

# REBUILDING AUSTRALIA'S LOST SHELLFISH REEFS

2021 Reef Builder Annual Report



Australian Government

The Nature  
Conservancy   
Australia

# Contents

Executive Summary .....	3
Background .....	6
Reef Builder progress in 2021 .....	8
Objective 1: Build new reefs .....	8
Objective 2: Boost local employment .....	13
Objective 3: Strengthen community engagement .....	14
Objective 4: Improve local biodiversity.....	16
Next steps – plans for 2022.....	17

Version/Date	Issued as	Author/s	Approved
Version 1, December 2021	FINAL	Oceans Program	Fiona Valesini

*Cover: Shellfish reef restoration Glenelg, South Australia (Photo: Handeye Productions)*



The Reef Builder Project is led by The Nature Conservancy (TNC), with generous grant funding from the Australian Government and co-contributions from public and private partners



*Natural Sydney rock oyster beds within mangrove forests in the Bermagui River, NSW. (Photo: Francisco Martinez-Baena)*



# Executive Summary

Reef Builder, an exciting partnership between the Australian Government and The Nature Conservancy (TNC), is Australia's largest marine restoration initiative. This program will rebuild and protect 13 shellfish reef ecosystems across Australia, working towards TNC's ambitious target of restoring 60 reefs nationally. Our goal is to recover 30 % of this lost habitat, to bring shellfish reef ecosystems back from the brink of extinction for the benefit of both people and nature.

Shellfish reefs are created when millions of oysters and mussels settle onto each other, forming hard reef structures within the shallow waters of Australia's bays and estuaries. These vibrant reefs function just like their more colourful cousins, coral reefs, providing food and habitat for fish and marine life.

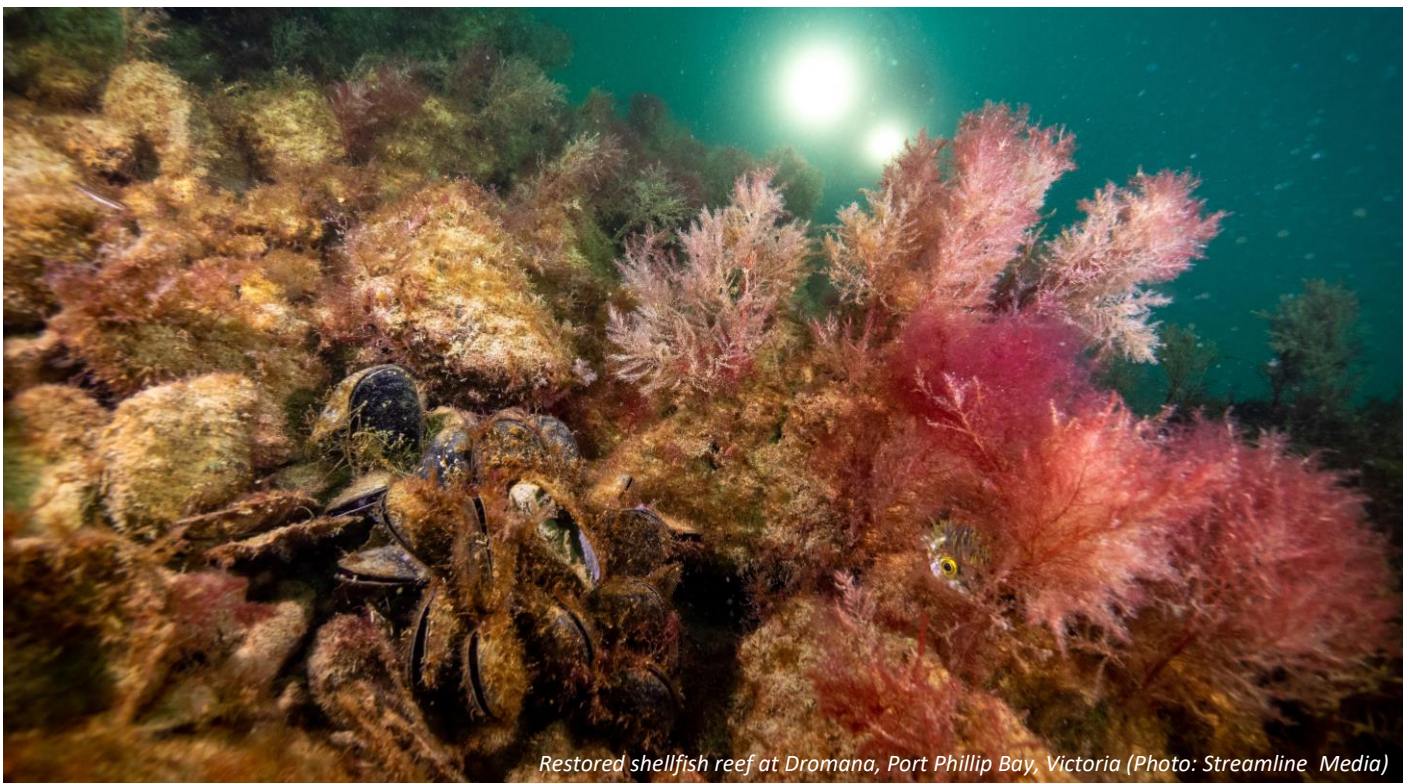
Shellfish reefs are natural solutions to some of our greatest conservation challenges. They improve water quality, boost fish stocks, provide homes for a diverse range of sea life, generate regional employment and protect Australia's coastal communities and shorelines from coastal erosion.

Two hundred years ago, Australia's southern coastline was full of oyster reefs and mussel beds stretching from Noosa in Queensland to north of Perth in Western Australia – quietly keeping our coastal waters clean and clear, safeguarding coastlines and acting as nursery grounds for fish. Unfortunately, these reefs have been decimated by years of commercial harvesting of wild shellfish, water pollution, introduced species and disease. Now, they have virtually disappeared – fewer than 8% remain today.

In 2014, TNC began an Australian-first initiative to restore shellfish reefs at impactful scales in areas where people need them most – the populated bays and estuaries across southern Australia. After seven years of demonstrated success in Victoria, South Australia and Western Australia, Reef Builder was launched in partnership with the Australian Government to grow this critical restoration work to a national scale, and accelerate the recovery of shellfish reef ecosystems from the brink of extinction.

Reef Builder is a \$20 million program of work that commenced in January 2021 and will rebuild oyster and mussel reefs at 13 locations across Australia by June 2023. It aims to (1) protect and restore Australia's estuarine and coastal ecosystems through rebuilding a critically endangered marine ecosystem, improving local biodiversity and boosting fish populations, and; (2) provide economic stimulus to shellfish aquaculture, marine engineering, construction, monitoring and ecotourism businesses in coastal and regional communities.

