



**2ND QUARTER (DECEMBER 2010 THROUGH
FEBRUARY 2011) MONITORING REPORT
MASSPORT AIR QUALITY
MONITORING STUDY, YEAR 2
LOGAN INTERNATIONAL AIRPORT**

Prepared for

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LIST OF ACRONYMS

BAM	Beta attenuation monitor
BC	Black carbon
CDM	Camp, Dresser & McKee, Inc.
EA	EA Engineering, Science, and Technology, Inc.
EPA	(U.S.) Environmental Protection Agency
FAA	Federal Aviation Administration
FRM	Federal Reference Method
HAP	Hazardous air pollutant
IRIS	(EPA) 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 Standard
PAH	Polynuclear aromatic hydrocarbon
ppbv	Parts per billion by volume
RfC	Reference concentration
RfD	Reference dose
RPD	Relative percent difference
QA/QC	Quality assurance/quality control
QAPP	Quality Assurance Project Plan, “ <i>Massport Air Quality Monitoring Study, Year 2, Logan International Airport, May 2011</i> ”
SVOC	Semi-volatile organic compound
ug/m ³	Cubic meter
VOC	Volatile organic compound

1. 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.

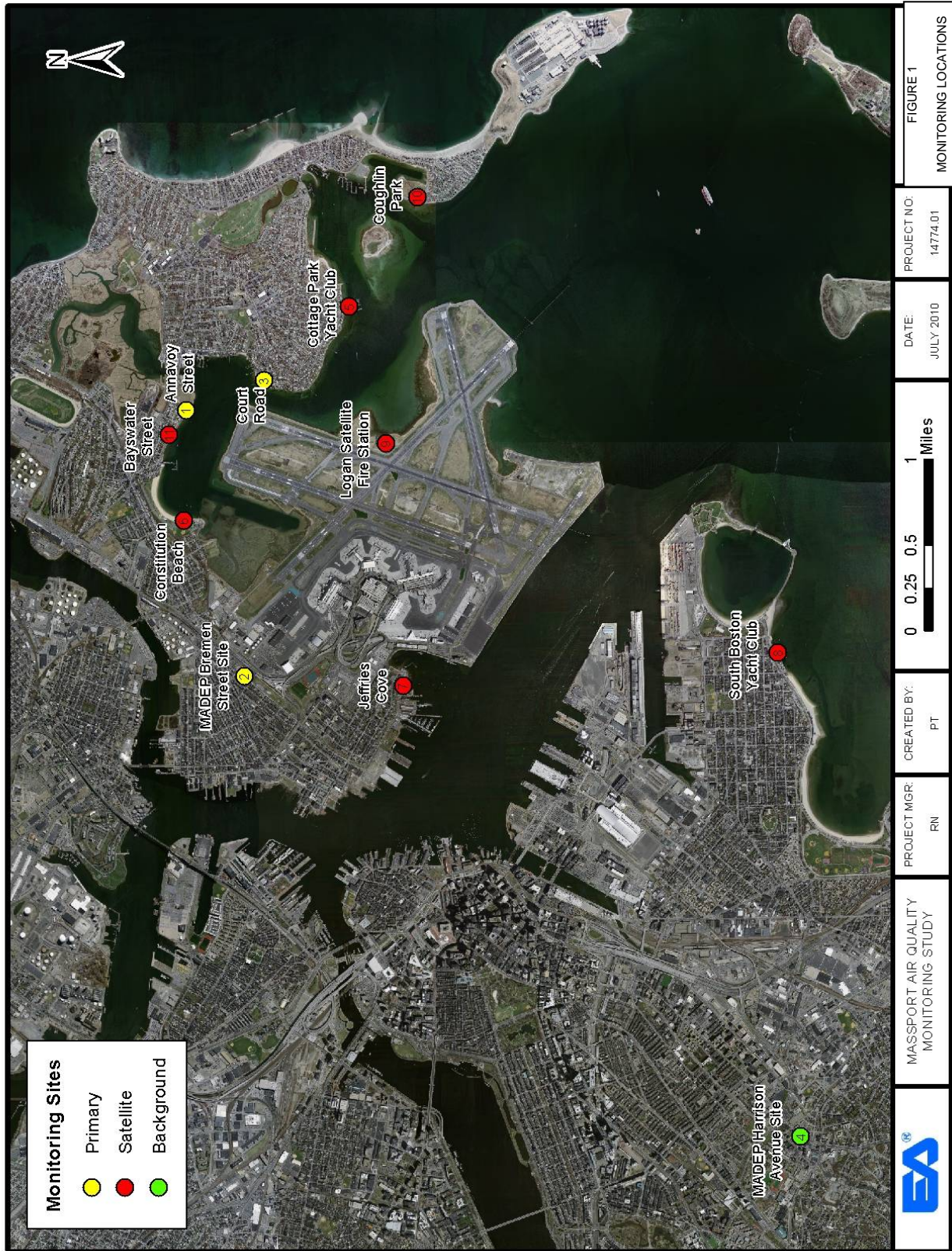
The monitoring network in this study is composed of 11 monitoring locations previously selected based on criteria established in the *Massport, Logan International Air Quality Monitoring Study, Final Air Quality Work Plan, September 2007, Camp, Dresser & McKee* (CDM). Of these 11 monitoring sites, three primary sites were established that use real-time and time-integrated air monitoring methods specifically selected for this study. In addition, seven satellite sites and one 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 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	Annavoy 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 – Semi-volatile organic compound	

