



**4TH QUARTER (1 JUNE 2011 THROUGH 6
SEPTEMBER 2011) MONITORING REPORT
MASSPORT AIR QUALITY
MONITORING STUDY, YEAR 2
LOGAN INTERNATIONAL AIRPORT**

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TABLE OF CONTENTS

	<u>Page</u>
LIST OF FIGURES	ii
LIST OF TABLES	ii
LIST OF ACRONYMS AND ABBREVIATIONS	iii
1.0 PROJECT OVERVIEW	1-1
2.0 INTRODUCTION	2-1
3.0 DATA COLLECTION ACTIVITIES	3-1
3.1 Continuous Data	3-1
3.1.1 Percent Data Recovery for Continuous Data	3-1
3.1.2 Percent Data Reported Below MDL for Continuous Data	3-2
3.2 Time-Integrated Data	3-3
3.2.1 Percent Data Recovery for Time-Integrated Data	3-3
3.2.2 Percent Data Reported Below Method Reporting Limit for Time-Integrated Data	3-5
4.0 DATA SUMMARY	4-1
5.0 QUALITY ASSURANCE / QUALITY CONTROL ACTIVITIES	5-1
5.1 FIELD BLANKS	5-1
5.2 DATA PRECISION (REPLICATE AND DUPLICATE SAMPLING)	5-1
6.0 UPCOMING DELIVERABLES	6-1
APPENDIX A: AIR QUALITY MONITORING AND METEOROLOGICAL DATA ON CD	

LIST OF FIGURES

<u>Number</u>	<u>Title</u>
1	Monitoring Locations.

LIST OF TABLES

<u>Number</u>	<u>Title</u>
1	Summary of Monitoring Sites, Station Type, and Instrumentation.
2	Airport-Related HAPs.
3	Data Recovery for Continuous Monitoring (%).
4	Percent of Continuous Data Reported Below MDL.
5	Data Recovery for Time-Integrated Monitoring (%).
6	Active Sample Target Pollutants Percent of Time Integrated Data Reported Below the Reporting Limit (RL).
7	Carbonyl Target Pollutants Analytical Summary Statistics.
8	PAH Target Pollutants Analytical Summary Statistics.
9	Voc Target Pollutants Analytical Summary Statistics.
10	Fine Particulate Matter (PM _{2.5}) Analytical Summary Statistics.
11	Continuous Data Summary Statistics.
12	Summary of Samples Collected During the 4 th Quarter With Blanks and Duplicates.

LIST OF ACRONYMS AND ABBREVIATIONS

BAM	Beta Attenuation Monitor
BC	Black Carbon
CDM	Camp, Dresser & McKee
EA	EA Engineering, Science, and Technology, Inc.
EPA	Environmental Protection Agency
FAA	Federal Aviation Administration
FRM	Federal Reference Method
HAP	Hazardous Air Pollutant
IRIS	Integrated Risk Information System
MassDEP	Massachusetts Department of Environmental Protection
MDL	Minimum Detection Limit
MRL	Method Reporting Limit
MV	Airmetrics MiniVol™
NAAQS	National Ambient Air Quality Standards
PAH	Polynuclear Aromatic Hydrocarbon
PM	Particulate Matter
PM _{2.5}	Fine Particulate Matter
ppbv	Part(s) Per Billion by Volume
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
RfC	Reference Concentration
RfD	Reference Dose
RL	Reporting Limit
RPD	Relative Percent Difference
SVOC	Semivolatile Organic Compound
VOC	Volatile Organic Compound
µg/m ³	Microgram(s) Per Cubic Meter

1.0 PROJECT OVERVIEW

As part of the Massachusetts Environmental Policy Act Certificate on the Final Environmental Impact Report for the Logan Airside Improvements Project, the Secretary of the Executive Office of Environmental Affairs has called for a focused air quality study (the Study). The purpose of the Study is to monitor air quality conditions (with a focus on air toxics) in the vicinity of Logan in advance of, and following, the implementation of the new Centerfield Taxiway. The Centerfield Taxiway is one of the primary components of the Logan Airside Improvements Project.

