extensible framework for the future of Cockburn Sound science

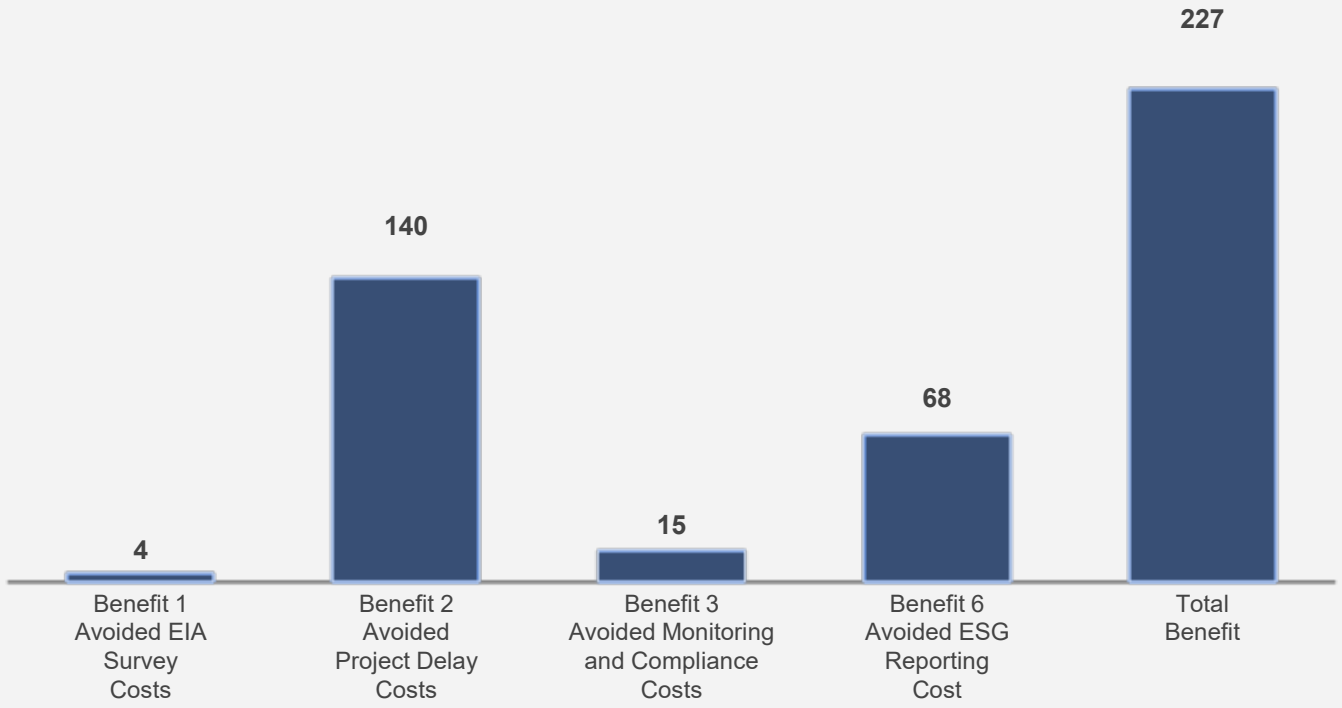
The goal of a cloud-based data framework is to allow compatibility, inter-operability between critical data assets, and version control as is required for the development of a more comprehensive platform than has been traditionally possible.

- Wide ranging cross-agency data ingestion.
- Expandable, on demand resources for data ingestion and compute.
- Standardisation between disparate datasets.
- Transferrable ingestion pipelines between different workgroups and agencies.
- Standardisation of analytical workflows between cross-agency datasets.
- Cost savings when compared to traditional on-premise data infrastructure.

4c.
Cockburn Sound:
Value proposition and benefits case

Cockburn Sound Regional Spoke is expected to realise $227m NPV in quantified benefits over 10 years, with significant additional environmental, social and commercial benefits

Total Cockburn Sound Benefits (10 year NPV, $m)



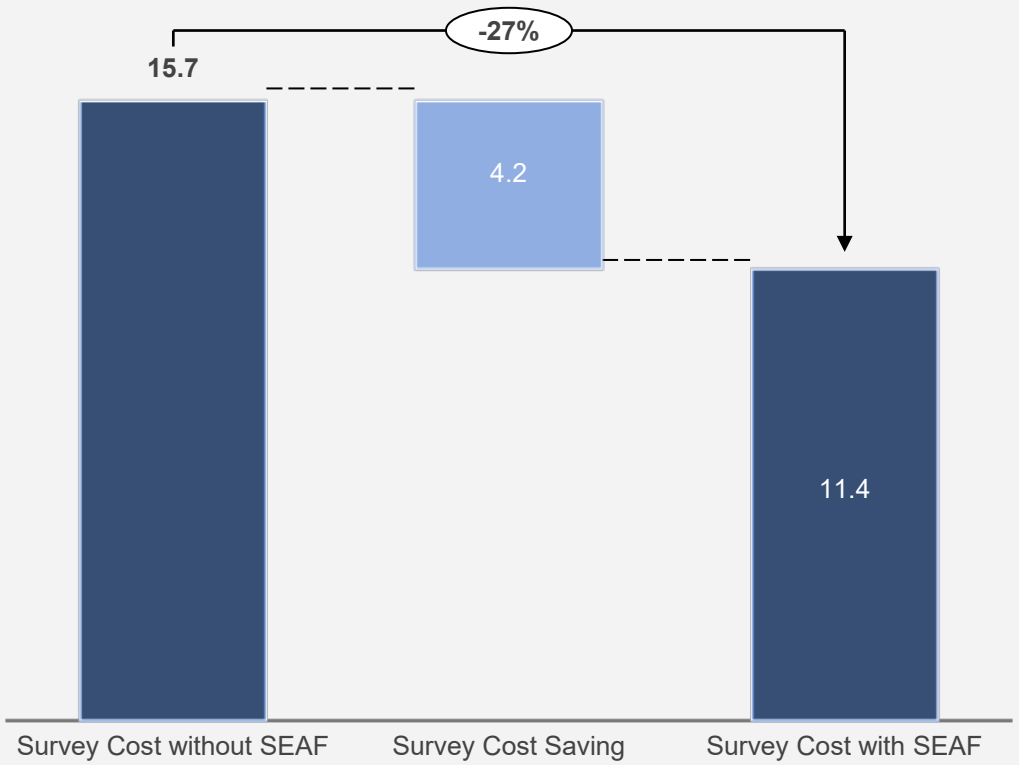
Note: Net Present Values have been calculated using a 6% discount rate to Year 0.

SEAF Benefits

- Cockburn Sound's regional spoke is expected to contribute as much as $227m NPV in quantified benefits over the first 10 years, resulting from reduced costs of conducting surveys and analysis and avoided project delays
- The smaller three benefits (Benefits 1, 3 and 6) are considered direct offsetting benefits (i.e. the direct survey and analytics cost savings resulting from the central analytics capability held in the SEAF)
- These alone contribute $51m NPV in benefits over 5 years, approximately 59% higher than the estimated cost of the Cockburn Sound spoke (this does not include the cost of the SEAF hub)
- This is in addition to a number of non-quantified benefits including critical environmental benefits that arise from enhanced data and a whole-of-environment view

Avoided survey costs are expected to contribute NPV $4.2m in benefits over the 10 year period, amounting to a 27% reduction in estimated costs compared to the base case

Survey Cost Breakdown – Cockburn Sound (10 year NPV, $m)



Avoided Survey Cost

- Avoided survey cost in the Cockburn Sound region is expected to amount to $4.2m NPV over the next 10 years
- This saving equates to a reduction in 27% of overall survey cost over the assessment period
- Savings are primarily driven by access to improved information, indicating a smaller saving for first projects and larger savings as the SEAF is able to collect more data
- High concentration of projects in the next two years (WestPort, AMC LVDB and Woodside H2Perth) expected to contribute significant savings in the first two years, with lower certainty and less assumed projects coming online in the following 8 years

Avoided project delay cost is expected to be the most significant benefit, contributing $140m over 10 years

- Case studies of EPA WA reported completed assessments indicate an Environmental Review can take 42 months to complete, compared to a Referral Information, which can take 8 months
- The SEAF would reduce the time compiling surveys and data (which accounts almost entirely for the time difference)
- This leads to an **average assumed time reduction of 34 months**

- The *Digitally Transforming Environmental Assessment* report estimates delay costs at $6m/month for a large capital project ($1b) and $3m/month for a small capital project ($500m)
- This leads to an assumed blended **monthly delay cost of $5.7m/month**
- Further estimates indicate that delay costs can be significantly higher (from $100m-$1.3b per year),[1] however the above more conservative estimate has been used for this analysis

$140m NPV over 10 years

Estimated project delay costs avoided

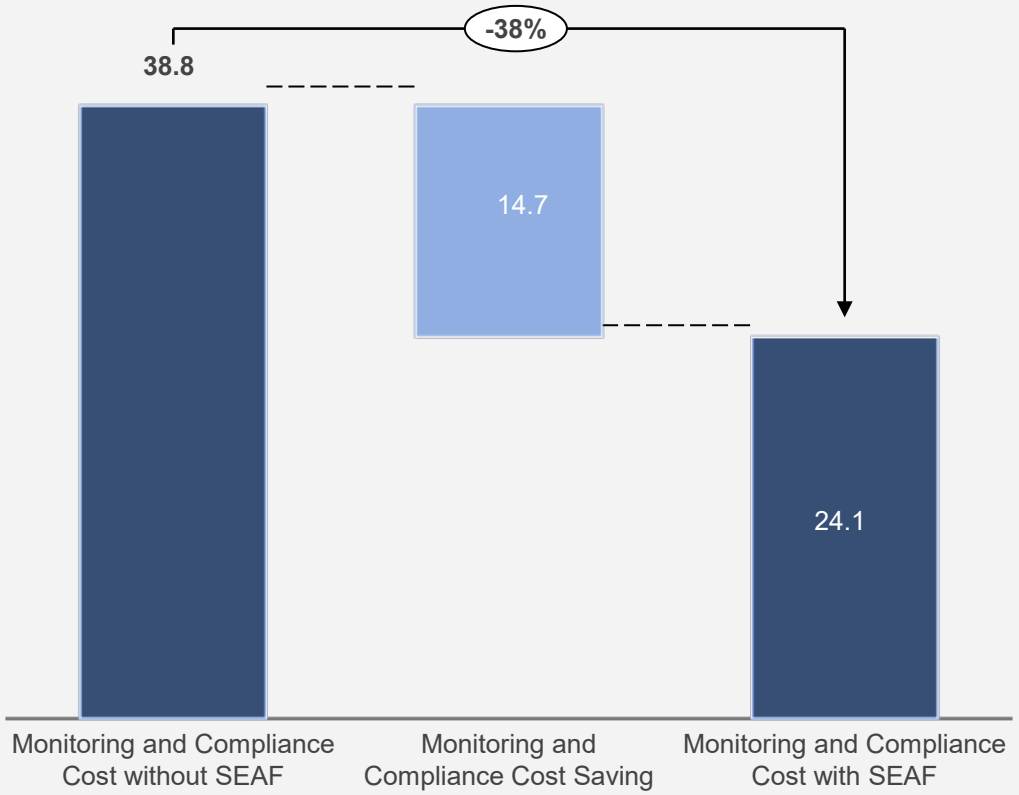
- Per the EPA WA published figures, only **one Environmental Review** has been completed in the Cockburn Sound area **in the last 3 years** – this compares to three Referral Information assessments over the same period
- While this figure has been used as the basis for this analysis, further data provided indicates as many as five projects over the next nine years, with three projects schedule over the next two years

- While not all project assessments will necessarily be reduced (and certainly not all by 34 months), this analysis assumes **30% of projects will be able to be reduced on average**
- However, sensitivity analysis has been conducted, and is presented below:

1. The Productivity Commission (2013) found that cost of delaying by one year an average-sized Australian oil and gas extraction project, valued at $17 billion, could range from $300 million to $1.3 billion. An MCA submission (2020) on the review of the EPBC Act stated a one-year delay to a project can reduce the Net Present Value (NPV) by between 10 and 13 per cent.
Source: WABSI, EPA WA

Monitoring and compliance costs are expected to decline in similar fashion to avoided survey costs, contributing an additional $14.7m NPV in benefits over the 10 year period

Monitoring and Compliance Cost Breakdown – Cockburn Sound (10 year NPV, $m)



Avoided Monitoring and Compliance Cost

- Monitoring and compliance costs are incurred regularly by majority of organisations with activity in the Cockburn Sound region
- While the costs may be less on a per project basis than the original EIA approval, given the breadth of organisations and the recurring annual cost, monitoring and compliance costs are higher than EIA costs
- Similar to EIA survey cost savings, these savings are primarily driven by access to improved information leading to a reduced need for duplication in survey efforts and efficiencies with collective surveying
- These efficiencies are expected to reduce the monitoring and compliance costs by 38%, leading to a benefit of $14.7 NPV over the next 10 years

ESG reporting costs are expected to decline in similar fashion to avoided survey and monitoring and compliance costs, adding $68m NPV in benefits over the 10 year period

ESG Reporting Analysis – Cockburn Sound

Item	Value
Average Annual Cost of ESG Reporting	
Without SEAF	$1,000,000
With SEAF	$800,000
Average Annual Cost Saving (per reporting entity)	**$200,000**
Full members - Cockburn Sound	14
Associate members - Cockburn Sound	33
Total Cockburn Sound reporting entities	47
Cockburn Sound Annual ESG Reporting Cost Saving	$9,400,000
Cockburn Sound ESG Reporting Cost Saving (10y NPV)	**$67,946,614**

Avoided Survey Cost

- Given the wealth of data expected to be already available for reporting entities as a result of the SEAF, significant savings (20%) are expected for ESG reporting
- Conservative estimates indicate at least 47 ESG reporting entities – this number is expected to grow as ESG reporting becomes the norm
- An overall saving of $9.4m annually creates a net benefit of $67.9m NPV over 10 years

4d.
Cockburn Sound:
Products and science requirements

Cockburn Sound products and science requirements overview

Bespoke tools in Cockburn Sound are inefficient

Project based bespoke tools do not efficiently enable an understanding of regional or cumulative pressures.

Environmental Impact Assessment requires project proponents and operators to demonstrate their compliance against the EP Act.

Proponents use EIA tools, such as models, maps and surveys to predict and demonstrate how a project will comply against the EP Act.

Project operators also use EIA tools to assess compliance against licence conditions.

Currently tools are bespoke for each project proponent or operator, which creates duplication. Further, the EPA needs to test QA/QC of each tool for each project, which requires considerable resourcing.

A Cockburn Sound SEAF to develop, maintain, and improve shared tools

A Cockburn Sound SEAF would deliver the governance, operational and science frameworks to create efficiencies for proponents and operators, reduce risk and improve certainty for environmental approvals, and would provide a system to understand cumulative impacts to the region.

This would be achieved by operationalising data reporting and forecasting products, improved by a best practice science program.

The product and science packages proposed for the Cockburn Sound SEAF were developed following consultation with over 60 key government, regulatory, industry and research stakeholders.

Product Packages

Building tools; operating and maintaining them

Product Packages – shared tools identified by industry, government and scientists, developed, maintained and operated by the Cockburn Sound SEAF to provide knowledge to assist project proponents and operators understand and comply with environmental regulation. The tools are important for planning and design, operation and decommissioning of projects. The tools are also important for regulators to assess EP Act compliance, especially for cumulative impact.

Science Packages

Continuously improving tools, adding new tools

Science Packages – the shared tools will be maintained with monitoring data and new data from Science Packages. Science Packages are necessary to continuously review and improve the tools to ensure that they are fit for purpose, dynamic, and able to reflect and assess change over time (such as impact, improvements, effectiveness of management or long-term climate change trends).

The products and science packages have been codeveloped with key Cockburn Sound stakeholders to meet end user needs (1 of 3)

Product / Science Package	Work Package Output	Timing	Benefit
1.1 Industry Operation and Growth	A single point of reference for all reasonably foreseeable projects in Cockburn Sound. Existing project footprints shared openly, projects under assessment shared either openly or collaboratively, future projects private (or as determined by the proponent).	Development in Year 1 Operation in Year 2	A single point of reference for all reasonably foreseeable projects in Cockburn Sound to assist with cumulative impact assessment.
2.1 Industrial Area Groundwater Model	Establish a common dataset that is contributed to by all participants, and that can meet the requirements of the shared / collaborative / private data model.	Development in Year 1 Operational from Year 2 Science in Years 3-5	Access to and curation of data Increased efficiency in analysis and assessment for both proponent and regulator Enables later Product and Science Packages (Science Package 2 - IAGM)
Science Package 2	Continuous improvement of the groundwater model to provide decision support for infrastructure proposals, design, operation and management.	Development in Years 1-2 Operation in Years 2-5	Reduce assumptions and uncertainty, improve model resolution, reduce risk for proponents and regulator. Improve collective understanding of cumulative impact to the region.
3.1 Hydrodynamic and Sediment Transport Models and Maps	Increased knowledge of hydrodynamics and sediment transport processes in Cockburn Sound and Owen Anchorage (including sediment geotechnics and contamination). Establish shared, collaborative and private databases; agreed data standards. Operate and maintain databases, establish update regularity and responsibility. Develop models (Science Packages 3.1 – 3.5). Operate and maintain shared models. Operate and maintain shared maps. Establish and incorporate monitoring program.	Development in Year 0 Operation in Years 1-5 Science in Years 2-5	Access to and curation of data Capacity to scenario test and predict hydrodynamics and sediments transport from construction (i.e. dredging) and operation (i.e. turbidity from ships). Capacity to assess cumulative impacts. Increased efficiency in analysis and assessment for both proponent and regulator. Enables later Product and Science Packages (Science Package 3).

