Response to Paul Lavery's Review of the Sampling and Analysis Plan and Benthic Primary Producer Habitat Report (SKM 2007)

This document provides a response to the peer review conducted by Professor Paul Lavery on the Sampling and Analysis Plan and Benthic Primary Producer Habitat Report prepared by SKM.

Sediment Quality Investigations

The peer review assessed and provided comment on various methods used to conduct investigations documented in the Sampling and Analysis Plan (SAP). This includes the methods used to evaluate bioavailability, infauna assessment and epifauna assessment. The SAP containing the methods was submitted to the Department of the Environment and Heritage (DEH) on May 25th 2005 and approved for use on November 14th 2005. A Supplemental SAP was submitted to address further sampling and analysis on February 7th 2006 and was approved on May 3, 2006. The SAPBPPH report summarised the findings of the SAP and Supplemental SAP. This indicates that the methods were agreed by the DEH (now DEWHA) and as such should not be the subject of review. Whilst there is more than on way to do an investigation, the methods used are in agreement with the guidelines and any deviation has been agreed with DEWHA as well as DEC and therefore; do not require any further assessment. It is acknowledged that further tests are available, but as demonstrated through the process and approval by the appropriate regulatory authority the sediments and risks from them have been adequately characterised.

The reviewer comments that the validity of the assumptions about local hydrodynamics and flushing can not be confirmed from the data presented in the report. It is acknowledged that the review in isolation (i.e. without the combination of the modelling report) would have been a difficult task. However, the results of the modelling did not form part of this review. The combination of the modelling and the report being reviewed were fed into the PER and formed the basis of the impact assessment. Both, the peer review scope and Peer Reviewer, Professor Lavery were requested and nominated by the EPASU, respectively.

Biological Assessments

Under section 3.1 the reviewer indicated that they were unable to confirm the quality of the photography used but suggests that the methods are standard and appear appropriate. The imagery is a satellite image, rather than a series of photographs stitched together with all the associated additional errors associated with photography. Therefore, the satellite imagery is far-superior to an aerial photography approach. The quality of the satellite photograph is given in section 5.11.2 of the report with a pixel size of 0.6-0.7 metres and no cloud cover. The image is provided in the report in Figure 27. The error associated with the mapping is difficult to quantify but essentially it would be related to detection of seagrass in the image of ±3 m and rectification error of ±10 m.

Qualitative assessments were used to assess biological communities of the reef and for the assessment of the disposal areas. The reviewer notes that the surveys will not provide adequate baseline data for any assessment of impact. It is acknowledged and clearly outlined in the report that the assessment of these factors was qualitative and fit for purpose in-line with guidance Statement 29, as the proposal will not impact on these communities. The assessment of these factors was used to contextualise the adjacent environments in a transparent manner framed in a way that both a scientific and lay person could understand (the information and qualitative assessments were included in the PER for this reason). Monitoring is subject to the implementation of a regulatory approved Dredging and Land Reclamation Management Plan (DLRMP). Baseline and performance monitoring do not form part of the SAP, however; the comments are acknowledged and the DLRMP is well developed and has already been through several iterations through the EPASU.

Impact to Benthic Primary producer Habitat
Minimum Light Requirements

The peer review details that recent data suggests that the minimum light requirement value of 8% could be at the lower end of the possible range when correcting for epihphyte cover on the leaves. The *Posidonia sinuosa* and *Posidonia coriacea* under consideration had a very low epiphyte load in King George Sound and thus the minimum light requirement value of 8.5% and not 8% was chosen. The epiphyte load has been discussed with a local seagrass expert and we do not believe that the seagrasses in King George Sound have a significant epiphyte load worthy of altering the MLR above the agreed 8.5% with DEC. A higher MLR was used for Princess Royal Harbour of 10% for the water depths of <5 m in recognition of the *Posidonia australis* and their generally moderate epiphyte load.

The threshold light level for permanent loss of seagrass was set at 1%. Investigations undertaken in Albany by Gordon *et al*. indicate that 1% of incident light for a similar period of time did not extinguish *Posidonia* with heavy epiphyte loads (at that time) in Princess Royal Harbour thus zero light was chosen. It does not appear appropriate or necessary to re-run the modelling as nutrient concentrations from the regulatory approved Sampling and Analysis Plan were found to be below the guidelines before they reached the seagrass meadows.

Predicted Distributions of TSS

The reviewer states that it would be valuable to confirm the appropriateness of the DRDGE3D model and the particle tracking model used in the EIA with a suitably qualified physical oceanographer, and to confirm that the relationship of TSS suspension and transport has been validated for the types of sediments present in the dredge area. The comments are acknowledged and are beyond the scope of the review. However, model validation has been carried out using sediments from the proposed dredge area and appropriate peer reviews have been completed.

Relationship between TSS and LAC

The reviewer correctly notes that the ambient LAC and TSS were determined from water quality monitoring but comments that they were based on a limited period in July to September 2006. Sampling and analysis also took place in April and May as indicated in Section 5.2.

