DEPARTMENT OF NATURAL RESOURCE PROTECTION

TECHNICAL REPORT SERIES

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A SURVEY OF THE OCCURRENCE AND DISTRIBUTION OF VOLATILE ORGANIC COMPOUNDS IN BROWARD COUNTY SURFACE WATERS

ENVIRONMENTAL MONITORING DIVISION

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EXECUTIVE SUMMARY

A study of the occurrence of volatile organic compounds (VOCs) in the surface waters of Port Everglades revealed the widespread presence of the octane-enhancing lead substitute, methyltertbutylether (MTBE). The study report suggested that the source of the MTBE might be the many fuel-inefficient 2-cycle outboard-engine powered vessels that traverse Port waters and proposed that county-wide VOC survey be conducted.

The follow up study, on which this paper reports, found that MTBE occurred in many areas of the county. In total, 6 of the 61 volatile organic compounds that were studied, were detected in one or more samples. The detected VOCs can be grouped into 3 general classifications: petroleum hydrocarbons, chlorinated hydrocarbon decomposition products and naturally-occurring VOCs.

The petroleum hydrocarbons included benzene, toluene and (MTBE). These compounds are components of gasoline and were detected in samples scattered throughout the county. With the exception of MTBE, no discernable pattern of distribution was found. The majority of MTBE detections, and most of the highest levels, occurred in the eastern portion of the county where boat traffic is more common. This finding supported the contention that outboard motors were a major, but not the only source, of MTBE in county surface waters. Stormwater runoff from roadways was suspected in some areas.

Chlorinated decomposition products, including vinyl chloride and cis-1,2-dichloroethene are known to be formed in groundwater as a result of the decomposition of trichloroethene and tetrachloroethene. The finding of these compounds in surface waters suggests that contaminated groundwater was impacting surface waters in the area of the detections. One possible source of the groundwater contamination is seepage from septic tanks.

The final finding of this study was the detection of naturally-occurring VOCs in county surface waters. Bromoform was detected in 13.6% of all samples with the majority of these detections at stations on the eastern side of the county, primarily in the Intracoastal Waterway. Because of the occurrence of bromoform primarily in the eastern areas and the knowledge that bromoform is formed naturally by marine macro algae, the source of this VOC is likely ocean waters carried inland by tide.

While the VOCs detected in this study show the impact of natural, transportation and recreational activities, none of the VOCs detected occurred at levels in excess of surface water standards. The chronic or cumulative impacts VOCs at these levels might have on environmental health is not known.

1. INTRODUCTION

In April 1998, DNRP performed a study of the occurrence of petroleum hydrocarbons in the surface waters of Port Everglades (DNRP, 1998). The impetus for that study was the conjecture that shrimp mortality at an experimental aquiculture facility at the mouth of the Port was a result of petroleum hydrocarbon contamination of Port surface waters. The suspected source of the petroleum hydrocarbons was the seepage of groundwater laden with petroleum hydrocarbons as a result of decades of fuel handling activities in the Port. While that study did not find significant quantities of petroleum products in Port water, one common component of gasoline, MTBE, occurred rather uniformly distributed in Port surface waters.

MTBE is an octane-enhancing lead substitute that has a relatively high solubility in water. While the occurrence of MTBE at higher concentrations in the vicinity of the petroleum handling areas would have substantiated contamination of surface water by contaminated groundwater, the study found no apparent concentration gradient in Port surface waters. Because of the fact that many fuel-inefficient outboard motor-powered vessels traverse Port waters, it was proposed that the MTBE in Port waters originated from the outboard motors. A study of county-wide surface waters was proposed to determine if MTBE was present in other areas of the county where outboard motor-powered vessels are common. This paper reports on that follow up study.

2. METHODOLOGY

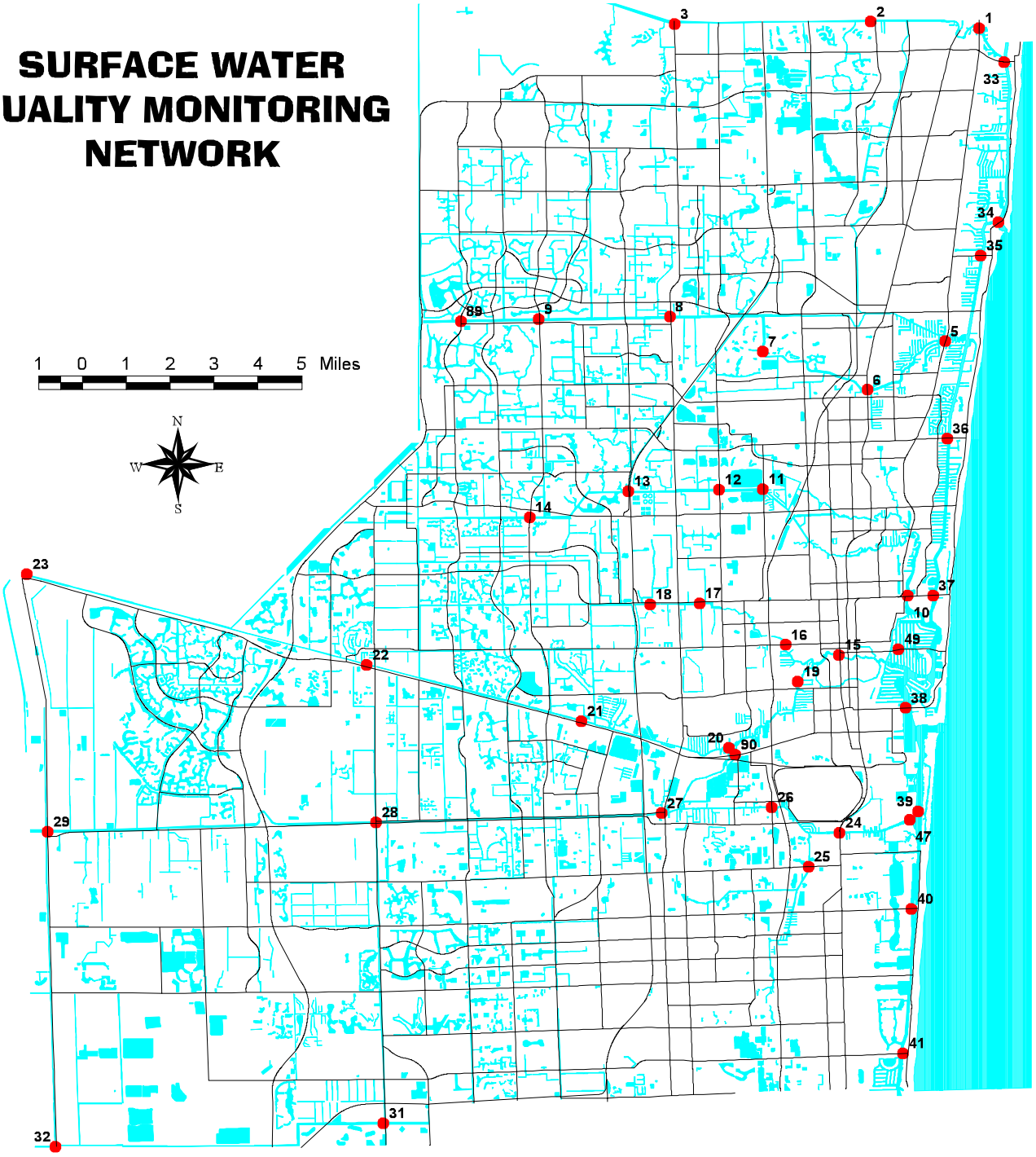
All sampling and analyses were performed according to EPA-approved protocols as specified in the Environmental Monitoring Division's (EMD) Comprehensive Quality Assurance Plan (FDEP, 1992). Statistical analyses were performed using SigmaStat computer software (Jandel, 1992-95).

2.1 Sample Collection Procedure

The collection of samples for this study occurred during the sampling of DNRP's 44-station surface water quality monitoring network (see Figure 1) on July 28 and 29, 1998. The times and dates of sampling coincided with an incoming tide. All samples except those on the Intracoastal Waterway (ICW) were collected from bridges at approximately ½ meter below the surface of the water using a 2 liter Kemmerer sampling bottle. After sampling, water was carefully drained from the Kemmerer without aeration into pairs of 40 ml glass vials and sealed without air bubbles using teflon-lined silicone septum caps. Samples collected from the ICW were collected by hand from a boat directly into the 40 ml vials. After collection, the vials were stored on ice for transport to the lab and were analyzed within 7 days.

Figure 1

SURFACE WATER QUALITY MONITORING NETWORK



2.2 Sample Analysis Procedure

The samples were analyzed according to EPA Method 8260 following purge and trap extraction by EPA Method 5030 (USEPA, 1986). A Tekmar Aquatek50 autosampler was used to deliver a 25 ml sample aliquot to a Tekmar LSC 2000 purge and trap sampler.

The sample was purged with inert gas for 11 minutes. The purged VOCs were trapped on a 25 cm trap containing OV-1, charcoal, Tenax, and silica gel. The trapped VOCs were then desorbed for 4 minutes at 180 degrees Celcius (C).

The desorbed VOCs were then chromatographed on a 75 m, 0.53 mm I.D. DB-624 fused-silica capillary column with a 3.0 µ film thickness contained in the oven of a Hewlett-Packard 5890 Series II gas chromatograph (GC). The GC was programmed to hold an initial temperature of 35° C for 8 minutes, ramped at 4° C/min. to 150°C and held for 5 minutes. The VOCs eluted from the column were introduced via jet separator into a Hewlett-Packard 5971 Series mass-selective detector programmed to delay 1 minute then to scan from 45-260 m/z at approximately 2 scans per second.

This system was calibrated for 61 environmentally-significant VOCs. A listing of these VOCs and associated precision, accuracy and detection limit data are listed in the appendix.

