

**Department of Health and
Human Services
Public and Environmental
Health Service
First Floor
152 Macquarie Street
HOBART TAS 7000**



UniQuest Pty Limited
Consulting & Research
(A.B.N. 19 010 529 898)

Cumbræ-Stewart Building
Research Road
The University of Queensland
Queensland 4072

Postal Address:
PO Box 6069
St. Lucia
Queensland 4067

Telephone: (61-7) 3365 4037
Facsimile: (61-7) 3365 7115

UniQuest Project No. 14917

**Report Prepared for: Department of Health and Human Services
Public and Environmental**

**Subject: Comments on Responses from Toxikos and Dr
Wadsley on Dioxin Calculation Concerns.**

Date: 1 August 2007

**Report Prepared By: Professor Michael Moore and Emeritus Professor
Barry Chiswell**

Signed for and on behalf of UniQuest Pty Limited

Professor Michael Moore

UniQuest is providing consultant advice to the Department of Health and Human Services Tasmania, to assist with assessment of health and environmental aspects of effluent from the proposed Gunns pulp mill.

The dangers of pursuing a disagreement regarding modelling calculations which depend upon a number of core assumptions is that it descends into a slanging match in which scientific objectivity can be compromised. Critically the approach taken by the two respondents is quite different. The work by Dr Wadsley represents a worst case scenario using extreme assumptions, which strongly questions the limits for regulation of dioxins in the effluent, whilst that of Toxikos, accepting the proposed dioxin limits, is more pragmatic and based upon precedents set elsewhere and actual experimental data compiled from a number of sources. The difference in the platforms guarantees that agreement is impossible.

There are a number of critical issues associated with the decisions on the total load of dioxin that will be discharged into the marine environment as a consequence of the proposed pulp mill operations. The first of these and probably the most important is the decision on just how much dioxin is likely to be generated. Regrettably, we do not have any reliable estimate from the chemistry involved on the relationship between the concentrations of residual chlorine in the discharge and generation of TEQs of PCDD/PCDF. This lack of information on the relationship between the chlorine levels and dioxin production in a pulp mill being operated under the proposed conditions is a matter that needs further study with a view to establishing the likely total dioxin load of the effluent discharge. In this respect we would note that in the initial calculations by Toxikos the concentrations are based on data supplied by other consultants and not on any new compilations.

The facts are these:

1. the presence of chlorine in pulp mill production will generate dioxins;
2. dioxin generation by pulp mills has decreased dramatically since the 1980s with the introduction of the ECF (which includes chlorine dioxide) and TCF processes;
3. the particular proposed chlorine dioxide process has not been used previously in pulp production.

In view of these facts and the lack of information on the relationship between chlorine presence and dioxin production it is important to remember that the proposed process has been used previously for sodium chlorite production, rather than the production of chlorine dioxide.

Critically, chlorine dioxide production with the required low concentrations of chlorine will depend on the competence of scavenging processes to remove chlorine to acceptable levels. We are persuaded by the evidence given in the Toxikos report, which pertains to a number of operational ECF and TCF mills, that adherence to the regulatory limits placed on the level of chlorine in the chlorine dioxide stream at the proposed mill will satisfactorily control the presence of chlorine and consequentially lead to dioxin production markedly lower than that found previously in typical chlorine pulp mills. However, we re-emphasise that this belief is based upon evidence obtained from actual pulp mill operations, rather than from any knowledge that we have of research correlating dioxin production with chlorine concentration. Nevertheless, we also re-emphasise that current best practice ECF mills yield low dioxin effluent concentrations.

In conclusion on this aspect, we would again make the point, that it will be essential, particularly during mill start-up, that the chlorine content of the chlorine dioxide stream is closely monitored, fit with the licence conditions and that the methods used in such monitoring meet proven analytical standards.

