Tropical Water Quality Hub

National Environmental Science Programme

Reef & Rainforest RESEARCH CENTRE

# Annual Progress Report #1

## 1 January 2015 - 31 December 2015



The Tropical Water Quality hub is funded by the Australian Government's National Environmental Science Programme

# NESP ANNUAL PROGRESS REPORT #1
# 1 January 2015 – 31 December 2015

## Section 1. Hub information

**Hub Name (full activity title): NESP Tropical Water Quality Hub**

**Host organisation:** Reef and Rainforest Research Centre Ltd

**Key Contact:** Sheriden Morris

**Contact telephone number:** (07) 4050 7400

**Contact email address:** Sheriden.morris@rrrc.org.au

**Other consortium partners/subcontractors/research organisations:** James Cook University; Australian Institute of Marine Science; Central Queensland University; CSIRO; Griffith University; University of Queensland

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This annual progress report comprises three parts:

A. **Certification** by the hub leadership that, in all material respects, the report is complete and accurate and that funding conditions have been met and that risks to research delivery have been notified to the Department;
B. **Performance information** – describing in qualitative and quantitative terms progress against the Research Plan; and
C. **Financial information** - demonstrating that funds have been used for the purpose for which they were provided.

## A: HUB CERTIFICATION

### Section 2. Certification by Hub Leadership

**Hub Leader Certification**

As Hub Leader, I certify that I have taken adequate steps to reasonably assure myself that:

each required report component is attached;

the contents of each component of the report is complete and accurate in all material respects;

funds have been used for the purpose for which they were provided and all funding conditions have been met, including that appropriate oversight has been maintained of hub projects, their progress, performance and budgets during the reporting period;

all relevant risks to project delivery have been notified to the Department in this and previous reports and that appropriate steps are being taken to manage those risks;

any carryover of project funds have been allocated to projects in the next reporting period or financial year in accordance with the Research Plan, or that alternative projects have been identified if necessary, or funds identified for refund to the Department of the Environment; and

full payment for this milestone by the Department is recommended on the basis that the milestone has been successfully achieved.

Signed: DBurrows

Hub Leader Name: Dr Damien Burrows

Date: 30-03-16

**Hub Steering Committee Chair[1] Certification:**

As steering committee chair, I certify that any issues of concern or matters raised during steering committee meetings where the draft progress report was discussed have been adequately resolved, amended or incorporated into the final report submitted to the department.

Signed: LBoully

Hub Steering Committee Chair Name: Ms Leith Boully

Date: 30-3-2016

[1] Hub steering committees have been established as an important governance mechanism for NESP. Committee responsibilities include: i) assisting in ensuring the alignment of hub research to the research priorities and needs of users including the Department, state and local governments, industry and community groups; ii) providing advice on proposals and projects' use of funds; and iii) to review performance. The co-signing of annual progress reports closes the governance loop and provides a more formal reporting interaction between hub Steering Committees and the Department of the Environment. Importantly, the steering committee chair is not certifying the accuracy of the detailed contents of the report and this certification removes the risk that the steering committee and the Department are viewing different or disconnected reports.

## B: PERFORMANCE INFORMATION

### Section 2. Performance against Project and Departmental Milestones

**Have all milestones for the reporting period and to date been met?** Yes.

**Departmental Milestones:**
Milestones 1–9 of the NESP TWQ Hub funding agreement have all been met during the reporting period by the Hub Administrator – Reef and Rainforest Research Centre.

**Known risks to the achievement of milestones in the next reporting period (January – December 2016):**
There are no known risks to the achievement of Departmental Milestones by the NESP Tropical Water Quality Hub during the next reporting period.

### Section 3. Description of work undertaken during the reporting period

***Overview***
The condition of the Great Barrier Reef (GBR) has declined over the last 30 years. This decline has been attributed to poor water quality originating from catchments, increased crown-of-thorns starfish outbreaks, severe storms and cyclones and large coastal developments. Previous and current investments by government, industry and community are aimed at reversing this decline. Good, targeted science is required to guide the NESP investment towards more effective implementation of on-ground actions that result in improved water quality outcomes, more informed decision-making for the GBR and improved condition and resilience of aquatic biota and habitats.

The objective of the NESP TWQ Hub is to deliver innovative research for practical solutions to maintain and improve tropical water quality from catchment to coast focused on the Great Barrier Reef and other tropical waters under three key themes:

1) Improved understanding of the impacts, including cumulative impacts, and pressures on priority freshwater, coastal and marine ecosystems and species.
2) Maximise the resilience of vulnerable species to the impacts of climate change and climate variability by reducing other pressures, including poor water quality.
3) Natural resource management improvements based on sound understanding of the status and long-term trends of priority species and systems.

**Funding of Projects**
Two project funding rounds, open to the six partner institutions of the TWQ Hub were made in 2015. The first funding round focused on short-term projects (6-9 months) and closed on 13 April 2015. A total of 131 proposals were received requesting a total of $10.3 million. A selection process through the Hub Scientific Advisory Committee and the Hub Steering Committee resulted in the funding of 24 projects that met the Minister's research priorities. This included funding of the eAtlas hosted by AIMS. The Minister for Environment, Hon. Greg Hunt identified the need for a further project in the sugarcane catchments of North Queensland that focused on engaging the farming community directly in the research and monitoring of water quality in their Catchment: Project 25. Research Plan v1 was approved by the Minister 10 June 2015. A second call for multi-year research projects (1-3 years) closed on 12 October 2015 for commencement in January 2016. The research priorities were narrowed to reflect the targets of the Reef 2050 Long Term Sustainability Plan. A total of 44 proposals were received. A selection process through the Hub Scientific Advisory Committee and the Hub Steering Committee resulted in the funding of 18 projects. Research Plan v2 was approved by the Minister on 23 December 2015. In 2015, the

NESP TWQ Hub distributed $1,797,300 to 25 projects (under Research Plan v1) across the six partner institutions.

**Hub Launch**
The NESP TWQ Hub was officially launched by The Honourable Greg Hunt, Minister for the Environment on the 22 September 2015 at a function hosted at Deeral on the banks of the Russell River, North Queensland. The launch was attended by representatives from government, NRM, Indigenous Rangers, Traditional Owners, NGO and the cane farming community.

**Indigenous Engagement**
The NESP TWQ Hub Indigenous Engagement and Participation Strategy (IEPS) was submitted for approval on 1 May 2015 (Milestone 8). The IEPS was approved by the Department on 6 July 2015. Indigenous engagement (IE) was further developed in Research Plan v2 to encourage project leaders to include IE in their projects from the beginning. A category framework was developed (Category 1, 2 or 3) to guide the level of engagement by projects with Traditional Owners of the land and sea country under the IEPS. This category framework was well accepted by the Department and subsequently shared with the five other NESP Hubs for their information. The TWQ Hub participated in the NESP Community of Practice inaugural meeting held 28 October 2015 in Melbourne.

***Hub Impact Case Studies (6) from previous 12 months***
Three short-term Research Plan v1 projects were completed in the reporting period. These three projects focus on monitoring and evaluation:

1. Project 3.8: Towards an integrated monitoring program: Identifying indicators and existing monitoring programs to cost-effectively evaluate the GBR Long Term Sustainability Plan (Dr Prue Addison, AIMS)
2. Project 3.7: Monitoring the effects of zoning on coral reefs and their associated fish communities in the GBR Marine Park (Dr Hugh Sweatman, AIMS)
3. Project 1.5: Legacy of the Lower Burdekin Water Quality Tender (Dr Romy Greiner, JCU)

| **CASE STUDY #1** |
|---|
| **1. Research Hub:** Tropical Water Quality |
| **2. Project number and title:** Project 3.8 – Towards an integrated monitoring program: Identifying indicators and existing monitoring programs to effectively evaluate the Long Term Sustainability Plan |
| **3. Title of Case Study:** Can existing monitoring effectively evaluate the Great Barrier Reef Long Term Sustainability Plan, and what is needed for a comprehensive integrated monitoring program? |
| **4. Context/Problem Statement:**<br>The Reef 2050 Long-Term Sustainability Plan (LTSP) uses an outcomes-based approach to align its vision, long-term objectives, short-term targets and actions. Targets are specified for 2020 and represent stepping-stones for achieving the objectives by 2035 and outcomes by 2050. The LTSP calls for an integrated monitoring and reporting program that will provide a comprehensive and up-to-date understanding of the Great Barrier Reef (GBR) ecosystem, its values, supporting ecological processes, and pressures affecting the system. The evidence of success (or failure) of meeting the LTSP targets, objectives and outcomes will be provided by the results of an integrated monitoring program. This project delivered a series of critical initial steps required to develop an integrated monitoring and reporting program in the GBR to support the LTSP. All outputs, including a full monitoring program inventory, were delivered to the Reef Integrated Monitoring and Reporting (RIMReP) Program Design working group in December 2015 to assist in the design of the LTSP integrated monitoring and reporting program. |
| **5. Summary of the Case Study Impact** |

The comprehensive review of existing GBR monitoring provided: (1) a breakdown of LTSP targets and objectives to assist in indicator development; (2) an inventory of existing monitoring assessed against environmental and socio-economic values and attributes of the LTSP; and (3) an assessment of statistical performance of the AIMS Long Term and Marine Monitoring Programs. The results identified gaps in current monitoring programs, in terms of delivering against the LTSP, and highlighted the importance of specific indicators to detect signals of change relevant to LTSP targets and objectives. Ultimately, being able to report against all LTSP targets and objectives will be cost-prohibitive, and any integrated monitoring program will involve trade-offs between comprehensiveness and price.

**6. Details of the Impact**

The project team consulted with the Department of the Environment (DoE), GBRMPA, Parks Australia and the Department of the Environment and Heritage Protection (QEHP) staff in the project development phase (25-26 May; 5 June; 12-13 June) to discuss the focus, aims and method, and ensure results would contribute to the development of an effective LTSP integrated monitoring program, and align with related initiatives. A series of end-user meetings were integral to the assessment of current monitoring programs and the desired features of an integrated LTSP monitoring program.

The meetings – conducted with GBRMPA from 22-26 June – explored the LTSP monitoring program needs to ensure the research outputs aligned with end-user LTSP projects and decision-making. A facilitated workshop on 15 July 2015 – Marine Strategy Framework Directive (EU) and the Long Term Sustainability Plan (GBRWHA) – included 22 participants (scientists and decision-makers from AIMS, GBRMPA, Queensland Government, DoE and JCU). The workshop provided an opportunity to understand the policy background to the LTSP and the variety of approaches used to select marine indicators and set targets in other regions (EU). Participants discussed the relevance of lessons learnt from other regions, in relation to the development of an integrated monitoring and reporting program for the GBR, and initiated discussions about indicator development for the LTSP. Ongoing engagement with end-users (8-17 Sept) to provide progress updates on research and receive feedback on preliminary results and approach ensured the project continued to align with policy and decision-making processes for LTSP. Consultation with the RIMReP program design working group (27 Oct – 6 Nov) sought comments on the draft monitoring program inventory and preliminary indicator results.

The recommendations of the project have been provided to all end-users and include specific advice on indicator selection, developing an effective integrated monitoring program, and aligning with existing monitoring and policy initiatives. The project also provided a power analysis tool that GBRMPA can use to evaluate the statistical power of any monitoring being considered as part of the LTSP integrated monitoring program. Overall, the project has provided a fundamental review of existing monitoring and how it might deliver on assessing the success of LTSP targets and objectives, and has recommended a way forward for developing indicators and an integrated monitoring program for the LTSP. The team worked closely with end-users of the information to ensure results delivered on their management needs and that there are positive impacts of the research.

**7. Research Underpinning Impact**

Establishing an effective integrated monitoring program is fundamental to measuring success of the LTSP and enabling adaptive management to protect and restore the GBR. Recognising that such a monitoring program must be established in time to deliver data for the next GBRMPA Outlook Report in 2019, a pragmatic, adaptive, approach to the design and implementation of the monitoring program is needed. The approach must include the formulation and agreement on the indicators, objectives and targets of the monitoring program, evaluate the adequacy of existing monitoring, and, where appropriate, build on existing programs to establish a ‘first generation’ LTSP integrated monitoring program. The integrated monitoring program must also have the capacity to evolve over time, to incorporate new indicators and technologies as they become

available.
Results illustrate that there are many environmental, ecological and socio-economic values, attributes and threatening processes that could be monitored to help assess progress towards the LTSP objectives and targets. A substantial amount of work will be required to refine the list of indicators to provide clear signals of whether the LTSP objectives and targets are being achieved. The project outlined a range of decision-making tools and frameworks that can help with the challenging task of indicator development, prioritisation and selection, including the use of criteria to prioritise indicators.
Developing an integrated monitoring and reporting program should be a concurrent task with indicator selection, as both tasks will influence each other. The integrated monitoring and reporting program can utilise data from existing monitoring programs providing standardised protocols are used for data collection, analyses, sharing, collation and aggregation. A tool was also provided to assess the statistical power of any monitoring program implemented.

**8. Research Outputs from Research Underpinning Impact**

- Addison, P., Walshe, T., Sweatman, H., Jonker, M., MacNeil, A., Thompson, A., Logan, M. (2015) Towards an integrated monitoring program: Identifying indicators and existing monitoring programs to effectively evaluate the Long Term Sustainability Plan. Report to the National Environmental Science Programme. Reef and Rainforest Research Centre Limited, Cairns (118pp).

**9. Additional Information**

**a) Validation of the Impact**

- Addison, P., Walshe, T., Sweatman, H., Jonker, M., MacNeil, A., Thompson, A., Logan, M. (2015) Towards an integrated monitoring program: Identifying indicators and existing monitoring programs to effectively evaluate the Long Term Sustainability Plan. Report to the National Environmental Science Programme. Reef and Rainforest Research Centre Limited, Cairns (118pp).
- Monitoring program inventory (Excel spreadsheet and Endnote library) for the RIMReP Program Design working group.