2.3 Statistics

Because of the high sensitivity of the instrumentation used in this study, contamination of samples during sampling and analysis is a concern, particularly for common laboratory solvents that may also be target analytes. In order to assess the potential for contamination, blanks or samples of reagent water were processed along with the actual samples. The results of these analyses were then used to identify those VOCs and concentrations that may be artifacts of the sample handling process. For each compound that was detected in the blanks, a range of concentrations (95% confidence interval) that must be exceeded in the actual samples before it could be attributed to the sample, was calculated. The compounds that were detected in the blanks and the values that must be exceeded in order to ensure that the compound was actually present in the samples were as follows: MTBE, 0.16 ug/L; toluene, 0.69 ug/L; chloroform, 0.77 ug/L; and methylene chloride, 14.2 ug/L.

The data were further screened to eliminate those concentrations that are below the *minimum detection limit* (MDL) of the system. The MDL is defined as the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero (Federal Register, 1984). For this report, only those concentrations that exceed both the MDL and the 95% confidence interval for the blanks will be discussed.

Approximately ten percent of the stations were sampled in duplicate. For the purpose of summarizing detections, the duplicates were averaged and treated as a single value. In cases where one of the duplicates was below the detection limit, for the purpose of coumputing the average value, one-half the detection limit was used as the duplicate value.

The petroleum hydrocarbon concentrations of one of the duplicate samples was greatly different from its mate. The duplicate sample with the higher values (Site #35, Lab ID #65135ID) was judged an outlier, possibly contaminated during handling, and was not averaged or included in the statistical analyses.

3. RESULTS

After screening the data as described above, a total of 6 compounds were found to be present at levels that could be reasonably attributed to environmental contamination. Table 1 provides a summary of statistics for the 6 VOCs.

Table 1
Summary of VOC Detection Statistics

	n	Mean ug/L	Std. Dev. ug/L	Median ug/L	Min. ug/L	Max. ug/L	Freq %	MDL ug/L
methyltertbutyl-ether	32	1.620	1.0155	1.370	0.390	4.340	72.7	0.09
benzene	10	0.079	0.0484	0.055	0.040	0.180	22.7	0.039
bromoform	6	0.150	0..0456	0.150	0.100	0.210	13.6	0.092
cis-1,2-dichloroethene	5	0.258	0.2029	0.130	0.080	0.530	11.4	0.071
vinyl chloride	2	0.305	0.1202	0.305	0.220	0.390	4.5	0.128
toluene	5	0.190	0.1478	0.130	0.060	0.410	11.4	0.054

The VOCs detected in this study may be grouped into three general classifications: (1) petroleum hydrocarbons, (2) chlorinated hydrocarbon decomposition products, and (3) naturally-occurring VOCs.

3.1 Petroleum Hydrocarbons

Benzene, toluene and MTBE are common petroleum hydrocarbon constituents of motor fuels, especially gasoline. A total of 32 sites contained one or more of these compounds.

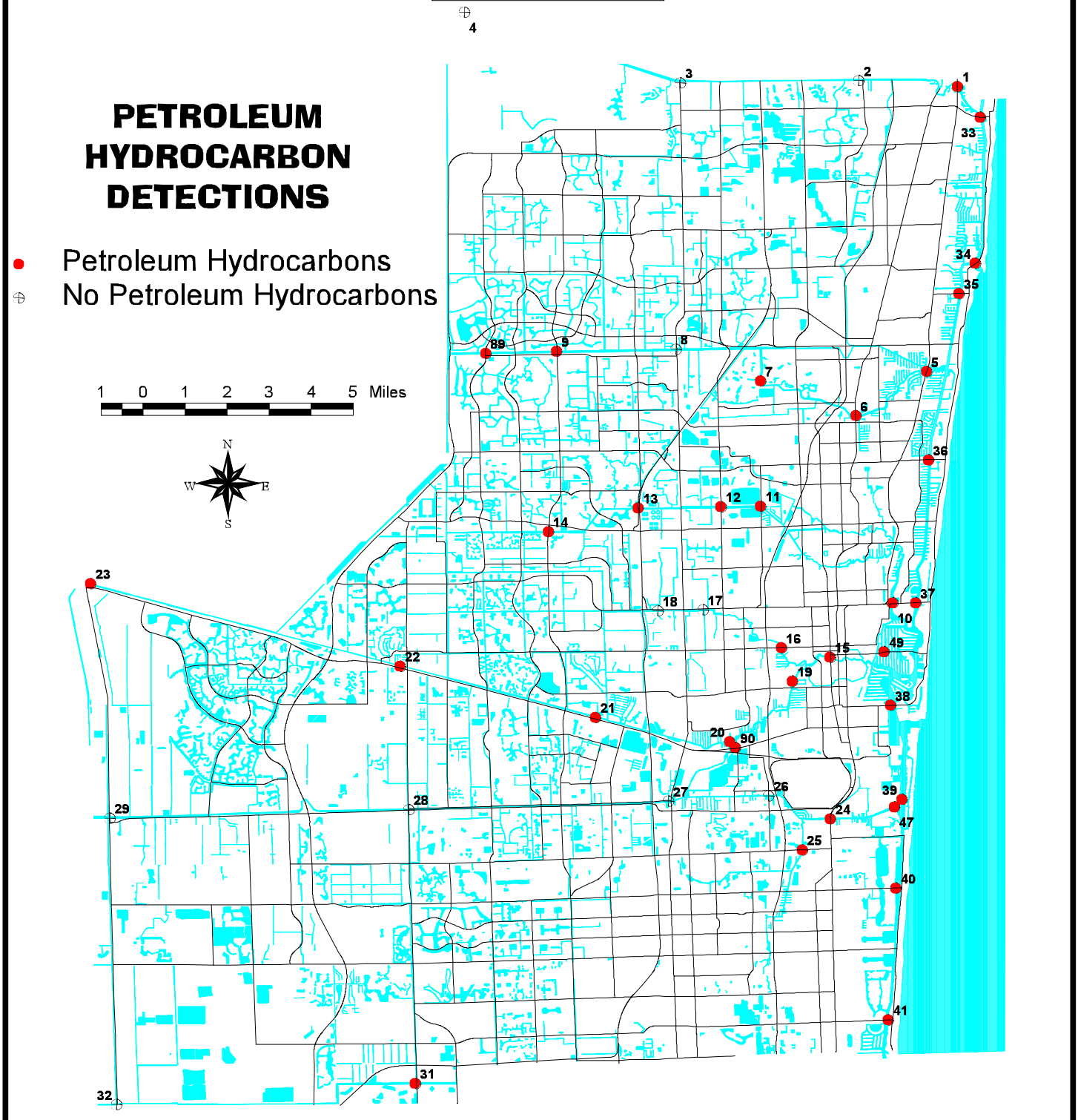
MTBE and benzene were the most commonly detected petroleum hydrocarbons, occurring in 72.7% and 22.7% of the samples respectively. MTBE concentrations ranged from 0.39 to 4.34 ug/L. There is no ground or surface water standard for MTBE, however, the EPA has set advisory levels at 20-40 ug/L to avoid unacceptable taste and odor in potable water. These levels are 20,000-100,000 lower than the range of exposure levels in which health effects were observed in rodents (Zogorski, 1998). The effects of MTBE on marine or estuarine organisms is not known.

Benzene concentrations ranged from 0.04 to 0.18 ug/L. No benzene standard has been set for surface waters. The Broward County groundwater standard is 1.0 ug/l.

Toluene was detected at six stations at concentrations of 0.055 to 0.41 ug/L. Broward County has not set a standard for toluene in surface water. The groundwater standard for toluene is 40 ug/L.

Figure 2 depicts the distribution of petroleum hydrocarbons in County surface waters.

Figure 2


PETROLEUM HYDROCARBON DETECTIONS
Petroleum Hydrocarbons
No Petroleum Hydrocarbons
1 0 1 2 3 4 5 Miles
N
W
E
S
1
2
3
4
5
6
7
8
89
9
10
11
12
13
14
15
16
17
18
19
20
90
21
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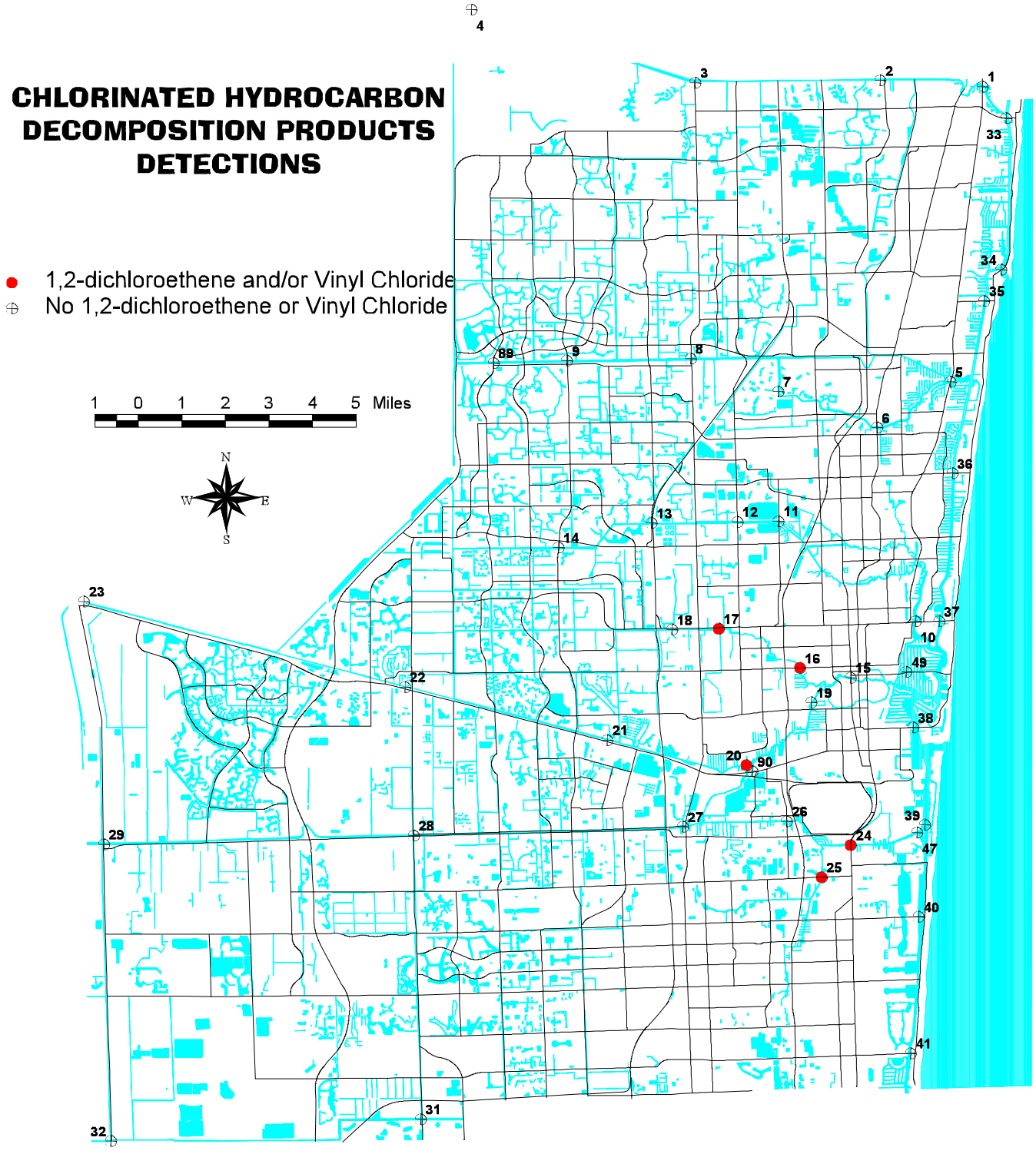
3.2 Chlorinated Hydrocarbon Decomposition Products

