# INTERIM DATA SUMMARY OF ONGOING BASELINE OFF-SITE AIR MONITORING VIA SAMPLING FOR VOLATILE ORGANIC COMPOUNDS AND HYDROGEN SULFIDE BY APPLICATION OF PASSIVE/DIFFUSIVE SAMPLING METHODS

**WEST LAKE LANDFILL SITE**
**BRIDGETON, MISSOURI**
**CERCLIS ID: MOD079900932**

**Superfund Technical Assessment and Response Team (START) 4**
**Contract No. EP-S7-13-06, Task Order No. 0058**

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## CONTENTS

**Section** **Page**

EXECUTIVE SUMMARY ..... ES-1

1.0 INTRODUCTION ..... 1

2.0 PROBLEM DEFINITION, BACKGROUND, AND SITE DESCRIPTION ..... 2

3.0 SAMPLING STRATEGY AND METHODOLOGY ..... 3

4.0 SUMMARY AND EVALUATION OF VOC AND $H_2S$ RESULTS ..... 5

4.1 DATA VALIDATION, VERIFICATION, AND USABILITY ..... 5

4.2 RESULTS AND EVALUATION ..... 5

4.2.1 Summary of Results ..... 5
4.2.2 Comparison of Results Among Off-Site Monitoring Stations ..... 6
4.2.3 Comparison of VOC Results from Radiello and Summa Canister Methods ..... 7
4.2.4 Comparison of $H_2S$ Results to Typical Ambient Concentrations ..... 7

5.0 ANALYSIS OF RESULTS ..... 8

6.0 SUMMARY OF OBSERVATIONS ..... 9

7.0 REFERENCES ..... 10

## APPENDICES

**Appendix**

A FIGURES

B TABULATED RESULTS

C TIME-SERIES PLOTS

D FREQUENCY OF DETECTION SUMMARY AND STATISTICAL ANALYSIS RESULTS

E BOXPLOTS



WLLFOIA4312 - 001 - 0031870

## EXECUTIVE SUMMARY

The Tetra Tech, Inc. (Tetra Tech) Superfund Technical Assessment and Response Team (START) has been tasked by the U.S. Environmental Protection Agency (EPA) to assist with baseline air monitoring at off-site locations around the West Lake Landfill site (WLLS) in Bridgeton, Missouri. This interim report summarizes results of sampling air for volatile organic compounds (VOC) and hydrogen sulfide ($H_2S$) by use of passive/diffusive samplers from December 18, 2014, through March 13, 2015. Baseline sampling via passive/diffusive methods was initiated during the baseline monitoring period after stakeholders had identified the sampling methodology for possible use during construction of the isolation barrier.

The baseline period air monitoring occurred at the following off-site monitoring stations according to the EPA-approved quality assurance project plan (QAPP):

**Station 1** – Robertson Fire Protection District Station 2, 3820 Taussig Rd., Bridgeton, Missouri

**Station 2** – Pattonville Fire Department District, 13900 St Charles Rock Rd., Bridgeton, Missouri

**Station 3** – Pattonville Fire Department District Station 2, 3365 McKelvey Rd., Bridgeton, Missouri

**Station 4** – Spanish Village Park, 12827 Spanish Village Dr., Bridgeton, Missouri

**Station 5** – St. Charles Fire Department Station #2, 1550 S. Main St., St. Charles, Missouri.

The Station 1 through 4 locations were selected primarily for their positions near and around WLLS (approximately 0.3 to 1 mile from WLLS, in various directions from WLLS). Station 5, designated as a reference (or background) station, is farther away from WLLS than the other stations, but still within the general vicinity so as to be representative of the North St. Louis County and eastern St. Charles County area.

Data from the passive/diffusive samplers collected from December 18, 2014, through March 13, 2015, were evaluated for differences in measured concentrations among the air monitoring stations off site of the WLLS. In addition, VOC results obtained by use of the passive/diffusive samplers were compared to VOC results previously obtained via 24-hour Summa® canister sampling at the WLLS air monitoring stations. The following describes the findings:

- VOC concentrations detected at the five WLLS air monitoring stations via passive/diffusive sampling are within the concentration ranges previously detected at the air monitoring stations via 24-hour Summa canister sampling. Previous examination of 24-hour VOC concentrations detected at the five WLLS air monitoring stations revealed concentrations typical for an outdoor urban environment (see Tetra Tech 2015d). Thus, VOC concentrations detected at the five WLLS air monitoring stations via passive/diffusive sampling also appear typical for an outdoor urban environment.



WLLFOIA4312 - 001 - 0031871

- Statistical testing for differences in VOC concentrations detected via passive/diffusive sampling among the five air monitoring stations suggests tendency for detection of TCE at higher concentrations at Station 2 than at the other stations (Stations 1, 3, 4, and 5). A similar result was obtained from statistical testing of TCE data obtained via 24-hour sampling with Summa canisters at the five air monitoring stations. Although differences were detected among the stations, TCE concentrations at the five WLLS monitoring stations (including Station 2) were found comparable to 24-hour TCE concentrations EPA has detected at other urban areas via the National Air Toxics Treads Stations (NATTS) air monitoring program.

- No statistically significant differences in $H_2S$ concentrations were found among the five WLLS air monitoring stations, and the concentrations were consistent with typical $H_2S$ concentrations within outdoor urban environments.

Overall, the VOC and $H_2S$ measurements obtained via passive/diffusive sampling at the off-site monitoring stations appear typical for outdoor urban measurements.

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WLLFOIA4312 - 001 - 0031872

# 1.0 INTRODUCTION

The Tetra Tech, Inc. (Tetra Tech) Superfund Technical Assessment and Response Team (START) has been tasked by the U.S. Environmental Protection Agency (EPA) to assist with baseline monitoring at off-site locations around the West Lake Landfill site (WLLS) in Bridgeton, Missouri. This interim report summarizes results from sampling air for volatile organic compounds (VOC) and hydrogen sulfide ($H_2S$) by use of passive/diffusive samplers from December 18, 2014, through March 13, 2015. Baseline sampling via passive/diffusive methods was initiated during the baseline monitoring period after stakeholders had identified the sampling methodology for possible use during construction of the isolation barrier.

For the overall baseline monitoring campaign, START's tasks have included: (1) assembling and maintaining a network of off-site air monitoring stations with instrumentation and sampling devices to measure parameters of concern, (2) collecting samples and coordinating laboratory analysis, (3) assisting EPA with data acquisition and management, (4) documenting off-site air monitoring efforts, and (5) validating/verifying initial screening of the data. The objective of this report is to present an interim summary of VOCs and $H_2S$ data acquired by use of passive/diffusive samplers, including findings related to data validation, verification, and usability.



WLLFOIA4312 - 001 - 0031873

## 2.0 PROBLEM DEFINITION, BACKGROUND, AND SITE DESCRIPTION

EPA is conducting ongoing air monitoring at locations off site of WLLS during a pre-construction, baseline period prior to initiation of construction of a planned isolation barrier at WLLS. Air monitoring during the baseline period will provide data for use to (1) evaluate pre-construction concentrations of chemical and radiological parameters of potential concern in outdoor air, and (2) optimize the sampling and monitoring plan for the off-site air monitoring to occur during construction of the isolation barrier. During barrier construction, air monitoring will occur to address concerns that construction operations at WLLS could impact human health and the environment via release to ambient air of solid waste landfill gases of concern or of particulates with radiologically-impacted materials (RIM).

West Lake Landfill is an approximately 200-acre property including several closed solid waste landfill units that accepted wastes for landfilling from the 1940s or 1950s through 2004, plus a solid waste transfer station, a concrete plant, and an asphalt batch plant. WLLS is at 13570 St. Charles Rock Road in Bridgeton, St. Louis County, Missouri, approximately 1 mile north of the intersection of Interstate 70 and Interstate 270 (see Appendix A, Figure 1). WLLS was used for limestone quarrying and crushing operations from 1939 through 1988. Beginning in the late 1940s or early 1950s, portions of the quarried areas and adjacent areas were used for landfilling municipal refuse, industrial solid wastes, and construction/demolition debris. In 1973, approximately 8,700 tons of leached barium sulfate residues (a remnant from the Manhattan Engineer District/Atomic Energy Commission project) was reportedly mixed with approximately 39,000 tons of soil from the 9200 Latty Avenue site in Hazelwood, Missouri, transported to the WLLS, and used as daily or intermediate cover material. In December 2004, the Bridgeton Sanitary Landfill—the last landfill unit to receive solid waste—stopped receiving waste pursuant to an agreement with the City of St. Louis to reduce potential for birds to interfere with Lambert Field International Airport operations. In December 2010, Bridgeton Landfill detected changes—elevated temperatures and elevated carbon monoxide levels—in its landfill gas extraction system operating at the South Quarry of the Bridgeton Sanitary Landfill portion of the Site (a landfill portion not associated with known RIM). Further investigation indicated that the South Quarry Pit landfill was undergoing an exothermic subsurface smoldering event (SSE). In 2013, potentially responsible parties committed to constructing an isolation barrier that would separate the Bridgeton Landfill undergoing the SSE from the RIM-containing portions of WLLS (EPA 2014).



WLLFOIA4312 - 001 - 0031874

## 3.0 SAMPLING STRATEGY AND METHODOLOGY

In April/May 2014, EPA and START began baseline monitoring and sampling for the chemical and radiological parameters of concern at five off-site monitoring stations. Baseline sampling for VOCs and $H_2S$ via passive/diffusive methods (the subject of this interim report) began in December 2014 after the sampling methodology had been identified for possible use during the isolation barrier construction. Sampling is occurring at the following monitoring stations (see Appendix A, Figure 1):

**Station 1** – Robertson Fire Protection District Station 2, 3820 Taussig Rd., Bridgeton, Missouri

**Station 2** – Pattonville Fire Department District, 13900 St Charles Rock Rd., Bridgeton, Missouri

**Station 3** – Pattonville Fire Department District Station 2, 3365 McKelvey Rd., Bridgeton, Missouri

**Station 4** – Spanish Village Park, 12827 Spanish Village Dr., Bridgeton, Missouri

**Station 5** – St. Charles Fire Department Station #2, 1550 S. Main St., St. Charles, Missouri.

The Station 1 through 4 locations were selected primarily for their positions near and around WLLS (approximately 0.3 to 1 mile from WLLS, in various directions from WLLS). Station 5 was designated as a reference (or background) station, and its location was selected according to the criterion that it be frequently upwind of WLLS and farther away from WLLS than the other stations, but still within the general vicinity so as to be representative of the North St. Louis County and eastern St. Charles County area (see wind rose in Appendix A, Figure 1).

VOCs were identified as a parameter of potential concern in the Quality Assurance Project Plan (QAPP) (Tetra Tech 2014) based on historical information regarding the site and program experience with similar types of sites. Sampling for VOCs during the baseline monitoring period has occurred primarily by use of Summa® canisters (collected over a 24-hour period) and laboratory analysis via EPA Method TO-15. Sampling by use of Summa canisters occurred weekly at the air monitoring stations from May 8 to December 17, 2014, and the resulting data were summarized and evaluated by Tetra Tech (2015d). The report herein provides an interim summary of VOC sampling by use of passive/diffusive samplers that began in December 2014 after stakeholders had identified the sampling methodology for possible use during isolation barrier construction. This sampling occurred via deployment of Radiello® brand passive/diffusive samplers fitted with activated charcoal adsorbent cartridges. The cartridges were generally deployed at each of the five monitoring stations continuously for sampling durations of



WLLFOIA4312 - 001 - 0031875

approximately 7 days[1]. At the end of the sampling duration, the deployed cartridges were collected, and a new sampling deployment was initiated with new cartridges. The Radiello cartridges for VOC sampling were shipped to Pace Analytical Laboratory (Pace) in Lenexa, Kansas, for analysis via Method EPA TO-17 modified for analysis of the Radiello cartridges.

$H_2S$, another parameter of potential concern identified in the QAPP (Tetra Tech 2014), was also sampled by use of Radiello cartridges concurrently with the VOC Radiello sampling at the five air monitoring stations. Radiello samplers deployed for $H_2S$ sampling were fitted with adsorbent cartridges containing zinc acetate. These cartridges were shipped to ALS Laboratory in Simi Valley, California, for analysis via an extraction and colorimetric analysis specified by the Radiello cartridge manufacturer.

[1] The Radiello cartridges collected on January 19, 2015 were deployed for 14 days to assess for any significant differences in measured analyte concentrations (or detection limits) compared to a 7 day deployment (no significant differences were observed).



WLLFOIA4312 - 001 - 0031876

# 4.0 SUMMARY AND EVALUATION OF VOC AND $H_2S$ RESULTS

The following sections present data summaries of the VOC and $H_2S$ results from Radiello passive/diffusive samplers during the baseline monitoring period, including time series and box plots of the data, and results of statistical analyses.

## 4.1 DATA VALIDATION, VERIFICATION, AND USABILITY

As laboratory analytical reports are received for the analyses, START reviews and qualifies the data according to the EPA *Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review* guidance document (EPA 2008). This is standard practice for EPA data. A data validation report is appended to each analytical laboratory report, and is included in each data deliverable package (see Tetra Tech 2015a, b, c, d). Qualifications to the data from START's review are indicated by qualifier flags that accompany the data presented therein. Overall, review of the laboratory analytical data packages indicated that quality of the VOC and $H_2S$ data was acceptable and usable as qualified for the intended purposes of the data.

On March 19, 2015, Pace notified Tetra Tech that its chemists had identified benzene and toluene contamination in the sorbent media that appeared to originate from the sorbent media supplied by the manufacturer. For the samples affected, Pace did not report benzene or toluene concentrations. The affected samples were generally those collected on and after January 28, 2015. Because the potentially affected data (benzene and toluene concentrations) were not reported by the laboratory, no specific qualifications were assigned via START's data validation/verification.

## 4.2 RESULTS AND EVALUATION

The following describes results of sampling for VOCs and $H_2S$ from December 18, 2014, through March 13, 2015, by use of passive/diffusive Radiello samplers.

### 4.2.1 Summary of Results

Appendix B presents the Radiello sampling results and summary statistics for VOCs (see Tables B-1 through B-14) and $H_2S$ (see Table B-15). Appendix C presents a time-series plot for each VOC (see Exhibits C-1 through C-14) and for $H_2S$ (see Exhibit C-15). As discussed in Section 4.2.3, the time-series



WLLFOIA4312 - 001 - 0031877

plots for the VOCs also show, for comparison, VOC results obtained via 24-hour sampling by use of Summa canisters[2].

### 4.2.2 Comparison of Results Among Off-Site Monitoring Stations

Differences in measured concentrations of VOCs and $H_2S$ among the air monitoring stations are evaluated and described in this section so that data users can be aware of those differences when using the pre-construction baseline data. Comparisons of measured concentrations among the air monitoring stations proceeded via statistical testing and examination of boxplots. Results obtained by use of Radiello cartridges were compared (comparisons of Summa VOC results among the stations appears in Tetra Tech 2015e). The following describes the evaluations.

Kruskal-Wallis Statistical Test

The Kruskal-Wallis statistical test was used to test for differences in VOCs and $H_2S$ concentrations among the five monitoring stations. The Kruskal-Wallis test compares multiple treatments (such as the multiple monitoring locations), and was selected in particular because it is a non-parametric statistical (rank- or percentiles-based) test that can accommodate non-detect (or "less than") results found in the data. Before performance of the test, the data were prepared for the Kruskal-Wallis test as recommended in *Statistics for Censored Environmental Data Using Minitab® and R* (Helsel 2012). That is, the data were censored at the highest reporting limit in the dataset by assigning all values below the highest reporting limit (including all non-detects and any reported value less than the highest reporting limit) a low and arbitrary value; the value "-1" was used. The statistical software package R was used to conduct the Kruskal-Wallis tests. Results of the analysis suggested statistically significant differences in concentrations of one analyte among the five monitoring stations:

> **Trichloroethene (TCE):** Measurements of concentration at Station 2 tended to be higher than at Stations 1, 3, 4, and 5.

The analysis found no statistically significant difference in $H_2S$ concentrations among the five monitoring stations. A summary of the Kruskal-Wallis test results is in Appendix D, Table D-1.

The same statistical analysis applied to VOC results obtained via 24-hour sampling by use of Summa canisters also found statistically significant differences in TCE concentrations among the five stations (the

[2] *Data Summary of Ongoing Baseline Off-Site Air Monitoring, Volatile Organic Compounds by Test Method TO-15* (Tetra Tech 2015d) presents an evaluation of VOC results obtained via 24-hour sampling by use of Summa canisters.



WLLFOIA4312 - 001 - 0031878

test indicated that measurements of concentration at Station 2 tended to be higher than at Stations 1, 3, and 4) (see Tetra Tech 2015e).

Boxplots

Boxplots of VOC and $H_2S$ results were constructed and evaluated to verify results of the Kruskal-Wallis statistical testing (see Appendix E). Boxplots are visual comparisons of data that display relative positions of the 25th, 50th, and 75th percentiles, and also individual outlier data points. The "NADA" (Nondetects and Data Analysis for environmental data) for the statistical software package R was used to create "censored" boxplots of the VOC data. In constructing the censored boxplots, the NADA software accounts for non-detect values and displays a horizontal line across the boxplots representing the maximum "less than" value in the data. Boxplot elements above the line are statistically accurate, but boxplot elements below the line represent only estimated percentiles (based on the distribution of the uncensored data). Review of the boxplots supports findings of the Kruskal-Wallis testing that indicated no significant statistical differences in measured concentrations of $H_2S$ or VOCs (except for TCE) among the five monitoring stations.

### 4.2.3 Comparison of VOC Results from Radiello and Summa Canister Methods

To compare passive/diffusive Radiello sampling data with data from previous 24-hour sampling by use of Summa canisters[3], both data sets were plotted in the Appendix C plots (isopropylbenzene, methyl-tert-butyl ether, and *trans*-1,2-dichloroethene were reported only in the Radiello analysis). Notably, for those VOCs concentrations measured by both methods, Radiello results were within the range of concentrations measured by use of Summa canisters.

### 4.2.4 Comparison of $H_2S$ Results to Typical Ambient Concentrations

The reported $H_2S$ concentrations ranged 0.16 to 0.64 micrograms per cubic meter ($\mu g/m^3$) (approximately 0.12 to 0.46 parts per billion [ppb]). The Agency for Toxic Substances and Disease Registry (ATSDR) reports that ambient air concentrations of $H_2S$ from natural sources range between 0.11 and 0.33 ppb, and that concentrations of $H_2S$ in urban areas are generally less than 1 ppb (ATSDR 2014). Thus, $H_2S$ results from the five off-site monitoring stations appear typical for outdoor urban measurements.

[3] *Data Summary of Ongoing Baseline Off-Site Air Monitoring, Volatile Organic Compounds by Test Method TO-15* (Tetra Tech 2015d) presents an evaluation of VOC results obtained via 24-hour sampling by use of Summa canisters.



WLLFOIA4312 - 001 - 0031879

## 5.0 ANALYSIS OF RESULTS

As discussed above, statistical testing for differences in concentrations among the five air monitoring stations suggests a tendency for measurements of TCE concentration to be higher at Station 2 than at the other stations 1, 3, 4, and 5. A similar result was obtained from statistical testing of the TCE data obtained via 24-hour sampling by use of Summa canisters at the five air monitoring stations; however, the 24-hour TCE concentrations were found comparable to 24-hour TCE concentrations EPA had detected at other urban areas under the National Air Toxics Treads Stations (NATTS) air monitoring program (see Tetra Tech 2015e). TCE concentrations detected via Radiello sampling are within the range of 24-hour concentrations previously detected at WLLS air monitoring stations via 24-hour Summa sampling (see Appendix C, Exhibit C-13), and are thus also comparable to concentrations detected in other urban areas.