**b) People (researchers, institutions)**

**i. Staff**

- Prue Addison, Terry Walshe, Hugh Sweatman, Michelle Jonker, Ken Anthony, Aaron MacNeil, Angus Thompson, Murray Logan – Australian Institute of Marine Science

**ii. Others (end-users and beneficiaries consulted)**

- Katherine O'Callaghan, Giles West – DoE
- Fergus Molloy, Hayley Gorsuch, Katherine Martin, David Wachenfeld, Josh Gibson – GBRMPA
- Amanda Parr – Parks Australia
- Jeff Dambacher – CSIRO and co-chair of the RIMReP Program Design working group
- Nyssa Henry, Julie Coysh, Matthew Fullerton – QEHP
- RIMReP program design working group

**c) Research and Investment Income**

- Funding was awarded to Dr Prue Addison, Australian Institute of Marine Science
- Towards an integrated monitoring program: identifying indicators and existing monitoring programs to effectively evaluate the Long Term Sustainability Plan
- Funded under the National Environmental Science Programme, Tropical Water Quality Hub
- Grant period: 1 July – 31 Dec 2015
- Total value of the grant: $100,000 (NESP) $110,000 (In-kind)

| CASE STUDY #2 |
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| **1. Research Hub:** Tropical Water Quality |
| **2. Project number and title:** 1.5 – Legacy of the 2008 Lower Burdekin Water Quality Tender |
| **3. Title of Case Study:** Does on-farm water quality improvement continue in the long-term once programs and investment end? |
| **4. Context/Problem Statement**:<br>Environmental tenders are becoming an increasingly popular policy instrument that use economic incentives (e.g. reverse auction tenders) to achieve environmental outcomes (e.g. water quality improvements). These tenders are designed and based on economic theory and there is an absence of ex-post evaluations of effectiveness. The 2008 Lower Burdekin Water Quality Tender (the Tender) was the first NRM program in the GBR catchment to allocate funding for on-farm projects delivering water quality improvements through a competitive tender process. The Tender attracted 87 bids from 64 landholders for a range of water quality improvements, mostly for reducing sediment, nutrient, herbicide and pesticide emissions from cane land. The available funding of $600,000 was allocated to fund the top 33 bids from 32 landholders. The allocative efficiency of the Tender was assessed in 2011 but no retrospective assessment of tender efficacy was conducted. This projected evaluated the effectiveness of the Lower Burdekin Water Quality Tender to determine its enduring benefits for water quality, and identify any lessons that could inform the design of future tender-based environmental funding programs. |
| **5. Summary of the Case Study Impact**<br>The research found that the vast majority of investments contracted under and co-funded by the Tender had been implemented as proposed. In particular, all acquisitions of machinery to support precision farming and reduce water quality impacts had been completed, and the equipment was being used as intended. Similarly, all new or modified recycle pits co-funded by the Tender were reported to be working well and to the satisfaction of landholders, with one exception only. By achieving implementation of long-lasting improvements to land and water management, the Tender has proven to be effective in achieving long-term water quality improvements. However, the Tender failed to achieve its anticipated effectiveness (total pollution abated) because some major projects which had been approved for funding did not proceed, and the principal reason for this was cost under-estimation during proposal preparation.<br>Tender participants were not very inclined to participate in a new tender program being offered in the Lower Burdekin – the Reef Trust Tender Burdekin. The new tender program was generally regarded as being targeted at late adopters of established industry best practice, and many respondents questioned the rationale of financially “rewarding” laggards. Tender participants prefer a more diverse government policy approach to water quality improvement in the GBR that includes non-agricultural industries and urban pollution, and addresses climate change to stem the threat to the GBR arising from multiple detrimental effects of climate change.<br>The learnings from the research have been summarised as recommendations to inform the design and implementation of future competitive government tenders:<br>• Engage with industry at a grass-roots level in the design of new policies and programs.<br>• Treat funding program information sessions as an opportunity for educating landholders about conservation issue and current science, as well as for farmer feedback.<br>• Provide technical advice for bid development and maximise accuracy and realism of technical and costing assumptions.<br>• Maximise transparency of the process and communication of funding decisions.<br>• When implementing competitive tenders, be prepared to deal with situations where participants struggle to implement approved activities. The first priority should be to offer assistance to try to overcome impediments to implementation.<br>• Review the appropriate use of approved funding, and help participants overcome difficulties with implementation and problems with functionality. |

- Consider changes to environmental regulation as part of a comprehensive and systematic approach to environmental policy.
- Systematically build ex-post evaluations into all competitive tenders.
- Conduct two ex-post evaluations of a program, the first not long after program completion and the second in 3-5 years time.
- Ensure ex-post evaluations cover participants' experiences with all aspects of process as well as effectiveness, allocative efficiency of funding and legacy.
- Complement ex-post program evaluations with research, which enables comparison of program participants with farmers who have not participated.

**6. Details of the Impact**

The project team conducted several meetings with NQ Dry Tropics officers as part of the method planning and research implementation. The results are being disseminated through a conference presentation (2016 Australian Agricultural and Resource Economics Conference) and follow-up discussions with NQ Dry Tropics. The project engaged with 42 farmers in the Lower Burdekin, providing information exchange opportunities and follow-up to the 2008 Tender program.

**7. Research Underpinning Impact**

For the ex-post evaluation, a survey was implemented using a mixed-method approach. Structured interviews were conducted with 42 Tender participants who had submitted a total of 64 bids. Respondents and their bids were representative of the overall Tender participants and bids. Of the respondents, 22 received funding (no more than one successful proposal per respondent) and 20 respondents did not have a successful proposal. The survey was based on a questionnaire, which asked Tender-related questions and explored socio-demographic and farm descriptors.

The research found a high level of persistence of investments and continuing functionality, which means that water quality benefits continue to accrue. The Tender achieved additionality and crowding-in effects, which improved the efficiency of the investment. In particular, the research provided evidence that the Tender:

- Engaged in an information and communications strategy which generated high levels of participant satisfaction during implementation, but once funding decisions were made the level of transparency and communication became less satisfactory.
- Provided incentives for participation of farmers that encouraged those who had not previously addressed on-farm water quality or participated in any NRM programs.
- Effected learning about the impacts of agriculture on water quality—irrespective of success of proposals—and thereby generated intrinsic motivation for many Tender participants to do more about improving water quality.
- Generated a series of subsequent investments into water quality improvements, many of which were entirely funded by the farmers while others were undertaken with the assistance of other NRM funding programs.
- Triggered and facilitated farming-systems change to more environmentally benign practices in some cases.

**8. Research Outputs from Research Underpinning Impact**

- Greiner, R. 2016. Evidence of additionality and crowding-in effects achieved by an environmental tender. Paper presented at the 2016 Australian Agricultural and Resource Economics Conference, Canberra, 9-12 February 2016.
- Greiner, R (2015) Ex-post evaluation of an environmental auction: Legacy of the 2008 Lower Burdekin Water Quality Tender. Report to the National Environmental Science Program. Reef and Rainforest Research Centre Limited, Cairns (46pp).

**9. Additional Information**

**a) Validation of the Impact**

- Greiner, R. 2016. Evidence of additionality and crowding-in effects achieved by an environmental tender. Paper presented at the 2016 Australian Agricultural and Resource

Economics Conference, Canberra, 9-12 February 2016.
- Greiner, R (2015) Ex-post evaluation of an environmental auction: Legacy of the 2008 Lower Burdekin Water Quality Tender. Report to the National Environmental Science Program. Reef and Rainforest Research Centre Limited, Cairns (46pp).

**b) People (researchers, institutions)**

**i. Staff**

Romy Greiner – Cairns Institute, JCU; John Rolfe, CQU; Scott Crawford, Paul Duncanson, NQ Dry Tropics

**ii. Others** (end-users and beneficiaries consulted)
- Sarah Rodriguez, Angela Cameron – DoE
- Scott Crawford – NQ Dry Tropics
- Donna Audas - GBRMPA

**c) Research and Investment Income**
- Grant was awarded to James Cook University
- Legacy of the 2008 Lower Burdekin Water Quality Tender
- Funded under the National Environmental Science Programme, Tropical Water Quality Hub
- Grant period: 1 July – 31 Dec 2015
- Total value of the grant: $39,795 (NESP) $39,795 (In-kind)

**CASE STUDY #3**

**1. Research Hub:** Tropical Water Quality

**2. Project number and title:** 3.7 – Monitoring the effects of zoning on coral reefs and their associated fish communities in the GBR Marine Park

**3. Title of Case Study:** The effects of marine park zoning on communities of fish and corals in the Capricorn-Bunker group.

**4. Context/Problem Statement:**

The establishment of marine protected areas (MPAs) where fishing is prohibited is the most commonly advocated measure for conserving biodiversity in marine ecosystems. There is clear evidence that 'no-take' MPAs are associated with increased populations and size of target fisheries species within protected areas, and increasing evidence for spill-over of adults and recruits into surrounding unprotected habitats. In some circumstances, the establishment of MPAs has led to broader ecosystem effects: higher abundances of herbivorous fish, higher coral cover and less frequent crown-of-thorns starfish (COTS) outbreaks in 'no-take' reserves. In 2004, the Great Barrier Reef Marine Park (GBRMP) was rezoned and included the objective of protecting 20% of each bioregion in 'no-take' zones, leading to a substantial increase in the area of the Marine Park that was closed to fishing. Beginning in late 2005, AIMS has been monitoring the changes in communities on mid- and outer-shelf reefs that can be attributed to greater protection in 'no-take' zones.

**5. Summary of the Case Study Impact**

While the objective of rezoning the GBRMP was to better protect biodiversity of the GBR, the principal management intervention was to control fishing activity, so the primary effects of rezoning should be evident in differences in the population characteristics of species that are affected by fishing. The most important reef-associated fisheries species in the GBR is coral trout. Over 12 years of surveys in Capricorn-Bunker reefs, the average number of coral trout has varied annually but generally 'no-take' reefs have had more individuals and a greater biomass of coral trout than fished reefs.

Herbivorous fish are considered to have an important ecological function in promoting ecological resilience by inhibiting the growth of macroalgae and so favouring coral recruitment. The surveys in 2015 found variation in the numbers of mobile herbivorous fish on all reefs and results suggests

that protection from fishing has not had a strong effect on populations of mobile herbivorous reef fishes on southern GBR reefs.
Similarly, reef studies in the Caribbean found that coral cover was higher in long-established marine protected areas however this was not the case on offshore reefs of the southern GBR, with trajectories of coral cover being similar on both no-take and fished reefs. There is also no consistent difference in coral recruitment or COTS numbers that can be attributed to zoning.
The project has provided clear evidence that no-take zoning has a positive effect on numbers and size (and hence biomass) of target fish species but little evidence of indirect ecosystem effects of zoning in the southern section of the GBR. There may be several reasons for this, primarily, fishing is already highly regulated in Queensland and fishers in this region target relatively few high-value, top carnivores, with spatial closures unlikely to benefit well-managed sustainable fisheries.
Secondly, a large-scale study of fish communities in MPAs globally concluded that the greatest conservation benefits were evident in marine reserves with five characteristics: (1) no-take zoning, (2) effective enforcement, (3) long-established (>10 years), (4) large, and (5) isolated. Therefore, GBR Marine Park protected areas established in 2004 can only recently be considered "long-established".
Thirdly, the period since the re-zoning in 2004 has experienced a high number of large tropical storms that have caused wide-scale destruction of reef habitats. Acute destruction by cyclones is unaffected by zoning, and has been similar on both 'no-take' and fished reefs. Major disturbances caused by cyclones may have masked other more subtle and long-term indirect effects of zoning on reef ecosystems. These results provide valuable information for decision-makers in responding to acute disturbances, such as cyclone damage, coral bleaching and COTS outbreaks, as well as longer-term strategic decisions on zoning and marine protection.

**6. Details of the Impact**

The project team presented the zoning survey results at the annual GBRMPA pre-summer Reef Health workshop on 30 November 2015. The purpose of the meeting was to consider how the events of the previous summer (2014/15) had conformed to predictions and to anticipate and plan for reef threats in the coming 2015/16 summer (notably COTS and El Niño conditions).
An AIMS "Survey Update" providing preliminary results from the project was circulated by email to end-users and posted on the AIMS website shortly after the fieldwork:
http://www.aims.gov.au/reef-monitoring/capricorn-bunker-sector-of-the-great-barrier-reef-2015
The survey activity has also been made publically available on Youtube via a video showing the fieldwork in the Capricorn- Bunker reefs: https://www.youtube.com/watch?v=wm2ne-SO0PU

**7. Research Underpinning Impact**

The AIMS monitoring team surveyed the effects of marine park zoning on communities of fish and corals in the Capricorn-Bunker group of reefs in October 2015. Four pairs of reefs were surveyed using standard AIMS long-term monitoring methods. The pairs of reefs were chosen to be similar in size, setting, and underwater topography. One reef in each pair is open to fishing while the other has been zoned as a 'no-take' reserve since 2004. The abundance and biomass of the primary target of the reef line fishery, coral trout, were higher on 'no-take' reefs in the Capricorn-Bunker region. However there were no consistent differences between the reefs in each pair in terms of the number of herbivorous fish, which are considered to be important for reef resilience. The Capricorn-Bunker reefs were damaged by storms in 2008 and 2009 but coral cover is recovering rapidly. There were no consistent differences in cover of live hard coral or the abundance of juvenile hard corals between the reefs in each pair. These results concur with previous findings of surveys examining the effects of zoning on GBR reefs since 2006 (Emslie et al. 2015), that is, protection from fishing has a clear effect on target fish species but few indirect effects on other components of the reef community.

**8. Research Outputs from Research Underpinning Impact**


- Emslie MJ, et al. (2015) Expectations and outcomes of reserve network performance following re-zoning of the Great Barrier Reef Marine Park. *Current Biology*, 25(8): 983-92.