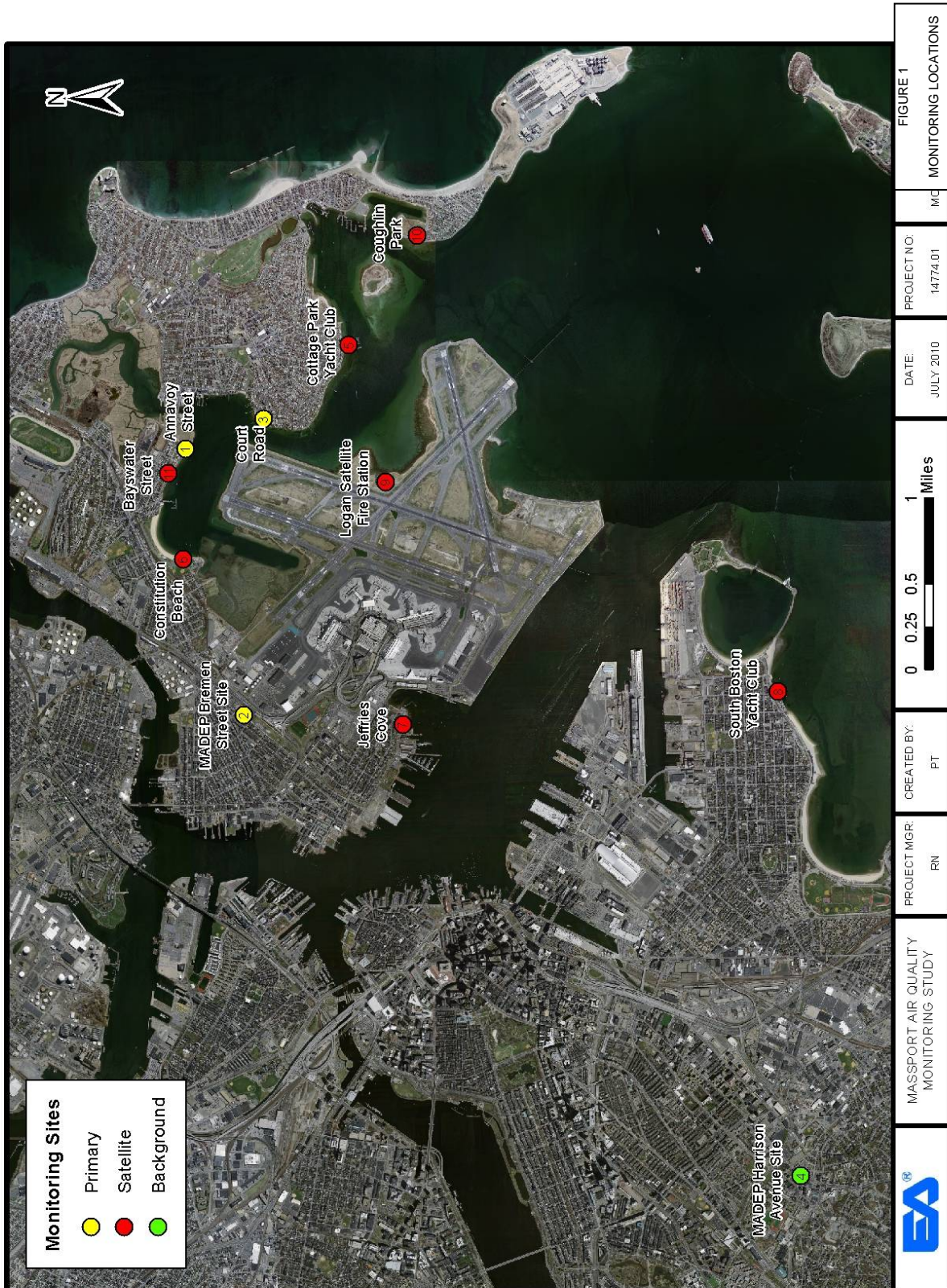
The monitoring network in this study is composed of 11 monitoring locations previously selected based on criteria established in the *Massport, Logan International Air Quality Monitoring Study, Final Air Quality Work Plan, September 2007, Camp, Dresser & McKee* (CDM). Of these 11 monitoring sites, 3 primary sites were established that use real-time and time-integrated air monitoring methods specifically selected for this study. In addition, 7 satellite sites and 1 urban background site were added to expand the study area. These additional sites utilize cost-effective methods of collecting active PM_{2.5} samples. The urban background site is located at the Massachusetts Department of Environmental Protection (MassDEP) Harrison Avenue monitoring site. An aerial map showing the 11 monitoring sites is provided as Figure 1. A table outlining the sampling locations and sampling methods conducted at each location is provided as Table 1.

To facilitate an accessible data collection and storage platform, a telemetry system was installed and incorporated into an EA Engineering, Science, and Technology, Inc. (EA) web portal in October 2010. The primary objective of the telemetry system is to monitor the real-time sampling equipment to ensure proper operation. Additionally, Massport has posted data and documents related to the Study on the internet at the following web address:

http://www.massport.com/environment/environmental_reporting/Air%20Quality/CenterfieldTaxiwayStudy.aspx.

The *Final Work Plan Massport Air Quality Study, Year 2, Logan International Airport* (EA, June 2011) identifies 13 target pollutants that the U.S. Environmental Protection Agency (EPA) and the Federal Aviation Administration (FAA) classify as toxic air pollutants typically associated with airports. Fine particulate matter (PM) (i.e., PM_{2.5}) and black carbon (BC) were added to this list to provide a more comprehensive record of pollutants that could originate from Logan. A table outlining the airport-related hazardous air pollutants (HAPs) is provided as Table 2.