This Annual Report outlines our progress throughout 2021, reporting on the four key Program objectives (below) and outlining our next steps for 2022.



*Restored shellfish reef at Dromana, Port Phillip Bay, Victoria (Photo: Streamline Media)*

## What Reef Builder has achieved during 2021



18

Hectares of reef restored



251

Tonnes of recycled shells used



6.4

Million shellfish seeded on reefs



543

Hours of diving for restoration



60

Volunteers involved



563

Hours volunteered



168

Jobs created by Reef Builder



71

Small to medium enterprises engaged

## Summary of progress against the four key Reef Builder objectives

Program Objective (2021-2023)	Status – December 2021
1. <b>Build new reefs</b> – Construct shellfish reefs at 13 locations, following established best practice project management, restoration and siting protocols.	30% Complete 4 sites restored totalling 18 ha of reefs
2. <b>Boost local employment</b> – Create up to 170 jobs through employing 120 local contractors from maritime construction, earthmoving, aquaculture, engineering and natural resource management businesses across resource procurement, reef construction and reef monitoring activities.	168 jobs (99% of overall target) 71 local contractors engaged (59% of overall target)
3. <b>Strengthen community engagement</b> – Harness community interest, support and participation by communicating project progress and success through media opportunities, an online project dashboard, interactive graphics and a project video, as well as creating community volunteering opportunities.	220 media opportunities with a combined reach of 63 million viewers 563 hours of volunteering 60 volunteers 12 volunteer events helping prepare recycled shell for reef restoration
4. <b>Improve local biodiversity</b> – Establish oyster and mussel populations and enhance associated ecological communities compared to benchmark ecological targets at each of the 13 reef locations.	Shellfish populations established at 4 reef sites 6.4 million shellfish seeded to the reefs 543 hours SCUBA diving to seed shellfish and monitor the establishment of the reefs

# Background

Until the start of the 20th century, Australia was home to a huge southern reef, stretching further than the Great Barrier Reef, from Noosa in Queensland to north of Perth in Western Australia. These oyster reefs and mussel beds filtered the water, buffered waves reducing coastal erosion and were vital nursery grounds for fish. After years of wild commercial harvest, water pollution, introduced species and disease, shellfish reefs have virtually disappeared – only 8% remain in Australia today, with similar trends observed globally.

Oysters and mussels are ecosystem engineers, settling onto each other to form hard reef structures similar to coral reefs. The disappearance of these reefs from many of Australia’s bays and estuaries has changed how these coastal ecosystems function, with flow-on effects such as reduced water quality, fish abundance and natural shoreline protection.

To reverse this decline, TNC has been leading shellfish reef restoration efforts in Australia since 2014, in partnership with the public and private sectors. This effort has built on 25 years of restoration experience in the United States and elsewhere and has been tailored to suit local conditions. Port Phillip in Victoria was the first restored reef site established in Australia, followed by Windara on the Yorke Peninsula in South Australia and Oyster Harbour in Albany, Western Australia. After seven years of demonstrated restoration success, backed by the global track record of TNC, we know that shellfish reefs can be restored at scale and their social, economic and ecological benefits returned.

The Reef Builder partnership between TNC and the Australian Government is our nation’s largest marine restoration program and will rebuild shellfish reefs at 13 locations across Australia. This is the next exciting step in bringing shellfish reef ecosystems back from the brink of extinction for the benefit of both people and nature.

The Reef Builder Program (2021-23) will provide:

**Economic stimulus** in coastal and regional communities, including those impacted by COVID-19 and the 2019-20 bushfires. Key industry sectors likely to benefit include aquaculture, marine engineering and construction, science, fisheries and tourism.

**Healthier estuarine and coastal waters** through the restoration of a critically-endangered marine ecosystem and improvements to local biodiversity and fish populations. This will assist in protecting and enhancing the resilience of Australia’s coastal ecosystems.

**Social and environmental benefits** through job creation, community volunteering and boosting tourism opportunities.

The above Reef Builder outcomes will be delivered by focussing on four key objectives:

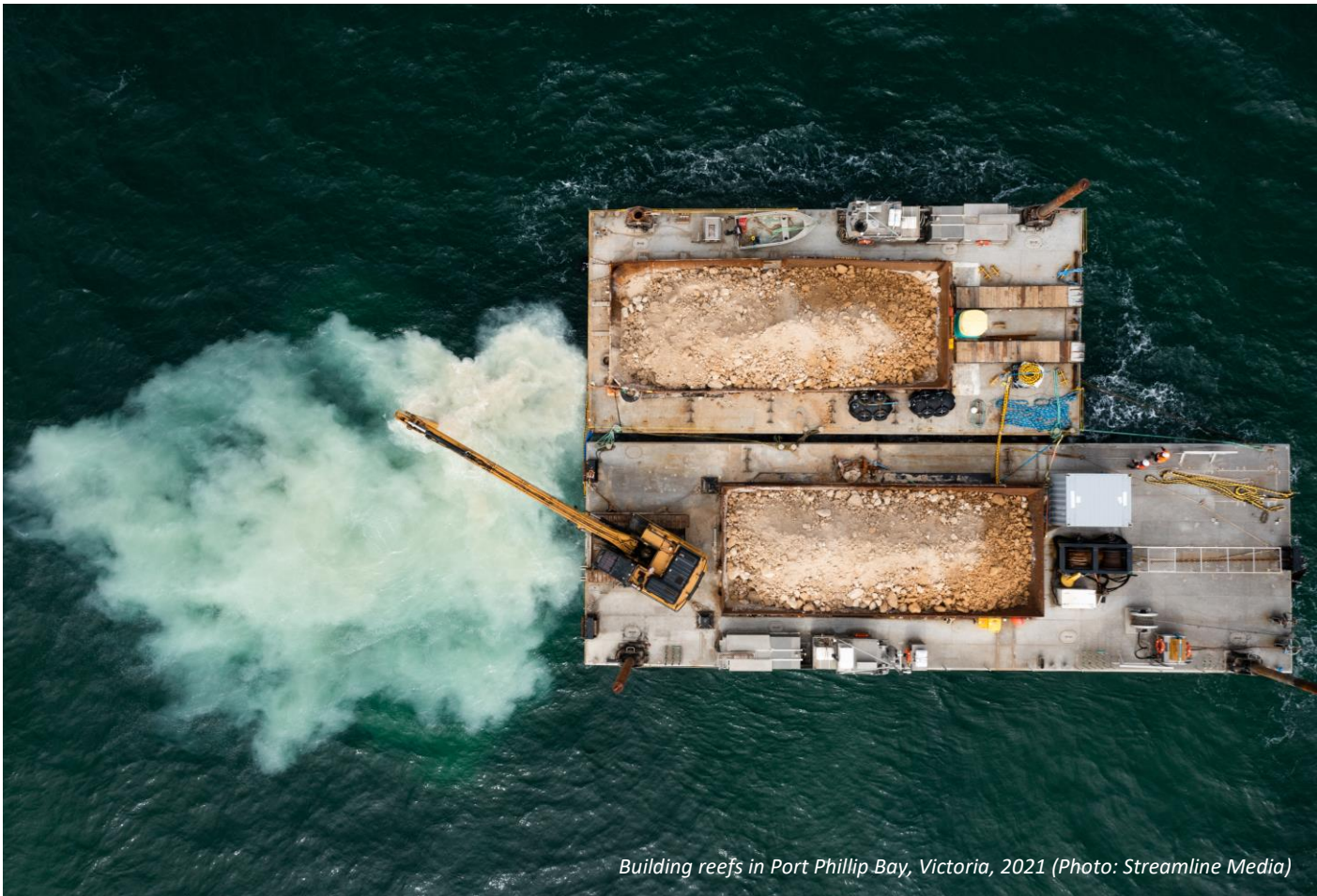
1. **Build new reefs** – Construct shellfish reefs at 13 locations, following established best practice project management, restoration and siting protocols.
2. **Boost local employment** – Create up to 170 jobs through employing 120 local contractors from maritime construction, earthmoving, aquaculture, engineering and natural resource management businesses across resource procurement, reef construction and reef monitoring activities.
3. **Strengthen community engagement** – Harness community interest, support and participation by communicating project progress and success through media opportunities, an online project dashboard, interactive graphics and a project video, as well as creating community volunteering opportunities.
4. **Improve local biodiversity** – Establish oyster and mussel populations and enhance associated ecological communities compared to benchmark ecological targets at each of the 13 locations.

