

Rhode Island Airport Corporation

Third Quarter 2018

Outfall Sampling

T.F. Green Airport

Prepared by:
Rhode Island Airport Corporation

October 2018

Background

The RIPDES permit identifies a total of 16 perimeter outfalls at PVD. Outfalls 001A, 002A, 003A, 004A and 013A discharge to tributaries of Warwick Pond. Outfalls, 006A, 006B, 006C, 006D, 007A, 007B, 008A and 009A discharge to tributaries of Buckeye Brook downstream of Warwick Pond. Outfalls 010A, 011A, and 012A discharge to Tuscatucket Brook. Major outfalls, 002A, 003A, 008A, and 010A, are those outfalls which receive or may receive drainage from areas where aircraft deicing fluid is applied. Sampling for these major outfalls is defined at Part I.A.1 of the permit. Minor outfalls drain taxiways, runways and other paved services. Outfall 005A was combined with Outfall 006A during construction of Runway 34 Safety Area Improvements. Sampling for these minor outfalls is defined at Part I.A.2. of the permit. Additional sampling requirements are defined at Part I.A.5. and Parts I.C. and I.D. Table 1 lists parameters sampled. Figure 1 identifies outfall and in-stream sampling locations.

Industrial activities at PVD with the potential to impact stormwater quality include the use of glycol-based Aircraft Deicing and Anti-icing Fluids (ADFs/AAFs) and pavement deicers. Only propylene glycol (PG)-based ADFs/AAFs are used at PVD. Pavement deicers used at PVD include solid sodium formate, and liquid potassium acetate. No deicing chemicals were applied during this event.

Summary of Storm

Third Quarter (July 1 through September 30) sampling consists of the major outfalls (002A, 003A, 008A and 010A) hourly for twelve hours. The sampling began upon a precipitation event of sufficient magnitude as specified in the RIPDES permit.

Light rain began falling around 10:00 AM on September 10, 2018. Sampling commenced at 5:00 PM subsequent to measurable accumulation and continued until approximately 4:00 AM on September 11, 2018.

A total of 1.03 inches of precipitation (as water equivalent) was measured at PVD during this event. Precipitation data is summarized in Table 1.

Summary of Flow

Flow meters are installed at three of the major outfalls: OF-002A, OF-003A, and OF-008A. Continuous flow measurements during the 12 hours of sampling were made using these Isco 2150 area velocity meters programmed to measure level and velocity and produce flow rate (GPM) at 15 minute increments. No flow meter is installed at outfall 010A, as it is off airport property.

Estimated runoff volumes calculated using drainage area and depth of precipitation for all outfalls are presented in Table 2. A summary of measured flows for outfalls OF-002A, OF-003A, and OF-008A are presented in Table 4.

Sample Collection

The laboratory analytical parameters for each sample for this event are listed in Table 4. For the Third Quarter sampling event the major outfalls (002A, 003A, 008A, and 010A) were sampled hourly for twelve hours. Flow was observed at Outfall 010A only during hours 5, 11, and 12.

Samples were collected and decanted into sample bottles based on the analysis necessary. The bottles were then placed in ice in a cooler for transport to RIAL. Because of the short sample holding time (six hours) for some of the analytical parameters, all samples collected in the first three hours were delivered to the laboratory immediately. Samples collected in hours four through 12 were delivered at the completion of sampling.

RIAC also collected and recorded field measurements at each outfall for temperature, pH, specific conductance, and dissolved oxygen (DO).

Sampling Results

Laboratory Analysis and field measurements for the major outfall sampling results are presented in Table 4. Table 5 presents a summary of pH measurements. In accordance with the RIPDES permit, measurements and analytical results are expressed as monthly average and maximum daily concentrations for most parameters. Temperature and Oil and Grease are expressed as maximum daily; pH is expressed as minimum daily and maximum daily.

