Acting Committee Secretary,
Innovation, Tourism, Development and Environment Committee.
Parliament House
George Street
Brisbane. 4000.

Dear Sir,

I wish to raise the following issues for the consideration of the Committee in regard to the Reef Regulations Bill.
The following are extracts from the Reef Scientific Consensus Statement 2017 (https://www.reefplan.qld.gov.au/about/reef-science/scientific-consensus-statement/).

2.1.2 How does the source of sediments vary over time and space

Bainbridge et al. (2012) determined that it is only the fine (<16um) and organic-rich suspended sediment that is transported long distances in riverine flood plumes, with coarser fractions being deposited closer to the river mouth. This fine material also influences water clarity on the inshore and mid-shelf of the Great Barrier Reef (Lewis et al., 2015a; Lewis et al., 2015b; Lewis et al., 2014a). Recent research using paired optical and radiocarbon dating on sediment cores from key depositional areas off the Burdekin River showed that most fine sediment is held within 20 km of the river mouth and is not transported as far offshore as previously thought (Lewis et al., 2014a). This finding has been subsequently supported by 3D modelling of river discharges, sediment transport and deposition (Delandmeter et al., 2015). A re-examination of sediment budgets from the Fitzroy River and adjacent Keppel Bay (Brooke et al., 2006) also indicate that the majority of sediment delivered from the Fitzroy River is largely retained near the river mouth (Lewis et al., 2015b).

2.1.4 What are the drivers and land uses delivering the anthropogenic sediment loss.

After identifying the major geographical sources of sediment, and the erosion process contributing that sediment, it is useful to identify the causes or drivers of the erosion. Factors such as geology and soil type, landscape gradient and climate are all important drivers of erosion. These factors are, however, generally not considered to be within our immediate control. The main contemporary factors that govern sediment erosion that are within our control are land use and land condition. Importantly, however, it is largely the landscape and climatic factors that govern sediment delivery.

4. Research gaps and areas of further research

The key knowledge gaps related to each of the pollutant sources were summarised in Table 20 of the Reef 2017 Scientific Consensus Statement. This section provides some more context on the key opportunities, research gaps and priority needs. Limitations and associated opportunities.

•There are good (up to nine-year) records of measured pollutant data at up to 32 sites across the Great Barrier Reef. It would be timely to undertake a focused analysis and comparison of the measured and modelled data at multiple sites within each catchment. This would provide:-
(i) an understanding of where the models and measurements are working well and where they could be improved (e.g. Alvarez-Romero et al., 2014; Newham et al., 2003; Wilkinson et al., 2014b),
(ii) an insight into how the models and measurements vary at different scales (subcatchment vs. end of system) (e.g. Wilkinson, 2008),
(iii) evaluate if there are differences between modelled and measured datasets for different pollutants or erosion processes (e.g. Bartley et al., 2007; Hughes and Croke, 2011),
(iv) an evaluation of the potential influence of climate change.
•There is relatively low confidence in the pre-development load estimates for sediments and particulate nutrients due to the scarcity of measured data to validate models. The lack of data makes the setting of water quality targets based on anthropogenic loads problematic. Various techniques (e.g. isotopes and dating) are now available that would provide important insights into pre-development conditions that should be applied more broadly.
• Given our improved understanding of the importance of particle size and the nutrient status of sediments in terms of delivery and ecological risk to the Great Barrier Reef, an increased effort should be given to measuring and reporting on particle size and other chemical metrics within the loads monitoring program.

Research gaps
• Processes such as the 'Birch effect' (Jarvis et al., 2007; Xiang et al., 2008), which relates soil nutrient release to soil wetting and drying cycles, should be investigated.
• A more thorough consideration of the impact of roads and fences on sediment delivery should be undertaken.
• There is a need to initiate (i) targeted sampling programs, and (ii) open source data management for existing data on priority emerging pollutants. Priority needs
• There is an urgent need to explicitly quantify certainty and confidence in the load modelling and monitoring data. Error or confidence is currently accounted for in the flow modelling but not the load modelling. Techniques are available for evaluating models (e.g. Daggupati et al., 2015; Moriasi et al., 2015; Saraswat et al., 2015) as well as for quantifying uncertainty by blending modelling and monitoring data (as discussed in Section 2.4.2).
• We now have considerable data to identify that sub-surface erosion is a dominant source of fine sediment and particulate nutrients; however, further work is needed to determine which type of sub-surface erosion dominates erosion sources in key areas (e.g. alluvial gully walls, hillslope gully walls, scalds, rills, cane drains or streambank erosion).
• The influence of ground cover (amount, biomass, composition and distribution) on subcatchment- and catchment-scale run-off, sediment and nutrient delivery is not fully understood.
Sources of pollutants to the Great Barrier Reef 76 Scientific Consensus Statement 2017—Chapter 2 is important for understanding the influence of hillslope hydrology on riverbank and gully erosion. Continued work using the most recent, higher resolution, remotely sensed ground cover should be a priority.

• A key gap in our understanding is knowledge of the best place for returning riparian vegetation in the landscape and the associated cost effectiveness of such approaches. • Recent research has highlighted the need for a better understanding of the role of land use, soil type and erosion processes (including gully erosion dynamics) in controlling the delivery and bioavailability of nutrients (nitrogen and phosphorus).

Given this new knowledge, there is an urgent need to develop whole-of-catchment/basin nutrient budgets (using measured field data) that compare all bioavailable nutrient sources and include areas such as estuaries, mud flats, freshwater lagoons and a range of land uses (e.g. cropping and grazing).

Investigating the bioavailability of nutrients from individual processes or land units (e.g. alluvial gullies) is useful, but this needs to be put into a broader context, and all sources need to be evaluated at the landscape scale.

• The role of long-term natural climate fluctuation on end-of-catchment sediment and nutrient fluxes is not well understood; this knowledge is essential for developing achievable water quality targets.

Section 2.1.2 indicates the latest research on sediment distribution will not reach beyond 20km of the river mouth. This would indicate to me that almost all coral reefs would not be impacted by sediments carried to sea by coastal river systems.

Section 2.1.4. states that “it is largely the landscape and climatic conditions that govern sediment delivery” conditions beyond the control of the landholder.

Section 4 repeatedly indicates that considerably more research is necessary to achieve a full understanding of the whole sediment/nutrient load.

Given the information listed above, I fail to see how a responsible democratic government can implement the proposed legislation with the inherent draconian penalties given the limited scientific data available.

We must remember that the available scientific modelling is largely based on water sampling data that has only been collected over a two to nine year period. An issue this complex surely demands a longer and more thorough research period.