800-RICR-10-00-3

TITLE 800 – AIRPORT CORPORATION

CHAPTER 10 – OPERATIONS

SUBCHAPTER 00 – N/A

PART 3 – Air Quality Monitoring Work Plan

3.1 Introduction

A. The Rhode Island Airport Corporation (RIAC) operates and maintains a long-term air quality monitoring program in the vicinity of T.F. Green Airport in Warwick as required by R.I. Gen. Laws § 1-7-1 *et seq*., The Permanent Air Quality Monitoring Act ("the Act"). In accordance with the Act, any amendments to the Final Work Plan may be proposed by RIAC in consultation with the Rhode Island Departments of Environmental Management ("RIDEM") and Health ("RIDOH") on or before March 30, 2009, and every March 30th thereafter. RIAC has instituted the amendments included in the Final Work Plan (2009). RIAC has developed the amendments included in this Proposed Amendments to the Air Quality Monitoring Work Plan for T.F. Green Airport in consultation with RIDEM and RIDOH. The purpose of the amendment to the previous plan is to adjust the monitoring program to address the suitability of the monitoring devices and adaptations indicated by the data collected since 2008. There have been no changes to state and/or federal regulations that warrant adjustments to the program and there are no new monitoring technologies, methodologies or criteria changes proposed in this work plan.

B. The following components of the program are addressed:

1. Monitoring Parameters;
2. Number, Type, and Location of the Monitors;
3. Monitoring Criteria;
4. Quality Assurance Procedures;
5. Agency Coordination; and
6. Funding

3.2 Monitoring Parameters

A. The air quality monitoring program meets the requirements set forth in the Act. The program shall provide for the monitoring of ~~These parameters include the following:~~

~~1.~~ Particulate Matter (PM), ~~–~~ including only ~~"fine" PM of those less than 2.5 microns in diameter ($PM_{2.5}$),~~ "ultra-fine" PM of those less than 0.1 microns in diameter ($PM_{0.1}$) and black carbon (i.e. elemental) carbon~~;~~.

~~2. Volatile Organic compounds (VOCs) – including (but not limited to) benzene and 1,3 butadiene;~~

~~3. Semi-volatile organic compounds (SVOCs) – including (but not limited to) formaldehyde and acetaldehyde; and~~

~~4. Polycyclic aromatic hydrocarbons (PAHs) – including (but not limited to) those that are bound to particulate matter.~~

B. Wind direction and wind speed and other meteorological parameters will also be acquired from the airport National Weather Service station and recorded by RIAC.

3.3 Number, Type and Location of the Monitors

A. This section provides a description of the number, type and locations of the air quality monitors selected for this program.

B. The RIAC monitoring network consists of four (4) separate monitoring sites located north, south, west, and east of the airport. The locations of the sites are shown in § 3.3(D) of this Part and are described below:

1. ~~South Site (~~Fieldview ~~Drive)~~ - Located south-southwest of the airfield approximately 450 feet from Taxiway S and 900 feet from the end of Runway 5. Adjoining land uses include single-family residential to the west and south, long-term parking for airport patrons to the north and the taxiway/runway system to the east. This site is generally upwind of the airport in the summer.