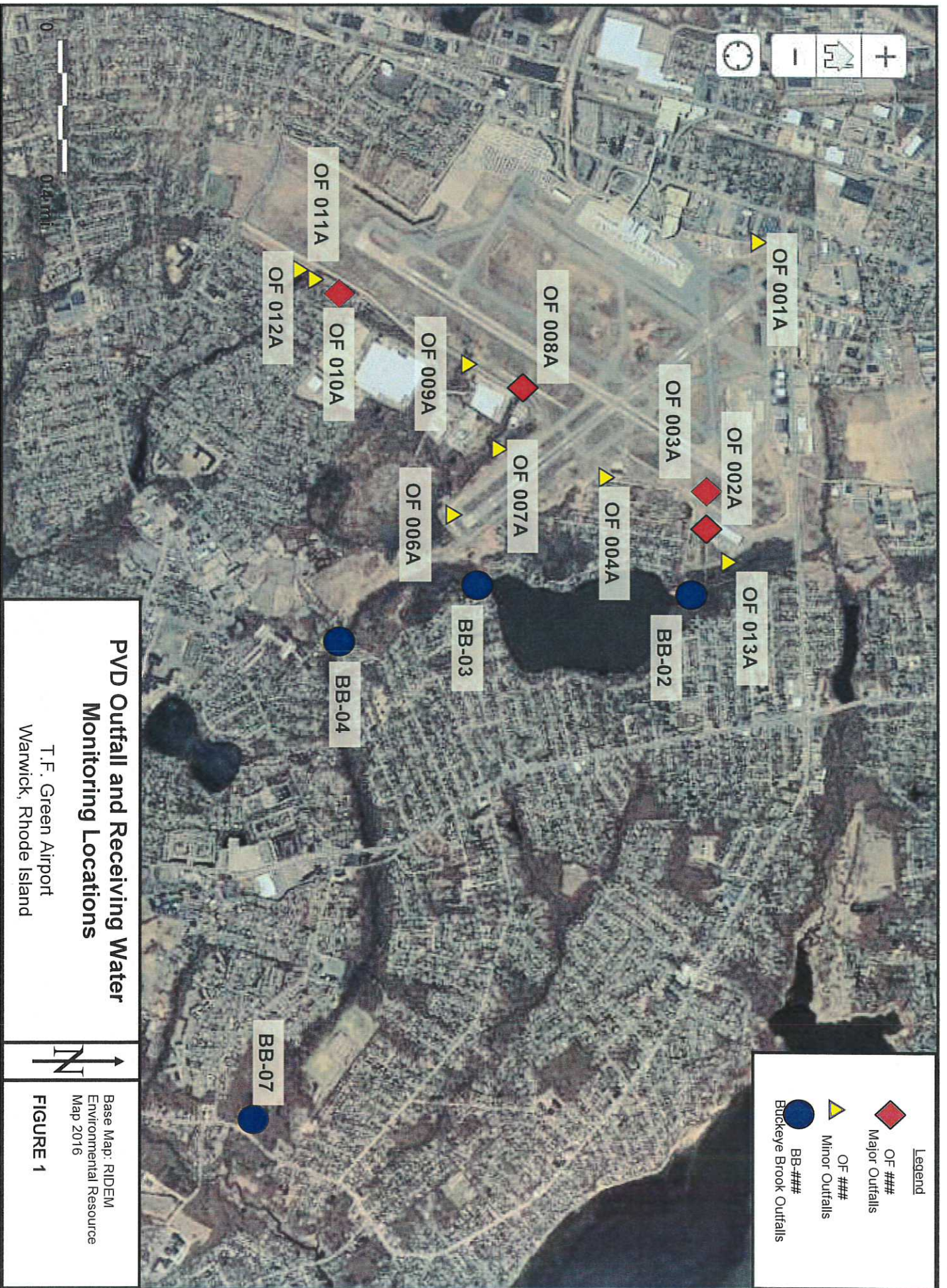


TABLE 1
PRECIPITATION AMOUNTS
T.F. GREEN AIRPORT
WARWICK, RHODE ISLAND
THIRD QUARTER 2018
September 10-11, 2018

Date	Total Precipitation (water equivalent,in inches)
September 7, 2018	0.12
September 8, 2018	0.00
September 9, 2018	0.00
September 10, 2018	0.77
September 11, 2018	0.30