This Annual Report outlines our progress against the four key objectives in 2021.



Figure 1: The 13 Reef Builder locations





*Building reefs in Port Phillip Bay, Victoria, 2021 (Photo: Streamline Media)*



*Reefs built in Port Stephens, NSW, 2021 (Photo: Kirk Dahle)*

# Reef Builder progress in 2021

## Objective 1: Build new reefs

**Construct shellfish reefs at 13 locations, following established best practice project management, restoration and siting protocols.**

Planning, permitting and on-ground (reconstruction and seeding) works for reef restoration follows best practice ecological restoration principles, including seven key delivery stages: (1) Project pre-planning; (2) Site selection and suitability; (3) Planning and permitting; (4) Procurement of materials and contractors; (5) Reef restoration; (6) Monitoring and evaluation; (7) Handover and closeout. The progress achieved in 2021 across each of the seven delivery stages is summarised below for all 13 sites.

This progress has been tracked and summarised via an online project management system (pmo365), which was tailored specifically to the delivery framework for Reef

Builder and follows industry best-practice. The pmo365 system provides:

- i. A consistent delivery framework across all 13 reef-building project locations
- ii. Connectivity across projects
- iii. Improved accountability and workflow approvals
- iv. The ability to track and summarise the progress and implementation of all projects

This project management system is also complemented by a developing data management system (the Monitoring, Evaluation and Learning Data Hub - MELD Hub) to collate and visualise biological, social and economic data collected throughout Reef Builder (see 'Stage 6 - Monitoring & Evaluation' section below for more details).

Table 1: Summary of Reef Builder progress in 2021

STAGE 1 Project Pre-Planning: 100% complete	STAGE 2 Site Selection & Suitability: 100% complete	STAGE 3 Planning & Permitting: 30 % complete	STAGE 4 Procurement: 30 % complete	STAGE 5 Reef Restoration: 30 % complete	STAGE 6 Monitoring & Evaluation: 43 % complete	STAGE 7 Handover & Closeout
13 locations complete	13 locations complete	4 locations approved 3 locations submitted pending approval 6 locations pending submission	4 locations awarded to preferred local contractors for on-ground works (construction and monitoring and evaluation) 6 locations tendering for on-ground works 3 locations pending procurement of on-ground works	4 locations restored 9 locations pending restoration	7 location baseline monitoring complete 9 locations pending baseline monitoring 13 locations post construction monitoring pending	Ongoing conversations with local and state government partners



## Stage 1 – Project Pre-Planning – 100% complete

Project pre-planning was conducted in early 2021 with budget allocations and scheduling undertaken across all the 13 reef building locations. An overarching Project Management, and Monitoring and Evaluation Plans have been developed, as well as individual Communication, Stakeholder Engagement and Monitoring and Evaluation Plans for each of the 13 sites.

## Stage 2 - Site Selection & Suitability – 100% complete

Restoration Suitability Modelling (RSM) is key decision-support framework that has guided decision making and site selection for each Reef Builder location. These quantitative models combine a library of spatial data layers to map areas that are most suitable for building shellfish reefs and are an important tool for engaging the local community in the decision-making process. These models are developed using three main components:

1. **Environmental suitability** - this model selects sites that are most likely to maximise shellfish survival and growth and is vital to the success of a restoration project. Parameters used in this model are water quality (e.g. salinity, temperature, dissolved oxygen) and seabed characteristics relative to the preference and tolerance of the species of oyster or mussel being restored.

2. **Restoration suitability** – this model ensures that conflict is limited within our highly-used estuaries and bays by selecting areas that have minimal conflicting human-uses. This model is established through consultation with the relevant regulatory agencies and other water-way users:

- Navigational safety, i.e. sufficient vessel clearance over the top of reefs and avoidance of all navigational channels
- Coastal infrastructure, e.g. marinas, jetties, navigation aids
- Mooring areas
- Gazetted human-use areas, e.g. sailing areas, water ski areas
- Marine Protection Areas (MPAs)
- Priority habitats, e.g. seagrass beds

3. **Stakeholder suitability** – this model ensures reef locations are situated in areas that are supported by stakeholders and community members.