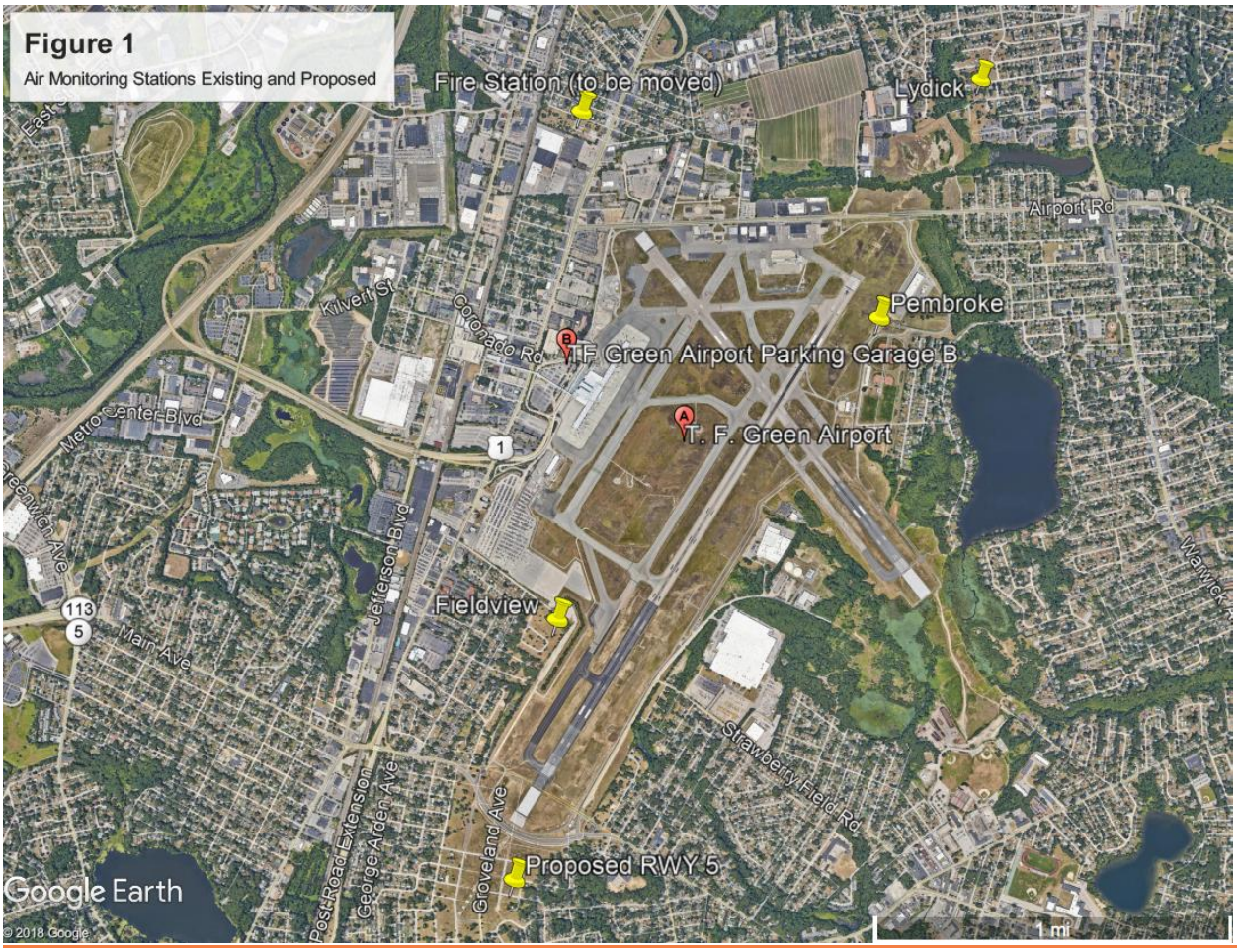
2. ~~North Site (~~Lydick Avenue~~)~~ - Located adjacent to the Spring Green neighborhood and the airport's northeastern property line, approximately 3/4 mile (3,680 feet) from the end of Runway 23. Adjoining land uses include single-family residential to the north, east and south. To the west is the runway protection zone (RPZ). ~~This site is approximately 900 meters northeast of the main runway.~~ This site is generally downwind of the airport in the summer.

3. ~~West Site (~~Fire Station No. 8~~)~~ – ~~Located west-northwest of the airport approximately 1/2 mile (2,250 feet) from the end of Runway 16. Adjoining land uses include an open field and single family residential to the north and west, commercial development to the south and the fire station and Post Road to the east.~~This site will be relocated and renamed (Smith St.). The proposed location is approximately 1,900 feet south and east of Runway 5. It will be located east of Greenlawn St on the south side of Smith St. This site is typically ~~upwind~~ downwind of the airport most of the year.

4. ~~East Site (~~Pembroke Avenue~~)~~ - Located due east of the airport approximately 1/4 mile (1,425 feet) from the intersection of Runways 5/23 and 16/34. Adjoining land uses are the airport to the west and residential or vacant land to the north, east and south. This site is mostly downwind from the airport in the fall and winter.