The second year of the monitoring program was initiated in September 2010, with the first full quarter of monitoring from September through November 2010. The real-time measurements of PM_{2.5} and BC occurred continuously throughout the 3-month monitoring period. The monitoring program for the other compounds followed the EPA Ambient Monitoring Technology Information Center 6-day sampling schedule, with the first round of sampling conducted on 5 September 2010.



This quarterly report focuses primarily on the data collection and quality assurance activities related to the monitoring for these target pollutants. However, samples were also analyzed for other potential pollutants. These secondary pollutant concentrations are reported in Appendix A.

TABLE 1 SUMMARY OF MONITORING SITES, STATION TYPE, AND INSTRUMENTATION

<i>Site ID</i>	<i>Site Description</i>	<i>Monitoring Station Type</i>	<i>Monitoring Method and Instrumentation</i>
01	Annvoy Street	Primary	<u>Real-Time</u> : BAM PM _{2.5} , aethalometer, meteorological (wind speed, wind direction, temperature, relative humidity) <u>Time-Integrated</u> : VOCs, carbonyls, PAHs, MV PM _{2.5} , FRMPM _{2.5}
02	Bremen Street	Primary	<u>Real-Time</u> : BAM PM _{2.5} , aethalometer <u>Time-Integrated</u> : VOCs, carbonyls, MV PM _{2.5}
03	Court Road	Primary	<u>Real-Time</u> : BAM PM _{2.5} , aethalometer, meteorological (wind speed, wind direction, temperature, relative humidity) <u>Time-Integrated</u> : VOCs, carbonyls, PAHs, MV PM _{2.5}
04	Harrison Avenue	Satellite (urban background)	<u>Time-Integrated</u> : PAHs, MV PM _{2.5}
05	Cottage Park Yacht Club	Satellite	<u>Time-Integrated</u> : MV PM _{2.5}
06	Constitution Beach	Satellite	<u>Time-Integrated</u> : MV PM _{2.5}
07	Jeffries Cove	Satellite	<u>Time-Integrated</u> : MV PM _{2.5}
08	South Boston Yacht Club	Satellite	<u>Time-Integrated</u> : MV PM _{2.5}
09	Logan Satellite Fire Station	Satellite	<u>Time-Integrated</u> : MV PM _{2.5}
10	Coughlin Park	Satellite	<u>Time-Integrated</u> : MV PM _{2.5}
11	Bayswater Street	Satellite	<u>Time-Integrated</u> : MV PM _{2.5}
<p><u>Key</u>:</p> <p>BAM – Beta attenuation monitor VOC – Volatile organic compound PAH – Polynuclear aromatic hydrocarbon MV – Airmetrics MiniVol™ FRM – Federal Reference Method</p>			

TABLE 2 AIRPORT-RELATED HAPS

1,3-Butadiene (VOC)	Lead (Metal)
Acetaldehyde (Carbonyl)	Naphthalene (SVOC)
Acrolein (Carbonyl)	Propionaldehyde (Carbonyl)
Benzene (VOC)	Styrene (VOC)
Ethylbenzene (VOC)	Toluene (VOC)
Formaldehyde (Carbonyl)	Xylene (VOC)
PAHs: 2,2,4-Trimethylpentane, Acenaphthylene, Phenanthrene, Fluorene, Fluoranthene, Pyrene, Anthracene, Acenphthene, Benzo(ghi)perylene, Benzo(bk)fluoranthene, Benzo(a)anthracene, Benzo(a)pyrene, Chrysene, Indeno(123-cd)pyrene, and Dibenzo(ah)anthracene (SVOCs)	
Source: FAA 2003	
<u>Key:</u> SVOC – Semivolatile organic compound	

2.0 INTRODUCTION

This report serves as the fourth of four quarterly monitoring data reports covering post-construction monitoring results for the year at all monitoring locations as part of the Year 2 Study. EA prepared this report to provide:

- An overall status of the air quality monitoring program from 1 June 2011 through 6 September 2011.
- The status of meeting the data quality objectives presented in the *Quality Assurance Project Plan, Massport Air Quality Monitoring Study, Year 2, Logan International Airport, July 2010 (QAPP)*.
- Summary statistics for each compound including minimum, maximum, mean, median, and standard deviation values.
- The raw air quality monitoring and meteorological data for review by Massport, MassDEP, and the Massachusetts Department of Public Health.

The following sections of this report include an overview discussion of issues affecting the data quality and quantity during this portion of the monitoring program, along with data collection and quality assurance activities based on the objectives established in the QAPP. A CD with the raw air quality monitoring and meteorological data is provided as Appendix A. This data will also be provided on the Massport website at the following web address:

http://www.massport.com/environment/environmental_reporting/Air%20Quality/CenterfieldTaxiwayStudy.aspx.

3.0 DATA COLLECTION ACTIVITIES

The following sections present a summary of the percent data recovery and percent data reported below minimum detection limits (MDLs) for both continuous and real-time integrated monitoring data for the target pollutants.