The products and science packages have been codeveloped with key Cockburn Sound stakeholders to meet end user needs (2 of 3)

Product / Science Package	Work Package Output	Timing	Benefit
Science Package 3	Continuous improvement of the hydrodynamic and sediment transport models and maps to provide decision support tools for infrastructure proposals, design, operation and management. Incorporate elements: sediment transport model; coastal processes model; marine geotechnical map; marine sediment contaminants map.	Develop in Year 1 Gap analysis in Years 1-2 Operate in Years 1-5	Continuous improvement of models and maps. Increased certainty / reduced risk. Improved understanding of cumulative pressures
4.1 Integrated Marine Ecosystem Biogeochemistry and Ecological Models and Maps	Increased knowledge of the marine ecosystem and biogeochemistry in Cockburn Sound and Owen Anchorage. Establish private, collaborative and constrained databases; agreed data standards. Operate and maintain databases, establish update regularity and responsibility. Develop shared models and maps (Science Packages 4.1 – 4.5). Operate and maintain shared models. Operate and maintain shared maps. Establish and incorporate monitoring program.	Develop in Year 2-4 Operate in Years 3-5 Science in Years	Data access and curation. Capacity to scenario test and predict marine ecosystem dynamics and biogeochemistry from construction (i.e. dredging impact on fish) and operation (i.e. turbidity impacts on penguins). Capacity to assess cumulative impacts. Increased efficiency in analysis and assessment for both proponent and regulator. Enables later Product and Science Packages (Science Package 4).
Science Package 4	Continuous improvement of the integrated marine ecosystem biogeochemical and ecological models and maps to provide decision support tools for infrastructure proposals, design, operation and management. Incorporate elements: sediment biogeochemistry; benthic communities and habitat map; underwater noise model; Marine Biodiversity and Marine Fauna distribution Map.	Develop in Year 0 Gap analysis in Year 1 Operate in Years 1-5	Continuous improvement of models and maps. Increased certainty / reduced risk. Improved understanding of cumulative pressures

The products and science packages have been codeveloped with key Cockburn Sound stakeholders to meet end user needs (3 of 3)

Product / Science Package	Work Package Output	Timing	Benefit
5.1 Terrestrial Emissions Models and Maps	Increased knowledge of terrestrial emissions in Cockburn Sound and Owen Anchorage. Establish private, collaborative and constrained databases; agreed data standards. Operate and maintain databases, establish update regularity and responsibility. Develop shared models and maps (Science Packages 5.1 and 5.2). Operate and maintain shared models. Operate and maintain shared maps. Establish and incorporate monitoring program.	Develop in Year 1-2 Science Packages in Years 3-5 Operate in Years 4-5	Access to and curation of data. Capacity to scenario test and predict terrestrial atmospheric emissions and noise emissions. Capacity to assess cumulative impacts. Increased efficiency in analysis and assessment for both proponent and regulator. Enables later Product and Science Packages (Science Package 5).
Science Package 5	Continuous improvement of the terrestrial emissions models and maps to provide decision support tools for infrastructure proposals, design, operation and management. Incorporate elements: atmospheric emissions; noise.	Develop in Years 1-2 Operate in Years 2-5	Continuous improvement of models and maps. Increased certainty / reduced risk. Improved understanding of cumulative pressures
6.1 Cockburn Sound DPSIR Reporting Model	Drivers, Pressures, State, Impact and Response (DPSIR) for Cockburn Sound. Current state of the environment. Scenario testing of future state of the environment.	Develop in Year 1 Operate in Years 2-5	Expand the Cockburn Sound DPSIR to include Owen Anchorage. Operationalise the method to capture and describe cumulative impacts of the region over time. Regular review and maintenance of the agreed Cockburn Sound and Owen Anchorage DPSIR will enable qualitative and quantitative assessment of system-scale changes to the state of the environment.

4e.
Cockburn Sound: Costs

Cockburn Sound Implementation: Indicative Cost Profile

		Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Total	NPV[1]
Work Packages & Science Packages	1.1 Industry Operation and Growth	$25,000	$200,000	$100,000	$100,000	$100,000	$100,000	$625,000	$540,576
	2.1 Industrial Area Groundwater Model	$250,000	$600,000	$350,000	$350,000	$350,000	$350,000	$2,250,000	$1,960,176
	Science Package 2	-	-	-	$1,150,000		$500,000	$1,650,000	$1,339,191
	3.1 Hydrodynamic and Sediment Transport Models and Maps	$200,000		$1,250,000	$1,250,000	$500,000	$500,000	$3,700,000	$3,131,696
	Science Package 3	$400,000	$2,050,000	$1,650,000	$1,650,000	$1,650,000	$1,650,000	$9,050,000	$7,727,759
	4.1 Integrated Marine Ecosystem Biogeochemistry and Ecological Models and Maps	$200,000		$1,000,000	$1,000,000	$500,000	$500,000	$3,200,000	$2,699,292
	Science Package 4	$300,000	$2,000,000	$2,000,000	$2,000,000	$2,000,000	$2,000,000	$10,300,000	$8,724,728
	5.1 Terrestrial Ecosystem and Emissions Models and Maps	$250,000	$550,000	$400,000	$400,000	$400,000	$400,000	$2,400,000	$2,076,455
	Science Package 5	-	-	-	$300,000	$2,000,000	$1,000,000	$3,300,000	$2,583,331
	6.1 Cockburn Sound DPSIR Reporting Model	$20,000	$330,000	$330,000	$330,000	$330,000	$330,000	$1,670,000	$1,410,080
	Product Packages Subtotal	$945,000	$1,680,000	$3,430,000	$3,340,000	$2,180,000	$2,180,000	$13,845,000	$11,818,275
	Science Packages Subtotal	$700,000	$4,050,000	$3,650,000	$5,100,000	$5,650,000	$5,150,000	$24,300,000	$20,375,009
Total Costs		$1,645,000	$5,730,000	$7,080,000	$8,530,000	$7,830,000	$7,330,000	$38,145,000	$32,193,283

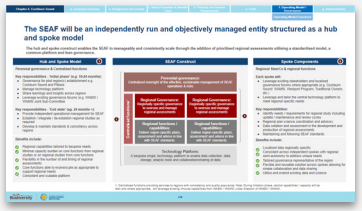
1. Net Present Values have been calculated using a 6% discount rate to Year 0.

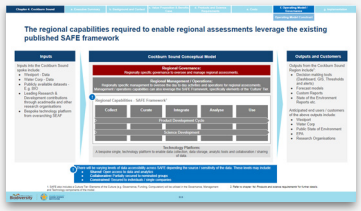
4f.
Cockburn Sound:
Operating model and governance

The proposed operating model design for each spoke to effectively undertake regional assessments has considered the construct, legal structure, capability needs and key risks

Model Construct

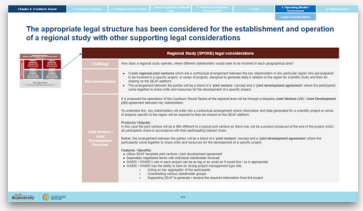
‘Hub & spoke’ model to balance consistency with regional flexibility

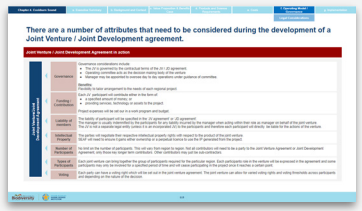




Legal Structure and Considerations

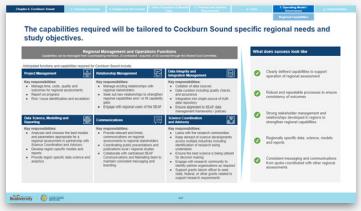
Regional Joint Ventures / Joint Developments established independently of SEAF entity





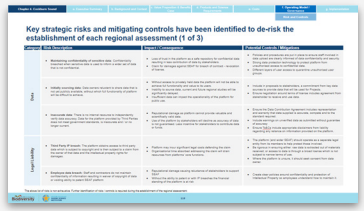
Governance and Capabilities

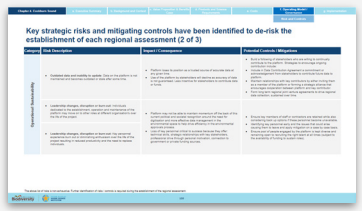
Perennial Governance overseeing operations & risks with Regionally specific Governance to oversee and manage regional assessments



Key Risks and Controls

High level risks identified and categorised mitigation strategies articulated





Operating Model Highlights

- **Consistent and scalable platform**
- Consistent across independent spokes with **regional semi-autonomy to address unique needs**
- **Joint Venture (JV) / Joint Development (JD)** arrangement between key stakeholders in any particular region
- **Comprehensive range of attributes** tailor agreements during JV / JD development
- **Lean** centralised Perennial Governance **leveraging existing committees and forums**
- Independent Regional Governance leveraging **local expertise and networks**
- Capabilities **tailored for specific regional requirements and study objectives**
- **12 strategic risks identified across 4 high level categories**: (a) Data; (b) Legal Liability; (c) Operational Sustainability; (d) Stakeholder Confidence

The SEAF will be an independently run and objectively managed entity structured as a hub and spoke model

The hub and spoke construct enables the SEAF to manageably and consistently scale through the addition of prioritised regional assessments utilising a standardised model, a common platform and lean governance.

Hub and Spoke Model (1)

Perennial governance & Centralised functions

Key responsibilities - 'Initial phase' (*e.g. 18-24 months*):
- Governance for pilot region(s) establishment e.g. Cockburn Sound and Pilbara
- Manage technology platform
- Share learnings and insights across regions
- Leverage existing governance forums (e.g. WABSI / WAMSI Joint Sub-Committee

Key responsibilities - 'End state' (*e.g. 24 months* +):
- Provide independent operational management for SEAF
- Establish / integrate / de-establish regional assessments as required
- Develop & maintain standards & consistency across regions

Benefits include:
- Regional capabilities tailored to bespoke needs
- Minimal capacity burden on core functions from regional assessments or on regional assessments from core functions
- Flexibility in the number of and timing of regional assessments
- Core functions able to evolve / scale as appropriate to support regional needs
- Consistent and scalable platform

SEAF Construct

Perennial governance:
Centralised oversight of the effective, sustainable management of SEAF operations & risks

Centralised functions[1] (1)

Regional Governance[2]:
Regionally specific governance to oversee and manage data and tools to support regional assessments

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Regionally specific governance to oversee and manage data and tools to support regional assessments

Regional functions / capabilities[2]:
Deliver region-specific analytics, reporting and forecasting in line with SEAF standards.

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Deliver region-specific analytics, reporting and forecasting in line with SEAF standards.

(2)

Technology Platform:
A bespoke single, technology platform to enable data collection, data storage, analytic tools and collaboration/sharing of data

Spoke Components (2)

Regional SteerCo & regional functions

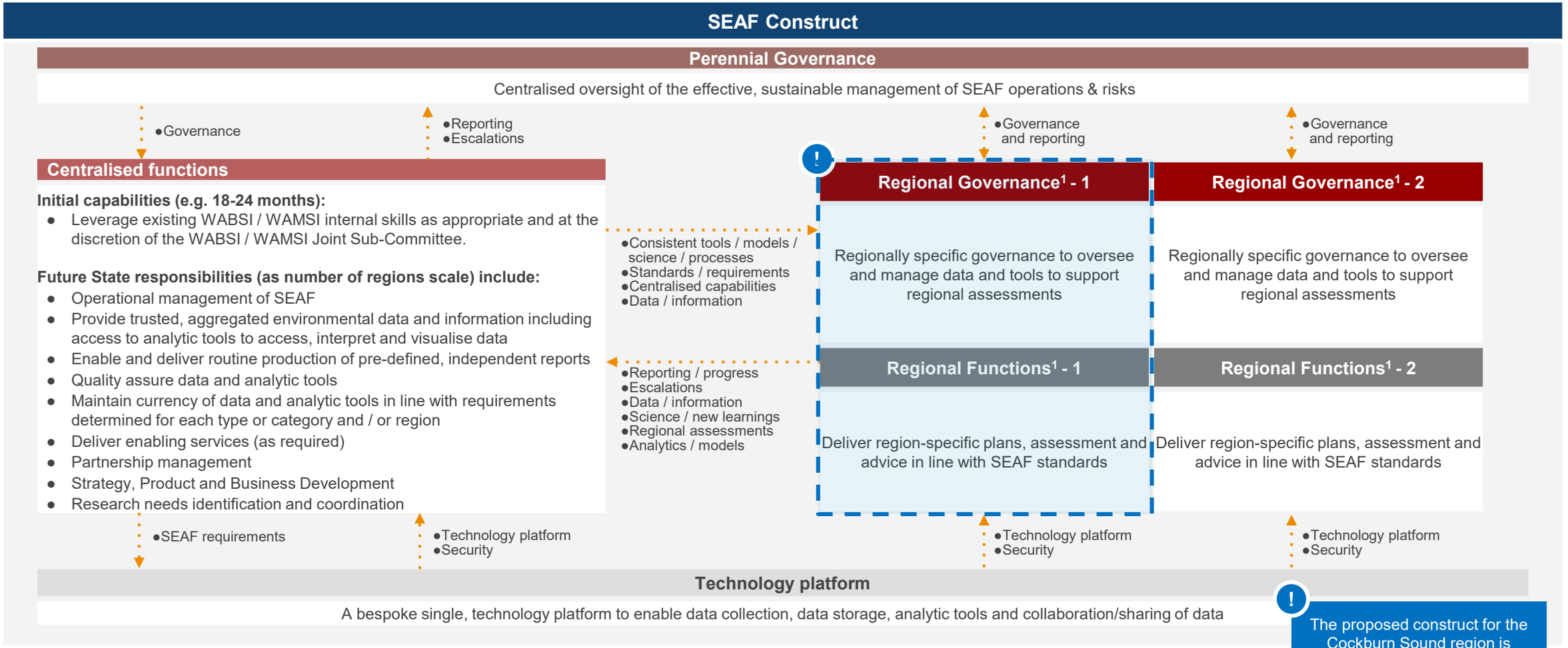
Each spoke will:
- Leverage existing stakeholders and localised governance forums where appropriate (e.g. Cockburn Sound: WAMSI, Westport Program, Traditional Owners etc.)
- Leverage and tailor the central technology platform to meet regional specific needs

Key responsibilities:
- Identify needs / requirements for regional assessment including update / maintenance and review cycles
- Regional plan science coordination and advisory
- Data collation and assessment in the development and production of regional assessments
- Maintaining and following SEAF standards

Benefits include:
- Localised data regionally specific
- Consistent across independent spokes with regional semi-autonomy to address unique needs
- Tailored governance representative of the region
- Flexible and reusable solution across spokes allowing for simple collaboration and data sharing
- Utilise and extend existing data and science

1. Centralised functions providing services to regions with consistency and quality assurance. Note: During initiation phase, central capabilities / capacity will be lean and where appropriate, will leverage existing inhouse capabilities from WABSI / WAMSI under direction of WABSI / WAMSI.
2. Spoke components include regional governance and regional functions / capabilities. Note while only two spokes have been depicted for clarity, there is no cap on the total number of regional spokes.

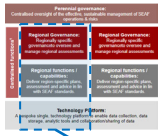
The high level interaction model below outlines how each component of the model connects to produce tailored regional assessments



The proposed construct for the Cockburn Sound region is expanded in subsequent slides

1. Note: While only two spokes have been depicted for clarity, there is no cap on the total number of regional spokes.

The conceptual model for the Cockburn Sound regional spoke has the required capabilities to flexibly and independently operate to produce a regional assessment



Regional Model Construct

- Regional Governance
- Regional Management / Operations
- Regional Capabilities (SAFE)[1]
  - Product Development Cycle
  - Science Development
- Technology Platform

Conceptual Model Overview:

The above 'building blocks' are required to operationalise each SEAF spoke. This model provides a consistent structure for each newly established spoke promoting consistency and regional flexibility. Benefits include:

- ***Sustainability*** via regional governance in concert with SEAF governance
- ***Repeatability*** through dedicated processes and operational management
- ***Robustness*** built upon dedicated SAFE capabilities providing foundation for science and product development

Building blocks to 'Operationalise' a Regional Spoke

Regional Governance		Regionally specific governance to oversee and manage data and tools to support regional assessments
Regional Functions / Capabilities	Management / Operations	Overall management and facilitation of regional assessment operations including: • Product reporting • Data and analytics: SAFE capabilities • Science and data • Platform, Governance, Operations
	Regional Capabilities[1]	The capabilities at a regional level will be founded upon the Shared Analytic Framework for the Environment (SAFE) framework. SAFE depicts the capabilities which work together across the information and analytic supply chain to provide input decision-support and reporting tools for environmental assessments[2].
	Products[2]	Environment reporting, forecast and decision support • **Regulatory**: Cumulative environmental impact assessments, monitoring and alerts • **Company**: TNFD, Paris climate goals & TCFD, green bonds, etc. • **National**: State of environment, state of country, sustainable development goals, other policy & program
	Science[2]	Ability to extend on existing research and provide robust outcomes through: • Best available local and national science • Pipeline from research to operations • Proponent data available to researchers
Technology Platform[3]		The platform will enable data collection / storage, provide analytics / tools and enable collaboration and data sharing.

1. Refer to: SAFE - A guide to Shared Analytical Framework for the Environment: URL: https://wabsi.org.au/wp-content/uploads/2023/05/SAFE-2.0_May-2023.pdf
2. Please refer to chapter *'4d. Products and science requirements'* for further details.
3. Please refer to chapter '*6. Technology'* for further details.

The regional capabilities required to enable regional assessments leverage the existing published SAFE framework

Inputs

Inputs into the Cockburn Sound spoke include:

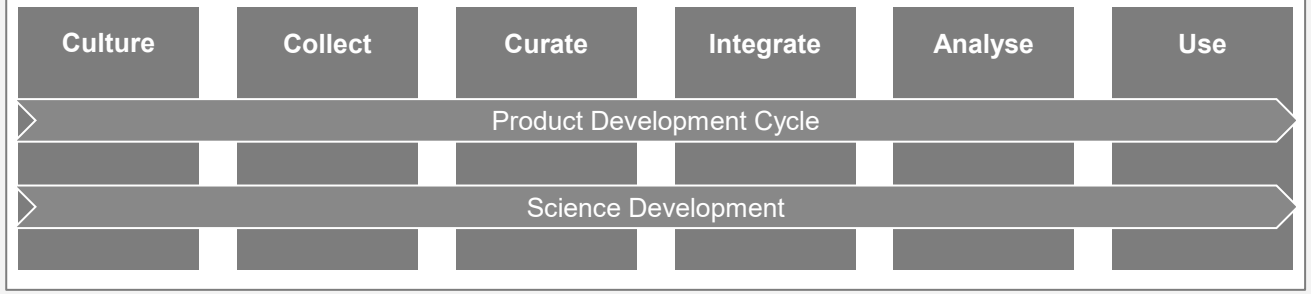
- Westport - Data
- Water Corp - Data
- Publicly available datasets - E.g. BIO
- Leading Research & Development contributions through academia and other research organisations
- Bespoke technology platform from overarching SEAF

Cockburn Sound Conceptual Model

Regional Governance:
Regionally specific governance to oversee and manage data and tools to support regional assessments

Regional Management / Operations:
Regionally specific management to oversee the day to day activities and operations for regional assessments. Management / operations capabilities can also leverage the SAFE Framework, specifically elements of the 'Culture' Tier.

