APPENDIX G

RADIUM RELEASE STUDIES

Radium-226 Release Controls in Cell 14 At Quirke

EcoMetrix Incorporated

CYCLE III SPECIAL STUDIES – RADIUM-226 RELEASE CONTROLS IN CELL 14 AT QUIRKE

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CYCLE III SPECIAL STUDIES – RADIUM-226 RELEASE CONTROLS IN CELL 14 AT QUIRKE

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EXECUTIVE SUMMARY

The Quirke Site (the Site) is a decommissioned uranium mine property located approximately 13 km north of the City of Elliot Lake and immediately north of Dunlop Lake. The Site is own and managed by Rio Algom Limited (RAL).

EcoMetrix Incorporated (EcoMetrix) was retained by RAL to complete a directed study that focused on the release of Ra-226 from the submerged tailings to the basin water in Cell 14 at the Quirke Tailings Management Area (TMA).

The main objectives of this investigation were to evaluate Ra-226 activities in solids, porewater and basin water to develop an understanding of the controls on Ra-226 releases to the basin water in Cell 14 in order to address the uncertainties related to the release of Ra-226 to the basin water that arose from the inconsistencies between the results from routine monitoring and those from the Martin *et al.* (2003) study. Another objective was to provide reasonable estimates for Ra-226 activities that may be observed in the basin water.

The investigation focused on Ra-226 activities in the solids, porewater and basin water in Cell 14 of the Quirke TMA to fill knowledge gaps and bound uncertainties related to the release of Ra-226 to the basin waters in Cell 14 that arose from inconsistencies between the results from routine monitoring and those from the Martin *et al*. (2003) study. It was understood that any release of Ra-226 to the basin water would be initiated in the solid phase but that the release from solids would be reflected by activities/concentrations in the porewater before eventual release to the overlying water.

Four stations were sampled in Cell 14 in September 2009 to obtain representative samples to quantify activities/concentrations of Ra-226 and other constituents that can potentially play a role in Ra-226 mobility in the tailings basin.

The Ra-226 activities as high as 70 Bq/L in porewater and 30 Bq/L in basin water measured in Cell 14 by Martin et al. (2003) were not observed in this investigation or during routine monitoring in the Quirke TMA. Although, field observations, together with TOC contents, suggested there could be a potential for sulphate reduction in the top portions of the tailings at QC14-2, there was no evidence of the consequential high release of Ra-226 to porewater in this study. The Ra-226 activities in the top samples at QC15-2 were 3.6 and 2.8 Bq/L.

Two mechanisms that could potentially control Ra-226 and barium activities/concentrations in the porewater, sorption and solubility controls were considered in this study. The first mechanism, sorption, can be represented by a Kd model and assumes that Ra-226 is distributed between solids and water so that the activities in the water are linearly correlated to the activities in the solids. The second mechanism, solubility, assumes that barium, for example, is distributed between the solids and water on the basis of thermodynamic solubility. The solubility model infers that the concentration of a constituent in the water is

independent of the content in the solids, but will depend on the concentration of the companion ion in the water phase. These two models may not be mutually exclusive, and therefore, both mechanisms may influence Ra-226 and barium activities/concentrations in porewater.

Plots for Ra-226 and barium activities/concentrations in solids and porewater showed that the sorption equilibrium, or Kd, model does not dominate the solids-porewater interactions in Cell 14.

Strong correlations between Ra-226 and barium in both the tailings solids and porewater support a similar mechanism for the formation of Ra-226 and barium in solids and suggest that solubility equilibrium controls Ra-226 and barium activities/concentrations in porewater.

The inverse relationship between Ra-226 and calcium indicated that Ra-226 activities in the porewater are not directly controlled by gypsum dissolution as the conceptual model in the EIS suggests. Instead, the inverse correlation between Ra-226 and calcium results from indirect controls by gypsum related to the linkage between high calcium and sulphate in the presence of gypsum. The sulphate concentrations control the Ra-226 activities in porewater and therefore, the presence of gypsum in the tailings solids indirectly controls the Ra-226 activities. This does not contradict the conceptual model in the EIS but provides a refinement of the interpretation of the model.

Inverse correlations between barium and sulphate and between Ra-226 and sulphate indicated that the solubility of a solid sulphate phase controls the concentrations of barium and the activity of Ra-226 in water that is in contact with the tailings solids. The theoretical solubility of barium and sulphate in equilibrium with $BaSO_4$ solids provided further evidence that barium concentrations, and therefore Ra-226 activities, are controlled by sulphate concentrations.

Solubility theory suggested that barium and Ra-226 activities will increase as sulphate concentrations decrease. Results from Cell 14 showed Ra-226 activities between 3 and 7 Bq/L in porewaters associated with sulphate concentrations below 30 mg/L. Radium-226 activities in porewater did not exceed 5 Bq/L in the top portions of the tailings, the primary location where the transfer of Ra-226 from porewater to basin water is controlled.

The theoretical solubility of $BaSO_4$, together with the strong correlation between Ra-226 and barium in porewater were used to predict Ra-226 activities in porewater. A Ra-226 activity of 4 Bq/L in porewater was predicted for a sulphate concentration of 5 mg/L. This result is consistent with the measured porewater data from Cell 14 that exhibited Ra-226 activities of 4.1 and 3.4 Bq/L when sulphate concentrations were 6 and 7 mg/L, respectively. A maximum Ra-226 activity of 5 Bq/L measured in the top portions of the tailings porewater in Cell 14 provides a reasonable upper limit for Ra-226 activities that could be anticipated in submerged tailings porewater, for existing conditions.

Concentration gradients between Ra-226 activities in the porewater and basin imply upward diffusion and mass transport of Ra-226 from porewater to the overlying water. In Cell 14 there are no up-gradient cells and therefore diffusive transport is the primary mechanism for Ra-226 release to the basin water.

A total Ra-226 load and activity of 666 MBq/a was calculated for diffusive flux assuming an average porewater activity for Ra-226 of 3.6 Bq/L. This diffusive load agrees well with the Ra-226 load of 579 MBq/a estimated from routine monitoring data. Radium-226 activities in the basin water in Cell 14 resulting from diffusive flux were estimated to be in the range of 0.27 to 0.76 Bq/L. These values were consistent with the range of annual average values from the routine monitoring data of 0.34 to 0.52 Bq/L. The load and activity calculations provided strong evidence that releases of Ra-226 from porewater to basin water are controlled by diffusive flux.

A range for Ra-226 activities of 0.42 to 1.15 Bq/L in basin water was predicted for a condition with Ra-226 activities of 5 Bq/L in porewater. These calculations provide an indication of Ra-226 activities that could be observed if porewater activities in the upper few centimetres of tailings approach maximum values that were observed in Cell 14 during this study.

As a sensitivity exercise, the Ra-226 activity in porewater was estimated for a sulphate concentration of 0.5 mg/L. Based on the solubility of $BaSO_4$ and the relationship between radium activities and barium concentrations, the predicted Ra-226 activity was 15 Bq/L. Furthermore, Ra-226 activities in basin water were predicted by assuming that porewater activities of 15 Bq/L and 5 Bq/L occurred over 25 and 75% of the tailings area in Cell 14, respectively. If this type of condition was to develop, the predicted Ra-226 activities in basin water were in the range of 0.67 to 1.87 Bq/L, for these assumptions. These calculations provide an indication for Ra-226 activities that could be observed in basin water for the Ra-226 activities in porewater either observed or assumed in this study, if pockets of sulphate reducing conditions were to develop in Cell 14 and sulphate concentrations of less than 1 mg/L occurred in the porewater.

Although possible, it is unlikely that significant areas of sulphate reduction could occur without an accumulation of organic material at the surface of the tailings that would also act as a diffusion barrier in the long term. An organic layer would mitigate the diffusive flux of Ra-226 by acting as a physical barrier by decreasing concentration gradients, as well as a chemical barrier by sorbing Ra-226 to the carbon solids. Therefore, in the long term, the risk of highly elevated Ra-226 activities in tailings porewater and basin wateras a result of sulphate reduction is considered to be very low.

There is no evidence of highly elevated levels in the basin or tailings porewater as of 2009. The monitoring program is considered to be more than adequate to detect any major changes in Ra-226 levels or possible geochemical conditions in the tailings porewater and the risk of abrupt changes is very low to non-existent.

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1.0 INTRODUCTION

The Quirke Site is a decommissioned uranium mine property located approximately 13 km north of the City of Elliot Lake and immediately north of Dunlop Lake (**Figure 1.1**). The Site is owned and managed by Rio Algom Limited (RAL).

EcoMetrix Incorporated (EcoMetrix) was retained by RAL to complete a directed study that focused on the release of Ra-226 from the submerged tailings to the basin water in Cell 14 at the Quirke Tailings Management Area (TMA).

Routine monitoring at the Quirke Mine Site is conducted as three directed studies. The Serpent River Watershed Monitoring Program (SRWMP) is a comprehensive watershed monitoring program that was implemented to replace the various, mine-specific environmental monitoring programs at each mine site. The Source Area Monitoring Program (SAMP) was developed to monitor the nature and quantity of constituents that discharge from the TMAs to the Serpent River Watershed. The TMA Operational Monitoring Program (TOMP) was designed to evaluate the performance of the TMAs.

EcoMetrix completed performance evaluations of the SAMP and TOMP data (EcoMetrix, 2008). As part of the review, and where appropriate, special studies were suggested to complement the monitoring programs as well as to refine our understanding of the long-term performances of the tailings facilities. It was recommended that a special study be conducted, at the Quirke TMA to address the uncertainty related to the release of Ra-226 to the basin water that arose from inconsistencies between the results from routine monitoring and those from other studies in Quirke Cell 14, specifically Martin *et al*. (2003).

1.1 Objectives and Scope of Work

The main objectives of this investigation were to evaluate Ra-226 activities in solids, porewater and basin water to develop an understanding of the controls on Ra-226 releases to the basin water in Cell 14 in order to address the uncertainties related to the release of Ra-226 to the basin water that arose from the inconsistencies between the results from routine monitoring and those from the Martin *et al.* (2003) study. Another objective was to provide reasonable estimates for Ra-226 activities that may be observed in the basin water.

The scope of work for this investigation included the following:

- review of routine monitoring data from the Quirke TMA, as well as previous studies related Ra-226 releases in Cell 14;
- collection of core samples and analysis of solids, porewater and basin water from four locations within Cell 14;

- data assessment of constituents that theoretically play a role in Ra-226 mobility;
- assessment of Ra-226 and other constituent activity/concentrations in the solids, porewater and basin water to understand controls for Ra-226 release to the basin water; and
- assessment of ranges of Ra-226 activities that could develop in the basin Cell 14 surface water associated with a range of Ra-226 activities in porewater.

2.0 BACKGROUND

The following section provides background information on the Quirke TMA, a discussion of the theoretical controls on Ra-226 release to overlying waters, a summary of previous studies conducted on Cell 14 relating to the release of Ra-226 as well as a summary of relevant trends observed for the routine monitoring at the Quirke TMA.

2.1 Quirke TMA Tailings and Configuration

The Quirke mine and mill operated from 1956 to 1961, and in 1968 the mine was re-opened and operated until closure in August, 1990. The Quirke mill produced approximately 42 million tonnes of tailings that were placed in the TMA.

The milling process consisted of a hot dilute sulphuric acid leach followed by removal of the uranium via precipitation of ammonium diuranate (yellow cake). The acidic wastes (i.e., tailings) generated during the milling process were neutralized with lime to pH values of 8.5 to 10.5 prior to discharge to the tailings basin (Rio Algom, 1995).

The Quirke Tailings Management Area (TMA) consists of five terraced flooded cells (Cells 14 to 18) within a bedrock-rimmed basin, separated by engineered, low permeability dykes that were constructed on the existing tailings (**Figure 2.1**). Upon closure, the tailings cells were flooded by raising the original dams to mitigate acid generation. Cell 14 was flooded by raising Dyke 14 between 1991 and 1992. Downstream of Cell 14, Cells 15 and 16 were flooded in 1994 by raising Dykes 15 and 16 and Cell 17 was flooded in 1995 by raising Dyke 17 (Golder, 1996).

A total elevation change of 14 m exists between Cell 14 and Cell 18, the final downstream cell. **Figure 2.2** provides a schematic of the cross-sectional profile of the Quirke TMA and the flow conditions within the flooded basin. The changes in water elevations across the TMA induced subsurface flow (seepage) through the tailings below the internal dykes.

2.2 Conceptual Model for Ra-226 Release

As part of the Environmental Impact Statement (EIS) for the Quirke Mine predictive model simulations using the Uranium Tailings Assessment Program (UTAP.3) were performed to predict future Ra-226 activities and sulphate concentrations in the porewater and basin water in the Quirke TMA. The model predicted Ra-226 activities of 0.5 and 1.5 Bq/L in the porewater after approximately 50 and 100 years, respectively. The predicted Ra-226 activities in the basin water were 0.4 and 0.5 Bq/L after 50 and 100 years. Model sensitivity analysis predicted a range in Ra-226 activities between 0.7 and 2.9 Bq/L in the basin at the Quirke TMA. The model predicted sulphate concentrations that remained at 1,600 and 350 mg/L in the porewater and basin water, respectively, for the first 100 years. After approximately 300 years, sulphate concentrations were predicted to decline to 100 and 50 mg/L in the porewater and basin water, respectively (Rio Algom, 1995).

The Ra-226 activities predicted in porewater and basin water were explained by the following conceptual model. Ra-226 activities in the Quirke basin are related to sulphate because the source of Ra-226 is the dissolution of Ra-226 bearing sulphate precipitates, such as gypsum ($CaSO_4 \cdot 2H_2O$) and barite ($BaSO_4$). In the first 300 years, the major source of Ra-226 in the porewater and basin water were expected to be controlled by the dissolution of gypsum that contains co-precipitated Ra-226 ($Ca,RaSO_4 \cdot 2H_2O$). Once gypsum is depleted from the solids after approximately 300 years, the Ra-226 activities in solution were expected to be controlled by the dissolution of barite that contains co-precipitated Ra-226 ($Ba,RaSO_4$) (SENES, 1992). Therefore, solubility theory suggests that the Ra-226 activities will be depressed if sulphate concentrations remain high, near gypsum solubility for example, and could increase when sulphate concentrations decline.

2.3 Previous Studies in Cell 14

Peacey *et al*. (2002) observed an increase in Ra-226 from 0.7 Bq/L to 2.5 Bq/L in the basin water of Cell 14 from 1992 to 1999. The increase in concentrations was accompanied by an increase in Ra-226 loads to the overlying water, and a decrease in sulphate loads. The primary mechanism was attributed to the diffusive flux of Ra-226 from porewater to the overlying basin water. These observations are consistent with the conceptual model for Ra-226.

Martin *et al*. (2003) reported on a field investigation in Cell 14 completed in July 2000. Peeper techniques, together with coring, were used to evaluate the direction of Ra-226 fluxes. Sampling was conducted at 4 sampling stations along a transect in Cell 14 at water depths between 0.43 and 2.70 m. Peepers were installed at stations Q1, Q3 and Q5, and cores were collected from Q1, Q3 and Q6.

The relevant findings from Martin *et al*. (2003) include the following:

- uniform concentration gradients between the porewater and basin water were observed at Q1 and Q3 corresponding to an area with shallow water depths of approximately 0.50 m and devoid of vegetation. A maximum Ra-226 activity of 5 Bq/L at 5 cm below the sediment-water interface was observed and Ra-226 activities decreased to 0.5 Bq/L in the water column above the tailings. Radium-226 activities in the basin waters at those locations were hypothesized to be controlled by the dissolution of $Ba,RaSO_4$.

- Ra-226 activities as high as 70 Bq/L in porewater that decreased to 30 Bq/L in the water column were reported at station Q5 in a deeper area of the cell with a water depth of 2.70 m. At this station extensive macrophyte beds were observed. It was hypothesized that the macrophytes inhibit water circulation, creating anoxic conditions at the surface-water interface. The elevated Ra-226 activities were interpreted to be controlled by anaerobic decomposition of sulphate phases by sulphate reducing bacteria, thereby releasing Ba and Ra-226 that diffused upward into the overlying water.

2.4 Diffusion Barrier Implementation

In response to the previous studies that indicated increasing Ra-226 activities in the basin water of Cell 14, RAL initiated a study on the potential effectiveness of placing a diffusion barrier over the tailings to reduce the flux of Ra-226 into the water column. Expected Ra-226 activities in the basin water were modeled for varying depths of cover over the tailings (SENES, 2003). Initial activities were selected to be 5 Bq/L in porewater and 0.61 Bq/L in basin water. High and low monthly flow rates were considered by analysing eight years of data from 1995 to 2002. The average for June represented the high flow and that for February represented the low flow months. The model predicted that with no cover applied the Ra-226 activities in the overlying basin water would be 0.59 Bq/L and 1.8 Bq/L for high and low flow conditions, respectively. The predicted activities in the basin water were 0.07 Bq/L for high flow and 0.23 Bq/L for low conditions if a 5 cm cover was constructed. The model was also used to predict the effectiveness of 10 and 15 cm thick covers. The results from the 10 and 15 cm cover scenarios predicated Ra-226 activities in the basin water that ranged from 0.03 to 0.16 Bq/L and 0.03 to 0.12 Bq/L, respectively, suggesting that there would be very little added benefit by increasing the barrier thickness above 10 cm.

In the winter of 2004, Cell 14 was dewatered and a 10 cm thick diffusion barrier consisting of sand was applied to 68% the cell to reduce the diffusive flux of Ra-226 from the tailings to the basin water. The remaining 32% of the deeper centre portions of the cell were not covered as they were inaccessible due to soft ground conditions even during freeze-up after dewatering of Cell 14. At that time, the till blanket initially placed in 1997 to reduce seepage from Cell 14 to Cell 15, was extended (**Figure 2.3**) to reduce seepage from the cell and to help maintain the water cover over the tailings. A schematic illustrating the extent of the diffusion barrier and till blanket is provided in **Figure 2.3**. The area in the vicinity of station Q5 with the reported Ra-226 activities of 70 Bq/L in tailings porewater in the Martin *et al*. (2003) study was not covered.

2.5 Routine Monitoring Data

This Section discusses the routine monitoring of basin water and porewater in each cell at the Quirke TMA. The locations of the routine monitoring stations are illustrated in **Figure 2.1**. The complete data sets are provided in **Appendix 1**.

2.5.1 Basin Surface Water Quality

Ra-226 and sulphate concentrations in the outflow from each cell are presented as time trend plots in **Figure 2.4**

Closure of the Quirke mill and flooding of the Quirke TMA (early 1990s) reduced Ra-226 activities upstream of the treatment plant by nearly an order of magnitude (**Figure 2.4**). Following installation of the diffusion barrier in Cell 14 in 2003, radium concentrations in Cell 14 declined from highs of 2.3 Bq/L in 2002 to a maximum of 0.69 Bq/L observed in November 2009. The maximum Ra-226 activities have remained lower than those observed prior to the diffusion barrier application.

Radium activities in Cells 15 and 16 have remained less than 0.8 Bq/L, with maximum activities in Cells 17 and 18 remaining below 1.5 Bq/L since the early 1990s. There are no statistically significant trends in basin surface water Ra-226 activities at the Quirke TMA since the TOMP was initiated in 2003 (Minnow, 2011).

Sulphate concentrations less than 20 mg/L in Cell 14 increase to 1,500 mg/L in Cell 18 reflecting continued flushing of historic oxidation products from the tailings. **Figure 2.4** indicates a long-term decreasing trend in sulphate concentrations in Cell 18 that has been statistically confirmed for the TOMP reporting period (Minnow, 2011).

2.5.2 Porewater in Basin Piezometers

Quirke porewater monitoring stations are located on the downstream side of the internal dykes as shown in **Figure 2.1**. Radium activities in porewater were determined annually for the period 1995 through 2003 and as part of the radium studies in 2010. A summary of the Ra-226 activities measured in the porewater from the downstream piezometers is provided in **Table 2.1**.

Radium-226 activities in the porewater in Cell 15 are represented by piezometer nest DK14-5 that is located along the downstream side of Dyke 14. The Ra-226 activities in the porewater ranged between 0.22 and 3.3 Bq/L, with an average value of 1.6 Bq/L.

The porewater quality in Cell 16 is represented by piezometer nests DK15-2 and DK15-4. The minimum and maximum Ra-226 activities measured in these wells were 0.23 and 4.2 Bq/L, respectively. The average Ra-226 activity in the porewater from Cell 16 was 2.9 Bq/L.

The porewater quality in Cell 17 is represented by piezometer nest DK16-2. The Ra-226 activities in the porewater in Cell 17 were in the range of 3.2 to 14 Bq/L, with an average of 7.9 Bq/L.

Radium-226 activities in porewater in Cell 18 are represented by piezometer nest DK17-2. The minimum and maximum Ra-226 activities in Cell 18 were 1.0 and 6.6 Bq/L, respectively. The average Ra-226 activity measured in Cell 18 was 4.0 Bq/L.

3.0 SAMPLE COLLECTION AND PROCESSING

Sampling was conducted at four stations in Cell 14 to obtain representative samples to quantify activities/concentrations of Ra-226 and other constituents that theoretically could play a role in Ra-226 mobility within the tailings basin. The sample stations were located in areas that were not influenced by either the till blanket or the diffusion barrier and that were located in the vicinity of the sample stations presented in Martin *et al.* (2003). A site map illustrating the sampling locations is provided in **Figure 3.1**.

3.1 Sediment Samples

Sediment samples were collected at each of the four stations using a 4-inch K-B coring device. At each location a total of four cores were collected to achieve sufficient sample volume for porewater extraction from the sediments.

The cores were sectioned at 2.5 to 5 cm intervals to depths of 10 to 20 cm. The intervals from the core sets from each sampling station were composited and placed into dedicated Ziploc bags and stored at 4°C until the porewater samples were extracted.

After the porewater was extracted (described in **Section 3.2**) the sediment samples were placed into dedicated Ziploc bags and stored at 4°C until analysed. Tailings samples were submitted to SGS Lakefield Laboratories for chemical analysis that included Ra-226, metals, major ions, as well as, sulphur and carbon series. Radium-226 analyses were completed by Becquerel Laboratories under subcontract to SGS Lakefield.

3.2 Porewater Samples

Porewater samples were extracted from the core samples in a field-based laboratory facility within 24 hours of collection. Each 5 cm interval from the composited core sets collected at each sampling station were transferred into 750 mL centrifuge bottles. The samples were centrifuged at approximately 3500 rpm for 45 to 50 minutes. After centrifugation, the porewater was decanted and filtered through a 0.45μm nylon filter. The pH of the filtered porewater samples was measured and recorded. The samples were then transferred into sample bottles supplied by SGS Lakefield and samples to be analysed for metals and Ra-226 were preserved with nitric acid. All samples were stored at 4°C until analysis.

Porewater samples were sent to SGS Lakefield Laboratories for chemical analysis of Ra-226, metals, major ions, sulphate, dissolved organic carbon (DOC) and acidity. Radium-226 was analysed by Becquerel Laboratories under subcontract to SGS Lakefield. Becquerel required 200 mL of sample to attain a detection limit of 0.01 Bq/L by alpha spectroscopy.

3.3 Basin Surface Water Samples

Basin water samples were collected at each of the four stations from the top of the water column and at the sediment/water interface. The sediment/water interface samples were collected and composited by siphoning the water above the solids in the core tubes.

All water samples were field filtered through a 0.45 µm nylon filter and the pH of the basin water samples was measured and recorded. Water samples were then transferred into sample bottles supplied by SGS Lakefield and samples to be analysed for metals and Ra-226 were preserved with nitric acid. All samples were stored at 4°C until analysis.

Basin water samples were sent to SGS Lakefield Laboratories for chemical analysis of Ra-226, metals, major ions, sulphate, dissolved organic carbon and acidity. Radium-226 analyses were completed by Becquerel Laboratories under subcontract to SGS Lakefield.

3.4 Field Observations

At the time of sample collection field observations did not indicate the presences of any macrophytes at any of the sampling stations. One dissolved oxygen measurement with a value of 8.25 mg/L was taken at the bottom of the water column at QC14-2. There were no notable hydrogen sulphide (H_2S) odours detected in most of core samples at the time of core sample processing. However, a faint H_2S odour was noted in the samples from the top 5 cm at QC14-2, as well as in the replicate core sets, Core09-EC-2 collected at the same location. Photographs of the core samples collected at sampling stations QC14-1 and QC14-2 are provided in **Figure 3.2**. The photograph of the cores collected at QC14-2 show a black layer in the top 5 cm. The organic carbon content of this layer, as shown in the results, was not markedly different from those in the other cores at similar depths.

4.0 QUALITY ASSURANCE/QUALITY CONTROL

The field campaign that was conducted by EcoMetrix personnel in September 2009 included the collection of samples from three different decommissioned mine sites (Panel, Quirke and Denison) in the Elliot Lake area. The field campaign was carried out to help gain a further understanding of the knowledge gaps identified in the Cycle III SAMP and TOMP performance evaluation (EcoMetrix, 2008).

A detailed quality assessment (DQA) was completed by EcoMetrix to evaluate the quality of the data collected during Cycle III Special Studies Field Campaign. Similar sampling methods and procedures were used at each mine site therefore the data quality assessment incorporated all of the QA/QC data collected during the field sampling campaign. This section provides a summary of the QA/QC for selected constituents that are discussed in this report. Data quality results for the selected constituents are summarized in **Tables 4.1 to 4.3**. Data quality results for all of the constituents analysed and for duplicates and replicates from all studies are provided **Appendix 2**.

The precision of the duplicate and replicate samples were evaluated by calculating the relative percent difference (RPD) as follows:

$$RPD = \frac{2|C_1 - C_2|}{C_1 + C_2} \times 100\%$$

where: C_1 = sample concentration; and

C_2 = replicate (or duplicate) concentration.

The Data Quality Objectives (DQO) for solids samples were less than or equal to a RPD value of 40%. The DQO for water samples were less than or equal to a RPD value of 20%.

For duplicate/replicate samples having concentrations less than five times the detection limit, the DQO was the absolute difference (AD) between the sample and duplicate/replicate that should not have been greater than the detection limit value.

Blind duplicates and replicates of solids and water samples, as well as laboratory blank sample (distilled water), were submitted to SGS Lakefield. Duplicate samples were labeled as EC-1 and replicate samples were labeled as EC-2. The duplicate samples are split samples of solids, porewater or basin water collected from a selected core section or sampling station. The solids replicate samples are replicate core sets from sampling station QC14-2 and were sectioned in accordance with study protocols. Replicate water samples were collected from porewater generated from replicate core sections or from replicate basin water sampling. The calculated RPD or AD values for selected constituents are presented in **Tables 4.1 to 4.2**.

4.1 Solids Sample Data Quality Assessment

The DQA for selected constituents in field duplicates from Cores 09-PSB-2 and 09-SR-4 are summarized in **Table 4.1a**. On average, the DQO of 40% was achieved for all selected constituents (Ra-226, barium, calcium, sulphate and total organic carbon), with the exception of three exceedances observed in the Core09-PSB-2 duplicate. Calcium and barium that had RPD values less than 55% and sulphate had an AD value of 0.3. As these values were only marginally above the DQOs, there are no impacts on the interpretation of the results.

The DQA for selected constituents in replicate core section intervals of Core09-QC14-2 (0-2.5), (2.5-5) and (5-7.5) are summarized in **Table 4.1b**. On average, the DQO of 40% was achieved for all selected constituents, except for Ra-226 where the average RPD was 48%. For Ra-226 the DQO of 40% was exceeded twice with RPD values of 73% and 48%. For barium the DQO was exceeded twice with RPD values of 51% and 60%. As these values were only marginally above the DQOs, there are no impacts on the interpretation of the results.

4.2 Water Sample Data Quality Assessment

Two duplicate and 5 replicate water samples were collected and analysed. The duplicate and replicate RPD values were compared to a DQO of ≤20%. The DQA for selected constituents in the water samples are presented in **Tables 4.2 a and b**.

When basin water samples were analysed for total organic carbon (TOC) and dissolved organic carbon (DOC) it was noted by SGS Lakefield that higher DOC concentrations were measured than TOC concentrations (Chris Sullivan pers. Comm., 2009). Upon further investigation, the source of this discrepancy was found. The basin water samples were collected in sample bottles that were previously acidified with nitric acid in preparation for storage of samples for metals analysis. The bottles were rinsed three times in the field before collection of the samples. However, this rinsing was insufficient to remove all traces of nitric acid. As a result, the dissolved organic carbon concentrations measured in the samples more likely represent total organic carbon concentrations. Therefore, during this study the DOC values are referred to as organic carbon (OC). In the context of this investigation and the use of the data for interpretation of Ra-226 mobility, this small bias in OC concentrations was not considered to be important because these differences do not change the interpretation or conclusions of this study.

As shown on **Table 4.2a**, the DQO of 20% in duplicate water samples was achieved for Ra-226, barium and calcium. Duplicate water samples are sample splits of basin water or porewater extracted from sectioned cores. The Ra-266 duplicate sample for PW09-EC-1 (5-10) is PW09-QC14-4 (0-5). The barium and calcium duplicate sample for PW09-EC-1

(5-10) is PW09-QC14-3 (0-5). Sulphate and OC duplicates were not analysed because of insufficient sample volume.

As shown on **Table 4.2b**, the DQO of 20% in replicate water samples was achieved on average for Ra-226, barium and calcium, with one DQO exceedance for Ra-226 with an RPD value of 22% in a replicate porewater sample. The average RPD of 21% for sulphate is marginally above the DQO. One DQO exceedance for sulphate had an RPD 40% in a replicate porewater sample. The average RPD value for organic carbon was 32%. Three of the four samples exceeded the DQO of 20%, with a maximum RPD of 50%. However, in the context of this investigation and the use of the OC data for interpretation of Ra-226 mobility, the DQO exceedences in basin water were not considered to be important.

4.3 Blank Sample Data Quality Assessment

One blank sample was subjected to the porewater extraction process that included centrifugation followed by filtration to determine potential for cross-contamination between samples. The results for selected constituents in the blank are provided **Table 4.3**. The Ra-226 activities and sulphate concentrations were below detection limits of 0.01 Bq/L and 2 mg/L, respectively. The calcium concentration in the blank sample was 0.03 mg/L and met the DQO of 0.06 mg/L. The dissolved barium concentration in the blank was 0.00216 mg/L and exceeded the DQO of 0.00002 mg/L. The OC concentration in the blank sample was 2.4 mg/L and marginally exceeded the DQO of 2.0 mg/L.

Barium concentrations measured in most of the water samples for the DQA (**Table 4.3**) are at least two orders of magnitude greater than the barium concentration measured in the blank. Therefore, the barium concentration that may be attributed to cross-contamination was negligible. The source of OC in the blank is not known. However, the average concentration of OC in all of the water samples was approximately 14 mg/L, therefore carry over or cross contamination was not expected to affect the interpretation of the data in this investigation.

4.4 Laboratory Quality Assurance and Quality Control

Laboratory Quality Assurance/Quality Control (QA/QC) included analysis of laboratory blanks and laboratory duplicate sample analyses. The Certificates of Analysis, including internal laboratory QA/QC results, are provided in **Appendix 3** and indicate that the data have acceptable accuracy and precision.

5.0 RESULTS OF FIELD SAMPLING

Select results from the September 2009 field sampling program are presented in **Figures 5.1 and 5.2** and are summarized in **Tables 5.1 to 5.3**. Concentrations of selected metals in the solids are provided in **Figure 5.1** as depth profiles at each of the sampling stations in Cell 14. **Figure 5.2** presents depth profiles for the porewaters that correspond to the solids samples, as well as the basin water samples collected at each sampling station. The basin water samples plotted above the surface water interface are not to scale. The actual depths for these samples below surface are provided in **Table 5.3**. The analytical data for all of the constituents are provided as Certificates of Analysis in **Appendix 3**.

5.1 Solids Samples

The results for selected constituents from the solids analyses are presented in **Table 5.1**.

Radium-226 activities in the solids generally ranged from 9.0 to 24 Bq/g. The upper two sections of Core09-QC14-2 had values below this range with Ra-226 activities of 4.3 and 6.5 Bq/g, respectively. Similar trends were observed for barium where concentrations in the solids generally ranged from 280 to 660 mg/kg, with values below this range of 150 and 220 mg/kg reported for the same upper two sections of Core09-QC14-2.

Calcium concentrations in solids generally ranged from 150 to 15,000 mg/kg with lower concentrations observed in the mid-basin profiles at QC14-2 and QC14-3 relative to the more distal samples at QC14-1 and QC14-4. The calcium concentrations at QC14-2 and QC14-3 ranged from 59 to 1,300 mg/kg, while the concentrations at QC14-1 and QC14-4 ranged from 1,400 to 19,000 mg/kg.

Sulphate concentrations in the solids generally ranged from 0.1% to 3.6%. The trends observed for calcium concentrations were also observed for sulphate concentrations where lower concentrations were observed in the mid-basin profiles at QC14-2 and QC14-3 compared to the more distal samples at QC14-1 and QC14-4. The sulphate concentrations measured at QC14-2 and QC14-3 ranged from less than detection limit of 0.1 to 0.3%, while the concentrations at QC-14-1 and QC14-4 ranged from 0.2 to 3.6%.

Total organic carbon (TOC) concentrations were similar among all sample stations. The highest TOC concentrations were measured in the upper portions of the solids (0 to 5 cm) and ranged from 0.29 to 0.68%. At all of the stations the TOC contents decreased with depth to values ranging from 0.07 to 0.11%. Field observations indicated a faint H_2S odour and a black layer in the top samples collected at QC14-2 even though TOC was present in all samples.

Depth profiles for Ra-226, barium, calcium, sulphate and TOC in the solids are presented in **Figure 5.1**. The depth profiles for Ra-226 and barium show similar trends where the activities/concentrations were generally lower in the upper portions of solids and decreased with depth.

The depth profiles for sulphate at QC14-1 and QC14-4 exhibited the lowest concentrations measured in the top portions of the solids that increased with depth. Maximum sulphate concentrations were measured in the 5 to 10 cm interval at QC14-1 and in the 10 to 15 cm interval at QC14-4. The trends for sulphate concentrations at QC14-2 and QC14-3 were generally uniform with depth. The depth profiles for calcium concentrations at each station exhibited similar trends to those observed for sulphate.

Depth profiles for TOC were consistent among the sample stations where the highest contents were measured in the top portions of the solids and the lowest contents were measured at depth.

5.2 Porewater and Basin Water Samples

The results for selected constituents in porewater and basin water samples are presented in **Tables 5.2 and 5.3**.

Radium-226 activities in the porewaters generally ranged from 0.42 to 4.8 Bq/L. The lower two sections of core 09-QC14-2 had values above this range with Ra-226 activities of 5.9 and 6.9 Bq/L, respectively. Similar trends were observed for barium where concentrations generally ranged from 0.02 to 0.33 mg/L with values above this range of 0.519 and 0.499 Bq/L reported for the same lower two sections of core 09-QC14-2.

Calcium concentrations in porewater were in the range of 6 to 530 mg/L with lower concentrations observed in the mid-basin profiles at QC14-2 and QC14-3 relative to the more distal samples at QC14-1 and QC14-4. The calcium concentrations at QC14-2 and QC14-3 ranged from 5.7 to 97.4 mg/L, while the concentrations at QC14-1 and QC14-4 ranged from 195 to 536 mg/L.

The trends for sulphate concentrations in porewater were similar to those observed for calcium, with the lowest sulphate concentrations in the mid-basin profiles at QC14-2 and QC14-3 compared to more distal samples collected at QC14-1 and QC14-4. The sulphate concentrations at QC14-2 and QC14-3 ranged 6 to 240 mg/L, while the concentrations at QC14-1 and QC14-4 ranged from 560 to 1,500 mg/L. Where there was inadequate sample volume for sulphate analysis in porewaters by ion chromatography, concentrations were calculated from sulphur concentrations reported in the ICP results (**Table 5.3**).

Organic carbon (OC) concentrations in the porewater ranged from 2.8 to 28 mg/L with concentrations generally decreasing with depth. The highest OC concentrations were measured at QC14-2 and ranged from 28 mg/L in the uppermost porewater sample (0 to 2.5 cm) to 17.9 mg/L in the 5 to 7.5 cm sample interval.

Radium-226 activities and barium and calcium concentrations in the basin waters were similar among sample stations with moderately elevated Ra-226 in bottom samples adjacent to the solids-water interface. The Ra-226 activities in the basin waters ranged from 0.71 to 1.0 Bq/L with average activities of 0.77 Bq/L in the top samples compared to average activities of 0.95 Bq/L in the bottom samples. Barium concentrations ranged from 0.099 to 0.116 mg/L and calcium concentrations were between 5.55 and 6.24 mg/L. Sulphate concentrations in the basin waters were similar at all sample stations with marginally higher sulphate concentrations measured at the top of the water column. The sulphate concentrations measured at the top of the water column ranged from 54 to 72 mg/L, while sulphate concentrations measured at the tailings-water interface ranged from 25 to 35 mg/L. Organic carbon concentrations in the basin waters ranged from 13.3 to 19.4 mg/L and were consistent between top and bottom samples and among sample stations.

Depth profiles for Ra-226, barium, calcium, sulphate and OC in porewater and basin water are presented in **Figure 5.2**. The basin water samples represent the top and bottom of the water column and are not plotted to scale. The actual depths below the water surface for each basin water sample are presented in **Table 5.3**.

The Ra-226 and barium depth concentration profiles within tailings generally exhibited similar trends with the highest activities/concentrations measured in the porewater in the 0 to 5 cm depth interval, with the exception of samples collected at QC14-2. The highest Ra-226 activities and barium concentrations in the porewater were measured depth at QC14-2.

Depth profiles for sulphate and calcium in porewater exhibited similar trends where the lowest concentrations were measured in the 0 to 5 cm interval and the highest concentrations were measured at depth. The sulphate and calcium concentrations measured in samples at QC14-2 were similar below a depth of 2.5 cm.

With the exception of QC14-2, the concentrations of OC in porewater samples were lower than those in the water column.

6.0 DISCUSSION

This phase of the Cycle III Special Studies was completed to fill knowledge gaps and bound uncertainties related to the release of Ra-226 to the basin waters in Cell 14 that arose from inconsistencies between the results from routine monitoring and those from the Martin *et al*. (2003) study. The investigation focused on Ra-226 activities in the solids, porewater and basin water in Cell 14 of the Quirke TMA. This approach was taken because it was understood that any release of Ra-226 to the basin water would be initiated in the solid phase but that the release from solids would be reflected by activities/concentrations in the porewater before eventual release to the overlying water.

6.1 Comparison of Current Study Results with those from Martin et al. (2003)

The study by Martin et al. (2003) implied that Ra-226 activities in water could increase substantially above the maximum values of 7 Bq/L in porewater and 1 Bq/L in basin water observed in the current study. Martin et al. reported a Ra-226 activity of 70 Bq/L in porewater and 30 Bq/L in the basin water samples above the tailings interface.

The high Ra-226 activities in porewater and basin water reported in Martin et al. (2003) were attributed to anoxic conditions that lead to bacterial sulphate reduction. Sulphate concentrations of 0.5 mg/L were reported in the porewater with the highest Ra-226 activities. It was concluded that the low sulphate concentrations resulted in the dissolution of $BaSO_4$, thereby releasing Ra-226 into the porewater with subsequent diffusion into the overlying basin water. As shown in **Figure 2.4**, Ra-226 activities in Cell 14 basin water have never exceeded a value of 2.5 Bq/L and have not been above 1 Bq/L since 2004.

In the current investigation, the TOC contents in the solids ranged 0.07% at depth to 0.7% at the tailings-water interface. These values suggest that adequate reduction potential, as organic carbon, was available in the solids to reduce sulphate and release Ra-226. Field observations indicated a faint H_2S odour and a black layer in the top samples collected at QC14-2. The results from TOC analysis on solids showed that the TOC value in the top layer of that core sample was similar to those in other cores. The field observations, together with the TOC results, suggest that there is a potential for sulphate reduction in the top portions of the tailings at this sampling location. However, the sulphate reduction release mechanism and its consequential high Ra-226 release to porewater were not supported by the measured Ra-226 activities in this study. The Ra-226 activities measured in the top samples at QC15-2 were 3.6 and 2.8 Bq/L. The Ra-226 results from the current investigation are more consistent with the Ra-226 activities for the near shore, oxidized sampling sites in Cell 14 reported by Martin et al. (2003).

One distinct difference in conditions that was observed in this investigation was the absence of macrophytes observed during the Martin *et al*. (2003) investigation.

Reconnaissance prior to sampling in 2009 found macrophytes only along the shoreline in Cell 14 and not in the deeper water zones. The macropytes may represent a linkage to sulphate reduction if dead and decaying root matter represented the organic carbon that played a role in sulphate reduction. This would limit sulphate reduction to areas in the basin that can support such macrophyte growth. These zones would likely be limited to pockets or small areas.

One consideration for the Martin *et al*. (2003) study relates to quality control for Ra-226 activities in porewater that were measured on samples that were less than 10 mL in volume. The analysis for Ra-226 on water samples usually requires sample volumes of a few hundred millilitres.

Regardless of the sample size, however, the chemical and Ra-226 results appear to be consistent in the Martin *et al*. (2003) study. The results in that study also show an excellent linear correlation between barium concentrations and Ra-226 activities in water that exhibited an R^2 value of 0.99 and a slope of about 17. The slope is almost a factor of 2 higher than that found in this study as discussed later in this section. However, the data also represent a difference of 7 years of flooded conditions over which the concentrations and activities have been declining in the Quirke TMA.

6.2 Solids and Porewater Interactions

Two likely mechanisms that can potentially control Ra-226 and barium activities/concentrations in the porewater include sorption and solubility.

The first mechanism, sorption, is commonly been used to quantify solids-water interactions and can be represented by a distribution coefficient (or Kd with units of L/kg). The Kd can be defined as the activities/concentrations in the solids phase (Bq/kg or mg/kg) divided by the respective activities/concentrations in porewater (Bq/L or mg/L). The Kd model assumes that Ra-226, for example, is distributed between solid and water on the basis of equilibrium sorption reactions. This infers that, for any Kd value, higher activities/concentrations in the solid phase will be reflected by higher activities/concentrations in the porewater.

The second mechanism, solubility, can control concentrations or activities in the porewater and can be quantified by thermodynamic equilibrium reactions. Solubility equilibrium controls assume that barium, for example, is distributed between the solids and water on the basis of solubility theory. This approach infers that activities/concentrations in the porewater are controlled by the dissolution of a solid phase, for example $BaSO_4$, to maintain equilibrium for constituents in the porewater and is consistent with EIS conceptual model. The solubility model infers that the activity/concentration of a constituent in the water is independent of the content in the solids, but will depend on the concentration of another constituent in the water phase that is also present in the solid phase.

The sorption, or Kd, model and the solubility model may not be mutually exclusive in some environments, therefore, it is important to consider both approaches when understanding Ra-226 release in submerged tailings.

The activities of Ra-226 in the solids and associated porewater ranged from 4 to 24 Bq/g and from 0.42 to 6.9 Bq/L, respectively (**Figures 5.1 and 5.2**). The ranges in activities provide a strong basis to interpret relationships between the solids contents and concentrations in porewater.

6.2.1 Evidence of Sorption Equilibrium Controls

Plots of Ra-226 activities in solids versus their respective Ra-226 activities in porewater are shown in **Figure 6.1a**. The plot shows that higher activities in the solids did not necessarily correlate with higher activities in the porewater, as illustrated by the negative slope of the regression line in **Figure 6.1a**.

Similar regression plots for barium are provided in **Figure 6.1b**. The regression line exhibited a negative slope, indicating that higher concentrations of barium in solids did not correlate with higher concentrations in porewater. This result is consistent with the regression plot for Ra-226 data.

These results suggest that sorption equilibrium controls do not appear to control the tailings solids-porewater system in Cell 14. However, the similar relationships observed for Ra-226 and barium suggest that a similar mechanism, for example solubility, may be acting to control the activities/concentrations in porewater.

Although the Kd model does not appear to dominate the tailings solids-porewater system in Cell 14, sorption equilibrium controls on Ra-226 and barium activities/concentrations may exist for other geologic materials, as shown in the investigation on Serpent River sediments (EcoMetrix, 2011). Therefore, Kd relationships should not be completely dismissed from the interpretation of Ra-226 controls.

6.2.2 Evidence of Solubility Equilibrium Controls

Correlations between barium and sulphate in porewater were examined. The observed concentrations of these constituents were also compared to theoretical solubility values. Together with strong correlations between Ra-226 activities and barium concentrations in porewater, the evidence supports a solubility control on Ra-226 as discussed in more detail in the following discussion.

6.2.2.1 Correlations in Solids

Selected relationships between constituents in the solids, for example Ra-226 and barium, are presented in **Figure 6.2**.

Radium-226 and barium in the tailings exhibited correlations with an R^2 value of 0.91 as shown in **Figure 6.2a**. This relationship suggests a similar mechanism for the accumulation of Ra-226 and barium in the solids. This is expected because chemically Ra-226 behaves similarly to barium.

The correlation between calcium and sulphate with an R^2 value of 0.99 confirms the presence of gypsum ($CaSO_4 \cdot 2H_2O$) and indicates that the dominant form of sulphate in the tailings solids is gypsum (**Figure 6.2b**). Gypsum would have formed in the tailings in the mill when lime was added to neutralize the effluent prior to release to Cell 14.

No correlation between barium and sulphate (R^2=0.02) was observed in the tailings solids (**Figure 6.2c**). There is a lack of correlation between barium and sulphate because most of the sulphate is in the form of gypsum, resulting in only trace amounts of $BaSO_4$ in the tailings solids compared to the percentage quantities of gypsum that are present. Any correlation between barium and sulphate that theoretically exists because of the presence of $BaSO_4$ solids is lost because of the dominance of gypsum in the solids.

Because calcium is strongly correlated with sulphate, the absence of a correlation between barium and sulphate translates to an absence of a correlation between calcium and barium (R^2=0.03) (**Figure 6.2d**).

Because Ra-226 behaves similarly to barium, the absence of correlations between barium and other constituents agreed with the absence of correlations for Ra-226 and the same constituents (**Figures 6.2 e and f**). The lack of correlations between Ra-226 and sulphate (R^2=0.09) and between Ra-226 and calcium (R^2=0.11) can be explained by the dominance of gypsum in the solids that was described above for the poor correlation between barium and sulphate.

6.2.2.2 Correlations in Porewater

Selected relationships between activities/concentrations of constituents in porewater are presented in **Figure 6.3**.

The correlation between Ra-226 and barium in the porewater had an R^2 value of 0.85 (**Figure 6.3a**). The strong correlation suggests that Ra-226 in porewater behaves similarly to barium in porewater and indicates that a similar mechanism for control on Ra-226 and barium activities/concentrations. This is supported by other correlations between barium and other constituents that are similar to those between Ra-226 and the same constituents.

The plot for barium and sulphate in porewater shows an inverse relationship that is non-linear and that is consistent with solubility control by a solid phase. The solid green curve in **Figure 6.3b** represents the theoretical solubility of barium and sulphate in equilibrium with $BaSO_4$ solids and shows a reasonable fit to the data, when sulphate concentrations were below 50 mg/L. This curve represents an equilibrium condition mathematically as;

$K_{sp}=[Ba^{2+}][SO_4^{2-}]$ in which the K_{sp} is the solubility product that is a constant. The solubility relationship was solved using MINTEQ (Gustafsson, 2010) for solutions corresponding to the water chemistry associated with the low sulphate values observed in porewater samples. The concentrations of barium and sulphate are inversely correlated so that as the concentration of one constituent increases, the other decreases.

The correlation plot for Ra-226 and sulphate shows an inverse trend that is similar to that for barium and sulphate (**Figure 6.3e**). The molar ratio of barium to Ra-226 is approximately $2x10^9$ indicating that only trace concentrations of Ra-226 compared to barium in the porewater and by inference, the Ra-226 in the sulphate solids should be 9 orders of magnitude lower than that of barium. Because Ra-226 is a trace constituent compared to barium, it is incorporated into a solid phase only by ionic substitution and therefore should not practically affect the solubility of the solid phase.

The correlation plot for Ra-226 and calcium (**Figure 6.3f**) shows an inverse trend that is similar to the correlation plot for Ra-226 and sulphate (**Figures 6.3e**). The conceptual model in the EIS suggested that the control on Ra-226 activities in porewater is gypsum dissolution. If Ra-226 activities were controlled by gypsum dissolution a positive slope of the regression line in **Figure 6.3f** would be expected, however, this relationship is not evident from the data. However, the negative correlation between Ra-226 and calcium results from indirect controls by gypsum. When gypsum is present, calcium and sulphate concentrations are high. The inverse correlation of Ra-226 and sulphate was discussed above. The inverse correlation between Ra-226 and calcium is therefore related to the linkage between high calcium and high sulphate in the presence of gypsum and it is the high sulphate that controls Ra-226 to lower values in porewater. This does not contradict the conceptual model in the EIS but provides a refinement of the interpretation of the model.

6.3 Implications of Low Sulphate Concentrations in Solids and Porewater

A conceptual model for the release of Ra-226 from Ba,RaSO4 solids suggests that when sulphate concentrations in water decrease, barium concentrations, and therefore Ra-226 activities, will increase. This would occur as a result of the dissolution of Ba,RaSO4 to re-establish equilibrium with the lower sulphate concentrations.

The sulphate concentrations are low in solids from Core09-QC14-2 and Core09-QC14-3 (0.1 to 0.3% sulphate). This would imply that little to no gypsum is present in the tailings in these areas of the basin. The reason for the removal of gypsum from these samples is not obvious. Sampling stations QC-14-2 and QC14-3 are located in the central part of Cell 14 and the low gypsum contents could be related to the re-suspension of solids during tailings relocation prior to flooding of the basin and subsequent settling in the central deeper areas of the basin. When particles are re-suspended, gypsum can dissolve depleting calcium and sulphate. Therefore, the solids that settle in the deeper areas of Cell 14 may be expected to have low calcium and sulphate concentrations.

The low sulphate concentrations in the solids have resulted in low sulphate concentrations in the porewater at QC14-2 and QC14-3. The sulphate concentrations in the porewaters ranged from 13 to 32 mg/L at QC-14-2 and from 5.6 to 18 mg/L at QC14-3. The conceptual model would suggest that these tailings should exhibit the highest barium concentrations and Ra-226 activities in porewater samples from this investigation. The data confirm that the highest barium concentrations and Ra-226 activities were measured in these tailings samples. Barium concentrations ranged from 0.13 to 0.52 mg/L and Ra-226 activities ranged from 2.6 to 6.9 Bq/L.

Scatter plots for barium and sulphate, Ra-226 and sulphate and for barium and Ra-226 in porewater with low sulphate concentrations of less than 35 mg/L are presented in **Figure 6.4**. The plot for barium and Ra-226 in porewater with low sulphate concentrations (**Figure 6.4a**) retains a strong correlation (R^2=0.83) similar to that for all of the data (**Figure 6.3**). These data suggest that when sulphate is flushed from the tailings and sulphate concentrations are as low as 5 mg/L, the maximum corresponding Ra-226 activities in porewater are in the range of 3 to 7 Bq/L. Although there are no correlations between either barium or Ra-226 and sulphate, the concentrations of barium predicted by the theoretical solubility of $BaSO_4$ shown as the solid green line in **Figure 6.4b**, are similar to the observed values.

6.4 Controls on Ra-226 Activities in Porewater

Similar relationships between Ra-226 and barium were observed for both the water-solids partitioning, or Kd, plots and the solubility correlation plots. These relationships provide strong support that similar mechanisms are acting to control Ra-226 and barium activities/concentration in porewater.

Inverse correlations between barium and sulphate provide strong support for solubility controls on barium in porewater and indicated that the solubility of a sulphate bearing solid phase controls barium concentrations in porewater. The theoretical solubility curve for barium and sulphate in equilibrium with $BaSO_4$ provided strong evidence that the dissolution of $BaSO_4$ controls barium concentrations in porewater. Collectively, these results suggest that sulphate concentrations in porewater control the solubility of $Ba,RaSO_4$ solids and therefore control the barium and Ra-226 concentrations/activities in the porewaters associated with $Ba,RaSO_4$

Sulphate values that represent background concentrations in the Serpent River Watershed are in the range of 5 to 10 mg/L (Minnow, 2008) and it is anticipated that the lowest sulphate concentrations will remain within this range. The theoretical solubility curve predicted barium concentrations in porewater of about 0.4 when sulphate concentrations were 5 mg/L.

Because of the strong relationship between Ra-226 and barium, the theoretical solubility of $BaSO_4$ can be used to predict Ra-226 activities in porewater. The slope of the regression line in **Figure 6.3a** represents the average Ra-226 to barium ratio in porewater represented by the slope that has a value of approximately 10. Using this relationship and a barium concentration of 0.4 mg/L estimated from the $BaSO_4$ theoretical solubility curve for a sulphate concentration of 5 mg/L (**Figures 6.3c**), the predicted Ra-226 activity in porewater is approximately 4 Bq/L. This result is consistent with the measured porewater data from Cell 14 that exhibited Ra-226 activities of 4.1 and 3.4 Bq/L when sulphate concentrations were 5.6 and 6.8 mg/L, respectively.

Overall, the results from Cell 14 showed Ra-226 activities in porewaters in the range of 3 to 7 Bq/L that were associated with sulphate concentrations in porewater below 35 mg/L. The release of Ra-226 will only effectively take place from the porewater near the tailings-water interface to the overlying basin water. The Ra-226 concentrations measured in the top portions of the porewater (0 to 5 cm) were in the range of approximately 3 to 5 Bq/L.

The maximum Ra-226 activity of 5 Bq/L measured in the top portions of the tailings porewater in Cell 14 provides a reasonable upper-bound for Ra-226 activities that could be expected in submerged tailings porewater for the existing conditions noted during this study.

The Martin et al. (2003) study assumed a sulphate concentration of 0.5 mg/L for porewaters collected in the deeper anoxic zones. If the Ra-226 activity in porewater is estimated from $BaSO_4$ solubility curve and the Ra-226 to barium ratio, the predicted activity in porewater is approximately 15 Bq/L.

6.5 Porewater and Basin Water Interactions

The Ra-226 activities in porewater provide insight into the potential for release to the basin water. At the Quirke TMA there are potential sources of Ra-226. The first is porewater in the tailings that releases Ra-226 to surface water by diffusion. Because diffusion is controlled by concentration gradients, the activities in the basin waters will always be less than those in the porewater even when there is little flow in the basin. The second source of Ra-226 is seepage flow beneath the internal dykes at the Quirke TMA. Downward seepage on the upstream sides of the internal dykes results in upward flow on the downstream sides, thereby displacing the tailings porewater into the water column. There are no cells upstream of Cell 14, therefore seepage flow or advective transport of Ra-226 does not apply to Cell 14. However, advective transport of Ra-226 in the downstream cells may be important. Regardless of the transport mechanism, the Ra-226 activities in porewater represent the source of Ra-226 activities that affect the activities in the basin. Therefore, these data assist in reducing uncertainty in estimates of Ra-226 activities and loads associated with outflows from Cell 14.

The release of Ra-226 from porewater to the basin water by diffusion is supported by the data that show Ra-226 activities in the porewater that are greater than those in the overlying basin water (**Figure 5.2**). Porewater activities in the top 5 cm of the tailings were in the range of 3 to 5 Bq/L and the basin water activities ranged from 0.7 to 1 Bq/L. These results indicate that a concentration gradient has developed and imply upward diffusion and mass transport of Ra-226 from the porewater to the overlying basin water.

6.6 Water Balance and Ra-226 Loads for the Quirke TMA

A water balance was completed to estimate Ra-226 loads from the monitoring data for the Quirke TMA. The observed Ra-226 loads were calculated for comparison with Ra-226 loads calculated in terms of diffusive flux (**Section 6.7**) to verify whether the observed Ra-226 loads could be explained by Ba,RaSO_4 dissolution and subsequent diffusion from porewater to the basin water.

Annual flow rates were calculated to develop a mass balance for Ra-226 loads from each Cell and the overall Quirke TMA. The estimated flow rates were based on measured flows into and out of the Quirke TMA from 2006 to 2009, as well as the estimated natural inputs to each cell. The Ra-226 loads were calculated from the estimated flow rates and the routine monitoring data for the period of 2006 through 2009. The results for the estimated flow rates are presented in **Tables 6.1** and Ra-226 activities from routine monitoring are presented in **Table 6.2**. The estimated loads are presented in **Table 6.3**.

6.6.1 Water Balance

The annual flow rate for Cell 14 is dependent on the input from Gravel Pit Lake (Q-29) and the net natural input (NNI) that represents precipitation and runoff minus evaporation. The annual flow rate for each consecutive downstream cell is maintained by the inflow from the previous cell and the NNI. The NNI for the entire TMA was estimated from the average annual outflow from the Quirke TMA at Cell 18 (Q-05) less the average annual input from Gravel Pit Lake (Q-29). The values used for the average annual flows from Gravel Pit Lake (Q-29) and Cell 18 (Q-05) represent the average measured flow rates from 2006 through 2009. The flow rates for the 2006 through 2009 time period were considered for this investigation to remain consistent with the SOE (Minnow, 2011).

The NNI for each cell was calculated as the fraction of the total NNI based on the percentage of the watershed each cell represents. The flow rates for each cell were calculated as the total input to the Cell plus the respective NNI. Calculated annual flow rates for each cell are presented in **Table 6.1**.

6.6.2 Ra-226 Loads

Radium-226 loads were calculated for each cell using the estimated flow rates and average Ra-226 activities from **Tables 6.1 and 6.2**. Radium-226 loads for each cell were calculated as follows:

$$L = Q \bullet C_{BW} \qquad \text{Eq. (1)}$$

Where: L = Load (MBq/a);

Q = Flow (m^3/a); and

C_{BW} = Ra-226 activity in the basin water (Bq/L)

The cumulative Ra-226 loads, together with their respective incremental loads for each cell are presented in **Table 6.3**. The incremental loads of Ra-226 represent the differences between the Ra-226 entering and/or exiting the cell.

The Ra-226 load from Cell 14 was approximately 580 MBq/a. The total load from Cell 15 was 560 MBq/a, suggesting that either there was no net release of Ra-226 or that there may have been a small amount of removal of Ra-226 in Cell 15. The total Ra-226 loads from Cells 16 and 17 were 1,560 and 2,650 MB/a. The incremental loads for Cells 16 and 17 were 1,000 and 1,080 MBq/a, while the total Ra-226 load entering the Quirke effluent treatment plant (ETP) from Cell 18 was estimated to be 2,590 MBq/a. The incremental load for Cell 18 was -54 MBq/a. The negative values for the incremental Ra-226 loads in Cell 18 may be the result of variability in the actual flow rates compared to the annual values that were used or may reflect a small removal in Cell 18 resulting from settling of solids formed during *in-situ* lime addition in Cell 17.

The results for the incremental Ra-226 load calculations indicate that the majority of the Ra-226 loads from the Quirke TMA originate from Cells 16 and 17. The Ra-226 load from Cell 14 represents about one fifth of the total, while Cells 15 and 18 represent little to no contributions to the overall Ra-226 loads for the entire Quirke TMA.

The Ra-226 loads exiting Cells 16 and 17 are about 2 times higher than those exiting their respective upstream cells. The data show average Ra-226 activities in the porewater and basin water in Cells 16 and 17 with values that are about 2 to 3 times higher than the average values in their respective upstream cells (**Tables 2.1 and 6.2**). These results indicate that the loads from Cells 16 and 17 are consistent with Ra-226 contributions from porewater that is flushing from the tailings near the upstream dykes.

The activities for Ra-226 in porewater seepage that enters a cell were monitored annually between 1995 and 2003 and as part of the Ra-226 studies in 2010 by piezometers down-gradient of the dykes. The piezometer nest at DK16-2 was observed to have the highest

Ra-226 activities in the 1990s, as shown for DK16-2B in **Figure 6.5**. The highest activity of 14 Bq/L observed in 1998 have likely discharged to Cell 17 and the most recent sample in 2010 had a value of about 6.5 Bq/L that is more consistent with porewater values observed near the tailings surface in this investigation. The overall trend of declining Ra-226 activities over time is observed for most piezometers and the trend is consistent with the conceptual model shown in **Figure 2.2**.

6.7 Ra-226 Flux and Loads in Cell 14

The load from Cell 14 related to the diffusive flux of Ra-226 from the tailings was calculated to verify whether the load calculated for Cell 14 in **Section 6.6.2** could be explained by diffusion from porewater to the basin water. The results from the calculations are presented in **Table 6.4**.

Radium-226 loads in terms of diffusive flux were calculated as follows:

$$L = F \bullet A \qquad \text{Eq. (2)}$$

Where: L = Load (MBq/a);

F = Mass Flux ($Bq/m^2 \bullet a$);

A = Surface area over which the diffusion is taking place (m^2).

The total surface area of Cell 14 is 630,000 m^2 (Golder, 1994). Because the diffusion barrier plus the till seepage blanket covers 68% of Cell 14, the surface area for diffusion was adjusted to 210,000 m^2 representing only the area for which diffusion will take place through the tailings directly to the water column.

The mass flux was calculated as follows:

$$F = -D_e \bullet \frac{\partial C}{\partial z} \qquad \text{Eq (3)}$$

Where: F = Mass Flux ($Bq/m^2 \bullet a$);

D_e = effective diffusion coefficient in the tailings porewater (m^2/a);

∂C = change in Ra-226 activity over the interface (Bq/L); and

∂z = interface thickness (m).

Typical values for diffusion coefficients (D) for aqueous solutions in a porous medium, neglecting porosity, were obtained from the literature (Spitz and Moreno, 1996). An average value of 8.43×10^{-10} m^2/s (2.66×10^{-2} m^2/a) was considered reasonable for this investigation. In porous media, such as tailings, the effective diffusion is smaller than that in pure aqueous solution because ions follow a longer path of diffusion through the pore spaces and do not migrate through the solid particles. Therefore, an effective diffusion coefficient, D_e, should be used for tailings and can be represented by:

$$D_e = D \bullet \eta$$

Where: η = porosity

With a porosity in the tailings of 0.45 (SENES, 2003), the value of D_e becomes 3.79×10^{-10} m^2/s (1.20×10^{-2} m^2/a).

The change in Ra-226 activity across the interface, or concentration gradient, was estimated from the 2009 sampling data and represents the concentration in porewater from the top 2.5 to 5 cm of the tailings, minus the concentration at the bottom of the water column. Interface thickness values equal to the sample interval thickness of the uppermost solids samples were considered for the calculation of gradients. These intervals were 0.025 m for QC14-2 and 0.05 m for all other stations. Sensitivity on the interface thickness was tested using conservative values of 0.01 and 0.03 m. The interface thickness of 0.01 was considered to represent a conservative upper value for the calculation of gradients.

The loads for Ra-226 for Cell 14 ranged from 659 to 166 MBq/a for interface thicknesses between 0.01 and 0.05 m (**Table 6.4**). The estimated Ra-226 activities in the basin water were in the range of 0.42 and 0.11 Bq/L for the assumed interface thicknesses.

When an interface thickness of 0.01 m was used to calculate the diffusive flux, the load from Cell 14 was 659 MBq/a and this value agrees well with the measured load value of 579 MBq/a in **Table 6.3**. The Ra-226 activity calculated with an interface value of 0.01 m was 0.42 Bq/L. This value agrees well with the average Ra-226 activity of 0.37 Bq/L from routine monitoring at the outflow from Cell 14 for the 2006 through 2009 time period (**Table 6.2**). These results indicate that the Ra-226 activities measured in the outflow from Cell 14 are consistent with Ra-226 resulting from a diffusive flux in the tailings porewater to the basin water.

6.7.1 Estimated Ranges in Ra-226 Activities

The diffusive flux calculations provided strong evidence that upward diffusion of Ra-226 is the primary mechanism for Ra-226 release to the basin water. Sensitivity on flow through Cell 14 was also tested to provide an estimate for the ranges in Ra-226 activities that may be anticipated in the basin waters as a result of natural variations in flow rates in the basins. The residence time in Cell 14 is about 3 months (SENES, 2003). It is expected that it will require approximately three cell volumes of flow for the Ra-226 activities in the basin water to be substantially shifted from current values either by changes in the water balance in the basin or loading of Ra-226 from the porewater in the submerged tailings. Three cell volumes represent a total time of about 9 months. Therefore, an averaging period of 9 months in Cell 14 can be considered for variations in flow to the basin. Flow at the Quirke TMA is measured at the inflow from Gravel Pit Lake (Q-29) and at the outflow from Cell 18 (Q-05). The monthly flow rates are presented in **Figure 6.5** as a time-trend plot for the period of 1997, after all of the cells were flooded, through 2009. **Figure 6.5** also shows the 9-month moving averages for flow data, at Q-29 and Q-05 as well as the difference between the measured flows, at Q-05 minus those Q-29 at that represents the NNI into the TMA. The 9-month moving averages from Q-29 and the NNI were used to determine representative minimum and maximum flow rates for the Quirke TMA. The high and low values for the 9-month moving average for Q-29 were 48 and 25 L/s, respectively. The high and low values for the 9-month moving average for the NNI were 100 and 10 L/s, respectively.

Figure 6.5 exhibits some higher and lower values than those used in this assessment, however, some of these fluctuations are not representative of normal flow conditions. The lowest flow rate was determined from the lowest observed 9-month moving average from 2000 to 2001 because that time period represented a 1 in 50 year return drought event (Pers. Comm., Golder, 2011). The highest flow rate was observed in 2004, however, the value was considered not to be representative of maximum flow rates because the flow rates represent higher the re-flooding of Cell 14 after the construction of the diffusion barrier in 2003. Instead, the maximum flow from 2002 was used to calculate the activities in **Table 6.5**.

The loads and activities were calculated using an interface thickness of 0.01 m. The estimated Ra-226 activities for the 9-month average high and low flows in Cell 14 were 0.27 and 0.76 Bq/L, respectively (**Table 6.5**). These values were similar to the range of annual average values from the routine monitoring data that ranged from 0.34 to 0.52 Bq/L between 2006 and 2009 (**Table 6.2**).

These results provide further support that Ra-226 activities measured in the outflow from the Quirke TMA are consistent with Ra-226 loads resulting from diffusive flux in the porewater to the basin water with variations that are consistent with natural variations in the flow within the basins.

Similar calculations were performed for an estimated maximum Ra-226 activity of 5 Bq/L in the porewater of the submerged solids measured in this study. With an activity of 5 Bq/L in porewater, the expected Ra-226 activities resulting from diffusive flux could be in the range of 0.42 to 1.15 Bq/L as shown in **Table 6.6**. These calculations provide an indication of Ra-226 activities that could be observed if porewater concentrations near the tailings-water interface approach the maximum values that were observed in Cell 14 from this study.

As a sensitivity exercise, calculations were performed to assess a potential range of Ra-226 activities in basin water assuming that pockets of sulphate reduction with Ra-226 activities of 15 Bq/L in porewater developed over 25% of the area of Cell 14. The calculations were performed with a porewater activity of 5 Bq/L for the remaining 75% of the cell area. With these conditions, an anticipated range in Ra-226 activities that could potentially develop from diffusive flux could be in the range of 0.67 to 1.87 Bq/L as shown in **Table 6.7**. If pockets with sulphate reducing conditions were to develop in Cell 14, these calculations provide an indication of Ra-226 activities that could be observed in the basin water for the Ra-226 activities in porewater either observed or assumed in this study.

6.8 Risk Related to Sulphate Reduction

The results of this investigation indicate that the Ra-226 activities in porewater near the tailings-water interface controls the activities in the basin water at the Quirke TMA. With sulphate concentrations as low as 5 mg/L, a value below background values in the Serpent River Watershed, the Ra-226 activities in porewater are constrained to values of less than 5 Bq/L as a result of $BaSO_4$ solubility control. In turn, the limit of 5 Bq/L of Ra-226 in porewater, the corresponding activity in Cell 14 basin water was predicted to be in the range of 0.4 to 1.1 Bq/L. The results of an investigation in 2000, reported by Martin *et al*. (2003), however, suggested that if sulphate reduction lowers sulphate concentrations below 0.5 mg/L, Ra-226 activities as high as 70 Bq/L may occur in tailings porewater. The Ra-226 solubility model proposed in this report does not negate the possibility that such high Ra-226 values can occur. However, it is appropriate to discuss the context of such elevated values and the probability that those values will occur over the long term in the Quirke TMA.

First, concentrations of sulphate below 1 mg/L will likely be attainable only if the solids do not contain gypsum, or sulphate. Any gypsum in the solids would need to be balanced by an organic carbon source to act as the energy or electron source for sulphate reduction so that 1% sulphate would require 0.25% carbon, based on the stoichiometry of the sulphate reduction reaction. In addition, a conversion of sulphate in solids would result in an equivalent mass of sulphide, or H_2S, in the porewater. The tailings porewater has long residence times so that the sulphide would accumulate rather than being replaced and sulphide levels would quickly become toxic to the sulphate reducing bacteria.

Some of the tailings in Cell 14 were found to contain little or no sulphate in the solids, at Core09-QC14-2 and Core09-QC14-3, for example. Even though there was organic carbon present and sulphide odour was present at one of those sites, sulphate maintained above 5 mg/L in the porewater. These observations suggest that special conditions may be required to induce substantial sulphate reduction.

In the long term, deposition of organic matter in the basins is inevitable. Natural processes over time result in sediment accumulation in lakes and similar processes will prevail in the tailings basins. While organic matter may increase the risk of sulphate reduction at the organic-tailings interface, it may not necessarily do so any more than what was observed in this study. The accumulation of the organic layer will also result in the formation of a diffusion barrier over the tailings. This layer will reduce the flux into the water column in two ways. First, the layer will act as a physical barrier that will reduce concentration gradients and thus the diffusive flux. The organics will also sorb Ra-226 and further retard transport through the organic layer into the water column. Investigation of Serpent River sediments suggest that a Kd value as high as 1,300 L/kg may apply to Ra-226 in organic rich sediments. This sorption capacity is very large and has the ability to substantially attenuate Ra-226 transport through the organic layer.

It can be shown with the currently proposed model that a sulphate concentration of 0.5 Bq/L in porewater, the corresponding Ra-226 activities would be constrained to 15 Bq/L assuming the Ra-226 to barium ratio of 10 found in this study. If the ratio of 17 found in the Martin *et al*. (2003) study is used, the Ra-226 activity in porewater would be almost a factor of two higher or about 30 Bq/L. It is not likely that sulphate reduction resulting in such low sulphate concentrations would occur basin-wide. It is more probable that extreme sulphate reduction would occur locally as a result of local accumulation of unique organic matter, for example. Calculations in **Section 6.7** of this report demonstrated that the development of low sulphate zones in limited areas of the tailings in Cell 14 can result in incremental increases of Ra-226 in basin water. However, these increases were on the order of terms of percent.

The risks related to sulphate reduction are therefore considered to be limited. If sulphate reduction is related to macrophyte growth in deeper areas of the basins, these can be monitored for such growth and the hypothesis tested. There is no evidence of highly elevated levels in the basin or tailings porewater as of 2009. The monitoring program is considered to be more than adequate to detect any major changes in Ra-226 levels or possible conditions in the tailings porewater and the risk of abrupt changes is very low to non-existent.

7.0 SUMMARY OF CONCLUSIONS

The main objectives of this investigation were to evaluate Ra-226 activities in solids, porewater and basin water to develop an understanding of the controls on Ra-226 releases to the basin water in Cell 14 in order to address the uncertainties related to the release of Ra-226 to the basin water that arose from the inconsistencies between the results from routine monitoring and those from the Martin *et al.* (2003) study. Another objective was to provide reasonable estimates for Ra-226 activities that may be observed in the basin water.

Four stations were sampled in Cell 14 at the Quirke TMA in September 2009 to obtain representative samples of Ra-226 and other constituents that theoretically can play a role in Ra-226 mobility in basin waters.

The Ra-226 activities as high as 70 Bq/L in porewater measured in Cell 14 by Martin *et al*. (2003) were not observed in this investigation or during routine monitoring in the Quirke TMA. Although, field observations, together with TOC contents, suggested there could be a potential for sulphate reduction in the top portions of the tailings at QC14-2, there was no evidence of the consequential high release of Ra-226 to porewater in this study. The Ra-226 activities in the top samples at QC15-2 were 3.6 and 2.8 Bq/L.

Two mechanisms that can potentially control Ra-226 and barium activities/concentrations in porewater, sorption and solubility, were evaluated. Water-solids partitioning plots showed that the sorption equilibrium, or Kd, model does not control the solids-porewater interactions in Cell 14.

Strong correlations between Ra-226 and barium in both the tailings solids and porewater support a similar mechanism for the formation of Ra-226 and barium in solids and suggest that solubility equilibrium controls the Ra-226 activities and barium concentrations in porewater.

The inverse relationship between Ra-226 and calcium indicated that Ra-226 activities in the porewater are not directly controlled by gypsum dissolution as the conceptual model in the EIS suggests. Instead, the inverse correlation between Ra-226 and calcium results from indirect controls by gypsum related to the linkage between high calcium and sulphate in the presence of gypsum. The sulphate concentrations control the Ra-226 activities in porewater and therefore, the presence of gypsum in the tailings solids indirectly controls the Ra-226 activities. This does not contradict the conceptual model in the EIS but provides a refinement of the interpretation of the model.

Inverse correlations between barium and sulphate and between Ra-226 and sulphate indicated that the solubility of a solid sulphate phase controls the concentrations of barium and the activity of Ra-226 in water that is in contact with the tailings solids. The theoretical solubility of barium and sulphate in equilibrium with $BaSO_4$ solids provided further evidence that barium concentrations, and therefore Ra-226 activities, are controlled by sulphate concentrations.

The theoretical solubility of $BaSO_4$ was used to predict Ra-226 activities in porewater. The slope of the regression line for Ra-226 and barium in porewater indicated a Ra-226 to barium ratio of approximately 10. Using this relationship and a sulphate concentration of 5 mg/L the $BaSO_4$ theoretical solubility curve predicts a barium concentration of 0.4 mg/L. A Ra-226 activity of 4 Bq/L in porewater is estimated from the Ra-226 to barium ratio. This result is consistent with the measured porewater data from Cell 14 that exhibited Ra-226 activities of 4.1 and 3.4 Bq/L when sulphate concentrations were 5.6 and 6.8 mg/L, respectively.

The maximum Ra-226 activity of 5 Bq/L measured in the top portions of the tailings porewater in Cell 14 provides a reasonable upper limit for Ra-226 activities that could be anticipated in submerged tailings porewater, existing conditions noted during this study.

The Martin et al. (2003) study assumed a sulphate concentration of 0.5 mg/L for porewaters collected in the deeper anoxic zones. If the Ra-226 activity in porewater is estimated from $BaSO_4$ solubility curve and the Ra-226 to barium ratio, the predicted activity in porewater is approximately 15 Bq/L.

Concentration gradients between Ra-226 activities in the porewater and basin imply upward diffusion and mass transport of Ra-226 from porewater to the overlying water. In Cell 14 there are no up-gradient cells and therefore diffusive transport is the primary mechanism for Ra-226 release to the basin water.

Radium-226 loads and activities estimated from diffusive flux calculations agreed well with observed Ra-226 loads and activities from routine monitoring. These results provided further evidence that releases of Ra-226 from porewater to overlying basin water are controlled by diffusive flux.

A range for Ra-226 activities of 0.42 to 1.15 Bq/L in basin water was predicted for a condition with assumed Ra-226 activities of 5 Bq/L in porewater near the tailings-water interface. These calculations provide an indication of Ra-226 activities that could be observed if porewater activities approach maximum values that were observed in Cell 14 during this study.

As a sensitivity exercise, the Ra-226 activity in porewater was estimated for a sulphate concentration of 0.5 mg/L. Based on the solubility of $BaSO_4$ and the relationship between radium activities and barium concentrations, the predicted Ra-226 activity was 15 Bq/L. Furthermore, Ra-226 activities in basin water were predicted by assuming that porewater activities of 15 Bq/L and 5 Bq/L occurred over 25 and 75% of the tailings area in Cell 14, respectively. If this type of condition was to develop, the predicted Ra-226 activities in basin water were in the range of 0.67 to 1.87 Bq/L, for these assumptions. These calculations provide an indication for Ra-226 activities that could be observed in basin water for the Ra-226 activities in porewater either observed or assumed in this study, if pockets of sulphate reducing conditions were to develop in Cell 14 and sulphate concentrations of less than 1 mg/L occurred in the porewater.

Although possible, it is unlikely that significant areas of sulphate reduction could occur without an accumulation of organic material at the surface of the tailings that would also act as a diffusion barrier in the long term. An organic layer would mitigate the diffusive flux of Ra-226 by acting as a physical barrier by decreasing concentration gradients, as well as a chemical barrier by sorbing Ra-226 to the carbon solids. Therefore, in the long term, the risk of highly elevated Ra-226 activities in tailings porewater associated with sulphate reduction is considered to be very low.

There is no evidence of highly elevated levels in the basin or tailings porewater as of 2009. The monitoring program is considered to be more than adequate to detect any major changes in Ra-226 levels or possible conditions in the tailings porewater and the risk of abrupt changes is very low to non-existent.

8.0 REFERENCES

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TABLES

Table 2.1: Summary of Ra-226 Activities in Porewater at the Quirke TMA

Statistic	Radium-226 (Bq/L)
Cell 15	
Minimum	0.22
Maximum	3.3
Mean	1.6
Count	53
Cell 16	
Minimum	0.23
Maximum	4.2
Mean	2.9
Count	56
Cell 17	
Minimum	3.2
Maximum	14.4
Mean	7.9
Count	32
Cell 18	
Minimum	0.99
Maximum	6.6
Mean	4.0
Count	32

Table 4.1a: Data Quality Assessment Summary for Selected Constituents in Solids - Duplicate Samples

		Parameter				
		Radium-226	Barium	Calcium	Sulphate	Total Organic Carbon
		(Bq/g)	(mg/kg)	(mg/kg)	(%)	(%)
Method Detection Limit		0.01	0.05	1	0.1	0.01
RPD Data Quality Objective		≤ 40%	≤ 40%	≤ 40%	≤ 40%	≤ 40%
Sample ID	CORE 09-PSB-2 (5-10)	4.5	160	7,600	0.6	9.78
Replicate ID	CORE 09-EC-1 (0-5)	4.1	94	4,600	0.3	10.5
RPD (%) or AD		9	**52**	**49**	**0.3**	7
Sample ID	CORE 09-SR-4 (10-15)	2.1	440	7,300	0.2	16.8
Replicate ID	CORE 09-EC-1 (5-10)	1.6	450	7,400	0.1	16.7
RPD (%) or AD		27	2	1	0.1	1
Average RPD or AD		***18***	***27***	***25***	***0.2***	***4***
Count		*3*	*3*	*3*	*3*	*3*

Notes:

RPD - relative percent difference; is calculated for analytes with concentrations greater than or equal to five times the detection limit and should be less than or equal to 40%

AD - absolute difference; for samples having concentrations less than five times the detection limit, the difference between the sample and duplicate, or difference between the sample or duplicate and the detection limit if either the sample or duplicate analyte concentration is below detection limit; should not be greater then the detection limit

BD - Sample and/or replicate had analyte concentrations below detection limit

"--" Indicates parameter was not measured

Boldface type and shaded indicates that Data Quality Objective was not achieved

Table 4.1b: Data Quality Assessment Summary for Selected Constituents in Solids - Replicate Samples

		Parameter				
		Radium-226	Barium	Calcium	Sulphate	Total Organic Carbon
		(Bq/g)	(mg/kg)	(mg/kg)	(%)	(%)
Method Detection Limit		0.01	0.05	1	0.1	0.01
RPD Data Quality Objective		≤ 40%	≤ 40%	≤ 40%	≤ 40%	≤ 40%
Sample ID	CORE 09-QC14-2 (0-2.5)	4.3	150	190	0.1	0.519
Replicate ID	CORE 09-EC-2 (0-2.5)	7.0	280	230	0.1	0.617
RPD (%) or AD		**48**	**60**	19	0	17
Sample ID	CORE 09-QC14-2 (2.5-5)	6.5	220	130	0.1	0.289
Replicate ID	CORE 09-EC-2 (2.5-5)	8.3	370	110	0.1	0.206
RPD (%) or AD		24	**51**	17	0	34
Sample ID	CORE 09-QC14-2 (5-7.5)	9.3	330	79	0.1	0.121
Replicate ID	CORE 09-EC-2 (5-7.5)	20.0	310	63	0.1	0.090
RPD (%) or AD		**73**	6	23	0	29
Average RPD or AD		***48***	***39***	***19***	***0***	***27***
Count		*3*	*3*	*3*	*3*	*3*

Notes:
RPD - relative percent difference; is calculated for analytes with concentrations greater than or equal to five times the detection limit and should be less than or equal to 40%
AD - absolute difference; for samples having concentrations less than five times the detection limit, the difference between the sample and duplicate, or difference between the sample or duplicate and the detection limit if either the sample or duplicate analyte concentration is below detection limit; should not be greater then the detection limit
BD - Sample and/or replicate had analyte concentrations below detection limit
"--" Indicates parameter was not measured
Boldface type and shaded indicates that Data Quality Objective was not achieved

Table 4.2a: Data Quality Assessment Summary for Selected Constituents in Water - Duplicate Samples

		Parameter				
		Radium-226	**Barium**	**Calcium**	**Sulphate**	**Organic Carbon**[1]
		(Bq/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
Method Detection Limit		0.01	0.00001	0.03	0.2	0.2
RPD Data Quality Objective		≤ 20%	≤ 20%	≤ 20%	≤ 20%	≤ 20%
Sample ID	SW09-SR-4B	0.30	0.222	11.2	25	2.0
Duplicate ID	PW09-EC-1 (0-5)	0.30	0.221	11.4	--	--
RPD (%) or AD		0	0	2	--	--
Sample ID	PW09-QC14-3 (0-5)	--	0.333	6.12	54	15.1
Duplicate ID	PW09-QC14-4 (0-5)	4.1	--	--	560	9.3
Duplicate ID	PW09-EC-1 (5-10)	4.7	0.335	6.06	--	--
RPD (%) or AD		14	1	1	--	--
Average RPD or AD		***7***	***1***	***1***	**--**	**--**
Count		*2*	*2*	*2*	--	--

Notes:

RPD - relative percent difference; is calculated for analytes with concentrations greater than or equal to five times the detection limit and should be less than or equal to 20%

AD - absolute difference; for samples having concentrations less than five times the detection limit, the difference between the sample and duplicate, or difference between the sample or duplicate and the detection limit if either the sample or duplicate analyte concentration is below detection limit; should not be greater then the detection limit

BD - Sample and/or replicate had analyte concentrations below detection limit

"--" Indicates parameter was not analysed because of insufficient sample volume

Boldface type and shaded indicates that Data Quality Objective was not achieved

Table 4.2b: Data Quality Assessment Summary for Selected Constituents in Water - Replicate Samples

		Parameter				
		Radium-226	**Barium**	**Calcium**	**Sulphate**	**Organic Carbon[1]**
		(Bq/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
Method Detection Limit		0.01	0.00001	0.03	0.2	0.2
RPD Data Quality Objective		≤ 20%	≤ 20%	≤ 20%	≤ 20%	≤ 20%
Sample ID	SW09-QC14-2T	0.82	0.104	5.69	72	72
Replicate ID	SW09-EC-2T	0.78	0.108	5.69	85	85
RPD (%) or AD		5	4	0	17	17
Sample ID	SW09-QC14-2B	0.91	0.108	5.55	32	19.4
Replicate ID	SW09-EC-2B	0.85	0.114	5.63	36	11.7
RPD (%) or AD		7	5	1	12	**50**
Sample ID	PW09-QC14-2 (0-2.5)	3.6	0.309	8.79	32	28
Replicate ID	PW09-EC-2 (0-2.5)	2.9	0.285	7.28	27	19
RPD (%) or AD		**22**	8	19	17	**38**
Sample ID	PW09-QC14-2 (2.5-5)	2.8	0.308	5.68	12	18.3
Replicate ID	PW09-EC-2 (2.5-5)	3.3	0.337	5.35	18	14.3
RPD (%) or AD		16	9	6	**40**	**25**
Sample ID	PW09-QC14-2 (5-7.5)	5.9	0.519	6.06	12	17.9
Replicate ID	PW09-EC-2 (5-7.5)	5.4	0.487	5.54	--	--
RPD (%) or AD		9	6	9	--	--
Average RPD or AD		***12***	***7***	***7***	***21***	***32***
Count		*5*	*5*	*5*	*4*	*4*

Notes:

[1] Organic Carbon RPD calculated from dissolved organic carbon value from SW09-QC14-2B and total organic carbon value from SW09-EC-2B

RPD - relative percent difference; is calculated for analytes with concentrations greater than or equal to five times the detection limit and should be less than or equal to 20%

AD - absolute difference; for samples having concentrations less than five times the detection limit, the difference between the sample and duplicate, or difference between the sample or duplicate and the detection limit if either the sample or duplicate analyte concentration is below detection limit; should not be greater then the detection limit

BD - Sample and/or replicate had analyte concentrations below detection limit

"--" Indicates parameter was not analysed because of insufficient sample volume

Boldface type and shaded indicates that Data Quality Objective was not achieved

Table 4.3: Data Quality Assessment Summary for Selected Constituents in Blank Sample

Analysis	Units	Detection Limit	Data Quality Objective	Blank 1
Radium-226	Bq/L	0.01	0.02	<0.01
Barium	mg/L	0.00001	0.00002	**0.00216**
Calcium	mg/L	0.03	0.06	0.03
Sulphate	mg/L	2	4	<2
Organic Carbon	mg/L	1.0	2.0	**2.4**

Notes:
Boldface type and shaded indicates that Data Quality Objective was not achieved

Table 5.1: Summary of Selected Constituents in Tailings Solids from Cell 14 Sampled in September 2009

Sample ID	Depth Interval (cm)	Radium-226	Barium	Calcium Sulphate		Total Organic Carbon
		(Bq/g)	(mg/kg)	(mg/kg)	(%)	(%)
CORE 09-QC14-1	(0-5)	19	550	2,400	0.6	0.490
	(5-10)	13	340	8,900	2.2	0.114
	(10-15)	9.7	280	4,900	1.2	0.065
CORE 09-QC14-2	(0-2.5)	4.3	150	190	0.1	0.519
	(2.5-5)	6.5	220	130	0.1	0.289
	(5-7.5)	9.3	330	79	0.1	0.121
	(7.5-10)	9.0	320	59	0.1	0.086
CORE 09-QC14-3	(0-5)	16	540	350	<0.1	0.617
	(5-10)	22	640	710	0.2	0.136
	(10-15)	24	660	940	0.3	0.112
	(15-20)	23	630	1,300	0.3	0.097
CORE 09-QC14-4	(0-5)	16	570	1,400	0.2	0.683
	(5-10)	17	560	9,900	1.9	0.188
	(10-15)	22	580	19,000	3.6	0.178
	(15-20)	19	470	16,000	3.1	0.109

Table 5.2: Summary of Selected Constituents in Porewater in Cell 14 Sampled in September 2009

Sample ID	Depth Interval (cm)	Radium-226 (Bq/L)	Barium (mg/L)	Calcium (mg/L)	Sulphate (mg/L)	Organic Carbon (mg/L)
PW09-QC14-1	(0-5)	1.8	0.058	290	*726*	NA
PW09-QC14-1	(5-10)	1.4	0.028	516	*1,188*	NA
PW09-QC14-1	(10-15)	0.97	0.021	532	1,500	4.7
PW09-QC14-2	(0-2.5)	3.6	0.309	8.79	32	28
PW09-QC14-2	(2.5-5)	2.8	0.308	5.68	12	18.3
PW09-QC14-2	(5-7.5)	5.9	0.519	6.06	12	17.9
PW09-QC14-2	(7.5-10)	6.9	0.499	6.44	*13*	NA
PW09-QC14-3	(0-5)	4.1	0.333	6.12	5.6	3.5
PW09-QC14-3	(5-10)	3.4	0.233	8.51	6.8	3.2
PW09-QC14-3	(10-15)	2.6	0.131	15.5	18	2.8
PW09-QC14-3	(15-20)	2.5	0.076	97.4	240	3.8
PW09-QC14-4	(0-5)	4.8	0.231	195	560	9.3
PW09-QC14-4	(5-10)	1.6	0.066	536	1,400	6.6
PW09-QC14-4	(10-15)	2.2	0.033	527	1,400	7.3
PW09-QC14-4	(15-20)	0.42	0.020	519	1,400	4.0

Notes:
PW - Porewater - Depth refers to "below solids-water interface"
NA - Not Analysed
Italicized sulphate concentrations indicates values estimated from the total sulphur concentrations from the ICP-MS scan

Table 5.3: Summary of Selected Constituents in Basin Water in Cell 14 Sampled in September 2009

Sample ID	Depth Below Surface	Radium-226	Barium	Calcium	Sulphate	Organic Carbon
	(m)	(Bq/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
SW09-QC14-1T	0	0.77	0.109	5.72	55	13.3
SW09-QC14-1B	2.5	1.0	0.116	6.24	32	18.5
SW09-QC14-2T	0	0.82	0.104	5.69	72	14.4
SW09-QC14-2B	3.1	0.91	0.108	5.55	32	19.4
SW09-QC14-3T	0	0.71	0.105	5.59	54	15.1
SW09-QC14-3B	3.1	0.95	0.105	5.69	35	16.0
SW09-QC14-4T	0	0.79	0.099	5.63	57	13.4
SW09-QC14-4B	2.5	0.95	0.109	5.67	25	14.2

Notes:
SW - Basin Water - Depth refers to "below surface"

Table 6.1: Water Balance Calculations for the Quirke TMA

Quirke TMA Characteristics		
Annual Flow at Q-29[a]	(m^3/a)	1,053,077
Annual Flow at Q-05[b]	(m^3/a)	2,786,883
TMA Flow Q-05 to Q-29	(m^3/a)	1,733,806
Watershed Surface Area	(ha)	292
Cell Characteristics		
Cell 14		
Watershed Surface Area	(ha)	86
NNI[c]	(m^3/a)	510,641
Flow	**(m^3/a)**	**1,563,718**
Cell 15		
Watershed Surface Area	(ha)	40
NNI[c]	(m^3/a)	237,508
Flow	**(m^3/a)**	**1,801,226**
Cell 16		
Watershed Surface Area	(ha)	102
NNI[c]	(m^3/a)	605,645
Flow	**(m^3/a)**	**2,406,871**
Cell 17		
Watershed Surface Area	(ha)	19
NNI[c]	(m^3/a)	112,816
Flow	**(m^3/a)**	**2,519,687**
Cell 18		
Watershed Surface Area	(ha)	45
NNI[c]	(m^3/a)	267,196
Flow	**(m^3/a)**	**2,786,883**

Notes:

[a] Q-29 represents inflow from Gravel Pit Lake (Average from 2006 to 2009)

[b] Q-05 represents outflow from Cell 18 (Average from 2006 to 2009)

[c] NNI = Net Natural Input (Precipitation + Runoff - Evaporation)

Surface Area values from CCL (1999)

Table 6.2: Average Radium-226 Activities (Bq/L) at the Outflow from Cells at the Quirke TMA

Year	Cell 14		Cell 15		Cell 16		Cell 17		Cell 18 (Q-05)	
	Average	**Count**	**Average**	**Count**	**Average**	**Count**	**Average**	**Count**	**Average**	**Count**
2006	0.35	5	0.25	3	0.65	3	1.23	3	1.02	12
2007	0.35	4	0.38	4	0.69	4	1.12	4	0.97	12
2008	0.34	4	0.26	4	0.65	4	0.84	4	0.86	12
2009	0.52	2	0.38	2	0.55	2	1.05	2	0.87	12
Average for 2006 through 2009	**0.37**	**15**	**0.31**	**13**	**0.65**	**13**	**1.05**	**13**	**0.93**	**48**

Note:
All Ra-226 activities are reported in Bq/L

Table 6.3: Radium-226 Loads at the Quirke TMA

	Radium-226 Activities in Basin Waters[a]	Flow Rate (m^3/a)[a,b]	Ra-226 Load (MBq/a)	Incremental Ra-226 Load (MBq/a)
Cell 14				
Average	0.37	1,563,718	579	579
Count	15	--	--	--
Cell 15				
Average	0.31	1,801,226	558	-20
Count	13	--	--	--
Cell 16				
Average	0.65	2,406,871	1,564	1,006
Count	13	--	--	--
Cell 17				
Average	1.05	2,519,687	2,646	1,081
Count	13	--	--	--
Cell 18				
Average	0.93	2,786,883	2,592	-54
Count	48	--	--	--

Notes:

[a] Average Ra-226 activity for 2006 through 2009 from routine monitoring (Table 6.2)

[b] Average flow rate for 2006 through 2009 from routine monitoring (Table 6.1)

Table 6.4: Ra-226 Fluxes, Loads and Activities in Cell 14 for Different Interface Thicknesses

Calculation	Units	Sample ID	Interface Thickness (m)		
			0.01	0.03	0.05
Activity	(Bq/L)	QC14-1	Basin Water[a]		1.0
			Porewater		1.8
		QC14-2	Basin Water[a]		0.91
			Porewater		3.6
		QC14-3	Basin Water[a]		0.95
			Porewater		4.1
		QC14-4	Basin Water[a]		0.95
			Porewater		4.8
Concentration Gradient	(Bq/L•m)	QC14-1	80	27	16
		QC14-2[a]	269	90	108
		QC14-3	315	105	63
		QC14-4	385	128	77
		Average	***262***	***87***	***66***
Flux	(MBq/m2•a)	QC14-1	9.58E-04	3.19E-04	1.92E-04
		QC14-2	3.22E-03	1.07E-03	1.29E-03
		QC14-3	3.77E-03	1.26E-03	7.54E-04
		QC14-4	4.61E-03	1.54E-03	9.22E-04
		Average	***3.14E-03***	***1.05E-03***	***7.89E-04***
Diffusive Load to Basin Water	(MBq/a)	***Average***	***659***	***220***	***166***
Calculated Activities in Basin Water	(Bq/L)	***Average***	***0.42***	***0.14***	***0.11***

Notes:
[a] Basin water activities are samples from the solids-water interface (Table 5.3)
[b] Top most sample from 0 to 2.5 cm interval giving an interface thickness of of 0.025 m for the 0.05 m interface thickness assessment
Area of uncovered tailings was 210,000 m^2 or 32% of the total area of 630,000 m^2 (Golder, 1994)
Average flow value for Cell 14 from Table 6.1

Table 6.5: Predicted Range of Ra-226 Activities in Basin Water Based on Average Porewater Activities and a Range of Flow Rates

Calculation	Units	Flow (m^3/a)[a]	
		2,444,201	881,884
Activity	(Bq/L)	Basin Water[a]	0.95
		Porewater[c]	3.6
Concentration Gradient	(Bq/L•m)	***265***	***265***
Flux	(MBq/m2•a)	3.17E-03	3.17E-03
Diffusive Load to Basin Water	(MBq/a)	***666***	***666***
Calculated Activities in Basin Water	(Bq/L)	***0.27***	***0.76***

Notes:

[a] Flow values represent the high and low 9-month moving averages from Figure 6.5

[b] Average basin water activity at the solids-water interface (Table 5.3)

[c] Average tailings porewater activities (Table 5.2)

Area of uncovered tailings was 210,000 m^2 or 32% of the total area of 630,000 m^2 (Golder, 1994)

Interface thickness equals 0.01 m

Table 6.6: Predicted Range of Ra-226 Activities in Basin Water Based on a Porewater Activity of 5 Bq/L

Calculation	**Units**	**Flow (m^3/a)[a]**	
		2,444,201	881,884
Activity	(Bq/L)	Basin Water[a]	0.95
		Porewater[c]	5
Concentration Gradient	(Bq/L•m)	***405***	***405***
Flux	(MBq/m2•a)	4.85E-03	4.85E-03
Diffusive Load to Basin Water	(MBq/a)	***1,018***	***1,018***
Calculated Activities in Basin Water	(Bq/L)	***0.42***	***1.15***

Notes:

[a] Flow values represent the high and low 9-month moving averages from Figure 6.5

[b] Average basin water activity from the solids-water interface (Table 5.3)

[c] Average tailings porewater activities (Table 5.2)

Area of uncovered tailings was 210,000 m^2 or 32% of the total area of 630,000 m^2 (Golder, 1994)

Interface thickness equals 0.01 m

Table 6.7: Predicted Range of Ra-226 Activities in Basin Water Based on a Porewater Activity of 15 Bq/L

Calculation	Units	Flow (m^3/a)[a]	
		2,444,201	881,884
Activity	(Bq/L)	Basin Water[a]	0.95
		Porewater[c]	5
		Basin Water[a]	0.95
		Porewater[d]	15
Concentration Gradient[e]	(Bq/L•m)	***655***	***655***
Flux	(MBq/m2•a)	7.84E-03	7.84E-03
Diffusive Load to Basin Water	(MBq/a)	***1,647***	***1,647***
Calculated Activities in Basin Water	(Bq/L)	***0.67***	***1.87***

Notes:

[a] Flow values represent the high and low 9-month moving averages from Figure 6.5

[b] Maximum Predicted Ra-226 Activity in Basin Water Based on a Porewater Activity of 5 Bq/L (Table 6.6)

[c] Average tailings porewater activities (Table 5.2)

[d] Ra-226 activity in porewater estimated from the Barium-Ra-226 regression and $BaSO_4$ solubility (Figure 6.3)

[e] Weighted average with Ra-226 of 5 and 15 Bq/L representing 75 and 25%

Area of uncovered tailings was 210,000 m^2 or 32% of the total area of 630,000 m^2 (Golder, 1994)

Interface thickness equals 0.01 m

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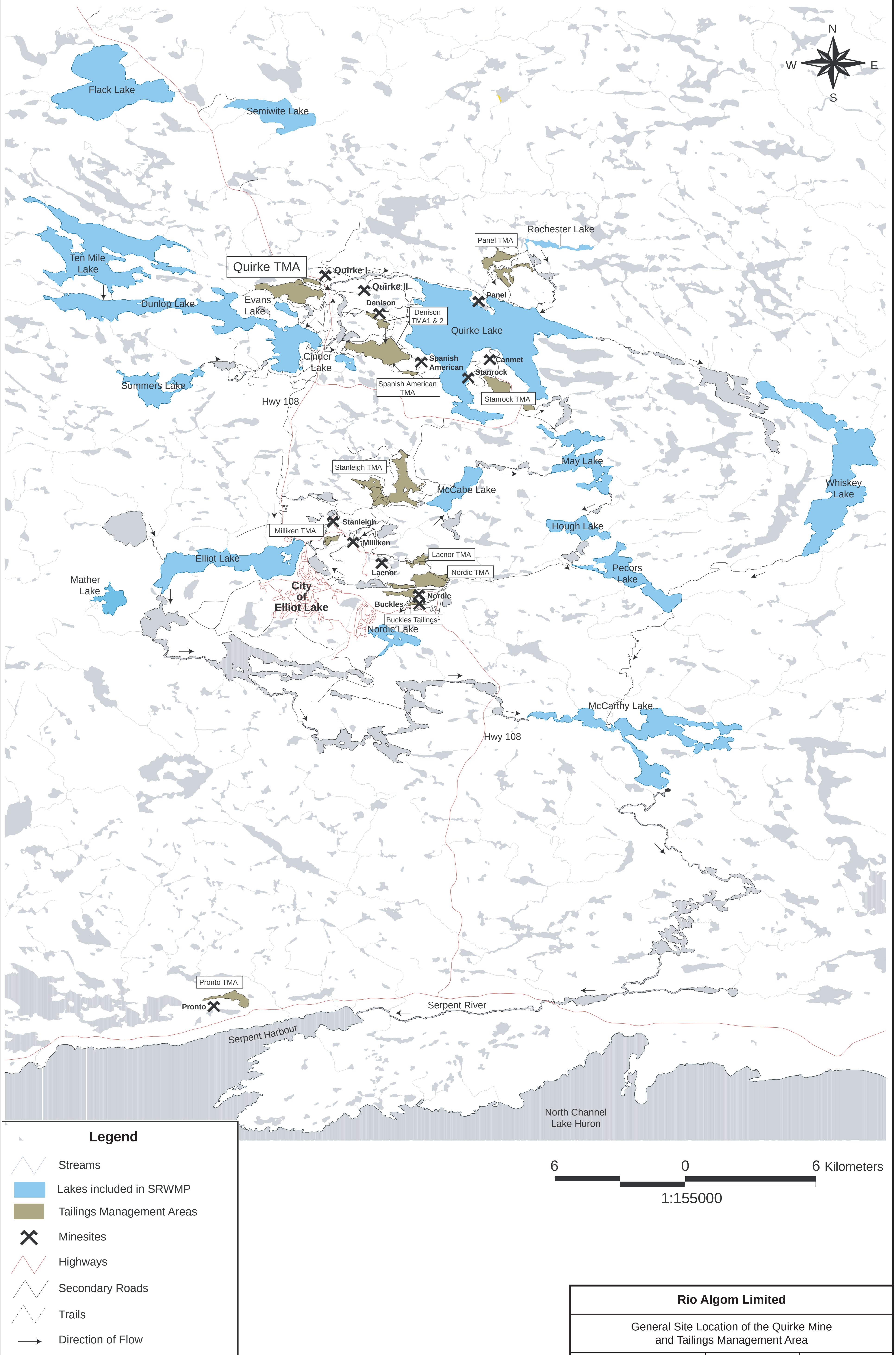
FIGURES



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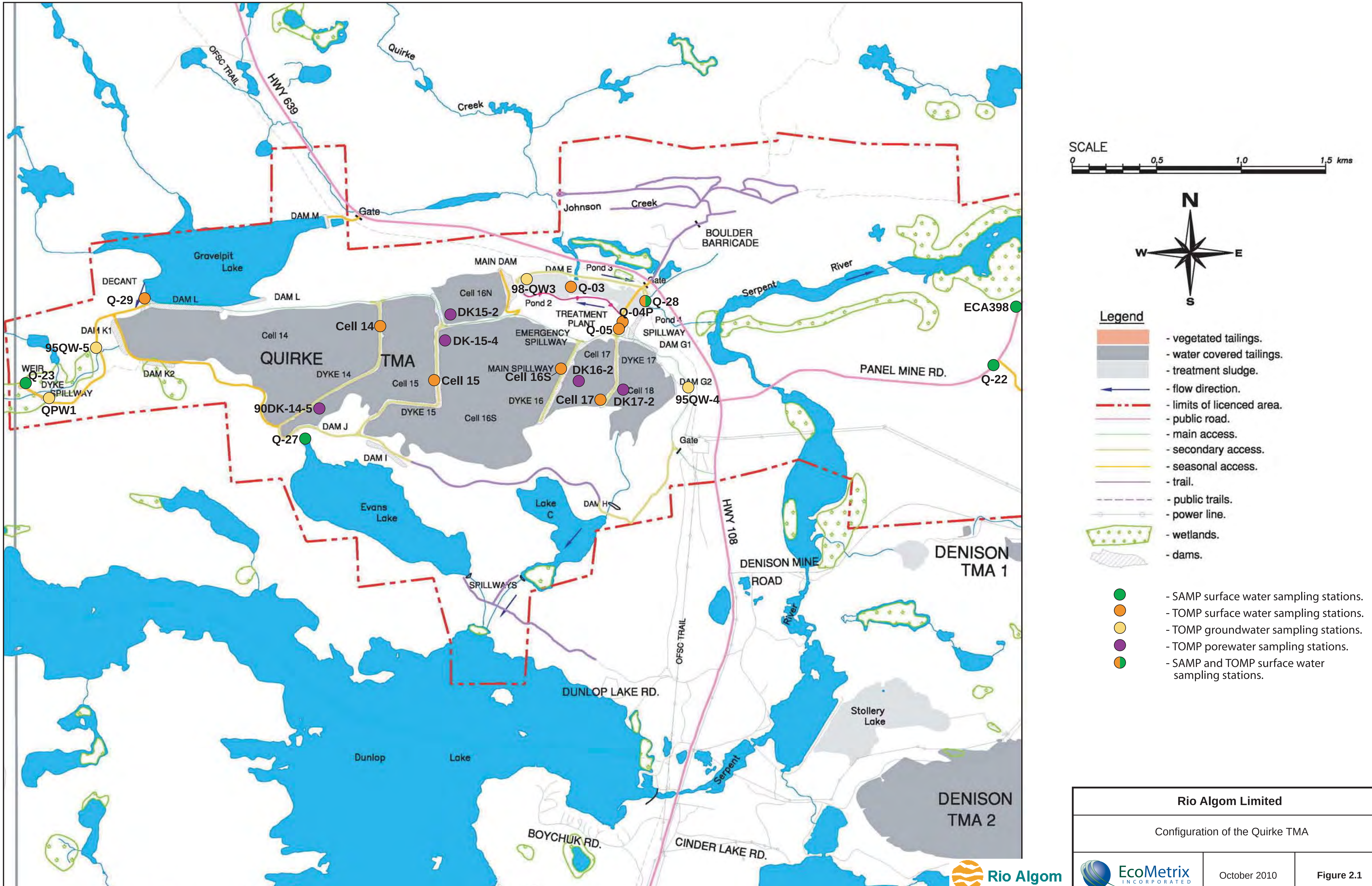
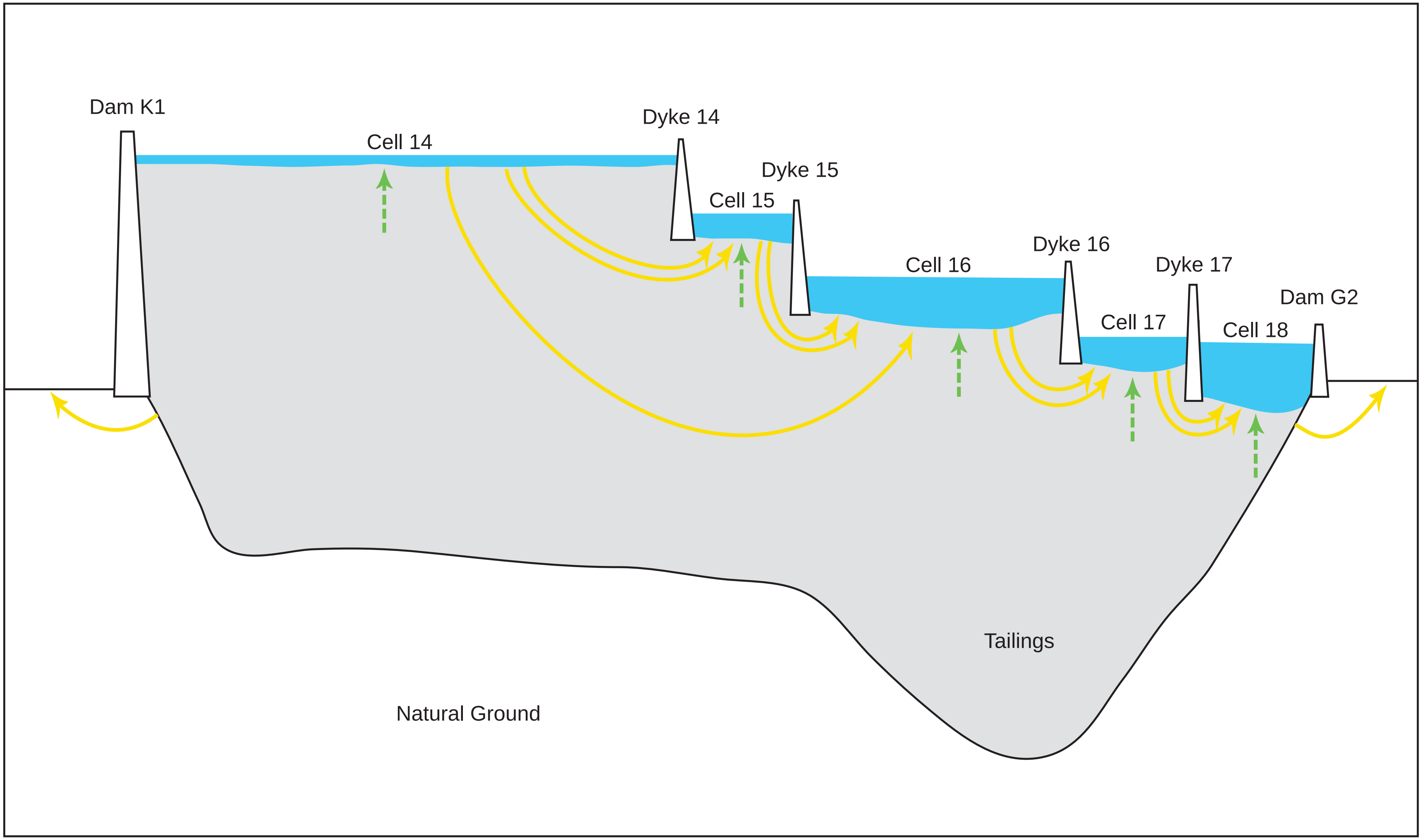
General Site Location of the Quirke Mine and Tailings Management Area

Rio Algom | EcoMetrix Incorporated | February 2011 | **Figure 1.1**



Rio Algom

Rio Algom Limited		
Configuration of the Quirke TMA		
EcoMetrix INCORPORATED	October 2010	Figure 2.1



Tailings
Water
Seepage
Diffusion

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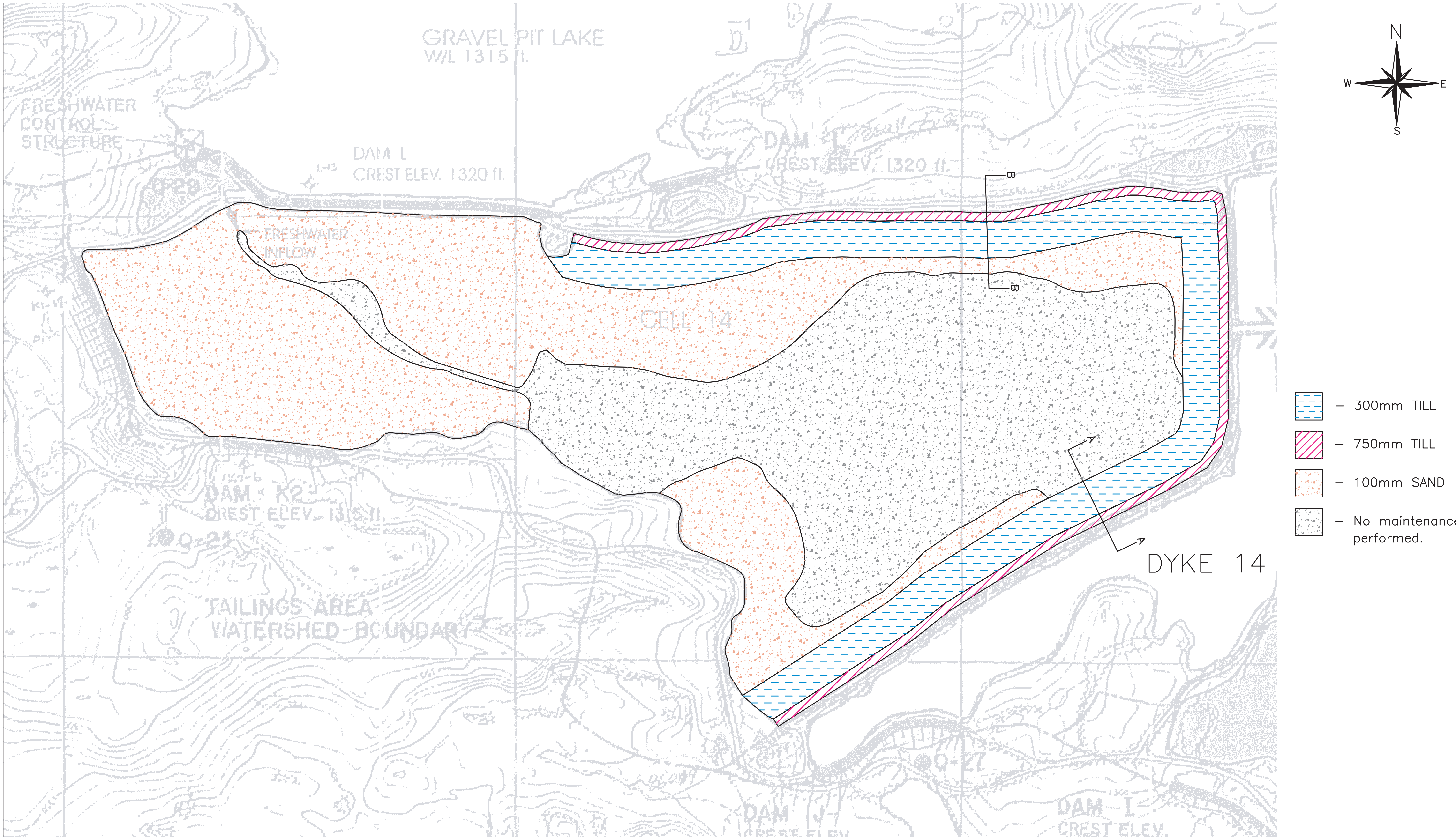
Schematic Cross-section Flow Conditions in the Flooded Tailings at the Quirke TMA

EcoMetrix INCORPORATED

January 2011

Figure 2.2



Approximate Areas	
300mm TILL	– 9.4 ha.
750mm TILL	– 2.3 ha.
100mm SAND	– 27.2 ha.
No Maintenance	– 23.4 ha.

