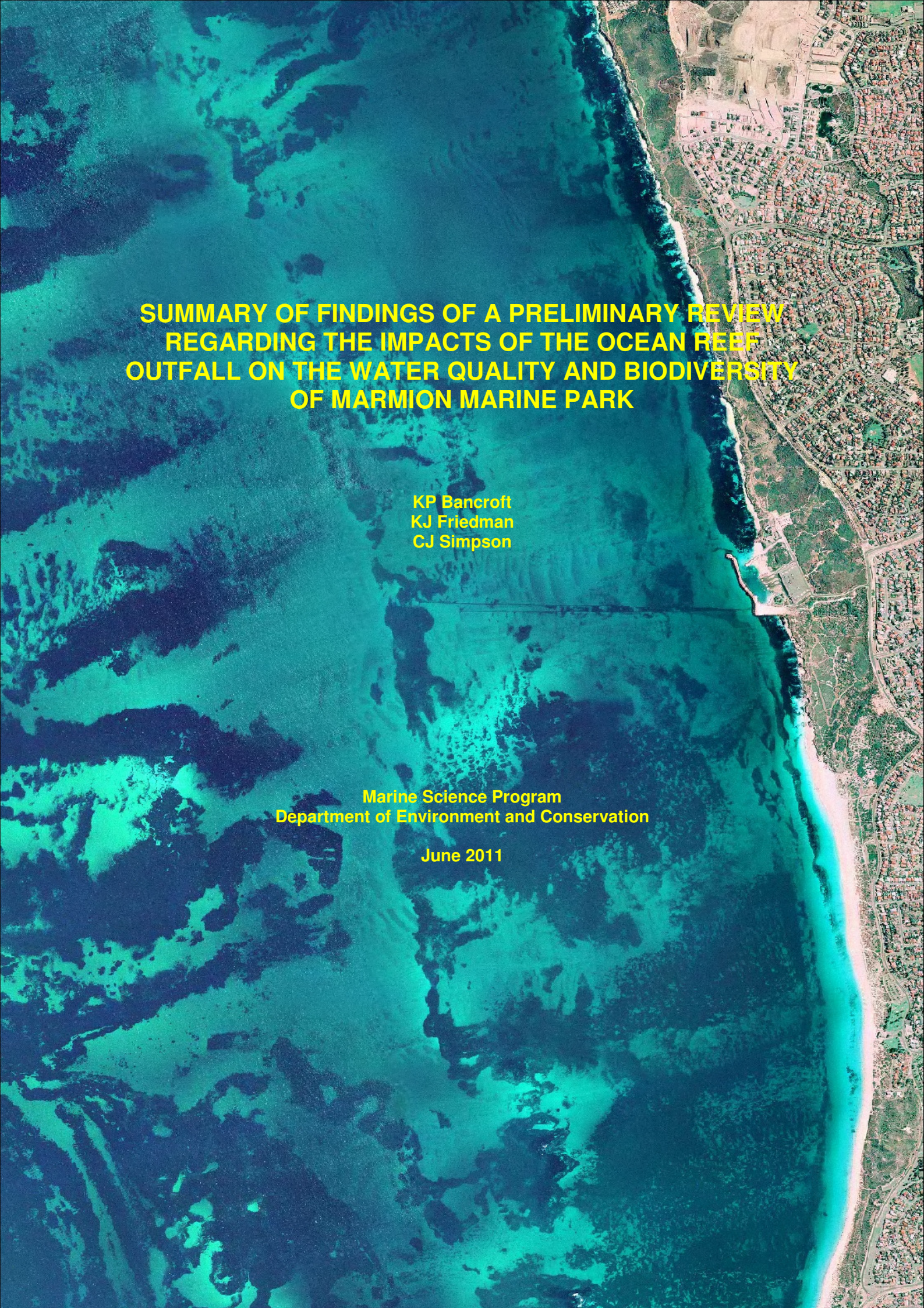

SUMMARY OF FINDINGS OF A PRELIMINARY REVIEW REGARDING THE IMPACTS OF THE OCEAN REEF OUTFALL ON THE WATER QUALITY AND BIODIVERSITY OF MARMION MARINE PARK