Regional Capabilities - SAFE Framework



Technology Platform:
A bespoke single, technology platform to enable data collection, data storage, analytic tools and collaboration / sharing of data.

Outputs and Customers

Outputs from the Cockburn Sound Region include[1]:

- Decision making tools (Dashboard, GIS, Thresholds and alerts)
- Forecast models
- Custom Reports
- State of the Environment Reports etc.

Anticipated end users / customers of the above outputs include:

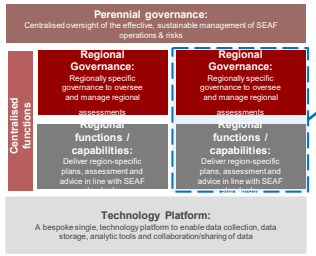
- Westport
- Water Corp
- Public State of Environment
- EPA
- Research Organisations

There will be varying levels of data accessibility depending the source / sensitivity of the data. These levels may include:

- ***Private:*** Secured to individuals / single companies
- ***Collaborative:*** Partially secured to nominated groups
- ***Constrained:*** Restricted access to one or more participants.

1. Refer to chapter *'4d. Products and science requirements'* for further details.

The appropriate legal structure has been considered for the establishment and operation of a regional assessment with other supporting legal considerations



Regional Spoke legal considerations	
Challenge	How does a regional spoke operate, where different stakeholders would seek to be involved in each geographical area?
Recommendation	• Create **regional joint ventures** which are a contractual arrangement between the key stakeholders in any particular region who are prepared to be involved in a specific project, or series of projects, or series of projects designed to generate data in relation to the region for scientific study and then for sharing on the SEAF platform. • The arrangement between the parties will be a blend of a 'joint venture' concept and a 'joint development agreement' where the participants come together to share skills and resources for the development of a specific project.

Joint Venture / Joint Development Overview	It is proposed the operations of the Cockburn Sound Spoke at the regional level will be through a bespoke **Joint Venture (JV) / Joint Development (JD)** agreement between key stakeholders.
	
	To undertake this, key stakeholders will enter into a contractual arrangement where information and data generated for a scientific project or series of projects specific to the region will be required to then be shared on the SEAF platform.
	
	Products/ Outputs:
	In this case the joint venture will be a little different to a typical joint venture as there may not be a product produced at the end of the project which all participants share in accordance with their participating interest share.
	
	Rather, the arrangement between the parties will be a blend of a 'joint venture' concept and a 'joint development agreement' where the participants come together to share skills and resources for the development of a specific project.
	
	Features / Benefits:
	• Utilise SEAF template joint venture / joint development agreement
	• Separately negotiated terms with individual stakeholder involved
	• WABSI / WAMSI's role in each project can be as big or as small as it would like / as is appropriate
	• WABSI / WAMSI has the ability to take on strong project management type role;
	  ○ Acting as key aggregator of the participants
	  ○ Coordinating various stakeholder groups
	  ○ Supporting SEAF to generate / receive the required information from the project.

There are a number of attributes that need to be considered during the development of a Joint Venture / Joint Development agreement

Joint Venture / Joint Development Agreement in Action

Joint Venture/Joint Development Agreement

Governance	Governance considerations include: ● The JV is governed by the contractual terms of the JV / JD agreement. ● Operating committee acts as the decision making body of the venture. ● Manager may be appointed to oversee day to day operations under guidance of committee. **Benefits:** Flexibility to tailor arrangement to the needs of each regional project.
Funding / Contribution	Each JV participant will contribute either in the form of: ● a specified amount of money; or ● providing services, technology or assets to the project. Project expenses will be set our in a work program and budget.
Liability of members	The liability of participants will be specified in the 'JV agreement' or 'JD agreement'. The manager is usually indemnified by the participants for any liability incurred by the manager when acting within their role as manager on behalf of the joint venture. The JV is not a separate legal entity (unless it is an incorporated JV) to the participants and therefore each participant will directly be liable for the actions of the venture.
Intellectual Property	The parties will negotiate their respective intellectual property rights with respect to the product of the joint venture. SEAF will need to ensure it gains either ownership or a perpetual licence to use the IP generated from the project.
Number of Participants	No limit on the number of participants. This will vary from region to region. Not all contributors will need to be a party to the Joint Venture Agreement or Joint Development Agreement, only those key longer term contributors. Other contributors may just be sub-contractors.
Types of Participants	Each joint venture can bring together the group of participants required for the particular region. Each participants' role in the venture will be expressed in the agreement and some participants may only be involved for a specified period of time and will cease participating in the project once it reaches a certain point.
Voting	Each party can have a voting right which will be set out in the joint venture agreement. The joint venture can allow for varied voting rights and voting thresholds across participants and / or depending on the nature of the decision.

A Regional Governance will provide oversight and direction of each Regional Assessment

Regional Governance

Purpose	The Regional Governance will provide regionally specific, independent and objective governance through representative members. The steering committee will be established or built on existing regional interest groups as appropriate, for each region.
Considerations	**Enabling Structures:** The Regional Governance will have established Rules of Procedure, further elaborating on the provisions of the Memorandum of Understanding (MoU) regarding the structure of the board, meetings, requirements for participation and the establishment of subsidiary bodies. **Responsibilities:** The regional management board will be responsible for making collective decisions around and management of the regional assessment including ensuring the objectives are being met, stakeholders are being appropriately engaged, that any identified data or science gaps are being filled, and that the needs of the collective are being met through the work being undertaken. Those appointed to the Regional Governance should ideally be well respected within the group they represent, have similar experience and have the capacity to be engaged throughout the duration of the regional assessment and beyond. **Potential Skills and Roles:** The make-up of each of these Regional Governance will be tailored depending on the region and is expected to be participant representative to recognise the diversity of needs and interests across the stakeholder spectrum.

What does success look like

- Regionally representative and independent governance
- Tailored governance procedures (i.e. regionally specific MoU) to ensure governance structure is ‘right sized’ for each region
- Deep knowledge of local pressures and expertise to support regional assessment development
- Well established local networks and relationships to support the development and advocation of regional assessment outcomes
- Alignment to broader SEAF standards to ensure consistency and quality of regional assessments is maintained across regions

The capabilities required will be tailored to Cockburn Sound specific regional needs and assessment objectives

Regional Management and Operations Functions

Capabilities can be leveraged from i) participating members, ii) contracted / acquired, or iii) sourced through the Shared Sub-Committee.

Anticipated functions and capabilities required for Cockburn Sound include:

Project Management

Key responsibilities:

- Manage time, costs, quality and outcomes for regional assessments
- Report on progress
- Risk / issue identification and escalation

Relationship Management

Key responsibilities:

- Manage existing relationships with regional stakeholders
- Seek out new relationships to strengthen regional capabilities and / or fill capability gaps
- Engage with regional users of the SEAF

Data Integrity and Integration Management

Key responsibilities:

- Collation of data sources
- Data curation including quality checks and assurance
- Integration into single source of truth data repository
- Ensure alignment to SEAF data management frameworks / policies

Data Science, Modelling and Reporting

Key responsibilities:

- Analyses and chooses the best models and parameters appropriate for a regional assessment in partnership with Science Coordination and Advisory
- Develop region specific models and reports
- Provide region specific data science and analytics

Communications

Key responsibilities:

- Provide relevant and timely communications on regional assessments to regional stakeholders
- Coordinating public presentations and publications local / regional assessment
- Collaborate with centralised SEAF Communications and Marketing team to maintain consistent messaging and branding

Science Coordination and Advisory

Key responsibilities:

- Liaise with the research communities
- Keep abreast of science developments across multiple industries including identification of research being undertaken
- Ensure the best science is being utilised for decision making
- Engage with research community to identify partner organisations as required
- Support grants liaison officer to seek state, federal, or other grants related to support research requirements

What does success look like

- Clearly defined capabilities to support operation of regional assessment
- Robust and repeatable processes to ensure consistency of outcomes
- Strong stakeholder management and relationships developed in regions to strengthen regional capabilities
- Regionally specific data, science, models and reports
- Consistent messaging and communications from spoke coordinated with other regional assessments

SAFE provides an existing structured framework on which the required capabilities to develop a robust regional assessment can be founded

SAFE Capabilities[1]

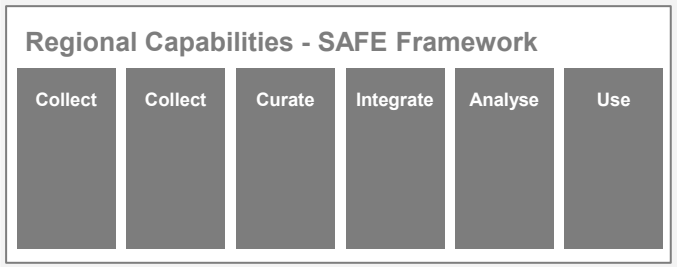
What is SAFE?

A Shared Analytic Framework for the Environment (SAFE) depicts the capabilities – the building blocks – which work together across the information and analytic supply chain to provide input decision-support and reporting tools for environmental assessments. It is a management tool, providing a framework and language to:

- Facilitate a consistent view of the capabilities and their interdependencies;
- Help align effort and prioritise investment across these capabilities.

Each 'Tier' of the framework outlines the required capabilities.

SAFE has been developed by WABSI, WAMSI and many others. It is based upon the Global Biodiversity Information (GBIO) Outlook[2].



Tier	Culture	Collect	Curate	Integrate	Analyse	Use
Tier Description	The Culture layer comprises the fundamental approaches and capabilities needed to enable all elements of SAFE to operate and to interact effectively.	The Collect tier includes the capabilities to generate multiple types of data, from existing sources to new fieldwork observations and automated sensors.	The Curate tier is the engine room where data are processed to make it fit for purpose, complete and FAIR. Data curation is an active and ongoing process that covers the full data lifecycle.	The Integration tier takes data and curated data products and links them to other data products in preparation for being used in analytic and modelling tools. It also identifies the key characteristics necessary to ensure their continued integrity, and the scientific basis for their integration.	The Analysis tier identifies the analytic and modelling capabilities that underpin research outcomes, reporting and decision support tools.	**Decision support tools**: Environmental Impact Assessment processes (including cumulative impacts), environment management, monitoring. **Reporting:** Regional and national: State of Environment reporting, environmental economic accounts, Sustainable Development Goals, etc Company level: Task Force on Nature-related Financial Disclosures. **Research:** Multi-disciplinary research, new analysis methods, input into and feedback from decision support and reporting tools
Capabilities	• Legal, policy and program incentives • Data governance and access • Culture of FAIR data and software • Indigenous Knowledge and CARE Principles • Communication and communities of practice	• Observations and measurements • Collection systems and protocols • Reference samples • Metadata and data standards • Data discovery and reuse	• Data quality and fitness for purpose • Vocabularies and conventions • Identifiers • Data and software publishing • Managed datasets, layers and products	• Trusted data on drivers, pressures, state, impacts and responses • Conceptual frameworks and methods for modelling • Standards and systems for data sharing and exchange • Provenance and lineage	• Explanatory and predictive modelling • Standards for models and model linkage • Model traceability, reproducibility and stewardship • Assurance and uncertainty methods	

1. Refer to: SAFE - A guide to Shared Analytical Framework for the Environment: URL: https://wabsi.org.au/wp-content/uploads/2023/05/SAFE-2.0_May-2023.pdf
2. Based on the report Delivering Biodiversity Knowledge in the Information Age. Available at: https://doi.org/10.15468/6jxa-yb44.

Key strategic risks and mitigating controls have been identified to de-risk the establishment of each regional assessment (1 of 3)

Category	Risk Description	Impact / Consequence	Potential Controls / Mitigations
Data	• **Maintaining confidentiality of sensitive data:** Confidentiality breached when sensitive data is used to inform a wider set of data that is not confidential.	• Loss of trust in the platform as a safe repository for confidential data resulting in less contribution of data by stakeholders. • Claim for damages against SEAF for breach of contract - revocation of license.	• Policies and procedures are put in place to ensure staff involved in data upload are clearly informed of data confidentiality and security. • Strong data protection technology to protect platform from unauthorised access to confidential data. • Different layers of user access to quarantine unauthorised user groups.
	• **Initially sourcing data:** Data owners reluctant to share data that is not yet publicly available, without which full functionality of platform will be difficult to achieve.	• Without access to privately held data the platform will not be able to achieve full functionality and value to its users. • Inability to source data, current and future regional assessments will be significantly delayed. • Insufficient data can impact the operationality of the platform for public use.	• Include in proposals to stakeholders, a commitment from key data sources to provide data that will be used for projects. • Ensure negotiation around terms of license includes agreement from stakeholder to receive and use data.
	• **Inaccurate data:** There is no internal resource to independently verify data accuracy. Data for the platform provided by Third Parties does not meet government standards, is inaccurate and / or no longer current.	• Reputational damage as platform cannot provide valuable and scientifically valid data. • Use of the platform by stakeholders will decline as accuracy of data is not guaranteed. Less incentive for stakeholders to contribute data or funds.	• Ensure the Data Contribution Agreement includes representation and warranty that data supplied is accurate, compete and to the standard required. • Include warnings on unverified data as submitted without guarantee of accuracy. • Ensure T&Cs include appropriate disclaimers from liability regarding any reliance on information provided on the platform.
Legal Liability	• **Third Party IP breach:** The platform obtains access to third party data which is subject to copyright and is then subject to a claim from the owner of that data and the intellectual property rights for damages.	• Platform may incur significant legal costs defending the claim. • Organisational time absorbed addressing the claim will drain resources from platform's core functions.	• The platform (and wider SEAF) should operate as a separate legal entity from its members to help protect those involved. • Be rigorous in ensuring either: raw data is extracted out of materials received; or access to data is through a broad license which is not subject to narrow terms of use. • Where the platform is unsure, it should seek consent from data owner.
	• **Employee data breach:** Staff and contractors do not maintain confidentiality of information resulting in waiver of copyright of data or voiding ability to patent SEAF platform.	• Reputational damage causing reluctance of stakeholders to support SEAF. • Without the ability to patent or with IP breaches the financial standing of the platform is at risk.	• Create clear policies around confidentiality and protection of intellectual property so employees understand how to maintain it.

The above list of risks is non-exhaustive. Further identification of risks / controls is required during the establishment of the regional assessment.

Key strategic risks and mitigating controls have been identified to de-risk the establishment of each regional assessment (2 of 3)

Category	Risk Description	Impact / Consequence	Potential Controls / Mitigations

Operational Sustainability	• **Outdated data and inability to update:** Data on the platform is not maintained and becomes outdated or stale after some time.	• Platform loses its position as a trusted source of accurate data at any given time.
		• Use of the platform by stakeholders will decline as accuracy of data is not guaranteed. Less incentive for stakeholders to contribute data or funds.
			• Build a following of stakeholders who are willing to continually contribute to the platform. Strategies to encourage ongoing contribution include:
			  ○ Include in Data Contribution Agreement a commitment or acknowledgement from stakeholders to contribute future data to platform.
			  ○ Maintain relationships with key contributors by either inviting them as a member of the platform or forming a strategic alliance that encourages cooperation between platform and key contributor.
			  ○ Form long term regional joint venture agreements to drive regional data collection, sustained over time.

	• **Leadership changes, disruption or burn-out:** Individuals dedicated to the establishment, operation and maintenance of the platform may move on to other roles at different organisation's over the life of the project.	• Platform may not be able to maintain momentum off the back of this current political and societal recognition around the need for digitisation and more effective data management in the environmental space to help drive efficiency in the environmental approvals process. • Loss of key personnel critical to success because they offer technical skills, strategic relationships with key stakeholders, professional drive through personal motivation, connection to government or private funding sources.	• Ensure key members of staff or contractors are retained while also considering back up options if these personnel become unavailable. • Identifying key personnel early and the issues that could arise causing them to leave and apply mitigation on a case by case basis. • Ensure pool of people engaged by the platform is kept diverse and remaining open to recruiting the right talent at all times (subject to the availability of funding to sustain roles).
	• **Leadership changes, disruption or burn-out:** Key personnel experience burn out or diminishing enthusiasm over the life of the project resulting in reduced productivity and the need to replace individuals.		

The above list of risks is non-exhaustive. Further identification of risks / controls is required during the establishment of the regional assessment.