- Sweatman H, Cheal A, Emslie M, Johns K, Jonker M, Miller I, and Osborne K (2015) Effects of marine park zoning on coral reefs of the Capricorn-Bunker Group – Report on surveys in October 2015. Report to the National Environmental Science Program, Reef and Rainforest Research Centre Limited, Cairns (15pp).
- Posted a "Survey Update" with preliminary results on the AIMS website and circulated by email to end-users shortly after the surveys: http://www.aims.gov.au/reef-monitoring/capricorn-bunker-sector-of-the-great-barrier-reef-2015
- Release of video on Youtube showing the surveys of the Capricorn - Bunker Reefs (8 December 2015): https://www.youtube.com/watch?v=wm2ne-SO0PU

**9. Additional Information**

**a) Validation of the Impact**

- Sweatman H, Cheal A, Emslie M, Johns K, Jonker M, Miller I, and Osborne K (2015) Effects of marine park zoning on coral reefs of the Capricorn-Bunker Group – Report on surveys in October 2015. Report to the National Environmental Science Program, Reef and Rainforest Research Centre Limited, Cairns (15pp).
- Completed NESP-funded dataset submitted to eAtlas, along with corresponding metadata, as per NESP Data Management Guidelines.
- Release of video on Youtube showing the surveys of the Capricorn- Bunker Reefs (8 December 2015): https://www.youtube.com/watch?v=wm2ne-SO0PU

**b) People (researchers, institutions)**

**i. Staff**

- Hugh Sweatman, Alistair Cheal, Mike Emslie, Kerryn Johns, Michelle Jonker, Ian Miller, Kate Osborne – Australian Institute of Marine Science

**ii. Others (end-users and beneficiaries consulted)**

- Fergus Molloy – GBRMPA

**c) Research and Investment Income**

- Grant was awarded to the Australian Institute of Marine Science
- Monitoring the effects of zoning on coral reefs and their associated fish communities in the GBR Marine Park
- Funded under the National Environmental Science Programme, Tropical Water Quality Hub
- Grant period: 1 July – 31 Dec 2015
- Total value of the grant: $100,000 (NESP) $225,450 (In-kind)

***Upcoming highlights over the next 6 months***

Key research highlights or activities expected under the TWQ Hub over the next six months include:

1. Submission of remaining Research Plan v1 project outputs, including final technical reports and other communication products to disseminate findings to end users (due end March – mid-April 2016).
2. Announcement of Research Plan v2 successful projects by The Honourable Greg Hunt, Minister for the Environment (March 2016).
3. Project 3.1 media release to announce the launch of seagrass spatial data in eAtlas (all seagrass mapping along Queensland coast) (March 2016).
4. Final technical report from Project 3.9 will identify opportunities and desire for Indigenous engagement with NESP TWQ Hub projects (30 March 2016).
5. Development of Research Plan v2 project factsheets in collaboration with project leaders (April 2016).
6. Distribution of the 2nd NESP TWQ Hub quarterly e-Newsletter (April 2016).

## Section 4. Progress against the Research Plan (incl. whether milestones and timeframes are being met) and risks to delivery

**Does the hub confirm that hub project progress and performance is in accordance with the approved Research Plan, including timing and milestones?** No

**Project Milestones:**
Within the reporting period, 1 January – 31 December 2015, nine projects requested extensions to their completion dates. These were approved by the Hub Leader as detailed below.

| Project | Project Leader | Request | Reason for Extension |
|---|---|---|---|
| Project 1.1 | Westcott (CSIRO) | Request for extension to completion date from 31 December 2015 to 30 January 2016. | Extension to finalise and submit the final technical report reviewed by all stakeholders. APPROVED 15 December 2015. |
| Project 1.9 | Schaffelke (AIMS) | Request for extension to completion date from 31 December 2015 to 30 January 2016. | The final draft technical report (also submitted with milestone) is currently under review by Kirstin Dobbs (GBRMPA) and Kevin Kane (Ports sector) who were selected as end-user affiliates. APPROVED 18 December 2015. |
| Project 1.10 | Kroon (AIMS) | Request for extension to completion date from 31 December 2015 to 15 March 2016. | Enable the inclusion of datasets on: (i) marine debris (from Tangaroa Blue Foundation), and (ii) metals and antifoul (from various Qld ports) that are currently under negotiation. The project leader negotiated the use of these datasets with the various partners, taking longer than anticipated. The inclusion of these datasets in the qualitative risk assessments, however, will significantly enhance the final outcomes of the project. APPROVED 16 November 2015. |
| Project 3.1 | Coles (JCU) | Request for extension to completion date from 31 December 2015 to 15 February 2016. | The project was delayed in data checking for the GIS layers due to unexpected sick leave by the project leader who broke his leg in the first week of August and missed nearly a month of work at a crucial time. APPROVED 17 November 2015. |
| Project 3.3 | Collier (JCU) | Request for extension to completion date from 31 December 2015 to 15 March 2016. | The project team requested a small roadshow to highlight outcomes of Project 3.3 on seagrass light thresholds to key stakeholders in Townsville (GBRMPA) and Brisbane (EHP) in February 2016. APPROVED 19 November 2015 |
| Project 3.9 | George/ Hill (NAILSMA/ CSIRO) | Request for extension to completion date from 15 December 2015 to 30 March 2016. | Late signing of contract by CSIRO. APPROVED 5 October 2015. |
| Project 3.10 | Rolfe (CQU) | Request for extension to completion date from 31 December 2015 to 15 March 2016. | The project is waiting on Paddock-to-Reef data (due Jan 2016) to complete the final technical report. APPROVED 15 January 2016. |
| Project | Dale (JCU) | Request for an extension to | To enable the project to contribute to the |

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| 3.11 | | completion date from 31 December 2015 to 15 March 2016. | State's Water Quality Taskforce. APPROVED 5 November 2015. |
| Project 3.13 | Lawrey (AIMS) | Request for an extension to completion date from 31 December 2015 to 31 March 2016. | Most NERP TE datasets have been published, but there are still some outstanding to be completed. Additionally the reef mapping has taken longer than expected, in particular, setting it up to ensure it can be done collaboratively with TSRA. APPROVED 18 December 2015. |

**Project Progress**

Three projects had not met all project milestones (completion date or change in scope) as at 31 December 2015 for valid reasons.

Administration activity and project status has been assessed against the following indicators:

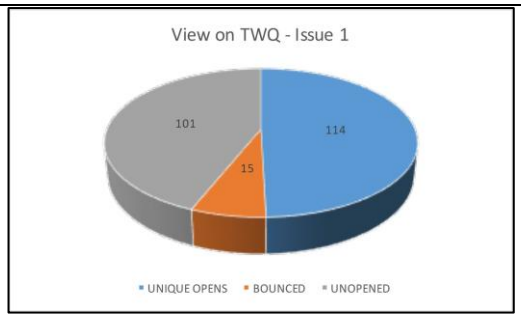
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| | Project is on track or only requires minor refinement; there are no significant difficulties and/or risks emerging. |
| | There are real or potential difficulties and risks that should be brought to the attention of the Department and other stakeholders even if the project is being well managed. |
| | There are significant difficulties or risks emerging that may compromise the project. Immediate remediation is required. |
| | Task has been completed. |

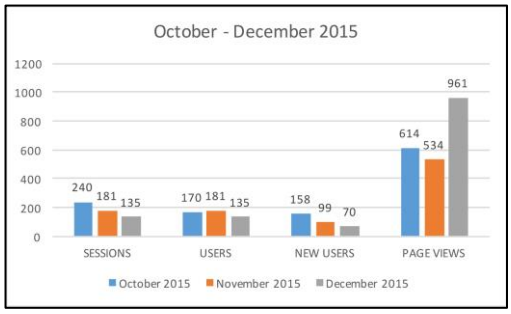
| | Project | Delay or Deviation | Hub Response |
|---|---|---|---|
| | 1.3 A validation of coral geochemical records to reconstruct suspended sediment loads to the Great Barrier Reef lagoon (Lewis, JCU) | The project leader needs to resolve the issue with establishing a reliable coral chronology. A methodology that provides the 'current-best' possible chronology (without additional information) has been established. The preliminary results appear to point toward a more complicated (than anticipated) story in the interpretation of these coral geochemical proxies for river runoff. | Extension granted to 1 March 2016. |
| | 1.8 Sub-catchment scale monitoring, modelling and extension design to support reef water quality improvement (Davis, JCU) | The practical roll-out of one of the pilot sub-catchment monitoring projects in the lower Burdekin had to be abandoned. A number of programs with similar aims (small, sub-catchment scale water quality monitoring, including real-time water quality monitoring capacity) have, however, | The Hub accepted the change in scope as it will allow for much needed information on field testing/calibration of nitrate monitoring equipment with nitrate spiked water samples of varying turbidity to assess the scale of this issue with current equipment (and identify potential equipment |

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| | | recently been implemented in the lower Burdekin region which can provide equivalent proof-of-concept. | calibration options to rectify the issue). Given the often comparatively high turbidity of many Australian floodwaters, it is an issue of broader scientific relevance to RTWQM at a national scale. |
| | 3.10 Benchmarking costs of NRM improvements for the GBR (Rolfe, CQU) | The project has requested access to Paddock-to-Reef data. An interim project report has been drafted but will be enhanced with addition of analysis of the Paddock-to-Reef data. | The desktop review has collated cost-effectiveness data on improving agricultural water management from a variety of sources. Extension granted to 15 March 2016. |

## Knowledge Brokering and Communication

| | Short term (Year 1) activities | Outcomes |
|---|---|---|
| | Develop project information sheets/Infographics for topical or significant project findings, as required | • The *Guide to the NESP Tropical Water Quality Hub* brochure was developed for the Hub launch in September 2015.<br>• A project factsheet was developed for Project 3.9 on request and uploaded to the website in December.<br>• Factsheets for Research Plan v1 project outcomes will be developed in the first quarter of 2016 as required. |
| | Build on previous networks (under NERP) to develop program contacts database and check with end users and researchers | Comprehensive contacts database with 376 contacts (as of 31 December 2015) was developed for the TWQ Hub based on researchers, end-users, other stakeholders and subscribers. Expansion of the database is an ongoing activity. |
| | Facilitate targeted workshops, meetings and networking events for specific year 1 projects with identified engagement milestones or deliverables | Research Plan v1 short-term projects within the Hub held workshops with stakeholders and end-users:<br>• Project 1.1: Workshop 1-2 September 2015 TVL<br>• Project 1.6: Workshop 14 July 2015 TVL<br>• Project 1.9: Workshop 21 August 2015 TVL<br>• Project 1.10: Workshop 3 September 2015 TVL<br>• Project 3.6: Workshop 20-21 August 2015 CNS<br>• Project 3.12: Workshop 5 August 2015 TVL |
| | Workshops and meetings with TO groups to understand aspirations for engagement with NESP projects | • Individual discussions by the Hub Administrator have been held with some Traditional Owners of GBR sea country within the region to link these groups with projects of interest (e.g. Project 3.6, Project 1.1, Project 1.10).<br>• Project 3.9 (George/Hill) is engaging with 41 TO groups of the GBR in early 2016 to understand aspirations for involvement in NESP TWQ Hub project activities. The project will deliver its final report on 30 March 2016. |
| | Circulate media release announcing the 'launch' of the NESP TWQ Hub and year 1 projects | Coverage of TWQ Hub Launch at Deeral, FNQ on September 22 2015 by:<br>• *Cairns Post front-page story on TWQ Hub launch, 22 September 2015 "$32M Hub To Fix Reef": http://tinyurl.com/guzxhqa*<br>• *Seven News Cairns*<br>• *Win News Cairns* |

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| | | • *ABC Far North Queensland*<br>• *Black Star Radio* |
| | Launch NESP Tropical Water Quality Hub website | The NESP TWQ Hub website was launched on the 22 September 2015 to coincide with the Hub launch by The Honourable Minister Greg Hunt. |
| | Develop an Indigenous Engagement and Participation Strategy | The IEPS is available online: http://nesptropical.edu.au/wp-content/uploads/2015/09/NESP-TWQ-Hub-Indigenous-Engagment-Strategy-FINAL-COMPLETE.pdf |
| | Biannual Steering Committee meetings or more frequently as required to communicate findings and discuss strategic direction of Hub | Four NESP TWQ Hub Steering Committee Meetings were held during the reporting period:<br>• Meeting #1 – 2 April 2015<br>• Meeting #2 – 27 April 2015<br>• Meeting #3 – 28 May 2015<br>• Meeting #4 – 13 August 2015 |
| | Prepare project or topic specific policy briefings as Year 1 project results are available. | Project and topic specific policy briefings of interest will be prepared and made available in 2016 after the delivery of all final Research Plan v1 project outputs. |
| | Collaboratively develop research priorities and Research Plan | Research priorities for the TWQ Hub were collaboratively developed with regional stakeholders, State and Federal Government, GBRMPA, and TSRA, and addressed the Reef 2050 Long Term Sustainability Plan targets. |
| | Provide Hub stakeholders with legacy datasets from MTSRF, NERP TE Hub and accessible secondary sources. | All legacy datasets from NERP TE Hub and MTSRF are openly accessible on the eAtlas. |
| | Prepare and distribute quarterly e-newsletters in consultation with DoE; establish and maintain social media presence (e.g. Twitter, Facebook) | The first quarterly e-newsletter was distributed on 22 December 2015 to 230 unique subscribers.<br><br>NESP TWQ Hub on Facebook, Twitter and RSS feeds became live in September 2015. These are regularly updated. |
| | NESP TWQ e-newsletter - *View on TWQ* | <br>**Issue 1:**<br><br>• Sent to 230 unique subscribers.<br>• Opened by 114 unique subscribers a total of 379 times.<br>• 15 subscribers email addresses bounced.<br>• 30 (26.32%) unique subscribers who opened the e-newseltter clicked a link that took them to the www.nesptroical.edu.au website.<br><br>*NB: These figures measure the number of times recipients open the email. They do not account for those that access the content* |