KP Bancroft
KJ Friedman
CJ Simpson

Marine Science Program
Department of Environment and Conservation

June 2011

SUMMARY OF FINDINGS OF A PRELIMINARY REVIEW REGARDING THE IMPACTS OF THE OCEAN REEF OUTFALL ON THE WATER QUALITY AND BIODIVERSITY OF MARMION MARINE PARK

KP Bancroft
KJ Friedman
CJ Simpson

Marine Science Program
Department of Environment and Conservation

June 2011

Suggested citation

Bancroft KP, Friedman KJ, Simpson CJ (2011) *Summary of findings of a preliminary review regarding the impacts of the Ocean Reef Outfall on the water quality and biodiversity of Marmion Marine Park*. Marine Science Program, Science Division, Department of Environment and Conservation, Perth, Western Australia. 8 p.

SUMMARY OF FINDINGS OF A PRELIMINARY REVIEW REGARDING THE IMPACTS OF THE OCEAN REEF OUTFALL ON THE MARMION MARINE PARK

Introduction

The MPRA are currently undergoing a review of the Marmion Marine Park (MMP) management plan. Part of this review is to consider the impacts of the Western Australian Water Corporation's (WC) domestic treated wastewater discharge into the MMP. The original ocean outfall was commissioned in 1978 and a second outfall was commissioned in 1992. Currently, these outfalls discharge approximately 130 ML day^{-1} of treated (advanced secondary treatment) wastewater into MMP every day. The Ministerial conditions of approval for these outfalls, require the WC to undertake extensive monitoring of the water quality (WQ), sediment quality and biota of MMP. A preliminary review of the readily available information from this monitoring program by DEC's Marine Science Program was undertaken, where possible, to:

(i) assess the spatial scale and nature of the impacts of the discharge on the WQ of the MMP;

(ii) assess the spatial scale and nature of the impacts of the discharge on the biota of the MMP; and

(iii) assess whether the current WC monitoring program is 'fit for purpose' to answer the above questions.

The preliminary findings are outlined below.

Findings

- The total load of treated wastewater from the Ocean Reef outfalls into Marmion Marine Park (MMP) in 2010 was ~ 47,432 ML or ~130 ML day^{-1} (Figure 1).
- The load of total nitrogen from the Ocean Reef outfalls into MMP in 2010 was ~862 tonnes or ~2.4 tonnes day^{-1} (Figure 1).
- The load of total nitrogen is now similar to the period between 1999 and 2003, that is, before treatment was upgraded to advanced secondary in 2003/04 (Figure 1).
- Total nitrogen loads to MMP are likely to continue increasing.
- Available water quality data indicates that summer means of dissolved inorganic nitrogen (DIN) are above reference site levels up to ~1 km north of the outfalls (Figure 2).
- Available water quality data indicates that summer means of chlorophyll *a* (CHLA) up to ~8 km north of the outfalls are ~2x above the level of the reference site and 3.5 x the level in the lagoon waters of the Jurien Bay Marine Park (Figure 2 & Figure 3).
- The reference sites in Marmion Marine Park for DIN and CHLA are ~20% and 2x higher than comparable sites in the Jurien Bay Marine Park (Figure 3).
- The above comparison with Jurien Bay Marine Park and the location of the southern reference site 4 km south of the outfalls (Figure 4) in relation to the spatial scales of the above impacts suggest that the reference site may at times be within the zone of influence of the outfalls.
- Using the data available to this review it is not possible to determine the impacts of the outfalls on the seagrass, macroalgae and invertebrate communities.
- A visual assessment of the ortho-images, suggest that the structural complexity of benthic communities appears to be lower in the area immediately to the north of the outfalls (Figure 4).
- Available data suggest faecal bacterial concentrations above the National Health and Medical Research Council (NHMRC) guidelines are largely confined to an area within ~500m of the outfalls (Figure 5).