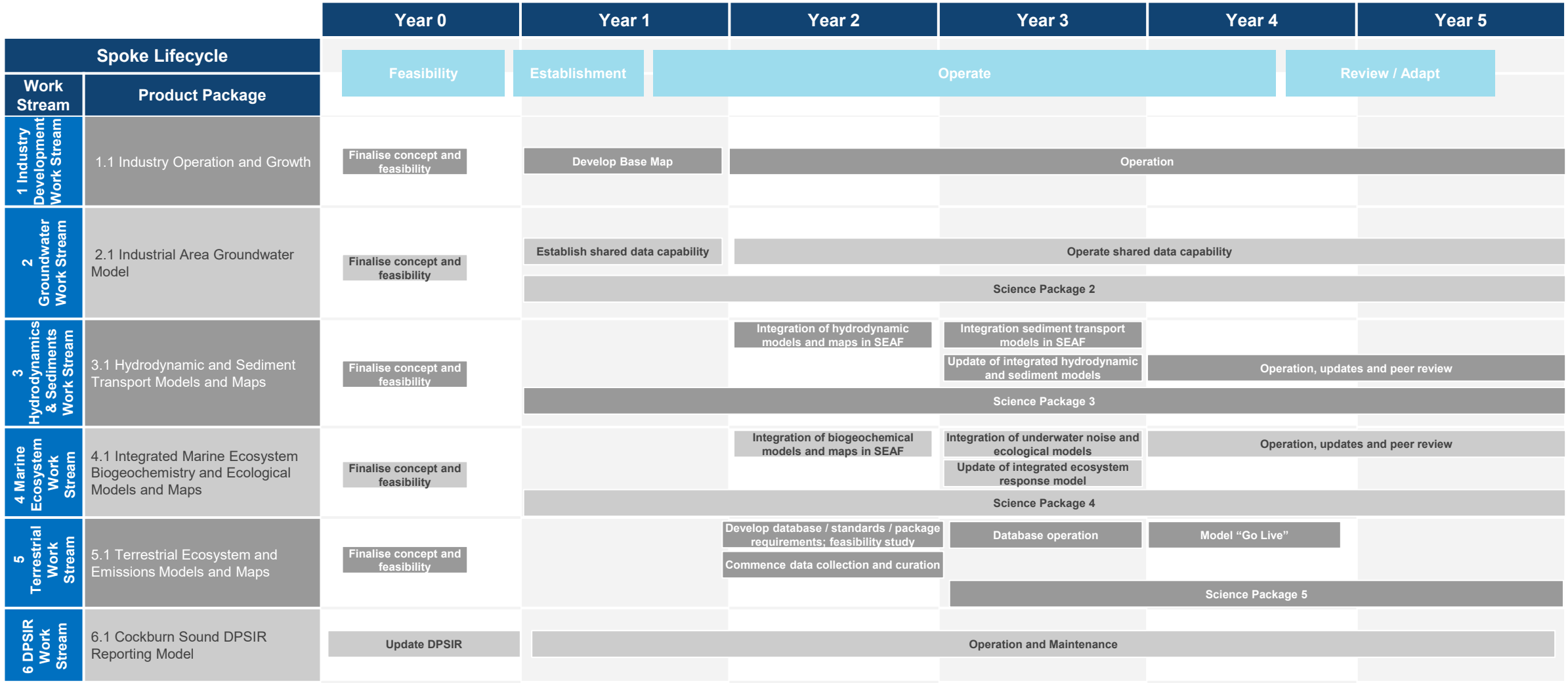
Key strategic risks and mitigating controls have been identified to de-risk the establishment of each regional assessment (3 of 3)

Category	Risk Description	Impact / Consequence	Potential Controls / Mitigations
Stakeholder Confidence	• **Independence:** The SEAF and each region wishes to have, and maintain, a position as an independent provider of open-source data which is trusted by stakeholders to be objective and non-partisan about the manner in which it operates, curates and allows access to data on the SEAF platform.	• If seen to align with one particular group of stakeholders (nationally or regionally) or is politically tied to any side of politics in terms of its interaction with Government, then this could deter stakeholders from contributing data or funds to SEAF to help support the project. Once a reputation for being biased or too aligned with one particular group arises, it will take a lot of work to dispel that reputation whether it was justly acquired or not.	Ensure independence and objectivity is maintained across all aspects of its operations including in: • the manner it attains data (i.e. the consideration for acquiring such data should not result in having to show favour to that contributor); • the way the data is curated and presented on the platform; • the formation of its governance structures, including; membership base; the Board of Directors and its advisory groups; • strategic alliances or joint venture relationships; • the priorities it has when building out the platform. • Source and nature of funding sources.
	• **Misuse of Platform:** Third Parties accessing data in the platform and used for purposes not aligned to the platforms' objectives or the commercial interests of the parties who contributed data.	• Assertions made by third parties may or may not be an accurate interpretation of the data provided by the platform resulting in stakeholders affected by the assertions becoming reluctant to contribute data to the platform in the future.	• While limiting access to the platform or screening users will impact the platforms ability to appear independent, causing all users to log into the platform and verifying identity will allow for the restriction or termination of access by users who have misused the data. • Moving to a subscription model will also act as a 'gatekeeper' mechanism to prevent users misusing the data.
	• **Under delivery:** Platform becomes under resourced / underfunded and is therefore unable to deliver on its objectives or build confidence in the platform.	• Reputational damage impacting platforms ability to raise funds in the future, and likewise jeopardise future collaborative efforts from organisations.	• Ensure funding for each regional platform is in place prior to commitment to adding the regional project to the platform. • Ensure stakeholders the platform partners with are reputable, reliable and willing to invest either financially or in providing services or assistance to generate data required to maintain the platform. • Ensure legal advice is sought for every joint venture - that each participant is legally bound to deliver on their commitments.
	• **Lack of buy-in from Stakeholders:** Stakeholders do not have confidence in Platform being a long term and sustainable platform and therefore do not want to get involved.	• Unable to attract funding and strategic support from key stakeholders who have the skills or money to help support platform or the Regional Joint Venture.	• Secure support from strategic individuals within key stakeholders, such as high-profile board members whose public and / or private support can generate interest in the project from operational level stakeholders. • Develop a funding model which is sustainable and not reliant on any one particular source. • Government funding will still be critical to seed, scale and sustain however, maintaining independence from Government funding is crucial.

The above list of risks is non-exhaustive. Further identification of risks / controls is required during the establishment of the regional assessment.

4g.
Cockburn Sound: Implementation plan

Implementation Approach: Cockburn Sound Implementation Plan and Work Packages



Work Stream 1: Industry Development

Product Package 1.1: Industry Operation and Growth

Overview

Overview

Reasonable foresight is fundamental to being able to describe cumulative impacts. A SEAF would enable all existing project footprints to be shared openly, with projects under assessment to be shared either openly or collaboratively, and future projects to be constrained (or as determined by the proponent). This will provide proponents with a single point of reference for all reasonably foreseeable projects, which will significantly reduce the level of effort required to identify projects and calculate their footprints. The benefit of this to proponents is that they can also upload existing and proposed management. It will also enable regulators to understand where gaps in the knowledge base of existing developments are (e.g., sediment contamination).

Deliverables

1. Agree scope of inclusions (Private/Collaborative/Constrained)
2. Regional map of proposed development
3. Develop method for uploading past, current and future project footprints into SEAF

Assumptions

1. SEAF can operate as a GIS platform for showing developments in 2D / 3D
2. Proponents are willing to share / upload actual footprints of existing projects
3. Baseline information is made available - 2023 WAMSI/JTSI project on proposed industry projects

Risks / Issues

1. Lack of willingness to share current proposals
2. Project proponents are not identified
3. ASIC anti competitive regulations

Dependencies

1. SEAF platform is in operation

Scope and Timing

In Scope

1. Feasibility study to determine method for reporting past, present and future projects in SEAF
2. Collation of spatial data for existing projects and future projects in public domain
3. Collation of spatial data for future projects

Out of Scope

Goals / Outcomes

1. To provide a single point of reference for all reasonably foreseeable projects

Timeline / Milestones

1. Year 1 – Develop base map
2. Year 2 - Operation

Resources and Interfaces

Key Stakeholders

1. Government – EPA, DWER, DBCA, JTSI, DCCEEW
2. Industry
3. Consultants
4. Traditional owners

Budget

1. Agree scope - $25,000
2. Project map enhancement (expand 2023 scope) - $200,000
3. Operation and Maintenance - $100,000 annual maintenance

Resource Requirements

1. SEAF

Work Stream 2: Groundwater

Product Package 2.1: Industrial Area Groundwater Model

Overview

Overview

Groundwater would collate integrated groundwater data, which would enable establishment of an Industrial Area Groundwater Model (IAGM). The model would provide the ability to hindcast and forecast groundwater dynamics throughout the Rockingham Industrial Zone, Kwinana Industrial Area, Australian Maritime Complex, and Latitude 32 Industry Zone (or other important areas as needed). The IAGM would provide predictive capabilities for: water level; spatial and temporal dynamics of freshwater and saltwater plumes; nutrient and contaminant concentrations, input, distribution and discharge.
The IAGM would provide valuable information for project operators/proponents to better understand their contribution to cumulative impacts to groundwater. It will be a useful tool to scenario test management, mitigation and amelioration options designed to manage and improve groundwater quality. Further, the IAGM will provide a tool for water allocation managers to better understand the impacts of groundwater recharge/abstraction in the region.
By having access to groundwater data outside the proponent's lease boundaries, the modelled boundary conditions will be based on more accurate conditions than would be assumed in the absence of neighbouring data. The database will have the ability to store various model data sets. An IAGM would provide a baseline for future assessments to be considered against. sniThe model will incorporate data supplied to the groundwater database and modelled developments as they are created. Model outputs for new projects will include consideration for adjacent projects, which will provide a more accurate cumulative impact assessment on groundwater values.

Deliverables

1. Shared data: established databases; agreed data standards
2. Shared data: operation and maintenance – establish update regularity and responsibility
3. Science package 2.1 – Industrial Area Groundwater Model
4. Shared model: operation and maintenance

Assumptions

1. Users agree to provide data to the database
2. Data collection and reporting protocols are agreed and consistent
3. Data/analytics sharing is assumed within a SEAF
4. Cockburn DPSIR model concepts and principles are generally adaptable to Pilbara setting
5. Science packages will be funded via the Science budget

Risks / Issues

1. Reluctance to share baseline data and post development monitoring data
2. Reluctance to share project models

Dependencies

1. Data/analytics sharing is assumed within a SEAF
2. Data sharing agreements

Scope and Timing

In Scope

1. Collection of historical data
2. Data package requirements
3. Develop mechanism for new projects to be incorporated under the "Private/Collaborative/Constrained" model

Out of Scope

1. Full catchment scale model (PRAMS)
2. Science Package 2 – Ground water modelling

Goals / Outcomes

1. Establish a common dataset that is contributed to by all participants, and that can meet the requirements of the 'data zoned' data model
2. Improve understanding of groundwater movement
3. More accurate model outcomes
4. Improved understanding of cumulative effects on groundwater as a result of multiple developments within a catchment

Timeline / Milestones

1. Year 1 – establish shared data capability
2. Year 2 – operate shared data capability
3. Year 3 – Science package 2.1.1 – model proof of concept
4. Year 3 – Science package 2.1.2 – model development
5. Year 4 – operate model
6. Year 5+ – Science package 2.1.3 – Identify beneficial analytics and build into model capability

Resources and Interfaces

Key Stakeholders

1. Government – EPA, DWER, DCCEEW
2. Industry
3. Researchers
4. Consultants
5. Traditional Owners

Budget

1. $250,000 Data Sharing Scope
2. $150,000 DWER Aligned Data Sharing Platform Build
3. $450,000 Data Migration
4. $250,000 Data Sharing Annual Maintenance
5. $100,000 Model Operation and Annual Maintenance
6. * Extended annual monitoring not costed

Resource Requirements

1. Hosted server
2. Data analyst to check / curate data packages
3. Groundwater model operator

Work Stream 2: Groundwater

Science Package 2: Industrial Area Groundwater Model (1 of 2)

Overview

Overview

Science packages are discrete studies to support the development of SEAF tools. Science packages may include one or more of the following objectives: 1) proof of concept; 2) scientific development; and, 3) continuous improvement

Tool description: A groundwater model to hindcast, or forecast the groundwater dynamics of the Rockingham Industrial Zone, Kwinana Industrial Area, Australian Maritime Complex, and Latitude 32 Industry Zone (or other important connected areas as required).

Science package 2.1 –proof of concept, scientific development and continuous improvement of a shared Industrial Area Groundwater Model (IAGM).

Vision: Development of the Industrial Area Groundwater Digital Twin – development, maintenance and expansion of the groundwater model to enable scenario testing for project development, approvals, operation and decommissioning. The groundwater model will enable assessment of cumulative impacts and the effectiveness of management, mitigation and amelioration strategies.

Deliverables

1. Science Package 2.1
   Science package 2.1.1 - Proof of concept IAGM
   Science package 2.1.2 – Scientific development IAGM
   Science package 2.1.3 – Continuous improvement IAGM

The sub-components of each Science Package are expanded below:
Proof of concept
- assess existing models
- select/develop model
- select/develop features
- decide on standards, agree data types
- demonstrate model can meet the data zones approach

Scientific development
- literature review,
- data identification and collation
- data QA/QC, data standardisation, gap analysis
- model development, including validation and optimisation

Continuous improvement
- review assumptions and field validation
- gap analysis
- focussed data collection
- model recalibration, validation and optimisation

Assumptions

1. Theme 3 of WWMSP will provide contemporary information of groundwater flux
2. IAGM will provide information to decision makers that cannot be derived from existing models/products/services
3. WA Government and industry utilise the groundwater model as a decision support tool
4. EPA accept IAGM as a suitable tool to describe cumulative pressures/impacts
5. IAGM operation funded separately (Work Package 2.1).

Risks / Issues

1. Lack of willingness to share current or future data
2. Understanding how a Cockburn regional model would intersect with established PRAMS model and bespoke industry models
3. Legal liability risk for operator (SEAF)

Dependencies

1. SEAF platform is in operation

Work Stream 2: Groundwater

Science Package 2: Industrial Area Groundwater Model (2 of 2)

Scope and Timing

In Scope

1. Science package 2.1

Out of Scope

1. SEAF operation (IAGM operation)

Goals / Outcomes

1. To develop a Cockburn Sound and Owen Anchorage groundwater model to provide decision support for infrastructure proposals, design, operation and management.
2. To update and continuously improve the groundwater model
3. Reduce assumptions and uncertainty, improve model resolution, reduce risk for proponents and regulator
4. Improve collective understanding of cumulative impact to the region.

Timeline / Milestones

1. Year 0 – Feasibility Study
2. Year 1-2 – Gap analysis and prioritisation program
3. Year 2-5+ – Implement science program (1-5 year program depending on identified priorities)

Resources and Interfaces

Key Stakeholders

1. Government (WA EPA, DWER, DPIRD, DBCA, DCCEEW, JTSI, DoT, DoD, Pawsey)
2. Science Providers (Universities, AIMS, CSIRO)
3. Industry (new project proponents, existing project operators)
4. Consultants (with Cockburn Sound experience)

Budget

1. Science package 2.1.1 - Proof of concept IAGM - $150,000
2. Science package 2.1.2 – Scientific development IAGM - $1,000,000
3. Science package 2.1.3 – Continuous improvement IAGM - $500,000

Resource Requirements

1. Capacity to support modelling
2. Capability to support research programs

Work Stream 3: Hydrodynamics and Sediments

Product Package 3.1: Hydrodynamic and Sediment Transport Models and Maps

Overview

Overview

A series of data, GIS and analytical tools to improve understanding of the dynamics of flow, temperature and salinity, circulation, mixing and stratification (hydrodynamics) and concentrations of suspended sediment, resuspension, settling and advection (sediment transport) in Cockburn Sound and Owen Anchorge. The geotechnical and marine contaminated site maps will provide the basis for describing the sediment properties and contaminants of concern to inform the sediment transport model. Once developed the hydrodynamic and sediment transport models can be used to determine environmental impact assessment for proposed development and planning for climate change risk.

Deliverables

1. Shared data: established databases; agreed data standards
2. Shared data: operation and maintenance – establish update regularity and responsibility
3. Science Package 3.1 Hydrodynamic Model
4. Science Package 3.2 Sediment Transport Model
5. Science Package 3.3 Coastal Processes Model
6. Science Package 3.4 Marine Geotechnical Map
7. Science Package 3.5 Marine Sediment Contaminants Map
8. Shared models: operation and maintenance
9. Shared maps of hydrodynamics (currents, temperature and salinity, flushing times) for baseline and future planning scenarios
10. Shared maps of sediment geotechnics and contaminants of concern for baseline and future planning scenarios
11. Monitoring: collation of government. and industry monitoring; monitoring gap analysis; establish monitoring program *

Assumptions

1. Science package will be funded via the Science budget

Risks / Issues

1. Delays due to modelling dependencies of data provision from Science Packages
2. Difficulties in calibration to level of approvals due to complexity of hydrodynamics and sediment transfer in Cockburn Sound
3. Significant changes in hydrodynamics between hindcast years may restrict ability to have one size fits all model

Dependencies

1. Work package 1.1 established prior to 3.1 Operate stage
2. Work package 2.1 established prior to 3.1 Operate stage
3. Regional ocean circulation models for open boundary condition

Scope and Timing

In Scope

1. Models set up and development for baseline
2. Calibration for representative climatological conditions
3. Baseline models output maps
4. Standardised models output templates

Out of Scope

1. Calibration for historical periods not relevant to future planning
2. Scenario modelling for specific project EIAs

Goals / Outcomes

1. Increased knowledge of hydrodynamics and sediment transport processes in Cockburn Sound and Owen Anchorage (including sediment geotechnics and contamination)
2. A predictive hydrodynamic model that can be used for scenario modelling for forward planning, climate change risk and EIA
3. A predictive sediment transport model that can be used for scenario modelling for forward planning, climate change risk and EIA
4. Integrated hydrodynamic sediment transport model for quantifying value of environmental protection and mitigation efforts.

Timeline / Milestones

1. Year 2 – Integration of hydrodynamic models and maps in SEAF
2. Year 3 – Integration sediment transport models in SEAF
3. Year 3 – Update of integrated hydrodynamic and sediment models
4. Year 4 – Operation, updates and peer review

Resources and Interfaces

Key Stakeholders

1. Government – EPA, DWER, IMOS, DCCEEW
2. Industry
3. Consultants
4. Traditional Owners
5. Scientific research community

Budget

1. $200,000 Scope
2. $2,500,000 Implementation
3. $500,000 Annual Maintenance
4. * Extended annual monitoring not costed

Resource Requirements

1. Hosted server
2. Resources to complete model development, calibration and presentation of output
3. Researchers to provide scientific review and additional data where required

Work Stream 3: Hydrodynamics and Sediments

Science Package 3: Hydrodynamic and Sediment Transport Model and Maps (1 of 2)

Overview

Overview

Tool description: A hydrodynamic model to hindcast, or forecast the hydrodynamics of Cockburn Sound and Owen Anchorage, and other connected waters as required. The shared hydrodynamic model provides an understanding of water circulation patterns, stratification (thermal, salinity or oxygen dependent layering of water), mixing, and sediment transport. The hydrodynamic model is the 'master' model that provides a base platform for other important models such as the ecosystem model, sediment transport model, underwater noise model, and groundwater model. There is an large and growing need for state of the art, high resolution hydrodynamic modelling capability to assist the >$15B of proposed projects for Cockburn Sound in the next 5-10 years. A shared hydrodynamic model has been developed under the WAMSI Westport Marine Science Program. The model is designed to enable the Westport program to undertake scenario testing to assist the design of infrastructure and environmental approvals for a proposed future port in Cockburn Sound. Continuous improvement of the shared model will assist other project proponents. The greatest beneficiaries will be the Commonwealth and State regulators, who will use the same 'master' hydrodynamic model platform as the project proponents to assess project proposals for environmental impact. The relatively small investment in continuous improvement of the existing shared 'master' hydrodynamic model will develop an essential tool to assist planning, development, construction, operation and assessment for new infrastructure in the context of cumulative impact in Cockburn Sound.

Science package 3 – continuous improvement of the Cockburn Sound and Owen Anchorage Hydrodynamic Model; proof of concept, scientific development and continuous improvement of related sub models for sediment transport, coastal processes, marine geotechnical and marine sediment contaminants.

Vision: Operation and continuous improvement of the Cockburn Sound and Owen Anchorage Hydrodynamic Model. Development of important tools such as sub-models or maps including: sediment transport, coastal processes model; marine geotechnical map; marine sediment contaminants map.