C. The ~~North (~~Lydick, ~~Ave.), South (~~Fieldview, and ~~Drive) and West (~~Fire Station ~~No. 8)~~ sites were originally part of the Warwick Air Monitoring Study completed in 2006 by RIDEM. The ~~East Site (~~Pembroke ~~Ave.)~~site was established in 2008 and was not included in the RIDEM study. The Pembroke ~~Avenue~~ site was moved approximately 230 yards south of the initial location in September 2014 as a result of construction activity. The site ~~will be~~was relocated ~~on~~ to the eastern edge of the property adjacent to the end of Rowe Avenue in May 2015. This was determined subsequent to public input and consultation with RIDEM and RIDOH. ~~The unit will be relocated May 2015.~~

D. Air Monitoring Stations


Figure 1
Air Monitoring Stations Existing and Proposed
Fire Station (to be moved)
Lydick
Airport Rd
Pembroke
Kilvert St
Colonado Rd
TF Green Airport Parking Garage B
T. F. Green Airport
Metro Center Blvd
1
Jefferson Blvd
Fieldview
113
5
Main Ave
Strawberry Field Rd
Post Road Extension
George Arden Ave
Groveland Ave
Proposed RWY 5
Google Earth
© 2018 Google
1 mi



E. The four sites also have the following important attributes:

1. the sites are located close to the airport but outside the FAA-restricted area;

2. the sites are accessible by public roads and have electricity and shelter;

3. when taken together, the sites serve as "up-wind" and "downwind" pairs under most meteorological conditions; and

4. the sites allow comparison to the data collected during the RIDEM study. (See § 3.10 of this Part for site photographs and wind rose diagrams.)

F. Background air monitoring ~~data (i.e., data from areas away from the airport) for $PM_{2.5}$, black carbon, VOC's, SVOC's/PAH etc.,~~ will be obtained from RIDEM stations located elsewhere in the state (i.e. Providence, E. Providence,

Pawtucket and/or Providence National Air Toxics Trends Site (NATTS)~~)~~ as necessary.

3.4 Monitoring Methods

A. The equipment and monitoring methods used to collect and analyze air samples are summarized in § 3.3(F) of this Part. The methods and equipment are considered to be the most appropriate for the parameters established in the Act, listed in § 3.1 of this Part, based on the following:

1. the suitability of the air monitoring devices, sample collection methods and/or analytical techniques for the individual compounds;

2. the expected pollutant levels and the method's detections limits; and

3. the overall reliability and cost-effectiveness of the equipment or method.

B. If the United States Environmental Protection Agency (USEPA) "Reference Methods" (USEPA, 1999) are established, they are utilized. Where such designations do not exist, the methods are broadly accepted by the USEPA, RIDEM as appropriate for the application.

~~C. Two other terms applicable to the discussion of the monitoring methods are:~~

~~1. "real- time"; and~~

~~2. "time-integrated."~~

C~~D~~. Real-time measurements are based on samples taken over short time periods (from several minutes to an hour), in this case a minimum of one minute increments, and the results are representative of the instantaneous or "at-the-moment" conditions. ~~By comparison, time-integrated samples are collected over 24-hour intervals before they are sent for laboratory analyses and representative of the cumulative amount of contaminates collected over the entire sampling period.~~

~~E. As shown, fine PM will be analyzed following the USEPA Reference Method for $PM_{2.5}$. This method involves the collection of air samples over a 24-hour period with the high volume sampler equipped with a size-segregating cyclone and pre-weighed filters. The exposed filters are analyzed gravimetrically in a laboratory and the increase in weight, combined with the amount of air sampled, is a function of the $PM_{2.5}$ particles present. This method allows direct comparison to the NAAQS for $PM_{2.5}$.~~

D~~F~~. Air Quality Monitoring Equipment and Methods

Parameters and Target Compounds[1]	Sampling and Analysis Equipment/Methods[2]	Summary Description
Particulate Matter		
Fine PM ($PM_{2.5}$) < 2.5 microns	EPA Reference Method for $PM_{2.5}$	Time-integrated (24-hr) sample collected on filters and based on sample weight
Ultra-fine PM ($PM_{0.1}$) < 0.1 microns	Water-based Condensation Particle Counter[3]	Real-time measurements based on light (infrared) scattering characteristics of airborne PM
Black Carbon	Aethalometer monitors	Real-time measurements based on the light absorbing characteristics of soot
Volatile Organic Compounds (VOCs)[4]		
Benzene[4]	EPA Method TO-15	Time-integrated (24-hr) sample collected in canisters and based on laboratory GC/MS analysis
1,3 butadiene[4]	EPA Method TO-15	(same as above)
Semi-Volatile Organic Compounds (SVOCs)[4]		
Napthalene[4]	EPA Method TO-13 (with XAD-2 resin)	(same as above)
Carbonyls[3]		
Aetaldehyde[4]	EPA Method TO-11A	Time-integrated (24-hr) sample collected on adsorbent cartridges