TCE is a common industrial solvent that frequently appears in groundwater contaminant plumes at cleanup sites from historical use and improper disposal. Given the chemical properties of TCE, if found in the buried waste at WLLS, TCE likely would be found in the groundwater and released to the air. However, EPA reviewed groundwater data from WLLS and found no indication of presence of TCE. Further, if TCE were found in the buried waste at WLLS, it likely would be detected in the leachate resulting from moisture percolating through the buried waste material. However, TCE was also not detected in leachate samples collected at WLLS prior to treatment. Thus, TCE does not appear to be present in the buried waste at WLLS, and, by inference, the detections in ambient air are not believed to have resulted from releases of this VOC from WLLS. Moreover, EPA's examination of reports of air emissions from various industrial facilities in the area revealed presence of other possible sources of TCE.



WLLFOIA4312 - 001 - 0031880

## 6.0 SUMMARY OF OBSERVATIONS

VOCs and $H_2S$ sampling via 1- and 2-week deployments of passive/diffusive samplers began in December 2014 as part of baseline off-site air monitoring at five air monitoring stations off site of WLLS. This interim report summarizes and evaluates data from the passive/diffusive samplers obtained from December 18, 2014, through March 13, 2015. Differences in measured concentrations among the air monitoring stations off site of the WLLS were evaluated. In addition, VOC results obtained by use of the passive/diffusive samplers were compared to VOC results previously obtained via 24-hour Summa canister sampling at the WLLS air monitoring stations. The following describes the findings.

- VOC concentrations detected at the five WLLS air monitoring stations via passive/diffusive sampling are within the concentration ranges previously detected at the air monitoring stations via 24-hour Summa canister sampling. Previous examination of 24-hour VOC concentrations detected at the five WLLS air monitoring stations revealed concentrations typical for an outdoor urban environment (see Tetra Tech 2015e). Thus, VOC concentrations detected at the five WLLS air monitoring stations via passive/diffusive sampling also appear typical for an outdoor urban environment.

- Statistical testing for differences in VOC concentrations detected via passive/diffusive sampling among the five air monitoring stations suggests tendency for detection of TCE at higher concentrations at Station 2 than at the other stations (Stations 1, 3, 4, and 5). A similar result was obtained from statistical testing of TCE data obtained via 24-hour sampling with Summa canisters at the five air monitoring stations. Although differences were detected among the stations, TCE concentrations at the five WLLS monitoring stations (including Station 2) were found comparable to 24-hour TCE concentrations EPA had detected at other urban areas via the National Air Toxics Treads Stations (NATTS) air monitoring program.

- No statistically significant differences in $H_2S$ concentrations were found among the five WLLS air monitoring stations, and the concentrations were consistent with typical $H_2S$ concentrations within outdoor urban environments.

Overall, the VOCs and $H_2S$ measurements obtained via passive/diffusive sampling at the off-site monitoring stations appear typical for outdoor urban measurements.



WLLFOIA4312 - 001 - 0031881

## 7.0 REFERENCES


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Tetra Tech. 2015c. Data Deliverable Package 09, West Lake Landfill Site, Bridgeton, Missouri. March 20.

Tetra Tech. 2015d. Data Deliverable Package 10, West Lake Landfill Site, Bridgeton, Missouri. April 27.

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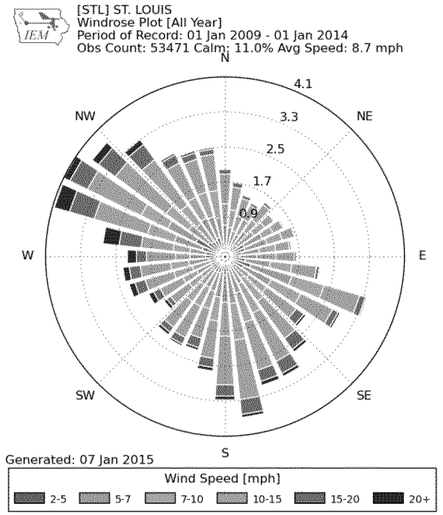
# APPENDIX A

# FIGURES

Legend

- Off-site air monitoring station
- West Lake Landfill Site Operable Unit 1 (radiological area)
- Bridgeton Landfill




N

0 1,000 2,000

Feet

Source: ArcGIS Online Aerial Imagery, 2013; Iowa State University of Science and Technology, 2015

West Lake Landfill
Bridgeton, Missouri

**Figure 1**

Off-Site Air Monitoring Stations

TETRA TECH

Date: 1/19/2015 | Drawn By: Bill Spiking | Project No: X9025.14.0058.000

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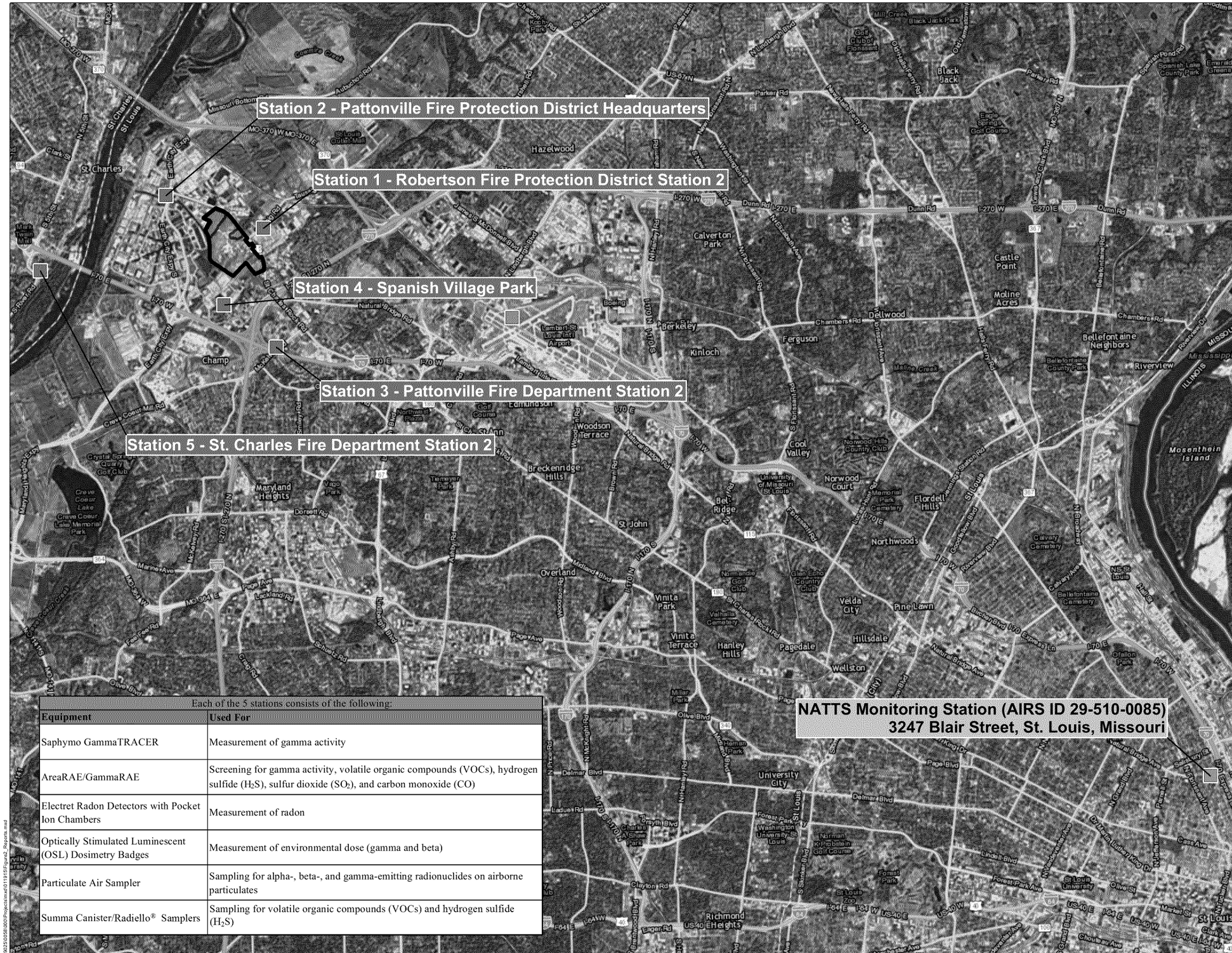
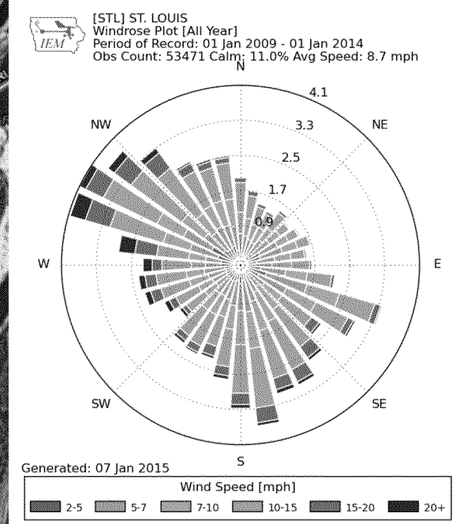



| Each of the 5 stations consists of the following: | |
|---|---|
| **Equipment** | **Used For** |
| Saphymo GammaTRACER | Measurement of gamma activity |
| AreaRAE/GammaRAE | Screening for gamma activity, volatile organic compounds (VOCs), hydrogen sulfide ($H_2S$), sulfur dioxide ($SO_2$), and carbon monoxide (CO) |
| Electret Radon Detectors with Pocket Ion Chambers | Measurement of radon |
| Optically Stimulated Luminescent (OSL) Dosimetry Badges | Measurement of environmental dose (gamma and beta) |
| Particulate Air Sampler | Sampling for alpha-, beta-, and gamma-emitting radionuclides on airborne particulates |
| Summa Canister/Radiello® Samplers | Sampling for volatile organic compounds (VOCs) and hydrogen sulfide ($H_2S$) |

Legend

- Lambert St. Louis International Airport Metar Station
- NATTS monitoring station
- Off-site air monitoring station
- Bridgeton Landfill
- West Lake Landfill Site Operable Unit 1 (radiological area)

NATTS National Air Toxics Trends Station




N

0 3,500 7,000

Feet

Source: ArcGIS Online Aerial Imagery, 2013; Iowa State University of Science and Technology, 2015

West Lake Landfill
Bridgeton, Missouri

**Figure 2**

Location of St. Louis NATTS Air Monitoring Station

TETRA TECH

Date: 1/19/2015 Drawn By: Gustavo Orozco Project No: X9025.14.0058.000

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# APPENDIX B

# TABULATED RESULTS

**Table B-1**
**1,2,4-Trimethylbenzene**

| Date Collected | Station 1 | Station 2 | Station 3 | Station 4 | Station 5 |
|---|---|---|---|---|---|
| 12/18/2014 | ND (0.012) | ND (0.013) | ND (0.013) | ND (0.012)/ND (0.012) | ND (0.013) |
| 12/27/2014 | ND (0.012) | ND (0.012) | ND (0.012) | ND (0.012)/ND (0.012) | ND (0.012) |
| 1/5/2015 | ND (0.011) | ND (0.011) | ND (0.011) | ND (0.011)/ND (0.011) | ND (0.011) |
| 1/19/2015 | ND (0.0074) | ND (0.0074) | ND (0.0074) | ND (0.0074)/ND (0.0074) | ND (0.0074) |
| 1/28/2015 | 0.26 | 0.27 | 0.32 | 0.25 /0.35 | 0.45 |
| 2/4/2015 | ND (0.034) | ND (0.034) | ND (0.034) | ND (0.034)/ND (0.034) | ND (0.034) |
| 2/13/2015 | ND (0.031)/ND (0.026) | ND (0.026) | ND (0.026) | ND (0.026) | ND (0.026) |
| 2/20/2015 | U | U | U | U/U | U |
| 2/27/2015 | ND (0.14) | ND (0.14) | ND (0.14) | ND (0.14)/ND (0.14) | ND (0.14) |
| 3/6/2015 | ND (0.14) | ND (0.14) | ND (0.14) | ND (0.14)/ND (0.14) | ND (0.14) |
| 3/13/2015 | ND (0.15) | ND (0.15) | ND (0.15) | ND (0.14)/ND (0.14) | ND (0.15) |
| **No. of Detects** | **1** | **1** | **1** | **2** | **1** |
| **No. of Samples** | **12** | **11** | **11** | **21** | **11** |
| **Minimum** | **0.26** | **0.27** | **0.32** | **0.25** | **0.45** |
| **Median** | **0.26** | **0.27** | **0.32** | **0.3** | **0.45** |
| **Maximum** | **0.26** | **0.27** | **0.32** | **0.35** | **0.45** |

**Notes:**

All concentrations in micrograms per cubic meter ($\mu g/m^3$)

ND ( ) not detected (method detection limit)

U indicates a sample flagged by the data validator as not meeting data quality objectives; result is considered a non-detect

**Table B-2**
**1,3,5-Trimethylbenzene**

| Date Collected | Station 1 | Station 2 | Station 3 | Station 4 | Station 5 |
|---|---|---|---|---|---|
| 12/18/2014 | ND (0.012) | ND (0.012) | ND (0.012) | ND (0.012)/ND (0.012) | ND (0.012) |
| 12/27/2014 | ND (0.011) | ND (0.011) | ND (0.011) | ND (0.011)/ND (0.011) | ND (0.011) |
| 1/5/2015 | ND (0.01) | ND (0.011) | ND (0.011) | ND (0.011)/ND (0.011) | ND (0.011) |
| 1/19/2015 | ND (0.0068) | ND (0.0068) | ND (0.0068) | ND (0.0068)/ND (0.0068) | ND (0.0068) |
| 1/28/2015 | ND (0.032) | ND (0.032) | ND (0.032) | ND (0.032)/ND (0.032) | ND (0.032) |
| 2/4/2015 | ND (0.041) | ND (0.041) | ND (0.041) | ND (0.041)/ND (0.041) | ND (0.041) |
| 2/13/2015 | ND (0.038)/ND (0.032) | ND (0.032) | ND (0.032) | ND (0.032) | ND (0.032) |
| 2/20/2015 | ND (0.041) | ND (0.041) | U | ND (0.041)/U | ND (0.041) |
| 2/27/2015 | ND (0.17) | ND (0.17) | ND (0.17) | ND (0.17)/ND (0.17) | ND (0.17) |
| 3/6/2015 | ND (0.17) | ND (0.17) | ND (0.17) | ND (0.17)/ND (0.17) | ND (0.17) |
| 3/13/2015 | ND (0.18) | ND (0.18) | ND (0.18) | ND (0.17)/ND (0.17) | ND (0.18) |
| **No. of Detects** | **0** | **0** | **0** | **0** | **0** |
| **No. of Samples** | **12** | **11** | **11** | **21** | **11** |
| **Minimum** | **NA** | **NA** | **NA** | **NA** | **NA** |
| **Median** | **NA** | **NA** | **NA** | **NA** | **NA** |
| **Maximum** | **NA** | **NA** | **NA** | **NA** | **NA** |

**Notes:**

All concentrations in micrograms per cubic meter ($\mu g/m^3$)

NA not applicable

ND ( ) not detected (method detection limit)

U indicates a sample flagged by the data validator as not meeting data quality objectives; result is considered a non-detect

**Table B-3**
**Benzene**

| Date Collected | Station 1 | Station 2 | Station 3 | Station 4 | Station 5 |
|---|---|---|---|---|---|
| 12/18/2014 | ND (0.039) | ND (0.039) | ND (0.039) | ND (0.039)/ND (0.039) | ND (0.039) |
| 12/27/2014 | ND (0.036) | ND (0.036) | ND (0.036) | ND (0.036)/ND (0.036) | ND (0.036) |
| 1/5/2015 | ND (0.035) | ND (0.035) | ND (0.035) | ND (0.035)/ND (0.035) | ND (0.035) |
| 1/19/2015 | ND (0.023) | ND (0.023) | ND (0.023) | ND (0.023)/ND (0.023) | ND (0.023) |
| 2/20/2015 | NR | NR | U | NR/U | NR |
| **No. of Detects** | **0** | **0** | **0** | **0** | **0** |
| **No. of Samples** | **4** | **4** | **5** | **9** | **4** |
| **Minimum** | **NA** | **NA** | **NA** | **NA** | **NA** |
| **Median** | **NA** | **NA** | **NA** | **NA** | **NA** |
| **Maximum** | **NA** | **NA** | **NA** | **NA** | **NA** |

**Notes:**

All concentrations in micrograms per cubic meter ($\mu g/m^3$)

| | |
|---|---|
| NA | not applicable |
| ND ( ) | not detected (method detection limit) |
| NR | not reported by laboratory |
| U | indicates a sample flagged by the data validator as not meeting data quality objectives; result is considered a non-detect |

**Table B-4**
**cis-1,2-Dichloroethene**

| Date Collected | Station 1 | Station 2 | Station 3 | Station 4 | Station 5 |
|---|---|---|---|---|---|
| 12/18/2014 | ND (0.076) | ND (0.076) | ND (0.076) | ND (0.076)/ND (0.076) | ND (0.076) |
| 12/27/2014 | ND (0.071) | ND (0.071) | ND (0.071) | ND (0.071)/ND (0.071) | ND (0.071) |
| 1/5/2015 | ND (0.068) | ND (0.069) | ND (0.069) | ND (0.069)/ND (0.069) | ND (0.069) |
| 1/19/2015 | ND (0.045) | ND (0.045) | ND (0.045) | ND (0.045)/ND (0.045) | ND (0.045) |
| 1/28/2015 | ND (0.025) | ND (0.025) | ND (0.025) | ND (0.025)/ND (0.025) | ND (0.025) |
| 2/4/2015 | ND (0.032) | ND (0.032) | ND (0.032) | ND (0.032)/ND (0.032) | ND (0.032) |
| 2/13/2015 | ND (0.029)/ND (0.025) | ND (0.025) | ND (0.025) | ND (0.025) | ND (0.025) |
| 2/20/2015 | ND (0.032) | ND (0.032) | U | ND (0.032)/U | ND (0.032) |
| 2/27/2015 | ND (0.13) | ND (0.13) | ND (0.13) | ND (0.13)/ND (0.13) | ND (0.13) |
| 3/6/2015 | ND (0.13) | ND (0.13) | ND (0.13) | ND (0.13)/ND (0.13) | ND (0.13) |
| 3/13/2015 | ND (0.14) | ND (0.14) | ND (0.14) | ND (0.14)/ND (0.14) | ND (0.14) |
| **No. of Detects** | **0** | **0** | **0** | **0** | **0** |
| **No. of Samples** | **12** | **11** | **11** | **21** | **11** |
| **Minimum** | **NA** | **NA** | **NA** | **NA** | **NA** |
| **Median** | **NA** | **NA** | **NA** | **NA** | **NA** |
| **Maximum** | **NA** | **NA** | **NA** | **NA** | **NA** |

**Notes:**

All concentrations in micrograms per cubic meter ($\mu g/m^3$)

| | |
|---|---|
| NA | not applicable |
| ND ( ) | not detected (method detection limit) |
| U | indicates a sample flagged by the data validator as not meeting data quality objectives; result is considered a non-detect |

**Table B-5**
**Ethylbenzene**

| Date Collected | Station 1 | Station 2 | Station 3 | Station 4 | Station 5 |
|---|---|---|---|---|---|
| 12/18/2014 | ND (0.01) | ND (0.01) | ND (0.01) | ND (0.01)/ND (0.01) | ND (0.01) |
| 12/27/2014 | ND (0.0096) | ND (0.0096) | ND (0.0096) | ND (0.0096)/ND (0.0096) | ND (0.0096) |
| 1/5/2015 | ND (0.0092) | ND (0.0093) | ND (0.0093) | ND (0.0092)/ND (0.0092) | ND (0.0093) |
| 1/19/2015 | ND (0.006) | ND (0.006) | ND (0.006) | ND (0.006)/ND (0.006) | ND (0.006) |
| 1/28/2015 | 0.32 | 0.31 | 0.29 | 0.28 /0.31 | 0.37 |
| 2/4/2015 | 0.19 | 0.18 | 0.18 | 0.18 /0.16 | 0.17 |
| 2/13/2015 | 0.21 /0.19 | 0.19 | 0.2 | 0.19 | 0.26 |
| 2/20/2015 | U | U | U | U/U | U |
| 2/27/2015 | ND (0.08) | ND (0.08) | ND (0.08) | ND (0.08)/ND (0.08) | ND (0.08) |
| 3/6/2015 | ND (0.08) | ND (0.08) | ND (0.08) | ND (0.08)/ND (0.08) | ND (0.08) |
| 3/13/2015 | ND (0.082) | ND (0.082) | ND (0.082) | ND (0.081)/ND (0.081) | ND (0.082) |
| **No. of Detects** | **4** | **3** | **3** | **5** | **3** |
| **No. of Samples** | **12** | **11** | **11** | **21** | **11** |
| **Minimum** | **0.19** | **0.18** | **0.18** | **0.16** | **0.17** |
| **Median** | **0.2** | **0.19** | **0.2** | **0.19** | **0.26** |
| **Maximum** | **0.32** | **0.31** | **0.29** | **0.31** | **0.37** |

