Submission to the Rural and Regional Affairs and Transport Committee

November 2019

8 November 2019

Committee Secretary
Senate Standing Committees on Rural and Regional Affairs and Transport
PO Box 6100
Parliament House
Canberra ACT 2600

Dear Committee Secretary

Thank-you for the opportunity to make a submission to this Senate Inquiry into the **Identification of leading practices in ensuring evidence-based regulation of farm practices that impact water quality outcomes in the Great Barrier Reef**.

A submission to the Inquiry is attached for the committee's attention.

This submission is intended to inform the Committee of the large evidence-base that exists for the impact of water quality from the adjacent, predominately agriculture areas, on the Great Barrier Reef (GBR). This includes the connected catchment and important coastal ecosystems that support a wide variety of marine life as well as local economies with many tourism- and fisheries-dependent jobs. Summaries of the thousands of peer reviewed, published scientific papers that provide this supporting evidence have been periodically undertaken since 2003 with bipartisan support, as the underpinning evidence base for the joint Reef Water Quality Protection Plans, now Reef 2050 Water Quality Improvement Plan 2017-2022 developed in collaboration between the Australian and Queensland Governments.

The Queensland Government supports the rigorous process that underpins the proven Reef science including peer review, independent expert reviews and audits. The evidence is strong, the science robust, and the conclusions drawn from the science are sound.

Farm management practices within the Reef Regulations are based on the best available science and guided by industry-led expertise. They focus on improving water quality flowing into the Reef while improving and maintaining grower productivity and profitability. The substantial evidence and processes used by the Queensland Government to ensure best practice evidence-base policy is also outlined in this submission.

Yours Sincerely,

Jamie Merrick
Director-General, Queensland Department of Environment and Science

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Background

Improving water quality is the best way we can support the health of the Great Barrier Reef (Reef) locally. While climate change remains the biggest threat, improving the quality of water flowing from the land is critical to reducing pressure, ensuring a resilient Reef and supporting its recovery.

One of the most manageable impacts on the Reef is human-induced run-off of pollutants. For this reason, the Australian and Queensland governments are investing significant funds to reduce the run-off of sediment, nutrients and pesticides from catchments.

Farm management practices and interventions are informed by the best available science that has been through rigorous peer review processes.

In response to mass coral bleaching events and the deteriorating outlook for the Reef, both levels of government have recognised the need to accelerate priority actions to improve Reef health. The updated **Reef 2050 Long-Term Sustainability Plan (Reef 2050 Plan)** and **Reef 2050 Water Quality Improvement Plan (Reef 2050 WQIP)** aim to protect the Reef's values.

While the main source of water pollution is agriculture (as it is by far the largest land use within the catchments adjacent to the Reef), the Reef 2050 WQIP includes a diverse set of actions in recognition that urban and industrial areas can create concentrated pollution that has important local impacts. It includes targets for improving water quality leaving the catchments to help prioritise actions.

The Great Barrier Reef catchment
The Great Barrier Reef receives runoff from six natural resource management regions and 35 catchments which drain 424,000 square kilometres of coastal Queensland, including: the eastern coast of the Cape York region, Wet Tropics region, Burdekin region, Mackay Whitsunday region, Fitzroy region and the Burnett Mary region (www.reefplan.qld.gov.au/reef-regions).

The Great Barrier Reef catchments are largely rural and dominated by summer monsoonal rains and occasional cyclones delivering sediments, nutrients and pesticides to the inshore and sometimes offshore portions of the Reef in pulsed flows, which can be affected by water reservoirs and dams.

Grazing (77 per cent) is the dominant agricultural land use, particularly in the Burdekin and Fitzroy regions. Sugarcane (1.4 per cent) and horticulture crops (0.2 per cent) are more prevalent on the coastal floodplains with high rainfall and irrigation. Grain crops and irrigated cotton are prevalent in the inland areas of the Fitzroy region. Small urban centres are located on the coastal strip.

Habitats include wetlands, coral reefs, seagrass and mangroves, and continental islands and coral cays are present. Reef-based tourism, as well as commercial and recreational fisheries, are also an important part of the regional economies (www.reefplan.qld.gov.au/water-quality-and-the-reef/connected-ecosystems).

Reef 2050 Water Quality Improvement Plan

The joint Reef 2050 Water Quality Improvement Plan 2017–2022[1] (www.reefplan.qld.gov.au/water-quality-and-the-reef/the-plan) guides how industry, government and the community will work together to improve the quality of water flowing to the Great Barrier Reef.

The plan builds on 15 years of efforts by governments at all levels working in partnership with landholders, natural resource managers, industry, research and conservation groups through successive Reef Water Quality Protection Plans (www.reefplan.qld.gov.au/water-quality-and-the-reef/history).

The scope of the most recent plan has been broadened to reflect its position as a nested plan under the Reef 2050 Long-Term Sustainability Plan[2] (www.environment.gov.au/marine/gbr/publications/reef-2050-long-term-sustainability-plan-2018).

It addresses all land-based sources of water pollution including run-off from urban, industrial and public lands; while recognising the majority of pollution comes from agricultural activities. It includes social, cultural and economic values for the first time.

The Australian and Queensland governments are investing more than $600 million to deliver actions in the plan through to 2022 (www.reefplan.qld.gov.au/__data/assets/pdf_file/0019/46117/reef-2050wqip-investment.pdf).

The Reef 2050 WQIP is:

- underpinned by comprehensive, peer-reviewed research—the **2017 Scientific Consensus Statement** (www.reefplan.qld.gov.au/science-and-research/the-scientific-consensus-statement), and
- supported by a robust monitoring and evaluation program—the Paddock to Reef Integrated Monitoring, Modelling and Reporting program (**Paddock to Reef program**) (www.reefplan.qld.gov.au/tracking-progress/paddock-to-reef).

The Reef 2050 WQIP set joint Government water quality reduction **targets for key pollutants** at a finer scale than previous Plans – now at the individual catchments that flow to the Great Barrier Reef (www.reefplan.qld.gov.au/tracking-progress/targets/catchment-targets).

Progress towards the joint Government targets is outlined in the **Reef Water Quality Report Card**. Report Card 2017 and 2018[3] was released in August 2019. It assesses the results of all Reef 2050 Water Quality Improvement Plan actions reported up to June 2018. While many landholders have improved their land management practices, the results reflect the scale of change still required to meet the water quality targets and the timelag between project completion and reporting timeframes (www.reefplan.qld.gov.au/tracking-progress/reef-report-card/2017-2018).

