



HOFFMAN ENGINEERING INC.

March 28, 2017

Mr. Jay Brolin
Manager of Environmental Programs
Rhode Island Airport Corporation
2000 Post Road
Warwick, Rhode Island 02886

Re: First Quarter Stormwater Outfall Sampling
T.F. Green Airport
February 2017

Dear Mr. Brolin:

Hoffman Engineering, Inc. (HEI) as sub consultant to RI Analytical Laboratories, Inc. (RIAL) is pleased to provide the Rhode Island Airport Corporation (RIAC) with the results of stormwater sampling and laboratory analyses for samples collected from stormwater outfalls at T.F. Green Airport (PVD) located in Warwick, Rhode Island on February 1, 2017 through February 3, 2017. The sampling was conducted to meet the requirements for quarterly monitoring at PVD in accordance with the Rhode Island Pollution Discharge Elimination System (RIPDES) Permit RI0021598 issued by the Rhode Island Department of Environmental Management (RIDEM).

Background

Storm water discharges from PVD to the City of Warwick municipal separate storm sewer system, Warwick Pond, Buckeye Brook, and Tuscatucket Brook (Figure 1). Warwick Pond is located due east of PVD. Buckeye Brook starts at the south end of Warwick Pond, just off the end of Runway 34 at PVD. It continues southward across the airport property, then heads east, crossing under Warwick Avenue and West Shore Road, to empty into Narragansett Bay near Conimicut Point, at Old Mill Cove. The eastern, tidal extent of Buckeye Brook is also known as Old Mill Creek. Tuscatucket Brook, located to the west of PVD in the vicinity of the end of Runway 5, starts near Warwick Industrial Drive and drains southeasterly into Brush Neck Cove and Greenwich Bay. Warwick Pond and Buckeye Brook are identified as Class B waters; Tuscatucket Brook is identified as Class A.

The RIPDES permit identifies a total of 19 perimeter outfalls at PVD. Outfalls 001A, 002A, 003A, 004A and 013A discharge to tributaries of Warwick Pond. Outfalls 004B, 004C, 005A, 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 Tuscawetuck Brook. Major outfalls, 002A, 003A, 008A, and 010A, are those outfalls which receive or may receive drainage from areas where aircraft deicing chemicals are 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. 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.

Part I.B.4.h describes water quality monitoring requirements for receiving water bodies. Stream monitoring is to be conducted at four locations: 1. the inlet to Warwick Pond at Lake Shore Drive; 2. the outlet to Warwick Pond at the south end of Lake Shore Drive; 3. Buckeye Brook at West Shore Road; and 4. Old Mill Creek at Tidewater Drive. These sample locations were identified as BB-02, BB-03, BB-04 and BB-07 (respectively) to maintain consistency with previous sampling studies in the Buckeye Brook watershed.

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, liquid potassium acetate, or liquid sodium acetate. The table below summarizes the amount of aircraft deicing fluid applied associated with the storm event.

Dates	Estimated Applied As fluid (gal)
<u>1/30/2017</u>	<u>868</u>
<u>1/31/2017</u>	<u>8277</u>
<u>2/1/2017</u>	<u>2693</u>
<u>2/2/2017</u>	<u>453</u>
Total	<u>11523</u>

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Summary of Storm

First Quarter (January 1 through March 31) sampling includes the major outfalls (002A, 003A, 008A and 010A) hourly for twelve hours and Buckeye Brook outfalls (BB-02, BB-03, BB-04 and BB-07) every four hours for forty eight hours. The sampling began upon a precipitation event of sufficient magnitude as specified in the RIPDES permit. The laboratory analytical parameters for each sample for this sampling event are listed in Table 2.

Light snow began falling around 12:30 PM on January 31, 2017 and continued until around 4:30 AM on February 1, 2017 with a total precipitation of 0.17 inches for the full storm duration. Weather Underground reported a total of 0.16 inches of rain and/or melted snow and 2.90 inches of snow on January 31, 2017, and reported a total of 0.01 inches of rain and/or melted snow and 0.10 inches of snow on February 1, 2017. Precipitation data for the sampling date is shown on Table 1, and provided in Attachment A.