3.1 CONTINUOUS DATA

The pollutant concentrations were measured using continuous ambient air monitoring instruments and time-integrated ambient air sampling equipment. The continuous pollutant data includes mass of BC measured using a 7-wavelength aethalometer (Magee Scientific Co.) and mass of particulate matter with an equivalent aerodynamic diameter of 2.5 micrometers (PM_{2.5}) measured using a beta attenuation monitor (BAM) (Met One Instruments, Inc.). In addition to the air pollution data, meteorological data was collected at the three primary sites. This included wind speed, wind direction, ambient temperature, and relative humidity. Meteorological stations were operated at two of the primary sites, and data was collected from a third party at the third primary site for the first three quarters of the Year 2 study. According to MassDEP, the Bremen Street monitoring station was shut down following 31 May 2011, and therefore the meteorological data from this site is not available for the fourth quarter of the Year 2 study. Please note that the units operated by EA continued to run and supplemental meteorological data that was collected by EA will be used for the fourth quarter of this study.

3.1.1 Percent Data Recovery for Continuous Data

EA has developed a database to track the sampling program progress to achieve the percent data recovery goal established for the study. The data collection period of June 2011 through 6 September 2011 included 2,208 hours in total. The goal for the study is to obtain at least 75 percent data recovery, i.e., at least 75 percent of scheduled data samples collected as valid samples. This percentage recovery is the average for the entire 12-month monitoring program. For continuous monitoring instruments, this value would represent 1,656 hours of valid data during the reporting period.

The percent data recovery for the continuous data collected during the reporting period is presented in Table 3. The 0 percent recovery of meteorological data noted for Bremen Street for this quarter is due to the Bremen Street meteorological station being shut down following 31 May 2011.

TABLE 3 DATA RECOVERY FOR CONTINUOUS MONITORING (%)

	<i>Jun</i>	<i>Jul</i>	<i>Aug</i>	<i>Quarter 4</i>
Black Carbon				
Annavoy	100%	99%	84%	93%
Bremen	100%	81%	77%	85%
Court	100%	59%	84%	81%
PM_{2.5} BAM				
Annavoy	99%	100%	83%	93%
Bremen	99%	99%	76%	90%
Court	100%	97%	84%	93%
Meteorology				
Annavoy	100%	100%	84%	94%
Bremen	0%	0%	0%	0%
Court	100%	100%	84%	94%

3.1.2 Percent Data Reported Below MDL for Continuous Data

MDLs of monitoring equipment utilized in this study and laboratory analyses performed for this study are presented below. Most air pollutant concentrations tend to be normally distributed in the ambient air, resulting in a significant proportion of measured values being found at relatively low concentrations and a much lower proportion being found at higher concentrations. Due to analytical limitations, some of the lower concentrations cannot be quantified and must be considered to be below the MDL of the analytical method. The MDL for the Magee Scientific 7-wavelength aethalometer is 50 nanograms of BC per cubic meter for 1-hour average measurements. The MDL for the Met One Instruments' BAM is 5 micrograms of PM_{2.5} per cubic meter ($\mu\text{g}/\text{m}^3$) for 1-hour measurements. Table 4 presents the percent of continuous data reported below the MDL. For the continuous BC 1-hour average measurements, less than 4 percent of the measurements were below the MDL at all three monitoring sites during this period. For the continuous PM_{2.5} 1-hour average measurements, less than 30 percent of the time measurements were below the MDL at all three of the monitoring sites during this period.

TABLE 4 PERCENT OF CONTINUOUS DATA REPORTED BELOW MDL

	<i>Annavoy</i>	<i>Bremen</i>	<i>Court</i>
Black Carbon	2.46%	0.90%	3.83%
PM _{2.5} (BAM)	28%	16%	22%

3.2 TIME-INTEGRATED DATA

The time-integrated pollutant data includes speciated volatile organic compounds (VOCs), speciated carbonyl compounds, speciated polynuclear aromatic hydrocarbons (PAHs), and PM_{2.5} mass. The time-integrated samples were collected consistent with the EPA Ambient Monitoring Technology Information Center 6-day sampling schedule over designated periods of 24 consecutive hours from midnight to midnight.

Time-integrated samples of PM_{2.5} were collected at the Annavoy Street site once every 6 days using a Federal Reference Method (FRM) BGI, Inc. PQ200 PM_{2.5} sampler. Time-integrated samples of PM_{2.5} were also collected at each of the 3 primary sites, the 7 satellite sites, and 1 urban background site once every 6 days using an Airmetrics MiniVolTM (MV) sampler. Time-integrated air samples were collected over a 24-hour period once every 6 days in passivated Summa canisters for analysis of speciated VOCs at each of the three primary sites. Time-integrated samples were also collected once every 6 days on dinitrophenylhydrazine medium for analysis of speciated carbonyl compounds. In addition, time-integrated samples were collected once every 6 days on XADTM resin with pre-filters for analysis of speciated PAHs.

