STATE OF FLORIDA
DEPARTMENT OF HEALTH AND REHABILITATIVE SERVICES

Date: January 10, 1994

From: Florida Dept. of Health and Rehabilitative Services,
Toxicology and Hazard Assessment

Subject: Health Consultation: Air Stripper, Hipps Road Landfill
Superfund Site - Jacksonville, FL

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Background and Statement of Issues

Residents around the Hipps Road Landfill NPL Superfund site in Jacksonville, Florida are concerned that inhalation of chemicals from the recently constructed air stripper, combined with previous exposures from contaminated drinking water, will further affect their health. These residents, and Region IV of the U.S. Environmental Protection Agency (EPA), requested that the Florida Department of Health and Rehabilitative Services (Florida HRS) review air monitoring data from this air stripper. In this health consultation, we evaluate health effects from inhalation of chemicals from this air stripper, independent of previous exposures. In a separate public health assessment, we will evaluate the combined health effects from the air stripper and all prior exposures.

The Hipps Road Landfill is in the Jacksonville Heights area of Jacksonville, Florida. From 1965 to 1970, several hauling companies reportedly disposed of airplane parts, wire, electric cable, paint, solvents, grease, and oils from two nearby naval air stations at this seven acre site. The property owner then covered the landfill and subdivided it for residential lots. Six homes on the site as well as other nearby homes used private wells as their drinking water source. In 1983, the Duval County Public Health Unit discovered contamination in nearby residential drinking water wells and EPA added the site to the Superfund National Priorities List. From 1988 to 1990, contractors for Waste Control of Florida, a Potentially Responsible Party (PRP), purchased and demolished the six on-site houses and constructed a landfill cover. In a 1990 amended record of decision, EPA selected extraction and air stripping as the ground water remediation.

I. Air Monitoring Data

From August 25 to September 17, 1993, Golder Associates, Inc. (Golder) operated the air stripper at the Hipps Road Landfill, recorded the weather conditions, and measured the on-site air quality (1). Golder is a contractor for one of the PRPs: Waste Control of Florida. See Figure 1 for the air stripper and air sample locations.

Prior to operation of the air stripper, Golder collected two composite "background" air samples (one 8 hr. and one 24 hr.) at location "AS-3" along Hipps Rd. For the first five days of air stripper operation, August 25 to August 29, Golder collected 24 hour composite air samples at "AS-1" at the top of the air stripper, at "AS-2" near the northeast corner of the site, and at "AS-3" along Hipps Rd. For the last 16 days of the air stripper operation, Golder only collected air samples from the top of the air stripper. Golder collected all of the composite air samples in Suma canisters which were analyzed by a contract laboratory using EPA air analytical method TO-14.

Golder detected low levels of six chemicals in the "background" air at this site, independent of the air stripper. In addition to the two background air samples Golder collected prior to operation of the air stripper, we consider two other air samples as background. We consider air samples collected at AS-2 and AS-3 on August 26 as background since the wind was predominately from the northeast on that day and blew the air stripper emissions away from these two sample locations. (During the other four days the wind direction was too erratic to use samples from AS-2 and AS-3 as background.) Background air samples had between 0.4 and 49 parts per billion (ppb) of chloromethane, methylene chloride, 1,1,1-trichloroethane, toluene, m+p xylenes, and acetone. Direct emissions from the landfill itself, automobile exhaust, nearby fiberglass use, nearby painting operations, and other solvent uses are possible sources of these air contaminants.

The maximum measured air concentrations for the 21 chemicals detected are summarized in Table 1. Other chemicals reportable using EPA air analytical method TO-14 were below detection limits.

Unfortunately, EPA air analytical method TO-14 does not include all of the volatile organic chemicals found in the ground water at this site. Naphthalene and 1,2,4-trimethylbenzene were found in the ground water extracted during the air stripper trial but are not reportable under method TO-14. 1,4-Dichlorobenzene was also found in the ground water extracted during the air stripper

trial and is reportable under method TO-14. Golder, however, did not report the air concentrations of 1,4-dichlorobenzene.