		and based on laboratory HPLC analysis
Formaledhyde[4]	EPA Method TO-11A	(same as above)
Other		
Polycyclic Aromatic Hydrocarbons (PAH) bound to particulate matter[3]	Monitors for particle-bound PAH's	Real-time measurements based on photoionizations of particle-bound PAH
Wind Direction and Speed	Wind vane and anemometer instrumentation	Direction and speed from National Weather Service at the airport

[1]Parameters taken from R.I. Gen. Laws § 1-7-1 (The Permanent Air Quality Monitoring Act

[2]Methods cited include the following:

- Federal Register Notice (04/22/99): "Revisions to Reference Method for the Determination of Fine Particulate Matter as PM2.5 in the Atmosphere" (Direct Final Rule)

- EPA Method TO-11A, Determination of Formaldehyde in Ambient Air Using Adsorbent Cartridge Followed by High Performance Liquid Chromatography (HPLC) [Active Sampling Methodology]

- EPA Method TO-13A, Determination of Polycyclic Aromatic Hydrocarbons in Ambient Air Using GC/MS

- EPA Method TO-15, Determination of VOCs in Air Collected in Specially-Prepared Canisters and Analyzed by GC/MS

[3]Because of the limited applications of this instrumentation, the use of water-based condensation particle counters will remain under evaluation by RIDEM.

[4]Includes the assessment of all the compounds in the classification, not just the ones identified as "target compounds". For example, EPA Method TO-15 includes additional VOCs other than benzene and 1,3 butadiene.

EG. Ultra-fine PM ($PM_{0.1}$) will continue to be measured using the water-based condensation particle counter. This instrumentation is the best available equipment for real-time measurements of particulate matter.

FH. Black carbon will continue to be measured using the aethalometers which collect PM in real time on a quartz filter tape and use infrared light to determine the amount of optically-absorbing material in a unit volume of sampled air. Since elemental (or black) carbon is the dominant optically-absorbing material in the sample, this measurement is interpreted as mass of black carbon according to the comparisons with other chemical analysis techniques. Presently, there is no designated EPA Reference Method for this pollutant (either real-time or time integrated), but aethalometers are commonly used to measure black carbon.

~~I. The VOC samplers consist of evacuated stainless steel canisters that have interior surfaces that are polished, cleaned and conditioned using the Summa process. Outside air is drawn into the canister over a 24-hour period through a stainless steel sampling line and a PM filter with the flow rate controlled by a calibrated volumetric flow meter. The collected sample is then transferred to a laboratory for analysis using a chromatograph/mass spectrometer (GC/MS). This time-integrated method is consistent with USEPA Method TO-15 (Determination of VOCs in Air Collected in Specially-Prepared Canisters and Analyzed by GC/MS).~~

~~J. SVOC's will continue to be collected using high-volume air samplers that are equipped with a filter and sorbent cartridge containing a pre-treated polyurethane foam (PUF) plug and XAD resin. Outside air is drawn into the device over a 24-hour period by a calibrated blower fan, bringing the air sample through the filter and then through the sorbent plug and resin. The collected samples are transferred to a laboratory for analysis using GC/MS. This time-integrated method is consistent with USEPA Method TO-13A (Determination of Polycyclic Aromatic Hydrocarbons {PAHs) in Ambient Air Using Gas Chromatography/Mass Spectrometry).~~

~~K. Carbonyls will continue to be collected using a method comprised of a prepackaged cartridge containing acidified 2,4-dinitrophenylhydrazine (DNPH). A sample pump draws the outside air through the cartridge using a stainless steel sampling line having the same rate controlled by a calibrated pump. The flow rate is established to sample a known volume of air for an appropriate integration period. The collected sample is then transferred to a laboratory for analysis using High Performance Liquid Chromatography (HPLC). This method is consistent with USEPA Method T0-11A (Determination of Formaldehyde in Ambient Air Using Adsorbent Cartridge Followed by HPLC).~~