3.2.1 Percent Data Recovery for Time-Integrated Data

During the data collection period from June 2011 through 6 September 2011, the following samples were collected:

- 16 total samples of PM_{2.5} were collected using the FRM at one of the primary sites
- 14 to 17 time-integrated samples for PM_{2.5} analysis at the 11 satellite sites
- 16 to 17 time-integrated samples for VOCs analyses at each of the primary sites
- 17 carbonyl analyses at each of the primary sites
- 16 to 17 time-integrated samples for PAH analysis at each of the 2 of the primary sites and the urban background site.

The percent data recovery for the time-integrated data collected during the reporting period is presented in Table 5. The data recovery goal was met for all sample types during this quarter.

TABLE 5 DATA RECOVERY FOR TIME-INTEGRATED MONITORING (%)

	<i>Jun</i>	<i>Jul</i>	<i>Aug</i>	<i>Quarter 4</i>
VOC				
Annavoy	100%	100%	86%	94%
Bremen	100%	100%	100%	100%
Court	100%	100%	100%	100%
Carbonyl	<i>Jun</i>	<i>Jul</i>	<i>Aug</i>	<i>Quarter 4</i>
Annavoy	100%	100%	100%	100%
Bremen	100%	100%	100%	100%
Court	100%	100%	100%	100%
PAH	<i>Jun</i>	<i>Jul</i>	<i>Aug</i>	<i>Quarter 4</i>
Annavoy	100%	100%	86%	94%
Court	100%	100%	100%	100%
Harrison	100%	100%	100%	100%
PM_{2.5} FRM	<i>Jun</i>	<i>Jul</i>	<i>Aug</i>	<i>Quarter 4</i>
Annavoy	80%	100%	100%	94%
PM_{2.5} MV	<i>Jun</i>	<i>Jul</i>	<i>Aug</i>	<i>Quarter 4</i>
Annavoy	100%	100%	100%	100%
Bayswater	100%	100%	100%	100%
Bremen	100%	100%	100%	100%
Constitution	100%	100%	100%	100%
Cottage	100%	100%	86%	94%
Coughlin	100%	100%	100%	100%
Court	100%	100%	100%	100%
Harrison	100%	100%	100%	100%
Jeffries	100%	100%	100%	100%
Logan	80%	80%	71%	76%
S. Boston	100%	100%	86%	94%

3.2.2 Percent Data Reported Below Method Reporting Limit for Time-Integrated Data

Table 6 presents the percent of time-integrated data reported below the method reporting limit (MRL) for the sampling program. The VOC data indicates the detection of most compounds at Bremen Street and Court Road during each sampling event. The exception is 1,3-Butadiene, which is not typically detected above laboratory reporting limits at any of the sampling locations. At the Annavoy Street sampling location, the detection of various VOC compounds varies significantly. Carbonyl data indicates acetaldehyde and formaldehyde were not typically detected above the laboratory reporting limits, and acrolein and propionaldehyde detections varied spatially and temporally. The PAH data demonstrates the presence of all three PAH compounds at concentrations above the laboratory reporting limit in every sample collected from the Annavoy Street and Court Road stations. The three PAH compounds were detected in almost 90 percent of the samples collected from Bremen Street.

**TABLE 6 ACTIVE SAMPLE TARGET POLLUTANTS
PERCENT OF TIME INTEGRATED DATA REPORTED BELOW THE
REPORTING LIMIT (RL)**

	<i>Annavoy</i>	<i>Bremen</i>	<i>Court</i>	<i>RLs ($\mu\text{g}/\text{m}^3$)</i>
VOC				
1,3-Butadiene	94%	71%	82%	0.11
Benzene	0%	0%	0%	0.16
Ethylbenzene	6%	0%	0%	0.217
m&p-Xylene	0%	0%	0%	0.217
o-Xylene	19%	0%	0%	0.217
Styrene	13%	0%	0%	0.213
Toluene	0%	0%	0%	0.188
Carbonyl				
Acetaldehyde	12%	6%	18%	0.006
Acrolein	75%	0%	29%	1.14
Formaldehyde	0%	0%	12%	0.003
Propionaldehyde	59%	41%	71%	0.0001
	<i>Annavoy (%)</i>	<i>Court (%)</i>	<i>Harrison (%)</i>	<i>MRLs ($\mu\text{g}/\text{m}^3$)</i>
PAH				
1-Methylnaphthalene	0%	12%	0%	0.0005
2-Methylnaphthalene	0%	12%	0%	0.0005
Naphthalene	0%	11%	0%	0.0005

The results presented in these tables represent a subset of the total number of compounds that were collected and analyzed from the sampling media. The concentration results for the additional compounds are presented in Appendix A.

4.0 DATA SUMMARY

As noted above, air monitoring for Year 2 of the Study commenced in September 2010. The fourth quarter of Year 2 includes June 2011 through 6 September 2011. Included in this section are summary statistics of data from real-time and time-integrated monitoring methods for the third quarter of Year 2 monitoring.

