Spent Aircraft Deicing Fluid (SADF) and Storm Water Environmental System

The CVG Airport is owned and operated by the Kenton County Airport Board (KCAB)
The CVG Airport is located at the headwaters of two major waterways that flow (North & South) through land outside the Airport’s property.

These two waterways pass through several residential and industrial areas and eventually empty into the Ohio river.
• **Headwaters of Elijah and Gunpowder Creeks**
  - Flow through several residential and industrial areas eventually emptying into the Ohio River.
  - Gunpowder flows South
  - Elijah Creek flows North

• **Environmental System – Why?**
  - Impacted by Spent Aircraft Deicing Fluid (SADF) from deicing activities at the Airport.

  - Mitigation – Capture and Treat the SADF via the following components
    - Deicing pads
    - Holding tanks
    - Glycol processors
    - Stormwater Treatment Plant
    - Storm Water Retention
System Evolution

- Deice Pad
- Glycol Recovery Vehicle
- Additional Deicing pads with associated holding tanks
- Use of Sanitary District (SD1) to handle SADF
- Addition of large holding tanks to hold more SADF
- Addition of small Storm Water Treatment Plant (SWTP)
- Addition of glycol processor (evaporator) to make SADF “treatable”
- SD1 capacity impacts requiring another approach
- Addition of a more significant Storm Water Treatment Plant

Resulting in layers of protection
- Deicing Pads
- SADF Holding Tanks
- Glycol Processor
- Storm Water System
- Storm Water Treatment Plant
- Detention Ponds
<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
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<tbody>
<tr>
<td>Early 1990s</td>
<td>Elijah Creek &amp; Gunpowder Creek impacted by deicing activities</td>
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<tr>
<td>1991</td>
<td>First Deicing Pad constructed (Pad 7)</td>
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<td>1992-1995</td>
<td>Additional ten deicing pads constructed</td>
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<tr>
<td>Feb-Mar 1997</td>
<td>Kentucky Division of Water issues Kentucky Pollutant Discharge Elimination System (KPDES) permit. Kenton County Airport Board (KCAB) issued a Consent Decree by State of Kentucky - fined $106,000</td>
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<tr>
<td>Dec-97</td>
<td>Glycol Recovery Vehicle purchased</td>
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<td>1997-1998</td>
<td>Installed under drain collection system at Pad 7 &amp; Concourse C, installed boundary lines for pads, added signage and Wig-Wags lights on all pads</td>
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<tr>
<td>1999-2000</td>
<td>Utilized existing camera system to monitor and videotape all deicing pad activities. Concrete glycol collection tanks installed, recycle tanks installed at pads 7,8,10, &amp; 11</td>
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<tr>
<td>Summer 1999</td>
<td>North Retention pond closed and aeration begins. As an interim measure, the pond was transformed into aerated wet pond 1999/2000.</td>
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<tr>
<td>Summer 2001</td>
<td>South retention pond closed and aeration begins. Aerators were installed during 2001/2002</td>
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<tr>
<td>Sep-01</td>
<td>Pilot Study and conceptual design for Gunpowder Creek SWTP</td>
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<tr>
<td>2001/2002</td>
<td>Two, 3 million gallon and one, 2 million gallon concrete storage tanks added</td>
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<td>Fall 2003</td>
<td>GPRF on line; four south storm water pump stations on-line; SWTP Sequence Batch Reactors(SBR) online; Relocation of South Storm Water Detention Facility</td>
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<tr>
<td>Feb 2005</td>
<td>Kentucky Division of Water reissues KCAB KPDES permit. Consent Decree order is amended</td>
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<tr>
<td>Feb 2005</td>
<td>Evaporator and auxiliary heat exchanger tube leaks take GPRF off-line</td>
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<tr>
<td>Mar 2005</td>
<td>Notice of Violation issued for permit exceedance at Gunpowder Creek in December 2004 and January 2005</td>
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<tr>
<td>June 2005</td>
<td>GPRF back online with retubed evaporator and auxiliary heat exchanger</td>
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<tr>
<td>October 2005</td>
<td>South storm water pump stations upgraded for expanded SWTP. SWTP utilizes SBR technology for 2005-2006 deicing season</td>
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<tr>
<td>Date</td>
<td>Event Description</td>
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<tr>
<td>October 2006</td>
<td>Five north and one south pump stations on-line</td>
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<tr>
<td>December 2006</td>
<td>Expanded SWTP Extended Aeration Activated Sludge (EAAS) technology online</td>
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<tr>
<td>2007</td>
<td>Capacity and aeration at the North and south detention ponds increased</td>
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<tr>
<td>January 2007</td>
<td>KCAB executes Division of Water Agreed Consent Order; $12,500 fines imposed by Division of Water</td>
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<tr>
<td>August 2007</td>
<td>Evaporator upgrades at GPRF completed</td>
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<tr>
<td>January 2009</td>
<td>Operation of GPRF and SWTP brought in house</td>
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<tr>
<td>February 2009</td>
<td>Division of Water issues letter stating the Agreed Orders are considered resolved and closed</td>
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<tr>
<td>July 2009</td>
<td>DHL returns to CVG</td>
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<td>February 2010</td>
<td>Operational upset at SWTP, duration approximately two weeks</td>
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<tr>
<td>August 2010</td>
<td>Division of Water reissues KCAB KPDES Permit</td>
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<tr>
<td>December 2010</td>
<td>Operational upset at SWTP, duration approximately seven weeks</td>
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<tr>
<td>March 2011</td>
<td>GPRF shut down</td>
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<tr>
<td>2016</td>
<td>DHL North Ramp Constructed</td>
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<tr>
<td>2017</td>
<td>6 mil basin Constructed for additional capacity</td>
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<tr>
<td>Feb 2018</td>
<td>6 mil basin brought online -</td>
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</table>
Environmental System Components