SCALE
0 50 100 150 200 250 metres

NOTE: MAINTENANCE WAS COMPLETED THROUGH THE SUMMER OF 2004.

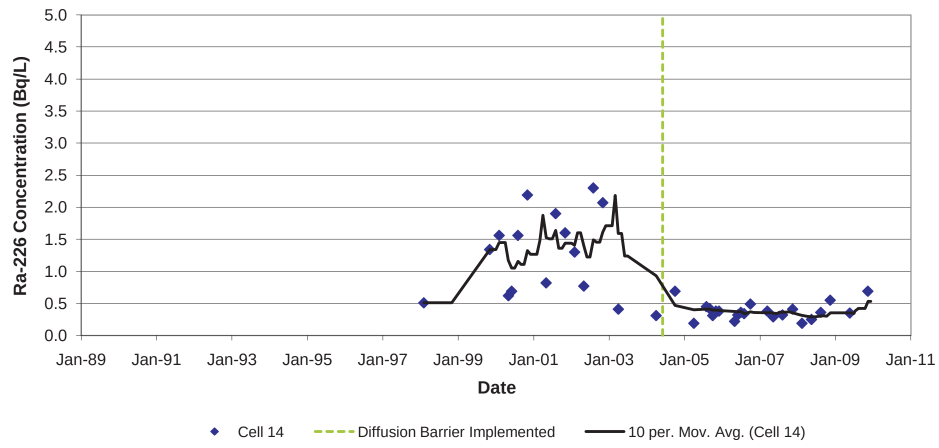
Rio Algom Limited

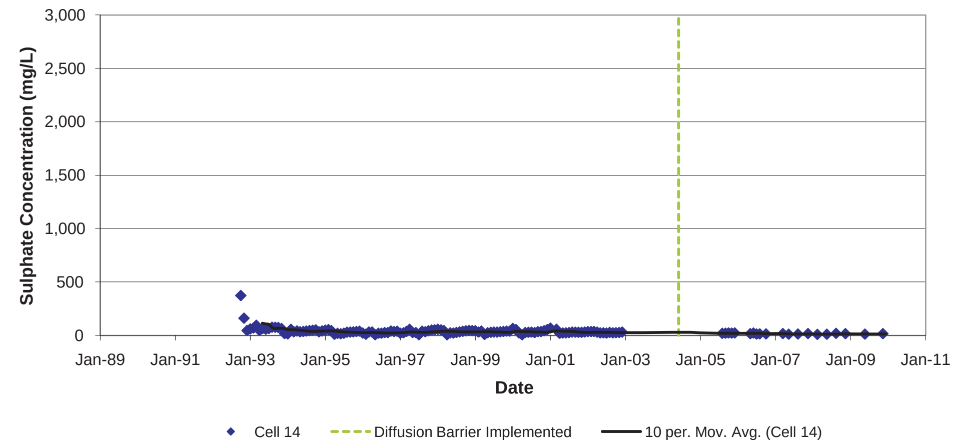
Extent of Till Blankets and Diffusion Barrier

February 2011

Figure 2.3

Cell 14





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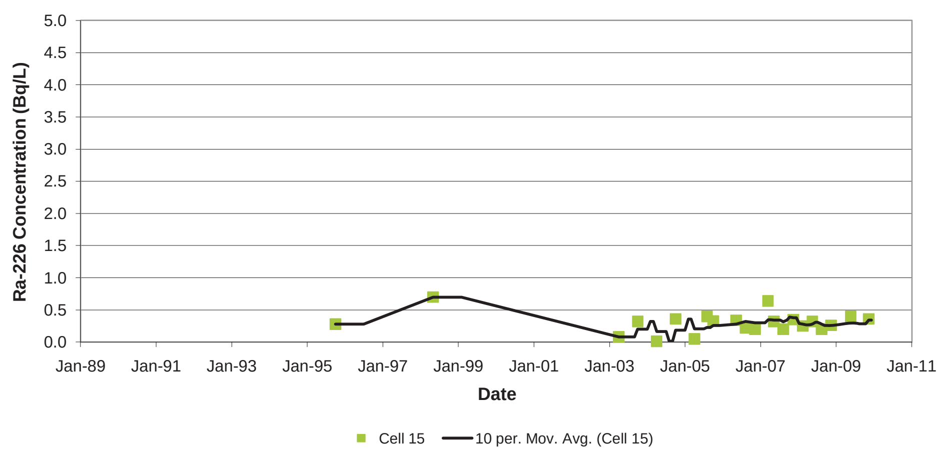

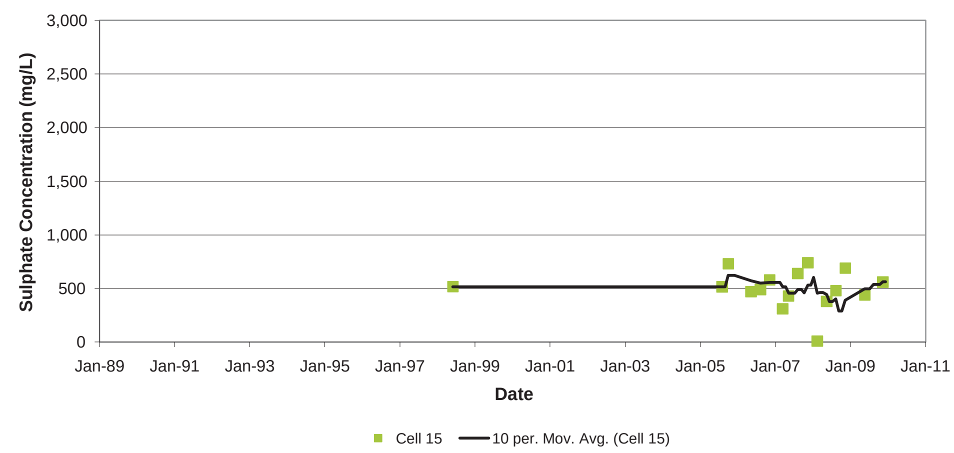

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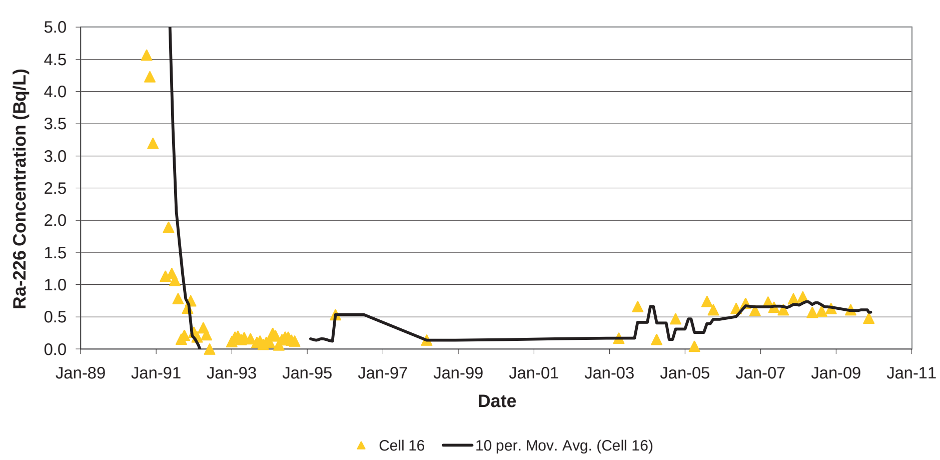

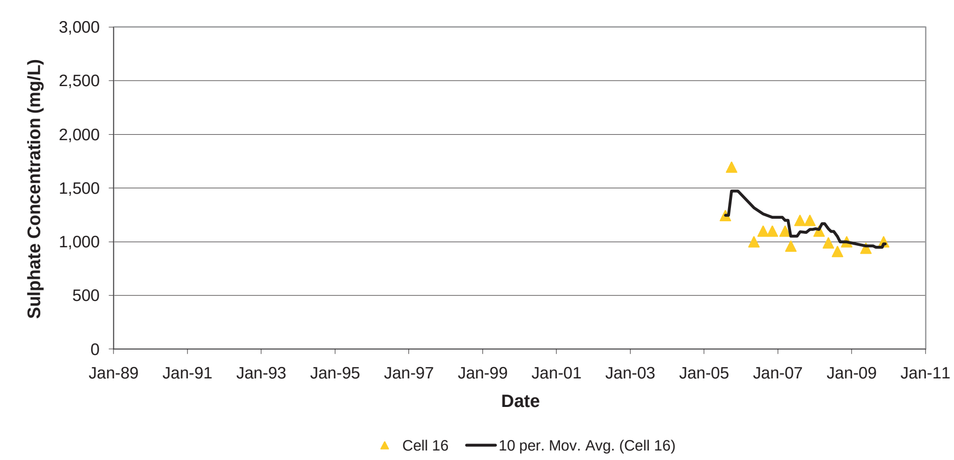

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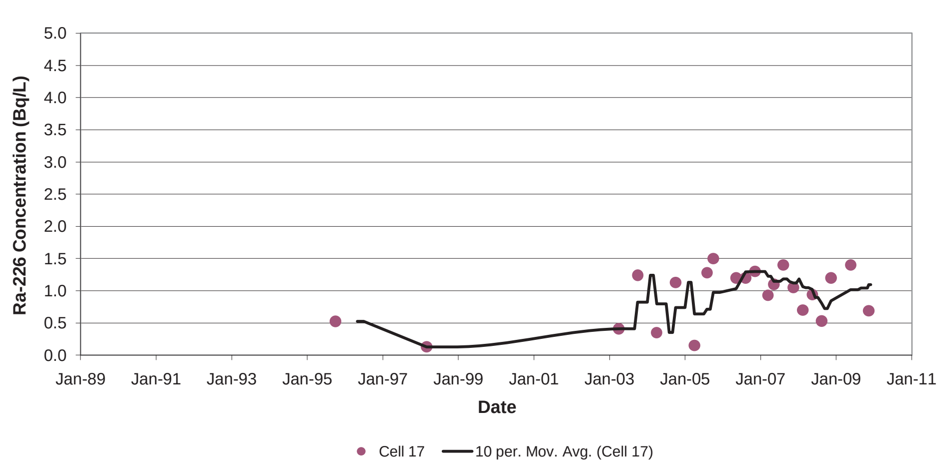

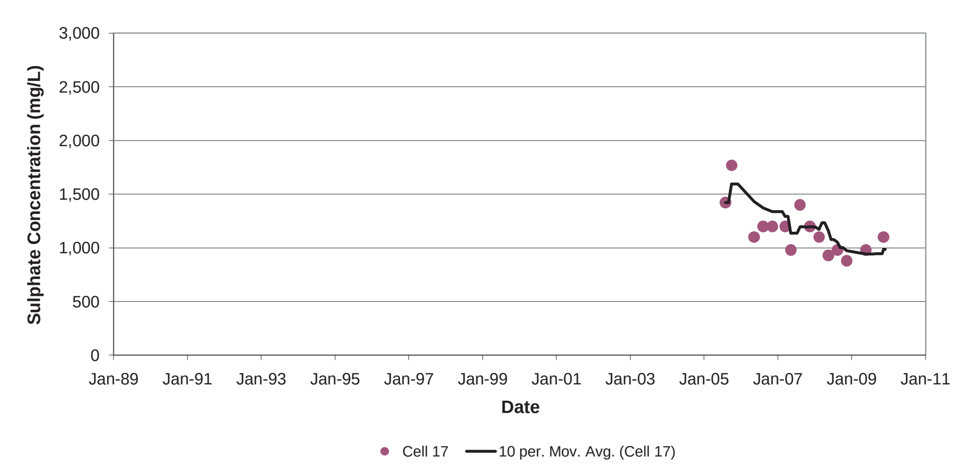

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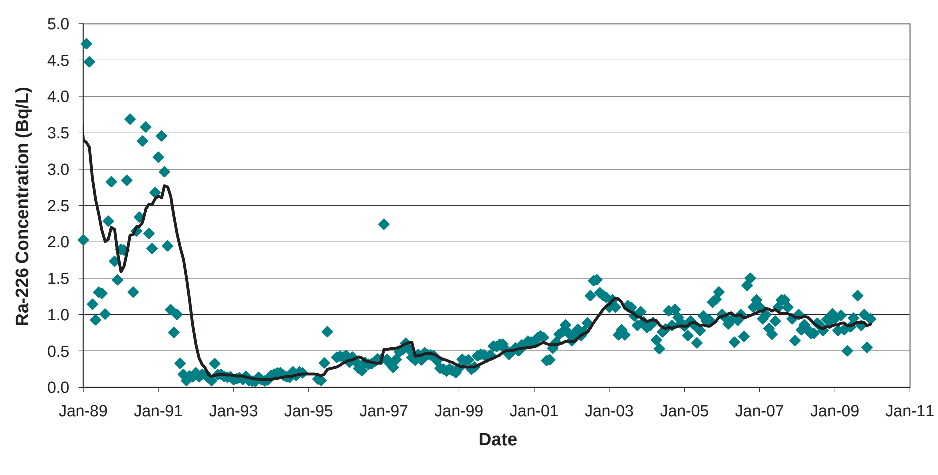

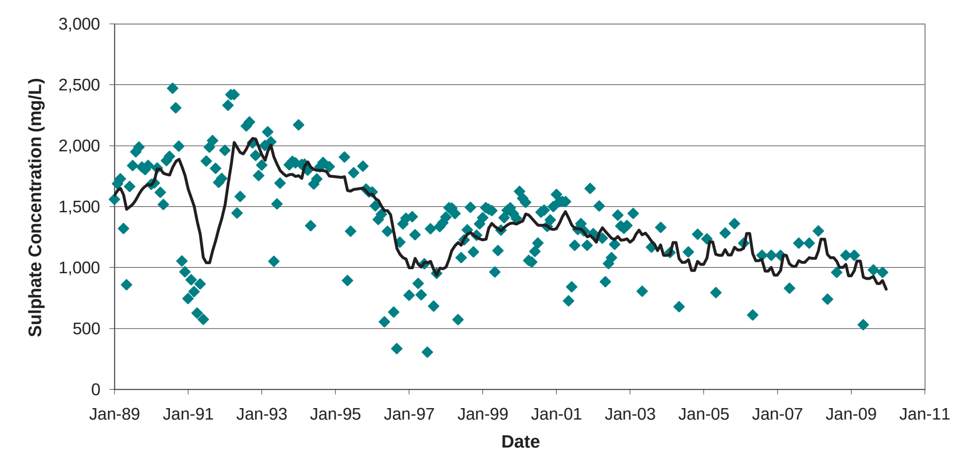

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Routine Monitoring Data from the Quirke TMA

Rio Algom	EcoMetrix Incorporated	February 2011	**Figure 2.4**

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Quirke Cell 14 Sample Stations

EcoMetrix INCORPORATED

February 2011

Figure 3.1

Core09-QC14-1

Core09-QC14-2

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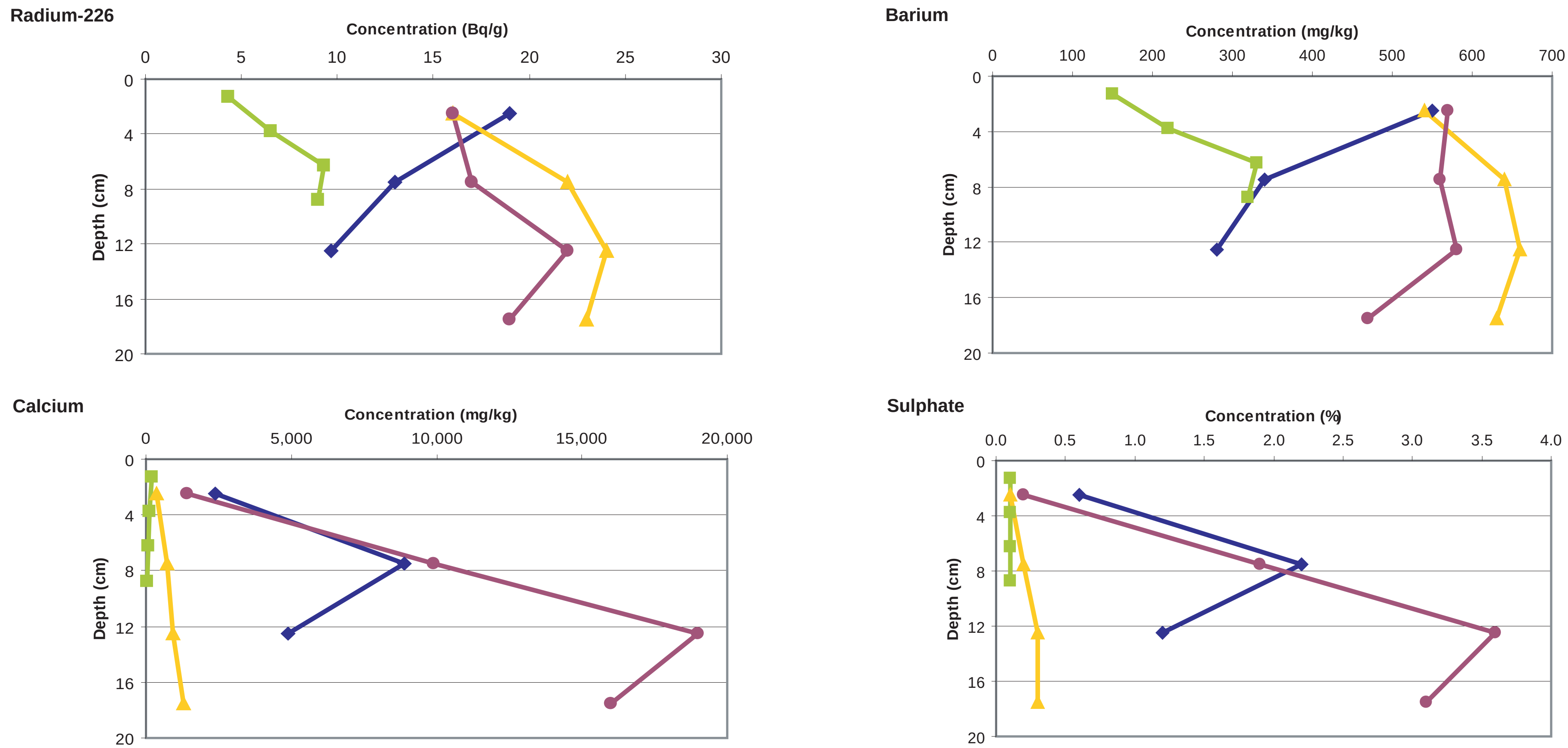
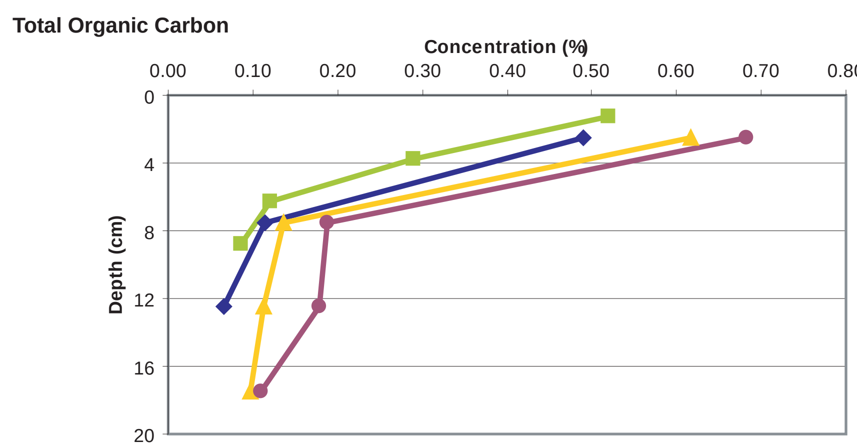
Photographs of Core09-QC14-1
and Core09-QC14-2

Rio Algom | EcoMetrix INCORPORATED | February 2011 | **Figure 3.2**





QC14-1 QC14-2 QC14-3 QC14-4

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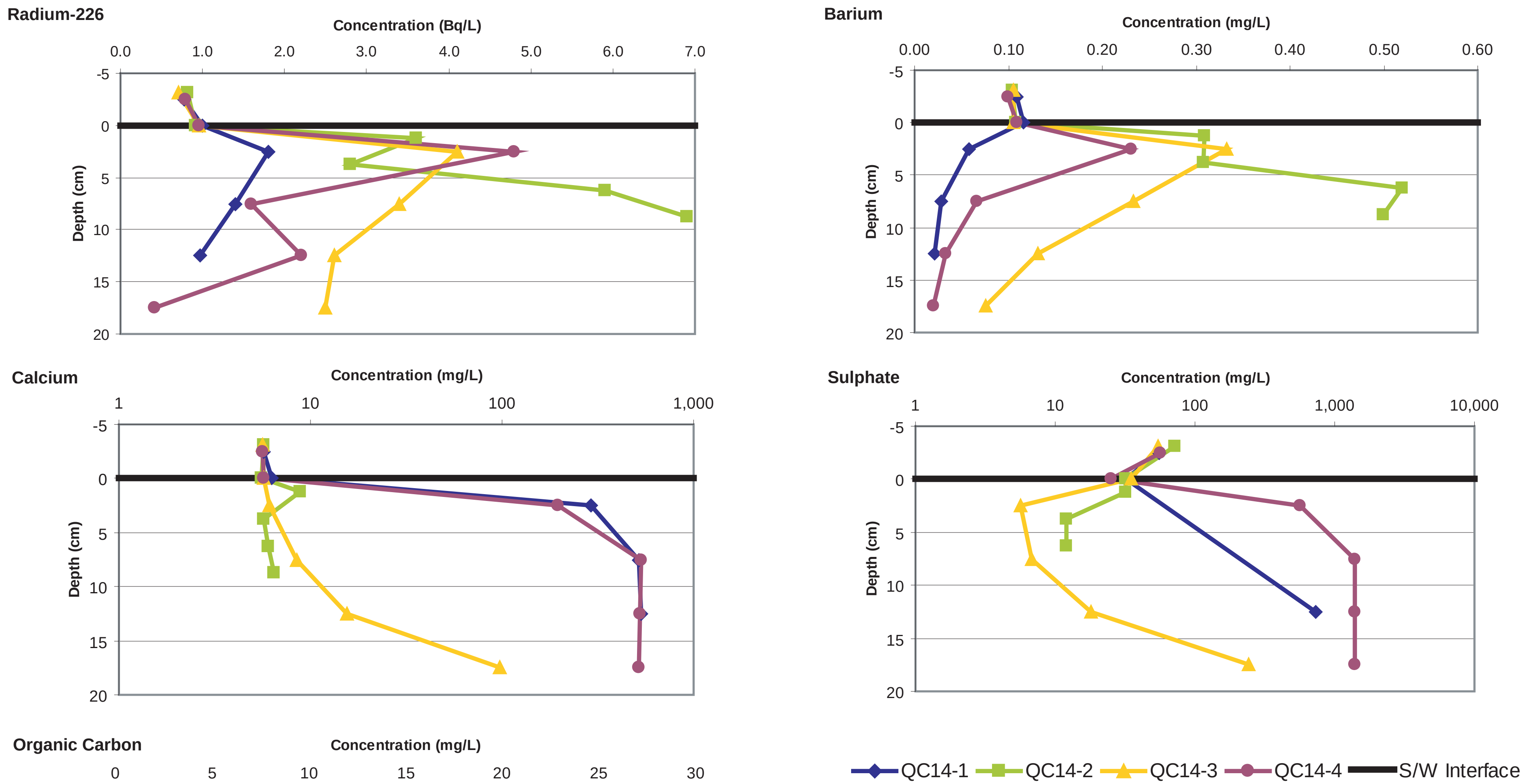
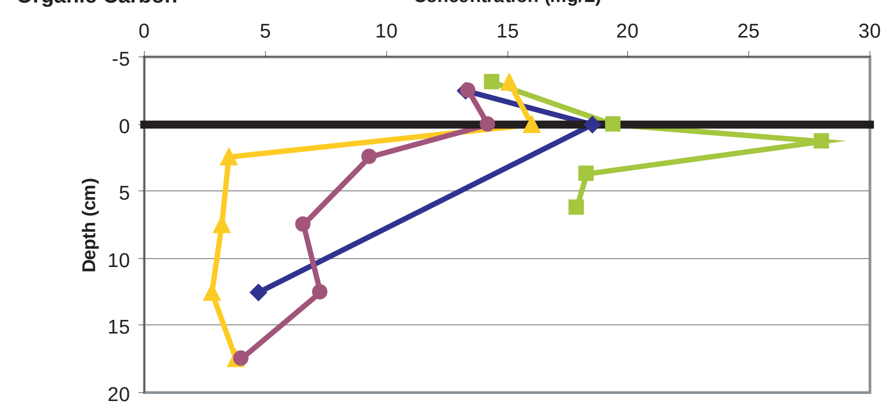
Rio Algom Limited		
Depth Profiles for Selected Constituents in Tailings Solids		
EcoMetrix INCORPORATED	February 2011	**Figure 5.1**





Note: Data points above the surface water interface represent Top and Bottom water samples. See Table 4.2 for actual depth values.

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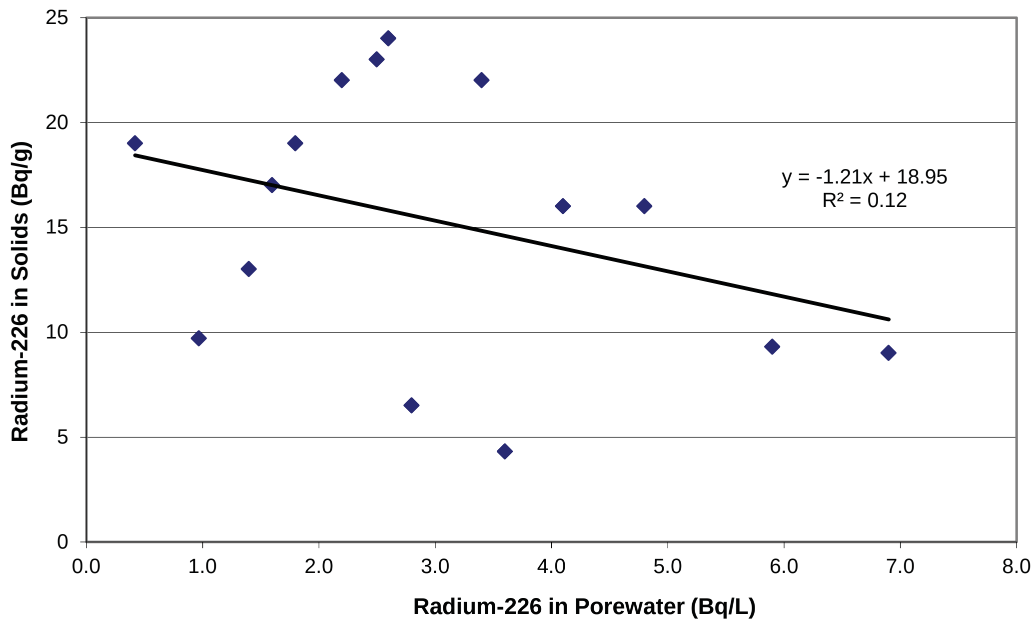
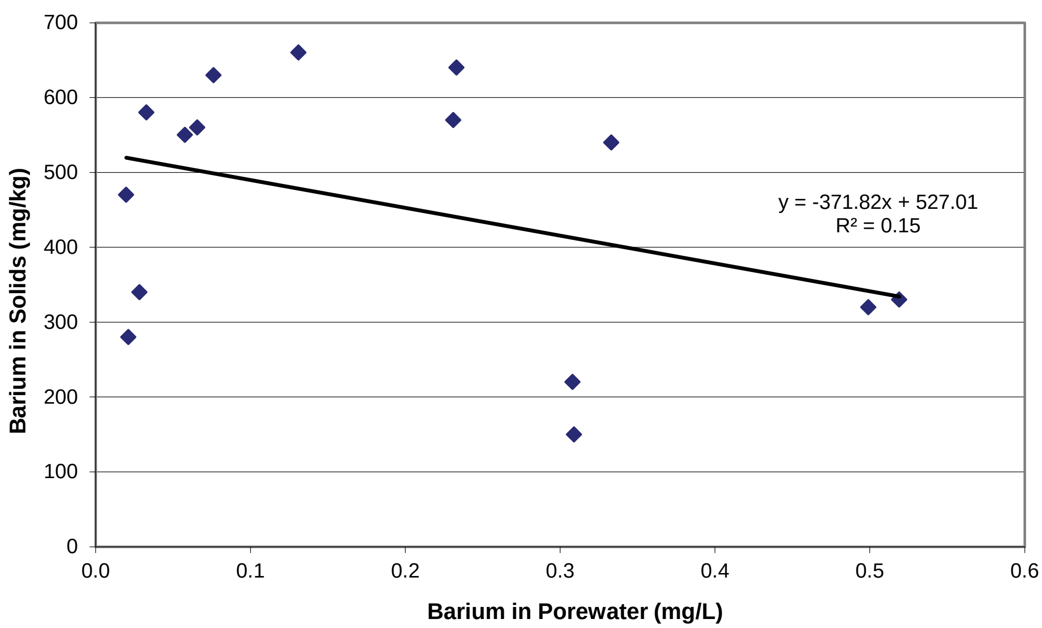
Rio Algom Limited		
Depth Profiles for Selected Constituents in Porewater and Basin Water		
EcoMetrix INCORPORATED	February 2011	**Figure 5.2**

a)



b)



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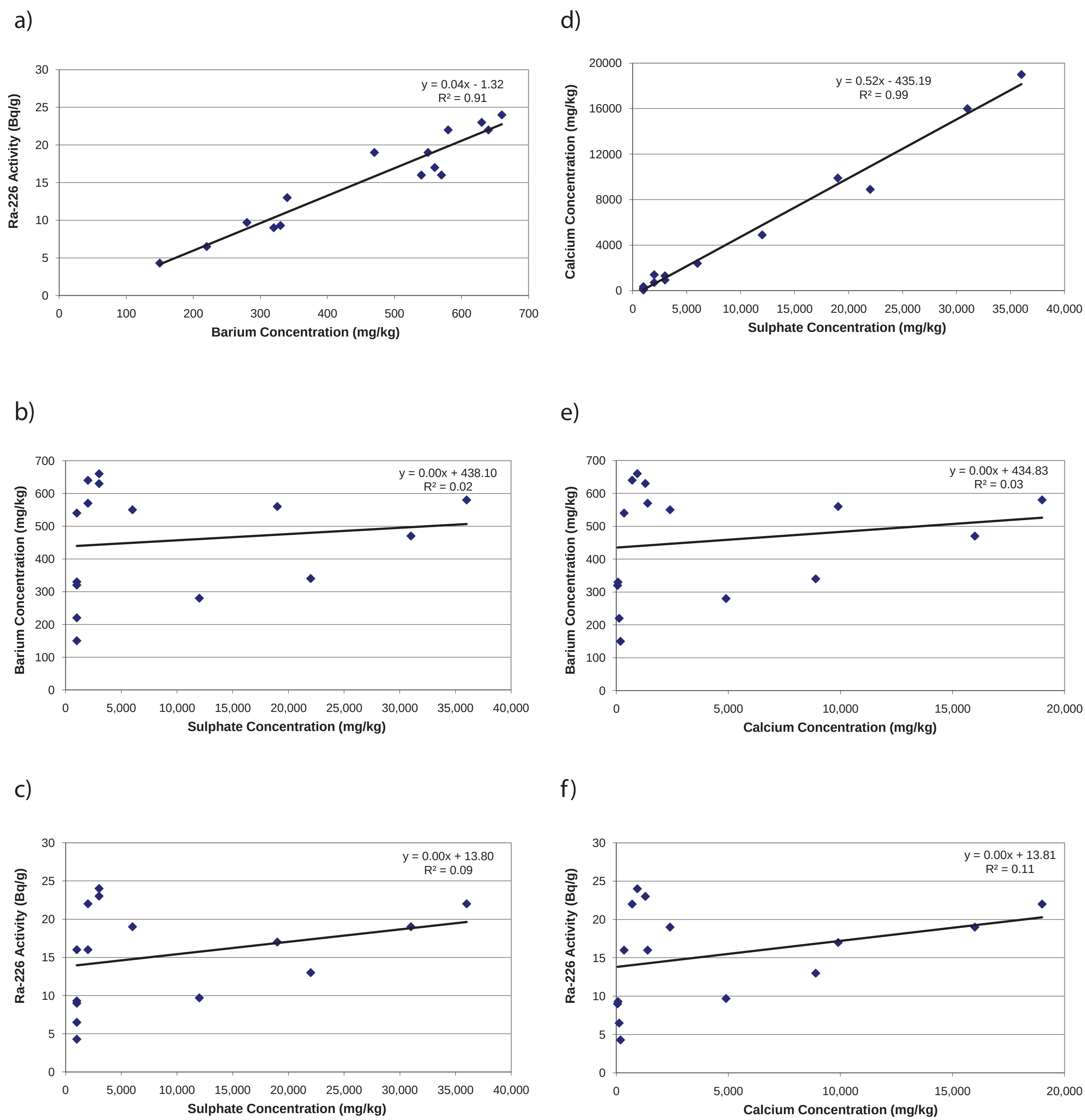
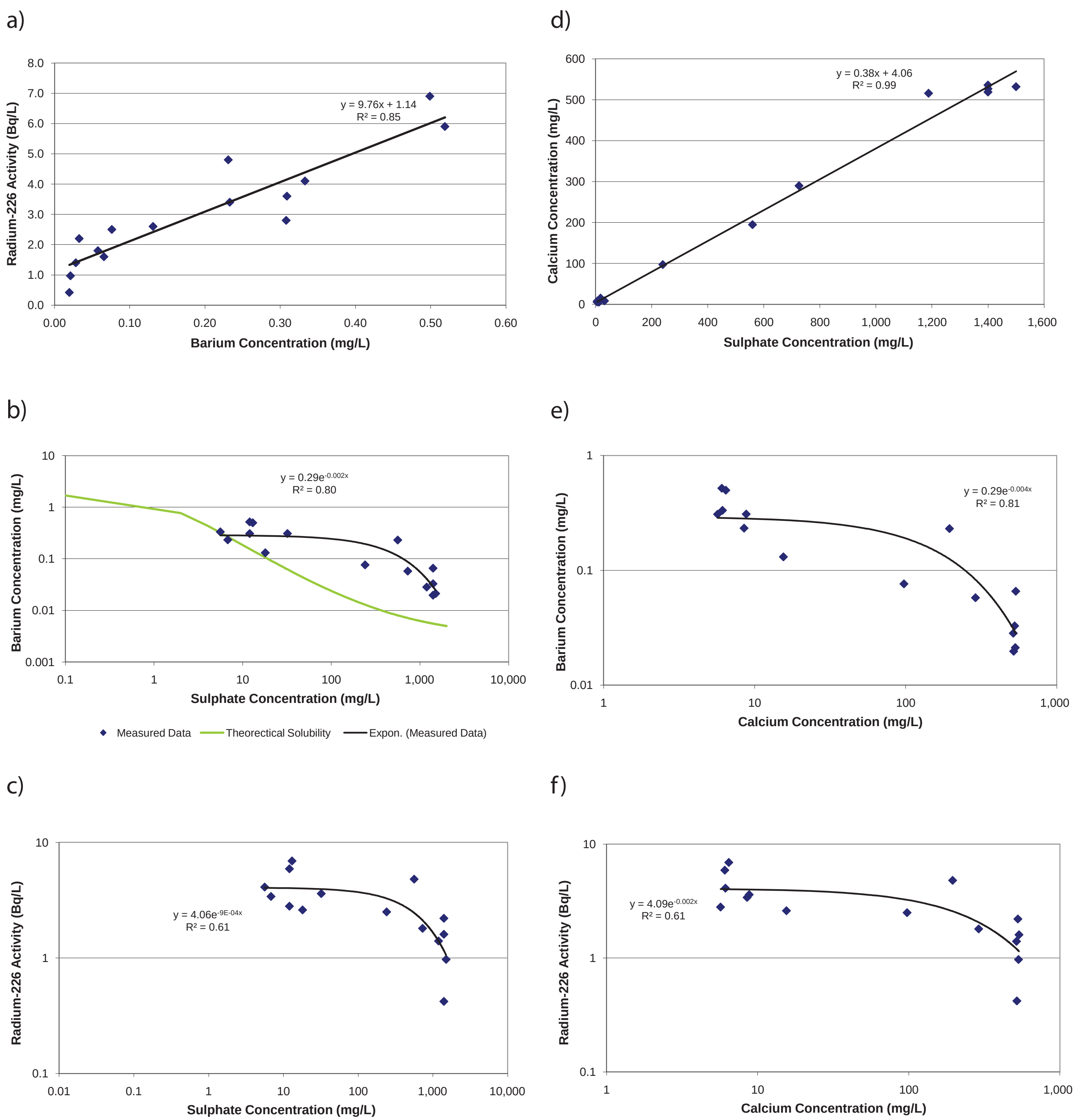
Rio Algom Limited		
Water-Solids Partitioning Plots for Ra-226 and Barium		
EcoMetrix INCORPORATED	February 2011	**Figure 6.1**



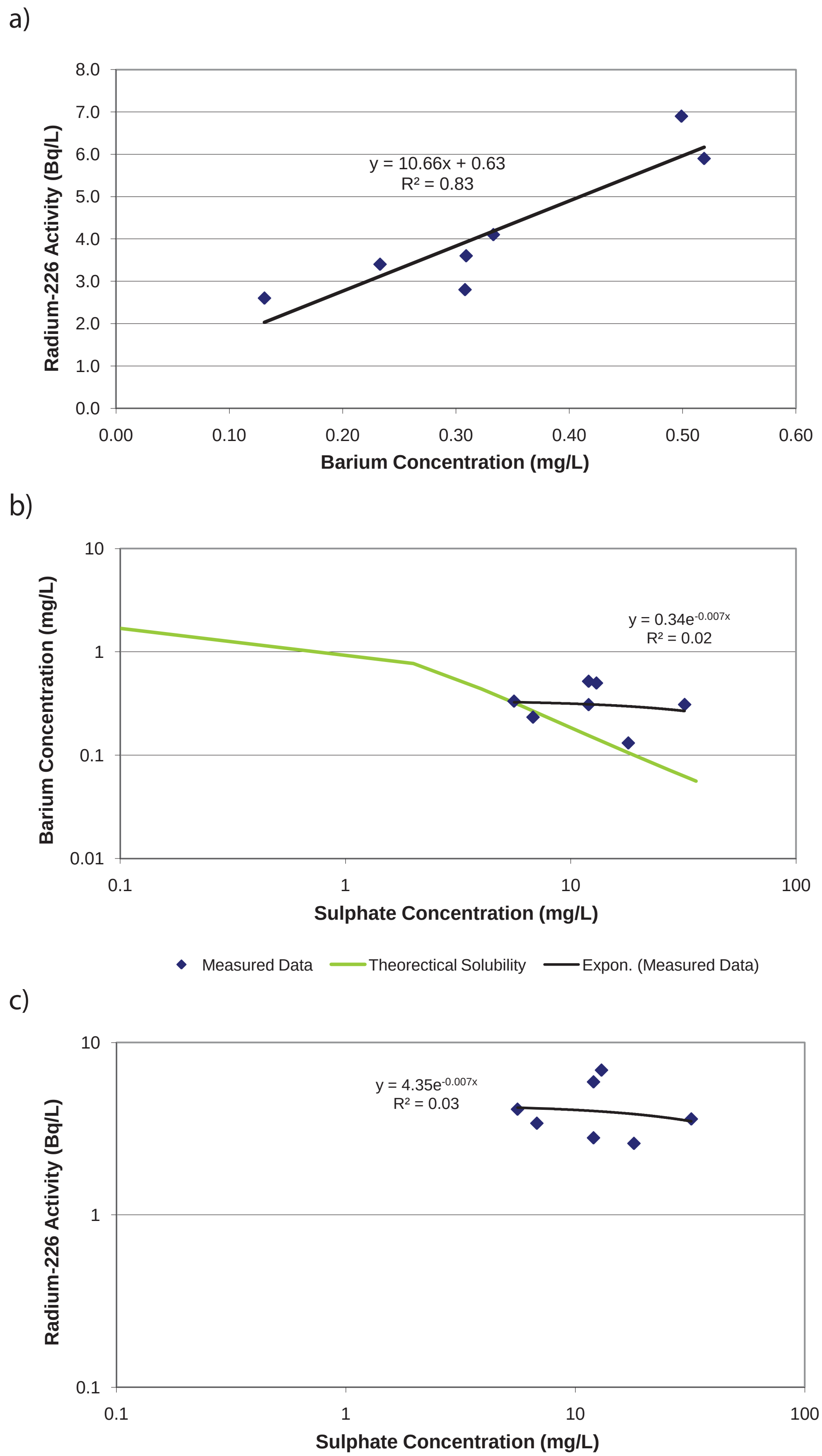
Rio Algom Limited		
Correlation Plots for Selected Constituents in Tailings Solids		
EcoMetrix INCORPORATED	February 2011	Figure 6.2

Rio Algom



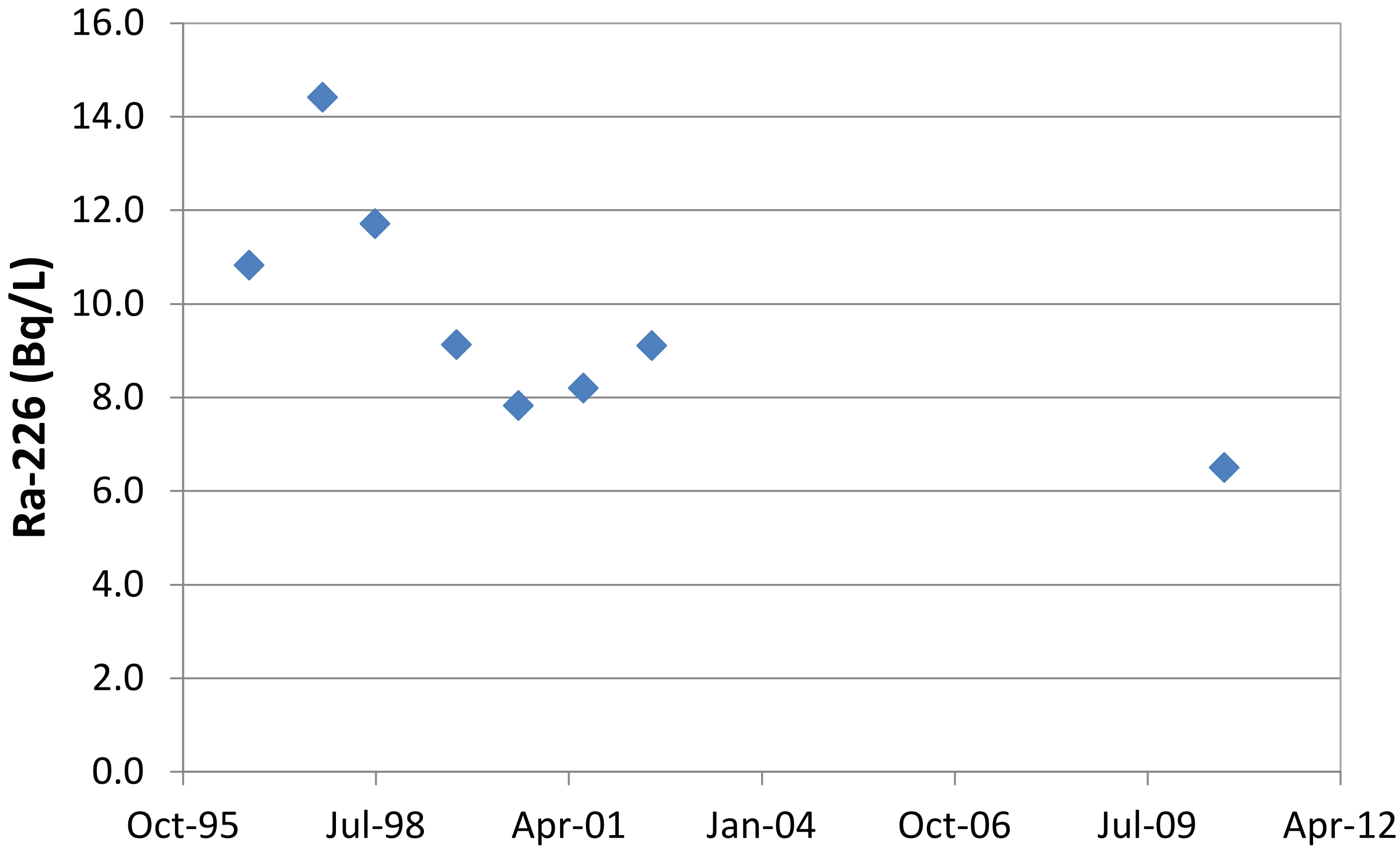
Rio Algom Limited		
Correlation Plots for Selected Constituents in Porewater		
EcoMetrix INCORPORATED	February 2011	**Figure 6.3**

Rio Algom

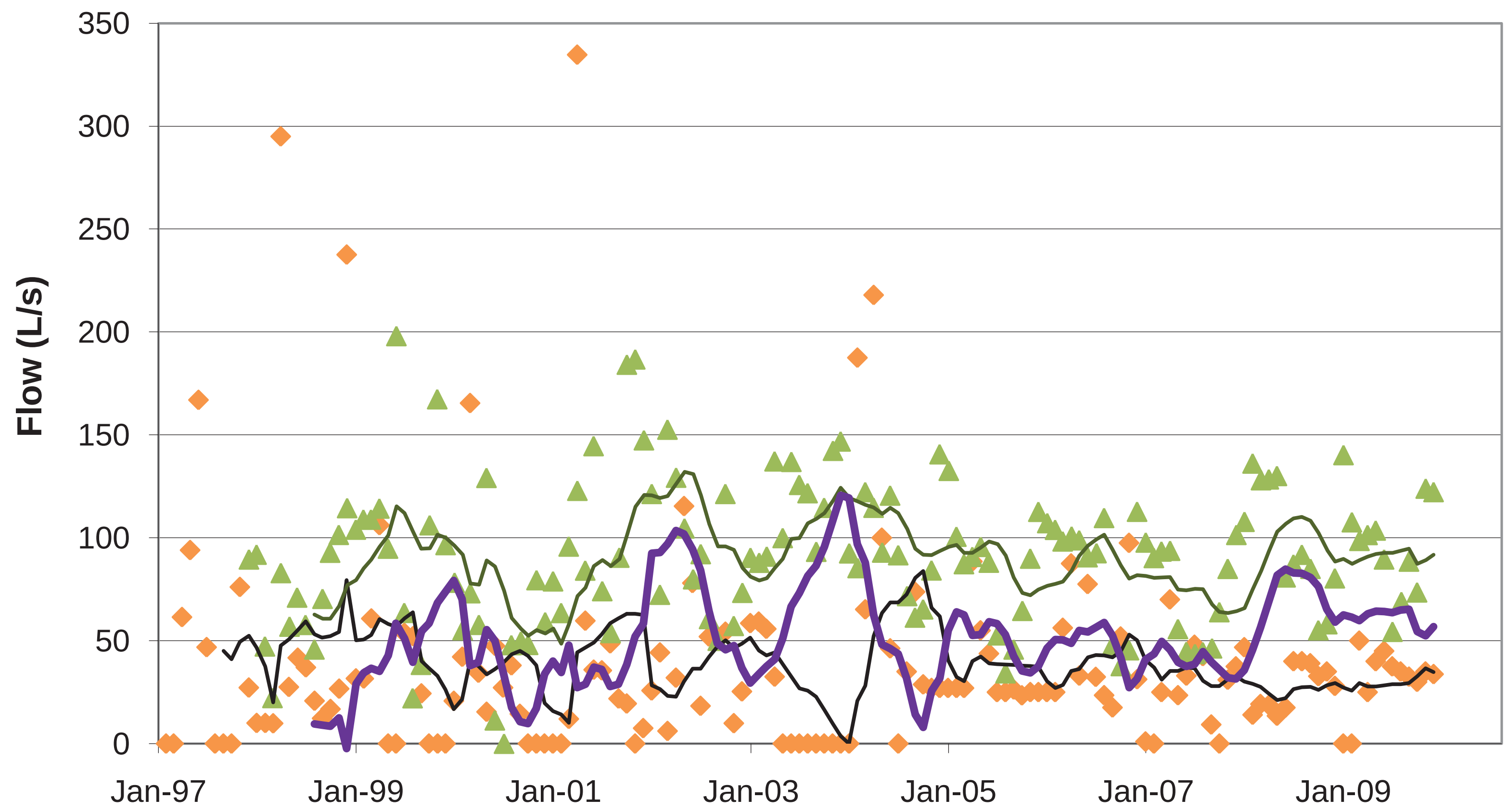


Rio Algom Limited		
Scatter Plots for Ra-226 and Barium, Barium and Sulphate, and Ra-226 and Sulphate in Low Sulphate Tailings Porewater		
EcoMetrix INCORPORATED	February 2011	**Figure 6.4**

Rio Algom



Rio Algom Limited		
Time-Trend Plot for Radium-226 Activities in Porewater in Piezometer DK16-2		
EcoMetrix Incorporated	February 2011	**Figure 6.5**



- Flow at Q-29
- Flow at Q-05
- 9-Month Moving Average for Flow at Q-29
- 9-Month Moving Average for Flow at Q-05
- 9-Month Moving Average for Net Natural Input (Q-05 minus Q-29)

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Monthly Flow Data at the Quirke TMA		
EcoMetrix INCORPORATED	February 2011	**Figure 6.6**

APPENDIX 1

Compilation of Routine Monitoring Data at the Quirke TMA

Table A1.1: Flow Data for Cell 14 Inflow from Gravel Pit Lake Quirke TMA (Q-29)

1997		1998		1999		2000		2001		2002	
Date	Flow (L/s)	Date	Flow (L/s)	Date	Flow (L/s)	Date	Flow (L/s)	Date	Flow (L/s)	Date	Flow (L/s)
1-Jan-97	36.0	2-Jan-98	10	4-Jan-99	86	5-Jan-00	15	2-Jan-01	0	1-Jan-02	50
1-Feb-97	0.0	6-Jan-98	10	5-Jan-99	83	7-Jan-00	20	5-Jan-01	0	4-Jan-02	48
1-Mar-97	0.0	9-Jan-98	10	8-Jan-99	19	11-Jan-00	20	9-Jan-01	0	8-Jan-02	45
1-Apr-97	61.5	13-Jan-98	10	12-Jan-99	15.2	14-Jan-00	23	12-Jan-01	0	11-Jan-02	10
1-May-97	94.0	16-Jan-98	10	15-Jan-99	15.2	18-Jan-00	23	16-Jan-01	0	15-Jan-02	10
1-Jun-97	167.0	20-Jan-98	10	19-Jan-99	15.2	21-Jan-00	23	19-Jan-01	0	18-Jan-02	18
1-Jul-97	46.9	23-Jan-98	10	22-Jan-99	15.2	25-Jan-00	21	23-Jan-01	0	22-Jan-02	17
1-Aug-97	0.0	27-Jan-98	10	26-Jan-99	17.1	28-Jan-00	21	26-Jan-01	0	25-Jan-02	17
1-Sep-97	0.0	30-Jan-98	10	29-Jan-99	19	1-Feb-00	21.1	30-Jan-01	0	29-Jan-02	17.1
1-Oct-97	0.0	3-Feb-98	10	2-Feb-99	19	4-Feb-00	21.07	2-Feb-01	0	1-Feb-02	17
1-Nov-97	76.1	10-Feb-98	10	3-Feb-99	19.1	8-Feb-00	21.07	6-Feb-01	0	5-Feb-02	57
4-Dec-97	68	13-Feb-98	10	5-Feb-99	19	11-Feb-00	21.07	9-Feb-01	0	8-Feb-02	59
5-Dec-97	20	17-Feb-98	10	9-Feb-99	19	15-Feb-00	19.03	13-Feb-01	0	12-Feb-02	60
18-Dec-97	19	25-Feb-98	10	12-Feb-99	19	18-Feb-00	19.03	16-Feb-01	0	15-Feb-02	60
23-Dec-97	19	26-Feb-98	10	16-Feb-99	21.1	22-Feb-00	19.03	20-Feb-01	0	19-Feb-02	63
30-Dec-97	10	4-Mar-98	9	19-Feb-99	51	25-Feb-00	21.07	23-Feb-01	0	22-Feb-02	21
		6-Mar-98	10	23-Feb-99	51	29-Feb-00	216.97	27-Feb-01	0	26-Feb-02	17
		11-Mar-98	10	26-Feb-99	66	3-Mar-00	216.97	2-Mar-01	0	1-Mar-02	17
		18-Mar-98	10	2-Mar-99	66	7-Mar-00	216	6-Mar-01	0	5-Mar-02	19
		20-Mar-98	10	5-Mar-99	75.9	10-Mar-00	216.97	9-Mar-01	0	8-Mar-02	19
		25-Mar-98	10	9-Mar-99	66	14-Mar-00	216.97	13-Mar-01	0	12-Mar-02	0
		1-Apr-98	150	12-Mar-99	66	17-Mar-00	216.97	16-Mar-01	0	15-Mar-02	0
		3-Apr-98	340	16-Mar-99	57	21-Mar-00	216.97	20-Mar-01	0	19-Mar-02	0
		8-Apr-98	340	19-Mar-99	57	24-Mar-00	69	23-Mar-01	0	22-Mar-02	0
		10-Apr-98	340	23-Mar-99	54	28-Mar-00	69	27-Mar-01	50	26-Mar-02	0
		16-Apr-98	340	26-Mar-99	51	31-Mar-00	50	30-Mar-01	58	28-Mar-02	0
		17-Apr-98	340	30-Mar-99	54	4-Apr-00	45	3-Apr-01	127.5	2-Apr-02	0
		21-Apr-98	340	1-Apr-99	66.13	7-Apr-00	48	6-Apr-01	300	5-Apr-02	0
		27-Apr-98	170	6-Apr-99	112	11-Apr-00	96.8	10-Apr-01	300	9-Apr-02	0
		1-May-98	0	8-Apr-99	127	14-Apr-00	51	13-Apr-01	300	12-Apr-02	0
		5-May-98	0	9-Apr-99	136	18-Apr-00	0	17-Apr-01	450	16-Apr-02	0
		7-May-98	0	13-Apr-99	144	25-Apr-00	0	20-Apr-01	450	19-Apr-02	50
		8-May-98	0	15-Apr-99	139	28-Apr-00	0	24-Apr-01	450	23-Apr-02	50
		13-May-98	50	19-Apr-99	250	2-May-00	0	27-Apr-01	300	26-Apr-02	95
		15-May-98	50	20-Apr-99	148	5-May-00	0	1-May-01	79.23	30-Apr-02	93
		19-May-98	50	23-Apr-99	45.4	9-May-00	0	4-May-01	79	3-May-02	170
		22-May-98	47	27-Apr-99	0	12-May-00	0	8-May-01	79	7-May-02	170
		26-May-98	40	30-Apr-99	0	16-May-00	0	11-May-01	0	10-May-02	93
		29-May-98	38	3-May-99	0	19-May-00	0	15-May-01	0	17-May-02	100
		3-Jun-98	40	4-May-99	0	23-May-00	0	18-May-01	0	21-May-02	100
		5-Jun-98	40	7-May-99	0	26-May-00	82	22-May-01	0	24-May-02	100
		9-Jun-98	40	11-May-99	0	30-May-00	56.9	25-May-01	300	28-May-02	100
		12-Jun-98	37	14-May-99	0	2-Jun-00	54	29-May-01	0	31-May-02	90
		16-Jun-98	42.6	18-May-99	0	6-Jun-00	51	1-Jun-01	0	4-Jun-02	54
		19-Jun-98	42.6	21-May-99	0	9-Jun-00	48	5-Jun-01	110	7-Jun-02	50
		23-Jun-98	42.7	26-May-99	0	13-Jun-00	48	8-Jun-01	108	11-Jun-02	51
		26-Jun-98	45	28-May-99	0	16-Jun-00	45.4	12-Jun-01	105	14-Jun-02	51
		30-Jun-98	45.4	1-Jun-99	0	20-Jun-00	45	15-Jun-01	0	18-Jun-02	107
		3-Jul-98	46	4-Jun-99	0	23-Jun-00	40	19-Jun-01	0	21-Jun-02	107
		7-Jul-98	42.7	8-Jun-99	0	27-Jun-00	48	22-Jun-01	0	25-Jun-02	100
		10-Jul-98	42.7	11-Jun-99	0	30-Jun-00	48	26-Jun-01	0	28-Jun-02	104
		14-Jul-98	40	14-Jun-99	0	4-Jul-00	40	29-Jun-01	0	2-Jul-02	0
		17-Jul-98	37.4	15-Jun-99	0	7-Jul-00	32.38	3-Jul-01	0	5-Jul-02	0
		21-Jul-98	34.9	18-Jun-99	0	11-Jul-00	27.6	6-Jul-01	0	9-Jul-02	0
		24-Jul-98	32	22-Jun-99	0	14-Jul-00	0	10-Jul-01	0	12-Jul-02	0
		28-Jul-98	30	30-Jun-99	0	18-Jul-00	30	13-Jul-01	55	16-Jul-02	0
		31-Jul-98	27.6	2-Jul-99	0	21-Jul-00	30	17-Jul-01	55	19-Jul-02	0
		4-Aug-98	23	6-Jul-99	0	25-Jul-00	30	20-Jul-01	55	23-Jul-02	56.9
		7-Aug-98	25	9-Jul-99	75	28-Jul-00	27.6	24-Jul-01	50	26-Jul-02	54
		11-Aug-98	23.2	12-Jul-99	72	1-Aug-00	25	27-Jul-01	50	30-Jul-02	54
		14-Aug-98	21.1	13-Jul-99	72	4-Aug-00	25	31-Jul-01	55	2-Aug-02	54
		19-Aug-98	19	16-Jul-99	70	8-Aug-00	24	3-Aug-01	0	6-Aug-02	51
		21-Aug-98	19	20-Jul-99	66	11-Aug-00	23	7-Aug-01	50	9-Aug-02	54
		25-Aug-98	19	23-Jul-99	63	15-Aug-00	50	10-Aug-01	50	13-Aug-02	54
		28-Aug-98	17	27-Jul-99	60	18-Aug-00	50	14-Aug-01	63	16-Aug-02	51
		1-Sep-98	15.2	30-Jul-99	60	23-Aug-00	50	17-Aug-01	50	20-Aug-02	51
		4-Sep-98	15.2	3-Aug-99	60	25-Aug-00	50	21-Aug-01	55	23-Aug-02	51
		9-Sep-98	14	9-Aug-99	60	29-Aug-00	45	24-Aug-01	60	27-Aug-02	51
		11-Sep-98	11	17-Aug-99	54	1-Sep-00	40	28-Aug-01	55	30-Aug-02	51
		15-Sep-98	11.7	20-Aug-99	50	5-Sep-00	40	31-Aug-01	55	3-Sep-02	51
		18-Sep-98	11.7	24-Aug-99	50	8-Sep-00	0	4-Sep-01	0	6-Sep-02	54
		22-Sep-98	10	27-Aug-99	48	12-Sep-00	0	7-Sep-01	0	10-Sep-02	54
		25-Sep-98	10	31-Aug-99	43	15-Sep-00	0	11-Sep-01	0	13-Sep-02	54
		29-Sep-98	11.7	3-Sep-99	40	19-Sep-00	0	14-Sep-01	0	17-Sep-02	50
		2-Oct-98	10	7-Sep-99	37	22-Sep-00	0	18-Sep-01	0	20-Sep-02	50
		6-Oct-98	10	10-Sep-99	32	26-Sep-00	0	21-Sep-01	0	24-Sep-02	54
		9-Oct-98	17.1	14-Sep-99	31	29-Sep-00	50	25-Sep-01	0	27-Sep-02	50
		13-Oct-98	19	17-Sep-99	30	3-Oct-00	0	28-Sep-01	175	1-Oct-02	57
		16-Oct-98	19	21-Sep-99	25	6-Oct-00	0	2-Oct-01	0	4-Oct-02	57
		20-Oct-98	19	24-Sep-99	0	10-Oct-00	0	5-Oct-01	0	8-Oct-02	69
		23-Oct-98	19	28-Sep-99	0	13-Oct-00	0	9-Oct-01	0	11-Oct-02	54
		27-Oct-98	19	1-Oct-99	0	17-Oct-00	0	12-Oct-01	0	15-Oct-02	54
		30-Oct-98	19	5-Oct-99	0	20-Oct-00	0	16-Oct-01	175	18-Oct-02	51
		3-Nov-98	19	8-Oct-99	0	24-Oct-00	0	19-Oct-01	0	22-Oct-02	51
		11-Nov-98	21.1	12-Oct-99	0	27-Oct-00	0	23-Oct-01	0	25-Oct-02	51
		12-Nov-98	23	15-Oct-99	0	31-Oct-00	0	26-Oct-01	0	29-Oct-02	45
		13-Nov-98	25.4	19-Oct-99	0	3-Nov-00	0	30-Oct-01	0	1-Nov-02	10
		17-Nov-98	30	22-Oct-99	0	7-Nov-00	0	2-Nov-01	0	5-Nov-02	9
		20-Nov-98	30	26-Oct-99	0	10-Nov-00	0	6-Nov-01	0	8-Nov-02	10
		24-Nov-98	32.4	29-Oct-99	0	14-Nov-00	0	9-Nov-01	0	12-Nov-02	10
		27-Nov-98	32.4	2-Nov-99	0	17-Nov-00	0	13-Nov-01	0	15-Nov-02	10
		1-Dec-98	37.4	5-Nov-99	0	21-Nov-00	0	16-Nov-01	0	19-Nov-02	10
		4-Dec-98	100	9-Nov-99	0	24-Nov-00	0	20-Nov-01	0	22-Nov-02	10
		8-Dec-98	500	12-Nov-99	0	28-Nov-00	0	23-Nov-01	0	26-Nov-02	10
		11-Dec-98	500	16-Nov-99	0	1-Dec-00	0	27-Nov-01	0	29-Nov-02	10
		15-Dec-98	500	19-Nov-99	0	5-Dec-00	0	30-Nov-01	0	3-Dec-02	10
		18-Dec-98	160	23-Nov-99	0	8-Dec-00	0	4-Dec-01	0	6-Dec-02	10
		22-Dec-98	135.7	26-Nov-99	0	12-Dec-00	0	7-Dec-01	0	10-Dec-02	10
		29-Dec-98	108	30-Nov-99	0	15-Dec-00	0	11-Dec-01	0	13-Dec-02	10
		31-Dec-98	97	3-Dec-99	0	19-Dec-00	0	14-Dec-01	0	17-Dec-02	10
				7-Dec-99	0	22-Dec-00	0	18-Dec-01	0	20-Dec-02	10
				10-Dec-99	0	27-Dec-00	0	21-Dec-01	20	24-Dec-02	56
				14-Dec-99	0	29-Dec-00	0	25-Dec-01	20	27-Dec-02	56
				17-Dec-99	0			28-Dec-01	20	31-Dec-02	56
				21-Dec-99	0						
				22-Dec-99	0						
				24-Dec-99	0						
				28-Dec-99	0						
				31-Dec-99	0						

2003		2004		2005		2006		2007		2008		2009	
Date	Flow (L/s)	Date	Flow (L/s)	Date	Flow (L/s)	Date	Flow (L/s)	Date	Flow (L/s)	Date	Flow (L/s)	Date	Flow (L/s)
6-Jan-03	60	5-Jan-04	0	4-Jan-05	27	3-Jan-06	25	2-Jan-07	5	2-Jan-08	50	5-Jan-09	0
13-Jan-03	60	12-Jan-04	0	10-Jan-05	27	9-Jan-06	25	8-Jan-07	0	7-Jan-08	50	12-Jan-09	0
20-Jan-03	57	19-Jan-04	0	17-Jan-05	27	16-Jan-06	25	15-Jan-07	0	14-Jan-08	60	19-Jan-09	0
27-Jan-03	57	26-Jan-04	0	24-Jan-05	27	23-Jan-06	25	22-Jan-07	0	21-Jan-08	60	26-Jan-09	0
3-Feb-03	54	2-Feb-04	300	31-Jan-05	27	30-Jan-06	25	29-Jan-07	0	29-Jan-08	14	2-Feb-09	0
10-Feb-03	63	9-Feb-04	220	7-Feb-05	27	6-Feb-06	25	5-Feb-07	0	4-Feb-08	14	9-Feb-09	0
17-Feb-03	60	16-Feb-04	140	14-Feb-05	27	13-Feb-06	25	12-Feb-07	0	11-Feb-08	14	17-Feb-09	0
24-Feb-03	60	23-Feb-04	90	21-Feb-05	27	20-Feb-06	25	19-Feb-07	0	19-Feb-08	14	23-Feb-09	0
3-Mar-03	60	1-Mar-04	26	28-Feb-05	27	27-Feb-06	25	26-Feb-07	0	25-Feb-08	14	2-Mar-09	0
10-Mar-03	55	8-Mar-04	70	7-Mar-05	27	6-Mar-06	25	5-Mar-07	0	3-Mar-08	18	9-Mar-09	0
17-Mar-03	48	15-Mar-04	70	14-Mar-05	27	13-Mar-06	25	12-Mar-07	0	10-Mar-08	18	16-Mar-09	50
24-Mar-03	45	22-Mar-04	60	21-Mar-05	27	20-Mar-06	25	19-Mar-07	0	17-Mar-08	20	23-Mar-09	100
31-Mar-03	75	29-Mar-04	100	28-Mar-05	27	27-Mar-06	150	26-Mar-07	100	24-Mar-08	20	31-Mar-09	100
7-Apr-03	90	5-Apr-04	139.8	4-Apr-05	27	3-Apr-06	150	2-Apr-07	100	31-Mar-08	20	6-Apr-09	100
14-Apr-03	40	12-Apr-04	132	11-Apr-05	27	10-Apr-06	25	9-Apr-07	100	7-Apr-08	20	13-Apr-09	0
21-Apr-03	0	19-Apr-04	300	18-Apr-05	150	17-Apr-06	25	16-Apr-07	100	14-Apr-08	20	20-Apr-09	0
28-Apr-03	0	26-Apr-04	300	25-Apr-05	150	24-Apr-06	150	23-Apr-07	25	21-Apr-08	20	27-Apr-09	0
5-May-03	0	3-May-04	120	2-May-05	100	1-May-06	25	30-Apr-07	25	28-Apr-08	15	4-May-09	0
12-May-03	0	10-May-04	150	9-May-05	100	8-May-06	20	7-May-07	25	5-May-08	15	11-May-09	55
20-May-03	0	17-May-04	0	16-May-05	25	15-May-06	20	10-May-07	0	12-May-08	15	19-May-09	55
26-May-03	0	25-May-04	100	24-May-05	25	23-May-06	20	14-May-07	25	20-May-08	14	25-May-09	50
2-Jun-03	0	31-May-04	150	30-May-05	25	29-May-06	80	22-May-07	35	26-May-08	10	1-Jun-09	50
9-Jun-03	0	7-Jun-04	75	6-Jun-05	25	5-Jun-06	80	28-May-07	32.38	2-Jun-08	10	8-Jun-09	50
16-Jun-03	0	14-Jun-04	55	13-Jun-05	25	12-Jun-06	80	4-Jun-07	37	9-Jun-08	10	15-Jun-09	50
23-Jun-03	0	21-Jun-04	55	20-Jun-05	100	19-Jun-06	80	11-Jun-07	35	16-Jun-08	25	22-Jun-09	40
1-Jul-03	0	28-Jun-04	0	27-Jun-05	25	26-Jun-06	70	18-Jun-07	30	23-Jun-08	25	29-Jun-09	35
7-Jul-03	0	5-Jul-04	0	4-Jul-05	25	4-Jul-06	50	25-Jun-07	30	2-Jul-08	35	6-Jul-09	40
14-Jul-03	0	12-Jul-04	0	11-Jul-05	25	10-Jul-06	40	3-Jul-07	30	7-Jul-08	35	13-Jul-09	35
21-Jul-03	0	19-Jul-04	0	18-Jul-05	25	17-Jul-06	25	9-Jul-07	35	14-Jul-08	40	20-Jul-09	40
28-Jul-03	0	26-Jul-04	0	25-Jul-05	25	24-Jul-06	25	16-Jul-07	35	21-Jul-08	45	27-Jul-09	35
5-Aug-03	0	3-Aug-04	35	2-Aug-05	25	31-Jul-06	22	23-Jul-07	40	28-Jul-08	45	4-Aug-09	35
11-Aug-03	0	9-Aug-04	35	8-Aug-05	25	8-Aug-06	22	30-Jul-07	100	5-Aug-08	40	10-Aug-09	35
18-Aug-03	0	16-Aug-04	35	15-Aug-05	25	14-Aug-06	25	7-Aug-07	40	11-Aug-08	40	17-Aug-09	35
25-Aug-03	0	23-Aug-04	35	22-Aug-05	25	21-Aug-06	22	13-Aug-07	45	18-Aug-08	40	24-Aug-09	35.0
2-Sep-03	0	30-Aug-04	35	29-Aug-05	25	28-Aug-06	25	20-Aug-07	45	25-Aug-08	40	31-Aug-09	35.0
8-Sep-03	0	7-Sep-04	100	6-Sep-05	30	5-Sep-06	25	27-Aug-07	40	2-Sep-08	40	8-Sep-09	35.0
15-Sep-03	0	13-Sep-04	95	12-Sep-05	25	11-Sep-06	23.19	4-Sep-07	37	8-Sep-08	35	15-Sep-09	35.0
22-Sep-03	0	20-Sep-04	50	19-Sep-05	25	18-Sep-06	0	10-Sep-07	0	15-Sep-08	45	21-Sep-09	30.0
29-Sep-03	0	27-Sep-04	50	26-Sep-05	25	25-Sep-06	22	17-Sep-07	0	22-Sep-08	40	29-Sep-09	30.0
6-Oct-03	0	4-Oct-04	30	3-Oct-05	25	2-Oct-06	25	24-Sep-07	0	29-Sep-08	35	5-Oct-09	30.0
14-Oct-03	0	12-Oct-04	30	11-Oct-05	17.1	10-Oct-06	25	1-Oct-07	0	6-Oct-08	0	14-Oct-09	30.0
20-Oct-03	0	18-Oct-04	28	17-Oct-05	25	16-Oct-06	10	9-Oct-07	0	14-Oct-08	48	19-Oct-09	30.0
27-Oct-03	0	25-Oct-04	27	24-Oct-05	25	23-Oct-06	100	15-Oct-07	0	20-Oct-08	48	26-Oct-09	30.0
3-Nov-03	0	1-Nov-04	27	31-Oct-05	25	30-Oct-06	100	22-Oct-07	0	27-Oct-08	35	2-Nov-09	35.0
10-Nov-03	0	8-Nov-04	27	7-Nov-05	25	6-Nov-06	90	29-Oct-07	0	3-Nov-08	35	9-Nov-09	35.0
17-Nov-03	0	15-Nov-04	27	14-Nov-05	25	13-Nov-06	100	5-Nov-07	0	10-Nov-08	35	16-Nov-09	35.0
24-Nov-03	0	22-Nov-04	27	21-Nov-05	25	20-Nov-06	100	12-Nov-07	42	17-Nov-08	35	23-Nov-09	35.0
1-Dec-03	0	29-Nov-04	27	28-Nov-05	25	27-Nov-06	100	19-Nov-07	42	24-Nov-08	35	30-Nov-09	35.0
8-Dec-03	0	6-Dec-04	27	5-Dec-05	25	4-Dec-06	100	26-Nov-07	40	1-Dec-08	35	7-Dec-09	35.0
15-Dec-03	0	13-Dec-04	27	12-Dec-05	25	11-Dec-06	25	3-Dec-07	35	8-Dec-08	35	14-Dec-09	35.0
22-Dec-03	0	20-Dec-04	27	19-Dec-05	25	18-Dec-06	0	10-Dec-07	30	15-Dec-08	35	21-Dec-09	35.0
29-Dec-03	0			26-Dec-05	25	27-Dec-06	0	17-Dec-07	35	22-Dec-08	35	29-Dec-09	30.0
								24-Dec-07	50	29-Dec-08	0		

Table A1.2: Flow Data for Cell 18 Inflow to the Effluent Treatment Plant (Q-05)

1997		1998		1999		2000		2001		2002		2003		2004		2005		2006		2007		2008		2009	
Date	Flow	Date	Flow	Date	Flow	Date	Flow	Date	Flow	Date	Flow	Date	Flow	Date	Flow	Date	Flow	Date	Flow	Date	Flow	Date	Flow	Date	Flow
	(L/s)		(L/s)		(L/s)		(L/s)		(L/s)		(L/s)		(L/s)		(L/s)		(L/s)		(L/s)		(L/s)		(L/s)		(L/s)
5-Dec-97	78	2-Jan-98	96	4-Jan-99	65	4-Jan-00	0	2-Jan-01	96	2-Jan-02	159	2-Jan-03	93	2-Jan-04	140	4-Jan-05	138	3-Jan-06	110	2-Jan-07	153	2-Jan-08	102	2-Jan-09	127
8-Dec-97	78	5-Jan-98	96	7-Jan-99	94	6-Jan-00	170	4-Jan-01	91	4-Jan-02	156	3-Jan-03	92	5-Jan-04	140	5-Jan-05	136	4-Jan-06	110	3-Jan-07	155	3-Jan-08	102	5-Jan-09	127
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		27-Jan-98	87	8-Feb-99	135	7-Feb-00	56	5-Feb-01	64	5-Feb-02	65	16-Jan-03	90	16-Jan-04	90	18-Jan-05	131	17-Jan-06	108	16-Jan-07	94	16-Jan-08	105	16-Jan-09	129
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		5-Feb-98	87	18-Feb-99	100	17-Feb-00	54	15-Feb-01	56	15-Feb-02	66	21-Jan-03	88	21-Jan-04	88	21-Jan-05	132	20-Jan-06	105	19-Jan-07	94	21-Jan-08	102	21-Jan-09	159
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		16-Feb-98	29	1-Mar-99	110	28-Feb-00	54	26-Feb-01	50	26-Feb-02	85	24-Jan-03	82	26-Jan-04	88	26-Jan-05	131	25-Jan-06	105	24-Jan-07	91	24-Jan-08	105	26-Jan-09	155
		19-Feb-98	25	4-Mar-99	110	2-Mar-00	51	1-Mar-01	70	1-Mar-02	84	27-Jan-03	88	27-Jan-04	84	27-Jan-05	128	26-Jan-06	105	25-Jan-07	91	25-Jan-08	105	27-Jan-09	155
		23-Feb-98	25	8-Mar-99	110	6-Mar-00	51	5-Mar-01	74	5-Mar-02	86	28-Jan-03	88	28-Jan-04	86	28-Jan-05	126	27-Jan-06	107	26-Jan-07	91	28-Jan-08	105	28-Jan-09	153
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		2-Mar-98	25	15-Mar-99	105	13-Mar-00	46	12-Mar-01	100	13-Mar-02	180	30-Jan-03	88	30-Jan-04	84	1-Feb-05	128	31-Jan-06	105	30-Jan-07	94	30-Jan-08	135	30-Jan-09	155
		5-Mar-98	25	18-Mar-99	105	16-Mar-00	111	15-Mar-01	106	15-Mar-02	185	31-Jan-03	90	2-Feb-04	86	2-Feb-05	126	1-Feb-06	105	31-Jan-07	91	31-Jan-08	135	2-Feb-09	149
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		16-Mar-98	25	29-Mar-99	110	27-Mar-00	0	26-Mar-01	90	26-Mar-02	179	5-Feb-03	90	5-Feb-04	85	7-Feb-05	128	6-Feb-06	105	5-Feb-07	86	5-Feb-08	139	5-Feb-09	95
		19-Mar-98	25	1-Apr-99	112	31-Mar-00	120	29-Mar-01	113	28-Mar-02	175	6-Feb-03	88	6-Feb-04	85	8-Feb-05	124	7-Feb-06	105	6-Feb-07	86	6-Feb-08	139	6-Feb-09	99
		23-Mar-98	25	5-Apr-99	115	3-Apr-00	220	2-Apr-01	114	2-Apr-02	164	7-Feb-03	86	9-Feb-04	85	9-Feb-05	124	8-Feb-06	105	7-Feb-07	86	7-Feb-08	139	9-Feb-09	102
		24-Mar-98	20	8-Apr-99	117	6-Apr-00	110	5-Apr-01	116	5-Apr-02	94	10-Feb-03	88	10-Feb-04	85	10-Feb-05	123	9-Feb-06	105	8-Feb-07	91	8-Feb-08	139	10-Feb-09	104
		25-Mar-98	20	12-Apr-99	115	10-Apr-00	106	9-Apr-01	114	9-Apr-02	95	11-Feb-03	90	11-Feb-04	86	11-Feb-05	125	10-Feb-06	105	9-Feb-07	89	11-Feb-08	139	11-Feb-09	102
		26-Mar-98	20	15-Apr-99	117	13-Apr-00	0	12-Apr-01	114	12-Apr-02	97	12-Feb-03	87	12-Feb-04	86	14-Feb-05	121	13-Feb-06	105	12-Feb-07	86	12-Feb-08	132	12-Feb-09	102
		27-Mar-98	0	19-Apr-99	117	17-Apr-00	0	17-Apr-01	118	16-Apr-02	150	13-Feb-03	89	13-Feb-04	86	15-Feb-05	123	14-Feb-06	103	13-Feb-07	89	13-Feb-08	136	13-Feb-09	102
		28-Mar-98	23	22-Apr-99	120	20-Apr-00	0	20-Apr-01	161	19-Apr-02	203	14-Feb-03	87	16-Feb-04	85	16-Feb-05	65	15-Feb-06	103	14-Feb-07	86	14-Feb-08	137	17-Feb-09	102
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		6-Apr-98	102	13-May-99	82	11-May-00	106	11-May-01	60	10-May-02	104	24-Feb-03	88	24-Feb-04	85	24-Feb-05	70	23-Feb-06	103	22-Feb-07	94	25-Feb-08	134	25-Feb-09	99
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		16-Apr-98	64	24-May-99	102	23-May-00	215	22-May-01	68	21-May-02	104	27-Feb-03	88	27-Feb-04	85	1-Mar-05	72	28-Feb-06	103	27-Feb-07	94	28-Feb-08	132	2-Mar-09	102
		20-Apr-98	89	27-May-99	125	26-May-00	208	25-May-01	99	24-May-02	105	28-Feb-03	88	1-Mar-04	85	2-Mar-05	72	1-Mar-06	103	28-Feb-07	94	29-Feb-08	132	3-Mar-09	100
		23-Apr-98	89	31-May-99	200	29-May-00	200	29-May-01	220	28-May-02	104	3-Mar-03	88	2-Mar-04	85	3-Mar-05	72	2-Mar-06	103	1-Mar-07	94	3-Mar-08	132	4-Mar-09	99
		27-Apr-98	63	3-Jun-99	223	1-Jun-00	25	1-Jun-01	232	31-May-02	104	4-Mar-03	85	3-Mar-04	85	4-Mar-05	89	3-Mar-06	100	2-Mar-07	93	4-Mar-08	132	5-Mar-09	99
		30-Apr-98	34	7-Jun-99	221	5-Jun-00	0	5-Jun-01	202	4-Jun-02	70	5-Mar-03	86	4-Mar-04	85	7-Mar-05	90	6-Mar-06	98	5-Mar-07	91	5-Mar-08	132	6-Mar-09	99
		4-May-98	34	10-Jun-99	211	8-Jun-00	0	8-Jun-01	197	7-Jun-02	72	6-Mar-03	86	5-Mar-04	85	8-Mar-05	90	7-Mar-06	98	6-Mar-07	94	6-Mar-08	132	9-Mar-09	97
		7-May-98	24	14-Jun-99	206	12-Jun-00	25	12-Jun-01	194	11-Jun-02	75	7-Mar-03	86	8-Mar-04	85	9-Mar-05	90	8-Mar-06	98	7-Mar-07	93	7-Mar-08	132	10-Mar-09	99
		11-May-98	70	17-Jun-99	122	15-Jun-00	0	15-Jun-01	113	14-Jun-02	75	10-Mar-03	86	9-Mar-04	85	10-Mar-05	90	9-Mar-06	98	8-Mar-07	93	10-Mar-08	129	11-Mar-09	99
		14-May-98	106.5	21-Jun-99	120	20-Jun-00	25	19-Jun-01	102	18-Jun-02	77	11-Mar-03	86	10-Mar-04	130	11-Mar-05	90	10-Mar-06	98	9-Mar-07	93	11-Mar-08	130	12-Mar-09	100
		19-May-98	80	24-Jun-99	250	22-Jun-00	0	22-Jun-01	96	21-Jun-02	76	12-Mar-03	86	11-Mar-04	128	14-Mar-05	90	13-Mar-06	98	12-Mar-07	93	12-Mar-08	129	13-Mar-09	100
		22-May-98	63.2	28-Jun-99	231	26-Jun-00	0	26-Jun-01	80	25-Jun-02	85	13-Mar-03	88	12-Mar-04	128	15-Mar-05	90	14-Mar-06	98	13-Mar-07	94	13-Mar-08	129	16-Mar-09	100
		25-May-98	39	2-Jul-99	44	29-Jun-00	27	29-Jun-01	85	28-Jun-02	109	14-Mar-03	86	15-Mar-04	125	16-Mar-05	90	15-Mar-06	98	14-Mar-07	94	14-Mar-08	130	17-Mar-09	100
		28-May-98	38.4	5-Jul-99	42	5-Jul-00	0	3-Jul-01	80	2-Jul-02	110	17-Mar-03	88	16-Mar-04	126	17-Mar-05	88	16-Mar-06	98	15-Mar-07	94	17-Mar-08	129	18-Mar-09	97
		1-Jun-98	39	8-Jul-99	46	7-Jul-00	0	6-Jul-01	80	5-Jul-02	108	18-Mar-03	88	17-Mar-04	126	18-Mar-05	89	17-Mar-06	98	16-Mar-07	94	18-Mar-08	127	19-Mar-09	99
		4-Jun-98	64	12-Jul-99	73	11-Jul-00	0	10-Jul-01	57	9-Jul-02	107	19-Mar-03	88	18-Mar-04	125	21-Mar-05	90	20-Mar-06	98	19-Mar-07	91	19-Mar-08	127	20-Mar-09	99
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		15-Jun-98	80	22-Jul-99	73	21-Jul-00	0	20-Jul-01	154	19-Jul-02	107	24-Mar-03	88	23-Mar-04	126	24-Mar-05	88	23-Mar-06	96	22-Mar-07	94	25-Mar-08	125	25-Mar-09	97
		18-Jun-98	79	26-Jul-99	75	25-Jul-00	0	24-Jul-01	48	23-Jul-02	60	25-Mar-03	90	24-Mar-04	126	28-Mar-05	90	24-Mar-06	98	23-Mar-07	94	26-Mar-08	125	26-Mar-09	96
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		25-Jun-98	89	2-Aug-99	0	31-Jul-00	0	31-Jul-01	50	30-Jul-02	60	27-Mar-03	92	26-Mar-04	175	30-Mar-05	90	28-Mar-06	98	27-Mar-07	94	28-Mar-08	125	30-Mar-09	98
		29-Jun-98	89	6-Aug-99	0	1-Aug-00	23	3-Aug-01	50	2-Aug-02	67	28-Mar-03	90	29-Mar-04	175	31-Mar-05	90	29-Mar-06	96	28-Mar-07	94	31-Mar-08	122	31-Mar-09	98
		2-Jul-98	89	9-Aug-99	0	3-Aug-00	48	7-Aug-01	52	6-Aug-02	65	31-Mar-03	156	30-Mar-04	175	1-Apr-05	90	30-Mar-06	98	29-Mar-07	94	1-Apr-08	125	1-Apr-09	98
		6-Jul-98	89	12-Aug-99	0	8-Aug-00	50	10-Aug-01	54	9-Aug-02	67	1-Apr-03	163	31-Mar-04	175	4-Apr-05	90	31-Mar-06	98	30-Mar-07	94	2-Apr-08	125	2-Apr-09	97
		9-Jul-98	50.3	16-Aug-99	0	10-Aug-00	58	14-Aug-01	54	13-Aug-02	65	2-Apr-03	163	1-Apr-04	175	5-Apr-05	90	3-Apr-06	98	2-Apr-07	94	3-Apr-08	125	3-Apr-09	99
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		20-Jul-98	50.3	26-Aug-99	29	21-Aug-00	48	24-Aug-01	54	23-Aug-02	52	7-Apr-03	161	6-Apr-04	168	8-Apr-05	90	6-Apr-06	100	5-Apr-07	94	8-Apr-08	122	8-Apr-09	100
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		20-Aug-98	42	27-Sep-99	36	21-Sep-00	50	26-Sep-01	136	24-Sep-02	49	21-Apr-03	102	20-Apr-04	98	21-Apr-05	90	20-Apr-06	103	18-Apr-07	94	21-Apr-08	132	22-Apr-09	102
		24-Aug-98	97	30-Sep-99	73	25-Sep-00	50	28-Sep-01	176	27-Sep-02	49	22-Apr-03	104	21-Apr-04	103	22-Apr-05	90	21-Apr-06	103	19-Apr-07	96	22-Apr-08	132	23-Apr-09	105
		27-Aug-98	101	4-Oct-99	80	28-Sep-00	50	2-Oct-01	139	1-Oct-02	50	23-Apr-03	102	22-Apr-04	100	25-Apr-05	90	24-Apr-06	101	20-Apr-07	94	23-Apr-08	132	24-Apr-09	105
		31-Aug-98	42	7-Oct-99	80	2-Oct-00	47	5-Oct-01	140	4-Oct-02	62	24-Apr-03	105	23-Apr-04	100	26-Apr-05	90	25-Apr-06	100	23-Apr-07	96	24-Apr-08	132	27-Apr-09	105
		3-Sep-98	60	12-Oct-99	80	5-Oct-00	50	9-Oct-01	140	8-Oct-02	143	25-Apr-03	102	26-Apr-04	100	27-Apr-05	94	26-Apr-06	100	24-Apr-07	96	25-Apr-08	132	28-Apr-09	107
		8-Sep-98	78	14-Oct-99	80	10-Oct-00	50	12-Oct-01	138	11-Oct-02	142	28-Apr-03	104	27-Apr-04	100	28-Apr-05	94	27-Apr-06	100	25-Apr-07	96	28-Apr-08	132	29-Apr-09	107
		10-Sep-98	60	18-Oct-99	105	12-Oct-00	50	16-Oct-01	215	15-Oct-02	144	29-Apr-03	100	28-Apr-04	100	29-Apr-05	94	28-Apr-06	100	26-Apr-07	92	29-Apr-08	132	30-Apr-09	105
		14-Sep-98	63	21-Oct-99	127	16-Oct-00	47	19-Oct-01	200	18-Oct-02	142	30-Apr-03	100	29-Apr-04	75	2-May-05	92	1-May-06	100	27-Apr-07	92	30-Apr-08	132	1-May-09	105
		17-Sep-98	65	25-Oct-99	150	19-Oct-00	47	23-Oct-01	185	22-Oct-02	140	1-May-03	100	30-Apr-04	74	3-May-05	122	2-May-06	100	30-Apr-07	92	1-May-08	132	4-May-09	105
		21-Sep-98	61	28-Oct-99	147	23-Oct-00	47	26-Oct-01	250	25-Oct-02	138	2-May-03	100	3-May-04	75	4-May-05	118	3-May-06	97	1-May-07	93	2-May-08	132	5-May-09	107
		24-Sep-98	61	1-Nov-99	142	26-Oct-00	47	30-Oct-01	250	29-Oct-02	131	5-May-03	100	4-May-04	76	5-May-05	118	4-May-06	97	2-May-07	92	5-May-08	132	6-May-09	105
		28-Sep-98	115	4-Nov-99	146	30-Oct-00	47	2-Nov-01	250	1-Nov-02	56	6-May-03	100	5-May-04	75	6-May-05	116	5-May-06	95	3-May-07	92	6-May-08	132	7-May-09	105
		1-Oct-98	116	8-Nov-99	140	2-Nov-00	70	6-Nov-01	240	5-Nov-02	56	7-May-03	102	6-May-04	75	9-May-05	114	8-May-06	100	4-May-07	90	7-May-08	132	8-May-09	105

Table A1.2: Flow Data for Cell 18 Inflow to the Effluent Treatment Plant (Q-05)