Real-time monitoring data includes:

- Mass of BC measured using a seven-wavelength aethalometer.
- Mass of particulate matter with an equivalent aerodynamic diameter of less than or equal to 2.5 micrometers (PM_{2.5}) measured using a BAM.
- Meteorological data including wind speed, wind direction, temperature, and relative humidity.

Time-integrated monitoring data includes:

- Speciated VOC, analyzed via EPA Method TO-15 SIM.
- Speciated semivolatile organic compounds (SVOC), analyzed via EPA Method TO-13a.
- Speciated carbonyls, analyzed via EPA Method TO-11a.
- Mass of PM_{2.5}, by gravimetric analysis.

**TABLE 7 CARBONYL TARGET POLLUTANTS ANALYTICAL
SUMMARY STATISTICS**

<i>Location</i>	<i>Minimum Result</i>	<i>Maximum Result</i>	<i>Mean Result</i>	<i>Standard Deviation</i>	<i>Benchmark</i>
Acetaldehyde					5.0
Annvoy Street	0.0214	4.2190	0.8069	1.0210	
Bremen Street	0.0215	2.6348	1.1145	0.8415	
Court Road	0.0244	2.8259	0.5153	0.7286	
Acrolein					0.009
Annvoy Street	0.2473	0.8213	0.3376	0.1737	
Bremen Street	0.6493	1.8146	1.1496	0.3334	
Court Road	0.2473	0.7998	0.5242	0.1967	
Formaldehyde					570
Annvoy Street	0.3920	13.4512	2.7928	3.3166	
Bremen Street	0.0697	8.1932	4.6098	2.4847	
Court Road	0.0198	7.7759	1.8428	2.0096	
Propionaldehyde					3.4
Annvoy Street	0.0391	4.3177	0.4104	1.0262	
Bremen Street	0.0405	1.4633	0.3143	0.3802	
Court Road	0.0459	8.5183	0.6124	2.0401	
* All concentrations presented in parts per billion by volume (ppbv)					
**Benchmark values are chronic inhalation reference concentrations (RfCs), except for formaldehyde, which is based on chronic oral reference doses (RfDs), from EPA's Integrated Risk Information System (IRIS). The benchmark values should be compared to the mean result.					
***If target analyte is not detected, laboratory reporting limit is used.					

Summary statistics indicate acrolein is the only carbonyl target pollutant exceeding the benchmark value. However, acrolein was not typically detected above the laboratory reporting limit, therefore skewing the average value (half of the detection limit was used when calculating non-detect values). The average concentrations of acetaldehyde, formaldehyde, and propionaldehyde are well below the benchmark values of 5.0, 570 and 3.4 ppbv, respectively. The maximum concentrations of acetaldehyde, formaldehyde, and propionaldehyde are well below the benchmark values of 5.0, 570, and 3.4 as well, with the exception of the maximum propionaldehyde concentration of 4.3177 at Annvoy Street. This maximum concentration slightly exceeds the benchmark value of 3.4.

TABLE 8 PAH TARGET POLLUTANTS ANALYTICAL SUMMARY STATISTICS

<i>Location</i>	<i>Minimum Result</i>	<i>Maximum Result</i>	<i>Mean Result</i>	<i>Standard Deviation</i>	<i>Benchmark</i>
1-Methylnaphthalene					NA
Annvoy Street	0.0004	0.0232	0.0100	0.0083	
Court Road	0.0001	0.0095	0.0025	0.0022	
Harrison Avenue	0.0006	0.0062	0.0025	0.0015	
2-Methylnaphthalene					2.6
Annvoy Street	0.0008	0.0669	0.0295	0.0218	
Court Road	0.0001	0.0168	0.0049	0.0040	
Harrison Avenue	0.0013	0.0108	0.0054	0.0031	
Naphthalene					0.57
Annvoy Street	0.0022	0.0917	0.0431	0.0289	
Court Road	0.0002	0.0284	0.0111	0.0075	
Harrison Avenue	0.0035	0.0285	0.0134	0.0077	
*All concentrations presented in ppbv.					
**Benchmark values are RfCs, except for 2-methyl naphthalene, which is based on RfDs, from EPA's IRIS. The benchmark values should be compared to the mean result.					

The table above demonstrates that the average values of the PAH target pollutants do not approach the benchmark values. Furthermore, the maximum values are well below the benchmark values.