2. INTRODUCTION

This report serves as the second 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 startup of Year 2 from 1 December 2010 through 28 February 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, May 2011* (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. 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.

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 December 2010 through February 2011 included 2,160 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 1,620 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 63 percent recovery for meteorological data at Court Road in December is relative to operator error when reprogramming the data logger. Once the data was reprogrammed correctly, data recovery has increased to 100 percent.

TABLE 3 DATA RECOVERY FOR CONTINUOUS MONITORING (%)

	<i>Dec</i>	<i>Jan</i>	<i>Feb</i>	<i>Quarter 2</i>
Black Carbon				
Annavoy	100	100	100	100
Bremen	100	100	95	98
Court	100	100	100	100
PM_{2.5} BAM				
Annavoy	100	90	94	95
Bremen	100	94	99	98
Court	100	97	98	98
Meteorology				
Annavoy	100	100	100	100
Bremen	98	84	100	94
Court	63	100	100	87

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 one-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 one-hour measurements. Table 4 presents the percent of continuous data reported below MDL. For the continuous BC one-hour average measurements, approximately one-half percent or less of the measurements were below the MDL at all three monitoring sites during this period. For the continuous PM_{2.5} one-hour average measurements, approximately 25 percent or less 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	0.46	0.28	0.42
PM _{2.5} (BAM)	23	15	24

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 December 2010 through February 2011, 12 total samples of PM_{2.5} were collected using the FRM at one of the primary sites, a range of 12 to 13 time-integrated samples for PM_{2.5} analysis at the 11 satellite sites, 13 to 14 time-integrated samples for VOCs and carbonyl analyses at each of the primary sites, and 15 time-integrated samples for PAH analysis at 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 VOC samples, PAH samples, carbonyl samples, and ten of the eleven PM_{2.5} sampling locations during this quarter. The data recovery goal was not met for the PM_{2.5} sampling location adjacent to the South Boston Yacht Club during this reporting period. The low recoveries in December are attributed to samples not meeting the quality control and handling requirements specified by the program. This situation has been addressed and recovery percentiles should improve in the future, as demonstrated by the January and February 2011 recoveries.

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

	<i>Dec</i>	<i>Jan</i>	<i>Feb</i>	<i>Quarter 2</i>
VOC				
Annavoy	80	80	100	87
Bremen	80	100	100	93
Court	80	80	100	87

	<i>Dec</i>	<i>Jan</i>	<i>Feb</i>	<i>Quarter 2</i>
Carbonyl				
Annavoy	100	100	100	100
Bremen	100	100	100	100
Court	100	100	100	100
PAH				
Annavoy	100	100	100	100
Court	100	100	100	100
Harrison	100	100	100	100
PM_{2.5} FRM				
Annavoy	60	100	80	80
PM_{2.5} MV				
Annavoy	60	100	100	87
Bayswater	60	100	100	87
Bremen	60	100	100	87
Constitution	60	100	100	87
Cottage	60	100	100	87
Coughlin	60	100	100	87
Court	60	100	100	87
Harrison	60	100	100	87
Jeffries	60	100	100	87
Logan	40	100	100	80
S. Boston	40	100	80	73

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 most compound detection varies spatially with the exception of 1,3-butadiene, which is typically not detected above laboratory reporting limits at any of the three sites. Carbonyl data indicates acetaldehyde, formaldehyde, and propionaldehyde were detected above the laboratory reporting limits in every sample collected from all three sampling locations. The PAH data demonstrates the presence of all three PAH compounds at concentrations above the laboratory reporting limit in every sample collected from all three sites as well.