It was questioned by the reviewer whether the dredging technique will cut or in some other way change the nature of sediment particles. The material to be dredged is predominantly silica sand and the particle size distribution will not be affected by the dredging process. The difference of behaviour of the particles in marine water rather than the fresh water used in the testing is unlikely given the significant overwhelming effect of TSS generated by dredging on the ambient conditions. The significance of this for the TSS-LAC relationship does therefore not need to be clarified. However, the sea-water corrections have been made and incorporated into the model and subsequent impact predictions.

The choice of coefficient to estimate LAC from a given TSS was questioned by the reviewer. Pooling of the data used to determine the relationship is appropriate given that the dredge will not be working a given area exclusively but rather it will dredge swaths/cuts/runs from the start of the channel to the end, dispose of the material offshore and then return for another run. Each run will take less than a few hours. Spoil will effectively be collected from all of the sampling locations and as such a pooled number would better represent the relationship of the material being dredged and the effects on the water quality. Treating each sediment sample as a separate regression is also not appropriate statistically. The reason for this is multiple measurements were made from a single sample which would result in pseudo replication. It was appropriate to take the multiple

measurements from each of the samples and combine them to give us a combined regression relationship.

Contribution of background (non dredge) turbidity is accounted for by reducing the threshold values for seagrass loss by the ambient TSS concentration. It is clearly stated at the bottom of Table 43 that threshold includes the subtraction of ambient TSS of 4.52 mg/L indicative of conditions in the region as requested by EPASU. Baseline monitoring thus far, from April to October 2009, indicate that mean TSS across all sites is ~1.2mg/L and thus the ambient TSS has been conservatively set and the actual data to date more closely align with the proponents previous model assumption that was set at 1.96mg/L TSS (ambient).

The reviewer comments that the ambient LAC is likely to include a number of particles which have quite different light absorbing characteristics to those used in the experimental tests, such as phytoplankton with light harvesting pigments. The same TSS-LAC relationship to the background turbidity was applied as the levels of TSS generated by the dredge will overshadow the minimal effect of ambient TSS of LAC. As such the dredge effect which is dominated by sediment particle effects that have been found to be highly correlated with light attenuation will provide the best estimate of effect on light climate and hence impact on seagrasses.

The use of a Light Attenuation value of the Sargasso Sea has probably lead to an over estimate of background TSS. This value was used because the lack of site specific data available was insufficient to demonstrate ambient conditions to the EPASU. The comparison of the existing data sets was also not accepted by the EPASU and subsequently instructed that it should be removed from the report to facilitate acceptance. The use of data from Cockburn Sound was deemed inappropriate due to the markedly different water and sediment quality characteristics of the two areas. The only suitable alternative, until a long term data set is available for King George Sound, is the literature which provided an estimate similar to that found during sampling. Using a literature value that is likely to overestimate the background LAC leads to a lower threshold value and thus a more conservative prediction of impact. As stated previously, the baseline data is well advanced and is currently (October 2009) confirming that the ambient TSS level used was conservative by a factor in excess of 3.

Application of BPPH

The cumulative impact of losses from anchoring devices which produce losses of up to 10-100 m² in some aquaculture farms, the reviewer suggests that it should be possible to include a conservative estimate of these losses in the report. It is acknowledged, that this is possible but in doing so it results in a value which does not alter the assessment of this factor. As an applied example a loss of 100 m² of seagrass from a total of 817.5 ha would be in the order of 0.001%. As the acceptance criteria of loss is 5% this negligible loss does not significantly affect the impact assessment and as such appears entirely appropriate in-line with the guidance.

The predicted losses in Tables 46 and 47 do not specify the BPPH but this is clearly stated in Section 5.11.3. Here it is stated that ”For this project the primary BPPH that will be impacted based on the footprint of dredging, disposal and numerical modelling of TSS levels is seagrass (see Section 5.11.2)”. The calculation of the threshold values is, therefore, based upon light attenuation effects on seagrass correlated to TSS values used in the numerical modelling. Reefs are not considered BPPH by the guidance unless there is dominant coral habitat present and the lack of dominant coral habitat is clearly communicated within the report. Gio Batta and Michaelmas reefs are the closest nearby reefs and do have some macroalgae present but the thresholds used for seagrass are likely to be more sensitive than that which would adversely affect kelp (see Port Phillip Bay Channel Deepening Project). Further, the areas identified are not in the predicted zone of permanent and temporary loss and therefore; will not be influenced by the project.

The review comments, ”that in many cases the potential is to underestimate potential effects, but in other cases the assumptions made have been conservative and may over-estimate the impact on seagrasses. Overall, then, the issues cumulatively reduce confidence in the outputs”. It is understandable that the reviewer has made such assumptions based on the very narrow scope of the review being sought; that is, only this report and not the modelling report in unison. The reviewers comments and uncertainty were largely based around evidence and answers found elsewhere (mainly in the modelling report – Technical Appendix 16.1) and the outcomes and confidence in the findings in this report are sound. Since the issues raised by the reviewer are not applicable to this report the confidence in the outputs appears to be no longer in question.