Joint governance for the management of Great Barrier Reef Water Quality

The Queensland Government is a joint partner for the Reef 2050 Plan with the Australian Government. The Reef 2050 Plan forms a schedule to the Great Barrier Reef Intergovernmental Agreement and joint decision making is governed through the Great Barrier Reef Ministerial Forum. The Queensland Government is represented at the Ministerial Forum by the Premier and Minister for Trade, the Honourable Annastacia Palaszczuk MP, and the Minister for Environment and Great Barrier Reef, Minister for Science and Minister for the Arts, the Honourable Leeanne Enoch MP.

Administratively, advice is provided to the Ministerial Forum by a Standing Committee of Officials including relevant Queensland and Australian Government departments and the Great Barrier Reef Marine Park Authority. Regular coordination occurs through an Executive Steering Committee including the Office of the Great Barrier Reef within the Department of Environment and Science, Department of the Environment and Energy and the Great Barrier Reef Marine Park Authority. The Office of the Great Barrier Reef coordinates across seven Queensland Government agencies that have a role in implementation of activities within the Reef 2050 Plan to provide a whole-of-Queensland Government perspective. The three agencies – the Office

of the Great Barrier Reef, the Department of the Environment and Energy and the Great Barrier Reef Marine Park Authority - effectively form a joint team for the purposes of implementing the Reef 2050 Plan and work collaboratively.

Evidence for Terms of Reference

(a) the existing evidence-base on the impact of farm water runoff on the health of the Great Barrier Reef (the Reef) and catchment areas

(b) the connectivity of farm practices throughout the Reef catchment areas to water quality outcomes in the Great Barrier Reef Marine Park

Evidence for both a) and b):
Farm management practices within the Reef Regulations are based on the best available science and guided by industry-led expertise. They focus on improving Reef water quality while improving and maintaining grower productivity and profitability. Rigorous processes underpin proven Reef science, including peer review, independent expert reviews and audits. The evidence is strong, the science robust, and the conclusions drawn from the science are sound.

Impacts to the Great Barrier Reef marine and coastal aquatic ecosystems include habitats such as coral reefs, seagrass meadows, freshwater and mangrove wetlands, i.e. much broader than the scope of recent questioning of the science that selectively focused on offshore coral reefs. These habitats, that are closer to the coast and are therefore more likely to be impacted by land-based run-off from adjacent catchments, are important for the dependent fisheries industries and are part of the lifecycle of many target species.

Land use impacts from agriculture on the Great Barrier Reef have been confirmed via many reviews and synthesis of the underpinning science since 2001 (see Scientific Consensus Statements below).

The evidence base supports that (see **Attachment 1**, Scientific Consensus Statement, 2017[4]):

- The decline of marine water quality associated with land-based run-off from the adjacent catchments is a major cause of the current poor state of many of the coastal and marine ecosystems of the Great Barrier Reef. Water quality improvement has an important role in ecosystem resilience.
- The main source of the primary pollutants (nutrients, fine sediments and pesticides) from Great Barrier Reef catchments is diffuse source pollution from agriculture. These pollutants pose a risk to Great Barrier Reef coastal and marine ecosystems.
- Progress towards the water quality targets has been slow and the present trajectory suggests these targets will not be met.
- There is an urgent need for greater investment in voluntary practice change programs, the use of regulatory tools and other policy mechanisms to accelerate the adoption of practice change to further reduce Reef water quality pollution.

The Scientific Consensus Statement examined the impacts of water quality pollutants on the Great Barrier Reef marine and coastal ecosystems (Chapter 1[5], Scientific Consensus Statement, 2017), as well as the sources of water quality pollutants from the Great Barrier Reef catchment (Chapter 2[6], SCS 2017). This was based on multiple lines of evidence including scientific tracing studies, water quality monitoring and catchment modelling underpinned by robust data. This data is generated by leading national and state agencies and research institutions including remote sensing with high resolution satellite imagery to assess

levels of ground cover, riparian vegetation to maintain streambanks, and other erosions features such as gullies. A summary by each key pollutant is provided below. Farm trials and experiments have produced a large body of evidence that supports the promoted farm management practices (summarised in Chapter 4[7], Scientific Consensus Statement, 2017) and previous Scientific Consensus Statements.

Sediment

Sediments in water (total suspended solids) are characterised by different particle sizes, e.g. clay, silt and sand. It is the fine fraction (silt and clay) that is of greatest concern to marine ecosystem health as it remains in suspension and is transported furthest within the marine environment. This leads to increased turbidity and reduced light for seagrasses and coral, reducing their growth. When sediment settles, it can have detrimental effects on the early life stages of coral, and in more extreme conditions, can smother corals and seagrasses. Fine sediment can remain within inshore areas for decades, making it available for wind-driven resuspension which causes ongoing coastal turbidity.

Monitoring and scientific modelling indicate the main source of sediments from the Great Barrier Reef catchment is from agricultural land uses. Compared to pre-development conditions, it is estimated that fine sediment loads delivered to the Great Barrier Reef lagoon have increased approximately 5-fold for the entire catchment, ranging between 3- and 8-fold depending on the region (Chapter 2[6], Scientific Consensus Statement, 2017).

Grazing, including gully and hillslope erosion (45%) and streambank erosion (39%) are the greatest contributors of anthropogenic fine sediments delivered to the Reef. Sugarcane cropping (8%) and dryland (non-irrigated) cropping (4%) also contribute to the fine sediment loads delivered to the Reef. Urban and other industrial land uses contribute less than 1% to the fine sediments delivered to the Reef.

Excess nutrients

Excess nutrients, (e.g. from excess fertilisers), are transported to the Reef in dissolved form (making them immediately available for biological uptake) or are attached to sediment in particulate form (which can also become available in the marine environment). They are rapidly consumed by phytoplankton, algae and bacteria and can be transported further into the Great Barrier Reef. Excess nutrients interrupt the natural balance of reef ecosystems. There is strong evidence for several effects of nutrients on Great Barrier Reef ecosystems including increased outbreaks of crown-of-thorns starfish, macroalgae abundance resulting in lower coral diversity, increased bio-erosion and some coral diseases, reduced benthic light due to algal blooms, and increased macroalgae and epiphytes on seagrass. While most effects occur in the wet season during river discharge conditions, some effects have consequences beyond the wet season and continue for many years.