- Data on faecal bacterial concentrations along the beaches of MMP have not been assessed in this review.
- Data on heavy metals, pesticides and other possible contaminants (e.g. endocrine disruptors) have not been assessed in this review.

CONCLUSIONS:

A preliminary assessment of the potential impacts of the Ocean Reef Outfalls into MMP has found that the significant volumes of treated wastewater (~130ML day^{-1}) discharged into the Park may be having measurable effects on water quality of up to at least 8.4 km from the outfalls. Historical and current impacts on the benthic communities are unclear from available data and need further explanation from the Water Corporation.

The locations of water quality 'reference' sites and benthic community 'control' sites suggest monitoring results may be confounded by these sites being within the zone of influence of the outfall discharge.

The data on faecal bacterial contamination indicate that an area of about 1 km^2, in the immediate vicinity of the outfall diffusers in MMP, is potentially unsafe for swimming.

RECOMMENDATION:

The recommendations are made in relation to the following objectives:

(i) assess the spatial scale and nature of the impacts of the discharge on the WQ of the MMP;

(ii) assess the spatial scale and nature of the impacts of the discharge on the biota of the MMP; and

(iii) assess whether the current WC monitoring program is 'fit for purpose' to answer the above questions.

1. That the Water Corporation be requested to provide a presentation to the MPRA/DEC regarding the design, methods and the results, of their long-term monitoring program assessing the environmental impact of these outfalls on the water quality and biodiversity of the Marmion Marine Park.

2. Following the above presentation, that the Water Corporation be requested to provide a written response to questions (examples of questions attached) from the MPRA/DEC regarding the design, methods and the results, of their long-term monitoring program assessing the environmental impact of these outfalls on the water quality and biodiversity of the Marmion Marine Park.

Appendices

EXAMPLE QUESTIONS:

1. What are the major constituents and loads in the wastewater?

2. What are the historical, current and projected treated wastewater discharge level and loads to the waters of Marmion Marine Park?

3. Why have these discharges and loads changed through time?

4. What is the spatial and temporal extent of measurable WQ parameters (e.g. chlorophyll a and dissolved inorganic nitrogen concentrations and faecal coliforms)?

5. How do these WQ levels compare with 'background' levels?

6. How and when (e.g. daily, monthly, annually) have/are these parameters measured?

7. Have spatial and temporal changes occurred in the benthic communities (e.g. seagrass, macroalgae, invertebrates)?

8. Are the WQ 'reference' and the 'biota' within the zone of influence of the outfall discharge?

9. Was the reduced structural complexity in the benthic communities to the north of the outfall (see Figure 4) present prior to the commissioning of the ocean outfall?

10. What is the level of toxic contamination of sediments?

11. Are the beaches in the Marmion Marine Park always safe for swimming?

12. What are the protocols for sampling that will be employed for on-going long-term monitoring by the Water Corporation, and at what times annually can DEC review data outputs from this monitoring?
13. In the absence of environmental target, what benchmarks will the Water Corporation use to assess whether the environmental impacts of the discharge are acceptable or not?

FIGURES:

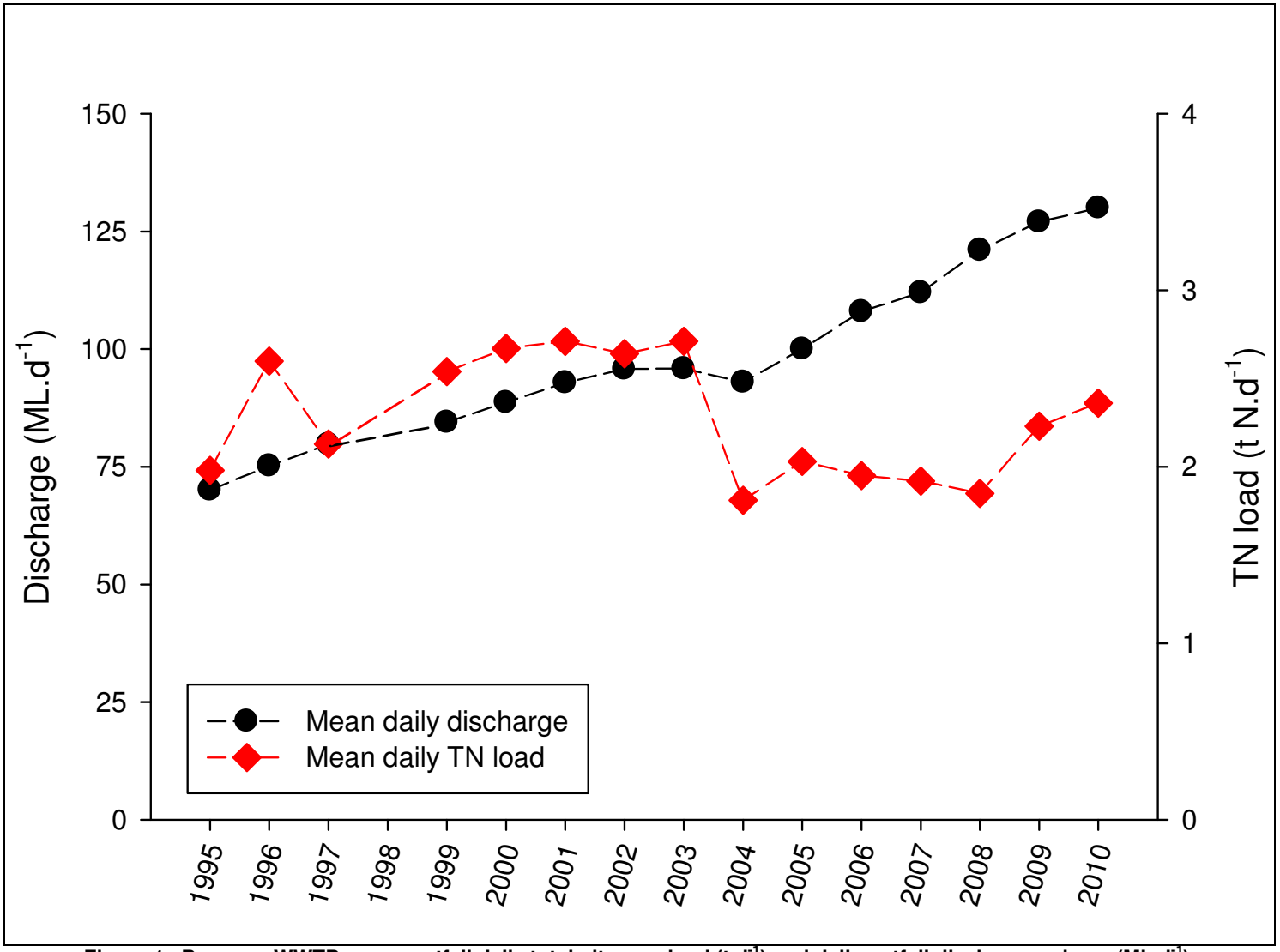

Figure 1. Beenyup WWTP ocean outfall daily total nitrogen load ($t.d^{-1}$) and daily outfall discharge volume ($ML.d^{-1}$).