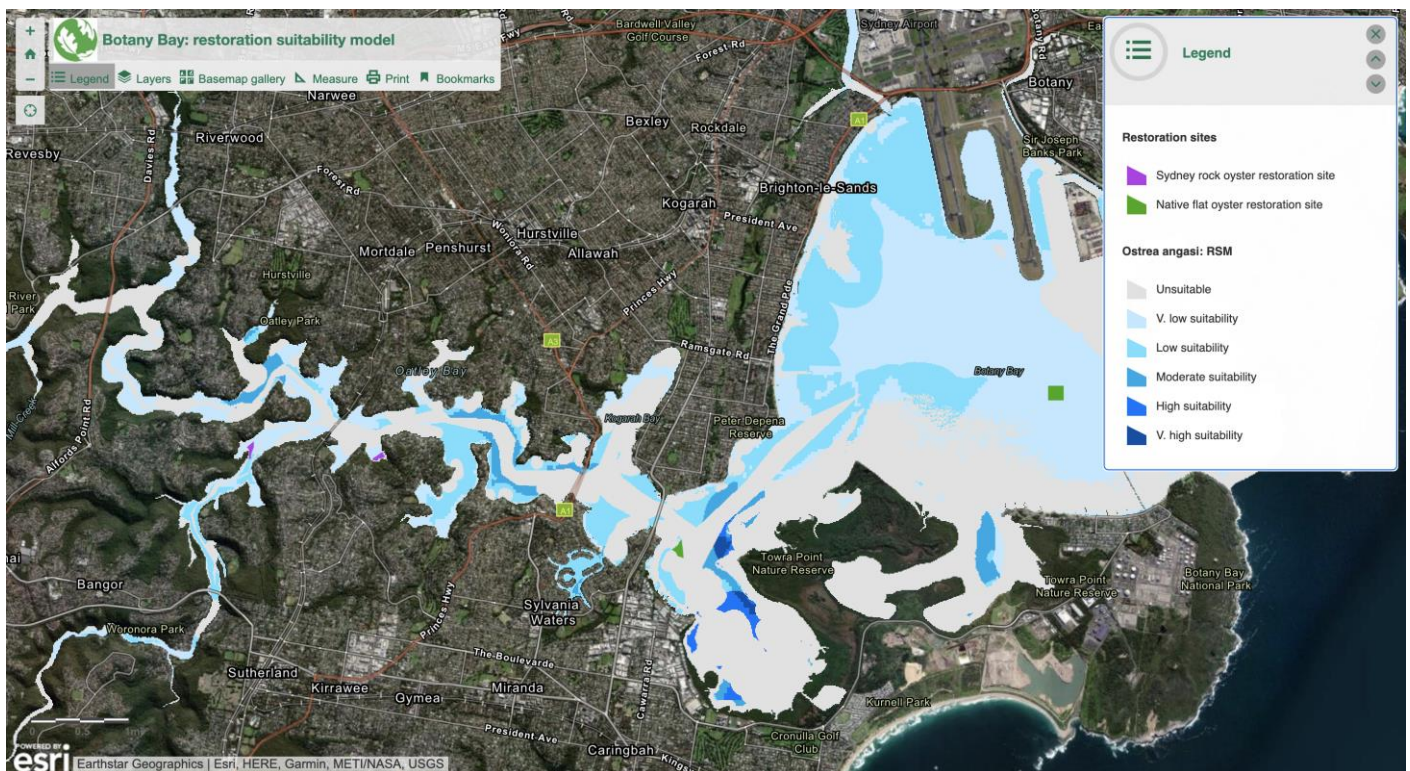


Figure 2: Restoration suitability model for Botany Bay and Georges River estuary

## Stage 3 - Planning & Permitting – 40% complete (4 locations approved, 3 submitted pending approval and 6 pending submission)

### Restoration planning - reef specifications

Reef Builder projects are designing reefs that achieve a conservative balance between ecological and engineering principles, and minimising impacts to adjacent habitats and foreshores. Identifying the reef design and layout is an important step in providing regulators with the best available information to progress permitting for restoration works (Figure 4).

From a water movement and seabed perspective, the following principles are considered and assessed by coastal engineers to minimise the risk of reef structure instability, scour, and negative effects on other nearby structures and habitats:

1. For reefs located in areas with strong, well-defined seabed water flows, the long axis of the reef is aligned with the flow direction (to minimise barriers to sediment movement).
2. For reefs with more inconsistent flow (strength and direction), a more flexible design approach can be adopted. However, individual reef units are arranged to optimally fit within the build envelope and align with seabed depth contours.
3. Reef layouts located on relatively flat areas of seabed are prioritised (to minimise risk of reef structure instability).

From an ecological perspective, the reefs are designed to increase biological gains and resilience for restored shellfish populations. Optimisation of edge effects, variability in reef height and creating a diversity of 3-dimensional space within reefs will cater to the needs of a wide range of plant and animal species, thereby boosting local biodiversity.

### Permitting

A key stage of any restoration project is securing the relevant local and state government permits and approvals, which includes community consultation. The approval pathway differs from state to state, however a common element is the requirement for a Development Approval (DA). In many jurisdictions, shellfish reef restoration is considered the same as building grey infrastructure such as bridges, jetties and groynes, and undergoes a similar assessment and permitting process. The approval timeframe for DAs and associated consultation requirements, combined with other permit obligations (e.g. Crown Lands), can take up to a year for assessment. Other common permits/approvals required are biosecurity approvals (to ensure seeding of the reefs with shellfish does not introduce any new pests or diseases to the waterway), stock enhancement approvals and Aboriginal Heritage approvals.

The full suite of required permits have been obtained for four of the reef building sites (i.e. Port Stephens, NSW; Port

Phillip Bay, Vic; Glenelg, SA; Onkaparinga, SA), with those for the remaining eight sites either pending approval or pending submission.

## Stage 4 - Procurement – 30% complete (4 locations fully procured, 6 locations procurement underway and 3 pending procurement)

The Nature Conservancy commits to sourcing materials and services required to design, construct and monitor the reefs from local suppliers wherever practical and financially feasible. This includes:

- Commitment to source at least 10% of all procurement by value from small and medium enterprises.
- All rock required to build the reef bases to be sourced from local quarries if logistically feasible.
- Local trucking companies to be hired to move the rock from the quarry to the load-out sites.
- All shellfish to be bred in local hatcheries or on local aquaculture farms, unless otherwise required by state government biosecurity protocols.
- Local research institutions, consultants, commercial divers and engineering firms to be identified and invited to tender for project work.
- Local shellfish farmers to be paid a fee if ongoing management of juvenile shellfish is required.
- All small vessels used for site visits to be hired locally.
- Interstate personnel to stay locally contributing to the local economy.

Procurement for all materials and contractors has been completed at Port Stephens, NSW; Port Phillip, Vic; Glenelg, SA; and Onkaparinga, SA, and is underway for Noosa, QLD; Gippsland Lakes, Vic; Albany, WA; Peel-Harvey, WA, Swan-Canning Estuary, WA and Derwent River Estuary, Tas.

## Stage 5 - Reef Restoration – 30% complete (reef reconstruction, seeding and natural ecological colonisation underway at 4 locations; restoration yet to commence at 9 locations)

Shellfish reef restoration follows a series of restoration steps, namely:

1. Deployment of a natural rock/rubble base to recreate a new reef
2. Seeding of the base with a native shellfish species
3. Natural ecological colonisation and development of the reef ('maturation'), which typically takes ~5-7 years to become a fully established and self-sustaining ecosystem.