Monitoring and scientific modelling estimates that dissolved inorganic nitrogen loads to the Great Barrier Reef have increased 2-fold compared to pre-development conditions (ranging between 1.2 and 6-fold depending on the region). For particulate nutrients, there is an estimated 1.5-fold increase for particulate nitrogen and a 2.9-fold increase for particulate phosphorus (Chapter 2[6], Scientific Consensus Statement, 2017).

Sugarcane is by far the greatest contributor to the dissolved inorganic nitrogen loads transported to the Great Barrier Reef (contributing 78% of the anthropogenic load). This is primarily from applied fertilisers. Urban areas contribute 9% of the anthropogenic dissolved inorganic nitrogen load, and may be important at local scales. Most particulate nutrients come from grazing areas, although sugarcane land-use dominates contributions in the Wet Tropics and Mackay Whitsunday regions.

Pesticides

Pesticides include herbicides, insecticides and fungicides. More than 50 different pesticides have been detected in rivers, creeks, wetlands, estuaries, and the inshore parts of the Great Barrier Reef lagoon. Pesticides are carried in river run-off, most often as mixtures of pesticides, and can take a long time to break down in the marine environment (months to years).

Monitoring and scientific modelling indicate the main source of pesticides from the Great Barrier Reef catchment is in runoff from agricultural activities. Sugarcane areas are the largest contributors of pesticides (more than 95% of the total load) (Chapter 2[6], Scientific Consensus Statement, 2017).

Pesticide mixtures produce a cumulative effect in organisms, and when combined with other stressors (such as increased sea surface temperature) the combined effects are often found to be greater. The herbicides commonly used in sugarcane for weed control act by inhibiting photosynthesis, which can therefore affect non-target plant species if they are exposed, including those in the marine environment, such as phytoplankton, seagrass and corals. Similarly, insecticides commonly used in sugarcane, such as neonicotinoids (internationally known for their impacts on bees), can also affect non-target aquatic arthropod species if they are exposed, such as insects, crabs and prawns. Based on laboratory studies, these pesticides have been reported to affect a range of Great Barrier Reef marine organisms including corals, microalgae, crustose coralline algae, seagrass and prawns.

Pesticides pose the greatest risk to ecosystems closest to the source of the pesticides, i.e. freshwater wetlands, rivers and estuaries, followed by coastal ecosystems, seagrass and coral. Mixtures of pesticides, detected in a number of Great Barrier Reef ecosystems, have been recorded at concentrations that are high enough to cause direct adverse impacts on more than 5% of aquatic species; a level considered too high for protecting these ecosystems. Based on monitoring data, pesticides pose the highest risk to aquatic ecosystems in the Mackay Whitsunday and Lower Burdekin regions, with the herbicide diuron primarily contributing the highest risk of those detected (Chapter 3[8], Scientific Consensus Statement, 2017).

Supporting evidence:

Scientific Consensus Statement – Land use impacts on Great Barrier Reef Water Quality and Ecosystem Condition

www.reefplan.qld.gov.au/science-and-research/the-scientific-consensus-statement

All plans for managing the Reef are based on the best available scientific evidence, in particular the Scientific Consensus Statement. The Scientific Consensus Statement is the foundational document that provides the scientific understanding underpinning the joint Queensland and Australian government Reef 2050 WQIP (www.reefplan.qld.gov.au/water-quality-and-the-reef/the-plan).

The Scientific Consensus Statement is a major review study of land use impacts on Reef water quality and ecosystem condition. Thousands of Reef water quality studies have been undertaken based on real data, including from paddock trials. It reviews the significant advances in scientific knowledge of water quality issues in the Reef to arrive at a consensus on the current understanding of the system.

The quality of scientific research is examined through multiple, internationally recognised processes including peer review, which is undertaken by scientific experts before any research is published and continues after it is published through examination by other independent scientists. It is the synthesis of scientific research that underpins actions for protecting the Reef, not one single piece of research, researcher or organisation.

The Statement is updated approximately every five years to ensure that Reef policy remains up-to-date and is based on the best available evidence. In 2017 several leading academic institutions, including CSIRO, the

Australian Institute of Marine Science, James Cook University, Griffith University, the University of Queensland and Central Queensland University completed the 2017 Scientific Consensus Statement. It was produced by a multidisciplinary group of 48 scientists from these institutions with expertise in Great Barrier Reef water quality science and management, led by TropWATER James Cook University.

It applies a risk management framework based on the ISO 31000 (AS/NZS, 2004) – the world's most best-known and applied quality management standard for risk management. The scientists reviewed over 1,600 published scientific journal papers and technical reports including quality assured monitoring data for the Statement. The processes allow for robust debate, enabling the best available science to be brought forth and shared. The scientists then assessed the forward pathways, and recommended responses based on the level of certainty. One of the conclusions is that there was an urgent need for regulatory tools and other policy mechanisms to accelerate improving water quality in the Great Barrier Reef.

The 2017 Scientific Consensus Statement includes five supporting chapters that summarise and cite the evidence base (www.reefplan.qld.gov.au/__data/assets/pdf_file/0029/45992/2017-scientific-consensus-statement-summary.pdf).
The overarching consensus was:

- Key Great Barrier Reef ecosystems continue to be in poor condition. This is largely due to the collective impact of land runoff associated with past and ongoing catchment development, coastal development activities, extreme weather events and climate change impacts (such as the 2016 and 2017 coral bleaching events).
- Current initiatives will not meet the water quality targets. To accelerate the change in on-ground management, improvements to governance, program design, delivery and evaluation systems are urgently needed. This will require greater incorporation of social and economic factors, better targeting and prioritisation, exploration of alternative management options, and increased support and resources.
- Inshore marine water quality remains in moderate to poor condition, linked to pollutant inputs from land run-off, especially when there is a large amount of rainfall.
- The condition of coastal freshwater wetlands in the Great Barrier Reef catchment has declined considerably, and many wetlands are under high threat of degradation by a range of chronic and acute pressures such as excess nutrients and sediments, high concentrations of pesticides, loss of connectivity, changes in hydrology, and invasive species.
- On inshore coral reefs, the cumulative impact of tropical cyclones, extreme flood events and recent outbreaks of crown-of-thorn starfish resulted in declines in coral community condition.
- Inshore seagrass meadows remain in poor condition overall.