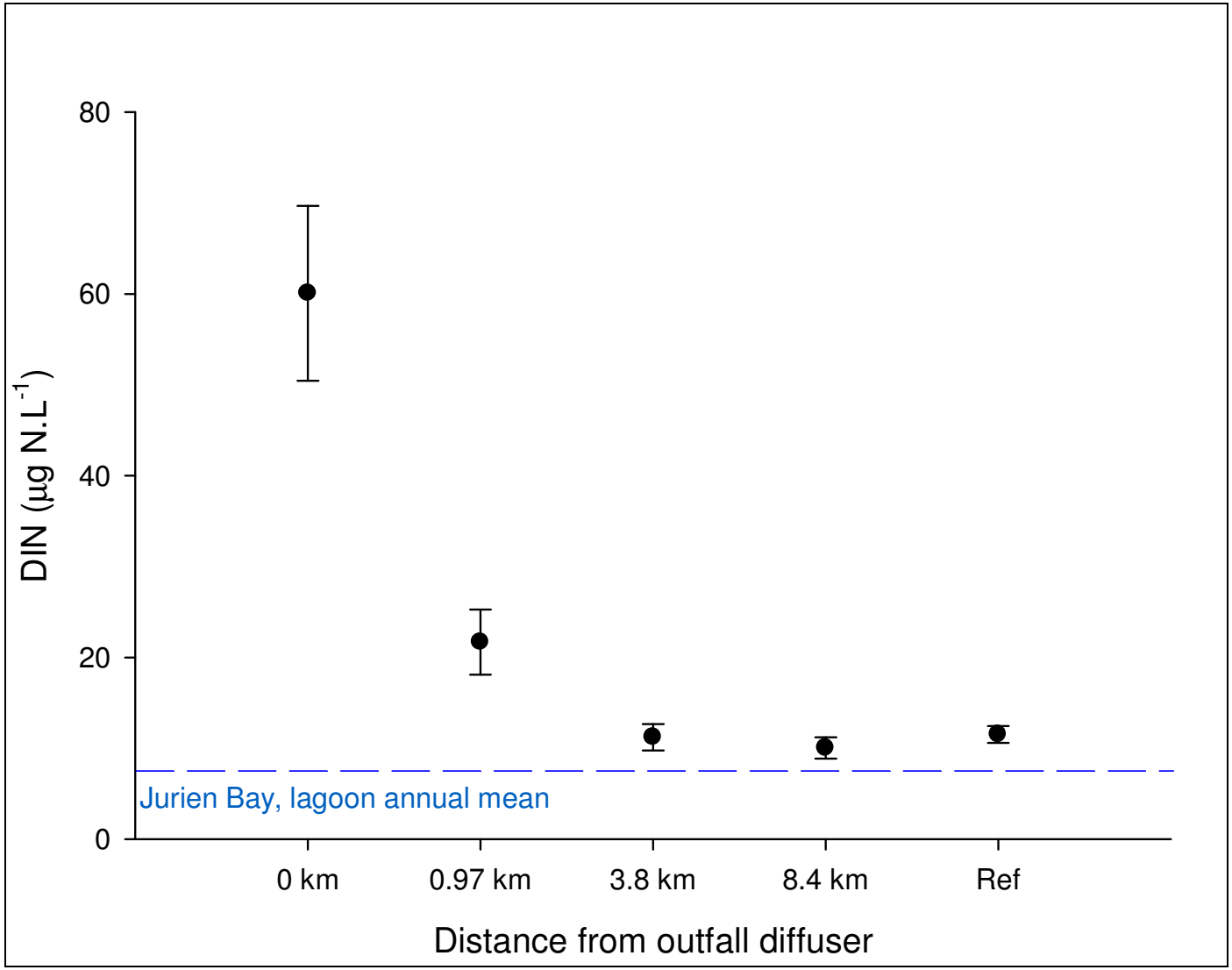

Figure 2. Mean of annual summer means (1996 to 2009) of DIN concentrations at sites of varying distances from the Beenyup WWTP ocean outfall (blue dashed line is the annual mean for lagoonal Jurien Bay).