The reef restoration techniques are tailored to account for the difference in approach between subtidal and intertidal areas. However, both approaches involve reconstruction

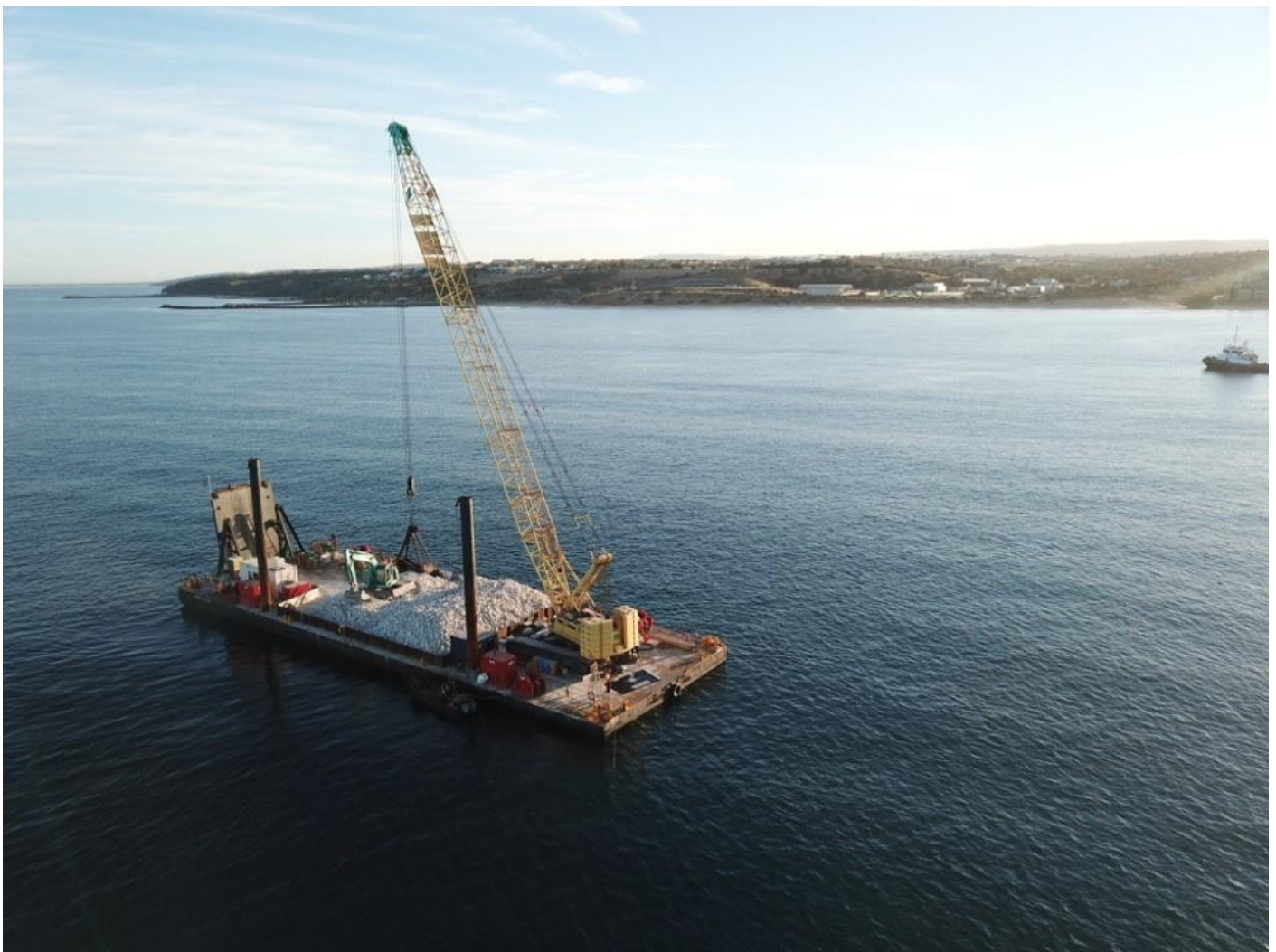


and seeding of this reef base with native shellfish species if the estuary or bay is recruitment-limited (i.e. natural remnant populations of native shellfish species are low).

This is an exciting stage where all the hard planning and preparation work comes to fruition. Barges and excavators are on the water, and local communities can see the restoration in action with rock being deployed and commercial divers seeding the reefs with shellfish.

Almost as soon as the reefs are reconstructed, fish and other marine animals start to make a home amongst the new habitat.

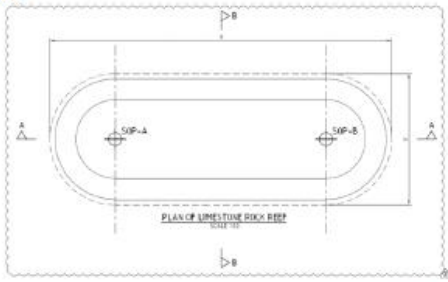
Following construction of the reef base, a key next step is to survey the reefs to ensure they have been constructed to design specifications. These post-construction surveys are undertaken by local hydrographic surveyors using multi-beam bathymetric echosound survey (MBES) technology, producing maps of the reefs which can be compared to the reef designs and layout plans (Figure 5).



*Figure 3: The marine construction vessel "Sea Pelican" and the construction barge "Rock Sea" placing 4800 tonnes of dolomitic limestone offshore from Onkaparinga, South Australia, to construct reefs in November 2021 ©Maritime Constructions.*



**REEF TOP VIEW**



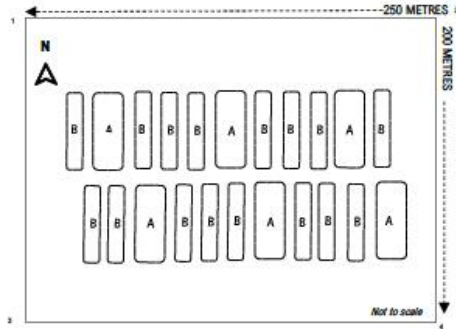
**REEF DIMENSIONS**

REEF TYPE	NOMINAL LENGTH (m)	NOMINAL WIDTH (m)	HEIGHT (m)	TONNAGE PER REEF*	APPROXIMATE VOLUME (m <sup>3</sup> )	NO. OF REEFS	TOTAL TONNAGE
A	34	17	0.5	325	217	6	1951
B	34	8.5	0.5	163	108	16	2601
						<b>TOTAL</b>	<b>4779***</b>

\* based on rock density of 1.57 g/cm<sup>3</sup>

\*\* estimate at 75% volume to account for sloped sides to create reef crest

\*\*\* estimate +5% wastage to 4652 tonnes total (add 228 tonnes)