**Notes:**

All concentrations in micrograms per cubic meter ($\mu g/m^3$)

ND ( ) not detected (method detection limit)

U indicates a sample flagged by the data validator as not meeting data quality objectives; result is considered a non-detect

**Table B-6**
**Isopropylbenzene (Cumene)**

| Date Collected | Station 1 | Station 2 | Station 3 | Station 4 | Station 5 |
|---|---|---|---|---|---|
| 12/18/2014 | ND (0.011) | ND (0.011) | ND (0.011) | ND (0.011)/ND (0.011) | ND (0.011) |
| 12/27/2014 | ND (0.011) | ND (0.011) | ND (0.011) | ND (0.011)/ND (0.011) | ND (0.011) |
| 1/5/2015 | ND (0.01) | ND (0.01) | ND (0.01) | ND (0.01)/ND (0.01) | ND (0.01) |
| 1/19/2015 | ND (0.0066) | ND (0.0066) | ND (0.0066) | ND (0.0066)/ND (0.0066) | ND (0.0066) |
| 1/28/2015 | ND (0.018) | ND (0.018) | ND (0.018) | ND (0.018)/ND (0.018) | ND (0.018) |
| 2/4/2015 | ND (0.023) | ND (0.023) | ND (0.023) | ND (0.023)/ND (0.023) | ND (0.023) |
| 2/13/2015 | ND (0.021)/ND (0.018) | ND (0.018) | ND (0.018) | ND (0.018) | ND (0.018) |
| 2/20/2015 | ND (0.023) | ND (0.023) | U | ND (0.023)/U | ND (0.023) |
| 2/27/2015 | ND (0.096) | ND (0.096) | ND (0.096) | ND (0.096)/ND (0.096) | ND (0.096) |
| 3/6/2015 | ND (0.096) | ND (0.096) | ND (0.096) | ND (0.096)/ND (0.096) | ND (0.096) |
| 3/13/2015 | ND (0.099) | ND (0.099) | ND (0.099) | ND (0.098)/ND (0.098) | ND (0.099) |
| **No. of Detects** | **0** | **0** | **0** | **0** | **0** |
| **No. of Samples** | **12** | **11** | **11** | **21** | **11** |
| **Minimum** | **NA** | **NA** | **NA** | **NA** | **NA** |
| **Median** | **NA** | **NA** | **NA** | **NA** | **NA** |
| **Maximum** | **NA** | **NA** | **NA** | **NA** | **NA** |

**Notes:**

All concentrations in micrograms per cubic meter ($\mu g/m^3$)

NA not applicable

ND ( ) not detected (method detection limit)

U indicates a sample flagged by the data validator as not meeting data quality objectives; result is considered a non-detect

**Table B-7**
**m&p-Xylene**

| Date Collected | Station 1 | Station 2 | Station 3 | Station 4 | Station 5 |
|---|---|---|---|---|---|
| 12/18/2014 | ND (0.025) | ND (0.025) | ND (0.025) | ND (0.025)/ND (0.025) | ND (0.025) |
| 12/27/2014 | ND (0.023) | ND (0.023) | ND (0.023) | ND (0.023)/ND (0.023) | ND (0.023) |
| 1/5/2015 | ND (0.022) | ND (0.023) | ND (0.023) | ND (0.023)/ND (0.023) | ND (0.023) |
| 1/19/2015 | ND (0.015) | ND (0.015) | ND (0.015) | ND (0.015)/ND (0.015) | ND (0.015) |
| 1/28/2015 | 0.98 | 0.96 | 0.89 | 0.84 /0.91 | 1.1 |
| 2/4/2015 | 0.5 | 0.48 | 0.47 | 0.47 /0.41 | 0.44 |
| 2/13/2015 | 0.49 J/0.51 J | 0.49 J | 0.52 J | 0.47 J | 0.66 J |
| 2/20/2015 | U | U | U | U/U | U |
| 2/27/2015 | ND (0.07) | ND (0.07) | ND (0.07) | ND (0.07)/ND (0.07) | ND (0.07) |
| 3/6/2015 | ND (0.07) | ND (0.07) | ND (0.07) | ND (0.07)/ND (0.07) | ND (0.07) |
| 3/13/2015 | ND (0.071) | ND (0.071) | ND (0.071) | 0.87 /0.94 | 0.87 |
| **No. of Detects** | **4** | **3** | **3** | **7** | **4** |
| **No. of Samples** | **12** | **11** | **11** | **21** | **11** |
| **Minimum** | **0.49** | **0.48** | **0.47** | **0.41** | **0.44** |
| **Median** | **0.505** | **0.49** | **0.52** | **0.84** | **0.765** |
| **Maximum** | **0.98** | **0.96** | **0.89** | **0.94** | **1.1** |

**Notes:**

All concentrations in micrograms per cubic meter ($\mu g/m^3$)

| | |
|---|---|
| J | laboratory flag indicating an estimated result less than reporting limit |
| ND ( ) | not detected (method detection limit) |
| U | indicates a sample flagged by the data validator as not meeting data quality objectives; result is considered a non-detect |

**Table B-8**
**Methyl-tert-butyl ether**

| Date Collected | Station 1 | Station 2 | Station 3 | Station 4 | Station 5 |
|---|---|---|---|---|---|
| 12/18/2014 | ND (0.033) | ND (0.033) | ND (0.033) | ND (0.033)/ND (0.033) | ND (0.033) |
| 12/27/2014 | ND (0.031) | ND (0.031) | ND (0.031) | ND (0.031)/ND (0.031) | ND (0.031) |
| 1/5/2015 | ND (0.03) | ND (0.03) | ND (0.03) | ND (0.03)/ND (0.03) | ND (0.03) |
| 1/19/2015 | ND (0.02) | ND (0.02) | ND (0.02) | ND (0.02)/ND (0.02) | ND (0.02) |
| 1/28/2015 | ND (0.035) | ND (0.035) | ND (0.035) | ND (0.035)/ND (0.035) | ND (0.035) |
| 2/4/2015 | ND (0.045) | ND (0.045) | ND (0.045) | ND (0.045)/ND (0.045) | ND (0.045) |
| 2/13/2015 | ND (0.042)/ND (0.035) | ND (0.035) | ND (0.035) | ND (0.035) | ND (0.035) |
| 2/20/2015 | ND (0.046) | ND (0.046) | U | ND (0.046)/U | ND (0.046) |
| 2/27/2015 | ND (0.19) | ND (0.19) | ND (0.19) | ND (0.19)/ND (0.19) | ND (0.19) |
| 3/6/2015 | ND (0.19) | ND (0.19) | ND (0.19) | ND (0.19)/ND (0.19) | ND (0.19) |
| 3/13/2015 | ND (0.2) | ND (0.2) | ND (0.2) | ND (0.2)/ND (0.2) | ND (0.2) |
| **No. of Detects** | **0** | **0** | **0** | **0** | **0** |
| **No. of Samples** | **12** | **11** | **11** | **21** | **11** |
| **Minimum** | **NA** | **NA** | **NA** | **NA** | **NA** |
| **Median** | **NA** | **NA** | **NA** | **NA** | **NA** |
| **Maximum** | **NA** | **NA** | **NA** | **NA** | **NA** |

**Notes:**

All concentrations in micrograms per cubic meter ($\mu g/m^3$)

| | |
|---|---|
| J | laboratory flag indicating an estimated result less than reporting limit |
| NA | not applicable |
| ND ( ) | not detected (method detection limit) |
| U | indicates a sample flagged by the data validator as not meeting data quality objectives; result is considered a non-detect |

**Table B-9**
**o-Xylene**

| Date Collected | Station 1 | Station 2 | Station 3 | Station 4 | Station 5 |
|---|---|---|---|---|---|
| 12/18/2014 | ND (0.014) | ND (0.014) | ND (0.014) | ND (0.014)/ND (0.014) | ND (0.014) |
| 12/27/2014 | ND (0.014) | ND (0.014) | ND (0.014) | ND (0.014)/ND (0.014) | ND (0.014) |
| 1/5/2015 | ND (0.013) | ND (0.013) | ND (0.013) | ND (0.013)/ND (0.013) | ND (0.013) |
| 1/19/2015 | ND (0.0085) | ND (0.0085) | ND (0.0085) | ND (0.0085)/ND (0.0085) | ND (0.0085) |
| 1/28/2015 | 0.34 | 0.33 | 0.3 | 0.29 /0.31 | 0.39 |
| 2/4/2015 | 0.18 | 0.17 | 0.17 | 0.17 /0.15 | 0.16 |
| 2/13/2015 | 0.18 /0.18 | 0.18 | 0.19 | 0.17 | 0.24 |
| 2/20/2015 | U | U | U | U/U | U |
| 2/27/2015 | ND (0.083) | ND (0.083) | ND (0.083) | ND (0.083)/ND (0.083) | ND (0.083) |
| 3/6/2015 | ND (0.083) | ND (0.083) | ND (0.083) | ND (0.083)/ND (0.083) | ND (0.083) |
| 3/13/2015 | ND (0.085) | ND (0.085) | ND (0.085) | ND (0.085)/ND (0.085) | ND (0.085) |
| **No. of Detects** | **4** | **3** | **3** | **5** | **3** |
| **No. of Samples** | **12** | **11** | **11** | **21** | **11** |
| **Minimum** | **0.18** | **0.17** | **0.17** | **0.15** | **0.16** |
| **Median** | **0.18** | **0.18** | **0.19** | **0.17** | **0.24** |
| **Maximum** | **0.34** | **0.33** | **0.3** | **0.31** | **0.39** |

**Notes:**

All concentrations in micrograms per cubic meter ($\mu g/m^3$)

ND ( ) not detected (method detection limit)

U indicates a sample flagged by the data validator as not meeting data quality objectives; result is considered a non-detect

**Table B-10**
**Tetrachloroethene**

| Date Collected | Station 1 | Station 2 | Station 3 | Station 4 | Station 5 |
|---|---|---|---|---|---|
| 12/18/2014 | ND (0.032) | ND (0.032) | ND (0.032) | ND (0.031)/ND (0.031) | ND (0.032) |
| 12/27/2014 | ND (0.03) | ND (0.03) | ND (0.03) | ND (0.03)/ND (0.03) | ND (0.03) |
| 1/5/2015 | ND (0.029) | ND (0.029) | ND (0.029) | ND (0.029)/ND (0.029) | ND (0.029) |
| 1/19/2015 | ND (0.019) | ND (0.019) | ND (0.019) | ND (0.019)/ND (0.019) | ND (0.019) |
| 1/28/2015 | 0.27 | 0.46 | ND (0.03) | ND (0.03)/ND (0.03) | 0.23 |
| 2/4/2015 | ND (0.039) | ND (0.039) | ND (0.039) | ND (0.039)/ND (0.039) | ND (0.039) |
| 2/13/2015 | ND (0.036)/ND (0.03) | ND (0.03) | ND (0.03) | ND (0.03) | ND (0.03) |
| 2/20/2015 | ND (0.039) | ND (0.039) | U | ND (0.039)/U | ND (0.039) |
| 2/27/2015 | ND (0.17) | ND (0.17) | ND (0.17) | ND (0.17)/ND (0.17) | ND (0.17) |
| 3/6/2015 | ND (0.17) | ND (0.16) | ND (0.17) | ND (0.17)/ND (0.17) | ND (0.17) |
| 3/13/2015 | ND (0.17) | ND (0.17) | ND (0.17) | ND (0.17)/ND (0.17) | ND (0.17) |
| **No. of Detects** | **1** | **1** | **0** | **0** | **1** |
| **No. of Samples** | **12** | **11** | **11** | **21** | **11** |
| **Minimum** | **0.27** | **0.46** | **NA** | **NA** | **0.23** |
| **Median** | **0.27** | **0.46** | **NA** | **NA** | **0.23** |
| **Maximum** | **0.27** | **0.46** | **NA** | **NA** | **0.23** |

**Notes:**

All concentrations in micrograms per cubic meter ($\mu g/m^3$)

NA not applicable

ND ( ) not detected (method detection limit)

U indicates a sample flagged by the data validator as not meeting data quality objectives; result is considered a non-detect

**Table B-11**
**Toluene**

| Date Collected | Station 1 | Station 2 | Station 3 | Station 4 | Station 5 |
|---|---|---|---|---|---|
| 12/18/2014 | ND (0.017) | ND (0.017) | ND (0.017) | ND (0.017)/ND (0.017) | ND (0.017) |
| 12/27/2014 | ND (0.016) | ND (0.016) | ND (0.016) | ND (0.016)/ND (0.016) | ND (0.016) |
| 1/5/2015 | ND (0.016) | ND (0.016) | ND (0.016) | ND (0.016)/ND (0.016) | ND (0.016) |
| 1/19/2015 | 0.58 | 0.56 | ND (0.01) | 0.56 J/0.50 | 0.39 J |
| 2/20/2015 | NR | NR | 0.24 J, CL, L2 | 0.20 J, CL, L2 | NR |
| **No. of Detects** | **1** | **1** | **1** | **3** | **1** |
| **No. of Samples** | **4** | **4** | **5** | **9** | **4** |
| **Minimum** | **0.58** | **0.56** | **0.24** | **0.2** | **0.39** |
| **Median** | **0.58** | **0.56** | **0.24** | **0.5** | **0.39** |
| **Maximum** | **0.58** | **0.56** | **0.24** | **0.56** | **0.39** |

**Notes:**

All concentrations in micrograms per cubic meter ($\mu g/m^3$)

| | |
|---|---|
| CL | indicates the continue calibration for the compound was outside of the laboratory's acceptance limits and the result may be biased low |
| L2 | indicates analyte recovery in the laboratory control sample was below quality control limits and the result may be biased low |
| ND ( ) | not detected (method detection limit) |
| NR | not reported by laboratory |

**Table B-12**
**trans-1,2-Dichloroethene**

| Date Collected | Station 1 | Station 2 | Station 3 | Station 4 | Station 5 |
|---|---|---|---|---|---|
| 12/18/2014 | ND (0.033) | ND (0.033) | ND (0.033) | ND (0.033)/ND (0.033) | ND (0.033) |
| 12/27/2014 | ND (0.031) | ND (0.031) | ND (0.031) | ND (0.031)/ND (0.031) | ND (0.031) |
| 1/5/2015 | ND (0.03) | ND (0.03) | ND (0.03) | ND (0.03)/ND (0.03) | ND (0.03) |
| 1/19/2015 | ND (0.019) | ND (0.019) | ND (0.019) | ND (0.019)/ND (0.019) | ND (0.019) |
| 1/28/2015 | ND (0.019) | ND (0.019) | ND (0.019) | ND (0.019)/ND (0.019) | ND (0.019) |
| 2/4/2015 | ND (0.024) | ND (0.024) | ND (0.024) | ND (0.024)/ND (0.024) | ND (0.024) |
| 2/13/2015 | ND (0.022)/ND (0.019) | ND (0.019) | ND (0.019) | ND (0.019) | ND (0.019) |
| 2/20/2015 | ND (0.024) | ND (0.024) | U | ND (0.024)/U | ND (0.024) |
| 2/27/2015 | ND (0.1) | ND (0.1) | ND (0.1) | ND (0.1)/ND (0.1) | ND (0.1) |
| 3/6/2015 | ND (0.1) | ND (0.1) | ND (0.1) | ND (0.1)/ND (0.1) | ND (0.1) |
| 3/13/2015 | ND (0.1) | ND (0.1) | ND (0.1) | ND (0.1)/ND (0.1) | ND (0.1) |
| **No. of Detects** | **0** | **0** | **0** | **0** | **0** |
| **No. of Samples** | **12** | **11** | **11** | **21** | **11** |
| **Minimum** | **NA** | **NA** | **NA** | **NA** | **NA** |
| **Median** | **NA** | **NA** | **NA** | **NA** | **NA** |
| **Maximum** | **NA** | **NA** | **NA** | **NA** | **NA** |

**Notes:**

All concentrations in micrograms per cubic meter ($\mu g/m^3$)

NA not applicable

ND ( ) not detected (method detection limit)

U indicates a sample flagged by the data validator as not meeting data quality objectives; result is considered a non-detect

**Table B-13**
**Trichloroethene**

| Date Collected | Station 1 | Station 2 | Station 3 | Station 4 | Station 5 |
|---|---|---|---|---|---|
| 12/18/2014 | ND (0.031) | ND (0.031) | ND (0.031) | ND (0.031)/ND (0.031) | ND (0.031) |
| 12/27/2014 | ND (0.029) | ND (0.029) | ND (0.029) | ND (0.029)/ND (0.029) | ND (0.029) |
| 1/5/2015 | ND (0.028) | ND (0.028) | ND (0.028) | ND (0.028)/ND (0.028) | ND (0.028) |
| 1/19/2015 | ND (0.018) | ND (0.018) | ND (0.018) | ND (0.018)/ND (0.018) | ND (0.018) |
| 1/28/2015 | ND (0.026) | 0.51 | ND (0.026) | ND (0.026)/ND (0.026) | ND (0.026) |
| 2/4/2015 | ND (0.033) | ND (0.033) | ND (0.033) | ND (0.033)/ND (0.033) | ND (0.033) |
| 2/13/2015 | ND (0.031)/ND (0.026) | 0.33 | ND (0.026) | ND (0.026) | ND (0.026) |
| 2/20/2015 | ND (0.033) | 0.41 | U | ND (0.033)/U | ND (0.033) |
| 2/27/2015 | ND (0.14) | ND (0.14) | ND (0.14) | ND (0.14)/ND (0.14) | ND (0.14) |
| 3/6/2015 | ND (0.14) | ND (0.14) | ND (0.14) | ND (0.14)/ND (0.14) | ND (0.14) |
| 3/13/2015 | ND (0.14) | ND (0.14) | ND (0.14) | ND (0.14)/ND (0.14) | ND (0.14) |
| **No. of Detects** | **0** | **3** | **0** | **0** | **0** |
| **No. of Samples** | **12** | **11** | **11** | **21** | **11** |
| **Minimum** | **NA** | **0.33** | **NA** | **NA** | **NA** |
| **Median** | **NA** | **0.41** | **NA** | **NA** | **NA** |
| **Maximum** | **NA** | **0.51** | **NA** | **NA** | **NA** |

**Notes:**

All concentrations in micrograms per cubic meter ($\mu g/m^3$)

NA not applicable

ND ( ) not detected (method detection limit)

U indicates a sample flagged by the data validator as not meeting data quality objectives; result is considered a non-detect

