TransAlta Generation Partnership
And Capital Power Corporation
Wabamun-Genesee Area Air Monitoring Programs

2012 FIRST QUARTER REPORT

AMBIENT AIR QUALITY MONITORING PROGRAM
ACID DEPOSITION ASSESSMENT PROGRAM
MERCURY ASSESSMENT PROGRAM

Final

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Executive Summary

TransAlta Generation Partnership and Capital Power Corporation operate three coal-fired thermal generating stations – Sundance, Keephills, and Genesee – located in the Wabamun-Genesee area of west-central Alberta. The generating stations operate under Alberta Environmental Protection and Enhancement Act approvals. Under their approvals, the generating stations are committed to conducting environmental monitoring programs. Three environmental monitoring programs conducted on an on-going manner include:

- Regional ambient air monitoring program
- Acid deposition assessment program
- Mercury assessment program

This report summarizes key results of data collected for these programs in the first quarter (January, February, and March) of 2012. Completeness of monitoring data, quarterly summary statistics for selected air quality parameters, and contraventions of approval terms and applicable air quality monitoring objectives are summarized and discussed.

Regional Ambient Air Program

There was one instance of invalid or missing data for intermittent particulate matter <10 and 2.5 micro metres (µm) in diameter (PM_{10} and PM_{2.5}) samples out of 60 samples sought during the first quarter:

- The PM_{10} sampler did not run for the March 4th National Air Pollutant Surveillance (NAPS) sample run at Genesee air monitoring station (AMS). A reset of the instrument showed no problems.

There were no instances of invalid or missing passive results out of 123 samples for the first quarter of 2012.

Data capture rates for continuous monitoring parameters at the air monitoring stations were well above the 90% criterion on a monthly basis as stipulated in the Air Monitoring Directive (1989).

Measured concentrations for all continuous monitoring parameters were below applicable Alberta Ambient Air Quality Guideline values or Canada Wide Standard values at each of the air monitoring stations.

There were no contraventions of approval terms and applicable air quality monitoring objectives during the January to March 2012 period.

Acid Deposition Assessment Program

There were no instances of invalid or missing data out of 42 samples sought in the first quarter of 2012.

Mercury Assessment Program

There were 10 valid precipitation samples from 13 collection periods in the wet deposition sampling program during the first quarter of 2012. The identified cause of the three invalid samples was due to poor snow capture efficiency. This cause represents a deficiency that is accepted to be within the normal operating limitations of sampling equipment used in the Mercury Deposition Network.
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### Abbreviations

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<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>AAAQO</td>
<td>Alberta ambient air quality objective</td>
</tr>
<tr>
<td>AMS</td>
<td>Air Monitoring Station</td>
</tr>
<tr>
<td>Ca$^{2+}$</td>
<td>Calcium ion</td>
</tr>
<tr>
<td>CPC</td>
<td>Capital Power Corporation</td>
</tr>
<tr>
<td>CWS</td>
<td>Canada Wide Standard</td>
</tr>
<tr>
<td>EPEA</td>
<td>Environmental Protection and Enhancement Act</td>
</tr>
<tr>
<td>Hg</td>
<td>Mercury</td>
</tr>
<tr>
<td>HNO$_2$</td>
<td>Nitrous acid</td>
</tr>
<tr>
<td>HNO$_3$</td>
<td>Nitric acid</td>
</tr>
<tr>
<td>K$^+$</td>
<td>Potassium ion</td>
</tr>
<tr>
<td>km</td>
<td>Kilometre</td>
</tr>
<tr>
<td>Mg$^{2+}$</td>
<td>Magnesium ion</td>
</tr>
<tr>
<td>MW</td>
<td>Megawatts</td>
</tr>
<tr>
<td>Na$^+$</td>
<td>Sodium ion</td>
</tr>
<tr>
<td>NAPS</td>
<td>National Air Pollutant Surveillance</td>
</tr>
<tr>
<td>NH$_4^+$</td>
<td>Ammonium ion</td>
</tr>
<tr>
<td>NO$_2$</td>
<td>Nitrogen dioxide</td>
</tr>
<tr>
<td>NO$_3$</td>
<td>Nitrate ion</td>
</tr>
<tr>
<td>MDN</td>
<td>Mercury Deposition Network</td>
</tr>
<tr>
<td>O$_3$</td>
<td>Ozone</td>
</tr>
<tr>
<td>PM$_{2.5}$</td>
<td>Particulate matter ≤2.5 µm diameter</td>
</tr>
<tr>
<td>PM$_{10}$</td>
<td>Particulate matter ≤10 µm diameter</td>
</tr>
<tr>
<td>Q1</td>
<td>First quarter</td>
</tr>
<tr>
<td>RH</td>
<td>Relative humidity</td>
</tr>
<tr>
<td>SO$_2$</td>
<td>Sulphur dioxide</td>
</tr>
<tr>
<td>SO$_4^{2-}$</td>
<td>Sulfate ion</td>
</tr>
<tr>
<td>SW</td>
<td>Surface wetness</td>
</tr>
<tr>
<td>T$_2$</td>
<td>Ambient temperature at 2 m above ground</td>
</tr>
<tr>
<td>T$_{10}$</td>
<td>Ambient temperature at 10 m above ground</td>
</tr>
<tr>
<td>µm</td>
<td>Micrometre</td>
</tr>
<tr>
<td>TSP</td>
<td>Total suspended particulate</td>
</tr>
<tr>
<td>WDR</td>
<td>Wind direction</td>
</tr>
<tr>
<td>WSP</td>
<td>Wind speed</td>
</tr>
</tbody>
</table>
1 Introduction