~~L. Particulate bound PAHs will continue to be measured using real-time monitors that work on the principle of photo-ionization. In these instruments, ultraviolet radiation ionizes the air sample and particles containing PAH's cause changes in the electric field. This change is compared to pre-calibrated mixtures of PAH's~~

~~and is used to compute the amount of contaminate present. Presently, there is no designated USEPA Reference Method for this pollutant (either real-time or time-integrated) but this method has previously been accepted by RIDEM.~~

G~~M~~. Wind direction, wind speed, temperature, relative humidity and precipitation data will be collected at the meteorological station located at the airport and operated by the National Weather Service.

H~~N~~. Because the black carbon (aethalometers) monitors and ~~particulate-bound PAHs~~ Ultra-fine particulate instruments are fully automated, these "real-time" measurements will be taken and recorded continuously 24-hours daily, 7 days a week. ~~The PM0.1 (water based particle counters [CPCs]) will be operated continuously 24-hours daily during the third week of every month. The CPCs will only operate one week per month. A thorough analysis of air traffic frequency demonstrates that air traffic is generally consistent throughout the month. The third week of the month was selected as it includes the Thanksgiving holiday and typically showed a slightly higher level of air traffic activity. In addition, the original CPC samplers were TSI Model 3781s. The "time-integrated" sampling of the $PM_{2.5}$ and the SVOC's will follow the conventional rotation plan used by the USEPA and RIDEM. The "rotation plan" involves taking samples once every 6 days so that each day of the week is sampled several times annually. VOC's and carbonyls are also measured with time-integrated samplers and the monitoring schedule will follow the same rotation plan. Samples for VOC and carbonyls will be taken monthly (Refer to § 3.11 of this Part for specifics).~~

3.5 Monitoring Criteria

A. For the purpose of this Work Plan the term "monitoring criteria" means the standards or "benchmarks" against which the monitoring data can be compared. ~~For $PM_{2.5}$, the NAAQS are considered the most appropriate criteria. The values are 35 and 15 micrograms/cubic meter (µg/m3), respectively, for the 24-hour and annual average concentrations. Unfortunately, there are no NAAQS for any of the other parameters included in the monitoring program including PM0.1 and black carbon.~~ There are no NAAQS for Ultra-fine particulates and black carbon.

~~B. For VOCs (i.e. benzene and 1,3 butadiene), SVOCs (i.e. naphthalene) and carbonyls (i.e. acetaldehyde and formaldehyde), the data can be compared to acute (i.e. short-term) and chronic (long-term) health benchmarks (both cancer and non-cancer) established by the USEPA. However, it must be noted that these Reference Concentrations (RfC) and risk values assume population exposure durations and other confounding factors that are not replicated in this Work Plan and render them highly limited for this application. It is expected that these comparisons will be made by RIDEM.~~

3.6 Quality Assurance Criteria

A. As discussed previously in § 3.4 of this Part (Monitoring Methods), sampling and measurements will be accomplished using methods and equipment that are specifically designed for each type of pollutant, the expected range of ambient concentrations and the applicable time periods. ~~These methods are designated as either "Reference" methods, where applicable or accepted by the USEPA as appropriate for the application.~~

~~B. The processing of the data is subdivided into two areas:~~

~~1. the collection of continuous ("real-time") measurements; and~~

~~2. the field collection and laboratory analysis of the time- integrated samples.~~

~~C~~B. The real-time measurements comprise the $PM_{0.1}$ (water-based particle counters)~~,~~ and black carbon (aethalometers). ~~and particle-bound PAH monitors and the time-integrated sampling involves PM2.5, VOCs, SVOCs and carbonyls.~~

~~D~~C. Quality assurance will be achieved in the field by ~~trained and qualified technicians that will visit~~visiting each monitoring station on an average of once a ~~week~~month to check on the operation of the continuous instruments, and the shelters in which they are housed ~~and to set up or collect the time-integrated samplers. Other tasks will include zero, span, and precision calibration checks on the continuous instruments as well as beginning and ending flow rate and time clock checks on the 24-hour samplers~~. Site visits will be documented. ~~on web-based site forms with each set of collected data receiving a unique identifier and all the sample handling will be controlled following strict "chain of custody" procedures.~~

~~E~~D. Other conditions related to Quality Assurance Procedures include the statistical methods for ~~the~~ determining the precision and accuracy of the collected data~~, the performance of field audit checks, and appropriate laboratory documentation are provided in~~. RIAC intends to work with RIDOH and RIDEM to revise and refine the Quality Assurance Project Plan (QAPP) developed specifically for this monitoring program.