Deliverables

1. Science Package 3.1 Hydrodynamic Model
   Science package 3.1.1 – Continuous improvement
1. Science Package 3.2 Sediment Transport Model
   Science package 3.2.1 – Proof of concept
   Science package 3.2.2 – Scientific development
   Science package 3.2.3 – Continuous improvement
1. Science Package 3.3 Coastal Processes Model
   Science package 3.3.1 – Proof of concept
   Science package 3.3.2 – Scientific development
   Science package 3.3.3 – Continuous improvement
4. Science package 3.4 Marine geotechnical Map
   Science package 3.4.1 – Proof of concept
   Science package 3.4.2 – Scientific development
   Science package 3.4.3 – Continuous improvement
5. Science package 3.5 Marine Sediment Contaminants Map
   Science package 3.5.1 – Proof of concept
   Science package 3.5.2 – Scientific development
   Science package 3.5.3 – Continuous improvement

The sub-components of each Science Package are expanded below:

Proof of concept
- assess existing models
- select/develop model
- select/develop features
- decide on standards, agree data types
- demonstrate model can meet the private/collaborative/constrained approach

Scientific development
- literature review,
- data identification and collation
- data QA/QC, data standardisation, gap analysis
- model development, including validation and optimisation

Continuous improvement
- review assumptions and field validation
- gap analysis
- focussed data collection
- model recalibration, validation and optimisation

Assumptions

Continuous improvement of the hydrodynamic model will rely on development of the following:
1. SEAF shared data
2. Operation of the Regional Hydrodynamic and Sediment Models (Works Stream 3)
3. New knowledge (this program)

Risks / Issues

1. Lack of willingness to share current or future data
2. Legal liability risk for operator (SEAF)

Dependencies

1. SEAF platform is in operation

Work Stream 3: Hydrodynamics and Sediments

Science Package 3: Hydrodynamic and Sediment Transport Model and Maps (2 of 2)

Scope and Timing

In Scope

1. Science Package 3.1
2. Science Package 3.2
3. Science Package 3.3
4. Science Package 3.4
5. Science Package 3.5

Out of Scope

1. SEAF platform maintenance
2. SEAF platform operation

Goals / Outcomes

1. To update and continuously improve the SEAF hydrodynamic model to provide decision support for infrastructure proposals, design, operation and management.
2. Add modules to expand and improve the utility of the model
3. Reduce assumptions and uncertainty, improve model resolution, reduce risk for proponents and regulator.
4. Improve collective understanding of cumulative impact to the region.

Timeline / Milestones

1. Year 0 – Feasibility Study
2. Year 1-2 – Gap analysis and prioritisation program
3. Year 2-5+ – Implement science program (1-5 year program depending on identified priorities)

Resources and Interfaces

Key Stakeholders

1. Government (WA EPA, DWER, DPIRD, DBCA, DCCEEW, JTSI, DoT, DoD, Pawsey)
2. Science Providers (Universities, AIMS, CSIRO)
3. Industry (new project proponents, existing project operators)
4. Consultants (with Cockburn Sound experience)

Resource Requirements

1. Capacity to support monitoring
2. Capacity to support modelling

Budget (refer to deliverables)

1. Science Package 3.1.1 - $1,000,000
2. Science Package 3.2.1 - $100,000
3. Science Package 3.2.2 - $250,000
4. Science Package 3.2.3 - $50,000
5. Science Package 3.3.1 - $150,000
6. Science Package 3.3.2 - $1,000,000
7. Science Package 3.3.3 - $500,000
8. Science Package 3.4.1 - $50,000
9. Science Package 3.4.2 - $500,000
10. Science Package 3.4.3 - $50,000
11. Science Package 3.5.1 - $100,000
12. Science Package 3.5.2 - $300,000
13. Science Package 3.5.3 - $50,000

Work Stream 4: Marine Ecosystem

Product Package 4.1: Integrated Marine Ecosystem Biogeochemical and Ecological Models and Maps

Overview

Overview

A series of data, GIS and analytical tools to improve understanding of the marine ecosystem in Cockburn Sound and Owen Anchorage and response to drivers, pressures and future development. The benthic habitat maps will provide the basis for describing the sediment diagenesis and sea grass models. Once developed the integrated ecosystem response tool can be used to determine environmental impact assessment for proposed development and planning for climate change risk.

Deliverables

1. Shared data: establish private, collaborative and constrained databases; agreed data standards
2. Shared data: operation and maintenance – establish update regularity and responsibility
3. Science package 4.1 – Marine Ecological Model
4. Science package 4.2 - Biogeochemistry Model
5. Science package 4.3 - Benthic Communities and Habitat Map
6. Science Package 4.4 - Underwater Noise Model
7. Science Package 4.5 - Marine Biodiversity and Marine Fauna Distribution Map
8. Integrated Marine Ecosystem Model and GIS of model predictive outputs for Marine Spatial Planning and cumulative impacts
9. Shared models and maps: operation and maintenance
10. Monitoring: collation of government. and industry monitoring; monitoring gap analysis; establish monitoring program *

Assumptions

1. Science package will be funded via the Science budget

Risks / Issues

1. Delays due to modelling dependencies of data provision from Science Packages
2. Difficulties in calibration to level of approvals due to complexity of biogeochemistry and ecology in Cockburn Sound and Owen Anchorage
3. Significant changes in biogeochemistry (particularly nutrients) and ecology (sea grass and marine fauna) between hindcast years may restrict ability to have one size fits all model

Dependencies

1. Work package 1.1 established prior to 4.1 Operate stage
2. Work package 2.1 established prior to 4.1 Operate stage
3. Work package 3.1 established prior to 4.1 Operate stage

Scope and Timing

In Scope

1. Models set up and development for baseline conditions, biogeochemical, underwater noise and ecological model
2. Calibration for representative ecosystem state of respective models
3. Integrated Marine Ecosystem Response Model
4. Standardised model output templates and GIS maps for dissolved oxygen, nutrients, phytoplankton, sea grass and marine fauna

Out of Scope

1. Benthic communities and habitat maps
2. Calibration for historical periods not relevant to future planning
3. Scenario modelling for specific project EIAs

Goals / Outcomes

1. Increased knowledge of biogeochemical cycles and ecological response dynamics in Cockburn Sound and Owen Anchorage
2. Predictive biogeochemical, underwater noise and ecological models that can be used for scenario modelling for forward planning, climate change risk and EIA
3. A GIS of model outputs under forward planning scenarios for cumulative impacts and marine spatial planning
4. Integrated Marine Ecosystem Response Model for quantifying value of environmental protection and mitigation efforts.

Timeline / Milestones

1. Year 2 – Integration of biogeochemical models and maps in SEAF
2. Year 3 – Integration of underwater noise and ecological models
3. Year 3 – Update of integrated Ecosystem Response Model
4. Year 4 – Operation, updates and peer review

Resources and Interfaces

Key Stakeholders

1. Government – EPA, DWER, IMOS, DCCEEW
2. Industry
3. Consultants
4. Traditional Owners
5. Scientific research community

Budget

1. $200,000 Scope
2. $2,000,000 Implementation
3. $500,000 Annual Maintenance
4. * Extended annual monitoring not costed

Resource Requirements

1. Hosted server
2. Resources to complete model development, calibration and presentation of output
3. Researchers to provide scientific review and additional data where required

Work Stream 4: Marine Ecosystem

Science Package 4: Integrated Marine Ecosystem Biogeochemical and Ecological Models and Maps (1 of 2)

Overview

Overview

Tool description: An integrated marine ecosystem model to hindcast, or forecast the response of the Cockburn Sound ecosystem to changes. The WAMSI Westport Marine Science Program (WWMSP) has developed the modelling infrastructure necessary to track and assess the ecological health of several ecosystem elements within Cockburn Sound. It is envisaged that the ecosystem model will become a tool for all Cockburn Sound project operators/proponents to better understand their contribution to cumulative impacts to ecosystem function. Further, the ecosystem model will be a useful tool to scenario test management, mitigation and amelioration options designed to improve ecosystem function and resilience.

Science Package 4: proof of concept, scientific development and continuous improvement of shared Integrated Marine Ecosystem Model (IMEM); proof of concept, scientific development and continuous improvement of related sub models for sediment biogeochemistry; benthic communities and habitats; underwater noise; and, Biodiversity and Marine Fauna distribution.

Vision: Development of the Cockburn Sound and Owen Anchorage Integrated Marine Ecosystem Model – maintenance and continuous improvement of the ecosystem model to include important values of Cockburn Sound. The IMEM will enable scenario testing for project development, approvals, operation and decommissioning. The IMEM will enable assessment of cumulative impacts and the impact of management, mitigation and amelioration strategies on components of the ecosystem.

Deliverables

1. Science Package 4.1 Marine Ecosystem Model
   Science package 4.1.1 – Continuous improvement
1. Science package 4.2 Sediment Biogeochemistry Model
   Science package 4.2.1 – Proof of concept
   Science package 4.2.2 – Scientific development
   Science package 4.2.3 – Continuous improvement
1. Science package 4.3 Benthic Communities and Habitat Map
   Science package 4.3.1 – Continuous improvement
4. Science package 4.4 Underwater Noise Model
   Science package 4.4.1 – Proof of concept
   Science package 4.4.2 – Scientific development
   Science package 4.4.3 – Continuous improvement
4. Science package 4.5 Marine Biodiversity and Marine Fauna distribution Map
   Science package 4.5.1 – Proof of concept
   Science package 4.5.2 – Scientific development
   Science package 4.5.3 – Continuous improvement

The sub-components of each Science Package are expanded below:

Proof of concept
- assess existing models
- select/develop model
- select/develop features
- decide on standards, agree data types
- demonstrate model can meet the data zones approach

Scientific development
- literature review,
- data identification and collation
- data QA/QC, data standardisation, gap analysis
- model development, including validation and optimisation

Continuous improvement
- review assumptions and field validation
- gap analysis
- focussed data collection
- model recalibration, validation and optimisation

Assumptions

1. Theme 1 of WWMSP will develop the baseline Ecosystem Model, including key ecosystem components.
2. The WWMSP has not filled all key gaps of understanding on ecosystem function.
3. Gap analysis - key ecosystem components will be identified by the community, government, industry and scientists.
4. WA Government and industry utilise the ecosystem model as a decision support tool.
5. EPA accepts the ecosystem model as a suitable tool to describe cumulative pressures/impacts.
6. Operation of the model will be funded separately from the knowledge package.

Risks / Issues

1. Insufficient knowledge to accurately model key ecosystem modules
2. Insufficient knowledge of ecosystem processes, links, feedback and important processes
3. Lack of willingness of project operators or proponents to share current or future data
4. Legal liability risk for operator (SEAF)

Dependencies

1. SEAF platform is in operation

Work Stream 4: Marine Ecosystem

Science Package 4: Integrated Marine Ecosystem Biogeochemical and Ecological Models and Maps (2 of 2)

Scope and Timing

In Scope

1. Science Package 4.1
2. Science Package 4.2
3. Science Package 4.3
4. Science Package 4.4
5. Science Package 4.5

Out of Scope

1. SEAF platform maintenance
2. SEAF platform operation

Goals / Outcomes

1. To update and continuously improve the SEAF ecosystem model to provide decision support for infrastructure proposals, design, operation and management.
2. Add modules to expand and improve the utility of the model.
3. Reduce assumptions and uncertainty, improve model resolution, reduce risk for project operators, proponents and regulators.
4. Improve understanding of cumulative impacts (for individual project operators/proponents, and for the collective across region).
5. Provide a tool to assist scenario testing management, mitigation and amelioration options.

Timeline / Milestones

1. Year 0 – Feasibility Study
2. Year 1 – Gap analysis and prioritisation program
3. Year 1-5 – Implement knowledge discovery program (1-5 years depending on identified priorities)

Resources and Interfaces

Key Stakeholders

1. Government (WA EPA, DWER, DPIRD, DBCA, DCCEEW, JTSI, DoT, DoD, Pawsey)
2. Science Providers (Universities, AIMS, CSIRO)
3. Industry (new project proponents, existing project operators) and their consultants
4. Traditional Owners
5. Community

Budget

1. Science Package 4.1.1 - $500,000
2. Science Package 4.2.1 - $150,000
3. Science Package 4.2.2 - $1,000,000
4. Science Package 4.2.3 - $500,000
5. Science Package 4.3.1 - $500,000
6. Science Package 4.4.1 - $75,000
7. Science Package 4.4.2 - $500,000
8. Science Package 4.4.3 - $250,000
9. Science Package 4.5.1 - $75,000
10. Science Package 4.5.2 - $500,000
11. Science Package 4.5.3 - $250,000

Resource Requirements

1. Capacity to support monitoring
2. Capacity to support modelling
3. Capacity to develop and implement new knowledge discovery programs

Work Stream 5: Terrestrial

Product Package 5.1: Terrestrial Ecosystem and Emissions Models and Maps

Overview

Overview

The terrestrial areas which include the Rockingham Industrial Zone, Kwinana Industrial Area, Australian Maritime Complex, and Latitude 32 Industry Zone are heavily modified industrial landscapes, whereby existing practices are closely regulated and proposed practices require strict assessment.
A suite of terrestrial tools (models and maps) for the region are proposed to assist in front-end project design and to facilitate impact avoidance associated with atmospheric emissions, noise emissions and terrestrial flora and fauna conservation and management. Modelling would enable hindcast and forecast predictions of cumulative impacts across the region. The terrestrial tools would benefit industry users in project design and operation to mitigate and manage impacts from their facilities, and regulators with assessment of industry users compliance against licence conditions.

Deliverables

1. Shared data: establish private, collaborative and constrained database
2. Shared data: establish agreed data standards
3. Shared data: operate a shared data repository – establish update regularity and responsibility
4. Science Package 5.1 – Shared atmospheric emissions model and maps (proof of concept, development, continuous improvement)
5. Science Package 5.2 – Shared noise emission model and maps (proof of concept, development, continuous improvement)
6. Science Package 5.3 – Shared terrestrial ecosystem model and maps (proof of concept, development, continuous improvement)
7. Shared models: operation and maintenance
8. Monitoring: collation of government. and industry monitoring; monitoring gap analysis; establish monitoring program *

Assumptions

1. Deliverables are consistent across domains (atmosphere, noise, ecosystem)
2. Data/analytics sharing is assumed within a SEAF
3. Science package will be funded via the Science budget

Risks / Issues

1. Reluctance to share baseline data
2. Reluctance to share post development monitoring data
3. Reluctance to share existing models

Dependencies

1. Data/analytics sharing is assumed within a SEAF
2. Data sharing agreements

Scope and Timing

In Scope

1. Historical data collection and translation
2. Development of on-line maps (flora, fauna)
3. Lowest-cost path models development (use/expand of existing models; off-shelf commercial models)

Out of Scope

1. Science packages

Goals / Outcomes

1. Securely combine, data across the SEAF data zones
2. Mapping of environmental features (terrestrial ecosystem maps of important values)
3. Predictive models (atmosphere, noise, terrestrial ecosystem)

Timeline / Milestones

1. Year 0 – finalise concept and feasibility
2. Year 1 – develop database, data standards and data package requirements; undertake model feasibility study
3. Year 1 – commence data collection and curation
4. Year 2 – database operation
5. Year 3 – initiate Science Packages
6. Year 4 – model ‘Go live’

Resources and Interfaces

Key Stakeholders

1. Government (DWER, DoT, EPA)
2. Industry
3. Consultants
4. Traditional owners
5. Scientific research community

Budget

1. $250,000 Data Sharing Scope
2. $100,000 DWER Aligned Data Sharing Platform Build
3. $450,000 Data Migration
4. $250,000 Data Sharing Annual Maintenance
5. $150,000 Model Operation and Maintenance
6. * Extended Annual Monitoring Not Costed

Resource Requirements

1. Hosting for data and portal
2. Highly experienced technical expertise or research scientists (atmospheric, noise, flora & fauna, modelling)
3. Resources to verify and upload regular updates to keep the dataset current

Work Stream 5: Terrestrial

Science Package 5: Terrestrial Ecosystem and Emissions Models and Maps (1 of 2)

Overview

Overview

Tool description: Shared terrestrial emissions models and maps will provide the ability to hindcast, forecast and describe contemporary features for important terrestrial factors across the industrial complex and surrounding areas. The tools proposed will assist in front-end project design and will facilitate impact avoidance associated with atmospheric emissions and noise emissions. Modelling will enable hindcast and forecast predictions of cumulative impacts across the region.

Science Package 5 – proof of concept, scientific development and continuous improvement of shared Terrestrial Emissions Models and Maps (TEMM)

Vision: Development of the Industrial Area Terrestrial Emissions Digital Twin – development, maintenance and expansion of the TEMM to enable scenario testing for project development, approvals, operation and decommissioning. The TEMM will enable assessment of cumulative impacts and the effectiveness of management, mitigation and amelioration strategies.

Deliverables

1. Science Package 5.1 Atmospheric Emissions Models and Maps
   Science package 5.1.1 – Proof of concept
   Science package 5.1.2 – Scientific development
   Science package 5.1.3 – Continuous improvement

1. Science package 5.2 Noise Emissions Models and Maps
   Science package 5.2.1 – Proof of concept
   Science package 5.2.2 – Scientific development
   Science package 5.2.3 – Continuous improvement

The sub-components of each Science Package are expanded below:
Proof of concept
- assess existing models
- select/develop model
- select/develop features
- decide on standards, agree data types
- demonstrate model can meet the data zones approach

Scientific development
- literature review,
- data identification and collation
- data QA/QC, data standardisation, gap analysis
- model development, including validation and optimisation

Continuous improvement
- review assumptions and field validation
- gap analysis
- focussed data collection
- model recalibration, validation and optimisation

Assumptions

1. Existing information from government agencies and industries is available to develop the TEMM.
2. Government and industry utilise the model as a decision support tool.
3. EPA accepts the model as a suitable tool to describe cumulative pressures/impacts.
4. Operation of the model will be funded separately from the knowledge package.

Risks / Issues

1. Lack of willingness to share current or future data
2. Legal liability risk for operator (SEAF)

Dependencies

1. SEAF platform is in operation

Work Stream 5: Terrestrial

Science Package 5: Terrestrial Ecosystem and Emissions Models and Maps (2 of 2)

Scope and Timing

In Scope

1. Science Package 5.1
2. Science Package 5.2

Out of Scope

1. SEAF platform maintenance
2. SEAF platform operation

Goals / Outcomes

1. To develop a shared TEMM to provide decision support for infrastructure proposals, design, operation and management.
2. To update and continuously improve the TEMM
3. Reduce assumptions and uncertainty, improve model resolution, reduce risk for proponents and regulator.
4. Improve collective understanding of cumulative impact to the region.

