MEMORANDUM

To: Dr. Stephen B. Hamilton

From: Patrick O. Gwinn POG
Russell E. Keenan, Ph.D. REK

Date: February 21, 1997

Re: **Summary of Screening-level Air Modeling and Human Health Risk Assessment Results for PCB Vapors from the Hudson River**

cc: John Haggard - GE
Mel Schweiger - GE
Angus Macbeth - Sidley & Austin

ChemRisk® was retained by the General Electric Company (GE) to estimate the hypothetical chronic human health risks associated with inhaling polychlorinated biphenyl (PCB) vapors emitted from the surface of the Hudson River water column into the overlying air. For this analysis, ChemRisk used an EPA-approved screening-level air dispersion model to estimate air concentrations of PCB vapors. A human health risk assessment was then performed to calculate upper-bound potential health risks associated with inhaling the vapors. Factors used in the air dispersion model and risk assessment were chosen such that the results of this assessment are likely to over-predict the true risks, if any, associated with this exposure pathway. This memorandum summarizes the procedures and results of the analysis.

GE has estimated PCB vapor flux rates for eight different reaches of the Hudson River between Fort Edward, NY and the river's confluence with the Mohawk River. ChemRisk identified the reach of the river with the greatest estimated potential to emit PCB vapor and, using air dispersion modeling, calculated the annual average air concentration of PCB vapors for both sides of the Hudson River. Air concentrations were modeled for that vicinity of the shoreline which begins at the river's edge and ends at a total distance of 500 meters away from the river. The EPA approved air dispersion model ISC3ST was used to estimate the air concentrations of PCB vapors emitted from the Hudson River water surface.

Because the vapors are emitted at what is essentially ground-level, the highest predicted concentrations of PCB vapors in air were at the river's edge where the degree of atmospheric dispersion is minimized by its proximity to the emission area (*i.e.* river water surface). As the distance from the river's edge increased, the concentration of PCB vapors in air decreased due to

atmospheric dispersion and dilution. In our screening-level risk assessment, we used the maximum estimated air concentration as the exposure point concentration (EPC). We then assumed that a hypothetical population of individuals is exposed to this EPC of PCB vapors. Therefore, all calculations of human health risks were made assuming that the receptors are breathing the maximum estimated concentration of PCB vapors in air.

To estimate the hypothetical chronic human health risks associated with the inhalation of PCB vapors, ChemRisk assumed that an individual resides at the edge of the Hudson River for thirty years of their life. Those thirty years were broken into three age categories to account for age-dependent differences in inhalation rates and body weights. The age categories used in the assessment were young children (age 0-6), children (age 7-13), and adults (over 18 years old). The exposure factors used in this assessment are summarized in Table 1 and are based on standard EPA guidance and recommendations for use in risk assessments. For each age category, the receptor was assumed to breath the air at the river's edge for 24 hours per day, 365 days per year, for the duration of each age category. Using these exposure parameters, ChemRisk calculated a chronic daily dose of PCB vapors to assess both carcinogenic and non-carcinogenic risks to the hypothetical receptor (see Table 1).

Because the PCB is in a vapor form, the EPA recommended cancer slope factor (CSF) equal to 0.4 $(mg/kg\text{-}day)^{-1}$ was used to calculate the hypothetical lifetime cancer risk. Non-carcinogenic hazard quotients were calculated using the EPA recommended reference dose of 2.0×10^{-5} mg/kg-day (20 ng/kg-day for Aroclor 1254). Table 1 summarizes the results of the risk assessment.

The hypothetical incremental lifetime cancer risk was estimated to be 2.6×10^{-7}. In comparison, the range of incremental lifetime cancer risks considered acceptable under the EPA's National Contingency Plan (NCP) is 1×10^{-6} to 1×10^{-4} (one-in-one-million to one-in-one-hundred thousand). Therefore, even though this assessment used factors that are likely to over-predict the chronic human health risk, the theoretical carcinogenic risks from inhalation of PCB vapors fall below the range that EPA considers significant.

The total non-carcinogenic hazard index was estimated to be 0.27, well below a level considered to have significance for noncancer effects. Again, even based on the conservative nature of this analysis and the comparison of estimated doses with the noncancer toxicity criteria for Aroclor 1254, non-carcinogenic health risks are not above a *de minimis* level.

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Table 1. Hudson River PCB Air Pathway Risk Analysis

Scenario: Hypothetical Resident Living Adjacent to the River
Pathway: Inhalation of Airborne PCB Vapors

CARCINOGENIC
LADI =Ca x IhR x t x EF x ED x 1/BW x 1/ATc
Risk = LADI x CSF

Receptor Age Category	Ca Conc. in air (mg/m^3)	IhR Inhalation Rate (m^3/min)	t Time Spent at River's Edge (min/day)	EF Exposure Frequency (days/year)	ED Exposure Duration (years)	BW Body Weight (kg)	ATc Averaging Time, Carcinogen (days)	LADI Chronic Daily Intake (mg/kg-day)	CSF Cancer Slope Factor (mg/kg-day)-1	Risk
Young Child (0-6 years)	5.67E-06	0.006	1440	365	6	15.5	25550	2.50E-07	4.00E-01	1.0E-07
Child (7-13 years)	5.67E-06	0.006	1440	365	7	36.8	25550	1.34E-07	4.00E-01	5.4E-08
Adult (> 18 years)	5.67E-06	0.009	1440	365	17	71.8	25550	2.54E-07	4.00E-01	1.0E-07
									Total:	2.6E-07

NONCARCINOGENIC
ADI =Ca x IhR x t x EF x ED x 1/BW x 1/ATnc
HQ = ADI/RfD

Receptor Age Category	Ca Conc. in air (mg/m^3)	IhR Inhalation Rate (m^3/min)	t Time Spent at River's Edge (min/day)	EF Exposure Frequency (days/year)	ED Exposure Duration (years)	BW Body Weight (kg)	ATnc Averaging Time, Noncarcinogen (days)	ADI Chronic Daily Intake (mg/kg-day)	RfD Reference Dose (mg/kg-day)	HQ
Young Child (0-6 years)	5.67E-06	0.006	1440	365	6	15.5	2190	2.92E-06	2.00E-05	0.15
Child (7-13 years)	5.67E-06	0.006	1440	365	7	36.8	2555	1.34E-06	2.00E-05	0.07
Adult (> 18 years)	5.67E-06	0.009	1440	365	17	71.8	6205	1.05E-06	2.00E-05	0.05
									Total:	0.27

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