UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5

DATE: November 12, 1998

SUBJECT: Dover Chemical Corporation Site, Dioxin Remediation Levels and Ecological Risk

FROM: Edward Karecki, U.S. Fish and Wildlife Service Biologist

TO: Tom Short, Remedial Project Manager

The following preliminary findings are based on a review of the following document: Baseline Risk Assessment, Dover Chemical Corporation Site, May 1995.

This purpose of this memo is to determine possible remediation levels for dioxins (2,3,7,8 TCDD and equivalents). The areas of ecological concern at the site include: Sugar Creek, Georgette Run, a drainage canal, two ponds, wetlands, and the surrounding area. The document referenced above contains a baseline ecological risk assessment which used models to estimate the risk to various site receptors. Although the estimates are sufficient to estimate risk, there is some uncertainty because of a lack of site specific data on bioavalability (the proportion of measured dioxin that is actually available for ingestion/absorption), bioaccumulation (the difference between dioxin concentrations in the environment and in the animals using the site), site use, etc. Additionally, piscivorous (fish eating) mammals, which are known to be sensitive to dioxins were not evaluated.

A literature review indicated that preliminary evaluations of dioxin related ecological risk are provided by papers issued by the USEPA Office of Toxic Substances (Rabert 1991) and the Office of Research and Development (USEPA 1993 and 1994). The first reference specifically assesses the effects of paper mill sludge and focuses primarily on terrestrial exposures, the latter is a more general evaluation of the direct toxic effects of 2,3,7,8-TCDD (tetrachlorinated dibenzo-*p*-dioxin) to aquatic life and wildlife based on uptake from aquatic prey, sediment and surface water. The results of these studies are used in this memo to estimate a dioxin cleanup level based on ecological risks. The screening values do not have regulatory status, and may overestimate the risks at the site because they also do not include area use factors (the proportion of time spent at the site by an animal), bioavailability, or site-specific bioaccumulation factors.

Solid concentrations are given as picograms per gram (pg/g), equivalent to parts per trillion (ppt). Total 2,3,7,8-TCDD toxicity equivalents (TEQ) are calculated according to Barnes, et al. 1989.

The soil or sludge screening concentrations range from 0.03 and 0.04 to 0.6 pg/g, which are protective for woodcock embryos, shrews, and adult woodcock, respectively (Rabert 1991). The embryo value is based on a chicken egg injection study, with an estimated lowest observed adverse effect level (LOAEL) of 65 pg/g egg tissue (Cheung et al. 1987). This study has been criticized by industry, which derived a pheasant egg LOAEL of 1000 pg/g egg tissue (cited in Rabert 1991). The woodcock embryo screening value is 0.8 pg/g soil based on the industry study (Rabert 1991). Comparisons are made in this report

with the screening values based on both the chicken egg and pheasant egg studies. This is done not as an endorsement of the industry study, but to demonstrate how disagreements over the avian embryo toxicity of dioxin affect the outcome of the screening assessments.

USEPA calculated environmental concentrations in sediment and water which may be protective of fish, piscivorous mammals, and birds. Low risk and high risk levels were calculated. "Low risk" is the estimated highest concentration which is unlikely to cause significant effects to sensitive organisms. "High risk" is the lowest estimated concentration at which severe effects to sensitive organism would be expected. The sediment concentration levels (dry weight) are summarized below:

Low Risk		High Risk	
Fish	60 pg/g	Fish	100 pg/g
Mammals	2.5 pg/g	Mammals	25 pg/g
Birds	21 pg/g	Birds	210 pg/g

(USEPA 1993)

Based on the information presented above a sediment cleanup level in the range of 0.03 to 2.5 pg/g is expected to be protective of most environmental receptors. As discussed above, the only way to decrease the uncertainty in these numbers would be to perform sampling and analysis of site biota.

Please contact me at 3-3202 if you have any questions or would like to discuss this information in more detail.

cc: L. Schmitt

Literature Cited

Barnes, D., F. Kutz, and D. Bottimore. 1989. 1989 update to the interim procedures for estimating risks associated with exposures to mixtures of chlorinated dibenzo-*p*-dioxins and -dibenzofurans (CDDs and CDFs). EPA 625/3-89/016.

Cheung, M., E. Gilbert, and R. Peterson. 1981. Cardiovascular teratogenicity of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin in the chick embryo. Toxicol Appl Pharmacol 61: 197-204.

Rabert, W. 1991. Environmental risk assessment for TCDD- and TCDF-contaminated pulp sludges on terrestrial and aquatic wildlife. USEPA Environmental Effects Branch, Health and Environmental Review Division, Office of Toxic Substances, January 31, 1991, 89 p.

USEPA. 1993. Interim Report on Data and Methods for Assessment of 2,3,7,8-Tetrachlorodibenzo-p-dioxin Risks to Aquatic Life and Associated Wildlife. EPA/600/R-93/055.

USEPA. 1994. Workshop on the Use of Available Data and Methods for Assessing the Ecological Risks of 2,3,7,8-Tetrachlorodibenzo-p-Dioxin to Aquatic Life and Associated Wildlife. EPA/630/R-94/002.