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| | | *of the unopened email in the reading pane.* |
| | NESP TWQ Hub Website nesptropical.edu.au | <br>**For the 3 month period, October-December 2015 there were:**<br>• 556 visits to the website by 344 users<br>• Of the 344 users, 327 were unique users<br>• A total of 2,109 page views were made with an average of 3.79 pages viewed per visit |
| | The Chirp submissions | A total of **12** Chirp articles related to NESP TWQ Hub projects in the reporting period were submitted:<br>• Indigenous-specific framework for the co-management of sea country (Project 3.9)<br>• Testing the effectiveness of managing gully erosion (Project 1.7)<br>• Developing a research investment framework to tackle COTS (Project 1.1)<br>• A guide to maintaining healthy seagrass (Project 3.3)<br>• Developing a port dredging research framework (Project 1.9)<br>• Developing an approach to evaluate the effectiveness of investments in riparian management in the GBR catchments (Project 1.2)<br>• Focus on emerging contaminants into the GBR lagoon (Project 1.10)<br>• NESP Tropical Water Quality Hub – Launched by Minister Hunt<br>• Coordinating governance structures for long-term health of GBR (Project 3.11)<br>• Current status and improved approaches for GBR pressures under review (Project 1.6)<br>• Contributing to a reef-wide integrated monitoring program (Project 3.8)<br>• A novel technique for quantifying sediment load into the GBR (Project 1.3) |
| | NESP TWQ Hub media (Jan – Dec 2015) | • Media release for Project 3.6 distributed to local, state and national media outlets:<br>  ○ *Jellyfish workshop brings together scientists, stakeholders* http://tinyurl.com/jr32h4d<br>• Project 1.7 media:<br>  ○ https://app.secure.griffith.edu.au/news/2015/11/23/tackling-giant-alluvial-gullies-key-to-saving-the-great-barrier-reef/ |

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| | | ○ http://www.abc.net.au/news/2015-11-23/unsoiling-the-great-barrier-reef/6963598<br>○ http://mpegmedia.abc.net.au/news/lateline/video/201511/LATb_ReefSoil_2311_512k.mp4 |
| | NESP TWQ Hub Technical Reports uploaded as they are released | Final Technical Reports were not available in 2015 to upload as the completion date for projects was 31 December 2015. All TWQ Hub Research Plan v1 projects are expected to deliver a final technical report and other communication outputs in the first quarter of 2016. These will be uploaded to the website in a timely manner. |

**Has a mechanism been established to ensure ongoing discoverability and accessibility of NESP research outputs?** Yes

**Please describe the arrangements in place for your Hub:**

Website: The NESP TWQ Hub website www.nesptropical.edu.au was launched on 22 September 2015. Project pages have been developed for each Research Plan v1 and Research Plan v2 project outlining the project scope; project keywords; funding partners; and publications/outputs when approved for upload, will be available from the project pages. Ongoing development of the Hub website will occur throughout the life of the program. Note: Research Plan v2 project pages will be accessible once permission is given by the Department of the Environment.

Online Database: The eAtlas www.eatlas.org.au is the data repository for the NESP TWQ Hub project datasets. The eAtlas is an ongoing project funded by the NESP TWQ Hub. Both the NESP TWQ Hub website and eAtlas website link to each other and to project outputs.

Social Media: NESP TWQ Hub on Facebook, Twitter and RSS feeds are now live.

E-Newsletter: *"View on TWQ"* highlights final technical reports and other project outputs. The first quarterly e-newsletter was sent 22 December 2015 to a contact database of 230 addresses.

Communication with identified end-users: Once project outputs are uploaded to the NESP TWQ Hub website (after the five-day Department notification process), an email is sent to identified project end-users notifying them of the project output and its availability on the website.

The Chirp: A 150-word article is submitted weekly to the Department of the Environment "The Chirp" e-newsletter focusing on one of the TWQ Hub projects activities or outputs.

**Please identify any known risks to future delivery against the agreed Research Plan (not previously advised by the Department), or where previously identified risks have been realised, or moved to a higher risk rating.**

There are no known risks to future delivery against the agreed Research Plan v1 in the following reporting period.

## Section 5. Key Performance Indicators

| Key Performance Indicator | Hub Result for 12-month Period | Reference for further explanation (if any) |
|---|---|---|
| 1. Total number of stakeholder workshops/formal meetings:<br>Sub-measures:<br>• Number of those interactions that include with Environment Department or Portfolio staff;<br>• Number of those interactions that include senior executives, the Commonwealth Minister for the Environment or ministerial advisers | Total: **46** workshops/ formal meetings | Projects: 1.1; 1.6; 1.9; 1.10; 2.2; 3.3; 3.4; 3.5; 3.6; 3.7; 3.8; 3.9; 3.10; 3.11; 3.12; 3.13<br>Sub-measures:<br>DOE – Projects 1.1; 2.2; 3.8; 3.10; 3.12; 3.13<br>Parks Australia – Project 3.8<br>GBRMPA – Projects 1.1; 1.6; 3.3; 3.4; 3.6; 3.7; 3.8; 3.9; 3.13<br>TSRA – Projects 3.2; 3.5<br>Senior Policy Advisor to Minister Hunt – Project 3.11 |
| 2. Total number of stakeholder workshops/formal meetings with State and local Government<br>Sub-measure:<br>• Number of those interactions that include state/local government senior executives, a State Minister or local mayor or councillor or their advisers | Total: **34** workshops/ formal meetings | Projects: 1.3; 1.6; 1.7; 1.8; 1.9; 1.10; 2.1; 2.2; 3.5; 3.6; 3.8; 3.10; 3.11; 3.12<br>Sub-measures:<br>QLD Chief Scientist – Project 1.3<br>LGAQ – Project 3.11<br>DSITI – Projects 1.6; 1.8<br>Office of the GBR – Projects 1.7; 2.2; 3.11; 3.12<br>DEHP – Projects 1.8; 3.8; 3.11<br>Director General DEHP – Project 3.11<br>QPWS – Project 2.1<br>DNRM – Project 3.11<br>Mura Badulgal RNTBC – Project 3.2<br>Malu Ki'ai RNTBC – Project 3.5 |
| 3. Number of stakeholder workshops/formal meetings with parties external to Government | Total: **51** workshops/formal meetings | Projects: 1.1; 1.2; 1.3; 1.5; 1.7; 1.9; 1.10; 2.1; 2.2; 3.2; 3.3; 3.4; 3.8; 3.9; 3.10; 3.11; 3.12; 3.13 |
| 4. Number of workshops/formal meetings with other NESP hubs to further hub objectives | Total: **2** workshops/ formal meetings | Projects: 3.9 (2 meetings) |

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| 5. Number of cross-disciplinary meetings held between Hub consortium members to further Hub objectives | Total: **5** cross-disciplinary meetings | Projects: 1.6; 1.9; 1.10; 2.1; 3.9 |
| 6. Number of research outputs provided to end users on time and as identified in the Research Plan | Total: **15** research outputs | Projects: 1.1 (draft report for comment); 1.5 (final report); 1.8 (draft report for comment); 1.9 (final dredging research priorities); 3.2 (draft report for comment, community poster, weekly update of animal movements via e-maps); 3.5 (field report); 3.7 (field survey results); 3.8 (final report, monitoring program inventory to RIMREP); 3.9 (project factsheet, working group papers); 3.12 (draft report for comment); 3.13 (publication of NERP TE Hub datasets) |
| 7. Proportion of research outputs provided to end users on time and as identified in the Research Plan | **100%** of projects that were completed in 2015 delivered research outputs to end users. | Projects 1.5; 3.7; 3.8 |
| 8. Number of instances of where the hub has used NESP-generated information from another NESP hub. | Total: **1** use of NESP generated information from another NESP Hub. | Project 3.12 – Project report and approach informed by work summarised in global review of offsets as part of NESP Threatened Species Recovery Hub Project 5.1: Better Offsets for Threatened Species |
| 9. Number of peer reviewed NESP-funded publications during the reporting period | Total: **11** peer reviewed NESP-funded publications (**5** were NESP/NERP funded) | 1 book chapter; 1 factsheet; 4 journal articles; 2 final reports; 2 media releases; 1 news story |
| 10. Number of researchers, including PhD and Post-Doc positions engaged as a result of NESP (total, Full-time equivalent) during the reporting period | Total: **140** researchers<br>FTE: **25.925** | |
| 11. Percentage of NESP research outputs (including publications, data and metadata) that are discoverable and accessible in accordance | 100% of NESP research outputs discoverable and accessible on the NESP TWQ Hub website and eAtlas. | |

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| with NESP data accessibility requirements and the funding agreement. | | |
| 12. Co-benefits arising from Indigenous engagement and participation - with reference to *Appendix E of the NESP Monitoring and Evaluation Plan*, please report against all relevant indicators to quantify:<br>1. The extent to which Indigenous engagement has contributed positively to NESP research activity;<br>2. The extent to which NESP supported Indigenous communities to work on, and care for, Country;<br>3. The extent to which Indigenous people have derived professional development and knowledge sharing from engagement and participation in NESP;<br>4. The extent to which NESP has delivered outcomes that supports Indigenous land and sea managers/owners to care for Country;<br>5. The extent to which hub Knowledge and Communication Broker Strategies effectively address Indigenous knowledge sharing and communication needs; and<br>6. The extent to which understanding of Australia's environment has been improved through a collaborative approach that delivers accessible results and informs decisions; | **10** Projects had Indigenous Engagement at various levels.<br>*The extent to which Indigenous engagement has contributed positively to NESP research activity:*<br>• Partnerships were established with TSRA Land and Sea Management Unit for 2 projects.<br>• Three projects indicated traditional knowledge contributed or enhanced scientific knowledge of environmental issues and two projects indicated traditional knowledge contributed to development of environmental solutions.<br>*The extent to which NESP supported Indigenous communities to work on, and care for, Country:*<br>• Eight Indigenous rangers participated in the Project 3.6 workshop to discuss future investment in box-jellyfish research.<br>• Nine TSRA LSMU rangers assisted part-time in Projects 3.2 and 3.5. Two Indigenous researchers are employed (1x 0.1 & 1 x 0.6 FTE) in the Project 3.9 team.<br>*The extent to which Indigenous people have derived professional development and knowledge sharing from engagement and participation in NESP:*<br>• Two Indigenous researchers are employed (1x 0.1 & 1 x 0.6 FTE) in the Project 3.9 team.<br>• 15 Indigenous people have been trained in the use of environmental management tools and techniques.<br>*The extent to which NESP has* | Project 1.9 (Schaffelke) - Traditional owners responded to a stakeholder survey conducted as part of the preparations for the end-user consultation workshop to develop research priorities for future NESP TWQ dredging research.<br>Project 1.10 (Kroon) - Representative identified in collaboration with RRRC, and subsequently (and repeatedly) invited to project workshop, but no response.<br>Project 2.1(Jones) - 1 x Communications product. 1 day spent with Indigenous community. Continuing contact with Bob Muir and Leon Jackson (GBRMPA) to schedule a meeting with Woppaburra TUMRA committee in February – March 2016.<br>Project 2.2 (Smart) - Communication materials for stakeholders still under development. Opportunities for incorporation of traditional knowledge and findings from the project to contribute to ILC focus areas will be explored as the project proceeds.<br>Project 3.2 (Marsh) - High level of Indigenous engagement at multi-levels of the project. Project has employed Indigenous people and undertaken targeted communications activities.<br>Project 3.5 (Rasheed) - High level of Indigenous engagement at multi-levels of the project. Project has employed Indigenous people and undertaken thorough communications activities.<br>Project 3.6 (Kingsford) - Engagement was through the workshop and more engagement is planned before the end of the project. The groups engaged in the workshop represented 'country' from the Lockhart River |

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| 7. The extent to which hubs and Indigenous communities have developed partnerships to undertake NESP research. | *delivered outcomes that supports Indigenous land and sea managers/owners to care for Country:*<br>• Project 1.7 is contributing outcomes to support the Indigenous (ILC) owners of Crocodile-Welcome Station (124,800ha).<br>• Project 2.1 is working with the Woppaburra TOs.<br>• Project 3.9 is working with Traditional Owners of sea country along the GBR (>79,842 ha).<br>*The extent to which Hub Knowledge and Communication Broker Strategies effectively address Indigenous knowledge sharing and communication needs:*<br>• Four projects produced posters/flyers to inform communities of the research project over 3 community meetings and communicated the research to all participants involved in fieldwork.<br>• Information was also passed onto students at TAGAI College (Badu and Boigu campus) by two projects.<br>• Four Hub researchers completed cultural awareness training in the reporting period.<br>*The extent to which understanding of Australia's environment has been improved through a collaborative approach that delivers accessible results and informs decisions:*<br>• The Torres Strait is 100% Indigenous owned land.<br>• Crocodile-Welcome Station is an ILC-operated pastoral business based on cattle breeding and hosting an ILC training to employment program for young Indigenous | to Townsville. Other groups were invited to the workshop but could not attend. All members of the project team attended the workshop and engaged with the indigenous groups as follows – Balkanu, Yirrganydji, Yuku Baja Muliku Rangers, Djunbunji Ltd Land & Sea Program; Indigenous officers from JCU.<br>Project 3.7 (Sweatman) - One member of the project team has participated in cultural awareness training.<br>Project 3.9 (George/Hill) - Substantial level of Indigenous engagement at multi-levels of the project. Project has employed Indigenous people and undertaken thorough communications activities. Project has produced 1 jointly authored paper and 1 jointly authored draft discussion paper. Project team has made substantial contributions to the development of the project Ethics procedures and discussion paper.<br>Project 3.11(Dale) - Engagement associated with this project will be linked to the engagement being carried out in Project 3.9. This will include a major workshop of GBR land and sea managers in February 2016. |

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| | people.<br>*The extent to which Hubs and Indigenous communities have developed partnerships to undertake NESP research:*<br>• One Indigenous Engagement and Participations Strategy has been developed.<br>• Two Indigenous representative in Hub governance (Melissa George on the Hub Steering Committee and Dr Felicia Watkin-Lui on the Hub Scientific Advisory Committee)<br>• One Knowledge Brokering and Communication Strategy addresses Indigenous issues.<br>• The proportion of NESP TWQ Hub projects with Indigenous engagement and participation is 40%. | |