The Scientific Consensus Statement chapters are summarised as follows:
Chapter 1[5]: The condition of coastal and marine ecosystems of the Reef and their responses to water quality and disturbances.
This chapter summarises the published evidence that describes Reef marine and coastal aquatic ecosystem status and condition, identifies the primary drivers, pressures and threats to these systems, and the known effects of land-based pollutants (Schaffelke et al., 2017).
www.reefplan.qld.gov.au/__data/assets/pdf_file/0030/45993/2017-scientific-consensus-statement-summary-chap01.pdf

Chapter 2[6]**:** Sources of sediment, nutrients, pesticides and other pollutants to the Reef.
This chapter summarises the published evidence that describes the sources of pollutants, considered as the hazards to Reef ecosystems (Bartley et al., 2017).
www.reefplan.qld.gov.au/__data/assets/pdf_file/0031/45994/2017-scientific-consensus-statement-summary-chap02.pdf

Chapter 3[8]: The risks from anthropogenic pollutants to the Reef coastal and marine ecosystems.
This chapter outlines a risk assessment that evaluated the likelihood, consequences and quantified risk to the Reef coastal aquatic and marine ecosystems, particularly from different nutrient species, suspended sediment (including different size fractions) and pesticides (Waterhouse et al., 2017).
www.reefplan.qld.gov.au/__data/assets/pdf_file/0032/45995/2017-scientific-consensus-statement-summary-chap03.pdf

Chapter 4[7]: Management options and their effectiveness.
This chapter summarises the published evidence for management of the identified risks. This includes agricultural practice change (water quality, economic and social dimensions), wetlands and treatment systems and urban management (Eberhard et al., 2017).
www.reefplan.qld.gov.au/__data/assets/pdf_file/0033/45996/2017-scientific-consensus-statement-summary-chap04.pdf

Chapter 5[9]: Overview of key findings, management implications and knowledge gaps.
This chapter presents an overall synthesis and draws on the previous chapters to present a management prioritisation and discussion on management implications of the new knowledge (Waterhouse et al., 2017).
www.reefplan.qld.gov.au/__data/assets/pdf_file/0034/45997/2017-scientific-consensus-statement-summary-chap05.pdf

There are supporting Frequently Asked Questions for the Reef 2050 Water Quality Improvement Plan and the 2017 Scientific Consensus Statement:
www.reefplan.qld.gov.au/__data/assets/pdf_file/0034/48697/faqs-reef-2050wqip-2017scs.pdf

The 2017 Scientific Consensus Statement builds on earlier statements in 2013 and 2008, supporting and further refining the understanding of land use impacts on the Great Barrier Reef.

2013 Scientific Consensus Statement[10]:

- Summary
  www.reefplan.qld.gov.au/__data/assets/pdf_file/0018/46170/scientific-consensus-statement-2013.pdf

- Supporting chapters (Ref)
  www.reefplan.qld.gov.au/__data/assets/pdf_file/0020/46172/scsu-chapter-1-marine-impacts.pdf
  www.reefplan.qld.gov.au/__data/assets/pdf_file/0021/46173/scsu-chapter-2-resilience.pdf
  www.reefplan.qld.gov.au/__data/assets/pdf_file/0022/46174/scsu-chapter-3-relative-risks.pdf
  www.reefplan.qld.gov.au/__data/assets/pdf_file/0023/46175/scsu-chapter-4-sources-of-pollutants.pdf
  www.reefplan.qld.gov.au/__data/assets/pdf_file/0024/46176/scsu-chapter-5-mgt-practices.pdf

2008 Scientific Consensus Statement[11]:

- Summary
  www.reefplan.qld.gov.au/__data/assets/pdf_file/0019/46171/scientific-consensus-statement-on-water-quality-in-the-gbr.pdf

- Synthesis of evidence to support the Scientific Consensus Statement on Water Quality in the Great Barrier Reef[12]
  www.reefplan.qld.gov.au/__data/assets/pdf_file/0020/46118/reef-consensus.pdf

The formal **Scientific Consensus Statements support earlier synthesis of science** including:

The **2003 report** by an independent panel of experts 'A Report on the Study of Land Sourced Pollutants and their Impacts on Water Quality in and adjacent to the Great Barrier Reef'[13] led by Chairman of the Science Panel Joe Baker, AO, OBE, FTSE, MSc, PhD, FRACI, C Chem.
www.reefplan.qld.gov.au/__data/assets/pdf_file/0026/46169/report-impact-of-land-pollutants-on-gbr.pdf

It concluded:

> *'The evidence that we now have for the GBR is as follows:*
> *a. Land-sourced pollutants such as chemicals used by humans in current urban and rural activities are reaching the GBR. These include chemicals used in agricultural and veterinary applications (AgVet Chemicals)*
> *b. Excess nutrients that are transported by rivers in peak floods, reach the GBR*
> *c. Some areas of the coastal GBR, most affected by river run-off, appear to be degraded and/or slow to recover from natural events, such as cyclones. In this regard, we note the experiences documented overseas that the first major signs (that is, hard proof of adverse impact) appear when the coral reef system fails to recover from other disturbance (including natural events such as cyclonic level events).'*

2003 Productivity Commission[14] examined and evaluated a number of policy options to address declining water quality entering the Reef, titled 'Industries, Land Use and Water Quality in the Great Barrier Reef Catchment' research report. https://www.pc.gov.au/inquiries/completed/great-barrier-reef/report/gbr.pdf

- This report included a Cooperative Research Centre Reef consensus statement on 'The current level of scientific understanding on impacts of terrestrial run-off on the Great Barrier Reef World Heritage Area'[15] from 2001.

2001 - The Great Barrier Reef Ministerial Council accepted a report by the Great Barrier Reef Marine Park Authority on the decline in water quality in the Great Barrier Reef and the importance and urgency in addressing the issue.

Reef 2050 Independent Expert Panel

www.environment.gov.au/marine/gbr/reef2050/advisory-bodies
The IEP provides scientific and expert advice related to the Great Barrier Reef, including support for the implementation and review of the Reef 2050 Plan, Reef 2050 WQIP and other matters, as requested. The Panel also advises the Australian Government Minister for the Environment and Energy on funding priorities for the Reef Trust. The inaugural Chair is Professor Ian Chubb, former Australian Chief Scientist.