Timeline / Milestones

1. Year 0 – Feasibility Study
2. Year 1-2 – Gap analysis and prioritisation program
3. Year 2-5+ – Implement science program (1-5 year program depending on identified priorities)

Resources and Interfaces

Key Stakeholders

1. Government (WA EPA, DWER, DPIRD, DBCA, DCCEEW, JTSI, DoT, DoD, Pawsey)
2. Science Providers (Universities, AIMS, CSIRO)
3. Industry (new project proponents, existing project operators)
4. Consultants (with Cockburn Sound experience)

Budget

1. Science Package 5.1.1 - $150,000
2. Science Package 5.1.2 - $1,000,000
3. Science Package 5.1.3 - $500,000
4. Science Package 5.2.1 - $150,000
5. Science Package 5.2.2 - $1,000,000
6. Science Package 5.2.3 - $500,000

Resource Requirements

1. Capacity to support modelling
2. Capability to support research programs

Work Stream 6: DPSIR

Product Package 6.1: Cockburn Sound DPSIR Reporting Model

Overview

Overview

The Drivers, Pressures, States, Impacts and Responses (DPSIR) is conceptual and flexible framework that can be used to relate human activities to the state of the environment. The Cockburn Sound DPSIR was first considered by the Cockburn Sound Management Council in 2001 and later expanded and updated in the Cockburn-Sound-Drivers-Pressures-State-Impacts-Responses-Assessment (BMT 2017). The Cockburn Sound DPSIR provided an understanding of the current state of the environment, and provided a forecast of the future state of the environment base on expected future human activities. A high level review and update was undertaken in 2023 by WAMSI, to provide a contemporary understanding of the current state and the potential cumulative impacts of proposed development on Cockburn Sound and Owen Anchorage.

This Work Stream will expand the Cockburn Sound DPSIR to include Owen Anchorage, and will operationalise the method to capture and describe the cumulative impacts of the region over time. Regular review and maintenance of the agreed Cockburn Sound and Owen Anchorage DPSIR will enable qualitative and quantitative assessment of system-scale changes to the state of the environment.

The Cockburn Sound and Owen Anchorage DPSIR will provide conceptual diagrams of ecosystem functioning based on qualitative and quantitative ecosystem modelling to assist explanation of complex interactions between humans and the environment. The DPSIR will enable stakeholders to understand how current and proposed projects may influence to overall state of the environment, and how management, mitigation and amelioration of impacts may contribute.

Deliverables

1. Agree on the scale, definitions, structure, approach
2. Undertake detailed revision of CSOA DPSIR and produce DPSIR models for current state and future scenarios
3. Develop data standards and framework to be used by SEAF
4. Science Package 4.1 – Marine Ecological Model

Assumptions

1. DPSIR method embraced and accepted as appropriate model to define: “the current state of the environment” and “future state of the environment”
2. Data/analytics sharing is assumed within a SEAF
3. Science packages will be funded via the Science budget

Risks / Issues

1. Reluctance to share post development monitoring data

Dependencies

1. Integrated ecosystem model (WWMSP Theme 1)
2. 2023 DPSIR review (WAMSI Project)
3. Industry operation and growth forecast (Workstream 1)

Scope and Timing

In Scope

1. Regional qualitative and quantitative DPSIR model
2. Data entry and reporting tools
3. Integrated Ecosystem Model (WWMSP Theme 1) to demonstrate cause and effect pathways

Out of Scope

1. Workstream 1 and Workstream 4
2. Science Package 4

Goals / Outcomes

1. Agree and refine DPSIR qualitative and quantitative models
2. Increased understanding of environmental impacts from changes in drivers and pressures and how these have influenced historical trends
3. Increased ability to predict environmental impacts of future changes in drivers and pressures
4. Identification of key gaps in understanding.

Timeline / Milestones

1. Year 0 – Update DPSIR (completed - WAMSI project 2023)
2. Year 1 – Operation
3. Year 3 – Revise and update DPSIR

Resources and Interfaces

Key Stakeholders

1. Government – EPA, DWER, DCCEEW, JTSI
2. Industry
3. Consultants
4. Traditional Owners
5. Scientific research community

Budget

1. $20,000 Scoping
2. $200,000 Annual Operation (ecosystem modeller)
3. $130,000 Annual Maintenance including platform

Resource Requirements

1. Ecosystem modeller (qualitative and quantitative modeller)
2. DPSIR expert (consultant)
3. Stakeholder engagement personnel

6. Technology

What is the technical solution for the SEAF platform?

Technical solution design has been informed by stakeholder needs, SEAF guiding principles and target capabilities to enable it to deliver the value proposition. Design has been validated with Microsoft, based on requirements and the assumptions made. Further tailoring may occur during implementation to ensure the solution meets stakeholder requirements.

Platform summary

The SEAF technology platform will **bring together disparate environmental data sets** and components to a **shared point of access** and support their development and dissemination with the aim to become a **trusted** source of environmental data and analytics.

It will **transform** environmental planning, assessment and reporting to meet the multiple challenges driving environmental reforms by providing users with the necessary tools for analysis, modelling and interpretation of data of a given region through **integrated** modelling and analytics.

The technology solution provides:

- **Easy access** to historical and current data.
- Ability to **develop and apply** advanced analytics, interpretation and modelling of environmental data.
- Support for the development and articulation of cumulative environmental impacts for a region.
- Onboarding of data from **multiple sources** while providing **traceability and auditability** across all data layers.
- Ability to **catalogue the data** and empower the data consumers to find **valuable and trustworthy** data.
- **Private zones** to work within to ensure data security and privacy.
- **Fully Scalable** for any number of zones

Private Zones

For participant teams to perform environmental impact assessments on a purpose-built cloud infrastructure, including the ability to consume, process and develop data models necessary to support proponents. There is an ability to consume data share data with (curated or modelled) with other zones.

Zone-specific capabilities
- Data Encryption (optional - prior to sharing)

Collaboration Zones

Collaboration Zones provide access for the participants that are providing data and working together. Operator has responsibility for provisioning and maintaining this zone, but access to internal services and data will be limited to participants.

Zone-specific capabilities
- Modelling on Encrypted data (where required)
- Data Sharing Agreements

Constrained Zones

Constrained Zones restrict access to one or more participants that are providing data - in cases where cumulative EIA is being generated with additional highly-sensitive data from certain participants. Operator has responsibility for provisioning and maintaining this zone, but access to internal services and data will be limited to participants

Zone-specific capabilities
- Modelling on Encrypted data (where required)
- Data Sharing Agreements

Common Zone Capabilities
● Identity & Access Control ● CI/CD ● Code Repository ● Data Ingestion ● Compute / Processing ● Governance & Cost Management
● Data Lake / Analytical Data Store ● Data Access - AI Model & Science Model ● Data Delivery – Reporting & Sharing

Shared Data Lake (Run by the Operator)

- Identity & Access Control
- Centralised curated datasets (i.e. BoM, DoT, DWER)
- Governance
- Admin reporting (model runs, data set usage))
- Data Delivery - Sharing

Designed to support a secure exchange of data and models between regional teams operating independently from Spokes based on access policies defined for content sharing.

Administration Platform (Run by the Operator)

- Platform Security (User management)
- Technology & Operational Resilience
- Infrastructure as a Code
- DevSecOps
- CI/CD

For the platform and technology operations team to have an ability to build, deploy and manage the ecosystem including an ability to support the platform, networks, applications on the platform, and access to application and data services on the platform.

A solution designed for flexibility and reusability

The proposed technology solution is cloud-first and aligns the reference architecture to the SAFE Framework. The included solution components are based on Microsoft Azure and designed to be open and extensible to enable collaboration with research institutions and relevant third parties. Together, they form a robust and scalable platform for SEAF data and analytics workloads that can evolve over time.

The requirements:

The requirements of the SEAF were used to help inform the technical solution design:

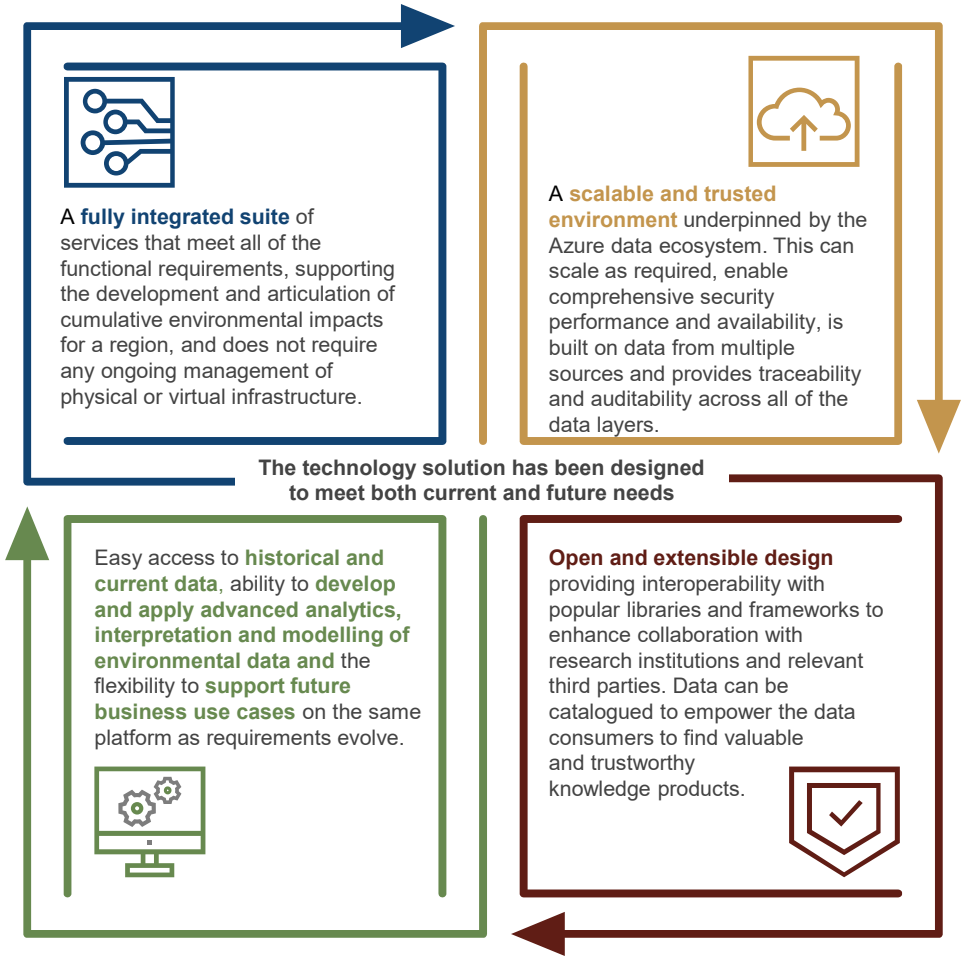
- The Operator Requirements: To support a **secure exchange of data and models** between zone based on access policies defined for content sharing.
- Zone Requirements - perform environmental impact assessments on a purpose built cloud infrastructure, including the **ability to consume, process, and develop data models** necessary to support proponents.

Key drivers for design:

- **Trust and Transparency:** Be a trusted source of curated environmental data, information and reporting, enabling confident decision making for regulators, proponents and the wider community in line with stakeholders expectations.
- **Scalability and Flexibility:** Provide the tools and capabilities for data modelling, analysis and forecasting to undertake and deliver cumulative environmental impact assessments.
- **Speed and Consistency:** Support streamlining and de-risking of the Environmental Impact Assessment process from both a proponent and regulator perspective, enable more efficient production of ESG and EEA reporting.

The high-level technology design has been developed in accordance with five core design principles:

- Ability to **integrate data** from a range of sources, including data hosted on organisations on premise platforms and external data from different cloud provides into the SEAF platform.
- Ability to **manage and protect data** from unauthorised third parties or vendors and ensure it is only used for the purpose it was intended.
- Data is protected and **complies** with Australian Government Information Security Manual (ISM) standards.
- Data can be **archived** and / or **deleted** without any traces after the retention period.
- Ability to **use or integrate data models or data products from other systems or organisations.**



1. https://wabsi.org.au/wp-content/uploads/2021/07/SAFE-Guide-V1.1P.pdf

The multiple benefits of building SEAF on a cloud platform

Trust and transparency

- Cloud governance and metadata management services provides the required capabilities to **make data FAIR** (Findable, Accessible, Interoperable and Reusable), thus **enabling trust and transparency** for the SEAF users
- Once data is in the cloud it can be discovered, catalogued and described making it **easier to know what data is available** and understand it and thereby providing opportunities for enhanced collaboration, sharing and reuse
- The wide variety of tools and capabilities available on cloud makes it possible to create **fit-for-purpose secure solutions**. It provides SEAF data / model producers and consumers the confidentiality, integrity, and availability of the data, while also enabling transparent accountability

Scalability and flexibility

- Cloud is flexible and can dynamically scale and adapt to meet **varied needs of different SEAF users**
- Compared to on-premise services, a cloud solution is able to be deployed on demand and has an economic advantage as it can be scaled up or down based on consumption patterns. On-premise services require an upfront CAPEX investment for hardware, however with cloud you only **pay for what is used**
- Operating in a single purpose built could environment makes the **experience seamless** thereby providing the flexibility for organisations and researchers to **work within their own area of expertise (zone)** and also **being able to collaborate and contribute to a larger effort** to support information and analytic supply chain

Speed and consistency

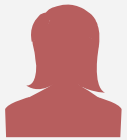
- Cloud is accessible and available on demand which **reduces lead time to provision new services**
- Cloud provides **better performance** compared to desktop computing and fills the gap between desktop computing and supercomputing - at a better price point. I.e. compute power on cloud is cheaper than on a supercomputer and cloud different storage tiers are available for cost optimisation
- A single cloud platform improves integration, reduces silos and enables reuse of analytical tools, thereby **increasing efficiencies, reducing cost, and enabling collective learning and continuous improvements**

SEAF platform high level design principles

Design principles have been based on stakeholder needs, including industry proponents, research organisations, State or Commonwealth Government, Environment Regulation Organisation and internal project teams conducting environmental impact assessments.

Design principles	How this is achieved on the SEAF platform	Outcomes
1 Ability to **integrate data from a range of sources,** including data hosted on organisations on premise platforms and external data from different cloud platforms into the SEAF platform.	**Microsoft's Interoperability Principles [1] -** Open Connections to Microsoft Products, Support for Standards, Data Portability and Open Engagement ensures interoperability between products from different vendors.	Organisations are able to access consolidated, current, consistent and trusted data to complete the assessment process.
2 Ability to **manage and protect data**, including Environmental Impact Assessment outcomes and approval decisions on the SEAF platform from unauthorised third parties or vendors and ensure it is only used for the purpose it was intended.	Microsoft's commitment to **Privacy [4]** ensures that the data will secured at rest and in transit and defended. It enables SEAF to choose the services and data location that is right for their stakeholder needs.	Organisations have comfort that the SEAF will manage and protect their data and ensure it is not used for purposes beyond the intended objectives.
3 Data is protected and **complies** with Australian Government Information Security Manual (ISM) standards.	Azure has been assessed by **Information Security Registered Assessors Program (IRAP) [3]** a standard similar to the Australian Government Information Security Manual (ISM).	The **IRAP assessment [3]** of Microsoft's cloud services provides assurance to public sector customers in government and their partners that Microsoft has appropriate and **effective security controls in place** for the processing, storage, and transmission of data at the PROTECTED level and below.
4 Data can be **archived** and / or **deleted** without any traces after the retention period.	Microsoft Azure Cloud Services are governed by strict **Data Management Standards [2]**. Microsoft removes cloud customer data from systems under its control, by overwriting the storage resources before reuse, and purging, and destroying decommissioned hardware before Microsoft returns it to the manufacturer for replacement or repair.	Guarantees the data is completely deleted without any trace after the retention period.
5 Ability to **use or integrate data models or data products from and to other systems or organisations.**	Microsoft's Interoperability Principle, **"Data Portability" [1]** enables the SEAF Platform to meet the varied needs of its stakeholders. Microsoft supports many data formats promulgated by standards bodies in its products today. Microsoft's "Open Format and Import/Export" methods helps to achieve the same, when data is not in Industry Standard Formats.	Data, models or knowledge products from other systems can be readily used through the SEAF platform to overcome limitations in the fragmented information landscape. Similarly data and model can be exported to other platforms if needed.

"We need to integrate our company information (data and models) with other external data sets from governments, research organisations and other business to undertake an environmental assessment to gain approval for major new development."



"I am a Research organisation providing data and models to SEAF towards the the development and assessment of EIA submissions and for a sustained regional cumulative impact assessment. I need to know SEAF will manage and protect my data and how it ensures that it is not used for any other purpose?"

"It is important to me that the Australian State and Government Environment Impact Assessment (EIA) data and its outcomes are PROTECTED and the data management requires complies to Australian Government ISM (Information Security Manual) standards"

"It is critical that the Environmental Impact Assessment outcomes and approval decisions are protected and managed on the SEAF platform and not mined by the cloud vendor and its sub-contractors for other purposes."