At the point of discharge in the sea, the Bass Strait, there is a reasonable understanding now of the hydrodynamics of this body of water. The discharge pipe is engineered to achieve a one in a hundred dilution one hundred metres from the point of discharge. To imply that this level of dilution is not increased over much greater distances is clearly naive. As one would intuitively expect, the hydrodynamic modelling shows that the dilution becomes much greater as one moves away from the point of discharge. It should also be borne in mind that unlike some of the other bodies of water with which the Bass Strait is being compared, the Bass Strait is a much more dynamic marine environment than for example the Baltic Sea or the Gulf of Finland. Differences in bottom sediments prove this. Notably the Bass Strait seabed is made up of coarse sand consistent with relatively rapid water flows. This accords with the local knowledge of currents around this area. These currents would provide for relatively rapid dispersion of the plume from the discharge pipe and of course rapid dilution of the plume. It is correct that dioxins are generally water-insoluble and that the likelihood would be that they would associate with particulates in the discharge. In this respect one should remember that particulates present in the discharge are subsequent to ponding treatment which will include particle settlement at the pulp mill. This means that they will comprise of material of relatively higher

buoyancy. The combination of the dynamic marine environment together with high buoyancy particulates would suggest that this sedimentary material will not settle proximal to the discharge point but would be more likely to experience wider dispersion into the Bass Strait.

Exposure of fish and shellfish is an important aspect of the safety of this operation especially with respect to human exposure through seafood. Fish behaviour has to be considered in these circumstances. The presence of a non-saline discharge containing a number of chemical wastes into a marine environment is unlikely to attract marine species. Indeed the fish are likely to find such a discharge aversive. Since fish uptake of dioxins will be directly proportional to the concentrations in their immediate environment it is likely that their moving away from the point of discharge to areas of greater dilution will minimise their uptake of dioxins.

Again the regulatory process will provide checks and balances in respect of fish uptake of these pollutants. The presence of sentinel species in the sea, in which concentrations cannot be higher than food safety standards, provides the pragmatic check on pulp mill operations and discharges.

Assertions are made by Dr Wadsley that key equations have been omitted in the Toxikos calculation protocol for dioxins. We are unclear whether this is really the case or if the original Toxikos calculations discounted such equations as being unimportant. However, we note that the most recent calculations by Toxikos show that the inclusion of the "missing" equations have little effect upon the conclusions drawn. Pragmatically, the measured concentrations in fish in other jurisdictions are many orders of magnitude less than those predicted by Dr Wadsley's calculations. We believe that Toxikos has addressed the issue definitively. The regulatory controls in the licence conditions, using both sentinel species and chemical evaluation, will provide a level of safety assurance in respect of both human exposures at the Mill site and likely levels in fisheries.

Our conclusions on the Wadsley and Toxikos documentation is that if one assumes, as Wadsley does, that the projected effluent dioxin concentration of 3.4pg TEQ/L is too high, and thus that the RPDC limit of 13pg TEQ/L is much too high, it is the case that any analysis will lead to the conclusion that dioxins levels will be unacceptable. On the other hand, if one uses the Toxikos approach, which adduces practical evidence that the projected concentration of TEQ Dioxins/L is negligible, then any analysis will suggest that there is no evidence that dioxins in the effluent will present either an environmental health risk or an environmental risk. Our considered judgement is that the Toxikos approach is the most appropriate and likely to be the best predictor of the actual situation.

TERMS OF REPORT

UniQuest Pty Limited employees and University of Queensland staff and consultants operating with UniQuest will make all reasonable efforts to ensure an accurate understanding of client requirements. The information in reports is based on that understanding, and UniQuest strives to be accurate in its advice and to engage suitably qualified consultants with requisite skills of the highest order.

While all reasonable care will be taken in the preparation of reports, all information, assumptions, and recommendations therein are published, given, made, or expressed on the basis that:

- (a) Any liability of any nature which would otherwise exist or arise in any circumstances by reference to any part or any omission from this report is excluded to the maximum extent permitted by law;
- (b) Any liability which is unable to be excluded is limited to the minimum sum permitted by law;
- (c) These provisions bind any person who refers to, or relies upon, all or any part of a report; and
- (d) These provisions apply in favour of UniQuest and its directors, employees, servants, agents and consultants.

The client shall indemnify UniQuest and its directors, employees, servants, agents, consultants, successors in title and assigns against any claim made against any or all of them by third parties arising out of the disclosure of reports, whether directly or indirectly, to a third party.

A laboratory certificate, statement, or report may not be published except in full, unless permission for publication of an approved abstract has been obtained, in writing from the Managing Director of UniQuest.

Samples will be destroyed within 30 days unless collected by the client, or alternative arrangements have been agreed to by UniQuest.