**REEF LAYOUT**

- 1. -35°7'42.93 S, 138°27'33.801 E
- 2. -35°7'42.93 S, 138°27'43.756 E
- 3. -35°7'49.394 S, 138°27'33.801 E
- 4. -35°7'49.394 S, 138°27'43.758 E

**TOLERANCES:**

DIMENSION	REQUIREMENTS	ACCEPTABLE DEVIATIONS
TONNAGE	FOR EACH REEF OF THE GOVERNMENTAL DIMENSIONS THE TONNAGE SHALL BE PLACED WITHIN THE AREA SHOWN IN THE TABLE.	+/- 2 TONNES PER REEF
LENGTH X	FOR EACH REEF ALL OF THE MATERIAL SHALL BE PLACED WITHIN THE AREA DEFINED BY LENGTH X.	+/- 1% FROM DIMENSION X.
WIDTH Y	FOR EACH REEF ALL OF THE MATERIAL SHALL BE PLACED WITHIN THE AREA DEFINED BY LENGTH Y.	AT INDIVIDUAL LOCATIONS THE WIDTH MAY DEVIATE BY +5% OR -10% THE AVERAGE WIDTH OF THE REEF SHALL NOT FLUATE BY MORE THAN +/- 0.5m
HEIGHT Z	FOR EACH REEF THE MATERIAL SHALL BE PLACED TO THE HEIGHT Z.	AT INDIVIDUAL LOCATIONS THE HEIGHT MAY VARY BY +0.5m OR BY +/- 0.3m

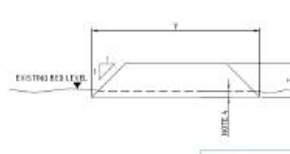
IN ALL DIMENSIONS IT IS ACKNOWLEDGED THAT THE METHOD OF PLACING ROCKS MAY LEAD TO OVERSPILL OF INDIVIDUAL ROCKS OUTSIDE OF THE DEFINED AREA. SUCH OVERSPILL ROCKS SHALL BE SMALL IN NUMBER, AND GENERALLY LESS THAN 2 ROCKS PER M LENGTH OF REEF DIMENSION X.

**NOTES:**

1. ALL DIMENSIONS SHALL BE MILLIMETRES UNLESS OTHERWISE NOTED.
2. FOR DETAILS OF MATERIAL TYPE AND GRADE REFER TO SPECIFICATION.
3. THE APPROXIMATE VOLUME GIVEN IN THE DIMENSIONS TABLE IS FOR INFORMATION ONLY. ACTUAL VOLUME WILL VARY DEPENDING ON THE BULK BEHAVIOUR OF THE PLACED MATERIAL.
4. AN ALLOWANCE IS GIVEN FOR MATERIAL ENGAGEMENT BELOW THE EXISTING SEA BED FOR PLACING SETTLEMENT. THE ACTUAL VALUE WILL VARY DEPENDING ON THE REEF PROPERTIES, PLACEMENT METHOD AND ROCK MATERIAL GRADE.



**REEF SIDE VIEW**



**REEF END VIEW**



DA 0100/154/21  
SECTION 151  
DEVELOPMENT APPROVAL  
MINISTER FOR PLANNING AND LOCAL GOVERNMENT

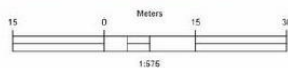
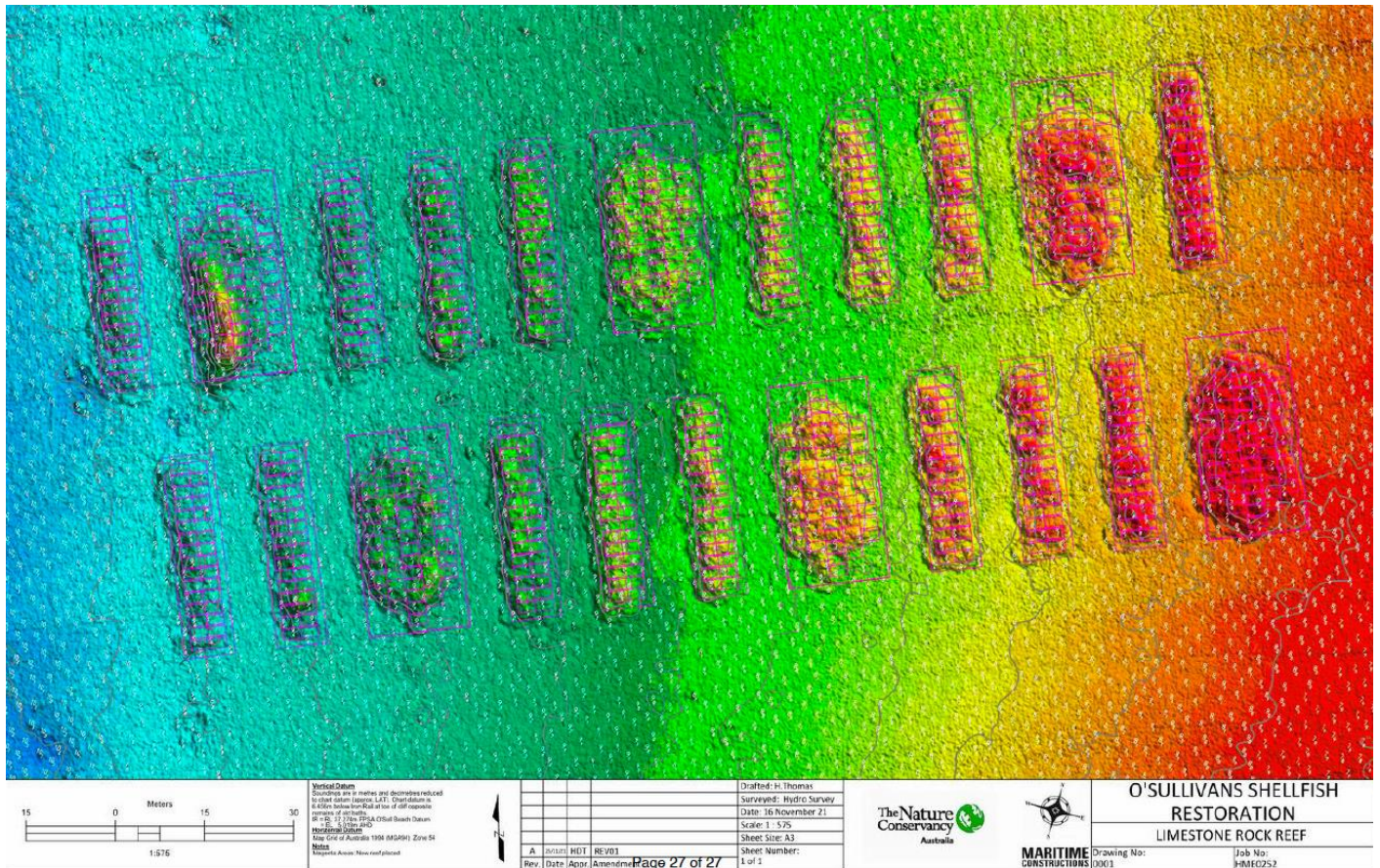
DATE 30JUN21

REEF DESIGN CONCEPT  
LIMESTONE ROCK REEF



O'SULLIVAN BEACH  
REEF RESTORATION

Figure 4: Reef design and layout plan for Onkaparinga, South Australia.