II. Modeled Air Concentrations

The closest air sample location (AS-2) was about 1,000 feet north of the air stripper. The closest resident, however, is on Camfield Road about 300 feet east of the air stripper. To predict air concentrations for this resident, we contacted the Florida Department of Environmental Protection, Air Modeling and Assessment Section in Tallahassee. They used an air dispersion model called "Screen 2", to predict dilution with distance from the air stripper (2). This model predicts the highest concentrations likely at various distances by assuming "worst case" weather conditions: a gentle breeze and little dispersion. Actual air concentrations are likely to be lower than the maximum predicted by this model. Wind direction and dispersion are the major factors that determine air concentration downwind of an air pollution source.

In general, the dilution predicted using the Screen 2 air dispersion model is consistent with the actual measured concentrations. To check the accuracy of this model, we compared the predicted dilution to the actual concentrations measured at As-2 and AS-3 on August 25. On August 25 the wind was predominately from the south: from the air stripper toward samples locations AS-2 (1,000 feet away) and AS-3 (1,300 feet away). Screen 2 predicts a minimum dilution of over 500 times (0.0019) at 1,000 feet and over 600 times (0.0016) at 1,300 feet. For 17 of the 21 chemicals emitted by the air stripper, the modeled dilution was consistent with the actual concentrations measured at AS-2 and AS-3. For 3 of the 21 chemicals--benzene, toluene, and carbon disulfide--the actual measured concentrations were higher that predicted by the model. The measured concentrations for these three chemical were, however, only slightly higher that their detection limits. Exhaust from automobiles along Hipps Rd. may have been the source of the benzene and toluene. Likewise, there may be a source other than the air stripper for the carbon disulfide. For one chemical--1,1,1-trichloroethane--the concentration at the top of the air stripper was below detection limits but was measurable at AS-2. Either 1,1,1-trichloroethane was emitted from the air stripper and Golder failed to detect it, or there is another source.

At a distance of about 300 feet from the air stripper, Screen 2 predicts a minimum dilution of over 400 times (0.0024). Table 1 lists the predicted maximum air concentrations at the nearest resident (300 feet) for all of the chemicals detected in the air stripper. For example, this model predicts that air from the air

stripper with a concentration of 360 parts per billion (ppb) of acetone would be diluted to 0.86 ppb at the nearest resident. This model predicts the highest concentrations likely at various distances by assuming "worst case" weather conditions: a gentle breeze and little dispersion. Actual concentrations are likely to be lower.

III. Comparison of Air Data to Health Based Standards

This health consultation does not evaluate the possible health effects from additive exposure to multiple chemicals from the air stripper. This health consultation also does not evaluate the possible health effect from exposures to chemicals from the air stripper combined with past exposures. In a separate public health assessment, we will evaluate possible additive effects as well as the combined health effects from the air stripper and all past exposures. Without air monitoring data, we cannot evaluate possible health effects of inhalation of volatile ground water contaminants such as naphthalene, 1,2,4-trimethylbenzene, and 1,4-dichlorobenzene from the air stripper.

Golder measured between 0.4 and 49 parts per billion (ppb) of chloromethane, methylene chloride, 1,1,1-trichloroethane, toluene, m+p xylenes, and acetone in the background air at this site, independent of the air stripper. The maximum measured background concentrations are unlikely, however, to cause any health effects.

To evaluate possible health effects from breathing chemicals from the air stripper, we considered the maximum concentrations measured at the top of the air stripper. We also considered the maximum concentrations predicted at the nearest resident on Camfield Road (300 feet away) using the Screen 2 air dispersion model. We compared these maximum concentrations to two sets of screening values: the Florida Department of Environmental Protection's (Florida DEP) Ambient Reference Concentrations (3) and the Agency for Toxic Substances and Disease Registry's (ATSDR) Comparison Values (4-21). The Florida DEP Ambient Reference Concentrations and ATSDR Comparison Values are non-regulatory, health-based guidelines used to screen air concentrations. Concentrations that exceed these screening guidelines will not necessarily cause health effects but should be evaluated further. The maximum air concentrations and screening values are listed in Table 1.

Comparing the measured or predicted air concentrations to OSHA or NIOSH work place standards is inappropriate since work place standards are designed to protect healthy workers exposed 8 hours-a-day, 5 days-a-week. Work place standards are not

designed to protect the general population exposed continuously 24 hours-a-day, 7 days-a-week.