"It is important that the project team is able to bring in data models or knowledge products from other system and can also be readily exported / used by external system and people. It is critical to integrate elements from a range of sources seamlessly, in Australia's current fragmented information landscape"

References

1. Microsoft Interoperability Principles
2. Microsoft Data Management Procedures
3. Australia IRAP Compliance
4. Microsoft Trust Center

The solution components of a zone

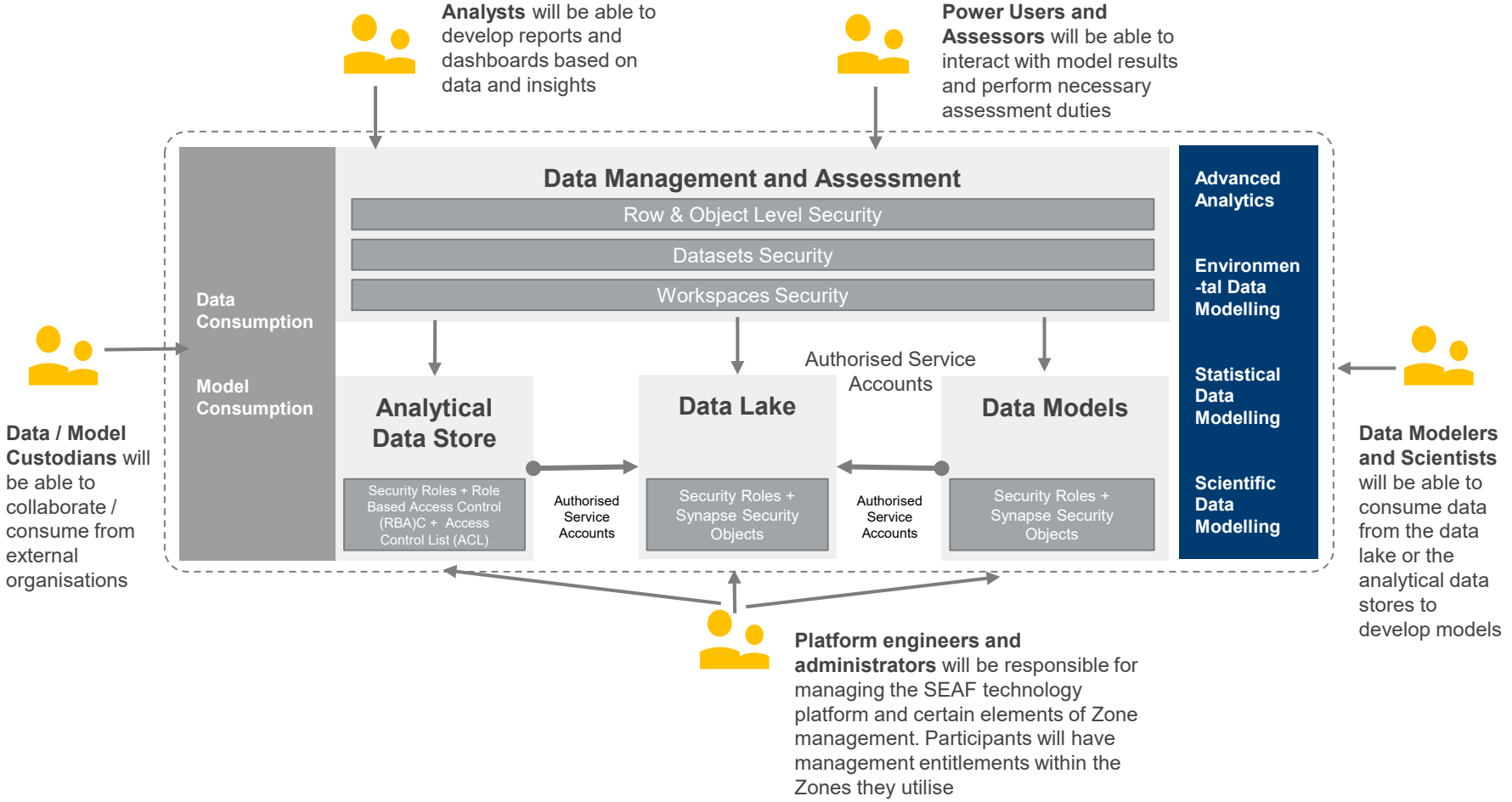
SEAF comprises a single cloud platform supporting multiple analytics zones. These zones differ depending on the scope of use - providing the necessary boundaries to support multiple participants working in isolation (private zones), but also facilitating collaborative analytics between participants.

The solution components of a zone are deployed using Microsoft's ADS Go Fast framework, which provides, Infrastructure as code (IAC) deployment of Azure Data Platform, "Out of the box" Continuous Integration and Continuous Deployment framework, Enterprise grade security and monitoring with full support for Key Vault, VNETS, Private Endpoints and Managed Service Identities, Codeless Ingestion from commonly used enterprise source systems into an enterprise data lake and users can interact with capabilities through a webpage and embedded dashboards.

Zone summary

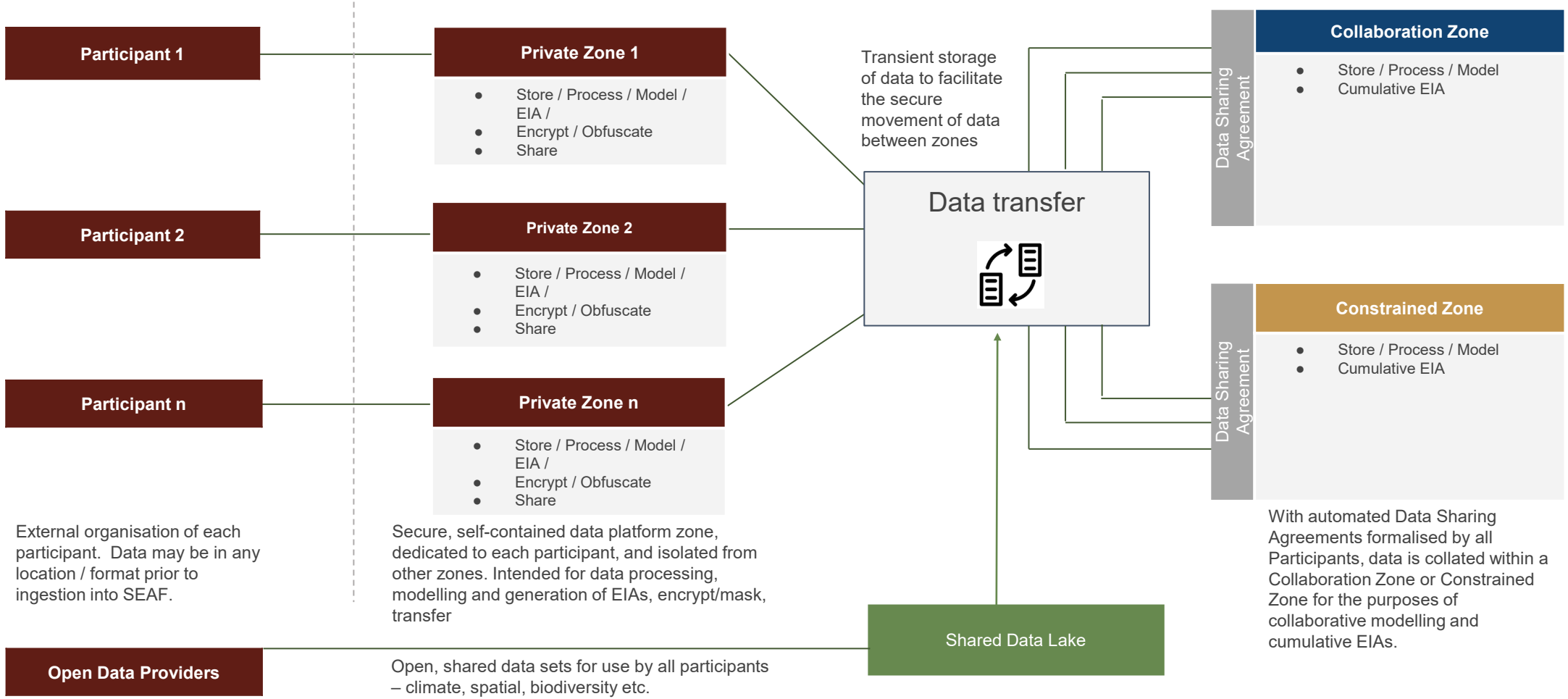
Each zone will contain a complete data/analytics stack, following reference architecture patterns, with:

- Consistent data ingestion (inbound) and sharing (outbound) mechanisms
- Optional modelling components where required
- Appropriate access control based on zone type
- Per-user/persona privileges dependent on the zone type
- Homorphoic data encryption / obfuscation / data sharing agreements
- Research users (non-commercial) will have access to resources at Pawsey Supercomputing Centre for data processing and model execution
- The 'default' zone configuration includes Azure data services for ingestion, processing, and storage
- Zones can be customised to include other Azure data services, for specific data processing and analytics requirements
- Platform evolution – as the SEAF platform is utilised its capabilities will evolve through new services and/or architectural changes. This will keep the platform current and in alignment with participant requirements.



How will the data flow through the SEAF platform?

The structure of the SEAF platform allows all participants to operate independently and then also work together to share data for the purposes of a cumulative EIA. The Collaboration Zone allows for access to all participants that are providing data. A Constrained Zone restricts access to one or more participants that are providing data – in cases where cumulative EIA is being generated with additional highly-sensitive data from certain participants. NDA/Data Sharing Agreements are essential as part of this process.



What is the technical operating model for the platform?

The SEAF prototype implemented (detail over page) a central Azure tenancy and framework that serves as an administration platform. The technical operating model proposed for the SEAF utilises an administration platform for the Operator and Zone model for Participant(s). The model is intended to be scalable from start up to full national roll out with key milestones and checkpoints.

Key definitions

- **Operator** – the foundational platform supports all zones and participants and requires a platform operator to manage and administer the overall environment.
- **Participants** – a SEAF participant is an organisation utilising the environment to import data, process, model, and generate EIA outputs. Participants may collaborate with each other through the Collaborative and Constrained Zone model.
- **Zone provisioning & participant specific requirements** – Zones are provisioned by the operator as required for each participant. Any Azure services required that are not provided in the default configuration can be deployed manually by the operator or participant.
- **Zone security & isolation** – All zones are isolated with both networking and identity controls to ensure access to services and data is only possible by zone participants. Operator will have administrative rights to the zone for monitoring and management, but no data or service access.
- **Data privacy & security** – data is encrypted in transit and at rest. Zone participants have access to clear text data by default. For scenarios requiring multiple participants operating on combined data sets, optional homomorphic encryption technology can protect sensitive data throughout the modelling process.
- **Non-Disclosure Agreements (NDA)** – to be established between SEAF and each participant prior to onboarding into the platform.
- **Data Sharing Agreements** – to be established between participants where requirements for data sharing and collaborative analytics exist. This agreement defines the data being shared, intended use cases and outputs, and data purging process.

Role of the operator

- Provide the key foundational services to be utilised by each zone
- Shared access to trusted, aggregated and curated environmental data and information
- Provision of new zones based off template
- Reporting and allocation of costs per zone
- Establish/Integrate/De-establish zones
- Own and manages the overall Azure tenancy
- Govern and manage overall SEAF operations including the technology platform
- Manage controls & processes
  - Access/session controls
  - Activity auditing
  - Data purge/cleanse process
  - Zone creation/destruction
- Participant onboarding & enablement, and maintaining supporting SEAF collateral
- Establishing NDAs with platform Participants, and facilitating Data Sharing Agreements between Participants (for Collaborative/Constrained Zones)
  - Agreed intent / use cases
  - Use of collaborative data
  - Access to zone
  - Timeframes
  - Purging / destruction process

Role of participant(s)

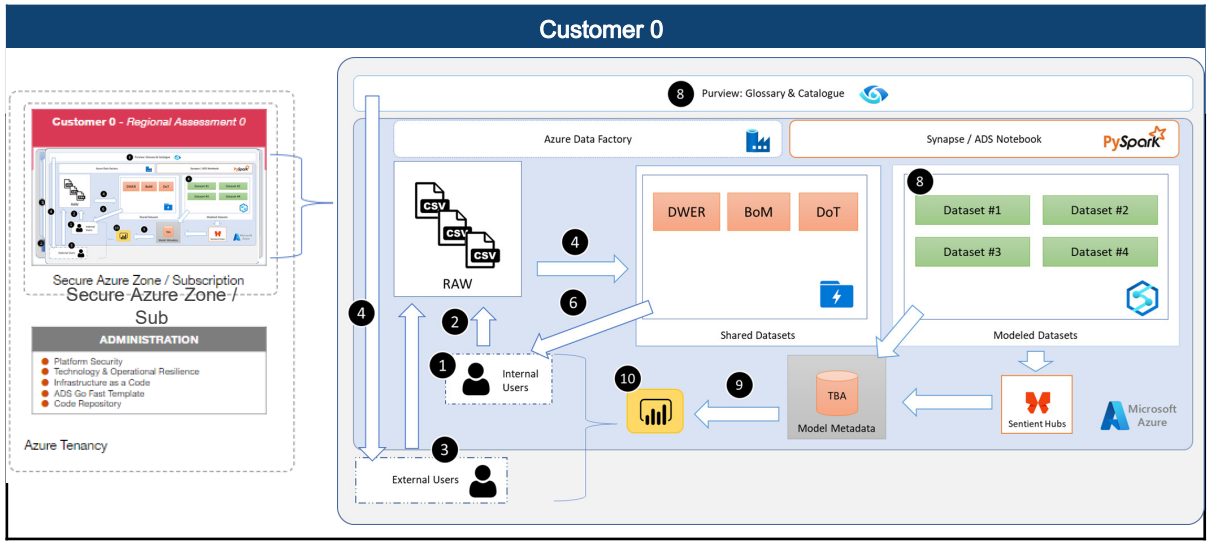
- Participant(s) have semi-autonomy to address unique needs whilst maintaining entity consistency within zones
- Participant(s) oversees and manages a specific assessment
- Functions and capabilities required to undertake and deliver a specific assessment are available within the zones. It is up to the Participant to identify what capabilities/components it requires.
- A participant is responsible to identify needs/requirements for a specific study, including update, maintenance and review cycles
- The Data collation and assessment in the development and production of specific assessments happens within a zone
- The participant is responsible for maintaining and following SEAF technical standards
- Zone is created at a subscription level and the participant(s) are responsible for costs for incurred in the zone

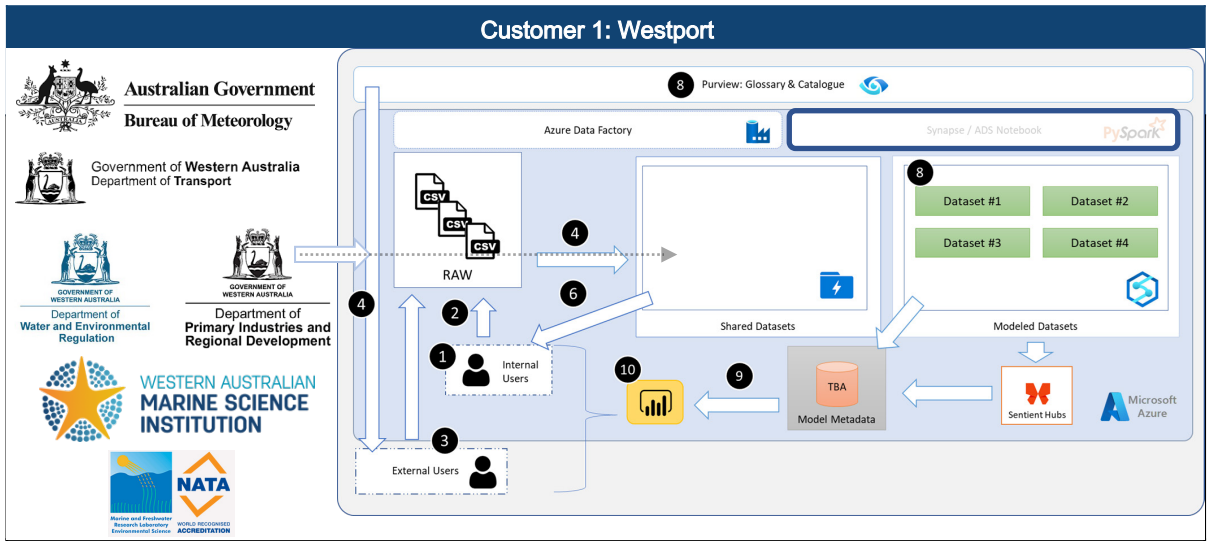
A prototype of the SEAF platform was established to develop the technical solution; a second zone was created to facilitate Westport cloud-based modelling

In the DWER Azure Tenancy, a protected cloud (enterprise grade security) zone was deployed using ADS go fast. This included deployment of all Azure Service using Infrastructure as Code.
We proved the concept of data ingestion into Synapse, transforming and visualizing research datasets (16 million rows of data). This was turned off to reduce costs while idle.

1. *Internal users log into Azure securely*
2. *Uploads Raw research files using **Azure Storage Explorer***
3. *User logs in with external identity using Azure Virtual Desktop. This will show the user experience for external user and will present same options in VM (including **Azure Data Explorer**)*
4. *Discovery of data assets via the data catalogue in Purview*
5. ***ADF Pipelines** loads files into processed layer of data lake*
6. *Validation of loaded data can be performed using Synapse notebooks (using **PySpark** or **SQL**)*
7. *Users can use language of choice (**PySpark/Scala/SQL**) to model data and validate. Final model output datasets will be created in Gold/curated layer of data lake*
8. *Purview add governance on data assets and including scans to get current datasets and lineage (table/file/detailed schema)*
9. *Model metadata extracted into a Power BI mode to surface summary information on datasets/research projects*
10. *Research coverage dashboard could allow data points to be show relevant coverage by location based on other search parameters. This can also use custom shapes to show boundaries and heat maps based coverage/# of data points. Researcher can also query the model metadata repository directly to gain understanding of research coverage.*

Leveraging off the workflows developed during the initial deployment, a second zone has been established to assist with the modelling demands of Westport. An expanded dataset from an array of Agencies was ingested onto the platform, as well as real-time access to the latest Cockburn Sound model configurations.





How can the SEAF prototype be made operational?

- The below table summarises the indicative implementation costs to make the SEAF Prototype operational.
- Pricing is indicative only and is a best estimate on current known information. Further analysis will need to be undertaken to improve the accuracy of the estimate detailed requirements are confirmed.

	Scope	Key capabilities	Number of days effort	Time (in weeks)	Cost (in AUD)
Productionise the prototype	Requirements & detailed design	Key capabilities to be design and implemented: • Data sharing using ADF • IXUP • Automated deployment	300-360	12-14 weeks	~$750,000 - ~$900,000
	Foundational platform				
	Shared data lake				
	Testing Security testing				
	Prod / Hyper-care				

Technology costs: Indicative expenditure run for the platform - based on varying *sizes of usage and / complexity requirements*

The technology costs have been developed to indicate potential costs for varying usage sizes

Varying sizes have been utilised to provide pricing costs across various usage and implementation scenarios. Each size is based on a number of assumptions, if these assumptions change, there would be an impact on costing.

Small: Less than 10 consumers of the platform, typically less than 10TB of data storage required, simple modelling requirements.

Medium: Between 10-20 consumers of the platform, ~50 TB of data storage required. Some simple modelling requirements, in addition to custom science models with complex modelling requirements.
(note - used as basis of costing calculations)

Large: Between 20-50 consumers of the platform, ~ 100 TB of data storage required.