Vertical Datum  
Soundings are in metres and decimetres reduced to chart datum (approx. LAT). Chart datum is 6.600 metres above the top of the lowest astronomical tide (LAT).  
Horizontal Datum  
The map is based on the Australian Geodetic Datum (AGD84).  
Map of Australia 1:50,000 (MGA84) Zone 54  
Notes  
Proprietary Assets: None confirmed



Author	HET	RE-V01
Rev	Date	Amendment

Drafted: H. Thomas  
Surveyed: Hydro Survey  
Date: 16 November 21  
Scale: 1:525  
Sheet Size: A3  
Sheet Number: 1 of 1



O'SULLIVAN'S SHELLFISH RESTORATION  
LIMESTONE ROCK REEF

Drawing No: JME0252  
Job No: JME0252





Figure 6: Commercial divers seeding reefs with millions of juvenile oysters settled onto recycled shell, Onkaparinga November 2021 (Photo: Adelaide Commercial Diving)

In 2021, the Reef Builder program reconstructed full-scale reefs at four sites, specifically Port Stephens, NSW (5 ha); Port Phillip Bay, Vic (5 ha); Glenelg, SA (5 ha) and Onkaparinga, SA (5 ha), totalling 18 ha hectares of reconstructed reefs, using 13,804 tonnes of rock, 251 tonnes of recycled shells, and seeded with 6.4 million shellfish.

### Stage 6 - Monitoring & Evaluation – 30 % complete (4 locations baseline monitoring complete, 9 locations pending start of monitoring)

Monitoring and evaluation for Reef Builder collects data to measure the environmental, economic and social outcomes of the Program. The Nature Conservancy and monitoring partners measure several key environmental indicators before and after reef construction, and at both reef and control sites, to assess how the reefs are developing against their predefined ecological baselines. Additionally, we measure social and economic indicators to inform on the benefits of shellfish restoration to people and the economy.

In 2021, baseline monitoring prior to reef construction was completed at Port Stephens, Port Phillip, Onkaparinga and Glenelg. Post-construction monitoring will occur at all these sites in early 2022. The other nine locations have baseline monitoring pending, with most due to be completed by June 2022.

TNC, in partnership with RUBIX consulting, have developed a Monitoring, Evaluation and Learning Data Hub (MELD Hub) to collate and visualise data collected during the restoration works for Reef Builder. The system produces standardised and tidy data, enhancing programmatic decision making and adaptive management via curated visuals that display key aspects of the Reef Builder dataset.

The MELD Hub uses existing infrastructure already supported by Federal and state governments alongside open-source products, e.g. GlobalArchive, Squidle+, MERMAID and Reef Life Survey. The system delivers a unified platform to provide:

- i. A 'single source of truth' for monitoring data collected for Reef Builder
- ii. Connectivity across Reef Builder projects and systems
- iii. Timely, tidy data and insights through dashboards and visualizations
- iv. A publicly accessible repository of biological data from Reef Builder restoration projects

Throughout 2021, the Reef Builder MELD Hub has been developed to a baseline, functional stage. Monitoring partners can upload biodiversity data, monitoring photos and annotate marine imagery. The Hub will undergo further development and refinement over the next few months, including improvements to the curated data visualisations for key audiences. These improvements are reliant on available data, with greater amounts of data becoming available as more reefs are constructed and monitored.

Restoration, economic and social metrics are continuously monitored by Reef Builder project staff, with data collected as on-ground works are completed. All data collected is managed and stored using the MELD Hub, and will later be used to produce curated visuals, maps and graphics to illustrate the Reef Builder story and share project success.

### Stage 7 - Handover & Closeout – In progress

For each of the 13 Reef Builder sites, ongoing management arrangements will be determined before the end of the funding timeframe.

## What we've achieved since 2021



Hectares of reef restored



Tonnes of recycled shells used



Million shellfish seeded on reefs



Hours of diving for restoration



Volunteers involved



Hours volunteered



Jobs created by Reef Builder



Small to medium enterprises engaged

### Objective 2: Boost local employment

**Create up to 170 jobs through employing 120 local contractors from maritime construction, earthmoving, aquaculture, engineering and natural resource management businesses across resource procurement, reef construction and reef monitoring activities.**

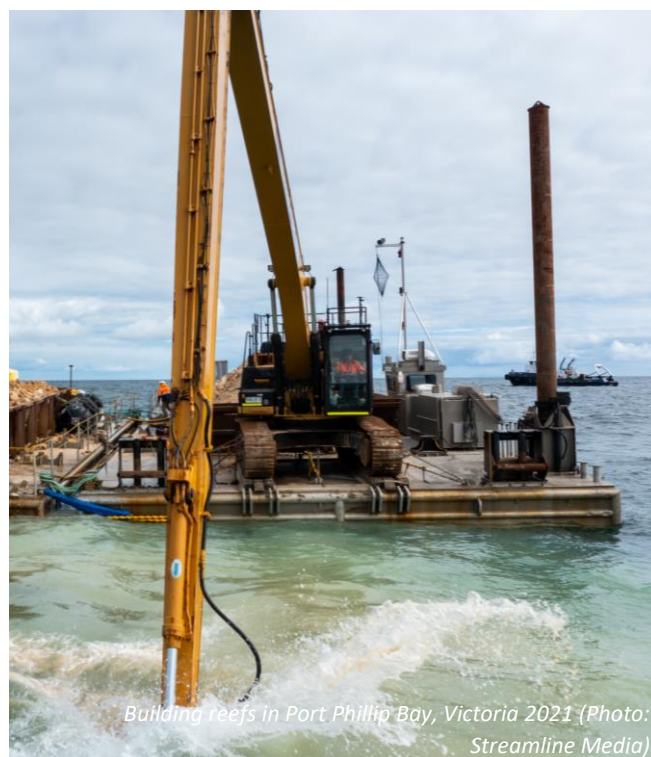
During 2021, Reef Builder created 168 jobs, which involved subcontracting 71 small to medium enterprises. This provided a much-needed direct economic stimulus for coastal and regional communities and businesses impacted by COVID-19 and bushfires.