TransAlta Generation Partnership (TransAlta) and Capital Power Corporation (CPC) operate three coal-fired thermal generating stations, including Sundance, Keephills and Genesee, which are located in the Wabamun–Genesee area of west-central Alberta. Figure 1 shows the location of each of these generating stations. The three generating stations operate under the terms and conditions of their respective Alberta Environmental Protection and Enhancement Act (EPEA) approvals for construction, operation and reclamation, listed in Table 1.

The TransAlta Sundance generating station consists of six generating units; it is the largest coal-fired generating station in western Canada. Sundance is situated on the south shore of Lake Wabamun, approximately 70 kilometres (km) west of Edmonton, Alberta (Figure 1). The station has operated since 1970, with steady expansion throughout the 1970s from a single original generating unit to six generating units. Sundance Units 1 and 2 were removed from operation in December 2010. Sundance currently has a net generating capacity of 1,566 megawatts (MW) from Units 3 through 6.

TransAlta’s Keephills generating station is located 5 km south of Wabamun Lake (Figure 1). Keephills Unit’s 1 and 2 have been in operation since 1983. They have a net generating capacity of 766 MW. Keephills Unit 3 began commercial operation on September 1, 2011. This plant (Unit 3) is a 50/50 joint venture between TransAlta and CPC and it has a net generating capacity of 450 MW.

The Genesee generating station consists of three generating units. It is located 50 km southwest of Edmonton (Figure 1). CPC fully owns and operates Units 1 and 2, which have a net combined generating capacity of 762 MW. These units have been in operation since 1994 and 1989, respectively. Genesee Unit 3, commissioned in 2005, is a 50/50 joint venture between TransAlta and CPC. Genesee Unit 3 has a net generating capacity of 450 MW.

Collectively, the three generating stations have the capacity to generate a net total of 3,994 MW to Alberta’s electrical grid.

Table 1

<table>
<thead>
<tr>
<th>Facility</th>
<th>Capacity (MW, net)</th>
<th>Location</th>
<th>Approval No. (as amended)</th>
<th>Applicable Approval Terms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sundance</td>
<td>1,566</td>
<td>3,4,8,9,10,16,17,20, and 31-52-04 W5M</td>
<td>9830-02-00</td>
<td>Sections within Part 7</td>
</tr>
<tr>
<td>Keephills</td>
<td>1,216</td>
<td>36-51-04 W5M</td>
<td>10324-02-00</td>
<td>Sections within Part 7</td>
</tr>
<tr>
<td>Genesee</td>
<td>1,212</td>
<td>25-50-03 W5M</td>
<td>773-02-00</td>
<td>Sections within Part 7</td>
</tr>
</tbody>
</table>
Location of TransAlta and Capital Power Coal-fired Generating Stations and Air Monitoring Area in the Wabamun-Genesee Area of Alberta
1.1 Environmental Monitoring Programs for Generating Stations

The generating stations operate under the Alberta EPEA approvals listed in Table 1. Under their EPEA approvals, the generating stations are committed to conducting environmental monitoring programs. These programs are specifically designed to:

- Identify and quantify ambient levels and deposition patterns of chemical species of potential concern that are associated with generating station emissions.
- Generate an inventory of representative baseline data for the chemicals of potential concern.
- Provide data for assessing long-term impacts and for evaluating and implementing air quality management plans.

1.1.1 Ambient Air Quality Monitoring Program

The ambient air quality monitoring program consists of the following elements:

- A continuous monitoring program consisting of four air monitoring stations (AMS) (Figure 2) – Powers, Meadows, Wagner, and Genesee. Sulphur dioxide (SO\(_2\)), nitrogen dioxide (NO\(_2\)), and a number of meteorological parameters are measured at all four stations; particulate matter with aerodynamic diameter less than or equal to 2.5 microns (PM\(_{2.5}\)) is measured at the Powers and Genesee AMS; and ozone (O\(_3\)) is measured at the Genesee AMS.

- An integrated monitoring program consisting of 24 hour sampling every 6 days for particulate matter with aerodynamic diameter less than or equal to 10 microns (PM\(_{10}\)), and PM\(_{2.5}\), and metals speciation of PM\(_{2.5}\) is measured at Powers AMS and Genesee AMS.