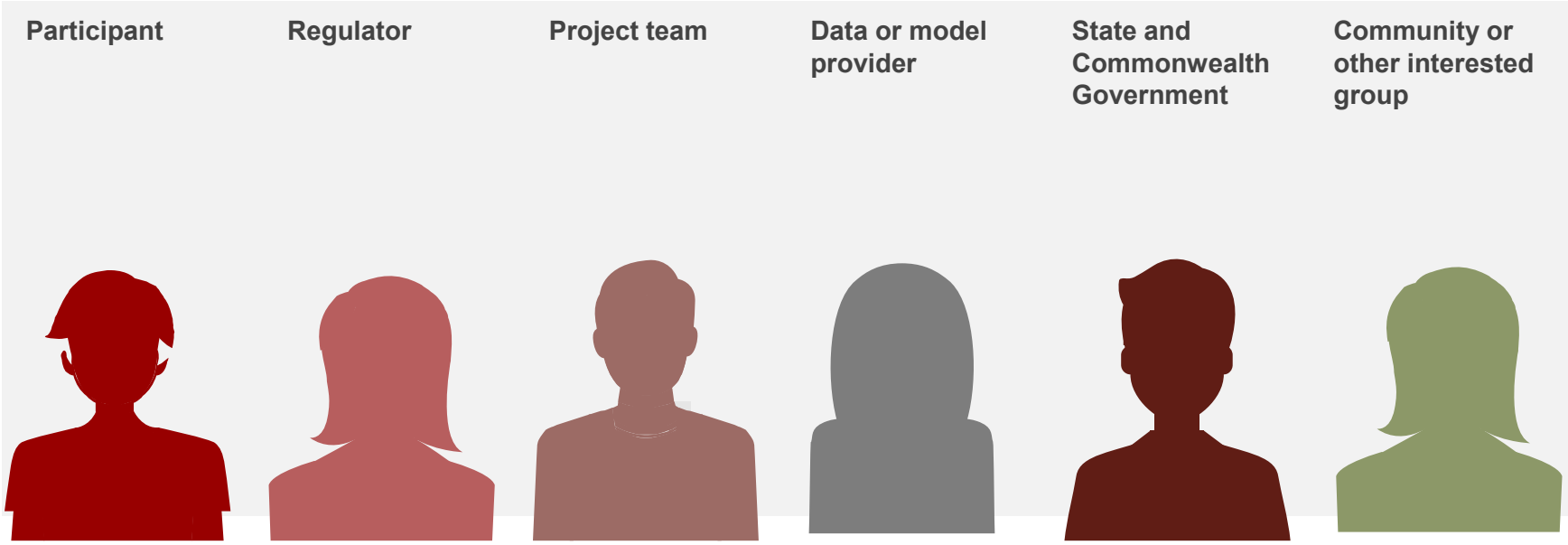
Extra Large: > 50 users of the platform ~ 200 TB of data storage required.

	OPERATOR COSTS (admin/shared zone)				Participant Costs (per ZONE)			
	S	M	L	XL	S	M	L	XL
Base Azure run costs (DevOps, Security)	$2,500	$2,500	$2,500	$2,500	$3,500	$3,500	$3,500	$3,500
Storage & Compute								
Storage Account	$2,700	$4,700	$8,700	$18,700	$400	$2,000	$6,000	$16,000
Managed Disk	-	-	-	-	$780	$3,900	$7,800	$15,600
VMs Modelling	-	-	-	-	$1,400	$2,800	$4,200	$5,600
VMs Software	$570	$570	$570	$570	$2,016	$2,016	$2,016	$2,016
Synapse Analytics	-	-	-	-	$2,250	$2,600	$2,900	$3,250
Modelling								
Sentient Hubs					$5,000	$10,000	$25,000	$50,000
Delivery								
Power BI Premium	$6,500	$6,500	$6,500	$6,500	$28	$55	$138	$275
Governance								
Azure Purview - Catalogue / Lineage	$785	$865	$1,239	$4,949	$785	$865	$1,239	$4,949
Encryption								
IXUP	$15,000	$15,000	$15,000	$15,000	$5,000	$5,000	$5,000	$5,000
Monthly Licensing Costs	**$28,055**	**$30,135**	**$34,509**	**$48,219**	**$21,159**	**$32,736**	**$57,793**	**$106,190**
Microsoft Licenses	$13,055	$15,135	$19,509	$33,219	$11,159	$17,736	$27,793	$51,190
3rd Party Software Licences	$15,000	$15,000	$15,000	$15,000	$10,000	$15,000	$30,000	$55,000
Yearly Licensing Costs	**$336,660**	**$361,620**	**$414,108**	**$578,628**	**$253,902**	**$392,832**	**$693,510**	**$1,274,280**
Application Managed Support (Yearly)	**$120,000**	**$240,000**	**$360,000**	**$480,000**	**$60,000**	**$90,000**	**$120,000**	**$150,000**

Pricing shown here is indicative only, based on several assumptions – accurate pricing for a specific participant would be done as part of their evaluation of the SEAF platform, based on their individual requirements.

User journeys developed for several personas - reflecting groups expected to interact with SEAF

The scenarios on the following pages are designed to illustrate how, at a high level, different users will interact with and use the SEAF based on the current thinking around the guiding principles, operating model and value proposition. The intent remains that SEAF will inform users, whatever their role in the EIA or other processes, to make decisions and support secure, transparent, interoperable sharing of data and information.



Participant	Regulator	Project team	Data or model provider	State and Commonwealth Government	Community or other interested group
Company undertaking decision making, assessment development and seeking approval for a major new development	Organisation responsible for assessment of EIA submissions, approvals and ongoing monitoring of environmental performance	Regional project team responsible for developing and maintaining the regional cumulative impact assessment	Research organisation or business providing data or models for use in the facility in the development and assessment of EIA submissions and a sustained regional cumulative impact assessment	State or Commonwealth Government department looking to ensure the proponents and state government are meeting their obligations in regard to matters of state and national environmental significance	Traditional Owner or Environmental Advocacy Group seeking to understand a proposed development in order to comment on it, and to understand the long term impact of operations in a region on the environment

User journey: Proponent

Proponent

Scenario
A mining company is assessing the potential for a major new site and is looking for information to inform its decision making around whether the site is viable, likely to receive approval having gone through the EIA process, and additional information to support development of an EIA submission in relation to the proposed development.

Expectations
- Data and information needed will be available, easily accessible, accurate and up-to-date
- We are able to review our proposed development in regard to the overall regional cumulative environmental impact utilising models trusted by decision makers in the government
- The information being available and trusted will assist us with gaining community support for the development

1 Stage	Identify the potential development site(s)	Gather data and information on the potential site	Assess feasibility of the site including potential environmental impact limitations	Make go/no go decision for the site	If decision is "go" - start preparation of EIA submission materials for referral to the EPA
2 Activity	Identify the sites shortlisted for consideration for the new site development	Collect existing information on the sites being considered and any desired additional information	Utilising the available information, including environmental reports, assess the pros and cons of each site being considered	Use the feasibility assessments to decide on which site is most likely to receive approval whilst best meeting the needs of the business	Use the regional environmental report to support development of EIA submission for the preferred development site
3 SEAF Touchpoint	No SEAF touchpoint at this stage	Identify relevant dynamic regional assessment and any other relevant environmental data, models and reports held	Utilise available environmental data, models and reports to support assessment of environmental impacts and therefore site feasibility	Utilising information from the SEAF on environmental and heritage impacts, alongside other data make go/no-go decision for each site	Utilise SEAF data, models and reports to develop EIA submission for the preferred site
4 Expectations	Research has been undertaken to identify and shortlist potential development sites	Information is easy to find, understandable, current and relevant	Ability to utilise models to support what-if / scenario modelling for each shortlisted site to inform decision making	SEAF outputs are able to be utilised as part of MCA comparing like with like for each shortlisted site	SEAF streamlines the EIA submission development process and allows EPA to quickly understand the basis of preparation
5 Experiences	Collection of data and information from within own company through central portal	Easily able to identify relevant information for identified shortlist of potential development sites	Able to simply access models or assistance to utilise models to support feasibility assessments	Outputs from the SEAF are simple to use and in a consistent format to support decision making	SEAF allows for a streamlined, transparent, collaborative approach to EIA submission development and EPA assessment

User journey: Regulator

Regulator

Scenario
The Western Australian EPA are looking to review the information, data and modelling used by a mining company in preparation of an EIA submission to inform their assessment report for the Minister including review of the current dynamic cumulative environmental impact assessment for the region including the impact of the proponents current activities.

Expectations
- Data and information we need will be available, easily accessible, accurate and up-to-date
- We are able to review the proposed development in regard to the overall regional cumulative environmental impact utilising trusted and agreed models
- The flow of data and information and model outcomes is transparent, and easily available to simplify our activities and streamline our processes.

1 Stage	Receive EIA submission from proponent	Review data utilised in development of the assessment	Review models utilised in development of the assessment	Review outputs from the models and their interpretation	Sensitivity testing on data and models utilised	Make a decision on recommendation to go to the Minister
2 Activity	EIA submission received from proponent via Environment Online	Review the source of the data utilised, including relevance, accuracy/assurance checks done and how current it is	Review the source of the models utilised, when they were last reviewed and updated and relevance	Assess the outputs from the models against expected results or outcomes and whether they can be accepted	Undertake, where possible, sensitivity testing on the data and model outputs and cumulative regional impact	Develop a recommendation to go to the Minister on the proposed development
3 SEAF Touchpoint	Access the SEAF and check if a relevant dynamic regional environmental assessment exists	Through the SEAF review the relevance and acceptability of the data utilised by the proponent	Through the SEAF review the relevant and acceptability of the models utilised by the proponent	Utilising the information and outputs in the SEAF review the model results against acceptance criteria	Using the SEAF review the sensitivity of the data and models utilised on cumulative impact in the region	Utilising the information and reporting from the SEAF as an input, develop a recommendation / decision
4 Expectations	Straightforward to see whether a relevant dynamic regional environmental assessment exists	Simple to review the data utilised by the proponent for source, relevance and currency	Simple to review the models utilised, their developer, when last updated and their accuracy	Clear and relevant reporting available to allow review of model outputs against standards and criteria	Functionality allows sensitive testing of data and models selected on outcomes	Information and reports are robust and enable decision making
5 Experiences	Simple to see that relevant dynamic regional assessment exists and is up to date	Transparency of process makes it simple to see data utilised and all relevant attributes	Transparency of process makes it simple to see models utilised and all relevant attributes	Model outputs and associated reports are easy to understand and align with assessment criteria	Full support from the SEAF to undertake desired sensitivity analysis to support decision making	Able to confidently make a recommendation to the Minister

User journey: Project team

Regional Project Team

Scenario
Regional project team responsible for supporting development and maintenance of the regional cumulative impact assessment though working with industries, researchers and others with data, information and models in the region that will support the overall goal.

Expectations
- Organisations will be able to simply share their data in accordance with data standards
- The tools are available to allow for data quality assurance and curation quickly to ensure this step is not a blocker in the process
- The team will be supported by experts able to identify any gaps in the data or science required to enable the regional assessment to be developed
- Organisations are happy to share their data confident that confidentiality requirements are being met and it is only being made available to appropriate users.

1 Stage	Agree project deliverables	Ascertain relevant key environmental values and factors and geographical scope	Identify key outputs and develop delivery plan	Bring together required capabilities	Conduct analysis	Develop report
2 Activity	Agree project deliverables with the project manager and the customer	Work collaboratively to ascertain relevant key factors and scope, apply DPSIR and gather initial data	Identify key outputs and develop plan to deliver them. Apply SAFE to understand existing capabilities and gaps	Bring together people, data, andmodels to form specialist team to deliver required outputs	Develop dynamic regional environmental assessment	Assemble information into report for the project team to utilise
3 SEAF Touchpoint	Review any existing data, models or assessments for the region	Provision of information to support determination of Key Environmental Values	Identification of data and analysis tools to support deliverables.	Development of data and analysis tools to meet required capabilities	Provision of data and analysis tools	Utilise standard report templates, model outputs and other standardised information formats
4 Expectations	Quick and easy to see what data and information is available for a geographical region	Information is available from the SEAF to support setting key values and scope	Able to simply assess available data and any gaps which need to be filled to deliver the assessment	SEAF supports connectivity required between data sources and models to meet the desired outcomes	Robust up to date data and models are available to support development of the regional assessment	Model results are available in standard formats and required reporting templates are also available for use
5 Experiences	SEAF is easily accessible and simple to use to find required information	The data required is available from the SEAF when needed, and it's easy to identify gaps or data issues	Application of SAFE through the SEAF is seamless and supports development of a realistic delivery plan	SEAF fully supports the development of the data and analysis tools needed in a timely manner	Outputs from the analysis tools are trusted and whole end to end is transparent so able to be easily verified	Templates are available, and meet the needs of the project

User journey: Model / data provider

Model / data provider

Scenario
Research organisation or business providing data or models for use in the facility to support the development and assessment of EIA submissions by proponents and regulators, and the development of a sustained regional cumulative impact assessment. They have been approached by the project team to help fill an identified data or science gap and are comfortable with the controls in place for use of their data so are happy for it to be included in the facility.

Expectations
- Robust contractual / legal processes and agreements are in place to ensure any necessary data confidentiality or data anonymisation requirements are met and data is only made available to appropriate users
- The process for sharing data or models to the facility is user friendly and support is available if any issues are encountered
- The project team will work collaboratively with us so we can be sure their needs are being met

1 Stage	Data or model provision agreement and standards	Develop / collate data package or model(s)	Submit data or models to the SEAF	Data package review	Address any identified issues and resubmit	Ongoing maintenance of data or models provided
2 Activity	Sign new or review existing data or model provision agreement and associated standards	Develop or collate data package or model(s) to be supplied to meet the identified need	Enter data package (data and / or models) via the submission process	Answer any questions the SEAF team have as a result of review of submission	If any deviation from required standards is identified, amend as per the advice received and resubmit	On regular basis, as per the agreement and standards, review and update the data and / or models as required
3 SEAF Touchpoint	Identified data or model requirement from the project team or SEAF	Clear definition of need	Portal for submission of data package for review, with notification of receipt	Review of data package contents by SEAF team and interaction with SEAF team	Resubmission of data package if required	Accessibility to support review and submission of updated data and / or models
4 Expectations	Requirements are clear and agreements and standards are straightforward	Able to see what data or models the information to be supplied will interact with and interoperability requirements	Simple process for submission of data or models	Updates on the data review package process	Issues identified are clearly articulated	Required access to support review of data and models and provide updates as needed
5 Experiences	No surprises in agreements and standards and clearly understand expectations of what is to be provided	Able to quickly understand what is required	Simple process for submission of data package with notification of successful submission	Regular notifications as the data package passess through the review process	Identified issues are spelled out clearly to allow for resolution without multiple loops through the process	Notified of when data or models are due for review

User journey: Government

Government

Scenario
State or Commonwealth Government department looking to ensure that proponents and State Government are meeting their obligations in regard to matters of state and national environmental significance through review of the dynamic cumulative environmental assessments. Also,how what is happening in a region aligns with expected results from mitigations put in place as part of environmental approvals.

Expectations
- Dynamic regional cumulative environmental assessment utilises most recent information and models and there are no material gaps in the data provided to inform the models
- Information is available in a simple and understandable format that can be utilised by non-technical specialists to quickly and accurately assesses the impact of operations in a region and any unintended consequences, positive and negative, from the operations and the environmental impact mitigations in place
- Able to utilise information to inform the State of the Environment Report

1 Stage	 Identify region to be assessed and available information	 Access information to support review	 Review current environmental performance	 Report on outcomes of review
2 Activity	Confirm region to be assessed and what current reports and information exist including any regional dynamic environmental assessments	Access data and information, including dynamic cumulative environmental assessment, to support review of regional environmental performance	Utilising available information and standard reporting review current environmental performance against conditions applied to approvals for activities in the region	Assess any issues with current regional environmental performance, report on review outcomes and develop and implement an action plan if needed to address issues
3 SEAF Touchpoint	Review what data, information, models and assessments are available to support the selected regional review	Access to available information and reports	Utilise information and reporting to review current and forecast regional environmental performance	Reference relevant information to support review findings and recommendations
4 Expectations	Able to simply and clearly see what information is available for a region	Access information for a region with as few clicks as possible including relevant metadata	Information is up to date, quality checked and available in a format useable for review purposes	Standard reporting provides clear information to support review, including identification of issues and areas where action is required
5 Experiences	Simple interactive geographical based interface allows quick assessment of available information	Able to simply see when data and models were last updated, any data quality concerns and confidence in the assessment developed	Standard outputs and reporting are structured to meet what is needed for the review	Able to state with confidence what the current regional environmental performance is and where there are issues to be addressed and by who

User journey: Community

Community

Scenario
A Traditional Owner Group in a region is seeking to understand a proposed development, including its impact on native title rights, cultural heritage and the environment and to understand the expected and experienced long-term impacts of operations in a region ahead of making a submission or comment.

Expectations
- Information is available in a simple and understandable format that can be utilised to quickly and accurately assess the impact of operations in a region on cultural heritage and the environment
- Able to clearly see what information or data has been used, and who provided it
- Able to also share relevant cultural heritage information in a confidential manner to ensure it is only shared with appropriate people or organisations that will treat the information with respect and not misuse it

1 Stage	Become aware of EIA submission of interest	Access information on the proposal	Review data and information utilised in the assessment	Review forecast impact of the proposed development	Provide feedback / comment on the proposal
2 Activity	Received notification of an EIA submission of interest in a specific region for review and comment	Access information on the proposal and associated regional environmental assessment	Review data and information utilised in the assessment for relevance and gaps in what has been considered	Review the regional dynamic cumulative environmental assessment outcomes including impact of the proposed development	Provide feedback on any areas of concern including provision of supporting data or information as appropriate
3 SEAF Touchpoint	Notification received via Environment Online - no SEAF touchpoint at this stage	Access publicly available data and information for the region the proposed development lies within	Review the data and information utilised for relevance and any gaps	Review the available reporting to understand the impact of the proposed development on the environmental and cultural heritage	Provide feedback via Environment Online referencing SEAF outputs as appropriate
4 Expectations	Notifications are timely and relevant	Sufficient data and information is publicly available to allow for relevant groups to understand impacts on their region	Relevant and up to data information has been utilised in the assessment including consideration of native title rights and cultural heritage	The impact of the proposed development is reported in such a way that it can be understood by well informed members of the public	Able to provide robust and defensible feedback on proposed developments
5 Experiences	Notification received for relevant region with plenty of time to review and provide feedback	Reasonable amount of data and information appears to be available for the region and the proposed development	Reporting allows simple review of assessment undertaken, information and data utilised and any associated data gaps	Regional assessment outputs are clearly and simply displayed and allow layperson review and understanding	Able to provide factual feedback on the proposed development in a secure manner

More information

More information on the suite of work in biodiversity data and information management, undertaken by WABSI and WAMSI in Western Australia, can be accessed at www.wabsi.org.au and www.wamsi.org.au.

wabsi.org.au wamsi.org.au