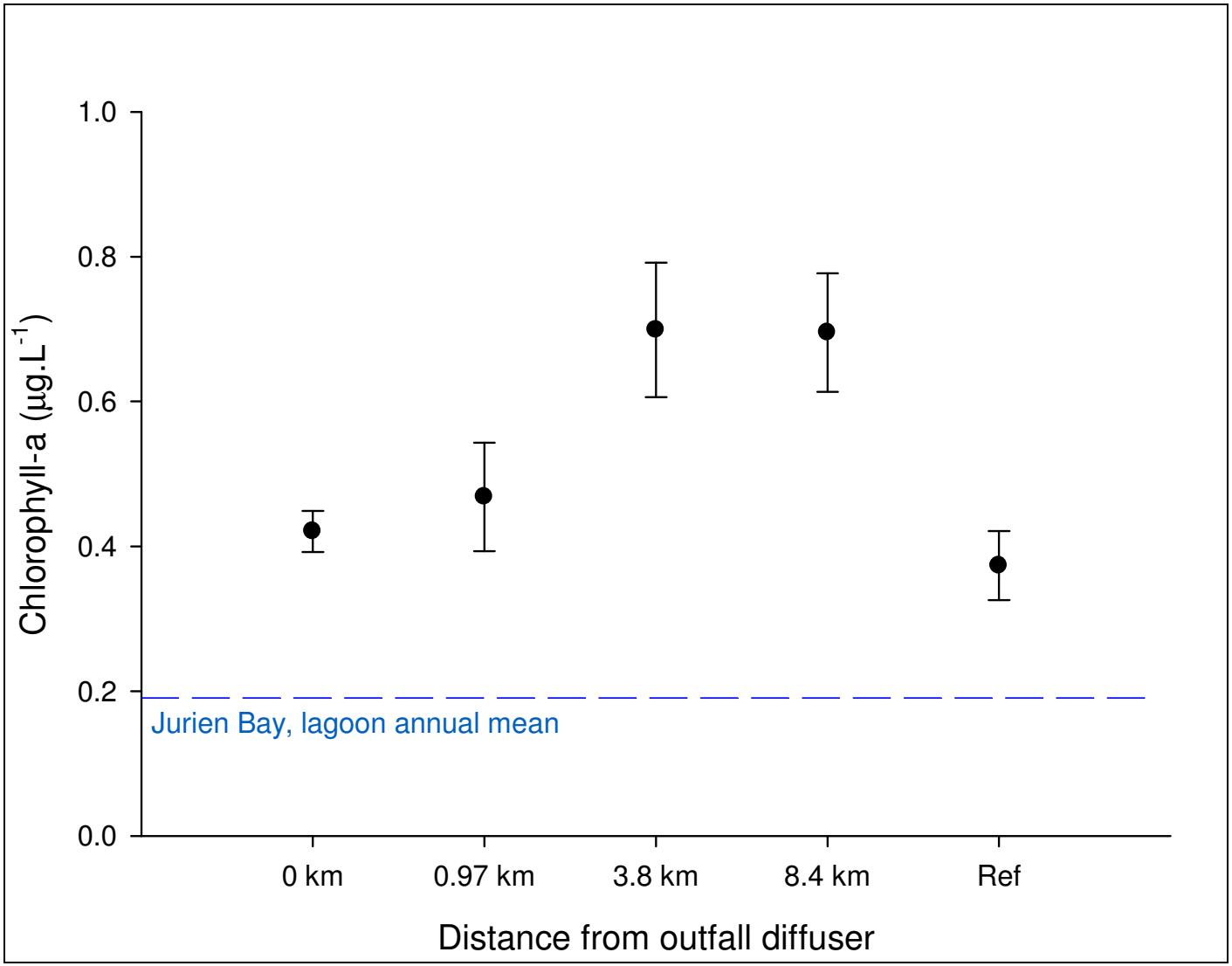

Figure 3. Mean of annual summer means (1996 to 2009) of chlorophyll-a concentrations at sites of varying distances from the Beenyup WWTP ocean outfall (blue dashed line is the annual mean for lagoonal Jurien Bay).