Summary of Flow

During 2007 flow meters were installed at three of the major Providence outfalls: OF-002A, OF-003A, and OF-008A. Continuous flow measurements during the 12 hours of sampling on December 12, 2016 were made using these Isco 2150 area velocity meters manufactured by Teledyne Isco, Inc. The flow meters were programmed to measure level and velocity at 15 minute increments. No flow meters are installed at minor outfalls or at outfall 010A, as it is off airport property.

The base flows at OF-002A, OF-003A and OF-008A were 134,994, 194,922 and 686,631 gallons per day (gpd) respectively. The maximum daily flows during the December 12, 2016 sampling event were 346,412 gpd for OF-002A, 298,211 gpd for OF-003A and 1,092,737 gpd for OF-008A. Maximum daily and average monthly flows for the 12 hour sampling event were calculated and are presented in Table 3. Estimated runoff volumes are presented in Table 7. Minor outfall flow was calculated using the values in Table 7 and are presented in Table 5.

It should be noted that OF-010A is not equipped with flow monitoring equipment as it is off airport property. The flow for outfall OF-010A was calculated using the storm duration, intensity, and drainage area. ~~As such, flow calculations for this outfall are approximate.~~

Sample Collection

For the First Quarter sampling event, three of the major outfalls (002A, 003A, and 008A) were sampled hourly for twelve hours. No flow from OF-010A was observed during the last hour of the sampling event, and therefore ~~outfall OF-010A was not sampled only eleven (11) samples were collected in the twelve hours.~~

Receiving water sampling in Buckeye Brook (BB-02, BB-03, ~~BB-047~~ and ~~BB-078~~) commenced concurrent with the outfall sampling. Downstream samples were collected every four hours for 48 hours. ~~During downstream sample collection, N no~~ discoloration, foaming, or unusual odors were observed by sampling personnel.

All samples were collected directly into sample bottles. 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, a staff person at RIAL made several trips to PVD to return samples to the laboratory.

RIAL also collected and recorded field measurements at each outfall for temperature, pH, dissolved oxygen (DO), and specific conductance. Dissolved oxygen (DO) percent saturation was determined using a chart that plots percent saturation based on DO measurement and water temperature.

Sampling Results

Tables 3 and 4 present a summary of field measurements and analytical results expressed as monthly average and maximum daily concentrations for the major outfalls. Analytical non-detects are presented as ND in Tables 3 and 5. Temperature and Oil and Grease are expressed as maximum daily only. In accordance with the permit, pH is expressed as minimum daily and maximum daily. The percent saturation of Dissolved Oxygen is a calculated value based on the temperature and concentration of Dissolved Oxygen.

Fecal Coliform was detected in samples collected from the outfalls. These levels have been observed in previous sampling events, and are not considered significant. It is expected the Fecal Coliform derives from wildlife and likely attributable to the antecedent dry conditions.

High concentrations of total sodium were detected in the majority of the samples collected from the outfalls. These levels have been observed in prior sampling and are not necessarily indicative of pavement deicing.

Several measurements of pH were measured outside the permit standard, above 6.5 SU and below 9.0 SU. This is the first round that the average of one outfall was also outside the permit standard. Eight of the twelve samples for Outfall 003A measured below 6.5 SU, with the average of all samples being 6.37 SU. Measurements also did not correlate well with analytical results. This appeared to be a function of field instruments. As such, laboratory analyses were used in lieu of field pH measurements. Table 9 presents a summary of these permit exceptions and exceedances submitted with Discharge Monitoring Reports (DMRs) to the RIDEM.

Summary / Conclusions

Analytical results for discharges associated with this event are consistent with previous monitoring, other than the pH readingsmeasurements, which were slightly more acidic than previous rounds. These lower pH readings are likely indicative of more acidic precipitation, and not a result of Site operations.

Thank you for the opportunity to assist on this project. Should you have any questions relative to sample collection or analytical results, please call Kristen Mayo at RI Analytical Laboratories at 401-737-8500 x 109. Should you have any questions about this report, please contact me.

Sincerely,
Hoffman Engineering, Inc.

Hoffman Engineering, Inc.

Robert L. Hoffman, P.E.
President

Eli Salsberry
Engineer in Training

Attachments:
Figure 1: PVD Outfall and Receiving Water Monitoring Locations
Tables 1-9: As Stated
Appendix A: Climate Data

Appendix B: Laboratory Analytical Reports

Cc: Kristen Mayo, RI Analytical Laboratories, Inc.