## Section 6. Key changes (if any) to Research plan to better meet the needs of end-users and respond to emerging needs

<table>
<tr><th>Project</th><th>Project Leader</th><th>Updates to Research Plan V1</th><th>Reason for Update</th></tr>
<tr><td>1.1-3.13</td><td>Attachment A</td><td>Departmental stakeholders, end-users and team members for all projects updated in Research Plan v1 where required/available.</td><td>Identified stakeholders/end-users sent through by the DOE. All project leaders contacted and asked to provide missing end-users and email addresses.</td></tr>
<tr><td>1.1</td><td>Westcott</td><td>Amendments to expenditure summary splits between salaries and operating – NESP cash and Applicant in-kind
<table>
<tr><th></th><th colspan="6">Project Costs</th></tr>
<tr><th></th><th>NESP</th><th colspan="3">Applicants</th><th colspan="2">Other stakeholders</th><th>TOTAL</th></tr>
<tr><th></th><th>cash</th><th>cash</th><th>In-kind</th><th>cash</th><th>In-kind</th><th></th></tr>
<tr><td>Salaries</td><td>83,278</td><td>-</td><td>69,603</td><td>-</td><td>31,131</td><td>$186,081</td></tr>
<tr><td>Operating (incl. equipment, travel and communication) –include $30K for Workshop</td><td>16,722</td><td>-</td><td>13,976</td><td>-</td><td>5,000</td><td>$33,629</td></tr>
<tr><td>Admin support (in-kind only)</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>TOTAL</td><td>$100,000</td><td>-</td><td>$83,579</td><td>-</td><td>$36,131</td><td>$219,710</td></tr>
</table></td><td>CSIRO amendment on contract signing.</td></tr>
<tr><td>1.1</td><td>Westcott</td><td>Request for extension of completion date from 31 December 2015 to 30 January 2016.</td><td>Extension to allow stakeholder comment before final submission of the final technical report.<br><br>APPROVED 15 December 2015</td></tr>
<tr><td>1.2</td><td>Bartley</td><td>Amendments to expenditure summary splits between salaries and operating – NESP cash and Applicant in-kind. Other stakeholder in-kind amended (now $17,500 DSITI and $17,500 UQ).
<table>
<tr><th></th><th colspan="6">Project Costs</th></tr>
<tr><th></th><th>NESP</th><th colspan="3">Applicants</th><th colspan="2">Other stakeholders</th><th>TOTAL</th></tr>
<tr><th></th><th>cash</th><th>cash</th><th>In-kind</th><th>cash</th><th>In-kind</th><th></th></tr>
<tr><td>Salaries</td><td>65,364</td><td>-</td><td>32,673</td><td>-</td><td>35,000</td><td>$133,037</td></tr>
<tr><td>Operating (incl. equipment, travel and communication)</td><td>34,608</td><td>-</td><td>17,299</td><td>-</td><td>-</td><td>$51,907</td></tr>
</table></td><td>CSIRO amendment on contract signing.</td></tr>
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<tr><td></td><td></td><td>
<table>
<tr><td>Admin support (in-kind only)</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>TOTAL</td><td>$99,972</td><td>-</td><td>$49,972</td><td>-</td><td>$35,000</td><td>$184,944</td></tr>
</table>
</td><td></td></tr>
<tr><td>1.3</td><td>Lewis</td><td>Project end date changed from 1 February 2016 to 31 January 2016.</td><td>JCU amendment on contract signing.</td></tr>
<tr><td>1.5</td><td>Greiner</td><td>Amendments to expenditure summary. Reduced in-kind support from JCU $39,795 to $0. Other in-kind support is CQU $2,984; NQ Dry Tropics $18,970; Peregrine Economics $17,841.
<table>
<tr><td></td><td colspan="6">Project Costs</td></tr>
<tr><td></td><td>NESP</td><td colspan="2">Applicants</td><td colspan="2">Other stakeholders</td><td>TOTAL</td></tr>
<tr><td></td><td>cash</td><td>cash</td><td>In-kind</td><td>cash</td><td>In-kind</td><td></td></tr>
<tr><td>Salaries</td><td>37,595</td><td>-</td><td>-</td><td>-</td><td>34,835</td><td>$72,430</td></tr>
<tr><td>Operating (incl. equipment, travel and communication)</td><td>2,200</td><td>-</td><td>-</td><td>-</td><td>4,960</td><td>$7,160</td></tr>
<tr><td>Admin support (in-kind only)</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>TOTAL</td><td>$39,795</td><td>-</td><td>-</td><td>-</td><td>$39,795</td><td>$79,590</td></tr>
</table>
</td><td>JCU amendment on contract signing.</td></tr>
<tr><td>1.6</td><td>Uthicke</td><td>Amanda Brigdale replaced Hayley Gorsuch (GBRMPA Cumulative Impacts).</td><td>Hayley Gorsuch left GBRMPA.</td></tr>
<tr><td>1.9</td><td>Schaffelke</td><td>Total of Applicants in-kind amended to reflect correct total. Now $16,634 not $18,094.</td><td>Accounting error.</td></tr>
<tr><td>1.9</td><td>Schaffelke</td><td>Request for extension from 31 December 2015 to 30 January 2016.</td><td>The final draft technical report (also submitted with milestone) is currently with Kirstin Dobbs (GBRMPA) and Kevin Kane (Ports sector) who were selected as our end-user affiliates.<br><br>APPROVED 18 December 2015</td></tr>
<tr><td>1.10</td><td>Kroon</td><td>Request for extension from 31 December 2015 to 15 March 2016.</td><td>To enable the inclusion of datasets on (i) marine debris (from Tangaroa Blue Foundation), and (ii) metals and antifoul (from various Qld ports). We are at various stages of negotiating the use of these datasets with the various partners, but it has taken longer than anticipated. The inclusion of these datasets in the qualitative risk assessments, however, will significantly enhance the final outcomes of our</td></tr>
</table>

| | | | |
|---|---|---|---|
| | | | project. Hence my request for a 3-month extension for the project.<br><br>APPROVED 16 November 2015 |
| 2.2 | Smart | Request for extension to project completion from 29 February to 15 March 2016. | The project commencement was delayed by two months whilst contractual negotiations were concluded between NESP TWQ and Griffith University. The project team requested that RRRC extend the project completion date from 29 February 2016 to 31 March 2016.<br><br>APPROVED 13 January 2016 |
| 3.1 | Coles | Request for extension to project completion date from 31 December 2015 to 15 February 2016. | The project team requested an extension to mid-February 2016. The project has assembled all data sets and has written and received all the permissions expected. The project is behind on the data checking for the GIS layers, mainly due to unexpected sick leave by the project leader who broke his leg in the first week of August and missed nearly a month of work at a crucial time.<br><br>APPROVED 17 November 2015 |
| 3.3 | Collier | Request for extension to project completion date from 31 Dec 2015 to 15 March 2016. | Project would like to do a small roadshow in early 2016 to highlight outcomes of project 3.3 on seagrass light thresholds to key stakeholders in Townsville and Brisbane.<br>February is going to be the best time, as both December and January can be |

<table>
<tr><td></td><td></td><td></td><td>difficult times for availability, plus the information may get lost in the end of year rush.<br><br>APPROVED 19 November 2015</td></tr>
<tr><td>3.4</td><td>Collier</td><td>Request for extension to project completion date from 31 January 2016 to 20 February 2016.</td><td>Request for extension to allow time for Katherine Martin, GBRMPA, who has fallen ill and unable to review final report. Extension granted until 20 February 2016 to allow GBRMPA time to review the final report.<br><br>APPROVED 27 January 2016</td></tr>
<tr><td>3.5</td><td>Rasheed</td><td>Replace project team member Stan Lui (TSRA) with Tristan Simpson (TSRA)</td><td>Tristan Simpson is Acting Sea Project Manager while Stan Lui is on 12 months leave.</td></tr>
<tr><td>3.6</td><td>Kingsford</td><td>Dr Lyndon Llewellyn FTE changed from 0.1 to 0.025</td><td>AIMS amendment on contract signing</td></tr>
<tr><td>3.8</td><td>Addison</td><td>This project is not collecting its own new data but is instead locating existing datasets relevant to the project objectives. Milestone wording amended to reflect data ownership in final report - “The project will discuss existing datasets and, if relevant, the possible submission of this material to eAtlas”.</td><td>The project leader does not own these data sets so will not be able to submit these to eAtlas.</td></tr>
<tr><td>3.8</td><td>Addison</td><td>Amendments to expenditure summary – Applicants in-kind now $100,000 (salaries) reduced from $110,000; Other stakeholders in-kind now $10,000 (operating) instead of $0.
<table>
<tr><td></td><td colspan="6">Project Costs</td></tr>
<tr><td></td><td>NESP</td><td colspan="2">Applicants</td><td colspan="2">Other stakeholders</td><td>TOTAL</td></tr>
<tr><td></td><td>cash</td><td>cash</td><td>In-kind</td><td>cash</td><td>In-kind</td><td></td></tr>
<tr><td>Salaries</td><td>94,000</td><td>-</td><td>100,000</td><td>-</td><td>-</td><td>$194,000</td></tr>
<tr><td>Operating (incl. equipment, travel and communication)</td><td>6,000</td><td>-</td><td>-</td><td>-</td><td>10,000</td><td>$16,000</td></tr>
<tr><td>Admin support (in-kind only)</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>TOTAL</td><td>$100,000</td><td>-</td><td>$100,000</td><td>-</td><td>$10,000</td><td>$210,000</td></tr>
</table></td><td>AIMS amendment on contract signing.</td></tr>
</table>

<table>
<tr><td>3.9</td><td>George/Hill</td><td>Project Milestone table – amend project end date from 15 December 2015 to 30 March 2016.</td><td>Request for extension approved to project completion date due to late signing of contract by CSIRO.<br><br>APPROVED 5 October 2015</td></tr>
<tr><td>3.9</td><td>George/Hill</td><td>Cash contribution of $15,767 reduced to $0. Applicant in-kind co-contribution increased from $84,233 to $100,000.</td><td>CSIRO amendment on contract signing.</td></tr>
<tr><td>3.9</td><td>George/Hill</td><td>Amendments to expenditure summary splits between salaries and operating for NESP cash, applicants cash operating and applicants in-kind.
<table>
<tr><th></th><th colspan="5">Project Costs</th></tr>
<tr><th></th><th>NESP</th><th colspan="2">Applicants</th><th colspan="2">Other stakeholders</th><th>TOTAL</th></tr>
<tr><th></th><th>cash</th><th>cash</th><th>In-kind</th><th>cash</th><th>In-kind</th><th></th></tr>
<tr><td>Salaries</td><td>80,173</td><td>-</td><td>28,060</td><td>-</td><td>20,000 (JCU)<br>45,000 (NAILSMA)</td><td>$173,233</td></tr>
<tr><td>Operating (incl. equipment, travel and communication)</td><td>19,827</td><td>-</td><td>6,940</td><td>-</td><td>-</td><td>$26,767</td></tr>
<tr><td>Admin support (in-kind only)</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>TOTAL</td><td>$100,000</td><td>-</td><td>$35,000</td><td>-</td><td>$65,000</td><td>$200,000</td></tr>
</table></td><td>CSIRO amendment on contract signing.</td></tr>
<tr><td>3.10</td><td>Rolfe</td><td>Extension requested for the final technical report to be delivered in March 2016.<br>The project leader is waiting on Paddock-to-Reef data (due January 2016) to complete the final technical report.</td><td>APPROVED 15 January 2016 for project extension to 15 March 2016.</td></tr>
<tr><td>3.11</td><td>Dale</td><td>Extension granted to project end date from 31 December 2015 to 15 March 2016.</td><td>The request is for the project to contribute to the State’s Water Quality Taskforce.<br><br>APPROVED 5 November 2015</td></tr>
</table>

<table>
<tr>
<td>3.11</td>
<td>Dale</td>
<td>Amendment to expenditure summary to accommodate project completion date extended to 15 March 2016. Original NESP cash salaries $50,000; NESP cash operating $5,537. Now increased salaries and decreased operating.
<table>
<tr><td></td><td colspan="6">Project Costs</td></tr>
<tr><td></td><td>NESP</td><td colspan="2">Applicants</td><td colspan="2">Other stakeholders</td><td>TOTAL</td></tr>
<tr><td></td><td>cash</td><td>cash</td><td>In-kind</td><td>cash</td><td>In-kind</td><td></td></tr>
<tr><td>Salaries</td><td>52,536</td><td>-</td><td>69,037</td><td>-</td><td>13,500</td><td>135,073</td></tr>
<tr><td>Operating (incl. equipment, travel and communication)</td><td>3,001</td><td>-</td><td>2,000</td><td>-</td><td>-</td><td>5,001</td></tr>
<tr><td>Admin support (in-kind only)</td><td>-</td><td>-</td><td>14,749</td><td>-</td><td>-</td><td>14,749</td></tr>
<tr><td>TOTAL</td><td>$55,537</td><td>-</td><td>$85,786</td><td>-</td><td>$13,500</td><td>$154,823</td></tr>
</table>
</td>
<td>APPROVED 5 November 2015</td>
</tr>
<tr>
<td>3.12</td>
<td>Maron</td>
<td>Project team member Melissa Bos is now married – Melissa Walsh. Change to email address: melissa@marineconservationfinance.com</td>
<td></td>
</tr>
<tr>
<td>3.13</td>
<td>Lawrey</td>
<td>Request for an extension from 31 December 2015 to 31 March 2016.</td>
<td>“I have a number of project tasks that will not be completed by the end of the year, despite my hardest efforts to do so. The bulk of the NERP TE datasets have been published, but there are still some outstanding to be completed. Additionally the reef mapping has taken longer than expected, in particular, setting it up to ensure we can do this collaboratively with TSRA. “<br><br>APPROVED 18 December 2015</td>
</tr>
</table>