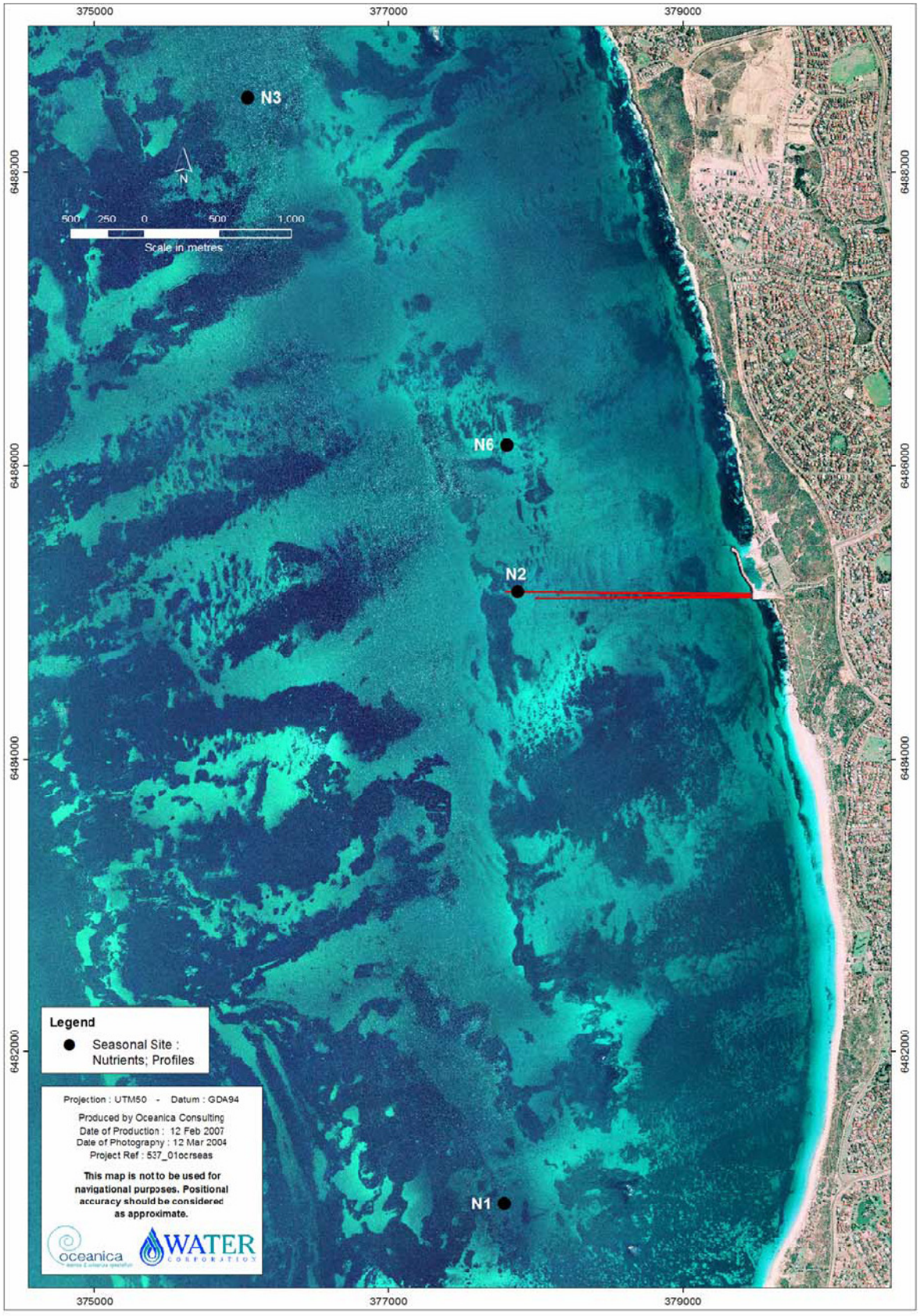

Figure 4: Beenyup WWTP ocean outfall (red) highlighting the water quality sampling sites (black points) (*courtesy of the Water Corporation and Oceanica Consulting*).