TABLE 9 VOC TARGET POLLUTANTS ANALYTICAL SUMMARY STATISTICS

<i>Location</i>	<i>Minimum Result</i>	<i>Maximum Result</i>	<i>Mean Result</i>	<i>Standard Deviation</i>	<i>Benchmark</i>
1,3-Butadiene					0.9
Annavoy Street	0.0250	0.0567	0.0270	0.0079	
Bremen Street	0.0250	0.0747	0.0353	0.0172	
Court Road	0.0250	0.0707	0.0332	0.0159	
Benzene					9.4
Annavoy Street	0.0574	0.5611	0.1574	0.1182	
Bremen Street	0.1752	0.4929	0.2782	0.0805	
Court Road	0.0930	0.5890	0.2481	0.1202	
Ethylbenzene					230
Annavoy Street	0.0250	1.2788	0.4863	0.4005	
Bremen Street	0.9522	2.0378	1.4811	0.2909	
Court Road	0.9844	2.7830	2.0850	0.4735	
m,p-Xylenes					23
Annavoy Street	0.0720	1.1385	0.4965	0.3696	
Bremen Street	1.2581	2.0171	1.6183	0.2650	
Court Road	1.0281	2.7140	2.0654	0.4856	
o-Xylene					23
Annavoy Street	0.0250	0.3956	0.1712	0.1264	
Bremen Street	0.3887	0.6348	0.5275	0.0865	
Court Road	0.7199	1.4996	1.0369	0.2396	
Styrene					230
Annavoy Street	0.0245	0.6118	0.1786	0.1459	
Bremen Street	0.3450	2.0079	0.9291	0.3970	
Court Road	0.3197	1.2926	0.6095	0.2171	
Toluene					1300
Annavoy Street	0.2067	2.9120	1.1324	0.8197	
Bremen Street	1.6744	6.9160	2.7834	1.1489	
Court Road	1.1076	3.9780	2.7822	0.7646	
*All concentrations presented in ppbv.					
**Benchmark values are RfCs from EPA's IRIS. The benchmark values should be compared to the mean result.					

The table above demonstrates that the average values of the VOC target pollutants do not approach the benchmark values. Furthermore, the maximum values are well below the benchmark values.

TABLE 10 FINE PARTICULATE MATTER (PM_{2.5}) ANALYTICAL SUMMARY STATISTICS

<i>Location</i>	<i>Minimum Result</i>	<i>Maximum Result</i>	<i>Mean Result</i>	<i>Standard Deviation</i>	<i>Benchmark</i>
FRM PM_{2.5}					15 and 35
Annavoy Street	0.08	15.68	10.193	4.720	
MiniVol PM_{2.5}					
Annavoy Street	0.28	35.51	16.085	10.063	
Bayswater Street	0.26	46.77	13.296	10.329	
Bremen Street	0.25	32.16	14.409	9.067	
Constitution Beach	0.25	34.13	14.389	9.089	
Cottage Park Yacht Club	0.30	34.39	18.063	9.705	
Coughlin Park	0.25	44.26	15.964	10.082	
Court Road	0.26	43.55	14.549	12.250	
Harrison Avenue	0.26	35.08	12.785	9.314	
Jeffries Cove	0.25	30.78	13.922	8.588	
Logan Satellite Fire Station	0.20	45.94	10.756	12.794	
South Boston Yacht Club	3.01	25.30	13.811	7.456	
* All concentrations shown in $\mu\text{g}/\text{m}^3$.					
** Benchmark values are the 24-hour ($35 \mu\text{g}/\text{m}^3$) and annual ($15 \mu\text{g}/\text{m}^3$) National Ambient Air Quality Standards (NAAQS) for PM _{2.5} . The 24-hour NAAQS (to be compared to the maximum result) is not to be exceeded more than once per year while the annual NAAQS (to be compared to the average measured concentration) is not to be exceeded.					

Summary statistics for the fine particulate matter sampling and analysis are provided above. The data indicates exceedances of the NAAQS 24-hour standard at six sampling locations. Five of the six exceedances of the NAAQS 24-hour standard were observed on 8 June 2011. The annual NAAQS standard, which should be compared to the mean value, was also exceeded at three sites. The highest PM_{2.5} average was observed at the Cottage Park Yacht Club. The other locations that exceed the annual NAAQS standard include Annavoy Street and Coughlin Park.

TABLE 11 CONTINUOUS DATA SUMMARY STATISTICS

<i>Site Name</i>	<i>Min</i>	<i>Max</i>	<i>Median</i>	<i>Avg</i>	<i>Std Dev</i>	<i>Benchmarks</i>
Hourly BC/Aethalometer Data ($\mu\text{g}/\text{m}^3$)						
Annavoy	0.0000	3.797	0.530	0.647	0.506	N/A
Bremen	0.0082	4.874	0.607	0.738	0.541	
Court	0.0000	8.734	0.632	0.737	0.622	
24-Hour BC/Aethalometer Data ($\mu\text{g}/\text{m}^3$)						
Annavoy	0.0410	1.757	0.623	0.645	0.347	5.00
Bremen	0.0549	1.982	0.665	0.738	0.341	
Court	0.0519	1.823	0.729	0.737	0.398	
Hourly PM_{2.5}/BAM Data ($\mu\text{g}/\text{m}^3$)						
Annavoy	-7	39	7.000	8.658	6.970	N/A
Bremen	-4	54	9.000	10.623	6.960	
Court	-4	239	8.000	9.456	8.919	
24-Hour PM_{2.5}/BAM Data ($\mu\text{g}/\text{m}^3$)						
Annavoy	-1.667	26.958	7.646	8.649	5.564	15 and 35
Bremen	0.75	30.75	9.479	10.539	5.570	
Court	1.833	36.833	8.792	9.435	5.233	
<p>* Benchmark for 24-hour BC is the RfC for diesel engine exhaust from EPA's IRIS. The benchmark values should be compared to the average measured concentrations.</p> <p>** Benchmark values for the 24-hour BAM data are the 24-hour (35 $\mu\text{g}/\text{m}^3$) and annual (15 $\mu\text{g}/\text{m}^3$) NAAQS, respectively, for PM_{2.5}. The 24-hour NAAQS (to be compared to the maximum measured concentrations) is not to be exceeded more than once per year while the annual NAAQS (to be compared to the average measured concentrations) is not to be exceeded.</p> <p>***-5 $\mu\text{g}/\text{m}^3$ measurement reflects negative offset of BAM units to reflect urban background conditions.</p>						