3.7 Agency Coordination

In accordance with the Act, RIDEM and RIDOH have reviewed and commented on this Amendment to the Air Quality Monitoring Work Plan for T. F. Green Airport. As part of this consultation process, it is expected that these agencies will continually provide RIAC with peer consultation review, scientific knowledge and specialized expertise as necessary and relevant to this air quality monitoring program. It is also RIAC's intent to coordinate with RIDEM/RIDOH on a regular (but unscheduled) basis in furtherance of the air monitoring program and whenever the need arises.

3.8 Funding Sources

The Act also calls for an evaluation of funding sources, such as federal grants, that may be available to RIAC to cover some, or all, of the costs of the air quality monitoring program. RIAC has searched for funding sources and will continue to do so in the hopes that sources may become available.

3.9 Air Monitoring Station Summary

Site Location	North	South	West	East
Site Name	Lydick Ave.	Fieldview Dr.	Fire Station	Pembroke Ave.
Land-use(s) On-site Adjoining	Vacant Residential north, east, and south. Runway protection zone west.	Vacant Residential east and south. Airport long-term parking north. Runway/taxiway east.	Fire Station Residential north and west. Commercial south. Fire Station and Post Road east.	Vacant Residential north, east and west. Airport west.
Location	Adjacent to the Spring Green neighborhood and the airport's northeastern property line, approximately ¾ mile (3,680 ft.) from the end of Runway 23.	South-southwest of the T.F. Green airfield approximately 450 feet from Taxiway S and 900 feet from the end of Runway 5.	West-southwest of the airport approximately ½ mile (2,250 ft.) from the end of Runway 16.	Due east of the airport approximately ¼ of a mile from the intersection of Runways 5/23 and 16/34
Monitoring Parameters	- $PM_{2.5}$ - $PM_{0.1}$ - Black carbon	- $PM_{2.5}$ - $PM_{0.1}$ - Black carbon	- $PM_{2.5}$ - $PM_{0.1}$ - Black carbon	- $PM_{2.5}$ - $PM_{0.1}$ - Black carbon

	- VOCs - SVOCs - Carbonyls - PAHs on PM	- VOCs - SVOCs - Carbonyls - PAHs on PM	- VOCs - SVOCs - Carbonyls - PAHs on PM	- VOCs - SVOCs - Carbonyls - PAHs on PM

This table contains the list of monitoring stations to be operated by RIAC.

Background air monitoring data will be obtained from monitoring stations operated by RIDEM elsewhere in the state. These data will be supplemented by measurements of SVOC's, PM0.1 and particle bound PAH's by RIAC at one of these RIDEM monitoring stations.

Carbonyls – including (but not limited to) formaldehyde and acetaldehyde

PAHs – polycyclic aromatic hydrocarbons including (but not limited to) PM bound to semi-volatile organic compounds

PM – particular matter, 2.5 microns and 0.1 microns in diameter

SVOCs – semi-volatile organic compounds including (but not limited to) Napthalene

VOCs – volatile organic compounds including (but not limited to) benzene and 1,3 butadiene