- A passive monitoring program with monthly passive monitoring at 21 stations in the Wabamun-Genesee area measures NO\(_2\), SO\(_2\), and O\(_3\) at selected stations. Twenty stations are shown in Figure 2 and the Genesee AMS has passive monitors for NO\(_2\), SO\(_2\) and O\(_3\).

The schedule for sampling continuous, intermittent and passive parameters in the ambient air quality monitoring program is shown in Table 2.

Table 2 Schedule for Components of the Ambient Air Quality Monitoring Program in the Wabamun-Genesee Area

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Continuous</th>
<th>Sampled intermittently – every 6th day according to NAPS schedule</th>
<th>Sampled monthly (passives)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SO(_2)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NO(_2)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>O(_3)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PM(_{10})</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PM(_{2.5})</td>
<td></td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Wind speed and direction, temperature, relative humidity</td>
<td></td>
<td></td>
<td>* (includes metals speciation)</td>
</tr>
</tbody>
</table>
Continuous and Passive Monitoring Locations in the Wabamun-Genesee Area

Acknowledgements:
Original Drawing by Stantec
1.1.2 Acid Deposition Assessment Program

The acid deposition assessment program consists of wet and dry deposition monitoring of sulphur and nitrogen species that are important contributors to acid deposition in the Wabamun-Genesee area.

Two dedicated acid deposition monitoring sites are operated in the Wabamun-Genesee area. These sites are the Genesee air monitoring station and the Violet Grove air monitoring station (refer to Figure 2). The three coal-fired generating stations are located at distances of 8 to 33 km away from the Genesee AMS. The three generating stations are located at distances of 60 to 65 km away from the Violet Grove station. Wet and dry deposition of selected sulphur and nitrogen species are currently measured at these two stations.

Wet Deposition

Wet deposition monitoring involves collecting rain and snow samples using a wet-only precipitation sampler. Precipitation samples are retrieved from the field and sent to the Alberta Innovates – Technology Futures (Vegreville, AB) for chemical analysis.

Dry Deposition

Dry deposition monitoring involves measuring and recording concentrations of the following atmospheric pollutants and meteorological parameters:

* Atmospheric Pollutants

Atmospheric pollutants measured for dry deposition include eleven species:

- Continuous measurements for SO$_2$ and NO$_2$.
- Monthly integrated annular denuder samples for nitric acid (HNO$_3$) and nitrous acid (HNO$_2$).
- One 24-hour integrated particulate matter (TSP) sample collected every 6th day for ionic species (sodium (Na$^+$), potassium (K$^+$), magnesium (Mg$^{2+}$), calcium (Ca$^{2+}$), ammonium (NH$_4^+$), sulphate (SO$_4^{2-}$), and nitrate (NO$_3^-$)).

* Meteorological Parameters

Hourly average measured values are obtained for the following meteorological parameters:

- Wind speed (WSP).
- Wind direction standard deviation (WDR).
- Relative humidity (RH).
- Surface wetness (SW).
- Air temperature at surface (2 m above ground), (T$_2$).
- Air temperature at standard height (10 m above ground), (T$_{10}$); or difference in air temperature at standard height and the surface (delta T).

1.1.3 Mercury Assessment Program

The mercury assessment program consists of wet deposition monitoring. The objective of this program component is to measure wet deposition rates of mercury (Hg) in the Wabamun-Genesee region to understand the potential effects of generating station emissions on receptors in the area.
Wet deposition monitoring is conducted at the Genesee air monitoring station (Figure 2) where samples are collected on a weekly basis with sample change out occurring every Tuesday. This monitoring program is part of the U.S. National Acid Deposition Program – Mercury Deposition Network (MDN) (http://nadp.sws.uiuc.edu/mdn/).

The objective of the MDN is to develop a database of weekly concentrations of total mercury in precipitation and the seasonal and annual flux of total mercury in wet deposition across North America. The data are being used to develop information on spatial and seasonal trends in mercury deposited to surface waters, forested watersheds, and other sensitive receptors. There are currently over 110 wet deposition sampling sites in operation in North America. The network uses standardized methods for collection and analyses.

1.2 Purpose of Report

This quarterly report summarizes key results of data collected in the first quarter (January to March) of the calendar year 2012. Specifically, completeness of monitoring data, quarterly summary statistics for selected air quality parameters, and contraventions of approval terms and applicable air quality monitoring objectives are summarized and discussed.
2 Results and Discussion

2.1 Regional Ambient Air Quality Monitoring Program

2.1.1 Data Completeness

Data capture rates for PM$_{10}$ and PM$_{2.5}$ intermittent samples are listed in Table 3. There was one instance of invalid or missing data for intermittent PM$_{10}$ and PM$_{2.5}$ samples out of 60 samples sought during the first quarter:

- The PM$_{10}$ sampler did not run for the March 4th National Air Pollutant Surveillance (NAPS) sample run at Genesee AMS. A reset of the instrument showed no problems.