Vinyl Chloride and cis-1,2-dichloroethene are commonly detected in groundwater known to have been contaminated with trichloroethene and/or tetrachloroethene (Wood et al, 1981). Sites #20 and #25 contained 0.39 and 0.22 ug/L of vinyl chloride respectively. Cis-1,2-dichloroethene was also found at these sites as well as sites #24, #16, and #17. Concentrations of cis-1,2-dichloroethene ranged from 0.08-0.53 ug/L. While there are no standards for cis-1,2-dichloroethene or vinyl chloride in surface water, the ground water standards are 70 ug/L and 1.0 ug/L respectively. Figure 3 depicts the distribution of these compounds in County surface waters.

Figure 3


CHLORINATED HYDROCARBON DECOMPOSITION PRODUCTS DETECTIONS
1,2-dichloroethene and/or Vinyl Chloride
No 1,2-dichloroethene or Vinyl Chloride
1 0 1 2 3 4 5 Miles
N
W
E
S
1
2
3
4
5
6
7
8
89
9
10
11
12
13
14
15
16
17
18
19
20
90
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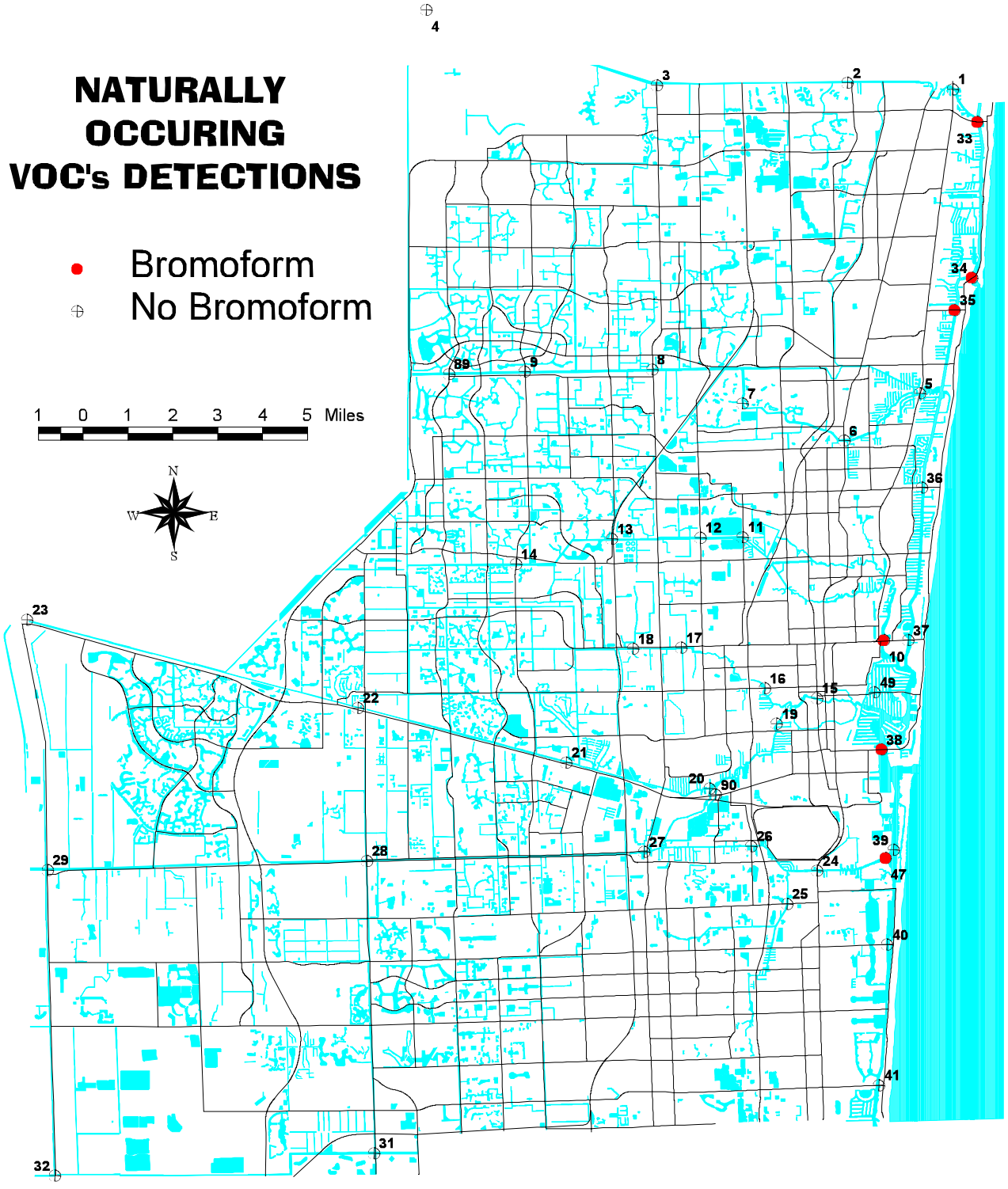
3.3 Naturally-Occurring VOCs

Bromoform was found in six samples (13.6%). Bromoform is known to be formed naturally by marine macro algae (Manley et al, 1992). Bromoform is also one of four common disinfection by-products, known as trihalomethanes, that result from the reaction of naturally-occurring organic compounds in raw water during the disinfection of drinking water with chlorine. The U.S. Environmental Protection Agency has established a primary drinking water standard of 100 ug/L total THMs. The county standard for bromoform in surface water is 360 ug/L as an annual average. Figure 4 depicts the distribution of bromoform in County surface waters.

Figure 4


NATURALLY OCCURING VOC's DETECTIONS
Bromoform
No Bromoform
1 0 1 2 3 4 5 Miles
N
W
E
S

4. DISCUSSION

Most of the VOCs detected in this study are characterized by low solubility in water and relatively high vapor pressures. As a result, their concentrations in surface waters would be expected to be very low. One exception is MTBE which, though quite volatile, has a relatively high solubility in water. The VOCs detected in this study will be discussed as members of 3 general groups; petroleum hydrocarbons, chlorinated hydrocarbon decomposition products and naturally-occurring VOCs.