For the following ten chemicals, the maximum concentrations measured at the top of the air stripper exceed either a Florida DEP Ambient Reference Concentration and/or an ATSDR Comparison Value: benzene, carbon disulfide, 1,2-dichloroethane, 1,1-dichloroethene, methylene chloride, tetrachloroethene, toluene, trichloroethene, vinyl chloride, and m + o xylenes. It is unlikely, however, that anyone will breathe the maximum concentrations measured at the top of the air stripper. It is more likely that, due to dilution, the nearest residence on Camfield Road (300 feet away) will breathe much lower concentrations. Using the dilution factor from the Screen 2 air dispersion model, the maximum concentration at the nearest resident on Camfield Road is likely to be over 400 times less that the maximum concentration measured at the top of the air stripper (Table 1). Assuming this dilution, the maximum predicted concentrations at the nearest resident for 20 of the chemicals are below their screening concentrations and are unlikely to cause any health effects. The predicted maximum concentration for one chemical, 1,2-dichloroethane, exceeds its screening concentration. This concentration of 1,2-dichloroethane will not necessarily cause health effects but is evaluated in more detail below.

People who accidentally breathe large amounts of 1,2-dichloroethane in the air often develop nervous system disorders and liver and kidney disease. Studies in experimental animals also found breathing large amounts of 1,2-dichloroethane causes nervous system disorders and kidney disease. Evidence from animal studies suggests that 1,2-dichloroethane probably does not produce birth defects or affect reproduction. Exposure to 1,2-dichloroethane has so far not been associated with cancer in humans. However, cancer was seen in laboratory animals breathing 1,2-dichloroethane. In view of the cancer findings in animals, one cannot rule out the possibility of cancer in humans. The Department of Health and Human Services (DHHS) has determined that 1,2-dichloroethane may reasonably be anticipated to be a carcinogen. The International Agency for Research on Cancer (IARC) has determined that 1,2-dichloroethane is possibly carcinogenic to humans. EPA has determined that 1,2-dichloroethane is a probable human carcinogen (10).

The maximum predicted concentration of 1,2-dichloroethane at the nearest resident to the air stripper, however, is unlikely to cause any of the above health effects. Also, the predicted concentration of 1,2-dichloroethane is so low that the increased risk of cancer is insignificant.

Conclusions

1. Golder measured chloromethane, methylene chloride, 1,1,1-trichloroethane, toluene, m+p xylenes, and acetone in the "background" air at this site, independent of the air stripper. The concentrations of these background air contaminants, however, are unlikely to cause any health effects. Possible sources of these chemicals include direct emissions from the landfill itself, automobile exhaust, nearby fiberglass use, nearby painting operations, and other solvent uses.

2. Without air monitoring data, we cannot evaluate possible health effects of inhalation of ground water contaminants such as naphthalene, 1,2,4-trimethylbenzene, and 1,4-dichlorobenzene.

3. In general, the dilution predicted using the Screen 2 air dispersion model is consistent with the actual measured concentrations. At the nearest resident to the air stripper (300 feet away), this model predicts a minimum dilution of over 400 times.

4. Although the concentrations of 10 of 21 chemicals measured in the air at the top of the air stripper exceed health-based screening guidelines, the maximum modeled concentrations at the nearest resident are unlikely to cause any health effects.

5. This health consultation is based on the air concentrations measured during the 21-day air stripper trial operation. If the concentrations of contaminants in the water influent to the air stripper exceed those measured during this trial, the public health threat should be reevaluated.

6. This health consultation evaluates, on a chemical-by-chemical basis, the health risk from inhalation of volatile organic chemicals from the Hipps Road Landfill air stripper. It does not evaluate the possible health effects from additive exposure to multiple chemicals from the air stripper. It also does not evaluate the possible health effect from exposures to chemicals from the air stripper combined with past exposures. In a separate public health assessment, we will evaluate possible additive effects as well as the combined health effects from the air stripper and all past exposures.