<table>
<thead>
<tr>
<th>Table 3</th>
<th>Data Capture Rates for Intermittent PM$<em>{10}$ and PM$</em>{2.5}$ Monitoring during the First Quarter 2012</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Powers AMS</td>
</tr>
<tr>
<td>Month</td>
<td>January</td>
</tr>
<tr>
<td>PM$_{10}$:</td>
<td>5/5</td>
</tr>
<tr>
<td>PM$_{2.5}$:</td>
<td>5/5</td>
</tr>
</tbody>
</table>

Note: Data capture rates expressed as: valid samples/total samples scheduled.

Data capture rates for passive samples are presented in Table 4. There were no instances of invalid or missing passive results for the first quarter of 2012:

<table>
<thead>
<tr>
<th>Table 4</th>
<th>Data Capture Rates for Passive Monitoring Parameters during the First Quarter 2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter</td>
<td>Capture Rate</td>
</tr>
<tr>
<td>NO$_2$</td>
<td>54/54</td>
</tr>
<tr>
<td>SO$_2$</td>
<td>33/33</td>
</tr>
<tr>
<td>O$_3$</td>
<td>36/36</td>
</tr>
</tbody>
</table>

Note: Data capture rates expressed as number of valid samples/total number of samples.

First quarter (Q1) 2012 uptimes for continuous monitoring equipment and air monitoring stations are summarized in Table 5. In all cases, data capture rates for continuous monitoring parameters at the air monitoring stations were above the 90% criterion on a monthly basis as stipulated in the Air Monitoring Directive (1989). The additional operating events that occurred during the first quarter include:

Powers AMS:
- The PM$_{2.5}$ analyzer experienced unstable operation in January, February, and March, returning uptimes of 99.9%, 99.7%, and 99.2%, respectively.

Meadows AMS:
- Failure of the uninterruptible power supply system resulted in a station wide uptime of 95% in January.
Genesee AMS:

- The PM\textsubscript{2.5} analyzer experienced unstable operation in January, returning an uptime of 98.7%.
- The SO\textsubscript{2} analyzer underwent maintenance, returning an uptime of 99.7% in March.

### 2.1.2 Summary Statistics

Box-and-whisker plots were used to display continuous air quality data during Q1 2012. The plots presented include:

- 1-hour average NO\textsubscript{2} concentrations from continuous monitoring (Figure 3)
- 1-hour average SO\textsubscript{2} concentrations from continuous monitoring (Figure 4)
- 24-hour average SO\textsubscript{2} concentrations from continuous monitoring (Figure 5)
- 1-hour average O\textsubscript{3} concentrations from continuous monitoring (Figure 6)
- 8-hour average O\textsubscript{3} concentrations from continuous monitoring (Figure 7)
- 1-hour average PM\textsubscript{2.5} concentrations from continuous monitoring (Figure 8)
- 24-hour average PM\textsubscript{2.5} concentrations from continuous monitoring (Figure 9)
- 24-hour average PM\textsubscript{10} concentrations from intermittent monitoring (Figure 10)
- 24-hour average PM\textsubscript{2.5} concentrations from intermittent monitoring (Figure 11)
- comparison of 24-hour average PM\textsubscript{2.5} concentrations from intermittent and continuous monitoring at Genesee AMS (Figure 12)
- comparison of 24-hour average PM\textsubscript{2.5} concentrations from intermittent and continuous monitoring at Powers AMS (Figure 13)

Measured concentrations for all air quality parameters were below applicable Alberta ambient air quality objectives (AAAQO) or Canada Wide Standard (CWS) values shown in these figures at each of the air monitoring stations. Figures 12 and 13 compare intermittent versus continuous 24-hour average PM\textsubscript{2.5} concentrations at the Genesee and Powers air monitoring stations during Q1 2012. Twenty-four hour average intermittent and continuous PM\textsubscript{2.5} measurements are not expected to give the same concentration. The continuous PM\textsubscript{2.5} measurements are always smaller than filter-based intermittent measurements due to the different measurement technologies employed. This is shown in Figures 13 and 14. These figures show moderate correlation between intermittent and continuous PM\textsubscript{2.5} measurements (i.e., R\textsuperscript{2} values >0.53). What is observed in these figures is within the normal range of expected variation between these different measurement technologies.
# Table 5: Data Capture Rates Expressed as Percentages for Continuous Monitoring Parameters during Q1 2012

<table>
<thead>
<tr>
<th></th>
<th>Powers AMS</th>
<th>Meadows AMS</th>
<th>Wagner AMS</th>
<th>Genesee AMS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Month</td>
<td>Jan</td>
<td>Feb</td>
<td>Mar</td>
</tr>
<tr>
<td>NO2</td>
<td></td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>SO2</td>
<td></td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>O3</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>PM2.5</td>
<td>99.9</td>
<td>100</td>
<td>99.2</td>
<td>99.7</td>
</tr>
<tr>
<td>WSP</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>WDR</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>T2</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>T10</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>RH</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