Summary statistics for the aethalometer indicate BC concentrations are well below the benchmark values established for this study. The data indicates exceedances of the NAAQS 24-hour standard at two sampling locations for the hourly BAM PM_{2.5} sample data. The locations that exceed the 24-hour NAAQS standard are Annavoy Street and Court Road. The maximum 24-hour BAM concentration observed at Court Road exceeded the applicable NAAQS standard. The annual NAAQS standard, which should be compared to the mean value, was not exceeded at any sampling locations for hourly and 24-hour BAM PM_{2.5} values.

5.0 QUALITY ASSURANCE / QUALITY CONTROL ACTIVITIES

Quality assurance/quality control (QA/QC) activities include those routine and non-routine activities that are intended to improve or assure the quality of measured data. The following discussion briefly addresses those activities conducted during this monitoring period. The QAPP provides more in-depth discussion of the monitoring QA/QC procedures. Table 12 provides tallies of the field and lab blank samples that were analyzed during this monitoring period.

TABLE 12 SUMMARY OF SAMPLES COLLECTED DURING THE 4TH QUARTER WITH BLANKS AND DUPLICATES

<i>Samples/Blanks/Duplicates</i>	<i>Active</i>				
	<i>VOC</i>	<i>Carbonyl</i>	<i>PAH</i>	<i>PM (FRM)</i>	<i>PM (MiniVol)</i>
Field Samples	50	51	50	16	183
Field Blanks	0	5	1	5	15
Lab Blanks	7	15	17	0	0
Lab Duplicates	7	13	0	0	0

5.1 FIELD BLANKS

The practice of conducting and analyzing field blanks is to provide information about contamination that may be introduced during sample collection, storage, and transport. Field blanks are to be collected on or near the scheduled sample day and shipped back to the laboratory for analysis.

For the active sampling portion of the Study during the reporting period, there was one field blank analyzed for speciated PAHs and five for speciated carbonyls. For time-integrated PM_{2.5} sampling, five FRM field blanks were collected and fifteen MV field blanks were collected. Details of the field blank results can be found in Appendix A.

5.2 DATA PRECISION (REPLICATE AND DUPLICATE SAMPLING)

Data precision is one of the measures used to assess the quality of the monitoring data. Data precision is the degree of mutual agreement among individual measurements under identical or substantially similar conditions measured as either the range or as the standard deviation. This can be done by either using the same analytical instrument to make repeated analyses of the same (replicate) sample, or it can be done by collecting, processing, and analyzing collocated (duplicate) samples.

For time-integrated samples with subsequent laboratory analysis, precision was determined by periodic laboratory replicate analyses. Laboratory replication involves splitting a single sample

in the laboratory and performing replicate tests. For continuous measurements, it is determined by periodic presentation of transfer standards to the measurement system.

For the time-integrated portion of the Study during the reporting period, there were no collocated (duplicate) samples collected in the field. However, there were seven valid replicate analyses for speciated VOCs performed in the laboratory which provide a measure of the precision, or reproducibility, of the sample data. The results of the replicate analyses for the six target VOCs were less than 10 percent, with the exception of two samples. The duplicate analysis of the VOC sample collected at Bremen Street on 14 June 2011 indicates benzene relative percent difference (RPD) of 15 percent and the duplicate analysis of the VOC sample collected at Court Road on 26 July 2011 indicates a benzene RPD of 13 percent. All other RPDs were 10 percent or below for the six target VOCs. An RPD of 25 percent is considered valid.

It should be noted that there are collocated active measurements of $PM_{2.5}$ at the three primary sites. The Annavoy Street site includes sample collection for $PM_{2.5}$ via an FRM as well as via an MV and continuous measurement of $PM_{2.5}$ via the BAM. Both the Bremen Street site and the Court Road site include both an MV and a BAM. However, since the collocated methods at each of these sites represent different methodologies, a direct comparison of the collocated results is not a true measure of precision for $PM_{2.5}$.

6.0 UPCOMING DELIVERABLES

This report represents the final quarterly report for the Year 2 Study. A year-end report will be prepared that will summarize the data for the entire Year 2 period.

Appendix A

Air Quality Monitoring and Meteorological Data on CD