7. Only those sources of information listed in the References section were reviewed for this health consultation. The interpretation, advice, and recommendations provided are based on the data and information referenced. Additional data could alter the conclusions and recommendations of this health consultation. ATSDR and/or Florida HRS will review additional data as it

becomes available or respond to additional requests as necessary. The conclusions of this health consultation are site-specific and should not be considered applicable to any other site.

Recommendation

If air stripping is used to remediate ground water at this site, the potentially responsible parties (PRPs) should, on a regular basis, collect and analyze the water influent to the air stripper. They should sample and analyzed this water at least monthly for the first three months and then at least every three months for the duration of the air stripper operation. They should analyze these water samples for all of the volatile organic chemicals in the ground water at this site and all of the volatile organic chemicals detected in the air from the air stripper. Continued monitoring is necessary to insure that public health is protected and off-site air concentrations do not exceeded those predicted from the trial operation of the air stripper.

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References

1. Golder Associates, Inc. Letter to Ms. Patsy Goldberg, EPA, from Kenneth Karably and Donald Miller regarding review of trial test analytical results. November 24, 1993.

2. Screen 2 Model User's Guide. U.S. EPA Office of Air Quality Planning and Standards. EPA-450/4-92-006. September 1992.

3. Florida Department of Environmental Protection, Air Modeling and Assessment Section, Tallahassee, FL. Air Toxics Working List, Version 3.0, 1992.

4. Draft Update Toxicological Profile for Acetone. Agency for Toxic Substances and Disease Registry, U.S. Public Health Service. October 1992.

5. Update Toxicological Profile for Benzene. Agency for Toxic Substances and Disease Registry, U.S. Public Health Service. April 1993. TP-92/03.

6. Toxicological Profile for Carbon Disulfide. Agency for Toxic Substances and Disease Registry, U.S. Public Health Service. September 1992. TP-91/09.

7. Toxicological Profile for Chlorobenzene. Agency for Toxic Substances and Disease Registry, U.S. Public Health Service. December 1990. TP-90/06.

8. Toxicological Profile for Chloromethane. Agency for Toxic Substances and Disease Registry, U.S. Public Health Service. December 1990. TP-90/07.

9. Toxicological Profile for 1,1-Dichloroethane. Agency for Toxic Substances and Disease Registry, U.S. Public Health Service. December 1990. TP-90/12.

10. Draft Update Toxicological Profile for 1,2-Dichloroethane. Agency for Toxic Substances and Disease Registry, U.S. Public Health Service. October 1992.

11. Draft Update Toxicological Profile for 1,1-Dichloroethene. Agency for Toxic Substances and Disease Registry, U.S. Public Health Service. October 1992.

12. Toxicological Profile for 1,2-Dichloroethene. Agency for Toxic Substances and Disease Registry, U.S. Public Health Service. December 1990. TP-90/13.

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14. Toxicological Profile for Ethylbenzene. Agency for Toxic Substances and Disease Registry, U.S. Public Health Service. December 1990. TP-90/15.

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16. Update Toxicological Profile for Tetrachloroethylene. Agency for Toxic Substances and Disease Registry, U.S. Public Health Service. April 1993. TP-92/18.

17. Draft Update Toxicological Profile for Toluene. Agency for Toxic Substances and Disease Registry, U.S. Public Health Service. October 1992.

18. Draft Update Toxicological Profile for 1,1,1-Trichloroethane. Agency for Toxic Substances and Disease Registry, U.S. Public Health Service. October 1993.

19. Update Toxicological Profile for Trichloroethylene. Agency for Toxic Substances and Disease Registry, U.S. Public Health Service. April 1993. TP-92/19.

20. Update Toxicological Profile for Vinyl Chloride. Agency for Toxic Substances and Disease Registry, U.S. Public Health Service. April 1993. TP-92/20.