3.10 Site Photos

A. Pictures of the Lydick site in the four cardinal directions

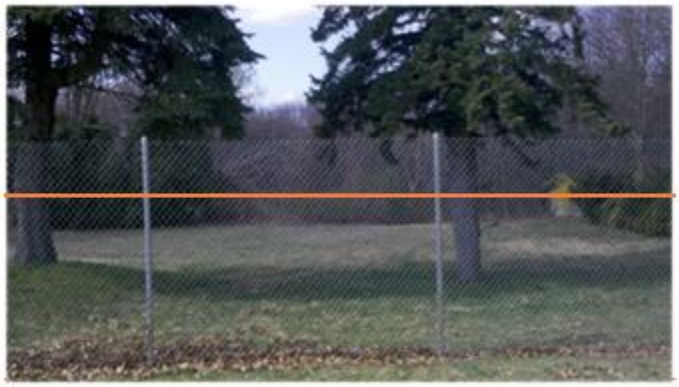
1. Facing North



2. Facing East



3. Facing West



4. Facing South



B. Pictures of the Pembroke site in the four cardinal directions

1. Facing North



2. Facing East



3. Facing West



4. Facing South



C. Picture of the Field View site in the four cardinal directions

1. Facing North



2. Facing East



3. Facing West



4. Facing South



D. Pictures of the Fire Station site in the four cardinal directions

1. Facing North



2. Facing East



3. Facing West



4. Facing South



~~3.11 2015 Sampling Schedule~~

AMERICAN ECOTECH

Rhode Island Airport Corporation

2015

January

Su	Mo	Tu	We	Th	Fr	Sa	Duplicates, Blanks
				1	2	3	
4	5	6	7	8	9	10	
11	12	13	14	15	16	17	
18	19	20	21	22	23	24	FV, PB to DOH
25	26	27	28	29	30	31	

February

Su	Mo	Tu	We	Th	Fr	Sa	Duplicates, Blanks
1	2	3	4	5	6	7	
8	9	10	11	12	13	14	
15	16	17	18	19	20	21	
22	23	24	25	26	27	28	Pembroke

March

Su	Mo	Tu	We	Th	Fr	Sa	Duplicates, Blanks
1	2	3	4	5	6	7	
8	9	10	11	12	13	14	
15	16	17	18	19	20	21	
22	23	24	25	26	27	28	Fire Station
29	30	31					

April

Su	Mo	Tu	We	Th	Fr	Sa	Duplicates, Blanks
			1	2	3	4	
5	6	7	8	9	10	11	
12	13	14	15	16	17	18	
19	20	21	22	23	24	25	LY, FS to DOH
26	27	28	29	30			

May

Su	Mo	Tu	We	Th	Fr	Sa	Duplicates, Blanks
					1	2	
3	4	5	6	7	8	9	
10	11	12	13	14	15	16	
17	18	19	20	21	22	23	
24	25	26	27	28	29	30	Fieldview
31							

June

Su	Mo	Tu	We	Th	Fr	Sa	Duplicates, Blanks
	1	2	3	4	5	6	
7	8	9	10	11	12	13	
14	15	16	17	18	19	20	
21	22	23	24	25	26	27	Pembroke
28	29	30					

2015

July

Su	Mo	Tu	We	Th	Fr	Sa	Duplicates, Blanks
			1	2	3	4	
5	6	7	8	9	10	11	
12	13	14	15	16	17	18	
19	20	21	22	23	24	25	FS, LY to DOH
26	27	28	29	30	31		

August

Su	Mo	Tu	We	Th	Fr	Sa	Duplicates, Blanks
						1	
2	3	4	5	6	7	8	
9	10	11	12	13	14	15	
16	17	18	19	20	21	22	Lydick
23	24	25	26	27	28	29	
30	31						

September

Su	Mo	Tu	We	Th	Fr	Sa	Duplicates, Blanks
		1	2	3	4	5	
6	7	8	9	10	11	12	
13	14	15	16	17	18	19	
20	21	22	23	24	25	26	Fieldview
27	28	29	30				

October

Su	Mo	Tu	We	Th	Fr	Sa	Duplicates, Blanks
				1	2	3	
4	5	6	7	8	9	10	
11	12	13	14	15	16	17	
18	19	20	21	22	23	24	PB, FV to DOH
25	26	27	28	29	30	31	

November

Su	Mo	Tu	We	Th	Fr	Sa	Duplicates, Blanks
1	2	3	4	5	6	7	
8	9	10	11	12	13	14	
15	16	17	18	19	20	21	Fire Station
22	23	24	25	26	27	28	
29	30						

December

Su	Mo	Tu	We	Th	Fr	Sa	Duplicates, Blanks
		1	2	3	4	5	
6	7	8	9	10	11	12	
13	14	15	16	17	18	19	
20	21	22	23	24	25	26	Lydick
27	28	29	30	31			