1997		1998		1999		2000		2001		2002		2003		2004		2005		2006		2007		2008		2009	
Date	Flow	Date	Flow	Date	Flow	Date	Flow	Date	Flow	Date	Flow	Date	Flow	Date	Flow	Date	Flow	Date	Flow	Date	Flow	Date	Flow	Date	Flow
	(L/s)		(L/s)		(L/s)		(L/s)		(L/s)		(L/s)		(L/s)		(L/s)		(L/s)		(L/s)		(L/s)		(L/s)		(L/s)
		5-Oct-98	62	11-Nov-99	203	6-Nov-00	64	9-Nov-01	235	8-Nov-02	58	8-May-03	100	7-May-04	75	10-May-05	114	9-May-06	95	7-May-07	88	8-May-08	132	11-May-09	105
		8-Oct-98	124	15-Nov-99	190	10-Nov-00	94	13-Nov-01	203	12-Nov-02	57	9-May-03	100	10-May-04	75	11-May-05	117	10-May-06	97	8-May-07	46	9-May-08	132	12-May-09	102
		13-Oct-98	115	18-Nov-99	181	13-Nov-00	100	16-Nov-01	150	15-Nov-02	57	12-May-03	100	11-May-04	75	12-May-05	117	11-May-06	95	9-May-07	44	12-May-08	132	13-May-09	102
		15-Oct-98	70	22-Nov-99	170	16-Nov-00	112	20-Nov-01	150	19-Nov-02	58	13-May-03	100	12-May-04	75	13-May-05	115	12-May-06	97	10-May-07	44	13-May-08	129	14-May-09	100
		19-Oct-98	85	25-Nov-99	167	20-Nov-00	106	23-Nov-01	150	22-Nov-02	58	14-May-03	100	13-May-04	75	16-May-05	110	15-May-06	95	11-May-07	44	14-May-08	132	15-May-09	105
		22-Oct-98	85	29-Nov-99	167	23-Nov-00	59	27-Nov-01	150	26-Nov-02	57	15-May-03	100	14-May-04	75	17-May-05	75	16-May-06	100	14-May-07	47	15-May-08	129	19-May-09	102
		26-Oct-98	88	2-Dec-99	152	27-Nov-00	55	30-Nov-01	152	29-Nov-02	58	16-May-03	100	17-May-04	75	18-May-05	72	17-May-06	100	15-May-07	44	16-May-08	132	20-May-09	102
		29-Oct-98	90	6-Dec-99	159	30-Nov-00	55	4-Dec-01	135	3-Dec-02	58	20-May-03	100	18-May-04	104	19-May-05	72	18-May-06	100	16-May-07	47	20-May-08	129	21-May-09	102
		2-Nov-98	88	9-Dec-99	147	4-Dec-00	55	7-Dec-01	136	6-Dec-02	58	21-May-03	100	19-May-04	104	20-May-05	74	19-May-06	100	17-May-07	44	21-May-08	127	22-May-09	105
		5-Nov-98	80	13-Dec-99	142	7-Dec-00	53	11-Dec-01	140	10-Dec-02	60	22-May-03	100	20-May-04	107	24-May-05	75	23-May-06	100	18-May-07	44	22-May-08	129	25-May-09	105
		9-Nov-98	80	16-Dec-99	142	11-Dec-00	56	14-Dec-01	137	13-Dec-02	63	23-May-03	100	21-May-04	104	25-May-05	75	24-May-06	100	22-May-07	44	23-May-08	129	26-May-09	100
		12-Nov-98	105	20-Dec-99	0	12-Dec-00	56	18-Dec-01	135	17-Dec-02	61	26-May-03	100	25-May-04	107	26-May-05	72	25-May-06	102	23-May-07	46	26-May-08	129	27-May-09	102
		16-Nov-98	112	22-Dec-99	41	14-Dec-00	62	21-Dec-01	165	20-Dec-02	61	27-May-03	100	26-May-04	126	27-May-05	75	26-May-06	100	24-May-07	47	27-May-08	129	28-May-09	102
		19-Nov-98	112	23-Dec-99	58	18-Dec-00	59	25-Dec-01	167	24-Dec-02	92	28-May-03	100	27-May-04	127	30-May-05	76	29-May-06	102	25-May-07	46	28-May-08	127	29-May-09	105
		23-Nov-98	110	29-Dec-99	62	21-Dec-00	92	28-Dec-01	164	27-Dec-02	94	29-May-03	98	28-May-04	127	31-May-05	89	30-May-06	100	28-May-07	47	29-May-08	127	1-Jun-09	102
		26-Nov-98	112	30-Dec-99	62	27-Dec-00	0			30-Dec-02	94	30-May-03	98	31-May-04	125	1-Jun-05	86	31-May-06	102	29-May-07	46	30-May-08	127	2-Jun-09	102
		30-Nov-98	114			28-Dec-00	98			31-Dec-02	92	2-Jun-03	100	1-Jun-04	126	2-Jun-05	86	1-Jun-06	100	30-May-07	46	2-Jun-08	125	3-Jun-09	102
		3-Dec-98	160									3-Jun-03	100	2-Jun-04	124	3-Jun-05	86	2-Jun-06	100	31-May-07	44	3-Jun-08	70	4-Jun-09	102
		7-Dec-98	160									4-Jun-03	100	3-Jun-04	126	6-Jun-05	86	5-Jun-06	100	1-Jun-07	46	4-Jun-08	71	5-Jun-09	102
		10-Dec-98	104									5-Jun-03	100	4-Jun-04	123	7-Jun-05	89	6-Jun-06	100	4-Jun-07	46	5-Jun-08	71	8-Jun-09	100
		14-Dec-98	111									6-Jun-03	100	7-Jun-04	126	8-Jun-05	87	7-Jun-06	100	5-Jun-07	42	6-Jun-08	70	9-Jun-09	102
		17-Dec-98	110									9-Jun-03	100	8-Jun-04	126	9-Jun-05	87	8-Jun-06	100	6-Jun-07	42	9-Jun-08	71	10-Jun-09	100
		21-Dec-98	104									10-Jun-03	100	9-Jun-04	126	10-Jun-05	89	9-Jun-06	99	7-Jun-07	42	10-Jun-08	72	11-Jun-09	100
		24-Dec-98	107									11-Jun-03	172	10-Jun-04	126	13-Jun-05	86	12-Jun-06	100	8-Jun-07	42	11-Jun-08	72	12-Jun-09	100
		29-Dec-98	107									12-Jun-03	200	11-Jun-04	125	14-Jun-05	87	13-Jun-06	100	11-Jun-07	42	12-Jun-08	72	15-Jun-09	100
		31-Dec-98	67									13-Jun-03	200	14-Jun-04	124	15-Jun-05	89	14-Jun-06	100	12-Jun-07	47	13-Jun-08	72	16-Jun-09	100
												16-Jun-03	200	15-Jun-04	126	16-Jun-05	89	15-Jun-06	100	13-Jun-07	44	16-Jun-08	71	17-Jun-09	100
												17-Jun-03	192	16-Jun-04	124	17-Jun-05	87	16-Jun-06	96	14-Jun-07	44	17-Jun-08	85	18-Jun-09	100
												18-Jun-03	150	17-Jun-04	124	20-Jun-05	89	19-Jun-06	97	15-Jun-07	44	18-Jun-08	86	19-Jun-09	100
												19-Jun-03	150	18-Jun-04	126	21-Jun-05	89	20-Jun-06	95	18-Jun-07	44	19-Jun-08	86	22-Jun-09	100
												20-Jun-03	152	21-Jun-04	126	22-Jun-05	89	21-Jun-06	95	19-Jun-07	44	20-Jun-08	86	23-Jun-09	100
												23-Jun-03	122	22-Jun-04	124	23-Jun-05	89	22-Jun-06	95	20-Jun-07	44	23-Jun-08	86	24-Jun-09	50
												24-Jun-03	125	23-Jun-04	126	24-Jun-05	89	23-Jun-06	69	21-Jun-07	47	24-Jun-08	86	25-Jun-09	52
												25-Jun-03	125	24-Jun-04	122	27-Jun-05	89	26-Jun-06	69	22-Jun-07	47	25-Jun-08	88	26-Jun-09	51
												26-Jun-03	125	25-Jun-04	124	28-Jun-05	89	27-Jun-06	70	25-Jun-07	47	26-Jun-08	88	29-Jun-09	52
												27-Jun-03	125	28-Jun-04	122	29-Jun-05	89	28-Jun-06	70	26-Jun-07	47	27-Jun-08	88	30-Jun-09	52
												1-Jul-03	112	29-Jun-04	78	30-Jun-05	89	29-Jun-06	69	27-Jun-07	47	1-Jul-08	88	2-Jul-09	52
												2-Jul-03	112	30-Jun-04	78	4-Jul-05	89	30-Jun-06	69	28-Jun-07	47	2-Jul-08	88	3-Jul-09	52
												3-Jul-03	111	1-Jul-04	78	5-Jul-05	85	4-Jul-06	69	29-Jun-07	42	3-Jul-08	88	6-Jul-09	53
												4-Jul-03	115	5-Jul-04	78	6-Jul-05	85	5-Jul-06	69	3-Jul-07	42	4-Jul-08	88	7-Jul-09	54
												7-Jul-03	112	6-Jul-04	80	7-Jul-05	84	6-Jul-06	69	4-Jul-07	42	7-Jul-08	88	8-Jul-09	54
												8-Jul-03	112	7-Jul-04	80	8-Jul-05	84	7-Jul-06	70	5-Jul-07	42	8-Jul-08	88	9-Jul-09	54
												9-Jul-03	115	8-Jul-04	80	11-Jul-05	84	10-Jul-06	69	6-Jul-07	44	9-Jul-08	88	10-Jul-09	54
												10-Jul-03	111	9-Jul-04	80	12-Jul-05	50	11-Jul-06	69	9-Jul-07	44	10-Jul-08	88	13-Jul-09	54
												11-Jul-03	115	12-Jul-04	80	13-Jul-05	50	12-Jul-06	120	10-Jul-07	44	11-Jul-08	88	14-Jul-09	54
												14-Jul-03	116	13-Jul-04	85	14-Jul-05	36	13-Jul-06	120	11-Jul-07	42	14-Jul-08	88	15-Jul-09	54
												15-Jul-03	116	14-Jul-04	99	15-Jul-05	36	14-Jul-06	120	12-Jul-07	44	15-Jul-08	86	16-Jul-09	53
												16-Jul-03	116	15-Jul-04	96	18-Jul-05	36	17-Jul-06	120	13-Jul-07	44	16-Jul-08	86	17-Jul-09	54
												17-Jul-03	116	16-Jul-04	97	19-Jul-05	36	18-Jul-06	115	16-Jul-07	44	17-Jul-08	86	20-Jul-09	54
												18-Jul-03	115	19-Jul-04	101	20-Jul-05	36	19-Jul-06	115	17-Jul-07	44	18-Jul-08	86	21-Jul-09	56
												21-Jul-03	118	20-Jul-04	99	21-Jul-05	36	20-Jul-06	115	18-Jul-07	44	21-Jul-08	86	22-Jul-09	56
												22-Jul-03	118	21-Jul-04	100	22-Jul-05	36	21-Jul-06	115	19-Jul-07	44	22-Jul-08	86	23-Jul-09	56
												23-Jul-03	122	22-Jul-04	98	25-Jul-05	39	24-Jul-06	110	20-Jul-07	44	23-Jul-08	86	24-Jul-09	56
												24-Jul-03	120	23-Jul-04	99	26-Jul-05	38	25-Jul-06	110	23-Jul-07	44	24-Jul-08	86	27-Jul-09	56
												25-Jul-03	122	26-Jul-04	99	27-Jul-05	38	26-Jul-06	108	24-Jul-07	44	25-Jul-08	88	28-Jul-09	56
												28-Jul-03	167	27-Jul-04	97	28-Jul-05	38	27-Jul-06	110	25-Jul-07	44	28-Jul-08	86	29-Jul-09	54
												29-Jul-03	175	28-Jul-04	99	29-Jul-05	37	28-Jul-06	30	26-Jul-07	44	29-Jul-08	88	30-Jul-09	54
												30-Jul-03	177	29-Jul-04	99	2-Aug-05	36	31-Jul-06	28	27-Jul-07	43	30-Jul-08	86	31-Jul-09	56
												31-Jul-03	179	30-Jul-04	99	3-Aug-05	31	1-Aug-06	27	30-Jul-07	44	31-Jul-08	86	4-Aug-09	56
												1-Aug-03	179	3-Aug-04	99	4-Aug-05	31	3-Aug-06	124	31-Jul-07	44	1-Aug-08	86	5-Aug-09	56
												5-Aug-03	184	4-Aug-04	97	5-Aug-05	31	4-Aug-06	125	1-Aug-07	44	5-Aug-08	86	6-Aug-09	54
												6-Aug-03	180	5-Aug-04	97	8-Aug-05	31	8-Aug-06	120	2-Aug-07	44	6-Aug-08	72	7-Aug-09	54
												7-Aug-03	183	6-Aug-04	97	9-Aug-05	31	9-Aug-06	150	3-Aug-07	44	7-Aug-08	90	10-Aug-09	56
												8-Aug-03	130	9-Aug-04	95	10-Aug-05	31	10-Aug-06	150	7-Aug-07	44	8-Aug-08	92	11-Aug-09	56
												11-Aug-03	130	10-Aug-04	65	11-Aug-05	31	11-Aug-06	143	8-Aug-07	44	11-Aug-08	95	12-Aug-09	75
												12-Aug-03	130	11-Aug-04	63	12-Aug-05	31	14-Aug-06	134	9-Aug-07	46	12-Aug-08	95	13-Aug-09	76
												13-Aug-03	130	12-Aug-04	62	15-Aug-05	33	15-Aug-06	132	10-Aug-07	46	13-Aug-08	97	14-Aug-09	76
												14-Aug-03	132	13-Aug-04	62	16-Aug-05	33	16-Aug-06	147	13-Aug-07	44	14-Aug-08	95	17-Aug-09	75
												15-Aug-03	150	16-Aug-04	62	17-Aug-05	31	17-Aug-06	144	14-Aug-07	44	15-Aug-08	95	18-Aug-09	75
												18-Aug-03	150	17-Aug-04	62	18-Aug-05	33	18-Aug-06	142	15-Aug-07	46	18-Aug-08	95	19-Aug-09	75
												19-Aug-03	90	18-Aug-04	64	19-Aug-05	33	21-Aug-06	130	16-Aug-07	46	19-Aug-08	95	20-Aug-09	75
												20-Aug-03	88	19-Aug-04	64	22-Aug-05	38	22-Aug-06	150	17-Aug-07	44	20-Aug-08	92	21-Aug-09	74
												21-Aug-03	90	20-Aug-04	64	23-Aug-05	38	23-Aug-06	147	20-Aug-07	44	21-Aug-08	95	24-Aug-09	75
												22-Aug-03	89	23-Aug-04	64	24-Aug-05	38	24-Aug-06	140	21-Aug-07	44	22-Aug-08	95	25-Aug-09	75
												25-Aug-03	78	24-Aug-04	65	25-Aug-05	38	25-Aug-06	51	22-Aug-07	44	25-Aug-08	92	26-Aug-09	75
												26-Aug-03	78	25-Aug-04	66	26-Aug-05	38	28-Aug-06	50	23-Aug-07	44	26-Aug-08	90	27-Aug-09	73
												27-Aug-03	80	26-Aug-04	67	29-Aug-05	38	29-Aug-06	35	24-Aug-07	46	27-Aug-08	95	28-Aug-09	73
												28-Aug-03	80	27-Aug-04	67	30-Aug-05	38	30-Aug-06	31	27-Aug-07	46	28-Aug-08	92	31-Aug-09	73
												29-Aug-03	83	30-Aug-04	62	31-Aug-05	40	31-Aug-06	31	28-Aug-07	46	29-Aug-08	92	1-Sep-09	75
												2-Sep-03	80	31-Aug-04	62	1-Sep-05	40	1-Sep-06	45	29-Aug-07	44	2-Sep-08	92	2-Sep-09	75
												3-Sep-03	80	1-Sep-04	64	2-Sep-05	40	5-Sep-06	45	30-Aug-07	42	3-Sep-08	95	3-Sep-09	90
												4-Sep-03	98	2-Sep-04	64	6-Sep-05	40	6-Sep-06	54	31-Aug-07	42	4-Sep-08	90	4-Sep-09	90
												5-Sep-03	100	3-Sep-04	64	7-Sep-05	45	7-Sep-06	54	4-Sep-07	47	5-Sep-08	92	8-Sep-09	90
												8-Sep-03	102	7-Sep-04	65	8-Sep-05	45	8-Sep-06	60	5-Sep-07	47	8-Sep-08	92	9-Sep-09	92
												9-Sep-03	102	8-Sep-04	65	9-Sep-05	45	11-Sep-06	60	6-Sep-07	47	9-Sep-08	89	10-Sep-09	92
												10-Sep-03	102	9-Sep-04	65	12-Sep-05	48	12-Sep-06	58	7-Sep-07	47	10-Sep-08	90	11-Sep-09	92
												11-Sep-03	75	10-Sep-04	66	13-Sep-05	45	13-Sep-06	61	10-Sep-07	42	11-Sep-08	90	14-Sep-09	90
												12-Sep-03	75	13-Sep-04	65	14-Sep-05	45	14-Sep-06	58	11-Sep-07	47	12-Sep-08	90	15-Sep-09	92

Table A1.2: Flow Data for Cell 18 Inflow to the Effluent Treatment Plant (Q-05)

1997		1998		1999		2000		2001		2002		2003		2004		2005		2006		2007		2008		2009	
Date	Flow	Date	Flow	Date	Flow	Date	Flow	Date	Flow	Date	Flow	Date	Flow	Date	Flow	Date	Flow	Date	Flow	Date	Flow	Date	Flow	Date	Flow
	(L/s)		(L/s)		(L/s)		(L/s)		(L/s)		(L/s)		(L/s)		(L/s)		(L/s)		(L/s)		(L/s)		(L/s)		(L/s)
												15-Sep-03	72	14-Sep-04	65	15-Sep-05	45	15-Sep-06	58	12-Sep-07	47	15-Sep-08	97	16-Sep-09	90
												16-Sep-03	76	15-Sep-04	64	16-Sep-05	45	18-Sep-06	40	13-Sep-07	47	16-Sep-08	97	17-Sep-09	92
												17-Sep-03	77	16-Sep-04	64	19-Sep-05	45	19-Sep-06	40	14-Sep-07	47	17-Sep-08	94	18-Sep-09	90
												18-Sep-03	76	17-Sep-04	62	20-Sep-05	45	20-Sep-06	60	17-Sep-07	47	18-Sep-08	92	21-Sep-09	87
												19-Sep-03	75	20-Sep-04	0	21-Sep-05	45	21-Sep-06	60	18-Sep-07	47	19-Sep-08	94	22-Sep-09	89
												22-Sep-03	76	21-Sep-04	62	22-Sep-05	45	22-Sep-06	20	19-Sep-07	45	22-Sep-08	92	23-Sep-09	91
												23-Sep-03	115	22-Sep-04	62	23-Sep-05	43	25-Sep-06	65	20-Sep-07	45	23-Sep-08	67	24-Sep-09	89
												24-Sep-03	116	23-Sep-04	65	26-Sep-05	43	26-Sep-06	26	21-Sep-07	45	24-Sep-08	69	25-Sep-09	88
												25-Sep-03	115	24-Sep-04	65	27-Sep-05	45	27-Sep-06	29	24-Sep-07	45	25-Sep-08	65	28-Sep-09	89
												26-Sep-03	119	27-Sep-04	65	28-Sep-05	45	28-Sep-06	32	25-Sep-07	47	26-Sep-08	67	29-Sep-09	90
												29-Sep-03	115	28-Sep-04	65	29-Sep-05	62	29-Sep-06	31	26-Sep-07	47	29-Sep-08	65	30-Sep-09	85
												30-Sep-03	112	29-Sep-04	65	30-Sep-05	60	2-Oct-06	32	27-Sep-07	47	30-Sep-08	65	1-Oct-09	70
												1-Oct-03	112	30-Sep-04	65	3-Oct-05	62	3-Oct-06	32	28-Sep-07	47	1-Oct-08	55	2-Oct-09	70
												2-Oct-03	110	1-Oct-04	65	4-Oct-05	64	4-Oct-06	32	1-Oct-07	42	2-Oct-08	55	5-Oct-09	73
												3-Oct-03	150	4-Oct-04	65	5-Oct-05	64	5-Oct-06	32	2-Oct-07	42	3-Oct-08	53	6-Oct-09	70
												6-Oct-03	147	5-Oct-04	65	6-Oct-05	64	6-Oct-06	32	3-Oct-07	42	6-Oct-08	53	7-Oct-09	74
												7-Oct-03	145	6-Oct-04	65	7-Oct-05	65	10-Oct-06	36	4-Oct-07	42	7-Oct-08	53	8-Oct-09	73
												8-Oct-03	143	7-Oct-04	65	11-Oct-05	62	11-Oct-06	37	5-Oct-07	42	8-Oct-08	55	9-Oct-09	70
												9-Oct-03	144	8-Oct-04	65	12-Oct-05	66	12-Oct-06	35	9-Oct-07	45	9-Oct-08	55	14-Oct-09	74
												10-Oct-03	144	12-Oct-04	65	13-Oct-05	64	13-Oct-06	38	10-Oct-07	46	10-Oct-08	55	15-Oct-09	73
												14-Oct-03	140	13-Oct-04	65	14-Oct-05	64	16-Oct-06	37	11-Oct-07	46	14-Oct-08	54	16-Oct-09	75
												15-Oct-03	98	14-Oct-04	65	17-Oct-05	64	17-Oct-06	37	12-Oct-07	46	15-Oct-08	55	19-Oct-09	75
												16-Oct-03	98	15-Oct-04	65	18-Oct-05	64	18-Oct-06	40	15-Oct-07	45	16-Oct-08	55	20-Oct-09	75
												17-Oct-03	98	18-Oct-04	67	19-Oct-05	62	19-Oct-06	40	16-Oct-07	45	17-Oct-08	55	21-Oct-09	75
												20-Oct-03	98	19-Oct-04	65	20-Oct-05	64	20-Oct-06	40	17-Oct-07	47	20-Oct-08	55	22-Oct-09	75
												21-Oct-03	98	20-Oct-04	65	21-Oct-05	62	23-Oct-06	40	18-Oct-07	44	21-Oct-08	55	23-Oct-09	73
												22-Oct-03	97	21-Oct-04	65	24-Oct-05	64	24-Oct-06	42	22-Oct-07	47	22-Oct-08	55	26-Oct-09	75
												23-Oct-03	97	22-Oct-04	68	25-Oct-05	64	25-Oct-06	42	23-Oct-07	66	23-Oct-08	58	27-Oct-09	75
												24-Oct-03	100	25-Oct-04	65	26-Oct-05	64	26-Oct-06	42	24-Oct-07	106	24-Oct-08	55	28-Oct-09	75
												27-Oct-03	100	26-Oct-04	65	27-Oct-05	64	27-Oct-06	42	25-Oct-07	106	27-Oct-08	55	29-Oct-09	75
												28-Oct-03	101	27-Oct-04	65	28-Oct-05	72	30-Oct-06	42	26-Oct-07	110	28-Oct-08	55	30-Oct-09	75
												29-Oct-03	101	28-Oct-04	65	31-Oct-05	72	31-Oct-06	42	29-Oct-07	112	29-Oct-08	58	2-Nov-09	77
												30-Oct-03	100	29-Oct-04	65	1-Nov-05	72	1-Nov-06	42	30-Oct-07	113	30-Oct-08	58	3-Nov-09	77
												31-Oct-03	100	1-Nov-04	65	2-Nov-05	72	2-Nov-06	42	31-Oct-07	108	31-Oct-08	55	4-Nov-09	77
												3-Nov-03	100	2-Nov-04	67	3-Nov-05	72	3-Nov-06	44	1-Nov-07	108	3-Nov-08	55	5-Nov-09	80
												4-Nov-03	101	3-Nov-04	67	4-Nov-05	72	6-Nov-06	44	2-Nov-07	108	4-Nov-08	58	6-Nov-09	100
												5-Nov-03	98	4-Nov-04	67	7-Nov-05	74	7-Nov-06	47	5-Nov-07	105	5-Nov-08	55	9-Nov-09	130
												6-Nov-03	101	5-Nov-04	67	8-Nov-05	74	8-Nov-06	44	6-Nov-07	0	6-Nov-08	58	10-Nov-09	130
												7-Nov-03	101	8-Nov-04	67	9-Nov-05	72	9-Nov-06	44	7-Nov-07	106	7-Nov-08	58	11-Nov-09	130
												10-Nov-03	101	9-Nov-04	85	10-Nov-05	74	10-Nov-06	44	8-Nov-07	108	10-Nov-08	55	12-Nov-09	130
												11-Nov-03	101	10-Nov-04	87	11-Nov-05	74	13-Nov-06	44	9-Nov-07	108	11-Nov-08	55	13-Nov-09	135
												12-Nov-03	101	11-Nov-04	87	14-Nov-05	74	14-Nov-06	44	12-Nov-07	105	12-Nov-08	55	16-Nov-09	141
												13-Nov-03	101	12-Nov-04	85	15-Nov-05	96	15-Nov-06	44	14-Nov-07	0	13-Nov-08	55	17-Nov-09	141
												14-Nov-03	101	15-Nov-04	85	16-Nov-05	96	16-Nov-06	44	15-Nov-07	0	14-Nov-08	55	18-Nov-09	143
												17-Nov-03	103	16-Nov-04	87	17-Nov-05	96	17-Nov-06	43	16-Nov-07	106	17-Nov-08	58	19-Nov-09	141
												18-Nov-03	145	17-Nov-04	87	18-Nov-05	96	20-Nov-06	42	19-Nov-07	0	18-Nov-08	58	20-Nov-09	141
												19-Nov-03	200	18-Nov-04	87	21-Nov-05	96	21-Nov-06	42	20-Nov-07	104	19-Nov-08	55	23-Nov-09	140
												20-Nov-03	198	19-Nov-04	87	22-Nov-05	95	22-Nov-06	42	21-Nov-07	104	20-Nov-08	58	24-Nov-09	136
												21-Nov-03	197	22-Nov-04	87	23-Nov-05	96	23-Nov-06	44	22-Nov-07	104	21-Nov-08	55	25-Nov-09	136
												24-Nov-03	200	23-Nov-04	87	24-Nov-05	115	24-Nov-06	42	23-Nov-07	104	24-Nov-08	65	26-Nov-09	139
												25-Nov-03	200	24-Nov-04	87	25-Nov-05	115	27-Nov-06	42	26-Nov-07	104	25-Nov-08	64	27-Nov-09	139
												26-Nov-03	199	25-Nov-04	87	28-Nov-05	115	28-Nov-06	45	27-Nov-07	104	26-Nov-08	63	30-Nov-09	139
												27-Nov-03	198	26-Nov-04	87	29-Nov-05	117	29-Nov-06	65	28-Nov-07	104	27-Nov-08	63	1-Dec-09	139
												28-Nov-03	200	29-Nov-04	120	30-Nov-05	115	30-Nov-06	65	29-Nov-07	102	28-Nov-08	63	2-Dec-09	136
												1-Dec-03	196	30-Nov-04	120	1-Dec-05	115	1-Dec-06	65	30-Nov-07	100	1-Dec-08	63	3-Dec-09	136
												2-Dec-03	194	1-Dec-04	120	2-Dec-05	115	4-Dec-06	64	3-Dec-07	102	2-Dec-08	63	4-Dec-09	136
												3-Dec-03	194	2-Dec-04	120	5-Dec-05	115	5-Dec-06	64	4-Dec-07	104	3-Dec-08	63	7-Dec-09	136
												4-Dec-03	198	3-Dec-04	120	6-Dec-05	114	6-Dec-06	62	5-Dec-07	104	4-Dec-08	63	8-Dec-09	136
												5-Dec-03	194	6-Dec-04	140	7-Dec-05	114	7-Dec-06	64	6-Dec-07	101	5-Dec-08	65	9-Dec-09	136
												8-Dec-03	190	7-Dec-04	140	8-Dec-05	114	8-Dec-06	64	7-Dec-07	101	8-Dec-08	65	10-Dec-09	136
												9-Dec-03	190	8-Dec-04	140	9-Dec-05	114	11-Dec-06	64	10-Dec-07	96	9-Dec-08	65	11-Dec-09	134
												10-Dec-03	100	9-Dec-04	142	12-Dec-05	114	12-Dec-06	64	11-Dec-07	104	10-Dec-08	67	14-Dec-09	131
												11-Dec-03	100	10-Dec-04	141	13-Dec-05	114	13-Dec-06	79	12-Dec-07	99	11-Dec-08	66	15-Dec-09	131
												12-Dec-03	101	13-Dec-04	141	14-Dec-05	114	14-Dec-06	96	13-Dec-07	101	12-Dec-08	65	16-Dec-09	129
												15-Dec-03	101	14-Dec-04	141	15-Dec-05	110	15-Dec-06	160	14-Dec-07	101	15-Dec-08	65	17-Dec-09	129
												16-Dec-03	100	15-Dec-04	141	16-Dec-05	112	18-Dec-06	164	17-Dec-07	99	16-Dec-08	65	18-Dec-09	131
												17-Dec-03	100	16-Dec-04	141	19-Dec-05	112	19-Dec-06	164	18-Dec-07	99	17-Dec-08	85	21-Dec-09	129
												18-Dec-03	103	17-Dec-04	141	20-Dec-05	110	20-Dec-06	165	19-Dec-07	102	18-Dec-08	90	22-Dec-09	129
												19-Dec-03	148	20-Dec-04	141	21-Dec-05	110	21-Dec-06	164	20-Dec-07	100	19-Dec-08	85	23-Dec-09	85
												22-Dec-03	148	21-Dec-04	145	22-Dec-05	112	22-Dec-06	164	21-Dec-07	100	22-Dec-08	85	24-Dec-09	85
												23-Dec-03	147	22-Dec-04	155	23-Dec-05	110	27-Dec-06	158	24-Dec-07	104	23-Dec-08	90	29-Dec-09	87
												24-Dec-03	146	23-Dec-04	155	28-Dec-05	110	28-Dec-06	158	27-Dec-07	104	24-Dec-08	87	30-Dec-09	88
												29-Dec-03	148	24-Dec-04	155	29-Dec-05	110	29-Dec-06	158	28-Dec-07	104	29-Dec-08	130	31-Dec-09	88
												30-Dec-03	145	27-Dec-04	155	30-Dec-05	114			31-Dec-07	102	30-Dec-08	130		
												31-Dec-03	140	28-Dec-04	140							31-Dec-08	130		
														29-Dec-04	140										
														30-Dec-04	140										
														31-Dec-04	140										

Table A1.3: Surface Water Quality in Cell 14 at the Quirke TMA

Date	pH (pH units)	Sulphate (mg/L)	Radium (Bq/L)
Jun-92	3.4		
Sep-92	3.7		
Oct-92	3.3	374	
Nov-92	4.3	161	
Dec-92	7.4	45	
Jan-93	6.9	60	
Feb-93	7.2	68	
Mar-93	6.5	94	
Apr-93	5.2	45	
May-93	6.7	64	
Jun-93	7.1	57	
Jul-93	7.2	64	
Aug-93	7.2	76	
Sep-93	7.2	75	
Oct-93	7.0	73	
Nov-93	6.8	64	
Dec-93	6.8	16	
Jan-94	6.5	13	
Feb-94	6.8	56	
Mar-94	6.8	33	
Apr-94	6.7	41	
May-94	6.7	33	
Jun-94	7.1	36	
Jul-94	7.9	40	
Aug-94	6.9	44	
Sep-94	7.0	47	
Oct-94	7.0	51	
Nov-94	6.9	33	
Dec-94	7.0	41	
Jan-95	6.8	48	
Feb-95	6.7	53	
Mar-95	6.6	44	
Apr-95	6.8	9	
May-95	6.6	18	
Jun-95	6.5	14	
Jul-95	7.0	19	
Aug-95	7.4	29	
Sep-95	6.7	30	
Oct-95	6.6	32	
Nov-95	6.3	35	
Dec-95	7.0	38	
Jan-96	6.0	21	
Feb-96	5.9	10	
Mar-96	6.1	31	
Apr-96	6.5	31	
May-96	5.0	<5	
Jun-96	7.1	19	
Jul-96	7.1	19	
Aug-96	7.3	25	
Sep-96	7.4	25	
Oct-96	6.9	40	

Table A1.3: Surface Water Quality in Cell 14 at the Quirke TMA

Date	pH (pH units)	Sulphate (mg/L)	Radium (Bq/L)
Nov-96	6.7	35	
Dec-96	7.6	38	
Jan-97	6.4	19	
Feb-97	6.4	23	
Mar-97	7.0	35	
Apr-97	6.8	56	
May-97	6.8	26	
Jun-97	7.0	25.5	
Jul-97	7.3	<5	
Aug-97	7.0	38	
Sep-97	7.7	33	
Oct-97	7.0	42	
Nov-97	7.5	49	
Dec-97	7.8	51	
Jan-98	7.1	56	
Feb-98	7.0	51	0.509
Mar-98	7.0	44	
Apr-98	6.4	<5	
May-98	7.1	22.4	
Jun-98	7.5	21	
Jul-98	7.5	26.4	
Aug-98	6.9	31.8	
Sep-98	7.8	37	
Oct-98	7.6	42.2	
Nov-98	7.7	45.5	
Dec-98	7.6	43.6	
Jan-99	7.5	42.5	
Feb-99	7.3	29.9	
Mar-99	7.4	39.4	
Apr-99	6.6	7.6	
May-99	7.6	23.5	
Jun-99	7.7	28	
Jul-99	7.8	30	
Aug-99	8.2	30.1	
Sep-99	8.2	33	
Oct-99	7.7	35.6	
Nov-99	7.7	38.5	1.340
Dec-99	7.8	38.3	
Jan-00	7.8	63.8	
Feb-00	7.5	53.6	1.560
Mar-00	7.0	22.4	
Apr-00	6.2	4.8	
May-00	7.7	25.7	0.620
Jun-00	8.6	27.8	0.690
Jul-00	7.7	29.2	
Aug-00	7.7	25.1	1.560
Sep-00	8.0	33.9	
Oct-00	7.8	34.7	
Nov-00	7.8	43.1	2.190
Dec-00	7.7	53	
Jan-01	7.1	67.2	

Table A1.3: Surface Water Quality in Cell 14 at the Quirke TMA

Date	pH (pH units)	Sulphate (mg/L)	Radium (Bq/L)
Mar-01	7.0	56.3	
Apr-01	7.0	18.2	
May-01	7.7	21.4	0.820
Jun-01	7.6	22.4	
Jul-01	7.7	25.2	
Aug-01	8.0	30	1.900
Sep-01	8.1	28.9	
Oct-01	8.1	28.1	
Nov-01	7.5	27.3	1.600
Dec-01	7.6	30.1	
Jan-02	7.5	34.3	
Feb-02	7.3	34.8	1.300
Mar-02	7.5	35.6	
Apr-02	7.1	29.7	
May-02	7.7	22.5	0.770
Jun-02	7.8	23.1	
Jul-02	8.2	20.4	
Aug-02	7.5	26.7	2.300
Sep-02	7.8	23	
Oct-02	7.6	24.4	
Nov-02	7.6	25.7	2.070
Dec-02	7.6	30.3	
Apr-03	6.4		0.410
Apr-04	5.9		0.310
Oct-04	6.8		0.690
Apr-05	6.5		0.190
Aug-05	7.1	18.3	0.450
Sep-05	7.0	19.3	0.420
Oct-05	7.4	22	0.310
Nov-05	6.8	20	0.380
Dec-05	7.2	21.9	0.380
May-06	7.0	15	0.220
Jun-06	6.8	21	0.320
Jul-06	7.1	12	0.360
Aug-06	7.8	13	0.340
Oct-06	7.1	13	0.490
Nov-06	6.5	13	0.310
Mar-07	6.2	16	0.380
May-07	6.8	10	0.290
Aug-07	7.0	12	0.320
Nov-07	6.2	16	0.410
Feb-08	6.6	8.6	0.190
May-08	6.9	9.7	0.250
Aug-08	7.1	18	0.360
Nov-08	6.7	15	0.550
May-09	6.5	11	0.350
Nov-09	6.8	15	0.690

Table A1.4: Surface Water Quality in Cell 15 at the Quirke TMA

Date	Sulphate (mg/L)	Radium (Bq/L)
	mg/L	Bq/L
1-Oct-95		0.28
1-May-98		0.70
1-Jun-98	517	
1-Apr-03		0.08
1-Oct-03		0.32
1-Apr-04		0.01
1-Oct-04		0.36
1-Apr-05		0.05
1-Aug-05	515	0.40
1-Oct-05	730	0.33
10-May-06	470	0.34
9-Aug-06	490	0.22
8-Nov-06	580	0.20
14-Mar-07	310	0.64
10-May-07	430	0.32
8-Aug-07	640	0.20
14-Nov-07	740	0.35
13-Feb-08	9	0.25
15-May-08	380	0.32
13-Aug-08	480	0.20
12-Nov-08	690	0.26
21-May-09	440	0.40
12-Nov-09	560	0.36

Table A1.5: Surface Water Quality in Cell 16S at the Quirke TMA

Date	Sulphate (mg/L)	Radium (Bq/L)
Jan-90		7.136
Feb-90		5.786
Mar-90		9.961
Apr-90		11.428
May-90		6.103
Jun-90		6.336
Jul-90		11.707
Aug-90		13.749
Sep-90		11.431
Oct-90		4.566
Nov-90		4.229
Dec-90		3.195
Feb-91		5.074
Apr-91		1.133
May-91		1.893
Jun-91		1.173
Jul-91		1.067
Aug-91		0.784
Sep-91		0.154
Oct-91		0.214
Nov-91		0.636
Dec-91		0.749
Jan-92		0.261
Feb-92		0.188
Apr-92		0.33
May-92		0.222
Jun-92		<0.037
Jan-93		0.115
Feb-93		0.185
Mar-93		0.2
Apr-93		0.148
May-93		0.178
Jul-93		0.16
Sep-93		0.104
Oct-93		0.124
Nov-93		0.073
Dec-93		0.106
Jan-94		0.106
Feb-94		0.245
Mar-94		0.204
Apr-94		0.063
May-94		0.144
Jun-94		0.186
Jul-94		0.185
Aug-94		0.139
Sep-94		0.124
Oct-95		0.533
Mar-98		0.14
Apr-03		0.17
Oct-03		0.66
Apr-04		0.15

Table A1.5: Surface Water Quality in Cell 16S at the Quirke TMA

Date	Sulphate (mg/L)	Radium (Bq/L)
Oct-04		0.47
Apr-05		0.044
Aug-05	1245	0.74
Oct-05	1697	0.61
May-06	1000	0.63
Aug-06	1100	0.71
Nov-06	1100	0.6
Mar-07	1100	0.73
May-07	960	0.65
Aug-07	1200	0.61
Nov-07	1200	0.78
Feb-08	1100	0.81
May-08	990	0.57
Aug-08	910	0.59
Nov-08	1000	0.63
May-09	940	0.61
Nov-09	1000	0.48

Table A1.6: Surface Water Quality in Cell 17 at the Quirke TMA

Date	Sulphate (mg/L)	Radium (Bq/L)
1-Oct-95		0.524
1-Mar-98		0.13
1-Apr-03		0.41
1-Oct-03		1.24
1-Apr-04		0.35
1-Oct-04		1.13
1-Apr-05		0.15
1-Aug-05	1422	1.28
1-Oct-05	1768	1.5
10-May-06	1100	1.2
9-Aug-06	1200	1.2
8-Nov-06	1200	1.3
14-Mar-07	1200	0.93
10-May-07	980	1.1
8-Aug-07	1400	1.4
14-Nov-07	1200	1.05
13-Feb-08	1100	0.7
15-May-08	930	0.94
13-Aug-08	980	0.53
12-Nov-08	880	1.2
21-May-09	980	1.4
12-Nov-09	1100	0.69

Table A1.7: Surface Water Quality in Cell 18 (Q-05) at the Quirke TMA

Date	Sulphate (mg/L)	Radium (Bq/L)
Jan-87	1836	3.333
Feb-87	1868	2.372
Mar-87		1.046
Apr-87	1464	2.392
May-87	1590	1.923
Jun-87		2.382
Jul-87	1805	3.994
Aug-87		4.819
Sep-87		4.393
Oct-87	1579.5	4.862
Nov-87	1768	3.187
Dec-87		4.975
Jan-88	1642	9.084
Feb-88	1839	6.439
Mar-88		7.687
Apr-88	1381	5.047
May-88		5.138
Jun-88	1738	5.383
Jul-88	1792	4.021
Aug-88		3.169
Sep-88	1636.5	3.484
Oct-88	1624	2.593
Nov-88		1.969
Dec-88	1419	1.161
Jan-89	1560	2.025
Feb-89	1688	4.722
Mar-89	1728	4.473
Apr-89	1320	1.141
May-89	858	0.927
Jun-89	1665	1.307
Jul-89	1837	1.293
Aug-89	1950	1.007
Sep-89	1989	2.284
Oct-89	1825	2.825
Nov-89	1804	1.731
Dec-89	1838	1.476
Jan-90	1683	1.896
Feb-90	1694	1.886
Mar-90	1817	2.846
Apr-90	1617	3.686
May-90	1517	1.309
Jun-90	1878	2.147
Jul-90	1913	2.337
Aug-90	2471.7	3.384
Sep-90	2311	3.577
Oct-90	1996.3	2.114
Nov-90	1053.4	1.907
Dec-90	964.4	2.676
Jan-91	745	3.162
Feb-91	899	3.454
Mar-91	802	2.963

Table A1.7: Surface Water Quality in Cell 18 (Q-05) at the Quirke TMA

Date	Sulphate (mg/L)	Radium (Bq/L)
Apr-91	626	1.943
May-91	865	1.066
Jun-91	574	0.756
Jul-91	1874	1.003
Aug-91	1988	0.329
Sep-91	2042	0.177
Oct-91	1814	0.093
Nov-91	1699	0.155
Dec-91	1731	0.143
Jan-92	1962	0.198
Feb-92	2332	0.145
Mar-92	2419.3	0.176
Apr-92	2419.8	0.184
May-92	1447	0.129
Jun-92	1583	0.092
Jul-92		0.326
Aug-92	2162	0.172
Sep-92	2195	0.179
Oct-92	2023	0.151
Nov-92	1920	0.138
Dec-92	1755	0.145
Jan-93	1841	0.105
Feb-93	2002	0.118
Mar-93	2114	0.130
Apr-93	2032	0.108
May-93	1051	0.152
Jun-93	1522	0.091
Jul-93	1693	0.085
Aug-93		0.080
Sep-93		0.137
Oct-93	1843	0.103
Nov-93	1872	0.087
Dec-93	1859	0.101
Jan-94	2171	0.162
Feb-94	1846	0.180
Mar-94	1848	0.197
Apr-94	1799	0.202
May-94	1343	0.165
Jun-94	1685	0.143
Jul-94	1727	0.139
Aug-94	1826	0.212
Sep-94	1862	0.164
Oct-94		0.211
Nov-94	1828	0.197
Apr-95	1907	0.114
May-95	893	0.096
Jun-95	1298	0.334
Jul-95	1778	0.764
Oct-95	1832	0.413
Nov-95	1644	0.429
Dec-95	1620	0.416

Table A1.7: Surface Water Quality in Cell 18 (Q-05) at the Quirke TMA

Date	Sulphate (mg/L)	Radium (Bq/L)
Jan-96	1620	0.438
Feb-96	1506	0.345
Mar-96	1394	0.414
Apr-96	1437	0.353
May-96	554	0.258
Jun-96	1297	0.227
Jul-96		0.341
Aug-96	634	0.317
Sep-96	334	0.323
Oct-96	1208	0.351
Nov-96	1358	0.389
Dec-96	1404	0.380
Jan-97	772	2.242
Feb-97	1417	0.383
Mar-97	1269	0.324
Apr-97	869	0.275
May-97	776	0.383
Jun-97	1030	0.490
Jul-97	305	0.517
Aug-97	1318	0.605
Sep-97	683	0.526
Oct-97	952	0.412
Nov-97	1336	0.373
Dec-97	1367	0.450
Jan-98	1414	0.375
Feb-98	1491	0.475
Mar-98	1487.5	0.450
Apr-98	1443	0.444
May-98	572	0.433
Jun-98	1081	0.366
Jul-98	1227	0.263
Aug-98	1309	0.250
Sep-98	1494	0.222
Oct-98	1128	0.250
Nov-98	1265	0.226
Dec-98	1358	0.200
Jan-99	1409	0.265
Feb-99	1491	0.385
Mar-99	1479	0.359
Apr-99	1467	0.377
May-99	963	0.248
Jun-99	1139	0.278
Jul-99	1307	0.432
Aug-99	1409	0.455
Sep-99	1470	0.445
Oct-99	1490	0.415
Nov-99	1441	0.441
Dec-99	1402	0.565
Jan-00	1625	0.560
Feb-00	1568	0.591
Mar-00	1535	0.593

Table A1.7: Surface Water Quality in Cell 18 (Q-05) at the Quirke TMA

Date	Sulphate (mg/L)	Radium (Bq/L)
Apr-00	1058	0.515
May-00	1045	0.454
Jun-00	1132	0.495
Jul-00	1201	0.540
Aug-00	1454	0.500
Sep-00	1471	0.580
Oct-00	1337	0.580
Nov-00	1391	0.635
Dec-00	1500	0.622
Jan-01	1600	0.636
Feb-01	1541	0.680
Mar-01	1542	0.705
Apr-01	1541	0.685
May-01	726	0.368
Jun-01	841	0.378
Jul-01	1182	0.538
Aug-01	1312	0.615
Sep-01	1360	0.728
Oct-01	1300	0.762
Nov-01	1182	0.857
Dec-01	1649	0.742
Jan-02	1278	0.640
Feb-02	1252	0.738
Mar-02	1505	0.798
Apr-02	1241	0.708
May-02	883	0.768
Jun-02	1032	0.885
Jul-02	1081	1.260
Aug-02	1190	1.465
Sep-02	1430	1.478
Oct-02	1341	1.298
Nov-02	1322	1.265
Dec-02	1345	1.238
Jan-03		1.100
Feb-03	1444	1.200
Mar-03		1.100
Apr-03		0.720
May-03	805	0.790
Jun-03		0.720
Jul-03		1.120
Aug-03	1167	1.100
Sep-03		0.980
Oct-03		0.850
Nov-03	1329	1.040
Dec-03		0.900
Jan-04		0.820
Feb-04	1123	0.850
Mar-04		0.890
Apr-04		0.650
May-04	678	0.530
Jun-04		0.760

Table A1.7: Surface Water Quality in Cell 18 (Q-05) at the Quirke TMA

Date	Sulphate (mg/L)	Radium (Bq/L)
Jul-04		0.800
Aug-04	1128	1.050
Sep-04		0.850
Oct-04		1.070
Nov-04	1273	0.960
Dec-04		0.880
Jan-05		0.840
Feb-05	1235	0.710
Mar-05		0.910
Apr-05		0.860
May-05	794	0.610
Jun-05		0.780
Jul-05		0.980
Aug-05	1283	0.910
Sep-05		0.920
Oct-05		1.170
Nov-05	1360	1.210
Dec-05		1.310
Jan-06		1.000
Feb-06	1200	0.960
Mar-06		0.870
Apr-06		0.920
May-06	610	0.620
Jun-06		0.920
Jul-06		1.000
Aug-06	1100	0.700
Sep-06		1.400
Oct-06		1.500
Nov-06	1100	1.100
Dec-06		1.200
Jan-07		1.100
Feb-07	1100	0.940
Mar-07		1.000
Apr-07		0.810
May-07	830	0.730
Jun-07		0.910
Jul-07		1.100
Aug-07	1200	1.200
Sep-07		1.200
Oct-07		1.100
Nov-07	1200	0.940
Dec-07		0.640
Jan-08		1.000
Feb-08	1300	0.790
Mar-08		0.860
Apr-08		0.790
May-08	740	0.740
Jun-08		0.740
Jul-08		0.880
Aug-08	960	0.850
Sep-08		0.780

Table A1.7: Surface Water Quality in Cell 18 (Q-05) at the Quirke TMA

Date	Sulphate (mg/L)	Radium (Bq/L)
Oct-08		0.930
Nov-08	1100	0.910
Dec-08		1.010
Jan-09		0.940
Feb-09	1100	0.780
Mar-09		0.990
Apr-09		0.790
May-09	530	0.500
Jun-09		0.830
Jul-09		0.950
Aug-09	980	1.260
Sep-09		0.850
Oct-09		1.000
Nov-09	960	0.550
Dec-09		0.940

Table A1.8: Routine Monitoring Data in Piezometers at DK14-5

DK14-5A (366.2 masl)		DK14-5B (369.2 masl)		DK14-5C (370.5 masl)		DK14-5D (372.0 masl)	
Date	Radium (Bq/L)	Date	Radium (Bq/L)	Date	Radium (Bq/L)	Date	Radium (Bq/L)
13-Oct-92	1.5	13-Oct-92	0.9	13-Oct-92	1.5	13-Oct-92	1.0
22-Jun-93	1.2	22-Jun-93	1.0	22-Jun-93	1.5	22-Jun-93	0.5
16-Aug-93	1.9	16-Aug-93	1.0	16-Aug-93	1.7	16-Aug-93	0.9
5-Oct-93	1.8	4-Oct-93	1.3	4-Oct-93	1.1	4-Oct-93	1.3
20-Oct-94	0.9	20-Oct-94	0.7	20-Oct-94	0.7	20-Oct-94	0.2
3-Oct-95	2.6	3-Oct-95	3.1	3-Oct-95	1.7	3-Oct-95	1.3
10-Oct-96	2.5	8-Oct-96	2.1	8-Oct-96	2.0	8-Oct-96	1.4
25-Oct-97	2.7	25-Oct-97	2.3	25-Oct-97	2.2	25-Oct-97	1.5
11-Jun-98	1.9	11-Jun-98	2.0	11-Jun-98	2.0	11-Jun-98	0.8
22-Jun-99	2.6	23-Jun-99	1.8	23-Jun-99	1.5	23-Jun-99	0.6
27-Jun-00	1.8	27-Jun-00	2.2	27-Jun-00	1.5	27-Jun-00	0.7
29-Jun-01	2.8	29-Jun-01	1.9	29-Jun-01	2.0	29-Jun-01	0.9
31-May-02	3.3	22-Jul-02	1.7	22-Jul-02	1.5	22-Jul-02	0.8
				6-Aug-10	1.3		

Table A1.9: Routine Monitoring Data in Piezometers at DK15-2

DK15-2A (360.7 masl)		DK15-2B (363.6 masl)		DK15-2C (365.4 masl)		DK15-2D (366.8 masl)	
Date	Radium (Bq/L)	Date	Radium (Bq/L)	Date	Radium (Bq/L)	Date	Radium (Bq/L)
28-Jul-98	3.3	28-Jul-98	5.8	28-Jul-98	5.2	28-Jul-98	1.2
28-Sep-99	5.2	28-Sep-99	5.9	28-Sep-99	9.4	28-Sep-99	1.5
4-Jul-01	5.5	4-Jul-01	5.9	4-Jul-01	6.9	4-Jul-01	1.3
31-Oct-02	2.7	31-Oct-02	5.0	31-Oct-02	5.2	31-Oct-02	1.2
5-Sep-03	4.2	5-Sep-03	5.1	5-Sep-03	6.2	5-Sep-03	1.4
6-Aug-10	3.5	6-Aug-10	4.4	6-Aug-10	2.7	6-Aug-10	0.8

Table A1.10: Routine Monitoring Data in Piezometers at DK15-4

DK15-4A (360.8 masl)		DK15-4B (363.8 masl)		DK15-4C (365.3 masl)		DK15-4D (366.8 masl)	
Date	Radium (Bq/L)	Date	Radium (Bq/L)	Date	Radium (Bq/L)	Date	Radium (Bq/L)
21-Oct-96	2.9	21-Oct-96	1.1	21-Oct-96	0.8	21-Oct-96	0.8
31-Oct-97	5.4	31-Oct-97	1.9	31-Oct-97	1.1	31-Oct-97	0.9
28-Jul-98	3.4	28-Jul-98	1.4	28-Jul-98	1.3	28-Jul-98	0.9
29-Sep-99	3.9	29-Sep-99	1.6	29-Sep-99	1.7	29-Sep-99	1.7
1-Aug-00	3.5	1-Aug-00	1.4	6-Jul-01	1.5	6-Jul-01	1.6
31-Oct-02	3.8	31-Oct-02	1.3	31-Oct-02	1.3	31-Oct-02	1.1
5-Sep-03	5.6	5-Sep-03	1.5	5-Sep-03	1.5	5-Sep-03	1.4
9-Aug-10	3.7	9-Aug-10	0.2	9-Aug-10	1.0	9-Aug-10	0.2

Table A1.11: Routine Monitoring Data in Piezometers at DK16-2

DK16-2A (356.8 masl)		DK16-2B (359.9 masl)		DK16-2C (361.4 masl)		DK16-2D (362.9 masl)	
Date	Radium (Bq/L)	Date	Radium (Bq/L)	Date	Radium (Bq/L)	Date	Radium (Bq/L)
8-Oct-96	9.0	8-Oct-96	10.8	8-Oct-96	5.4	8-Oct-96	4.4
23-Oct-97	8.9	23-Oct-97	14.4	23-Oct-97	9.7	23-Oct-97	9.9
22-Jul-98	12.2	22-Jul-98	11.7	22-Jul-98	4.3	22-Jul-98	5.7
16-Sep-99	9.9	16-Sep-99	9.1	16-Sep-99	6.3	16-Sep-99	6.3
3-Aug-00	10.8	3-Aug-00	7.8	3-Aug-00	7.1	3-Aug-00	6.8
6-Jul-01	9.3	6-Jul-01	8.2	6-Jul-01	5.9	6-Jul-01	6.7
25-Jun-02	9.3	25-Jun-02	9.1	25-Jun-02	6.3	25-Jun-02	6.5
10-Aug-10	6.8	10-Aug-10	6.5	10-Aug-10	4.6	10-Aug-10	3.2

Table A1.12: Routine Monitoring Data in Piezometers at DK17-2

DK17-2A (353.8 masl)		DK17-2B (356.9 masl)		DK17-2C (358.4 masl)		DK17-2D (359.9 masl)	
Date	Radium (Bq/L)	Date	Radium (Bq/L)	Date	Radium (Bq/L)	Date	Radium (Bq/L)
26-Sep-96	2.6	26-Sep-96	6.6	26-Sep-96	5.1	26-Sep-96	3.9
20-Oct-97	1.3	20-Oct-97	5.3	20-Oct-97	4.3	20-Oct-97	3.6
14-Jul-98	1.2	14-Jul-98	4.9	14-Jul-98	4.9	14-Jul-98	4.2
14-Sep-99	1.0	14-Sep-99	5.4	14-Sep-99	5.8	14-Sep-99	4.6
19-Jul-00	3.3	19-Jul-00	3.8	19-Jul-00	3.6	19-Jul-00	2.9
9-Jul-01	1.3	9-Jul-01	4.9	9-Jul-01	5.0	9-Jul-01	4.7
31-May-02	2.4	31-May-02	4.9	31-May-02	4.7	31-May-02	5.0
9-Aug-10	2.2	9-Aug-10	4.9	9-Aug-10	3.4	9-Aug-10	5.3

APPENDIX 2

Detailed Data Quality Assessment

Table A2.1: Detailed Data Quality Assessment for Constituents in Solids

Analysis	Units	Method Detection Limit	RPD Data Quality Objective	Sample ID	Duplicate ID	RPD (%) or AD	Sample ID	Duplicate ID	RPD (%) or AD	Sample ID	Replicate ID	RPD (%) or AD	Sample ID	Replicate ID	RPD (%) or AD	Sample ID	Replicate ID	RPD (%) or AD
				CORE 09-PSB-2 (5-10)	CORE 09-EC-1 (0-5)		CORE 09-SR-4 (10-15)	CORE 09-EC-1 (5-10)		CORE 09-QC14-2 (0-2.5)	CORE 09-EC-2 (0-2.5)		CORE 09-QC14-2 (2.5-5)	CORE 09-EC-2 (2.5-5)		CORE 09-QC14-2 (5-7.5)	CORE 09-EC-2 (5-7.5)	
Conventional Parameters																		
Sulphur (S)	%	0.005	≤ 40%	1.57	1.17	29	1.00	0.762	27	0.633	0.628	1	0.885	1.03	15	0.871	1.18	30
Carbonate (CO_3)	%	0.005	≤ 40%	0.097	0.058	**50**	0.419	0.280	40	<0.005	<0.005	BD	<0.005	<0.005	BD	<0.005	<0.005	BD
Total Organic Carbon (TOC)	%	0.01	≤ 40%	9.78	10.5	7	16.8	16.7	1	0.519	0.617	17	0.289	0.206	34	0.121	0.090	29
Total Carbon (C)	%	0.005	≤ 40%	9.80	10.5	7	16.9	16.8	1	0.519	0.616	17	0.289	0.207	33	0.121	0.089	30
Sulphide	%	0.01	≤ 40%	0.36	0.47	27	0.65	0.70	7	0.52	0.53	2	0.77	1.04	30	0.84	1.07	24
Sulphate (SO_4)	%	0.1	≤ 40%	0.6	0.3	**0.3**	0.2	0.1	0.1	0.1	0.1	0	0.1	0.1	0	0.1	0.1	0
Metals																		
Radium-226 (Ra-226)	Bq/g	0.01	≤ 40%	4.5	4.1	9	2.1	1.6	27	4.3	7.0	**48**	6.5	8.3	24	9.3	20.0	**73**
Silver (Ag)	mg/kg	0.7	≤ 40%	<0.7	<0.7	BD	<0.7	<0.7	BD	0.8	1.5	**1**	1.0	1.2	0.2	1.1	1.1	0
Aluminum (Al)	mg/kg	1	≤ 40%	3600	3800	5	5600	5800	4	830	1500	**58**	690	1200	**54**	850	890	5
Arsenic (As)	mg/kg	1	≤ 40%	14	14	0	26	26	0	17	22	26	19	24	23	21	24	13
Barium (Ba)	mg/kg	0.05	≤ 40%	160	94	**52**	440	450	2	150	280	**60**	220	370	**51**	330	310	6
Beryllium (Be)	mg/kg	0.1	≤ 40%	0.34	0.35	0.01	0.12	0.13	0.01	0.28	0.51	**0.23**	0.28	0.41	0.1	0.34	0.34	0
Bismuth (Bi)	mg/kg	0.5	≤ 40%	11	12	9	<0.5	<0.5	BD	7.5	11	38	9.2	8.6	7	8.5	7.8	9
Calcium (Ca)	mg/kg	1	≤ 40%	7600	4600	**49**	7300	7400	1	190	230	19	130	110	17	79	63	23
Cadmium (Cd)	mg/kg	0.05	≤ 40%	4.5	4.0	12	1.8	1.8	0	0.18	0.25	33	0.22	0.27	20	0.22	0.29	27
Cerium (Ce)	mg/kg	0.006	≤ 40%	220	240	9	840	800	5	300	340	13	290	300	3	280	240	15
Cobalt (Co)	mg/kg	0.3	≤ 40%	15	15	0	16	17	6	15	16	6	18	21	15	17	22	26
Chromium (Cr)	mg/kg	0.5	≤ 40%	6.5	7.8	18	17	17	0	4.7	8.2	**54**	4.9	6.5	28	5.7	5.8	2
Cesium (Cs)	mg/kg	0.01	≤ 40%	0.97	1.1	13	0.87	0.90	3	0.18	0.32	**56**	0.22	0.20	10	0.31	0.19	**48**
Copper (Cu)	mg/kg	0.1	≤ 40%	14	15	7	56	56	0	43	50	15	46	54	16	42	54	25
Iron (Fe)	mg/kg	0.5	≤ 40%	240000	240000	0	12000	16000	29	10000	13000	26	12000	17000	34	13000	19000	38
Gallium (Ga)	mg/kg	0.03	≤ 40%	2.4	2.7	12	6.6	6.5	2	2.1	2.8	29	2.1	2.4	13	2.0	1.9	5
Germanium (Ge)	mg/kg	0.3	≤ 40%	7.2	7.2	0	3.8	4.0	5	1.2	1.4	0.2	1.2	1.4	0.2	1.2	1.2	0
Hafnium (Hf)	mg/kg	0.1	≤ 40%	0.1	0.1	0	0.6	0.9	40	0.3	0.5	**0.2**	0.6	0.7	15	1.0	0.7	35
Indium (In)	mg/kg	0.01	≤ 40%	<0.01	<0.01	BD	<0.01	0.01	BD	<0.01	0.02	BD	<0.01	0.01	BD	0.01	0.01	0
Potassium (K)	mg/kg	1	≤ 40%	190	210	10	270	270	0	210	330	44	230	300	26	250	230	8
Lanthanum (La)	mg/kg	0.001	≤ 40%	110	130	17	430	420	2	170	190	11	170	170	0	160	140	13
Lithium (Li)	mg/kg	0.1	≤ 40%	0.9	0.9	0	1.1	1.3	17	0.2	0.8	**120**	0.1	0.5	**0.4**	0.4	0.2	**0.2**
Lutetium (Lu)	mg/kg	0.001	≤ 40%	0.98	1.1	12	5.3	5.3	0	0.081	0.14	**53**	0.048	0.060	22	0.031	0.038	20
Magnesium (Mg)	mg/kg	1	≤ 40%	360	240	40	1400	1500	7	88	110	22	46	38	19	25	18	33
Manganese (Mn)	mg/kg	0.05	≤ 40%	89	84	6	180	180	0	13	18	32	8.6	7.6	12	4.7	4.6	2
Molybdenum (Mo)	mg/kg	0.5	≤ 40%	10	10	0	3.6	3.9	8	5.3	6.4	19	5.2	6.1	16	7.9	5.5	36
Sodium (Na)	mg/kg	1	≤ 40%	35	40	13	59	55	7	8	11	32	7	8	13	6	5	1
Niobium (Nb)	mg/kg	0.7	≤ 40%	2.8	2.7	4	0.8	<0.7	BD	7.0	9.7	32	8.2	7.8	5	8.4	7.5	11
Nickel (Ni)	mg/kg	1	≤ 40%	17	19	11	43	43	0	8	9	12	8	10	22	8	11	32
Lead (Pb)	mg/kg	0.7	≤ 40%	270	280	4	640	640	0	180	240	29	260	270	4	270	310	14
Phosphorous (P)	mg/kg	5	≤ 40%	740	810	9	340	360	6	260	400	**42**	300	360	18	360	330	9
Rubidium (Rb)	mg/kg	0.004	≤ 40%	2.1	2.5	17	4.0	4.0	0	1.9	2.6	31	1.9	2.0	5	1.8	1.4	25
Antimony (Sb)	mg/kg	1	≤ 40%	<1	<1	BD	<1	<1	BD	<1	1	BD	<1	<1	BD	<1	<1	BD
Scandium (Sc)	mg/kg	0.2	≤ 40%	1.3	1.6	21	2.7	3.0	11	0.5	0.9	**57**	0.4	0.8	**67**	0.5	0.6	0.1
Selenium (Se)	mg/kg	1	≤ 40%	<1	<2	BD	<1	<2	BD	<2	<2	BD	<2	<2	BD	<2	<2	BD
Tin (Sn)	mg/kg	6	≤ 40%	<6	<6	BD	<6	<6	BD	<6	<6	BD	<6	<6	BD	<6	<6	BD
Strontium (Sr)	mg/kg	0.01	≤ 40%	7.6	7.9	4	14	14	0	3.6	5.1	34	4.1	5.4	27	4.8	4.6	4
Sulphur (S)	mg/kg	1	≤ 40%	--	15000	--	11000	11000	0	6500	6700	3	8700	11000	23	8600	12000	33
Tantalum (Ta)	mg/kg	0.01	≤ 40%	0.05	0.05	0	0.15	0.23	**42**	0.04	0.07	**55**	0.05	0.12	**82**	0.12	0.28	**80**
Terbium (Tb)	mg/kg	0.01	≤ 40%	3.9	4.3	10	35	33	6	0.97	1.4	36	0.83	0.90	8	0.68	0.67	1
Tellurium (Te)	mg/kg	0.1	≤ 40%	0.1	0.1	0	<0.1	<0.1	BD	0.1	0.2	0.1	0.2	0.2	0	0.2	0.2	0
Thorium (Th)	mg/kg	0.01	≤ 40%	110	120	9	85	89	5	310	560	**57**	310	470	41	360	380	5
Titanium (Ti)	mg/kg	0.2	≤ 40%	82	91	10	210	220	5	210	330	**44**	250	260	4	260	240	8
Thallium (Tl)	mg/kg	3	≤ 40%	<3	<3	BD	<3	<3	BD	<3	<3	BD	<3	<3	BD	<3	<3	BD
Uranium (U)	mg/kg	3	≤ 40%	210	230	9	110	150	31	17	23	30	17	18	6	13	15	2
Vanadium (V)	mg/kg	0.1	≤ 40%	25	26	4	16	17	6	2.7	4.0	39	2.7	2.7	0	2.7	2.4	12
Tungsten (W)	mg/kg	1	≤ 40%	2	79	**190**	<1	5	BD	3	5	**2**	4	5	1	5	6	18
Yttrium (Y)	mg/kg	0.1	≤ 40%	78	84	7	740	750	1	9.1	12	27	6.8	6.7	1	5.5	5.2	6
Ytterbium (Yb)	mg/kg	0.1	≤ 40%	7.4	8.7	16	45	46	2	0.74	1.2	**47**	0.46	0.57	21	0.33	0.40	0.07
Zinc (Zn)	mg/kg	0.1	≤ 40%	64	65	2	55	58	5	8.8	8.9	1	6.9	8.0	15	4.7	5.8	21
Zirconium (Zr)	mg/kg	5	≤ 40%	6	6	0	6	<5	BD	20	30	40	26	27	4	28	26	7

Notes:

RPD - relative percent difference; is calculated for analytes with concentrations greater than or equal to five times the detection limit and should be less than or equal to 40%

AD - absolute difference; for samples having concentrations less than five times the detection limit, the difference between the sample and duplicate, or difference between the sample or duplicate and the detection limit if either the sample or duplicate analyte concentration is below detection limit; should not be greater then the detection limit

BD - Sample and/or replicate had analyte concentrations below detection limit

Boldface type and shaded indicates that Data Quality Objective was not achieved

Table A2.2: Detailed Data Quality Assessment for Constituents in Waters

Analysis	Units	Method Detection Limit	RPD Data Quality Objective	Sample ID SW09-SR-4B	Duplicate ID PW09-EC-1 (0-5)	RPD (%) or AD	Sample ID PW09-QC14-3 (0-5)	Duplicate ID PW09-QC14-4 (0-5)	Dupicate ID PW09-EC-1 (5-10)	RPD (%) or AD	Sample ID SW09-QC14-2T	Replicate ID SW09-EC-2T	RPD (%) or AD	Sample ID SW09-QC14-2B	Replicate ID SW09-EC-2B	RPD (%) or AD	Sample ID PW09-QC14-2 (0-2.5)	Replicate ID PW09-EC-2 (0-2.5)	RPD (%) or AD	Sample ID PW09-QC14-2 (2.5-5)	Replicate ID PW09-EC-2 (2.5-5)	RPD (%) or AD	Sample ID PW09-QC14-2 (5-7.5)	Replicate ID PW09-EC-2 (5-7.5)	RPD (%) or AD
Conventional Parameters																									
Acidity (as $CaCO_3$)	mg/L	2	≤ 20%	<2.0	--	--	6	19	--	--	56	67	18	15	16	6	21	17	**21**	15	16	6	16	--	--
Dissolved Inorganic Carbon (DIC)	mg/L	0.2	≤ 20%	1.4	--	--	2.0	<1.0	--	BD	<1.0	<1.0	BD	<1.0	<1.0	BD	<1.0	4.2	BD	<1.0	1.1	BD	<1.0	--	BD
Dissolved Organic Carbon (DOC)	mg/L	0.2	≤ 20%	2.0	--	--	3.5	9.3	--	--	14.4	11.4	**23**	19.4	11.7	**50**	28	19	**38**	18.3	14.3	**25**	17.9	--	--
Sulphate (SO_4)	mg/L	0.2	≤ 20%	25	--	--	5.6	512	--	--	72	85	17	32	36	12	32	27	17	12	18	**40**	12	--	--
Hardness (as $CaCO_3$)	mg/L	0.5	≤ 20%	33.4	33.9	1	18	NC	17.8	1	16.9	17	1	16.6	16.8	1	26.2	21.7	19	16.9	16	5	17.9	16.4	9
Metals																									
Radium-226 (Ra-226)	Bq/L	0.01	≤ 20%	0.30	0.30	0	NC	4.1	4.7	14	0.82	0.78	5	0.91	0.85	7	3.6	2.9	**22**	2.8	3.3	16	5.9	5.4	9
Aluminum (Al)	mg/L	0.01	≤ 20%	<0.01	<0.01	BD	<0.01	NC	<0.01	BD	<0.01	0.03	BD	<0.01	<0.01	BD	<0.01	<0.01	BD	0.03	<0.01	BD	<0.01	<0.01	BD
Arsenic (As)	mg/L	0.0002	≤ 20%	0.0007	0.0006	0.0001	0.0026	NC	0.0024	8	0.0006	0.0007	0.0001	0.0011	0.0007	**0.0004**	0.0064	0.0058	10	0.0084	0.0046	**58**	0.0066	0.0065	2
Barium (Ba)	mg/L	0.00001	≤ 20%	0.222	0.221	0	0.333	NC	0.335	1	0.104	0.108	4	0.108	0.114	5	0.309	0.285	8	0.308	0.337	9	0.519	0.487	6
Beryllium (Be)	mg/L	0.00002	≤ 20%	<0.00002	<0.00002	BD	0.00013	NC	<0.00002	BD	<0.00002	0.00003	BD	<0.00002	0.00002	BD	<0.00002	<0.00002	BD	<0.00002	<0.00002	BD	<0.00002	<0.00002	BD
Boron (B)	mg/L	0.0002	≤ 20%	0.0089	0.0082	8	0.0026	NC	0.0028	0.0002	0.0045	0.0076	**51**	0.0056	0.0072	**25**	0.0054	0.0039	**32**	0.0047	0.0034	**32**	0.0051	0.0039	**27**
Bismuth (Bi)	mg/L	0.00001	≤ 20%	0.00001	<0.00001	BD	0.00012	NC	<0.00001	BD	<0.00001	0.00002	BD	<0.00001	0.00002	BD	0.00003	0.00003	0	0.00024	0.00006	**120**	0.00006	0.00003	**0.00003**
Calcium (Ca)	mg/L	0.03	≤ 20%	11.2	11.4	2	6.12	NC	6.06	1	5.69	5.69	0	5.55	5.63	1	8.79	7.28	19	5.68	5.35	6	6.06	5.54	9
Cadmium (Cd)	mg/L	0.000003	≤ 20%	0.000028	0.000012	0.000016	0.000112	NC	<0.000003	BD	0.000023	0.000046	**67**	0.000023	0.000056	**84**	0.000055	0.000031	**56**	<0.000003	0.000012	BD	0.000005	0.000009	**0.000004**
Cobalt (Co)	mg/L	0.000002	≤ 20%	0.00031	0.000321	3	0.00189	NC	0.00192	2	0.00549	0.00655	18	0.00169	0.00196	15	0.00521	0.00289	**57**	0.000917	0.0012	**27**	0.000766	0.00183	**82**
Chromium (Cr)	mg/L	0.0005	≤ 20%	<0.0005	<0.0005	BD	<0.0005	NC	<0.0005	BD	<0.0005	<0.0005	BD	<0.0005	<0.0005	BD	<0.0005	<0.0005	BD	<0.0005	<0.0005	BD	<0.0005	<0.0005	BD
Copper (Cu)	mg/L	0.0005	≤ 20%	0.0011	0.001	0.0001	<0.0005	NC	<0.0005	BD	0.0038	0.0037	3	0.0023	0.0029	**23**	0.0043	0.0018	**0.0025**	0.0025	0.0018	**0.0007**	0.0015	0.0011	**31**
Iron (Fe)	mg/L	0.01	≤ 20%	0.08	0.07	13	7.18	NC	6.63	8	0.04	0.07	**55**	0.01	0.04	**0.03**	0.03	0.44	**174**	0.52	3.3	**146**	2.46	5.71	**80**
Potassium (K)	mg/L	0.01	≤ 20%	0.80	0.80	0	0.37	NC	0.58	**44**	0.32	0.31	3	0.26	0.32	**21**	0.34	0.3	13	0.4	0.34	16	0.62	0.48	**25**
Lithium (Li)	mg/L	0.002	≤ 20%	<0.002	<0.002	BD	<0.002	NC	<0.002	BD	<0.002	<0.002	BD	<0.002	<0.002	BD	<0.002	<0.002	BD	<0.002	<0.002	BD	<0.002	<0.002	BD
Magnesium (Mg)	mg/L	0.003	≤ 20%	1.29	1.31	2	0.67	NC	0.655	2	0.663	0.67	1	0.657	0.663	1	1.02	0.864	17	0.664	0.634	5	0.675	0.632	7
Manganese (Mn)	mg/L	0.00001	≤ 20%	0.119	0.12	1	0.143	NC	0.142	1	0.0288	0.0315	9	0.0353	0.0319	10	0.282	0.217	**26**	0.133	0.134	1	0.133	0.132	1
Molybdenum (Mo)	mg/L	0.00001	≤ 20%	0.00032	0.00029	10	0.00045	NC	0.00051	13	<0.00001	0.00018	BD	0.00002	0.00008	**120**	0.00029	0.00015	**64**	0.00133	0.00116	14	0.00107	0.00149	**33**
Sodium (Na)	mg/L	0.01	≤ 20%	2.79	2.75	1	1.3	NC	1.24	5	1.82	1.59	13	1.83	1.58	15	2.35	2.2	7	1.98	1.87	6	1.79	1.5	18
Nickel (Ni)	mg/L	0.0001	≤ 20%	0.0006	0.0008	**29**	0.001	NC	0.001	0	0.0025	0.0022	13	0.0024	0.0022	9	0.0044	0.0024	**59**	0.0012	0.0013	8	0.0012	0.0017	**34**
Lead (Pb)	mg/L	0.00002	≤ 20%	0.00043	0.00023	**61**	0.00029	NC	0.00016	**58**	0.00717	0.00699	3	0.00597	0.00391	**42**	0.0242	0.00216	**167**	0.00596	0.0009	**148**	0.00098	0.00049	**67**
Phosphorous (P)	mg/L	0.01	≤ 20%	<0.01	<0.01	BD	<0.01	NC	<0.01	BD	0.01	<0.01	BD	<0.01	<0.01	BD	<0.01	0.07	BD	0.01	0.01	0	0.01	<0.01	BD
Antimony (Sb)	mg/L	0.0002	≤ 20%	0.0002	<0.0002	BD	<0.0002	NC	<0.0002	BD	0.0077	0.0086	11	0.0007	0.0016	**78**	0.0002	0.0003	0.0001	0.0006	<0.0002	BD	0.0004	<0.0002	BD
Selenium (Se)	mg/L	0.001	≤ 20%	<0.001	<0.001	BD	<0.001	NC	<0.001	BD	<0.001	<0.001	BD	<0.001	<0.001	BD	<0.001	<0.001	BD	<0.001	<0.001	BD	<0.001	<0.001	BD
Sulphur (S)	mg/L	0.01	≤ 20%	8.58	7.26	17	1.67	NC	1.58	6	4.69	4.64	1	4.74	4.63	2	8.28	6.26	**28**	3.87	3.35	14	3.61	4.21	15
Silicon (Si)	mg/L	0.01	≤ 20%	0.73	0.72	1	5.18	NC	5.07	2	0.58	0.59	2	0.59	0.6	2	1.23	1.42	14	1.71	1.86	8	2.15	2.71	**23**
Tin (Sn)	mg/L	0.00001	≤ 20%	0.00016	<0.00001	BD	<0.00001	NC	0.00002	BD	<0.00001	<0.00001	BD	<0.00001	<0.00001	BD	0.00004	0.00017	**124**	<0.00001	<0.00001	BD	<0.00001	0.00001	BD
Strontium (Sr)	mg/L	0.0001	≤ 20%	0.0268	0.0269	0	0.017	NC	0.0168	1	0.0121	0.0122	1	0.012	0.0122	2	0.0205	0.0168	20	0.0154	0.0149	3	0.0204	0.0187	9
Titanium (Ti)	mg/L	0.0001	≤ 20%	0.0001	<0.0001	BD	0.0003	NC	0.0003	0	0.0003	0.0004	0.0001	<0.0001	0.0001	BD	0.0003	0.0007	**80**	0.0062	0.0004	**0.0058**	0.0005	0.0002	**0.0003**
Thallium (Tl)	mg/L	0.0002	≤ 20%	<0.0002	<0.0002	BD	<0.0002	NC	<0.0002	BD	<0.0002	<0.0002	BD	<0.0002	<0.0002	BD	<0.0002	<0.0002	BD	<0.0002	<0.0002	BD	<0.0002	<0.0002	BD
Uranium (U)	mg/L	0.000001	≤ 20%	0.00122	0.000835	**37**	0.000744	NC	0.000671	10	0.000535	0.000654	20	0.000338	0.00079	**80**	0.000946	0.000173	**138**	0.000524	0.000115	**128**	0.000143	0.000105	**31**
Vanadium (V)	mg/L	0.00003	≤ 20%	0.00008	0.00007	0.00001	0.00019	NC	0.00005	**0.00014**	0.00006	0.00007	0.00001	0.00005	0.00007	0.00002	0.00007	0.00008	0.00001	0.00013	0.00007	**0.00006**	0.00006	0.00004	0.00002
Zinc (Zn)	mg/L	0.001	≤ 20%	0.004	0.003	0.001	0.002	NC	0.001	0.001	0.002	0.004	0.002	0.005	0.005	0	0.005	0.005	0	0.003	0.004	0.001	0.002	0.003	0.001

Notes:

RPD - relative percent difference; is calculated for analytes with concentrations greater than or equal to five times the detection limit and should be less than or equal to 40%

AD - absolute difference; for samples having concentrations less than five times the detection limit, the difference between the sample and duplicate, or difference between the sample or duplicate and the detection limit if either the sample or duplicate analyte concentration is below detection limit; should not be greater then the detection limit

BD - Sample and/or replicate had analyte concentrations below detection limit

"--" Indicates parameter was not analysed

"NC" Indicates that parameter in the sample was not compared to the duplicate/replicate sample in the data quality assessment

Boldface type and shaded indicates that Data Quality Objective was not achieved

Table A2.3: Detailed Data Quality Assessment for Constituents in the Blank Sample

Analysis	Units	Detection Limit	Data Quality Objective	Blank
Convential Parameters				
Acidity (as $CaCO_3$)	mg/L	2	4	**7**
Total Inorganic Carbon (DIC)	mg/L	1.0	2.0	<1.0
Total Organic Carbon (DOC)	mg/L	1.0	2.0	**2.4**
Sulphate (SO_4)	mg/L	2	4	<2
Hardness (as $CaCO_3$)	mg/L	0.5	1.0	<0.5
Metals				
Radium-226 (Ra-226)	Bq/L	0.01	0.02	<0.01
Aluminum (Al)	mg/L	0.01	0.02	<0.01
Arsenic (As)	mg/L	0.0002	0.0004	<0.0002
Barium (Ba)	mg/L	0.00001	0.00002	**0.00216**
Beryllium (Be)	mg/L	0.00002	0.00004	<0.00002
Boron (B)	mg/L	0.0002	0.0004	<0.0002
Bismuth (Bi)	mg/L	0.00001	0.00002	<0.00001
Calcium (Ca)	mg/L	0.03	0.06	0.03
Cadmium (Cd)	mg/L	0.000003	0.000006	<0.000003
Cobalt (Co)	mg/L	0.000002	0.000004	0.000003
Chromium (Cr)	mg/L	0.0005	0.0010	<0.0005
Copper (Cu)	mg/L	0.0005	0.0010	**0.0053**
Iron (Fe)	mg/L	0.01	0.02	<0.01
Potassium (K)	mg/L	0.01	0.02	<0.01
Lithium (Li)	mg/L	0.002	0.004	<0.002
Magnesium (Mg)	mg/L	0.003	0.006	<0.003
Manganese (Mn)	mg/L	0.00001	0.00002	**0.00034**
Molybdenum (Mo)	mg/L	0.00001	0.00002	<0.00001
Sodium (Na)	mg/L	0.01	0.02	**0.15**
Nickel (Ni)	mg/L	0.0001	0.0002	**0.0003**
Lead (Pb)	mg/L	0.00002	0.00004	<0.00002
Phosphorous (P)	mg/L	0.01	0.02	<0.01
Antimony (Sb)	mg/L	0.0002	0.0004	<0.0002
Selenium (Se)	mg/L	0.001	0.002	<0.001
Sulphur (S)	mg/L	0.01	0.02	**0.05**
Silicon (Si)	mg/L	0.01	0.02	<0.01
Tin (Sn)	mg/L	0.00001	0.00002	<0.00001
Strontium (Sr)	mg/L	0.0001	0.0002	0.0001
Titanium (Ti)	mg/L	0.0001	0.0002	<0.0001
Thallium (Tl)	mg/L	0.0002	0.0004	<0.0002
Uranium (U)	mg/L	0.000001	0.000002	<0.000001
Vanadium (V)	mg/L	0.00003	0.00006	<0.00003
Zinc (Zn)	mg/L	0.001	0.002	<0.001

Notes:
Boldface type and shaded indicates that Data Quality Objective was not achieved

APPENDIX 3

Certificates of Analysis for the 2009 Field Data

ANALYSIS REPORT

Becquerel Laboratories Inc.
6790 Kitimat Rd., Unit 4
Mississauga, Ontario
Canada, L5N 5L9

Phone: (905) 826-3080
FAX: (905) 826-4151

Batch: T09-01487.0

Date: 13-Nov-2009

Lakefield Research Ltd.

185 Concession St., Postal Bag 4300
Lakefield, ON, K0L 2H0

Phone: (705) 652-2038
FAX: (705) 652-1918

Client Ref.
Oct 10063.R09
P.O: 17820

attn: Brian Graham

20 solid samples Sampled: 28-Sep-2009 Received: 21-Oct-2009

Results of Analysis

Sample	Test	Result	Units	Date	Method
CORE 09-EC-1 (0-5)	Ra-226	4.1	Bq/g	11-Nov-2009	ALPHA
CORE 09-EC-1 (5-10)	Ra-226	1.6	Bq/g	11-Nov-2009	ALPHA
CORE 09-EC-2 (0-2.5)	Ra-226	7.0	Bq/g	11-Nov-2009	ALPHA
CORE 09-EC-2 (2.5-5)	Ra-226	8.3	Bq/g	11-Nov-2009	ALPHA
CORE 09-EC-2 (5-7.5)	Ra-226	9.7	Bq/g	11-Nov-2009	ALPHA
CORE 09-QC14-1 (0-5)	Ra-226	19	Bq/g	11-Nov-2009	ALPHA
CORE 09-QC14-1 (5-10)	Ra-226	13	Bq/g	11-Nov-2009	ALPHA
CORE 09-QC14-1 (10-15)	Ra-226	9.7	Bq/g	11-Nov-2009	ALPHA
CORE 09-QC14-2 (0-2.5)	Ra-226	4.3	Bq/g	12-Nov-2009	ALPHA
CORE 09-QC14-2 (2.5-5)	Ra-226	6.5	Bq/g	12-Nov-2009	ALPHA
CORE 09-QC14-2 (5-7.5)	Ra-226	9.3	Bq/g	12-Nov-2009	ALPHA
CORE 09-QC14-2 (7.5-10)	Ra-226	9.0	Bq/g	12-Nov-2009	ALPHA
CORE 09-QC14-3 (0-5)	Ra-226	16	Bq/g	12-Nov-2009	ALPHA
CORE 09-QC14-3 (5-10)	Ra-226	22	Bq/g	12-Nov-2009	ALPHA
CORE 09-QC14-3 (10-15)	Ra-226	24	Bq/g	12-Nov-2009	ALPHA
CORE 09-QC14-3 (15-20)	Ra-226	23	Bq/g	12-Nov-2009	ALPHA
CORE 09-QC14-4 (0-5)	Ra-226	16	Bq/g	12-Nov-2009	ALPHA
CORE 09-QC14-4 (5-10)	Ra-226	17	Bq/g	12-Nov-2009	ALPHA
CORE 09-QC14-4 (10-15)	Ra-226	22	Bq/g	12-Nov-2009	ALPHA
CORE 09-QC14-4 (15-20)	Ra-226	19	Bq/g	12-Nov-2009	ALPHA

ANALYSIS REPORT

Becquerel Laboratories Inc.
6790 Kitimat Rd., Unit 4
Mississauga, Ontario
Canada, L5N 5L9

Phone: (905) 826-3080
FAX: (905) 826-4151

Batch: T09-01487.0

Date: 13-Nov-2009

Methods: ALPHA BQ-RAD-ALPHA alpha-particle spectrometry

Units: Bq/g Becquerels per gram

These results relate only to the samples analysed and only to the items tested.

13-Nov-2009 approved by: ______________________

Donald D. Burgess PhD
Senior Scientist, Division Supervisor

SGS Lakefield Research Limited
P.O. Box 4300 - 185 Concession St.
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Ecometrix
Attn : Erin Clyde

6800 Campobello Road, Mississauga
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Tuesday, October 27, 2009

Date Rec. : 01 October 2009
LR. Ref. : **CA10063-OCT09**
Project : 09-1663

Copy to : #1

CERTIFICATE OF ANALYSIS

Final Report

Analysis	**3: Analysis Approval Date**	**4: Analysis Approval Time**	**5: CORE 09-EC-1 (0-5)**	**6: CORE 09-EC-1 (5-10)**	**7: CORE 09-EC-2 (0-2.5)**	**8: CORE 09-EC-2 (2.5-5)**	**9: CORE 09-EC-2 (5-7.5)**	**10: CORE 09-QC14-1 (0-5)**
Sample Date & Time			28-Sep-09	28-Sep-09	28-Sep-09	28-Sep-09	28-Sep-09	28-Sep-09
Ba as BaSO4 Calc. * [µg/g]	---	---	160	770	480	630	530	940
SO4 as BaSO4 Calc. ** [µg/g]	---	---	7280	2430	2430	2430	2430	14600
Total Sulphur [%]	09-Oct-09	10:07	1.17	0.762	0.628	1.03	1.18	1.21
Carbonate (CO3) [%]	08-Oct-09	10:46	0.058	0.280	< 0.005	< 0.005	< 0.005	< 0.005
Total Organic Carbon [%]	09-Oct-09	10:07	10.5	16.7	0.617	0.206	0.090	0.490
Total Carbon [%]	09-Oct-09	10:07	10.5	16.8	0.616	0.207	0.089	0.489
Sulphide [%]	08-Oct-09	11:47	0.47	0.70	0.53	1.04	1.07	0.96
Sulphate [%]	13-Oct-09	16:45	0.3	0.1	0.1	0.1	0.1	0.6
Silver [µg/g]	14-Oct-09	13:32	< 0.7	< 0.7	1.5	1.2	1.1	3.0
Aluminum [µg/g]	14-Oct-09	13:32	3800	5800	1500	1200	890	6700
Arsenic [µg/g]	14-Oct-09	13:32	14	26	22	24	24	37
Barium [µg/g]	14-Oct-09	13:32	94	450	280	370	310	550
Beryllium [µg/g]	14-Oct-09	13:32	0.35	0.13	0.51	0.41	0.34	1.5
Bismuth [µg/g]	14-Oct-09	13:32	12	< 0.5	11	8.6	7.8	15
Calcium [µg/g]	14-Oct-09	13:32	4600	7400	230	110	63	2400
Cadmium [µg/g]	14-Oct-09	13:32	4.0	1.8	0.25	0.27	0.29	0.45
Cerium [µg/g]	14-Oct-09	13:32	240	800	340	300	240	600
Cobalt [µg/g]	14-Oct-09	13:32	15	17	16	21	22	25
Chromium [µg/g]	14-Oct-09	13:32	7.8	17	8.2	6.5	5.8	16
Cesium [µg/g]	14-Oct-09	13:32	1.1	0.90	0.32	0.20	0.19	1.1
Copper [µg/g]	14-Oct-09	13:32	15	56	50	54	54	120
Iron [µg/g]	14-Oct-09	13:32	240000	16000	13000	17000	19000	22000
Gallium [µg/g]	14-Oct-09	13:32	2.7	6.5	2.8	2.4	1.9	5.3
Germanium [µg/g]	14-Oct-09	13:32	7.2	4.0	1.4	1.4	1.2	2.6
Hafnium [µg/g]	14-Oct-09	13:32	0.1	0.9	0.5	0.7	0.7	1.5
Indium [µg/g]	14-Oct-09	13:32	< 0.01	0.01	0.02	0.01	0.01	0.03
Potassium [µg/g]	14-Oct-09	13:32	210	270	330	300	230	570
Lanthanum [µg/g]	14-Oct-09	13:32	130	420	190	170	140	310
Lithium [µg/g]	14-Oct-09	13:32	0.9	1.3	0.8	0.5	0.2	4.7

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LR Report : CA10063-OCT09

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: CORE 09-EC-1 (0-5)	6: CORE 09-EC-1 (5-10)	7: CORE 09-EC-2 (0-2.5)	8: CORE 09-EC-2 (2.5-5)	9: CORE 09-EC-2 (5-7.5)	10: CORE 09-QC14-1 (0-5)
Lutetium [µg/g]	14-Oct-09	13:32	1.1	5.3	0.14	0.060	0.038	1.1
Magnesium [µg/g]	14-Oct-09	13:32	240	1500	110	38	18	97
Manganese [µg/g]	14-Oct-09	13:32	84	180	18	7.6	4.6	14
Molybdenum [µg/g]	14-Oct-09	13:32	10	3.9	6.4	6.1	5.5	10
Sodium [µg/g]	14-Oct-09	13:32	40	55	11	8	5	15
Niobuim [µg/g]	14-Oct-09	13:32	2.7	< 0.7	9.7	7.8	7.5	13
Nickel [µg/g]	14-Oct-09	13:32	19	43	9	10	11	20
Lead [µg/g]	14-Oct-09	13:32	280	640	240	270	310	650
Phosphorus [µg/g]	14-Oct-09	13:32	810	360	400	360	330	820
Rubidium [µg/g]	14-Oct-09	13:32	2.5	4.0	2.6	2.0	1.4	4.1
Antimony [µg/g]	14-Oct-09	13:32	< 1	< 1	1	< 1	< 1	2
Scandium [µg/g]	14-Oct-09	13:32	1.6	3.0	0.9	0.8	0.6	2.8
Selenium [µg/g]	14-Oct-09	13:32	< 2	< 2	< 2	< 2	< 2	< 2
Tin [µg/g]	14-Oct-09	13:32	< 6	< 6	< 6	< 6	< 6	< 6
Strontium [µg/g]	14-Oct-09	13:32	7.9	14	5.1	5.4	4.6	11
Sulphur [µg/g]	14-Oct-09	13:32	15000	11000	6700	11000	12000	12000
Tantalum [µg/g]	14-Oct-09	13:32	0.05	0.23	0.07	0.12	0.28	0.30
Terbium [µg/g]	14-Oct-09	13:32	4.3	33	1.4	0.90	0.67	5.6
Tellerium [µg/g]	14-Oct-09	13:32	0.1	< 0.1	0.2	0.2	0.2	0.3
Thorium [µg/g]	14-Oct-09	13:32	120	89	560	470	380	1600
Titanium [µg/g]	14-Oct-09	13:32	91	220	330	260	240	610
Thallium [µg/g]	14-Oct-09	13:32	< 3	< 3	< 3	< 3	< 3	< 3
Uranium [µg/g]	14-Oct-09	13:32	230	150	23	18	15	83
Vanadium [µg/g]	14-Oct-09	13:32	26	17	4.0	2.7	2.4	7.2
Tungsten [µg/g]	14-Oct-09	13:32	79	5	5	5	6	8
Yttrium [µg/g]	14-Oct-09	13:32	84	750	12	6.7	5.2	87
Ytterbium [µg/g]	14-Oct-09	13:31	8.7	46	1.2	0.57	0.40	9.2
Zinc [µg/g]	14-Oct-09	13:32	65	58	8.9	8.0	5.8	23
Zirconium [µg/g]	14-Oct-09	13:32	6	< 5	30	27	26	58

Ra226 subcontracted to Becquerel Labs.
* BaSO4 Calculation based on Ba values and assumes all Ba is in BaSO4 form.
** BaSO4 Calculation based on SO4 values and assumes all SO4 is in BaSO4 form.

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Tuesday, October 27, 2009

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Project : 09-1663

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CERTIFICATE OF ANALYSIS

Final Report

Analysis	**11: CORE 09-QC14-1 (5-10)**	**12: CORE 09-QC14-1 (10-15)**	**13: CORE 09-QC14-2 (0-2.5)**	**14: CORE 09-QC14-2 (2.5-5)**	**15: CORE 09-QC14-2 (5-7.5)**	**16: CORE 09-QC14-2 (7.5-10)**	**17: CORE 09-QC14-3 (0-5)**
Sample Date & Time	28-Sep-09	28-Sep-09	28-Sep-09	28-Sep-09	28-Sep-09	28-Sep-09	28-Sep-09
Ba as BaSO4 Calc. * [µg/g]	580	480	260	370	560	540	920
SO4 as BaSO4 Calc. ** [µg/g]	53400	29100	2430	2430	2430	2430	<2430
Total Sulphur [%]	2.33	2.21	0.633	0.885	0.871	1.29	1.35
Carbonate (CO3) [%]	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.005
Total Organic Carbon [%]	0.114	0.065	0.519	0.289	0.121	0.086	0.617
Total Carbon [%]	0.115	0.064	0.519	0.289	0.121	0.086	0.618
Sulphide [%]	1.56	1.80	0.52	0.77	0.84	1.26	1.37
Sulphate [%]	2.2	1.2	0.1	0.1	0.1	0.1	< 0.1
Silver [µg/g]	1.7	1.3	0.8	1.0	1.1	1.3	3.4
Aluminum [µg/g]	3800	2600	830	690	850	1400	7700
Arsenic [µg/g]	33	26	17	19	21	23	36
Barium [µg/g]	340	280	150	220	330	320	540
Beryllium [µg/g]	0.81	0.61	0.28	0.28	0.34	0.51	1.7
Bismuth [µg/g]	10	8.1	7.5	9.2	8.5	7.6	15
Calcium [µg/g]	8900	4900	190	130	79	59	350
Cadmium [µg/g]	0.42	0.43	0.18	0.22	0.22	0.31	0.55
Cerium [µg/g]	610	430	300	290	280	250	770
Cobalt [µg/g]	35	36	15	18	17	24	38
Chromium [µg/g]	8.2	6.2	4.7	4.9	5.7	6.6	18
Cesium [µg/g]	0.49	0.32	0.18	0.22	0.31	0.20	0.55
Copper [µg/g]	100	88	43	46	42	51	140
Iron [µg/g]	21000	21000	10000	12000	13000	18000	22000
Gallium [µg/g]	4.3	3.0	2.1	2.1	2.0	1.9	6.2
Germanium [µg/g]	2.6	2.1	1.2	1.2	1.2	1.2	3.1
Hafnium [µg/g]	1.2	0.9	0.3	0.6	1.0	0.7	1.5
Indium [µg/g]	0.02	0.02	< 0.01	< 0.01	0.01	0.01	0.04
Potassium [µg/g]	440	290	210	230	250	250	600
Lanthanum [µg/g]	310	220	170	170	160	140	390
Lithium [µg/g]	1.8	1.0	0.2	0.1	0.4	0.7	5.7

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Analysis	11: CORE 09-QC14-1 (5-10)	12: CORE 09-QC14-1 (10-15)	13: CORE 09-QC14-2 (0-2.5)	14: CORE 09-QC14-2 (2.5-5)	15: CORE 09-QC14-2 (5-7.5)	16: CORE 09-QC14-2 (7.5-10)	17: CORE 09-QC14-3 (0-5)
Lutetium [µg/g]	1.4	1.1	0.081	0.048	0.031	0.036	1.9
Magnesium [µg/g]	76	65	88	46	25	23	120
Manganese [µg/g]	5.3	5.4	13	8.6	4.7	3.9	20
Molybdenum [µg/g]	7.8	7.3	5.3	5.2	7.9	4.8	8.0
Sodium [µg/g]	12	7	8	7	6	6	16
Niobuim [µg/g]	7.2	4.9	7.0	8.2	8.4	7.7	15
Nickel [µg/g]	25	24	8	8	8	12	32
Lead [µg/g]	490	390	180	260	270	230	650
Phosphorus [µg/g]	490	320	260	300	360	350	830
Rubidium [µg/g]	3.2	2.1	1.9	1.9	1.8	1.6	4.3
Antimony [µg/g]	< 1	< 1	< 1	< 1	< 1	< 1	2
Scandium [µg/g]	1.5	1.0	0.5	0.4	0.5	0.8	3.0
Selenium [µg/g]	< 2	< 2	< 2	< 2	< 2	< 2	< 2
Tin [µg/g]	< 6	< 6	< 6	< 6	< 6	< 6	< 6
Strontium [µg/g]	12	8.5	3.6	4.1	4.8	4.6	7.5
Sulphur [µg/g]	22000	20000	6500	8700	8600	12000	13000
Tantalum [µg/g]	0.15	0.09	0.04	0.05	0.12	0.35	0.45
Terbium [µg/g]	7.5	5.5	0.97	0.83	0.68	0.64	9.5
Tellerium [µg/g]	0.2	0.2	0.1	0.2	0.2	0.2	0.3
Thorium [µg/g]	880	630	310	310	360	580	1800
Titanium [µg/g]	370	240	210	250	260	240	630
Thallium [µg/g]	< 3	< 3	< 3	< 3	< 3	< 3	< 3
Uranium [µg/g]	71	47	17	17	13	15	120
Vanadium [µg/g]	3.7	2.8	2.7	2.7	2.7	2.6	8.0
Tungsten [µg/g]	7	7	3	4	5	6	8
Yttrium [µg/g]	160	100	9.1	6.8	5.5	5.1	180
Ytterbium [µg/g]	12	9.1	0.74	0.46	0.33	0.36	16
Zinc [µg/g]	28	24	8.8	6.9	4.7	5.4	42
Zirconium [µg/g]	38	27	20	26	28	25	57

Ra226 subcontracted to Becquerel Labs.
* BaSO4 Calculation based on Ba values and assumes all Ba is in BaSO4 form.
** BaSO4 Calculation based on SO4 values and assumes all SO4 is in BaSO4 form.

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Tuesday, October 27, 2009

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Project : 09-1663

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CERTIFICATE OF ANALYSIS

Final Report

Analysis	**18: CORE 09-QC14-3 (5-10)**	**19: CORE 09-QC14-3 (10-15)**	**20: CORE 09-QC14-3 (15-20)**	**21: CORE 09-QC14-4 (0-5)**	**22: CORE 09-QC14-4 (5-10)**	**23: CORE 09-QC14-4 (10-15)**	**24: CORE 09-QC14-4 (15-20)**
Sample Date & Time	28-Sep-09	28-Sep-09	28-Sep-09	28-Sep-09	28-Sep-09	28-Sep-09	28-Sep-09
Ba as BaSO4 Calc. * [µg/g]	1090	1120	1070	970	950	990	800
SO4 as BaSO4 Calc. ** [µg/g]	4850	7280	7280	4850	46100	87400	75200
Total Sulphur [%]	1.48	1.39	1.60	1.48	2.00	2.36	2.58
Carbonate (CO3) [%]	< 0.005	< 0.005	< 0.005	0.022	0.100	0.123	0.034
Total Organic Carbon [%]	0.136	0.112	0.097	0.683	0.188	0.178	0.109
Total Carbon [%]	0.136	0.113	0.096	0.688	0.208	0.202	0.116
Sulphide [%]	1.43	1.32	1.48	1.40	1.37	1.08	1.44
Sulphate [%]	0.2	0.3	0.3	0.2	1.9	3.6	3.1
Silver [µg/g]	3.2	3.9	3.7	3.0	2.9	4.0	2.9
Aluminum [µg/g]	7700	11000	9000	6500	6200	10000	7500
Arsenic [µg/g]	45	49	46	40	38	40	38
Barium [µg/g]	640	660	630	570	560	580	470
Beryllium [µg/g]	1.6	2.1	1.9	1.4	1.4	2.0	1.5
Bismuth [µg/g]	15	16	15	15	14	17	14
Calcium [µg/g]	710	940	1300	1400	9900	19000	16000
Cadmium [µg/g]	0.61	0.66	0.58	0.64	0.56	0.64	0.55
Cerium [µg/g]	1100	1200	1000	900	830	1100	890
Cobalt [µg/g]	45	41	38	39	35	38	38
Chromium [µg/g]	17	24	21	16	15	21	16
Cesium [µg/g]	0.77	0.88	0.76	0.54	0.70	0.87	0.81
Copper [µg/g]	140	160	160	130	120	160	130
Iron [µg/g]	24000	25000	24000	23000	22000	24000	23000
Gallium [µg/g]	7.5	8.6	7.5	6.4	6.1	8.0	6.3
Germanium [µg/g]	4.2	4.4	4.1	3.5	3.3	4.0	3.5
Hafnium [µg/g]	2.2	2.4	2.2	1.5	1.8	2.5	2.2
Indium [µg/g]	0.04	0.05	0.06	0.04	0.03	0.05	0.04
Potassium [µg/g]	630	730	690	600	600	760	650
Lanthanum [µg/g]	560	600	520	460	420	540	450
Lithium [µg/g]	5.2	7.7	7.0	4.9	5.7	10	6.2

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Analysis	**18: CORE 09-QC14-3 (5-10)**	**19: CORE 09-QC14-3 (10-15)**	**20: CORE 09-QC14-3 (15-20)**	**21: CORE 09-QC14-4 (0-5)**	**22: CORE 09-QC14-4 (5-10)**	**23: CORE 09-QC14-4 (10-15)**	**24: CORE 09-QC14-4 (15-20)**
Lutetium [µg/g]	3.1	3.3	2.8	2.3	2.0	3.5	2.6
Magnesium [µg/g]	300	220	120	770	520	1300	400
Manganese [µg/g]	35	31	18	79	53	130	57
Molybdenum [µg/g]	5.8	8.1	8.9	9.0	9.4	8.0	6.6
Sodium [µg/g]	15	18	15	18	16	21	18
Niobuim [µg/g]	9.5	9.0	8.9	13	11	12	10
Nickel [µg/g]	38	39	34	31	28	37	31
Lead [µg/g]	690	720	680	630	550	800	640
Phosphorus [µg/g]	840	930	860	760	740	950	710
Rubidium [µg/g]	4.8	5.8	5.4	4.3	4.3	5.4	5.0
Antimony [µg/g]	< 1	1	1	1	1	1	< 1
Scandium [µg/g]	3.1	4.2	3.6	2.7	2.5	3.8	2.9
Selenium [µg/g]	< 2	< 2	< 2	< 2	< 2	< 2	< 2
Tin [µg/g]	< 6	< 6	< 6	< 6	< 6	< 6	< 6
Strontium [µg/g]	11	14	15	9.2	16	21	18
Sulphur [µg/g]	14000	14000	15000	14000	19000	22000	25000
Tantalum [µg/g]	0.27	0.27	0.28	0.48	0.57	0.55	0.48
Terbium [µg/g]	17	18	14	12	10	18	13
Tellerium [µg/g]	0.3	0.4	0.4	0.3	0.3	0.4	0.3
Thorium [µg/g]	1900	2400	2200	1600	1600	2400	1800
Titanium [µg/g]	660	680	640	590	550	740	570
Thallium [µg/g]	< 3	< 3	< 3	< 3	< 3	< 3	< 3
Uranium [µg/g]	100	110	110	100	100	140	110
Vanadium [µg/g]	7.7	9.3	8.3	7.4	6.4	9.8	6.7
Tungsten [µg/g]	8	9	8	8	8	8	8
Yttrium [µg/g]	370	350	290	240	220	360	260
Ytterbium [µg/g]	26	28	24	19	17	30	22
Zinc [µg/g]	58	59	51	46	42	59	46
Zirconium [µg/g]	64	68	64	56	54	70	58

Ra226 subcontracted to Becquerel Labs.
* BaSO4 Calculation based on Ba values and assumes all Ba is in BaSO4 form.
** BaSO4 Calculation based on SO4 values and assumes all SO4 is in BaSO4 form.