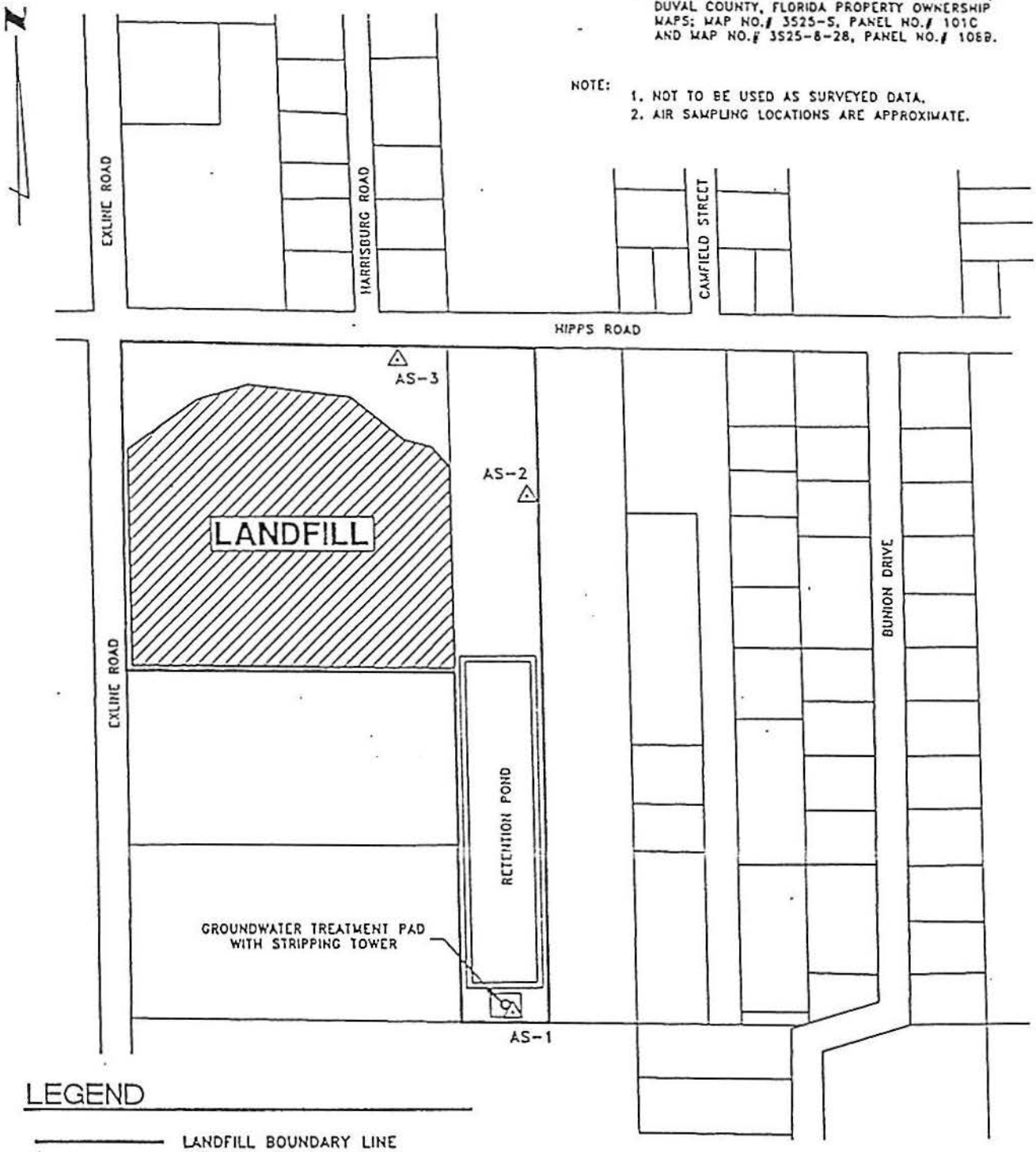
21. Draft Update Toxicological Profile for Xylenes. Agency for Toxic Substances and Disease Registry, U.S. Public Health Service. October 1993.

REFERENCE:

1. MAP SCAN TAKEN FROM CITY OF JACKSONVILLE, DUVAL COUNTY, FLORIDA PROPERTY OWNERSHIP MAPS; MAP NO.# 3525-S, PANEL NO.# 101C AND MAP NO.# 3525-8-28, PANEL NO.# 106B.