System Purpose
- Mitigate potential negative environmental impacts of Spent Aircraft Deicing Fluid (SADF)
- Meet environmental compliance with state & federal laws

Function
- SADF Systems
  - Collects SADF with a series of designated deicing pads, conveyance, glycol pump stations, and tanks
  - Runoff from the airfield not captured by the designated deicing pads is collected with a series of collection trenches, culverts, diversion valves, and storm water pump stations.
  - Detention Facilities: (3) Facilities – Midfield, Elijah Creek, Gunpowder Creek

- Storm Water Treatment
  - Captured storm water is directed to the Storm Water Treatment Plant (SWTP) via storm water pump stations and tanks via glycol pump stations.

Components
- Deice Pads
- Pump Stations (Storm Water & Glycol)
- SADF Tanks
- Storm Water Treatment Plan (SWTP)
- Retention Ponds
- Glycol Processing and Recycling Facility (GPRF)

All of these components are connected and supported by a significant underground infrastructure such as piping, pumps, wells, oil/water separators, valves & actuators.
CVG Storm Water Treatment Plant

Facility Layout

- Digester Tanks
- Sludge Holding Tank
- Basin effluent channel
- Extended Aerated Activated Sludge Basins (EAAS)
- Clarifiers
- Flow/Splitter Box
- Blower Building
- Main Building, Lab, MCC, Blowers
- Sludge Management Building
- 6 Million Gallons Basin
EAAS Basins

- The three Extended Aeration Activated Sludge (EAAS) Basins can process up to 6 million gallons per day of impacted storm water, at a total load of 30,000 lbs of BOD. The system is rated to treat the load at temperatures near 32°F with a biomass concentration (or mixed liquor suspended solids level) of 3,700 mg/L. The biomass consists mainly of stalk ciliates, free swimming ciliates, and rotifers.
MICROORGANISMS – EAAS Basins

[Diagram showing various microorganisms such as amoeboids, flagellates, ciliates, and rotifers.]
Dewatered Sludge
Elijah Creek Detention Facility
Southwest Detention Basin #3
Maintenance Activities

• Preventative Maintenance
  – Performed late Spring/ Summer
    • Twenty-Two Pump Stations (Glycol & Storm) PMs
      – Electrical Panel PMs
      – Visual check of piping
    • Deice Pads (PMs)
      – Rotork Actuators for Diversion Valves
  • Industrial Cleaning
    – All Components of the Environmental Systems

• Repairs
  • Pumps
  • Clarifiers
Preventative Maintenance – Glycol Pump Stations
Industrial Cleaning Activities – SWTP Clarifiers
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Industrial Cleaning Activities – SWTP Clarifiers
Industrial Cleaning Activities – SWTP
Industrial Cleaning Activities- Glycol Pump Station
Industrial Cleaning Activities – Oil Water Separators
Industrial Cleaning Activities- Oil Water Separators
Clarifier Repairs
Clarifier Repairs (continued)
Maintenance Activities – Pump Repairs

70 h.p. Pump
Maintenance Activities – Pump Repairs (continued)

Worn Impeller
Maintenance Activities – Pump Repairs (continued)

Burnt Stator
Cord Cap Full of Waste
Questions