A letter from the IEP to Ministers expressed their unanimous support for the science that underpins the evidence of the extent and probable causes of damage to the Reef (see **Attachment 2**).

Reef Water Quality Independent Science Panel (ISP)

www.reefplan.qld.gov.au/science-and-research/independent-panel

The Reef Water Quality Independent Science Panel (ISP) provides strong independent science-based and technical advice to the Australian and Queensland governments on water quality science needs. It is a working group of the Reef 2050 Independent Expert Panel (IEP), which provides broader scientific advice on implementing the Reef 2050 Plan.

The Reef Water Quality ISP is made up of nine independent expert scientists. ISP provided technical review of the Scientific Consensus Statement chapters and summary. They also have an ongoing role in providing technical advice on implementing and monitoring progress against the Reef 2050 WQIP including reviewing the scientific evidence behind the Reef Water Quality Report Cards.

Reef Water Quality Report Cards
www.reefplan.qld.gov.au/tracking-progress/reef-report-card

The Australian and Queensland Governments jointly release the Reef Water Quality Report Cards. The Reef Water Quality Report Card measures progress towards the joint Reef 2050 WQIP targets and objectives. The information in these reports determines the success of actions and identifies whether further measures need to be taken to address water quality in the Great Barrier Reef.

The report cards outline results from the Paddock to Reef Integrated Monitoring, Modelling and Reporting Program (Paddock to Reef program). The scientific methods and results of the Reef Water Quality Report Cards are reviewed by the Reef Water Quality ISP, the Paddock to Reef Program Coordination and Advisory Group, along with additional peer and external reviews of the Paddock to Reef program areas that deliver the report card results.

There have been eight report cards released since 2009, all indicating that faster progress towards the land management and water quality targets are required.

The **Reef Water Quality Report Card 2017 and 2018**[3] was released on 30 August 2019, assessing the results of Reef 2050 WQIP actions reported up to June 2018.
www.reefplan.qld.gov.au/tracking-progress/reef-report-card/2017-2018.

The report card draws on multiple lines of evidence including industry best management practice and extension programs. Fifty-five (55) science and technical experts contributed to the Reef Water Quality Report Card. There is a 12-month time lag between data collection and the release of the report card due to the significant work that goes into validation, analysis, scientific review and reporting of results.

This is the first report card to detail results at the finer catchment scale in addition to regional and Great Barrier Reef-wide results, reflecting the updated targets in the Reef 2050 WQIP.

- Results can be examined via the **online interactive report card**:
  https://reportcard.reefplan.qld.gov.au/

- The science behind the report card is detailed at:
  - Detailed results - www.reefplan.qld.gov.au/__data/assets/pdf_file/0022/82903/report-card-2017-2018-results-combined.pdf
  - Methods - www.reefplan.qld.gov.au/__data/assets/pdf_file/0022/82921/report-card-2017-2018-methods-combined.pdf

Summary:

- Although results continue overall to track in the right direction, progress on improving Reef water quality is small and improvements minor.
- The report card showed that overall inshore marine condition was poor in 2017-2018.
- It identified that while many landholders have improved their land management practices, the results reflect the scale of change required to meet the water quality targets.
- There was poor to very poor progress towards the 2025 agricultural land management practice adoption and water quality targets.
- Results show very poor progress towards the dissolved inorganic nitrogen target with only an estimated 0.3% reduction over 2017 and 2018 (the target is to achieve a 60% reduction by 2025).
- There was also very poor progress towards the sediment target with a 0.5% reduction (the target is to achieve a 25% reduction by 2025).

Paddock to Reef Integrated Monitoring, Modelling and Reporting Program (Paddock to Reef program)[16]

www.reefplan.qld.gov.au/tracking-progress/paddock-to-reef

The Paddock to Reef program is a joint program of the Australian and Queensland Governments to assess progress towards the Reef 2050 WQIP targets. Launched in 2009, the program unites more than 20 industry bodies, government agencies, natural resource management bodies, landholders and research organisations to measure and report on water quality factors that impact Reef health.

It involves monitoring and modelling across a range of attributes, from paddock scale through to sub-catchment, catchment, regional and Great Barrier Reef-wide. In line with the Reef 2050 WQIP framework, it evaluates land management practice adoption and effectiveness, catchment condition, pollutant runoff and inshore marine condition.

Over the 10-year period of implementation it has continued to improve in terms of scope, methodology and application. The program areas are inter-linked and integrated through a common assessment and reporting framework. The scientific monitoring and modelling data is reported via the Reef Water Quality Report Cards, reviewed by the Reef Water Quality ISP.

Great Barrier Reef Outlook Report[17]

www.gbrmpa.gov.au/our-work/outlook-report-2019

Every five years, the Great Barrier Reef Marine Park Authority prepares an Outlook Report that provides an independent assessment of the health, condition, use, management arrangements and long-term outlook for the Reef. The Report is evidence-based and peer-reviewed. It incorporates published peer-reviewed literature with additional input from technical experts, as well as long-term data sets and monitoring programs. Sources for evidence are cited throughout the report.

The Outlook Report 2019 was released by the Great Barrier Reef Marine Park Authority on 30 August 2019 and identifies the outlook for the Reef as very poor. It stated that without urgent and effective additional management intervention, the Reef's values are likely to deteriorate rapidly. The Report identifies that initiatives to halt and reverse the effects of climate change at a global level, and to effectively improve water quality at a regional scale are the most urgent to improve the Reef's long-term outlook.

The Report confirms data from the Scientific Consensus Statement and the Reef Water Quality Report Card.

Australian Institute of Marine Science (AIMS) Long-term Monitoring Program

Further information on coral reefs are provided by the AIMS Long-term Monitoring Program
www.aims.gov.au/docs/research/monitoring/reef/reef-monitoring.html

This program surveys the health of 47 midshore and offshore reefs across the Great Barrier Reef region, and is the longest continuous record of change in reef communities over such a large geographic area.

The program encompasses surveys of fish, coral and other bottom-dwelling organisms along the same sections of reef on each visit. It also documents the impacts of disturbances such as crown-of-thorns starfish outbreaks, cyclones and bleaching events, and coral disease outbreaks.