NOTE:

1. NOT TO BE USED AS SURVEYED DATA.
2. AIR SAMPLING LOCATIONS ARE APPROXIMATE.



Golder Associates

JACKSONVILLE, FLORIDA

TITLE

Figure 1. AIR SAMPLING LOCATIONS FOR TRIAL TEST

CLIENT/PROJECT	DRAWN	DATE	JOB NO.	
WCF/HIPPS RD/FL	TRG	9/23/93	913-3314	
	CHECKED	SCALE	DWG NO.	REV. NO.
		AS SHOWN	3314A2	
	REVIEWED	FILE NO.	SUBTITLE	FIGURE NO.
		913-3314		1

Table 1. Hipps Road Landfill: Maximum Air Concentrations and Comparison Values (parts per billion: volume/volume)

Parameter	Maximum Concentration at Air Stripper (AS-1)	Maximum Concentration at 1,000 feet (AS-2) and 1,300 feet (AS-3)	Predicted Maximum Concentration at 300 feet	Florida DEP Ambient Reference Concentration	ATSDR Comparison Values (and Sources)
acetone	360	49	0.86	3,600	400 (Acute MRL)
benzene	8.2	0.4	0.02	0.04[a]	0.03 (CREG)
2-butanone	8.2	<0.9	0.02	27[a]	340 (RfC)
carbon disulfide	36	1.1	0.086	23	20 (Chronic MRL)
chlorobenzene	11	<0.4	0.026	180	NA
chloromethane	1.3	1.3	0.003	120	400 (Chronic MRL)
1,1-dichloroethane	5.7	<0.4	0.014	480	NA
1,2-dichloroethane	4.9	<0.4	0.012	0.009[a]	0.01 (CREG)
1,1-dichloroethene	0.8	<0.4	0.002	0.005[a]	0.005 (CREG)
cis-1,2-dichloroethene	28	<0.4	0.067	480	NA
trans-1,2-dichloroethene	0.4	<0.4	0.001	480	NA
1,2-dichloropropane	0.3	<0.4	0.001	0.8[a]	0.8 (Chronic MRL)
ethylbenzene	28	<0.4	0.067	230[a]	300 (Inter. MRL)
methylene chloride	18	1.9	0.043	0.6[a]	0.6 (CREG)
tetrachloroethene	0.4	<0.4	0.001	120	0.3 (CREG)
toluene	97	1.2	0.23	80[a]	110 (RfC)
1,1,1-trichloroethane	190	23	0.46	1,700	300 (Acute MRL)
trichloroethene	1.8	<0.4	0.004	120	0.1 (CREG)
vinyl chloride	26	<0.4	0.062	12	2 (Inter. MRL)
o-xylene	11	<0.4	0.026	18	50 (Acute MRL)
m+p xylenes	29	0.7	0.07	18	50 (Acute MRL)

(Table 1. continued next page)

Table 1. Continued

All concentrations are 24-hour averages unless noted.

* Ambient Reference Concentration calculated assuming 365 days of exposure.

Florida DEP Ambient Reference Concentrations: non-regulatory guidelines compiled by the Florida Department of Environmental Protection, Air Modeling and Assessment Section used to screen air concentrations. Air concentrations below the Ambient Reference Concentration are unlikely to cause health effects. Concentrations above the Ambient Reference Concentration will not necessarily cause a health effect but should be looked at closer.

ATSDR Comparison Values: Estimates compiled by the Agency for Toxic Substances and Disease Registry, U.S. Public Health Service to screen air concentrations. Concentrations above the Comparison Values will not necessarily cause a health effect but should be looked at closer.

NA - Not available

MRL - The Agency for Toxic Substances and Disease Registry's Minimal Risk Level: the estimate of daily human exposure to a chemical likely to be without an appreciable risk of non-cancerous adverse health effects, for a period of less than 14 days (acute), for greater than 14 days but less than 365 days (intermediate), or greater than 365 days (chronic).

CREG - ATSDR Cancer Risk Evaluation Guide: calculated from the Environmental Protection Agency's cancer slope factors, the contaminant concentration estimated to result in one excess cancer in a million persons exposed over a lifetime.

RfC - Reference Concentration: the Environmental Protection Agency's estimate of daily human exposure to a chemical likely to be without an appreciable risk of non-cancerous adverse health effects, generally for a period of a year or longer.