**Table B-14**
**Vinyl chloride**

| Date Collected | Station 1 | Station 2 | Station 3 | Station 4 | Station 5 |
|---|---|---|---|---|---|
| 12/18/2014 | ND (0.22) | ND (0.22) | ND (0.22) | ND (0.22)/ND (0.22) | ND (0.22) |
| 12/27/2014 | ND (0.2) | ND (0.2) | ND (0.2) | ND (0.2)/ND (0.2) | ND (0.2) |
| 1/5/2015 | ND (0.19) | ND (0.2) | ND (0.2) | ND (0.2)/ND (0.2) | ND (0.2) |
| 1/19/2015 | ND (0.13) | ND (0.13) | ND (0.13) | ND (0.13)/ND (0.13) | ND (0.13) |
| 1/28/2015 | ND (0.014) | ND (0.014) | ND (0.014) | ND (0.014)/ND (0.014) | ND (0.014) |
| 2/4/2015 | ND (0.019) | ND (0.019) | ND (0.019) | ND (0.019)/ND (0.019) | ND (0.019) |
| 2/13/2015 | ND (0.017)/ND (0.014) | ND (0.014) | ND (0.014) | ND (0.014) | ND (0.014) |
| 2/20/2015 | ND (0.019) | ND (0.019) | U | ND (0.019)/U | ND (0.019) |
| 2/27/2015 | ND (0.078) | ND (0.078) | ND (0.078) | ND (0.078)/ND (0.078) | ND (0.078) |
| 3/6/2015 | ND (0.078) | ND (0.078) | ND (0.078) | ND (0.078)/ND (0.078) | ND (0.078) |
| 3/13/2015 | ND (0.08) | ND (0.08) | ND (0.08) | ND (0.08)/ND (0.08) | ND (0.08) |
| **No. of Detects** | **0** | **0** | **0** | **0** | **0** |
| **No. of Samples** | **12** | **11** | **11** | **21** | **11** |
| **Minimum** | **NA** | **NA** | **NA** | **NA** | **NA** |
| **Median** | **NA** | **NA** | **NA** | **NA** | **NA** |
| **Maximum** | **NA** | **NA** | **NA** | **NA** | **NA** |

**Notes:**

All concentrations in micrograms per cubic meter ($\mu g/m^3$)

NA not applicable

ND ( ) not detected (method detection limit)

U indicates a sample flagged by the data validator as not meeting data quality objectives; result is considered a non-detect

**Table B-15**
**Hydrogen Sulfide**

| Date Collected | Station 1 | Station 2 | Station 3 | Station 4 | Station 5 |
|---|---|---|---|---|---|
| 12/18/2014 | 0.57 J | 0.56 J | 0.54 J | 0.57 J/0.51 J | 0.64 J |
| 12/27/2014 | 0.40 J | 0.49 J | 0.46 J | 0.40 J/0.59 J | 0.51 J |
| 1/5/2015 | 0.53 J | 0.37 J | 0.55 J | 0.60 J/0.62 J | 0.55 J |
| 1/19/2015 | 0.29 J | 0.22 J | 0.16 J | 0.30 J/0.24 J | 0.24 J |
| 1/28/2015 | 0.45 J | 0.39 J | 0.38 J | 0.59 J/0.41 J | 0.25 J |
| 2/4/2015 | 0.31 J | 0.24 J | ND (0.21) | 0.28 J/0.28 J | 0.26 J |
| 2/13/2015 | ND (0.17)/ND (0.17) | ND (0.17) | ND (0.17) | ND (0.17) | ND (0.17) |
| 2/20/2015 | ND (0.25) | 0.39 J | ND (0.25) | ND (0.25)/ND (0.25) | ND (0.25) |
| 2/27/2015 | ND (0.24) | ND (0.24) | ND (0.24) | ND (0.24)/ND (0.24) | ND (0.24) |
| 3/6/2015 | ND (0.23) | ND (0.23) | ND (0.23) | ND (0.23)/0.24 J | ND (0.23) |
| 3/13/2015 | 0.24 J | 0.48 J | ND (0.2) | 0.43 J/0.38 J | 0.31 J |
| **No. of Detects** | **7** | **8** | **5** | **15** | **7** |
| **No. of Samples** | **12** | **11** | **11** | **21** | **11** |
| **Minimum** | **0.24** | **0.22** | **0.16** | **0.24** | **0.24** |
| **Median** | **0.4** | **0.39** | **0.46** | **0.41** | **0.31** |
| **Maximum** | **0.57** | **0.56** | **0.55** | **0.62** | **0.64** |

**Notes:**

All concentrations in micrograms per cubic meter ($\mu g/m^3$)

J laboratory flag indicating an estimated result less than reporting limit

ND ( ) not detected (method detection limit)