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CERTIFICATE OF ANALYSIS
Final Report (QC Report)

Analysis	25: MDL	26: QC - Blank	27: QC - STD % Recovery	28: QC - DUP % Recovery
Ba as BaSO4 Calc. * [µg/g]	---	---	---	---
SO4 as BaSO4 Calc. ** [µg/g]	---	---	---	---
Total Sulphur [%]	0.005	< 0.005	100%	98%
Carbonate (CO3) [%]	0.005	< 0.005	101%	100%
Total Organic Carbon [%]	0.01	---	---	---
Total Carbon [%]	0.005	< 0.005	100%	95%
Sulphide [%]	0.01	< 0.01	103%	100%
Sulphate [%]	0.1	< 0.1	98%	107%
Silver [µg/g]	0.7	< 0.7	98%	93%
Aluminum [µg/g]	1	< 1	99%	114%
Arsenic [µg/g]	1	< 1	98%	96%
Barium [µg/g]	0.05	< 0.05	100%	110%
Beryllium [µg/g]	0.1	< 0.1	100%	111%
Bismuth [µg/g]	0.5	< 0.5	98%	100%
Calcium [µg/g]	1	< 1	99%	103%
Cadmium [µg/g]	0.05	< 0.05	98%	100%
Cerium [µg/g]	0.006	< 0.006	107%	99%
Cobalt [µg/g]	0.3	< 0.3	96%	965
Chromium [µg/g]	0.5	< 0.5	99%	106%
Cesium [µg/g]	0.01	< 0.01	100%	99%
Copper [µg/g]	0.1	< 0.1	101%	110%
Iron [µg/g]	0.5	< 0.5	98%	91%
Gallium [µg/g]	0.03	< 0.03	100%	101%
Germanium [µg/g]	0.3	< 0.3	100%	95%
Hafnium [µg/g]	0.1	< 0.1	100%	120%
Indium [µg/g]	0.01	< 0.01	100%	109%
Potassium [µg/g]	1	< 1	100%	110%
Lanthanum [µg/g]	0.001	< 0.001	101%	99%
Lithium [µg/g]	0.1	< 0.1	99%	100%
Lutetium [µg/g]	0.001	< 0.001	96%	99%
Magnesium [µg/g]	1	< 1	100%	105%
Manganese [µg/g]	0.05	< 0.05	98%	108%
Molybdenum [µg/g]	0.5	< 0.5	101%	74%

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Project : 09-1663

LR Report : **CA10063-OCT09**

Analysis	25: MDL	26: QC - Blank	27: QC - STD % Recovery	28: QC - DUP % Recovery
Sodium [µg/g]	1	< 1	102%	104%
Niobuim [µg/g]	0.7	< 0.7	100%	99%
Nickel [µg/g]	1	< 1	99%	103%
Lead [µg/g]	0.7	< 0.7	98%	110%
Phosphorus [µg/g]	5	< 5	98%	106%
Rubidium [µg/g]	0.004	< 0.004	100%	100%
Antimony [µg/g]	1	< 1	102%	100%
Scandium [µg/g]	0.2	< 0.2	100%	103%
Selenium [µg/g]	1	< 2	97%	100%
Tin [µg/g]	6	< 6	103%	94%
Strontium [µg/g]	0.01	< 0.01	100%	96%
Sulphur [µg/g]	1	< 1	---	90%
Tantalum [µg/g]	0.01	< 0.01	100%	101%
Terbium [µg/g]	0.001	< 0.001	94%	100%
Tellerium [µg/g]	0.1	< 0.1	100%	107%
Thorium [µg/g]	0.01	< 0.01	100%	99%
Titanium [µg/g]	0.2	< 0.2	104%	99%
Thallium [µg/g]	3	< 3	97%	100%
Uranium [µg/g]	0.002	< 0.002	---	97%
Vanadium [µg/g]	0.1	< 0.1	100%	109%
Tungsten [µg/g]	1	< 1	99%	100%
Yttrium [µg/g]	0.1	< 0.1	100%	110%
Ytterbium [µg/g]	0.001	---	100%	100%
Zinc [µg/g]	0.1	< 0.1	98%	103%
Zirconium [µg/g]	5	< 5	102%	105%

Ra226 subcontracted to Becquerel Labs.
* BaSO4 Calculation based on Ba values and assumes all Ba is in BaSO4 form.
** BaSO4 Calculation based on SO4 values and assumes all SO4 is in BaSO4 form.

Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

OnLine LIMS

ANALYSIS REPORT

Becquerel Laboratories Inc.
6790 Kitimat Rd., Unit 4
Mississauga, Ontario
Canada, L5N 5L9

Phone: (905) 826-3080
FAX: (905) 826-4151

Batch: T09-01384.0

Date: 04-Nov-2009

Lakefield Research Ltd.

185 Concession St., Postal Bag 4300
Lakefield, ON, K0L 2H0

attn: Brian Graham

Phone: (705) 652-2038
FAX: (705) 652-1918

Client Ref.Oct 10066
P.O: 17820

23 water samples Received: 06-Oct-2009

Results of Analysis

Sample	Test	Result	Units	Date	Method
SW09-QC14-1T	Ra-226	0.77	Bq/l	27-Oct-2009	ALPHA
SW09-QC14-1B	Ra-226	1.0	Bq/l	27-Oct-2009	ALPHA
SW09-QC14-2T	Ra-226	0.82	Bq/l	27-Oct-2009	ALPHA
SW09-QC14-2B	Ra-226	0.91	Bq/l	27-Oct-2009	ALPHA
SW09-QC14-3T	Ra-226	0.71	Bq/l	27-Oct-2009	ALPHA
SW09-QC14-3B	Ra-226	0.95	Bq/l	31-Oct-2009	ALPHA
SW09-QC14-4T	Ra-226	0.79	Bq/l	31-Oct-2009	ALPHA
SW09-QC14-4B	Ra-226	0.95	Bq/l	31-Oct-2009	ALPHA
PW09-QC14-1 (0-5)	Ra-226	1.8	Bq/l	31-Oct-2009	ALPHA
PW09-QC14-1 (5-10)	Ra-226	1.4	Bq/l	01-Nov-2009	ALPHA
PW09-QC14-1 (10-15)	Ra-226	0.97	Bq/l	01-Nov-2009	ALPHA
PW09-QC14-2 (0-2.5)	Ra-226	3.6	Bq/l	01-Nov-2009	ALPHA
PW09-QC14-2 (2.5-5)	Ra-226	2.8	Bq/l	01-Nov-2009	ALPHA
PW09-QC14-2 (5-7.5)	Ra-226	5.9	Bq/l	01-Nov-2009	ALPHA
PW09-QC14-2 (7.5-10)	Ra-226	6.9	Bq/l	01-Nov-2009	ALPHA
PW09-QC14-3 (0-5)	Ra-226	4.1	Bq/l	01-Nov-2009	ALPHA
PW09-QC14-3 (5-10)	Ra-226	3.4	Bq/l	01-Nov-2009	ALPHA
PW09-QC14-3 (10-15)	Ra-226	2.6	Bq/l	01-Nov-2009	ALPHA
PW09-QC14-3 (15-20)	Ra-226	2.5	Bq/l	01-Nov-2009	ALPHA
PW09-QC14-4 (0-5)	Ra-226	4.8	Bq/l	01-Nov-2009	ALPHA
PW09-QC14-4 (5-10)	Ra-226	1.6	Bq/l	01-Nov-2009	ALPHA
PW09-QC14-4 (10-15)	Ra-226	2.2	Bq/l	01-Nov-2009	ALPHA
PW09-QC14-4 (15-20)	Ra-226	0.42	Bq/l	01-Nov-2009	ALPHA

ANALYSIS REPORT

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Mississauga, Ontario
Canada, L5N 5L9

Phone: (905) 826-3080
FAX: (905) 826-4151

Batch: T09-01384.0

Date: 04-Nov-2009

Methods:	ALPHA	BQ-RAD-ALPHA	alpha-particle spectrometry	MDL 0.01 Bq/l
Units:	Bq/l	Becquerels per litre		

These results relate only to the samples analysed and only to the items tested.
These results have not been corrected for blanks

04-Nov-2009 approved by: ______________
Donald D. Burgess PhD
Senior Scientist, Division Supervisor

SGS Lakefield Research Limited
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
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Ecometrix
Attn : Erin Clyde

6800 Campobello Road, Mississauga
Canada, L5N 2L8
Phone: 905-794-2325, Fax:905-794-2338

October 14, 2009

Date Rec. : 01 October 2009
LR Report : **CA10066-OCT09**
Project : 09-1663

CERTIFICATE OF ANALYSIS
Final Report

Analysis	**1: Analysis Start Date**	**2: Analysis Start Time**	**3: Analysis Approval Date**	**4: Analysis Approval Time**	**13: PW09-QC14-1 (0-5)**	**14: PW09-QC14-1 (5-10)**	**15: PW09-QC14-1 (10-15)**	**16: PW09-QC14-2 (0-2.5)**	**17: PW09-QC14-2 (2.5-5)**
Sample Date & Time					27-Sep-09	27-Sep-09	29-Sep-09	28-Sep-09	28-Sep-09
Sulphate [mg/L]	02-Oct-09	19:39	06-Oct-09	14:20	---	---	1500	32	12
Tot. Suspended Solids [mg/L]	05-Oct-09	10:24	06-Oct-09	12:15	---	---	---	---	---
Dissolved Organic Carbon [mg/L]	02-Oct-09	10:00	06-Oct-09	13:53	---	---	4.7	28.0	18.3
Dissolved Inorganic Carbon [mg/L]	05-Oct-09	14:35	07-Oct-09	12:41	---	---	1.0	< 1.0	< 1.0
Total Organic Carbon [mg/L]	02-Oct-09	10:00	05-Oct-09	13:40	---	---	---	---	---
Acidity [mg/L as CaCO3]	02-Oct-09	15:00	08-Oct-09	09:53	---	---	49	21	15
Hardness [mg/L as CaCO3]	05-Oct-09	09:00	05-Oct-09	13:21	731	1294	1335	26.2	16.9
Aluminum [mg/L]	05-Oct-09	09:00	05-Oct-09	13:18	< 0.01	< 0.01	< 0.01	< 0.01	0.03
Arsenic [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.0082	0.0102	0.0064	0.0064	0.0084
Barium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.0577	0.0283	0.0212	0.309	0.308
Beryllium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Boron [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.0048	0.0107	0.0138	0.0054	0.0047
Bismuth [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	< 0.00001	< 0.00001	0.00008	0.00003	0.00024
Calcium [mg/L]	05-Oct-09	09:00	05-Oct-09	13:21	290	516	532	8.79	5.68
Cadmium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.000012	0.000050	0.000118	0.000055	< 0.000003
Cobalt [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.0154	0.0367	0.0438	0.00521	0.000917
Chromium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Copper [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	< 0.0005	0.0008	0.0012	0.0043	0.0025
Iron [mg/L]	05-Oct-09	09:00	05-Oct-09	13:18	63.9	40.0	24.3	0.03	0.52
Potassium [mg/L]	05-Oct-09	09:00	05-Oct-09	13:18	1.21	1.34	1.49	0.34	0.40
Lithium [mg/L]	05-Oct-09	09:00	05-Oct-09	13:18	0.002	0.002	< 0.002	< 0.002	< 0.002
Magnesium [mg/L]	05-Oct-09	09:00	05-Oct-09	13:18	1.63	1.48	1.37	1.02	0.664

OnLine LIMS

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LR Report : **CA10066-OCT09**

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	13: PW09-QC14-1 (0-5)	14: PW09-QC14-1 (5-10)	15: PW09-QC14-1 (10-15)	16: PW09-QC14-2 (0-2.5)	17: PW09-QC14-2 (2.5-5)
Manganese [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.771	0.503	0.346	0.282	0.133
Molybdenum [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.00589	0.0119	0.00918	0.00029	0.00133
Sodium [mg/L]	05-Oct-09	09:00	05-Oct-09	13:18	1.77	2.04	2.08	2.35	1.98
Nickel [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.0050	0.0172	0.0173	0.0044	0.0012
Phosphorus [mg/L]	05-Oct-09	09:00	05-Oct-09	13:18	< 0.01	< 0.01	< 0.01	< 0.01	0.01
Lead [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.00069	0.00078	0.00202	0.0242	0.00596
Sulphur [mg/L]	05-Oct-09	09:00	05-Oct-09	13:18	242	396	399	8.28	3.87
Antimony [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	< 0.0002	< 0.0002	< 0.0002	0.0002	0.0006
Selenium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Silica [mg/L]	05-Oct-09	09:00	05-Oct-09	13:18	8.09	10.3	10.3	1.23	1.71
Tin [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	< 0.00001	0.00004	0.00008	0.00004	< 0.00001
Strontium [mg/L]	05-Oct-09	09:00	05-Oct-09	13:18	0.149	0.260	0.266	0.0205	0.0154
Titanium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.0006	0.0007	0.0007	0.0003	0.0062
Thallium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Uranium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.0136	0.0589	0.0445	0.000946	0.000524
Vanadium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.00010	0.00011	0.00013	0.00007	0.00013
Zinc [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.011	0.039	0.041	0.005	0.003

Groundwater samples are field filtered
Ra226 subcontracted to Becquerel Labs.

Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

OnLine LIMS

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October 14, 2009

Date Rec. : 01 October 2009
LR Report : **CA10066-OCT09**
Project : 09-1663

CERTIFICATE OF ANALYSIS
Final Report

Analysis	18: PW09-QC14-2 (5-7.5)	19: PW09-QC14-2 (7.5-10)	20: PW09-QC14-3 (0-5)	21: PW09-QC14-3 (5-10)	22: PW09-QC14-3 (10-15)	23: PW09-QC14-3 (15-20)	24: PW09-QC14-4 (0-5)	25: PW09-QC14-4 (5-10)	26: PW09-QC14-4 (10-15)	27: PW09-QC14-4 (15-20)
Sample Date & Time	28-Sep-09	28-Sep-09	29-Sep-09	29-Sep-09	29-Sep-09	29-Sep-09	29-Sep-09	29-Sep-09	29-Sep-09	29-Sep-09
Sulphate [mg/L]	12	---	5.6	6.8	18	240	560	1400	1400	1400
Tot. Suspended Solids [mg/L]	---	---	---	---	---	---	---	---	---	---
Dissolved Organic Carbon [mg/L]	17.9	---	3.5	3.2	2.8	3.8	9.3	6.6	7.3	4.0
Dissolved Inorganic Carbon [mg/L]	< 1.0	---	2.0	3.0	4.7	3.1	< 1.0	4.7	3.1	5.9
Total Organic Carbon [mg/L]	---	---	---	---	---	---	---	---	---	---
Acidity [mg/L as CaCO3]	16	---	6	< 4	< 4	< 4	19	< 4	---	---
Hardness [mg/L as CaCO3]	17.9	19.1	18.0	24.5	42.8	250	512	1362	1335	1310
Aluminum [mg/L]	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.04	< 0.01
Arsenic [mg/L]	0.0066	0.0066	0.0026	0.0025	0.0040	0.0042	0.0050	0.0054	0.0026	0.0027
Barium [mg/L]	0.519	0.499	0.333	0.233	0.131	0.0762	0.231	0.0657	0.0328	0.0197
Beryllium [mg/L]	< 0.00002	< 0.00002	0.00013	0.00005	0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Boron [mg/L]	0.0051	0.0044	0.0026	0.0070	0.0121	0.0162	0.0220	0.0944	0.0802	0.0387
Bismuth [mg/L]	0.00006	< 0.00001	0.00012	0.00004	0.00001	0.00001	0.00005	0.00002	0.00001	0.00003
Calcium [mg/L]	6.06	6.44	6.12	8.51	15.5	97.4	195	536	527	519
Cadmium [mg/L]	0.000005	0.000006	0.000112	0.000043	0.000034	0.000086	0.000029	0.000016	0.000017	0.000015
Cobalt [mg/L]	0.000766	0.000876	0.00189	0.00766	0.00912	0.0123	0.00473	0.00237	0.00186	0.00185
Chromium [mg/L]	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Copper [mg/L]	0.0015	0.0007	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0009	0.0007	0.0006	0.0008
Iron [mg/L]	2.46	6.07	7.18	6.88	5.66	7.35	23.5	1.62	0.41	0.26
Potassium [mg/L]	0.62	0.53	0.37	0.50	0.60	0.90	0.65	1.06	0.94	0.92
Lithium [mg/L]	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	0.002	0.002	< 0.002	< 0.002
Magnesium [mg/L]	0.675	0.734	0.670	0.801	0.980	1.78	6.05	5.49	4.43	3.52

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LR Report : **CA10066-OCT09**

Analysis	18: PW09-QC14-2 (5-7.5)	19: PW09-QC14-2 (7.5-10)	20: PW09-QC14-3 (0-5)	21: PW09-QC14-3 (5-10)	22: PW09-QC14-3 (10-15)	23: PW09-QC14-3 (15-20)	24: PW09-QC14-4 (0-5)	25: PW09-QC14-4 (5-10)	26: PW09-QC14-4 (10-15)	27: PW09-QC14-4 (15-20)
Manganese [mg/L]	0.133	0.146	0.143	0.161	0.191	0.249	1.27	0.400	0.352	0.251
Molybdenum [mg/L]	0.00107	0.00241	0.00045	0.00042	0.00155	0.00615	0.00339	0.0289	0.0291	0.0149
Sodium [mg/L]	1.79	1.51	1.30	1.20	1.36	1.63	2.05	2.00	1.94	1.80
Nickel [mg/L]	0.0012	0.0011	0.0010	0.0019	0.0020	0.0039	0.0025	0.0020	0.0018	0.0019
Phosphorus [mg/L]	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.02	< 0.01	0.02	< 0.01
Lead [mg/L]	0.00098	0.00018	0.00029	0.00023	0.00027	0.00042	0.00043	0.00047	0.00044	0.00059
Sulphur [mg/L]	3.61	4.46	1.67	2.21	5.91	69.9	155	391	387	385
Antimony [mg/L]	0.0004	0.0005	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	0.0003	0.0003	< 0.0002
Selenium [mg/L]	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.002	< 0.001	< 0.001	< 0.001	0.002
Silica [mg/L]	2.15	3.04	5.18	7.70	8.81	8.23	4.59	3.66	2.45	3.95
Tin [mg/L]	< 0.00001	< 0.00001	< 0.00001	< 0.00001	0.00005	0.00011	0.00004	0.00006	0.00010	0.00022
Strontium [mg/L]	0.0204	0.0211	0.0170	0.0318	0.0499	0.146	0.137	0.277	0.263	0.268
Titanium [mg/L]	0.0005	0.0002	0.0003	0.0005	0.0005	0.0005	0.0004	0.0004	0.0003	0.0003
Thallium [mg/L]	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Uranium [mg/L]	0.000143	0.000072	0.000744	0.000806	0.000839	0.00957	0.0421	0.275	0.242	0.233
Vanadium [mg/L]	0.00006	0.00006	0.00019	0.00012	0.00014	0.00016	0.00013	0.00022	0.00021	0.00023
Zinc [mg/L]	0.002	0.003	0.002	0.005	0.008	0.015	0.006	0.003	0.003	0.003

Groundwater samples are field filtered
Ra226 subcontracted to Becquerel Labs.

Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

OnLine LIMS

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October 14, 2009

Date Rec. : 01 October 2009
LR Report : **CA10066-OCT09**
Project : 09-1663

CERTIFICATE OF ANALYSIS
Final Report

Analysis	5: SW09-QC14-1T	6: SW09-QC14-1B	7: SW09-QC14-2T	8: SW09-QC14-2B	9: SW09-QC14-3T	10: SW09-QC14-3B	11: SW09-QC14-4T	12: SW09-QC14-4B
Sample Date & Time	26-Sep-09	26-Sep-09	27-Sep-09	27-Sep-09	27-Sep-09	27-Sep-09	27-Sep-09	27-Sep-09
Sulphate [mg/L]	55	32	72	32	54	35	57	25
Tot. Suspended Solids [mg/L]	---	---	---	43	---	---	---	6
Dissolved Organic Carbon [mg/L]	13.3	18.5	14.4	19.4	15.1	16.0	13.4	14.2
Dissolved Inorganic Carbon [mg/L]	2.4	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Organic Carbon [mg/L]	---	---	---	5.3	---	---	---	5.2
Acidity [mg/L as CaCO3]	31	20	56	15	29	15	31	20
Hardness [mg/L as CaCO3]	17.1	18.3	16.9	16.6	16.7	16.9	16.8	16.9
Aluminum [mg/L]	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Arsenic [mg/L]	0.0006	0.0008	0.0006	0.0011	0.0007	0.0009	0.0006	0.0012
Barium [mg/L]	0.109	0.116	0.104	0.108	0.105	0.105	0.0989	0.109
Beryllium [mg/L]	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Boron [mg/L]	0.0044	0.0045	0.0045	0.0056	0.0045	0.0047	0.0043	0.0053
Bismuth [mg/L]	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Calcium [mg/L]	5.72	6.24	5.69	5.55	5.59	5.69	5.63	5.67
Cadmium [mg/L]	0.000023	0.000029	0.000023	0.000023	0.000021	0.000035	0.000017	0.000052
Cobalt [mg/L]	0.00304	0.00143	0.00549	0.00169	0.00246	0.00165	0.00297	0.00144
Chromium [mg/L]	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Copper [mg/L]	0.0051	0.0045	0.0038	0.0023	0.0040	0.0034	0.0030	0.0025
Iron [mg/L]	0.02	0.36	0.04	0.01	0.02	0.07	0.02	0.01
Potassium [mg/L]	0.32	0.30	0.32	0.26	0.31	0.29	0.30	0.27
Lithium [mg/L]	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Magnesium [mg/L]	0.679	0.667	0.663	0.657	0.660	0.658	0.664	0.667

OnLine LIMS

SGS Lakefield Research Limited
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Lakefield - Ontario - KOL 2HO
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LR Report : **CA10066-OCT09**

Analysis	**5: SW09-QC14-1T**	**6: SW09-QC14-1B**	**7: SW09-QC14-2T**	**8: SW09-QC14-2B**	**9: SW09-QC14-3T**	**10: SW09-QC14-3B**	**11: SW09-QC14-4T**	**12: SW09-QC14-4B**
Manganese [mg/L]	0.0328	0.0379	0.0288	0.0353	0.0292	0.0337	0.0272	0.0348
Molybdenum [mg/L]	0.00001	0.00002	< 0.00001	0.00002	< 0.00001	< 0.00001	< 0.00001	0.00003
Sodium [mg/L]	1.84	1.87	1.82	1.83	1.81	1.78	1.88	1.73
Nickel [mg/L]	0.0027	0.0025	0.0025	0.0024	0.0024	0.0024	0.0023	0.0026
Phosphorus [mg/L]	0.01	< 0.01	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Lead [mg/L]	0.00375	0.00604	0.00717	0.00597	0.00374	0.00642	0.00386	0.00361
Sulphur [mg/L]	4.72	5.21	4.69	4.74	4.64	4.78	4.74	4.76
Antimony [mg/L]	0.0034	0.0007	0.0077	0.0007	0.0021	0.0009	0.0027	0.0005
Selenium [mg/L]	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Silica [mg/L]	0.59	0.63	0.58	0.59	0.58	0.64	0.58	0.63
Tin [mg/L]	0.00002	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Strontium [mg/L]	0.0122	0.0125	0.0121	0.0120	0.0119	0.0122	0.0120	0.0122
Titanium [mg/L]	< 0.0001	< 0.0001	0.0003	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Thallium [mg/L]	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Uranium [mg/L]	0.00107	0.000679	0.000535	0.000338	0.000489	0.000749	0.000386	0.000459
Vanadium [mg/L]	0.00004	0.00004	0.00006	0.00005	0.00005	0.00004	0.00004	0.00004
Zinc [mg/L]	0.003	0.004	0.002	0.005	0.002	0.004	0.003	0.005

Ra226 subcontracted to Becquerel Labs.

Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

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OnLine LIMS

SGS

SGS Canada Inc.
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Phone: 705-652-2000 FAX: 705-652-6365

Env ICP-MS Metals

Project : 09-1663

October 7, 2010

Ecometrix
Attn : Erin Clyde

6800 Campobello Road, Mississauga
Canada, L5N 2L8
Phone: 905-794-2325, Fax:905-794-2338

Date Rec. : 01 October 2009
LR Report: **CA10066-OCT09**

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CERTIFICATE OF ANALYSIS
Final Report (QC Report)

Analysis	28: MDL	29: QC - Blank	30: QC - STD % Recovery	31: QC - DUP % Recovery
Sulphate [mg/L]	0.2	< 0.2	100%	110%
Tot. Suspended Solids [mg/L]	2	< 2	96%	83%
Dissolved Organic Carbon [mg/L]	0.2	< 0.2	105%	98%
Dissolved Inorganic Carbon [mg/L]	0.2	0.7	107%	100%
Total Organic Carbon [mg/L]	0.2	< 0.2	105%	98%
Acidity [mg/L as CaCO3]	4	< 4	98%	102%
Hardness [mg/L as CaCO3]	0.5	---	---	---
Aluminum [mg/L]	0.01	< 0.01	98%	---
Arsenic [mg/L]	0.0002	< 0.0002	106%	---
Barium [mg/L]	0.00001	< 0.00001	122%	---
Beryllium [mg/L]	0.00002	< 0.00002	104%	---
Boron [mg/L]	0.0002	< 0.0002	96%	---
Bismuth [mg/L]	0.00001	< 0.00001	109%	---
Calcium [mg/L]	0.03	< 0.03	101%	---
Cadmium [mg/L]	0.000003	0.000003	99%	---
Cobalt [mg/L]	0.000002	< 0.000002	102%	---
Chromium [mg/L]	0.0005	< 0.0005	102%	---
Copper [mg/L]	0.0005	< 0.0005	102%	---
Iron [mg/L]	0.01	< 0.01	102%	---
Potassium [mg/L]	0.01	< 0.01	98%	---
Lithium [mg/L]	0.002	< 0.002	98%	---
Magnesium [mg/L]	0.003	< 0.003	98%	---
Manganese [mg/L]	0.00001	< 0.00001	107%	---
Molybdenum [mg/L]	0.00001	< 0.00001	99%	---
Sodium [mg/L]	0.01	< 0.01	94%	---
Nickel [mg/L]	0.0001	< 0.0001	100%	---
Phosphorus [mg/L]	0.01	< 0.01	100%	---
Lead [mg/L]	0.00002	< 0.00002	106%	---

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Env ICP-MS Metals

Project : 09-1663

LR Report : **CA10066-OCT09**

Analysis	28: MDL	29: QC - Blank	30: QC - STD % Recovery	31: QC - DUP % Recovery
Sulphur [mg/L]	0.01	< 0.01	98%	---
Antimony [mg/L]	0.0002	< 0.0002	101%	---
Selenium [mg/L]	0.001	< 0.001	102%	---
Silica [mg/L]	0.01	< 0.01	104%	---
Tin [mg/L]	0.00001	< 0.00001	96%	---
Strontium [mg/L]	0.0001	< 0.0001	100%	---
Titanium [mg/L]	0.0001	< 0.0001	96%	---
Thallium [mg/L]	0.0002	< 0.0002	107%	---
Uranium [mg/L]	0.000001	0.000001	1065	---
Vanadium [mg/L]	0.00003	< 0.00003	107%	---
Zinc [mg/L]	0.001	< 0.001	104%	---

Ra226 subcontracted to Becquerel Labs.

Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

OnLine LIMS

ANALYSIS REPORT

Becquerel LABORATORIES

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Mississauga, Ontario
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FAX: (905) 826-4151

Batch: T09-01485.0

Date: 12-Nov-2009

Lakefield Research Ltd.

185 Concession St., Postal Bag 4300
Lakefield, ON, K0L 2H0

attn: Brian Graham

Phone: (705) 652-2038
FAX: (705) 652-1918

Client Ref.
Sep 10524.R09
P.O: 17820

9 rock samples   Sampled: 22-Sep-2009   Received: 21-Oct-2009   Page 1 of 1

Results of Analysis

Sample	Test	Result	Units	Date	Method
CORE 09-PSB-1 0-2.5	Ra-226	12	Bq/g	07-Nov-2009	ALPHA
CORE 09-PSB-1 2.5-5	Ra-226	4.9	Bq/g	07-Nov-2009	ALPHA
CORE 09-PSB-1 5-7.5	Ra-226	1.6	Bq/g	07-Nov-2009	ALPHA
CORE 09-PSB-1 7.5-10	Ra-226	2.8	Bq/g	07-Nov-2009	ALPHA
CORE 09-PSB-1 10-15	Ra-226	2.2	Bq/g	08-Nov-2009	ALPHA
CORE 09-PSB-2 0-5	Ra-226	16	Bq/g	08-Nov-2009	ALPHA
CORE 09-PSB-2 5-10	Ra-226	4.5	Bq/g	08-Nov-2009	ALPHA
CORE 09-PSB-2 10-15	Ra-226	5.6	Bq/g	08-Nov-2009	ALPHA
CORE 09-PSB-2 15-20	Ra-226	14	Bq/g	08-Nov-2009	ALPHA

Methods: ALPHA BQ-RAD-ALPHA alpha-particle spectrometry

Units: Bq/g Becquerels per gram

These results relate only to the samples analysed and only to the items tested.

12-Nov-2009 approved by: S. Seg
f. Donald D. Burgess PhD
Senior Scientist, Division Supervisor

NOV 24 2009

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Tuesday, October 27, 2009

Date Rec. : 30 September 2009
LR. Ref. : **CA10524-SEP09**
Project : 09-1663

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CERTIFICATE OF ANALYSIS

Final Report

Analysis	**3: Analysis Approval Date**	**4: Analysis Approval Time**	**5: CORE 09-PSB-1 0-2.5**	**6: CORE 09-PSB-1 2.5-5**	**7: CORE 09-PSB-1 5-7.5**	**8: CORE 09-PSB-1 7.5-10**
Sample Date & Time			22-Sep-09	22-Sep-09	22-Sep-09	22-Sep-09
BaSO4 Calc. using Ba* [µg/g]	---	---	2210	870	680	610
BaSO4 Calc. using SO4** [µg/g]	---	---	14600	238000	330000	381000
Total Sulphur [%]	06-Oct-09	14:44	0.698	3.33	4.55	5.14
Carbonate (CO3) [%]	06-Oct-09	14:42	9.43	11.7	6.45	10.7
Total Organic Carbon [%]	06-Oct-09	14:42	2.25	0.940	0.380	0.260
Total Carbon [%]	06-Oct-09	14:45	4.14	3.27	1.67	2.41
Sulphide [%]	07-Oct-09	16:00	0.43	0.18	0.11	< 0.01
Sulphate [%]	23-Oct-09	10:29	0.6	9.8	14	16
Silver [µg/g]	14-Oct-09	14:09	< 0.7	< 0.7	< 0.7	< 0.7
Aluminum [µg/g]	14-Oct-09	14:09	15000	11000	13000	8400
Arsenic [µg/g]	14-Oct-09	14:09	37	24	27	18
Barium [µg/g]	14-Oct-09	14:09	1300	510	400	360
Beryllium [µg/g]	14-Oct-09	14:09	1.1	0.88	1.2	0.82
Bismuth [µg/g]	14-Oct-09	14:09	13	8.9	6.6	5.4
Calcium [µg/g]	14-Oct-09	14:09	67000	140000	140000	180000
Cadmium [µg/g]	14-Oct-09	14:09	3.8	2.5	2.5	2.0
Cerium [µg/g]	13-Oct-09	15:45	690	510	690	440
Cobalt [µg/g]	14-Oct-09	14:09	98	79	100	69
Chromium [µg/g]	14-Oct-09	14:09	16	13	15	10
Cesium [µg/g]	13-Oct-09	15:45	19	0.55	0.24	0.19
Copper [µg/g]	14-Oct-09	14:09	55	33	43	26
Iron [µg/g]	14-Oct-09	14:09	190000	140000	140000	110000
Gallium [µg/g]	13-Oct-09	15:45	7.3	4.5	4.3	2.8
Germanium [µg/g]	13-Oct-09	15:45	6.5	4.9	5.5	4.0
Hafnium [µg/g]	13-Oct-09	15:45	0.5	0.5	0.4	0.3
Indium [µg/g]	13-Oct-09	15:45	0.01	< 0.01	0.01	< 0.01
Potassium [µg/g]	14-Oct-09	14:09	310	220	130	150
Lanthanum [µg/g]	13-Oct-09	15:45	380	280	380	240
Lithium [µg/g]	14-Oct-09	14:09	9.9	7.3	3.6	4.5

OnLine LIMS

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LR Report : CA10524-SEP09

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: CORE 09-PSB-1 0-2.5	6: CORE 09-PSB-1 2.5-5	7: CORE 09-PSB-1 5-7.5	8: CORE 09-PSB-1 7.5-10
Lutetium [µg/g]	13-Oct-09	15:45	3.0	2.6	3.3	2.2
Magnesium [µg/g]	14-Oct-09	14:09	9900	13000	9900	9000
Manganese [µg/g]	14-Oct-09	14:09	1600	750	770	660
Molybdenum [µg/g]	14-Oct-09	14:09	34	11	1.5	0.6
Sodium [µg/g]	14-Oct-09	14:09	62	48	29	40
Niobuim [µg/g]	13-Oct-09	15:45	3.3	2.3	1.7	1.3
Nickel [µg/g]	14-Oct-09	14:09	90	63	64	44
Lead [µg/g]	14-Oct-09	14:09	280	150	96	78
Phosphorus [µg/g]	14-Oct-09	14:09	280	150	110	120
Rubidium [µg/g]	13-Oct-09	15:44	2.5	1.4	0.63	0.58
Antimony [µg/g]	14-Oct-09	14:08	< 1	< 1	< 1	< 1
Scandium [µg/g]	13-Oct-09	15:44	2.1	1.4	1.4	1.0
Selenium [µg/g]	14-Oct-09	14:08	< 1	< 1	< 1	< 1
Tin [µg/g]	14-Oct-09	14:08	< 6	< 6	< 6	< 6
Strontium [µg/g]	14-Oct-09	14:08	30	30	23	35
Tantalum [µg/g]	13-Oct-09	15:44	0.10	0.09	0.07	0.06
Terbium [µg/g]	13-Oct-09	15:44	12	9.8	12	8.2
Tellerium [µg/g]	13-Oct-09	15:44	0.2	0.1	0.1	< 0.1
Thorium [µg/g]	13-Oct-09	15:44	350	300	420	290
Titanium [µg/g]	14-Oct-09	14:08	230	150	100	73
Thallium [µg/g]	14-Oct-09	14:08	< 3	< 3	< 3	< 3
Uranium [µg/g]	13-Oct-09	15:44	370	160	110	75
Vanadium [µg/g]	14-Oct-09	14:08	15	9.2	8.0	5.8
Tungsten [µg/g]	14-Oct-09	14:05	5	2	< 1	< 1
Yttrium [µg/g]	14-Oct-09	14:05	270	220	280	200
Ytterbium [µg/g]	13-Oct-09	15:44	23	20	25	17
Zinc [µg/g]	14-Oct-09	14:05	210	130	110	87
Zirconium [µg/g]	15-Oct-09	10:44	14	10	8	6

Ra226 subcontracted to Becquerel Labs.
* BaSO4 Calculation based on Ba values and assumes all Ba is in BaSO4 form.
** BaSO4 Calculation based on SO4 values and assumes all SO4 is in BaSO4 form.

Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

OnLine LIMS

SGS

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Tuesday, October 27, 2009

Date Rec. : 30 September 2009
LR. Ref. : **CA10524-SEP09**
Project : 09-1663

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CERTIFICATE OF ANALYSIS

Final Report

Analysis	**9: CORE 09-PSB-1 10-15**	**10: CORE 09-PSB-2 0-5**	**11: CORE 09-PSB-2 5-10**	**12: CORE 09-PSB-2 10-15**	**13: CORE 09-PSB-2 15-20**
Sample Date & Time	22-Sep-09	23-Sep-09	23-Sep-09	23-Sep-09	23-Sep-09
BaSO4 Calc. using Ba* [µg/g]	540	580	270	310	320
BaSO4 Calc. using SO4** [µg/g]	418000	19400	14600	12100	14600
Total Sulphur [%]	5.96	1.31	1.57	2.00	2.23
Carbonate (CO3) [%]	9.65	0.170	0.097	0.052	0.071
Total Organic Carbon [%]	0.130	6.97	9.78	15.2	9.61
Total Carbon [%]	2.06	7.00	9.80	15.2	9.63
Sulphide [%]	< 0.01	0.18	0.36	0.88	1.82
Sulphate [%]	17	0.8	0.6	0.5	0.6
Silver [µg/g]	< 0.7	1.0	< 0.7	< 0.7	1.0
Aluminum [µg/g]	6800	8400	3600	3000	3300
Arsenic [µg/g]	15	30	14	12	19
Barium [µg/g]	320	340	160	180	190
Beryllium [µg/g]	0.66	0.75	0.34	0.37	0.66
Bismuth [µg/g]	4.5	13	11	14	21
Calcium [µg/g]	190000	9600	7600	9400	7600
Cadmium [µg/g]	1.6	5.7	4.5	0.86	0.96
Cerium [µg/g]	360	250	220	230	290
Cobalt [µg/g]	61	20	15	25	46
Chromium [µg/g]	8.6	15	6.5	13	17
Cesium [µg/g]	0.34	0.47	0.97	1.1	0.74
Copper [µg/g]	22	110	14	29	64
Iron [µg/g]	87000	290000	240000	45000	30000
Gallium [µg/g]	2.3	11	2.4	2.1	2.7
Germanium [µg/g]	3.5	8.1	7.2	2.1	1.9
Hafnium [µg/g]	0.3	0.2	0.1	0.1	0.3
Indium [µg/g]	< 0.01	0.02	< 0.01	< 0.01	0.01
Potassium [µg/g]	170	230	190	470	610
Lanthanum [µg/g]	200	130	110	110	140
Lithium [µg/g]	4.5	0.9	0.9	< 0.1	1.1

OnLine LIMS

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Analysis	**9: CORE 09-PSB-1 10-15**	**10: CORE 09-PSB-2 0-5**	**11: CORE 09-PSB-2 5-10**	**12: CORE 09-PSB-2 10-15**	**13: CORE 09-PSB-2 15-20**
Lutetium [µg/g]	1.8	1.2	0.98	0.79	0.81
Magnesium [µg/g]	9900	540	360	510	410
Manganese [µg/g]	610	430	89	75	51
Molybdenum [µg/g]	< 0.5	128	10	4.3	3.9
Sodium [µg/g]	47	28	35	80	74
Niobuim [µg/g]	1.0	2.7	2.8	7.8	12
Nickel [µg/g]	39	22	17	22	30
Lead [µg/g]	80	270	270	190	410
Phosphorus [µg/g]	75	590	740	480	510
Rubidium [µg/g]	0.61	2.1	2.1	4.3	4.8
Antimony [µg/g]	< 1	< 1	< 1	< 1	< 1
Scandium [µg/g]	0.8	2.2	1.3	2.3	2.2
Selenium [µg/g]	< 1	< 1	< 1	< 1	< 1
Tin [µg/g]	< 6	< 6	< 6	< 6	< 6
Strontium [µg/g]	27	9.0	7.6	12	10
Tantalum [µg/g]	0.05	0.09	0.05	0.08	0.09
Terbium [µg/g]	6.8	5.1	3.9	3.0	3.5
Tellerium [µg/g]	< 0.1	0.1	0.1	0.1	0.3
Thorium [µg/g]	220	560	110	250	550
Titanium [µg/g]	60	81	82	140	240
Thallium [µg/g]	< 3	< 3	< 3	< 3	< 3
Uranium [µg/g]	68	480	210	84	94
Vanadium [µg/g]	4.6	11	25	9.4	11
Tungsten [µg/g]	< 1	14	2	< 1	1
Yttrium [µg/g]	170	97	78	51	61
Ytterbium [µg/g]	14	9.3	7.4	6.3	6.7
Zinc [µg/g]	83	170	64	27	76
Zirconium [µg/g]	5	8	6	8	18

Ra226 subcontracted to Becquerel Labs.
* BaSO4 Calculation based on Ba values and assumes all Ba is in BaSO4 form.
** BaSO4 Calculation based on SO4 values and assumes all SO4 is in BaSO4 form.

Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

OnLine LIMS

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Project : 09-1663

October 7, 2010

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Date Rec. : 30 September 2009
LR Report: **CA10524-SEP09**

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CERTIFICATE OF ANALYSIS
Final Report (QC Report)

Analysis	14: MDL	15: QC - Blank	16: QC - STD % Recovery	17: QC - DUP % Recovery
BaSO4 Calc. using Ba* [µg/g]	---	---	---	---
BaSO4 Calc. using SO4** [µg/g]	---	---	---	---
Total Sulphur [%]	0.005	< 0.005	102%	100%
Carbonate (CO3) [%]	0.005	< 0.005	100%	140%
Total Organic Carbon [%]	0.01	< 0.01	---	100%
Total Carbon [%]	0.005	< 0.005	100%	100%
Sulphide [%]	0.01	< 0.01	90%	106%
Sulphate [%]	0.1	< 0.1	100%	107%
Silver [µg/g]	0.7	< 0.7	93%	100%
Aluminum [µg/g]	1	< 1	97%	100%
Arsenic [µg/g]	1	< 1	99%	94%
Barium [µg/g]	0.05	< 0.05	96%	100%
Beryllium [µg/g]	0.1	< 0.1	98%	102%
Bismuth [µg/g]	0.5	< 0.5	98%	104%
Calcium [µg/g]	1	< 1	98%	100%
Cadmium [µg/g]	0.05	< 0.05	97%	99%
Cerium [µg/g]	0.006	< 0.006	94%	110%
Cobalt [µg/g]	0.3	< 0.3	97%	100%
Chromium [µg/g]	0.5	< 0.5	98%	103%
Cesium [µg/g]	0.01	< 0.01	100%	107%
Copper [µg/g]	0.1	< 0.1	98%	100%
Iron [µg/g]	0.5	< 0.5	98%	100%
Gallium [µg/g]	0.03	< 0.03	100%	99%
Germanium [µg/g]	0.3	< 0.3	103%	105%
Hafnium [µg/g]	0.1	< 0.1	96%	150%
Indium [µg/g]	0.01	< 0.01	---	100%
Potassium [µg/g]	1	< 1	100%	100%
Lanthanum [µg/g]	0.001	0.001	94%	110%
Lithium [µg/g]	0.1	< 0.1	97%	107%
Lutetium [µg/g]	0.001	0.001	95%	102%

OnLine LIMS

SGS

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : 09-1663

LR Report : **CA10524-SEP09**

Analysis	14: MDL	15: QC - Blank	16: QC - STD % Recovery	17: QC - DUP % Recovery
Magnesium [µg/g]	1	< 1	96%	---
Manganese [µg/g]	0.05	< 0.05	98%	100%
Molybdenum [µg/g]	0.5	< 0.5	100%	154%
Sodium [µg/g]	1	< 1	97%	104%
Niobuim [µg/g]	0.7	< 0.7	99%	118%
Nickel [µg/g]	1	< 1	97%	101%
Lead [µg/g]	0.7	< 0.7	98%	100%
Phosphorus [µg/g]	5	< 5	98%	100%
Rubidium [µg/g]	0.004	< 0.004	---	105
Antimony [µg/g]	1	< 1	98	100%
Scandium [µg/g]	0.2	< 0.2	100%	99%
Selenium [µg/g]	1	< 1	99%	100%
Tin [µg/g]	6	< 6	100%	123%
Strontium [µg/g]	0.01	< 0.01	97%	103%
Tantalum [µg/g]	0.01	< 0.01	97%	108%
Terbium [µg/g]	0.01	< 0.001	96%	93%
Tellerium [µg/g]	0.1	< 0.1	99%	101%
Thorium [µg/g]	0.01	< 0.01	114%	100%
Titanium [µg/g]	0.2	< 0.2	98%	100%
Thallium [µg/g]	3	< 3	99%	76%
Uranium [µg/g]	3	< 3	---	100%
Vanadium [µg/g]	0.1	< 0.1	99%	102%
Tungsten [µg/g]	1	< 1	97%	93%
Yttrium [µg/g]	0.1	< 0.1	96%	100%
Ytterbium [µg/g]	0.1	< 0.1	98%	105%
Zinc [µg/g]	0.1	< 0.1	97%	100%
Zirconium [µg/g]	5	< 5	100%	107%

Ra226 subcontracted to Becquerel Labs.
* BaSO4 Calculation based on Ba values and assumes all Ba is in BaSO4 form.
** BaSO4 Calculation based on SO4 values and assumes all SO4 is in BaSO4 form.

Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

OnLine LIMS

ANALYSIS REPORT

Becquerel Laboratories Inc.
6790 Kitimat Rd., Unit 4
Mississauga, Ontario
Canada, L5N 5L9

Phone: (905) 826-3080
FAX: (905) 826-4151

Batch: T09-01387.0

Date: 09-Nov-2009

Lakefield Research Ltd.

185 Concession St., Postal Bag 4300
Lakefield, ON, K0L 2H0

attn: Brian Graham

Phone: (705) 652-2038
FAX: (705) 652-1918

Client Ref.Sep 10523
P.O: 17820

9 water samples

Received: 06-Oct-2009

Results of Analysis

Sample	Test		Result	Units	Date	Method
PW09-PSB-1 0-2.5	Ra-226		0.76	Bq/l	06-Nov-2009	ALPHA
PW09-PSB-1 2.5-5	Ra-226		0.12	Bq/l	06-Nov-2009	ALPHA
PW09-PSB-1 5-7.5	Ra-226		0.02	Bq/l	06-Nov-2009	ALPHA
PW09-PSB-1 7.5-10	Ra-226	<	0.01	Bq/l	06-Nov-2009	ALPHA
PW09-PSB-1 10-15	Ra-226	<	0.01	Bq/l	06-Nov-2009	ALPHA
PW09-PSB-2 0-5	Ra-226		3.2	Bq/l	06-Nov-2009	ALPHA
PW09-PSB-2 5-10	Ra-226		1.8	Bq/l	06-Nov-2009	ALPHA
PW09-PSB-2 10-15	Ra-226		1.1	Bq/l	06-Nov-2009	ALPHA
PW09-PSB-2 15-20	Ra-226		1.4	Bq/l	06-Nov-2009	ALPHA

Methods: ALPHA BQ-RAD-ALPHA alpha-particle spectrometry

Units: Bq/l Becquerels per litre

These results relate only to the samples analysed and only to the items tested.

09-Nov-2009 approved by: Donald D. Burgess

Donald D. Burgess PhD
Senior Scientist, Division Supervisor

SGS Lakefield Research Limited
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Ecometrix
Attn : Erin Clyde

6800 Campobello Road, Mississauga
Canada, L5N 2L8
Phone: 905-794-2325, Fax:905-794-2338

October 14, 2009

Date Rec. : 30 September 2009
LR Report : **CA10523-SEP09**
Project : 09-1663

CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	5: PW09-PSB-1 0-2.5	6: PW09-PSB-1 2.5-5	7: PW09-PSB-1 5-7.5
Sample Date & Time					22-Sep-09	22-Sep-09	22-Sep-09
Temperature Upon Receipt [°C]	---	---	---	---	4.0	4.0	4.0
Sulphate [mg/L]	02-Oct-09	15:00	06-Oct-09	14:01	410	1100	1300
Dissolved Organic Carbon [mg/L]	02-Oct-09	10:00	06-Oct-09	13:52	10.7	9.9	12.2
Dissolved Inorganic Carbon [mg/L]	05-Oct-09	14:35	08-Oct-09	12:46	1.7	< 1.0	< 1.0
Alkalinity [mg/L as CaCO3]	02-Oct-09	15:19	05-Oct-09	15:11	24	24	33
Acidity [mg/L as CaCO3]	02-Oct-09	15:19	05-Oct-09	15:11	---	---	---
Hardness [mg/L as CaCO3]	02-Oct-09	09:00	08-Oct-09	16:00	504	934	1270
Aluminum [mg/L]	02-Oct-09	09:00	02-Oct-09	12:08	0.03	0.12	0.04
Arsenic [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	0.0018	0.0047	0.0059
Barium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	0.0167	0.00872	0.00558
Beryllium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	< 0.00002	< 0.00002	< 0.00002
Boron [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	0.0287	0.0284	0.0078
Bismuth [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	< 0.00001	0.00001	< 0.00001
Calcium [mg/L]	02-Oct-09	09:00	08-Oct-09	16:00	193	373	506
Cadmium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.000014	0.000017	0.000007
Cobalt [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.000458	0.000560	0.000695
Chromium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	< 0.0005	0.0006	0.0009
Copper [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.0014	0.0012	0.0014
Iron [mg/L]	02-Oct-09	09:00	02-Oct-09	12:09	< 0.01	< 0.01	0.01
Potassium [mg/L]	02-Oct-09	09:00	02-Oct-09	12:09	10.3	17.3	23.3
Lithium [mg/L]	02-Oct-09	09:00	02-Oct-09	12:09	< 0.002	< 0.002	0.003
Magnesium [mg/L]	02-Oct-09	09:00	02-Oct-09	12:09	5.17	0.966	0.296

OnLine LIMS

SGS Lakefield Research Limited
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Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

LR Report : **CA10523-SEP09**

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	5: PW09-PSB-1 0-2.5	6: PW09-PSB-1 2.5-5	7: PW09-PSB-1 5-7.5
Manganese [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.0679	0.00194	0.00031
Molybdenum [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.00679	0.0118	0.00655
Sodium [mg/L]	02-Oct-09	09:00	02-Oct-09	12:09	6.60	10.0	13.0
Nickel [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.0043	0.0093	0.0126
Phosphorus [mg/L]	02-Oct-09	09:00	02-Oct-09	12:09	< 0.01	< 0.01	< 0.01
Lead [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.00025	0.00017	0.00008
Sulphur [mg/L]	02-Oct-09	09:00	02-Oct-09	12:09	179	331	449
Antimony [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	< 0.0002	< 0.0002	< 0.0002
Selenium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	< 0.001	< 0.001	< 0.001
Silica [mg/L]	02-Oct-09	09:00	02-Oct-09	12:09	0.44	0.22	0.13
Tin [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.00018	0.00026	0.00043
Strontium [mg/L]	02-Oct-09	09:00	02-Oct-09	12:09	0.115	0.156	0.170
Titanium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.0002	0.0002	0.0003
Thallium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	< 0.0002	< 0.0002	< 0.0002
Uranium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.0636	0.00363	0.000341
Vanadium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.00005	0.00006	0.00019
Zinc [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.002	< 0.001	< 0.001

Samples are field filtered
Ra226 subcontracted to Becquerel Labs.

Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

OnLine LIMS

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SGS Lakefield Research Limited
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Ecometrix
Attn : Erin Clyde

6800 Campobello Road, Mississauga
Canada, L5N 2L8
Phone: 905-794-2325, Fax:905-794-2338

October 14, 2009

Date Rec. : 30 September 2009
LR Report : **CA10523-SEP09**
Project : 09-1663

CERTIFICATE OF ANALYSIS
Final Report

Analysis	**8: PW09-PSB-1 7.5-10**	**9: PW09-PSB-1 10-15**	**10: PW09-PSB-2 0-5**	**11: PW09-PSB-2 5-10**	**12: PW09-PSB-2 10-15**	**13: PW09-PSB-2 15-20**
Sample Date & Time	22-Sep-09	22-Sep-09	23-Sep-09	23-Sep-09	23-Sep-09	23-Sep-09
Temperature Upon Receipt [°C]	4.0	4.0	4.0	4.0	4.0	4.0
Sulphate [mg/L]	1600	1800	190	250	---	---
Dissolved Organic Carbon [mg/L]	14.6	12.0	5.5	21.8	---	---
Dissolved Inorganic Carbon [mg/L]	< 1.0	< 1.0	8.6	14.6	---	---
Alkalinity [mg/L as CaCO3]	45	36	---	---	---	---
Acidity [mg/L as CaCO3]	---	---	< 2	< 2	---	---
Hardness [mg/L as CaCO3]	1970	1810	217	312	415	875
Aluminum [mg/L]	0.01	0.04	< 0.01	< 0.01	< 0.01	0.01
Arsenic [mg/L]	0.0069	0.0059	0.0012	0.0015	0.0028	0.0064
Barium [mg/L]	0.00624	0.00582	0.0443	0.0344	0.0266	0.0380
Beryllium [mg/L]	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Boron [mg/L]	0.0023	0.0077	0.0232	0.0422	0.0889	0.118
Bismuth [mg/L]	0.00001	< 0.00001	< 0.00001	< 0.00001	0.00001	< 0.00001
Calcium [mg/L]	787	723	76.4	106	138	297
Cadmium [mg/L]	0.000006	0.000013	0.000011	< 0.000003	0.000012	0.000010
Cobalt [mg/L]	0.000763	0.000834	0.00271	0.000540	0.000530	0.00114
Chromium [mg/L]	< 0.0005	0.0011	< 0.0005	< 0.0005	0.0010	0.0009
Copper [mg/L]	0.0021	0.0022	0.0008	0.0012	0.0022	0.0023
Iron [mg/L]	< 0.01	0.02	8.19	12.1	6.95	16.1
Potassium [mg/L]	29.7	35.8	7.51	11.8	17.4	29.2
Lithium [mg/L]	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	0.007
Magnesium [mg/L]	0.213	0.713	6.39	11.8	17.0	32.7

OnLine LIMS

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Phone: 705-652-2000 FAX: 705-652-6365

LR Report : CA10523-SEP09

Analysis	8: PW09-PSB-1 7.5-10	9: PW09-PSB-1 10-15	10: PW09-PSB-2 0-5	11: PW09-PSB-2 5-10	12: PW09-PSB-2 10-15	13: PW09-PSB-2 15-20
Manganese [mg/L]	0.00012	0.00100	1.85	0.753	0.790	1.67
Molybdenum [mg/L]	0.00633	0.00445	0.00113	0.00071	0.00437	0.00563
Sodium [mg/L]	15.9	17.5	5.62	10.2	16.1	24.2
Nickel [mg/L]	0.0151	0.0132	0.0026	0.0028	0.0035	0.0046
Phosphorus [mg/L]	0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.01
Lead [mg/L]	0.00016	0.00018	0.00012	0.00022	0.00025	0.00023
Sulphur [mg/L]	503	560	63.7	87.8	123	311
Antimony [mg/L]	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	0.0004
Selenium [mg/L]	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Silica [mg/L]	0.22	0.43	4.34	7.44	11.3	12.0
Tin [mg/L]	0.00055	0.00046	0.00017	0.00031	0.00017	0.00009
Strontium [mg/L]	0.193	0.216	0.0915	0.131	0.177	0.347
Titanium [mg/L]	0.0002	0.0004	0.0003	0.0006	0.0012	0.0012
Thallium [mg/L]	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Uranium [mg/L]	0.000330	0.000201	0.00706	0.0241	0.0330	0.0214
Vanadium [mg/L]	0.00011	0.00029	< 0.00003	0.00008	0.00041	0.00060
Zinc [mg/L]	< 0.001	< 0.001	0.002	0.002	0.002	0.003

Samples are field filtered
Ra226 subcontracted to Becquerel Labs.

Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

OnLine LIMS

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SGS Canada Inc.
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Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : 09-1663

October 7, 2010

Ecometrix
Attn : Erin Clyde

6800 Campobello Road, Mississauga
Canada, L5N 2L8
Phone: 905-794-2325, Fax:905-794-2338

Date Rec. : 30 September 2009
LR Report: **CA10523-SEP09**

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report - (QC Report)

Analysis	14: MDL	15: QC - Blank	16: QC - STD % Recovery	17: QC - DUP % Recovery
Sulphate [mg/L]	0.2	< 0.2	98%	102%
Dissolved Organic Carbon [mg/L]	0.2	< 0.2	105%	98%
Dissolved Inorganic Carbon [mg/L]	0.2	0.2	97%	110%
Alkalinity [mg/L as CaCO3]	2	< 2	101%	98%
Acidity [mg/L as CaCO3]	2	3	98%	102%
Hardness [mg/L as CaCO3]	0.5	---	---	---
Aluminum [mg/L]	0.01	< 0.01	95%	100%
Arsenic [mg/L]	0.0002	< 0.0002	106%	111%
Barium [mg/L]	0.00001	< 0.00001	105%	100%
Beryllium [mg/L]	0.00002	< 0.00002	103%	94%
Boron [mg/L]	0.0002	< 0.0002	99%	97%
Bismuth [mg/L]	0.00001	0.00001	105%	82%
Calcium [mg/L]	0.03	---	98%	100%
Cadmium [mg/L]	0.000003	< 0.000003	102%	107%
Cobalt [mg/L]	0.000002	< 0.000002	105%	99%
Chromium [mg/L]	0.0005	< 0.0005	103%	170%
Copper [mg/L]	0.0005	< 0.0005	106%	85%
Iron [mg/L]	0.01	---	97%	122%
Potassium [mg/L]	0.01	< 0.01	98%	99%
Lithium [mg/L]	0.002	< 0.002	94%	120%
Magnesium [mg/L]	0.003	---	95%	100%
Manganese [mg/L]	0.00001	< 0.00001	104%	99%
Molybdenum [mg/L]	0.00001	< 0.00001	95%	155%
Sodium [mg/L]	0.01	---	94.8	99.3
Nickel [mg/L]	0.0001	< 0.0001	105%	87%
Phosphorus [mg/L]	0.01	< 0.01	95%	100%
Lead [mg/L]	0.00002	< 0.00002	102%	30%
Sulphur [mg/L]	0.01	---	100%	101%
Antimony [mg/L]	0.0002	< 0.0002	94%	124%
Selenium [mg/L]	0.001	< 0.001	108%	100%

OnLine LIMS

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : 09-1663
LR Report : **CA10523-SEP09**

Analysis	14: MDL	15: QC - Blank	16: QC - STD % Recovery	17: QC - DUP % Recovery
Silica [mg/L]	0.01	< 0.01	103%	101%
Tin [mg/L]	0.00001	< 0.00001	96%	140%
Strontium [mg/L]	0.0001	---	98%	100%
Titanium [mg/L]	0.0001	< 0.0001	95%	130%
Thallium [mg/L]	0.0002	< 0.0002	105%	106%
Uranium [mg/L]	0.000001	< 0.000001	102%	94%
Vanadium [mg/L]	0.00003	< 0.00003	106%	150%
Zinc [mg/L]	0.001	< 0.001	106%	90%

Samples are field filtered
Ra226 subcontracted to Becquerel Labs.
Revised to include Ra226 results from Becquerel.

Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

OnLine LIMS

ANALYSIS REPORT

Becquerel LABORATORIES

Becquerel Laboratories Inc.
6790 Kitimat Rd., Unit 4
Mississauga, Ontario
Canada, L5N 5L9

Phone: (905) 826-3080
FAX: (905) 826-4151

Batch: T09-01381.0

Date: 20-Oct-2009

Lakefield Research Ltd.

185 Concession St., Postal Bag 4300
Lakefield, ON, K0L 2H0

attn: Brian Graham

Phone: (705) 652-2038
FAX: (705) 652-1918

Client Ref.Sept 10522
P.O: 17820

4 water samples Sampled: 22-Sep-2009 Received: 06-Oct-2009 Page 1 of 1

Results of Analysis

Sample	Test	Result	Units	Date	Method
SW09-PSB-1T	Ra-226	0.34	Bq/l	17-Oct-2009	ALPHA
SW09-PSB-1B	Ra-226	0.65	Bq/l	17-Oct-2009	ALPHA
SW09-PSB-2T	Ra-226	0.31	Bq/l	17-Oct-2009	ALPHA
SW09-PSB-2B	Ra-226	0.39	Bq/l	17-Oct-2009	ALPHA

Methods: ALPHA BQ-RAD-ALPHA alpha-particle spectrometry

Units: Bq/l Becquerels per litre

These results relate only to the samples analysed and only to the items tested.

20-Oct-2009 approved by: Donald D. Burgess
Donald D. Burgess PhD
Senior Scientist, Division Supervisor

SGS

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Ecometrix
Attn : Erin Clyde

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Phone: 905-794-2325, Fax:905-794-2338

October 14, 2009

Date Rec. : 30 September 2009
LR Report : **CA10522-SEP09**
Project : 09-1663

CERTIFICATE OF ANALYSIS

Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	5: SW09-PSB-1T	6: SW09-PSB-1B	7: SW09-PSB-2T	8: SW09-PSB-2B
Sample Date & Time					22-Sep-09	22-Sep-09	23-Sep-09	23-Sep-09
Temperature Upon Receipt [°C]	---	---	---	---	4.0	4.0	4.0	4.0
Sulphate [mg/L]	02-Oct-09	15:00	06-Oct-09	14:19	180	410	180	180
Total Organic Carbon [mg/L]	02-Oct-09	10:00	05-Oct-09	13:41	2.1	4.6	2.2	4.0
Total Inorganic Carbon [mg/L]	05-Oct-09	14:35	08-Oct-09	12:45	3.5	< 1.0	2.9	< 1.0
Alkalinity [mg/L as CaCO3]	02-Oct-09	15:19	05-Oct-09	15:10	12	---	---	---
Acidity [mg/L as CaCO3]	02-Oct-09	15:19	05-Oct-09	15:10	---	20	< 2	15
Hardness [mg/L as CaCO3]	02-Oct-09	09:00	02-Oct-09	12:08	173	209	179	179
Aluminum [mg/L]	02-Oct-09	09:00	02-Oct-09	12:08	< 0.01	0.53	< 0.01	< 0.01
Arsenic [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	0.0005	0.0014	0.0004	0.0005
Barium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	0.0134	0.0196	0.0137	0.0160
Beryllium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	0.00007	0.00009	0.00002	< 0.00002
Boron [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	0.0249	0.0314	0.0252	0.0243
Bismuth [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	0.00007	0.00003	< 0.00001	0.00001
Calcium [mg/L]	02-Oct-09	09:00	02-Oct-09	12:08	62.2	74.4	64.5	64.1
Cadmium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	0.000079	0.000082	0.000005	0.000015
Cobalt [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	0.000281	0.0186	0.000319	0.00120
Chromium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Copper [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	0.0025	0.0019	0.0015	0.0009
Iron [mg/L]	02-Oct-09	09:00	02-Oct-09	12:08	0.03	1.61	< 0.01	0.02
Potassium [mg/L]	02-Oct-09	09:00	02-Oct-09	12:08	6.11	6.53	6.18	6.14
Lithium [mg/L]	02-Oct-09	09:00	02-Oct-09	12:08	< 0.002	< 0.002	< 0.002	< 0.002

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LR Report : **CA10522-SEP09**

Analysis	**1: Analysis Start Date**	**2: Analysis Start Time**	**3: Analysis Approval Date**	**4: Analysis Approval Time**	**5: SW09-PSB-1T**	**6: SW09-PSB-1B**	**7: SW09-PSB-2T**	**8: SW09-PSB-2B**
Magnesium [mg/L]	02-Oct-09	09:00	02-Oct-09	12:08	4.30	5.53	4.45	4.47
Manganese [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	0.00475	0.203	0.00313	0.0273
Molybdenum [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	0.00017	0.00043	0.00008	0.00025
Sodium [mg/L]	02-Oct-09	09:00	02-Oct-09	12:08	3.99	4.35	4.04	4.14
Nickel [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	0.0017	0.0101	0.0015	0.0025
Phosphorus [mg/L]	02-Oct-09	09:00	02-Oct-09	12:08	< 0.01	< 0.01	< 0.01	< 0.01
Lead [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	0.00057	0.00647	0.00013	0.00088
Sulphur [mg/L]	02-Oct-09	09:00	02-Oct-09	12:08	57.9	67.4	60.2	60.5
Antimony [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	< 0.0002	0.0084	0.0003	0.0015
Selenium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	< 0.001	< 0.001	< 0.001	< 0.001
Silica [mg/L]	02-Oct-09	09:00	02-Oct-09	12:08	0.99	1.14	1.01	1.12
Tin [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	0.00011	0.00035	0.00017	0.00020
Strontium [mg/L]	02-Oct-09	09:00	02-Oct-09	12:08	0.0715	0.0765	0.0736	0.0742
Titanium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	0.0003	0.0002	0.0002	0.0002
Thallium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Uranium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	0.00245	0.0557	0.00273	0.00317
Vanadium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	0.00008	0.00004	< 0.00003	0.00007
Zinc [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	0.009	0.024	< 0.001	0.002

Ra226 subcontracted to Becquerel Labs.

Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

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Env ICP-MS Metals

Project : 09-1663

October 7, 2010

Ecometrix
Attn : Erin Clyde

6800 Campobello Road, Mississauga
Canada, L5N 2L8
Phone: 905-794-2325, Fax:905-794-2338

Date Rec. : 30 September 2009
LR Report: **CA10522-SEP09**

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CERTIFICATE OF ANALYSIS
Final Report

Analysis	9: MDL	10: QC - Blank	11: QC - STD % Recovery	12: QC - DUP % Recovery
Sulphate [mg/L]	0.2	< 0.2	98%	102%
Total Organic Carbon [mg/L]	0.2	< 0.2	105%	98%
Total Inorganic Carbon [mg/L]	0.2	< 0.2	110%	100%
Alkalinity [mg/L as CaCO3]	2	< 2	101%	98%
Acidity [mg/L as CaCO3]	2	2	98%	102%
Hardness [mg/L as CaCO3]	0.5	---	---	---
Aluminum [mg/L]	0.01	< 0.01	95%	100%
Arsenic [mg/L]	0.0002	< 0.0002	106%	111%
Barium [mg/L]	0.00001	< 0.00001	105%	100%
Beryllium [mg/L]	0.00002	< 0.00002	103%	94%
Boron [mg/L]	0.0002	< 0.0002	99%	97%
Bismuth [mg/L]	0.00001	0.00001	105%	82%
Calcium [mg/L]	0.03	---	97%	100%
Cadmium [mg/L]	0.000003	< 0.000003	102%	107%
Cobalt [mg/L]	0.000002	< 0.000002	105%	99%
Chromium [mg/L]	0.00005	< 0.0005	103%	170%
Copper [mg/L]	0.0005	< 0.0005	106%	85%
Iron [mg/L]	0.01	---	96.8	122
Potassium [mg/L]	0.01	< 0.01	98%	99.1
Lithium [mg/L]	0.002	< 0.002	94.2	120
Magnesium [mg/L]	0.003	---	94.8	100
Manganese [mg/L]	0.00001	< 0.00001	104%	99%
Molybdenum [mg/L]	0.00001	< 0.00001	95%	155%
Sodium [mg/L]	0.01	---	94.8	99.3
Nickel [mg/L]	0.0001	< 0.0001	105%	87%
Phosphorus [mg/L]	0.01	< 0.01	95%	100%
Lead [mg/L]	0.00002	< 0.00002	102%	30%
Sulphur [mg/L]	0.01	---	100%	101

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Env ICP-MS Metals

Project : 09-1663

LR Report : **CA10522-SEP09**

Analysis	9: MDL	10: QC - Blank	11: QC - STD % Recovery	12: QC - DUP % Recovery
Antimony [mg/L]	0.0002	< 0.0002	94%	124%
Selenium [mg/L]	0.001	< 0.001	108%	100%
Silica [mg/L]	0.01	< 0.01	103%	101%
Tin [mg/L]	0.00001	< 0.00001	96%	140%
Strontium [mg/L]	0.0001	---	98%	99.7
Titanium [mg/L]	0.0001	< 0.0001	95%	130%
Thallium [mg/L]	0.0002	< 0.0002	105%	106%
Uranium [mg/L]	0.000001	< 0.000001	102%	94%
Vanadium [mg/L]	0.00003	< 0.00003	106%	150%
Zinc [mg/L]	0.001	< 0.001	106%	90%

Ra226 subcontracted to Becquerel Labs.

Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

OnLine LIMS

ANALYSIS REPORT

Becquerel Laboratories Inc.
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Phone: (905) 826-3080
FAX: (905) 826-4151

Batch: T09-01486.0

Date: 30-Nov-2009

Lakefield Research Ltd.

185 Concession St., Postal Bag 4300
Lakefield, ON, K0L 2H0

attn: Brian Graham

Phone: (705) 652-2038
FAX: (705) 652-1918

Client Ref.
Oct 10521.R09
P.O: 17820

14 solid samples   Sampled: 26-Sep-2009   Received: 21-Oct-2009   Page 1 of 1

Results of Analysis

Sample	Test	Result	Units	Date	Method
CORE 09-SR-1 (0-5)	Ra-226	0.16	Bq/g	23-Nov-2009	ALPHA
CORE 09-SR-1 (5-10)	Ra-226	0.08	Bq/g	23-Nov-2009	ALPHA
CORE 09-SR-1 (10-15)	Ra-226	0.02	Bq/g	23-Nov-2009	ALPHA
CORE 09-SR-1 (15-20)	Ra-226	0.04	Bq/g	29-Nov-2009	ALPHA
CORE 09-SR-2 (0-5)	Ra-226	14	Bq/g	29-Nov-2009	ALPHA
CORE 09-SR-2 (5-10)	Ra-226	4.6	Bq/g	29-Nov-2009	ALPHA
CORE 09-SR-2 (10-15)	Ra-226	0.06	Bq/g	29-Nov-2009	ALPHA
CORE 09-SR-3 (0-5)	Ra-226	8.2	Bq/g	29-Nov-2009	ALPHA
CORE 09-SR-3 (5-10)	Ra-226	9.7	Bq/g	29-Nov-2009	ALPHA
CORE 09-SR-3 (10-15)	Ra-226	16	Bq/g	29-Nov-2009	ALPHA
CORE 09-SR-3 (15-20)	Ra-226	20	Bq/g	29-Nov-2009	ALPHA
CORE 09-SR-4 (0-5)	Ra-226	2.6	Bq/g	29-Nov-2009	ALPHA
CORE 09-SR-4 (5-10)	Ra-226	2.7	Bq/g	29-Nov-2009	ALPHA
CORE 09-SR-4 (10-15)	Ra-226	2.1	Bq/g	29-Nov-2009	ALPHA

Methods: ALPHA BQ-RAD-ALPHA alpha-particle spectrometry

Units: Bq/g Becquerels per gram

These results relate only to the samples analysed and only to the items tested.

30-Nov-2009 approved by: Donald D. Burgess PhD
Senior Scientist, Division Supervisor

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Phone: 905-794-2325, Fax:905-794-2338

Tuesday, October 27, 2009

Date Rec. : 30 September 2009
LR. Ref. : **CA10521-SEP09**
Project : 09-1663

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CERTIFICATE OF ANALYSIS

Final Report

Analysis	**3: Analysis Approval Date**	**4: Analysis Approval Time**	**5: CORE 09-SR-1 (0-5)**	**6: CORE 09-SR-1 (5-10)**	**7: CORE 09-SR-1 (10-15)**	**8: CORE 09-SR-1 (15-20)**	**9: CORE 09-SR-2 (0-5)**	**10: CORE 09-SR-2 (5-10)**
Sample Date & Time			26-Sep-09	26-Sep-09	26-Sep-09	26-Sep-09	26-Sep-09	26-Sep-09
BaSO4 Calc. using Ba* [µg/g]	---	---	130	110	100	80	10900	4420
BaSO4 Calc. using SO4** [µg/g]	---	---	2430	<2430	2430	2430	12100	4860
Total Sulphur [%]	06-Oct-09	14:45	0.130	0.130	0.184	0.224	0.235	0.114
Carbonate (CO3) [%]	06-Oct-09	14:42	0.105	0.048	0.048	0.033	0.040	0.011
Total Organic Carbon [%]	06-Oct-09	14:45	5.34	4.23	5.87	5.94	2.05	0.820
Total Carbon [%]	06-Oct-09	14:45	5.36	4.24	5.88	5.95	2.05	0.825
Sulphide [%]	07-Oct-09	15:59	< 0.01	< 0.01	0.04	0.05	< 0.01	< 0.01
Sulphate [%]	23-Oct-09	14:22	0.1	< 0.1	0.1	0.1	0.5	0.2
Silver [µg/g]	14-Oct-09	14:05	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7
Aluminum [µg/g]	14-Oct-09	14:05	7600	6700	5300	4100	4400	2600
Arsenic [µg/g]	14-Oct-09	14:05	5	5	4	3	10	4
Barium [µg/g]	14-Oct-09	14:05	75	65	61	47	6400	2600
Beryllium [µg/g]	14-Oct-09	14:05	0.47	0.37	0.32	0.24	0.21	0.12
Bismuth [µg/g]	14-Oct-09	14:05	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Calcium [µg/g]	14-Oct-09	14:05	1900	1600	1500	1500	1100	720
Cadmium [µg/g]	14-Oct-09	14:05	1.2	0.96	1.2	1.1	0.42	0.18
Cerium [µg/g]	13-Oct-09	15:44	48	41	34	20	62	30
Cobalt [µg/g]	14-Oct-09	14:05	8.5	7.8	6.1	3.7	20	8.2
Chromium [µg/g]	14-Oct-09	14:05	19	18	15	12	9.8	6.8
Cesium [µg/g]	13-Oct-09	15:44	0.63	0.45	0.36	0.30	0.56	0.38
Copper [µg/g]	14-Oct-09	14:05	34	31	23	14	20	8.3
Iron [µg/g]	14-Oct-09	14:05	12000	9800	8100	6800	15000	7300
Gallium [µg/g]	13-Oct-09	15:44	2.9	2.6	2.0	1.6	2.8	1.4
Germanium [µg/g]	13-Oct-09	15:44	0.6	0.5	0.5	0.4	0.8	0.4
Hafnium [µg/g]	13-Oct-09	15:44	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Indium [µg/g]	13-Oct-09	15:44	0.05	0.02	0.01	< 0.01	< 0.01	< 0.01
Potassium [µg/g]	14-Oct-09	14:05	270	250	210	180	270	170
Lanthanum [µg/g]	13-Oct-09	15:44	25	21	18	12	33	16
Lithium [µg/g]	14-Oct-09	14:05	2.7	2.4	1.6	1.1	1.4	0.3

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LR Report : CA10521-SEP09

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: CORE 09-SR-1 (0-5)	6: CORE 09-SR-1 (5-10)	7: CORE 09-SR-1 (10-15)	8: CORE 09-SR-1 (15-20)	9: CORE 09-SR-2 (0-5)	10: CORE 09-SR-2 (5-10)
Lutetium [µg/g]	13-Oct-09	15:44	0.10	0.081	0.063	0.054	0.49	0.21
Magnesium [µg/g]	14-Oct-09	14:04	2100	1900	1500	1200	840	590
Manganese [µg/g]	14-Oct-09	14:04	250	180	200	230	1600	160
Molybdenum [µg/g]	14-Oct-09	14:04	< 0.5	< 0.5	< 0.5	< 0.5	2.8	1.3
Sodium [µg/g]	14-Oct-09	14:04	52	45	38	32	36	23
Niobuim [µg/g]	13-Oct-09	15:44	0.8	0.8	0.7	< 0.7	< 0.7	< 0.7
Nickel [µg/g]	14-Oct-09	14:04	15	13	11	7	19	8
Lead [µg/g]	14-Oct-09	14:04	61	44	32	19	100	38
Phosphorus [µg/g]	14-Oct-09	14:04	450	350	260	210	270	130
Rubidium [µg/g]	13-Oct-09	15:44	3.6	3.2	2.6	2.3	2.5	1.5
Antimony [µg/g]	14-Oct-09	14:04	< 1	< 1	< 1	< 1	< 1	< 1
Scandium [µg/g]	13-Oct-09	15:44	1.7	1.5	1.1	0.9	1.1	0.6
Selenium [µg/g]	14-Oct-09	14:04	< 1	< 1	< 1	< 1	< 1	< 1
Tin [µg/g]	14-Oct-09	14:04	< 6	< 6	< 6	< 6	< 6	< 6
Strontium [µg/g]	14-Oct-09	14:04	7.6	6.3	6.2	6.5	72	27
Sulphur [µg/g]	14-Oct-09	14:04	1100	1400	2000	2500	2400	1200
Tantalum [µg/g]	13-Oct-09	15:44	0.03	0.03	0.04	0.04	0.01	< 0.01
Terbium [µg/g]	13-Oct-09	15:44	0.47	0.33	0.22	0.16	2.0	0.87
Tellerium [µg/g]	13-Oct-09	15:44	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Thorium [µg/g]	13-Oct-09	15:44	9.5	7.7	7.0	3.4	33	12
Titanium [µg/g]	14-Oct-09	14:04	340	350	300	270	190	160
Thallium [µg/g]	14-Oct-09	14:04	< 3	< 3	< 3	< 3	< 3	< 3
Uranium [µg/g]	13-Oct-09	15:43	7.9	5.6	3.1	1.7	84	29
Vanadium [µg/g]	14-Oct-09	14:04	24	21	17	13	12	7.9
Tungsten [µg/g]	14-Oct-09	14:04	< 1	< 1	< 1	< 1	2	< 1
Yttrium [µg/g]	14-Oct-09	14:04	10	7.8	5.9	4.5	43	18
Ytterbium [µg/g]	13-Oct-09	15:43	0.76	0.59	0.46	0.37	4.0	1.6
Zinc [µg/g]	14-Oct-09	14:04	100	83	73	49	74	34
Zirconium [µg/g]	14-Oct-09	14:04	< 5	< 5	< 5	< 5	< 5	< 5

Ra226 subcontracted to Becquerel Labs.
* BaSO4 Calculation based on Ba values and assumes all Ba is in BaSO4 form.
** BaSO4 Calculation based on SO4 values and assumes all SO4 is in BaSO4 form.

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Environmental Services, Analytical

OnLine LIMS

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Tuesday, October 27, 2009

Date Rec. : 30 September 2009
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Project : 09-1663

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CERTIFICATE OF ANALYSIS

Final Report

Analysis	**11: CORE 09-SR-2 (10-15)**	**12: CORE 09-SR-3 (0-5)**	**13: CORE 09-SR-3 (5-10)**	**14: CORE 09-SR-3 (10-15)**	**15: CORE 09-SR-3 (15-20)**	**16: CORE 09-SR-4 (0-5)**	**17: CORE 09-SR-4 (5-10)**	**18: CORE 09-SR-4 (10-15)**
Sample Date & Time	26-Sep-09	27-Sep-09	27-Sep-09	27-Sep-09	27-Sep-09	27-Sep-09	27-Sep-09	27-Sep-09
BaSO4 Calc. using Ba* [µg/g]	340	3910	5100	6120	6970	1310	990	750
BaSO4 Calc. using SO4** [µg/g]	<2430	4860	9720	19400	24300	4860	4860	4860
Total Sulphur [%]	0.015	0.607	0.917	1.15	1.12	1.03	1.06	1.00
Carbonate (CO3) [%]	< 0.005	0.090	0.097	0.088	0.229	0.159	0.181	0.419
Total Organic Carbon [%]	0.330	13.9	14.6	13.3	10.7	16.8	17.6	16.8
Total Carbon [%]	0.326	13.9	14.6	13.3	10.7	16.8	17.6	16.9
Sulphide [%]	< 0.01	< 0.01	< 0.01	0.10	0.07	0.39	0.65	0.65
Sulphate [%]	< 0.1	0.2	0.4	0.8	1.0	0.2	0.2	0.2
Silver [µg/g]	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7
Aluminum [µg/g]	2000	8500	8300	9600	13000	7100	6000	5600
Arsenic [µg/g]	1	21	23	28	29	22	24	26
Barium [µg/g]	200	2300	3000	3600	4100	770	580	440
Beryllium [µg/g]	0.12	0.57	0.47	0.42	0.66	0.27	0.18	0.12
Bismuth [µg/g]	< 0.5	0.8	< 0.5	< 0.5	0.6	< 0.5	< 0.5	< 0.5
Calcium [µg/g]	420	3800	4600	4300	5100	6200	6700	7300
Cadmium [µg/g]	0.09	1.9	1.6	1.5	1.3	1.7	1.7	1.8
Cerium [µg/g]	15	170	200	240	310	590	680	840
Cobalt [µg/g]	2.6	59	60	64	48	28	21	16
Chromium [µg/g]	5.3	18	16	18	26	20	18	17
Cesium [µg/g]	0.21	0.70	0.81	1.1	1.6	0.86	0.82	0.87
Copper [µg/g]	2.3	57	64	84	98	61	58	56
Iron [µg/g]	5200	39000	34000	35000	50000	21000	16000	12000
Gallium [µg/g]	0.66	5.3	6.0	7.9	9.5	6.9	6.4	6.6
Germanium [µg/g]	0.3	1.7	1.8	2.0	2.6	3.1	3.3	3.8
Hafnium [µg/g]	< 0.1	0.2	0.2	0.3	0.3	0.5	0.6	0.6
Indium [µg/g]	< 0.01	< 0.01	< 0.01	< 0.01	0.02	0.01	< 0.01	< 0.01
Potassium [µg/g]	130	370	290	320	430	350	280	270
Lanthanum [µg/g]	8.9	87	110	120	140	300	360	430
Lithium [µg/g]	< 0.1	2.1	3.0	6.4	10	1.5	1.2	1.1

OnLine LIMS

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LR Report : **CA10521-SEP09**

Analysis	11: CORE 09-SR-2 (10-15)	12: CORE 09-SR-3 (0-5)	13: CORE 09-SR-3 (5-10)	14: CORE 09-SR-3 (10-15)	15: CORE 09-SR-3 (15-20)	16: CORE 09-SR-4 (0-5)	17: CORE 09-SR-4 (5-10)	18: CORE 09-SR-4 (10-15)
Lutetium [µg/g]	0.055	1.3	1.6	2.0	2.9	4.1	4.5	5.3
Magnesium [µg/g]	420	1300	1200	1300	1500	1400	1400	1400
Manganese [µg/g]	75	4200	2900	1100	480	550	280	180
Molybdenum [µg/g]	< 0.5	9.0	11	18	18	5.8	4.7	3.6
Sodium [µg/g]	18	53	43	43	54	64	58	59
Niobuim [µg/g]	< 0.7	0.9	1.0	1.1	1.4	1.0	0.9	0.8
Nickel [µg/g]	3	38	40	54	52	37	39	43
Lead [µg/g]	5.2	230	220	240	520	540	550	640
Phosphorus [µg/g]	68	650	580	650	660	470	380	340
Rubidium [µg/g]	1.00	3.8	3.3	3.9	5.1	4.1	3.8	4.0
Antimony [µg/g]	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Scandium [µg/g]	0.5	2.4	2.2	2.3	2.8	2.7	2.7	2.7
Selenium [µg/g]	< 1	1	1	< 1	< 1	< 1	< 1	< 1
Tin [µg/g]	< 6	< 6	< 6	< 6	< 6	< 6	< 6	< 6
Strontium [µg/g]	3.3	21	37	63	77	15	14	14
Sulphur [µg/g]	170	5500	7300	7900	7000	10000	11000	11000
Tantalum [µg/g]	< 0.01	0.04	0.07	0.07	0.09	0.11	0.13	0.15
Terbium [µg/g]	0.21	5.9	7.6	9.1	14	25	28	35
Tellerium [µg/g]	< 0.1	< 0.1	< 0.1	< 0.1	0.1	< 0.1	< 0.1	< 0.1
Thorium [µg/g]	3.4	85	120	160	490	180	120	85
Titanium [µg/g]	140	210	200	230	280	210	210	210
Thallium [µg/g]	< 3	5	< 3	< 3	< 3	< 3	< 3	< 3
Uranium [µg/g]	3.8	270	360	500	270	220	160	110
Vanadium [µg/g]	6.3	20	17	18	21	17	16	16
Tungsten [µg/g]	< 1	6	6	8	8	3	2	< 1
Yttrium [µg/g]	6.1	120	160	200	260	500	600	740
Ytterbium [µg/g]	0.41	11	14	16	24	34	38	45
Zinc [µg/g]	18	210	170	160	150	98	72	55
Zirconium [µg/g]	< 5	< 5	< 5	< 5	6	< 5	5	6

Ra226 subcontracted to Becquerel Labs.
* BaSO4 Calculation based on Ba values and assumes all Ba is in BaSO4 form.
** BaSO4 Calculation based on SO4 values and assumes all SO4 is in BaSO4 form.

Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

OnLine LIMS

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Project : 09-1663

October 7, 2010

Ecometrix
Attn : Erin Clyde

6800 Campobello Road, Mississauga
Canada, L5N 2L8
Phone: 905-794-2325, Fax:905-794-2338

Date Rec. : 30 September 2009
LR Report: **CA10521-SEP09**

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CERTIFICATE OF ANALYSIS
Final Report (QC Report)

Analysis	19: MDL QC - Blank QC - STD % Recovery	20: QC - Blank	21: QC - STD % Recovery	22: QC - DUP % Recovery
BaSO4 Calc. using Ba* [µg/g]	---	---	---	---
BaSO4 Calc. using SO4** [µg/g]	---	---	---	---
Total Sulphur [%]	0.005	< 0.005	102%	---
Carbonate (CO3) [%]	0.005	< 0.005	100%	140%
Total Organic Carbon [%]	0.01	< 0.01	---	100%
Total Carbon [%]	0.005	< 0.005	100%	---
Sulphide [%]	0.01	< 0.01	90%	---
Sulphate [%]	0.1	< 0.1	100%	107%
Silver [µg/g]	0.7	< 0.7	93%	100%
Aluminum [µg/g]	1	< 1	97%	100%
Arsenic [µg/g]	1	< 1	99%	94%
Barium [µg/g]	0.05	< 0.05	96%	100%
Beryllium [µg/g]	0.1	< 0.1	98%	102%
Bismuth [µg/g]	0.5	< 0.5	98%	104%
Calcium [µg/g]	1	< 1	98%	100%
Cadmium [µg/g]	0.05	< 0.05	97%	99%
Cerium [µg/g]	0.006	< 0.006	94%	100%
Cobalt [µg/g]	0.3	< 0.3	97%	103%
Chromium [µg/g]	0.5	< 0.5	98%	103%
Cesium [µg/g]	0.01	< 0.01	---	107%
Copper [µg/g]	0.1	< 0.1	98%	102%
Iron [µg/g]	0.5	< 0.5	98%	100%
Gallium [µg/g]	0.03	< 0.03	---	99%
Germanium [µg/g]	0.3	< 0.3	103%	105%
Hafnium [µg/g]	0.1	< 0.1	96%	150%
Indium [µg/g]	0.01	< 0.01	100%	100%
Potassium [µg/g]	1	< 1	100%	100%

OnLine LIMS

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Project : 09-1663

LR Report : **CA10521-SEP09**

Analysis	19: MDL QC - Blank QC - STD % Recovery	20: QC - Blank	21: QC - STD % Recovery	22: QC - DUP % Recovery
Lanthanum [µg/g]	0.001	0.001	94%	110%
Lithium [µg/g]	0.1	< 0.1	97%	107%
Lutetium [µg/g]	0.001	0.001	95%	102%
Magnesium [µg/g]	1	< 1	87%	100%
Manganese [µg/g]	0.05	< 0.05	97%	100%
Molybdenum [µg/g]	0.5	< 0.5	100%	154%
Sodium [µg/g]	1	< 1	97%	104%
Niobuim [µg/g]	0.7	< 0.7	99%	118%
Nickel [µg/g]	1	< 1	97%	101%
Lead [µg/g]	0.7	< 0.7	98%	100%
Phosphorus [µg/g]	5	< 5	98%	100%
Rubidium [µg/g]	0.004	< 0.004	---	105%
Antimony [µg/g]	1	< 1	98%	100%
Scandium [µg/g]	0.2	< 0.2	100%	99%
Selenium [µg/g]	1	< 1	99%	100%
Tin [µg/g]	6	< 6	100%	1235
Strontium [µg/g]	0.01	< 0.01	97%	103%
Sulphur [µg/g]	1	< 1	100%	100%
Tantalum [µg/g]	0.01	< 0.01	97%	108%
Terbium [µg/g]	0.001	< 0.001	96%	93%
Tellerium [µg/g]	0.1	< 0.1	99%	101%
Thorium [µg/g]	0.01	< 0.01	114%	100%
Titanium [µg/g]	0.2	< 0.2	98%	104%
Thallium [µg/g]	3	< 3	99%	76%
Uranium [µg/g]	0.002	0.006	100%	100%
Vanadium [µg/g]	0.1	< 0.1	99%	102%
Tungsten [µg/g]	1	< 1	97%	93%
Yttrium [µg/g]	0.1	< 0.1	96%	100%
Ytterbium [µg/g]	0.001	0.002	98%	105%
Zinc [µg/g]	0.1	< 0.1	97%	103%
Zirconium [µg/g]	5	< 5	100%	107%

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Ra226 subcontracted to Becquerel Labs.
* BaSO4 Calculation based on Ba values and assumes all Ba is in BaSO4 form.
** BaSO4 Calculation based on SO4 values and assumes all SO4 is in BaSO4 form.

Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

OnLine LIMS

Becquerel LABORATORIES

ANALYSIS REPORT

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Phone: (905) 826-3080
FAX: (905) 826-4151

Batch: T09-01386.0

Date: 12-Nov-2009

Lakefield Research Ltd.

185 Concession St., Postal Bag 4300
Lakefield, ON, K0L 2H0

attn: Brian Graham

Phone: (705) 652-2038
FAX: (705) 652-1918

Client Ref.Sep 10526
P.O: 17820

14 water samples   Received: 06-Oct-2009

Results of Analysis

Sample	Test		Result	Units	Date	Method
PW09-SR-1 (0-5)	Ra-226		0.02	Bq/l	08-Nov-2009	ALPHA
PW09-SR-1 (5-10)	Ra-226	<	0.02	Bq/l	08-Nov-2009	ALPHA
PW09-SR-1 (10-15)	Ra-226	<	0.01	Bq/l	08-Nov-2009	ALPHA
PW09-SR-1 (15-20)	Ra-226	<	0.01	Bq/l	08-Nov-2009	ALPHA
PW09-SR-2 (0-5)	Ra-226		2.4	Bq/l	08-Nov-2009	ALPHA
PW09-SR-2 (5-10)	Ra-226		2.3	Bq/l	08-Nov-2009	ALPHA
PW09-SR-2 (10-15)	Ra-226		0.87	Bq/l	08-Nov-2009	ALPHA
PW09-SR-3 (0-5)	Ra-226		5.1	Bq/l	08-Nov-2009	ALPHA
PW09-SR-3 (5-10)	Ra-226		6.0	Bq/l	08-Nov-2009	ALPHA
PW09-SR-3 (10-15)	Ra-226		5.4	Bq/l	08-Nov-2009	ALPHA
PW09-SR-3 (15-20)	Ra-226		4.5	Bq/l	08-Nov-2009	ALPHA
PW09-SR-4 (0-5)	Ra-226		0.87	Bq/l	08-Nov-2009	ALPHA
PW09-SR-4 (5-10)	Ra-226		1.2	Bq/l	08-Nov-2009	ALPHA
PW09-SR-4 (10-15)	Ra-226		1.4	Bq/l	08-Nov-2009	ALPHA

Methods: ALPHA BQ-RAD-ALPHA alpha-particle spectrometry

Units: Bq/l Becquerels per litre

These results relate only to the samples analysed and only to the items tested.

12-Nov-2009 approved by:

Donald D. Burgess PhD
Senior Scientist, Division Supervisor

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October 14, 2009

Date Rec. : 30 September 2009
LR Report : **CA10526-SEP09**
Project : 09-1663

CERTIFICATE OF ANALYSIS

Final Report

Analysis	**1: Analysis Start Date**	**2: Analysis Start Time**	**3: Analysis Approval Date**	**4: Analysis Approval Time**	**5: PW09-SR-1 (0-5)**	**6: PW09-SR-1 (5-10)**	**7: PW09-SR-1 (10-15)**	**8: PW09-SR-1 (15-20)**	**9: PW09-SR-2 (0-5)**
Sample Date & Time					26-Sep-09	26-Sep-09	26-Sep-09	26-Sep-09	26-Sep-09
Temperature Upon Receipt [°C]	---	---	---	---	4.0	4.0	4.0	4.0	4.0
Sulphate [mg/L]	02-Oct-09	15:00	07-Oct-09	09:19	2.6	< 2	< 2	< 2	16
Dissolved Organic Carbon [mg/L]	02-Oct-09	10:00	07-Oct-09	09:23	14.5	19.6	20.0	22.9	10.5
Dissolved Inorganic Carbon [mg/L]	05-Oct-09	14:35	08-Oct-09	12:47	< 1.0	< 1.0	3.1	2.7	2.4
Alkalinity [mg/L as CaCO3]	02-Oct-09	15:19	05-Oct-09	15:10	9	24	8	2	25
Acidity [mg/L as CaCO3]	02-Oct-09	15:19	05-Oct-09	15:10	6	< 2	3	6	< 2
Hardness [mg/L as CaCO3]	05-Oct-09	09:00	05-Oct-09	13:18	11.1	9.5	5.3	5.3	28.8
Aluminum [mg/L]	05-Oct-09	09:00	05-Oct-09	13:18	< 0.01	0.02	0.02	0.03	0.02
Arsenic [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.0014	0.0034	0.0054	0.0050	0.0015
Barium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.0271	0.0274	0.0313	0.0172	2.16
Beryllium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Boron [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.0052	0.0036	0.0057	0.0089	0.0046
Bismuth [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Calcium [mg/L]	05-Oct-09	09:00	05-Oct-09	13:18	3.54	3.00	1.68	1.71	9.60
Cadmium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.000017	0.000016	0.000025	0.000056	0.000003
Cobalt [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.000762	0.000476	0.000120	0.000079	0.00216
Chromium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Copper [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.0025	0.0037	0.0023	0.0051	0.0021
Iron [mg/L]	05-Oct-09	09:00	05-Oct-09	13:18	0.29	0.81	0.06	0.08	0.01
Potassium [mg/L]	05-Oct-09	09:00	05-Oct-09	13:18	0.24	0.26	0.34	0.38	0.79
Lithium [mg/L]	05-Oct-09	09:00	05-Oct-09	13:18	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Magnesium [mg/L]	05-Oct-09	09:00	05-Oct-09	13:18	0.538	0.492	0.277	0.255	1.16

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LR Report : **CA10526-SEP09**

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	5: PW09-SR-1 (0-5)	6: PW09-SR-1 (5-10)	7: PW09-SR-1 (10-15)	8: PW09-SR-1 (15-20)	9: PW09-SR-2 (0-5)
Manganese [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.365	0.305	0.245	0.325	3.91
Molybdenum [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.00069	0.00037	0.00024	0.00031	0.00064
Sodium [mg/L]	05-Oct-09	09:00	05-Oct-09	13:18	1.85	1.83	1.64	2.17	2.57
Nickel [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.0007	0.0009	0.0006	0.0009	0.0011
Phosphorus [mg/L]	05-Oct-09	09:00	05-Oct-09	13:18	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Lead [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.00087	0.00213	0.00036	0.00124	0.00037
Sulphur [mg/L]	05-Oct-09	09:00	05-Oct-09	13:18	1.05	0.78	0.46	0.74	4.67
Antimony [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Selenium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Silica [mg/L]	05-Oct-09	09:00	05-Oct-09	13:18	1.52	1.96	2.35	2.84	1.63
Tin [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.00007	0.00022	< 0.00001	< 0.00001	< 0.00001
Strontium [mg/L]	05-Oct-09	09:00	05-Oct-09	13:18	0.0121	0.0104	0.0064	0.0068	0.0668
Titanium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.0007	0.0011	0.0007	0.0012	0.0001
Thallium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Uranium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.000186	0.000137	0.000380	0.000250	0.00266
Vanadium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.00016	0.00026	0.00014	0.00029	0.00008
Zinc [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.002	0.002	0.002	0.003	0.002

Samples are field filtered
Ra226 subcontracted to Becquerel Labs.

Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

OnLine LIMS

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October 14, 2009

Date Rec. : 30 September 2009
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Project : 09-1663

CERTIFICATE OF ANALYSIS
Final Report

Analysis	**10: PW09-SR-2 (5-10)**	**11: PW09-SR-2 (10-15)**	**12: PW09-SR-3 (0-5)**	**13: PW09-SR-3 (5-10)**	**14: PW09-SR-3 (10-15)**	**15: PW09-SR-3 (15-20)**	**16: PW09-SR-4 (0-5)**	**17: PW09-SR-4 (5-10)**	**18: PW09-SR-4 (10-15)**
Sample Date & Time	26-Sep-09	26-Sep-09	27-Sep-09	27-Sep-09	27-Sep-09	27-Sep-09	27-Sep-09	27-Sep-09	27-Sep-09
Temperature Upon Receipt [°C]	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Sulphate [mg/L]	14	---	7.9	4.0	< 2	< 2	19	8.1	4.9
Dissolved Organic Carbon [mg/L]	26.5	---	9.9	18.8	13.2	---	---	---	---
Dissolved Inorganic Carbon [mg/L]	5.0	---	14.0	26.5	32.7	---	---	---	---
Alkalinity [mg/L as CaCO3]	5	---	69	99	135	177	33	---	87
Acidity [mg/L as CaCO3]	6	---	---	---	---	---	---	< 2	---
Hardness [mg/L as CaCO3]	25.6	31.5	42.6	67.1	87.2	130	45.2	63.4	78.8
Aluminum [mg/L]	0.07	0.07	< 0.01	< 0.01	< 0.01	0.02	< 0.01	0.01	0.02
Arsenic [mg/L]	0.0030	0.0027	0.0012	0.0014	0.0039	0.0027	0.0012	0.0022	0.0051
Barium [mg/L]	2.38	1.50	1.91	3.11	3.75	3.24	0.561	0.621	0.602
Beryllium [mg/L]	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Boron [mg/L]	0.0068	0.0090	0.0095	0.0146	0.0356	0.0758	0.0192	0.0424	0.0817
Bismuth [mg/L]	0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Calcium [mg/L]	8.74	10.5	14.7	23.8	31.6	47.6	15.7	22.3	27.8
Cadmium [mg/L]	0.000010	0.000010	0.000004	0.000005	0.000008	0.000007	0.000008	0.000007	0.000015
Cobalt [mg/L]	0.000948	0.000863	0.00704	0.00374	0.00264	0.00253	0.000880	0.000284	0.000291
Chromium [mg/L]	< 0.0005	0.0007	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Copper [mg/L]	0.0046	0.0049	0.0010	0.0010	0.0015	0.0014	0.0015	0.0016	0.0019
Iron [mg/L]	0.08	0.27	3.54	4.19	6.18	0.51	1.05	0.26	0.02
Potassium [mg/L]	0.95	2.11	1.03	1.86	3.28	6.21	0.96	1.57	2.77
Lithium [mg/L]	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	0.004	< 0.002	< 0.002	< 0.002
Magnesium [mg/L]	0.926	1.26	1.45	1.84	1.99	2.84	1.46	1.88	2.28

OnLine LIMS

SGS Lakefield Research Limited
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Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

LR Report : CA10526-SEP09

Analysis	**10: PW09-SR-2 (5-10)**	**11: PW09-SR-2 (10-15)**	**12: PW09-SR-3 (0-5)**	**13: PW09-SR-3 (5-10)**	**14: PW09-SR-3 (10-15)**	**15: PW09-SR-3 (15-20)**	**16: PW09-SR-4 (0-5)**	**17: PW09-SR-4 (5-10)**	**18: PW09-SR-4 (10-15)**
Manganese [mg/L]	1.82	1.34	10.8	8.04	5.58	2.89	1.24	0.613	0.341
Molybdenum [mg/L]	0.00150	0.00282	0.00065	0.00035	0.00369	0.00475	0.00056	0.00238	0.00909
Sodium [mg/L]	2.81	2.81	2.35	2.95	3.63	5.23	3.15	3.27	3.93
Nickel [mg/L]	0.0013	0.0012	0.0016	0.0018	0.0018	0.0019	0.0014	0.0009	0.0009
Phosphorus [mg/L]	0.02	0.02	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.01	< 0.01
Lead [mg/L]	0.00198	0.00084	0.00018	0.00008	0.00023	0.00004	0.00054	0.00091	0.00192
Sulphur [mg/L]	4.45	5.89	2.65	1.74	0.88	1.07	5.53	2.88	2.10
Antimony [mg/L]	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Selenium [mg/L]	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Silica [mg/L]	2.68	4.19	3.02	5.36	6.12	6.22	3.01	6.24	9.87
Tin [mg/L]	0.00004	< 0.00001	0.00003	< 0.00001	0.00007	< 0.00001	0.00002	< 0.00001	< 0.00001
Strontium [mg/L]	0.0685	0.0607	0.0508	0.0866	0.117	0.151	0.0328	0.0425	0.0515
Titanium [mg/L]	0.0012	0.0024	0.0002	0.0003	0.0004	0.0004	0.0002	0.0006	0.0008
Thallium [mg/L]	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Uranium [mg/L]	0.00258	0.000877	0.0113	0.00514	0.0400	0.0379	0.00413	0.00669	0.0110
Vanadium [mg/L]	0.00022	0.00082	0.00017	0.00033	0.00038	0.00071	0.00014	0.00032	0.00095
Zinc [mg/L]	0.004	0.005	0.002	0.004	0.003	0.003	0.003	0.002	0.002

Samples are field filtered
Ra226 subcontracted to Becquerel Labs.

Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

OnLine LIMS

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SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : 09-1663

October 7, 2010

Ecometrix
Attn : Erin Clyde

6800 Campobello Road
Mississauga, Ontario
L5N 2L8, Canada

Phone: 905-794-2325
Fax:905-794-2338

Date Rec. : 30 September 2009
LR Report: **CA10526-SEP09**

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CERTIFICATE OF ANALYSIS
Final Report - (QC Report)

Analysis	19: MDL	20: QC - Blank	21: QC - STD % Recovery	22: QC - DUP % Recovery
Temperature Upon Receipt [°C]	---	---	---	---
Sulphate [mg/L]	0.2	< 0.2	105%	100%
Dissolved Organic Carbon [mg/L]	0.2	< 0.2	105%	98%
Dissolved Inorganic Carbon [mg/L]	0.2	0.2	97%	100%
Alkalinity [mg/L as CaCO3]	2	< 2	101%	98%
Acidity [mg/L as CaCO3]	2	3	98%	102%
Hardness [mg/L as CaCO3]	0.5	< 0.5	---	---
Aluminum [mg/L]	0.01	< 0.01	98%	---
Arsenic [mg/L]	0.0002	< 0.0002	106%	---
Barium [mg/L]	0.00001	< 0.00001	122%	---
Beryllium [mg/L]	0.00002	< 0.00002	104%	---
Boron [mg/L]	0.0002	< 0.0002	96%	---
Bismuth [mg/L]	0.00001	< 0.00001	109%	---
Calcium [mg/L]	0.03	< 0.03	101%	---
Cadmium [mg/L]	0.000003	0.000003	99%	---
Cobalt [mg/L]	0.000002	< 0.000002	102%	---
Chromium [mg/L]	0.0005	< 0.0005	102%	---
Copper [mg/L]	0.0005	< 0.0005	102%	---
Iron [mg/L]	0.01	< 0.01	102%	---
Potassium [mg/L]	0.01	< 0.01	98%	---
Lithium [mg/L]	0.002	< 0.002	98%	---
Magnesium [mg/L]	0.003	< 0.003	99%	---
Manganese [mg/L]	0.00001	< 0.00001	107%	---
Molybdenum [mg/L]	0.00001	< 0.00001	99%	---
Sodium [mg/L]	0.01	< 0.01	94%	---
Nickel [mg/L]	0.0001	< 0.0001	100%	---
Phosphorus [mg/L]	0.01	< 0.01	100%	---
Lead [mg/L]	0.00002	< 0.00002	106%	---
Sulphur [mg/L]	0.01	< 0.01	100%	---
Antimony [mg/L]	0.0002	< 0.0002	101%	---

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Project : 09-1663

LR Report : **CA10526-SEP09**

Analysis	19: MDL	20: QC - Blank	21: QC - STD % Recovery	22: QC - DUP % Recovery
Selenium [mg/L]	0.001	< 0.001	102%	---
Silica [mg/L]	0.01	< 0.01	104%	---
Tin [mg/L]	0.00001	< 0.00001	96%	---
Strontium [mg/L]	0.0001	< 0.0001	100%	---
Titanium [mg/L]	0.0001	< 0.0001	96%	---
Thallium [mg/L]	0.0002	< 0.0002	107%	---
Uranium [mg/L]	0.000001	0.000001	106%	---
Vanadium [mg/L]	0.00003	< 0.00003	107%	---
Zinc [mg/L]	0.001	< 0.001	104%	---

Samples are field filtered
Ra226 subcontracted to Becquerel Labs.
Revised to include Ra226 results from Becquerel.

Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

ANALYSIS REPORT

Becquerel Laboratories Inc.
6790 Kitimat Rd., Unit 4
Mississauga, Ontario
Canada, L5N 5L9

Phone: (905) 826-3080
FAX: (905) 826-4151

Batch: T09-01385.0

Date: 09-Nov-2009

Lakefield Research Ltd.

185 Concession St., Postal Bag 4300
Lakefield, ON, K0L 2H0

attn: Brian Graham

Phone: (705) 652-2038
FAX: (705) 652-1918

Client Ref.Sep 10525
P.O: 17820

9 water samples   Received: 06-Oct-2009   Page 1 of 1

Results of Analysis

Sample	Test		Result	Units	Date	Method
SW09-SR-1T	Ra-226	<	0.01	Bq/l	06-Nov-2009	ALPHA
SW09-SR-1B	Ra-226	<	0.01	Bq/l	06-Nov-2009	ALPHA
SW09-SR-2T	Ra-226		0.11	Bq/l	06-Nov-2009	ALPHA
SW09-SR-2B	Ra-226		0.28	Bq/l	06-Nov-2009	ALPHA
SW09-SR-3T	Ra-226		0.15	Bq/l	06-Nov-2009	ALPHA
SW09-SR-3B	Ra-226		0.80	Bq/l	06-Nov-2009	ALPHA
SW09-SR-4T	Ra-226		0.19	Bq/l	06-Nov-2009	ALPHA
SW09-SR-4B	Ra-226		0.30	Bq/l	06-Nov-2009	ALPHA
Blank 1	Ra-226	<	0.01	Bq/l	06-Nov-2009	ALPHA

Methods: ALPHA BQ-RAD-ALPHA alpha-particle spectrometry

Units: Bq/l Becquerels per litre

These results relate only to the samples analysed and only to the items tested.

09-Nov-2009 approved by: Donald D. Burgess

Donald D. Burgess PhD
Senior Scientist, Division Supervisor

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Phone: 905-794-2325, Fax:905-794-2338

October 14, 2009

Date Rec. : 30 September 2009
LR Report : **CA10525-SEP09**
Project : 09-1663

CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	5: SW09-SR-1T	6: SW09-SR-1B	7: SW09-SR-2T
Sample Date & Time					24-Sep-09	25-Sep-09	24-Sep-09
Temperature Upon Receipt [°C]	---	---	---	---	4.0	4.0	4.0
Sulphate [mg/L]	02-Oct-09	15:00	05-Oct-09	16:12	8.5	5.6	31
Total Organic Carbon [mg/L]	02-Oct-09	10:00	05-Oct-09	13:41	2.7	5.4	2.3
Total Inorganic Carbon [mg/L]	05-Oct-09	14:35	08-Oct-09	12:46	< 1.0	< 1.0	< 1.0
Alkalinity [mg/L as CaCO3]	02-Oct-09	15:19	05-Oct-09	15:13	---	---	---
Acidity [mg/L as CaCO3]	02-Oct-09	15:19	05-Oct-09	15:13	11	9	9
Hardness [mg/L as CaCO3]	02-Oct-09	09:00	02-Oct-09	12:09	10.4	10.2	34.8
Aluminum [mg/L]	02-Oct-09	09:00	02-Oct-09	12:09	0.02	0.02	< 0.01
Arsenic [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.0004	0.0003	0.0005
Barium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.0144	0.0155	0.120
Beryllium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	< 0.00002	< 0.00002	< 0.00002
Boron [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.0059	0.0050	0.0084
Bismuth [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	< 0.00001	< 0.00001	< 0.00001
Calcium [mg/L]	02-Oct-09	09:00	02-Oct-09	12:09	3.26	3.21	11.8
Cadmium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.000013	0.000061	< 0.000003
Cobalt [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.00298	0.00250	0.00184
Chromium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	< 0.0005	< 0.0005	< 0.0005
Copper [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.0015	0.0016	0.0007
Iron [mg/L]	02-Oct-09	09:00	02-Oct-09	12:09	0.03	0.03	0.02
Potassium [mg/L]	02-Oct-09	09:00	02-Oct-09	12:09	0.25	0.24	0.78
Lithium [mg/L]	02-Oct-09	09:00	02-Oct-09	12:09	< 0.002	< 0.002	< 0.002
Magnesium [mg/L]	02-Oct-09	09:00	02-Oct-09	12:09	0.542	0.524	1.31

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LR Report : **CA10525-SEP09**

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	5: SW09-SR-1T	6: SW09-SR-1B	7: SW09-SR-2T
Manganese [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.0313	0.0284	0.0545
Molybdenum [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.00007	0.00008	0.00022
Sodium [mg/L]	02-Oct-09	09:00	02-Oct-09	12:09	1.83	1.89	2.06
Nickel [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.0004	0.0004	0.0005
Phosphorus [mg/L]	02-Oct-09	09:00	02-Oct-09	12:09	< 0.01	< 0.01	< 0.01
Lead [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.00031	0.00056	0.00031
Sulphur [mg/L]	02-Oct-09	09:00	02-Oct-09	12:09	1.66	1.67	9.17
Antimony [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.0045	0.0037	0.0028
Selenium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	< 0.001	< 0.001	< 0.001
Silica [mg/L]	02-Oct-09	09:00	02-Oct-09	12:09	0.63	0.63	0.63
Tin [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.00006	0.00019	0.00019
Strontium [mg/L]	02-Oct-09	09:00	02-Oct-09	12:09	0.0117	0.0115	0.0270
Titanium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.0002	0.0002	0.0001
Thallium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	< 0.0002	< 0.0002	< 0.0002
Uranium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.000257	0.000138	0.00154
Vanadium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.00005	0.00012	0.00004
Zinc [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.003	0.003	< 0.001

Ra226 subcontracted to Becquerel Labs.

Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

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Ecometrix
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Phone: 905-794-2325, Fax:905-794-2338

October 14, 2009

Date Rec. : 30 September 2009
LR Report : **CA10525-SEP09**
Project : 09-1663

CERTIFICATE OF ANALYSIS

Final Report

Analysis	**8: SW09-SR-2B**	**9: SW09-SR-3T**	**10: SW09-SR-3B**	**11: SW09-SR-4T**	**12: SW09-SR-4B**	**13: Blank 1**
Sample Date & Time	25-Sep-09	25-Sep-09	25-Sep-09	25-Sep-09	25-Sep-09	27-Sep-09
Temperature Upon Receipt [°C]	4.0	4.0	4.0	4.0	4.0	4.0
Sulphate [mg/L]	45	30	26	25	25	< 2
Total Organic Carbon [mg/L]	2.2	4.6	2.2	4.6	2.0	2.4
Total Inorganic Carbon [mg/L]	< 1.0	< 1.0	< 1.0	< 1.0	1.4	< 1.0
Alkalinity [mg/L as CaCO3]	---	---	7	---	---	---
Acidity [mg/L as CaCO3]	7	8	---	---	< 2	7
Hardness [mg/L as CaCO3]	36.5	33.7	32.7	33.0	33.4	< 0.5
Aluminum [mg/L]	0.04	< 0.01	< 0.01	0.01	< 0.01	< 0.01
Arsenic [mg/L]	0.0007	0.0004	0.0008	0.0004	0.0007	< 0.0002
Barium [mg/L]	0.294	0.147	0.334	0.191	0.222	0.00216
Beryllium [mg/L]	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Boron [mg/L]	0.0093	0.0079	0.0090	0.0081	0.0089	< 0.0002
Bismuth [mg/L]	< 0.00001	< 0.00001	< 0.00001	< 0.00001	0.00001	< 0.00001
Calcium [mg/L]	12.4	11.4	11.1	11.1	11.2	0.03
Cadmium [mg/L]	0.000045	0.000006	0.000011	0.000009	0.000028	< 0.000003
Cobalt [mg/L]	0.00270	0.00148	0.00178	0.000944	0.000310	0.000003
Chromium [mg/L]	0.0012	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Copper [mg/L]	0.0015	0.0012	0.0017	0.0009	0.0011	0.0053
Iron [mg/L]	0.02	0.02	0.40	0.02	0.08	< 0.01
Potassium [mg/L]	0.86	0.75	0.74	0.72	0.80	< 0.01
Lithium [mg/L]	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Magnesium [mg/L]	1.36	1.28	1.24	1.28	1.29	< 0.003

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LR Report : **CA10525-SEP09**

Analysis	8: SW09-SR-2B	9: SW09-SR-3T	10: SW09-SR-3B	11: SW09-SR-4T	12: SW09-SR-4B	13: Blank 1
Manganese [mg/L]	0.253	0.0424	0.752	0.0251	0.119	0.00034
Molybdenum [mg/L]	0.00013	0.00026	0.00036	0.00029	0.00032	< 0.00001
Sodium [mg/L]	2.13	2.16	2.17	2.65	2.79	0.15
Nickel [mg/L]	0.0016	0.0006	0.0010	0.0005	0.0006	0.0003
Phosphorus [mg/L]	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Lead [mg/L]	0.00151	0.00029	0.00031	0.00027	0.00043	< 0.00002
Sulphur [mg/L]	9.22	8.86	8.73	8.40	8.58	0.05
Antimony [mg/L]	0.0041	0.0021	0.0006	0.0013	0.0002	< 0.0002
Selenium [mg/L]	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Silica [mg/L]	0.62	0.62	0.77	0.65	0.73	< 0.01
Tin [mg/L]	0.00029	0.00052	0.00009	0.00007	0.00016	< 0.00001
Strontium [mg/L]	0.0302	0.0267	0.0275	0.0266	0.0268	0.0001
Titanium [mg/L]	0.0001	0.0001	0.0002	0.0002	0.0001	< 0.0001
Thallium [mg/L]	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Uranium [mg/L]	0.00345	0.00131	0.00137	0.00146	0.00122	< 0.000001
Vanadium [mg/L]	0.00003	0.00007	0.00005	0.00005	0.00008	< 0.00003
Zinc [mg/L]	0.009	0.002	0.002	< 0.001	0.004	< 0.001

Ra226 subcontracted to Becquerel Labs.

Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

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October 7, 2010

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Date Rec. : 30 September 2009
LR Report: **CA10525-SEP09**

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CERTIFICATE OF ANALYSIS

Final Report - (QC Report)

Analysis	14: MDL	15: QC - Blank	16: QC - STD % Recovery	17: QC - DUP % Recovery
Sulphate [mg/L]	0.2	< 0.2	105%	100%
Total Organic Carbon [mg/L]	0.2	< 0.2	105%	98%
Total Inorganic Carbon [mg/L]	0.2	0.2	97%	100%
Alkalinity [mg/L as CaCO3]	2	< 2	101%	98%
Acidity [mg/L as CaCO3]	2	3	98%	102%
Hardness [mg/L as CaCO3]	0.5	---	---	---
Aluminum [mg/L]	0.01	< 0.01	95%	100%
Arsenic [mg/L]	0.0002	< 0.0002	106%	111%
Barium [mg/L]	0.00001	< 0.00001	105%	100%
Beryllium [mg/L]	0.00002	< 0.00002	103%	94%
Boron [mg/L]	0.0002	< 0.0002	99%	97%
Bismuth [mg/L]	0.00001	0.00001	105%	82%
Calcium [mg/L]	0.03	---	98%	100%
Cadmium [mg/L]	0.000003	< 0.000003	102%	107%
Cobalt [mg/L]	0.000002	< 0.000002	105%	99%
Chromium [mg/L]	0.0005	< 0.0005	103%	170%
Copper [mg/L]	0.0005	< 0.0005	106%	85%
Iron [mg/L]	0.01	---	96.8	122
Potassium [mg/L]	0.01	< 0.01	98%	99.1
Lithium [mg/L]	0.002	< 0.002	94.2	120
Magnesium [mg/L]	0.003	---	95%	100%
Manganese [mg/L]	0.00001	< 0.00001	104%	99%
Molybdenum [mg/L]	0.00001	< 0.00001	95%	155%
Sodium [mg/L]	0.01	---	95%	99%
Nickel [mg/L]	0.0001	< 0.0001	105%	87%
Phosphorus [mg/L]	0.01	< 0.01	95%	100%
Lead [mg/L]	0.00002	< 0.00002	102%	30%
Sulphur [mg/L]	0.01	---	100%	101%
Antimony [mg/L]	0.0002	< 0.0002	94%	124%
Selenium [mg/L]	0.001	< 0.001	108%	100%

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Project : 09-1663

LR Report : **CA10525-SEP09**

Analysis	14: MDL	15: QC - Blank	16: QC - STD % Recovery	17: QC - DUP % Recovery
Silica [mg/L]	0.01	< 0.01	103%	101%
Tin [mg/L]	0.00001	< 0.00001	96%	140%
Strontium [mg/L]	0.0001	---	98%	100%
Titanium [mg/L]	0.0001	< 0.0001	95%	130%
Thallium [mg/L]	0.0002	< 0.0002	105%	106%
Uranium [mg/L]	0.000001	< 0.000001	102%	94%
Vanadium [mg/L]	0.00003	< 0.00003	106%	150%
Zinc [mg/L]	0.001	< 0.001	106%	90%

Ra226 subcontracted to Becquerel Labs.
Revised to include Ra226 results from Becquerel

Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

OnLine LIMS

ANALYSIS REPORT

Becquerel LABORATORIES

Becquerel Laboratories Inc.
6790 Kitimat Rd., Unit 4
Mississauga, Ontario
Canada, L5N 5L9

Phone: (905) 826-3080
FAX: (905) 826-4151

Batch: T09-01383.0

Date: 20-Oct-2009

Lakefield Research Ltd.

185 Concession St., Postal Bag 4300
Lakefield, ON, K0L 2H0

attn: Brian Graham

Phone: (705) 652-2038
FAX: (705) 652-1918

Client Ref.Oct 10069
P.O: 17820

5 water samples Sampled: 29-Sep-2009 Received: 06-Oct-2009

Results of Analysis

Sample	Test	Result	Units	Date	Method
PW09 EC2 0-2.5	Ra-226	2.9	Bq/l	18-Oct-2009	ALPHA
PW09 EC2 2.5-5	Ra-226	3.3	Bq/l	18-Oct-2009	ALPHA
PW09 EC2 5-7.5	Ra-226	5.4	Bq/l	18-Oct-2009	ALPHA
PW09 EC1 0-5	Ra-226	0.30	Bq/l	18-Oct-2009	ALPHA
PW09 EC1 5-10	Ra-226	4.7	Bq/l	18-Oct-2009	ALPHA

Methods: ALPHA BQ-RAD-ALPHA alpha-particle spectrometry

Units: Bq/l Becquerels per litre

These results relate only to the samples analysed and only to the items tested.

20-Oct-2009 approved by:
Donald D. Burgess PhD
Senior Scientist, Division Supervisor

SGS Lakefield Research Limited
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Ecometrix
Attn : Erin Clyde

6800 Campobello Road, Mississauga
Canada, L5N 2L8
Phone: 905-794-2325, Fax:905-794-2338

October 14, 2009

Date Rec. : 01 October 2009
LR Report : **CA10069-OCT09**
Project : 09-1663

CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	5: PW09 EC2 0-2.5	6: PW09 EC2 2.5-5	7: PW09 EC2 5-7.5	8: PW09 EC1 0-5	9: PW09 EC1 5-10
Sample Date & Time					29-Sep-09	29-Sep-09	29-Sep-09	29-Sep-09	29-Sep-09
Temperature Upon Receipt [°C]	---	---	---	---	9.0	9.0	9.0	9.0	9.0
Sulphate [mg/L]	02-Oct-09	19:39	06-Oct-09	12:35	27	18	---	---	---
Dissolved Organic Carbon [mg/L]	05-Oct-09	09:40	06-Oct-09	13:53	19.0	14.3	---	---	---
Dissolved Inorganic Carbon [mg/L]	06-Oct-09	08:15	07-Oct-09	12:40	4.2	1.1	---	---	---
Acidity [mg/L as CaCO3]	02-Oct-09	15:00	06-Oct-09	11:07	17	16	---	---	---
Hardness [mg/L as CaCO3]	05-Oct-09	09:00	05-Oct-09	13:17	21.7	16.0	16.4	33.9	17.8
Aluminum [mg/L]	05-Oct-09	09:00	05-Oct-09	13:17	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Arsenic [mg/L]	02-Oct-09	14:45	05-Oct-09	13:17	0.0058	0.0046	0.0065	0.0006	0.0024
Barium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:17	0.285	0.337	0.487	0.221	0.335
Beryllium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:17	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Boron [mg/L]	02-Oct-09	14:45	05-Oct-09	13:17	0.0039	0.0034	0.0039	0.0082	0.0028
Bismuth [mg/L]	02-Oct-09	14:45	05-Oct-09	13:17	0.00003	0.00006	0.00003	< 0.00001	< 0.00001
Calcium [mg/L]	05-Oct-09	09:00	05-Oct-09	13:17	7.28	5.35	5.54	11.4	6.06
Cadmium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:17	0.000031	0.000012	0.000009	0.000012	< 0.000003
Cobalt [mg/L]	02-Oct-09	14:45	05-Oct-09	13:17	0.00289	0.00120	0.00183	0.000321	0.00192
Chromium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:17	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Copper [mg/L]	02-Oct-09	14:45	05-Oct-09	13:17	0.0018	0.0018	0.0011	0.0010	< 0.0005
Iron [mg/L]	05-Oct-09	09:00	05-Oct-09	13:17	0.44	3.30	5.71	0.07	6.63
Potassium [mg/L]	05-Oct-09	09:00	05-Oct-09	13:17	0.30	0.34	0.48	0.80	0.58
Lithium [mg/L]	05-Oct-09	09:00	05-Oct-09	13:17	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Magnesium [mg/L]	05-Oct-09	09:00	05-Oct-09	13:17	0.864	0.634	0.632	1.31	0.655

SGS Lakefield Research Limited
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Lakefield - Ontario - KOL 2HO
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LR Report : CA10069-OCT09

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	5: PW09 EC2 0-2.5	6: PW09 EC2 2.5-5	7: PW09 EC2 5-7.5	8: PW09 EC1 0-5	9: PW09 EC1 5-10
Manganese [mg/L]	02-Oct-09	14:45	05-Oct-09	13:17	0.217	0.134	0.132	0.120	0.142
Molybdenum [mg/L]	02-Oct-09	14:45	05-Oct-09	13:17	0.00015	0.00116	0.00149	0.00029	0.00051
Sodium [mg/L]	05-Oct-09	09:00	05-Oct-09	13:17	2.20	1.87	1.50	2.75	1.24
Nickel [mg/L]	02-Oct-09	14:45	05-Oct-09	13:17	0.0024	0.0013	0.0017	0.0008	0.0010
Phosphorus [mg/L]	05-Oct-09	09:00	05-Oct-09	13:17	0.07	0.01	< 0.01	< 0.01	< 0.01
Lead [mg/L]	02-Oct-09	14:45	05-Oct-09	13:17	0.00216	0.00090	0.00049	0.00023	0.00016
Sulphur [mg/L]	05-Oct-09	09:00	05-Oct-09	13:17	6.26	3.35	4.21	7.26	1.58
Antimony [mg/L]	02-Oct-09	14:45	05-Oct-09	13:17	0.0003	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Selenium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:17	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Silica [mg/L]	05-Oct-09	09:00	05-Oct-09	13:17	1.42	1.86	2.71	0.72	5.07
Tin [mg/L]	02-Oct-09	14:45	05-Oct-09	13:17	0.00017	< 0.00001	0.00001	< 0.00001	0.00002
Strontium [mg/L]	05-Oct-09	09:00	05-Oct-09	13:17	0.0168	0.0149	0.0187	0.0269	0.0168
Titanium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:17	0.0007	0.0004	0.0002	< 0.0001	0.0003
Thallium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:17	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Uranium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:17	0.000173	0.000115	0.000105	0.000835	0.000671
Vanadium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:17	0.00008	0.00007	0.00004	0.00007	0.00005
Zinc [mg/L]	02-Oct-09	14:45	05-Oct-09	13:17	0.005	0.004	0.003	0.003	0.001

Samples are field filtered
Ra226 subcontracted to Becquerel Labs.

Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

OnLine LIMS

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OnLine LIMS

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Env ICP-MS Metals

Project : 09-1663

October 7, 2010

Ecometrix
Attn : Erin Clyde

6800 Campobello Road, Mississauga
Canada, L5N 2L8
Phone: 905-794-2325, Fax:905-794-2338

Date Rec. : 01 October 2009
LR Report: **CA10069-OCT09**

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CERTIFICATE OF ANALYSIS
Final Report

Analysis	10: MDL	11: QC - Blank	12: QC - STD % Recovery	13: QC - DUP % Recovery
Sulphate [mg/L]	0.2	< 0.2	100%	110%
Dissolved Organic Carbon [mg/L]	0.2	< 0.2	91%	100%
Dissolved Inorganic Carbon [mg/L]	0.2	0.7	107%	100%
Acidity [mg/L as CaCO3]	2	3	98%	102%
Hardness [mg/L as CaCO3]	0.5	< 0.5	---	---
Aluminum [mg/L]	0.01	< 0.01	98%	---
Arsenic [mg/L]	0.0002	< 0.0002	106%	---
Barium [mg/L]	0.00001	< 0.00001	122%	---
Beryllium [mg/L]	0.00002	< 0.00002	104%	---
Boron [mg/L]	0.0002	< 0.0002	96%	---
Bismuth [mg/L]	0.00001	< 0.00001	109%	---
Calcium [mg/L]	0.03	< 0.03	101%	---
Cadmium [mg/L]	0.000003	0.000003	99%	---
Cobalt [mg/L]	0.000002	< 0.000002	102%	---
Chromium [mg/L]	0.0005	< 0.0005	102%	---
Copper [mg/L]	0.0005	< 0.0005	102%	---
Iron [mg/L]	0.01	< 0.01	102%	---
Potassium [mg/L]	0.01	< 0.01	98%	---
Lithium [mg/L]	0.002	< 0.002	98%	---
Magnesium [mg/L]	0.003	< 0.003	98%	---
Manganese [mg/L]	0.00001	< 0.00001	107%	---
Molybdenum [mg/L]	0.00001	< 0.00001	99%	---
Sodium [mg/L]	0.01	< 0.01	94%	---
Nickel [mg/L]	0.0001	< 0.0001	100%	---
Phosphorus [mg/L]	0.01	< 0.01	100%	---
Lead [mg/L]	0.00002	< 0.00002	106%	---
Sulphur [mg/L]	0.01	< 0.01	98%	---
Antimony [mg/L]	0.0002	< 0.0002	101%	---

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Env ICP-MS Metals

Project : 09-1663

LR Report : **CA10069-OCT09**

Analysis	10: MDL	11: QC - Blank	12: QC - STD % Recovery	13: QC - DUP % Recovery
Selenium [mg/L]	0.001	< 0.001	102%	---
Silica [mg/L]	0.01	< 0.01	104%	---
Tin [mg/L]	0.00001	< 0.00001	96%	---
Strontium [mg/L]	0.0001	< 0.0001	100%	---
Titanium [mg/L]	0.0001	< 0.0001	96%	---
Thallium [mg/L]	0.0002	< 0.0002	107%	---
Uranium [mg/L]	0.000001	0.000001	107%	---
Vanadium [mg/L]	0.00003	< 0.00003	107%	---
Zinc [mg/L]	0.001	< 0.001	104%	---

Samples are field filtered
Ra226 subcontracted to Becquerel Labs.

Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

OnLine LIMS

ANALYSIS REPORT

Becquerel Laboratories Inc.
6790 Kitimat Rd., Unit 4
Mississauga, Ontario
Canada, L5N 5L9

Phone: (905) 826-3080
FAX: (905) 826-4151

Batch: T09-01382.0

Date: 20-Oct-2009

Lakefield Research Ltd.

185 Concession St., Postal Bag 4300
Lakefield, ON, K0L 2H0

attn: Brian Graham

Phone: (705) 652-2038
FAX: (705) 652-1918

Client Ref.Oct 10064
P.O: 17820

6 water samples Sampled: 28-Sep-2009 Received: 06-Oct-2009

Results of Analysis

Sample	Test	Result	Units	Date	Method
SW09 QC15-1	Ra-226	0.42	Bq/l	17-Oct-2009	ALPHA
SW09 QC15-2	Ra-226	0.45	Bq/l	18-Oct-2009	ALPHA
SW09 QC15-3	Ra-226	0.46	Bq/l	18-Oct-2009	ALPHA
SW09 QC15-4	Ra-226	0.45	Bq/l	18-Oct-2009	ALPHA
SW09 EC-2T	Ra-226	0.78	Bq/l	18-Oct-2009	ALPHA
SW09 EC-2B	Ra-226	0.85	Bq/l	18-Oct-2009	ALPHA

Methods: ALPHA BQ-RAD-ALPHA alpha-particle spectrometry

Units: Bq/l Becquerels per litre

These results relate only to the samples analysed and only to the items tested.

20-Oct-2009 approved by: [signature]
Donald D. Burgess PhD
Senior Scientist, Division Supervisor

SGS Lakefield Research Limited
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Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Ecometrix
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Canada, L5N 2L8
Phone: 905-794-2325, Fax:905-794-2338

October 14, 2009

Date Rec. : 01 October 2009
LR Report : **CA10064-OCT09**
Project : 09-1663

CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	5: SW09 QC15-1	6: SW09 QC15-2	7: SW09 QC15-3	8: SW09 QC15-4	9: SW09 EC-2T	10: SW09 EC-2B
Sample Date & Time					28-Sep-09	28-Sep-09	28-Sep-09	28-Sep-09	28-Sep-09	28-Sep-09
Temperature Upon Receipt [°C]	---	---	---	---	9.0	9.0	9.0	9.0	9.0	9.0
Sulphate [mg/L]	02-Oct-09	19:39	06-Oct-09	14:22	570	570	570	600	85	36
Acidity [mg/L as CaCO3]	02-Oct-09	15:00	05-Oct-09	15:14	22	27	44	50	67	16
Total Organic Carbon [mg/L]	05-Oct-09	09:40	06-Oct-09	13:53	---	---	---	---	11.4	11.7
Total Inorganic Carbon [mg/L]	05-Oct-09	14:35	08-Oct-09	12:46	---	---	---	---	< 1.0	< 1.0
Hardness [mg/L as CaCO3]	05-Oct-09	09:00	05-Oct-09	13:19	529	535	532	549	17.0	16.8
Aluminum [mg/L]	05-Oct-09	09:00	05-Oct-09	13:19	< 0.01	< 0.01	< 0.01	0.02	0.03	< 0.01
Arsenic [mg/L]	02-Oct-09	14:45	05-Oct-09	13:19	0.0010	0.0009	0.0009	0.0011	0.0007	0.0007
Barium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:19	0.0334	0.0301	0.0300	0.0296	0.108	0.114
Beryllium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:19	0.00006	< 0.00002	0.00002	< 0.00002	0.00003	0.00002
Boron [mg/L]	02-Oct-09	14:45	05-Oct-09	13:19	0.113	0.113	0.115	0.116	0.0076	0.0072
Bismuth [mg/L]	02-Oct-09	14:45	05-Oct-09	13:19	0.00004	0.00002	0.00001	< 0.00001	0.00002	0.00002
Calcium [mg/L]	05-Oct-09	09:00	05-Oct-09	13:19	202	205	204	210	5.69	5.63
Cadmium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:19	0.000074	0.000051	0.000039	0.000031	0.000046	0.000056
Cobalt [mg/L]	02-Oct-09	14:45	05-Oct-09	13:19	0.00558	0.00464	0.0106	0.0122	0.00655	0.00196
Chromium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:19	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Copper [mg/L]	02-Oct-09	14:45	05-Oct-09	13:19	0.0017	0.0014	0.0013	0.0016	0.0037	0.0029
Iron [mg/L]	05-Oct-09	09:00	05-Oct-09	13:19	0.10	0.06	0.16	0.18	0.07	0.04
Potassium [mg/L]	05-Oct-09	09:00	05-Oct-09	13:19	10.8	11.0	10.9	11.9	0.31	0.32
Lithium [mg/L]	05-Oct-09	09:00	05-Oct-09	13:19	0.008	0.008	0.008	0.009	< 0.002	< 0.002
Magnesium [mg/L]	05-Oct-09	09:00	05-Oct-09	13:19	5.69	5.79	5.77	6.19	0.670	0.663

SGS Lakefield Research Limited
P.O. Box 4300 - 185 Concession St.
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LR Report : **CA10064-OCT09**

Analysis	**1: Analysis Start Date**	**2: Analysis Start Time**	**3: Analysis Approval Date**	**4: Analysis Approval Time**	**5: SW09 QC15-1**	**6: SW09 QC15-2**	**7: SW09 QC15-3**	**8: SW09 QC15-4**	**9: SW09 EC-2T**	**10: SW09 EC-2B**
Manganese [mg/L]	02-Oct-09	14:45	05-Oct-09	13:19	0.207	0.214	0.214	0.310	0.0315	0.0319
Molybdenum [mg/L]	02-Oct-09	14:45	05-Oct-09	13:19	0.00319	0.00409	0.00368	0.00533	0.00018	0.00008
Sodium [mg/L]	05-Oct-09	09:00	05-Oct-09	13:19	2.38	2.42	2.37	2.59	1.59	1.58
Nickel [mg/L]	02-Oct-09	14:45	05-Oct-09	13:19	0.0067	0.0067	0.0067	0.0068	0.0022	0.0022
Phosphorus [mg/L]	05-Oct-09	09:00	05-Oct-09	13:19	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Lead [mg/L]	02-Oct-09	14:45	05-Oct-09	13:19	0.00151	0.00098	0.00194	0.00548	0.00699	0.00391
Sulphur [mg/L]	05-Oct-09	09:00	05-Oct-09	13:19	157	160	160	166	4.64	4.63
Antimony [mg/L]	02-Oct-09	14:45	05-Oct-09	13:19	0.0017	0.0010	0.0093	0.0106	0.0086	0.0016
Selenium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:19	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Silica [mg/L]	05-Oct-09	09:00	05-Oct-09	13:19	5.46	5.55	5.54	5.55	0.59	0.60
Tin [mg/L]	02-Oct-09	14:45	05-Oct-09	13:19	0.00002	0.00012	0.00002	0.00025	< 0.00001	< 0.00001
Strontium [mg/L]	05-Oct-09	09:00	05-Oct-09	13:19	0.159	0.161	0.160	0.166	0.0122	0.0122
Titanium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:19	0.0005	0.0004	0.0005	0.0004	0.0004	0.0001
Thallium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:19	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Uranium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:19	0.0143	0.0116	0.0144	0.0219	0.000654	0.00079
Vanadium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:19	0.00009	0.00004	0.00004	< 0.00003	0.00007	0.00007
Zinc [mg/L]	02-Oct-09	14:45	05-Oct-09	13:19	0.005	0.004	0.004	0.004	0.004	0.005

Ra226 subcontracted to Becquerel Labs.

Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

OnLine LIMS

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Env ICP-MS Metals

Project : 09-1663

October 7, 2010

Ecometrix
Attn : Erin Clyde

6800 Campobello Road, Mississauga
Canada, L5N 2L8
Phone: 905-794-2325, Fax:905-794-2338

Date Rec. : 01 October 2009
LR Report: **CA10064-OCT09**

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report (QC Report)

Analysis	11: MDL	12: QC - Blank	13: QC - STD % Recovery	14: QC - DUP % Recovery
Sulphate [mg/L]	0.2	< 0.2	98%	102%
Acidity [mg/L as CaCO3]	2	3	98%	102%
Total Organic Carbon [mg/L]	1	< 1	91%	100%
Total Inorganic Carbon [mg/L]	0.2	0.2	97%	100%
Hardness [mg/L as CaCO3]	0.5	< 0.5	---	---
Aluminum [mg/L]	0.01	< 0.01	99%	---
Arsenic [mg/L]	0.0002	< 0.0002	106%	---
Barium [mg/L]	0.00001	< 0.00001	122%	---
Beryllium [mg/L]	0.00002	< 0.00002	104%	---
Boron [mg/L]	0.0002	< 0.0002	96%	---
Bismuth [mg/L]	0.00001	< 0.00001	109%	---
Calcium [mg/L]	0.03	< 0.03	101%	---
Cadmium [mg/L]	0.000003	0.000003	99%	---
Cobalt [mg/L]	0.000002	< 0.000002	102%	---
Chromium [mg/L]	0.0005	< 0.0005	102%	---
Copper [mg/L]	0.0005	< 0.0005	102%	---
Iron [mg/L]	0.01	< 0.01	102%	---
Potassium [mg/L]	0.01	< 0.01	98%	---
Lithium [mg/L]	0.002	< 0.002	98%	---
Magnesium [mg/L]	0.003	< 0.003	99%	---
Manganese [mg/L]	0.00001	< 0.00001	107%	---
Molybdenum [mg/L]	0.00001	< 0.00001	99%	---
Sodium [mg/L]	0.01	< 0.01	93%	---
Nickel [mg/L]	0.0001	< 0.0001	100%	---
Phosphorus [mg/L]	0.01	< 0.01	100%	---
Lead [mg/L]	0.00002	< 0.00002	106%	---
Sulphur [mg/L]	0.01	< 0.01	98%	---
Antimony [mg/L]	0.0002	< 0.0002	101%	---
Selenium [mg/L]	0.001	< 0.001	102%	---
Silica [mg/L]	0.01	< 0.01	104%	---
Tin [mg/L]	0.00001	< 0.00001	96%	---
Strontium [mg/L]	0.0001	< 0.0001	100%	---
Titanium [mg/L]	0.0001	< 0.0001	96%	---
Thallium [mg/L]	0.0002	< 0.0002	107%	---

SGS Canada Inc.
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Env ICP-MS Metals

Project : 09-1663

LR Report : **CA10064-OCT09**

Analysis	11: MDL	12: QC - Blank	13: QC - STD % Recovery	14: QC - DUP % Recovery
Uranium [mg/L]	0.000001	0.000001	1065	---
Vanadium [mg/L]	0.00003	< 0.00003	107%	---
Zinc [mg/L]	0.001	< 0.001	104%	---

Ra226 subcontracted to Becquerel Labs.

Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

OnLine LIMS

Radium-226 Release Controls in the Panel TMA

EcoMetrix Incorporated

CYCLE III SPECIAL STUDIES – RADIUM-226 RELEASE CONTROLS IN THE PANEL TMA

Report prepared for:

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Elliot Lake, ON

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EcoMetrix
INCORPORATED

CYCLE III SPECIAL STUDIES – RADIUM-226 RELEASE CONTROLS IN THE PANEL TMA

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Ronald V. Nicholson, Ph.D.
Project Principal

EXECUTIVE SUMMARY

The Panel Site (the Site) is a decommissioned uranium mine property located approximately 19 km northeast of the City of Elliot Lake and immediately north of Quirke Lake. The Site is owned and managed by Rio Algom Limited (RAL).

EcoMetrix Incorporated (EcoMetrix) was retained by RAL to complete a directed study that focused on the release of Ra-226 from the submerged tailings and treatment solids to the basin waters at the Panel Tailings Management Area (TMA).

The objectives of this investigation were to evaluate Ra-226 activities in solids, porewater and basin waters to develop an understanding of the controls on Ra-226 releases to the basin waters and to provide estimates for Ra-226 activities that may be observed in the basin waters in the future.

As part of the Environmental Impact Statement (EIS) for the Panel Mine, predictive modeling using the Uranium Tailings Assessment Program (UTAP.3) was performed to predict future Ra-226 activities and sulphate concentrations in porewater and basin water in the Panel TMA. The predicted Ra-226 activities were explained by the following conceptual model. Radium-226 activities in the Panel are related to sulphate concentrations because the source of Ra-226 is the dissolution of Ra-226 bearing sulphate precipitates, such as gypsum ($CaSO_4{\cdot}2H_2O$) and barite ($BaSO_4$). The EIS stated that in the first 100 years, the major source of Ra-226 in the porewater and basin water will be controlled by the dissolution of gypsum that contains co-precipitated Ra-226 ($Ca,RaSO_4{\bullet}2H_2O$). Once gypsum is depleted from the solids after approximately 100 years, the Ra-226 activities in solution will be controlled by the dissolution of barite that contains co-precipitated Ra-226 ($Ba,RaSO_4$). Therefore, solubility theory suggests that the Ra-226 activities will be depressed if sulphate concentrations remain high, for example near gypsum saturation, and could increase when sulphate concentrations decline.

Two stations were sampled in the Panel South Basin in September 2009 to obtain representative samples to quantify activities/concentrations of Ra-226 and other constituents that can potentially play a role in Ra-226 mobility in the basin waters. Where appropriate, data from the South Basin, Main Basin and Pond C collected during a 2006 field campaign were included in this report to provide a more thorough description of Ra-226 activities and mobility in the Panel TMA.

The investigation focused on Ra-226 in solids, porewater and basin waters at the Panel TMA. This approach was taken because it was understood that any release of Ra-226 to the basin waters would be initiated in the solid phase and that the release from solids would be reflected by the concentrations in the porewaters before eventual release to the overlying water.

Two mechanisms that could potentially control Ra-226 and barium activities/concentrations in the porewater, sorption and solubility controls were considered in this study. The first mechanism, sorption, can be represented by a Kd model and assumes that Ra-226 is distributed between solids and water so that the activities in the water are linearly correlated to the activities in the solids. The second mechanism, solubility, assumes that barium, for example, is distributed between the solids and water on the basis of thermodynamic solubility. The solubility model infers that the concentration of a constituent in the water is independent of the content in the solids, but will depend on the concentration of the companion ion in the water phase. These two models may not be mutually exclusive, and therefore, both mechanisms may influence Ra-226 and barium activities/concentrations in porewater.

Plots for Ra-226 and barium activities/concentrations in solids and porewater showed that the sorption equilibrium (or Kd) model does not dominate the solids-porewater interactions at the Panel TMA.

Strong correlations between Ra-226 and barium in the tailings, treatment solids and porewater samples supported a similar mechanism for the formation of Ra-226 and barium solids and suggested that similar mechanisms control the Ra-226 activities and barium concentrations in porewater.

Inverse correlations between barium and sulphate and between Ra-226 and sulphate in porewaters indicated that the solubility of a solid phase controls the barium concentrations and Ra-226 activities in porewater. The theoretical solubility of barium and sulphate in equilibrium with $BaSO_4$ solids provided further evidence that barium concentrations, and therefore Ra-226 activities, in porewater are controlled by sulphate concentrations.

The inverse relationship between Ra-226 and calcium indicated that Ra-226 activities in porewater are not directly controlled by gypsum dissolution as the conceptual model in the EIS suggests. Instead, the inverse correlation between Ra-226 and calcium results from indirect controls by gypsum related to the linkage between high calcium and sulphate in the presence of gypsum. The sulphate concentration controls Ra-226 activities in the porewater; therefore the presence of gypsum in the tailings solids indirectly controls the Ra-226 activities. This does not contradict the conceptual model in the EIS but provides a refinement for interpretation of the model.

Solubility theory suggests that barium and Ra-226 concentrations/activities will increase as sulphate concentrations decrease. Results from Pond C (PW06) with sulphate concentrations in porewater near 50 mg/L, exhibited Ra-226 activities in porewaters in the range of 4.1 to 5.5 Bq/L. These results are consistent with results from the study in Cell 14 at Quirke that showed when sulphate concentrations in porewater were in the range of 6 to 30 mg/L, the Ra-226 activities in porewater were between 3 and 7 Bq/L, with Ra-226 in the top portions of the tailings solids not exceeding 5 Bq/L.

Together, these results indicate that the maximum Ra-226 activity of 5.5 Bq/L measured in the porewater at the Panel TMA provides a reasonable upper-bound for Ra-226 activities that could be expected in the submerged solids porewater.

Concentration gradients between Ra-226 activities in porewater and basin water imply upward diffusion and mass transport of Ra-226 from porewater to the overlying water. At the Panel TMA, there are no external inputs of Ra-226; therefore diffusive transport is the primary mechanism for Ra-226 release to the basin water.

A total Ra-226 load of 560 MBq/a was calculated from diffusive flux calculations and agreed well with the Ra-226 load of 547 MBq/a estimated from routine monitoring data. Radium-226 activities in the outflow from the Panel TMA resulting from diffusive flux were estimated to be in the range of 0.25 to 0.96 Bq/L. These values agree well with the average Ra-226 activity of 0.5 Bq/L from routine monitoring at the South Basin outflow (P-13) for the 2006 through 2009 time period. The diffusive flux calculations provided strong evidence that the radium activities in the overlying basin water are controlled by diffusive flux of Ra-226 from the porewater in the submerged tailings.

Predicted Ra-226 activities that could occur in the basin water as a result of diffusive flux with the observed upper limit of Ra-226 activity of 5.5 Bq/L in porewater were in the range of 0.65 and 1.79 Bq/L. These calculations provide an indication of the potential range of Ra-226 activities in basin water that could be observed if porewater activities approach the maximum activities in porewater associated with the lowest sulphate concentrations of about 50 mg/L at the Panel TMA.

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1.0 INTRODUCTION

The Panel Site (the Site) is a decommissioned uranium mine property located approximately 19 km northeast of the City of Elliot Lake and immediately north of Quirke Lake (**Figure 1.1**). The Site is owned and managed by Rio Algom Limited (RAL).

EcoMetrix Incorporated (EcoMetrix) was retained by RAL to complete a directed study that focused on the release of Ra-226 from the submerged tailings and treatment solids to the basin waters at the Panel Tailings Management Area (TMA).

Routine monitoring at the Panel Mine Site is conducted as part of three directed programs. The Serpent River Watershed Monitoring Program (SRWMP) is a comprehensive watershed monitoring program that was implemented to replace the various, mine-specific environmental monitoring programs at each mine site. The Source Area Monitoring Program (SAMP) was developed to monitor the nature and quantity of constituents that discharge from the TMAs to the Serpent River Watershed. The TMA Operational Monitoring Program (TOMP) was designed to evaluate the performances of the TMAs.

EcoMetrix completed performance evaluations of the SAMP and TOMP results to 2008 (EcoMetrix, 2008). As part of the review, and where appropriate, special studies were recommended to complement the monitoring programs as well as to refine the understanding of the long-term performances of the tailings facilities. While Ra-226 activities in the Panel basins remain within Ra-226 release model sensitivity analysis ranges (0.4 Bq/L to 1.4 Bq/L) and within current treatment plant capacity ranges, activities reported in the State of Environment Report (Minnow, 2008) were above peak activities as predicted in Environmental Impact Statements (Rio Algom, 1995). Therefore, it was recommended that a special study be conducted at the Panel TMA to reduce the uncertainty related to the release of Ra-226 to the basin waters.

1.1 Objectives and Scope of Work

The objectives of this study were to investigate Ra-226 activities in solids, porewater and basin waters to develop an understanding of the controls on Ra-226 releases to the basin waters and to provide estimates for Ra-226 activities that may be observed in the basin waters.

The scope of work for this investigation included the following:

- review of routine monitoring data from the Panel TMA;
- review and compilation of data collected from a previous field study conducted by DES in 2006;

- collection of core samples and analysis of solids, porewaters and surface waters from two locations within the Panel South Basin;

- data assessment of constituents that can potentially play a role in Ra-226 mobility;

- assessment of Ra-226 and other constituent activities and concentrations in the solids, porewater and basin water to understand controls for Ra-226 release to the basin waters; and

- assessment of ranges of Ra-226 activities that could develop in basin waters associated with a range of Ra-226 activities in porewater.

2.0 BACKGROUND

The following section provides background information on the Panel TMA, a discussion of the theoretical controls on Ra-226 release to overlying waters, a summary of relevant trends observed for the routine monitoring results at the Panel TMA and a summary of results from the 2006 field study.

2.1 Panel TMA Configuration

The Panel mine and mill operated from 1958 to 1961, and again from 1979 to 1990, following rehabilitation and upgrading. The milling process consisted of a hot dilute sulphuric acid leach followed by removal of the uranium via precipitation of ammonium diuranate (yellow cake). Prior to discharge to the TMAs, the acidic slurry (i.e., tailings) generated during the milling process were neutralized with lime. A total of 16 million tonnes of tailings and waste rock were deposited in two natural basins, creating the Panel Main Basin and the Panel South Basin. Collectively, these areas are referred to as the Panel TMA (**Figure 2.1**).

Starting in 1974 and until construction of the new plant in 1978, lime and barium chloride were mixed in a small treatment plant adjacent to the mill and pumped to the basins via a two-inch line during the frost-free season. Treatment solids settled in what is now the South Basin and treated effluent was discharged to Rochester Creek via Dam A (**Figure 2.1**). In 1978, the Panel TMA was upgraded to the current TMA configuration. The water from the Main Basin was directed to flow to the South Basin. The effluent treatment plant (ETP) was re-located to the southern end of Panel South Basin (Dam F) and settling ponds were constructed to receive the treated water and allow treatment solids to settle prior to discharge into Quirke Lake.

The Main Basin contains tailings produced in the milling operation. The South Basin contains a small quantity of tailings disposed in the late 1950s, together with treatment solids from the original ETP. Pond C contains small volumes of fine tailings and treatment solids that were deposited prior to construction of the new ETP.

After closure of the mine in 1990, the Panel TMA was flooded. From 1992 to 1999, in-situ lime additions were initiated to neutralize the acidic pond water (Minnow, 2008). The overflow from the South Basin enters the Panel ETP where it is treated with lime and $BaCl_2$ to neutralize acidity and remove Ra-226.

Between 1998 and 1999 the Panel TMA was extended to include Pond C (**Figure 2.1**). This involved the construction of an engineered earth-fill dam at the outlet of Pond C to Rochester Creek. The dam was constructed to control water levels and submerge the fine tailings and treatment solids in Pond C. Currently, Pond C receives seepage from the South Basin through Dam A and run-off from its 65-ha drainage area (Minnow, 2008).

2.2 Conceptual Model for Ra-226 Release

As part of the Environmental Impact Statement (EIS) for the Panel Mine, predictive model simulations using the Uranium Tailings Assessment Program (UTAP.3) were performed to predict future Ra-226 activities and sulphate concentrations in the porewater and basin water in the Panel TMA. The model predicted Ra-226 activities of 0.5 and 1.1 Bq/L in the porewater after approximately 50 and 100 years post-flooding, respectively. The predicted Ra-226 activities in the basin water were 0.2 and 0.4 Bq/L after 50 and 100 years, respectively. Model sensitivity analysis predicted a range in Ra-226 activities between 0.4 and 1.4 Bq/L in the basin water at the Panel TMA. The model predicted sulphate concentrations that remained at 1,600 in the porewater for the first 100 years. Sulphate concentrations in the basin waters were predicted to peak at 100 mg/L in the first 10 years after closure and to steadily decrease to approximately 40 mg/L at 100 years. By 200 years, sulphate concentrations were predicted to decline to 250 and 15 mg/L in the porewaters and basin waters, respectively (Rio Algom, 1995).

The Ra-226 activities predicted in porewater and basin water were explained by the following conceptual model. Ra-226 activities in the Panel TMA are related to sulphate concentrations because the source of Ra-226 is the dissolution of Ra-226 bearing sulphate precipitates, such as gypsum ($CaSO_4 \cdot 2H_2O$) and barite ($BaSO_4$). In the first 100 years, the major source of Ra-226 in the porewater and basin water were expected to be controlled by the dissolution of gypsum that contains co-precipitated Ra-226 ($Ca,RaSO_4 \cdot 2H_2O$). Once gypsum is depleted from the solids after approximately 100 years, the Ra-226 activities in solution were expected to be controlled by the dissolution of barite that contains co-precipitated Ra-226 ($Ba,RaSO_4$) (SENES,1992). Therefore, solubility theory suggests that the Ra-226 activities will be depressed if sulphate concentrations remain high, for example near gypsum saturation, and could increase when sulphate concentrations decline.

2.3 Routine Monitoring Data

This section discusses the routine monitoring of the basin water at the Panel TMA. The locations of the routine monitoring stations are illustrated in **Figure 2.1**. The complete data sets are provided in **Appendix 1**.

2.3.1 Basin Water

Radium-226 activities together with barium and sulphate concentrations are presented as time-trend plots in **Figure 2.2** for stations P-21, P-13 and P-03 that represent the water quality in the outflows from Panel Main Basin, Panel South Basin and Pond C, respectively.

Historically, the Ra-226 activities in the outflow from the Main Basin, P-21, were as high as 21 Bq/L (data not shown on graph), however, these elevated values likely resulted from the flushing of Ra-226 from the porewater during flooding in 1990. Since 1998, Ra-226 activities have remained relatively constant and below 0.5 Bq/L. Barium concentrations in the Main Basin have remained constant ranging from 0.01 to 0.02 mg/L. In the past, sulphate concentrations were as high as 1,200 mg/L. However, since 2006, sulphate concentrations have generally been in the range of 230 to 400 mg/L and exhibit a decreasing trend with time.

Historically, the Ra-226 activities in the outflow from the South Basin, P-13, were as high as 11 Bq/L (data not shown on graph), however, these elevated values likely resulted from the flushing of Ra-226 from the porewater during flooding in 1990. Between 2001 and 2007, Ra-226 activities remained below 1 Bq/L with an overall decreasing trend with time. Since 2007, Ra-226 activities have remained fairly constant at values close to 0.5 Bq/L. Barium concentrations in the South Basin have generally ranged from 0.01 to 0.04 mg/L. In the past, sulphate concentrations were as high as 600 mg/L. However, since 2006, sulphate concentrations have remained close to 200 mg/L and show a decreasing trend with time.

Between 1990 and 2002, Ra-226 activities in the outflow from Pond C, P-03, were variable ranging from 0.05 to 3.7 Bq/L. Since 2002, the Ra-226 activities have remained fairly constant, ranging from 0.2 to 0.9 Bq/L. The decrease in Ra-226 activities in 2002 likely resulted from the flooding of Pond C in 1999. Barium concentrations in Pond C were variable between 1997 and 2006 ranging from less than the detection limit of 0.005 mg/L to 0.05 mg/L. Since 2006, barium concentrations have remained fairly constant ranging from 0.02 to 0.04 mg/L. Prior to flooding Pond C in 1999, sulphate concentrations were variable and ranged from 10 to 421 mg/L. Since 2001, sulphate concentrations have remained low and in the range of 4 to 23 mg/L in the out flow from Pond C.

2.4 Summary of Results from the 2006 Field Study

The results from the 2006 field study at the Panel TMA were incorporated into the discussion of the current investigation and therefore are summarized in this section. Solids and water samples were collected by Denison Environmental Services in October 2006. Samples were submitted to SGS Lakefield for chemical analysis that included a suite of constituents that are known or suspected to play a role in Ra-226 mobility. Summaries of selected results in solids, porewaters and basin waters are provided in **Tables 2.1 to 2.3**. The locations of the sample stations at the Panel TMA from the 2006 field campaign are presented in **Figure 2.3**. The complete data sets are provided in **Appendix 2**.

The activities/concentrations for Ra-226, barium, calcium and sulphate in solids are presented in **Table 2.1**. Solids samples were collected using coring and ponar sampling devices. The bracketed numbers in the sample ID for core samples represent the depth interval that the sample was collected in centimetres. Radium-226 activities in the solids were variable and ranged from 0.61 Bq/g to 19 Bq/g. Barium concentrations generally ranged from 39 to 190 mg/kg, with the exception of two samples, PSB-06-2 (0-4) and PSB-06-3 (12.5-15), that had concentrations of 600 and 390 mg/kg. The concentrations of calcium were variable and ranged from 1,300 to 160,000 mg/kg. Sulphate concentrations generally ranged from less than the detection limit of 0.4% to 12%.

Porewater was extracted from ponar solids samples. The results for Ra-226, barium, calcium and sulphate activities/concentrations in the solids porewater are provided in **Table 2.2**. Radium-226 activities in porewater were in the range of 0.9 to 5.5 Bq/L. Barium and calcium concentrations were in the ranges of 0.04 to 0.21 mg/L and 53 to 519 mg/L, respectively. Sulphate concentrations ranged from 54 to 1,500 mg/L.

The results for Ra-226, barium, calcium and sulphate activities/concentrations measured in the basin waters are presented in **Table 2.3**. Radium-226 activities ranged from 0.14 to 0.82 Bq/L. Barium and calcium concentrations were in the ranges of 0.01 to 0.05 mg/L and 15 to 159 mg/L, respectively. Sulphate concentrations ranged from 6 to 440 mg/L.

3.0 2009 SAMPLE COLLECTION AND PROCESSING

Two stations were sampled in the Panel South Basin to obtain representative samples to quantify the activities/concentrations of Ra-226 and other constituents that theoretically could play a role in Ra-226 mobility in the basin waters. The sample stations were located in areas similar to those sampled by DES in 2006 to provide better resolution of Ra-226 activities in solids and porewater. A site map illustrating the sampling locations is provided in **Figure 2.3**.

3.1 Solids Samples

Solids samples were collected using a 2-inch K-B coring device at station PSB-1 and a 4-inch K-B coring device at PSB-2. A total of 12 and 4 cores were collected at PSB-1 and PSB-2, respectively, to achieve sufficient sample volumes of porewater after extraction from the solids.

The cores were sectioned at 2.5 to 5 cm intervals to depths of 15 or 20 cm. The corresponding intervals from the core sets at each sampling station were composited and placed into dedicated Ziploc bags and stored at 4°C until the porewater samples were extracted.

After the porewater was extracted (described in **Section 3.2.2**) the solids samples were placed into dedicated Ziploc bags and stored at 4°C until analysis. Solids samples were submitted to SGS Lakefield for chemical analysis that included Ra-226, metals, major ions, as well as, sulphur and carbon.

3.2 Porewater Samples

Porewater samples were extracted from the core samples in a field-based laboratory facility within 24 hours of collection. Each composite of 2.5 to 5 cm core intervals was transferred into 750 mL centrifuge bottles. The samples were centrifuged at approximately 3,500 rpm for 45 to 50 minutes. After centrifugation, the porewater was decanted and filtered through a 0.45 µm nylon filter. The pH of the filtered porewater samples was measured and recorded. The samples were then transferred into sample bottles supplied by SGS Lakefield and samples to be analysed for metals and Ra-226 were preserved with nitric acid. All samples were stored at 4°C until analysis.

Porewater samples were sent to SGS Lakefield for chemical analysis of Ra-226, metals, major ions, sulphate and acidity or alkalinity. The Ra-226 analyses were completed by Becquerel Laboratories (Becquerel) under subcontract to SGS Lakefield.

3.3 Basin Water Samples

Basin water samples were collected from the top of the water column and at the solids-water interface at the two stations. Basin water was collected as grab samples from the top of the water column. The solids-water interface samples were collected and composited by siphoning the water above the solids in the core tubes.

All water samples were field filtered through a 0.45 µm disposable nylon filter and the pH values were measured and recorded. Water samples were then transferred into sample bottles supplied by SGS Lakefield and samples to be analysed for metals and Ra-226 were preserved with nitric acid. All samples were stored at 4°C until analysis.

Basin water samples were sent to SGS Lakefield for chemical analysis of Ra-226, metals, major ions, sulphate and acidity or alkalinity. The Ra-226 analyses were completed by Becquerel Laboratories (Becquerel) under subcontract to SGS Lakefield.

3.4 Field Observations

At the time of sample collection observations suggested that solids from sampling station PSB-1 were consistent with treatment solids, while solids from sampling station PSB-2 were more consistent with tailings. The texture of the solids at PSB-1 was fine and the solids were black, white, orange, red and grey in colour, while the texture of the solids at PSB-2 was coarser (silt to sand) and the solids were brown, black and grey in colour. Photographs of one core collected from each station are provided in **Figure 3.1** for illustrative purposes.

After the porewater extraction step, the pH of the porewater was measured and recorded (**Table 3.1**). The pH values in the solids porewater at PSB-1 were in the range of 7.5 to 10.7 and were consistent with expected pH values for lime treatment solids. The pH values in the solids porewater at PSB-2 were lower than those at PSB-1 and were in the range of 6.8 to 7.1. The pH measurements provide support the visual observations that two types of solids, treatment solids and tailings solids were collected in the Panel South Basin.

The presence of treatment solids in the South Basin is consistent with the original TMA configuration. Between 1974 and 1978, treatment solids settled in what is now the South Basin and overlying water discharged to Rochester Creek via Dam A. Sampling station PSB-1 was located upstream of Dam A and along what would have been the flow path for the treated effluent from the original ETP.

The presence of tailings solids at PSB-2 is consistent with the disposal of tailings to the South Basin in the late 1950's. Sampling station PSB-2 was located upstream of the original ETP, therefore little to no influences from settled treatment solids are expected at this location.

4.0 QUALITY ASSURANCE/QUALITY CONTROL

The field campaign that was conducted by EcoMetrix personnel in September 2009 included the collection of samples from three different decommissioned mine sites (Panel, Quirke and Denison) in the Elliot Lake area. The field campaign was carried out to help gain a further understanding of the knowledge gaps identified in the Cycle III SAMP and TOMP performance evaluation.

A detailed quality assessment (DQA) was completed by EcoMetrix to evaluate the quality of the data collected during Cycle III Special Studies Field Campaign. Similar sampling methods and procedures were used at each mine site therefore the data quality assessment incorporated all of the QA/QC data collected during the field sampling campaign. This section provides a summary of the QA/QC for selected constituents that are discussed in this report. Data quality results for the selected constituents are summarized in **Tables 4.1 to 4.3**. Data quality results for all of the constituents analysed and for duplicates and replicates from all studies are provided **Appendix 3**.

The precision of the duplicate and replicate samples were evaluated by calculating the relative percent difference (RPD) as follows:

$$RPD = \frac{2|C_1 - C_2|}{C_1 + C_2} \times 100\%$$

where: C_1 = sample concentration; and

C_2 = replicate (or duplicate) concentration.

The Data Quality Objectives (DQO) for solids samples were less than or equal to a RPD value of 40%. The DQO for water samples were less than or equal to a RPD value of 20%.

For duplicate/replicate samples having concentrations less than five times the detection limit, the DQO was the absolute difference (AD) between the sample and duplicate/replicate that should not have been greater than the detection limit value.

Blind duplicates and replicates of solids and water samples, as well as laboratory blank sample (de-ionized water), were submitted to SGS Lakefield. Duplicate samples were labeled as EC-1 and replicate samples were labeled as EC-2. The duplicate samples are split samples of solids, porewater or basin water collected from a selected core section or sampling station. The solids replicate samples are replicate core sets from sampling station QC14-2 and were sectioned in accordance with study protocols. Replicate water samples were collected from porewater generated from replicate core sections or from replicate basin water sampling. The calculated RPD or AD values for selected constituents are presented in **Tables 4.1 to 4.2**.

4.1 Solids Sample Data Quality Assessment

The DQA for selected constituents in field duplicates from Cores 09-PSB-2 and 09-SR-4 are summarized in **Table 4.1a**. On average, the DQO of 40% was achieved for all selected constituents (Ra-226, barium, calcium, sulphate), with the exception of three exceedances observed in the Core09-PSB-2 duplicate. Calcium and barium had RPD values less than 55% and sulphate had an AD value of 0.3. As these individual values were only marginally above the data quality objectives, there are no impacts on the interpretation of the results.

The DQA for selected constituents in replicate core section intervals of Core09-QC14-2 (0-2.5), (2.5-5) and (5-7.5) are summarized in **Table 4.1b**. On average, the DQO of 40% was achieved for all selected constituents, except for Ra-226 where the average RPD was 48%. For Ra-226 the DQO of 40% was exceeded twice with RPD values of 73% and 48%. For barium the DQO was exceeded twice with RPD values of 51% and 60%. As these individual values were only marginally above the data quality objectives, there are no impacts on the interpretation of the results.

4.2 Water Samples Data Quality Assessment

Two duplicate and 5 replicate water samples were collected and analysed. The duplicate and replicate RPD values were compared to a DQO of ≤20%. The DQA for selected constituents in the water samples are presented in **Tables 4.2a** and **b**.

As shown on **Table 4.2a**, the DQO of 20% in duplicate water samples was achieved for Ra-226, barium and calcium. Duplicate water samples are sample splits of basin water or porewater extracted from sectioned cores. The Ra-266 duplicate sample identification is PW09-EC-1 (5-10) and corresponds to sample PW09-QC14-4 (0-5). The barium and calcium duplicate sample identification PW09-EC-1 (5-10) and corresponds to sample PW09-QC14-3 (0-5). Sulphate duplicates were not analysed because of insufficient sample volume.

As shown on **Table 4.2b**, the DQO of 20% in replicate water samples was achieved on average for Ra-226, barium and calcium, with one DQO exceedance for Ra-226 with an RPD value of 22% in a replicate porewater sample. The average RPD of 21% for sulphate is marginally above the DQO. One DQO exceedance for sulphate had an RPD 40% in a replicate porewater sample.

4.3 Blank Sample Data Quality Assessment

One blank sample was subjected to the porewater extraction process that included centrifugation followed by filtration to determine potential for cross-contamination between samples. The results for selected constituents in the blank are provided **Table 4.3**. The Ra-226 activities and sulphate concentrations were below detection limits of 0.01 Bq/L and 2 mg/L, respectively. The calcium concentration in the blank sample was 0.03 mg/L and met the DQO of 0.06 mg/L. The dissolved barium concentration in the blank was 0.00216 mg/L and exceeded the DQO of 0.00002 mg/L. Barium concentrations measured in most of the water samples for the DQA (**Table 4.3**) are at least two orders of magnitude greater than the barium concentration measured in the blank. Therefore, the barium concentration that may be attributed to cross-contamination was negligible.

4.4 Laboratory Quality Assurance and Quality Control

Laboratory Quality Assurance/Quality Control (QA/QC) included analysis of laboratory blanks and laboratory duplicate sample analyses. The Certificates of Analysis, including internal laboratory QA/QC results, are provided in **Appendix 4** and indicate that the data have acceptable accuracy and precision.

5.0 FIELD AND LABORATORY SAMPLING RESULTS

Selected results from the September 2009 field sampling program are presented in **Figures 5.1 to 5.2** and are summarized in **Tables 5.1 to 5.2**. Concentrations of selected constituents in solids are presented in **Figure 5.1** as depth profiles. **Figure 5.2** presents the activities/concentrations in the basin water samples from each station as well as in the porewater samples with depths that correspond to the depths of the core sample intervals. The depths of the basin water samples plotted above the solids-water interface are not to scale. The actual depths for these samples below surface are provided in **Table 5.2**. The analytical data for all of the constituents analysed in all of the samples from the 2009 field program are provided as Certificates of Analysis in **Appendix 4**.

5.1 Solids Samples

The results for selected constituents from the solids analyses are presented in **Table 5.1** and are presented as depth profiles in **Figure 5.1**.

Radium-226 activities in the solids generally ranged from 2.0 to 6 Bq/g with peak concentrations in the range of 12 to 16 Bq/g in the upper sections of both cores (Core09-PSB-1 (0-2.5) and Core09-PSB-2 (0-5)) and the bottom section Core09-PSB-2 (15-20). Barium concentrations in the solids were higher in Core09-PSB-1 ranging from 320 to 1300 mg/kg compared to the range in concentrations of 190 to 340 mg/kg at Core09-PSB-2. Maximum barium concentrations were measured in the topmost portions of the solids at both locations (Core09-PSB-1 (0-2.5) and Core09-PSB-2 (0-5)).

Higher calcium and sulphate concentrations were also measured in Core09-PSB-1 compared to Core-09-PSB-2. Results from Core09-PSB-1 showed a consistent trend of increasing calcium and sulphate concentrations with depth. Calcium and sulphate concentrations increased with depth from 67,000 to 190,000 mg/kg and from 0.6 to 17%, respectively. In contrast, calcium and sulphate concentrations in Core09-PSB-2 were an order of magnitude lower and remained constant at depth. Calcium and sulphate concentrations at PSB-2 were in the ranges of 7,600 to 9,600 mg/kg and 0.5 to 0.8%, respectively.

Higher calcium and sulphate concentrations in the solids at Core09-PSB-1 compared to those from Core09-PSB-2 are consistent with the field observations that solids from Core09-PSB-1 are treatment solids that were deposited at the time the original ETP was operational.

5.2 Porewater and Basin Water Samples

The results for selected constituents in porewater and basin water samples are presented in **Table 5.2** and are presented as depth profiles in **Figure 5.2**.

The lowest Ra-226 activities were measured at PSB-1 with values ranging from less than the detection limit of 0.01 Bq/L to 0.76 Bq/L. Higher Ra-226 activities in porewater were measured at PSB-2, with a maximum value of 3.2 Bq/L measured in the top 5 cm and values ranging from 1.1 to 1.4 Bq/L at depths between 5 and 20 cm. The low Ra-226 activities measured at PSB-1 are likely a reflection of the treatment solids that were deposited at the time that the original ETP was operational.

Barium concentrations exhibited similar trends to those for Ra-226. The lowest barium concentrations that ranged 0.01 to 0.02 mg/L were measured at PSB-1. Higher barium activities in porewater were measured at PSB-2, with values ranging from 0.03 to 0.04 mg/L.

Calcium and sulphate concentrations exhibited inverse trends to those for Ra-226 and barium. The samples from PSB-1 exhibited the highest calcium and sulphate concentrations that were in the ranges of 193 to 723 mg/L and 410 to 1,800 mg/L, respectively. Lower calcium and sulphate concentrations in the ranges of 76 to 297 mg/L and 190 to 933 mg/L were measured at PSB-2, with the minimum value measured in the top-most interval.

Radium-226 activities and barium concentrations in the basin water were generally similar between sample stations and were in the ranges of 0.31 to 0.65 Bq/L and 0.01 to 0.02 mg/L, respectively, with slightly higher values measured at the solids-water interfaces. Similar trends in the basin water were observed for calcium and sulphate concentrations that were in the ranges of 62 to 74 mg/L and 180 to 410 mg/L, with similar values measured between stations and higher values measured at the solids-water interface.

Depth profiles for Ra-226, barium, calcium and sulphate in porewater and basin water are presented in **Figure 5.2**.

The depth profiles for Ra-226 activities and barium concentrations exhibited trends of highest activities/concentrations measured in the porewater in the topmost samples. Lower Ra-226 activities and barium concentrations were measured at depth in the porewater.

Depth profiles for calcium and sulphate in porewater exhibited similar trends with the lowest concentrations measured in the topmost samples and the highest concentrations measured at depth. The trends for calcium and sulphate are the inverse of those observed for Ra-226 and barium.

Radium-226 and barium activities/concentrations in porewater from the topmost samples were consistently higher than those in the basin waters. Calcium and sulphate concentrations in porewater from the topmost solids samples remained fairly constant with those measured in the overlying water. One exception was the depth profile for sulphate at PSB-1 that exhibited higher sulphate values in porewater from the topmost tailings sample and lower values in the overlying basin water.

6.0 DISCUSSION

This phase of the Cycle III Special Studies was completed to fill knowledge gaps and bound uncertainties related to the control of Ra-226 activities in basin waters. The investigation focused on Ra-226 activities in solids, porewater and basin waters in the Panel TMA. This approach was taken because it was understood that any release of Ra-226 to the basin waters would be initiated in the solid phase and that the release from solids would be reflected by activities/concentrations in the porewaters before eventual release to the overlying water. Where appropriate, data from the South Basin, Main Basin and Pond C collected during the 2006 field campaign were included in this report to provide a more thorough description of Ra-226 activities and mobility at the Panel TMA.

6.1 Solids and Porewater Interactions

Radium-226 activities in the solids and porewater samples ranged from 0.61 to 19 Bq/g (**Tables 2.1** and **5.1**) and from less than the detection limit of 0.01 Bq/L to 5.5 Bq/L (**Tables 2.2** and **5.1**), respectively. This range provides a strong basis to interpret relationships between the solids contents and concentrations in the porewaters.

Two mechanisms that can potentially control Ra-226 and barium activities/concentrations in the porewater include sorption and solubility. These two mechanisms may not be mutually exclusive.

The first mechanism, sorption, is commonly been used to quantify solids-water interactions and can be represented by a distribution coefficient (or Kd with units of L/kg). The Kd can be defined as the activities/concentrations in the solids phase (Bq/kg or mg/kg) divided by the respective activities/concentrations in porewater (Bq/L or mg/L). The Kd model assumes that Ra-226, for example, is distributed between solid and water on the basis of equilibrium sorption reactions. This infers that, for any Kd value, higher activities/concentrations in the solid phase will be reflected by higher activities/concentrations in the porewater.

The second mechanism, solubility, can control concentrations or activities in the porewater and can be quantified by thermodynamic equilibrium reactions. Solubility equilibrium controls assume that barium, for example, is distributed between the solids and water on the basis of solubility theory. This approach infers that activities/concentrations in the porewater are controlled by the dissolution of a solid phase, for example $BaSO_4$, to maintain equilibrium for constituents in the porewater and is consistent with the EIS conceptual model. The solubility model infers that the activity/concentration of a constituent in the water is independent of the content in the solids, but will depend on the concentration of another constituent in the water phase that is also present in the solid phase.

The sorption, or Kd, model and the solubility model may not be mutually exclusive in some environments, therefore, it is important to consider both approaches when understanding Ra-226 release in submerged tailings.

6.1.1 Evidence of Sorption Equilibrium Controls

Plots of Ra-226 and barium activities/concentrations in solids versus their respective Ra-226 activities/concentrations in porewater are shown in **Figure 6.1**. The data in **Figure 6.1** includes solids and porewater activities/concentrations measured in 2006 and 2009.

The water-solids partitioning plot for Ra-226 (**Figure 6.1a**) showed a weak correlation (R^2=0.21) and indicated that higher Ra-226 activities in the solids did not correlate strongly with higher Ra-226 activities in porewater.

The water-solids partitioning plot for barium is provided in **Figure 6.1b**. The regression line exhibited a negative slope indicating that higher concentrations of barium in the solids did not correlate with higher concentrations in the porewater.

The water-solids partitioning plots for Ra-226 and barium showed that activities/concentrations in porewater were not consistent with equilibrium sorption controls. Although the Kd model does not appear to control the solids-porewater system in the Panel TMA, sorption equilibrium controls on Ra-226 and barium activities/concentrations may exist for other geologic materials, as shown in the investigation on Serpent River sediments (EcoMetrix, 2011a). Therefore, the Kd relationships should not be completely dismissed from the interpretation of Ra-226 controls.

6.1.2 Evidence of Solubility Equilibrium Controls

6.1.2.1 Correlations in Solids

Selected relationships between constituents, for example Ra-226 and barium, in the solids are presented in **Figure 6.2**. The data in **Figure 6.2** include solids activities/concentrations measured in 2006 and 2009 samples.

When all of the data from the 2006 and 2009 samples for one constituent in solids versus another constituent in solids were plotted, weak or no correlations were evident as shown in **Figure 6.2a, b, c, d, e, f**. The relationship between calcium and sulphate was an exception. The plot for calcium and sulphate in **Figure 6.2b** exhibited a strong correlation (R^2=0.84) and reflects that the source of these constituents in the tailings solids is the moderately soluble mineral gypsum ($CaSO_4 \cdot 2H_2O$).

Visual inspection of the core samples identified two very different types of solids in the South Basin. Historic operations suggest that the material in the northwest area of the South Basin (Core09-PSB-1) represent treatment solids that were formed when acidic waters were treated with lime and barium chloride and discharged in the basin. The samples from the west central area of the basin (Core09-PSB-2) are considered to be tailings deposited there during the operation of the mill. When the data from solids composed of tailings were plotted separately from those that represent treatment solids, correlations between constituents became evident as shown in **Figure 6.2g, h** and **i**. The tailings are represented by the samples collected in 2006 and those from Core09-PSB-2. The treatment solids are represented by the samples from Core09-PSB-1 and two samples from the 2006 data that contained barium concentrations greater than 300 mg/kg. These two samples were considered to represent treatment solids because they exhibited anomalously high barium concentrations with low Ra-226 activities that were consistent with the PSB-1 values for solids.

Radium-226 and barium in the tailings and treatment solids exhibited correlations with R^2 values of 0.51 and 0.83, respectively (**Figure 6.2g**). These correlations are expected because, chemically, Ra-226 behaves similarly to barium. The relationship between Ra-226 and barium for the treatment solids is consistent with treatment of Ra-226 in the original ETP by the addition of lime for pH control and $BaCl_2$ to form $BaSO_4$ solids that settled out in Panel South Basin. Because Ra-226 behaves similarly to barium, correlations between barium and other constituents were similar to those for Ra-226 and the same constituents.

Correlations between calcium and sulphate with R^2 values of 0.68 and 0.87 for the tailings and treatment solids, respectively, likely reflect the presence of gypsum ($CaSO_4 \cdot 2H_2O$) in both types of solids (**Figure 6.2h**). Gypsum precipitated in the tailings in the mill when lime was added to neutralize the effluent prior to release to the basin. Gypsum also formed when lime was added to the acidic effluent in the ETP.

No correlation between barium and sulphate was observed in the tailings solids (**Figure 6.2i**). The poor correlation between barium and sulphate exists because most of the sulphate is in the form of gypsum resulting in only trace quantities of $BaSO_4$ in the tailings solids, compared to the percentage quantities of gypsum that are present. Any correlation between barium and sulphate that theoretically exists because of the presence $BaSO_4$ solids is lost in the strong correlation between calcium and sulphate due to the dominance of gypsum in the solids.

An inverse correlation for barium and sulphate (R^2=0.65) was observed in the treatment solids (**Figure 6.2i**) suggesting that when more sulphate solids formed, less barium precipitated. This relationship was not expected. Instead, it was expected that when more sulphate precipitated, more barium would also precipitate in the form of $BaSO_4$. However, the inverse relationship likely reflects treatment at the original ETP, whereby, higher acidity and sulphate concentrations required more lime ($Ca(OH)_2$) to neutralize the acidity. As a result, more gypsum was formed.

The higher concentrations of calcium that were added during periods of pH adjustment would have resulted in a competition between the two cations, Ca^{2+} and Ba^{2+}, for the formation of sulphate solids and therefore an inverse correlation between calcium and barium in the precipitated solids would be anticipated. Because calcium is strongly correlated with sulphate, the inverse correlation between barium and calcium (**Figure 6.2k**) translates to an inverse correlation between barium and sulphate (**Figure 6.2i**). As the acidity in the Panel TMA decreased, $BaCl_2$ treatment for Ra-226 removal became more important and less lime would have been added during treatment. The decrease in acidity and lime use would have resulted in larger barium to calcium ratios resulting in relatively greater proportions of precipitated $BaSO_4$ in the treatment solids.

6.1.2.2 Correlations in Porewater

Selected relationships between concentrations of constituents in porewater are presented in **Figure 6.3**. **Figure 6.3** includes porewater activities/concentrations measured in 2006 and 2009 samples.

When all of the data from the 2006 and 2009 field programs are plotted, the correlation between Ra-226 and barium in the porewater had an R^2=0.76 (**Figure 6.3a**). Similar correlations were observed when the data for tailings and treatment solids cores were plotted separately (**Figure 6.3f**). The correlations indicate that Ra-226 in the porewater behaves similarly to barium in porewater. This is supported by similar correlations observed for both barium and Ra-226 with other measured constituents (**Figure 6.3**).

The plots of barium and sulphate in porewater show inverse correlations that are consistent with a solubility control by a solid phase for barium in the porewater. The red and green solid curves in **Figure 6.3b** represent the theoretical solubility of barium and sulphate in equilibrium with $BaSO_4$ solids and show excellent fits to the data. These curves represent equilibrium conditions mathematically as: $K_{sp}=[Ba^{2+}][SO_4^{2-}]$ in which the K_{sp} is the solubility product that is a constant. The solubility relationship was solved using MINTEQ (Gustafsson, 2010) for solutions containing high and low calcium concentrations corresponding to the range of values observed in porewater samples. The concentrations of barium and sulphate are inversely correlated so that as the concentration of one constituent increases, the concentration of the other decreases. The agreement between the measured data and the theoretical solubility curve provides strong evidence for solubility controls on barium in porewater.

When data from the tailings and treatment solids are considered separately, it appears that the treatment solids exhibit a very close agreement with the theoretical solubility as shown in **Figure 6.3g**. The tailings values exhibit good agreement with the theoretical solubility of $BaSO_4$ but with more scatter.

The correlation plots for Ra-226 and sulphate (**Figure 6.3c**) show inverse trends that are similar to the correlation plot for barium and sulphate (**Figure 6.3b**). This further supports the claim that solubility of a solid sulphate phase controls the concentrations of barium, as well as Ra-226, in the porewater. The molar ratio of barium to Ra-226 is approximately $2x10^7$ indicating that only trace concentrations of Ra-226 exist compared to barium in the porewater. By inference, the Ra-226 contents in the sulphate solids should be 7 orders of magnitude lower than those of barium. Because Ra-226 is a trace constituent compared to barium, it is incorporated into a solid phase only by ionic substitution and therefore does not practically affect the solubility of the $BaSO_4$ solid phase.

The correlation plots of Ra-226 and calcium (**Figure 6.3e**) show inverse trends that are similar to the correlation plots for Ra-226 and sulphate (**Figure 6.3c**). The negative correlations between Ra-226 and calcium result from indirect controls by gypsum. When gypsum is present, calcium and sulphate concentrations are high. The inverse correlations between Ra-226 and calcium are therefore related to the linkage between high calcium and high sulphate in the presence of gypsum, and it is the high sulphate that controls Ra-226 to lower concentrations. The conceptual model in the EIS suggested the source of Ra-226 activities in porewater is gypsum dissolution when gypsum solubility controls the concentrations of sulphate and calcium. These results do not contradict the conceptual model in the EIS but provides a refinement of the interpretation of the model.

6.2 Controls on Ra-226 Activities in Porewater

Similar relationships between Ra-226 and barium were observed for both the water-solids partitioning, or Kd, plots and the solubility correlation plots. These relationships provide support that solubility equilibrium controls are acting to control Ra-226 activities and barium concentrations in porewater.

Inverse correlations between barium and sulphate provided strong support for solubility controls on Ra-226 in porewater and indicated that the solubility of a sulphate bearing solid phase controls barium concentrations in porewater. The theoretical solubility curves for barium and sulphate in equilibrium with $BaSO_4$ provided strong evidence that the dissolution of $BaSO_4$ controls barium concentrations in porewater.

Because Ra-226 and barium behave similarly and Ra-226 is also inversely correlated with sulphate, the results indicated that the solubility of the same sulphate phase that controls barium concentrations also controls Ra-226 activities in porewater. Collectively, these results suggest that sulphate concentrations in porewater control the solubility of $(Ba,Ra)SO_4$ solids and therefore control the barium and Ra-226 concentrations/activities in the porewaters associated with $(Ba,Ra)SO_4$ solids.

If Ra-226 activities in porewater are controlled by solubility equilibrium, solubility theory suggests that barium and Ra-226 concentrations/activities will increase as sulphate concentrations decrease. Results from Pond C (PW06) showed the lowest sulphate concentrations in porewater were near 50 mg/L, corresponding to concentrations in the overlying water of about 10 mg/L. The Ra-226 activities in porewaters associated with the lowest sulphate concentrations were in the range of 4.1 to 5.5 Bq/L, corresponding to activities in the overlying water of about 0.5 Bq/L. These results are consistent with results from the study in Cell 14 at Quirke that showed when sulphate concentrations in porewater were in the range of 6 to 30 mg/L, the Ra-226 activities in porewater were between 3 and 7 Bq/L, with Ra-226 in the top portions of the tailings solids not exceeding 5 Bq/L (EcoMetrix, 2011b). The results from Quirke also showed that Ra-226 activities associated with low sulphate concentrations defined upper-bounds for Ra-226 activities in porewater.

Together, these results indicate that the maximum Ra-226 activity of 5.5 Bq/L measured in the porewater at the Panel TMA provides a reasonable upper-bound for Ra-226 activities that could be expected in the submerged solids porewater for existing conditions.

6.3 Porewater and Basin Water Interactions

The Ra-226 activities in porewater provide insight into the potential for release to the basin water. At the Panel TMA, there are no external inputs of Ra-226 and therefore there is one primary mechanism that can release Ra-226 into the basin water. This mechanism is the release of soluble constituents from porewater to the basin waters by diffusion. Because diffusion is controlled by concentration gradients, the activities in the basin waters will always be less than those in the porewaters even when there is little or no flow through the basin.

The release of Ra-226 from porewater in the submerged solids to the basin water by diffusion is supported by the data that show Ra-226 activities in the porewater were greater than those in the overlying basin waters as shown in **Figure 6.4**. Porewater activities in the top portions of the solids were in the range of 0.76 to 5.5 Bq/L and the activities measured in the basin waters immediately above the solids-water interface ranged from 0.17 to 0.82 Bq/L. Radium-226 activities at the top of the water column ranged from 0.14 to 0.41 Bq/L. These results indicate that concentration gradients had developed and imply upward diffusion and mass transport of Ra-226 from the porewater to the overlying basin water.

The concentrations of barium, calcium and sulphate in porewaters and basin waters are also provided in **Figure 6.4**. The concentrations of these constituents showed similar trends to those observed for Ra-226, whereby higher concentrations were measured in the porewater compared to those in the basin waters. These results provide further evidence that the release of constituents in the Panel TMA is controlled by diffusion from the porewater to the water column.

6.4 Water Balance and Ra-226 Loads for the Panel TMA

A water balance was completed to estimate Ra-226 loads from the monitoring data. The observed Ra-226 loads in the South Basin outflow were calculated for comparison with Ra-226 loads estimated from the diffusive flux from the porewater (**Section 6.6**) to verify whether the observed Ra-226 loads could be explained by the dissolution of $(Ba,Ra)SO_4$ solids and subsequent diffusion from porewater to the basin water.

Annual flow rates were estimated to develop a mass balance for Ra-226 loads in the Panel TMA. The loads were calculated from average flows and Ra-226 activities measured from routine monitoring data for the period of 2006 through 2009. The Ra-226 activities measured from routine monitoring for the 2006 through 2009 time period are summarized in **Table 6.1**. The flow rates and estimated loads are presented in **Table 6.2**.

6.4.1 Water Balance

As part of the routine monitoring, outflow from the South Basin is measured at the ETP and was assumed to represent the total flow through the Panel TMA. The annual flow rate for the Panel TMA is dependent on net natural input (NNI) that represents precipitation and runoff minus evaporation. Flow from the South Basin was assumed to be representative of the NNI for the entire TMA. Therefore, the flow rates for the Main and South Basins were calculated as the fraction of the total flow based on the percentage of the watershed each basin represents. Average annual flow rates of approximately 660,000 and 1,100,000 for the Main and South Basins, respectively, were estimated using measured flow data from the South Basin outflow (P-13) for the 2006 through 2009 time period. The average flow rates for the Main and South Basins are presented in **Table 6.2**.

6.4.2 Ra-226 Loads

Radium-226 loads from the Main and South Basins were calculated using the estimated flow rates together with average Ra-226 activities from monitoring data at the outflow (**Table 6.2**). Radium-226 loads for each area were calculated as follows:

$$L = Q \bullet C_{BW} \qquad \text{Eq.1}$$

Where: L = Load (Bq/a);

Q = Flow (m^3/a); and

C_{BW} = Ra-226 activity in the basin water (Bq/L).

The cumulative Ra-226 loads for each basin are presented in **Table 6.2** together with their respective incremental loads. The incremental loads of Ra-226 represent the differences between the Ra-226 exiting and/or entering each basin.

The average Ra-226 load from the Main Basin was approximately 85 MBq/a. The total and incremental Ra-226 loads exiting the South Basin were 547and 462 MBq/a, respectively. The incremental loads indicate that the majority of the Ra-226 load from the Panel TMA originates in the South Basin. The Ra-226 loads from the Main and South Basins represent approximately 16% and 84% of the total load, respectively.

The average Ra-226 activities measured in the South Basin outflow are about 4 times higher than those measured in the Main Basin. Therefore, the higher load from the South Basin is consistent with higher Ra-226 activities in the basin water.

6.5 Ra-226 Flux and Loads from the Submerged Solids

The loads from the South Basin related to the diffusive flux of Ra-226 from the porewater were calculated to verify whether the loads calculated for the South Basin in **Section 6.4.2** could be explained diffusion to the basin water. The results from the calculations are presented in **Table 6.3**.

Radium-226 loads based on the diffusive flux were calculated as follows:

$$L = F \bullet A \qquad \text{Eq.2}$$

Where: L = Load (Bq/a);

F = Mass Flux ($Bq/m^2 \bullet a$);

A = Surface area over which the diffusion is taking place (m^2).

The mass flux was calculated as follows:

$$F = -D_e \bullet \frac{\partial C}{\partial z} \qquad \text{Eq.3}$$

Where: F = Mass Flux ($Bq/m^2 \bullet a$);

D_e = effective diffusion coefficient in the solids porewater (m^2/a);

C = Ra-226 activity in porewater or in the water column (Bq/L); and

z = interface thickness (m).

Typical values for diffusion coefficients (D) in aqueous solutions in a porous medium, neglecting porosity, were obtained from the literature (Spitz and Moreno, 1996). An average value of 8.43×10^{-10} m^2/s (2.66×10^{-2} m^2/a) was considered reasonable for this investigation. In porous media, such as tailings, the effective diffusion coefficient is smaller than that in pure aqueous solution because ions follow a longer path of diffusion through the pore spaces and do not migrate through the solid particles. Therefore, an effective diffusion coefficient, D_e, should be used for tailings and can be represented by:

$$D_e = D \bullet \eta$$

Where: η = porosity

The physical properties of the tailings were considered to be similar to those in Quirke Cell 14, therefore a porosity 0.45 for the tailings of was used (SENES, 2003). With a porosity of 0.45, the value of D_e becomes 3.79×10^{-10} m^2/s (1.20×10^{-2} m^2/a).

The change in Ra-226 activity across the interface, or concentration gradient, was estimated from the 2006 and 2009 sampling data and represents the concentration in porewater from the top 2.5 or 5 cm of the tailings, minus the concentration in water immediately above the solids. Interface thickness values equal to the depths at which the uppermost tailings samples were collected were considered for the calculation of gradients. These depths were 0.025 m for PSB-1 and 0.05 m for all other stations. Sensitivity on the interface thickness was tested using conservative values of 0.01 and 0.02 m. The interface thickness of 0.01 m was considered to represent a conservative upper value for gradients.

The incremental load for Ra-226 for the South Basin ranged from 949 to 191 MBq/a for interface thicknesses between 0.01 and 0.05 metres (**Table 6.3**). Total loads from the South Basin ranged from 1,034 to 276 MBq/a for the assumed range of interface thicknesses. Total loads for the South Basin were calculated from the observed load from the Main Basin in **Table 6.2** plus the calculated load for the South Basin in **Table 6.3**.

Radium-226 activities in the basin water were estimated using the total loads from the South Basin. The estimated Ra-226 activities were in the range of 0.25 and 0.94 Bq/L for the assumed interface thicknesses (**Table 6.3**). When an interface thickness of 0.02 m was used to calculate the diffusive flux, the Ra-226 activity calculated was 0.51 Bq/L. This value agrees well with the average Ra-226 activity of 0.5 Bq/L from routine monitoring at the South Basin outflow (P-13) for the 2006 through 2009 time period (**Table 6.1**). These results indicate that the Ra-226 activities measured in the outflow from the Panel TMA are consistent with Ra-226 loads resulting from a diffusive flux in the tailings and treatment solids porewaters to the basin water.

6.5.1 Estimated Ranges in Ra-226 Activities

The diffusive flux calculations provided strong evidence that upward diffusion of Ra-226 is the primary mechanism for Ra-226 release to the basin water. Sensitivity on flow through the Panel TMA was also tested to provide an estimate for the ranges in Ra-226 activities that may be anticipated in the basin waters as a result of natural variations in flow rates in the basins. The residence time in the South Basin is about 1 year. It is expected that it will require approximately three basin volumes of flow for the Ra-226 activities in the basin water to be substantially shifted from current values either by changes in the water balance in the basin or loading of Ra-226 from the porewater in the submerged tailings. Three basin volumes represent a total time of about three years with a residence time of one year.

Therefore, an averaging period of three years in the South Basin can be considered for variations in flow to the basin. Flow from the Panel TMA is measured at the outflow from the South Basin. The monthly flow data are presented in **Figure 6.5** as a time-trend plot for the period of 1991 (after flooding) through 2009. **Figure 6.5** also shows the 3-year moving average for the flow data that was used to determine representative minimum and maximum flow rates for the Panel TMA for that period. The observed high and low values for the 3-year moving average were 50 and 18 L/s, corresponding to annual flow rates of 1.58 and 0.57 Mm^3/a, respectively. The Ra-226 activities in the basin water were predicted for the high and low flow conditions.

The loads and activities were calculated using an interface thickness of 0.02 m. The estimated Ra-226 activities for the 3-year average high and low flows in the South Basin were 0.35 and 0.96 Bq/L, respectively (**Table 6.4**). These values were similar to the range of annual average values from the routine monitoring data presented in **Table 6.1**.

These results provide further support that Ra-226 activities measured in the outflow from the Panel TMA are consistent with Ra-226 loads resulting from diffusive flux in the porewater to the basin water with variations that are consistent with natural variations in the flow within the basins.

Similar calculations were performed for an estimated upper-bound Ra-226 activity of 5.5 Bq/L in the porewater of the submerged solids. With an activity of 5.5 Bq/L in porewater, the expected Ra-226 activities resulting from diffusive flux could be in the range of 0.65 to 1.79 Bq/L as shown in **Table 6.5**. These calculations provide an indication of Ra-226 activities that could be observed if porewater activities in the top few centimetres of the tailings approach the maximum values that were observed at the Panel TMA.

7.0 SUMMARY OF CONCLUSIONS

The objectives of this investigation were to investigate Ra-226 activities in solids, porewater and basin waters to develop an understanding of the controls on Ra-226 releases to the basin waters and to provide upper-bounds for Ra-226 activities that may be observed in the basin waters.

Two stations were sampled in the Panel South Basin in September 2009 to obtain representative samples of Ra-226 and other constituents that theoretically can potentially play a role in Ra-226 mobility in the basin waters. Where appropriate, data from the South Basin, Main Basin and Pond C collected during a 2006 field campaign were included in this report to provide a more thorough description of Ra-226 activities and mobility in the Panel TMA.

Plots for Ra-226 and barium activities/concentrations in solids and porewater showed that the sorption equilibrium (or Kd) model does not appear to control the solids-porewater interactions at the Panel TMA.

Strong correlations between Ra-226 and barium in the tailings, treatment solids and porewater samples supported a similar mechanism for the formation of Ra-226 and barium solids and suggested that similar mechanisms control the Ra-226 activities and barium concentrations in porewater.

Inverse correlations between barium and sulphate and between Ra-226 and sulphate in porewaters indicated that the solubility of a solid phase controls the barium concentrations and Ra-226 activities in porewater. The theoretical solubility of barium and sulphate in equilibrium with $BaSO_4$ solids provided further evidence that barium concentrations, and therefore Ra-226 activities, in porewater are controlled by sulphate concentrations.

The inverse relationship between Ra-226 and calcium indicated that Ra-226 activities in porewater are not directly controlled by gypsum dissolution as the conceptual model in the EIS suggests. Instead, the inverse correlation between Ra-226 and calcium results from indirect controls by gypsum related to the linkage between high calcium and sulphate in the presence of gypsum. The sulphate concentration controls Ra-226 activities in the porewater; therefore the presence of gypsum in the tailings solids indirectly controls the Ra-226 activities. This does not contradict the conceptual model in the EIS but provides a refinement for interpretation of the model.

Solubility theory suggests that barium and Ra-226 concentrations/activities will increase as sulphate concentrations decrease. Results from Pond C (PW06) sulphate concentrations in porewater near 50 mg/L, with Ra-226 activities in porewaters in the range of 4.1 to 5.5 Bq/L. These results are consistent with results from the study in Cell 14 at Quirke that showed when sulphate concentrations in porewater were in the range of 6 to 30 mg/L, the

Ra-226 activities in porewater were between 3 and 7 Bq/L, with Ra-226 in the top portions of the tailings solids not exceeding 5 Bq/L (EcoMetrix, 2011b).

Together, these results indicate that the maximum Ra-226 activity of 5.5 Bq/L measured in the porewater at the Panel TMA provides a reasonable upper-bound for Ra-226 activities that could be expected in the submerged solids porewater under existing conditions.

Concentration gradients between Ra-226 activities in porewater and basin water imply upward diffusion and mass transport of Ra-226 from porewater to the overlying water. At the Panel TMA, there are no external inputs of Ra-226; therefore diffusive transport is the primary mechanism for Ra-226 release to the basin water.

The Ra-226 loads and activities estimated from the diffusive flux calculations agreed well with the observed Ra-226 loads and activities from routine monitoring data. These results provided strong evidence that releases of Ra-226 from the porewater to the overlying basin water are controlled by diffusive flux.

Predicted Ra-226 activities in the basin water associated with a Ra-226 activity of 5.5 Bq/L in porewater were in the range of 0.65 and 1.79 Bq/L. These calculations provide an indication of Ra-226 activities in basin water that could be observed if porewater activities approach the maximum activities in porewater that were associated with the lowest sulphate concentrations of about 50 mg/L at the Panel TMA.

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TABLES

Table 2.1: Summary of Selected Constituents in Solids from the Panel TMA Sampled in 2006

Sample ID	Depth Interval (cm)	Radium-226 (Bq/g)	Barium (mg/kg)	Calcium (mg/kg)	Sulphate (%)
Core Sample Results					
Main Basin					
PMB-06-1	0-5	4.9	80	31,000	0.8
	12.5-17.5	3.8	39	8,400	2.1
PMB-06-2	0-5	3.4	100	59,000	8.1
	15-20	12	170	42,000	9.9
South Basin					
PSB-06-1	0-4	1.2	61	2,000	1.2
	17.5-20	7.6	150	10,000	3.0
PSB-06-2	0-4	1.2	600	2,000	1.0
	10-12.5	7.8	130	28,000	7.3
PSB-06-3	0-4	1.7	87	37,000	3.4
	12.5-15	0.61	390	160,000	12
Pond C					
PW-06-1	0-5	1.0	98	4,700	0.7
	10-15	7.8	160	2,800	0.5
PW-06-2	0-10	1.2	77	5,600	0.6
	15-20	4.6	48	4,100	1.1
PW-06-3	0-10	1.9	110	1,800	0.4
	15-20	9.6	130	280	<0.4
Ponar Sample Results					
Main Basin					
PMB-06-1	--	2.6	56	24,000	3.1
PMB-06-2	--	11	128	29,000	5.4
South Basin					
PSB-06-3	--	19	142	1,300	1.2
Pond C					
PW-06-1	--	3.7	43	3,500	2.3
PW-06-3	--	12	189	3,600	4.3

Notes:
"--" Depths not recorded for Ponar Samples

Table 2.2: Summary of Selected Constituents in Porewater from the Panel TMA Sampled in 2006

Sample ID	Radium-226	Barium	Calcium	Sulphate
	(Bq/L)	(mg/L)	(mg/L)	(mg/L)
Main Basin				
PMB-06-1	0.88	0.065	241	*564*
PMB-06-2	2.6	0.042	519	*1,503*
South Basin				
PSB-06-3	2.0	0.038	191	*897*
Pond C				
PW-06-1	4.1	0.092	56.4	*53.7*
PW-06-3	5.5	0.211	53.4	*75.3*

Notes:
Porewater extracted from ponar solids samples
Italicized sulphate concentrations indicate values estimated from total sulphur concentrations from ICP-MS scan.