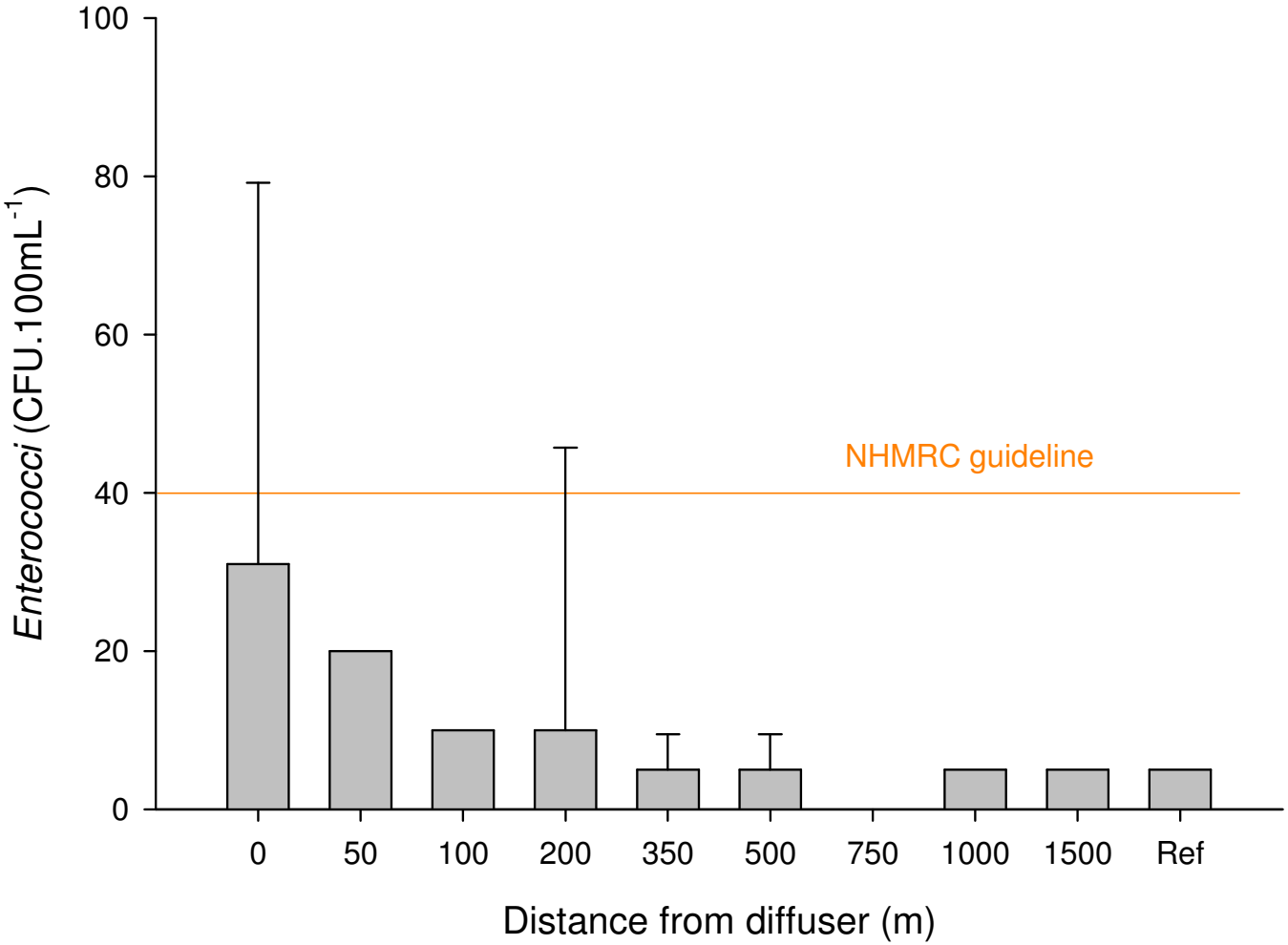

Figure 5. Median and 95 percentiles for *Enterococci* counts at sites of varying distance from the outfall Beenyup WWTP ocean outfall for the 2008-2011 period (NHMRC guideline in orange).