Sampling commenced 5:00 PM 9/10/18

Sampling completed 4:00 AM 9/11/18

**TABLE 2
PVD RUNOFF VOLUME CALCULATION
T.F. GREEN AIRPORT
WARWICK, RHODE ISLAND
THIRD QUARTER 2018**

September 10, 2018

Precip (inches): 1.07

Drainage Basin ID	PVD Storm Water Discharge	Receiving Water	Drainage Area (ac)	cu ft precip	gal precip
1	Outfall 001A	Warwick Pond	5.9	22,916.2	171,413
2	Outfall 002A	Warwick Pond	93.4	362,774.9	2,713,557
3	Outfall 003A	Warwick Pond	119.8	465,315.2	3,480,558
4	Outfall 004A	Warwick Pond	30.1	116,911.4	874,497
4B	Outfall 004B	Buckeye Brook	2	7,768.2	58,106
4C	Outfall 004C	Buckeye Brook	3	11,652.3	87,159
6	Outfall 006A	Buckeye Brook	10.7	41,559.9	310,868
6B	Outfall 006B	Buckeye Brook	1.5	5,826.2	43,580
6C	Outfall 006C	Buckeye Brook	0.8	3,107.3	23,242
6D	Outfall 006D	Buckeye Brook	0.7	2,718.9	20,337
7	Outfall 007A	Buckeye Brook	9.6	37,287.4	278,909
7B	Outfall 007B	Buckeye Brook	1.2	4,660.9	34,864
8	Outfall 008A	Buckeye Brook	240.6	934,514.5	6,990,168
9	Outfall 009A	Buckeye Brook	38.4	149,149.4	1,115,638
10	Outfall 010A	I uscatucket Brook	26	100,986.6	755,380
11	Outfall 011A	I uscatucket Brook	14	54,377.4	406,743
12	Outfall 012A	I uscatucket Brook	46.4	180,222.2	1,348,062
13	Outfall 013A	Warwick Pond	28	108,754.8	813,486
TOTAL AREA			672.1	2,610,503.6	19,526,567

TABLE 1
 LABORATORY ANALYTICAL PARAMETERS
 T.F. GREEN AIRPORT
 WARWICK, RHODE ISLAND
 THIRD QUARTER 2018

Sample Identification	Hours 1-3	Hours 4-12
OF-002A, OF-003A, OF-008A, OF-010A	<ul style="list-style-type: none"> • Fecal coliform • BOD, Surfactants, Dissolved Oxygen • pH and Temperature • COD, TOC • Oil & grease - 1664, TSS • Propylene glycol • Dissolved Potassium and Sodium • Total Metals (aluminum, chromium, copper, iron, lead, and zinc) 	<ul style="list-style-type: none"> • BOD, Surfactants, Dissolved Oxygen • pH and Temperature • COD, TOC • Propylene glycol • Dissolved Potassium and Sodium • Total Metals (aluminum, chromium, copper, iron, lead, and zinc)

BOD - Biological oxygen demand
 COD - Chemical oxygen demand
 TOC - Total organic carbon
 TSS - Total suspended solids

