IEG ADVICE TO THE CHANNEL DEEPENING PROJECT INQUIRY ON POMC'S REPORT: "DIOXINS IN SEDIMENT AND FISH", AND, GOLDER ASSOCIATES LETTER: "MAIN AREAS OF CONSERVATISM IN FISH TISSUE RESIDUE MODELLING – CHANNEL DEEPENING PROJECT" 17 AUGUST 2007.

BACKGROUND

The Inquiry considering the Supplementary Environment Effects Statement (SEES) for the Channel Deepening Project (CDP) has requested the Secretary DSE to seek advice from the Independent Expert Group (IEG) about various issues in relation to sediment chemistry for dredging and disposal of contaminated sediments.

The IEG has been asked to provide advice on the contaminant 'Dioxin' in relation to the following reports provided to the Inquiry:

- PoMC's report: "Dioxins in Sediment and Fish" dated 18 July 2007, Document Number 207, Annexure 8; and,
- Golder Associates letter: "Main areas of Conservatism in Fish Tissue Residue Modelling – Channel Deepening Project", dated 27 July 2007, Document Number 207, Annexure 8.

The Department of Sustainability (DSE) has asked the IEG to prepare their advice in response to the following questions:

1. *Does PoMC's report and Golder Associates letter (detailed above) provide sufficient support for PoMC's conclusion that the proposed dredging works for the Channel Deepening Project may lead to, at worst, a marginal increase the concentration of dioxins/furans and dioxin-like PCBs in fish fillet tissue from fish caught in the Yarra River?*

2. *If no more than a marginal increase in the concentration of these toxicants in fish fillet tissue were to occur in the Yarra River, would there be any reason to suspect that the concentration of these toxicants may be any worse in other areas of dredging works, namely:*
   - *The area that may be affected by the plume generated by Yarra River dredging?*
   - *The northern dredged material ground proposed to receive contaminated sediments?*

This advice has been prepared for the IEG by Dr Graeme Batley, Centre for Environmental Contaminants Research, CSIRO Land and Water, Sydney.

IEG ADVICE

The Port of Melbourne report on Dioxins in Sediment and Fish represents a reasonable summary of the data obtained to date for dioxins in sediments and fish for the proposed channel dredging in the Port of Melbourne. It includes comments on the Golder Associates' modelling of fish concentrations, and information from most of the teleconference discussions that took place with senior staff from PoMC's consultant Golder Associates (in Australia and Canada), from EPA and DSE Victoria, and Dr Jochen Muller (National Centre for Environmental Toxicology), and myself, on 4, 5 and 6 July 2007. Ms Therese Manning (NSW Department of Environment and Climate Change) also participated in one of these discussions.

Based on the Golder Associates predictions, increases in suspended sediment concentrations are unlikely to result in substantial increases in dioxin concentrations in fish over the levels that have been measured to date. Golder Associates' staff were, however, quite circumspect about the use of the model for making these sorts of predictions, as this they claimed this was not the original intent of the model. Nevertheless, given the uncertainties of the model that resulted in conservative predictions, not the least of which was the assumption of steady state, it was felt that the conclusions regarding a limited impact on fish dioxin concentrations of dredging activities were reasonable.

Subsequent to the teleconference, a letter sent on July 27 on behalf of Golder Associates by Lee Nikl to David Hyett of Maunsell Australia Pty Ltd, provided further comments on their modelling of fish 'mussel' (sic) tissue dioxin concentrations. In relation to the assumption of steady state, they reported that, based on published data (van der Linde et al. 2001), dioxin concentrations in fish were predicted to reach half of their steady state concentrations in two months, with dioxin-like PCBs taking two years. This meant that in a five-week dredging period, dioxin concentrations would be less than half of the predicted steady state concentrations and dioxin-like PCBs much less than half.