**TABLE 6 ACTIVE SAMPLE TARGET POLLUTANTS
PERCENT OF TIME-INTEGRATED DATA REPORTED BELOW MRL**

	<i>Annavoy</i> (%)	<i>Bremen</i> (%)	<i>Court</i> (%)	<i>MRLs</i> ($\mu\text{g}/\text{m}^3$)
VOC				
1,3-Butadiene	100	0	85	0.11
Benzene	0	0	0	0.16
Ethylbenzene	46	0	69	0.217
m,p-Xylene	15	0	0	0.217
o-Xylene	38	57	46	0.217
Styrene	69	0	85	0.213
Toluene	0	0	0	0.188
Carbonyl				
Acetaldehyde	0	0	0	0.006
Acrolein	100	100	100	1.14
Formaldehyde	0	0	0	0.003
Propionaldehyde	0	0	0	0.0001
	<i>Annavoy</i> (%)	<i>Court</i> (%)	<i>Harrison</i> (%)	<i>MRLs</i> ($\mu\text{g}/\text{m}^3$)
PAH				
1-Methylnaphthalene	0	0	0	0.0005
2-Methylnaphthalene	0	0	0	0.0005
Naphthalene	0	0	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. DATA SUMMARY

As noted above, air monitoring for Year 2 of the Study commenced in September 2010. The second quarter of Year 2 includes December 2010 through February 2011. Included in this section are summary statistics of data from real-time and time-integrated monitoring methods for the second 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 semi-volatile 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
Annavoy Street	0.0021	0.8465	0.3825	0.2767	
Bremen Street	0.0021	0.8155	0.3382	0.2567	
Court Road	0.0022	0.5802	0.1463	0.1578	
Acrolein					0.009
Annavoy Street	0.2451	0.2451	0.2451	0.0000	
Bremen Street	0.2451	0.2451	0.2451	0.0000	
Court Road	0.2451	0.2451	0.2451	0.0000	
Formaldehyde					570
Annavoy Street	0.0932	8.3059	3.3896	3.0320	
Bremen Street	0.0016	6.1315	1.8581	2.0033	
Court Road	0.0412	1.3069	0.3036	0.3303	

<i>Location</i>	<i>Minimum Result</i>	<i>Maximum Result</i>	<i>Mean Result</i>	<i>Standard Deviation</i>	<i>Benchmark</i>
Propionaldehyde					3.4
Annvoy Street	0.00002	0.6448	0.0805	0.2070	
Bremen Street	0.00002	0.00004	0.00002	0.00001	
Court Road	0.00002	0.00004	0.00004	0.00001	
* 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 never detected above the laboratory reporting limit, and the values reported represent the laboratory reporting limit. The average concentrations of acetaldehyde, formaldehyde and propionaldehyde are well below the benchmark values of 5, 570 and 3.4 ppbv, respectively.

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	0.0002	0.0021	0.0013	0.0006	
Court Road	0.0002	0.0048	0.0015	0.0014	
Harrison Avenue	0.0001	0.0021	0.0011	0.0006	
2-Methylnaphthalene					2.6
Annvoy Street	0.0004	0.0037	0.0022	0.0011	
Court Road	0.0004	0.0099	0.0027	0.0030	
Harrison Avenue	0.0001	0.0036	0.0019	0.0011	
Naphthalene					0.57
Annvoy Street	0.0011	0.0109	0.0062	0.0031	
Court Road	0.0011	0.0281	0.0092	0.0095	
Harrison Avenue	0.0001	0.0124	0.0059	0.0035	
*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 three 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	0.0248	0.0248	0.0248	0.0000	
Bremen Street	0.0248	0.0576	0.0314	0.0132	
Court Road	0.0248	0.1166	0.0349	0.0269	
Benzene					9.4
Annavoy Street	0.1088	0.3410	0.2093	0.0849	
Bremen Street	0.1525	0.3255	0.2507	0.0514	
Court Road	0.0911	0.4247	0.2061	0.0900	
Ethylbenzene					230
Annavoy Street	0.0250	0.7567	0.1759	0.2556	
Bremen Street	0.0538	4.4160	0.5933	1.1475	
Court Road	0.0250	0.6854	0.1045	0.1840	
m,p-Xylenes					23
Annavoy Street	0.0250	0.8188	0.2363	0.2567	
Bremen Street	0.1387	4.1860	0.7102	1.0484	
Court Road	0.0598	0.8510	0.1950	0.2334	
o-Xylene					23
Annavoy Street	0.0250	0.3864	0.1700	0.1306	
Bremen Street	0.0550	1.2742	0.2224	0.3142	
Court Road	0.0250	0.5106	0.1032	0.1431	
Styrene					230
Annavoy Street	0.0245	0.2438	0.0598	0.0711	
Bremen Street	0.0245	2.5990	0.2599	0.6796	
Court Road	0.0245	0.1810	0.0398	0.0440	
Toluene					1300
Annavoy Street	0.1225	1.3000	0.4917	0.4070	
Bremen Street	0.3120	5.7980	1.1329	1.4239	
Court Road	0.1243	1.4898	0.3747	0.3781	
*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 as well.