Table 2.3: Summary of Selected Constituents in Basin Water from the Panel TMA Sampled in 2006

Sample ID	Radium-226	Barium	Calcium	Sulphate
	(Bq/L)	(mg/L)	(mg/L)	(mg/L)
Main Basin				
PMB-06-1SW	NS	NS	NS	NS
PMB-06-1SI	0.17	0.014	112	310
PMB-06-2SW	0.14	0.013	117	310
PMB-06-2SI	0.69	0.021	159	440
South Basin				
PSB-06-1SW	NS	NS	NS	NS
PSB-06-1SI	0.50	0.019	82.6	230
PSB-06-2SW	0.62	0.018	84.2	220
PSB-06-2SI	0.50	0.018	83.1	230
PSB-06-3SW	NS	NS	NS	NS
PSB-06-3SI	0.56	0.018	83.8	220
Pond C				
PW-06-1SW	0.41	0.026	17.7	5.8
PW-06-1SI	0.46	0.028	14.5	6.0
PW-06-2SW	NS	NS	NS	NS
PW-06-2SI	0.42	0.032	18.1	6.9
PW-06-3SW	NS	NS	NS	NS
PW-06-3SI	0.82	0.048	25.5	27

NS = not sampled because lack of water depth
SW = top of water column
SI = bottom of water column at solids-water interface

Table 3.1: Porewater pH Values Sampled by EcoMetrix in September 2009

Sample ID	Depth	pH
	(cm)	(pH units)
PW09-PSB-1	(0-2.5)	7.5
PW09-PSB-1	(2.5-5.0)	9.5
PW09-PSB-1	(5.0-7.5)	10.5
PW09-PSB-1	(7.5-10)	10.7
PW09-PSB-1	(10-15)	10.5
PW09-PSB-2	(0-5)	6.7
PW09-PSB-2	(5-10)	6.8
PW09-PSB-2	(10-15)	7.1
PW09-PSB-2	(15-20)	6.7

Notes:
PW - Porewater - Depth refers to "below solids-water interface"

Table 4.1a: Data Quality Assessment Summary for Selected Constituents in Solids - Duplicate Samples

		Parameter			
		Radium-226	Barium	Calcium	Sulphate
		(Bq/g)	(mg/kg)	(mg/kg)	(%)
Method Detection Limit		0.01	0.05	1	0.1
RPD Data Quality Objective		≤ 40%	≤ 40%	≤ 40%	≤ 40%
Sample ID	Core09-PSB-2 (5-10)	4.5	160	7,600	0.6
Replicate ID	CORE 09-EC-1 (0-5)	4.1	94	4,600	0.3
RPD (%) or AD		9	**52**	**49**	**0.3**
Sample ID	Core09-SR-4 (10-15)	2.1	440	7,300	0.2
Replicate ID	CORE 09-EC-1 (5-10)	1.6	450	7,400	0.1
RPD (%) or AD		27	2	1	0.1
Average RPD or AD		***18***	***27***	***25***	***0.2***
Count		*3*	*3*	*3*	*3*

Notes:

RPD - relative percent difference; is calculated for analytes with concentrations greater than or equal to five times the detection limit and should be less than or equal to 40%

AD - absolute difference; for samples having concentrations less than five times the detection limit, the difference between the sample and duplicate, or difference between the sample or duplicate and the detection limit if either the sample or duplicate analyte concentration is below detection limit; should not be greater then the detection limit

BD - Sample and/or replicate had analyte concentrations below detection limit

"--" Indicates parameter was not measured

Boldface type and shaded indicates that Data Quality Objective was not achieved

Table 4.1b: Data Quality Assessment Summary for Selected Constituents in Solids - Replicate Samples

		Parameter			
		Radium-226	**Barium**	**Calcium**	**Sulphate**
		(Bq/g)	(mg/kg)	(mg/kg)	(%)
Method Detection Limit		0.01	0.05	1	0.1
RPD Data Quality Objective		≤ 40%	≤ 40%	≤ 40%	≤ 40%
Sample ID	CORE 09-QC14-2 (0-2.5)	4.3	150	190	0.1
Replicate ID	CORE 09-EC-2 (0-2.5)	7.0	280	230	0.1
RPD (%) or AD		**48**	**60**	19	0
Sample ID	CORE 09-QC14-2 (2.5-5)	6.5	220	130	0.1
Replicate ID	CORE 09-EC-2 (2.5-5)	8.3	370	110	0.1
RPD (%) or AD		24	**51**	17	0
Sample ID	CORE 09-QC14-2 (5-7.5)	9.3	330	79	0.1
Replicate ID	CORE 09-EC-2 (5-7.5)	20.0	310	63	0.1
RPD (%) or AD		**73**	6	23	0
Average RPD or AD		***48***	***39***	***19***	***0***
Count		*3*	*3*	*3*	*3*

Notes:

RPD - relative percent difference; is calculated for analytes with concentrations greater than or equal to five times the detection limit and should be less than or equal to 40%

AD - absolute difference; for samples having concentrations less than five times the detection limit, the difference between the sample and duplicate, or difference between the sample or duplicate and the detection limit if either the sample or duplicate analyte concentration is below detection limit; should not be greater then the detection limit

BD - Sample and/or replicate had analyte concentrations below detection limit

"--" Indicates parameter was not measured

Boldface type and shaded indicates that Data Quality Objective was not achieved

Table 4.2a: Data Quality Assessment Summary for Selected Constituents in Water - Duplicate Samples

		Parameter			
		Radium-226 (Bq/L)	**Barium** (mg/L)	**Calcium** (mg/L)	**Sulphate** (mg/L)
Method Detection Limit		0.01	0.00001	0.03	0.2
RPD Data Quality Objective		≤ 20%	≤ 20%	≤ 20%	≤ 20%
Sample ID	SW09-SR-4B	0.30	0.222	11.2	25
Duplicate ID	PW09-EC-1 (0-5)	0.30	0.221	11.4	--
RPD (%) or AD		0	0	2	--
Sample ID	PW09-QC14-3 (0-5)	--	0.333	6.12	54
Duplicate ID	PW09-QC14-4 (0-5)	4.1	--	--	560
Duplicate ID	PW09-EC-1 (5-10)	4.7	0.335	6.06	--
RPD (%) or AD		14	1	1	--
Average RPD or AD		***7***	***1***	***1***	**--**
Count		*2*	*2*	*2*	--

Notes:
RPD - relative percent difference; is calculated for analytes with concentrations greater than or equal to five times the detection limit and should be less than or equal to 20%
AD - absolute difference; for samples having concentrations less than five times the detection limit, the difference between the sample and duplicate, or difference between the sample or duplicate and the detection limit if either the sample or duplicate analyte concentration is below detection limit; should not be greater then the detection limit
BD - Sample and/or replicate had analyte concentrations below detection limit
"--" Indicates parameter was not analysed because of insufficient sample volume
Boldface type and shaded indicates that Data Quality Objective was not achieved

Table 4.2b: Data Quality Assessment Summary for Selected Constituents in Water - Replicate Samples

		Parameter			
		Radium-226	**Barium**	**Calcium**	**Sulphate**
		(Bq/L)	(mg/L)	(mg/L)	(mg/L)
Method Detection Limit		0.01	0.00001	0.03	0.2
RPD Data Quality Objective		≤ 20%	≤ 20%	≤ 20%	≤ 20%
Sample ID	SW09-QC14-2T	0.82	0.104	5.69	72
Replicate ID	SW09-EC-2T	0.78	0.108	5.69	85
RPD (%) or AD		5	4	0	17
Sample ID	SW09-QC14-2B	0.91	0.108	5.55	32
Replicate ID	SW09-EC-2B	0.85	0.114	5.63	36
RPD (%) or AD		7	5	1	12
Sample ID	PW09-QC14-2 (0-2.5)	3.6	0.309	8.79	32
Replicate ID	PW09-EC-2 (0-2.5)	2.9	0.285	7.28	27
RPD (%) or AD		**22**	8	19	17
Sample ID	PW09-QC14-2 (2.5-5)	2.8	0.308	5.68	12
Replicate ID	PW09-EC-2 (2.5-5)	3.3	0.337	5.35	18
RPD (%) or AD		16	9	6	**40**
Sample ID	PW09-QC14-2 (5-7.5)	5.9	0.519	6.06	12
Replicate ID	PW09-EC-2 (5-7.5)	5.4	0.487	5.54	--
RPD (%) or AD		9	6	9	--
Average RPD or AD		***12***	***7***	***7***	***21***
Count		*5*	*5*	*5*	*4*

Notes:
RPD - relative percent difference; is calculated for analytes with concentrations greater than or equal to five times the detection limit and should be less than or equal to 20%
AD - absolute difference; for samples having concentrations less than five times the detection limit, the difference between the sample and duplicate, or difference between the sample or duplicate and the detection limit if either the sample or duplicate analyte concentration is below detection limit; should not be greater then the detection limit
BD - Sample and/or replicate had analyte concentrations below detection limit
"--" Indicates parameter was not analysed because of insufficient sample volume
Boldface type and shaded indicates that Data Quality Objective was not achieved

Table 4.3: Data Quality Assessment Summary for Selected Constituents in Blank Sample

Analysis	Units	Detection Limit	Data Quality Objective	Blank 1
Radium-226	Bq/L	0.01	0.02	<0.01
Barium	mg/L	0.00001	0.00002	**0.00216**
Calcium	mg/L	0.03	0.06	0.03
Sulphate	mg/L	2	4	<2

Notes:
Boldface type and shaded indicates that Data Quality Objective was not achieved

Table 5.1: Summary of Selected Constituents in Solids from Panel South Basin Sampled in September 2009

Sample ID	Depth Interval	Radium-226	Barium	Calcium	Sulphate
	(cm)	(Bq/g)	(mg/kg)	(mg/kg)	(%)
CORE 09-PSB-1	(0-2.5)	12	1,300	67,000	0.6
CORE 09-PSB-1	(2.5-5)	4.9	510	140,000	9.8
CORE 09-PSB-1	(5-7.5)	1.6	400	140,000	14
CORE 09-PSB-1	(7.5-10)	2.8	360	180,000	16
CORE 09-PSB-1	(10-15)	2.2	320	190,000	17
CORE 09-PSB-2	(0-5)	16	340	9,600	0.8
CORE 09-PSB-2	(5-10)	4.5	160	7,600	0.6
CORE 09-PSB-2	(10-15)	5.6	180	9,400	0.5
CORE 09-PSB-2	(15-20)	14	190	7,600	0.6

Table 5.2: Selected Constituents in Basin Water and Porewater in Panel South Basin Sampled in September 2009

Sample ID	Depth Interval	Radium-226	Barium	Calcium	Sulphate
	(cm)	(Bq/L)	(mg/L)	(mg/L)	(mg/L)
SW09-PSB-1T	0	0.34	0.013	62.2	180
SW09-PSB-1B	800	0.65	0.020	74.4	410
PW09-PSB-1	(0-2.5)	0.76	0.017	193	410
PW09-PSB-1	(2.5-5)	0.01	0.009	373	1,100
PW09-PSB-1	(5-7.5)	0.02	0.006	506	1,300
PW09-PSB-1	(7.5-10)	<0.01	0.006	787	1,600
PW09-PSB-1	(10-15)	<0.01	0.006	723	1,800
SW09-PSB-2T	0	0.31	0.014	64.5	180
SW09-PSB-2B	400	0.39	0.016	64.1	180
PW09-PSB-2	(0-5)	3.20	0.044	76.4	190
PW09-PSB-2	(5-10)	1.18	0.034	106	250
PW09-PSB-2	(10-15)	1.10	0.027	138	*369*
PW09-PSB-2	(15-20)	1.40	0.038	297	*933*

Notes:
SW - Basin Water - Depth refers to "below surface"
PW - Porewater - Depth refers to "below solids-water interface"
Italicized sulphate concentrations indicate values estimated from total sulphur concentrations from ICP-MS scan

Table 6.1: Average Ra-226 Activities (Bq/L) in the Main Basin and South Basin Outflows from Routine Monitoring

Year	Panel Main Basin (P-21)		Panel South Basin (P-13)	
	Average	**Count**	**Average**	**Count**
2006	0.12	2	0.57	6
2007	0.13	12	0.57	13
2008	0.13	3	0.41	11
2009	0.12	2	0.44	8
Average for 2006 through 2009	**0.13**	**19**	**0.50**	**38**

Note:
All Ra-226 activities are reported in Bq/L

Table 6.2: Average Annual Flow Rates and Radium-226 Loads at the Panel TMA

	Radium-226 Activities in Basin Waters[a]	Average Annual Flow Rate (m^3/a)[a,b,c]	Ra-226 Load (MBq/a)	Incremental Ra 226 Load (MBq/a)
Panel Main Basin				
[c]Average	0.13	656,582	85	85
Count	20	--	--	--
Panel South Basin				
[c]Average	0.50	1,094,303	547	462
Count	38	--	--	--

Notes:
[a] From routine monitoring data
[b] Panel Main Basin flow represents 60% of the total flow through the Panel TMA (CCL, 1992)
[c] Average for 2006 to 2009 period

Table 6.3: Ra-226 Fluxes, Loads and Activities in the Panel TMA for different Interface Thicknesses

Calculation	Units	Sample ID	Interface Thickness (m)		
			0.01	0.02	0.05
Panel South Basin					
Activity	(Bq/L)	PSB-09-1	Basin Water[a]		0.65
			Porewater		0.76
		PMB-09-1	Basin Water[a]		0.39
			Porewater		3.2
Activity Gradient	(Bq/L•m)	PSB-09-1[b]	11	6	4
		PSB-09-2	281	141	56
		Average [c]	***254***	***127***	***51***
Flux	(MBq/m^2•a)	PSB-09-1[b]	1.32E-04	6.58E-05	5.27E-05
		PSB-09-2	3.36E-03	1.68E-03	6.73E-04
		Average	***3.04E-03***	***1.52E-03***	***6.11E-04***
Diffusive Load to the South Basin	(MBq/a)	***Average***	***949***	***474***	***191***
Total Load to Basin Water[d]	(MBq/a)	***Average***	***1,034***	***560***	***276***
Calculated Activities in Basin Water	(Bq/L)	***Average***	***0.94***	***0.51***	***0.25***

Notes:

[a] Basin water activities taken from samples at solids-water interface

[b] Top most sample from 0 to 2.5 cm interval giving an interface thickness of of 0.025 m

[c] Weighted Average assuming the treatment solids from PSB-09-1 represent 10% of the solids in the South Basin

[d] Total Load to Basin Water equals the calculated load from the South Basin plus the measured load from the Main Baisin presented in Table 6.2

Average flow values from Table 6.2 were used to calculate Ra-226 activities in basin water

Solids surface area assumed to be 80% of the basin water surface area reported by CCL (1992)

Table 6.4: Predicted Range of Ra-226 Activities in Basin Water Based on Average Porewater Activities and a Range of Flow Rates

Calculation	Units	Flow (m^3/a)[a]	
		1,577,880	568,037
Panel South Basin			
Activity	(Bq/L)	Basin Water[b]	0.50
		Porewater[c]	3.0
Activity Gradient	(Bq/L•m)	123	123
Flux	(MBq/m^2•a)	1.47E-03	1.47E-03
Load from South Basin	(MBq/a)	***459***	***459***
Total Load to Basin Water[d]	(MBq/a)	***545***	***545***
Calculated Activities in Basin Water	(Bq/L)	***0.35***	***0.96***

Notes:
[a] Flow values represent high and low 3-year moving averages from Figure 6.5
[b] Average Ra-226 Activity in South Basin Water from Routine Monitoring Data for the 2006 through 2009 time period (Table 6.1)
[c] Weighted Average assuming the treatment solids from PSB-09-1 represent 10% of the solids in the South Basin
[d] Total Load to Basin Water equals the calculated load from the South Basin plus the measured load from the Main Baisin presented in Table 6.2
Interface thickness equals 0.02 m
Solids surface area assumed to be 80% of the basin water surface area reported by CCL (1992)

`

Table 6.5: Predicted Range of Ra-226 Activities in Basin Water Based on a Porewater Activity of 5.5 Bq/L

Calculation	Units		Flow (m^3/a)[a]
		1,577,880	568,037
Panel South Basin			
Activity	(Bq/L)	Basin Water[b,c]	0.50
		Porewater	5.5
Activity Gradient	(Bq/L•m)	250	250
Flux	(MBq/m^2•a)	2.99E-03	2.99E-03
Load from South Basin	(MBq/a)	***934***	***934***
Total Load to Basin Water[d]	(MBq/a)	***1,019***	***1,019***
Calculated Activities in Basin Water	(Bq/L)	***0.65***	***1.79***

Notes:

[a] Flow values represent high and low 3-year moving averages from Figure 6.5

[b] Average Ra-226 Activity in South Basin Water from Routine Monitoring Data for the 2006 through 2009 time period (Table 6.1)

[c] Weighted Average assuming the treatment solids from PSB-09-1 represent 10% of the solids in the South Basin

[d] Total Load to Basin Water equals the calculated load from the South Basin plus the measured load from the Main Baisin presented in Table 6.2

Interface Thickness equals 0.02 m

Solids surface area assumed to be 80% of the basin water surface area reported by CCL (1992)

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FIGURES

N
W
E
S
Flack Lake
Semiwite Lake
Rochester Lake
Panel TMA
Ten Mile Lake
Quirke TMA
Quirke I
Quirke II
Panel
Dunlop Lake
Evans Lake
Denison
Denison TMA1 & 2
Quirke Lake
Cinder Lake
Spanish American
Canmet
Stanrock
Summers Lake
Spanish American TMA
Stanrock TMA
Hwy 108
May Lake
Stanleigh TMA
McCabe Lake
Whiskey Lake
Stanleigh
Milliken TMA
Hough Lake
Milliken
Elliot Lake
Lacnor TMA
Lacnor
Nordic TMA
Pecors Lake
Mather Lake
City of Elliot Lake
Nordic
Buckles
Buckles Tailings¹
Nordic Lake
McCarthy Lake
Hwy 108
Pronto TMA
Pronto
Serpent River
Serpent Harbour
North Channel Lake Huron
Legend
Streams
Lakes included in SRWMP
Tailings Management Areas
Minesites
Highways
Secondary Roads
Trails
Direction of Flow
6
0
6 Kilometers
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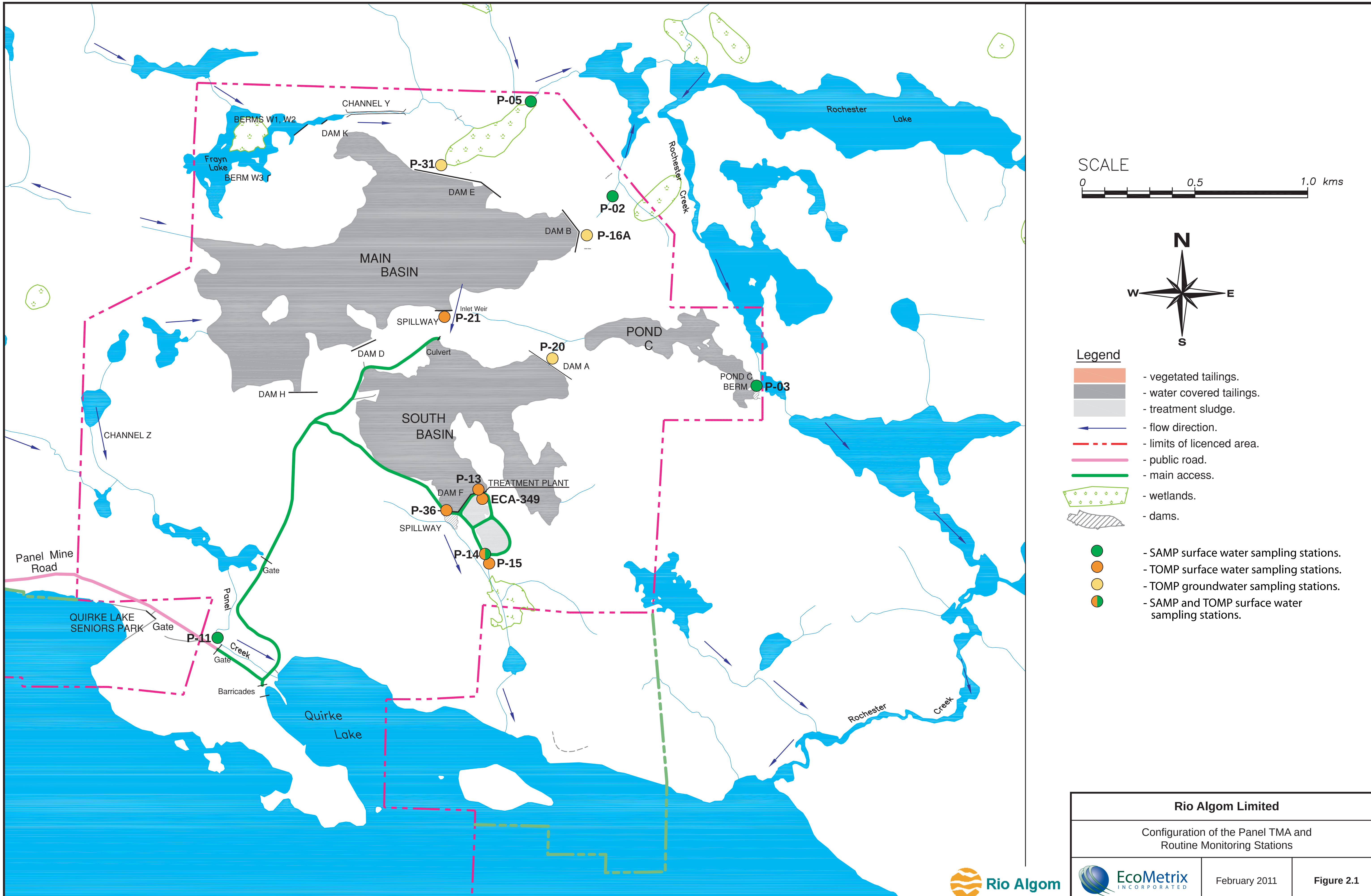
General Site Location of the Panel Mine and Tailings Management Area
EcoMetrix INCORPORATED
February 2011
Figure 1.1



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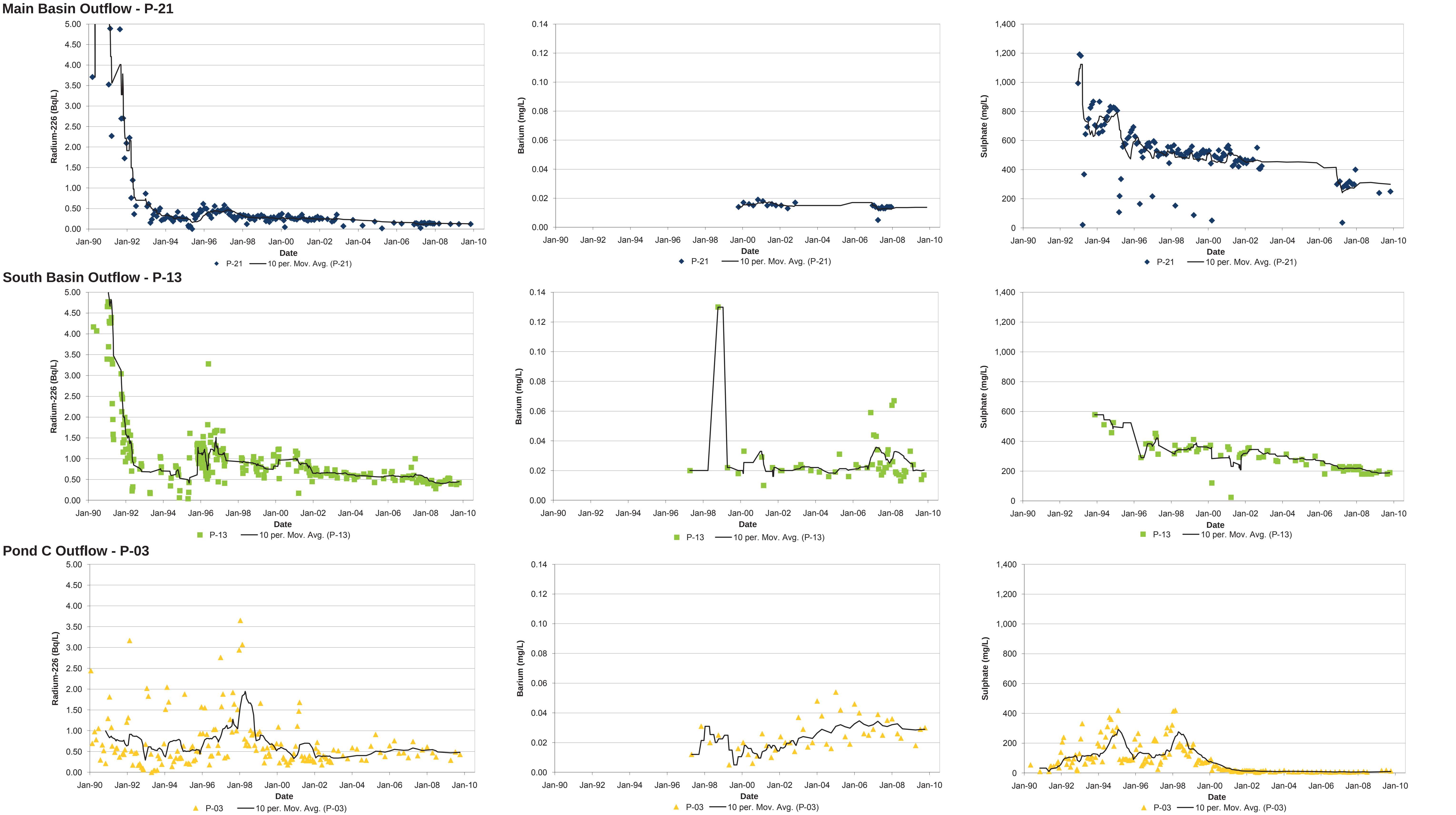
Configuration of the Panel TMA and Routine Monitoring Stations

February 2011

Figure 2.1



Note: Some data prior to 1992 are not shown

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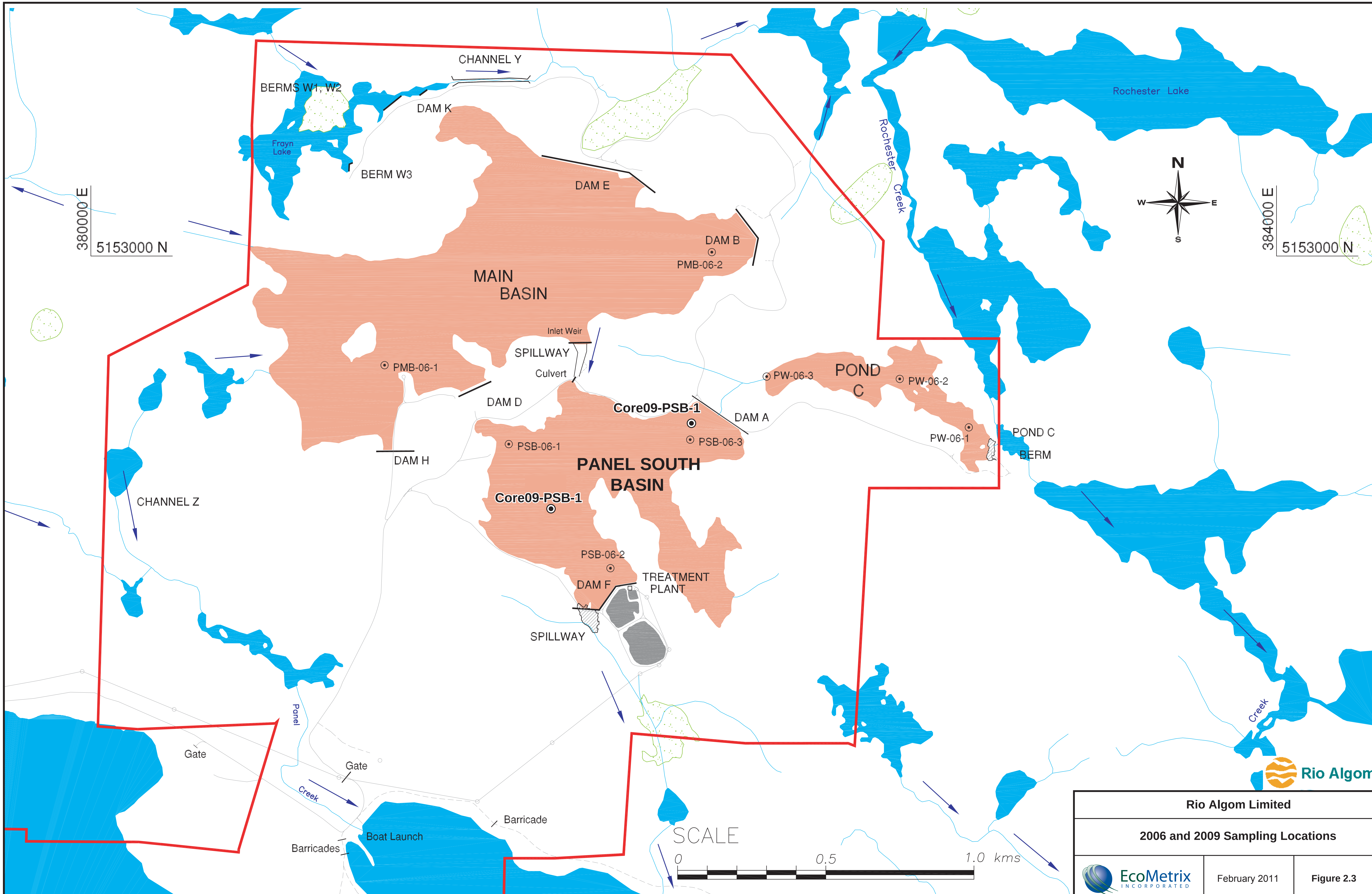
Routine Monitoring Data for Selected Constituents from the Panel TMA		
EcoMetrix INCORPORATED	February 2011	Figure 2.2



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2006 and 2009 Sampling Locations

Figure 2.3

Core09-PSB -1

Core09-PSB -2

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Photographs of Samples Core09-PSB-1
and Core09-PSB-2

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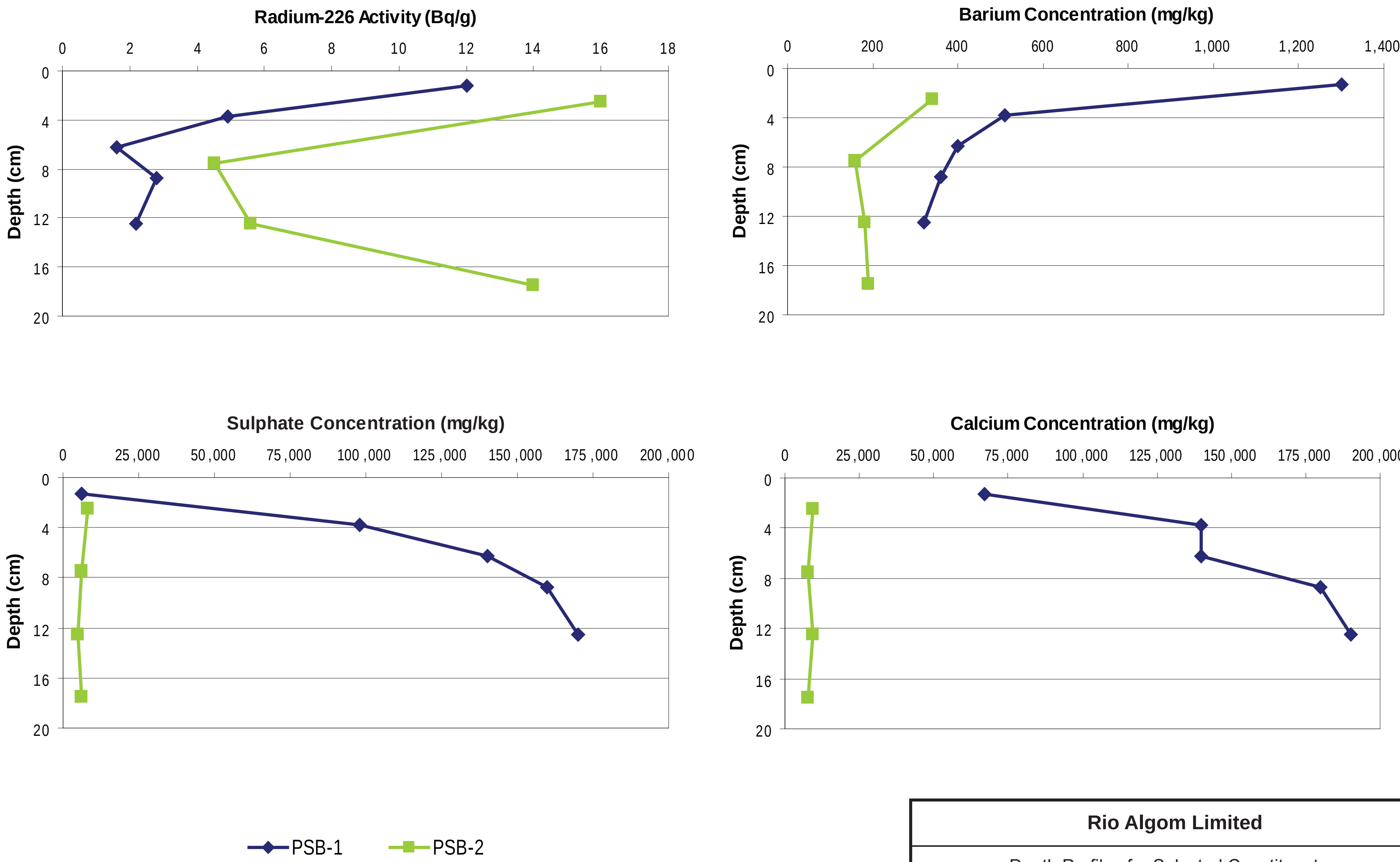
February 2011

Figure 3.1



Rio Algom

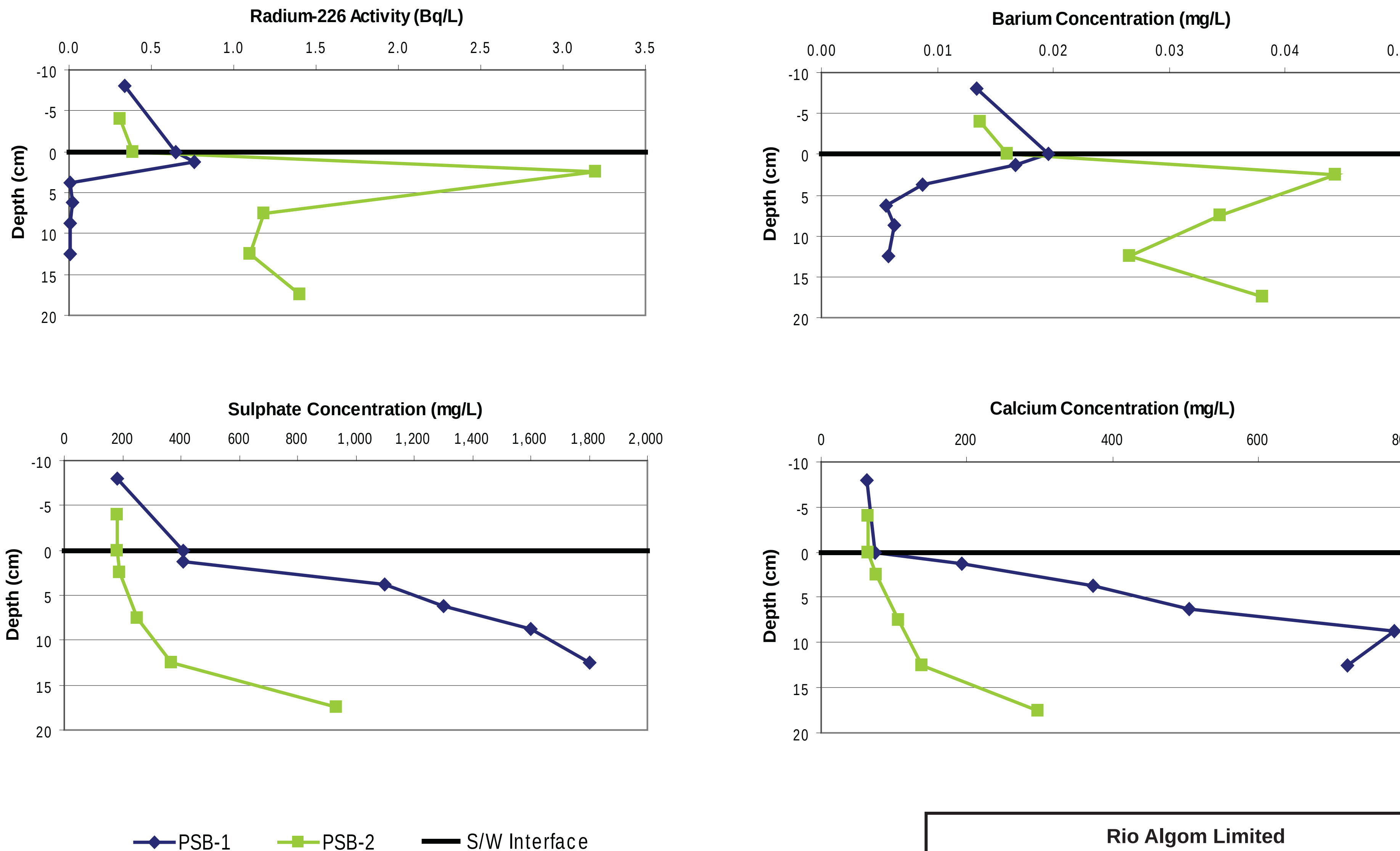
Rio Algom Limited

Depth Profiles for Selected Constituents
in Solids from the South Basin

EcoMetrix INCORPORATED

February 2011

Figure 5.1

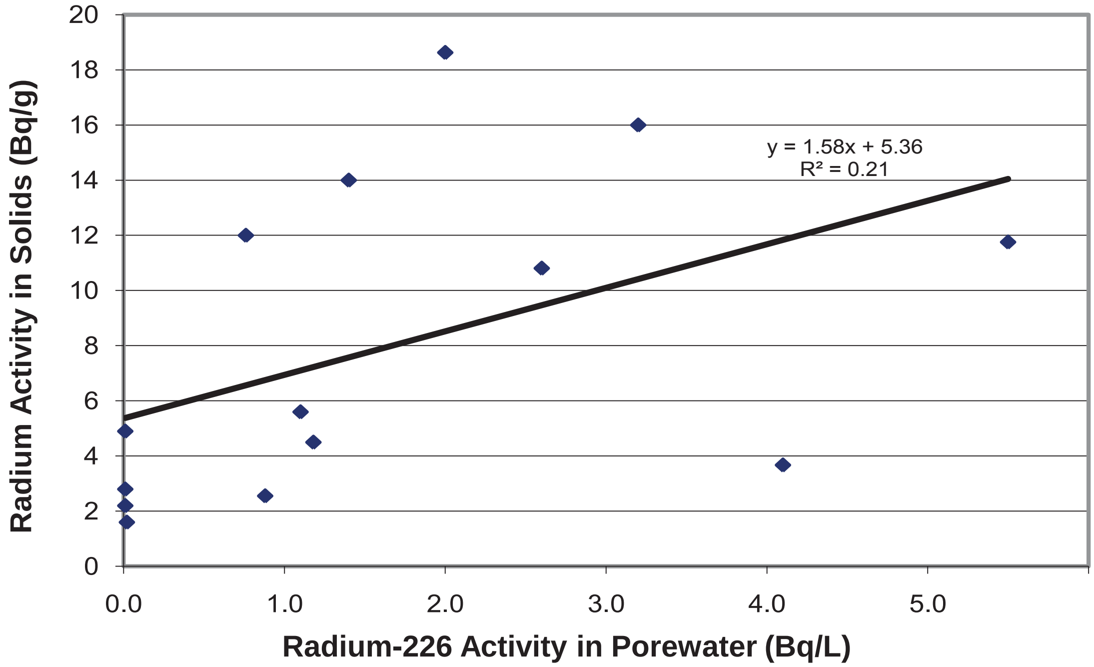


Note: Data points abpve the solids-water interface represent top and bottom water samples.
See Table 5.2 for actual depth values.

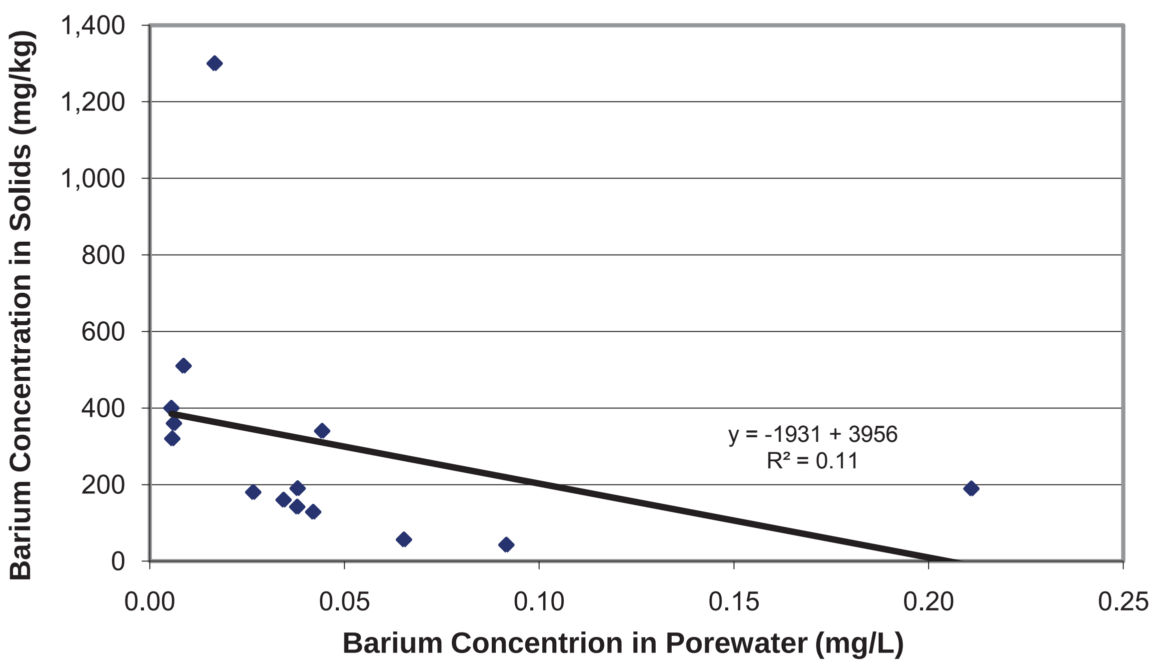
Rio Algom

Rio Algom Limited		
Depth Profiles for Selected Constituents in Porewater and Basin Water from the South Basin		
EcoMetrix INCORPORATED	February 2011	**Figure 5.2**

Radium-266

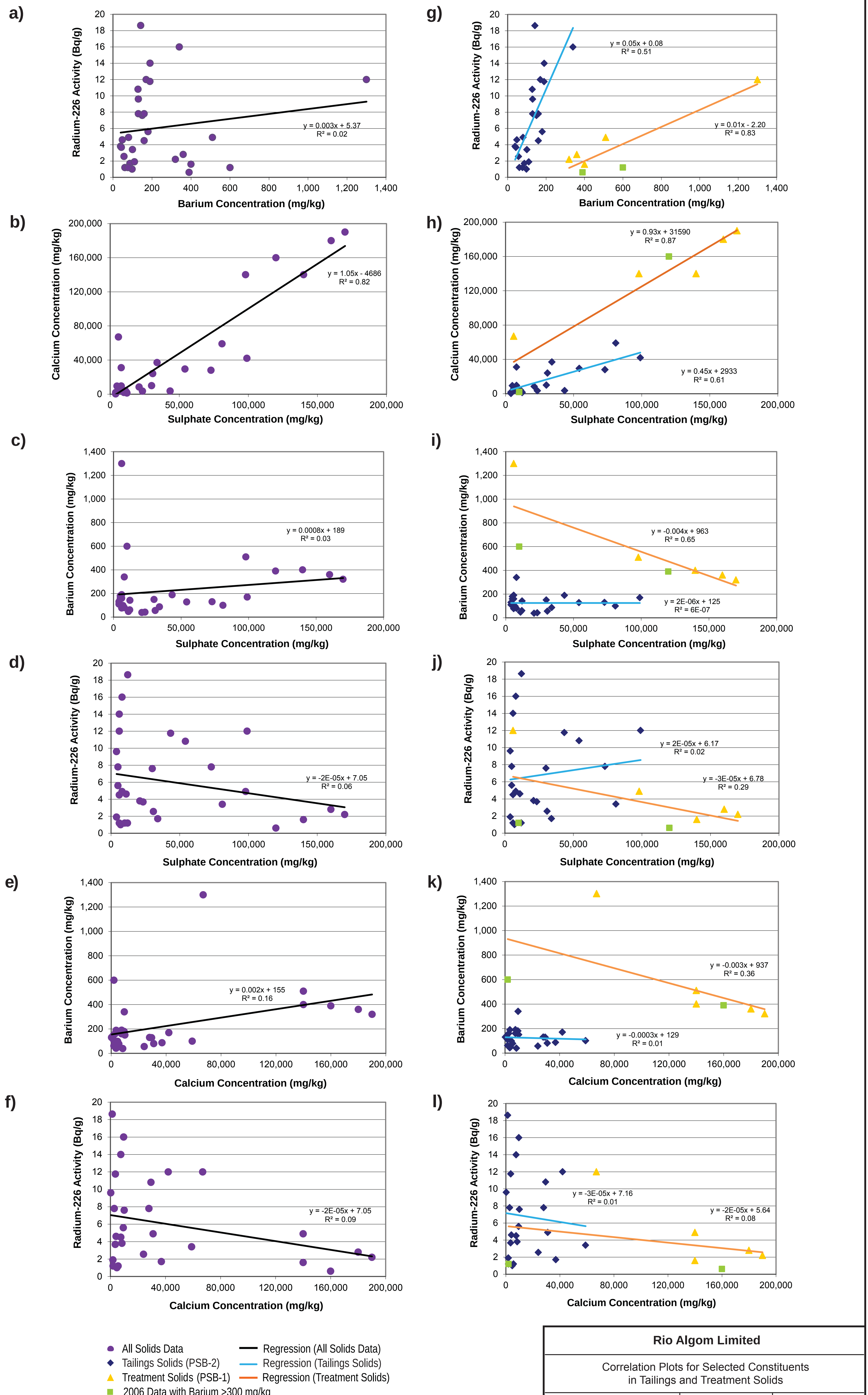


Barium



Rio Algom

Rio Algom Limited		
Water-Solids Partitioning Plots for Radium-226 and Barium		
EcoMetrix INCORPORATED	February 2011	**Figure 6.1**



Rio Algom

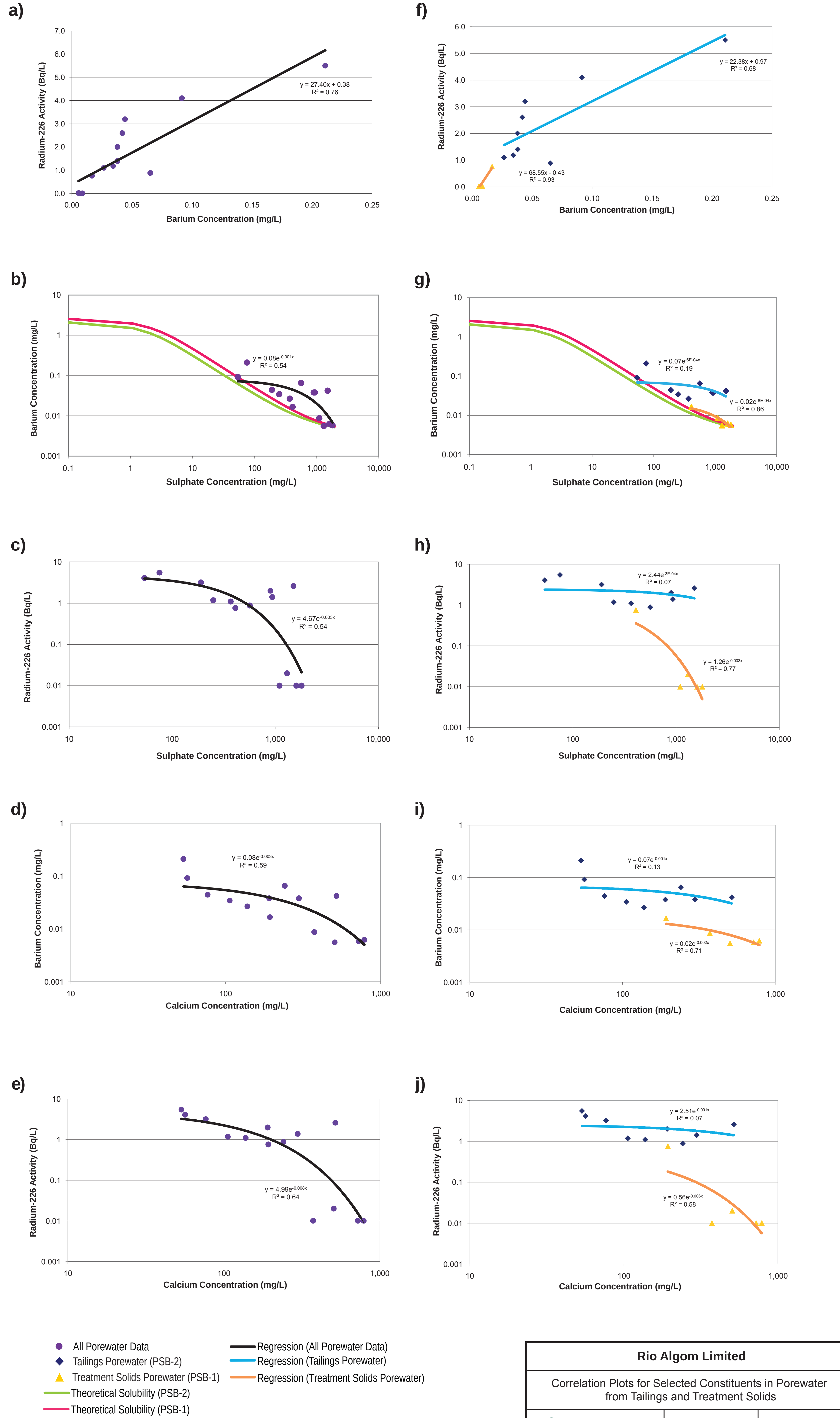
Rio Algom Limited

Correlation Plots for Selected Constituents in Tailings and Treatment Solids

EcoMetrix INCORPORATED

February 2011

Figure 6.2



Rio Algom

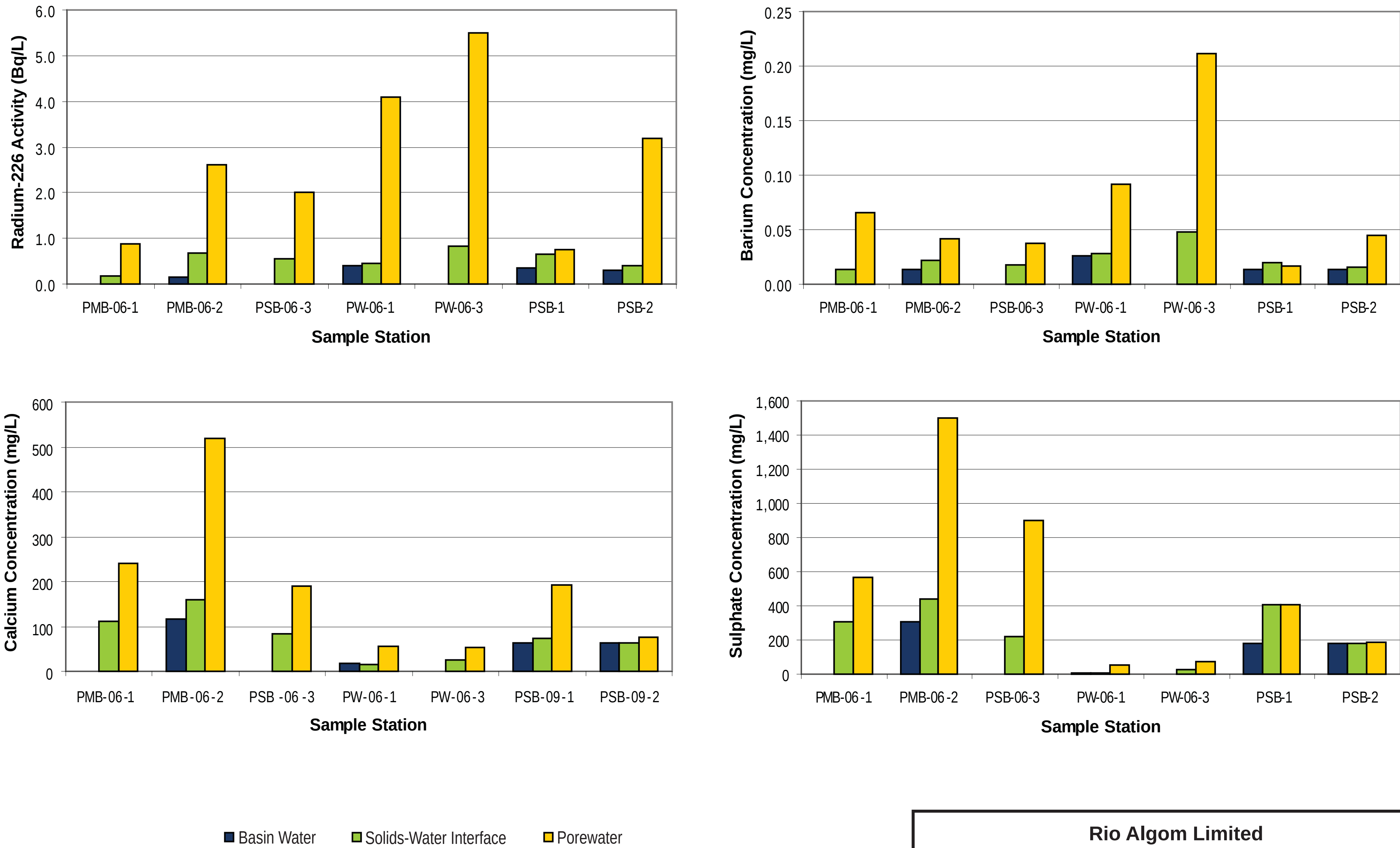
Rio Algom Limited

Correlation Plots for Selected Constituents in Porewater from Tailings and Treatment Solids

EcoMetrix INCORPORATED

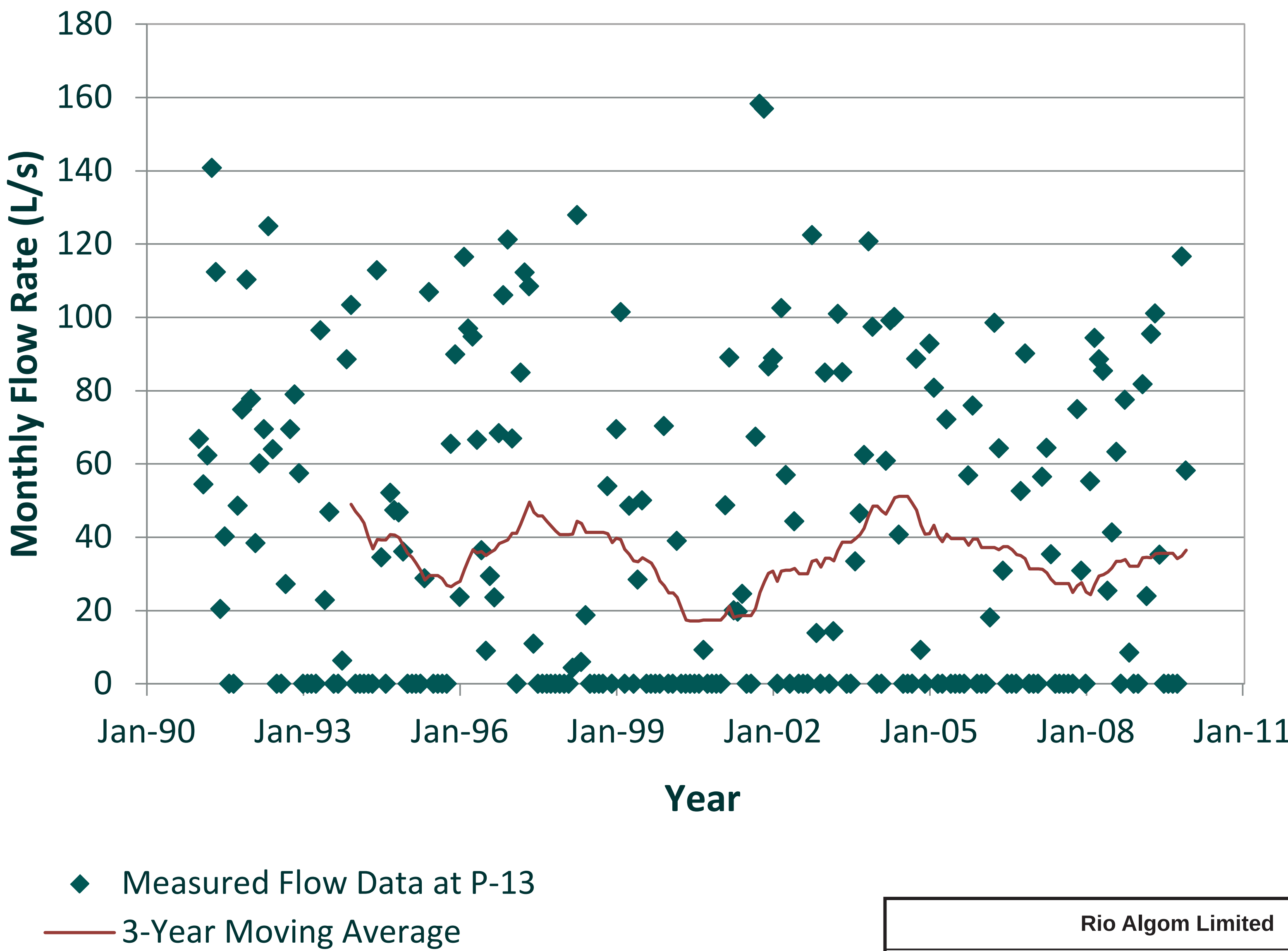
February 2011

Figure 6.3



Rio Algom

Rio Algom Limited		
Activities and Concentrations for Selected Constituents in Porewater and Basin Water		
EcoMetrix INCORPORATED	February 2011	Figure 6.4



Rio Algom

Rio Algom Limited		
Monthly Flow Data at the South Basin Outflow (P-13) from Routine Monitoring		
EcoMetrix INCORPORATED	February 2011	Figure 6.5

EcoMetrix
INCORPORATED

APPENDIX 1

Compilation of Routine Monitoring Data at the Panel TMA

Table A1.1: Routine Monitoring Data in the Main Basin (P-21) at the Panel TMA

Date	pH (pH units)	Acidity (mg/L as $CaCO_3$)	Sulphate (mg/L)	Radium-226 (Bq/L)	Barium (mg/L)
8-Jan-90	6.4	33		14.882	
15-Jan-90	6.6	32			
22-Jan-90	6.7	14			
29-Jan-90	6.8	16			
5-Feb-90	6.7	30			
13-Feb-90	4.0	48		14.670	
19-Feb-90	5.0	84			
27-Feb-90	5.9	60			
7-Mar-90	7.0	38		14.641	
12-Mar-90	6.9	32		9.462	
19-Mar-90	6.2	18			
27-Mar-90	4.6	33			
2-Apr-90	5.9	182			
9-Apr-90	4.8	82		3.706	
16-Apr-90	4.8	21			
23-Apr-90	4.8	18			
30-Apr-90	4.0	58			
14-May-90	3.7	130			
22-May-90	3.7	110			
28-May-90	4.1	250			
29-May-90	3.6	89		8.182	
4-Jun-90	3.6	134			
11-Jun-90	3.4	126		6.301	
19-Jun-90	3.5	405			
25-Jun-90	3.3	144			
3-Jul-90	3.2	364			
9-Jul-90	3.1	172		5.649	
16-Jul-90	3.2	178			
23-Jul-90	3.1	167			
30-Jul-90	3.2	264			
7-Aug-90	3.1	270			
13-Aug-90	3.1	224		8.589	
20-Aug-90	3.1	224			
28-Aug-90	3.3	796			
4-Sep-90	3.0	650			
10-Sep-90	3.1	500		21.507	
17-Sep-90	3.0	484			
25-Sep-90	3.4	540			
1-Oct-90	3.6	300			
9-Oct-90	3.7	298		8.517	
16-Oct-90	3.6	252			
22-Oct-90	3.8	275			
29-Oct-90	3.7	198			
5-Nov-90	3.4	225			
14-Nov-90	3.5	250		8.204	
19-Nov-90	3.7	181			
26-Nov-90	4.2	150			
3-Dec-90	4.1	163			
10-Dec-90	3.9	185		6.477	
17-Dec-90	3.8	180			
24-Dec-90	3.2	270			
8-Jan-91	3.3	220		6.370	
15-Jan-91	3.5	230			
23-Jan-91	3.2	240			
29-Jan-91	3.2	270			
5-Feb-91	3.1	230			
12-Feb-91	3.0	232		3.523	
18-Feb-91	3.6	180			
25-Feb-91	3.5	215			
4-Mar-91	3.5	210			
11-Mar-91	3.5	240		4.888	
18-Mar-91	3.5	165			
25-Mar-91	3.4	260			
1-Apr-91	3.0	275			
8-Apr-91	3.8	60		2.268	
15-Apr-91	4.1	35			
12-Sep-91	4.0	40		4.871	
16-Sep-91	4.0	31			
23-Sep-91	3.5	90			
30-Sep-91	3.8	50			
7-Oct-91	3.8	97		2.692	
15-Oct-91	3.4	130			
21-Oct-91	3.8	98			
28-Oct-91	3.6	90			
4-Nov-91	3.5	154			
12-Nov-91	3.7	57		2.702	
18-Nov-91	3.5	140			
25-Nov-91	3.6	140			
2-Dec-91	3.6	168			
9-Dec-91	3.6	140		1.724	

Table A1.1: Routine Monitoring Data in the Main Basin (P-21) at the Panel TMA

Date	pH (pH units)	Acidity (mg/L as $CaCO_3$)	Sulphate (mg/L)	Radium-226 (Bq/L)	Barium (mg/L)
16-Dec-91	3.6	142			
23-Dec-91	3.5	336			
30-Dec-91	3.5	180			
6-Jan-92	3.5	240			
13-Jan-92	3.5	170		2.092	
20-Jan-92	3.4	180			
27-Jan-92	3.4	150			
26-Feb-92	3.4	210			
3-Mar-92	3.4	170			
12-Mar-92	3.4	200		2.224	
16-Mar-92	3.4	215			
23-Mar-92	3.3	215			
30-Mar-92	3.3	150			
7-Apr-92	3.4	140			
13-Apr-92	3.2	220		0.756	
21-Apr-92	3.5	170			
27-Apr-92	3.7	100			
4-May-92	3.5	110			
11-May-92	3.3	160		1.190	
19-May-92	3.2	145			
25-May-92	3.3	72			
2-Jun-92	3.0	175			
8-Jun-92	3.0	195		0.362	
15-Jun-92	3.1	230			
22-Jun-92	3.1	266			
13-Jul-92	3.0	210		0.559	
4-Jan-93	3.0	380			
11-Jan-93	3.1	350	994	0.862	
9-Feb-93	3.0	340	1192	0.550	
22-Feb-93	3.0	402			
8-Mar-93	3.0	420	1182	0.610	
7-Apr-93	4.2	30			
12-Apr-93	4.4	20	21	0.152	
10-May-93	3.2	160	368	0.232	
7-Jun-93	3.2	310	644	0.351	
12-Jul-93	3.0	260	693	0.449	
4-Aug-93	3.0	260			
9-Aug-93	2.9	255	749	0.308	
13-Sep-93	3.3	325	825	0.437	
12-Oct-93	2.8	310	848	0.505	
8-Nov-93	2.7	315	868	0.212	
9-Dec-93	3.0	325	706	0.234	
11-Jan-94	2.9	275	694	0.245	
24-Feb-94	3.1	315	650	0.329	
10-Mar-94	2.9	300	867	0.312	
11-Apr-94	3.1	255	702	0.271	
9-May-94	3.4	180	664	0.259	
13-Jun-94	6.4	5		0.202	
15-Jun-94	6.7	6	711	0.185	
11-Jul-94	6.6	6	744	0.266	
8-Aug-94	5.8	6	764	0.291	
12-Sep-94	6.0	8	801	0.417	
11-Oct-94	8.3	<1	833	0.245	
7-Nov-94	8.3	<1	822	0.222	
12-Dec-94	6.6	6	828	0.288	
9-Jan-95	6.9	7	823	0.247	
22-Feb-95	6.9	6	806	0.240	
31-Mar-95	4.7	28	108	0.085	
10-Apr-95	5.5	17	219	0.048	
5-May-95	6.7	4			
8-May-95	6.9	2	336	0.069	
12-Jun-95	6.7	5	557	<0.037	
10-Jul-95	6.5	5	580	0.354	
8-Aug-95	6.6	4	576	0.247	
11-Sep-95	6.2	6	613	0.315	
10-Oct-95	6.7	4	624	0.374	
14-Nov-95	6.6	4	657	0.472	
6-Dec-95	6.4	5	673	0.428	
8-Jan-96	6.8	3	693	0.612	
8-Feb-96	6.7	4	629	0.503	
11-Mar-96	6.9	5	578	0.493	
9-Apr-96	6.4	8	588	0.366	
13-May-96	6.2	5	165	0.338	
10-Jun-96	7.0	4	524	0.269	
8-Jul-96	6.7	2	484	0.435	
12-Aug-96	6.7	5	535	0.558	
9-Sep-96	6.8	2	552	0.386	
9-Oct-96	6.8	1	579	0.450	
12-Nov-96	6.8	3	584	0.428	
4-Dec-96	6.3	3	555	0.444	

Table A1.1: Routine Monitoring Data in the Main Basin (P-21) at the Panel TMA

Date	pH	Acidity	Sulphate	Radium-226	Barium
	(pH units)	(mg/L as $CaCO_3$)	(mg/L)	(Bq/L)	(mg/L)
16-Jan-97	6.6	3	217	0.480	
11-Feb-97	6.8	4	596	0.580	
4-Mar-97	6.6	3	586	0.440	
9-Apr-97	6.9	3	530	0.490	
12-May-97	6.9	2	493	0.360	
9-Jun-97	6.7	12	507	0.420	
14-Jul-97	7.0	3	511	0.290	
20-Aug-97	6.9	3	511	0.300	
9-Sep-97	7.0	2	514	0.220	
14-Oct-97	6.7	4	505	0.280	
18-Nov-97	7.3	3	557	0.330	
12-Dec-97	7.2	3	445	0.340	
12-Jan-98	7.0	5	554	0.299	
9-Feb-98	7.1	4	525	0.340	
17-Mar-98	6.6	3	568	0.320	
13-Apr-98	6.5	4	153	0.120	
11-May-98	7.2	2	517	0.320	
9-Jun-98	7.0	2	538	0.240	
14-Jul-98	7.5	3	504	0.260	
11-Aug-98	7.0	5	504	0.290	
8-Sep-98	7.3	5	491	0.220	
13-Oct-98	7.1	3	489	0.297	
10-Nov-98	6.9	5	518	0.320	
16-Dec-98	7.2	3	513	0.290	
12-Jan-99	7.1	5	534	0.340	
7-Feb-99	7.1	3	526	0.310	
7-Mar-99	7.0	3	560	0.302	
12-Apr-99	5.6	5	88	0.190	
17-May-99	7.4	3	497	0.250	
14-Jun-99	7.3	2	506	0.170	
12-Jul-99	6.6	3	473	0.280	
17-Aug-99	7.3	2	504	0.250	
7-Sep-99	6.8	2	523	0.290	
12-Oct-99	6.5	3	535	0.240	
13-Oct-99	6.9				
3-Nov-99	6.8	3	514	0.260	0.014
13-Dec-99	7.1	4	525	0.330	
5-Jan-00	6.1	4	516	0.280	
7-Feb-00	7.0	3	530	0.370	0.017
14-Mar-00	6.5	4	442	0.210	
3-Apr-00	5.9	3	51	0.045	
25-May-00	7.0	5	497	0.300	0.016
5-Jun-00	7.0	3	490	0.340	
18-Jul-00	7.1	3	482	0.270	
16-Aug-00	7.2	3	533	0.260	0.015
25-Sep-00	7.0	3	466	0.240	
16-Oct-00	7.0	4	485	0.250	
16-Nov-00	6.7	5	512	0.230	0.019
14-Dec-00	6.6	6	500	0.270	
18-Jan-01	7.0	4	550	0.280	
20-Feb-01	6.9	3	566	0.350	0.018
21-Mar-01	6.9	3	536	0.260	
4-Apr-01	6.8	3	512	0.240	
17-May-01	6.7	3	425	0.220	0.015
14-Jun-01	7.2	2	434	0.200	
12-Jul-01	7.2	2	460	0.250	
16-Aug-01	6.9	3	458	0.220	0.016
12-Sep-01	6.2	5	421	0.240	
12-Oct-01	7.0	3	479	0.220	
2-Nov-01	7.1	2	457	0.270	0.015
14-Dec-01	7.0	2	446	0.300	
17-Jan-02	7.0	2	468	0.240	
14-Feb-02	6.9	2	444	0.270	0.015
14-Mar-02	6.9	2	463	0.250	
20-Jun-02	7.3	1	470	0.240	0.013
12-Sep-02	7.2	4	551	0.180	
21-Oct-02	7.0	2	407	0.200	
14-Nov-02	7.0	3	406	0.240	0.017
12-Dec-02	7.1	2	425	0.350	
17-Apr-03	6.1	5		0.069	
16-Oct-03	7.0	5		0.220	
15-Apr-04	6.6	7		0.083	
2-Dec-04	7.5	4		0.180	
18-Apr-05	6.0	5		0.015	
1-Dec-05	7.4	3		0.150	
25-Apr-06	7.0	<1		0.130	
18-Dec-06	7.0	<1		0.110	
4-Jan-07	7.1	<1	300	0.140	0.015
1-Feb-07	7.2	<1	310	0.140	0.015
1-Mar-07	7.2	<1	320	0.120	0.014

Table A1.1: Routine Monitoring Data in the Main Basin (P-21) at the Panel TMA

Date	pH	Acidity	Sulphate	Radium-226	Barium
	(pH units)	(mg/L as $CaCO_3$)	(mg/L)	(Bq/L)	(mg/L)
19-Apr-07	6.1	1	36	0.024	<0.005
3-May-07	7.2	<1	280	0.150	0.013
7-Jun-07	6.9	<1	290	0.140	0.013
5-Jul-07	7.6	<1	300	0.150	0.014
2-Aug-07	7.7	<1	280	0.110	0.013
6-Sep-07	7.6	<1	320	0.140	0.013
4-Oct-07	7.0	<1	310	0.150	0.014
1-Nov-07	7.0	<1	300	0.140	0.014
6-Dec-07	7.2	<1	300	0.130	0.014
3-Jan-08	6.9	<1	400	0.130	0.014
3-Apr-08	6.9	<1		0.130	
6-Nov-08	6.9	<1		0.120	
15-Apr-09	6.9	<1	240	0.120	
23-Nov-09	6.8	<1	250	0.120	

Table A1.2: Routine Monitoring Data in the South Basin (P-13) at the Panel TMA

Date	pH	Acidity	Sulphate	Radium-226	Barium
	(pH units)	(mg/L as $CaCO_3$)	(mg/L)	(Bq/L)	(mg/L)
2-Jan-90	3.7	102		5.090	
8-Jan-90	4.1	75		6.412	
15-Jan-90	4.7	35		6.616	
22-Jan-90	4.7	37		9.768	
29-Jan-90	4.4	36		9.321	
5-Feb-90	4.2	56		8.642	
13-Feb-90	4.0	47		7.050	
19-Feb-90	4.1	45		7.747	
26-Feb-90	4.0	50		7.812	
12-Mar-90	4.3	55		9.157	
19-Mar-90	4.2	41		9.094	
2-Apr-90	4.0	51		8.954	
9-Apr-90	4.2	102		9.774	
10-Apr-90	4.1	94		9.904	
16-Apr-90	4.1	137		10.622	
23-Apr-90	4.2	142		9.970	
30-Apr-90	3.9	101		9.115	
7-May-90	5.0	110		4.165	
14-May-90	3.8	72		7.110	
22-May-90	3.8	108		7.949	
28-May-90	3.7	95		6.898	
29-May-90	3.6	94			
4-Jun-90	3.6	27		6.270	
11-Jun-90	3.5	149		5.679	
19-Jun-90	3.4	142		6.521	
25-Jun-90	3.4	125		5.200	
3-Jul-90	3.1	184		7.962	
9-Jul-90	3.1	158		4.071	
16-Jul-90	3.2	162		5.507	
23-Jul-90	3.2	158		6.066	
30-Jul-90	3.2	224		6.186	
7-Aug-90	3.1	260		8.855	
13-Aug-90	3.1	232		8.059	
20-Aug-90	3.1	244		7.104	
28-Aug-90	3.0	364		8.974	
4-Sep-90	3.2	272		8.276	
10-Sep-90	3.3	252		9.339	
17-Sep-90	3.1	256		10.771	
25-Sep-90	3.3	210		10.145	
1-Oct-90	3.1	246		7.682	
9-Oct-90	3.3	260		6.866	
16-Oct-90	3.1	215		7.813	
22-Oct-90	3.2	268		6.717	
29-Oct-90	3.3	193		6.383	
5-Nov-90	2.7	210		5.913	
14-Nov-90	2.9	264		6.758	
19-Nov-90	2.9	232		6.755	
26-Nov-90	3.1	190		6.252	
3-Dec-90	3.1	191		5.704	
10-Dec-90	3.2	190		5.383	
17-Dec-90	4.2	250		5.002	
24-Dec-90	3.8	230		5.477	
8-Jan-91	2.9	250		5.960	
15-Jan-91	2.9	195		5.508	
23-Jan-91	2.8	250		5.875	
29-Jan-91	2.7	290		3.390	
5-Feb-91	2.9	230		4.652	
18-Feb-91	3.1	195		4.770	
25-Feb-91	3.1	230		3.691	
4-Mar-91	3.0	195		4.654	
11-Mar-91	3.2	245		4.300	
18-Mar-91	3.1	180		4.259	
25-Mar-91	3.0	240		5.538	
1-Apr-91	3.0	242		6.524	
8-Apr-91	3.1	245		5.594	
15-Apr-91	2.9	230		4.269	
22-Apr-91	3.2	198		4.391	
29-Apr-91	3.1	218		3.386	
6-May-91	3.5	196		2.321	
13-May-91	2.3	180		3.276	
21-May-91	3.4	102		1.941	
27-May-91	3.5	153		1.588	
3-Jun-91	2.9	175		1.458	
28-Oct-91	4.3	200		3.041	
4-Nov-91	4.6	234		2.549	
12-Nov-91	4.1	161		2.129	
18-Nov-91	3.5	172		2.476	
25-Nov-91	3.5	176		2.435	
2-Dec-91	3.5	180		1.383	
9-Dec-91	3.4	160		1.157	

Table A1.2: Routine Monitoring Data in the South Basin (P-13) at the Panel TMA

Date	pH	Acidity	Sulphate	Radium-226	Barium
	(pH units)	(mg/L as $CaCO_3$)	(mg/L)	(Bq/L)	(mg/L)
16-Dec-91	3.5	140		1.814	
23-Dec-91	3.4	330		1.452	
30-Dec-91	4.7	150		1.622	
6-Jan-92	4.1	212		1.993	
13-Jan-92	3.9	190		1.893	
20-Jan-92	4.4	160		0.929	
27-Jan-92	4.6	146		1.225	
26-Feb-92	4.8	160		1.870	
3-Mar-92	3.3	167		1.013	
10-Mar-92	4.4	140		1.650	
16-Mar-92	4.6	215		1.656	
23-Mar-92	4.8	150		1.576	
30-Mar-92	4.1	135		1.241	
6-Apr-92	4.7	180		1.082	
13-Apr-92	4.4	199		1.370	
21-Apr-92	4.3	220		1.296	
27-Apr-92	4.3	230		1.563	
4-May-92	3.8	202		1.314	
11-May-92	4.0	170		1.172	
19-May-92	3.6	100		0.705	
29-May-92	3.8	107		0.224	
2-Jun-92	3.5	140		0.273	
10-Jun-92	3.3	165		0.324	
16-Jun-92	3.1	130		0.948	
26-Jun-92	2.8	165		0.983	
29-Jun-92	2.4	190		0.980	
28-Oct-92	4.0	140		0.752	
23-Nov-92	3.2	155		0.878	
30-Nov-92	4.6	215		0.825	
7-Dec-92	3.4	190			
10-May-93	3.3	180		0.187	
17-May-93	3.3	125		0.162	
29-Nov-93	3.0	120		1.049	
6-Dec-93	4.0	105		1.013	
13-Dec-93	3.5	190	578	0.671	
20-Dec-93	3.1	183		0.801	
3-Jun-94	3.3	93			
14-Jun-94	3.1	100	511	0.344	
28-Jun-94	3.3	115		0.532	
27-Sep-94	3.0	105		0.826	
4-Oct-94	3.4	100		0.798	
9-Nov-94	4.1	63	458	0.629	
15-Nov-94	3.4	80		0.749	
22-Nov-94	4.2	65		0.608	
6-Dec-94	4.7	42		0.058	
9-Dec-94	4.7	48			
13-Dec-94	4.6	43	525	0.230	
24-May-95	4.1	45		<0.037	
6-Jun-95	4.8	18		0.190	
13-Jun-95	5.5	9		0.430	
20-Jun-95	7.0	7		1.020	
27-Jun-95	5.4	10		1.610	
14-Nov-95	5.8	7		1.331	
20-Nov-95				1.164	
21-Nov-95	3.5	16			
22-Nov-95	6.0	7			
23-Nov-95				1.277	
27-Nov-95	6.2	6		1.364	
30-Nov-95				1.022	
4-Dec-95				1.229	
5-Dec-95	2.8	70		1.161	
6-Dec-95	5.6	7			
7-Dec-95				1.166	
11-Dec-95	6.0	4		0.985	
14-Dec-95				1.081	
18-Dec-95	6.2	6		0.885	
6-Feb-96	5.4	10		1.207	
8-Feb-96				1.262	
13-Feb-96	5.8	5		1.262	
15-Feb-96				1.186	
20-Feb-96				1.064	
22-Feb-96				0.777	
26-Feb-96				1.363	
27-Feb-96	6.0	7		0.942	
4-Mar-96	5.6	8		1.132	
7-Mar-96				0.815	
11-Mar-96				1.529	
12-Mar-96	6.0	15		1.372	
14-Mar-96				1.290	
18-Mar-96	5.8	5		1.172	

Table A1.2: Routine Monitoring Data in the South Basin (P-13) at the Panel TMA

Date	pH	Acidity	Sulphate	Radium-226	Barium
	(pH units)	(mg/L as $CaCO_3$)	(mg/L)	(Bq/L)	(mg/L)
28-Mar-96	5.9	8		1.267	
1-Apr-96				1.177	
2-Apr-96	5.8	16		1.170	
4-Apr-96				1.058	
8-Apr-96	6.0	7		1.202	
9-Apr-96				1.052	
11-Apr-96				1.023	
15-Apr-96	5.4	20		1.213	
18-Apr-96				1.173	
22-Apr-96	5.9	12		1.051	
25-Apr-96				0.966	
29-Apr-96				0.887	
30-Apr-96	6.2	5		0.765	
2-May-96				0.706	
7-May-96	5.0	15		0.589	
17-May-96				0.833	
21-May-96	5.9	7		0.725	
27-May-96	6.0	6		0.719	
29-May-96				0.665	
3-Jun-96				0.513	
4-Jun-96	9.5	<1		1.075	
6-Jun-96	5.3	6		0.664	
11-Jun-96	5.5	6	290	1.817	
13-Jun-96				0.824	
17-Jun-96				0.658	
18-Jun-96	4.9	4		0.676	
20-Jun-96				0.812	
24-Jun-96				0.592	
25-Jun-96	5.9	5		3.276	
2-Aug-96	6.2	5		1.392	
6-Aug-96	6.5	5		1.556	
13-Sep-96	8.0	2	383	0.669	
15-Oct-96	7.2	3		1.329	
22-Oct-96	7.0	4		1.624	
29-Oct-96	7.3	3		1.655	
5-Nov-96	6.9	2		1.146	
14-Nov-96	6.7	4	384	1.159	
19-Nov-96	8.9	2		1.304	
26-Nov-96	7.1	3		0.975	
3-Dec-96	6.6	4		1.677	
10-Dec-96	6.8	3	381	0.977	
17-Dec-96	6.6	3		1.194	
24-Dec-96	6.5	3		1.117	
31-Dec-96	7.0	3		0.447	
7-Jan-97	6.8	2		1.130	
14-Jan-97	6.8	2	353	1.140	
21-Jan-97	7.3	7		1.100	
18-Mar-97	6.4	5	453	1.200	
25-Mar-97	6.6	8	453	1.100	
1-Apr-97	6.2	17		1.670	
8-Apr-97	6.4	10	429	1.240	
14-Apr-97	6.3	7		1.075	
22-Apr-97	6.5	9		0.970	
29-Apr-97	6.4	8		0.830	
6-May-97	6.2	7		0.410	
13-May-97	6.1	6	314	0.940	0.02
13-May-97					
20-May-97	6.2	6		1.030	
27-May-97	6.0	5		1.001	
3-Jun-97	6.0	2		1.070	
31-Mar-98	6.9	5	316	1.020	
7-Apr-98	6.8	3		0.950	
13-Apr-98	6.6	9	373	0.990	
20-Apr-98	6.7	4		0.780	
27-Apr-98	6.9	3		0.650	
25-Jun-98	7.1	3		0.720	
29-Jun-98	6.8	1	340	0.870	
12-Nov-98	7.4	2	343	0.930	0.13
16-Nov-98	7.0	4		0.910	
23-Nov-98	7.0	2		1.050	
4-Jan-99	6.8	2		0.910	
11-Jan-99	6.8	4	353	0.760	
17-Jan-99	6.9	4		0.840	
25-Jan-99	7.0	4		0.690	
31-Jan-99	6.8	4		0.896	
7-Feb-99	6.7	4	368	0.910	
15-Feb-99	6.7	3		0.860	
22-Feb-99	6.6	4		0.610	
8-Apr-99	6.4	4		0.800	
12-Apr-99	6.4	6	412	1.000	

Table A1.2: Routine Monitoring Data in the South Basin (P-13) at the Panel TMA

Date	pH (pH units)	Acidity (mg/L as $CaCO_3$)	Sulphate (mg/L)	Radium-226 (Bq/L)	Barium (mg/L)
13-May-99					0.022
8-Jun-99	7.4	2		0.615	
14-Jun-99	7.1	2	330	0.540	
14-Jul-99	7.0	3	346	0.720	
19-Jul-99	7.3	2		0.740	
8-Dec-99	7.4	2	357	0.820	0.018
13-Dec-99	7.0	13		1.070	
20-Dec-99	7.1	4		1.095	
23-Dec-99	6.3				
7-Mar-00	6.6	4	374	0.920	
14-Mar-00	6.7	5		1.220	
19-Mar-00	6.5	4		1.050	
28-Mar-00	6.4	4		1.230	0.033
3-Apr-00	5.9	5	120	0.520	
28-Sep-00	7.0	6	305	0.860	
12-Feb-01	6.7	4	363	1.000	
19-Feb-01	6.9	4		1.180	
9-Mar-01	6.5	6		0.700	
12-Mar-01	6.4	6	346	1.100	0.029
19-Mar-01	6.5	6		1.100	
26-Mar-01	6.4	7		1.130	
18-Apr-01	5.9	4	24	0.170	0.010
29-May-01	6.7	3		0.790	
5-Jun-01	6.7	3		0.860	
20-Sep-01	7.0	2		0.770	
24-Sep-01	7.2	2	292	0.760	
1-Oct-01	6.9	3		0.900	
9-Oct-01	6.9	1	309	0.890	0.022
15-Oct-01	6.9	2		0.840	
22-Oct-01	6.8	3		0.930	
29-Oct-01	6.9	3		0.830	
5-Nov-01	6.8	5		0.670	
12-Nov-01	7.1	7	318	0.770	
19-Nov-01	6.2	4		0.660	
26-Nov-01	6.8	5		0.600	
6-Dec-01	6.7	3		0.660	
10-Dec-01	6.8	3	317	0.700	
17-Dec-01	6.9	4		0.740	
3-Jan-02	6.7	5		0.450	
7-Jan-02	6.6	4		0.650	
14-Jan-02	6.7	2	324	0.650	
21-Jan-02	6.6	3		0.640	
11-Mar-02	6.4	4		0.770	
18-Mar-02	6.5	4	352	0.610	0.020
25-Mar-02	6.5	4		0.700	
1-Apr-02	6.8	6		0.720	
8-Apr-02	6.4	3	357	0.660	0.020
17-Jun-02	6.9	3		0.580	
24-Jun-02	6.7	2		0.600	
8-Oct-02	7.2	3		0.660	
18-Oct-02	7.2	2	290	0.670	
21-Oct-02	7.4	2		0.760	
28-Oct-02	7.1	2		0.650	
14-Jan-03	6.6	5	295	0.590	0.022
27-Mar-03	6.6	7	337	0.730	0.022
10-Apr-03	6.6	7	336	0.610	0.024
8-May-03				0.540	0.022
4-Sep-03					
18-Sep-03	7.1	4	270	0.670	
23-Oct-03	6.8	3	265	0.660	0.020
6-Nov-03				0.520	
4-Dec-03				0.610	
18-Mar-04				0.600	
8-Apr-04	6.1	8	313	0.500	0.019
6-May-04				0.560	
10-Jun-04				0.580	
30-Jul-04					
7-Oct-04	6.8	2	271	0.630	0.016
13-Jan-05				0.570	
10-Feb-05	6.8	3	279	0.650	0.019
5-May-05	6.6	3	243	0.430	0.031
8-Sep-05					
27-Oct-05	7.2	2	300	0.520	0.016
10-Nov-05				0.690	
23-Mar-06	6.6	<1	250	0.640	0.024
13-Apr-06				0.690	
4-May-06	6.9	<1	180	0.530	0.022
8-Jun-06				0.480	
10-Aug-06					
26-Oct-06	7.1	<1	220	0.490	0.022

Table A1.2: Routine Monitoring Data in the South Basin (P-13) at the Panel TMA

Date	pH	Acidity	Sulphate	Radium-226	Barium
	(pH units)	(mg/L as $CaCO_3$)	(mg/L)	(Bq/L)	(mg/L)
9-Nov-06				0.560	
4-Jan-07	6.7	<1	220	0.550	0.059
1-Feb-07	6.7	<1	220	0.550	0.024
1-Mar-07	6.7	<1	230	0.580	0.044
19-Apr-07	6.7	<1	230	0.790	0.043
10-May-07	6.9	<1	200	0.520	0.034
7-Jun-07	7.0	<1	220	0.600	0.021
5-Jul-07	6.9	<1	220	1.000	0.025
2-Aug-07	6.4	<1	210	0.430	0.017
6-Sep-07	7.4	<1	230	0.490	0.019
4-Oct-07	7.1	<1	220	0.540	0.022
1-Nov-07	7.2	<1	220	0.500	0.022
22-Nov-07	7.0	<1	210	0.470	0.031
6-Dec-07	7.0	<1	220	0.440	0.034
3-Jan-08	6.9	<1	230	0.500	0.024
21-Feb-08	6.9	<1	210	0.440	0.064
6-Mar-08	6.9	<1	230	0.400	0.026
3-Apr-08	6.9	<1	220	0.430	0.067
1-May-08	6.9	<1	180	0.420	0.019
22-May-08	6.9	<1	180	0.480	0.018
3-Jul-08	7.2	<1	180	0.350	0.017
7-Aug-08	7.2	<1	180	0.280	0.013
9-Oct-08	7.2	<1	190	0.400	0.016
16-Oct-08	7.1	<1	190	0.420	0.02
13-Nov-08	7.2	<1	180	0.440	0.019
12-Feb-09	7.0	<1	190	0.480	0.033
26-Mar-09				0.510	
8-Apr-09	6.7	<1	200	0.530	0.024
7-May-09				0.520	
4-Jun-09				0.390	
16-Sep-09	7.2	<1	180	0.380	0.014
5-Nov-09	7.2	<1	190	0.420	0.017

Table A1.3: Routine Monitoring Data in Pond C (P-03) at the Panel TMA

Date	pH	Acidity	Sulphate	Radium-226	Barium
	(pH units)	(mg/L as $CaCO_3$)	(mg/L)	(Bq/L)	(mg/L)
13-Jan-90	6.8	37		2.324	
15-Feb-90	7.2	49		2.443	
14-Mar-90	6.6	22		0.695	
30-Apr-90	6.2	5		0.978	
29-May-90	7	5	54	0.785	
13-Jul-90	7.4	4		1.053	
20-Aug-90	7.3	5		0.297	
26-Sep-90	7.2	3		0.660	
24-Oct-90	7.5	3		0.522	
30-Nov-90	6.3	16	10	0.214	
15-Jan-91	7	30		1.295	
14-Feb-91	7.1	21		1.813	
22-Mar-91	6.6	40		1.080	
5-Apr-91	6.7	35		0.631	
27-May-91	7.3	10	10	0.483	
24-Jun-91	7.1	12	44	0.575	
8-Jul-91	6.6	10	45	0.582	
27-Aug-91	7.7	2	45	0.367	
30-Oct-91	7	5	62	0.450	
22-Nov-91	6.3	13	75	0.431	
11-Dec-91	6.4	25	34	0.543	
15-Jan-92	6.4	45	139	1.205	
13-Feb-92	6.8	59	208	1.313	
11-Mar-92	6.8	68	239	3.167	
15-Apr-92	5.7	19	100	0.508	
11-May-92	6.9	5	58	0.176	
24-Jun-92	6.9	4	94	0.457	
24-Jul-92	8.6	<1	40	0.475	
27-Aug-92	7.6	3	70	0.172	
25-Sep-92	7.1	3	95	0.207	
30-Oct-92	7.3	3	121	0.124	
27-Nov-92	6	21	25	0.094	
4-Dec-92	5.8	16	15	0.066	
15-Jan-93	6.8	15	130	0.675	
10-Feb-93	6.8	42	229	2.019	
11-Mar-93	6.7	120	331	1.830	
30-Apr-93	6.7	4	60	0.440	
12-May-93	6.8	7	61	<0.037	
23-Jun-93	8.9	<1	103	0.043	
15-Jul-93	9.5	<1	99	0.046	
31-Aug-93	8.4	<1	94	0.053	
16-Sep-93	7	8	113	0.402	
14-Oct-93	7	7	75	0.334	
29-Nov-93	6.2	14	105	0.194	
11-Jan-94	7.2	60	199	0.688	
9-Feb-94	6.7	61	181	1.513	
10-Mar-94	6.8	75	276	2.045	
12-Apr-94	6.7	15	76	1.691	
12-May-94	7.3	7	175	0.388	
15-Jun-94	7.1	5	241	0.140	
20-Jul-94	7.5	3	311	0.263	
31-Aug-94	7.1	8	373	0.346	
29-Sep-94	7.3	4	360	0.510	
31-Oct-94	7.3	3	285	0.333	
25-Nov-94	7.1	2	180	0.361	
15-Dec-94	6.4	40	267	0.341	
23-Jan-95	7	12	307	0.634	
16-Feb-95	6.9	147	420	1.878	
17-Mar-95	6.4	10	91	0.214	
28-Apr-95	6.5	8	70	0.219	
24-May-95	6.3	6	95	0.200	
28-Jun-95	7.4	6	92	0.589	
21-Jul-95	7	3	93	0.630	
10-Aug-95	7.3	3	90	0.278	
14-Sep-95	6.6	3	84	0.309	
5-Oct-95	6.7	4	87	0.515	
28-Nov-95	6.1	8	88	0.500	
15-Dec-95	6.5	25	111	0.928	
10-Jan-96	6.4	45	228	1.573	
6-Feb-96	6.2	15	158	0.935	
15-Mar-96	6.6	16	266	1.551	
23-Apr-96	6.2	36	189	0.915	
23-May-96	6.8	4	49	0.644	
14-Jun-96	7	4	59	0.182	
5-Jul-96	7.5	3	68	0.392	
2-Aug-96	8.5	2	95	0.401	
5-Sep-96	7.4	2	77	1.031	
10-Oct-96	7.6	2	111	1.036	
27-Nov-96	6.5	7	73	0.649	

Table A1.3: Routine Monitoring Data in Pond C (P-03) at the Panel TMA

Date	pH	Acidity	Sulphate	Radium-226	Barium
	(pH units)	(mg/L as $CaCO_3$)	(mg/L)	(Bq/L)	(mg/L)
5-Dec-96	6.1	14	70	0.467	
17-Jan-97	7.3	42	217	2.760	
4-Feb-97	6.7	5	230	1.580	
4-Mar-97	6.3	6	215	1.880	
7-Apr-97	6.2	13	24	0.350	
16-May-97					0.012
22-May-97	7.2	2	59	0.380	
3-Jun-97	7.2	3	74	0.380	
25-Jul-97	9.1	<1	123	1.270	
28-Aug-97	8	1	106	0.970	
13-Sep-97	7.1	5	263	1.920	
8-Oct-97	7.4	4	304	1.640	
21-Nov-97	7.1	1	127	1.000	0.031
16-Dec-97	7	18	286	1.510	
14-Jan-98	6.9	35	322	2.940	
5-Feb-98	7	27	415	3.650	
17-Mar-98	6.7	68	421	3.070	
29-Apr-98	6.9	4	176	0.802	
11-May-98					0.020
21-May-98	7.4	3	175	0.650	
9-Jun-98	6.8	3	197	0.730	
23-Jul-98	8.2	1	180	0.640	
24-Aug-98	7.9	3	157	1.010	
18-Sep-98	8.2	2	150	0.900	
22-Oct-98	7.5	3	123	0.930	0.025
12-Nov-98	6.5	8	195	0.650	
11-Dec-98	6.5	8	113	0.530	
8-Jan-99	6.4	12	148	0.920	
16-Feb-99	6.4	3	170	0.980	
5-Mar-99	6.6	15	194	1.660	
22-Apr-99	6.4	4	56	0.570	
18-May-99	6.7	3	72	0.230	<0.005
10-Jun-99	6.5	3	87	0.380	
14-Jul-99	8.3	0	86	0.590	
16-Aug-99	7.4	2	66	0.460	
2-Sep-99	7.7	2	70	0.390	
13-Oct-99	7.6	2	69	0.650	
10-Nov-99	7.8	3	73	0.610	0.016
2-Dec-99	7.4	3	73	0.600	
12-Jan-00	6.9	15	80	0.690	
16-Feb-00	6.9	11	92	1.090	0.020
9-Mar-00	6.1	15	18	0.230	
7-Apr-00	6.4	10	46	0.680	
24-May-00	7.3	4	52	0.360	0.012
8-Jun-00	7.3	8	50	0.320	
18-Jul-00	7	11	32	0.250	
16-Aug-00	7.5	3	28	0.180	0.006
25-Sep-00	7.7	3	21	0.240	
16-Oct-00	7.9	3	23	0.310	
16-Nov-00	7.8	4	27	0.320	0.011
14-Dec-00	7.4	7	26	0.450	
18-Jan-01	7.2	12	23	0.630	
20-Feb-01	7.1	14	23	1.110	0.026
21-Mar-01	7	32	16	1.470	
4-Apr-01	6.8	27	10	1.680	
17-May-01	7.1	7	16	0.390	0.018
14-Jun-01	7.5	2	17	0.290	
12-Jul-01	7.7	4	12	0.370	
16-Aug-01	7.6	3	8	0.280	0.010
12-Sep-01	7.5	3	7	0.320	
12-Oct-01	7.3	3	9	0.400	
2-Nov-01	7.2	3	15	0.280	0.015
14-Dec-01	7	5	17	0.300	
17-Jan-02	6.7	10	16	0.250	
14-Feb-02	6.7	9	15	0.580	0.024
14-Mar-02	6.5	12	15	0.720	
11-Apr-02	6.3	26	13	0.490	
16-May-02	7.4	3	14	0.310	0.020
13-Jun-02	7.7	1	15	0.180	
11-Jul-02	7.5	4	7	0.400	
15-Aug-02	7.3	4	4	0.370	0.020
12-Sep-02	7.3	5	5	0.330	
17-Oct-02	7.5	4	11	0.260	
14-Nov-02	7.4	2	11	0.290	0.014
12-Dec-02	7.3	6	13	0.240	
27-Jan-03	6.8		16	0.540	0.037
28-Apr-03	6.8		7	0.520	0.029
28-Jul-03	7.4		7	0.400	0.017
27-Oct-03	7.4		12	0.330	0.020

Table A1.3: Routine Monitoring Data in Pond C (P-03) at the Panel TMA

Date	pH	Acidity	Sulphate	Radium-226	Barium
	(pH units)	(mg/L as $CaCO_3$)	(mg/L)	(Bq/L)	(mg/L)
26-Jan-04	6.7		17	0.590	0.048
26-Apr-04	6.7		8	0.560	0.038
26-Jul-04	7.6		7	0.300	0.019
25-Oct-04	7.2		7	0.290	0.016
24-Jan-05	6.3		10	0.630	0.054
25-Apr-05	6.6		7	0.910	0.042
25-Jul-05	7.2		5	0.480	0.024
24-Oct-05	7.1		6	0.380	0.019
23-Jan-06	6.6		10	0.640	0.046
25-Apr-06	6.9		7	0.760	0.040
25-Jul-06	7.3		5	0.460	0.026
24-Oct-06	7.3		6	0.470	0.025
22-Jan-07	6.5		8	0.354	0.029
23-Apr-07	6.9		6	0.740	0.039
23-Jul-07	7		5	0.400	0.025
22-Oct-07	6.6		6	0.540	0.035
24-Jan-08	6.4		9	0.610	0.036
8-May-08	6.8		10	0.470	0.026
15-Jul-08	7.5		6	0.369	0.023
15-Aug-08	7.3				
27-Apr-09	6.2		16	0.290	0.018
27-Jul-09	6.9		18	0.490	0.029
26-Oct-09	6.8		13	0.430	0.030

Table A1.4: Flow Data for the Panel TMA at the South Basin Outflow (P-13)

Month	FLOW (L/s)
Jan-87	115.6
Feb-87	119.3
Mar-87	122.5
Apr-87	140.8
May-87	134.6
Jun-87	114.0
Jul-87	101.1
Aug-87	82.0
Sep-87	24.6
Oct-87	79.1
Nov-87	115.5
Dec-87	127.6
Jan-88	121.9
Feb-88	117.0
Mar-88	119.9
Apr-88	170.1
May-88	155.2
Jun-88	146.7
Jul-88	103.2
Aug-88	103.8
Sep-88	96.4
Oct-88	115.5
Nov-88	170.5
Dec-88	190.8
Jan-89	176.9
Feb-89	159.2
Mar-89	151.7
Apr-89	169.6
May-89	172.4
Jun-89	158.5
Jul-89	128.1
Aug-89	69.2
Sep-89	83.6
Oct-89	75.5
Nov-89	114.4
Dec-89	119.2
Jan-90	115.2
Feb-90	125.1
Mar-90	144.4
Apr-90	137.5
May-90	120.2
Jun-90	116.6
Jul-90	143.6
Aug-90	115.2
Sep-90	101.6
Oct-90	58.9
Nov-90	59.9
Dec-90	64.4
Jan-91	66.8
Feb-91	54.4
Mar-91	62.3
Apr-91	140.8
May-91	112.4
Jun-91	20.3
Jul-91	40.2
Aug-91	0.0
Sep-91	0.0
Oct-91	48.6
Nov-91	74.8
Dec-91	110.2
Jan-92	77.8
Feb-92	38.3
Mar-92	60.1
Apr-92	69.5
May-92	124.8
Jun-92	64.0
Jul-92	0.0
Aug-92	0.0
Sep-92	27.2
Oct-92	69.5
Nov-92	78.9
Dec-92	57.4
Jan-93	0.0
Feb-93	0.0
Mar-93	0.0
Apr-93	0.0
May-93	96.5
Jun-93	22.8
Jul-93	46.8

Table A1.4: Flow Data for the Panel TMA at the South Basin Outflow (P-13)

Month	FLOW (L/s)
Aug-93	0.0
Sep-93	0.0
Oct-93	6.3
Nov-93	88.5
Dec-93	103.4
Jan-94	0.0
Feb-94	0.0
Mar-94	0.0
Apr-94	0.0
May-94	0.0
Jun-94	112.9
Jul-94	34.5
Aug-94	0.0
Sep-94	52.0
Oct-94	47.4
Nov-94	46.7
Dec-94	36.0
Jan-95	0.0
Feb-95	0.0
Mar-95	0.0
Apr-95	0.0
May-95	28.8
Jun-95	106.8
Jul-95	0.0
Aug-95	0.0
Sep-95	0.0
Oct-95	0.0
Nov-95	65.5
Dec-95	89.9
Jan-96	23.7
Feb-96	116.5
Mar-96	96.9
Apr-96	94.8
May-96	66.6
Jun-96	36.4
Jul-96	9.0
Aug-96	29.4
Sep-96	23.5
Oct-96	68.3
Nov-96	106.0
Dec-96	121.2
Jan-97	66.9
Feb-97	0.0
Mar-97	84.8
Apr-97	112.2
May-97	108.4
Jun-97	10.9
Jul-97	0.0
Aug-97	0.0
Sep-97	0.0
Oct-97	0.0
Nov-97	0.0
Dec-97	0.0
Jan-98	0.0
Feb-98	0.0
Mar-98	4.3
Apr-98	127.8
May-98	6.0
Jun-98	18.7
Jul-98	0.0
Aug-98	0.0
Sep-98	0.0
Oct-98	0.0
Nov-98	53.9
Dec-98	0.0
Jan-99	69.5
Feb-99	101.4
Mar-99	0.0
Apr-99	48.6
May-99	0.0
Jun-99	28.4
Jul-99	50.0
Aug-99	0.0
Sep-99	0.0
Oct-99	0.0
Nov-99	0.0
Dec-99	70.3
Jan-00	0.0
Feb-00	0.0

Table A1.4: Flow Data for the Panel TMA at the South Basin Outflow (P-13)

Month	FLOW (L/s)
Mar-00	38.9
Apr-00	0.0
May-00	0.0
Jun-00	0.0
Jul-00	0.0
Aug-00	0.0
Sep-00	9.2
Oct-00	0.0
Nov-00	0.0
Dec-00	0.0
Jan-01	0.0
Feb-01	48.7
Mar-01	89.0
Apr-01	20.0
May-01	19.7
Jun-01	24.5
Jul-01	0.0
Aug-01	0.0
Sep-01	67.3
Oct-01	158.2
Nov-01	156.9
Dec-01	86.6
Jan-02	88.9
Feb-02	0.0
Mar-02	102.5
Apr-02	56.9
May-02	0.0
Jun-02	44.3
Jul-02	0.0
Aug-02	0.0
Sep-02	0.0
Oct-02	122.4
Nov-02	13.8
Dec-02	0.0
Jan-03	84.8
Feb-03	0.0
Mar-03	14.3
Apr-03	100.9
May-03	85.0
Jun-03	0.0
Jul-03	0.0
Aug-03	33.4
Sep-03	46.5
Oct-03	62.4
Nov-03	120.7
Dec-03	97.4
Jan-04	0.0
Feb-04	0.0
Mar-04	60.9
Apr-04	99.1
May-04	100.0
Jun-04	40.6
Jul-04	0.0
Aug-04	0.0
Sep-04	0.0
Oct-04	88.7
Nov-04	9.2
Dec-04	0.0
Jan-05	92.8
Feb-05	80.8
Mar-05	0.0
Apr-05	0.0
May-05	72.1
Jun-05	0.0
Jul-05	0.0
Aug-05	0.0
Sep-05	0.0
Oct-05	56.8
Nov-05	75.9
Dec-05	0.0
Jan-06	0.0
Feb-06	0.0
Mar-06	18.0
Apr-06	98.5
May-06	64.2
Jun-06	30.9
Jul-06	0.0
Aug-06	0.0
Sep-06	0.0

Table A1.4: Flow Data for the Panel TMA at the South Basin Outflow (P-13)

