



**Rhode Island**  
Airport Corporation

**Third Quarter 2022**

**Outfall Sampling**

**Rhode Island T.F. Green International Airport**

Prepared by:  
Rhode Island Airport Corporation

October 2022

## **Background**

The Rhode Island Pollutant Discharge Elimination System (RIPDES) permit number RI0021598 issued to Rhode Island TF Green International Airport (PVD) identifies a total of 16 perimeter outfalls. 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. The permit requires quarterly sampling. Table 1 lists parameters sampled for this quarter. 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 aircraft or pavement deicing materials were applied during this quarter.

## **Summary of Storm**

Third Quarter (July 1 through September 30) consists of sampling the major outfalls (002A, 003A, 008A and 010A) hourly for twelve hours.

Light rain began falling just before 10:00 AM on August 22, 2022. Sampling commenced at 12:00 PM (noon) and continued until approximately 11:15 PM August 22, 2022.

A total of 0.23 inches of precipitation (as water equivalent) was measured at PVD during this event with a total of 0.33 inches for the day. Precipitation data measured at PVD and provided by the National Oceanic and Atmospheric Administration's National Climatological Data Center is summarized in Table 2.

## **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 meters are installed at minor outfalls or at outfall 010A, as it is off airport property.

Maximum daily and average monthly flows for the major outfalls were calculated and are presented in Table 3. Estimated runoff volumes calculated using drainage area and depth of precipitation for all outfalls are presented in Table 5.

### **Sample Collection**

The laboratory analytical parameters for each sample for the Third Quarter are listed in Table 2. The major outfalls (002A, 003A, 008A, and 010A) were sampled hourly for twelve hours.

Samples were collected and decanted into sample bottles based on the analysis necessary. The bottles were then placed on ice in a cooler for transport to Rhode Island Analytical Laboratories (RIAL) for analysis. 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 after the third hour. Samples collected in hours four through twelve 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**

Tables 3 and 4 present a summary of analytical results and field measurements expressed as monthly average and maximum daily concentrations for the major outfalls. Table values presented as zero reflect data that was non-detect. Temperature and Oil and Grease are expressed as maximum daily only. pH is expressed as minimum daily and maximum daily.