## C: FINANCIAL INFORMATION

### Section 7. Annual financial information

# REEF AND RAINFOREST RESEARCH CENTRE LTD

# NATIONAL ENVIRONMENTAL SCIENCE PROGRAMME

# TROPICAL WATER QUALITY HUB (NESP TWQ HUB)

# FINANCIAL REPORT

## FOR THE PERIOD 1ST JANUARY 2015 TO 31ST DECEMBER 2015

**Statement of Receipts and Expenditure**

**for the National Environmental Science Programme**
**Tropical Water Quality Hub (NESP TWQ HUB)**

**for the period 1st January 2015 to 31st December 2015**

| | Notes | $ | $ |
|---|---|---|---|
| **Balance at beginning of year** | | | - |
| **Receipts** | | | |
| Funds deposited into NESP TWQ Hub Account | | | |
| NESP Research Contract funds | | 1,782,000 | |
| Hub Administrator fees | | 132,000 | |
| KB & Comms | | 223,500 | |
| NESP Hub Leader | | 62,500 | |
| NESP Steering Committee | | - | |
| NESP Science Advisory | | - | |
| NESP TWQ Res Facilitation | | - | |
| | | | 2,200,000 |
| Estimated Interest earned on deposits | | | 500 |
| **Total Receipts** | | | 2,200,500 |

**Statement of Receipts and Expenditure**

**for the National Environmental Science Programme**
**Tropical Water Quality Hub (NESP TWQ HUB)**

**for the period 1st January 2015 to 31st December 2015**

| | Notes | $ | $ |
|---|---|---|---|
| **Expenditure** | | | |
| NERP Research Funds paid to providers | (i) | | 898,653 |
| Funds paid to RRRC for Hub Administration | (ii) | | 266,307 |
| Funds paid by RRRC for KB & Comms | (iii) | | 274,494 |
| Funds paid by RRRC for Hub Leader | (iv) | | 72,984 |
| Funds paid by RRRC for Steering Committee | (v) | | 13,758 |
| Funds paid by RRRC for Science Advisory | (vi) | | 3,174 |
| Funds paid by RRRC for TWQ Res Facilitation | (vii) | | 2,667 |
| **Total Expenditure** | | | 1,532,037 |
| **Balance at end of year** | | | **668,463** |
| Funds held at year end in NESP TWQ Hub Account | | | |
| NESP Research Projects | | 883,347 | |
| Bank interest | | 500 | |
| | | | 883,847 |
| RRRC Funds to be recovered from next Milestone release (due January 2016) | | | |
| NESP Hub Administrator Funds | | 134,307 | |
| NESP KB & Comms | | 50,994 | |
| NESP Hub Leader | | 10,484 | |
| Steering Committee | | 13,758 | |
| Science Advisory | | 3,174 | |
| TWQ Res Facilitation | | 2,667 | |
| | | | - 215,384 |
| **Net position as at 31st December 2015** | | | **668,463** |

Attached
Notes to Statement of Receipts and Expenditure

**Notes to the Statement of Receipts and Expenditure**

(i) **NESP Project funds distributed to Research Institutions during the period 1st January 2015 to 31st December 2015 included:**

| | $ |
|---|---|
| Theme 1 | 358,350 |
| Theme 2 | 331,680 |
| Theme 3 | 208,623 |
| | 898,653 |

The balance of the NESP TWQ Hub bank account is $972,181.52, which represents the balance of funds due to Research Institutions for Round 1 of $883,347 plus GST of $88,334.70, plus interest of $499.82.

The first payment of NESP Research and Administrator funds of $550,000 plus GST was received on 9th February 2015 (Milestone 1).

The second payment of NESP Research and Adminstrator funds of $550,000 plus GST was received on 24th April 2015 (Milestone 3).

The third payment of NESP Research and Adminstrator funds of $550,000 plus GST was received on 19th June 2015 (Milestone 5).

The fourth payment of NESP Research and Adminstrator funds of $550,000 plus GST was received on 23rd June 2015 (Milestone 7).

The fifth payment of NESP Research and Adminstrator funds of $2,815,000 plus GST was invoiced on 11th December June 2015 (Milestone 9) and received on 8th January 2016 and has not been included in this report.

**Interest received on NESP funds by RRRC:**

| | $ |
|---|---|
| Total interest earned on Westpac TWQ Hub Account* | 499.82 |

*unfortunately due to an internal adminstrative error with Westpac bank, interest was earned for the quarters 1st Jan 15 to 31st Mar 15 and 1st July 15 to 30th Sept 15. This issue has now been rectified by Westpac and these funds will be refunded by RRRC on receipt of an invoice from the Department.

(ii) **Funds paid by RRRC for Hub Administration**:**

| | $ |
|---|---|
| Audit, legal and contractors fees | 75,552 |
| Capital expenses | - |
| Salaries and oncosts | 167,942 |
| Hub development and communications costs | 22,813 |
| | 266,307 |

(iii) **Funds paid by RRRC for NESP KB & Comms:**

| | $ |
|---|---|
| Audit, legal and contractors fees | 108,722 |
| Salaries and oncosts | 122,537 |
| Website development, communications and conference expenses | 43,235 |
| | 274,494 |

**Notes to the Statement of Receipts and Expenditure**

(iv) **Funds paid by RRRC for Hub Leader:**

| | $ |
|---|---|
| Hub leader contracting expenses | 62,500 |
| Hub leader travel expenses | 10,484 |
| | 72,984 |

(v) **Funds paid by RRRC for Steering Committee:**

| | $ |
|---|---|
| Hub Chair contracting expenses | 8,483 |
| Hub Chair travel expenses | 3,884 |
| Steering committee expenses | 1,391 |
| | 13,758 |

(vi) **Funds paid by RRRC for Science Advisory:**

| | $ |
|---|---|
| Travel expenses | 3,022 |
| Other science advisory expenses | 153 |
| | 3,174 |

(vii) **Funds paid by RRRC for TWQ Res Facilitation:**

| | $ |
|---|---|
| Hub Chair contracting expenses | 1,024 |
| Hub Chair travel expenses | 1,643 |
| | 2,667 |

(vi) **Balance of each Research Organisation's account into which Funds have been deposited:**

| | Notes | $ |
|---|---|---|
| AIMS | - | 261,492 |
| CQU | - | 4,743 |
| CSIRO | - | 2,362 |
| GU | | 69,449 |
| JCU | - | 113,713 |
| UQ | | 40,596 |
| | - | 272,265 |

**REEF AND RAINFOREST RESEARCH CENTRE LTD**

**NATIONAL ENVIRONMENTAL SCIENCE PROGRAMME TROPICAL WATER QUALITY HUB (NESP TWQ)**

## MANAGEMENT CERTIFICATE

I hereby certify that all funding received in respect of the National Environmental Science Programme Tropical Water Quality Hub (NESP TWQ Hub) from the Commonwealth of Australia as represented by the Department of Environment has been expended for the purpose of the programme and in accordance with the contract between Reef and Rainforest Research Centre Ltd and the Commonwealth of Australia as represented by the Department of Environment for the funding period from 1 January 2015 to 31 December 2015.

**REEF AND RAINFOREST RESEARCH CENTRE LTD**

S Morris

**Sheriden Morris**

Managing Director

Dated this 9th day of February 2016.

## INDEPENDENT AUDITOR'S REPORT

## TO THE AUSTRALIAN GOVERNMENT DEPARTMENT OF THE ENVIRONMENT

We have audited the accompanying financial report, being a special purpose financial report, of Reef and Rainforest Research Centre Ltd for the delivery of the National Environment Science Program. This report comprises the statement of receipts and expenditure for the year ended 31 December 2015, notes to the statement of receipts and expenditure, and the Management Certificate. The financial report has been prepared by the management of Reef and Rainforest Research Centre Ltd in accordance with the funding agreement standard terms and conditions.

### Managements Responsibility for the Financial Report

Management is responsible for the preparation and fair presentation of the financial report in accordance with the basis of preparation described in the funding agreement terms and conditions, and for such internal control as management determines is necessary to enable the preparation of the financial report that is free from material misstatement, whether due to fraud or error.

### Auditor's Responsibility

Our responsibility is to express an opinion on the Statement of Receipts and Expenditure based on the audit. The audit was conducted in accordance with the Australian Auditing Standards. These auditing standards require compliance with relevant ethical requirements relating to audit engagements and that the audit is planned and performed to obtain reasonable assurance about whether the financial statement is free from material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the financial statement. The procedures selected depend on the auditor's judgement, including the assessment of risks of material misstatement in the financial report, whether due to fraud or error. In making those risk assessments, the auditor considers internal control relevant to the entity's preparation and fair presentation of the financial report in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the entity's internal control. An audit also includes evaluating the application of accounting policies and the reasonableness of accounting estimates made by the management, as well as evaluating the overall presentation of the financial report.

We believe that the audit evidence obtained is sufficient and appropriate to provide a basis for our audit opinion.

### Independence

In conducting our audit, we have complied with the independence requirements of Australian professional ethical pronouncements.



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Serious about Success

**Opinion**

In our opinion, the financial report of Reef and Rainforest Research Centre Ltd is prepared, in all material respects, in accordance with the funding agreement terms and conditions for the National Environment Science Program for the year ended 31 December 2015.

**Emphasis of Matter – Basis of Accounting**

Without modifying my opinion, attention is drawn to the Funding Agreement Standard Terms and Conditions, which describe the basis of accounting. The financial report has been prepared for the purpose of fulfilling management's reporting responsibilities to the Commonwealth of Australia as represented by the Department of Environment. As a result, the financial report may not be suitable for another purpose.

**Moore Stephens**
Chartered Accountants

**John Zabala (FCA)**
Director

Townsville

9 February , 2016

## Income statement for Annual Audit Report

Milestone #10: Reporting Period 1 January 2015 to 31st December 2015

All figures are exclusive of GST

| | | Research Theme 1 | Research Theme 2 | Research Theme 3 | Research Theme 4 | Research Theme 5 | Admin | Comms & Knowledge Brokering | NESP Hub Leader | NESP Steering Committee | NESP Science Advisory | NESP TWQ Res Facilitation | TOTAL (exc GST) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AIMS | NESP | $112,472 | $149,020 | | | | | | | | | | $261,492 |
| | Non-NESP Cash | $0 | $0 | | | | | | | | | | $0 |
| | Non-NESP In-kind | $191,670 | $342,307 | | | | | | | | | | $533,977 |
| | Total | $304,142 | $491,327 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $795,469 |
| CQU | NESP | $14,744 | | | | | | | | | | | $14,744 |
| | Non-NESP Cash | $7,372 | | | | | | | | | | | $7,372 |
| | Non-NESP In-kind | $68,241 | | | | | | | | | | | $68,241 |
| | Total | $90,357 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $90,357 |
| CSIRO | NESP | $99,986 | $50,000 | | | | | | | | | | $149,986 |
| | Non-NESP Cash | $71,235 | $21,443 | | | | | | | | | | $92,678 |
| | Non-NESP In-kind | $41,399 | $43,333 | | | | | | | | | | $84,732 |
| | Total | $212,619 | $114,777 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $327,396 |
| GU | NESP | $50,000 | $49,861 | $0 | | | | | | | | | $99,861 |
| | Non-NESP Cash | $10,000 | $0 | $0 | | | | | | | | | $10,000 |
| | Non-NESP In-kind | $109,228 | $85,836 | $12,012 | | | | | | | | | $207,076 |
| | Total | $169,228 | $135,697 | $12,012 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $316,937 |
| JCU | NESP | $81,148 | $42,500 | $208,623 | | | | | | | | | $332,271 |
| | Non-NESP Cash | $0 | $0 | $0 | | | | | | | | | $0 |
| | Non-NESP In-kind | $79,075 | $151,870 | $554,175 | | | | | | | | | $785,120 |
| | Total | $160,223 | $194,370 | $762,798 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $1,117,391 |
| UQ | NESP | $0 | $40,298 | | | | | | | | | | $40,298 |
| | Non-NESP Cash | $0 | $20,149 | | | | | | | | | | $20,149 |
| | Non-NESP In-kind | $0 | $0 | | | | | | | | | | $0 |
| | Total | $0 | $60,447 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $60,447 |
| RRRC | NESP | | | | | | $132,000 | $211,000 | $75,000 | $0 | $0 | $0 | $418,000 |
| | Non-NESP Cash | | | | | | | | | | | | $0 |
| | Non-NESP In-kind | | | | | | | | | | | | $0 |
| | Total | $0 | $0 | $0 | $0 | $0 | $132,000 | $211,000 | $75,000 | $0 | $0 | $0 | $418,000 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TOTAL NESP Funding | $358,350 | $331,679 | $208,623 | $0 | $0 | $132,000 | $211,000 | $75,000 | $0 | $0 | $0 | $1,316,652 |
| TOTAL Non-NESP Cash | $88,607 | $41,592 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $130,199 |
| TOTAL Non-NESP In-kind* | $489,613 | $623,347 | $566,187 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $1,679,147 |
| **TOTAL** | **$936,569** | **$996,618** | **$774,810** | **$0** | **$0** | **$132,000** | **$211,000** | **$75,000** | **$0** | **$0** | **$0** | **$3,125,997** |

**This income statement has been prepared based on information provided by Research Institutions in their audited annual reports and should be read in conjuction with these reports**