The Annual Summary Report[18] on coral reef condition for 2018/19 is available at:
www.aims.gov.au/reef-monitoring/gbr-condition-summary-2018-2019
Summary:

- Coral reefs are impacted by numerous disturbances. Over the last five years these collective disturbances have caused declines in hard coral cover to moderate (10-30%) levels across much of the Great Barrier Reef (GBR).
- Hard coral cover in the Northern GBR increased slightly from 11% in 2017 to 14% in 2019, but remains close to the lowest levels recorded by AIMS since 1985. This reflects the cumulative impacts of cyclones and two episodes of severe coral bleaching over the period of 2014 to 2019. To date recovery has been limited. These surveys may overestimate regional hard coral cover, as bleaching in 2016 caused the greatest mortality on inshore reefs, but few inshore reefs could be surveyed due to safety concerns.
- Reefs in the Central GBR sustained significant coral loss due to Severe Tropical Cyclone Debbie and due to the continued southward spread of crown-of-thorns starfish outbreaks. Average hard coral cover declined slightly, from 14% in 2018 to 12% in 2019.
- Reefs in the Southern GBR escaped major disturbances from 2009 until 2017, when a severe outbreak of crown-of-thorns starfish began that continued through to 2019. Mean coral cover continued to decline, albeit slightly from 25% in 2018 to 24% in 2019.

(c) Relevant legislation and regulation, including in relation to impacts of water quality, farm management and soil runoff

There are a number of Queensland legislative instruments that regulate and guide the conduct of activities to avoid or minimise adverse impacts to water quality, ensure good farm management, and prevent soil runoff.

These include, but are not limited to:

1. *Environmental Protection Act 1994* (EP Act)
2. *Planning Act 2016*
3. *Vegetation Management Act 1999*
4. *Economic Development Act 2012*
5. *Regional Planning Interests Act 2014*
6. *Land Act 1994*
7. *Aboriginal Land Act 1991*
8. *Torres Strait Islander Land Act 1991.*

Queensland legislation can be found on the legislation website at https://www.legislation.qld.gov.au/

The EP Act is a key element of Queensland's environmental legal system. Its objective is to protect Queensland's environment while allowing for development that improves the total quality of life, both now and in the future, in a way that maintains ecological processes (ecologically sustainable development).

It primarily regulates environmental harm and ensures ecologically sustainable development through the requirement for activities that contaminate the environment (environmentally relevant activities or ERAs) to obtain an environmental authority and the conditions that are imposed on an environmental

authority. Typical activities that are regulated this way including mining activities, sewage treatment plants and aquaculture developments. For example, all mining (including small-scale mining) is required to comply with environmental conditions which seek to avoid or minimise the impact of the activity on the environment.

In addition, the EP Act has regulated agricultural ERAs since 2010 to reduce water quality pollution impacting the Reef. Currently, this includes sugarcane growing and large cattle grazing operations in three of the six Reef regions (Wet Tropics, Burdekin and Mackay Whitsunday).

Note: the existing Reef protection regulations are being replaced by the new Reef Regulations package (discussed in section (d) below). The new Reef Regulations package is anticipated to commence on 1 December 2019.

The Acts listed above at numbers 2 to 5 are primarily land use frameworks. These Acts primarily regulate point source emissions or urban storm water management through the assessment of what activities can take place on what land. These assessment practices have been in place for many years and actions such as building new water infrastructure and the management of native vegetation clearing are included in this framework.

For example,

- Queensland's *Vegetation Management Act 1999* regulates the clearing of native vegetation. The purposes of this legislation include to ensure that clearing does not cause land degradation; to reduce greenhouse gas emissions; and to allow for sustainable use.
- Queensland's *Planning Act 2016* establishes a regulatory framework through which the process of development can be managed. This regulatory framework allows for water quality risks to be planned for and managed through local council plan making and development assessment.

The Acts listed above at numbers 6 to 8 include the regulation of leasehold land. This can include the regulation of pastoral leaseholders to ensure good farm management, minimising adverse impacts on water quality, and prevent soil loss off farm.

(d) Proposed changes to regulations that would impact on farm productivity and the potential benefits and costs of such proposed regulation

The *Environmental Protection (Great Barrier Reef Protection Measures) and Other Legislation Amendment Act 2019* (the GBR Act) was assented to on 26 September 2019 and is anticipated to commence on 1 December 2019. It was introduced to strengthen the existing Reef protection regulations (discussed above) and to improve the quality of water entering the Great Barrier Reef. The GBR Act is part of the Reef regulations package, which also includes amendments to subordinate legislation, statutory instruments, and guidance material. The Reef regulations package is designed to complement other measures being implemented to improve Reef water quality, such as investment in industry-led best management practice (BMP) programs. It supports a strong agricultural industry by promoting best practices that make good business sense for long-term farming sustainability based on industry expertise.

The Reef regulations package stemmed from the recommendations of the Great Barrier Reef Water Science Taskforce (the Taskforce). The Taskforce was established in May 2015 to provide the Queensland Government with advice on how its ambitious water quality targets could be achieved and the priority areas for investing an additional $90 million over five years.

The Taskforce consisted of experts in science, industry, government and the community and was chaired by the then Queensland Chief Scientist Dr Geoff Garrett AO. It involved on-ground advisers with industry know-how as well as water quality scientists and experts.

The Taskforce reported to the Queensland Government in May 2016 (see **Attachment 3**) and made 10 recommendations, including enhanced communication, increased levels of agricultural extension and innovation, expanded monitoring, financial and other incentives, and staged and targeted regulations. The Taskforce noted that everyone must play their part in reducing the cumulative impact of nutrient and sediment pollution on Reef water quality by reducing and limiting loads from existing activities and new development. To achieve this, it recommended regulation as an important part of the mix of policy instruments, including BMP programs, extension and incentives.

Specifically, the Taskforce recommendations included:

5. Implement staged regulations to reduce water pollution throughout the Reef regions.

The government accepted all 10 recommendations (some in principle) and the Queensland Government (through the Office of the Great Barrier Reef) has been implementing them in partnership with a range of stakeholders and organisations (see **Attachment 4** for the Queensland Government's response to the Taskforce report).

The Reef regulations package strengthens the existing regulatory regime to ensure primary producers in all Reef catchments replace practices that have a high risk of pollution runoff with practices that are known to limit nutrient and sediment run-off, while sustaining farm productivity and profitability.