4.1 Petroleum Hydrocarbons

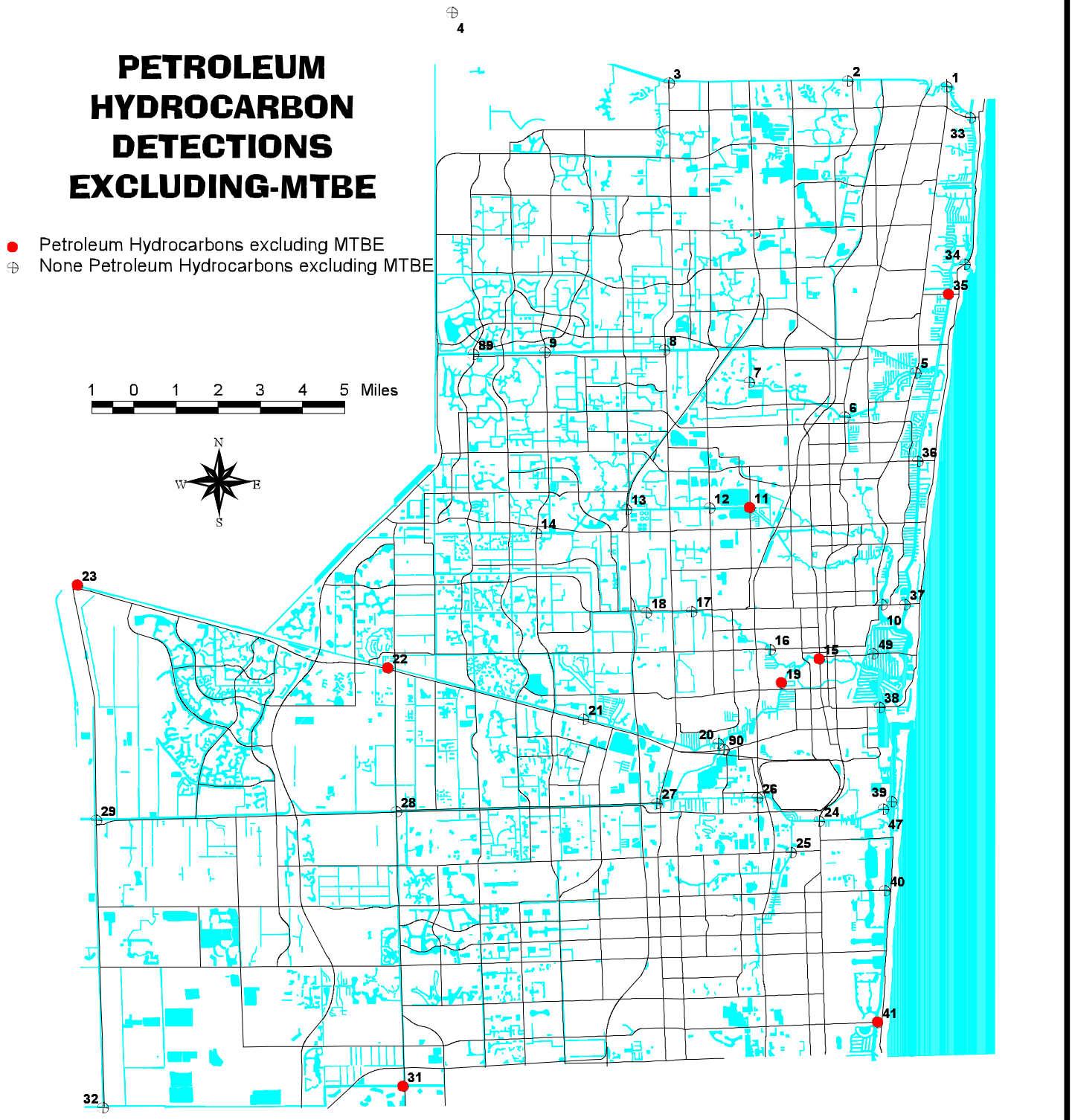
The presence of motor fuel contamination in surface waters was evident in stations the breadth and width of the county. Three VOCs found in the study, benzene, toluene and MTBE are common in motor fuels. Of these VOCs, a surface water standard has been set only for benzene; 71 ug/l as an annual average. The levels of benzene detected in this study, 0.04-0.20 ug/L, were far below this standard. MTBE is not normally produced during the petroleum refining process but is added to fuels as an octane enhancer. While MTBE shares the high vapor pressure characteristic of these other compounds, it is much more soluble in water. Because of this distinction, MTBE will discussed separately.

Figure 5 illustrates the distribution of the petroleum hydrocarbons, excluding MTBE. No pattern is evident in the figure that would suggest a possible source other than stormwater runoff from roads and highways.

In Figure 6, the distribution of MTBE in county surface waters is illustrated. The relative MTBE concentration at each station is color-coded; red for the upper half of all detections and orange for the lower half. Green is used to indicate those stations where MTBE was not detected.

MTBE is a gasoline additive that is used as an octane-enhancing lead substitute. MTBE is volatile and flammable. Pure liquid MTBE is fairly soluble in water (50,000 milligrams/liter). It is volatilized to the atmosphere from gasoline production and refueling activities and from incomplete combustion in automobile engines (Zogorski, 1998). It may then be absorbed by atmospheric moisture and enter surface water in rainfall. MTBE may also enter surface waters from the exhaust of vessel engines, especially two-cycle gasoline engines. The opportunity for MTBE to enter surface waters in localized areas is probably greatest by this mechanism. Outboard, two-cycle engines are notorious for the inefficient use of fuel. Unburned fuel including the MTBE component is commonly discharged with exhaust underwater from these engines. While the less water-soluble petroleum hydrocarbons quickly evaporate from the water's surface, the water soluble MTBE is easily dissolved in the water column.

Figure 5


PETROLEUM HYDROCARBON DETECTIONS EXCLUDING-MTBE
Petroleum Hydrocarbons excluding MTBE
None Petroleum Hydrocarbons excluding MTBE
1 0 1 2 3 4 5 Miles
N
W
E
S
4
3
2
1
33
34
35
89
9
8
7
5
6
36
13
12
11
14
23
18
17
37
10
16
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90
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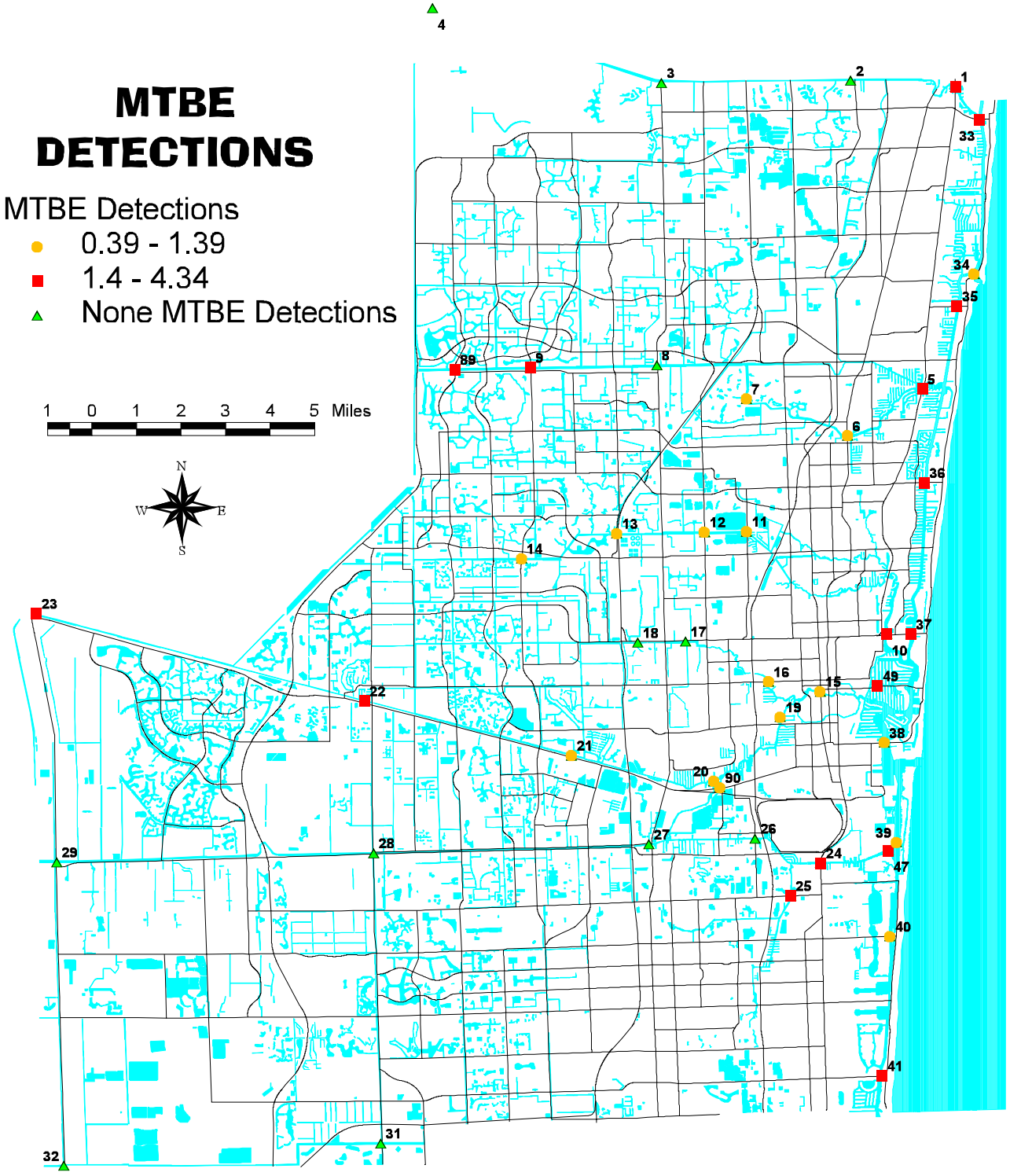
Figure 6


MTBE DETECTIONS
MTBE Detections
0.39 - 1.39
1.4 - 4.34
None MTBE Detections
1 0 1 2 3 4 5 Miles
N
W
E
S
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
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40
41
47
49
89
90

Figure 6 shows MTBE detections are common in the eastern and central areas of the county while northwest and southwest areas showed no trace of MTBE. With a few exceptions, the highest MTBE concentrations occurred in the eastern areas. Since boat traffic is most common on the eastern side of town, discharges from outboard motors is a likely source in these areas.

Relatively high levels of MTBE were also detected at three sites in the western areas of the developed portion of the county. Two of these sites, #23 and #89, also contained detectable levels of the other motor fuel components discussed in 3.3 above. This contamination is likely the result of runoff from nearby roadways.

The risk of contamination of drinking water supplies by MTBE has driven California congressmen to push for legislation to ban its use in state gasoline (Crow, 1998).

4.2 Chlorinated Hydrocarbon Decomposition Products

Vinyl chloride and cis-1,2-dichloroethene do not normally enter the environment as a result of accidental or purposeful discharge. They are, however, frequently detected in groundwater where they are known to be formed by the anaerobic bacterial decomposition of tetrachloroethene and trichloroethene, common de-greasers and dry cleaning fluids, (Woods et al, 1981). The detection of these compounds in oxygenated surface waters suggest that the surface waters where these compounds were detected may be receiving groundwater containing these compounds.

