	Biological Assessment Phytoplankton Results
	Executive Summary

The purpose of the shore based trials carried out at the University of Newcastle was to carry out a series of experiments using a standard test sea water containing a representative mix of phytoplankton and zooplankton. These experiments were designed to assess the biological efficiency of the different treatment methods.

Phytoplankton

The results showed that there was great natural variability of the phytoplankton cell numbers within the control samples, which made it difficult to interpret some of the results of the treatments as many of the experiments were not replicated. The heat treatment method showed consistent reductions in chlorophyll *a* and pheophytin but the cell count data were more variable. The results from the oxidation treatment were somewhat ambiguous and there was no clear treatment effect. The ozone treatment showed reductions in chlorophyll *a* but again the cell count data did not show such a clear effect. The results for the ultrasound technique were compromised by the fact that much of the water being treated remained in the equipment and a further flushing step had to be added, which resulted in an increased reduction of chlorophyll *a.* Again, the cell counts for this treatment were not so clear, with reductions of *Alexandrium tamarense* but more variable results from *Thalassiosira pseudonana* counts. The ultraviolet and a combination of ultraviolet and ultrasound treatments also had to have a flushing step added. For these treatments there was a reduction in chlorophyll *a* but again the cell counts did not show consistent reductions. The deoxygenation treatment resulted in reductions of chlorophyll *a* and some reductions in cell numbers but there were some high cell count results that did not correspond with high levels of chlorophyll *a* and were difficult to explain. The advanced oxidation technique generally showed reductions in chlorophyll *a* but the lack of replication made it difficult to determine which of the treatments was the most effective. The cell counts were also more variable and there was no clear treatment effect. The results of the hurdle technologies were difficult to explain as there was no replication at all and there did not seem to be any pattern to the results. It was therefore difficult to determine whether there was a treatment effect.

Overall, the results showed that some of the treatments produced a consistent decline in chlorophyll *a* levels, which indicates that there was a treatment effect. However, the more variable cell count data needs to be taken into account as well. It is possible that some of the cell count data may have included counts of cells that looked normal and undamaged but had actually been killed. It had been intended to use a flow cytometer to count and assess viability of the cells but this was not possible owing to circumstances beyond our control. The counts were therefore carried out on preserved samples where it is more difficult to assess whether a cell was alive before preservation.