The legislative changes include:

- enabling objectives for reduced nutrient and sediment contaminant loads to be set for catchment waters flowing into the Great Barrier Reef
- implementing measures to achieve a 'no net decline' standard for Great Barrier Reef water quality from new development from ERAs (including industrial activities)
- enabling minimum practice agricultural standards to be set, targeting nutrient and sediment pollution from key agricultural industries that may affect Reef water quality
- providing producers with an alternative pathway for meeting regulatory requirements through accreditation against recognised BMP programs or a similar program
- requiring advisers who provide advice about how farmers undertake an agricultural ERA including fertilising crops or managing erosion risks to ensure that the advice is not false or misleading.

The minimum practice agricultural standards align with the best available science and take into account local and industry knowledge. They are based on industry-developed practices that are promoted as practices that improve productivity and/or profits for farming businesses. For example, the proposed regulated methodology for nutrient application for sugarcane production is based on CANEGROWERS' Six Easy Steps methodology, which is available on CANEGROWERS' website at http://www.canegrowers.com.au/page/cane-to-coast/nutrient-management/six-easy-steps

Trials of the practices that will be required to be implemented under the regulations for sugarcane production have demonstrated they maintain profitability and productivity. A video of a farmer's experience of the RP20 Burdekin Nitrogen trials using Six East Steps is available at https://www.youtube.com/watch?v=dPoI9zWmc3w&feature=youtu.be

Beyond this farmer's experience, there is substantial evidence of the benefits of these improved practices, including economic assessments of the various practices undertaken by agricultural economists within the Queensland Department of Agriculture and Fisheries, CSIRO and universities. These are summarised in the Scientific Consensus Statement (chapter 4) (see **Attachment 1**).

Industry and peak bodies were supportive of these practices when they were the focus of incentive programs and were part of the joint bid for government funding for uptake of these practices. However, despite significant government and industry investment, particularly in agriculture, voluntary approaches have failed to facilitate sufficient uptake of improved practices[i] and, at the present trajectory, the Reef water quality targets will not be met. The recently released 2017 and 2018 Reef Water Quality Report Card confirms that, in spite of efforts to date, poor water quality continues to threaten the Reef. Establishing a regulatory regime will ensure rapid uptake of improved agricultural practices by producers who are not accredited under a BMP program or partnering with other programs. This approach is considered necessary to achieve the rapid and transformational change at a broad scale advocated by the Taskforce to achieve the Reef water quality targets and improved Reef outcomes.

Farmers engaged with BMP programs that are recognised under the legislation will be deemed to have met the minimum practice agricultural standards. In addition, farmers engaged with other government programs, such as the Grazing Resilience and Sustainable Solutions Program will be a low priority for compliance under the new Reef regulations package.

Many producers will already be doing everything necessary to meet the minimum practice agricultural standards through good farming practices. The Reef regulations package is aimed at shifting those producers who are operating with superseded practices to come up to a regulated minimum standard for their commodity. This will allow incentive schemes to focus on producers who are going beyond minimum practice agricultural standards to best practice (or improved practice), thereby rewarding producers who are operating above accepted industry standards.

This is achieved through setting standard conditions, which must be complied with, for farmers in Reef catchments. The standard conditions for the approved minimum practice agricultural standards (for sugarcane cultivation, banana cultivation and beef cattle grazing) are outcome-focussed, and require producers to calculate and manage nutrient application (for sugarcane cultivation and banana cultivation) and to manage erosion and sediment control on their property (for all). For example, graziers are required to take positive measures to manage erosion and sediment control to improve land that is in poor condition and to document the measures taken. The standard sets the outcome to be met, but allows farmers to determine the best way to achieve that outcome at the property-level.

The commencement of the minimum practice agricultural standards is being staged between 2019 and 2022, according to water quality risk.

The costs and benefits of the Reef regulations package were analysed as part of the Queensland Government's Regulatory Impact Statement framework (discussed at (e) below).

[i] For example, the 2017 and 2018 Reef Water Quality Report Card reported that 8% of sugarcane growers were accredited through the Smartcane Best Management Practice program up to June 2018. This is the longest running BMP program in Queensland that relates to the regulated communities of sugarcane cultivation, banana cultivation and beef cattle grazing.

The Reef regulations package has been the subject of extensive consultation. The Taskforce consulted on the recommendations of its report before they were finalised and released in May 2016. Since that time, the Department of Environment and Science (the department) has consulted widely on the Reef regulations package, including:

- Public consultation on the Regulatory Impact Statements (discussed in detail in section (e) below)
- Over 60 consultation meetings with peak agricultural bodies, key conservation groups, peak representatives from industrial sectors and Natural Resource Management bodies.

In addition, during examination of the Bill, the Innovation, Tourism Development and Environment Parliamentary Committee (the Committee) undertook further public consultation, visited cane, grazing and other farms in Townsville, Mackay and Bundaberg, and reviewed more than 1800 submissions. The Committee outlined its considerations in its report, which is available on the Queensland Parliament website at https://www.parliament.qld.gov.au/work-of-committees/committees/ITDEC/inquiries/current-inquiries/16EnvProGBRPM

Further information about the new Reef regulations package is available on the department's website at https://www.qld.gov.au/environment/agriculture/sustainable-farming/reef/reef-regulations/strengthening-regulations

(e) The wider economic and social impact of proposed regulations to restrict farm practices

The Reef is highly valued by the national and international community, and is critical to the cultural, economic and social wellbeing of the more than one million people who live in its catchment, and to Australians generally. A 2017 Deloitte Access Economics report, 'At what price? The economic, social and icon value of the Great Barrier Reef'[19], assessed the Reef's total asset value as $56 billion. The World Heritage site added $3.9 billion to the Queensland economy in 2015-16 and supported more than 33,000 full-time Queensland jobs. Nationally, it contributes over $6 billion to the economy and supports 64,000 jobs.

The impacts of the Reef regulations package was examined through the release of a Consultation Regulatory Impact Statement (RIS) and a Decision RIS (see **Attachments 5 and 6**). The Consultation RIS was released for public consultation for 11 weeks in total. It was initially released between 7 September 2017 and 3 November 2017, and again between 22 January 2018 and 19 February 2018, due to the 2017 Queensland State election interrupting the original consultation period. The Decision RIS was published on the department's website in February 2019, and contained a summary of the submissions received on the Consultation RIS and the department's response to those submissions.