# APPENDIX C

# TIME-SERIES PLOTS

Exhibit C - 1
1,2,4 - Trimethylbenzene

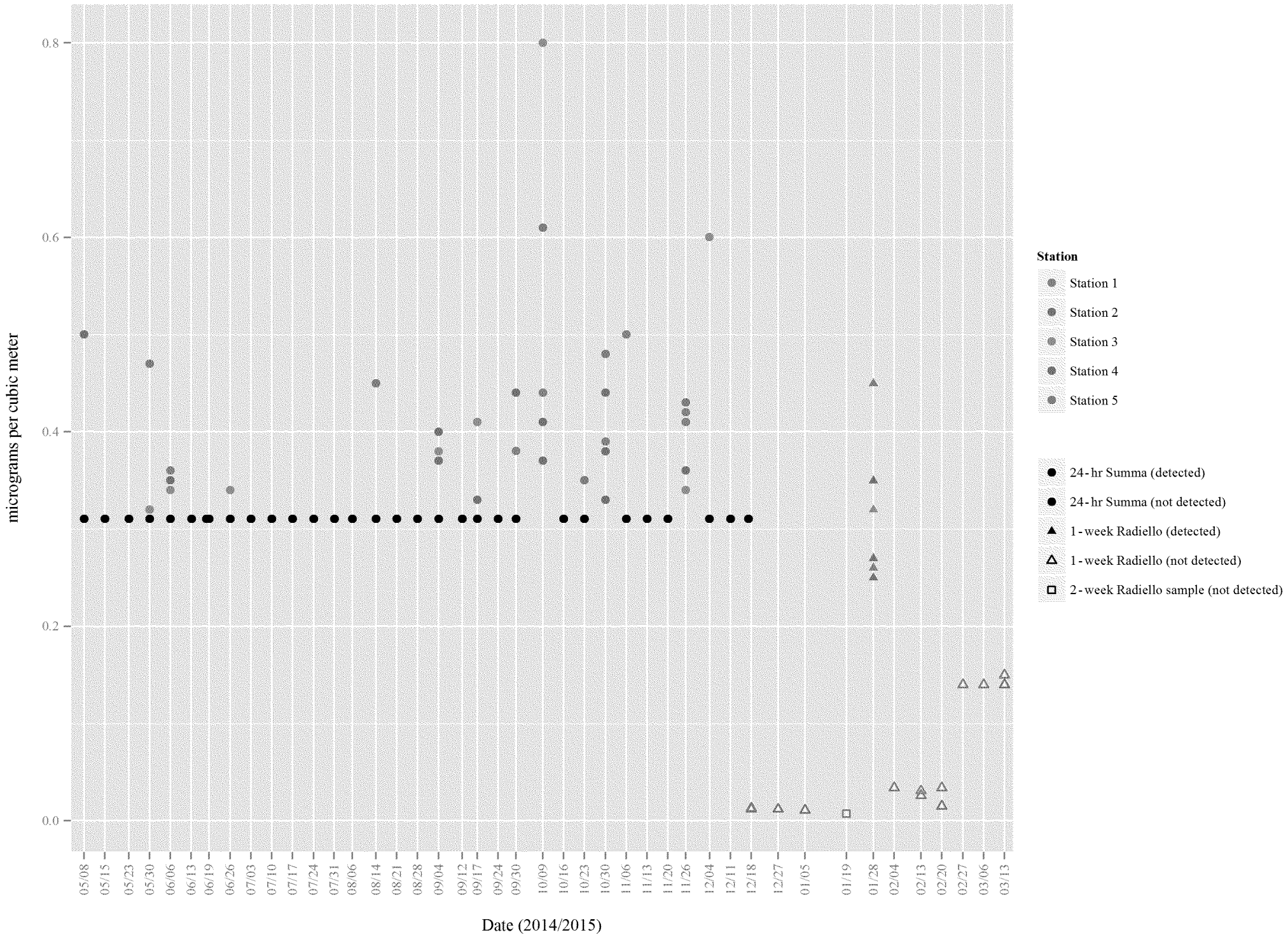


Exhibit C - 2
1,3,5 - Trimethylbenzene

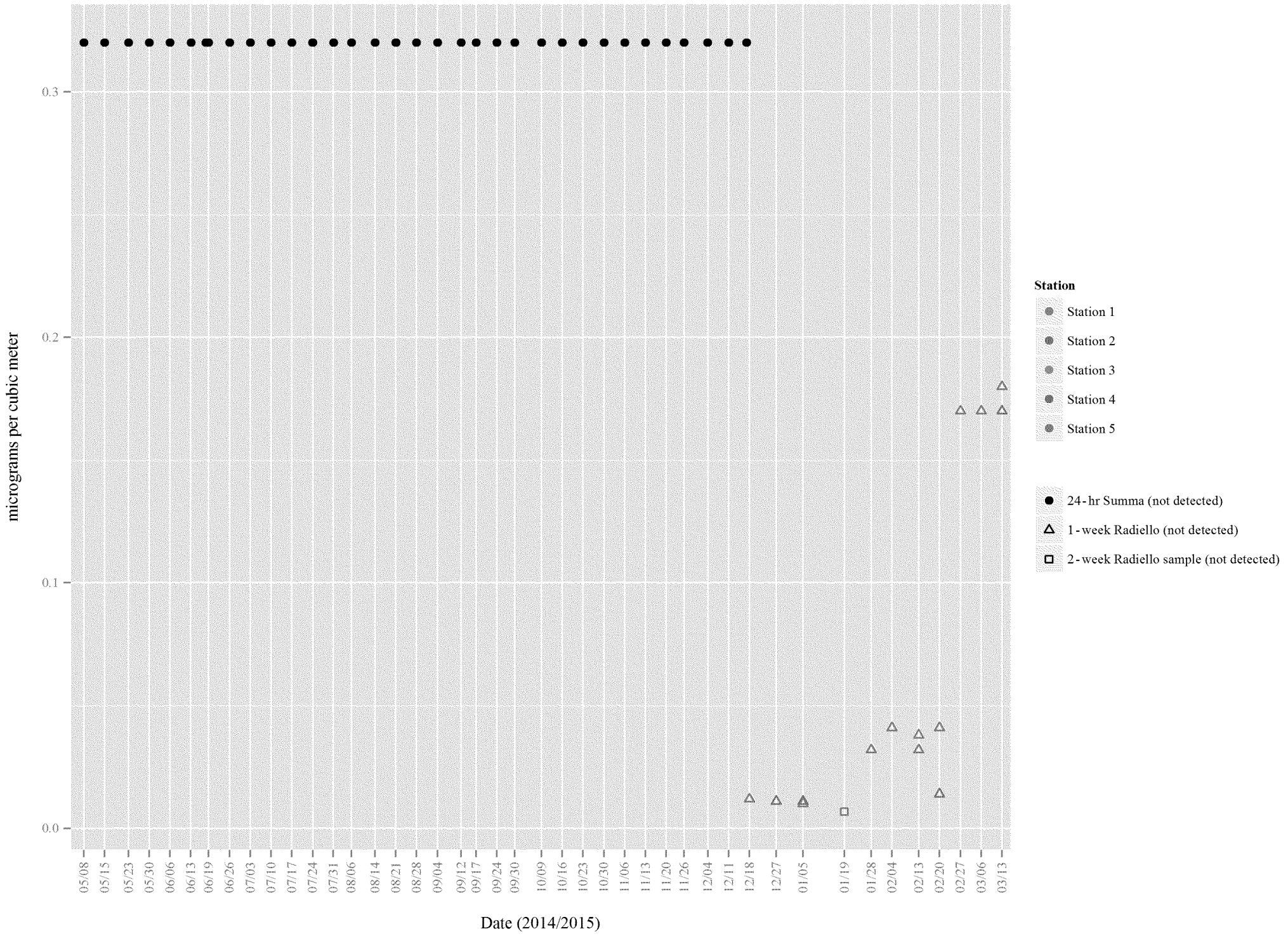


Exhibit C - 3
Benzene

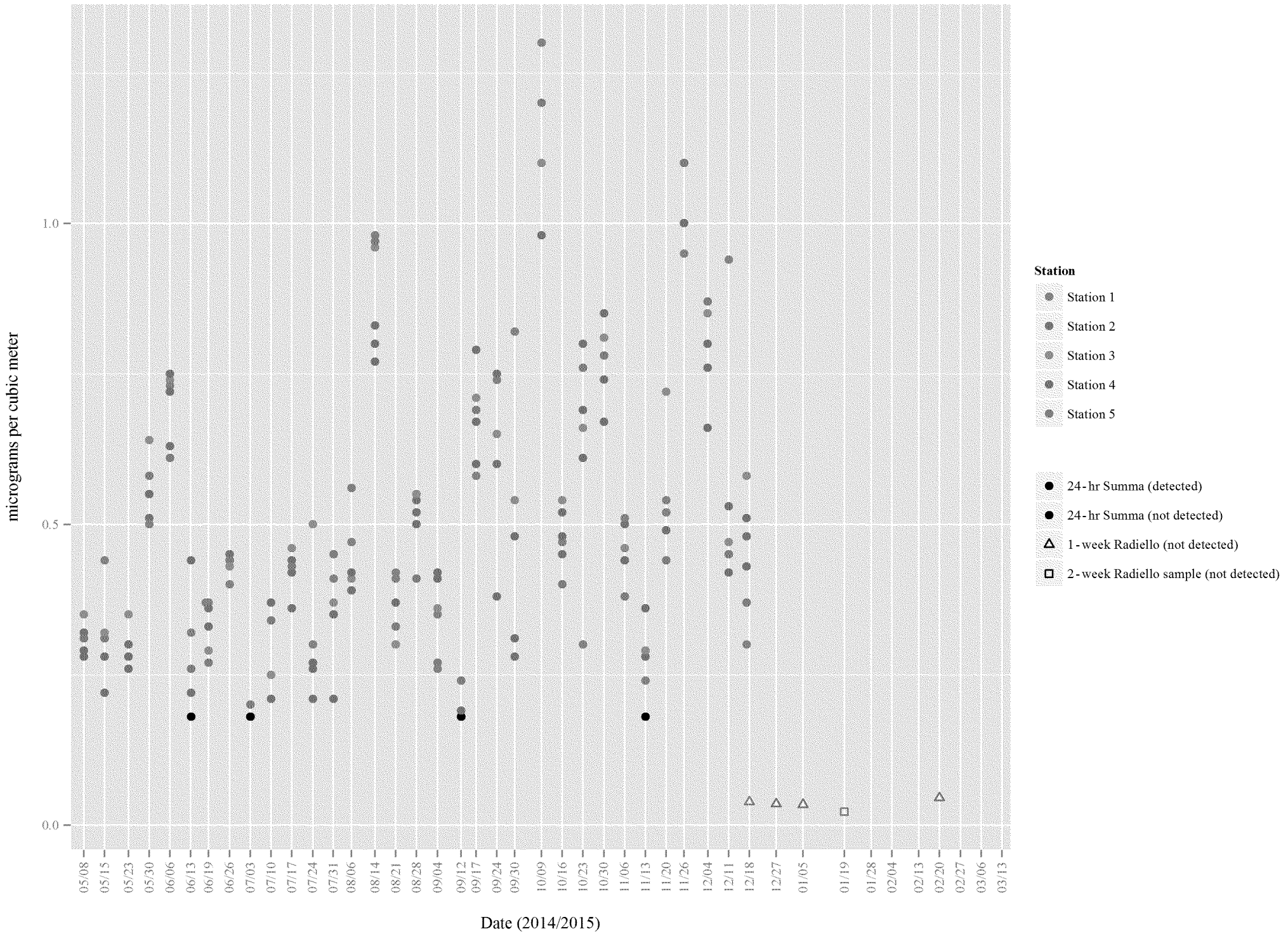


Exhibit C - 4
cis - 1,2 - Dichloroethene

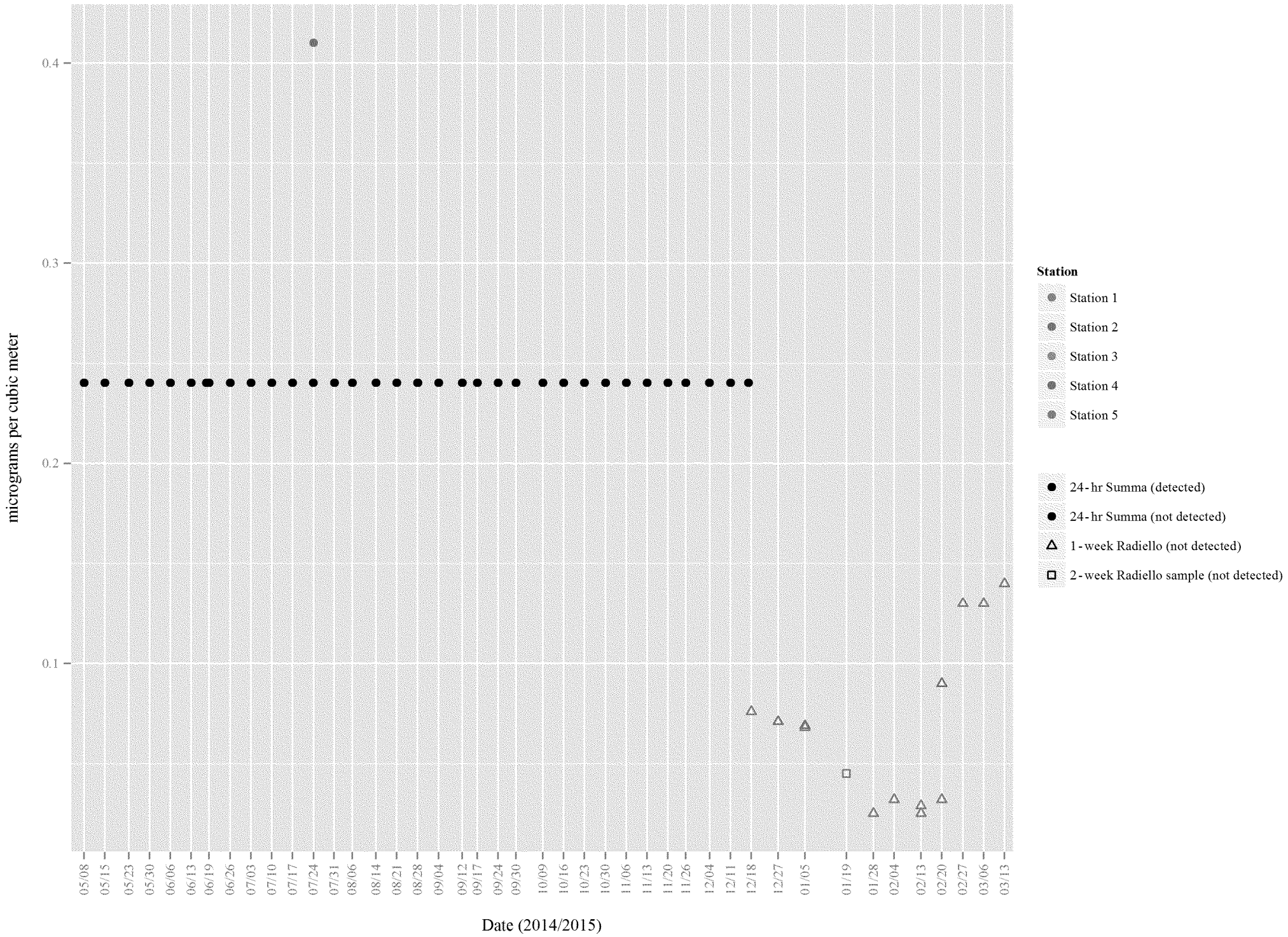


Exhibit C-5
Ethylbenzene

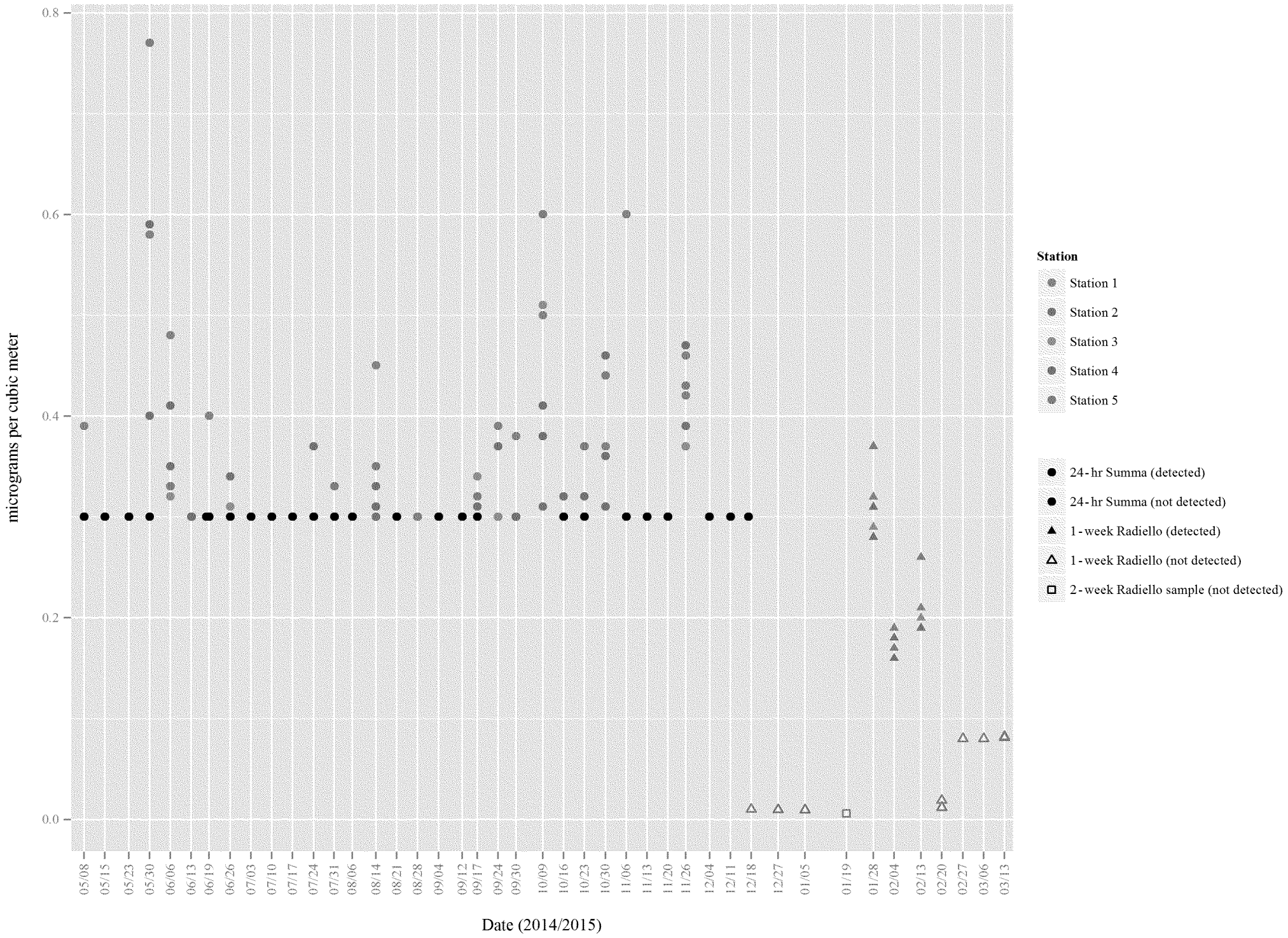


Exhibit C-6
Isopropylbenzene (Cumene)