**Expenditure statement for Annual Audit Report**

Milestone #10: Reporting Period 1st January 2015 to 31st December 2015

| | | Research Theme 1 | Research Theme 2 | Research Theme 3 | Research Theme 4 | Research Theme 5 | Admin | Comms & Knowledge Brokering | NESP Hub Leader | NESP Steering Committee | NESP Science Advisory | NESP TWQ Res Facilitation | TOTAL (exc GST) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **AIMS** | NESP | $224,944 | $298,040 | | | | | | | | | | $522,984 |
| | Non-NESP Cash | $0 | $0 | | | | | | | | | | $0 |
| | Non-NESP In-kind | $191,670 | $342,307 | | | | | | | | | | $533,977 |
| | Total | $416,614 | $640,347 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $1,056,961 |
| **CQU** | NESP | $19,487 | | | | | | | | | | | $19,487 |
| | Non-NESP Cash | $7,372 | | | | | | | | | | | $7,372 |
| | Non-NESP In-kind | $68,241 | | | | | | | | | | | $68,241 |
| | Total | $95,100 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $95,100 |
| **CSIRO** | NESP | $91,083 | $61,265 | | | | | | | | | | $152,348 |
| | Non-NESP Cash | $71,235 | $21,443 | | | | | | | | | | $92,678 |
| | Non-NESP In-kind | $41,399 | $43,333 | | | | | | | | | | $84,732 |
| | Total | $203,716 | $126,042 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $329,758 |
| **GU** | NESP | $4,245 | $36,167 | $0 | | | | | | | | | $40,412 |
| | Non-NESP Cash | $0 | $0 | $0 | | | | | | | | | $0 |
| | Non-NESP In-kind | $109,228 | $85,836 | $12,012 | | | | | | | | | $207,076 |
| | Total | $113,473 | $122,003 | $12,012 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $247,488 |
| **JCU** | NESP | $88,256 | $52,276 | $305,452 | | | | | | | | | $445,984 |
| | Non-NESP Cash | $0 | | $0 | | | | | | | | | $0 |
| | Non-NESP In-kind | $79,075 | $151,870 | $554,175 | | | | | | | | | $785,120 |
| | Total | $167,331 | $204,146 | $859,627 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $1,231,104 |
| **UQ** | NESP | $0 | $18,920 | | | | | | | | | | $18,920 |
| | Non-NESP Cash | $0 | $931 | | | | | | | | | | $931 |
| | Non-NESP In-kind | $0 | $0 | | | | | | | | | | $0 |
| | Total | $0 | $19,851 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $19,851 |
| **RRRC** | NESP | | | | | | $290,878 | $282,050 | $147,984 | $13,758 | $3,174 | $2,667 | $740,511 |
| | Non-NESP Cash | | | | | | | | | | | | $0 |
| | Non-NESP In-kind | | | | | | | | | | | | $0 |
| | Total | $0 | $0 | $0 | $0 | $0 | $290,878 | $282,050 | $147,984 | $13,758 | $3,174 | $2,667 | $740,511 |

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| TOTAL NESP Funding | $428,015 | $466,668 | $305,452 | $0 | $0 | $290,878 | $282,050 | $147,984 | $13,758 | $3,174 | $2,667 | $1,940,646 |
| TOTAL Non-NESP Cash | $78,607 | $22,374 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $100,981 |
| TOTAL Non-NESP In-kind* | $489,613 | $623,347 | $566,187 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $1,679,147 |
| **TOTAL** | **$996,235** | **$1,112,389** | **$871,639** | **$0** | **$0** | **$290,878** | **$282,050** | **$147,984** | **$13,758** | **$3,174** | **$2,667** | **$3,720,773** |

**This expenditure statement has been prepared based on information provided by Research Institutions in their audited annual reports and should be read in conjuction with these reports**

## Account Balances for Annual Audit Report
## Milestone #10: Reporting Period 1st January 2015 to 31st December 2015

**Balance of the Recipient/Contractor's account referred to in the Funding Agreement (if required to keep a separate account), or the balance of the Funding**

| Institution | Account/Funding Balance | Date | Notes |
|---|---|---|---|
| Reef and Rainforest Research Centre Ltd | $ 972,181.52 | 31/12/2015 | Closing balance includes funding still be distributed to research institutions $883,347 plus GST of $88,334.70, plus interest earned of $499.82 |

**Balance of each Research Organisation's account into which Funds have been deposited (if required to keep a separate account), or the balance of each Research Organisation's Funding**

| Institution | Account/Funding Balance | Date | Notes |
|---|---|---|---|
| **AIMS** | -$261,492.00 | 31/12/2015 | |
| **CQU** | -$4,743.35 | 31/12/2015 | |
| **CSIRO** | -$2,361.84 | 31/12/2015 | |
| **GU** | $69,449.12 | 31/12/2015 | Closing balance includes $10,000 non-NESP cash |
| **JCU** | -$113,713.20 | 31/12/2015 | |
| **UQ** | $40,596.08 | 31/12/2015 | Closing balance includes $19,217.87 non-NESP cash |
| **RRRC** | -$322,510.51 | 31/12/2015 | Invoice raised in December 2015 for Milestone 9 release of Hub Adminstrator, KB & Comms and Hub Leader funding - not yet received as at date of this report. |
| **TOTAL** | **-$594,775.70** | | |

**Account/Funding Balance totals include TOTAL funding income (NESP and non-NESP), less TOTAL funding expenditure (NESP and non-NESP).**

## Section 8. Other information (if any)

This information is for the purpose of the Hub Steering Committee.

Administration activity and project status has been assessed against the following indicators:

| | |
|---|---|
| | Project is on track or only requires minor refinement; there are no significant difficulties and/or risks emerging. |
| | There are real or potential difficulties and risks that should be brought to the attention of the Department and other stakeholders even if the project is being well managed. |
| | There are significant difficulties or risks emerging that may compromise the project. Immediate remediation is required. |
| | Task has been completed. |

| No. | Title | Project Leader | Total NESP Cash | 2015 | Past | Present |
|---|---|---|---|---|---|---|
| 1.1 | Establishing the future NESP CoTS research framework including an ecologically-based approach to the management of CoTS at multiple scales | Westcott | $100,00 | $50,000 | N/A | |

**Science Summary:** Developing appropriate strategies for incorporating surveillance into CoTS control activities at the local scale emerged as a key point of intervention where research could improve management performance. The project developed a mathematical model to examine the optimal trade-off between investment into surveillance versus investment into control activities. Based on data from MV Hero voyages from 2013-2015, when surveillance was not conducted, and using assumptions drawn from the day-to-day operations of the control activities, it was identified the proportion of available effort that should be invested in surveillance for any given number of crew. The rules of thumb derived from this model offer the potential to improve the effectiveness of control operations by as much as 70% through an appropriate investment in surveillance activities.

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| 1.2 | Developing an approach to evaluate the effectiveness of investments in riparian management in the GBR catchments | Bartley | $99,972 | $49,986 | N/A | |
| **Science Summary:** A summary of the key science findings will be provided in the final report due March 31, 2016. It is anticipated that the results will:<br>- Provide benchmark data (in the focus catchments) against which Regional Bodies can both prioritise and evaluate investments in riparian management; and<br>- Determine the appropriate research tool (Lidar, TLS or other) to evaluate physical improvement in erosion and water quality following investments in channel erosion. | | | | | | |
| 1.3 | A validation of coral geochemical records to reconstruct suspended sediment loads to the Great Barrier Reef lagoon | Lewis | $22,500 | $11,250 | N/A | |
| **Science Summary**: In total 70 coral pieces (from 10 coral cores) were analysed by laser ablation ICP-MS. The data have been processed using specialist software and incorporated into 10 individual files related to each core. While establishing the chronology for each coral core is much easier for the sites that are influenced by the Burdekin River, it is still very time consuming. One of the key issues which is being addressed is that there is some disagreement in the proxies of sea surface temperature (Sr/Ca, B/Ca, U/Ca ratios) which influence the establishment of a reliable coral chronology. This will not be fully overcome (i.e. considered final) until more detailed luminescent line scanning is performed at AIMS. The project has established a methodology that provides the 'current-best' possible chronology (without additional information) and two of the cores have been analysed in more detail. Preliminary results suggest a very interesting, yet complicated story. | | | | | | |
| 1.5 | Legacy of the 2008 Lower Burdekin Water Quality Tender | Greiner | $39,795 | $19,898 | N/A | |

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| **Science Summary:** The research found a high level of persistence of investments and continuing functionality, which means that water quality benefits continue to accrue. The Tender achieved additionality and crowding-in effects, which improved the efficiency of the investment. In particular, the research provided evidence that the Tender:<br>• Engaged in an information and communications strategy which generated high levels of participant satisfaction during Tender implementation, but once funding decisions were made the level of transparency and communication became less satisfactory;<br>• Incentivised the participation of many farmers who had not previously done anything about water quality or participated in any NRM programs;<br>• Effected learning about the impacts of agriculture on water quality—irrespective of success of proposals—and thereby generated intrinsic motivation for many Tender participants to be wanting to do more about improving water quality;<br>• Sparked a series of subsequent investments into water quality improvements, many of which were entirely funded by the farmers while others were undertaken with the assistance of other NRM funding programs; and<br>• Triggered and/or facilitated farming-systems change to more environmentally benign practices in some instances. | | | | | | |
| 1.6 | Multiple and cumulative impacts on the GBR: assessment of current status and development of improved approaches for management | Uthicke | $99,944 | $49,972 | N/A | |
| **Science Summary:** The four individual components of this project are: (i) summary and synthesis of existing experimental work on cumulative stressors, (ii) analysis of field data on stressors and thresholds, (iii) testing statistical tools used in toxicology, and (iv) investigating a novel tool for risk assessment. The work on all components is well under way. For the risk assessment tool, a combination of energy budget modelling and statistical exposure-response functions to derive risk metrics has been used. Mortality risk, as hazard rate, is linked to environmental pressures via energy budgets, bleaching risk (corals), state of energy reserves and disease risk. Hazard rate and energy budgets are used as late and early indicators of cumulative risks, respectively. The project explores the relative importance of different drivers (e.g. climate change, run-off, resuspension) or activities (dredging) in causing coral mortality risk under a set of environmental scenarios. The project has applied these scenario analyses to reefs in the inshore region of the central Great Barrier Reef. | | | | | | |
| 1.7 | Reducing sediment sources to the Reef: testing the effectiveness of managing alluvial gully erosion | Brooks | $100,000 | $50,000 | N/A | |

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| **Science Summary:** Terrestrial LiDAR scans of the gully rehabilitation trial sites at Crocodile Station will assess the effectiveness of the various treatments established in 2011 at the experimental plots. Data processing is still ongoing, but qualitative assessment of the sites would suggest that these treatments of sediment yield reduction (75% after 2 years) could be achieved and will withstand the onslaught of multiple cyclones, providing they are maintained as complete stock exclusion zones. This project is further testing the hypothesis that surface and sub-surface soils from grazing lands could well be highly significant sources of anthropogenically accelerated nutrients to the GBR. At each gully site in the Normanby catchment samples were collected from: the floodplain surface, the gully surface, the gully sub-surface and the material in the bed of the gully. For each sample a range of analyses are undertaken regarding the nutrient, physical and geochemical parameters on three sediment size fractions (whole soil, <63 um fraction and <10 um fraction). A series of four moderate scale (2 – 5 ha) cattle exclusion trial sites were established on Kings Plains, Springvale and Crocodile Stations in 2011. A total of 117 vegetation survey plots were established both inside and outside these exclusion plots in 2011, and the sites were all resurveyed in November 2015. These data will form the basis for assessing the progress of these exclusion trials, particularly the natural recruitment of grasses within areas of active alluvial gully erosion. | | | | | | |
| 1.8 | Sub-catchment scale monitoring, modelling and extension design to support reef water quality improvement | Davis | $100,000 | $50,000 | N/A | |
| **Science Summary:** The monitoring program design has used a range of existing risk assessments of water quality issues in the GBR catchment area to identify and prioritise 'hotspot' catchment areas in which to target future remedial management attention. This hierarchical risk assessment utilised a combination of Scientific Consensus Statement supporting information, Nutrient Management Zone reports and NRM regional Water Quality Improvement Plans (WQIPs) to identify specific, finer-scale sub-catchments where management intervention could be most cost-effectively implemented. The utility of tenure information and geographic information system (GIS) approaches to further prioritise key areas for water quality monitoring and extension approaches dependent on program objectives (i.e. targeting maximum numbers of growers vs farm-catchment areas) was also developed. Practical and methodological experiences and recommendations emerging from other similar national and global programs targeting management of diffuse agricultural pollution in collaboration with primary industries have also been reviewed and incorporated into program design. | | | | | | |
| 1.9 | The establishment of a future NESP dredging research investment framework | Schaffelke | $25,000 | $12,500 | N/A | |

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| **Science Summary:** The project conducted a facilitated workshop with key researchers and stakeholders to establish priorities for future investment of the NESP Tropical Water Quality Hub (NESP TWQ) in dredging research in the GBR. Based on existing literature and related projects, the project team synthesised potential research sub-themes for consideration and prioritisation by researchers and stakeholders from industry and government agencies. The resultant priorities to consider in subsequent funding calls were:<br>Priority 1a: Develop critical ecological tolerance thresholds for light reduction, suspended sediments and sediment deposition to predict ecological impacts of dredging operations.<br>Priority 1b: Better quantification of sediment transport pathways over relevant timeframe.<br>Priority 2: Assessment of potential impacts and risks associated with disposal of dredge material on land and in reclamation areas. | | | | | | |
| 1.10 | Identification, impacts, and prioritisation of emerging contaminants present in the Great Barrier Reef and Torres Strait marine environments | Kroon | $100,000 | $50,000 | N/A | |
| **Science Summary:** The project team has identified emerging contaminants likely to be present and of potential concern to the GBR and TS marine environments. These include heavy and trace metals, alternate pesticides, hydrocarbons, coal dust, pharmaceuticals, personal care products, nano-particles, antifouling paints, and marine debris (including microplastics). Monitoring information on concentrations of most (but not all) of these emerging contaminants is either rare, not available or completely absent in the GBR and TS marine environments. The qualitative risk assessments will thus mostly be based on information on potential sources in the GBR and TS, and on the fate and effects of emerging contaminants in marine ecosystems from the international literature. | | | | | | |
| 2.1 | Assessing the cumulative impacts of climatic disturbances on inshore GBR coral reefs, identifying key refuges and testing the viability of manipulative reef Restoration | Jones | $85,000 | $42,500 | N/A | |
| **Science Summary**: This project utilized the long-term monitoring dataset for the Keppel Islands to assess the current status of coral and fish communities, identify key refuge reefs and quantify the ecological effects of green zones. Underwater surveys of reef communities were successfully carried out at all monitoring sites in October 2015. There was a high degree of spatial patchiness in the condition of various reefs in 2015, and although a number of reefs are currently highly degraded, with below 5% hard coral cover, several reefs were identified that provide key refuges for coral (predominantly *Acropora* spp.) with upwards of 50% cover. Overall hard coral cover is currently around 30% and coral community recovery is underway at a number of sites. The abundance of coral trout (*Plectropomus* spp.) has fluctuated considerably over the monitoring period and is highly correlated with the cover of live hard coral cover, habitat structural complexity and prey abundance. Green zone reefs continue to support higher abundances of larger coral trout than reefs that are open to fishing, however the magnitude of the difference is not as pronounced as it was 2004 and 2009, when reef health and productivity was at its highest. | | | | | | |