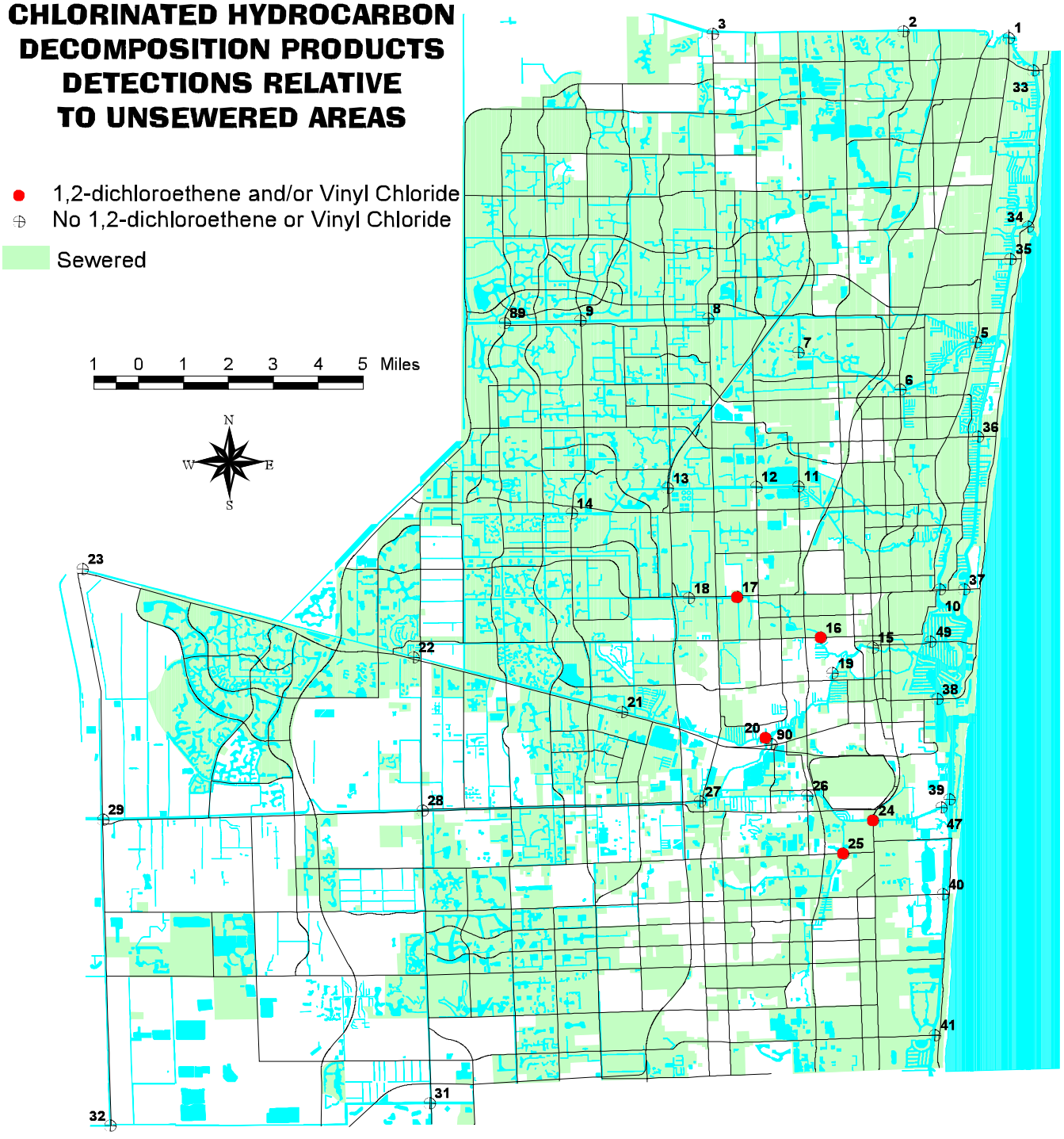
Tetrachloroethene and trichloroethene can enter the groundwater by several means. They might soak into the ground through spillage on the surface or as the result of leaking underground storage tanks.

The disposal of these compounds to septic tanks presents another opportunity for groundwater contamination. In this study, each of the stations where the compounds were detected were either within areas where municipal sanitary sewers are not available or in areas that would have received water from an unsewered area due to tidal action (incoming). Figure 7 depicts those stations were the compounds were detected overlaid by the sewered area coverage. Sampling of shallow groundwater wells in these areas would be useful for investigating this possibility.

Surface water standrds have not been set for these compounds.

Figure 7

LOCATIONS OF CHLORINATED HYDROCARBON DECOMPOSITION PRODUCTS DETECTIONS RELATIVE TO UNSEWERED AREAS



4.3 Naturally-Occurring VOCs

Bromoform was detected in 13.6% of the samples in this study. Concentrations ranged from 0.10-0.21 ug/L. Figure 4 shows that the majority of these sites were in the eastern portion of the county where the water is saline due to tidal exchange with the ocean. While bromoform is commonly seen in treated drinking water, it is invariably found there in the company of the other THMs. In this study, however, it was regularly detected in the absence of other THMs.

Because of the finding of bromoform in the absence of the other THMs, an alternate source of the bromoform is likely. A study of the macroalgal production and microbial degradation of brominated methanes in a marine environment established that Giant Kelp, *Macrocystis pyrifera*, produces bromoform as well as other brominated methanes (Manley et al, 1992). Furthermore, the samples where bromoform was detected were collected during a incoming tide when fresh seawater would have been flowing into the area being sampled. While *M. pyrifera* is not a common algae in South Florida, the ability of macro algae to produce bromoform would suggest ocean water as a possible natural source of the bromoform detected in County surface waters.

The low levels of bromoform detected in this study are far below those that would be expected to have any adverse human or environmental health implications.

5.0 CONCLUSIONS

This study found 6 of 61 targeted volatile organic compounds at levels above method detection limits and in excess of what might be attributed to contamination resulting form the sample collection and handling processes. The detected VOCs can be grouped into 3 general classifications: petroleum hydrocarbons, chlorinated hydrocarbon decomposition products and naturally-occurring VOCs.

Petroleum hydrocarbons were detected in samples scattered throughout the county and, with the exception of MTBE, occurred without any apparent distribution pattern. MTBE was detected in 72.7% of the samples with the greatest concentrations occurring in the eastern portion of the county. Because of the generally greater number of boats here, emissions from outboard engines is the likely source of the MTBE in these areas.

Chlorinated hydrocarbon decomposition products were detected at 11.4% of the sampling sites. Because of the tendency of trichlorethene and tetrachloroethene to decompose into vinyl chloride and cis-1,2-dichlorethene under anaerobic conditions typical of groundwater, it is likely that the source of these VOCs in surface waters is groundwater infiltration previously contaminated with trichloroethene and tetrachloroethene. The decomposition products were detected in areas without sanitary sewer service which suggests that septic tanks may be a source.

Bromoform was detected in 13.6% of the samples. The distribution pattern of primarily eastern sites, especially the ICW and the fact that bromoform can be produced naturally by marine algae suggest a natural source, specifically, ocean water.

The chronic or cumulative impacts the levels of VOCs detected in this study might have on environmental health is not known.

6.0 LITERATURE CITED

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APPENDIX
Parameter List and Data Quality Objectives

VOLATILE ORGANIC COMPOUND	PRECISION, %RD	ACCURACY, % REC.	MDL	UNITS
1,1-DICHLOROETHANE	0-10.7	30.8-142.9	0.099	UG/L
1,1-DICHLOROPROPENE	0-7.85	71.9-124.1	0.154	UG/L
1,1-DICHLOROETHENE	0-7.1	75.1-112.9	0.128	UG/L
1,1,1-TRICHLOROETHANE	0-7.0	74.3-121.7	0.247	UG/L
1,1,1,2 TETRACHLOROETHANE	0-7.1	71.7-128.3	0.064	UG/L
1,1,2-TRICHLOROETHANE	0-7.25	81.2-126.8	0.164	UG/L
1,1,2,2 TETRACHLOROETHANE	0-10.8	73.9-108.1	0.132	UG/L
1,2-DIBROMOETHANE(EDB)	0-7.60	90.0-114.0	0.080	UG/L
1,2-DICHLOROBENZENE	0-8.5	75.6-110.4	0.085	UG/L
1,2-DICHLOROETHANE	0-9.6	89.8-107.9	0.062	UG/L
1,2-DICHLOROPROPANE	0-7.3	79.3-114.7	0.041	UG/L
1,2-DIBROMO-3-CHLOROPROPANE	0-8.7	79.1-104.4	0.891	UG/L
1,2,3-TRICHLOROPROPANE	0-8.8	78.0-138.0	1.480	UG/L
1,2,3-TRICHLOROBENZENE	0-12.7	80.8-137.2	0.124	UG/L
1,2,4-TRICHLOROBENZENE	0-7.2	81.0-135.0	0.111	UG/L
1,2,4-TRIMETHYLBENZENE	0-14.7	75.0-123.0	0.088	UG/L
1,3-DICHLOROPROPANE	0-128	78.9-113.1	0.085	UG/L
1,3-DICHLOROBENZENE	0-15.1	78.6-119.4	0.085	UG/L
1,3,5-TRIMETHYLBENZENE	0-15.3	71.6-120.4	0.085	UG/L
1,4-DICHLOROBENZENE	0-8.9	83.2-122.8	0.088	UG/L
2-CHLOROTOLUENE	0-118	73.2-106.8	0.094	UG/L
2-CHLOROETHYL VINYL ETHER	0-12.4	94.4-107.6	0.148	UG/L
2,2-DICHLOROPROPANE	0-4.8	56.0-115.0	0.279	UG/L
4-CHLOROTOLUENE	0-8.2	74.4-123.6	0.082	UG/L
BENZENE	0-10.5	87.1-110.9	0.039	UG/L
BROMOBENZENE	0-9.9	83.5-116.5	0.052	UG/L
BROMOCHLOROMETHANE	0-7.2	72.9-107.1	0.148	UG/L
BROMODICHLOROMETHANE	0-129	86.3-103.7	0.076	UG/L
BROMOFORM	0-8.9	81.8-120.2	0.092	UG/L
BROMOMETHANE	0-6.0	71.6-118.4	0.205	UG/L
CIS-1,3-DICHLOROPROPENE	0-6.00	89.0-106.9	0.068	UG/L
CIS-1,2-DICHLOROETHENE	0-5.2	80.9-121.1	0.071	UG/L
CARBON TETRACHLORIDE	0-23.5	61.8-106.2	0.229	UG/L
CHLOROBENZENE	0-6.30	80.6-115.4	0.082	UG/L
CHLOROETHANE	0-10.4	65.0-113.0	0.276	UG/L
CHLOROFORM	0-1.77	73.5-106.5	0.085	UG/L
CHLOROMETHANE	0-6.4	68.1-117.9	0.221	UG/L
DIBROMOCHLOROMETHANE	0-9.80	72.5-111.5	0.099	UG/L
DIBROMOMETHANE	0-7.8	83.2-116.8	0.060	UG/L
DICHLORODIFLUOROMETHANE	0-14.8	69.3-110.7	0.253	UG/L
ETHYLBENZENE	0-8.0	73.8-124.2	0.057	UG/L
HEXACHLOROBUTADIENE	0-15.9	79.6-120.4	0.107	UG/L
ISOPROPYL BENZENE	0-16.8	78.9-119.1	0.067	UG/L
META/PARA XYLENE	0-37.7	80.0-128.0	0.121	UG/L
METHYLENE CHLORIDE	0-8.9	80.0-110.0	1.093	UG/L
METHYLTERTBUTYLETHER	0-11.1	76.7-115.3	0.090	UG/L
N-PROPYLBENZENE	0-15.9	82.6-117.4	0.088	UG/L
N-BUTYL BENZENE	0-14.4	77.2-122.8	0.118	UG/L
NAPHTHALENE	0-11.1	78.2-129.8	0.166	UG/L
ORTHO XYLENE	0-8.4	80.8-125.2	0.062	UG/L
PARA-ISOPROPYL TOLUENE	0-9.3	78.9-119.1	0.140	UG/L
SEC-BUTYLBENZENE	0-5.30	77.2-122.8	0.090	UG/L
STYRENE	0-6.1	80.1-123.9	0.287	UG/L
TRANS-1,2-DICHLOROETHENE	0-8.4	77.4-108.6	0.180	UG/L
TRANS-1,3-DICHLOROPROPENE	0-7.1	89.4-106.2	0.066	UG/L
TERT-BUTYLBENZENE	0-15.7	79.8-124.2	0.084	UG/L
TETRACHLOROETHENE	0-5.60	71.0-107.0	0.078	UG/L
TOLUENE	0-8.0	77.7-126.3	0.054	UG/L
TRICHLOROETHENE	0-4.1	70.5-109.5	0.087	UG/L
TRICHLOROFLUOROMETHANE	0-14.5	67.4-110.6	0.156	UG/L
VINYL CHLORIDE	0-7.0	78.5-117.5	0.128	UG/L