The Consultation RIS and Decision RIS used the best information that was available at the time about the potential costs and benefits of the regulatory proposals. It evaluated the existing Reef protection measures (see discussion under (c) above), and the proposed Reef protection package (see discussion under (d) above) as two separate options. It also included the proposed minimum practice agricultural standards for sugarcane cultivation, banana cultivation and cattle grazing.

The Decision RIS assessed the costs and benefits of the final regulatory package, showing a total financial benefit of $286 million, mostly from improved farm profitability and a total cost of $610 million to government, agricultural producers, and sewage treatment plant operators, over ten years.

Additionally, the regulations were (and still are) anticipated to result in significant reductions in pollutant loads. Using the latest figures available from the government's Paddock to Reef program modelling, widespread compliance with the practice standards is estimated to achieve 80 per cent of the 2025 target for reducing nutrient loads. The estimated sediment load reduction could deliver just over 16% of the 2025 sediment target.

The benefits of the water quality improvements could not be monetised for comparison to the costs. However, estimated load reductions are significant enough to expect to see improved ecosystem health over time, which will also contribute to the resilience of the Reef to recover from other impacts, such as coral bleaching. This in turn helps to protect the valuable commercial and non-commercial benefits derived from the Reef and provides confidence that the proposed regulations were a worthwhile investment to protect these values.

While the RIS outlined profitability gains from improved agricultural practices, it recognised that not all producers would make these profits. Financial outcomes will vary based on climate, markets, and differences between business structures, biophysical characteristics and other adoption barriers that may include accessing the necessary capital to help facilitate initiating change.

The total capital cost for implementation of the sugarcane standards in all reef catchments was estimated in the RIS at $142 million, with ongoing costs of $14 million a year to implement finer scale nutrient management planning that tailors fertiliser rates to crop needs at the farm scale. However, these are expected to be more than offset by increased profits estimated at $63 million per year.
To limit the impact of grazing minimum standards on graziers with land in good to fair condition (i.e. A or B class land condition), an outcomes based approach has been taken which requires this land condition to be maintained and action to be taken to improve land in C or D class condition (poor to very poor). The best available information from the RIS provides an indication of the total costs to the grazing industry for more prescriptive standards for favourable land condition outcomes. Based on this information, the estimated costs to the grazing sector are $148 million, with ongoing costs estimated at $32.5 million a year.

The standards for graziers promote matching stocking rates to available forage, and maintaining land condition for pasture and business resilience. The costing assumes that this may result in lower stocking rates for improved land condition.

Various economic assessments suggest that long-term profitability and sustainability for grazing enterprises is maximised by low to moderate stocking rates across most land types. This is due to the subsequent higher pasture production, higher market premiums for animals in better condition, and lower costs of production. Sediment run-off is also reduced where lower stocking rates increases groundcover.

While these benefits are likely to be realised outside of the 10-year timeframe for the RIS, it is still likely that landholders will benefit and face lower ongoing costs, in the medium-long term. Graziers whose land is in good condition with high levels of ground cover prior to the commencement of the wet season should not be significantly impacted by the regulatory requirements.

Although there is a great variation in physical attributes and business characteristics between different properties in Queensland, the overall conclusion of a trial run by the Department of Agriculture and Fisheries (the Wambiana grazing trial) that moderate stocking rates are likely to be more profitable and sustainable should hold true for similar enterprises.

There had been less economic analysis carried out on best management practices for bananas than for the sugarcane and grazing industries, and robust estimates of the costs of the practices for an average property did not exist at the time the RIS was released. Many of the proposed best management practices for banana farming concern appropriate fertiliser application rates and supporting practices (such as soil and leaf testing, calibration of fertiliser equipment and application to beds and not inter-rows). A recent assessment by the Department of Agriculture and Fisheries showed that in general best management practice adoption improved farm profitability. This is consistent with other research, which also found that many practices could be expected to generate a positive financial outcome, though the evidence is less clear for practices around sediment control. Additional costs associated with record keeping, auditing, and soil and leaf testing have been calculated for the Decision RIS are estimated at $719,000 a year for all banana growers.

The minimum practice agricultural standards have generally been found to improve productivity and/or profits and increase the resilience of properties to other factors such as drought. This will have flow on positive effects for local regional communities and reduce the need for drought assistance from government.

As noted by the Taskforce (see recommendation 5), using regulatory tools to bring operators who are below minimum practice agricultural standards to meet the minimum standards is cheaper and provides better value for money for taxpayers than using government funded incentives which should be aimed at driving further industry best practice and innovative farm management (i.e. not rewarding those who are not yet operating at the minimum standard).

Since the Consultation RIS and Decision RIS were released, the Queensland Government made a number of changes to the Reef regulations package in response to industry feedback. These changes are anticipated to further reduce the potential for the new Reef regulations package to have a negative impact on producers and include:

- A commitment to not turn on the minimum practice agricultural standards in the Cape York region within three years as planned as the catchment is already meeting its Reef 2050 water quality targets.
- A commitment to no substantial changes to the minimum practice agricultural standards for sugarcane cultivation, banana cultivation and beef cattle grazing for five years to give producers certainty going forward.
- Increasing the thresholds for the requirement to obtain a standard environmental authority for new commercial cropping and horticulture in the Great Barrier Reef catchment to two hectares (from two hectares).
- Increasing the threshold for a site-specific environmental authority for a new commercial cropping and horticultural activity to 100 hectares (from 30 hectares), or no threshold for banana growers who are relocating due to TR4 Panama disease. This means that a larger number of farmers can take advantage of the simplified application process of a standard environmental authority.

(f) Related matters

Responses to Questioning Reef claims, an editorial by Peter Ridd are documented in **Attachment 7**.

Attachments

Attachment 1 – 2017 Scientific Consensus Statement

Attachment 2 – Reef Independent Expert Panel advice to Ministers

Attachment 3 – Great Barrier Reef Water Science Taskforce report

Attachment 4 – Queensland Government response to Great Barrier Reef Water Science Taskforce report

Attachment 5 – Consultation Regulatory Impact Statement

Attachment 6 – Decision Regulatory Impact Statement

Attachment 7 – Response to Questioning reef claims raised by Peter Ridd

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