Other uncertainties in the model are the assumptions that fish feed at a normal rate in the turbidity plume and that they feed only in this plume. Golder Associates presented an illustrative calculation to show that in benthivorous fish, the predicted steady state concentration of dioxin compounds accumulated from food in a turbid environment would be an order of magnitude less than that calculated in the model, while for piscivorous fish, the over-estimation is almost two orders of magnitude. Overall, they concluded that, using feeding patterns that might be realistic for some species (20% of foraging time in the plume) and 50% reduction in prey capture success, the model "can result in order of magnitude over-estimations of concentrations in benthivorous fish, and substantially greater estimations of concentrations in piscivorous fish.

The above remarks were qualified by the statement that there was no quantitative basis for making the assumptions of altered feeding behaviour in the above calculations. Nevertheless, the use of best professional judgement is surely justifiable, and one wonders why a more realistic assessment of the extent of likely over-prediction of tissue dioxin concentrations was not included in the original report. Despite the statement that dioxins and dioxin-like compounds were not part of the

initial modelling effort, the over-estimations would apply equally to some of the other hydrophobic organics considered.

Turning to the teleconference discussions, Manning noted that the dioxin levels being considered as part of the Port of Melbourne monitoring were miniscule compared to those being addressed in Homebush Bay in Sydney where fish concentrations were of the order of 140 pg/g TEQ, compared to <9 in the Yarra River. The former value applies to bream, while prawns contained up to 20 pg/g (NSW Food Authority 2006). Sediment concentrations were as high as 300,000 pg TEQ/g for TCDD alone, which equates roughly to 900,000 for total TEQs (Parsons Brinkerhoff and Thiess Services 2002). This is compared to <17 pg TEQ/g in the Yarra River. For the length of the Parramatta River, dioxin concentrations in surface sediments were of the order of 100-200 pg TEQ/g (Birch et al. 2007, Mueller et al. 2004). She reported that the USEPA's background value for sediments was 5.3 pg/g (USEPA 2000). The ratio of fish to sediment dioxin concentrations was substantially lower in Sydney fish compared to Yarra River fish[1].

Manning also noted that dusky flathead sampled in Sydney appeared to not be a major carnivorous species (although the sample size for this species was small,). All of the samples except the one sample caught nearest Homebush Bay contained 4pg/g or less which placed this species in the same category as species like sand and trumpeter whiting and fan-belly leatherjacket (Manning et al. 2007, in preparation). There may be some error in that assumption with respect to flathead in the Golder Associates' model.

The Sydney findings, coupled with the conservative interpretation of the model, support the conclusion that there is likely, at worst, to only be a marginal increase in fish concentrations. There is no reason to suspect that the dioxin concentrations would be any worse in other areas of dredging works, including the area affected by the dredging plume and the northern dredged material management ground.

Golder Associates, in their letter of July 27 2007, suggested that direct measurements of fish tissue concentrations of dioxins and dioxin-like compounds be obtained through a 'properly designed' study. The IEG assumed that they were suggesting laboratory bioaccumulation experiments comparing turbid and non-turbid environments. In such studies, it would be difficult to provide the opportunity for fish to leave the turbid zone in a way that would realistically mimic the field situation. An appropriate alternative would be to monitor fish immediately subsequent to the dredging operations, while existing fishing advisories and limitations are in place, and use the data to review such advisories.

[1] Additional data on NSW fishing advisories and closures are available on the following web sites:
http://www.dpi.nsw.gov.au/fisheries/sydney-harbour-closure/Questions_and_Answers
http://www.dpi.nsw.gov.au/fisheries/sydney-harbour-closure
http://www.foodauthority.nsw.gov.au/consumer/c-dioxins.asp

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USEPA (2000). Exposure and Human Health Reassessment of 2,3,7,8-Tetrachlorodibenzo-p-Dioxin (TCDD) and Related Compounds Part I: Estimating Exposure to Dioxin-Like Compounds Volume 3: Properties, Environmental Levels, and Background Exposures. EPA/600/P-00/001Bc http://www.epa.gov/ncea/pdfs/dioxin/part1/volume3/chap-3.pdf

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