APPENDIX
Data Table
All Concentrations in Micrograms/Liter

Site Number			1	2	3	4	5	6	7	7-dup	8	9	10	11	12	13	13-DUP
Sample Date (yymmdd)		Blk Conf	980728	980728	980728	980728	980728	980728	980728	980728	980728	980728	980728	980728	980728	980728	980728
Sample Time	MDL	Interval	945	1053	1135	1219	1030	1105	1135	1205	1320	1405	940	910	940	1015	1020
Lab ID #			65101	65102	65103	65104	65105	65106	65107	65191	65108	65109	65110	65111	65112	65116	65192
1,1-dichloroethane	0.099	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-dichloroethene	0.128	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-dichloropropene	0.154	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-trichloroethane	0.247	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1,2-tetrachloroethane	0.064	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-trichloroethane	0.164	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-tetrachloroethane	0.132	NA	ND	Rej.	Rej.	Rej.	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-dibromo-3-chloropropane	0.891	NA	ND	Rej.	Rej.	Rej.	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-dibromoethane	0.080	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-dichlorobenzene	0.085	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-dichloroethane	0.062	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-dichloropropane	0.041	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3-trichlorobenzene	0.124	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3-trichloropropane	1.480	NA	ND	Rej.	Rej.	Rej.	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-trichlorobenzene	0.111	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-trimethylbenzene	0.088	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-dichlorobenzene	0.085	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-dichloropropane	0.085	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3,5-trimethylbenzene	0.085	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-dichlorobenzene	0.088	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-chloroethylvinylether	0.148	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-chlorotoluene	0.082	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,2-dichloropropane	0.279	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-chlorotoluene	0.082	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
benzene	0.039	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0400	ND	ND	ND
brombenzene	0.052	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
bromochloromethane	0.148	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
bromodichloromethane	0.076	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
bromoform	0.092	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.180	ND	ND	ND	ND
bromomethane	0.205	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
carbon tetrachloride	0.229	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
chlorobenzene	0.082	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
chloroethane	0.276	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
chloroform	0.085	0-0.77	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.150	0.110	0.320	0.380	0.350
chloromethane	0.221	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,2-dichloroethene	0.071	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,3-dichloropropene	0.068	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
dibromochloromethane	0.099	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
dibromomethane	0.060	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
dichlorodifluoromethane	0.253	NA	ND	ND	ND	ND	ND	ND	Rej.	Rej.	Rej.	Rej.	ND	ND	ND	Rej.	Rej.
ethylbenzene	0.057	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
hexachloro-1,3-butadiene	0.107	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
isopropylbenzene	0.067	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
meta/para-xylene	0.121	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
methylene chloride	1.093	0-14.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

MDL=method detection limit; Rej.=rejected for QA/QC considerations;

ND=not detected; NA=not applicable; DUP=duplicate

APPENDIX
Data Table
All Concentrations in Micrograms/Liter

Site Number			1	2	3	4	5	6	7	7-dup	8	9	10	11	12	13	13-DUP
Sample Date (yymmdd)		Blk Conf	980728	980728	980728	980728	980728	980728	980728	980728	980728	980728	980728	980728	980728	980728	980728
Sample Time	MDL	Interval	945	1053	1135	1219	1030	1105	1135	1205	1320	1405	940	910	940	1015	1020
Lab ID #			65101	65102	65103	65104	65105	65106	65107	65191	65108	65109	65110	65111	65112	65116	65192
methyltertbutylether	0.090	0-0.16	1.400	ND	ND	ND	3.320	0.970	0.800	0.760	ND	4.340	2.280	0.590	0.530	0.520	0.420
naphthalene	0.166	NA	ND	Rej.	Rej.	Rej.	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
n-butylbenzene	0.118	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
n-propylbenzene	0.088	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ortho-xylene	0.062	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
para-isopropyltoluene	0.140	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
sec-butylbenzene	0.090	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
styrene	0.287	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
tert-butylbenzene	0.084	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
tetrachloroethene	0.078	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
toluene	0.054	0-0.69	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.080	ND	0.060
trans-1,2-dichloroethene	0.180	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,3-dichloropropene	0.066	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
trichloroethene	0.087	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
trichlorofluoromethane	0.156	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
vinyl chloride	0.128	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Site Number			14	15	16	16-dup	17	18	19	20	21	22	23	24	25	26	27
Sample Date (yymmdd)		Blk Conf	980728	980729	980729	980729	980729	980729	980729	980729	980729	980729	980729	980729	980729	980729	980729
Sample Time	MDL	Interval	1105	1010	1045	1030	1115	1155	1005	1110	1135	1215	1240	1420	1355	1305	1235
Lab ID #			65114	65115	65194	65116	65117	65118	65119	65120	65121	65122	65123	65124	65125	65126	65127
1,1-dichloroethane	0.099	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-dichloroethene	0.128	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-dichloropropene	0.154	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-trichloroethane	0.247	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1,2-tetrachloroethane	0.064	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-trichloroethane	0.164	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-tetrachloroethane	0.132	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-dibromo-3-chloropropane	0.891	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-dibromoethane	0.080	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-dichlorobenzene	0.085	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-dichloroethane	0.062	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-dichloropropane	0.041	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3-trichlorobenzene	0.124	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3-trichloropropane	1.480	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-trichlorobenzene	0.111	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-trimethylbenzene	0.088	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-dichlorobenzene	0.085	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-dichloropropane	0.085	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3,5-trimethylbenzene	0.085	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-dichlorobenzene	0.088	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-chloroethylvinylether	0.148	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-chlorotoluene	0.082	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,2-dichloropropane	0.279	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

APPENDIX
Data Table
All Concentrations in Micrograms/Liter

Site Number				14	15	16	16-dup	17	18	19	20	21	22	23	24	25	26	27	
Sample Date (yymmdd)			Blk Conf	980728	980729	980729	980729	980729	980729	980729	980729	980729	980729	980729	980729	980729	980729	980729	
Sample Time		MDL	Interval	1105	1010	1045	1030	1115	1155	1005	1110	1135	1215	1240	1420	1355	1305	1235	
Lab ID #				65114	65115	65194	65116	65117	65118	65119	65120	65121	65122	65123	65124	65125	65126	65127	
0.082	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND			4-chlorotoluene
benzene		0.039	NA	ND	0.120	ND	ND	ND	ND	ND	ND	0.0400	0.080	0.0600	ND	ND	ND	ND	
brombenzene		0.052	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
bromochloromethane		0.148	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
bromodichloromethane		0.076	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
bromoform		0.092	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
bromomethane		0.205	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
carbon tetrachloride		0.229	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
chlorobenzene		0.082	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
chloroethane		0.276	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
chloroform		0.085	0-0.77	0.340	ND	0.090	0.110	0.110	ND	0.090	0.110	0.150	ND	0.290	ND	ND	ND	ND	
chloromethane		0.221	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
cis-1,2-dichloroethene		0.071	NA	ND	ND	0.130	0.130	0.530	ND	ND	0.130	ND	ND	ND	0.080	0.420	ND	ND	
cis-1,3-dichloropropene		0.068	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
dibromochloromethane		0.099	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
dibromomethane		0.060	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
dichlorodifluoromethane		0.253	NA	ND	Rej.	Rej.	Rej.	Rej.	Rej.	Rej.	Rej.	Rej.	Rej.	Rej.	Rej.	Rej.	Rej.	Rej.	
ethylbenzene		0.057	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
hexachloro-1,3-butadiene		0.107	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
isopropylbenzene		0.067	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
meta/para-xylene		0.121	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
methylene chloride		1.093	0-14.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
methyltertbutylether		0.090	0-0.16	1.240	0.990	0.380	0.400	ND	ND	0.900	1.340	1.190	1.430	2.630	3.190	2.110	ND	ND	
naphthalene		0.166	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
n-butylbenzene		0.118	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
n-propylbenzene		0.088	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
ortho-xylene		0.062	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
para-isopropyltoluene		0.140	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
sec-butylbenzene		0.090	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
styrene		0.287	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
tert-butylbenzene		0.084	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
tetrachloroethene		0.078	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
toluene		0.054	0-0.69	ND	ND	ND	ND	ND	ND	0.410	ND	ND	ND	ND	ND	ND	ND	ND	
trans-1,2-dichloroethene		0.180	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
trans-1,3-dichloropropene		0.066	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
trichloroethene		0.087	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
trichlorofluoromethane		0.156	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
vinyl chloride		0.128	NA	ND	ND	ND	ND	ND	ND	ND	0.390	ND	ND	ND	ND	0.220	ND	ND	