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| 2.2 | A tradable permit scheme for cost-effective reduction of nitrogen runoff in the sugarcane catchments of the Great Barrier Reef | Smart | $99,721 | $49,861 | N/A | |
| **Science Summary:** Existing literature indicates that nitrogen losses and gross margins from sugarcane production vary considerably with soil type, even within individual catchments. This project builds on previous literature to simulate an N-trading market for a sugarcane catchment in the Wet Tropics. The project develops a smart market approach to reduce transaction costs for market participants and thus increase the overall gains from trade. Initial N-trading simulations suggest that spatial variations in nitrogen losses and gross margins are large enough to stimulate considerable trading activity. Early indications are that N-trading could potentially provide a cost-effective approach for reducing nitrogen loads to the Reef Lagoon. | | | | | | |
| 3.1 | Seagrass mapping synthesis – A resource for marine park and coastal management | Coles | $36,000 | $18,000 | N/A | |
| **Science Summary:** The project has identified approximately 320 separate data sets that will be used to contribute to the final GIS meadow layers extending back to the early 1980s. Data will include species and meadow distribution and will have metadata associated with each layer. Datasets now include multiple surveys for ports and shipping projects that have not been included in previous composite seagrass meadow layers. | | | | | | |
| 3.2 | Improving historical estimates of abundance and distribution of dugongs and large green turtles in western and central Torres Strait | Marsh | $97,674 | $48,837 | N/A | |
| **Science Summary:** The field data for this project has been collected and analysis is underway. Initial observations from the field surveys have found that:<br>1. Dugongs range widely in western Torres Strait, crossing sea country boundaries and jurisdictional borders. One animal travelled twice between its capture site in Badu Sea country to waters around Boigu.<br>2. Three green turtles travelled from Badu sea country to Raine Island. | | | | | | |
| 3.3 | Light thresholds for seagrasses of the GBR: a synthesis and guiding document for managing seagrass | Collier | $29,755 | $14,878 | N/A | |

**Science Summary:** Comprehensive data on light thresholds is available for some species, in particular *Zostera muelleri*, and there is very little for other GBR species (e.g. *Enahlus acroides*). The project has identified a need for the light thresholds framework to include:
- biological thresholds for each species, which range from 1.1 mol $m^{-2}$ $d^{-1}$ to > 10 mol $m^{-2}$ $d^{-1}$, depending on species, measurement approach (e.g. experimental, *in-situ*) and measurement indicator (e.g. abundance or growth),
- time to impact after exceeding a threshold,
- management thresholds for each species (where possible), which are more conservative than biological thresholds, and allow for error in estimation of thresholds, as well as some effects of cumulative or interacting factors on thresholds that have not yet been quantified (e.g. water temperature, or meadow condition such as recovering or healthy), and
- management thresholds will be categorised according to 1. thresholds for management of acute impacts (<2 months), and 2. thresholds for longer-term assessment of seagrass condition (e.g. 3 mo – 1 year).

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| 3.4 | Developing and refining biological indicators for condition assessments in an integrated monitoring program | Collier | $68,584 | $34,292 | N/A | |

**Science Summary**: Two indicators are being explored: carbohydrate stores in seagrass rhizomes, and calibration formulae for integrating percent cover and biomass data. Carbohydrate results were received in November 2015, with more than 1000 samples available (including some analysed prior to this NESP project). *Halodule uninervis* is the most well represented species (586 samples), followed by *Thalassia hemprichii* (229), and *Cymodocea serrulata* (177). The sampling period (2008-2015) was affected by extreme weather events, which influenced seagrass abundance and composition, and resulted in some gaps in the long-term data set. Some preliminary results are available: there are differences among species in predominant carbohydrate storage form. Biomass calibration samples have been collected for five of the most dominant inshore GBR species and sample processing was almost complete in December 2015. A preliminary exploration of results has demonstrated a good relationship between seagrass percent cover and biomass, which was improved (lower IAC) when canopy height was factored into the calibration.

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| 3.5 | Assessment of key dugong and turtle seagrass resources in the northern Torres Strait | Rasheed | $99,696 | $49,848 | N/A | |
| **Science Summary:** The field data for this project has been collected and analysis is underway. Initial observations from the field surveys have found:<br>(1) Substantial areas of previously undescribed seagrass habitat in the northern Torres Strait particularly in shallow and intertidal locations;<br>(2) Evidence that these new areas are highly utilised by dugong, with extensive areas of dugong feeding scars. Large areas of dugong feeding was also observed along the PNG coast; and<br>(3) Numerous dugong were observed around Deliverance Island and the newly mapped seagrasses in the region.<br>Over 800 individual sites were assessed for seagrass and habitat forming benthic macro-invertebrate communities in the intertidal and subtidal surveys completed to date. | | | | | | |
| 3.6 | Establishing a research framework for future NESP investment into better understanding of the presence of Box-Jellyfishes (Irukandji) and risks in the Great Barrier Reef | Kingsford | $30,000 | $15,000 | N/A | |
| **Science Summary:** Current information suggests that water quality can affect all life history stages of box-jellyfishes (this includes the benthic polypoid and medusoid phases) as follows: changes in salinity trigger the release of small jellyfishes and if too low can kill; critical temperatures can affect them and further nutrient levels can influence the food available - that can in turn affect jellyfish survival. The key outcomes from the workshop of highest relevance to the hub are: (A1) Early warning by forecasting (models), detection (e.g. with jellycams) and accurate identification when jellyfish collected – the information would in turn be fed into a revitalized alert system – 'including app.' development; (A1) The development of risk models that are backed up by the good husbandry of jellyfish (and their benthic polyps) for experiments on the influence of water quality; | | | | | | |
| 3.7 | Monitoring the effects of zoning on coral reefs and their associated fish communities in the GBR Marine Park | Sweatman | $100,000 | $50,000 | N/A | |
| **Science Summary:** The AIMS monitoring team surveyed the effects of marine park zoning on communities of fishes and corals on Capricorn-Bunker Reefs in October 2015. The four pairs of reefs were chosen to be similar in size, setting, and underwater topography. One reef in each pair is open to fishing while the other was zoned no-take. The abundance and biomass of the primary target of reef line fishery, coral trout, were higher on no-take reefs in the Capricorn-Bunker region. However there were no consistent differences between the reefs in each pair in the numbers of herbivorous fishes, which are considered to be important for reef resilience. These reefs were damaged by storms in 2008 and 2009, but coral cover is recovering rapidly. There were no consistent differences in cover of live hard coral or the abundance of juvenile hard corals between the reefs in each pair. | | | | | | |

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| 3.8 | Towards an integrated monitoring program: identifying indicators and existing monitoring programs to effectively evaluate the Long Term Sustainability Plan | Addison | $100,000 | $50,000 | N/A | |
| **Science Summary:** The final report outlines: (1) Breakdown of the LTSP targets and objectives to assist in indicator development; (2) A monitoring program inventory to assess existing marine monitoring programs against the environmental and socio-economic values and attributes of the LTSP; and (3) An assessment of statistical performance of the AIMS Long Term and Marine Monitoring Programs. This project addresses a series of critical initial steps required to develop an integrated monitoring and reporting program for the LTSP. All outputs, including a full monitoring program inventory (Excel spreadsheet and Endnote library of supporting references), were delivered to the RIMREP Program Design working group in mid-December 2015 to assist in the development of an integrated monitoring and reporting program. | | | | | | |
| 3.9 | Indigenous capacity building and increased participation in management of Queensland sea country | George/ Hill | $100,000 | $50,000 | N/A | |
| **Science Summary:** Investigation and analysis of the coordinated framework for increasing Indigenous engagement in sea country has commenced with the draft of an issues discussion paper. This paper identifies that Traditional Owners over the last 20 years have been coming together, exploring and calling for a collective approach to achieving their aspirations for ownership, access to, and involvement in the management of sea country. Over these years, real progress has been made in people securing improved rights and the development of local capacities to govern and manage country. Despite this progress and while Australian and state governments have engaged well on key occasions, there has been no lasting, continuously improving GBR-wide level of Traditional Owner engagement. With the future health of the GBR under threat, the current *Reef 2050 Long Term Sustainability Plan* (LTSP) recognises, but does not fundamentally engage Traditional Owners as real partners in the long term management of sea country; inconsistent with emerging international guidelines for Traditional Owner engagement in protected area management. The discussion paper documents the history of Traditional Owner attempts to secure a more joined up approach and revisits their core aspirations regarding the management of GBR sea country. It does so to encourage discussion among GBR Traditional Owners about the next priorities for LTSP implementation. | | | | | | |
| 3.10 | Benchmarking costs of NRM improvements for the Great Barrier Reef | Rolfe | $29,487 | $14,744 | N/A | |
| **Science Summary:** The project findings can be summarised into two main groups.<br>The first explains why cost effectiveness varies, and identifies that estimates of cost effectiveness (e.g. $/tonne of sediment reduction) may not be comparable from different sources. This is because (a) what is included in costs can vary across modelling and data collection exercises, (b) estimates of pollutant reduction can vary | | | | | | |

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| by a number of factors (particularly if estimates are end-of-farm or end-of-catchment), and (c) estimates may vary from past projects to future projections. The key output of this part of the project is a categorisation system to systematically assess the comparability of cost–effectiveness data.<br>The second output of the project is a summary of the cost effectiveness data, drawing together data for both end-of-farm and end-of-catchment predictions. The summary illustrates that there is (a) regional heterogeneity in cost effectiveness across different pollutants, (b) better cost-effectiveness in targeting improvements in lower class management practices and on lower quality land, and (c) large increases in costs as target levels of pollutant reductions are approached. | | | | | | |
| 3.11 | Monitoring and adaptively reducing system-wide governance risks facing the GBR. | Dale | $55,537 | $27,769 | N/A | |
| **Science Summary:** A recent review suggests that the state and trend of the GBR's ecological health remains problematic. Previous reviews have helped trigger official UNESCO statements with regard to the governance of coastal management as it relates to the health of the GBR. While UNESCO concerns triggered separate strategic assessments by the Australian and Queensland governments, a more independent and integrated review of the key risks within the overall system of governance influencing outcomes in the GBR is needed. As a case study of international significance, this project has applied a newly published risk assessment method for analysing complex governance systems to the GBR context. The application of Governance Systems Analysis (GSA) enables the identification of those governance themes, domains and subdomains most likely to influence environmental and related social and economic outcomes in the GBR. Our analysis finds three clusters of governance domains/subdomains that currently present a high, medium and low risk to the GBR. Of significant integrative importance however, is the *Long Term Sustainability Plan Subdomain*. We find three broad-scale dilemmas facing the capacity of this subdomain in influencing the wider system of governance in mediating reef outcomes. First, the subdomain has little mandate or capacity to influence several high risk domains/subdomains not directly related to day-to-day reef management. Second, while having rapidly matured, this subdomain itself suffers significant governance challenges. Finally, this subdomain is not yet substantively guiding and aligning the efforts of other domains and subdomains linked to the effective delivery of effort at the catchment scale in the GBR. Hence, while this analysis enables us to make broad conclusions regarding necessary improvements in the overall system of GBR-wide governance, it also enables us to reflect upon the potential application of the GSA method in other critically important and complex land and sea-scapes across the globe. | | | | | | |
| 3.12 | Development of an offset financial contribution calculator for Reef Trust | Maron | $80,595 | $40,298 | N/A | |
| **Science Summary:** To date, the project has developed:<br>1) A condensed list of proposed surrogates for Great Barrier Reef values to use,<br>2) A new, tiered approach to applying the surrogates to minimise complexity and avoid double-counting,<br>3) A framework for developing risk multipliers for use in the calculator, and<br>4) A prototype calculation approach, incorporating estimation of benefit per unit of offset investment and total cost of offset delivery. | | | | | | |
| 3.13 | eAtlas - NESP data management, Torres Strait NRM plan delivery | Lawrey | $98,040 | $49,020 | N/A | |

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| | platform and Torres Strait reef mapping | | | | | |

**Science Summary:** The bulk of the NERP TE program datasets (85%) are now published on the eAtlas as high quality metadata records with accompanying downloadable data. The full NERP TE data collection will be an important legacy of the program consisting of over 80 datasets. The documentation for each published dataset underwent an extensive review and improvement process by the eAtlas team to ensure they are readily useable now and into the future.
The process of documenting and publishing new datasets in the eAtlas for NESP TWQ projects has been refined and updated based on lessons learnt from NERP. The first round of NESP TWQ datasets submissions using these updated forms are expected by early 2016.
Since the Torres Strait eAtlas was released in 2013, the eAtlas team has provided the TSRA with a series of training sessions on preparing and presenting content using this system. This project continued this training to allow the TSRA to present their Land and Sea Strategy NRM page using the Torres Strait eAtlas.
As part of the development of a good base map for the Torres Strait eAtlas the team previously, under the NERP, started developing an improved and detailed mapping of islands and reefs in Torres Strait. This project extended the work on this dataset, compiling updated and improved imagery for checking, correcting and tracing accurate boundaries for island features, many of which are very small (less than 100 m across).