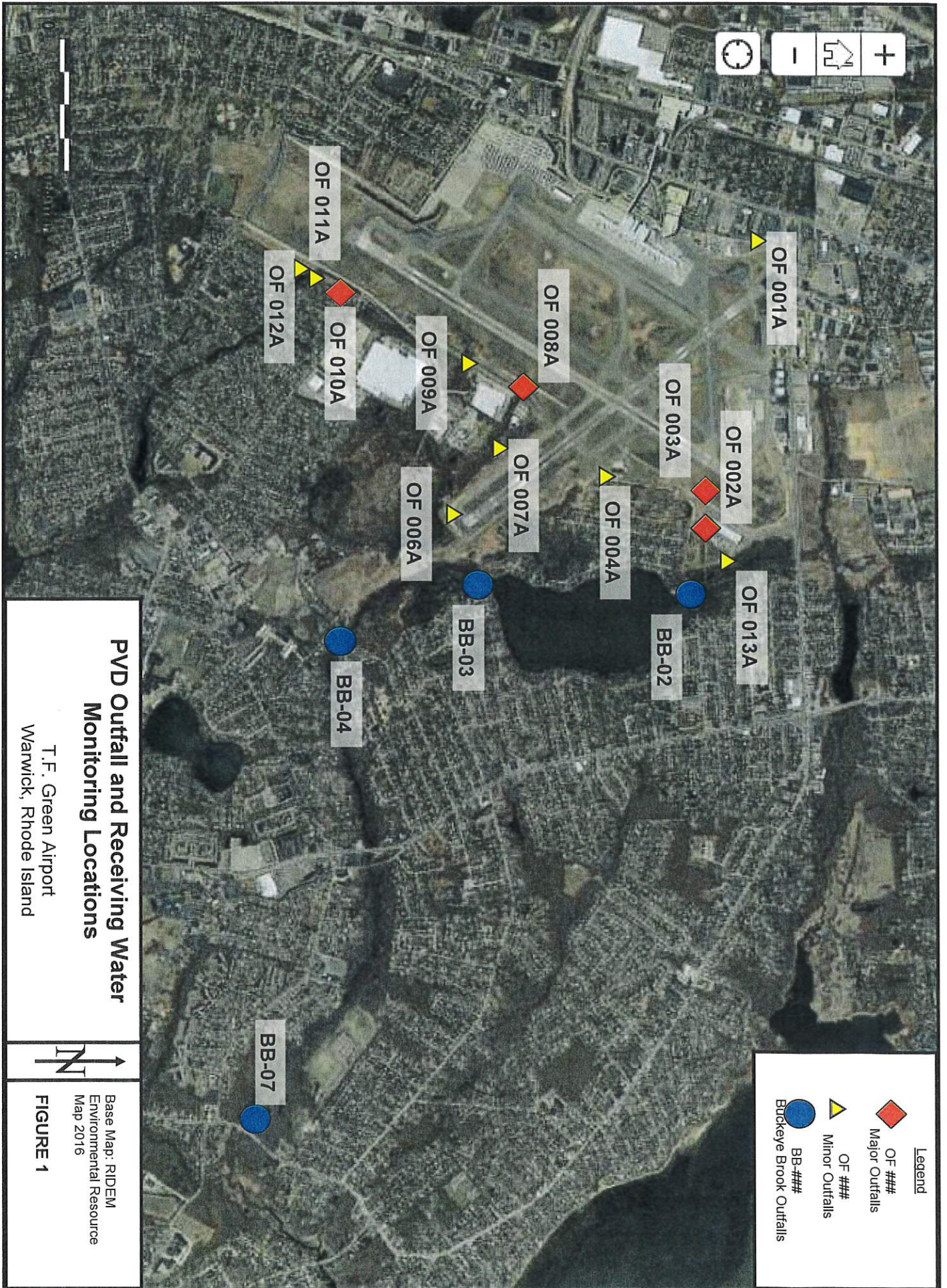


TABLE 1  
 LABORATORY ANALYTICAL PARAMETERS  
 RI T.F. GREEN INTERNATIONAL AIRPORT  
 WARWICK, RHODE ISLAND  
 THIRD QUARTER 2022

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

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

**TABLE 2**  
**PRECIPITATION AMOUNTS**  
**RI T.F. GREEN INTERNATIONAL AIRPORT**  
**WARWICK, RHODE ISLAND**  
**THIRD QUARTER 2022**  
**August 19 - 22, 2022**

<b>Date</b>	<b>Total Precipitation (water equivalent, in inches)</b>
August 19, 2022	0.00
August 20, 2022	0.00
August 21, 2022	0.00
August 22, 2022	0.33

[National Climatic Data Center \(NCDC\)](https://www.ncdc.noaa.gov/cdo-web/datatools/)

<https://www.ncdc.noaa.gov/cdo-web/datatools/>

TABLE 3  
ANALYTICAL RESULTS  
MAJOR OUTFALLS  
R. T. F. GREEN INTERNATIONAL AIRPORT  
WARWICK, RHODE ISLAND  
THIRD QUARTER 2022

Parameter	Major Outfalls							
	Outfall 002A		Outfall 003A		Outfall 008A		Outfall 010A	
	Average Monthly	Maximum Daily	Average Monthly	Maximum Daily	Average Monthly	Maximum Daily	Average Monthly	Maximum Daily
Flow (gpd) <sup>1,8</sup>	1,775,224	8,521,075	2,277,000	10,929,601	4,573,007	21,950,435	7,793,825	7,793,825
Oil & Grease (mg/l) <sup>5</sup>		8.4		1.8		2.1		4.3
TSS (mg/l) <sup>4,5</sup>	59.0	100	18.2	42.0	17.0	21.0	4.7	6
Fecal Coliform (MPN/100ml) <sup>7,5</sup>	166.0	3,500	184	9,200	70,692.0	24,000,000	181.0	540
BOD <sub>5</sub> (mg/l) <sup>2,5</sup>	1.8	5.3	4.9	7.1	5.6	10	1.1	5.9
Propylene Glycol (mg/l) <sup>2,6</sup>	ND	ND	ND	ND	ND	ND	ND	ND
COD (mg/l) <sup>2,6</sup>	1.9	21	26.4	50	4.7	34	3.7	20
Dissolved Potassium (mg/l) <sup>2,6</sup>	3.70	5.20	4.20	5.90	4.10	7.10	11.10	32.00
Dissolved Sodium (mg/l) <sup>2,6</sup>	0.90	4.80	6.80	16.00	17.20	41.00	8.10	9.90
Surfactants (ug/l) <sup>2,6</sup>	232.0	380	376.0	650	269.0	510	82.0	240
Dissolved Oxygen (mg/l) <sup>2,3</sup>	5.73	6.39	5.95	7.13	5.64	7.29	4.81	6.57
TOC (mg/l) <sup>2,6</sup>	5.33	7.3	13.16	23	7.19	13	4.22	5.8
Total Aluminum (ug/l) <sup>2,6</sup>	285.4	370	215.8	620	347.7	710	124.8	290
Total Chromium (ug/l) <sup>2,6</sup>	0.7	1.8	0.9	2.5	1.6	3.6	1.4	3.4
Total Copper (ug/l) <sup>2,6</sup>	8.1	11	19.1	37	11	18	ND	ND
Total Iron (mg/l) <sup>2,6</sup>	24.77	39.0	3.33	14.00	5.74	9.60	1.46	2.90
Total Lead (ug/l) <sup>2,6</sup>	5.8	8.0	2.8	5.7	1.7	3.5	1.2	2.9
Total Zinc (ug/l) <sup>2,6</sup>	59	77	36.3	150	59.5	110	15.6	31