Note: Jan = January; Feb = February; Mar = March. WSP = wind speed. WDR = wind direction. T2 = temperature at 2 metre height above ground. T10 = temperature at 10 metre height above ground. RH = relative humidity. n/a = not applicable.
Figure 3  Box-and-Whisker Plot of 1-hour Average NO$_2$ Concentrations from Continuous Monitoring at Selected Air Monitoring Stations (Q1 2012)

Note:  25th percentile (bottom of box)
       50th percentile (horizontal line within box)
       75th percentile (top of box)
       98th percentile (diamond)
       Maximum (top T)

Some of the values cannot be clearly observed in the figure (e.g., the 25th to 75th percentiles) because their magnitudes are too small.

Concentration values shown in the box-and-whisker plot are tabulated below in µg/m$^3$:

<table>
<thead>
<tr>
<th></th>
<th>January</th>
<th></th>
<th></th>
<th>February</th>
<th></th>
<th></th>
<th>March</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>September</td>
<td>Powers</td>
<td>Wagner</td>
<td>September</td>
<td>Powers</td>
<td>Wagner</td>
<td>September</td>
<td>Powers</td>
</tr>
<tr>
<td>25th percentile</td>
<td>2</td>
<td>6</td>
<td>3</td>
<td>6</td>
<td>4</td>
<td>3</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>50th percentile</td>
<td>5</td>
<td>17</td>
<td>8</td>
<td>10</td>
<td>7</td>
<td>17</td>
<td>9</td>
<td>11</td>
</tr>
<tr>
<td>75th percentile</td>
<td>8</td>
<td>29</td>
<td>12</td>
<td>16</td>
<td>13</td>
<td>30</td>
<td>13</td>
<td>15</td>
</tr>
<tr>
<td>98th percentile</td>
<td>17</td>
<td>59</td>
<td>21</td>
<td>32</td>
<td>35</td>
<td>68</td>
<td>35</td>
<td>41</td>
</tr>
<tr>
<td>Maximum</td>
<td>26</td>
<td>68</td>
<td>31</td>
<td>49</td>
<td>70</td>
<td>77</td>
<td>49</td>
<td>58</td>
</tr>
</tbody>
</table>
**Figure 4** Box-and-Whisker Plot of 1-hour Average SO$_2$ concentrations from Continuous Monitoring at Selected Air Monitoring Stations (Q1 2012)

Note: 25th percentile (bottom of box)
50th percentile (horizontal line within box)
75th percentile (top of box)
98th percentile (diamond)
Maximum (top T)

Some of the values cannot be clearly observed in the figure (e.g., the 25th to 75th percentiles) because their magnitudes are too small.

Concentration values shown in the box-and-whisker plot are tabulated below in µg/m$^3$:

<table>
<thead>
<tr>
<th></th>
<th>January</th>
<th></th>
<th>February</th>
<th></th>
<th>March</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>25th percentile</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>50th percentile</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>75th percentile</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>98th percentile</td>
<td>7</td>
<td>4</td>
<td>3</td>
<td>10</td>
<td>12</td>
<td>9</td>
</tr>
<tr>
<td>Maximum</td>
<td>18</td>
<td>12</td>
<td>7</td>
<td>40</td>
<td>46</td>
<td>69</td>
</tr>
</tbody>
</table>
Figure 5  Box-and-Whisker Plot of 24-hour Average SO$_2$ concentrations from Continuous Monitoring at Selected Air Monitoring Stations (Q1 2012)

Note: 25th percentile (bottom of box)
50th percentile (horizontal line within box)
75th percentile (top of box)
98th percentile (diamond)
Maximum (top T)
Some of the values cannot be clearly observed in the figure (e.g., the 25th to 75th percentiles) because their magnitudes are too small.
Concentration values shown in the box-and-whisker plot are tabulated below in µg/m$^3$:

<table>
<thead>
<tr>
<th></th>
<th>January</th>
<th>February</th>
<th>March</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Genesee</td>
<td>Meadows</td>
<td>Wagner</td>
</tr>
<tr>
<td>25th percentile</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>50th percentile</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>75th percentile</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>98th percentile</td>
<td>3</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Maximum</td>
<td>3</td>
<td>4</td>
<td>1</td>
</tr>
</tbody>
</table>
Figure 6  **Box-and-Whisker Plot of 1-hour Average O$_3$ Concentrations from Continuous Monitoring at Genesee AMS (Q1 2012)**

Note: 25th percentile (bottom of box)  
50th percentile (horizontal line within box)  
75th percentile (top of box)  
98th percentile (diamond)  
Maximum (top T)  

Concentration values shown in the box-and-whisker plot are tabulated below in µg/m$^3$:

<table>
<thead>
<tr>
<th></th>
<th>January</th>
<th>February</th>
<th>March</th>
</tr>
</thead>
<tbody>
<tr>
<td>25th percentile</td>
<td>34</td>
<td>37</td>
<td>51</td>
</tr>
<tr>
<td>50th percentile</td>
<td>46</td>
<td>49</td>
<td>66</td>
</tr>
<tr>
<td>75th percentile</td>
<td>57</td>
<td>57</td>
<td>80</td>
</tr>
<tr>
<td>98th percentile</td>
<td>68</td>
<td>72</td>
<td>99</td>
</tr>
<tr>
<td>Maximum</td>
<td>74</td>
<td>82</td>
<td>106</td>
</tr>
</tbody>
</table>
Figure 7  Box-and-Whisker Plot of 8-hour Average O$_3$ Concentrations from Continuous Monitoring at Genesee AMS (Q1 2012)

Note:  25th percentile (bottom of box)
      50th percentile (horizontal line within box)
      75th percentile (top of box)
      98th percentile (diamond)
      Maximum (top T)

Concentration values shown in the box-and-whisker plot are tabulated below in $\mu g/m^3$:

<table>
<thead>
<tr>
<th></th>
<th>January</th>
<th>February</th>
<th>March</th>
</tr>
</thead>
<tbody>
<tr>
<td>25th percentile</td>
<td>36</td>
<td>40</td>
<td>52</td>
</tr>
<tr>
<td>50th percentile</td>
<td>48</td>
<td>48</td>
<td>67</td>
</tr>
<tr>
<td>75th percentile</td>
<td>56</td>
<td>56</td>
<td>77</td>
</tr>
<tr>
<td>98th percentile</td>
<td>62</td>
<td>64</td>
<td>95</td>
</tr>
<tr>
<td>Maximum</td>
<td>63</td>
<td>70</td>
<td>98</td>
</tr>
</tbody>
</table>
Figure 8  
**Box-and-Whisker Plot of 1-hour Average PM$_{2.5}$ Concentrations from Continuous Monitoring at Genesee and Powers Air Monitoring Stations (Q1 2012)**

Note:  
- 25th percentile (bottom of box)  
- 50th percentile (horizontal line within box)  
- 75th percentile (top of box)  
- 98th percentile (diamond)  
- Maximum (top T)

Concentration values shown in the box-and-whisker plot are tabulated below in µg/m$^3$:

<table>
<thead>
<tr>
<th></th>
<th>Genesee</th>
<th></th>
<th>Powers</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>January</td>
<td>February</td>
<td>March</td>
<td>January</td>
<td>February</td>
<td>March</td>
<td>January</td>
<td>February</td>
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<td>February</td>
<td>March</td>
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<td>February</td>
<td>March</td>
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<td>February</td>
<td>March</td>
<td>January</td>
<td>February</td>
<td>March</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25th percentile</td>
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<td>1</td>
<td>1</td>
<td>1</td>
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<td>1</td>
<td>1</td>
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<tr>
<td>50th percentile</td>
<td>1</td>
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<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>75th percentile</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>3</td>
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<td>4</td>
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<td>4</td>
<td>3</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>98th percentile</td>
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<td>11</td>
<td>9</td>
<td>6</td>
<td>12</td>
<td>8</td>
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<td>12</td>
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<tr>
<td>Maximum</td>
<td>21</td>
<td>27</td>
<td>15</td>
<td>11</td>
<td>27</td>
<td>12</td>
<td>27</td>
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<td>15</td>
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<td>11</td>
<td>27</td>
<td>12</td>
<td>15</td>
<td>11</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Guideline (Alberta Ambient Air Quality Guideline): 80 µg/m$^3$
Section 2: Results and Discussion

Figure 9: Box-and-Whisker Plot of 24-hour Average PM$_{2.5}$ Concentrations from Continuous Monitoring at Genesee and Powers Air Monitoring Stations (Q1 2012)

Note: 25th percentile (bottom of box)  
50th percentile (horizontal line within box)  
75th percentile (top of box)  
98th percentile (diamond)  
Maximum (top T)

Concentration values shown in the box-and-whisker plot are tabulated below in µg/m$^3$:

<table>
<thead>
<tr>
<th></th>
<th>Genesee</th>
<th>Powers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>January</td>
<td>February</td>
</tr>
<tr>
<td>25th percentile</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>50th percentile</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>75th percentile</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>98th percentile</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>Maximum</td>
<td>4</td>
<td>10</td>
</tr>
</tbody>
</table>
Section 2: Results and Discussion

Figure 10 Box-and-Whisker Plot of 24-hour Average PM$_{10}$ Concentrations from Intermittent Monitoring at Genesee and Powers Air Monitoring Stations (Q1 2012)

Note: no guideline exists for PM$_{10}$

Concentration values shown in the box-and-whisker plot are tabulated below in $\mu$g/m$^3$:

<table>
<thead>
<tr>
<th></th>
<th>Genesee</th>
<th>Powers</th>
</tr>
</thead>
<tbody>
<tr>
<td>25th percentile</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>50th percentile</td>
<td>7</td>
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<tr>
<td>75th percentile</td>
<td>12</td>
<td>10</td>
</tr>
<tr>
<td>98th percentile</td>
<td>21</td>
<td>20</td>
</tr>
<tr>
<td>Maximum</td>
<td>23</td>
<td>21</td>
</tr>
</tbody>
</table>
Figure 11  Box-and-Whisker Plot of 24-hour Average PM$_{2.5}$ Concentrations from Intermittent Monitoring at Genesee and Powers Air Monitoring Stations (Q1 2012)

Note:  
- 25th percentile (bottom of box)
- 50th percentile (horizontal line within box)
- 75th percentile (top of box)
- 98th percentile (diamond)
- Maximum (top T)

Concentration values shown in the box-and-whisker plot are tabulated below in $\mu$g/m$^3$:

<table>
<thead>
<tr>
<th></th>
<th>Genesee</th>
<th>Powers</th>
</tr>
</thead>
<tbody>
<tr>
<td>25th percentile</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>50th percentile</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>75th percentile</td>
<td>9</td>
<td>5</td>
</tr>
<tr>
<td>98th percentile</td>
<td>14</td>
<td>13</td>
</tr>
<tr>
<td>Maximum</td>
<td>14</td>
<td>14</td>
</tr>
</tbody>
</table>
Figure 12  Comparison of Intermittent versus Continuous 24-hour Average PM$_{2.5}$ Concentrations (µg/m$^3$) at Genesee Air Monitoring Station during Q1 2012

Concentration values shown in the plot are tabulated below in µg/m$^3$:

<table>
<thead>
<tr>
<th>Sample date</th>
<th>Intermittent</th>
<th>Continuous</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/4/2012</td>
<td>1.3</td>
<td>1.8</td>
</tr>
<tr>
<td>1/10/2012</td>
<td>0.8</td>
<td>1.9</td>
</tr>
<tr>
<td>1/16/2012</td>
<td>6.1</td>
<td>3.3</td>
</tr>
<tr>
<td>1/22/2012</td>
<td>4.2</td>
<td>2.0</td>
</tr>
<tr>
<td>1/28/2012</td>
<td>1.8</td>
<td>0.7</td>
</tr>
<tr>
<td>2/3/2012</td>
<td>4.2</td>
<td>2.8</td>
</tr>
<tr>
<td>2/9/2012</td>
<td>13.8</td>
<td>10.1</td>
</tr>
<tr>
<td>2/15/2012</td>
<td>1.7</td>
<td>2.4</td>
</tr>
<tr>
<td>2/21/2012</td>
<td>0.8</td>
<td>0.9</td>
</tr>
<tr>
<td>2/27/2012</td>
<td>7.3</td>
<td>4.2</td>
</tr>
<tr>
<td>3/4/2012</td>
<td>9.6</td>
<td>0.4</td>
</tr>
<tr>
<td>3/10/2012</td>
<td>0.9</td>
<td>1.4</td>
</tr>
<tr>
<td>3/16/2012</td>
<td>0.2</td>
<td>1.1</td>
</tr>
<tr>
<td>3/22/2012</td>
<td>10.8</td>
<td>3.6</td>
</tr>
<tr>
<td>3/28/2012</td>
<td>12.9</td>
<td>5.1</td>
</tr>
</tbody>
</table>
Figure 13  
Comparison of Intermittent versus Continuous 24-hour Average PM$_{2.5}$ Concentrations (µg/m$^3$) at Powers Air Monitoring Station during Q1 2012

Concentration values shown in the plot are tabulated below in µg/m$^3$:

<table>
<thead>
<tr>
<th>Sample date</th>
<th>Intermittent</th>
<th>Continuous</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/4/2012</td>
<td>0.6</td>
<td>1.4</td>
</tr>
<tr>
<td>1/10/2012</td>
<td>0.5</td>
<td>1.8</td>
</tr>
<tr>
<td>1/16/2012</td>
<td>3.6</td>
<td>3.4</td>
</tr>
<tr>
<td>1/22/2012</td>
<td>2.1</td>
<td>2.8</td>
</tr>
<tr>
<td>1/28/2012</td>
<td>1.0</td>
<td>0.3</td>
</tr>
<tr>
<td>2/3/2012</td>
<td>4.5</td>
<td>3.5</td>
</tr>
<tr>
<td>2/9/2012</td>
<td>10.4</td>
<td>8.3</td>
</tr>
<tr>
<td>2/15/2012</td>
<td>2.0</td>
<td>2.3</td>
</tr>
<tr>
<td>2/21/2012</td>
<td>1.6</td>
<td>0.6</td>
</tr>
<tr>
<td>2/27/2012</td>
<td>5.2</td>
<td>2.9</td>
</tr>
<tr>
<td>3/4/2012</td>
<td>0.7</td>
<td>0.5</td>
</tr>
<tr>
<td>3/10/2012</td>
<td>1.8</td>
<td>1.0</td>
</tr>
<tr>
<td>3/16/2012</td>
<td>0.2</td>
<td>1.6</td>
</tr>
<tr>
<td>3/22/2012</td>
<td>9.6</td>
<td>3.8</td>
</tr>
<tr>
<td>3/28/2012</td>
<td>14.4</td>
<td>6.3</td>
</tr>
</tbody>
</table>
2.2 Acid Deposition Assessment Program

