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NAS CECIL FIELD, FL
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MEMORANDUM REGARDING U S EPA REGION IV EVALUATION OF EXPOSURE POINT CONCENTRATIONS AND FUTURE RESIDENTIAL EXPOSURE SCENARIO AT POTENTIAL SOURCE OF CONTAMINATION 51 GOLF COURSE NAS CECIL FIELD FL

10/18/2001

U S EPA REGION IV

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4

61 Forsyth Street
Atlanta, Georgia 30303-3104

October 18, 2001

4WD-OTS

MEMORANDUM

SUBJECT: Evaluation of Exposure Point Concentrations Applicable to a Maintenance Worker and Future Residential Exposure Scenario
PSC 51, Golf Course
NAS Cecil Field
Jacksonville, FL

FROM: Ted W. Simon, PhD, DABT
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RPM, FFB

CC: Elmer W. Akin,
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The purpose of this memo is to evaluate exposure point concentrations applicable to a future residential scenario at the golf course. Two sets of information were included here: (1) recent measurements of pesticide and arsenic levels in surface soil at greens and tees; and (2) possible reductions in dieldrin concentrations based on a pilot scale feasibility study for *in situ* treatment performed at the Defense Logistics Agency golf course. Please feel free to share this memo.

Summary

For this analysis, the golf course was assumed to have a 15 year life and after that, the property would be used for residential development. Assuming the concentrations of dieldrin and heptachlor epoxide would be subject to slow degradation by soil bacteria, the risks to a maintenance worker over the 15 year life of the golf course and the risk to a resident following residential development 15 years hence were estimated.

- *Golf Course Maintenance Worker* *1.3E-06*
- *Future Resident* *1.8E-06*

These estimates risks assume exposure to tees and greens only, where concentrations of pesticides are expected to be higher than the on the fairways. Thus, these estimated risks represent upper bounds vis-a-vis both the exposure unit for the maintenance worker (i.e., the entire golf course) and for the location of a future residence (i.e., on one of the greens or tees).

Exposure Point Concentrations developed from Recent Sampling

The most tended and treated areas of golf courses are the greens and tees. For this reason, it is assumed that concentrations on the tees and greens could be used to estimate a protective EPC for the future residential scenario. In addition, it was assumed that all tees and greens were treated equally with pesticide and a concentration measurement at a particular tee or green could be used to represent any tee or green. Thus, measurements at the tees and greens could be used to estimate the EPC of placing a future residence on any green or tee. Sampling data for pesticides at greens and tees was obtained electronically from Mr. Mark Jonnett of TTNUS.

Lognormal probability plots were constructed for the concentrations arsenic, heptachlor epoxide, dieldrin and chlordane. Visual inspection of these probability plots indicated departure from lognormality. Goodness-of-fit tests were not performed. The nonparametric bootstrap-t method was used to calculate the 95% UCL for arsenic, These values are given below.

Arsenic	8.2 mg/kg	Dieldrin	783 µg/kg
Heptachlor epoxide	169 µg/kg	Chlordane	7.3 µg/kg

The UCL for arsenic is below the level which Region 4 OTS considers appropriate for an unrestricted use residential scenario and hence will not be considered further. The UCL for chlordane is about two orders of magnitude less than the FDEP residential SCTL and will not be considered further.

The assumption that the present levels of heptachlor expoxide and dieldrin will remain constant is not correct and will be explored in the next section of this memo. However, assuming the present concentrations would persist, the risks associated with these concentrations are given in the table below. Risks were estimated using the ratio method and the FDEP SCTLs obtained at http://www.floridatox.org/techrept.htm.

Chemical	UCL	SCTL	Risk
Dieldrin	783	70	1E-05
Heptachlor Epoxide	169	100	2E-06

Potential Reduction in Concentration

A pilot study for reduction in soil dieldrin concentrations at a golf course at the Defense Logistics Agency in Memphis, TN indicated that without treatment, a 10 fold reduction in concentrations of dieldrin in soil could be achieved in 18 years. This reduction is due to soil bacteria. It seems reasonable to assume that similar soil bacteria would also be present at the Cecil Field golf course. Certain turf treatments that enhance the bacterial activity may shorten this degradation time, possible to 3 years for a 10 fold reduction in concentration. Assuming no treatment and hence a 10 fold reduction in 18 years, an empirical equation for the concentration as a function of time was derived.

$$C(t) = C_0 e^{-0.13t} \qquad (1)$$

My understanding is that the plans are to keep the golf course as a golf course for 15 years. Assuming that the reduction in pesticide concentration is spatially similar over the golf course and that both pesticides considered undergo the same degree of reduction, then the expected UCL for dieldrin after 15 years would be 111 µg/kg and for heptachlor epoxide would be 24 µg/kg, corresponding to estimated risks of 1.6E-06 and 2E-07 respectively with a total risk of 1.8E-06.

If treatments similar to those used at DLA were applied, then concentrations and estimated risks would be considerably lower. The projection at the DLA pilot study was a ten fold reduction in concentration in 3 years with treatment. Golf course management may want to examine these treatments to enhance bacterial activity for possible application at the Cecil Field golf course.

Taking into account the yearly reductions in concentration *without treatment* and applying Eq. 1 to estimate the yearly concentrations over the 15 year period of golf course operation, the risks to a maintenance worker are estimated to be 1.3E-6.

One caveat that should be mentioned is that additional pesticides applied to the golf course will contribute to these estimated risks. The above analysis was performed with the assumption that no dieldrin or heptachlor would be used at the Cecil Field golf course in the future.

Please let me know if you need further help.

T.W. Simon/tws:4WD-OTS:28642/10/18/1/A:\DISK13\OCT01\PSC51.WPD