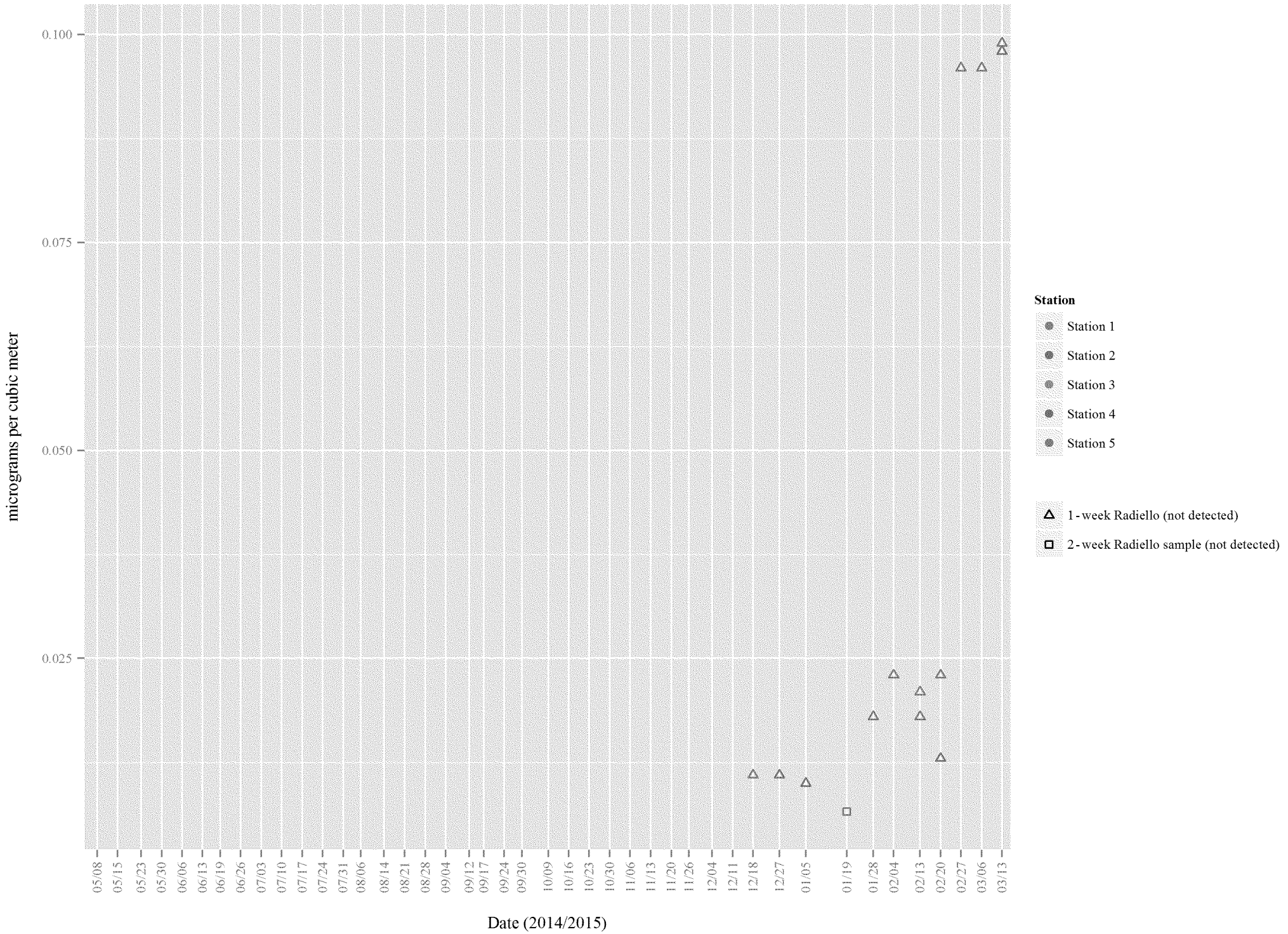


Exhibit C - 7
m&p - Xylene

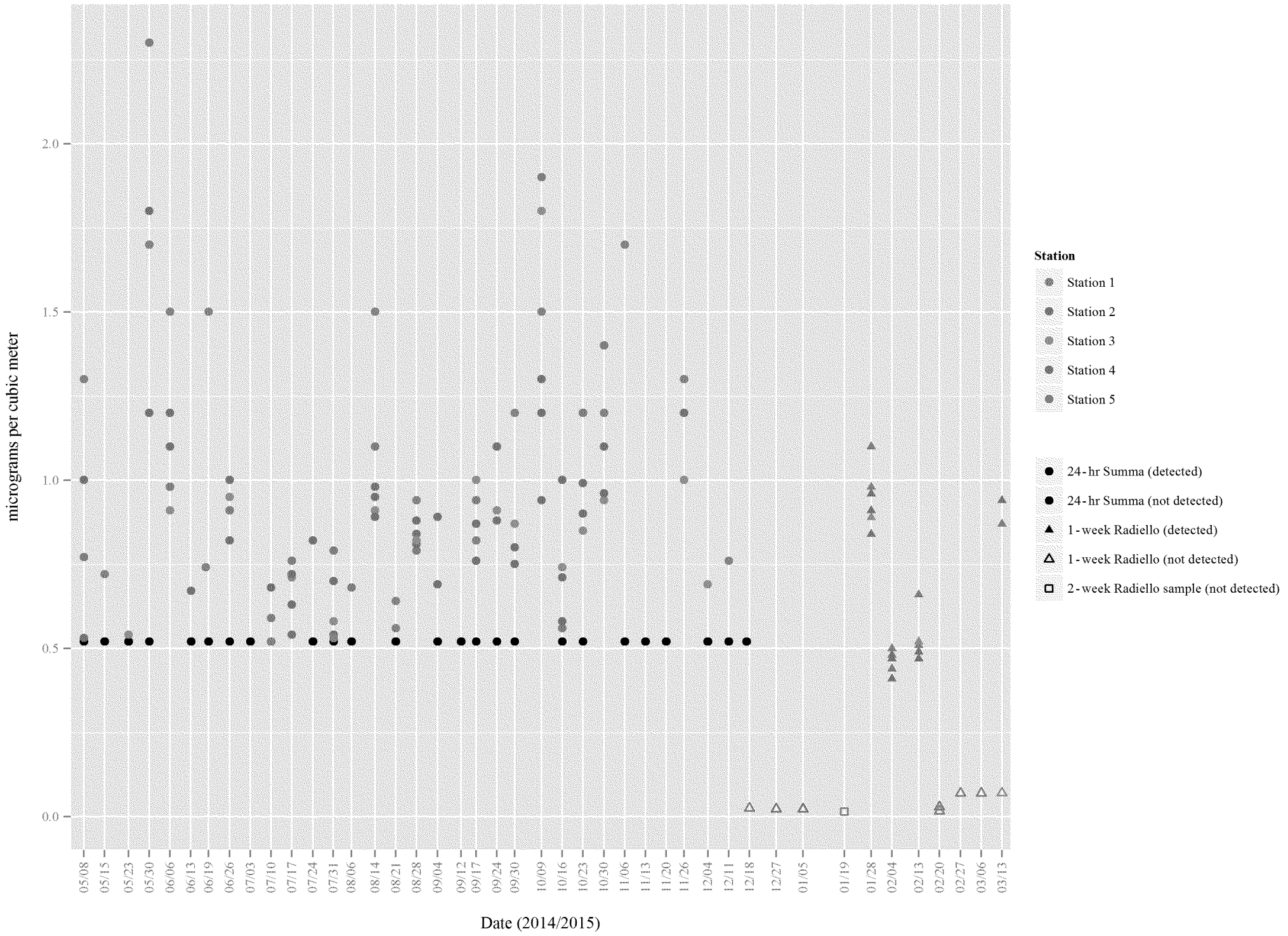


Exhibit C-8
Methyl-tert-butyl ether

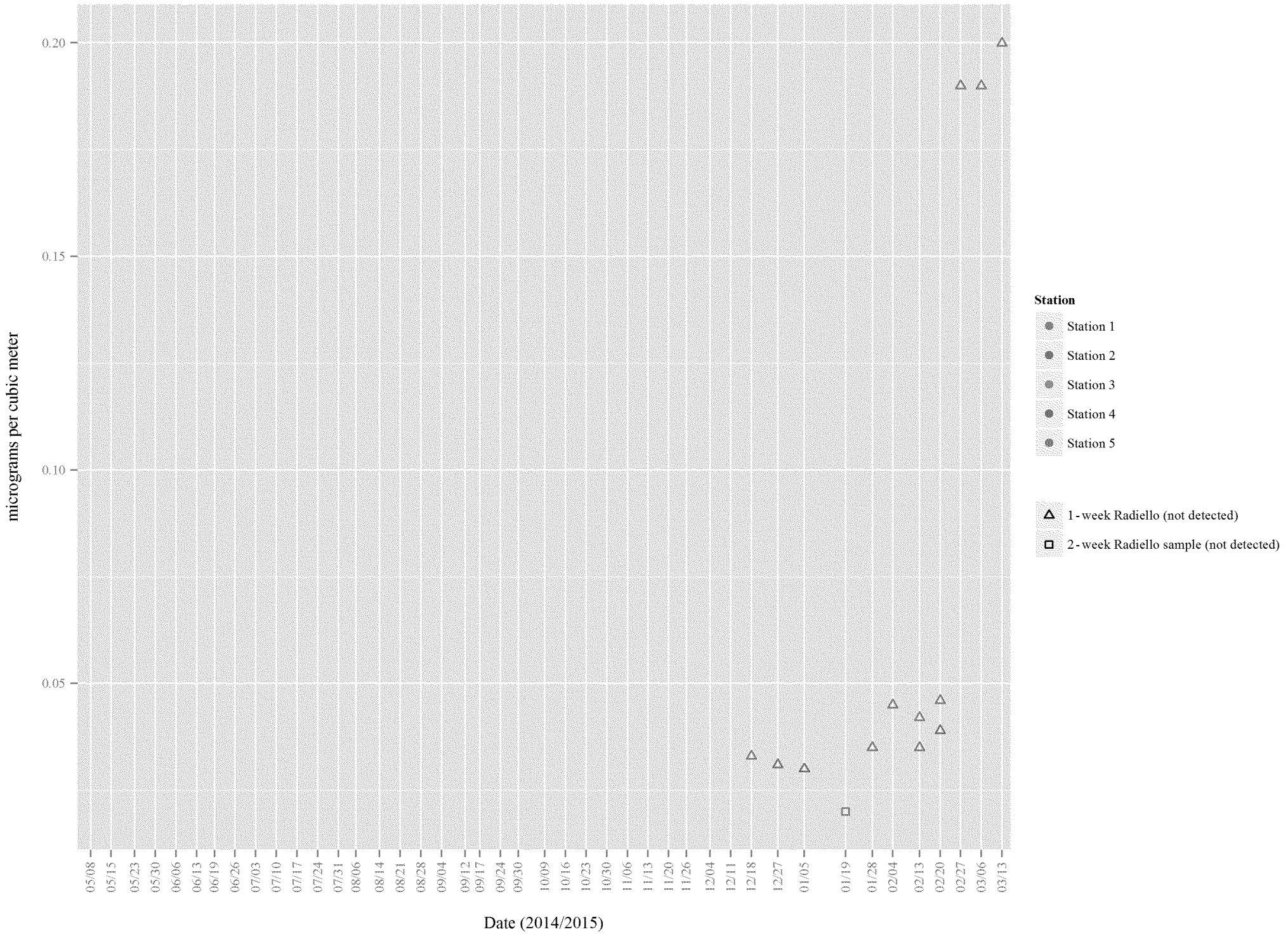


Exhibit C-9
o-Xylene

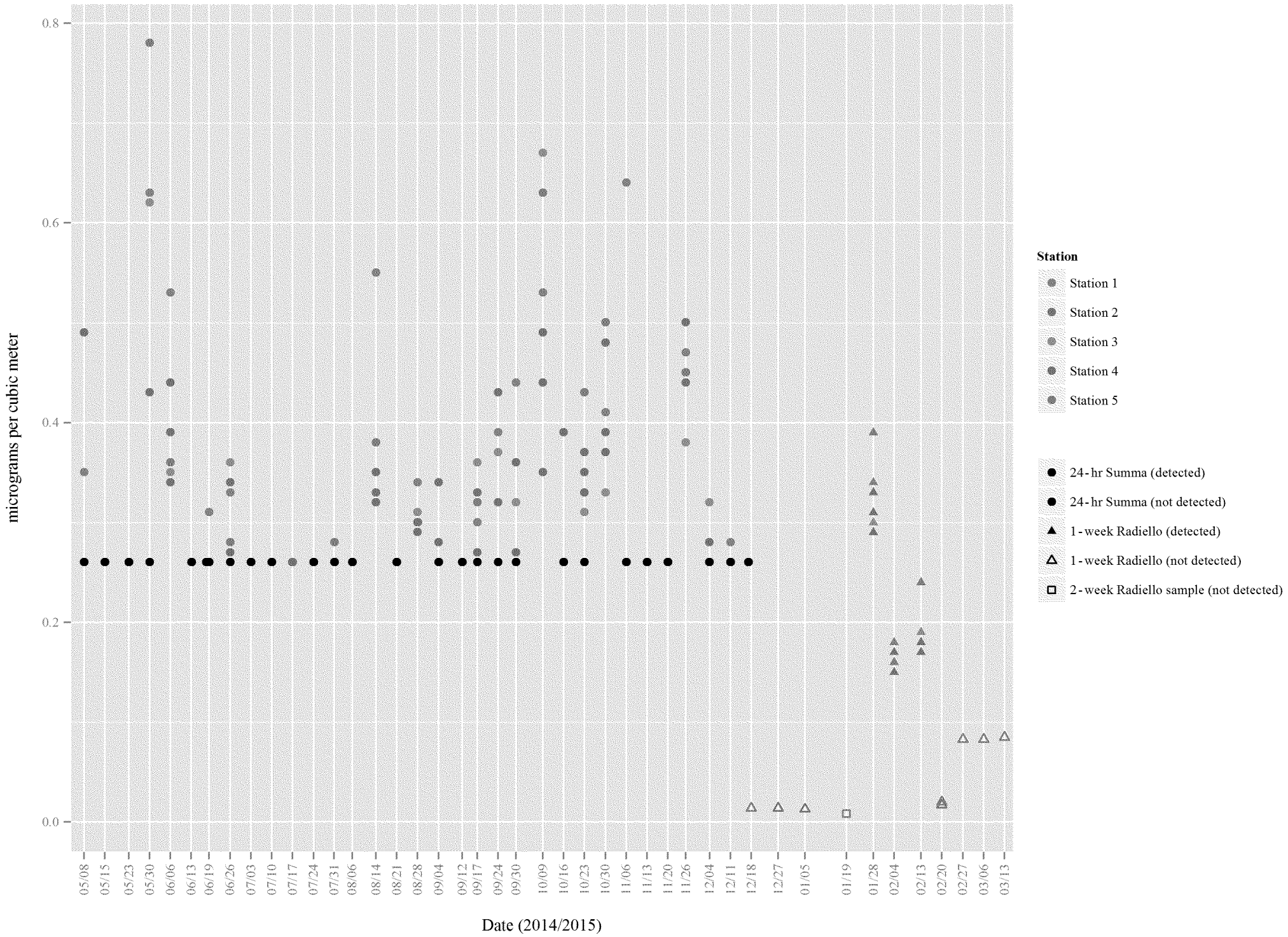


Exhibit C - 10
Tetrachloroethene

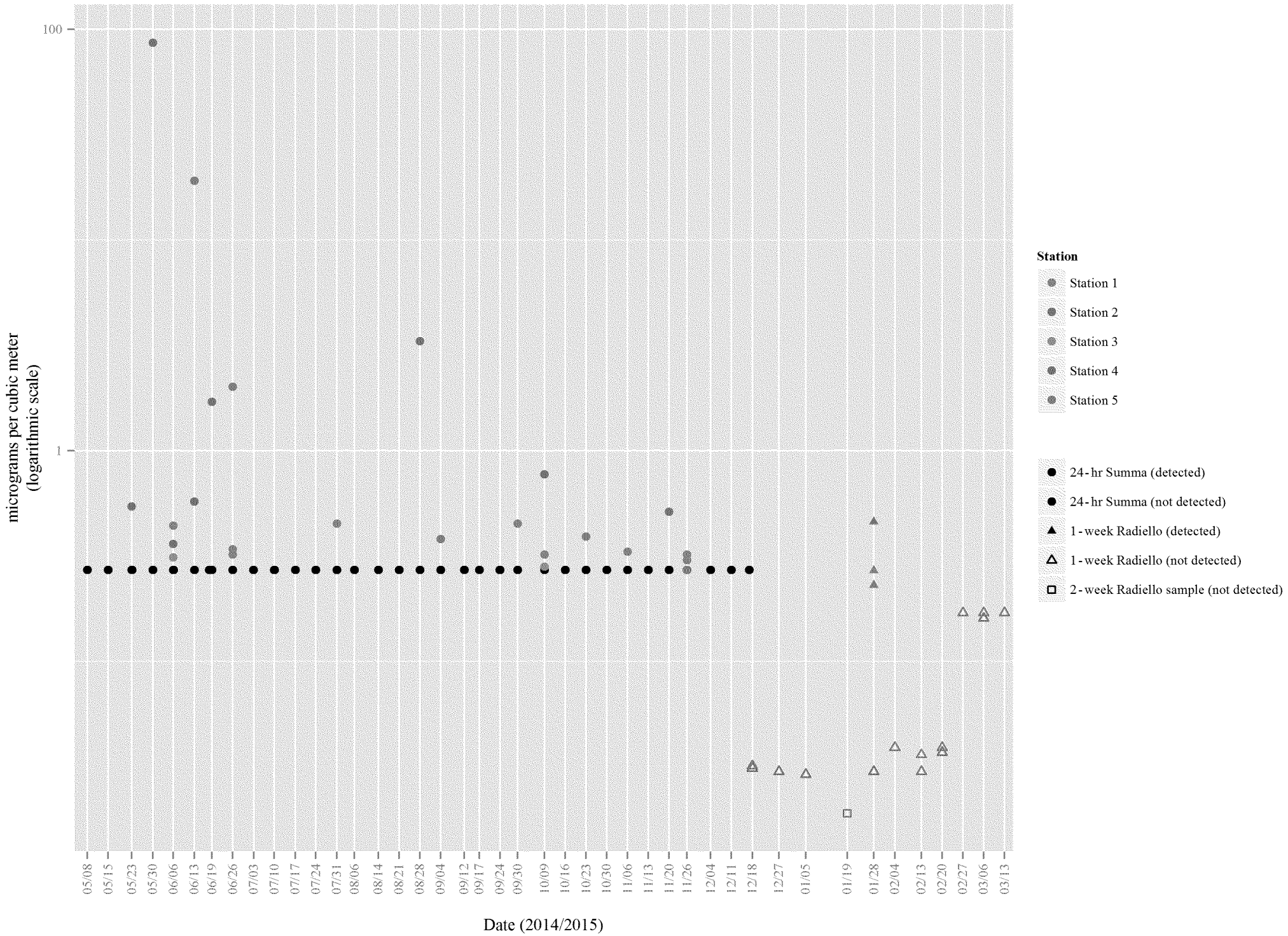


Exhibit C - 11
Toluene

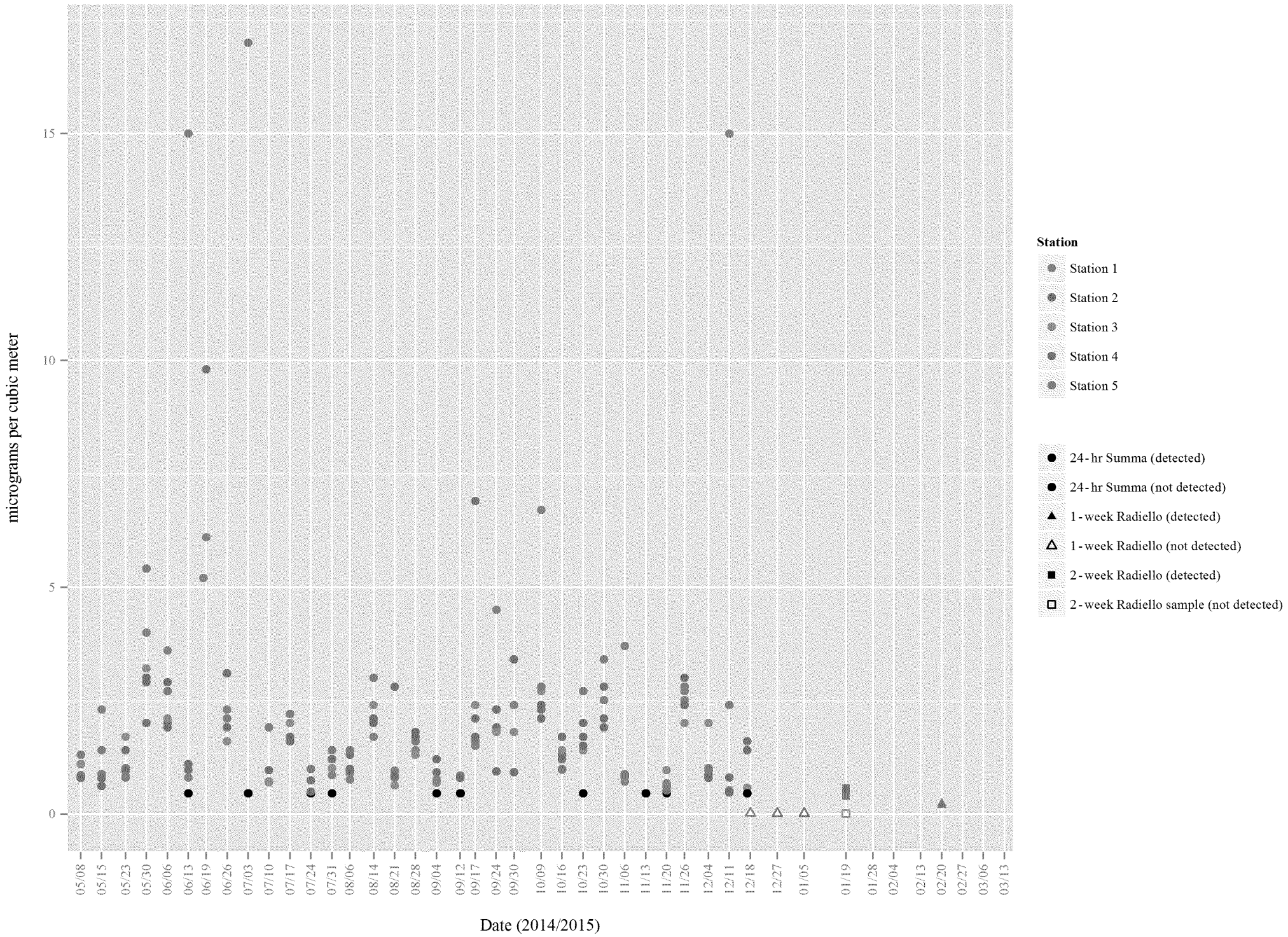


Exhibit C - 12
trans - 1,2 - Dichloroethene

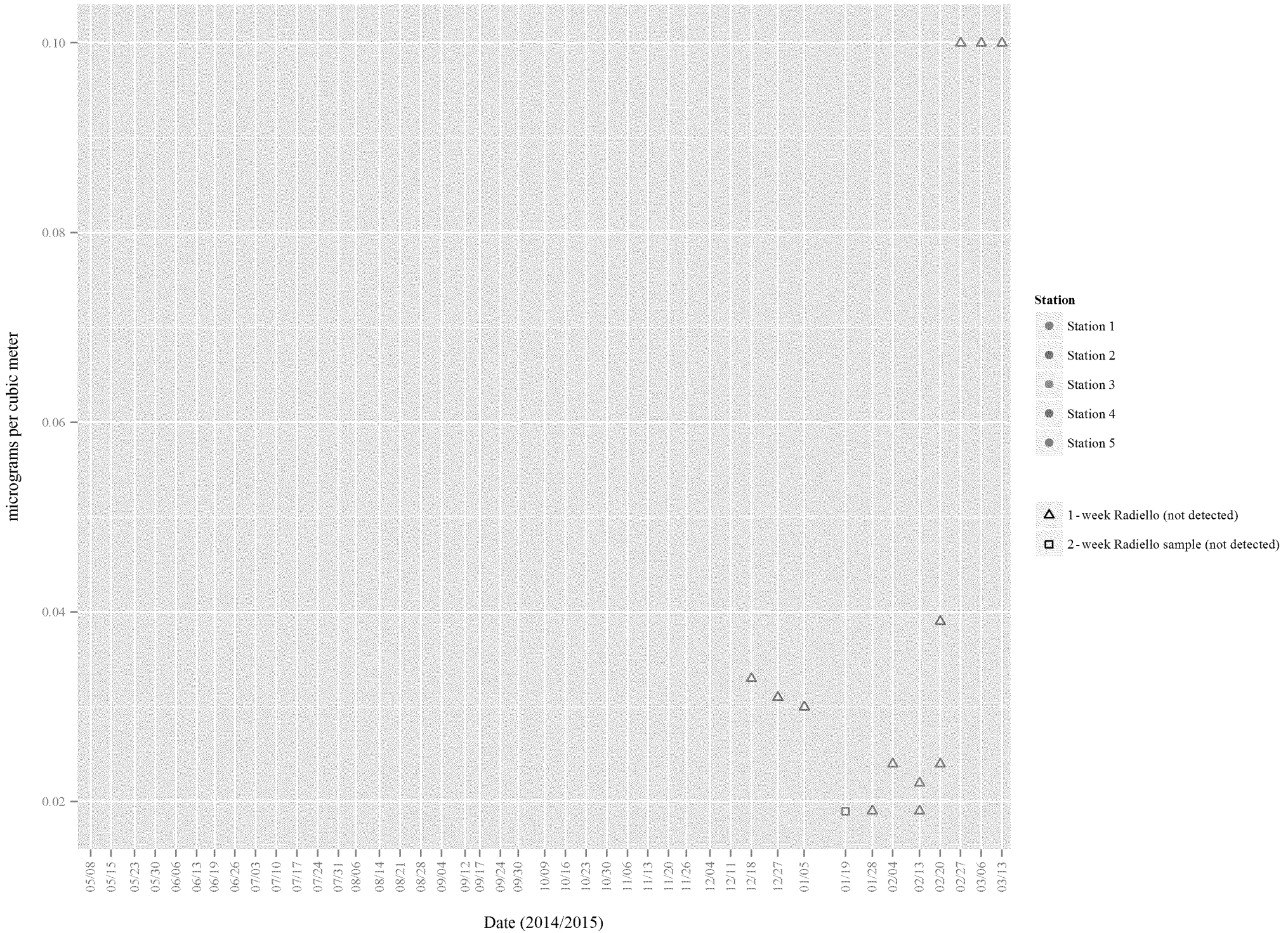


Exhibit C - 13
Trichloroethene

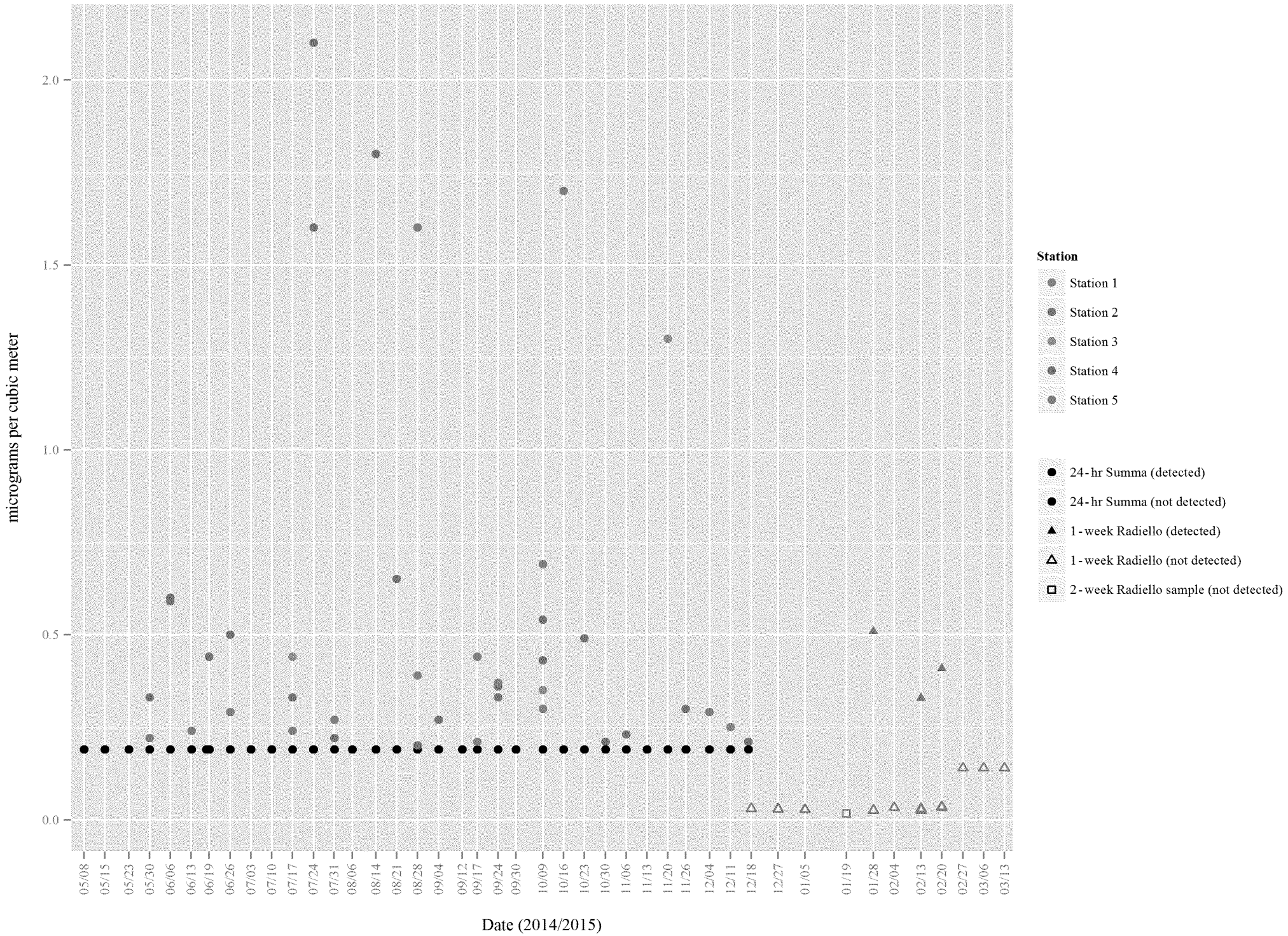


Exhibit C - 14
Vinyl chloride

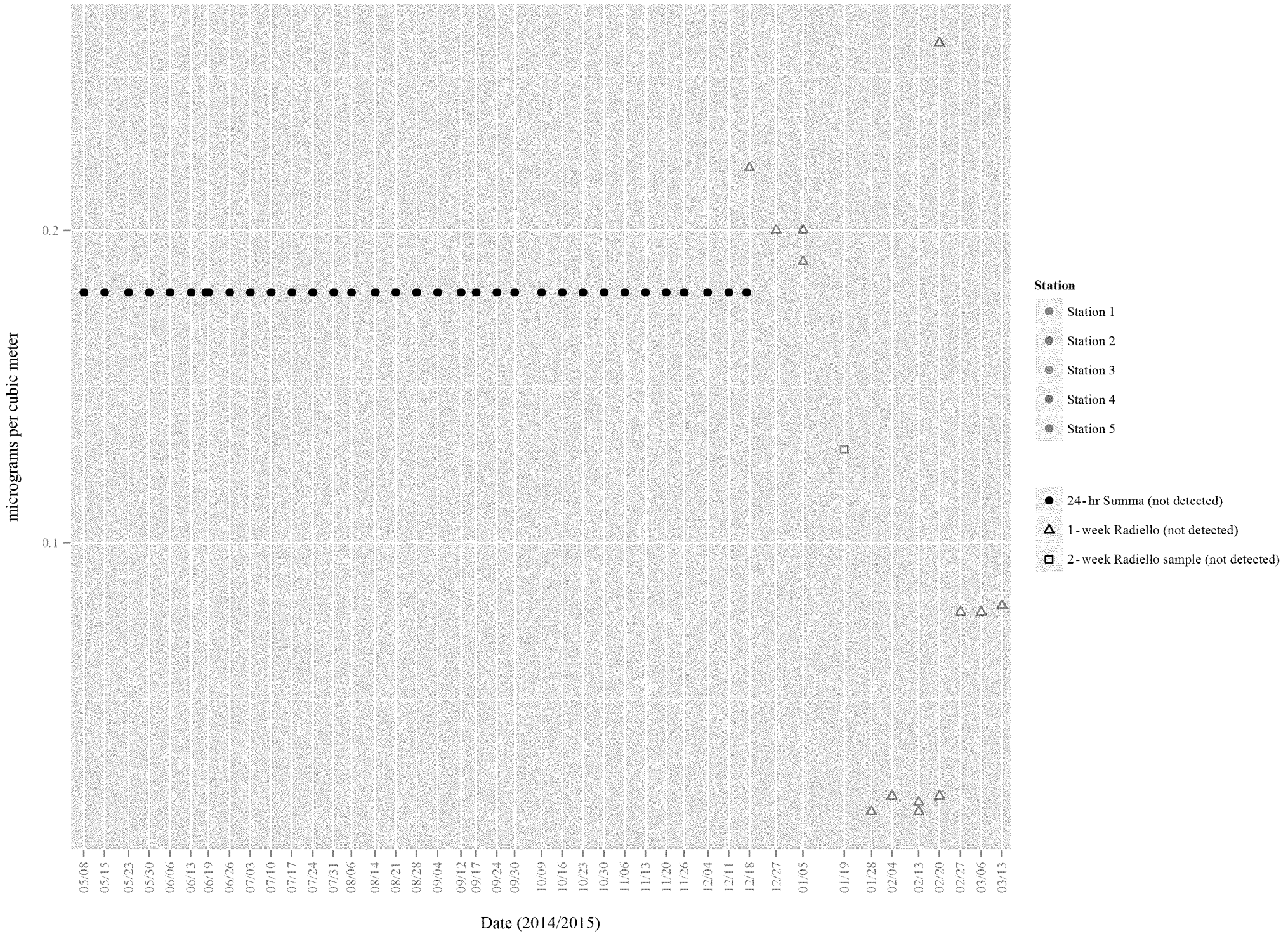
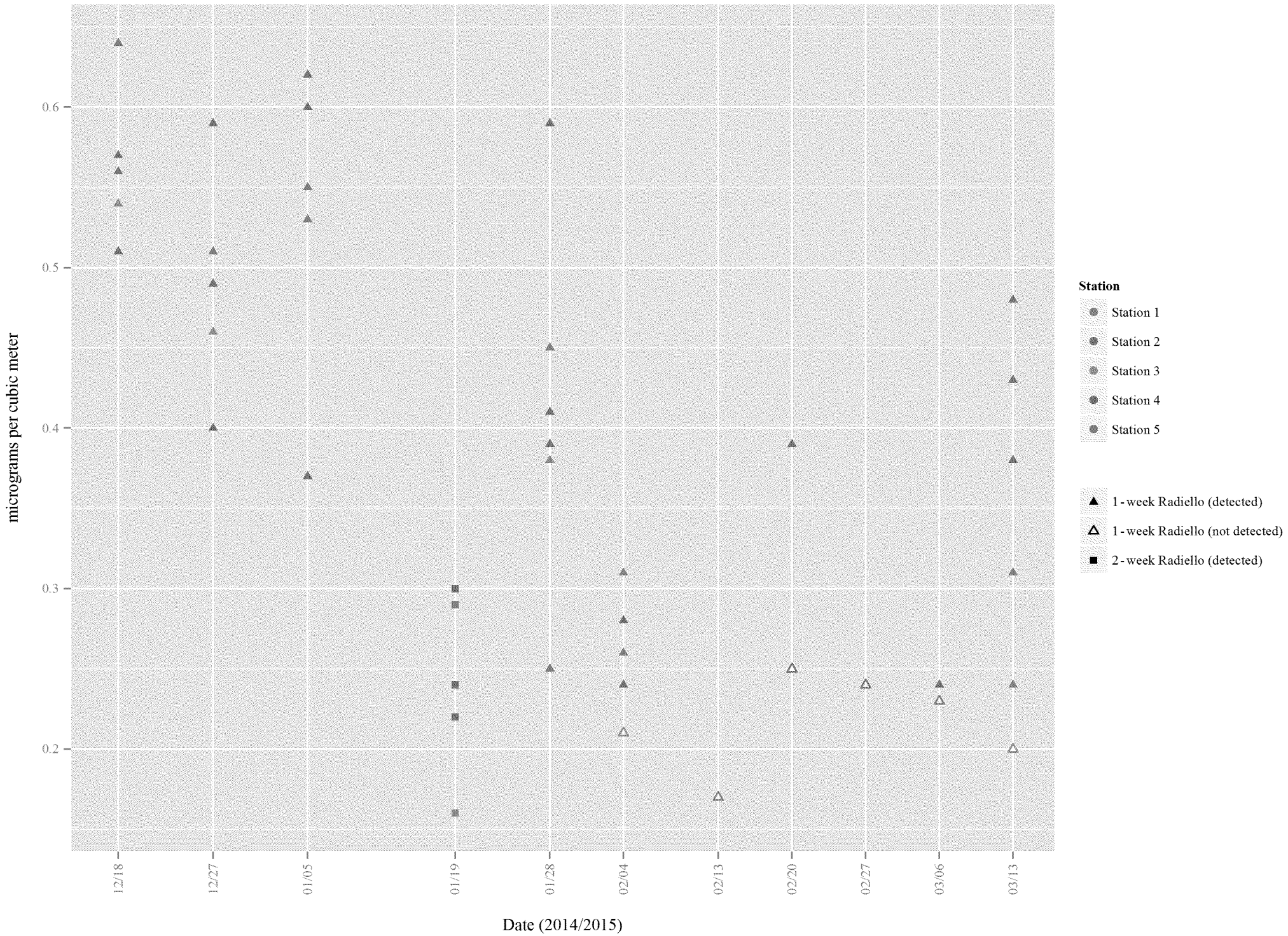