2.2.1 Data Completeness

Data capture rates for the acid deposition program integrated samples are presented in Table 6 for the first quarter of 2012. There were no incidences of invalid or missing data out of 42 samples sought.

Table 6 Capture Rates for Integrated Data for the Acid Deposition Assessment Program (Q1 2012)

<table>
<thead>
<tr>
<th>Station</th>
<th>Violet Grove AMS</th>
<th>Genesee AMS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>January</td>
<td>February</td>
</tr>
<tr>
<td>TSP</td>
<td>5/5</td>
<td>5/5</td>
</tr>
<tr>
<td>HNO₃</td>
<td>1/1</td>
<td>1/1</td>
</tr>
<tr>
<td>HNO₂</td>
<td>1/1</td>
<td>1/1</td>
</tr>
</tbody>
</table>

Note: Data capture rates expressed as: valid samples/total samples scheduled.

Table 7 shows data capture rates for continuous data collected at the Violet Grove and Genesee air monitoring stations for the acid deposition assessment program. Data capture rates for continuous monitoring parameters at the two air monitoring stations were well above the 90% criterion on a monthly basis.

Table 7 Capture Rates Expressed as a Percentage for Continuous Data for the Acid Deposition Assessment Program (Q1 2012)

<table>
<thead>
<tr>
<th>Station</th>
<th>Violet Grove AMS</th>
<th>Genesee AMS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>January</td>
<td>February</td>
</tr>
<tr>
<td>NO₂</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>SO₂</td>
<td>100</td>
<td>97</td>
</tr>
<tr>
<td>WSP</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>WDR</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>T₂</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>T₁₀</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>RH</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>PR</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

Note: WSP = wind speed.
WDR = wind direction.
T₂ = temperature at 2 metres height above ground.
T₁₀ = temperature at 10 metres height above ground.
RH = relative humidity.
PR = precipitation.
n/a = not applicable.
Where indicated, a bolded value represents <90% uptime.
2.3 Mercury Assessment Program

2.3.1 Data Completeness

Wet Deposition Program – There were 13 wet deposition sample collection periods (weeks) in the first quarter of 2012. From these 13 collection periods, all precipitation samples were submitted to the laboratory (Frontier Geosciences Inc.). Frontier Geosciences Inc. rated 10 precipitation samples as valid (Table 8).

The identified cause of all three invalid samples was due to poor snow capture efficiency (January and February samples). This cause was noted by the field technician. This cause represents a deficiency that is accepted to be within the normal operating limitations of sampling equipment used in the Mercury Deposition Network.

<table>
<thead>
<tr>
<th>Station</th>
<th>Genesee AMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Month</td>
<td>January</td>
</tr>
<tr>
<td>Hg wet deposition sample</td>
<td>3/5</td>
</tr>
</tbody>
</table>

Note: Data capture rates expressed as: valid samples/total samples scheduled.

2.3.2 Contraventions of Special Environmental Monitoring Programs

There were no contraventions of approval terms and applicable air quality monitoring objectives during the January to March 2012 period.
3 Summary

3.1 Regional Ambient Air Program
There was one instance of invalid or missing data for intermittent PM$_{10}$ and PM$_{2.5}$ samples out of 60 samples sought during the first quarter:

- The PM$_{10}$ sampler did not run for the March 4th NAPS sample run at Genesee AMS. A reset of the instrument showed no problems.

There were no instances of invalid or missing passive results out of 123 samples for the first quarter of 2012.

Data capture rates for continuous monitoring parameters at the air monitoring stations were well above the 90% criterion on a monthly basis as stipulated in the Air Monitoring Directive (1989).

Measured concentrations for all continuous monitoring parameters were below applicable Alberta Ambient Air Quality Guideline values or Canada Wide Standard values at each of the air monitoring stations.

There were no contraventions of approval terms and applicable air quality monitoring objectives during the January to March 2012 period.

3.2 Acid Deposition Assessment Program
There were no instances of invalid or missing data out of 42 samples sought in the first quarter of 2012.

3.3 Mercury Assessment Program
There were 10 valid precipitation samples from 13 collection periods in the wet deposition sampling program during the first quarter of 2012. The identified cause of the three invalid samples was due to poor snow capture efficiency. This cause represents a deficiency that is accepted to be within the normal operating limitations of sampling equipment used in the Mercury Deposition Network.