- 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

<sup>8</sup> Outfall 010A: Results reported as average monthly and maximum daily were determined using the rainfall amount during the entire storm for the outfall drainage area.  
 BOD<sub>5</sub> - 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**  
**RI T.F. GREEN INTERNATIONAL AIRPORT**  
**WARWICK, RHODE ISLAND**  
**THIRD QUARTER 2022**

Parameter	Major Outfalls							
	Outfall 002A		Outfall 003A		Outfall 008A		Outfall 010A	
	Minimum Daily <sup>1</sup>	Maximum Daily <sup>2</sup>	Minimum Daily <sup>1</sup>	Maximum Daily <sup>2</sup>	Minimum Daily <sup>1</sup>	Maximum Daily <sup>2</sup>	Minimum Daily <sup>1</sup>	Maximum Daily <sup>2</sup>
pH	<b>5.9</b>		<b>5.1</b>		<b>5.9</b>		<b>5.9</b>	
Temperature (°F)		72.6		71.3		74.2		74.5

**Bold text** indicates exceedance of permit standards

<sup>1</sup> Results reported as minimum daily were the minimum of the samples collected during the 12 hours of sampling.

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



**TABLE 5  
PVD RUNOFF VOLUME CALCULATION  
RI T.F. GREEN INTERNATIONAL AIRPORT  
WARWICK, RHODE ISLAND  
THIRD QUARTER 2022**

August 22, 2022

Precip (inches):

0.33

Drainage Basin ID	PVD Storm Water Discharge	Receiving Water	Drainage Area (ac)	cu ft precip	gal precip
1	Outfall 001A	Warwick Pond	5.9	7,067.6	52,866
2	Outfall 002A	Warwick Pond	93.4	111,883.9	836,891
3	Outfall 003A	Warwick Pond	119.8	143,508.4	1,073,443
4	Outfall 004A	Warwick Pond	30.1	36,056.8	269,705
4B	Outfall 004B	Buckeye Brook	2	2,395.8	17,921
4C	Outfall 004C	Buckeye Brook	3	3,593.7	26,881
6	Outfall 006A	Buckeye Brook	10.7	12,817.5	95,875
6B	Outfall 006B	Buckeye Brook	1.5	1,796.9	13,440
6C	Outfall 006C	Buckeye Brook	0.8	958.3	7,168
6D	Outfall 006D	Buckeye Brook	0.7	838.5	6,272
7	Outfall 007A	Buckeye Brook	9.6	11,499.8	86,019
7B	Outfall 007B	Buckeye Brook	1.2	1,437.5	10,752
8	Outfall 008A	Buckeye Brook	240.6	288,214.7	2,155,846
9	Outfall 009A	Buckeye Brook	38.4	45,999.4	344,075
10	Outfall 010A	Tuscatucket Brook	26	31,145.4	232,968
11	Outfall 011A	Tuscatucket Brook	14	16,770.6	125,444
12	Outfall 012A	Tuscatucket Brook	46.4	55,582.6	415,758
13	Outfall 013A	Warwick Pond	28	33,541.2	250,888
<b>TOTAL AREA</b>			<b>672.1</b>	<b>805,108.6</b>	<b>6,022,212</b>