APPENDIX
Data Table
All Concentrations in Micrograms/Liter

Site Number			28	29	31	32	33	34	35,outl	35-dup	36	37	38	39	40	41	41-dup
Sample Date (yymmdd)		Blk Conf	980729	980729	980729	980729	980728	980728	980728	980728	980728	980728	980729	980729	980729	980729	980729
Sample Time	MDL	Interval	1155	1345	1105	1015	1005	1100	1130	1130	1215	1256	955	1035	1115	1155	1155
Lab ID #			65128	65129	65131	65132	65133	65134	65135	65195	65136	65137	65138	65139	65140	65141	65193
1,1-dichloroethane	0.099	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-dichloroethene	0.128	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-dichloropropene	0.154	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-trichloroethane	0.247	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1,2-tetrachloroethane	0.064	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-trichloroethane	0.164	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-tetrachloroethane	0.132	NA	ND	ND	ND	ND	ND	ND	Rej.	ND	Rej.	Rej.	ND	ND	ND	ND	ND
1,2-dibromo-3-chloropropane	0.891	NA	ND	ND	ND	ND	ND	ND	Rej.	ND	Rej.	Rej.	ND	ND	ND	ND	ND
1,2-dibromoethane	0.080	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-dichlorobenzene	0.085	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-dichloroethane	0.062	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-dichloropropane	0.041	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3-trichlorobenzene	0.124	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3-trichloropropane	1.480	NA	ND	ND	ND	ND	ND	ND	Rej.	ND	Rej.	Rej.	ND	ND	ND	ND	ND
1,2,4-trichlorobenzene	0.111	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-trimethylbenzene	0.088	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.130
1,3-dichlorobenzene	0.085	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-dichloropropane	0.085	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3,5-trimethylbenzene	0.085	NA	ND	ND	ND	ND	ND	ND	0.240	ND	ND	ND	ND	ND	ND	ND	ND
1,4-dichlorobenzene	0.088	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-chloroethylvinylether	0.148	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-chlorotoluene	0.082	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,2-dichloropropane	0.279	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-chlorotoluene	0.082	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
benzene	0.039	NA	ND	ND	0.0500	ND	ND	ND	0.430	0.180	ND	ND	ND	ND	ND	ND	0.250
brombenzene	0.052	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
bromochloromethane	0.148	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
bromodichloromethane	0.076	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
bromoform	0.092	NA	ND	ND	ND	ND	0.180	0.210	0.100	0.120	ND	ND	0.100	ND	ND	ND	ND
bromomethane	0.205	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
carbon tetrachloride	0.229	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
chlorobenzene	0.082	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
chloroethane	0.276	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
chloroform	0.085	0-0.77	0.090	ND	0.180	0.310	ND	ND	ND	ND	0.130	0.120	ND	ND	ND	ND	ND
chloromethane	0.221	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,2-dichloroethene	0.071	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,3-dichloropropene	0.068	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
dibromochloromethane	0.099	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
dibromomethane	0.060	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
dichlorodifluoromethane	0.253	NA	Rej.	Rej.	Rej.	Rej.	ND	ND	ND	Rej.	ND	ND	Rej.	Rej.	Rej.	Rej.	Rej.
ethylbenzene	0.057	NA	ND	ND	ND	ND	ND	ND	0.200	ND	ND	ND	ND	ND	ND	ND	ND
hexachloro-1,3-butadiene	0.107	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
isopropylbenzene	0.067	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
meta/para-xylene	0.121	NA	ND	ND	ND	ND	ND	ND	0.810	ND	ND	ND	ND	ND	ND	ND	0.160

APPENDIX
Data Table
All Concentrations in Micrograms/Liter

Site Number			28	29	31	32	33	34	35,outl	35-dup	36	37	38	39	40	41	41-dup
Sample Date (yymmdd)		Blk Conf	980729	980729	980729	980729	980728	980728	980728	980728	980728	980728	980729	980729	980729	980729	980729
Sample Time	MDL	Interval	1155	1345	1105	1015	1005	1100	1130	1130	1215	1256	955	1035	1115	1155	1155
Lab ID #			65128	65129	65131	65132	65133	65134	65135	65195	65136	65137	65138	65139	65140	65141	65193
methylene chloride	1.093	0-14.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
methyltertbutylether	0.090	0-0.16	ND	ND	ND	ND	2.270	0.460	2.220	1.920	3.990	2.230	0.940	1.040	1.250	1.520	1.500
naphthalene	0.166	NA	ND	ND	ND	ND	ND	ND	Rej.	ND	Rej.	Rej.	ND	ND	ND	ND	ND
n-butylbenzene	0.118	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
n-propylbenzene	0.088	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ortho-xylene	0.062	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0900
para-isopropyltoluene	0.140	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
sec-butylbenzene	0.090	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
styrene	0.287	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
tert-butylbenzene	0.084	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
tetrachloroethene	0.078	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
toluene	0.054	0-0.69	0.060	ND	ND	ND	ND	ND	1.580	0.130	ND	ND	ND	ND	ND	ND	0.520
trans-1,2-dichloroethene	0.180	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,3-dichloropropene	0.066	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
trichloroethene	0.087	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
trichlorofluoromethane	0.156	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
vinyl chloride	0.128	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Site Number			47	49	89	90	Method Blank	Method Blank	Method Blank	Method Blank	Trip Blank	Trip Blank	Trip Blank	Trip Blank	Trip Blank
Sample Date (yymmdd)		Blk Conf	980729	980729	980728	980729	980728	980729	980803	980804	980728	980728	980803	980804	980804
Sample Time	MDL	Interval	1045	945	1140	1040	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lab ID #			65147	65149	65189	65190	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-dichloroethane	0.099	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-dichloroethene	0.128	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-dichloropropene	0.154	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-trichloroethane	0.247	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1,2-tetrachloroethane	0.064	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-trichloroethane	0.164	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-tetrachloroethane	0.132	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-dibromo-3-chloropropane	0.891	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-dibromoethane	0.080	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-dichlorobenzene	0.085	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-dichloroethane	0.062	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-dichloropropane	0.041	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3-trichlorobenzene	0.124	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3-trichloropropane	1.480	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-trichlorobenzene	0.111	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-trimethylbenzene	0.088	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-dichlorobenzene	0.085	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-dichloropropane	0.085	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3,5-trimethylbenzene	0.085	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-dichlorobenzene	0.088	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

APPENDIX
Data Table
All Concentrations in Micrograms/Liter

Site Number			47	49	89	90	Method Blank	Method Blank	Method Blank	Method Blank	Trip Blank	Trip Blank	Trip Blank	Trip Blank	Trip Blank
Sample Date (yymmdd)		Blk Conf	980729	980729	980728	980729	980728	980729	980803	980804	980728	980728	980803	980804	980804
Sample Time	MDL	Interval	1045	945	1140	1040	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lab ID #			65147	65149	65189	65190	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-chloroethylvinylether	0.148	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-chlorotoluene	0.082	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,2-dichloropropane	0.279	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-chlorotoluene	0.082	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
benzene	0.039	NA	ND	ND	0.0400	0.0500	ND	ND	ND	ND	ND	ND	ND	ND	ND
brombenzene	0.052	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
bromochloromethane	0.148	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
bromodichloromethane	0.076	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
bromoform	0.092	NA	0.110	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
bromomethane	0.205	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
carbon tetrachloride	0.229	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
chlorobenzene	0.082	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
chloroethane	0.276	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
chloroform	0.085	0-0.77	ND	ND	ND	ND	ND	0.500	ND	0.090	0.490	1.010	0.100	0.070	0.270
chloromethane	0.221	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,2-dichloroethene	0.071	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,3-dichloropropene	0.068	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
dibromochloromethane	0.099	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
dibromomethane	0.060	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
dichlorodifluoromethane	0.253	NA	Rej.	Rej.	Rej.	Rej.	ND	ND	ND	ND	ND	ND	ND	ND	ND
ethylbenzene	0.057	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
hexachloro-1,3-butadiene	0.107	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
isopropylbenzene	0.067	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
meta/para-xylene	0.121	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
methylene chloride	1.093	0-14.2	ND	ND	ND	ND	ND	ND	ND	ND	2.070	8.840	ND	ND	1.680
methyltertbutylether	0.090	0-0.16	1.800	1.520	2.120	0.720	ND	ND	0.130	0.170	ND	ND	0.130	0.120	0.110
naphthalene	0.166	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
n-butylbenzene	0.118	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
n-propylbenzene	0.088	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ortho-xylene	0.062	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
para-isopropyltoluene	0.140	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
sec-butylbenzene	0.090	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
styrene	0.287	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
tert-butylbenzene	0.084	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
tetrachloroethene	0.078	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
toluene	0.054	0-0.69	ND	ND	ND	ND	ND	ND	ND	ND	0.080	0.170	ND	ND	ND
trans-1,2-dichloroethene	0.180	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,3-dichloropropene	0.066	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
trichloroethene	0.087	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
trichlorofluoromethane	0.156	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
vinyl chloride	0.128	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