Exhibit C - 15
Hydrogen Sulfide



# APPENDIX D

# FREQUENCY OF DETECTION SUMMARY AND STATISTICAL ANALYSIS RESULTS

**TABLE D-1**
**COMPARISON OF PASSIVE/DIFFUSIVE SAMPLING RESULTS AT OFF-SITE AIR MONITORING STATIONS**
**WEST LAKE LANDFILL, BRIDGETON, MISSOURI**

| Analyte[1] | Frequency of Detection[2] | | | | | | Results of Statistical Comparison Among Off-Site WLLS Stations[3, 4] |
|---|---|---|---|---|---|---|---|
| | Station 1 | Station 2 | Station 3 | Station 4 | Station 5 | Total | |
| Hydrogen Sulfide | 58.3% | 72.7% | 45.5% | 71.4% | 63.6% | 62.3% | No significant difference (*p-value* = 0.7549) |
| m&p-Xylene | 33.3% | 27.3% | 27.3% | 33.3% | 36.4% | 31.5% | No significant difference (*p-value* = 0.9777) |
| Ethylbenzene | 33.3% | 27.3% | 27.3% | 23.8% | 27.3% | 27.8% | No significant difference (*p-value* = 0.9722) |
| o-Xylene | 33.3% | 27.3% | 27.3% | 23.8% | 27.3% | 27.8% | No significant difference (*p-value* = 0.9688) |
| Toluene | 25.0% | 25.0% | 20.0% | 33.3% | 25.0% | 25.7% | No significant difference (*p-value* = 0.9819) |
| 1,2,4-Trimethylbenzene | 8.3% | 9.1% | 9.1% | 9.5% | 9.1% | 9.0% | No significant difference (*p-value* = 0.9999) |
| Trichloroethene | 0.0% | 27.3% | 0.0% | 0.0% | 0.0% | 5.5% | Station 2 tended to have higher measurements than the other stations (*p-value* = 1.858e-05) |
| Tetrachloroethene | 8.3% | 9.1% | 0.0% | 0.0% | 9.1% | 5.3% | No significant difference (*p-value* = 0.6012) |
| 1,3,5-Trimethylbenzene | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | *Analyte not detected* |
| Benzene | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | *Analyte not detected* |
| *cis* -1,2-Dichloroethene | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | *Analyte not detected* |
| Isopropylbenzene (Cumene) | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | *Analyte not detected* |
| Methyl-tert-butyl ether | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | *Analyte not detected* |
| *trans* -1,2-Dichloroethene | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | *Analyte not detected* |
| Vinyl chloride | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | *Analyte not detected* |

Notes:

[1] Analytes listed in descending rank according to overall percent detection.

[2] Frequency of detection is the rate of analyte detection via laboratory analysis of the passive/diffusive samplers. Detectionof an analyte in either the sample or its duplicate was counted as one detect.

[3] Results from the statistical software package R version 3.1.2 using the non-parametric Kruskal-Wallis test to compare mean/medan characteristics of compounds among monitoring stations. A p-value equal to or less than 0.05 suggests significant differencesin mean/median characteristics among the stations. A p-value exceeding 0.05 suggests that mean/median characteristics among stations are comparable.

[4] Shading indicates detection of a difference.

# APPENDIX E

# BOXPLOTS

## BOXPLOT DESCRIPTION AND KEY

Boxplots render visual comparisons of data by displaying relative positions of the 25th, 50th, and 75th percentiles, and also individual outlier data points. The "NADA" (Nondetects and Data Analysis for environmental data) for the statistical software package R was used to create "censored" boxplots of the volatile organic compound (VOC) data. In constructing the censored boxplots, the NADA software accounts for non-detect values and displays a horizontal line across the boxplots representing the maximum "less than" value in the data. Boxplot elements above the line are statistically accurate, but boxplot elements below the line represent only estimated percentiles (based on the distribution of the uncensored data).