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}					35 and 15
Annavoy Street	0.08	10.573	4.259	4.108	
MiniVol PM_{2.5}					
Annavoy Street	0.28	19.238	5.859	6.489	
Bayswater Street	0.26	15.203	6.116	5.791	
Bremen Street	0.25	29.001	6.682	9.863	
Constitution Beach	0.25	16.975	6.788	5.841	
Cottage Park Yacht Club	0.30	16.699	5.861	6.206	
Coughlin Park	0.25	21.456	9.094	6.819	
Court Road	0.26	22.806	8.143	8.075	
Harrison Avenue	0.26	24.307	7.170	7.503	
Jeffries Cove	0.25	17.895	8.102	5.853	
Logan Satellite Fire Station	0.21	17.684	6.018	6.597	
South Boston Yacht Club	0.25	21.758	10.895	6.109	
* 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 compliance with the 24-hour NAAQS and the annual NAAQS.

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 ($\mu\text{g}/\text{m}^3$)						
Annvoy	0.00	7.04	0.43	0.64	0.64	N/A
Bremen	0.00	11.03	0.48	0.66	0.69	
Court	0.00	6.73	0.51	0.81	0.82	
<i>Site Name</i>	<i>Min</i>	<i>Max</i>	<i>Median</i>	<i>Avg</i>	<i>Std Dev</i>	<i>Benchmarks</i>
24-Hour BC/Aethalometer Data ($\mu\text{g}/\text{m}^3$)						
Annvoy	0.14	2.26	0.57	0.64	0.43	5.00
Bremen	0.11	2.81	0.58	0.66	0.47	
Court	0.13	2.58	0.63	0.81	0.59	
Hourly PM_{2.5}/BAM Data ($\mu\text{g}/\text{m}^3$)						
Annvoy	-15.00	240	8	10.78	11.97	N/A
Bremen	-7.00	67	9	11.10	8.30	
Court	-3.00	135	8	10.67	9.49	
24-Hour PM_{2.5}/BAM Data ($\mu\text{g}/\text{m}^3$)						
Annvoy	1.38	48.38	9.21	11.02	7.64	35 and 15
Bremen	2.67	37.68	9.32	11.11	6.68	
Court	1.79	33.92	9.25	11.12	7.58	
* 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.						
** 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.						
***- $5 \mu\text{g}/\text{m}^3$ measurement reflects negative offset of BAM units to reflect urban background conditions.						

Summary statistics for the aethalometer indicate BC concentrations are well below the benchmark values established for this study. BAM PM_{2.5} maximum values measured at all three of the sampling locations exceed the applicable benchmark. BAM PM_{2.5} average values measured at all three of the sampling locations are below the applicable benchmark. The BAM PM_{2.5} values appear elevated as compared to the time-integrated results. Review of the data indicates these elevated values are attributable to data outliers within the data set.

5. 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 2ND 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	40	45	45	12	141
Field Blanks	0	2	2	2	8
Lab Blanks	9	10	20	0	0
Lab Duplicates	9	10	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 VOCs, three for speciated PAHs, and five for speciated carbonyls. For time-integrated PM_{2.5} sampling, two FRM field blanks were collected and nine 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 six 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 14 percent, with the exception of one sample. The duplicate analysis of the VOC sample collected at Annavoy Street on 16 December 2010 indicates benzene relative percent difference (RPD) of 14 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 $PM_{2.5}$ being made 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. UPCOMING DELIVERABLES

The next reporting period will summarize project activities for the period from March 2011 through May 2011. The monitoring report will present the monitoring results and will include a discussion of any changes made to improve the monitoring program.

APPENDIX A

Air Quality Monitoring and Meteorological Data on CD