**TABLE 4
ANALYTICAL RESULTS
MAJOR OUTFALLS
T.F. GREEN AIRPORT
WARWICK, RHODE ISLAND
THIRD QUARTER 2018**

Parameter	Major Outfalls							
	Outfall 002A		Outfall 003A		Outfall 008A		Outfall 010A ⁹	
	Average Monthly	Maximum Daily	Average Monthly	Maximum Daily	Average Monthly	Maximum Daily	Average Monthly	Maximum Daily
Flow (gpd) ^{1,8}	681,012	1,384,665	972,159	2,262,359	4,044,409	6,695,161	755,380	755,380
Temperature (°F)		67		67		67		68
Oil & Grease (mg/l) ⁵		0.6		0.5		1.7		NS
TSS (mg/l) ^{4,5}	22.3	25	7	17	7.4	12	NS	NS
Fecal Coliform (MPN/100ml) ^{7,5}	147.6	540	404	540	926	1,600	NS	NS
BOD ₅ (mg/l) ^{2,6}	0.6	9.2	0.2	5.4	0.7	4.4	1.6	4.7
Propylene Glycol (mg/l) ^{2,6}	ND	ND	ND	ND	ND	ND	ND	ND
COD (mg/l) ^{2,6}	ND	ND	0.8	12	0.4	11	4.7	14
Dissolved Potassium (mg/l) ^{2,6}	0.24	3.30	1.32	3.40	1.22	6.00	2.27	4.00
Dissolved Sodium (mg/l) ^{2,6}	0.46	5.70	0.19	10.00	7.62	49.00	1.10	3.30
Surfactants (ug/l) ^{2,6}	30	190	30	250	30	230	ND	ND
Dissolved Oxygen (mg/l) ^{2,3}	6.64	8.13	6.87	8.04	6.66	8.09	6.95	7.74
TOC (mg/l) ^{2,6}	2.1	4.4	2.7	5.9	2.0	5.6	3.4	5.4
Total Aluminum (ug/l) ^{2,6}	17.2	64	12.4	80	85.3	162	18	54
Total Chromium (ug/l) ^{2,6}	ND	ND	ND	ND	0.8	3.4	0.7	2
Total Copper (ug/l) ^{2,6}	ND	ND	ND	ND	ND	ND	ND	ND
Total Iron (ug/l) ^{2,6}	4302	9820	443	3660	1225	3470	154	210
Total Lead (ug/l) ^{2,6}	ND	ND	ND	ND	ND	ND	ND	ND
Total Zinc (ug/l) ^{2,6}	ND	ND	ND	ND	ND	ND	ND	ND

¹ Results reported as average monthly were determined using the arithmetic average of measurement made every 15 minutes during the 12 hours of sampling. Results reported as maximum daily was the maximum flow measurements over the 12 hours of sampling. Both reported values were converted from GPM to GPD reflecting a 24 hour day

² Results reported as maximum daily were the maximum of the 12 samples collected during the 12 hours of sampling.

³ Results reported as average monthly were determined using the arithmetic average of the 12 samples collected during the 12 hours of sampling.

⁴ Results reported as average monthly were determined using the arithmetic average of the 3 samples collected (when available) during the first 3 hours of sampling.

⁵ Results reported as maximum daily were the maximum of the 3 samples collected (when available) during the first 3 hours of sampling

⁶ Results reported as average monthly were determined by using a flow-weighted average of the 12 samples collected during the 12 hours of sampling.

⁷ Results reported as average monthly were determined by using a geometric mean of the 3 samples collected (when available) during the 3 hours of sampling

⁸ Outfall 010A: Results reported as average monthly were determined using the arithmetic average of rainfall amount during the entire storm for the outfall drainage area. Results reported as maximum daily was determined from maximum rainfall measurement for the duration of the storm for each outfall drainage area.

⁹ Outfall 010A: Results reported are from samples collected during hours 5, 11, and 12.

BOD₅ - Biological oxygen demand 5-day test

COD - Chemical oxygen demand

gpd - Gallons per day

mg/l - Milligrams per liter

TOC - Total organic carbon

TSS - Total suspended solids

ug/l - Micrograms per liter

TABLE 4
 FIELD ANALYTICAL RESULTS
 MAJOR OUTFALLS
 T.F. GREEN AIRPORT
 WARWICK, RHODE ISLAND
 THIRD QUARTER 2018

Parameter	Major Outfalls							
	Outfall 002A		Outfall 003A		Outfall 008A		Outfall 010A ³	
	Minimum Daily ¹	Maximum Daily ²	Minimum Daily ¹	Maximum Daily ²	Minimum Daily ¹	Maximum Daily ²	Minimum Daily ¹	Maximum Daily ²
pH	6.30	6.70	6.40	6.80	6.50	6.80	6.30	6.40

Bold text indicates exceedance of permit standards

- ¹ Results reported as minimum daily were the minimum of the samples collected during the 12 hours of sampling.
- ² Results reported as maximum daily were the maximum of the samples collected during the 12 hours of sampling.
- ³ Outfall 010A: Results reported are from samples collected during hours 5, 11, and 12.