Reef construction activities in Port Stephens, Port Phillip, Glenelg and Onkaparinga generated most of the jobs for both skilled and unskilled workers. These workers were employed in occupations such as engineers (e.g. designing the reefs), project managers (e.g. overseeing and leading project planning and implementation for TNC and contractors), machine and stationary plant operators (e.g. skippers and deckhands for boats and barges, long-reach excavator operators), farm managers and labourers (e.g. hatchery managers and support staff growing shellfish) and science technicians (e.g. environmental consultants, surveyors and scientific divers involved in monitoring the reefs). The industries involved in supplying this workforce came from a variety of sectors, including Aquaculture; Building & Construction; and Professional, Scientific and Technical Services.

Reef construction and monitoring works are scheduled to be completed for the majority of remaining project sites during 2022. Reef Builder is therefore on track to at least double the projected 170 jobs, and meet the target of 120 local contractors engaged. This demonstrates that marine restoration at scale is beneficial for both nature and people and provides comparable (if not greater) economic benefits to traditional construction, such as road building and other grey infrastructure projects.



Building reefs in Glenelg, SA, 2021 (Photo: Handeye Productions)



Building reefs in Port Phillip Bay, Victoria 2021 (Photo: Streamline Media)



## Objective 3: Strengthen community engagement

***Harness community interest, support and participation by communicating project progress and success through media opportunities, an online project dashboard, interactive graphics and a project video, as well as creating community volunteering opportunities.***

A key component in strengthening community engagement that Reef Builder has developed in 2021 is the establishment and delivery of digital content and stories to provide partners and local communities with information on the program and local projects as they develop.

An online 'digital dashboard' has been established and is live on TNC Australia's Reef Builder webpage.

(<https://www.natureaustralia.org.au/what-we-do/our-priorities/oceans/ocean-stories/restoring-shellfish-reefs/>).

The dashboard provides a snapshot of current success against eight key metrics, including hectares of reef restored; tonnes of recycled shell used in reef restoration; numbers of shellfish seeded onto reefs; hours of diving for restoration; numbers of volunteers involved; number of hours volunteered; number of jobs created, and number of small to medium enterprises engaged (see 'What we've achieved since 2021').

A Reef Builder brochure was developed during the initial stages of the project alongside an FAQ brochure answering frequently asked questions on reef restoration. Reef Builder digital content continues to be developed across various media platforms such as Facebook and Instagram, traditional media (print, TV, radio) and webinars. During 2021, the Reef Builder Program had 220 media events with a combined reach of 63 million viewers. Project-specific webpages (example: Botany Bay -

<https://www.natureaustralia.org.au/what-we-do/our-priorities/oceans/ocean-stories/restoring-shellfish-reefs/botany-bay/>)

([reefs/botany-bay/](https://www.natureaustralia.org.au/what-we-do/our-priorities/oceans/ocean-stories/restoring-shellfish-reefs/botany-bay/)) have been developed to supplement the main Reef Builder webpage.

We are also currently working on the development of a video in partnership with a videographer, that will capture the delivery of the Reef Builder Program across all 13 locations and the outcomes achieved.

Another component of community engagement has been providing opportunities for community members to actively engage with the Program through the establishment of volunteering opportunities and stakeholder engagement events. Throughout 2021, 18 volunteers were engaged on local projects, contributing 165 hours to Reef Builder activities. Volunteer activities have mainly involved the cleaning and preparation of shell for hatchery seeding of shellfish. This is a critical step in the restoration process and enables shell to be recycled from seafood wholesalers and restaurants and used in reef building rather than going to landfill. The ongoing impacts of COVID-19, however, are proving to be a challenge with regard to volunteer participation in the Program. With restrictions generally easing, it is anticipated all projects will have further volunteer opportunities identified and initiated in 2022.

Stakeholder support is another key element of Reef Builder. During 2021, Reef Builder staff engaged extensively with local community groups, schools, government agencies (local, state and Federal), citizen scientists, recreational fishing groups and Traditional Owners, holding 45 stakeholder engagement events (e.g. community forums) with 1395 attendees.



Figure 7: Volunteers in Adelaide washing recycled shell ready for bagging (left); Clean shell bagged and ready for the hatchery (center); Bagged shell in hatchery tanks ready for seeding of oyster larvae (right) (Photos: Tania Sincock).



## Objective 4: Improve local biodiversity

**Establish oyster and mussel populations and enhance associated ecological communities compared to benchmark ecological targets at each of the 13 locations.**

In 2021, 6.4 million juvenile oysters and mussels were seeded onto the rebuilt reef bases at Glenelg (2.1 million), Onkaparinga (3.6 million) and Port Phillip (693,000) reefs. At the Port Stephens site, there remains a good remnant population of Sydney rock oysters, and natural settlement of juvenile oysters will be sufficient to populate those reefs without human intervention. Monitoring in early 2022 will establish how the newly seeded and settled oyster and mussel populations are growing and surviving. The remaining nine Reef Builder locations will have oyster and mussel populations established in 2022/23 once reefs have been reconstructed.

Baseline ecological monitoring of restoration locations and other nearby 'control' habitats establishes benchmark understanding of local biodiversity prior to reef restoration. These baseline ecological surveys are critical for Reef Builder staff to measure increases in biodiversity following restoration, due to the establishment of marine animals and plants from nearby habitats (e.g. seagrass, rocky and remnant shellfish reefs). These monitoring surveys give insight into the marine species that will be early colonisers of the reconstructed reefs alongside the newly established oyster and mussel populations. Some examples of this biodiversity are shown in the images below.





## Next steps – plans for 2022

2022 will be an exciting year for the Reef Builder program. We anticipate all permits to be submitted and approved so that pilot and full-scale builds can commence and be completed by December 2022. Monitoring and evaluation will be underway at all Reef Builder locations collecting data on how the reef ecosystems are restoring. We are quietly optimistic that COVID-19 will allow us to scale our community volunteering opportunities and enable us to harness the strength of community support and collectively bring shellfish reef ecosystems back from the brink of extinction for the benefit of both people and nature.



*Restoration works in Port Phillip Bay (Photo: Streamline Media)*





*Restored shellfish reef at Dromana, Port Phillip Bay, Victoria (Photo: Streamline Media)*

FOR MORE INFORMATION

Alison Rowe, Managing Director | [australia@tnc.org](mailto:australia@tnc.org) | 03 8346 8600

Suite 2-01, 60 Leicester Street, Carlton, VIC 3053

[www.natureaustralia.org.au](http://www.natureaustralia.org.au)

The Nature  
Conservancy   
Australia