APPENDIX
Sample Site Descriptions

Site #	Latitude	Longitude	Description
1	26 19 30.0	080 05 27.6	HILLSBORO CANAL; FEDERAL HIGHWAY (US 1) - HILLSBORO CANAL
2	26 19 40.8	080 07 51.6	HILLSBORO CANAL; W SIDE OF SALINITY CONTROL STRUCTURE - HILLSBORO CANAL
3	26 19 37.2	080 12 10.8	HILLSBORO CANAL; STATE RD. 7 (US 441) - HILLSBORO CANAL
4	26 21 10.8	080 17 24.0	HILLSBORO CANAL; BRIDGE TO SOUTHEAST GROWERS' ASSOCIATION -HILLSBORO CANAL
5	26 13 19.2	080 06 14.4	POMPANO CANAL; FEDERAL HIGHWAY (US 1) - POMPANO CANAL
6	26 12 21.6	080 07 58.8	CYPRESS CREEK CANAL; DIXIE HIGHWAY BRIDGE - CYPRESS CREEK CANAL
7	26 13 08.4	080 10 15.6	CYPRESS CREEK CANAL; SOUTH PALMAIRE DRIVE - CYPRESS CREEK CANAL
8	26 13 48.0	080 12 18.0	POMPANO CANAL; STATE RD 7 - POMPANO CANAL
9	26 13 48.0	080 15 10.8	POMPANO CANAL; UNIVERSITY DRIVE - POMPANO CANAL
10	26 08 16.8	080 07 04.8	MIDDLE RIVER; E SUNRISE BLVD - MIDDLE RIVER
11	26 10 22.8	080 10 15.6	MIDDLE RIVER; NW 21ST AVE BRIDGE - MIDDLE RIVER
12	26 10 22.8	080 11 13.2	MIDDLE RIVER; NW 31ST AVE - MIDDLE RIVER
13	26 10 22.8	080 13 15.6	MIDDLE RIVER; ROCK ISLAND RD - MIDDLE RIVER
14	26 09 00.4	080 15 25.2	MIDDLE RIVER; UNIVERSITY DRIVE - MIDDLE RIVER
15	26 07 04.8	080 08 38.4	NEW RIVER; ANDREWS AVE BRIDGE - NEW RIVER
16	26 07 15.6	080 09 46.8	NORTH FORK NEW RIVER; BROWARD BLVD - NORTH FORK NEW RIVER

APPENDIX
Sample Site Descriptions

Site #	Latitude	Longitude	Description
17	26 08 06.0	080 11 42.0	PLANTATION CANAL; W SIDE OF SALINITY CONTROL STRUCTURE - PLANTATION CANAL
18	26 08 06.0	080 12 46.8	PLANTATION CANAL; NW 9TH DRIVE - PLANTATION CANAL
19	26 06 32.4	080 09 32.4	S FORK NEW RIVER; RIVER REACH CONDO - SEAWALL E SIDE OF S FORK OF NEW RIVER
20	26 05 13.2	080 11 02.4	NORTH FORK NEW RIVER; BRADFORD MARINA DOCK - NORTH FORK NEW RIVER
21	26 05 49.2	080 14 16.8	NORTH NEW RIVER CANAL; W SIDE OF FLOOD CONTROL STRUCTURE ON THE NORTH NEW RIVER CANAL 1/4 MI W OF TURNPIKE
22	26 06 57.6	080 19 01.2	NORTH NEW RIVER CANAL; SW 125TH AVE BRIDGE OVER NORTH NEW RIVER CANAL (C15)
23	26 07 19.2	080 20 34.8	NORTH NEW RIVER CANAL; US 27 AT NORTH NEW RIVER CANAL
24	26 03 32.4	080 08 38.4	DANIA CUTOFF CANAL; US 1 BRIDGE OVER DANIA CUTOFF CANAL
25	26 02 52.8	080 09 18.0	HOLLYWOOD CANAL; STIRLING ROAD BRIDGE OVER THE HOLLYWOOD CANAL (E OF BRYAN BLVD)
26	26 04 04.8	080 10 08.4	DANIA CUTOFF CANAL; RAVENSWOOD ROAD BRIDGE OVER THE DANIA CUTOFF CANAL
27	26 03 57.6	080 12 32.4	SOUTH NEW RIVER CANAL; WEST SIDE OF FLOOD CONTROL STRUCTURE ON SOUTH NEW RIVER CANAL
28	26 03 46.8	080 18 50.4	SOUTH NEW RIVER CANAL; FLAMINGO ROAD BRIDGE OVER THE SOUTH NEW RIVER CANAL
29	26 03 39.6	080 26 02.4	SOUTH NEW RIVER CANAL; US 27 BRIDGE OVER THE SOUTH NEW RIVER CANAL
31	25 57 50.4	080 18 43.2	SNAKE CREEK CANAL; FLAMINGO ROAD BRIDGE OVER THE SNAKE CREEK CANAL

APPENDIX
Sample Site Descriptions

Site #	Latitude	Longitude	Description
32	25 57 25.2	080 25 55.2	SNAKE CREEK CANAL; US 27 BRIDGE OVER THE SNAKE CREEK CANAL
33	26 18 50.4	080 04 55.2	ICW; HILLSBORO BLVD BRIDGE OVER THE INTRACOASTAL WATERWAY
34	26 15 39.6	080 05 02.4	ICW; HILLSBORO INLET; 100' N OF MARKER 71; 50' W OF E BANK
35	26 15 00.0	080 05 27.6	ICW; 100' N OF NE 14TH STREET BRIDGE; E FENDER; 100' W OF EAST BANK
36	26 11 20.4	080 06 14.4	ICW; 100' N OF COMMERCIAL BLVD BRIDGE E FENDER; 100' W OF EAST BANK
37	26 08 16.8	080 06 32.4	ICW; 100' N OF SUNRISE BLVD BRIDGE E FENDER; 100' W OF E BANK
38	26 06 00.0	080 07 12.0	ICW; 100' N OF 17TH STREET CAUSEWAY BRIDGE E FENDER 100' W OF E BANK
39	26 03 57.6	080 06 54.0	ICW; 300' N OF MARKER #35; 50' W OF E BANK
40	26 02 02.4	080 07 04.8	ICW; 100' N OF SHERIDAN STREET BRIDGE E FENDER; 50' W OF E BANK; WEST LAKE PROJECT SITE #W-3.
41	25 59 09.6	080 07 15.6	ICW; 100' N OF HALLANDALE BEACH BLVD BRIDGE E FENDER; 50' W OF E BANK
47	26 03 46.8	080 07 04.8	DANIA CUTOFF CANAL; DANIA CUTOFF CANAL; 200' W OF ICW
49	26 07 12.0	080 07 19.2	SOSPIRO CANAL; LAS OLAS ISLE BRIDGE OVER SOSPIRO CANAL
89	26 05 06.0	080 10 55.2	POMPANO CANAL; CENTER OF CANAL W SIDE OF NOB HILL ROAD BRIDGE OVER POMPANO CANAL N OF SOUTHGATE ROAD
90	26 13 44.4	080 16 55.2	S FORK NEW RIVER; E BANK OF S FORK NEW RIVER ABOUT 15 METERS N OF SERVICE ROAD

1. TITLE AND SUBTITLE *A Survey of the Occurrence and Distribution of Volatile Organic Compounds in Broward County Surface Waters*	2. REPORT DATE *February, 1999*
3. CONTRIBUTORS *Maria Fernandez, Russ Rand, Nancy Holsing, Aniel Pierre-louis, Rob Jensen, Reann Soodeen, Ken Vathauer, and George F. Riley*	4. PERFORMING ORGANIZATION REPORT NO. *Technical Report Series* *TR:99-01*
5. RESPONSIBLE DEPARTMENT AND DIVISION *Broward County Department of Natural Resource Protection* *218 SW 1st Avenue* *Fort Lauderdale, Fl 33301*	6. STRATEGIC ASSESSMENT PROGRAM ELEMENT NO. 7. CONTRACT/GRANT NO.
8. SPONSORING AGENCY NAME AND ADDRESS *Broward County Department of Natural Resource Protection* *218 SW 1st Avenue* *Fort Lauderdale, Fl 33301*	9. TYPE OF REPORT AND PERIOD COVERED *Technical, July, 1998*
10. SUPPLEMENTARY NOTES	

11. ABSTRACT

A survey of the surface waters of Broward County found 8 of the 61 targetted volatile organic compounds were detected in one or more samples. The detected VOCs can be grouped into 3 general classifications: petroleum hydrocarbons, chlorinated hydrocarbon decomposition products and naturally-occurring VOCs.

The petroleum hydrocarbons included 1,3,5-trimethylbenzene, meta/para-xylene, benzene, toluene and methyltertbutylether (MTBE). With the exception of MTBE, there was no discernable pattern of distribution. The vast majority of MTBE detections, and most of the highest levels, occurred in the eastern portion of the county where boat traffic is more common. The suspected sources included outboard motors and stormwater runoff from roadways.

The detection of chlorinated decomposition products, including vinyl chloride and cis-1,2-dichloroethene suggests that contaminated groundwater is impacting surface waters. One possible source of the groundwater contamination is seepage from septic tanks.

Bromoform was detected in 13.6% of all samples with the majority of these detections at stations on the eastern side of the county, primarily in the Intracoastal Waterway. Because of the occurrence of bromoform primarily in the eastern areas and the knowledge that bromoform is formed naturally by marine grasses and macro algae, the source of this VOC is likely ocean waters carried inland by tide.

The VOCs detected in this study reflect natural, tranportation and recreational activity impacts on surface water quality. It is not clear whether the VOCs detected may result in any significant human or environmental harm.

12. KEY WORDS

Surface Water
Petroleum Hydrocarbons
Outboard Motors
Port Everglades
Methyltertbutylether
Chloroform

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