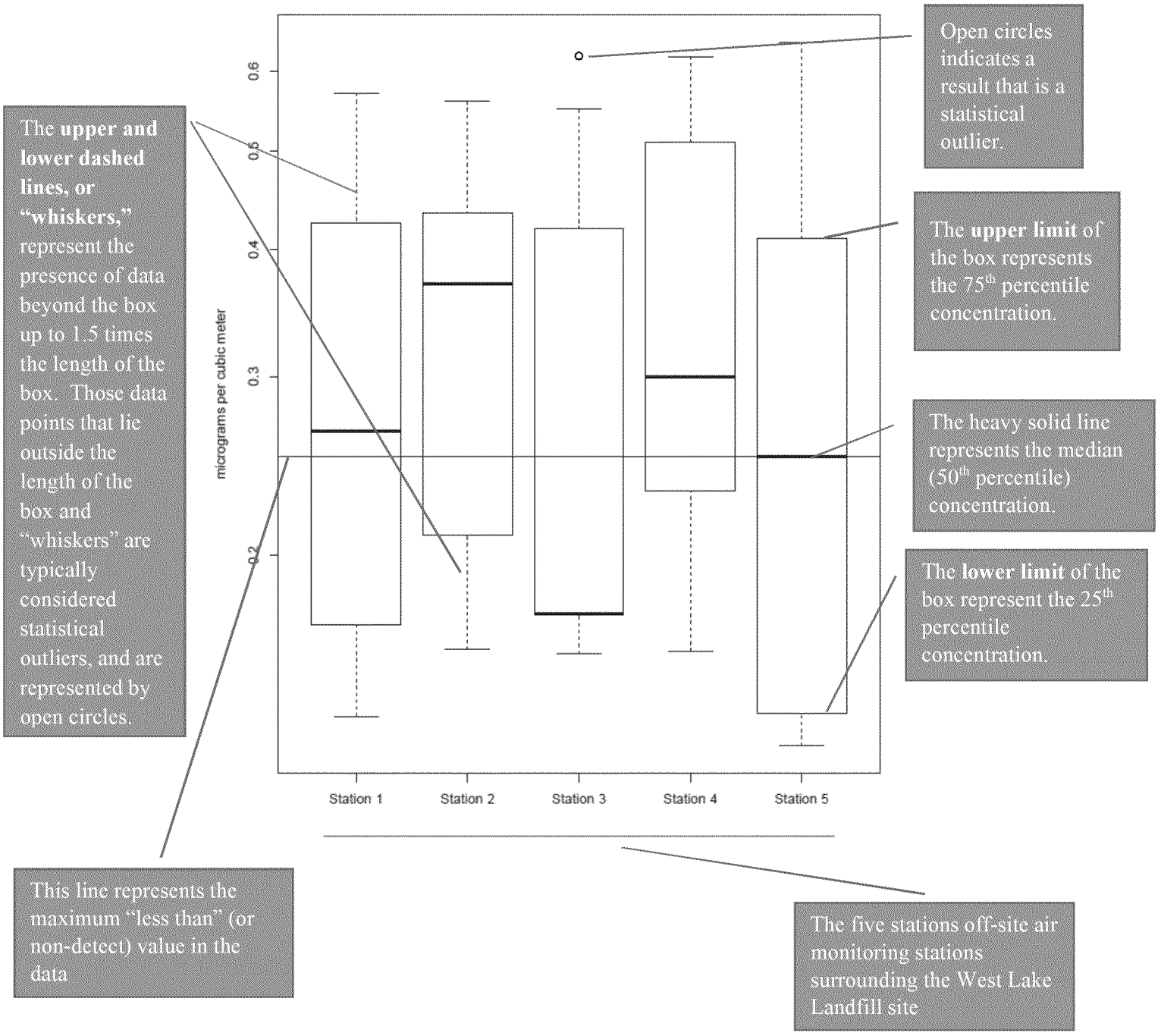


**Exhibit E−1**
**1,2,4−Trimethylbenzene**

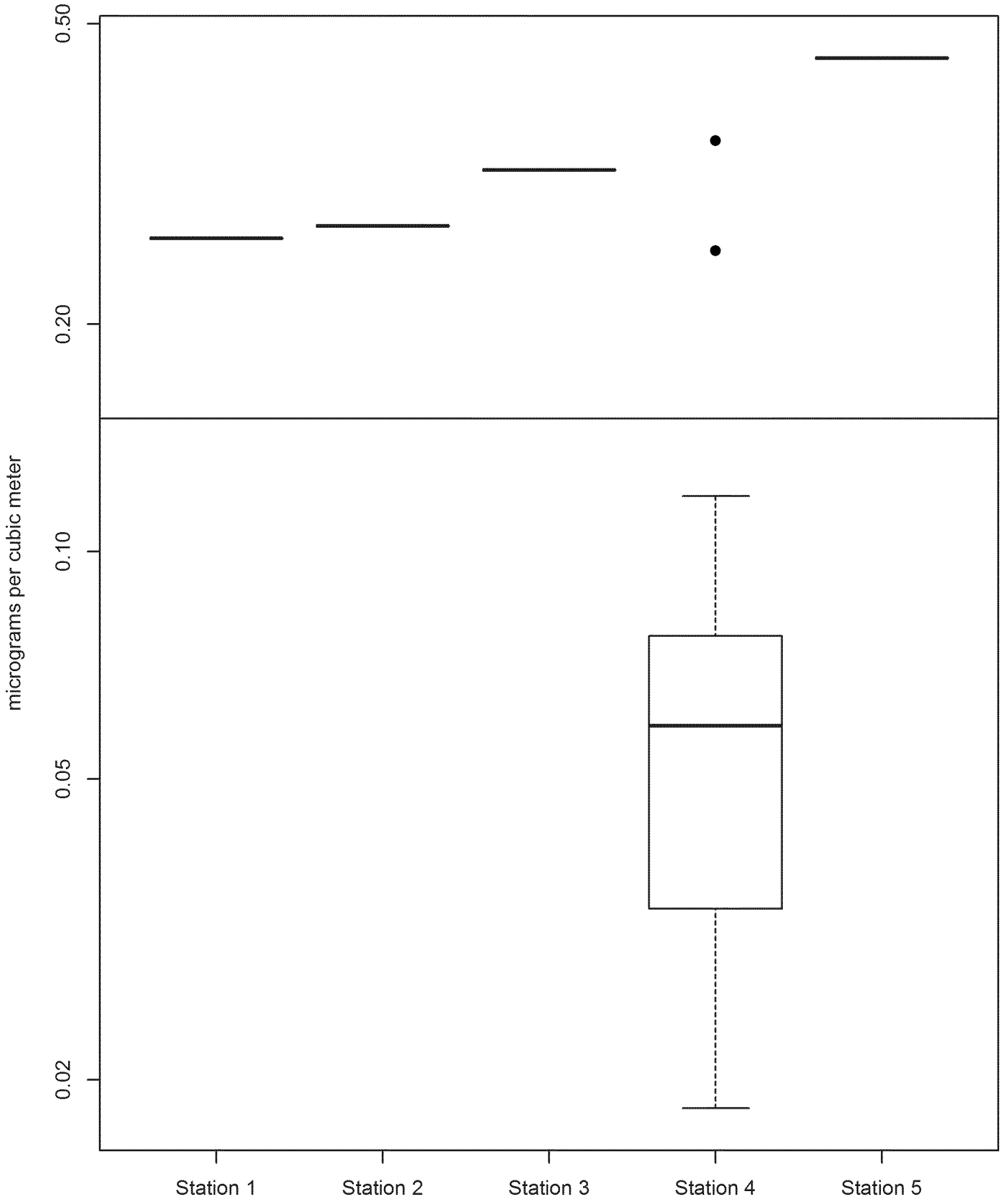


**Exhibit E−2**
**Ethylbenzene**

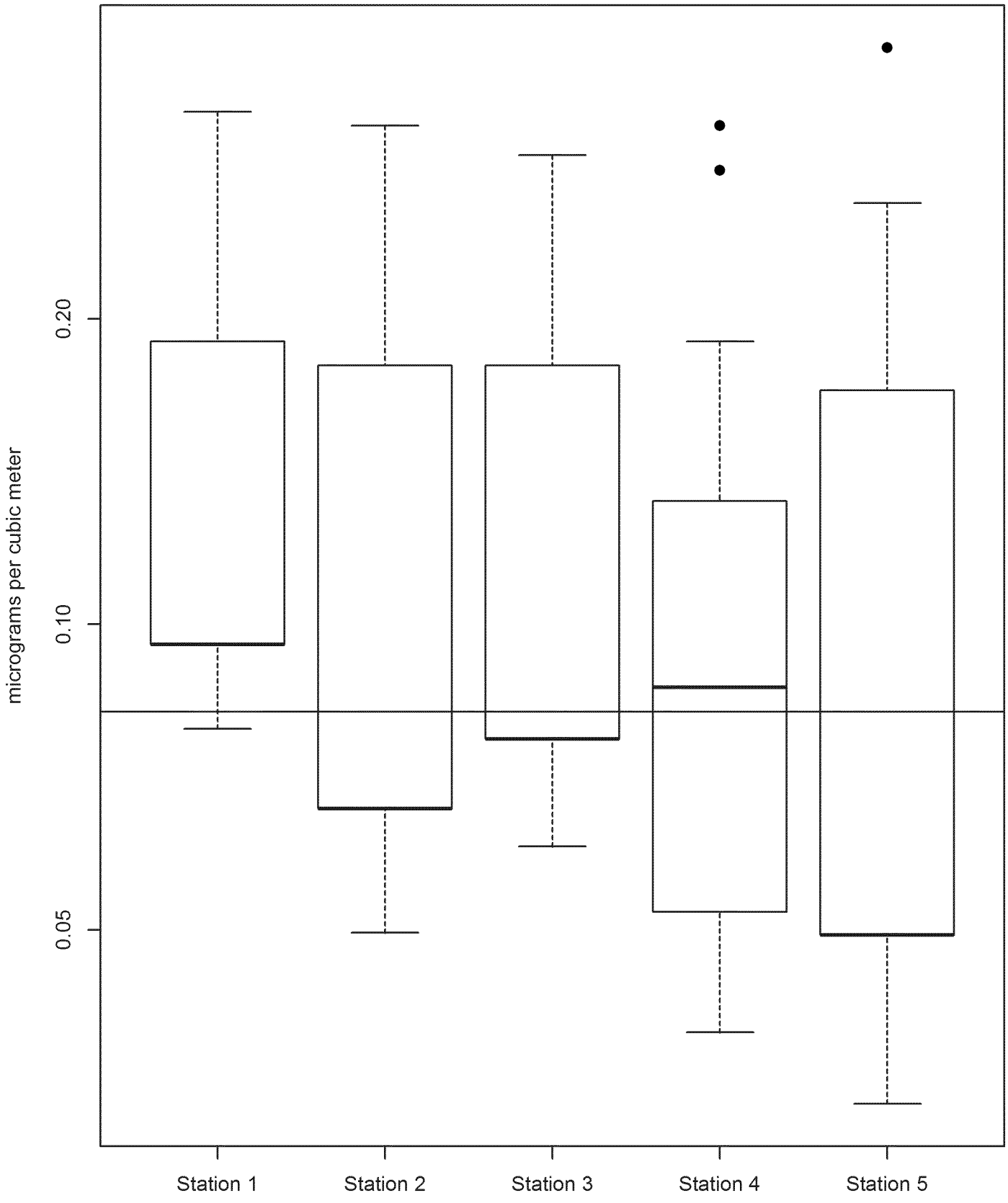


**Exhibit E−3**
**Hydrogen Sulfide**

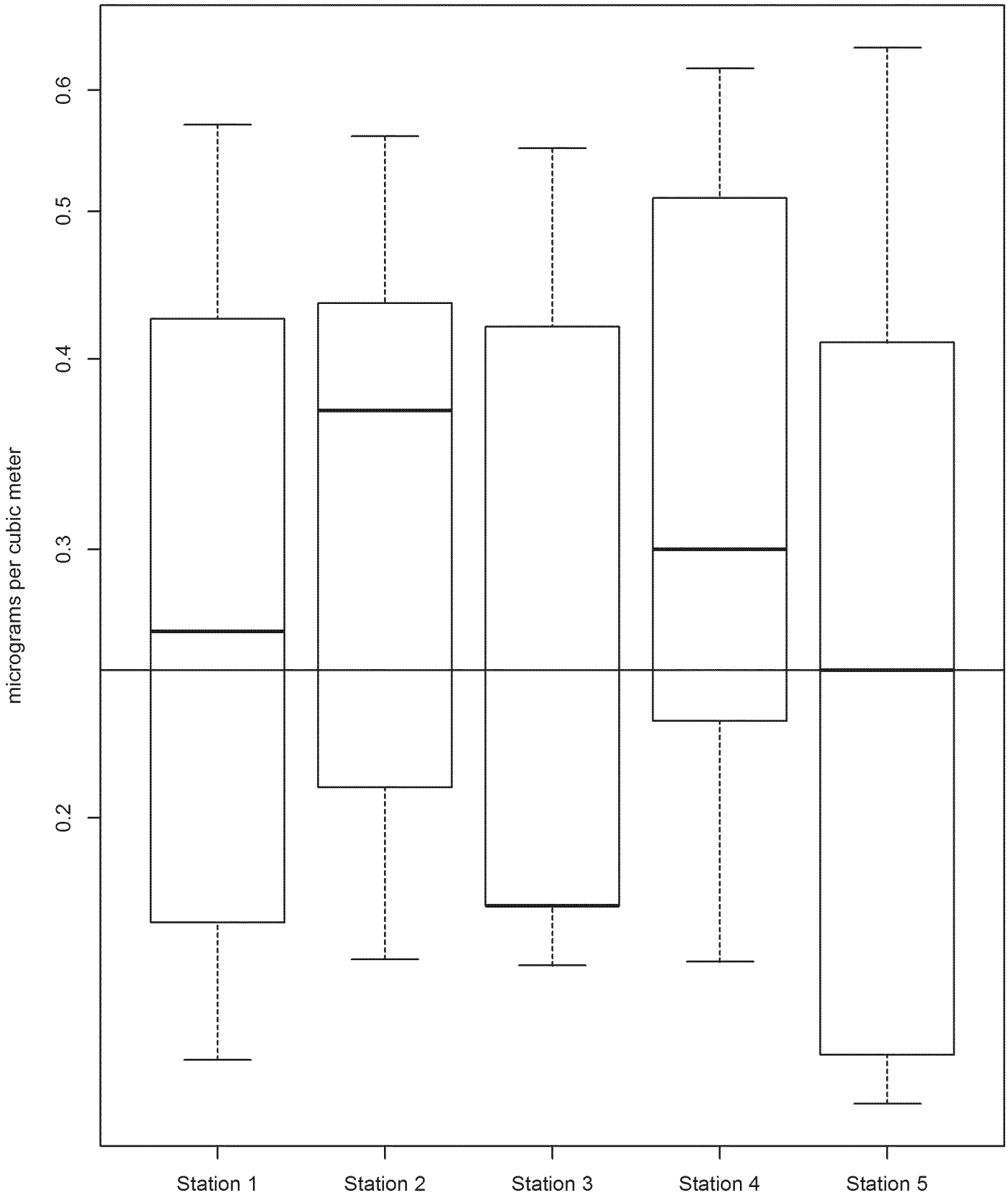


**Exhibit E−4**
**m&p−Xylene**

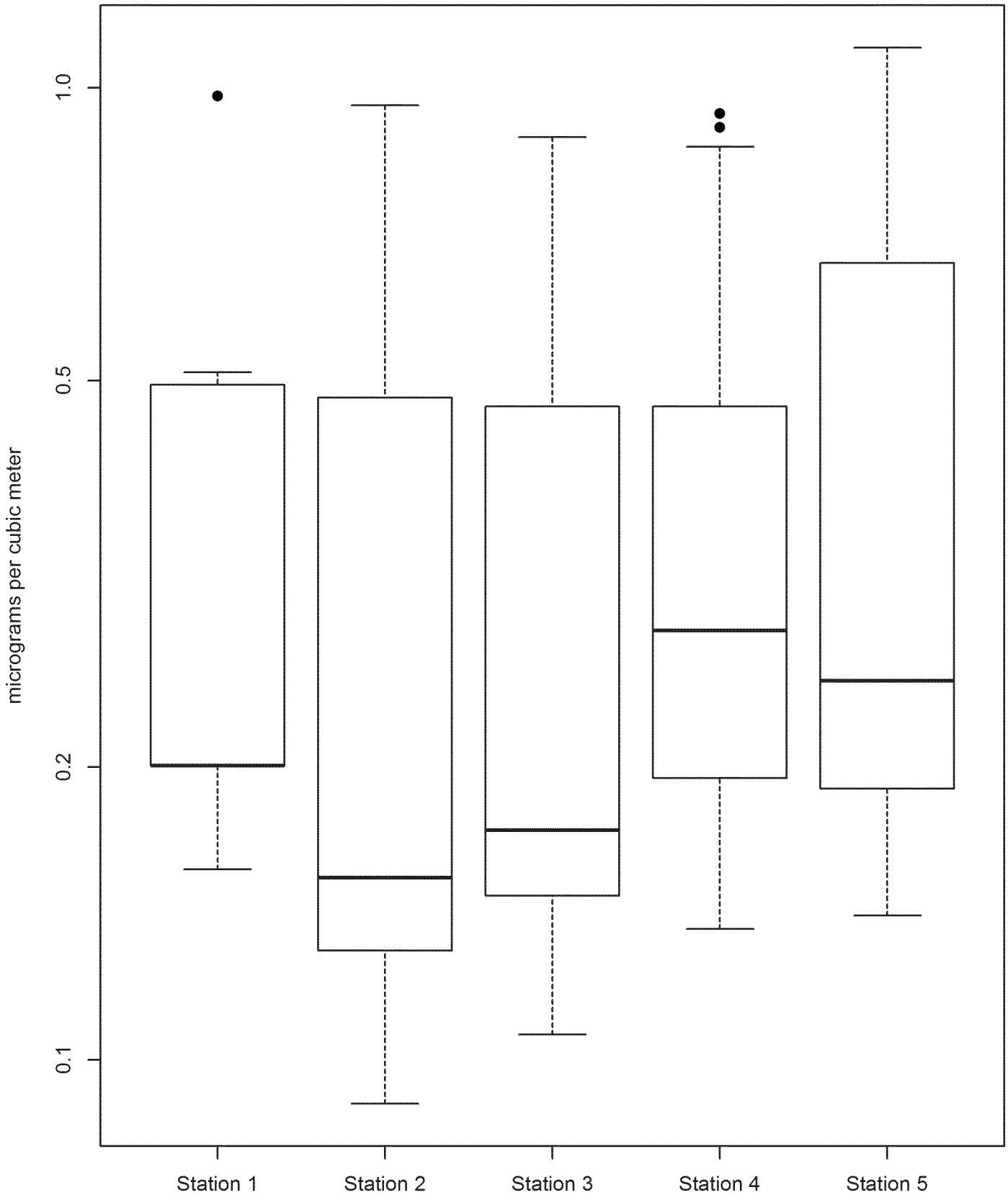
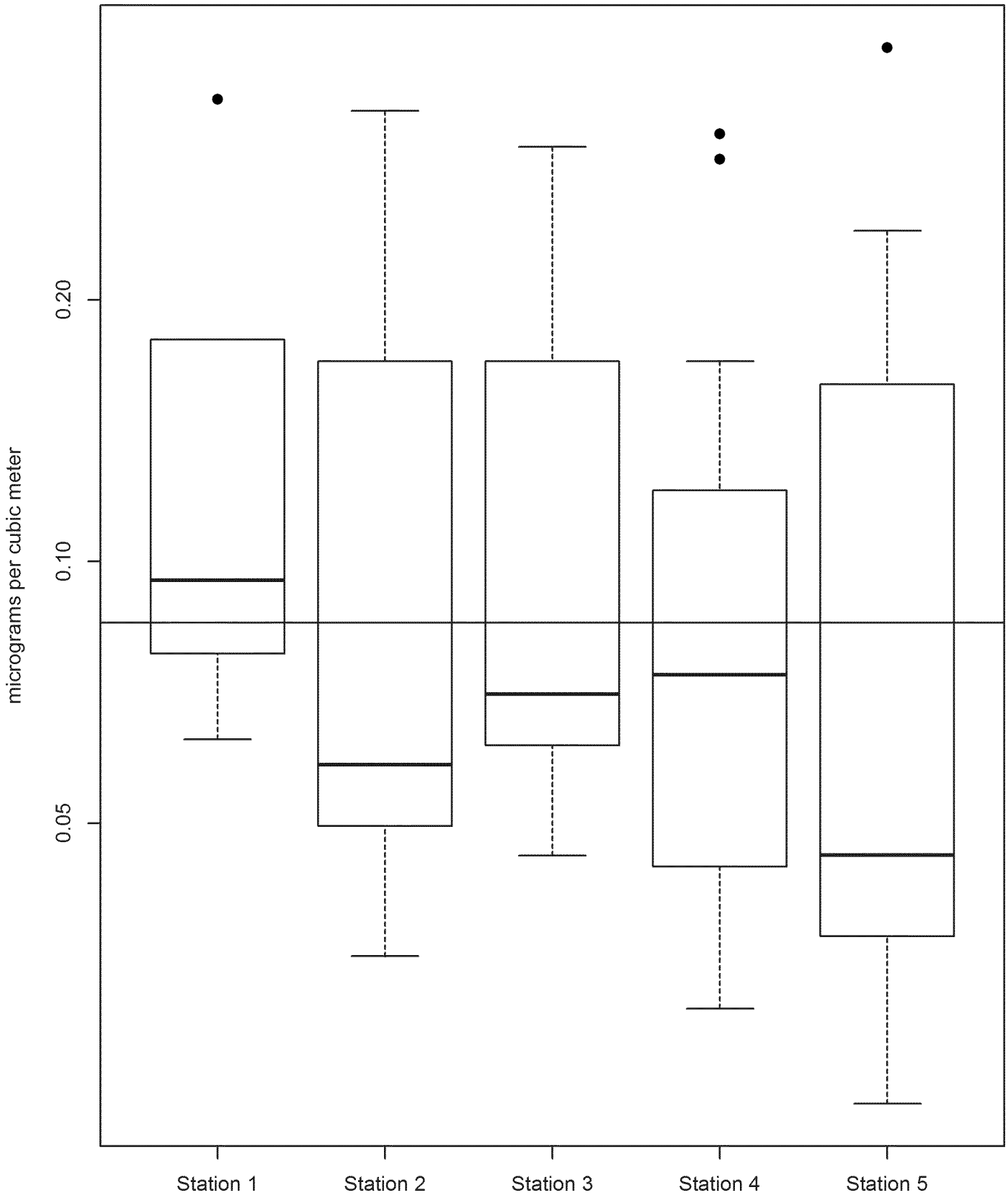


**Exhibit E−5**
**o−Xylene**



## Exhibit E−6
## Tetrachloroethene

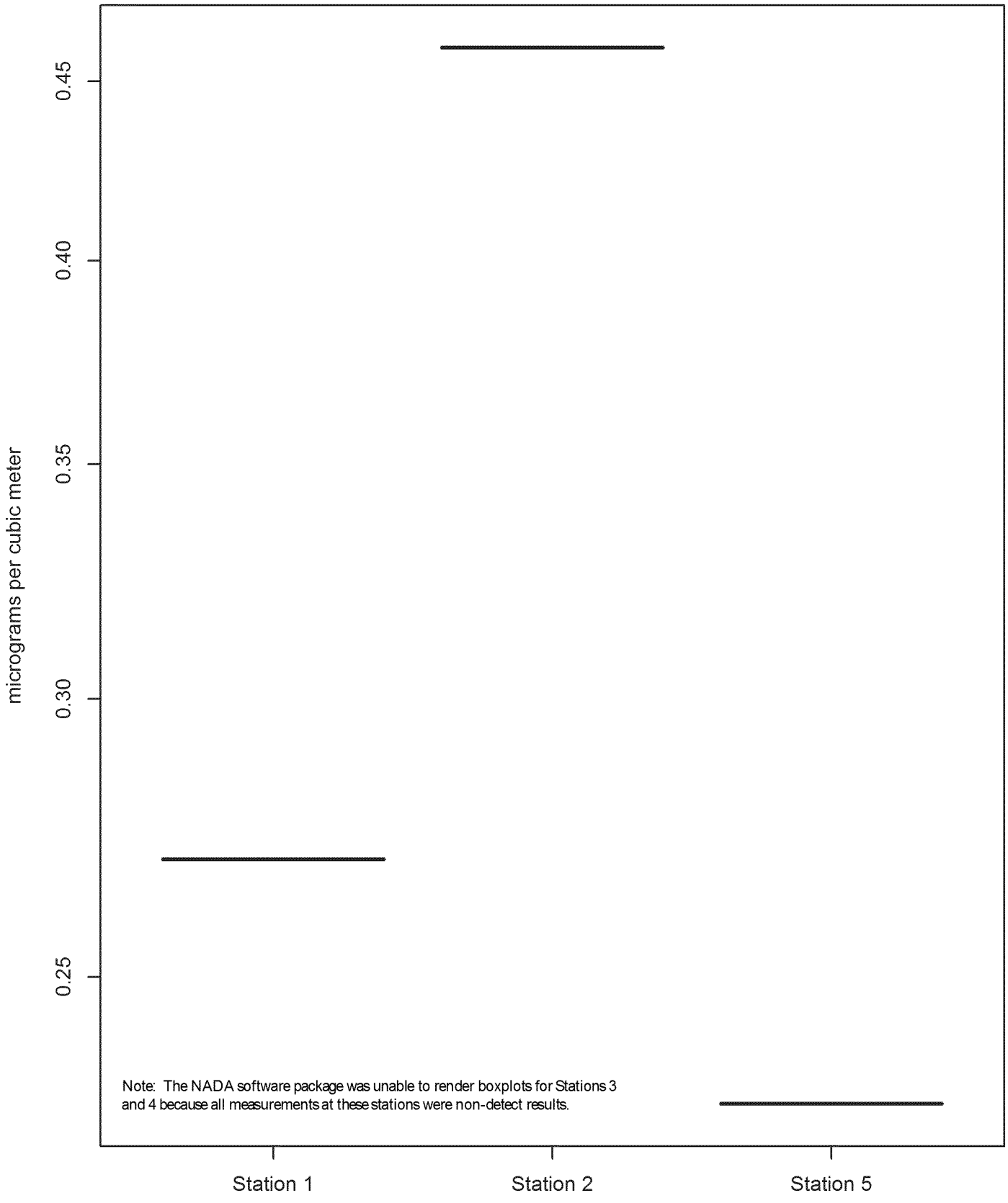
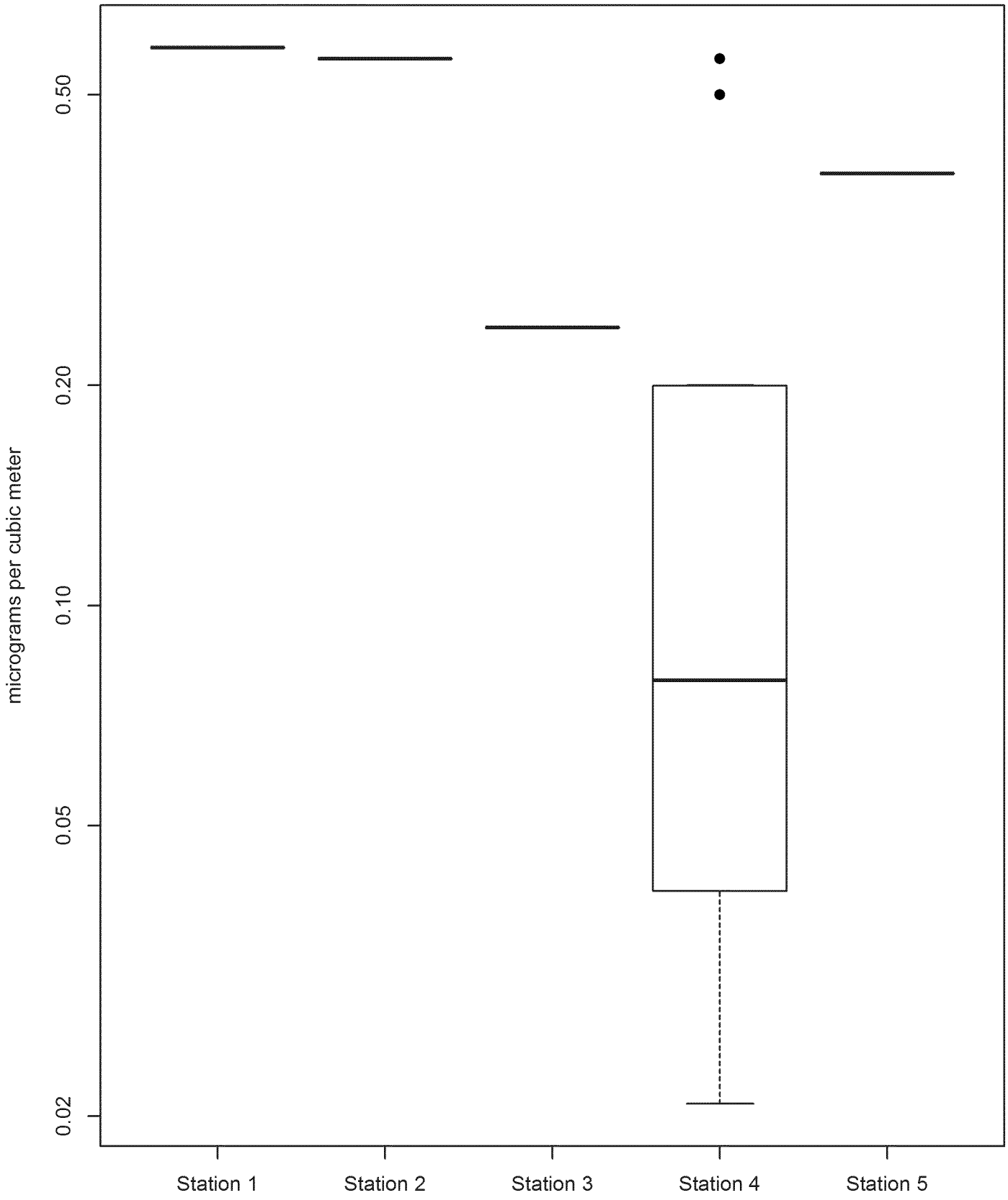
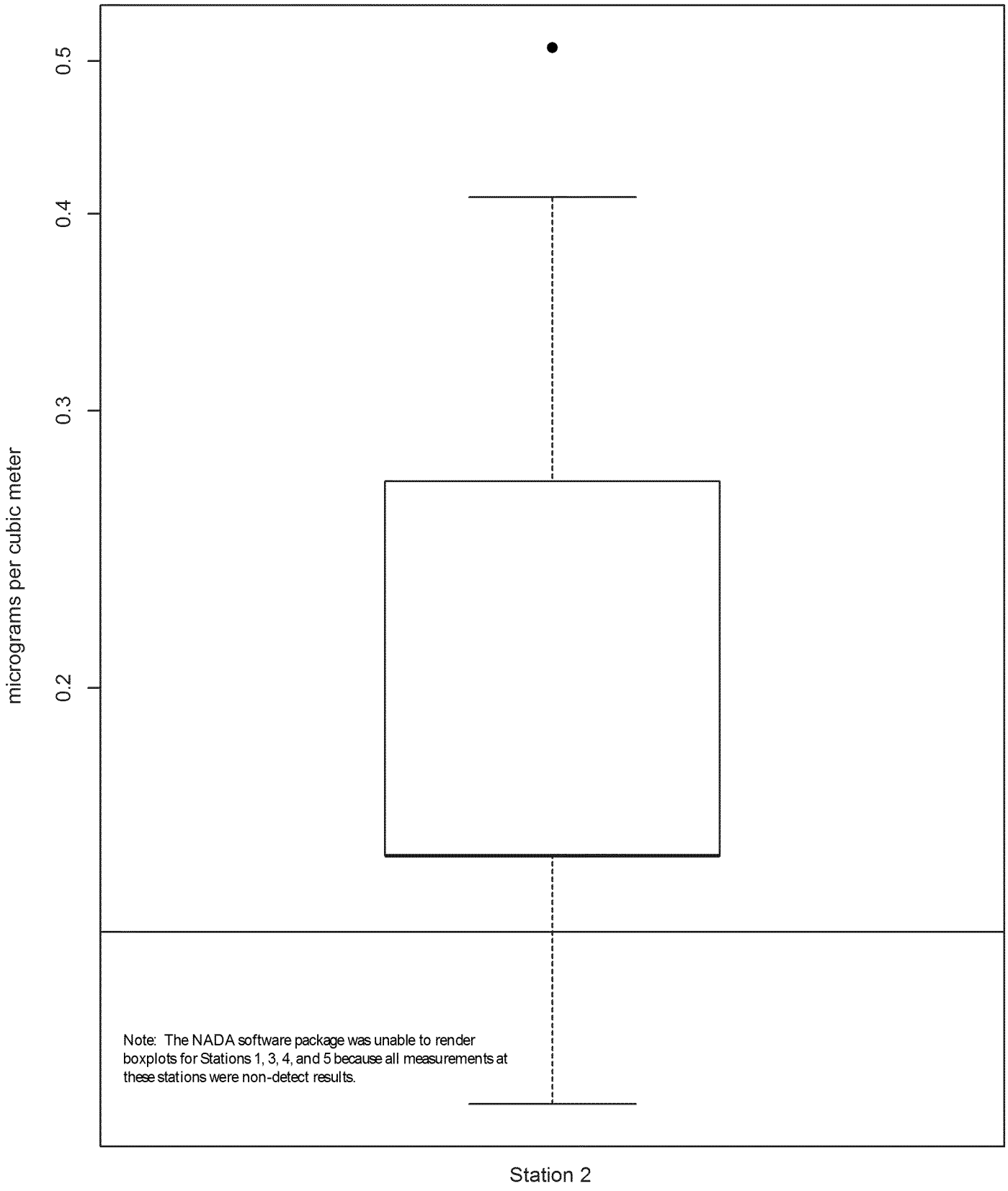


**Exhibit E−7**
**Toluene**



## Exhibit E−8
## Trichloroethene




Note: The NADA software package was unable to render boxplots for Stations 1, 3, 4, and 5 because all measurements at these stations were non-detect results.