Month	FLOW (L/s)
Oct-06	52.6
Nov-06	90.1
Dec-06	0.0
Jan-07	0.0
Feb-07	0.0
Mar-07	56.5
Apr-07	64.4
May-07	35.4
Jun-07	0.0
Jul-07	0.0
Aug-07	0.0
Sep-07	0.0
Oct-07	0.0
Nov-07	74.9
Dec-07	30.8
Jan-08	0.0
Feb-08	55.2
Mar-08	94.3
Apr-08	88.6
May-08	85.3
Jun-08	25.4
Jul-08	41.3
Aug-08	63.3
Sep-08	0.0
Oct-08	77.5
Nov-08	8.5
Dec-08	0.0
Jan-09	0.0
Feb-09	81.7
Mar-09	23.9
Apr-09	95.5
May-09	101.0
Jun-09	35.2
Jul-09	0.0
Aug-09	0.0
Sep-09	0.0
Oct-09	0.0
Nov-09	116.6
Dec-09	58.1
Jan-10	0.0

APPENDIX 2

Compilation of Data from the 2006 Field Sampling Program

Table A2.1: Solids Data from the 2006 Field Sampling Program - Core Samples

	Sample ID	PMB-06-1 0-5	PMB-06-1 12.5-17.5	PMB-06-2 0-5	PMB-06-2 15-20	PSB-06-1 0-4	PSB-06-1 17.5-20	PSB-06-2 0-4	PSB-06-2 10-12.5	PSB-06-3 0-4
	Sample Date	10-Oct-06	10-Oct-06	10-Oct-06	10-Oct-06	04-Oct-06	04-Oct-06	05-Oct-06	05-Oct-06	05-Oct-06
Analysis	**Units**									
$BaSO_4$[a]	mg/kg	140	67	170	290	100	250	1020	220	150
$BaSO_4$[b]	mg/kg	73	1090	<50.0	< 50	510	< 50	870	1090	< 50
Ra-226	Bq/g	4.9	3.8	3.4	12	1.2	7.6	1.2	7.8	1.7
Acid Volatile Sulphide	mg/L	< 1	< 0.2	< 0.2	< 0.2	< 0.1	< 0.2	< 0.1	< 0.2	< 0.1
COD	mg/kg	3480	1150	1330	2510	10900	1170	508	908	1040
Sulphur	%	0.782	1.58	2.55	5.18	0.940	2.02	1.10	4.74	1.99
Carbonate	%	2.92	<0.005	3.35	0.009	0.030	<0.005	0.048	0.031	4.72
Total Organic Carbon	%	0.865	0.035	2.05	0.190	4.09	1.31	4.54	1.49	6.70
Total Carbon	%	1.45	0.035	2.72	0.191	4.10	1.31	4.55	1.49	7.65
Sulphide Sulphur	%	0.37	0.73	0.43	1.43	0.38	0.78	0.27	1.83	0.25
Sulphate	%	0.8	2.1	8.1	9.9	1.2	3.0	1.0	7.3	3.4
Silver	mg/kg	< 2	< 2	2.7	4.2	< 2	< 2	< 2	3.6	< 2
Aluminum	mg/kg	1100	160	15000	2800	8600	9800	14000	12000	35000
Barium	mg/kg	80	39	100	170	61	150	600	130	87
Calcium	mg/kg	31000	8400	59000	42000	2000	10000	2000	28000	37000
Cobalt	mg/kg	16	10	230	30	10	26	26	130	330
Iron	mg/kg	11000	7500	240000	40000	380000	160000	470000	46000	240000
Potassium	mg/kg	320	140	1200	1100	370	950	210	950	440
Magnesium	mg/kg	1800	23	3100	120	510	1900	340	95	27000
Manganese	mg/kg	530	3.4	3600	27	230	120	210	14	6500
Sodium	mg/kg	35	8	500	55	38	34	28	45	110
Lead	mg/kg	290	200	480	680	330	420	230	1100	530
Selenium	mg/kg	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Uranium	mg/kg	29	3.6	1500	99	170	160	340	130	1200

Notes:
[a] Calculated from barium concentration
[b] Calculated from sulphur concentration

Table A2.1: Solids Data from the 2006 Field Sampling Program - Core Samples

	Sample ID	PSB-06-3 12.5-15	PW-06-1 0-5	PW-06-1 10-15	PW-06-2 0-10	PW-06-2 15-20	PW-06-3 0-10	PW-06-3 15-20
	Sample Date	05-Oct-06	23-Oct-06	23-Oct-06	24-Oct-06	24-Oct-06	24-Oct-06	24-Oct-06
Analysis	**Units**							
$BaSO_4$[a]	mg/kg	660	170	270	130	82	190	220
$BaSO_4$[b]	mg/kg	360	950	220	1460	440	800	73
Ra-226	Bq/g	0.61	1.0	7.8	1.2	4.6	1.9	9.6
Acid Volatile Sulphide	mg/L	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.2
COD	mg/kg	2110	13600	6560	16800	9650	8680	7910
Sulphur	%	4.36	5.13	2.99	3.39	3.08	0.945	2.25
Carbonate	%	11.0	0.058	0.023	0.014	0.018	0.015	0.007
Total Organic Carbon	%	1.27	9.37	6.66	8.15	0.753	3.62	0.280
Total Carbon	%	3.48	9.38	6.67	8.15	0.757	3.62	0.282
Sulphide Sulphur	%	0.10	1.81	2.26	2.34	2.83	0.27	1.68
Sulphate	%	12	0.7	0.5	0.6	1.1	0.4	< 0.4
Silver	mg/kg	< 2	< 2	4.5	< 2	< 2	< 2	< 2
Aluminum	mg/kg	12000	2200	2500	1800	1500	670	620
Barium	mg/kg	390	98	160	77	48	110	130
Calcium	mg/kg	160000	4700	2800	5600	4100	1800	280
Cobalt	mg/kg	90	36	65	34	34	6.7	27
Iron	mg/kg	220000	270000	110000	150000	110000	88000	47000
Potassium	mg/kg	240	430	690	360	250	290	230
Magnesium	mg/kg	17000	320	91	160	37	85	18
Manganese	mg/kg	850	82	24	49	11	17	7.3
Sodium	mg/kg	62	26	16	41	10	18	8
Lead	mg/kg	120	200	1500	170	320	560	570
Selenium	mg/kg	< 1	< 1	< 1	< 1	< 1	2	2
Uranium	mg/kg	120	50	220	47	46	9.4	24

Notes:
[a] Calculated from barium concentration
[b] Calculated from sulphur concentration

Table A2.2: Solids Data from the 2006 Field Sampling Program - Ponar Samples

Analysis	Units	Sample ID				
		PMB-1	PMB-2	PSB-3	PW-1	PW-3
Radium-226 Analysis (Ra-226)	Bq/g	2.6	10.8	18.6	3.7	11.8
Aluminum (Al)	mg/kg	1,696	14,529	15,346	4,002	5,510
Antimony (Sb)	mg/kg	1.4	1.2	1.1	1.1	1.7
Arsenic (As)	mg/kg	9.1	20.0	47.6	25.3	36.1
Barium (Ba)	mg/kg	56.2	128.5	141.9	42.5	189.4
Beryllium (Be)	mg/kg	0.2	1.3	0.8	0.4	0.2
Bismuth (Bi)	mg/kg	3.4	26.3	17.2	33.9	23.4
Boron (B)	mg/kg	4.6	15.3	3.3	6.1	6.2
Cadmium (Cd)	mg/kg	0.1	8.6	3.4	7.9	0.4
Calcium (Ca)	mg/kg	24,046	29,430	1,304	3,509	3,637
Chromium (Cr)	mg/kg	2.0	12.3	23.0	20.6	11.8
Cobalt (Co)	mg/kg	12.8	444.1	13.9	18.9	17.2
Copper (Cu)	mg/kg	30.8	65.7	97.1	103.1	88.3
Iron (Fe)	mg/kg	11,289	398,275	244,874	563,766	105,947
Lead (Pb)	mg/kg	84.6	315.8	388.1	210.2	803.8
Lithium (Li)	mg/kg	2.2	2.4	2.3	2.5	2.7
Magnesium (Mg)	mg/kg	70,945	144,359	140,537	186,219	308,055
Manganese (Mn)	mg/kg	112	2,357	128	74	23
Molybdenum (Mo)	mg/kg	2.1	2.4	180.4	1.4	8.6
Nickel (Ni)	mg/kg	14.4	361.2	21.6	25.8	32.2
Phosphorus (P)	mg/kg	102.1	423.4	425.7	489.4	893.4
Potassium (K)	mg/kg	125.2	490.2	705.1	333.8	529.0
Selenium (Se)	mg/kg	3.0	6.9	3.6	3.8	6.5
Silicon (Si)	mg/kg	756.7	5,246.0	3,149.2	3,781.4	1,060.0
Silver (Ag)	mg/kg	3.1	3.2	3.4	3.1	3.5
Sodium (Na)	mg/kg	178,114	430,499	354,096	500,160	786,660
Strontium (Sr)	mg/kg	9.8	16.8	5.4	4.5	8.8
Sulfur (S)	mg/kg	10,122	15,969	3,479	6,273	13,978
Thallium (Tl)	mg/kg	3.1	3.4	3.1	3.1	3.5
Tin (Sn)	mg/kg	6.5	9.6	9.3	7.3	20.8
Titanium (Ti)	mg/kg	33.3	241.9	223.4	318.5	233.5
Uranium (U)	mg/kg	13	1,977	232	33	19
Vanadium (V)	mg/kg	1.4	10.7	17.3	29.5	15.7
Zinc (Zn)	mg/kg	16	1,477	98	95	38
Sulphate	mg/kg	30,837	54,147	12,177	23,348	43,394

Table A2.3: Porewater Data from the 2006 Field Sampling Program

Sample ID	PMB-1	PMB-2	PSB-3	PW-1	PW-3
Units	(Bq/L or mg/L)	(Bq/L or mg/L)	(Bq/L or mg/L)	(Bq/L or mg/L)	(Bq/L or mg/L)
Analysis					
Radium-226	0.88	2.6	2	4.1	5.5
Aluminum	0.126	0.0055	0.0048	0.0090	0.0067
Antimony	0.00138	0.00003	0.00008	0.00003	0.00010
Arsenic	0.0079	0.0019	0.0206	0.0019	0.0042
Barium	0.0653	0.0420	0.0379	0.0916	0.211
Beryllium	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Bismuth	0.00003	<0.00001	<0.00001	0.00003	0.00007
Boron	0.053	0.177	0.076	0.027	0.022
Cadmium	0.000116	0.000010	0.000034	0.000009	0.000019
Calcium	241	519	191	56.4	53.4
Chromium	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Cobalt	0.0167	0.130	0.0178	0.000740	0.00399
Copper	0.0167	0.0021	0.0008	0.0011	0.0051
Iron	<0.01	12.4	185	6.20	2.00
Lead	0.00141	0.00022	0.00024	0.00075	0.00250
Lithium	<0.002	<0.002	0.003	<0.002	<0.002
Magnesium	5.90	38.6	15.1	2.93	4.96
Manganese	0.0318	7.13	5.73	0.163	0.0764
Molybdenum	0.0127	0.00045	0.00042	0.00015	0.00063
Nickel	0.698	0.115	0.0105	0.0024	0.0049
Phosphorous	0.03	0.06	0.08	0.07	0.14
Potassium	22.6	20.0	13.7	33.6	7.03
Selenium	0.005	0.004	0.002	<0.001	<0.001
Silicon	1.74	2.44	7.15	5.13	2.53
Silver	0.00006	<0.00001	<0.00001	<0.00001	<0.00001
Sodium	10.9	31.0	7.34	6.28	3.58
Strontium	0.341	0.388	0.217	0.0559	0.0827
Sulphur	188	501	299	17.9	25.1
Thallium	0.000032	<0.000002	<0.000002	<0.000002	0.000005
Tin	0.00005	<0.00001	<0.00001	<0.00001	<0.00001
Titanium	0.0004	0.0007	0.0003	0.0006	0.0010
Uranium	0.00514	0.887	0.0111	0.00414	0.00475
Vanadium	0.00079	0.00005	<0.00003	0.00013	0.00022
Zinc	<0.01	<0.01	0.02	<0.01	<0.01
Sulphate	564	1503	897	54	75

Table A2.4: Basin Water Data from the 2006 Field Sampling Program

	Sample ID	PMB-06-1 SI	PMB-06-2 SW	PMB-06-2 SI	PSB-06-1 SI	PSB-06-2 SW	PSB-06-2 SI	PSB-06-3 SI	PW-06-1 SW	PW-06-1 SI
	Sample Date	10-Oct-06	10-Oct-06	10-Oct-06	04-Oct-06	05-Oct-06	05-Oct-06	05-Oct-06	23-Oct-06	23-Oct-06
Analysis	**Units**									
Alkalinity	mg/L as $CaCO_3$	12	12	46	11	11	11	11	41	44
SO4	mg/L	310	310	440	230	220	230	220	5.8	6.0
H2S	mg/L	< 0.02	---	< 0.02	< 0.02	---	< 0.02	< 0.02	---	< 0.02
Ag	mg/L	0.0036	0.0034	< 0.0001	< 0.00003	< 0.00003	< 0.00003	< 0.00003	0.0126	0.0037
Al	mg/L	< 0.00003	< 0.00003	< 0.00003	< 0.01	0.02	0.02	0.01	< 0.00003	0.00005
Ba	mg/L	0.0136	0.0131	0.0214	0.0189	0.0176	0.0176	0.0176	0.0262	0.0279
Ca	mg/L	112	117	159	82.6	84.2	83.1	83.8	17.7	14.5
Co	mg/L	0.000087	0.000134	0.00973	0.000079	0.000018	0.001869	0.003382	0.00009	0.00008
Fe	mg/L	< 0.01	0.04	0.53	0.05	0.13	0.02	0.02	0.32	0.16
K	mg/L	10.2	10.3	13.4	7.58	7.34	7.49	7.56	0.39	0.43
Mg	mg/L	7.29	7.56	12.7	5.78	5.57	5.60	5.65	0.928	0.883
Na	mg/L	0.00116	0.0126	1.97	5.33	5.13	5.23	5.26	0.0043	0.0036
Mn	mg/L	7.89	8.04	10.3	0.00618	0.0171	0.00736	0.00561	0.71	0.67
Pb	mg/L	< 0.00002	< 0.00002	< 0.00002	< 0.00002	0.00038	< 0.00002	< 0.00002	0.00003	< 0.00002
S	mg/L	< 0.003	< 0.003	< 0.003	70.9	71.9	71.0	71.0	< 0.003	< 0.003
Se	mg/L	95.1	98.2	134	< 0.003	< 0.003	< 0.003	< 0.003	2.21	2.26
U	mg/L	0.00715	0.00767	0.0576	0.00259	0.00290	0.00268	0.00255	0.0001	0.0002

Notes:
SW - Basin Water sample - collected from top of water column
SI - Solids-Water Interface sample

APPENDIX 3

Detailed Data Quality Assessment

Table A3.1: Detailed Data Quality Assessment for Constituents in Solids

Analysis	Units	Method Detection Limit	RPD Data Quality Objective	Sample ID	Duplicate ID	RPD (%) or AD	Sample ID	Duplicate ID	RPD (%) or AD	Sample ID	Replicate ID	RPD (%) or AD	Sample ID	Replicate ID	RPD (%) or AD	Sample ID	Replicate ID	RPD (%) or AD
				CORE 09-PSB-2 (5-10)	CORE 09-EC-1 (0-5)		CORE 09-SR-4 (10-15)	CORE 09-EC-1 (5-10)		CORE 09-QC14-2 (0-2.5)	CORE 09-EC-2 (0-2.5)		CORE 09-QC14-2 (2.5-5)	CORE 09-EC-2 (2.5-5)		CORE 09-QC14-2 (5-7.5)	CORE 09-EC-2 (5-7.5)	
Conventional Parameters																		
Sulphur (S)	%	0.005	≤ 40%	1.57	1.17	29	1.00	0.762	27	0.633	0.628	1	0.885	1.03	15	0.871	1.18	30
Carbonate (CO_3)	%	0.005	≤ 40%	0.097	0.058	**50**	0.419	0.280	40	<0.005	<0.005	BD	<0.005	<0.005	BD	<0.005	<0.005	BD
Total Organic Carbon (TOC)	%	0.01	≤ 40%	9.78	10.5	7	16.8	16.7	1	0.519	0.617	17	0.289	0.206	34	0.121	0.090	29
Total Carbon (C)	%	0.005	≤ 40%	9.80	10.5	7	16.9	16.8	1	0.519	0.616	17	0.289	0.207	33	0.121	0.089	30
Sulphide	%	0.01	≤ 40%	0.36	0.47	27	0.65	0.70	7	0.52	0.53	2	0.77	1.04	30	0.84	1.07	24
Sulphate (SO_4)	%	0.1	≤ 40%	0.6	0.3	**0.3**	0.2	0.1	0.1	0.1	0.1	0	0.1	0.1	0	0.1	0.1	0
Metals																		
Radium-226 (Ra-226)	Bq/g	0.01	≤ 40%	4.5	4.1	9	2.1	1.6	27	4.3	7.0	**48**	6.5	8.3	24	9.3	20.0	**73**
Silver (Ag)	mg/kg	0.7	≤ 40%	<0.7	<0.7	BD	<0.7	<0.7	BD	0.8	1.5	**1**	1.0	1.2	0.2	1.1	1.1	0
Aluminum (Al)	mg/kg	1	≤ 40%	3600	3800	5	5600	5800	4	830	1500	**58**	690	1200	**54**	850	890	5
Arsenic (As)	mg/kg	1	≤ 40%	14	14	0	26	26	0	17	22	26	19	24	23	21	24	13
Barium (Ba)	mg/kg	0.05	≤ 40%	160	94	**52**	440	450	2	150	280	**60**	220	370	**51**	330	310	6
Beryllium (Be)	mg/kg	0.1	≤ 40%	0.34	0.35	0.01	0.12	0.13	0.01	0.28	0.51	**0.23**	0.28	0.41	0.1	0.34	0.34	0
Bismuth (Bi)	mg/kg	0.5	≤ 40%	11	12	9	<0.5	<0.5	BD	7.5	11	38	9.2	8.6	7	8.5	7.8	9
Calcium (Ca)	mg/kg	1	≤ 40%	7600	4600	**49**	7300	7400	1	190	230	19	130	110	17	79	63	23
Cadmium (Cd)	mg/kg	0.05	≤ 40%	4.5	4.0	12	1.8	1.8	0	0.18	0.25	33	0.22	0.27	20	0.22	0.29	27
Cerium (Ce)	mg/kg	0.006	≤ 40%	220	240	9	840	800	5	300	340	13	290	300	3	280	240	15
Cobalt (Co)	mg/kg	0.3	≤ 40%	15	15	0	16	17	6	15	16	6	18	21	15	17	22	26
Chromium (Cr)	mg/kg	0.5	≤ 40%	6.5	7.8	18	17	17	0	4.7	8.2	**54**	4.9	6.5	28	5.7	5.8	2
Cesium (Cs)	mg/kg	0.01	≤ 40%	0.97	1.1	13	0.87	0.90	3	0.18	0.32	**56**	0.22	0.20	10	0.31	0.19	**48**
Copper (Cu)	mg/kg	0.1	≤ 40%	14	15	7	56	56	0	43	50	15	46	54	16	42	54	25
Iron (Fe)	mg/kg	0.5	≤ 40%	240000	240000	0	12000	16000	29	10000	13000	26	12000	17000	34	13000	19000	38
Gallium (Ga)	mg/kg	0.03	≤ 40%	2.4	2.7	12	6.6	6.5	2	2.1	2.8	29	2.1	2.4	13	2.0	1.9	5
Germanium (Ge)	mg/kg	0.3	≤ 40%	7.2	7.2	0	3.8	4.0	5	1.2	1.4	0.2	1.2	1.4	0.2	1.2	1.2	0
Hafnium (Hf)	mg/kg	0.1	≤ 40%	0.1	0.1	0	0.6	0.9	40	0.3	0.5	**0.2**	0.6	0.7	15	1.0	0.7	35
Indium (In)	mg/kg	0.01	≤ 40%	<0.01	<0.01	BD	<0.01	0.01	BD	<0.01	0.02	BD	<0.01	0.01	BD	0.01	0.01	0
Potassium (K)	mg/kg	1	≤ 40%	190	210	10	270	270	0	210	330	44	230	300	26	250	230	8
Lanthanum (La)	mg/kg	0.001	≤ 40%	110	130	17	430	420	2	170	190	11	170	170	0	160	140	13
Lithium (Li)	mg/kg	0.1	≤ 40%	0.9	0.9	0	1.1	1.3	17	0.2	0.8	**120**	0.1	0.5	**0.4**	0.4	0.2	**0.2**
Lutetium (Lu)	mg/kg	0.001	≤ 40%	0.98	1.1	12	5.3	5.3	0	0.081	0.14	**53**	0.048	0.060	22	0.031	0.038	20
Magnesium (Mg)	mg/kg	1	≤ 40%	360	240	40	1400	1500	7	88	110	22	46	38	19	25	18	33
Manganese (Mn)	mg/kg	0.05	≤ 40%	89	84	6	180	180	0	13	18	32	8.6	7.6	12	4.7	4.6	2
Molybdenum (Mo)	mg/kg	0.5	≤ 40%	10	10	0	3.6	3.9	8	5.3	6.4	19	5.2	6.1	16	7.9	5.5	36
Sodium (Na)	mg/kg	1	≤ 40%	35	40	13	59	55	7	8	11	32	7	8	13	6	5	1
Niobium (Nb)	mg/kg	0.7	≤ 40%	2.8	2.7	4	0.8	<0.7	BD	7.0	9.7	32	8.2	7.8	5	8.4	7.5	11
Nickel (Ni)	mg/kg	1	≤ 40%	17	19	11	43	43	0	8	9	12	8	10	22	8	11	32
Lead (Pb)	mg/kg	0.7	≤ 40%	270	280	4	640	640	0	180	240	29	260	270	4	270	310	14
Phosphorous (P)	mg/kg	5	≤ 40%	740	810	9	340	360	6	260	400	**42**	300	360	18	360	330	9
Rubidium (Rb)	mg/kg	0.004	≤ 40%	2.1	2.5	17	4.0	4.0	0	1.9	2.6	31	1.9	2.0	5	1.8	1.4	25
Antimony (Sb)	mg/kg	1	≤ 40%	<1	<1	BD	<1	<1	BD	<1	1	BD	<1	<1	BD	<1	<1	BD
Scandium (Sc)	mg/kg	0.2	≤ 40%	1.3	1.6	21	2.7	3.0	11	0.5	0.9	**57**	0.4	0.8	**67**	0.5	0.6	0.1
Selenium (Se)	mg/kg	1	≤ 40%	<1	<2	BD	<1	<2	BD	<2	<2	BD	<2	<2	BD	<2	<2	BD
Tin (Sn)	mg/kg	6	≤ 40%	<6	<6	BD	<6	<6	BD	<6	<6	BD	<6	<6	BD	<6	<6	BD
Strontium (Sr)	mg/kg	0.01	≤ 40%	7.6	7.9	4	14	14	0	3.6	5.1	34	4.1	5.4	27	4.8	4.6	4
Sulphur (S)	mg/kg	1	≤ 40%	--	15000	--	11000	11000	0	6500	6700	3	8700	11000	23	8600	12000	33
Tantalum (Ta)	mg/kg	0.01	≤ 40%	0.05	0.05	0	0.15	0.23	**42**	0.04	0.07	**55**	0.05	0.12	**82**	0.12	0.28	**80**
Terbium (Tb)	mg/kg	0.01	≤ 40%	3.9	4.3	10	35	33	6	0.97	1.4	36	0.83	0.90	8	0.68	0.67	1
Tellurium (Te)	mg/kg	0.1	≤ 40%	0.1	0.1	0	<0.1	<0.1	BD	0.1	0.2	0.1	0.2	0.2	0	0.2	0.2	0
Thorium (Th)	mg/kg	0.01	≤ 40%	110	120	9	85	89	5	310	560	**57**	310	470	41	360	380	5
Titanium (Ti)	mg/kg	0.2	≤ 40%	82	91	10	210	220	5	210	330	**44**	250	260	4	260	240	8
Thallium (Tl)	mg/kg	3	≤ 40%	<3	<3	BD	<3	<3	BD	<3	<3	BD	<3	<3	BD	<3	<3	BD
Uranium (U)	mg/kg	3	≤ 40%	210	230	9	110	150	31	17	23	30	17	18	6	13	15	2
Vanadium (V)	mg/kg	0.1	≤ 40%	25	26	4	16	17	6	2.7	4.0	39	2.7	2.7	0	2.7	2.4	12
Tungsten (W)	mg/kg	1	≤ 40%	2	79	**190**	<1	5	BD	3	5	**2**	4	5	1	5	6	18
Yttrium (Y)	mg/kg	0.1	≤ 40%	78	84	7	740	750	1	9.1	12	27	6.8	6.7	1	5.5	5.2	6
Ytterbium (Yb)	mg/kg	0.1	≤ 40%	7.4	8.7	16	45	46	2	0.74	1.2	**47**	0.46	0.57	21	0.33	0.40	0.07
Zinc (Zn)	mg/kg	0.1	≤ 40%	64	65	2	55	58	5	8.8	8.9	1	6.9	8.0	15	4.7	5.8	21
Zirconium (Zr)	mg/kg	5	≤ 40%	6	6	0	6	<5	BD	20	30	40	26	27	4	28	26	7

Notes:
RPD - relative percent difference; is calculated for analytes with concentrations greater than or equal to five times the detection limit and should be less than or equal to 40%
AD - absolute difference; for samples having concentrations less than five times the detection limit, the difference between the sample and duplicate, or difference between the sample or duplicate and the detection limit if either the sample or duplicate analyte concentration is below detection limit; should not be greater then the detection limit
BD - Sample and/or replicate had analyte concentrations below detection limit
Boldface type and shaded indicates that Data Quality Objective was not achieved

Table A3.2: Detailed Data Quality Assessment for Constituents in Waters

Analysis	Units	Method Detection Limit	RPD Data Quality Objective	Sample ID SW09-SR-4B	Duplicate ID PW09-EC-1 (0-5)	RPD (%) or AD	Sample ID PW09-QC14-3 (0-5)	Duplicate ID PW09-QC14-4 (0-5)	Dupicate ID PW09-EC-1 (5-10)	RPD (%) or AD	Sample ID SW09-QC14-2T	Replicate ID SW09-EC-2T	RPD (%) or AD	Sample ID SW09-QC14-2B	Replicate ID SW09-EC-2B	RPD (%) or AD	Sample ID PW09-QC14-2 (0-2.5)	Replicate ID PW09-EC-2 (0-2.5)	RPD (%) or AD	Sample ID PW09-QC14-2 (2.5-5)	Replicate ID PW09 EC2 2.5-5	RPD (%) or AD	Sample ID PW09-QC14-2 (5-7.5)	Replicate ID PW09 EC2 5-7.5	RPD (%) or AD
Conventional Parameters																									
Acidity (as $CaCO_3$)	mg/L	2	≤ 20%	<2.0	--	--	6	19	--	--	56	67	18	15	16	6	21	17	**21**	15	16	6	16	--	--
Dissolved Inorganic Carbon (DIC)	mg/L	0.2	≤ 20%	1.4	--	--	2.0	<1.0	--	BD	<1.0	<1.0	BD	<1.0	<1.0	BD	<1.0	4.2	BD	<1.0	1.1	BD	<1.0	--	BD
Dissolved Organic Carbon (DOC)	mg/L	0.2	≤ 20%	2.0	--	--	3.5	9.3	--	--	14.4	11.4	**23**	19.4	11.7	**50**	28	19	**38**	18.3	14.3	**25**	17.9	--	--
Sulphate (SO_4)	mg/L	0.2	≤ 20%	25	--	--	5.6	512	--	--	72	85	17	32	36	12	32	27	17	12	18	**40**	12	--	--
Hardness (as $CaCO_3$)	mg/L	0.5	≤ 20%	33.4	33.9	1	18	NC	17.8	1	16.9	17	1	16.6	16.8	1	26.2	21.7	19	16.9	16	5	17.9	16.4	9
Metals																									
Radium-226 (Ra-226)	Bq/L	0.01	≤ 20%	0.30	0.30	0	NC	4.1	4.7	14	0.82	0.78	5	0.91	0.85	7	3.6	2.9	**22**	2.8	3.3	16	5.9	5.4	9
Aluminum (Al)	mg/L	0.01	≤ 20%	<0.01	<0.01	BD	<0.01	NC	<0.01	BD	<0.01	0.03	BD	<0.01	<0.01	BD	<0.01	<0.01	BD	0.03	<0.01	BD	<0.01	<0.01	BD
Arsenic (As)	mg/L	0.0002	≤ 20%	0.0007	0.0006	0.0001	0.0026	NC	0.0024	8	0.0006	0.0007	0.0001	0.0011	0.0007	**0.0004**	0.0064	0.0058	10	0.0084	0.0046	**58**	0.0066	0.0065	2
Barium (Ba)	mg/L	0.00001	≤ 20%	0.222	0.221	0	0.333	NC	0.335	1	0.104	0.108	4	0.108	0.114	5	0.309	0.285	8	0.308	0.337	9	0.519	0.487	6
Beryllium (Be)	mg/L	0.00002	≤ 20%	<0.00002	<0.00002	BD	0.00013	NC	<0.00002	BD	<0.00002	0.00003	BD	<0.00002	0.00002	BD	<0.00002	<0.00002	BD	<0.00002	<0.00002	BD	<0.00002	<0.00002	BD
Boron (B)	mg/L	0.0002	≤ 20%	0.0089	0.0082	8	0.0026	NC	0.0028	0.0002	0.0045	0.0076	**51**	0.0056	0.0072	**25**	0.0054	0.0039	**32**	0.0047	0.0034	**32**	0.0051	0.0039	**27**
Bismuth (Bi)	mg/L	0.00001	≤ 20%	0.00001	<0.00001	BD	0.00012	NC	<0.00001	BD	<0.00001	0.00002	BD	<0.00001	0.00002	BD	0.00003	0.00003	0	0.00024	0.00006	**120**	0.00006	0.00003	**0.00003**
Calcium (Ca)	mg/L	0.03	≤ 20%	11.2	11.4	2	6.12	NC	6.06	1	5.69	5.69	0	5.55	5.63	1	8.79	7.28	19	5.68	5.35	6	6.06	5.54	9
Cadmium (Cd)	mg/L	0.000003	≤ 20%	0.000028	0.000012	0.000016	0.000112	NC	<0.000003	BD	0.000023	0.000046	**67**	0.000023	0.000056	**84**	0.000055	0.000031	**56**	<0.000003	0.000012	BD	0.000005	0.000009	**0.000004**
Cobalt (Co)	mg/L	0.000002	≤ 20%	0.00031	0.000321	3	0.00189	NC	0.00192	2	0.00549	0.00655	18	0.00169	0.00196	15	0.00521	0.00289	**57**	0.000917	0.0012	**27**	0.000766	0.00183	**82**
Chromium (Cr)	mg/L	0.0005	≤ 20%	<0.0005	<0.0005	BD	<0.0005	NC	<0.0005	BD	<0.0005	<0.0005	BD	<0.0005	<0.0005	BD	<0.0005	<0.0005	BD	<0.0005	<0.0005	BD	<0.0005	<0.0005	BD
Copper (Cu)	mg/L	0.0005	≤ 20%	0.0011	0.001	0.0001	<0.0005	NC	<0.0005	BD	0.0038	0.0037	3	0.0023	0.0029	**23**	0.0043	0.0018	**0.0025**	0.0025	0.0018	**0.0007**	0.0015	0.0011	**31**
Iron (Fe)	mg/L	0.01	≤ 20%	0.08	0.07	13	7.18	NC	6.63	8	0.04	0.07	**55**	0.01	0.04	**0.03**	0.03	0.44	**174**	0.52	3.3	**146**	2.46	5.71	**80**
Potassium (K)	mg/L	0.01	≤ 20%	0.80	0.80	0	0.37	NC	0.58	**44**	0.32	0.31	3	0.26	0.32	**21**	0.34	0.3	13	0.4	0.34	16	0.62	0.48	**25**
Lithium (Li)	mg/L	0.002	≤ 20%	<0.002	<0.002	BD	<0.002	NC	<0.002	BD	<0.002	<0.002	BD	<0.002	<0.002	BD	<0.002	<0.002	BD	<0.002	<0.002	BD	<0.002	<0.002	BD
Magnesium (Mg)	mg/L	0.003	≤ 20%	1.29	1.31	2	0.67	NC	0.655	2	0.663	0.67	1	0.657	0.663	1	1.02	0.864	17	0.664	0.634	5	0.675	0.632	7
Manganese (Mn)	mg/L	0.00001	≤ 20%	0.119	0.12	1	0.143	NC	0.142	1	0.0288	0.0315	9	0.0353	0.0319	10	0.282	0.217	**26**	0.133	0.134	1	0.133	0.132	1
Molybdenum (Mo)	mg/L	0.00001	≤ 20%	0.00032	0.00029	10	0.00045	NC	0.00051	13	<0.00001	0.00018	BD	0.00002	0.00008	**120**	0.00029	0.00015	**64**	0.00133	0.00116	14	0.00107	0.00149	**33**
Sodium (Na)	mg/L	0.01	≤ 20%	2.79	2.75	1	1.3	NC	1.24	5	1.82	1.59	13	1.83	1.58	15	2.35	2.2	7	1.98	1.87	6	1.79	1.5	18
Nickel (Ni)	mg/L	0.0001	≤ 20%	0.0006	0.0008	**29**	0.001	NC	0.001	0	0.0025	0.0022	13	0.0024	0.0022	9	0.0044	0.0024	**59**	0.0012	0.0013	8	0.0012	0.0017	**34**
Lead (Pb)	mg/L	0.00002	≤ 20%	0.00043	0.00023	**61**	0.00029	NC	0.00016	**58**	0.00717	0.00699	3	0.00597	0.00391	**42**	0.0242	0.00216	**167**	0.00596	0.0009	**148**	0.00098	0.00049	**67**
Phosphorous (P)	mg/L	0.01	≤ 20%	<0.01	<0.01	BD	<0.01	NC	<0.01	BD	0.01	<0.01	BD	<0.01	<0.01	BD	<0.01	0.07	BD	0.01	0.01	0	0.01	<0.01	BD
Antimony (Sb)	mg/L	0.0002	≤ 20%	0.0002	<0.0002	BD	<0.0002	NC	<0.0002	BD	0.0077	0.0086	11	0.0007	0.0016	**78**	0.0002	0.0003	0.0001	0.0006	<0.0002	BD	0.0004	<0.0002	BD
Selenium (Se)	mg/L	0.001	≤ 20%	<0.001	<0.001	BD	<0.001	NC	<0.001	BD	<0.001	<0.001	BD	<0.001	<0.001	BD	<0.001	<0.001	BD	<0.001	<0.001	BD	<0.001	<0.001	BD
Sulphur (S)	mg/L	0.01	≤ 20%	8.58	7.26	17	1.67	NC	1.58	6	4.69	4.64	1	4.74	4.63	2	8.28	6.26	**28**	3.87	3.35	14	3.61	4.21	15
Silicon (Si)	mg/L	0.01	≤ 20%	0.73	0.72	1	5.18	NC	5.07	2	0.58	0.59	2	0.59	0.6	2	1.23	1.42	14	1.71	1.86	8	2.15	2.71	**23**
Tin (Sn)	mg/L	0.00001	≤ 20%	0.00016	<0.00001	BD	<0.00001	NC	0.00002	BD	<0.00001	<0.00001	BD	<0.00001	<0.00001	BD	0.00004	0.00017	**124**	<0.00001	<0.00001	BD	<0.00001	0.00001	BD
Strontium (Sr)	mg/L	0.0001	≤ 20%	0.0268	0.0269	0	0.017	NC	0.0168	1	0.0121	0.0122	1	0.012	0.0122	2	0.0205	0.0168	20	0.0154	0.0149	3	0.0204	0.0187	9
Titanium (Ti)	mg/L	0.0001	≤ 20%	0.0001	<0.0001	BD	0.0003	NC	0.0003	0	0.0003	0.0004	0.0001	<0.0001	0.0001	BD	0.0003	0.0007	**80**	0.0062	0.0004	**0.0058**	0.0005	0.0002	**0.0003**
Thallium (Tl)	mg/L	0.0002	≤ 20%	<0.0002	<0.0002	BD	<0.0002	NC	<0.0002	BD	<0.0002	<0.0002	BD	<0.0002	<0.0002	BD	<0.0002	<0.0002	BD	<0.0002	<0.0002	BD	<0.0002	<0.0002	BD
Uranium (U)	mg/L	0.000001	≤ 20%	0.00122	0.000835	**37**	0.000744	NC	0.000671	10	0.000535	0.000654	20	0.000338	0.00079	**80**	0.000946	0.000173	**138**	0.000524	0.000115	**128**	0.000143	0.000105	**31**
Vanadium (V)	mg/L	0.00003	≤ 20%	0.00008	0.00007	0.00001	0.00019	NC	0.00005	**0.00014**	0.00006	0.00007	0.00001	0.00005	0.00007	0.00002	0.00007	0.00008	0.00001	0.00013	0.00007	**0.00006**	0.00006	0.00004	0.00002
Zinc (Zn)	mg/L	0.001	≤ 20%	0.004	0.003	0.001	0.002	NC	0.001	0.001	0.002	0.004	0.002	0.005	0.005	0	0.005	0.005	0	0.003	0.004	0.001	0.002	0.003	0.001

Notes:

RPD - relative percent difference; is calculated for analytes with concentrations greater than or equal to five times the detection limit and should be less than or equal to 40%

AD - absolute difference; for samples having concentrations less than five times the detection limit, the difference between the sample and duplicate, or difference between the sample or duplicate and the detection limit if either the sample or duplicate analyte concentration is below detection limit; should not be greater then the detection limit

BD - Sample and/or replicate had analyte concentrations below detection limit

"--" Indicates parameter was not analysed

"NC" Indicates that parameter in the sample was not compared to the duplicate/replicate sample in the data quality assessment

Boldface type and shaded indicates that Data Quality Objective was not achieved

Table A3.3: Detailed Data Quality Assessment for Constituents in the Blank Sample

Analysis	Units	Detection Limit	Data Quality Objective	Blank
Convential Parameters				
Acidity (as $CaCO_3$)	mg/L	2	4	**7**
Total Inorganic Carbon (DIC)	mg/L	1.0	2.0	<1.0
Total Organic Carbon (DOC)	mg/L	1.0	2.0	**2.4**
Sulphate (SO_4)	mg/L	2	4	<2
Hardness (as $CaCO_3$)	mg/L	0.5	1.0	<0.5
Metals				
Radium-226 (Ra-226)	Bq/L	0.01	0.02	<0.01
Aluminum (Al)	mg/L	0.01	0.02	<0.01
Arsenic (As)	mg/L	0.0002	0.0004	<0.0002
Barium (Ba)	mg/L	0.00001	0.00002	**0.00216**
Beryllium (Be)	mg/L	0.00002	0.00004	<0.00002
Boron (B)	mg/L	0.0002	0.0004	<0.0002
Bismuth (Bi)	mg/L	0.00001	0.00002	<0.00001
Calcium (Ca)	mg/L	0.03	0.06	0.03
Cadmium (Cd)	mg/L	0.000003	0.000006	<0.000003
Cobalt (Co)	mg/L	0.000002	0.000004	0.000003
Chromium (Cr)	mg/L	0.0005	0.0010	<0.0005
Copper (Cu)	mg/L	0.0005	0.0010	**0.0053**
Iron (Fe)	mg/L	0.01	0.02	<0.01
Potassium (K)	mg/L	0.01	0.02	<0.01
Lithium (Li)	mg/L	0.002	0.004	<0.002
Magnesium (Mg)	mg/L	0.003	0.006	<0.003
Manganese (Mn)	mg/L	0.00001	0.00002	**0.00034**
Molybdenum (Mo)	mg/L	0.00001	0.00002	<0.00001
Sodium (Na)	mg/L	0.01	0.02	**0.15**
Nickel (Ni)	mg/L	0.0001	0.0002	**0.0003**
Lead (Pb)	mg/L	0.00002	0.00004	<0.00002
Phosphorous (P)	mg/L	0.01	0.02	<0.01
Antimony (Sb)	mg/L	0.0002	0.0004	<0.0002
Selenium (Se)	mg/L	0.001	0.002	<0.001
Sulphur (S)	mg/L	0.01	0.02	**0.05**
Silicon (Si)	mg/L	0.01	0.02	<0.01
Tin (Sn)	mg/L	0.00001	0.00002	<0.00001
Strontium (Sr)	mg/L	0.0001	0.0002	0.0001
Titanium (Ti)	mg/L	0.0001	0.0002	<0.0001
Thallium (Tl)	mg/L	0.0002	0.0004	<0.0002
Uranium (U)	mg/L	0.000001	0.000002	<0.000001
Vanadium (V)	mg/L	0.00003	0.00006	<0.00003
Zinc (Zn)	mg/L	0.001	0.002	<0.001

Notes:
Boldface type and shaded indicates that Data Quality Objective was not achieved

Table A3.4: Data Quality Analysis of Basin Water pH and Acidity Values Sampled in September 2009

Sample ID	Depth Below Surface	pH	Acidity
	(m)	(pH units)	(mg/L as $CaCO_3$)
Average Value at P-21		**7.1**	**<1.0**
Average Value at P-13		**7.0**	**<1.0**
SW09-PSB-1T[a]	0	7.1	--
SW09-PSB-1B	8	6.2	20
SW09-PSB-2T	0	6.9	<2
SW09-PSB-2B	4	4.2	15

Notes:
Average pH and acidity values were calcuated from the routine monitoring data from 2006 through 2009
T - indicates sample from the top of water column
B - indicates sample from the sediment-water interface
[a] SW09-PSB-1T was not analysed for acidity because pH value was greater than 7.0
Basin Water pH data collected in 2009 was rejected because of anomalous pH and acidity values

EcoMetrix
INCORPORATED

APPENDIX 4

Certificates of Analysis for the 2009 Field Data

Becquerel LABORATORIES

ANALYSIS REPORT

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FAX: (905) 826-4151

Batch: T09-01485.0

Date: 12-Nov-2009

Lakefield Research Ltd.

185 Concession St., Postal Bag 4300
Lakefield, ON, K0L 2H0

attn: Brian Graham

Phone: (705) 652-2038
FAX: (705) 652-1918

Client Ref.
Sep 10524.R09
P.O: 17820

9 rock samples Sampled: 22-Sep-2009 Received: 21-Oct-2009 Page 1 of 1

Results of Analysis

Sample	Test	Result	Units	Date	Method
CORE 09-PSB-1 0-2.5	Ra-226	12	Bq/g	07-Nov-2009	ALPHA
CORE 09-PSB-1 2.5-5	Ra-226	4.9	Bq/g	07-Nov-2009	ALPHA
CORE 09-PSB-1 5-7.5	Ra-226	1.6	Bq/g	07-Nov-2009	ALPHA
CORE 09-PSB-1 7.5-10	Ra-226	2.8	Bq/g	07-Nov-2009	ALPHA
CORE 09-PSB-1 10-15	Ra-226	2.2	Bq/g	08-Nov-2009	ALPHA
CORE 09-PSB-2 0-5	Ra-226	16	Bq/g	08-Nov-2009	ALPHA
CORE 09-PSB-2 5-10	Ra-226	4.5	Bq/g	08-Nov-2009	ALPHA
CORE 09-PSB-2 10-15	Ra-226	5.6	Bq/g	08-Nov-2009	ALPHA
CORE 09-PSB-2 15-20	Ra-226	14	Bq/g	08-Nov-2009	ALPHA

Methods: ALPHA BQ-RAD-ALPHA alpha-particle spectrometry

Units: Bq/g Becquerels per gram

These results relate only to the samples analysed and only to the items tested.

12-Nov-2009 approved by: S. Seg

for Donald D. Burgess PhD
Senior Scientist, Division Supervisor

NOV 24 2009

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Tuesday, October 27, 2009

Date Rec. : 30 September 2009
LR. Ref. : **CA10524-SEP09**
Project : 09-1663

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CERTIFICATE OF ANALYSIS

Final Report

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: CORE 09-PSB-1 0-2.5	6: CORE 09-PSB-1 2.5-5	7: CORE 09-PSB-1 5-7.5	8: CORE 09-PSB-1 7.5-10
Sample Date & Time			22-Sep-09	22-Sep-09	22-Sep-09	22-Sep-09
BaSO4 Calc. using Ba* [µg/g]	---	---	2210	870	680	610
BaSO4 Calc. using SO4** [µg/g]	---	---	14600	238000	330000	381000
Total Sulphur [%]	06-Oct-09	14:44	0.698	3.33	4.55	5.14
Carbonate (CO3) [%]	06-Oct-09	14:42	9.43	11.7	6.45	10.7
Total Organic Carbon [%]	06-Oct-09	14:42	2.25	0.940	0.380	0.260
Total Carbon [%]	06-Oct-09	14:45	4.14	3.27	1.67	2.41
Sulphide [%]	07-Oct-09	16:00	0.43	0.18	0.11	< 0.01
Sulphate [%]	23-Oct-09	10:29	0.6	9.8	14	16
Silver [µg/g]	14-Oct-09	14:09	< 0.7	< 0.7	< 0.7	< 0.7
Aluminum [µg/g]	14-Oct-09	14:09	15000	11000	13000	8400
Arsenic [µg/g]	14-Oct-09	14:09	37	24	27	18
Barium [µg/g]	14-Oct-09	14:09	1300	510	400	360
Beryllium [µg/g]	14-Oct-09	14:09	1.1	0.88	1.2	0.82
Bismuth [µg/g]	14-Oct-09	14:09	13	8.9	6.6	5.4
Calcium [µg/g]	14-Oct-09	14:09	67000	140000	140000	180000
Cadmium [µg/g]	14-Oct-09	14:09	3.8	2.5	2.5	2.0
Cerium [µg/g]	13-Oct-09	15:45	690	510	690	440
Cobalt [µg/g]	14-Oct-09	14:09	98	79	100	69
Chromium [µg/g]	14-Oct-09	14:09	16	13	15	10
Cesium [µg/g]	13-Oct-09	15:45	19	0.55	0.24	0.19
Copper [µg/g]	14-Oct-09	14:09	55	33	43	26
Iron [µg/g]	14-Oct-09	14:09	190000	140000	140000	110000
Gallium [µg/g]	13-Oct-09	15:45	7.3	4.5	4.3	2.8
Germanium [µg/g]	13-Oct-09	15:45	6.5	4.9	5.5	4.0
Hafnium [µg/g]	13-Oct-09	15:45	0.5	0.5	0.4	0.3
Indium [µg/g]	13-Oct-09	15:45	0.01	< 0.01	0.01	< 0.01
Potassium [µg/g]	14-Oct-09	14:09	310	220	130	150
Lanthanum [µg/g]	13-Oct-09	15:45	380	280	380	240
Lithium [µg/g]	14-Oct-09	14:09	9.9	7.3	3.6	4.5

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LR Report : CA10524-SEP09

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: CORE 09-PSB-1 0-2.5	6: CORE 09-PSB-1 2.5-5	7: CORE 09-PSB-1 5-7.5	8: CORE 09-PSB-1 7.5-10
Lutetium [µg/g]	13-Oct-09	15:45	3.0	2.6	3.3	2.2
Magnesium [µg/g]	14-Oct-09	14:09	9900	13000	9900	9000
Manganese [µg/g]	14-Oct-09	14:09	1600	750	770	660
Molybdenum [µg/g]	14-Oct-09	14:09	34	11	1.5	0.6
Sodium [µg/g]	14-Oct-09	14:09	62	48	29	40
Niobuim [µg/g]	13-Oct-09	15:45	3.3	2.3	1.7	1.3
Nickel [µg/g]	14-Oct-09	14:09	90	63	64	44
Lead [µg/g]	14-Oct-09	14:09	280	150	96	78
Phosphorus [µg/g]	14-Oct-09	14:09	280	150	110	120
Rubidium [µg/g]	13-Oct-09	15:44	2.5	1.4	0.63	0.58
Antimony [µg/g]	14-Oct-09	14:08	< 1	< 1	< 1	< 1
Scandium [µg/g]	13-Oct-09	15:44	2.1	1.4	1.4	1.0
Selenium [µg/g]	14-Oct-09	14:08	< 1	< 1	< 1	< 1
Tin [µg/g]	14-Oct-09	14:08	< 6	< 6	< 6	< 6
Strontium [µg/g]	14-Oct-09	14:08	30	30	23	35
Tantalum [µg/g]	13-Oct-09	15:44	0.10	0.09	0.07	0.06
Terbium [µg/g]	13-Oct-09	15:44	12	9.8	12	8.2
Tellerium [µg/g]	13-Oct-09	15:44	0.2	0.1	0.1	< 0.1
Thorium [µg/g]	13-Oct-09	15:44	350	300	420	290
Titanium [µg/g]	14-Oct-09	14:08	230	150	100	73
Thallium [µg/g]	14-Oct-09	14:08	< 3	< 3	< 3	< 3
Uranium [µg/g]	13-Oct-09	15:44	370	160	110	75
Vanadium [µg/g]	14-Oct-09	14:08	15	9.2	8.0	5.8
Tungsten [µg/g]	14-Oct-09	14:05	5	2	< 1	< 1
Yttrium [µg/g]	14-Oct-09	14:05	270	220	280	200
Ytterbium [µg/g]	13-Oct-09	15:44	23	20	25	17
Zinc [µg/g]	14-Oct-09	14:05	210	130	110	87
Zirconium [µg/g]	15-Oct-09	10:44	14	10	8	6

Ra226 subcontracted to Becquerel Labs.
* BaSO4 Calculation based on Ba values and assumes all Ba is in BaSO4 form.
** BaSO4 Calculation based on SO4 values and assumes all SO4 is in BaSO4 form.

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Project Specialist
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OnLine LIMS

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Tuesday, October 27, 2009

Date Rec. : 30 September 2009
LR. Ref. : **CA10524-SEP09**
Project : 09-1663

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CERTIFICATE OF ANALYSIS

Final Report

Analysis	**9: CORE 09-PSB-1 10-15**	**10: CORE 09-PSB-2 0-5**	**11: CORE 09-PSB-2 5-10**	**12: CORE 09-PSB-2 10-15**	**13: CORE 09-PSB-2 15-20**
Sample Date & Time	22-Sep-09	23-Sep-09	23-Sep-09	23-Sep-09	23-Sep-09
BaSO4 Calc. using Ba* [µg/g]	540	580	270	310	320
BaSO4 Calc. using SO4** [µg/g]	418000	19400	14600	12100	14600
Total Sulphur [%]	5.96	1.31	1.57	2.00	2.23
Carbonate (CO3) [%]	9.65	0.170	0.097	0.052	0.071
Total Organic Carbon [%]	0.130	6.97	9.78	15.2	9.61
Total Carbon [%]	2.06	7.00	9.80	15.2	9.63
Sulphide [%]	< 0.01	0.18	0.36	0.88	1.82
Sulphate [%]	17	0.8	0.6	0.5	0.6
Silver [µg/g]	< 0.7	1.0	< 0.7	< 0.7	1.0
Aluminum [µg/g]	6800	8400	3600	3000	3300
Arsenic [µg/g]	15	30	14	12	19
Barium [µg/g]	320	340	160	180	190
Beryllium [µg/g]	0.66	0.75	0.34	0.37	0.66
Bismuth [µg/g]	4.5	13	11	14	21
Calcium [µg/g]	190000	9600	7600	9400	7600
Cadmium [µg/g]	1.6	5.7	4.5	0.86	0.96
Cerium [µg/g]	360	250	220	230	290
Cobalt [µg/g]	61	20	15	25	46
Chromium [µg/g]	8.6	15	6.5	13	17
Cesium [µg/g]	0.34	0.47	0.97	1.1	0.74
Copper [µg/g]	22	110	14	29	64
Iron [µg/g]	87000	290000	240000	45000	30000
Gallium [µg/g]	2.3	11	2.4	2.1	2.7
Germanium [µg/g]	3.5	8.1	7.2	2.1	1.9
Hafnium [µg/g]	0.3	0.2	0.1	0.1	0.3
Indium [µg/g]	< 0.01	0.02	< 0.01	< 0.01	0.01
Potassium [µg/g]	170	230	190	470	610
Lanthanum [µg/g]	200	130	110	110	140
Lithium [µg/g]	4.5	0.9	0.9	< 0.1	1.1

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LR Report : **CA10524-SEP09**

Analysis	9: CORE 09-PSB-1 10-15	10: CORE 09-PSB-2 0-5	11: CORE 09-PSB-2 5-10	12: CORE 09-PSB-2 10-15	13: CORE 09-PSB-2 15-20
Lutetium [µg/g]	1.8	1.2	0.98	0.79	0.81
Magnesium [µg/g]	9900	540	360	510	410
Manganese [µg/g]	610	430	89	75	51
Molybdenum [µg/g]	< 0.5	128	10	4.3	3.9
Sodium [µg/g]	47	28	35	80	74
Niobuim [µg/g]	1.0	2.7	2.8	7.8	12
Nickel [µg/g]	39	22	17	22	30
Lead [µg/g]	80	270	270	190	410
Phosphorus [µg/g]	75	590	740	480	510
Rubidium [µg/g]	0.61	2.1	2.1	4.3	4.8
Antimony [µg/g]	< 1	< 1	< 1	< 1	< 1
Scandium [µg/g]	0.8	2.2	1.3	2.3	2.2
Selenium [µg/g]	< 1	< 1	< 1	< 1	< 1
Tin [µg/g]	< 6	< 6	< 6	< 6	< 6
Strontium [µg/g]	27	9.0	7.6	12	10
Tantalum [µg/g]	0.05	0.09	0.05	0.08	0.09
Terbium [µg/g]	6.8	5.1	3.9	3.0	3.5
Tellerium [µg/g]	< 0.1	0.1	0.1	0.1	0.3
Thorium [µg/g]	220	560	110	250	550
Titanium [µg/g]	60	81	82	140	240
Thallium [µg/g]	< 3	< 3	< 3	< 3	< 3
Uranium [µg/g]	68	480	210	84	94
Vanadium [µg/g]	4.6	11	25	9.4	11
Tungsten [µg/g]	< 1	14	2	< 1	1
Yttrium [µg/g]	170	97	78	51	61
Ytterbium [µg/g]	14	9.3	7.4	6.3	6.7
Zinc [µg/g]	83	170	64	27	76
Zirconium [µg/g]	5	8	6	8	18

Ra226 subcontracted to Becquerel Labs.
* BaSO4 Calculation based on Ba values and assumes all Ba is in BaSO4 form.
** BaSO4 Calculation based on SO4 values and assumes all SO4 is in BaSO4 form.

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Project : 09-1663

October 7, 2010

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Date Rec. : 30 September 2009
LR Report: **CA10524-SEP09**

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CERTIFICATE OF ANALYSIS
Final Report (QC Report)

Analysis	**14: MDL**	**15: QC - Blank**	**16: QC - STD % Recovery**	**17: QC - DUP % Recovery**
BaSO4 Calc. using Ba* [µg/g]	---	---	---	---
BaSO4 Calc. using SO4** [µg/g]	---	---	---	---
Total Sulphur [%]	0.005	< 0.005	102%	100%
Carbonate (CO3) [%]	0.005	< 0.005	100%	140%
Total Organic Carbon [%]	0.01	< 0.01	---	100%
Total Carbon [%]	0.005	< 0.005	100%	100%
Sulphide [%]	0.01	< 0.01	90%	106%
Sulphate [%]	0.1	< 0.1	100%	107%
Silver [µg/g]	0.7	< 0.7	93%	100%
Aluminum [µg/g]	1	< 1	97%	100%
Arsenic [µg/g]	1	< 1	99%	94%
Barium [µg/g]	0.05	< 0.05	96%	100%
Beryllium [µg/g]	0.1	< 0.1	98%	102%
Bismuth [µg/g]	0.5	< 0.5	98%	104%
Calcium [µg/g]	1	< 1	98%	100%
Cadmium [µg/g]	0.05	< 0.05	97%	99%
Cerium [µg/g]	0.006	< 0.006	94%	110%
Cobalt [µg/g]	0.3	< 0.3	97%	100%
Chromium [µg/g]	0.5	< 0.5	98%	103%
Cesium [µg/g]	0.01	< 0.01	100%	107%
Copper [µg/g]	0.1	< 0.1	98%	100%
Iron [µg/g]	0.5	< 0.5	98%	100%
Gallium [µg/g]	0.03	< 0.03	100%	99%
Germanium [µg/g]	0.3	< 0.3	103%	105%
Hafnium [µg/g]	0.1	< 0.1	96%	150%
Indium [µg/g]	0.01	< 0.01	---	100%
Potassium [µg/g]	1	< 1	100%	100%
Lanthanum [µg/g]	0.001	0.001	94%	110%
Lithium [µg/g]	0.1	< 0.1	97%	107%
Lutetium [µg/g]	0.001	0.001	95%	102%

OnLine LIMS

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : 09-1663

LR Report : **CA10524-SEP09**

Analysis	**14: MDL**	**15: QC - Blank**	**16: QC - STD % Recovery**	**17: QC - DUP % Recovery**
Magnesium [µg/g]	1	< 1	96%	---
Manganese [µg/g]	0.05	< 0.05	98%	100%
Molybdenum [µg/g]	0.5	< 0.5	100%	154%
Sodium [µg/g]	1	< 1	97%	104%
Niobuim [µg/g]	0.7	< 0.7	99%	118%
Nickel [µg/g]	1	< 1	97%	101%
Lead [µg/g]	0.7	< 0.7	98%	100%
Phosphorus [µg/g]	5	< 5	98%	100%
Rubidium [µg/g]	0.004	< 0.004	---	105
Antimony [µg/g]	1	< 1	98	100%
Scandium [µg/g]	0.2	< 0.2	100%	99%
Selenium [µg/g]	1	< 1	99%	100%
Tin [µg/g]	6	< 6	100%	123%
Strontium [µg/g]	0.01	< 0.01	97%	103%
Tantalum [µg/g]	0.01	< 0.01	97%	108%
Terbium [µg/g]	0.01	< 0.001	96%	93%
Tellerium [µg/g]	0.1	< 0.1	99%	101%
Thorium [µg/g]	0.01	< 0.01	114%	100%
Titanium [µg/g]	0.2	< 0.2	98%	100%
Thallium [µg/g]	3	< 3	99%	76%
Uranium [µg/g]	3	< 3	---	100%
Vanadium [µg/g]	0.1	< 0.1	99%	102%
Tungsten [µg/g]	1	< 1	97%	93%
Yttrium [µg/g]	0.1	< 0.1	96%	100%
Ytterbium [µg/g]	0.1	< 0.1	98%	105%
Zinc [µg/g]	0.1	< 0.1	97%	100%
Zirconium [µg/g]	5	< 5	100%	107%

Ra226 subcontracted to Becquerel Labs.
* BaSO4 Calculation based on Ba values and assumes all Ba is in BaSO4 form.
** BaSO4 Calculation based on SO4 values and assumes all SO4 is in BaSO4 form.

Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

OnLine LIMS

ANALYSIS REPORT

Becquerel LABORATORIES

Becquerel Laboratories Inc.
6790 Kitimat Rd., Unit 4
Mississauga, Ontario
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Phone: (905) 826-3080
FAX: (905) 826-4151

Batch: T09-01387.0

Date: 09-Nov-2009

Lakefield Research Ltd.

185 Concession St., Postal Bag 4300
Lakefield, ON, K0L 2H0

attn: Brian Graham

Phone: (705) 652-2038
FAX: (705) 652-1918

Client Ref.Sep 10523
P.O: 17820

9 water samples   Received: 06-Oct-2009   Page 1 of 1

Results of Analysis

Sample	Test		Result	Units	Date	Method
PW09-PSB-1 0-2.5	Ra-226		0.76	Bq/l	06-Nov-2009	ALPHA
PW09-PSB-1 2.5-5	Ra-226		0.12	Bq/l	06-Nov-2009	ALPHA
PW09-PSB-1 5-7.5	Ra-226		0.02	Bq/l	06-Nov-2009	ALPHA
PW09-PSB-1 7.5-10	Ra-226	<	0.01	Bq/l	06-Nov-2009	ALPHA
PW09-PSB-1 10-15	Ra-226	<	0.01	Bq/l	06-Nov-2009	ALPHA
PW09-PSB-2 0-5	Ra-226		3.2	Bq/l	06-Nov-2009	ALPHA
PW09-PSB-2 5-10	Ra-226		1.8	Bq/l	06-Nov-2009	ALPHA
PW09-PSB-2 10-15	Ra-226		1.1	Bq/l	06-Nov-2009	ALPHA
PW09-PSB-2 15-20	Ra-226		1.4	Bq/l	06-Nov-2009	ALPHA

Methods: ALPHA BQ-RAD-ALPHA alpha-particle spectrometry

Units: Bq/l Becquerels per litre

These results relate only to the samples analysed and only to the items tested.

09-Nov-2009 approved by: Donald D. Burgess

Donald D. Burgess PhD
Senior Scientist, Division Supervisor

SGS Lakefield Research Limited
P.O. Box 4300 - 185 Concession St.
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Ecometrix
Attn : Erin Clyde

6800 Campobello Road, Mississauga
Canada, L5N 2L8
Phone: 905-794-2325, Fax:905-794-2338

October 14, 2009

Date Rec. : 30 September 2009
LR Report : **CA10523-SEP09**
Project : 09-1663

CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	5: PW09-PSB-1 0-2.5	6: PW09-PSB-1 2.5-5	7: PW09-PSB-1 5-7.5
Sample Date & Time					22-Sep-09	22-Sep-09	22-Sep-09
Temperature Upon Receipt [°C]	---	---	---	---	4.0	4.0	4.0
Sulphate [mg/L]	02-Oct-09	15:00	06-Oct-09	14:01	410	1100	1300
Dissolved Organic Carbon [mg/L]	02-Oct-09	10:00	06-Oct-09	13:52	10.7	9.9	12.2
Dissolved Inorganic Carbon [mg/L]	05-Oct-09	14:35	08-Oct-09	12:46	1.7	< 1.0	< 1.0
Alkalinity [mg/L as CaCO3]	02-Oct-09	15:19	05-Oct-09	15:11	24	24	33
Acidity [mg/L as CaCO3]	02-Oct-09	15:19	05-Oct-09	15:11	---	---	---
Hardness [mg/L as CaCO3]	02-Oct-09	09:00	08-Oct-09	16:00	504	934	1270
Aluminum [mg/L]	02-Oct-09	09:00	02-Oct-09	12:08	0.03	0.12	0.04
Arsenic [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	0.0018	0.0047	0.0059
Barium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	0.0167	0.00872	0.00558
Beryllium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	< 0.00002	< 0.00002	< 0.00002
Boron [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	0.0287	0.0284	0.0078
Bismuth [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	< 0.00001	0.00001	< 0.00001
Calcium [mg/L]	02-Oct-09	09:00	08-Oct-09	16:00	193	373	506
Cadmium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.000014	0.000017	0.000007
Cobalt [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.000458	0.000560	0.000695
Chromium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	< 0.0005	0.0006	0.0009
Copper [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.0014	0.0012	0.0014
Iron [mg/L]	02-Oct-09	09:00	02-Oct-09	12:09	< 0.01	< 0.01	0.01
Potassium [mg/L]	02-Oct-09	09:00	02-Oct-09	12:09	10.3	17.3	23.3
Lithium [mg/L]	02-Oct-09	09:00	02-Oct-09	12:09	< 0.002	< 0.002	0.003
Magnesium [mg/L]	02-Oct-09	09:00	02-Oct-09	12:09	5.17	0.966	0.296

OnLine LIMS

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LR Report : CA10523-SEP09

Analysis	**1: Analysis Start Date**	**2: Analysis Start Time**	**3: Analysis Approval Date**	**4: Analysis Approval Time**	**5: PW09-PSB-1 0-2.5**	**6: PW09-PSB-1 2.5-5**	**7: PW09-PSB-1 5-7.5**
Manganese [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.0679	0.00194	0.00031
Molybdenum [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.00679	0.0118	0.00655
Sodium [mg/L]	02-Oct-09	09:00	02-Oct-09	12:09	6.60	10.0	13.0
Nickel [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.0043	0.0093	0.0126
Phosphorus [mg/L]	02-Oct-09	09:00	02-Oct-09	12:09	< 0.01	< 0.01	< 0.01
Lead [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.00025	0.00017	0.00008
Sulphur [mg/L]	02-Oct-09	09:00	02-Oct-09	12:09	179	331	449
Antimony [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	< 0.0002	< 0.0002	< 0.0002
Selenium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	< 0.001	< 0.001	< 0.001
Silica [mg/L]	02-Oct-09	09:00	02-Oct-09	12:09	0.44	0.22	0.13
Tin [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.00018	0.00026	0.00043
Strontium [mg/L]	02-Oct-09	09:00	02-Oct-09	12:09	0.115	0.156	0.170
Titanium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.0002	0.0002	0.0003
Thallium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	< 0.0002	< 0.0002	< 0.0002
Uranium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.0636	0.00363	0.000341
Vanadium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.00005	0.00006	0.00019
Zinc [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.002	< 0.001	< 0.001

Samples are field filtered
Ra226 subcontracted to Becquerel Labs.

Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

OnLine LIMS

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SGS Lakefield Research Limited
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Ecometrix
Attn : Erin Clyde

6800 Campobello Road, Mississauga
Canada, L5N 2L8
Phone: 905-794-2325, Fax:905-794-2338

October 14, 2009

Date Rec. : 30 September 2009
LR Report : **CA10523-SEP09**
Project : 09-1663

CERTIFICATE OF ANALYSIS
Final Report

Analysis	**8: PW09-PSB-1 7.5-10**	**9: PW09-PSB-1 10-15**	**10: PW09-PSB-2 0-5**	**11: PW09-PSB-2 5-10**	**12: PW09-PSB-2 10-15**	**13: PW09-PSB-2 15-20**
Sample Date & Time	22-Sep-09	22-Sep-09	23-Sep-09	23-Sep-09	23-Sep-09	23-Sep-09
Temperature Upon Receipt [°C]	4.0	4.0	4.0	4.0	4.0	4.0
Sulphate [mg/L]	1600	1800	190	250	---	---
Dissolved Organic Carbon [mg/L]	14.6	12.0	5.5	21.8	---	---
Dissolved Inorganic Carbon [mg/L]	< 1.0	< 1.0	8.6	14.6	---	---
Alkalinity [mg/L as CaCO3]	45	36	---	---	---	---
Acidity [mg/L as CaCO3]	---	---	< 2	< 2	---	---
Hardness [mg/L as CaCO3]	1970	1810	217	312	415	875
Aluminum [mg/L]	0.01	0.04	< 0.01	< 0.01	< 0.01	0.01
Arsenic [mg/L]	0.0069	0.0059	0.0012	0.0015	0.0028	0.0064
Barium [mg/L]	0.00624	0.00582	0.0443	0.0344	0.0266	0.0380
Beryllium [mg/L]	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Boron [mg/L]	0.0023	0.0077	0.0232	0.0422	0.0889	0.118
Bismuth [mg/L]	0.00001	< 0.00001	< 0.00001	< 0.00001	0.00001	< 0.00001
Calcium [mg/L]	787	723	76.4	106	138	297
Cadmium [mg/L]	0.000006	0.000013	0.000011	< 0.000003	0.000012	0.000010
Cobalt [mg/L]	0.000763	0.000834	0.00271	0.000540	0.000530	0.00114
Chromium [mg/L]	< 0.0005	0.0011	< 0.0005	< 0.0005	0.0010	0.0009
Copper [mg/L]	0.0021	0.0022	0.0008	0.0012	0.0022	0.0023
Iron [mg/L]	< 0.01	0.02	8.19	12.1	6.95	16.1
Potassium [mg/L]	29.7	35.8	7.51	11.8	17.4	29.2
Lithium [mg/L]	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	0.007
Magnesium [mg/L]	0.213	0.713	6.39	11.8	17.0	32.7

OnLine LIMS

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LR Report : **CA10523-SEP09**

Analysis	8: PW09-PSB-1 7.5-10	9: PW09-PSB-1 10-15	10: PW09-PSB-2 0-5	11: PW09-PSB-2 5-10	12: PW09-PSB-2 10-15	13: PW09-PSB-2 15-20
Manganese [mg/L]	0.00012	0.00100	1.85	0.753	0.790	1.67
Molybdenum [mg/L]	0.00633	0.00445	0.00113	0.00071	0.00437	0.00563
Sodium [mg/L]	15.9	17.5	5.62	10.2	16.1	24.2
Nickel [mg/L]	0.0151	0.0132	0.0026	0.0028	0.0035	0.0046
Phosphorus [mg/L]	0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.01
Lead [mg/L]	0.00016	0.00018	0.00012	0.00022	0.00025	0.00023
Sulphur [mg/L]	503	560	63.7	87.8	123	311
Antimony [mg/L]	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	0.0004
Selenium [mg/L]	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Silica [mg/L]	0.22	0.43	4.34	7.44	11.3	12.0
Tin [mg/L]	0.00055	0.00046	0.00017	0.00031	0.00017	0.00009
Strontium [mg/L]	0.193	0.216	0.0915	0.131	0.177	0.347
Titanium [mg/L]	0.0002	0.0004	0.0003	0.0006	0.0012	0.0012
Thallium [mg/L]	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Uranium [mg/L]	0.000330	0.000201	0.00706	0.0241	0.0330	0.0214
Vanadium [mg/L]	0.00011	0.00029	< 0.00003	0.00008	0.00041	0.00060
Zinc [mg/L]	< 0.001	< 0.001	0.002	0.002	0.002	0.003

Samples are field filtered
Ra226 subcontracted to Becquerel Labs.

Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

OnLine LIMS

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SGS Canada Inc.
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Project : 09-1663

October 7, 2010

Ecometrix
Attn : Erin Clyde

6800 Campobello Road, Mississauga
Canada, L5N 2L8
Phone: 905-794-2325, Fax:905-794-2338

Date Rec. : 30 September 2009
LR Report: **CA10523-SEP09**

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report - (QC Report)

Analysis	14: MDL	15: QC - Blank	16: QC - STD % Recovery	17: QC - DUP % Recovery
Sulphate [mg/L]	0.2	< 0.2	98%	102%
Dissolved Organic Carbon [mg/L]	0.2	< 0.2	105%	98%
Dissolved Inorganic Carbon [mg/L]	0.2	0.2	97%	110%
Alkalinity [mg/L as CaCO3]	2	< 2	101%	98%
Acidity [mg/L as CaCO3]	2	3	98%	102%
Hardness [mg/L as CaCO3]	0.5	---	---	---
Aluminum [mg/L]	0.01	< 0.01	95%	100%
Arsenic [mg/L]	0.0002	< 0.0002	106%	111%
Barium [mg/L]	0.00001	< 0.00001	105%	100%
Beryllium [mg/L]	0.00002	< 0.00002	103%	94%
Boron [mg/L]	0.0002	< 0.0002	99%	97%
Bismuth [mg/L]	0.00001	0.00001	105%	82%
Calcium [mg/L]	0.03	---	98%	100%
Cadmium [mg/L]	0.000003	< 0.000003	102%	107%
Cobalt [mg/L]	0.000002	< 0.000002	105%	99%
Chromium [mg/L]	0.0005	< 0.0005	103%	170%
Copper [mg/L]	0.0005	< 0.0005	106%	85%
Iron [mg/L]	0.01	---	97%	122%
Potassium [mg/L]	0.01	< 0.01	98%	99%
Lithium [mg/L]	0.002	< 0.002	94%	120%
Magnesium [mg/L]	0.003	---	95%	100%
Manganese [mg/L]	0.00001	< 0.00001	104%	99%
Molybdenum [mg/L]	0.00001	< 0.00001	95%	155%
Sodium [mg/L]	0.01	---	94.8	99.3
Nickel [mg/L]	0.0001	< 0.0001	105%	87%
Phosphorus [mg/L]	0.01	< 0.01	95%	100%
Lead [mg/L]	0.00002	< 0.00002	102%	30%
Sulphur [mg/L]	0.01	---	100%	101%
Antimony [mg/L]	0.0002	< 0.0002	94%	124%
Selenium [mg/L]	0.001	< 0.001	108%	100%

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Project : 09-1663

LR Report : **CA10523-SEP09**

Analysis	14: MDL	15: QC - Blank	16: QC - STD % Recovery	17: QC - DUP % Recovery
Silica [mg/L]	0.01	< 0.01	103%	101%
Tin [mg/L]	0.00001	< 0.00001	96%	140%
Strontium [mg/L]	0.0001	---	98%	100%
Titanium [mg/L]	0.0001	< 0.0001	95%	130%
Thallium [mg/L]	0.0002	< 0.0002	105%	106%
Uranium [mg/L]	0.000001	< 0.000001	102%	94%
Vanadium [mg/L]	0.00003	< 0.00003	106%	150%
Zinc [mg/L]	0.001	< 0.001	106%	90%

Samples are field filtered
Ra226 subcontracted to Becquerel Labs.
Revised to include Ra226 results from Becquerel.

Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

OnLine LIMS

ANALYSIS REPORT

Becquerel Laboratories Inc.
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Mississauga, Ontario
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Phone: (905) 826-3080
FAX: (905) 826-4151

Batch: T09-01381.0

Date: 20-Oct-2009

Lakefield Research Ltd.

185 Concession St., Postal Bag 4300
Lakefield, ON, K0L 2H0

attn: Brian Graham

Phone: (705) 652-2038
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Client Ref.Sept 10522
P.O: 17820

4 water samples   Sampled: 22-Sep-2009   Received: 06-Oct-2009   Page 1 of 1

Results of Analysis

Sample	Test	Result	Units	Date	Method
SW09-PSB-1T	Ra-226	0.34	Bq/l	17-Oct-2009	ALPHA
SW09-PSB-1B	Ra-226	0.65	Bq/l	17-Oct-2009	ALPHA
SW09-PSB-2T	Ra-226	0.31	Bq/l	17-Oct-2009	ALPHA
SW09-PSB-2B	Ra-226	0.39	Bq/l	17-Oct-2009	ALPHA

Methods: ALPHA BQ-RAD-ALPHA alpha-particle spectrometry

Units: Bq/l Becquerels per litre

These results relate only to the samples analysed and only to the items tested.

20-Oct-2009 approved by:
Donald D. Burgess PhD
Senior Scientist, Division Supervisor

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October 14, 2009

Date Rec. : 30 September 2009
LR Report : **CA10522-SEP09**
Project : 09-1663

CERTIFICATE OF ANALYSIS

Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	5: SW09-PSB-1T	6: SW09-PSB-1B	7: SW09-PSB-2T	8: SW09-PSB-2B
Sample Date & Time					22-Sep-09	22-Sep-09	23-Sep-09	23-Sep-09
Temperature Upon Receipt [°C]	---	---	---	---	4.0	4.0	4.0	4.0
Sulphate [mg/L]	02-Oct-09	15:00	06-Oct-09	14:19	180	410	180	180
Total Organic Carbon [mg/L]	02-Oct-09	10:00	05-Oct-09	13:41	2.1	4.6	2.2	4.0
Total Inorganic Carbon [mg/L]	05-Oct-09	14:35	08-Oct-09	12:45	3.5	< 1.0	2.9	< 1.0
Alkalinity [mg/L as CaCO3]	02-Oct-09	15:19	05-Oct-09	15:10	12	---	---	---
Acidity [mg/L as CaCO3]	02-Oct-09	15:19	05-Oct-09	15:10	---	20	< 2	15
Hardness [mg/L as CaCO3]	02-Oct-09	09:00	02-Oct-09	12:08	173	209	179	179
Aluminum [mg/L]	02-Oct-09	09:00	02-Oct-09	12:08	< 0.01	0.53	< 0.01	< 0.01
Arsenic [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	0.0005	0.0014	0.0004	0.0005
Barium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	0.0134	0.0196	0.0137	0.0160
Beryllium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	0.00007	0.00009	0.00002	< 0.00002
Boron [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	0.0249	0.0314	0.0252	0.0243
Bismuth [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	0.00007	0.00003	< 0.00001	0.00001
Calcium [mg/L]	02-Oct-09	09:00	02-Oct-09	12:08	62.2	74.4	64.5	64.1
Cadmium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	0.000079	0.000082	0.000005	0.000015
Cobalt [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	0.000281	0.0186	0.000319	0.00120
Chromium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Copper [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	0.0025	0.0019	0.0015	0.0009
Iron [mg/L]	02-Oct-09	09:00	02-Oct-09	12:08	0.03	1.61	< 0.01	0.02
Potassium [mg/L]	02-Oct-09	09:00	02-Oct-09	12:08	6.11	6.53	6.18	6.14
Lithium [mg/L]	02-Oct-09	09:00	02-Oct-09	12:08	< 0.002	< 0.002	< 0.002	< 0.002

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LR Report : **CA10522-SEP09**

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	5: SW09-PSB-1T	6: SW09-PSB-1B	7: SW09-PSB-2T	8: SW09-PSB-2B
Magnesium [mg/L]	02-Oct-09	09:00	02-Oct-09	12:08	4.30	5.53	4.45	4.47
Manganese [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	0.00475	0.203	0.00313	0.0273
Molybdenum [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	0.00017	0.00043	0.00008	0.00025
Sodium [mg/L]	02-Oct-09	09:00	02-Oct-09	12:08	3.99	4.35	4.04	4.14
Nickel [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	0.0017	0.0101	0.0015	0.0025
Phosphorus [mg/L]	02-Oct-09	09:00	02-Oct-09	12:08	< 0.01	< 0.01	< 0.01	< 0.01
Lead [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	0.00057	0.00647	0.00013	0.00088
Sulphur [mg/L]	02-Oct-09	09:00	02-Oct-09	12:08	57.9	67.4	60.2	60.5
Antimony [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	< 0.0002	0.0084	0.0003	0.0015
Selenium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	< 0.001	< 0.001	< 0.001	< 0.001
Silica [mg/L]	02-Oct-09	09:00	02-Oct-09	12:08	0.99	1.14	1.01	1.12
Tin [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	0.00011	0.00035	0.00017	0.00020
Strontium [mg/L]	02-Oct-09	09:00	02-Oct-09	12:08	0.0715	0.0765	0.0736	0.0742
Titanium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	0.0003	0.0002	0.0002	0.0002
Thallium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Uranium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	0.00245	0.0557	0.00273	0.00317
Vanadium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	0.00008	0.00004	< 0.00003	0.00007
Zinc [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	0.009	0.024	< 0.001	0.002

Ra226 subcontracted to Becquerel Labs.

Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

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Env ICP-MS Metals

Project : 09-1663

SGS Canada Inc.
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October 7, 2010

Ecometrix
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6800 Campobello Road, Mississauga
Canada, L5N 2L8
Phone: 905-794-2325, Fax:905-794-2338

Date Rec. : 30 September 2009
LR Report: **CA10522-SEP09**

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CERTIFICATE OF ANALYSIS

Final Report

Analysis	9: MDL	10: QC - Blank	11: QC - STD % Recovery	12: QC - DUP % Recovery
Sulphate [mg/L]	0.2	< 0.2	98%	102%
Total Organic Carbon [mg/L]	0.2	< 0.2	105%	98%
Total Inorganic Carbon [mg/L]	0.2	< 0.2	110%	100%
Alkalinity [mg/L as CaCO3]	2	< 2	101%	98%
Acidity [mg/L as CaCO3]	2	2	98%	102%
Hardness [mg/L as CaCO3]	0.5	---	---	---
Aluminum [mg/L]	0.01	< 0.01	95%	100%
Arsenic [mg/L]	0.0002	< 0.0002	106%	111%
Barium [mg/L]	0.00001	< 0.00001	105%	100%
Beryllium [mg/L]	0.00002	< 0.00002	103%	94%
Boron [mg/L]	0.0002	< 0.0002	99%	97%
Bismuth [mg/L]	0.00001	0.00001	105%	82%
Calcium [mg/L]	0.03	---	97%	100%
Cadmium [mg/L]	0.000003	< 0.000003	102%	107%
Cobalt [mg/L]	0.000002	< 0.000002	105%	99%
Chromium [mg/L]	0.00005	< 0.0005	103%	170%
Copper [mg/L]	0.0005	< 0.0005	106%	85%
Iron [mg/L]	0.01	---	96.8	122
Potassium [mg/L]	0.01	< 0.01	98%	99.1
Lithium [mg/L]	0.002	< 0.002	94.2	120
Magnesium [mg/L]	0.003	---	94.8	100
Manganese [mg/L]	0.00001	< 0.00001	104%	99%
Molybdenum [mg/L]	0.00001	< 0.00001	95%	155%
Sodium [mg/L]	0.01	---	94.8	99.3
Nickel [mg/L]	0.0001	< 0.0001	105%	87%
Phosphorus [mg/L]	0.01	< 0.01	95%	100%
Lead [mg/L]	0.00002	< 0.00002	102%	30%
Sulphur [mg/L]	0.01	---	100%	101

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Env ICP-MS Metals

Project : 09-1663

LR Report : **CA10522-SEP09**

Analysis	9: MDL	10: QC - Blank	11: QC - STD % Recovery	12: QC - DUP % Recovery
Antimony [mg/L]	0.0002	< 0.0002	94%	124%
Selenium [mg/L]	0.001	< 0.001	108%	100%
Silica [mg/L]	0.01	< 0.01	103%	101%
Tin [mg/L]	0.00001	< 0.00001	96%	140%
Strontium [mg/L]	0.0001	---	98%	99.7
Titanium [mg/L]	0.0001	< 0.0001	95%	130%
Thallium [mg/L]	0.0002	< 0.0002	105%	106%
Uranium [mg/L]	0.000001	< 0.000001	102%	94%
Vanadium [mg/L]	0.00003	< 0.00003	106%	150%
Zinc [mg/L]	0.001	< 0.001	106%	90%

Ra226 subcontracted to Becquerel Labs.

Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

OnLine LIMS

ANALYSIS REPORT

Becquerel LABORATORIES

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Batch: T09-01486.0

Date: 30-Nov-2009

Lakefield Research Ltd.

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Client Ref.
Oct 10521.R09
P.O: 17820

attn: Brian Graham

14 solid samples Sampled: 26-Sep-2009 Received: 21-Oct-2009 Page 1 of 1

Results of Analysis

Sample	Test	Result	Units	Date	Method
CORE 09-SR-1 (0-5)	Ra-226	0.16	Bq/g	23-Nov-2009	ALPHA
CORE 09-SR-1 (5-10)	Ra-226	0.08	Bq/g	23-Nov-2009	ALPHA
CORE 09-SR-1 (10-15)	Ra-226	0.02	Bq/g	23-Nov-2009	ALPHA
CORE 09-SR-1 (15-20)	Ra-226	0.04	Bq/g	29-Nov-2009	ALPHA
CORE 09-SR-2 (0-5)	Ra-226	14	Bq/g	29-Nov-2009	ALPHA
CORE 09-SR-2 (5-10)	Ra-226	4.6	Bq/g	29-Nov-2009	ALPHA
CORE 09-SR-2 (10-15)	Ra-226	0.06	Bq/g	29-Nov-2009	ALPHA
CORE 09-SR-3 (0-5)	Ra-226	8.2	Bq/g	29-Nov-2009	ALPHA
CORE 09-SR-3 (5-10)	Ra-226	9.7	Bq/g	29-Nov-2009	ALPHA
CORE 09-SR-3 (10-15)	Ra-226	16	Bq/g	29-Nov-2009	ALPHA
CORE 09-SR-3 (15-20)	Ra-226	20	Bq/g	29-Nov-2009	ALPHA
CORE 09-SR-4 (0-5)	Ra-226	2.6	Bq/g	29-Nov-2009	ALPHA
CORE 09-SR-4 (5-10)	Ra-226	2.7	Bq/g	29-Nov-2009	ALPHA
CORE 09-SR-4 (10-15)	Ra-226	2.1	Bq/g	29-Nov-2009	ALPHA

Methods: ALPHA BQ-RAD-ALPHA alpha-particle spectrometry

Units: Bq/g Becquerels per gram

These results relate only to the samples analysed and only to the items tested.

30-Nov-2009 approved by: Donald D. Burgess PhD
Senior Scientist, Division Supervisor

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Tuesday, October 27, 2009

Date Rec. : 30 September 2009
LR. Ref. : **CA10521-SEP09**
Project : 09-1663

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CERTIFICATE OF ANALYSIS

Final Report

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: CORE 09-SR-1 (0-5)	6: CORE 09-SR-1 (5-10)	7: CORE 09-SR-1 (10-15)	8: CORE 09-SR-1 (15-20)	9: CORE 09-SR-2 (0-5)	10: CORE 09-SR-2 (5-10)
Sample Date & Time			26-Sep-09	26-Sep-09	26-Sep-09	26-Sep-09	26-Sep-09	26-Sep-09
BaSO4 Calc. using Ba* [µg/g]	---	---	130	110	100	80	10900	4420
BaSO4 Calc. using SO4** [µg/g]	---	---	2430	<2430	2430	2430	12100	4860
Total Sulphur [%]	06-Oct-09	14:45	0.130	0.130	0.184	0.224	0.235	0.114
Carbonate (CO3) [%]	06-Oct-09	14:42	0.105	0.048	0.048	0.033	0.040	0.011
Total Organic Carbon [%]	06-Oct-09	14:45	5.34	4.23	5.87	5.94	2.05	0.820
Total Carbon [%]	06-Oct-09	14:45	5.36	4.24	5.88	5.95	2.05	0.825
Sulphide [%]	07-Oct-09	15:59	< 0.01	< 0.01	0.04	0.05	< 0.01	< 0.01
Sulphate [%]	23-Oct-09	14:22	0.1	< 0.1	0.1	0.1	0.5	0.2
Silver [µg/g]	14-Oct-09	14:05	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7
Aluminum [µg/g]	14-Oct-09	14:05	7600	6700	5300	4100	4400	2600
Arsenic [µg/g]	14-Oct-09	14:05	5	5	4	3	10	4
Barium [µg/g]	14-Oct-09	14:05	75	65	61	47	6400	2600
Beryllium [µg/g]	14-Oct-09	14:05	0.47	0.37	0.32	0.24	0.21	0.12
Bismuth [µg/g]	14-Oct-09	14:05	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Calcium [µg/g]	14-Oct-09	14:05	1900	1600	1500	1500	1100	720
Cadmium [µg/g]	14-Oct-09	14:05	1.2	0.96	1.2	1.1	0.42	0.18
Cerium [µg/g]	13-Oct-09	15:44	48	41	34	20	62	30
Cobalt [µg/g]	14-Oct-09	14:05	8.5	7.8	6.1	3.7	20	8.2
Chromium [µg/g]	14-Oct-09	14:05	19	18	15	12	9.8	6.8
Cesium [µg/g]	13-Oct-09	15:44	0.63	0.45	0.36	0.30	0.56	0.38
Copper [µg/g]	14-Oct-09	14:05	34	31	23	14	20	8.3
Iron [µg/g]	14-Oct-09	14:05	12000	9800	8100	6800	15000	7300
Gallium [µg/g]	13-Oct-09	15:44	2.9	2.6	2.0	1.6	2.8	1.4
Germanium [µg/g]	13-Oct-09	15:44	0.6	0.5	0.5	0.4	0.8	0.4
Hafnium [µg/g]	13-Oct-09	15:44	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Indium [µg/g]	13-Oct-09	15:44	0.05	0.02	0.01	< 0.01	< 0.01	< 0.01
Potassium [µg/g]	14-Oct-09	14:05	270	250	210	180	270	170
Lanthanum [µg/g]	13-Oct-09	15:44	25	21	18	12	33	16
Lithium [µg/g]	14-Oct-09	14:05	2.7	2.4	1.6	1.1	1.4	0.3

OnLine LIMS

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LR Report : CA10521-SEP09

Analysis	**3: Analysis Approval Date**	**4: Analysis Approval Time**	**5: CORE 09-SR-1 (0-5)**	**6: CORE 09-SR-1 (5-10)**	**7: CORE 09-SR-1 (10-15)**	**8: CORE 09-SR-1 (15-20)**	**9: CORE 09-SR-2 (0-5)**	**10: CORE 09-SR-2 (5-10)**
Lutetium [µg/g]	13-Oct-09	15:44	0.10	0.081	0.063	0.054	0.49	0.21
Magnesium [µg/g]	14-Oct-09	14:04	2100	1900	1500	1200	840	590
Manganese [µg/g]	14-Oct-09	14:04	250	180	200	230	1600	160
Molybdenum [µg/g]	14-Oct-09	14:04	< 0.5	< 0.5	< 0.5	< 0.5	2.8	1.3
Sodium [µg/g]	14-Oct-09	14:04	52	45	38	32	36	23
Niobuim [µg/g]	13-Oct-09	15:44	0.8	0.8	0.7	< 0.7	< 0.7	< 0.7
Nickel [µg/g]	14-Oct-09	14:04	15	13	11	7	19	8
Lead [µg/g]	14-Oct-09	14:04	61	44	32	19	100	38
Phosphorus [µg/g]	14-Oct-09	14:04	450	350	260	210	270	130
Rubidium [µg/g]	13-Oct-09	15:44	3.6	3.2	2.6	2.3	2.5	1.5
Antimony [µg/g]	14-Oct-09	14:04	< 1	< 1	< 1	< 1	< 1	< 1
Scandium [µg/g]	13-Oct-09	15:44	1.7	1.5	1.1	0.9	1.1	0.6
Selenium [µg/g]	14-Oct-09	14:04	< 1	< 1	< 1	< 1	< 1	< 1
Tin [µg/g]	14-Oct-09	14:04	< 6	< 6	< 6	< 6	< 6	< 6
Strontium [µg/g]	14-Oct-09	14:04	7.6	6.3	6.2	6.5	72	27
Sulphur [µg/g]	14-Oct-09	14:04	1100	1400	2000	2500	2400	1200
Tantalum [µg/g]	13-Oct-09	15:44	0.03	0.03	0.04	0.04	0.01	< 0.01
Terbium [µg/g]	13-Oct-09	15:44	0.47	0.33	0.22	0.16	2.0	0.87
Tellerium [µg/g]	13-Oct-09	15:44	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Thorium [µg/g]	13-Oct-09	15:44	9.5	7.7	7.0	3.4	33	12
Titanium [µg/g]	14-Oct-09	14:04	340	350	300	270	190	160
Thallium [µg/g]	14-Oct-09	14:04	< 3	< 3	< 3	< 3	< 3	< 3
Uranium [µg/g]	13-Oct-09	15:43	7.9	5.6	3.1	1.7	84	29
Vanadium [µg/g]	14-Oct-09	14:04	24	21	17	13	12	7.9
Tungsten [µg/g]	14-Oct-09	14:04	< 1	< 1	< 1	< 1	2	< 1
Yttrium [µg/g]	14-Oct-09	14:04	10	7.8	5.9	4.5	43	18
Ytterbium [µg/g]	13-Oct-09	15:43	0.76	0.59	0.46	0.37	4.0	1.6
Zinc [µg/g]	14-Oct-09	14:04	100	83	73	49	74	34
Zirconium [µg/g]	14-Oct-09	14:04	< 5	< 5	< 5	< 5	< 5	< 5

Ra226 subcontracted to Becquerel Labs.
* BaSO4 Calculation based on Ba values and assumes all Ba is in BaSO4 form.
** BaSO4 Calculation based on SO4 values and assumes all SO4 is in BaSO4 form.

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Project Specialist
Environmental Services, Analytical

OnLine LIMS

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Tuesday, October 27, 2009

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CERTIFICATE OF ANALYSIS

Final Report

Analysis	**11: CORE 09-SR-2 (10-15)**	**12: CORE 09-SR-3 (0-5)**	**13: CORE 09-SR-3 (5-10)**	**14: CORE 09-SR-3 (10-15)**	**15: CORE 09-SR-3 (15-20)**	**16: CORE 09-SR-4 (0-5)**	**17: CORE 09-SR-4 (5-10)**	**18: CORE 09-SR-4 (10-15)**
Sample Date & Time	26-Sep-09	27-Sep-09	27-Sep-09	27-Sep-09	27-Sep-09	27-Sep-09	27-Sep-09	27-Sep-09
BaSO4 Calc. using Ba* [µg/g]	340	3910	5100	6120	6970	1310	990	750
BaSO4 Calc. using SO4** [µg/g]	<2430	4860	9720	19400	24300	4860	4860	4860
Total Sulphur [%]	0.015	0.607	0.917	1.15	1.12	1.03	1.06	1.00
Carbonate (CO3) [%]	< 0.005	0.090	0.097	0.088	0.229	0.159	0.181	0.419
Total Organic Carbon [%]	0.330	13.9	14.6	13.3	10.7	16.8	17.6	16.8
Total Carbon [%]	0.326	13.9	14.6	13.3	10.7	16.8	17.6	16.9
Sulphide [%]	< 0.01	< 0.01	< 0.01	0.10	0.07	0.39	0.65	0.65
Sulphate [%]	< 0.1	0.2	0.4	0.8	1.0	0.2	0.2	0.2
Silver [µg/g]	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7
Aluminum [µg/g]	2000	8500	8300	9600	13000	7100	6000	5600
Arsenic [µg/g]	1	21	23	28	29	22	24	26
Barium [µg/g]	200	2300	3000	3600	4100	770	580	440
Beryllium [µg/g]	0.12	0.57	0.47	0.42	0.66	0.27	0.18	0.12
Bismuth [µg/g]	< 0.5	0.8	< 0.5	< 0.5	0.6	< 0.5	< 0.5	< 0.5
Calcium [µg/g]	420	3800	4600	4300	5100	6200	6700	7300
Cadmium [µg/g]	0.09	1.9	1.6	1.5	1.3	1.7	1.7	1.8
Cerium [µg/g]	15	170	200	240	310	590	680	840
Cobalt [µg/g]	2.6	59	60	64	48	28	21	16
Chromium [µg/g]	5.3	18	16	18	26	20	18	17
Cesium [µg/g]	0.21	0.70	0.81	1.1	1.6	0.86	0.82	0.87
Copper [µg/g]	2.3	57	64	84	98	61	58	56
Iron [µg/g]	5200	39000	34000	35000	50000	21000	16000	12000
Gallium [µg/g]	0.66	5.3	6.0	7.9	9.5	6.9	6.4	6.6
Germanium [µg/g]	0.3	1.7	1.8	2.0	2.6	3.1	3.3	3.8
Hafnium [µg/g]	< 0.1	0.2	0.2	0.3	0.3	0.5	0.6	0.6
Indium [µg/g]	< 0.01	< 0.01	< 0.01	< 0.01	0.02	0.01	< 0.01	< 0.01
Potassium [µg/g]	130	370	290	320	430	350	280	270
Lanthanum [µg/g]	8.9	87	110	120	140	300	360	430
Lithium [µg/g]	< 0.1	2.1	3.0	6.4	10	1.5	1.2	1.1

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LR Report : CA10521-SEP09

Analysis	**11: CORE 09-SR-2 (10-15)**	**12: CORE 09-SR-3 (0-5)**	**13: CORE 09-SR-3 (5-10)**	**14: CORE 09-SR-3 (10-15)**	**15: CORE 09-SR-3 (15-20)**	**16: CORE 09-SR-4 (0-5)**	**17: CORE 09-SR-4 (5-10)**	**18: CORE 09-SR-4 (10-15)**
Lutetium [µg/g]	0.055	1.3	1.6	2.0	2.9	4.1	4.5	5.3
Magnesium [µg/g]	420	1300	1200	1300	1500	1400	1400	1400
Manganese [µg/g]	75	4200	2900	1100	480	550	280	180
Molybdenum [µg/g]	< 0.5	9.0	11	18	18	5.8	4.7	3.6
Sodium [µg/g]	18	53	43	43	54	64	58	59
Niobuim [µg/g]	< 0.7	0.9	1.0	1.1	1.4	1.0	0.9	0.8
Nickel [µg/g]	3	38	40	54	52	37	39	43
Lead [µg/g]	5.2	230	220	240	520	540	550	640
Phosphorus [µg/g]	68	650	580	650	660	470	380	340
Rubidium [µg/g]	1.00	3.8	3.3	3.9	5.1	4.1	3.8	4.0
Antimony [µg/g]	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Scandium [µg/g]	0.5	2.4	2.2	2.3	2.8	2.7	2.7	2.7
Selenium [µg/g]	< 1	1	1	< 1	< 1	< 1	< 1	< 1
Tin [µg/g]	< 6	< 6	< 6	< 6	< 6	< 6	< 6	< 6
Strontium [µg/g]	3.3	21	37	63	77	15	14	14
Sulphur [µg/g]	170	5500	7300	7900	7000	10000	11000	11000
Tantalum [µg/g]	< 0.01	0.04	0.07	0.07	0.09	0.11	0.13	0.15
Terbium [µg/g]	0.21	5.9	7.6	9.1	14	25	28	35
Tellerium [µg/g]	< 0.1	< 0.1	< 0.1	< 0.1	0.1	< 0.1	< 0.1	< 0.1
Thorium [µg/g]	3.4	85	120	160	490	180	120	85
Titanium [µg/g]	140	210	200	230	280	210	210	210
Thallium [µg/g]	< 3	5	< 3	< 3	< 3	< 3	< 3	< 3
Uranium [µg/g]	3.8	270	360	500	270	220	160	110
Vanadium [µg/g]	6.3	20	17	18	21	17	16	16
Tungsten [µg/g]	< 1	6	6	8	8	3	2	< 1
Yttrium [µg/g]	6.1	120	160	200	260	500	600	740
Ytterbium [µg/g]	0.41	11	14	16	24	34	38	45
Zinc [µg/g]	18	210	170	160	150	98	72	55
Zirconium [µg/g]	< 5	< 5	< 5	< 5	6	< 5	5	6

Ra226 subcontracted to Becquerel Labs.
* BaSO4 Calculation based on Ba values and assumes all Ba is in BaSO4 form.
** BaSO4 Calculation based on SO4 values and assumes all SO4 is in BaSO4 form.

Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

OnLine LIMS

SGS Canada Inc.
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Lakefield - Ontario - KOL 2HO
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Project : 09-1663

October 7, 2010

Ecometrix
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Date Rec. : 30 September 2009
LR Report: **CA10521-SEP09**

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CERTIFICATE OF ANALYSIS

Final Report (QC Report)

Analysis	19: MDL QC - Blank QC - STD % Recovery	20: QC - Blank	21: QC - STD % Recovery	22: QC - DUP % Recovery
BaSO4 Calc. using Ba* [µg/g]	---	---	---	---
BaSO4 Calc. using SO4** [µg/g]	---	---	---	---
Total Sulphur [%]	0.005	< 0.005	102%	---
Carbonate (CO3) [%]	0.005	< 0.005	100%	140%
Total Organic Carbon [%]	0.01	< 0.01	---	100%
Total Carbon [%]	0.005	< 0.005	100%	---
Sulphide [%]	0.01	< 0.01	90%	---
Sulphate [%]	0.1	< 0.1	100%	107%
Silver [µg/g]	0.7	< 0.7	93%	100%
Aluminum [µg/g]	1	< 1	97%	100%
Arsenic [µg/g]	1	< 1	99%	94%
Barium [µg/g]	0.05	< 0.05	96%	100%
Beryllium [µg/g]	0.1	< 0.1	98%	102%
Bismuth [µg/g]	0.5	< 0.5	98%	104%
Calcium [µg/g]	1	< 1	98%	100%
Cadmium [µg/g]	0.05	< 0.05	97%	99%
Cerium [µg/g]	0.006	< 0.006	94%	100%
Cobalt [µg/g]	0.3	< 0.3	97%	103%
Chromium [µg/g]	0.5	< 0.5	98%	103%
Cesium [µg/g]	0.01	< 0.01	---	107%
Copper [µg/g]	0.1	< 0.1	98%	102%
Iron [µg/g]	0.5	< 0.5	98%	100%
Gallium [µg/g]	0.03	< 0.03	---	99%
Germanium [µg/g]	0.3	< 0.3	103%	105%
Hafnium [µg/g]	0.1	< 0.1	96%	150%
Indium [µg/g]	0.01	< 0.01	100%	100%
Potassium [µg/g]	1	< 1	100%	100%

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Project : 09-1663

LR Report : **CA10521-SEP09**

Analysis	19: MDL QC - Blank QC - STD % Recovery	20: QC - Blank	21: QC - STD % Recovery	22: QC - DUP % Recovery
Lanthanum [µg/g]	0.001	0.001	94%	110%
Lithium [µg/g]	0.1	< 0.1	97%	107%
Lutetium [µg/g]	0.001	0.001	95%	102%
Magnesium [µg/g]	1	< 1	87%	100%
Manganese [µg/g]	0.05	< 0.05	97%	100%
Molybdenum [µg/g]	0.5	< 0.5	100%	154%
Sodium [µg/g]	1	< 1	97%	104%
Niobuim [µg/g]	0.7	< 0.7	99%	118%
Nickel [µg/g]	1	< 1	97%	101%
Lead [µg/g]	0.7	< 0.7	98%	100%
Phosphorus [µg/g]	5	< 5	98%	100%
Rubidium [µg/g]	0.004	< 0.004	---	105%
Antimony [µg/g]	1	< 1	98%	100%
Scandium [µg/g]	0.2	< 0.2	100%	99%
Selenium [µg/g]	1	< 1	99%	100%
Tin [µg/g]	6	< 6	100%	1235
Strontium [µg/g]	0.01	< 0.01	97%	103%
Sulphur [µg/g]	1	< 1	100%	100%
Tantalum [µg/g]	0.01	< 0.01	97%	108%
Terbium [µg/g]	0.001	< 0.001	96%	93%
Tellerium [µg/g]	0.1	< 0.1	99%	101%
Thorium [µg/g]	0.01	< 0.01	114%	100%
Titanium [µg/g]	0.2	< 0.2	98%	104%
Thallium [µg/g]	3	< 3	99%	76%
Uranium [µg/g]	0.002	0.006	100%	100%
Vanadium [µg/g]	0.1	< 0.1	99%	102%
Tungsten [µg/g]	1	< 1	97%	93%
Yttrium [µg/g]	0.1	< 0.1	96%	100%
Ytterbium [µg/g]	0.001	0.002	98%	105%
Zinc [µg/g]	0.1	< 0.1	97%	103%
Zirconium [µg/g]	5	< 5	100%	107%

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** BaSO4 Calculation based on SO4 values and assumes all SO4 is in BaSO4 form.

Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

OnLine LIMS

ANALYSIS REPORT

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Canada, L5N 5L9

Phone: (905) 826-3080
FAX: (905) 826-4151

Batch: T09-01386.0

Date: 12-Nov-2009

Lakefield Research Ltd.

185 Concession St., Postal Bag 4300
Lakefield, ON, K0L 2H0

attn: Brian Graham

Phone: (705) 652-2038
FAX: (705) 652-1918

Client Ref.Sep 10526
P.O: 17820

14 water samples Received: 06-Oct-2009

Results of Analysis

Sample	Test		Result	Units	Date	Method
PW09-SR-1 (0-5)	Ra-226		0.02	Bq/l	08-Nov-2009	ALPHA
PW09-SR-1 (5-10)	Ra-226	<	0.02	Bq/l	08-Nov-2009	ALPHA
PW09-SR-1 (10-15)	Ra-226	<	0.01	Bq/l	08-Nov-2009	ALPHA
PW09-SR-1 (15-20)	Ra-226	<	0.01	Bq/l	08-Nov-2009	ALPHA
PW09-SR-2 (0-5)	Ra-226		2.4	Bq/l	08-Nov-2009	ALPHA
PW09-SR-2 (5-10)	Ra-226		2.3	Bq/l	08-Nov-2009	ALPHA
PW09-SR-2 (10-15)	Ra-226		0.87	Bq/l	08-Nov-2009	ALPHA
PW09-SR-3 (0-5)	Ra-226		5.1	Bq/l	08-Nov-2009	ALPHA
PW09-SR-3 (5-10)	Ra-226		6.0	Bq/l	08-Nov-2009	ALPHA
PW09-SR-3 (10-15)	Ra-226		5.4	Bq/l	08-Nov-2009	ALPHA
PW09-SR-3 (15-20)	Ra-226		4.5	Bq/l	08-Nov-2009	ALPHA
PW09-SR-4 (0-5)	Ra-226		0.87	Bq/l	08-Nov-2009	ALPHA
PW09-SR-4 (5-10)	Ra-226		1.2	Bq/l	08-Nov-2009	ALPHA
PW09-SR-4 (10-15)	Ra-226		1.4	Bq/l	08-Nov-2009	ALPHA

Methods: ALPHA BQ-RAD-ALPHA alpha-particle spectrometry

Units: Bq/l Becquerels per litre

These results relate only to the samples analysed and only to the items tested.

12-Nov-2009 approved by: Donald D. Burgess PhD
Senior Scientist, Division Supervisor

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October 14, 2009

Date Rec. : 30 September 2009
LR Report : **CA10526-SEP09**
Project : 09-1663

CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	5: PW09-SR-1 (0-5)	6: PW09-SR-1 (5-10)	7: PW09-SR-1 (10-15)	8: PW09-SR-1 (15-20)	9: PW09-SR-2 (0-5)
Sample Date & Time					26-Sep-09	26-Sep-09	26-Sep-09	26-Sep-09	26-Sep-09
Temperature Upon Receipt [°C]	---	---	---	---	4.0	4.0	4.0	4.0	4.0
Sulphate [mg/L]	02-Oct-09	15:00	07-Oct-09	09:19	2.6	< 2	< 2	< 2	16
Dissolved Organic Carbon [mg/L]	02-Oct-09	10:00	07-Oct-09	09:23	14.5	19.6	20.0	22.9	10.5
Dissolved Inorganic Carbon [mg/L]	05-Oct-09	14:35	08-Oct-09	12:47	< 1.0	< 1.0	3.1	2.7	2.4
Alkalinity [mg/L as CaCO3]	02-Oct-09	15:19	05-Oct-09	15:10	9	24	8	2	25
Acidity [mg/L as CaCO3]	02-Oct-09	15:19	05-Oct-09	15:10	6	< 2	3	6	< 2
Hardness [mg/L as CaCO3]	05-Oct-09	09:00	05-Oct-09	13:18	11.1	9.5	5.3	5.3	28.8
Aluminum [mg/L]	05-Oct-09	09:00	05-Oct-09	13:18	< 0.01	0.02	0.02	0.03	0.02
Arsenic [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.0014	0.0034	0.0054	0.0050	0.0015
Barium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.0271	0.0274	0.0313	0.0172	2.16
Beryllium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Boron [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.0052	0.0036	0.0057	0.0089	0.0046
Bismuth [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Calcium [mg/L]	05-Oct-09	09:00	05-Oct-09	13:18	3.54	3.00	1.68	1.71	9.60
Cadmium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.000017	0.000016	0.000025	0.000056	0.000003
Cobalt [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.000762	0.000476	0.000120	0.000079	0.00216
Chromium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Copper [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.0025	0.0037	0.0023	0.0051	0.0021
Iron [mg/L]	05-Oct-09	09:00	05-Oct-09	13:18	0.29	0.81	0.06	0.08	0.01
Potassium [mg/L]	05-Oct-09	09:00	05-Oct-09	13:18	0.24	0.26	0.34	0.38	0.79
Lithium [mg/L]	05-Oct-09	09:00	05-Oct-09	13:18	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Magnesium [mg/L]	05-Oct-09	09:00	05-Oct-09	13:18	0.538	0.492	0.277	0.255	1.16

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LR Report : **CA10526-SEP09**

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	5: PW09-SR-1 (0-5)	6: PW09-SR-1 (5-10)	7: PW09-SR-1 (10-15)	8: PW09-SR-1 (15-20)	9: PW09-SR-2 (0-5)
Manganese [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.365	0.305	0.245	0.325	3.91
Molybdenum [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.00069	0.00037	0.00024	0.00031	0.00064
Sodium [mg/L]	05-Oct-09	09:00	05-Oct-09	13:18	1.85	1.83	1.64	2.17	2.57
Nickel [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.0007	0.0009	0.0006	0.0009	0.0011
Phosphorus [mg/L]	05-Oct-09	09:00	05-Oct-09	13:18	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Lead [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.00087	0.00213	0.00036	0.00124	0.00037
Sulphur [mg/L]	05-Oct-09	09:00	05-Oct-09	13:18	1.05	0.78	0.46	0.74	4.67
Antimony [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Selenium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Silica [mg/L]	05-Oct-09	09:00	05-Oct-09	13:18	1.52	1.96	2.35	2.84	1.63
Tin [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.00007	0.00022	< 0.00001	< 0.00001	< 0.00001
Strontium [mg/L]	05-Oct-09	09:00	05-Oct-09	13:18	0.0121	0.0104	0.0064	0.0068	0.0668
Titanium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.0007	0.0011	0.0007	0.0012	0.0001
Thallium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Uranium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.000186	0.000137	0.000380	0.000250	0.00266
Vanadium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.00016	0.00026	0.00014	0.00029	0.00008
Zinc [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.002	0.002	0.002	0.003	0.002

Samples are field filtered
Ra226 subcontracted to Becquerel Labs.

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Project Specialist
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OnLine LIMS

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Date Rec. : 30 September 2009
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CERTIFICATE OF ANALYSIS
Final Report

Analysis	**10: PW09-SR-2 (5-10)**	**11: PW09-SR-2 (10-15)**	**12: PW09-SR-3 (0-5)**	**13: PW09-SR-3 (5-10)**	**14: PW09-SR-3 (10-15)**	**15: PW09-SR-3 (15-20)**	**16: PW09-SR-4 (0-5)**	**17: PW09-SR-4 (5-10)**	**18: PW09-SR-4 (10-15)**
Sample Date & Time	26-Sep-09	26-Sep-09	27-Sep-09	27-Sep-09	27-Sep-09	27-Sep-09	27-Sep-09	27-Sep-09	27-Sep-09
Temperature Upon Receipt [°C]	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Sulphate [mg/L]	14	---	7.9	4.0	< 2	< 2	19	8.1	4.9
Dissolved Organic Carbon [mg/L]	26.5	---	9.9	18.8	13.2	---	---	---	---
Dissolved Inorganic Carbon [mg/L]	5.0	---	14.0	26.5	32.7	---	---	---	---
Alkalinity [mg/L as CaCO3]	5	---	69	99	135	177	33	---	87
Acidity [mg/L as CaCO3]	6	---	---	---	---	---	---	< 2	---
Hardness [mg/L as CaCO3]	25.6	31.5	42.6	67.1	87.2	130	45.2	63.4	78.8
Aluminum [mg/L]	0.07	0.07	< 0.01	< 0.01	< 0.01	0.02	< 0.01	0.01	0.02
Arsenic [mg/L]	0.0030	0.0027	0.0012	0.0014	0.0039	0.0027	0.0012	0.0022	0.0051
Barium [mg/L]	2.38	1.50	1.91	3.11	3.75	3.24	0.561	0.621	0.602
Beryllium [mg/L]	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Boron [mg/L]	0.0068	0.0090	0.0095	0.0146	0.0356	0.0758	0.0192	0.0424	0.0817
Bismuth [mg/L]	0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Calcium [mg/L]	8.74	10.5	14.7	23.8	31.6	47.6	15.7	22.3	27.8
Cadmium [mg/L]	0.000010	0.000010	0.000004	0.000005	0.000008	0.000007	0.000008	0.000007	0.000015
Cobalt [mg/L]	0.000948	0.000863	0.00704	0.00374	0.00264	0.00253	0.000880	0.000284	0.000291
Chromium [mg/L]	< 0.0005	0.0007	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Copper [mg/L]	0.0046	0.0049	0.0010	0.0010	0.0015	0.0014	0.0015	0.0016	0.0019
Iron [mg/L]	0.08	0.27	3.54	4.19	6.18	0.51	1.05	0.26	0.02
Potassium [mg/L]	0.95	2.11	1.03	1.86	3.28	6.21	0.96	1.57	2.77
Lithium [mg/L]	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	0.004	< 0.002	< 0.002	< 0.002
Magnesium [mg/L]	0.926	1.26	1.45	1.84	1.99	2.84	1.46	1.88	2.28

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LR Report : **CA10526-SEP09**

Analysis	**10: PW09-SR-2 (5-10)**	**11: PW09-SR-2 (10-15)**	**12: PW09-SR-3 (0-5)**	**13: PW09-SR-3 (5-10)**	**14: PW09-SR-3 (10-15)**	**15: PW09-SR-3 (15-20)**	**16: PW09-SR-4 (0-5)**	**17: PW09-SR-4 (5-10)**	**18: PW09-SR-4 (10-15)**
Manganese [mg/L]	1.82	1.34	10.8	8.04	5.58	2.89	1.24	0.613	0.341
Molybdenum [mg/L]	0.00150	0.00282	0.00065	0.00035	0.00369	0.00475	0.00056	0.00238	0.00909
Sodium [mg/L]	2.81	2.81	2.35	2.95	3.63	5.23	3.15	3.27	3.93
Nickel [mg/L]	0.0013	0.0012	0.0016	0.0018	0.0018	0.0019	0.0014	0.0009	0.0009
Phosphorus [mg/L]	0.02	0.02	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.01	< 0.01
Lead [mg/L]	0.00198	0.00084	0.00018	0.00008	0.00023	0.00004	0.00054	0.00091	0.00192
Sulphur [mg/L]	4.45	5.89	2.65	1.74	0.88	1.07	5.53	2.88	2.10
Antimony [mg/L]	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Selenium [mg/L]	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Silica [mg/L]	2.68	4.19	3.02	5.36	6.12	6.22	3.01	6.24	9.87
Tin [mg/L]	0.00004	< 0.00001	0.00003	< 0.00001	0.00007	< 0.00001	0.00002	< 0.00001	< 0.00001
Strontium [mg/L]	0.0685	0.0607	0.0508	0.0866	0.117	0.151	0.0328	0.0425	0.0515
Titanium [mg/L]	0.0012	0.0024	0.0002	0.0003	0.0004	0.0004	0.0002	0.0006	0.0008
Thallium [mg/L]	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Uranium [mg/L]	0.00258	0.000877	0.0113	0.00514	0.0400	0.0379	0.00413	0.00669	0.0110
Vanadium [mg/L]	0.00022	0.00082	0.00017	0.00033	0.00038	0.00071	0.00014	0.00032	0.00095
Zinc [mg/L]	0.004	0.005	0.002	0.004	0.003	0.003	0.003	0.002	0.002

Samples are field filtered
Ra226 subcontracted to Becquerel Labs.

Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

OnLine LIMS

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SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : 09-1663

October 7, 2010

Ecometrix
Attn : Erin Clyde

6800 Campobello Road
Mississauga, Ontario
L5N 2L8, Canada

Phone: 905-794-2325
Fax:905-794-2338

Date Rec. : 30 September 2009
LR Report: **CA10526-SEP09**

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CERTIFICATE OF ANALYSIS
Final Report - (QC Report)

Analysis	19: MDL	20: QC - Blank	21: QC - STD % Recovery	22: QC - DUP % Recovery
Temperature Upon Receipt [°C]	---	---	---	---
Sulphate [mg/L]	0.2	< 0.2	105%	100%
Dissolved Organic Carbon [mg/L]	0.2	< 0.2	105%	98%
Dissolved Inorganic Carbon [mg/L]	0.2	0.2	97%	100%
Alkalinity [mg/L as CaCO3]	2	< 2	101%	98%
Acidity [mg/L as CaCO3]	2	3	98%	102%
Hardness [mg/L as CaCO3]	0.5	< 0.5	---	---
Aluminum [mg/L]	0.01	< 0.01	98%	---
Arsenic [mg/L]	0.0002	< 0.0002	106%	---
Barium [mg/L]	0.00001	< 0.00001	122%	---
Beryllium [mg/L]	0.00002	< 0.00002	104%	---
Boron [mg/L]	0.0002	< 0.0002	96%	---
Bismuth [mg/L]	0.00001	< 0.00001	109%	---
Calcium [mg/L]	0.03	< 0.03	101%	---
Cadmium [mg/L]	0.000003	0.000003	99%	---
Cobalt [mg/L]	0.000002	< 0.000002	102%	---
Chromium [mg/L]	0.0005	< 0.0005	102%	---
Copper [mg/L]	0.0005	< 0.0005	102%	---
Iron [mg/L]	0.01	< 0.01	102%	---
Potassium [mg/L]	0.01	< 0.01	98%	---
Lithium [mg/L]	0.002	< 0.002	98%	---
Magnesium [mg/L]	0.003	< 0.003	99%	---
Manganese [mg/L]	0.00001	< 0.00001	107%	---
Molybdenum [mg/L]	0.00001	< 0.00001	99%	---
Sodium [mg/L]	0.01	< 0.01	94%	---
Nickel [mg/L]	0.0001	< 0.0001	100%	---
Phosphorus [mg/L]	0.01	< 0.01	100%	---
Lead [mg/L]	0.00002	< 0.00002	106%	---
Sulphur [mg/L]	0.01	< 0.01	100%	---
Antimony [mg/L]	0.0002	< 0.0002	101%	---

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Project : 09-1663

LR Report : **CA10526-SEP09**

Analysis	19: MDL	20: QC - Blank	21: QC - STD % Recovery	22: QC - DUP % Recovery
Selenium [mg/L]	0.001	< 0.001	102%	---
Silica [mg/L]	0.01	< 0.01	104%	---
Tin [mg/L]	0.00001	< 0.00001	96%	---
Strontium [mg/L]	0.0001	< 0.0001	100%	---
Titanium [mg/L]	0.0001	< 0.0001	96%	---
Thallium [mg/L]	0.0002	< 0.0002	107%	---
Uranium [mg/L]	0.000001	0.000001	106%	---
Vanadium [mg/L]	0.00003	< 0.00003	107%	---
Zinc [mg/L]	0.001	< 0.001	104%	---

Samples are field filtered
Ra226 subcontracted to Becquerel Labs.
Revised to include Ra226 results from Becquerel.

Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

OnLine LIMS

ANALYSIS REPORT

Becquerel LABORATORIES

Becquerel Laboratories Inc.
6790 Kitimat Rd., Unit 4
Mississauga, Ontario
Canada, L5N 5L9

Phone: (905) 826-3080
FAX: (905) 826-4151

Batch: T09-01385.0

Date: 09-Nov-2009

Lakefield Research Ltd.

185 Concession St., Postal Bag 4300
Lakefield, ON, K0L 2H0

attn: Brian Graham

Phone: (705) 652-2038
FAX: (705) 652-1918

Client Ref.Sep 10525
P.O: 17820

9 water samples

Received: 06-Oct-2009

Results of Analysis

Sample	Test	Result	Units	Date	Method
SW09-SR-1T	Ra-226	< 0.01	Bq/l	06-Nov-2009	ALPHA
SW09-SR-1B	Ra-226	< 0.01	Bq/l	06-Nov-2009	ALPHA
SW09-SR-2T	Ra-226	0.11	Bq/l	06-Nov-2009	ALPHA
SW09-SR-2B	Ra-226	0.28	Bq/l	06-Nov-2009	ALPHA
SW09-SR-3T	Ra-226	0.15	Bq/l	06-Nov-2009	ALPHA
SW09-SR-3B	Ra-226	0.80	Bq/l	06-Nov-2009	ALPHA
SW09-SR-4T	Ra-226	0.19	Bq/l	06-Nov-2009	ALPHA
SW09-SR-4B	Ra-226	0.30	Bq/l	06-Nov-2009	ALPHA
Blank 1	Ra-226	< 0.01	Bq/l	06-Nov-2009	ALPHA

Methods: ALPHA BQ-RAD-ALPHA alpha-particle spectrometry

Units: Bq/l Becquerels per litre

These results relate only to the samples analysed and only to the items tested.

09-Nov-2009 approved by: Donald D. Burgess

Donald D. Burgess PhD
Senior Scientist, Division Supervisor

SGS Lakefield Research Limited
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Ecometrix
Attn : Erin Clyde

6800 Campobello Road, Mississauga
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Phone: 905-794-2325, Fax:905-794-2338

October 14, 2009

Date Rec. : 30 September 2009
LR Report : **CA10525-SEP09**
Project : 09-1663

CERTIFICATE OF ANALYSIS
Final Report

Analysis	**1: Analysis Start Date**	**2: Analysis Start Time**	**3: Analysis Approval Date**	**4: Analysis Approval Time**	**5: SW09-SR-1T**	**6: SW09-SR-1B**	**7: SW09-SR-2T**
Sample Date & Time					24-Sep-09	25-Sep-09	24-Sep-09
Temperature Upon Receipt [°C]	---	---	---	---	4.0	4.0	4.0
Sulphate [mg/L]	02-Oct-09	15:00	05-Oct-09	16:12	8.5	5.6	31
Total Organic Carbon [mg/L]	02-Oct-09	10:00	05-Oct-09	13:41	2.7	5.4	2.3
Total Inorganic Carbon [mg/L]	05-Oct-09	14:35	08-Oct-09	12:46	< 1.0	< 1.0	< 1.0
Alkalinity [mg/L as CaCO3]	02-Oct-09	15:19	05-Oct-09	15:13	---	---	---
Acidity [mg/L as CaCO3]	02-Oct-09	15:19	05-Oct-09	15:13	11	9	9
Hardness [mg/L as CaCO3]	02-Oct-09	09:00	02-Oct-09	12:09	10.4	10.2	34.8
Aluminum [mg/L]	02-Oct-09	09:00	02-Oct-09	12:09	0.02	0.02	< 0.01
Arsenic [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.0004	0.0003	0.0005
Barium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.0144	0.0155	0.120
Beryllium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	< 0.00002	< 0.00002	< 0.00002
Boron [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.0059	0.0050	0.0084
Bismuth [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	< 0.00001	< 0.00001	< 0.00001
Calcium [mg/L]	02-Oct-09	09:00	02-Oct-09	12:09	3.26	3.21	11.8
Cadmium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.000013	0.000061	< 0.000003
Cobalt [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.00298	0.00250	0.00184
Chromium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	< 0.0005	< 0.0005	< 0.0005
Copper [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.0015	0.0016	0.0007
Iron [mg/L]	02-Oct-09	09:00	02-Oct-09	12:09	0.03	0.03	0.02
Potassium [mg/L]	02-Oct-09	09:00	02-Oct-09	12:09	0.25	0.24	0.78
Lithium [mg/L]	02-Oct-09	09:00	02-Oct-09	12:09	< 0.002	< 0.002	< 0.002
Magnesium [mg/L]	02-Oct-09	09:00	02-Oct-09	12:09	0.542	0.524	1.31

OnLine LIMS

SGS Lakefield Research Limited
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

LR Report : **CA10525-SEP09**

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	5: SW09-SR-1T	6: SW09-SR-1B	7: SW09-SR-2T
Manganese [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.0313	0.0284	0.0545
Molybdenum [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.00007	0.00008	0.00022
Sodium [mg/L]	02-Oct-09	09:00	02-Oct-09	12:09	1.83	1.89	2.06
Nickel [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.0004	0.0004	0.0005
Phosphorus [mg/L]	02-Oct-09	09:00	02-Oct-09	12:09	< 0.01	< 0.01	< 0.01
Lead [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.00031	0.00056	0.00031
Sulphur [mg/L]	02-Oct-09	09:00	02-Oct-09	12:09	1.66	1.67	9.17
Antimony [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.0045	0.0037	0.0028
Selenium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	< 0.001	< 0.001	< 0.001
Silica [mg/L]	02-Oct-09	09:00	02-Oct-09	12:09	0.63	0.63	0.63
Tin [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.00006	0.00019	0.00019
Strontium [mg/L]	02-Oct-09	09:00	02-Oct-09	12:09	0.0117	0.0115	0.0270
Titanium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.0002	0.0002	0.0001
Thallium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	< 0.0002	< 0.0002	< 0.0002
Uranium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.000257	0.000138	0.00154
Vanadium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.00005	0.00012	0.00004
Zinc [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.003	0.003	< 0.001

Ra226 subcontracted to Becquerel Labs.

Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

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Ecometrix
Attn : Erin Clyde

6800 Campobello Road, Mississauga
Canada, L5N 2L8
Phone: 905-794-2325, Fax:905-794-2338

October 14, 2009

Date Rec. : 30 September 2009
LR Report : **CA10525-SEP09**
Project : 09-1663

CERTIFICATE OF ANALYSIS

Final Report

Analysis	**8: SW09-SR-2B**	**9: SW09-SR-3T**	**10: SW09-SR-3B**	**11: SW09-SR-4T**	**12: SW09-SR-4B**	**13: Blank 1**
Sample Date & Time	25-Sep-09	25-Sep-09	25-Sep-09	25-Sep-09	25-Sep-09	27-Sep-09
Temperature Upon Receipt [°C]	4.0	4.0	4.0	4.0	4.0	4.0
Sulphate [mg/L]	45	30	26	25	25	< 2
Total Organic Carbon [mg/L]	2.2	4.6	2.2	4.6	2.0	2.4
Total Inorganic Carbon [mg/L]	< 1.0	< 1.0	< 1.0	< 1.0	1.4	< 1.0
Alkalinity [mg/L as CaCO3]	---	---	7	---	---	---
Acidity [mg/L as CaCO3]	7	8	---	---	< 2	7
Hardness [mg/L as CaCO3]	36.5	33.7	32.7	33.0	33.4	< 0.5
Aluminum [mg/L]	0.04	< 0.01	< 0.01	0.01	< 0.01	< 0.01
Arsenic [mg/L]	0.0007	0.0004	0.0008	0.0004	0.0007	< 0.0002
Barium [mg/L]	0.294	0.147	0.334	0.191	0.222	0.00216
Beryllium [mg/L]	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Boron [mg/L]	0.0093	0.0079	0.0090	0.0081	0.0089	< 0.0002
Bismuth [mg/L]	< 0.00001	< 0.00001	< 0.00001	< 0.00001	0.00001	< 0.00001
Calcium [mg/L]	12.4	11.4	11.1	11.1	11.2	0.03
Cadmium [mg/L]	0.000045	0.000006	0.000011	0.000009	0.000028	< 0.000003
Cobalt [mg/L]	0.00270	0.00148	0.00178	0.000944	0.000310	0.000003
Chromium [mg/L]	0.0012	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Copper [mg/L]	0.0015	0.0012	0.0017	0.0009	0.0011	0.0053
Iron [mg/L]	0.02	0.02	0.40	0.02	0.08	< 0.01
Potassium [mg/L]	0.86	0.75	0.74	0.72	0.80	< 0.01
Lithium [mg/L]	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Magnesium [mg/L]	1.36	1.28	1.24	1.28	1.29	< 0.003

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LR Report : **CA10525-SEP09**

Analysis	8: SW09-SR-2B	9: SW09-SR-3T	10: SW09-SR-3B	11: SW09-SR-4T	12: SW09-SR-4B	13: Blank 1
Manganese [mg/L]	0.253	0.0424	0.752	0.0251	0.119	0.00034
Molybdenum [mg/L]	0.00013	0.00026	0.00036	0.00029	0.00032	< 0.00001
Sodium [mg/L]	2.13	2.16	2.17	2.65	2.79	0.15
Nickel [mg/L]	0.0016	0.0006	0.0010	0.0005	0.0006	0.0003
Phosphorus [mg/L]	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Lead [mg/L]	0.00151	0.00029	0.00031	0.00027	0.00043	< 0.00002
Sulphur [mg/L]	9.22	8.86	8.73	8.40	8.58	0.05
Antimony [mg/L]	0.0041	0.0021	0.0006	0.0013	0.0002	< 0.0002
Selenium [mg/L]	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Silica [mg/L]	0.62	0.62	0.77	0.65	0.73	< 0.01
Tin [mg/L]	0.00029	0.00052	0.00009	0.00007	0.00016	< 0.00001
Strontium [mg/L]	0.0302	0.0267	0.0275	0.0266	0.0268	0.0001
Titanium [mg/L]	0.0001	0.0001	0.0002	0.0002	0.0001	< 0.0001
Thallium [mg/L]	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Uranium [mg/L]	0.00345	0.00131	0.00137	0.00146	0.00122	< 0.000001
Vanadium [mg/L]	0.00003	0.00007	0.00005	0.00005	0.00008	< 0.00003
Zinc [mg/L]	0.009	0.002	0.002	< 0.001	0.004	< 0.001

Ra226 subcontracted to Becquerel Labs.

Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

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OnLine LIMS

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Project : 09-1663

October 7, 2010

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Canada, L5N 2L8
Phone: 905-794-2325, Fax:905-794-2338

Date Rec. : 30 September 2009
LR Report: **CA10525-SEP09**

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report - (QC Report)

Analysis	14: MDL	15: QC - Blank	16: QC - STD % Recovery	17: QC - DUP % Recovery
Sulphate [mg/L]	0.2	< 0.2	105%	100%
Total Organic Carbon [mg/L]	0.2	< 0.2	105%	98%
Total Inorganic Carbon [mg/L]	0.2	0.2	97%	100%
Alkalinity [mg/L as CaCO3]	2	< 2	101%	98%
Acidity [mg/L as CaCO3]	2	3	98%	102%
Hardness [mg/L as CaCO3]	0.5	---	---	---
Aluminum [mg/L]	0.01	< 0.01	95%	100%
Arsenic [mg/L]	0.0002	< 0.0002	106%	111%
Barium [mg/L]	0.00001	< 0.00001	105%	100%
Beryllium [mg/L]	0.00002	< 0.00002	103%	94%
Boron [mg/L]	0.0002	< 0.0002	99%	97%
Bismuth [mg/L]	0.00001	0.00001	105%	82%
Calcium [mg/L]	0.03	---	98%	100%
Cadmium [mg/L]	0.000003	< 0.000003	102%	107%
Cobalt [mg/L]	0.000002	< 0.000002	105%	99%
Chromium [mg/L]	0.0005	< 0.0005	103%	170%
Copper [mg/L]	0.0005	< 0.0005	106%	85%
Iron [mg/L]	0.01	---	96.8	122
Potassium [mg/L]	0.01	< 0.01	98%	99.1
Lithium [mg/L]	0.002	< 0.002	94.2	120
Magnesium [mg/L]	0.003	---	95%	100%
Manganese [mg/L]	0.00001	< 0.00001	104%	99%
Molybdenum [mg/L]	0.00001	< 0.00001	95%	155%
Sodium [mg/L]	0.01	---	95%	99%
Nickel [mg/L]	0.0001	< 0.0001	105%	87%
Phosphorus [mg/L]	0.01	< 0.01	95%	100%
Lead [mg/L]	0.00002	< 0.00002	102%	30%
Sulphur [mg/L]	0.01	---	100%	101%
Antimony [mg/L]	0.0002	< 0.0002	94%	124%
Selenium [mg/L]	0.001	< 0.001	108%	100%

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Project : 09-1663

LR Report : **CA10525-SEP09**

Analysis	14: MDL	15: QC - Blank	16: QC - STD % Recovery	17: QC - DUP % Recovery
Silica [mg/L]	0.01	< 0.01	103%	101%
Tin [mg/L]	0.00001	< 0.00001	96%	140%
Strontium [mg/L]	0.0001	---	98%	100%
Titanium [mg/L]	0.0001	< 0.0001	95%	130%
Thallium [mg/L]	0.0002	< 0.0002	105%	106%
Uranium [mg/L]	0.000001	< 0.000001	102%	94%
Vanadium [mg/L]	0.00003	< 0.00003	106%	150%
Zinc [mg/L]	0.001	< 0.001	106%	90%

Ra226 subcontracted to Becquerel Labs.
Revised to include Ra226 results from Becquerel

Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

OnLine LIMS

ANALYSIS REPORT

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Batch: T09-01487.0

Date: 13-Nov-2009

Lakefield Research Ltd.

185 Concession St., Postal Bag 4300
Lakefield, ON, K0L 2H0

Phone: (705) 652-2038
FAX: (705) 652-1918

Client Ref.
Oct 10063.R09
P.O: 17820

attn: Brian Graham

20 solid samples Sampled: 28-Sep-2009 Received: 21-Oct-2009

Results of Analysis

Sample	Test	Result	Units	Date	Method
CORE 09-EC-1 (0-5)	Ra-226	4.1	Bq/g	11-Nov-2009	ALPHA
CORE 09-EC-1 (5-10)	Ra-226	1.6	Bq/g	11-Nov-2009	ALPHA
CORE 09-EC-2 (0-2.5)	Ra-226	7.0	Bq/g	11-Nov-2009	ALPHA
CORE 09-EC-2 (2.5-5)	Ra-226	8.3	Bq/g	11-Nov-2009	ALPHA
CORE 09-EC-2 (5-7.5)	Ra-226	9.7	Bq/g	11-Nov-2009	ALPHA
CORE 09-QC14-1 (0-5)	Ra-226	19	Bq/g	11-Nov-2009	ALPHA
CORE 09-QC14-1 (5-10)	Ra-226	13	Bq/g	11-Nov-2009	ALPHA
CORE 09-QC14-1 (10-15)	Ra-226	9.7	Bq/g	11-Nov-2009	ALPHA
CORE 09-QC14-2 (0-2.5)	Ra-226	4.3	Bq/g	12-Nov-2009	ALPHA
CORE 09-QC14-2 (2.5-5)	Ra-226	6.5	Bq/g	12-Nov-2009	ALPHA
CORE 09-QC14-2 (5-7.5)	Ra-226	9.3	Bq/g	12-Nov-2009	ALPHA
CORE 09-QC14-2 (7.5-10)	Ra-226	9.0	Bq/g	12-Nov-2009	ALPHA
CORE 09-QC14-3 (0-5)	Ra-226	16	Bq/g	12-Nov-2009	ALPHA
CORE 09-QC14-3 (5-10)	Ra-226	22	Bq/g	12-Nov-2009	ALPHA
CORE 09-QC14-3 (10-15)	Ra-226	24	Bq/g	12-Nov-2009	ALPHA
CORE 09-QC14-3 (15-20)	Ra-226	23	Bq/g	12-Nov-2009	ALPHA
CORE 09-QC14-4 (0-5)	Ra-226	16	Bq/g	12-Nov-2009	ALPHA
CORE 09-QC14-4 (5-10)	Ra-226	17	Bq/g	12-Nov-2009	ALPHA
CORE 09-QC14-4 (10-15)	Ra-226	22	Bq/g	12-Nov-2009	ALPHA
CORE 09-QC14-4 (15-20)	Ra-226	19	Bq/g	12-Nov-2009	ALPHA

ANALYSIS REPORT

Becquerel Laboratories Inc.
6790 Kitimat Rd., Unit 4
Mississauga, Ontario
Canada, L5N 5L9

Phone: (905) 826-3080
FAX: (905) 826-4151

Batch: T09-01487.0

Date: 13-Nov-2009

Methods: ALPHA BQ-RAD-ALPHA alpha-particle spectrometry

Units: Bq/g Becquerels per gram

These results relate only to the samples analysed and only to the items tested.

13-Nov-2009 approved by:

Donald D. Burgess PhD
Senior Scientist, Division Supervisor

SGS Lakefield Research Limited
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Ecometrix
Attn : Erin Clyde

6800 Campobello Road, Mississauga
Canada, L5N 2L8
Phone: 905-794-2325, Fax:905-794-2338

Tuesday, October 27, 2009

Date Rec. : 01 October 2009
LR. Ref. : **CA10063-OCT09**
Project : 09-1663

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CERTIFICATE OF ANALYSIS

Final Report

Analysis	**3: Analysis Approval Date**	**4: Analysis Approval Time**	**5: CORE 09-EC-1 (0-5)**	**6: CORE 09-EC-1 (5-10)**	**7: CORE 09-EC-2 (0-2.5)**	**8: CORE 09-EC-2 (2.5-5)**	**9: CORE 09-EC-2 (5-7.5)**	**10: CORE 09-QC14-1 (0-5)**
Sample Date & Time			28-Sep-09	28-Sep-09	28-Sep-09	28-Sep-09	28-Sep-09	28-Sep-09
Ba as BaSO4 Calc. * [µg/g]	---	---	160	770	480	630	530	940
SO4 as BaSO4 Calc. ** [µg/g]	---	---	7280	2430	2430	2430	2430	14600
Total Sulphur [%]	09-Oct-09	10:07	1.17	0.762	0.628	1.03	1.18	1.21
Carbonate (CO3) [%]	08-Oct-09	10:46	0.058	0.280	< 0.005	< 0.005	< 0.005	< 0.005
Total Organic Carbon [%]	09-Oct-09	10:07	10.5	16.7	0.617	0.206	0.090	0.490
Total Carbon [%]	09-Oct-09	10:07	10.5	16.8	0.616	0.207	0.089	0.489
Sulphide [%]	08-Oct-09	11:47	0.47	0.70	0.53	1.04	1.07	0.96
Sulphate [%]	13-Oct-09	16:45	0.3	0.1	0.1	0.1	0.1	0.6
Silver [µg/g]	14-Oct-09	13:32	< 0.7	< 0.7	1.5	1.2	1.1	3.0
Aluminum [µg/g]	14-Oct-09	13:32	3800	5800	1500	1200	890	6700
Arsenic [µg/g]	14-Oct-09	13:32	14	26	22	24	24	37
Barium [µg/g]	14-Oct-09	13:32	94	450	280	370	310	550
Beryllium [µg/g]	14-Oct-09	13:32	0.35	0.13	0.51	0.41	0.34	1.5
Bismuth [µg/g]	14-Oct-09	13:32	12	< 0.5	11	8.6	7.8	15
Calcium [µg/g]	14-Oct-09	13:32	4600	7400	230	110	63	2400
Cadmium [µg/g]	14-Oct-09	13:32	4.0	1.8	0.25	0.27	0.29	0.45
Cerium [µg/g]	14-Oct-09	13:32	240	800	340	300	240	600
Cobalt [µg/g]	14-Oct-09	13:32	15	17	16	21	22	25
Chromium [µg/g]	14-Oct-09	13:32	7.8	17	8.2	6.5	5.8	16
Cesium [µg/g]	14-Oct-09	13:32	1.1	0.90	0.32	0.20	0.19	1.1
Copper [µg/g]	14-Oct-09	13:32	15	56	50	54	54	120
Iron [µg/g]	14-Oct-09	13:32	240000	16000	13000	17000	19000	22000
Gallium [µg/g]	14-Oct-09	13:32	2.7	6.5	2.8	2.4	1.9	5.3
Germanium [µg/g]	14-Oct-09	13:32	7.2	4.0	1.4	1.4	1.2	2.6
Hafnium [µg/g]	14-Oct-09	13:32	0.1	0.9	0.5	0.7	0.7	1.5
Indium [µg/g]	14-Oct-09	13:32	< 0.01	0.01	0.02	0.01	0.01	0.03
Potassium [µg/g]	14-Oct-09	13:32	210	270	330	300	230	570
Lanthanum [µg/g]	14-Oct-09	13:32	130	420	190	170	140	310
Lithium [µg/g]	14-Oct-09	13:32	0.9	1.3	0.8	0.5	0.2	4.7

OnLine LIMS

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LR Report : CA10063-OCT09

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: CORE 09-EC-1 (0-5)	6: CORE 09-EC-1 (5-10)	7: CORE 09-EC-2 (0-2.5)	8: CORE 09-EC-2 (2.5-5)	9: CORE 09-EC-2 (5-7.5)	10: CORE 09-QC14-1 (0-5)
Lutetium [µg/g]	14-Oct-09	13:32	1.1	5.3	0.14	0.060	0.038	1.1
Magnesium [µg/g]	14-Oct-09	13:32	240	1500	110	38	18	97
Manganese [µg/g]	14-Oct-09	13:32	84	180	18	7.6	4.6	14
Molybdenum [µg/g]	14-Oct-09	13:32	10	3.9	6.4	6.1	5.5	10
Sodium [µg/g]	14-Oct-09	13:32	40	55	11	8	5	15
Niobuim [µg/g]	14-Oct-09	13:32	2.7	< 0.7	9.7	7.8	7.5	13
Nickel [µg/g]	14-Oct-09	13:32	19	43	9	10	11	20
Lead [µg/g]	14-Oct-09	13:32	280	640	240	270	310	650
Phosphorus [µg/g]	14-Oct-09	13:32	810	360	400	360	330	820
Rubidium [µg/g]	14-Oct-09	13:32	2.5	4.0	2.6	2.0	1.4	4.1
Antimony [µg/g]	14-Oct-09	13:32	< 1	< 1	1	< 1	< 1	2
Scandium [µg/g]	14-Oct-09	13:32	1.6	3.0	0.9	0.8	0.6	2.8
Selenium [µg/g]	14-Oct-09	13:32	< 2	< 2	< 2	< 2	< 2	< 2
Tin [µg/g]	14-Oct-09	13:32	< 6	< 6	< 6	< 6	< 6	< 6
Strontium [µg/g]	14-Oct-09	13:32	7.9	14	5.1	5.4	4.6	11
Sulphur [µg/g]	14-Oct-09	13:32	15000	11000	6700	11000	12000	12000
Tantalum [µg/g]	14-Oct-09	13:32	0.05	0.23	0.07	0.12	0.28	0.30
Terbium [µg/g]	14-Oct-09	13:32	4.3	33	1.4	0.90	0.67	5.6
Tellerium [µg/g]	14-Oct-09	13:32	0.1	< 0.1	0.2	0.2	0.2	0.3
Thorium [µg/g]	14-Oct-09	13:32	120	89	560	470	380	1600
Titanium [µg/g]	14-Oct-09	13:32	91	220	330	260	240	610
Thallium [µg/g]	14-Oct-09	13:32	< 3	< 3	< 3	< 3	< 3	< 3
Uranium [µg/g]	14-Oct-09	13:32	230	150	23	18	15	83
Vanadium [µg/g]	14-Oct-09	13:32	26	17	4.0	2.7	2.4	7.2
Tungsten [µg/g]	14-Oct-09	13:32	79	5	5	5	6	8
Yttrium [µg/g]	14-Oct-09	13:32	84	750	12	6.7	5.2	87
Ytterbium [µg/g]	14-Oct-09	13:31	8.7	46	1.2	0.57	0.40	9.2
Zinc [µg/g]	14-Oct-09	13:32	65	58	8.9	8.0	5.8	23
Zirconium [µg/g]	14-Oct-09	13:32	6	< 5	30	27	26	58

Ra226 subcontracted to Becquerel Labs.
* BaSO4 Calculation based on Ba values and assumes all Ba is in BaSO4 form.
** BaSO4 Calculation based on SO4 values and assumes all SO4 is in BaSO4 form.

Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

OnLine LIMS

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Final Report

Analysis	**11: CORE 09-QC14-1 (5-10)**	**12: CORE 09-QC14-1 (10-15)**	**13: CORE 09-QC14-2 (0-2.5)**	**14: CORE 09-QC14-2 (2.5-5)**	**15: CORE 09-QC14-2 (5-7.5)**	**16: CORE 09-QC14-2 (7.5-10)**	**17: CORE 09-QC14-3 (0-5)**
Sample Date & Time	28-Sep-09	28-Sep-09	28-Sep-09	28-Sep-09	28-Sep-09	28-Sep-09	28-Sep-09
Ba as BaSO4 Calc. * [µg/g]	580	480	260	370	560	540	920
SO4 as BaSO4 Calc. ** [µg/g]	53400	29100	2430	2430	2430	2430	<2430
Total Sulphur [%]	2.33	2.21	0.633	0.885	0.871	1.29	1.35
Carbonate (CO3) [%]	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.005
Total Organic Carbon [%]	0.114	0.065	0.519	0.289	0.121	0.086	0.617
Total Carbon [%]	0.115	0.064	0.519	0.289	0.121	0.086	0.618
Sulphide [%]	1.56	1.80	0.52	0.77	0.84	1.26	1.37
Sulphate [%]	2.2	1.2	0.1	0.1	0.1	0.1	< 0.1
Silver [µg/g]	1.7	1.3	0.8	1.0	1.1	1.3	3.4
Aluminum [µg/g]	3800	2600	830	690	850	1400	7700
Arsenic [µg/g]	33	26	17	19	21	23	36
Barium [µg/g]	340	280	150	220	330	320	540
Beryllium [µg/g]	0.81	0.61	0.28	0.28	0.34	0.51	1.7
Bismuth [µg/g]	10	8.1	7.5	9.2	8.5	7.6	15
Calcium [µg/g]	8900	4900	190	130	79	59	350
Cadmium [µg/g]	0.42	0.43	0.18	0.22	0.22	0.31	0.55
Cerium [µg/g]	610	430	300	290	280	250	770
Cobalt [µg/g]	35	36	15	18	17	24	38
Chromium [µg/g]	8.2	6.2	4.7	4.9	5.7	6.6	18
Cesium [µg/g]	0.49	0.32	0.18	0.22	0.31	0.20	0.55
Copper [µg/g]	100	88	43	46	42	51	140
Iron [µg/g]	21000	21000	10000	12000	13000	18000	22000
Gallium [µg/g]	4.3	3.0	2.1	2.1	2.0	1.9	6.2
Germanium [µg/g]	2.6	2.1	1.2	1.2	1.2	1.2	3.1
Hafnium [µg/g]	1.2	0.9	0.3	0.6	1.0	0.7	1.5
Indium [µg/g]	0.02	0.02	< 0.01	< 0.01	0.01	0.01	0.04
Potassium [µg/g]	440	290	210	230	250	250	600
Lanthanum [µg/g]	310	220	170	170	160	140	390
Lithium [µg/g]	1.8	1.0	0.2	0.1	0.4	0.7	5.7

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Lutetium [µg/g]	1.4	1.1	0.081	0.048	0.031	0.036	1.9
Magnesium [µg/g]	76	65	88	46	25	23	120
Manganese [µg/g]	5.3	5.4	13	8.6	4.7	3.9	20
Molybdenum [µg/g]	7.8	7.3	5.3	5.2	7.9	4.8	8.0
Sodium [µg/g]	12	7	8	7	6	6	16
Niobuim [µg/g]	7.2	4.9	7.0	8.2	8.4	7.7	15
Nickel [µg/g]	25	24	8	8	8	12	32
Lead [µg/g]	490	390	180	260	270	230	650
Phosphorus [µg/g]	490	320	260	300	360	350	830
Rubidium [µg/g]	3.2	2.1	1.9	1.9	1.8	1.6	4.3
Antimony [µg/g]	< 1	< 1	< 1	< 1	< 1	< 1	2
Scandium [µg/g]	1.5	1.0	0.5	0.4	0.5	0.8	3.0
Selenium [µg/g]	< 2	< 2	< 2	< 2	< 2	< 2	< 2
Tin [µg/g]	< 6	< 6	< 6	< 6	< 6	< 6	< 6
Strontium [µg/g]	12	8.5	3.6	4.1	4.8	4.6	7.5
Sulphur [µg/g]	22000	20000	6500	8700	8600	12000	13000
Tantalum [µg/g]	0.15	0.09	0.04	0.05	0.12	0.35	0.45
Terbium [µg/g]	7.5	5.5	0.97	0.83	0.68	0.64	9.5
Tellerium [µg/g]	0.2	0.2	0.1	0.2	0.2	0.2	0.3
Thorium [µg/g]	880	630	310	310	360	580	1800
Titanium [µg/g]	370	240	210	250	260	240	630
Thallium [µg/g]	< 3	< 3	< 3	< 3	< 3	< 3	< 3
Uranium [µg/g]	71	47	17	17	13	15	120
Vanadium [µg/g]	3.7	2.8	2.7	2.7	2.7	2.6	8.0
Tungsten [µg/g]	7	7	3	4	5	6	8
Yttrium [µg/g]	160	100	9.1	6.8	5.5	5.1	180
Ytterbium [µg/g]	12	9.1	0.74	0.46	0.33	0.36	16
Zinc [µg/g]	28	24	8.8	6.9	4.7	5.4	42
Zirconium [µg/g]	38	27	20	26	28	25	57

Ra226 subcontracted to Becquerel Labs.
* BaSO4 Calculation based on Ba values and assumes all Ba is in BaSO4 form.
** BaSO4 Calculation based on SO4 values and assumes all SO4 is in BaSO4 form.

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Project Specialist
Environmental Services, Analytical

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Sample Date & Time	28-Sep-09	28-Sep-09	28-Sep-09	28-Sep-09	28-Sep-09	28-Sep-09	28-Sep-09
Ba as BaSO4 Calc. * [µg/g]	1090	1120	1070	970	950	990	800
SO4 as BaSO4 Calc. ** [µg/g]	4850	7280	7280	4850	46100	87400	75200
Total Sulphur [%]	1.48	1.39	1.60	1.48	2.00	2.36	2.58
Carbonate (CO3) [%]	< 0.005	< 0.005	< 0.005	0.022	0.100	0.123	0.034
Total Organic Carbon [%]	0.136	0.112	0.097	0.683	0.188	0.178	0.109
Total Carbon [%]	0.136	0.113	0.096	0.688	0.208	0.202	0.116
Sulphide [%]	1.43	1.32	1.48	1.40	1.37	1.08	1.44
Sulphate [%]	0.2	0.3	0.3	0.2	1.9	3.6	3.1
Silver [µg/g]	3.2	3.9	3.7	3.0	2.9	4.0	2.9
Aluminum [µg/g]	7700	11000	9000	6500	6200	10000	7500
Arsenic [µg/g]	45	49	46	40	38	40	38
Barium [µg/g]	640	660	630	570	560	580	470
Beryllium [µg/g]	1.6	2.1	1.9	1.4	1.4	2.0	1.5
Bismuth [µg/g]	15	16	15	15	14	17	14
Calcium [µg/g]	710	940	1300	1400	9900	19000	16000
Cadmium [µg/g]	0.61	0.66	0.58	0.64	0.56	0.64	0.55
Cerium [µg/g]	1100	1200	1000	900	830	1100	890
Cobalt [µg/g]	45	41	38	39	35	38	38
Chromium [µg/g]	17	24	21	16	15	21	16
Cesium [µg/g]	0.77	0.88	0.76	0.54	0.70	0.87	0.81
Copper [µg/g]	140	160	160	130	120	160	130
Iron [µg/g]	24000	25000	24000	23000	22000	24000	23000
Gallium [µg/g]	7.5	8.6	7.5	6.4	6.1	8.0	6.3
Germanium [µg/g]	4.2	4.4	4.1	3.5	3.3	4.0	3.5
Hafnium [µg/g]	2.2	2.4	2.2	1.5	1.8	2.5	2.2
Indium [µg/g]	0.04	0.05	0.06	0.04	0.03	0.05	0.04
Potassium [µg/g]	630	730	690	600	600	760	650
Lanthanum [µg/g]	560	600	520	460	420	540	450
Lithium [µg/g]	5.2	7.7	7.0	4.9	5.7	10	6.2

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Lutetium [µg/g]	3.1	3.3	2.8	2.3	2.0	3.5	2.6
Magnesium [µg/g]	300	220	120	770	520	1300	400
Manganese [µg/g]	35	31	18	79	53	130	57
Molybdenum [µg/g]	5.8	8.1	8.9	9.0	9.4	8.0	6.6
Sodium [µg/g]	15	18	15	18	16	21	18
Niobuim [µg/g]	9.5	9.0	8.9	13	11	12	10
Nickel [µg/g]	38	39	34	31	28	37	31
Lead [µg/g]	690	720	680	630	550	800	640
Phosphorus [µg/g]	840	930	860	760	740	950	710
Rubidium [µg/g]	4.8	5.8	5.4	4.3	4.3	5.4	5.0
Antimony [µg/g]	< 1	1	1	1	1	1	< 1
Scandium [µg/g]	3.1	4.2	3.6	2.7	2.5	3.8	2.9
Selenium [µg/g]	< 2	< 2	< 2	< 2	< 2	< 2	< 2
Tin [µg/g]	< 6	< 6	< 6	< 6	< 6	< 6	< 6
Strontium [µg/g]	11	14	15	9.2	16	21	18
Sulphur [µg/g]	14000	14000	15000	14000	19000	22000	25000
Tantalum [µg/g]	0.27	0.27	0.28	0.48	0.57	0.55	0.48
Terbium [µg/g]	17	18	14	12	10	18	13
Tellerium [µg/g]	0.3	0.4	0.4	0.3	0.3	0.4	0.3
Thorium [µg/g]	1900	2400	2200	1600	1600	2400	1800
Titanium [µg/g]	660	680	640	590	550	740	570
Thallium [µg/g]	< 3	< 3	< 3	< 3	< 3	< 3	< 3
Uranium [µg/g]	100	110	110	100	100	140	110
Vanadium [µg/g]	7.7	9.3	8.3	7.4	6.4	9.8	6.7
Tungsten [µg/g]	8	9	8	8	8	8	8
Yttrium [µg/g]	370	350	290	240	220	360	260
Ytterbium [µg/g]	26	28	24	19	17	30	22
Zinc [µg/g]	58	59	51	46	42	59	46
Zirconium [µg/g]	64	68	64	56	54	70	58

Ra226 subcontracted to Becquerel Labs.
* BaSO4 Calculation based on Ba values and assumes all Ba is in BaSO4 form.
** BaSO4 Calculation based on SO4 values and assumes all SO4 is in BaSO4 form.

Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

OnLine LIMS

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Project : 09-1663

October 7, 2010

Ecometrix
Attn : Erin Clyde

6800 Campobello Road, Mississauga
Canada, L5N 2L8
Phone: 905-794-2325, Fax:905-794-2338

Date Rec. : 01 October 2009
LR Report: **CA10063-OCT09**

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CERTIFICATE OF ANALYSIS
Final Report (QC Report)

Analysis	25: MDL	26: QC - Blank	27: QC - STD % Recovery	28: QC - DUP % Recovery
Ba as BaSO4 Calc. * [µg/g]	---	---	---	---
SO4 as BaSO4 Calc. ** [µg/g]	---	---	---	---
Total Sulphur [%]	0.005	< 0.005	100%	98%
Carbonate (CO3) [%]	0.005	< 0.005	101%	100%
Total Organic Carbon [%]	0.01	---	---	---
Total Carbon [%]	0.005	< 0.005	100%	95%
Sulphide [%]	0.01	< 0.01	103%	100%
Sulphate [%]	0.1	< 0.1	98%	107%
Silver [µg/g]	0.7	< 0.7	98%	93%
Aluminum [µg/g]	1	< 1	99%	114%
Arsenic [µg/g]	1	< 1	98%	96%
Barium [µg/g]	0.05	< 0.05	100%	110%
Beryllium [µg/g]	0.1	< 0.1	100%	111%
Bismuth [µg/g]	0.5	< 0.5	98%	100%
Calcium [µg/g]	1	< 1	99%	103%
Cadmium [µg/g]	0.05	< 0.05	98%	100%
Cerium [µg/g]	0.006	< 0.006	107%	99%
Cobalt [µg/g]	0.3	< 0.3	96%	965
Chromium [µg/g]	0.5	< 0.5	99%	106%
Cesium [µg/g]	0.01	< 0.01	100%	99%
Copper [µg/g]	0.1	< 0.1	101%	110%
Iron [µg/g]	0.5	< 0.5	98%	91%
Gallium [µg/g]	0.03	< 0.03	100%	101%
Germanium [µg/g]	0.3	< 0.3	100%	95%
Hafnium [µg/g]	0.1	< 0.1	100%	120%
Indium [µg/g]	0.01	< 0.01	100%	109%
Potassium [µg/g]	1	< 1	100%	110%
Lanthanum [µg/g]	0.001	< 0.001	101%	99%
Lithium [µg/g]	0.1	< 0.1	99%	100%
Lutetium [µg/g]	0.001	< 0.001	96%	99%
Magnesium [µg/g]	1	< 1	100%	105%
Manganese [µg/g]	0.05	< 0.05	98%	108%
Molybdenum [µg/g]	0.5	< 0.5	101%	74%

OnLine LIMS

SGS

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Project : 09-1663

LR Report : **CA10063-OCT09**

Analysis	25: MDL	26: QC - Blank	27: QC - STD % Recovery	28: QC - DUP % Recovery
Sodium [µg/g]	1	< 1	102%	104%
Niobuim [µg/g]	0.7	< 0.7	100%	99%
Nickel [µg/g]	1	< 1	99%	103%
Lead [µg/g]	0.7	< 0.7	98%	110%
Phosphorus [µg/g]	5	< 5	98%	106%
Rubidium [µg/g]	0.004	< 0.004	100%	100%
Antimony [µg/g]	1	< 1	102%	100%
Scandium [µg/g]	0.2	< 0.2	100%	103%
Selenium [µg/g]	1	< 2	97%	100%
Tin [µg/g]	6	< 6	103%	94%
Strontium [µg/g]	0.01	< 0.01	100%	96%
Sulphur [µg/g]	1	< 1	---	90%
Tantalum [µg/g]	0.01	< 0.01	100%	101%
Terbium [µg/g]	0.001	< 0.001	94%	100%
Tellerium [µg/g]	0.1	< 0.1	100%	107%
Thorium [µg/g]	0.01	< 0.01	100%	99%
Titanium [µg/g]	0.2	< 0.2	104%	99%
Thallium [µg/g]	3	< 3	97%	100%
Uranium [µg/g]	0.002	< 0.002	---	97%
Vanadium [µg/g]	0.1	< 0.1	100%	109%
Tungsten [µg/g]	1	< 1	99%	100%
Yttrium [µg/g]	0.1	< 0.1	100%	110%
Ytterbium [µg/g]	0.001	---	100%	100%
Zinc [µg/g]	0.1	< 0.1	98%	103%
Zirconium [µg/g]	5	< 5	102%	105%

Ra226 subcontracted to Becquerel Labs.
* BaSO4 Calculation based on Ba values and assumes all Ba is in BaSO4 form.
** BaSO4 Calculation based on SO4 values and assumes all SO4 is in BaSO4 form.

Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

OnLine LIMS

Becquerel LABORATORIES

ANALYSIS REPORT

Becquerel Laboratories Inc.
6790 Kitimat Rd., Unit 4
Mississauga, Ontario
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Phone: (905) 826-3080
FAX: (905) 826-4151

Batch: T09-01384.0

Date: 04-Nov-2009

Lakefield Research Ltd.

185 Concession St., Postal Bag 4300
Lakefield, ON, K0L 2H0

attn: Brian Graham

Phone: (705) 652-2038
FAX: (705) 652-1918

Client Ref.Oct 10066
P.O: 17820

23 water samples

Received: 06-Oct-2009

Results of Analysis

Sample	Test	Result	Units	Date	Method
SW09-QC14-1T	Ra-226	0.77	Bq/l	27-Oct-2009	ALPHA
SW09-QC14-1B	Ra-226	1.0	Bq/l	27-Oct-2009	ALPHA
SW09-QC14-2T	Ra-226	0.82	Bq/l	27-Oct-2009	ALPHA
SW09-QC14-2B	Ra-226	0.91	Bq/l	27-Oct-2009	ALPHA
SW09-QC14-3T	Ra-226	0.71	Bq/l	27-Oct-2009	ALPHA
SW09-QC14-3B	Ra-226	0.95	Bq/l	31-Oct-2009	ALPHA
SW09-QC14-4T	Ra-226	0.79	Bq/l	31-Oct-2009	ALPHA
SW09-QC14-4B	Ra-226	0.95	Bq/l	31-Oct-2009	ALPHA
PW09-QC14-1 (0-5)	Ra-226	1.8	Bq/l	31-Oct-2009	ALPHA
PW09-QC14-1 (5-10)	Ra-226	1.4	Bq/l	01-Nov-2009	ALPHA
PW09-QC14-1 (10-15)	Ra-226	0.97	Bq/l	01-Nov-2009	ALPHA
PW09-QC14-2 (0-2.5)	Ra-226	3.6	Bq/l	01-Nov-2009	ALPHA
PW09-QC14-2 (2.5-5)	Ra-226	2.8	Bq/l	01-Nov-2009	ALPHA
PW09-QC14-2 (5-7.5)	Ra-226	5.9	Bq/l	01-Nov-2009	ALPHA
PW09-QC14-2 (7.5-10)	Ra-226	6.9	Bq/l	01-Nov-2009	ALPHA
PW09-QC14-3 (0-5)	Ra-226	4.1	Bq/l	01-Nov-2009	ALPHA
PW09-QC14-3 (5-10)	Ra-226	3.4	Bq/l	01-Nov-2009	ALPHA
PW09-QC14-3 (10-15)	Ra-226	2.6	Bq/l	01-Nov-2009	ALPHA
PW09-QC14-3 (15-20)	Ra-226	2.5	Bq/l	01-Nov-2009	ALPHA
PW09-QC14-4 (0-5)	Ra-226	4.8	Bq/l	01-Nov-2009	ALPHA
PW09-QC14-4 (5-10)	Ra-226	1.6	Bq/l	01-Nov-2009	ALPHA
PW09-QC14-4 (10-15)	Ra-226	2.2	Bq/l	01-Nov-2009	ALPHA
PW09-QC14-4 (15-20)	Ra-226	0.42	Bq/l	01-Nov-2009	ALPHA

ANALYSIS REPORT

Becquerel Laboratories Inc.
6790 Kitimat Rd., Unit 4
Mississauga, Ontario
Canada, L5N 5L9

Phone: (905) 826-3080
FAX: (905) 826-4151

Batch: T09-01384.0

Date: 04-Nov-2009

Methods: ALPHA BQ-RAD-ALPHA alpha-particle spectrometry MDL 0.01 Bq/l

Units: Bq/l Becquerels per litre

These results relate only to the samples analysed and only to the items tested.
These results have not been corrected for blanks

04-Nov-2009 approved by: ____________________
Donald D. Burgess PhD
Senior Scientist, Division Supervisor

SGS Lakefield Research Limited
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October 14, 2009

Date Rec. : 01 October 2009
LR Report : **CA10066-OCT09**
Project : 09-1663

CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	13: PW09-QC14-1 (0-5)	14: PW09-QC14-1 (5-10)	15: PW09-QC14-1 (10-15)	16: PW09-QC14-2 (0-2.5)	17: PW09-QC14-2 (2.5-5)
Sample Date & Time					27-Sep-09	27-Sep-09	29-Sep-09	28-Sep-09	28-Sep-09
Sulphate [mg/L]	02-Oct-09	19:39	06-Oct-09	14:20	---	---	1500	32	12
Tot. Suspended Solids [mg/L]	05-Oct-09	10:24	06-Oct-09	12:15	---	---	---	---	---
Dissolved Organic Carbon [mg/L]	02-Oct-09	10:00	06-Oct-09	13:53	---	---	4.7	28.0	18.3
Dissolved Inorganic Carbon [mg/L]	05-Oct-09	14:35	07-Oct-09	12:41	---	---	1.0	< 1.0	< 1.0
Total Organic Carbon [mg/L]	02-Oct-09	10:00	05-Oct-09	13:40	---	---	---	---	---
Acidity [mg/L as CaCO3]	02-Oct-09	15:00	08-Oct-09	09:53	---	---	49	21	15
Hardness [mg/L as CaCO3]	05-Oct-09	09:00	05-Oct-09	13:21	731	1294	1335	26.2	16.9
Aluminum [mg/L]	05-Oct-09	09:00	05-Oct-09	13:18	< 0.01	< 0.01	< 0.01	< 0.01	0.03
Arsenic [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.0082	0.0102	0.0064	0.0064	0.0084
Barium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.0577	0.0283	0.0212	0.309	0.308
Beryllium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Boron [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.0048	0.0107	0.0138	0.0054	0.0047
Bismuth [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	< 0.00001	< 0.00001	0.00008	0.00003	0.00024
Calcium [mg/L]	05-Oct-09	09:00	05-Oct-09	13:21	290	516	532	8.79	5.68
Cadmium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.000012	0.000050	0.000118	0.000055	< 0.000003
Cobalt [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.0154	0.0367	0.0438	0.00521	0.000917
Chromium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Copper [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	< 0.0005	0.0008	0.0012	0.0043	0.0025
Iron [mg/L]	05-Oct-09	09:00	05-Oct-09	13:18	63.9	40.0	24.3	0.03	0.52
Potassium [mg/L]	05-Oct-09	09:00	05-Oct-09	13:18	1.21	1.34	1.49	0.34	0.40
Lithium [mg/L]	05-Oct-09	09:00	05-Oct-09	13:18	0.002	0.002	< 0.002	< 0.002	< 0.002
Magnesium [mg/L]	05-Oct-09	09:00	05-Oct-09	13:18	1.63	1.48	1.37	1.02	0.664

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LR Report : **CA10066-OCT09**

Analysis	**1: Analysis Start Date**	**2: Analysis Start Time**	**3: Analysis Approval Date**	**4: Analysis Approval Time**	**13: PW09-QC14-1 (0-5)**	**14: PW09-QC14-1 (5-10)**	**15: PW09-QC14-1 (10-15)**	**16: PW09-QC14-2 (0-2.5)**	**17: PW09-QC14-2 (2.5-5)**
Manganese [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.771	0.503	0.346	0.282	0.133
Molybdenum [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.00589	0.0119	0.00918	0.00029	0.00133
Sodium [mg/L]	05-Oct-09	09:00	05-Oct-09	13:18	1.77	2.04	2.08	2.35	1.98
Nickel [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.0050	0.0172	0.0173	0.0044	0.0012
Phosphorus [mg/L]	05-Oct-09	09:00	05-Oct-09	13:18	< 0.01	< 0.01	< 0.01	< 0.01	0.01
Lead [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.00069	0.00078	0.00202	0.0242	0.00596
Sulphur [mg/L]	05-Oct-09	09:00	05-Oct-09	13:18	242	396	399	8.28	3.87
Antimony [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	< 0.0002	< 0.0002	< 0.0002	0.0002	0.0006
Selenium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Silica [mg/L]	05-Oct-09	09:00	05-Oct-09	13:18	8.09	10.3	10.3	1.23	1.71
Tin [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	< 0.00001	0.00004	0.00008	0.00004	< 0.00001
Strontium [mg/L]	05-Oct-09	09:00	05-Oct-09	13:18	0.149	0.260	0.266	0.0205	0.0154
Titanium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.0006	0.0007	0.0007	0.0003	0.0062
Thallium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Uranium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.0136	0.0589	0.0445	0.000946	0.000524
Vanadium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.00010	0.00011	0.00013	0.00007	0.00013
Zinc [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.011	0.039	0.041	0.005	0.003

Groundwater samples are field filtered
Ra226 subcontracted to Becquerel Labs.

Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

OnLine LIMS

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October 14, 2009

Date Rec. : 01 October 2009
LR Report : **CA10066-OCT09**
Project : 09-1663

CERTIFICATE OF ANALYSIS
Final Report

Analysis	**18: PW09-QC14-2 (5-7.5)**	**19: PW09-QC14-2 (7.5-10)**	**20: PW09-QC14-3 (0-5)**	**21: PW09-QC14-3 (5-10)**	**22: PW09-QC14-3 (10-15)**	**23: PW09-QC14-3 (15-20)**	**24: PW09-QC14-4 (0-5)**	**25: PW09-QC14-4 (5-10)**	**26: PW09-QC14-4 (10-15)**	**27: PW09-QC14-4 (15-20)**
Sample Date & Time	28-Sep-09	28-Sep-09	29-Sep-09	29-Sep-09	29-Sep-09	29-Sep-09	29-Sep-09	29-Sep-09	29-Sep-09	29-Sep-09
Sulphate [mg/L]	12	---	5.6	6.8	18	240	560	1400	1400	1400
Tot. Suspended Solids [mg/L]	---	---	---	---	---	---	---	---	---	---
Dissolved Organic Carbon [mg/L]	17.9	---	3.5	3.2	2.8	3.8	9.3	6.6	7.3	4.0
Dissolved Inorganic Carbon [mg/L]	< 1.0	---	2.0	3.0	4.7	3.1	< 1.0	4.7	3.1	5.9
Total Organic Carbon [mg/L]	---	---	---	---	---	---	---	---	---	---
Acidity [mg/L as CaCO3]	16	---	6	< 4	< 4	< 4	19	< 4	---	---
Hardness [mg/L as CaCO3]	17.9	19.1	18.0	24.5	42.8	250	512	1362	1335	1310
Aluminum [mg/L]	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.04	< 0.01
Arsenic [mg/L]	0.0066	0.0066	0.0026	0.0025	0.0040	0.0042	0.0050	0.0054	0.0026	0.0027
Barium [mg/L]	0.519	0.499	0.333	0.233	0.131	0.0762	0.231	0.0657	0.0328	0.0197
Beryllium [mg/L]	< 0.00002	< 0.00002	0.00013	0.00005	0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Boron [mg/L]	0.0051	0.0044	0.0026	0.0070	0.0121	0.0162	0.0220	0.0944	0.0802	0.0387
Bismuth [mg/L]	0.00006	< 0.00001	0.00012	0.00004	0.00001	0.00001	0.00005	0.00002	0.00001	0.00003
Calcium [mg/L]	6.06	6.44	6.12	8.51	15.5	97.4	195	536	527	519
Cadmium [mg/L]	0.000005	0.000006	0.000112	0.000043	0.000034	0.000086	0.000029	0.000016	0.000017	0.000015
Cobalt [mg/L]	0.000766	0.000876	0.00189	0.00766	0.00912	0.0123	0.00473	0.00237	0.00186	0.00185
Chromium [mg/L]	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Copper [mg/L]	0.0015	0.0007	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0009	0.0007	0.0006	0.0008
Iron [mg/L]	2.46	6.07	7.18	6.88	5.66	7.35	23.5	1.62	0.41	0.26
Potassium [mg/L]	0.62	0.53	0.37	0.50	0.60	0.90	0.65	1.06	0.94	0.92
Lithium [mg/L]	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	0.002	0.002	< 0.002	< 0.002
Magnesium [mg/L]	0.675	0.734	0.670	0.801	0.980	1.78	6.05	5.49	4.43	3.52

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LR Report : CA10066-OCT09

Analysis	**18: PW09-QC14-2 (5-7.5)**	**19: PW09-QC14-2 (7.5-10)**	**20: PW09-QC14-3 (0-5)**	**21: PW09-QC14-3 (5-10)**	**22: PW09-QC14-3 (10-15)**	**23: PW09-QC14-3 (15-20)**	**24: PW09-QC14-4 (0-5)**	**25: PW09-QC14-4 (5-10)**	**26: PW09-QC14-4 (10-15)**	**27: PW09-QC14-4 (15-20)**
Manganese [mg/L]	0.133	0.146	0.143	0.161	0.191	0.249	1.27	0.400	0.352	0.251
Molybdenum [mg/L]	0.00107	0.00241	0.00045	0.00042	0.00155	0.00615	0.00339	0.0289	0.0291	0.0149
Sodium [mg/L]	1.79	1.51	1.30	1.20	1.36	1.63	2.05	2.00	1.94	1.80
Nickel [mg/L]	0.0012	0.0011	0.0010	0.0019	0.0020	0.0039	0.0025	0.0020	0.0018	0.0019
Phosphorus [mg/L]	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.02	< 0.01	0.02	< 0.01
Lead [mg/L]	0.00098	0.00018	0.00029	0.00023	0.00027	0.00042	0.00043	0.00047	0.00044	0.00059
Sulphur [mg/L]	3.61	4.46	1.67	2.21	5.91	69.9	155	391	387	385
Antimony [mg/L]	0.0004	0.0005	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	0.0003	0.0003	< 0.0002
Selenium [mg/L]	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.002	< 0.001	< 0.001	< 0.001	0.002
Silica [mg/L]	2.15	3.04	5.18	7.70	8.81	8.23	4.59	3.66	2.45	3.95
Tin [mg/L]	< 0.00001	< 0.00001	< 0.00001	< 0.00001	0.00005	0.00011	0.00004	0.00006	0.00010	0.00022
Strontium [mg/L]	0.0204	0.0211	0.0170	0.0318	0.0499	0.146	0.137	0.277	0.263	0.268
Titanium [mg/L]	0.0005	0.0002	0.0003	0.0005	0.0005	0.0005	0.0004	0.0004	0.0003	0.0003
Thallium [mg/L]	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Uranium [mg/L]	0.000143	0.000072	0.000744	0.000806	0.000839	0.00957	0.0421	0.275	0.242	0.233
Vanadium [mg/L]	0.00006	0.00006	0.00019	0.00012	0.00014	0.00016	0.00013	0.00022	0.00021	0.00023
Zinc [mg/L]	0.002	0.003	0.002	0.005	0.008	0.015	0.006	0.003	0.003	0.003

Groundwater samples are field filtered
Ra226 subcontracted to Becquerel Labs.

Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

OnLine LIMS

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SGS Lakefield Research Limited
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Ecometrix
Attn : Erin Clyde

6800 Campobello Road, Mississauga
Canada, L5N 2L8
Phone: 905-794-2325, Fax:905-794-2338

October 14, 2009

Date Rec. : 01 October 2009
LR Report : **CA10066-OCT09**
Project : 09-1663

CERTIFICATE OF ANALYSIS
Final Report

Analysis	5: SW09-QC14-1T	6: SW09-QC14-1B	7: SW09-QC14-2T	8: SW09-QC14-2B	9: SW09-QC14-3T	10: SW09-QC14-3B	11: SW09-QC14-4T	12: SW09-QC14-4B
Sample Date & Time	26-Sep-09	26-Sep-09	27-Sep-09	27-Sep-09	27-Sep-09	27-Sep-09	27-Sep-09	27-Sep-09
Sulphate [mg/L]	55	32	72	32	54	35	57	25
Tot. Suspended Solids [mg/L]	---	---	---	43	---	---	---	6
Dissolved Organic Carbon [mg/L]	13.3	18.5	14.4	19.4	15.1	16.0	13.4	14.2
Dissolved Inorganic Carbon [mg/L]	2.4	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Organic Carbon [mg/L]	---	---	---	5.3	---	---	---	5.2
Acidity [mg/L as CaCO3]	31	20	56	15	29	15	31	20
Hardness [mg/L as CaCO3]	17.1	18.3	16.9	16.6	16.7	16.9	16.8	16.9
Aluminum [mg/L]	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Arsenic [mg/L]	0.0006	0.0008	0.0006	0.0011	0.0007	0.0009	0.0006	0.0012
Barium [mg/L]	0.109	0.116	0.104	0.108	0.105	0.105	0.0989	0.109
Beryllium [mg/L]	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Boron [mg/L]	0.0044	0.0045	0.0045	0.0056	0.0045	0.0047	0.0043	0.0053
Bismuth [mg/L]	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Calcium [mg/L]	5.72	6.24	5.69	5.55	5.59	5.69	5.63	5.67
Cadmium [mg/L]	0.000023	0.000029	0.000023	0.000023	0.000021	0.000035	0.000017	0.000052
Cobalt [mg/L]	0.00304	0.00143	0.00549	0.00169	0.00246	0.00165	0.00297	0.00144
Chromium [mg/L]	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Copper [mg/L]	0.0051	0.0045	0.0038	0.0023	0.0040	0.0034	0.0030	0.0025
Iron [mg/L]	0.02	0.36	0.04	0.01	0.02	0.07	0.02	0.01
Potassium [mg/L]	0.32	0.30	0.32	0.26	0.31	0.29	0.30	0.27
Lithium [mg/L]	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Magnesium [mg/L]	0.679	0.667	0.663	0.657	0.660	0.658	0.664	0.667

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LR Report : **CA10066-OCT09**

Analysis	**5: SW09-QC14-1T**	**6: SW09-QC14-1B**	**7: SW09-QC14-2T**	**8: SW09-QC14-2B**	**9: SW09-QC14-3T**	**10: SW09-QC14-3B**	**11: SW09-QC14-4T**	**12: SW09-QC14-4B**
Manganese [mg/L]	0.0328	0.0379	0.0288	0.0353	0.0292	0.0337	0.0272	0.0348
Molybdenum [mg/L]	0.00001	0.00002	< 0.00001	0.00002	< 0.00001	< 0.00001	< 0.00001	0.00003
Sodium [mg/L]	1.84	1.87	1.82	1.83	1.81	1.78	1.88	1.73
Nickel [mg/L]	0.0027	0.0025	0.0025	0.0024	0.0024	0.0024	0.0023	0.0026
Phosphorus [mg/L]	0.01	< 0.01	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Lead [mg/L]	0.00375	0.00604	0.00717	0.00597	0.00374	0.00642	0.00386	0.00361
Sulphur [mg/L]	4.72	5.21	4.69	4.74	4.64	4.78	4.74	4.76
Antimony [mg/L]	0.0034	0.0007	0.0077	0.0007	0.0021	0.0009	0.0027	0.0005
Selenium [mg/L]	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Silica [mg/L]	0.59	0.63	0.58	0.59	0.58	0.64	0.58	0.63
Tin [mg/L]	0.00002	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Strontium [mg/L]	0.0122	0.0125	0.0121	0.0120	0.0119	0.0122	0.0120	0.0122
Titanium [mg/L]	< 0.0001	< 0.0001	0.0003	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Thallium [mg/L]	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Uranium [mg/L]	0.00107	0.000679	0.000535	0.000338	0.000489	0.000749	0.000386	0.000459
Vanadium [mg/L]	0.00004	0.00004	0.00006	0.00005	0.00005	0.00004	0.00004	0.00004
Zinc [mg/L]	0.003	0.004	0.002	0.005	0.002	0.004	0.003	0.005

Ra226 subcontracted to Becquerel Labs.

Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

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Env ICP-MS Metals

Project : 09-1663

October 7, 2010

Ecometrix
Attn : Erin Clyde

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Phone: 905-794-2325, Fax:905-794-2338

Date Rec. : 01 October 2009
LR Report: **CA10066-OCT09**

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CERTIFICATE OF ANALYSIS

Final Report (QC Report)

Analysis	28: MDL	29: QC - Blank	30: QC - STD % Recovery	31: QC - DUP % Recovery
Sulphate [mg/L]	0.2	< 0.2	100%	110%
Tot. Suspended Solids [mg/L]	2	< 2	96%	83%
Dissolved Organic Carbon [mg/L]	0.2	< 0.2	105%	98%
Dissolved Inorganic Carbon [mg/L]	0.2	0.7	107%	100%
Total Organic Carbon [mg/L]	0.2	< 0.2	105%	98%
Acidity [mg/L as CaCO3]	4	< 4	98%	102%
Hardness [mg/L as CaCO3]	0.5	---	---	---
Aluminum [mg/L]	0.01	< 0.01	98%	---
Arsenic [mg/L]	0.0002	< 0.0002	106%	---
Barium [mg/L]	0.00001	< 0.00001	122%	---
Beryllium [mg/L]	0.00002	< 0.00002	104%	---
Boron [mg/L]	0.0002	< 0.0002	96%	---
Bismuth [mg/L]	0.00001	< 0.00001	109%	---
Calcium [mg/L]	0.03	< 0.03	101%	---
Cadmium [mg/L]	0.000003	0.000003	99%	---
Cobalt [mg/L]	0.000002	< 0.000002	102%	---
Chromium [mg/L]	0.0005	< 0.0005	102%	---
Copper [mg/L]	0.0005	< 0.0005	102%	---
Iron [mg/L]	0.01	< 0.01	102%	---
Potassium [mg/L]	0.01	< 0.01	98%	---
Lithium [mg/L]	0.002	< 0.002	98%	---
Magnesium [mg/L]	0.003	< 0.003	98%	---
Manganese [mg/L]	0.00001	< 0.00001	107%	---
Molybdenum [mg/L]	0.00001	< 0.00001	99%	---
Sodium [mg/L]	0.01	< 0.01	94%	---
Nickel [mg/L]	0.0001	< 0.0001	100%	---
Phosphorus [mg/L]	0.01	< 0.01	100%	---
Lead [mg/L]	0.00002	< 0.00002	106%	---

OnLine LIMS

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Env ICP-MS Metals

Project : 09-1663

LR Report : **CA10066-OCT09**

Analysis	28: MDL	29: QC - Blank	30: QC - STD % Recovery	31: QC - DUP % Recovery
Sulphur [mg/L]	0.01	< 0.01	98%	---
Antimony [mg/L]	0.0002	< 0.0002	101%	---
Selenium [mg/L]	0.001	< 0.001	102%	---
Silica [mg/L]	0.01	< 0.01	104%	---
Tin [mg/L]	0.00001	< 0.00001	96%	---
Strontium [mg/L]	0.0001	< 0.0001	100%	---
Titanium [mg/L]	0.0001	< 0.0001	96%	---
Thallium [mg/L]	0.0002	< 0.0002	107%	---
Uranium [mg/L]	0.000001	0.000001	1065	---
Vanadium [mg/L]	0.00003	< 0.00003	107%	---
Zinc [mg/L]	0.001	< 0.001	104%	---

Ra226 subcontracted to Becquerel Labs.

Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

OnLine LIMS

ANALYSIS REPORT

Becquerel LABORATORIES

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Phone: (905) 826-3080
FAX: (905) 826-4151

Batch: T09-01383.0

Date: 20-Oct-2009

Lakefield Research Ltd.

185 Concession St., Postal Bag 4300
Lakefield, ON, K0L 2H0

attn: Brian Graham

Phone: (705) 652-2038
FAX: (705) 652-1918

Client Ref.Oct 10069
P.O: 17820

5 water samples Sampled: 29-Sep-2009 Received: 06-Oct-2009

Results of Analysis

Sample	Test	Result	Units	Date	Method
PW09 EC2 0-2.5	Ra-226	2.9	Bq/l	18-Oct-2009	ALPHA
PW09 EC2 2.5-5	Ra-226	3.3	Bq/l	18-Oct-2009	ALPHA
PW09 EC2 5-7.5	Ra-226	5.4	Bq/l	18-Oct-2009	ALPHA
PW09 EC1 0-5	Ra-226	0.30	Bq/l	18-Oct-2009	ALPHA
PW09 EC1 5-10	Ra-226	4.7	Bq/l	18-Oct-2009	ALPHA

Methods: ALPHA BQ-RAD-ALPHA alpha-particle spectrometry

Units: Bq/l Becquerels per litre

These results relate only to the samples analysed and only to the items tested.

20-Oct-2009 approved by:

Donald D. Burgess PhD
Senior Scientist, Division Supervisor

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October 14, 2009

Date Rec. : 01 October 2009
LR Report : **CA10069-OCT09**
Project : 09-1663

CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	5: PW09 EC2 0-2.5	6: PW09 EC2 2.5-5	7: PW09 EC2 5-7.5	8: PW09 EC1 0-5	9: PW09 EC1 5-10
Sample Date & Time					29-Sep-09	29-Sep-09	29-Sep-09	29-Sep-09	29-Sep-09
Temperature Upon Receipt [°C]	---	---	---	---	9.0	9.0	9.0	9.0	9.0
Sulphate [mg/L]	02-Oct-09	19:39	06-Oct-09	12:35	27	18	---	---	---
Dissolved Organic Carbon [mg/L]	05-Oct-09	09:40	06-Oct-09	13:53	19.0	14.3	---	---	---
Dissolved Inorganic Carbon [mg/L]	06-Oct-09	08:15	07-Oct-09	12:40	4.2	1.1	---	---	---
Acidity [mg/L as CaCO3]	02-Oct-09	15:00	06-Oct-09	11:07	17	16	---	---	---
Hardness [mg/L as CaCO3]	05-Oct-09	09:00	05-Oct-09	13:17	21.7	16.0	16.4	33.9	17.8
Aluminum [mg/L]	05-Oct-09	09:00	05-Oct-09	13:17	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Arsenic [mg/L]	02-Oct-09	14:45	05-Oct-09	13:17	0.0058	0.0046	0.0065	0.0006	0.0024
Barium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:17	0.285	0.337	0.487	0.221	0.335
Beryllium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:17	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Boron [mg/L]	02-Oct-09	14:45	05-Oct-09	13:17	0.0039	0.0034	0.0039	0.0082	0.0028
Bismuth [mg/L]	02-Oct-09	14:45	05-Oct-09	13:17	0.00003	0.00006	0.00003	< 0.00001	< 0.00001
Calcium [mg/L]	05-Oct-09	09:00	05-Oct-09	13:17	7.28	5.35	5.54	11.4	6.06
Cadmium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:17	0.000031	0.000012	0.000009	0.000012	< 0.000003
Cobalt [mg/L]	02-Oct-09	14:45	05-Oct-09	13:17	0.00289	0.00120	0.00183	0.000321	0.00192
Chromium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:17	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Copper [mg/L]	02-Oct-09	14:45	05-Oct-09	13:17	0.0018	0.0018	0.0011	0.0010	< 0.0005
Iron [mg/L]	05-Oct-09	09:00	05-Oct-09	13:17	0.44	3.30	5.71	0.07	6.63
Potassium [mg/L]	05-Oct-09	09:00	05-Oct-09	13:17	0.30	0.34	0.48	0.80	0.58
Lithium [mg/L]	05-Oct-09	09:00	05-Oct-09	13:17	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Magnesium [mg/L]	05-Oct-09	09:00	05-Oct-09	13:17	0.864	0.634	0.632	1.31	0.655

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LR Report : **CA10069-OCT09**

Analysis	**1: Analysis Start Date**	**2: Analysis Start Time**	**3: Analysis Approval Date**	**4: Analysis Approval Time**	**5: PW09 EC2 0-2.5**	**6: PW09 EC2 2.5-5**	**7: PW09 EC2 5-7.5**	**8: PW09 EC1 0-5**	**9: PW09 EC1 5-10**
Manganese [mg/L]	02-Oct-09	14:45	05-Oct-09	13:17	0.217	0.134	0.132	0.120	0.142
Molybdenum [mg/L]	02-Oct-09	14:45	05-Oct-09	13:17	0.00015	0.00116	0.00149	0.00029	0.00051
Sodium [mg/L]	05-Oct-09	09:00	05-Oct-09	13:17	2.20	1.87	1.50	2.75	1.24
Nickel [mg/L]	02-Oct-09	14:45	05-Oct-09	13:17	0.0024	0.0013	0.0017	0.0008	0.0010
Phosphorus [mg/L]	05-Oct-09	09:00	05-Oct-09	13:17	0.07	0.01	< 0.01	< 0.01	< 0.01
Lead [mg/L]	02-Oct-09	14:45	05-Oct-09	13:17	0.00216	0.00090	0.00049	0.00023	0.00016
Sulphur [mg/L]	05-Oct-09	09:00	05-Oct-09	13:17	6.26	3.35	4.21	7.26	1.58
Antimony [mg/L]	02-Oct-09	14:45	05-Oct-09	13:17	0.0003	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Selenium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:17	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Silica [mg/L]	05-Oct-09	09:00	05-Oct-09	13:17	1.42	1.86	2.71	0.72	5.07
Tin [mg/L]	02-Oct-09	14:45	05-Oct-09	13:17	0.00017	< 0.00001	0.00001	< 0.00001	0.00002
Strontium [mg/L]	05-Oct-09	09:00	05-Oct-09	13:17	0.0168	0.0149	0.0187	0.0269	0.0168
Titanium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:17	0.0007	0.0004	0.0002	< 0.0001	0.0003
Thallium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:17	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Uranium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:17	0.000173	0.000115	0.000105	0.000835	0.000671
Vanadium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:17	0.00008	0.00007	0.00004	0.00007	0.00005
Zinc [mg/L]	02-Oct-09	14:45	05-Oct-09	13:17	0.005	0.004	0.003	0.003	0.001

Samples are field filtered
Ra226 subcontracted to Becquerel Labs.

Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

OnLine LIMS

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Env ICP-MS Metals

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October 7, 2010

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Date Rec. : 01 October 2009
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CERTIFICATE OF ANALYSIS
Final Report

Analysis	10: MDL	11: QC - Blank	12: QC - STD % Recovery	13: QC - DUP % Recovery
Sulphate [mg/L]	0.2	< 0.2	100%	110%
Dissolved Organic Carbon [mg/L]	0.2	< 0.2	91%	100%
Dissolved Inorganic Carbon [mg/L]	0.2	0.7	107%	100%
Acidity [mg/L as CaCO3]	2	3	98%	102%
Hardness [mg/L as CaCO3]	0.5	< 0.5	---	---
Aluminum [mg/L]	0.01	< 0.01	98%	---
Arsenic [mg/L]	0.0002	< 0.0002	106%	---
Barium [mg/L]	0.00001	< 0.00001	122%	---
Beryllium [mg/L]	0.00002	< 0.00002	104%	---
Boron [mg/L]	0.0002	< 0.0002	96%	---
Bismuth [mg/L]	0.00001	< 0.00001	109%	---
Calcium [mg/L]	0.03	< 0.03	101%	---
Cadmium [mg/L]	0.000003	0.000003	99%	---
Cobalt [mg/L]	0.000002	< 0.000002	102%	---
Chromium [mg/L]	0.0005	< 0.0005	102%	---
Copper [mg/L]	0.0005	< 0.0005	102%	---
Iron [mg/L]	0.01	< 0.01	102%	---
Potassium [mg/L]	0.01	< 0.01	98%	---
Lithium [mg/L]	0.002	< 0.002	98%	---
Magnesium [mg/L]	0.003	< 0.003	98%	---
Manganese [mg/L]	0.00001	< 0.00001	107%	---
Molybdenum [mg/L]	0.00001	< 0.00001	99%	---
Sodium [mg/L]	0.01	< 0.01	94%	---
Nickel [mg/L]	0.0001	< 0.0001	100%	---
Phosphorus [mg/L]	0.01	< 0.01	100%	---
Lead [mg/L]	0.00002	< 0.00002	106%	---
Sulphur [mg/L]	0.01	< 0.01	98%	---
Antimony [mg/L]	0.0002	< 0.0002	101%	---

OnLine LIMS

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Env ICP-MS Metals

Project : 09-1663

LR Report : **CA10069-OCT09**

Analysis	10: MDL	11: QC - Blank	12: QC - STD % Recovery	13: QC - DUP % Recovery
Selenium [mg/L]	0.001	< 0.001	102%	---
Silica [mg/L]	0.01	< 0.01	104%	---
Tin [mg/L]	0.00001	< 0.00001	96%	---
Strontium [mg/L]	0.0001	< 0.0001	100%	---
Titanium [mg/L]	0.0001	< 0.0001	96%	---
Thallium [mg/L]	0.0002	< 0.0002	107%	---
Uranium [mg/L]	0.000001	0.000001	107%	---
Vanadium [mg/L]	0.00003	< 0.00003	107%	---
Zinc [mg/L]	0.001	< 0.001	104%	---

Samples are field filtered
Ra226 subcontracted to Becquerel Labs.

Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

OnLine LIMS

ANALYSIS REPORT

Becquerel Laboratories Inc.
6790 Kitimat Rd., Unit 4
Mississauga, Ontario
Canada, L5N 5L9

Phone: (905) 826-3080
FAX: (905) 826-4151

Batch: T09-01382.0

Date: 20-Oct-2009

Lakefield Research Ltd.

185 Concession St., Postal Bag 4300
Lakefield, ON, K0L 2H0

attn: Brian Graham

Phone: (705) 652-2038
FAX: (705) 652-1918

Client Ref.Oct 10064
P.O: 17820

6 water samples Sampled: 28-Sep-2009 Received: 06-Oct-2009 Page 1 of 1

Results of Analysis

Sample	Test	Result	Units	Date	Method
SW09 QC15-1	Ra-226	0.42	Bq/l	17-Oct-2009	ALPHA
SW09 QC15-2	Ra-226	0.45	Bq/l	18-Oct-2009	ALPHA
SW09 QC15-3	Ra-226	0.46	Bq/l	18-Oct-2009	ALPHA
SW09 QC15-4	Ra-226	0.45	Bq/l	18-Oct-2009	ALPHA
SW09 EC-2T	Ra-226	0.78	Bq/l	18-Oct-2009	ALPHA
SW09 EC-2B	Ra-226	0.85	Bq/l	18-Oct-2009	ALPHA

Methods: ALPHA BQ-RAD-ALPHA alpha-particle spectrometry

Units: Bq/l Becquerels per litre

These results relate only to the samples analysed and only to the items tested.

20-Oct-2009 approved by:
Donald D. Burgess PhD
Senior Scientist, Division Supervisor

SGS Lakefield Research Limited
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
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Ecometrix
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Phone: 905-794-2325, Fax:905-794-2338

October 14, 2009

Date Rec. : 01 October 2009
LR Report : **CA10064-OCT09**
Project : 09-1663

CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	5: SW09 QC15-1	6: SW09 QC15-2	7: SW09 QC15-3	8: SW09 QC15-4	9: SW09 EC-2T	10: SW09 EC-2B
Sample Date & Time					28-Sep-09	28-Sep-09	28-Sep-09	28-Sep-09	28-Sep-09	28-Sep-09
Temperature Upon Receipt [°C]	---	---	---	---	9.0	9.0	9.0	9.0	9.0	9.0
Sulphate [mg/L]	02-Oct-09	19:39	06-Oct-09	14:22	570	570	570	600	85	36
Acidity [mg/L as CaCO3]	02-Oct-09	15:00	05-Oct-09	15:14	22	27	44	50	67	16
Total Organic Carbon [mg/L]	05-Oct-09	09:40	06-Oct-09	13:53	---	---	---	---	11.4	11.7
Total Inorganic Carbon [mg/L]	05-Oct-09	14:35	08-Oct-09	12:46	---	---	---	---	< 1.0	< 1.0
Hardness [mg/L as CaCO3]	05-Oct-09	09:00	05-Oct-09	13:19	529	535	532	549	17.0	16.8
Aluminum [mg/L]	05-Oct-09	09:00	05-Oct-09	13:19	< 0.01	< 0.01	< 0.01	0.02	0.03	< 0.01
Arsenic [mg/L]	02-Oct-09	14:45	05-Oct-09	13:19	0.0010	0.0009	0.0009	0.0011	0.0007	0.0007
Barium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:19	0.0334	0.0301	0.0300	0.0296	0.108	0.114
Beryllium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:19	0.00006	< 0.00002	0.00002	< 0.00002	0.00003	0.00002
Boron [mg/L]	02-Oct-09	14:45	05-Oct-09	13:19	0.113	0.113	0.115	0.116	0.0076	0.0072
Bismuth [mg/L]	02-Oct-09	14:45	05-Oct-09	13:19	0.00004	0.00002	0.00001	< 0.00001	0.00002	0.00002
Calcium [mg/L]	05-Oct-09	09:00	05-Oct-09	13:19	202	205	204	210	5.69	5.63
Cadmium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:19	0.000074	0.000051	0.000039	0.000031	0.000046	0.000056
Cobalt [mg/L]	02-Oct-09	14:45	05-Oct-09	13:19	0.00558	0.00464	0.0106	0.0122	0.00655	0.00196
Chromium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:19	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Copper [mg/L]	02-Oct-09	14:45	05-Oct-09	13:19	0.0017	0.0014	0.0013	0.0016	0.0037	0.0029
Iron [mg/L]	05-Oct-09	09:00	05-Oct-09	13:19	0.10	0.06	0.16	0.18	0.07	0.04
Potassium [mg/L]	05-Oct-09	09:00	05-Oct-09	13:19	10.8	11.0	10.9	11.9	0.31	0.32
Lithium [mg/L]	05-Oct-09	09:00	05-Oct-09	13:19	0.008	0.008	0.008	0.009	< 0.002	< 0.002
Magnesium [mg/L]	05-Oct-09	09:00	05-Oct-09	13:19	5.69	5.79	5.77	6.19	0.670	0.663

OnLine LIMS

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LR Report : **CA10064-OCT09**

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	5: SW09 QC15-1	6: SW09 QC15-2	7: SW09 QC15-3	8: SW09 QC15-4	9: SW09 EC-2T	10: SW09 EC-2B
Manganese [mg/L]	02-Oct-09	14:45	05-Oct-09	13:19	0.207	0.214	0.214	0.310	0.0315	0.0319
Molybdenum [mg/L]	02-Oct-09	14:45	05-Oct-09	13:19	0.00319	0.00409	0.00368	0.00533	0.00018	0.00008
Sodium [mg/L]	05-Oct-09	09:00	05-Oct-09	13:19	2.38	2.42	2.37	2.59	1.59	1.58
Nickel [mg/L]	02-Oct-09	14:45	05-Oct-09	13:19	0.0067	0.0067	0.0067	0.0068	0.0022	0.0022
Phosphorus [mg/L]	05-Oct-09	09:00	05-Oct-09	13:19	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Lead [mg/L]	02-Oct-09	14:45	05-Oct-09	13:19	0.00151	0.00098	0.00194	0.00548	0.00699	0.00391
Sulphur [mg/L]	05-Oct-09	09:00	05-Oct-09	13:19	157	160	160	166	4.64	4.63
Antimony [mg/L]	02-Oct-09	14:45	05-Oct-09	13:19	0.0017	0.0010	0.0093	0.0106	0.0086	0.0016
Selenium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:19	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Silica [mg/L]	05-Oct-09	09:00	05-Oct-09	13:19	5.46	5.55	5.54	5.55	0.59	0.60
Tin [mg/L]	02-Oct-09	14:45	05-Oct-09	13:19	0.00002	0.00012	0.00002	0.00025	< 0.00001	< 0.00001
Strontium [mg/L]	05-Oct-09	09:00	05-Oct-09	13:19	0.159	0.161	0.160	0.166	0.0122	0.0122
Titanium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:19	0.0005	0.0004	0.0005	0.0004	0.0004	0.0001
Thallium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:19	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Uranium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:19	0.0143	0.0116	0.0144	0.0219	0.000654	0.00079
Vanadium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:19	0.00009	0.00004	0.00004	< 0.00003	0.00007	0.00007
Zinc [mg/L]	02-Oct-09	14:45	05-Oct-09	13:19	0.005	0.004	0.004	0.004	0.004	0.005

Ra226 subcontracted to Becquerel Labs.

Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

OnLine LIMS

Copy to : #1

SGS

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Env ICP-MS Metals

Project : 09-1663

October 7, 2010

Ecometrix
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Date Rec. : 01 October 2009
LR Report: **CA10064-OCT09**

Copy: #1

CERTIFICATE OF ANALYSIS

Final Report (QC Report)

Analysis	11: MDL	12: QC - Blank	13: QC - STD % Recovery	14: QC - DUP % Recovery
Sulphate [mg/L]	0.2	< 0.2	98%	102%
Acidity [mg/L as CaCO3]	2	3	98%	102%
Total Organic Carbon [mg/L]	1	< 1	91%	100%
Total Inorganic Carbon [mg/L]	0.2	0.2	97%	100%
Hardness [mg/L as CaCO3]	0.5	< 0.5	---	---
Aluminum [mg/L]	0.01	< 0.01	99%	---
Arsenic [mg/L]	0.0002	< 0.0002	106%	---
Barium [mg/L]	0.00001	< 0.00001	122%	---
Beryllium [mg/L]	0.00002	< 0.00002	104%	---
Boron [mg/L]	0.0002	< 0.0002	96%	---
Bismuth [mg/L]	0.00001	< 0.00001	109%	---
Calcium [mg/L]	0.03	< 0.03	101%	---
Cadmium [mg/L]	0.000003	0.000003	99%	---
Cobalt [mg/L]	0.000002	< 0.000002	102%	---
Chromium [mg/L]	0.0005	< 0.0005	102%	---
Copper [mg/L]	0.0005	< 0.0005	102%	---
Iron [mg/L]	0.01	< 0.01	102%	---
Potassium [mg/L]	0.01	< 0.01	98%	---
Lithium [mg/L]	0.002	< 0.002	98%	---
Magnesium [mg/L]	0.003	< 0.003	99%	---
Manganese [mg/L]	0.00001	< 0.00001	107%	---
Molybdenum [mg/L]	0.00001	< 0.00001	99%	---
Sodium [mg/L]	0.01	< 0.01	93%	---
Nickel [mg/L]	0.0001	< 0.0001	100%	---
Phosphorus [mg/L]	0.01	< 0.01	100%	---
Lead [mg/L]	0.00002	< 0.00002	106%	---
Sulphur [mg/L]	0.01	< 0.01	98%	---
Antimony [mg/L]	0.0002	< 0.0002	101%	---
Selenium [mg/L]	0.001	< 0.001	102%	---
Silica [mg/L]	0.01	< 0.01	104%	---
Tin [mg/L]	0.00001	< 0.00001	96%	---
Strontium [mg/L]	0.0001	< 0.0001	100%	---
Titanium [mg/L]	0.0001	< 0.0001	96%	---
Thallium [mg/L]	0.0002	< 0.0002	107%	---

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Env ICP-MS Metals

Project : 09-1663

LR Report : **CA10064-OCT09**

Analysis	11: MDL	12: QC - Blank	13: QC - STD % Recovery	14: QC - DUP % Recovery
Uranium [mg/L]	0.000001	0.000001	1065	---
Vanadium [mg/L]	0.00003	< 0.00003	107%	---
Zinc [mg/L]	0.001	< 0.001	104%	---

Ra226 subcontracted to Becquerel Labs.

Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

OnLine LIMS

Radium-226 in Serpent River Sediments

EcoMetrix Incorporated

CYCLE III SPECIAL STUDIES – RADIUM-226 IN SERPENT RIVER SEDIMENTS

Report prepared for:

DENISON MINES INC.
8 Kilborn Way
Elliot Lake, ON
P5A 2T1

Report prepared by:

ECOMETRIX INCORPORATED
6800 Campobello Road
Mississauga, Ontario
L5N 2L8

09-1663
February 2011

CYCLE III SPECIAL STUDIES – RADIUM-226 IN SERPENT RIVER SEDIMENTS

Erin Clyde, M.Sc.
Project Manager

Ronald V. Nicholson, Ph.D.
Project Principal

EXECUTIVE SUMMARY

The Denison Site (the Site) is a decommissioned uranium mine property located approximately 12 km north of the City of Elliot Lake and immediately west of Quirke Lake and east of the Serpent River. The Site is owned by Denison Mines Inc. (DMI) and care and maintenance for the Site is provided by Denison Environmental Services (DES), a division of DMI.

EcoMetrix Incorporated (EcoMetrix) was retained by DMI to complete a directed study that focused on the hypothesis that historic accumulation of Ra-226 in the Serpent River sediments and the subsequent release of Ra-226 from the sediment to the surface water have resulted in majority of the observed load at D-5 that were reported in the 2008 State of the Environment report.

The main objective of this study was to evaluate Ra-226 activities in sediments, porewater and surface water from the Serpent River to develop and understanding of the source of the Ra-226 load differences between monitoring stations D-4 and D-5. The second objective was to evaluate future load trends in the Serpent River.

Load differences in the Serpent River between D-4 and D-5 cannot be explained by or attributed to the Ra-226 activities and loads that have discharged from the Denison TMA since 1990. It was hypothesized that the source of the Ra-226 loads in the Serpent River are related to high Ra-226 activities in the sediments that would have accumulated as a result of historic loads from the TMAs. The treated waters that currently discharge from the Denison TMAs have low Ra-226 activities. High concentrations in the sediment have initiated recovery of the sediment via release of Ra-226 into the water column.

Four stations were sampled along the main flow path of the Serpent River in the quiescent bays to quantify the changes in Ra-226 activities in the sediments between D-4 and D-5. Chemical characterization of the sediments showed that Ra-226 activities were elevated in downstream samples compared to those located upstream of the Denison Mine Site. These results indicated that in the past Ra-226 had accumulated in the sediments.

Chemical characterization of the sediment porewater and the overlying surface water showed that Ra-226 activities in the porewater were higher than those measured in the surface water. These results indicate that a concentration gradient has developed and imply that upward diffusion from the porewater to the surface water is occurring.

The high Ra-226 activities in the sediments and porewater, together with low Ra-226 activities in the discharge from the Denison TMAs, have likely initiated recovery of the sediment and release of Ra-226 to the surface water as a result of desorption from the solids into sediment porewater and diffusive transport from porewater to the water column.

A sediment model that includes diffusive processes as the primary mechanism for sediment recovery was applied to the field data to estimate Ra-226 loads from sediment to surface water and to evaluate the recovery of the sediments. The purpose of the modeling exercise was to verify whether the loads calculated at D-5 in the 2008 State of the Environment report could be the result of Ra-226 recovery via diffusive processes from the sediments. The model was not used to definitively predict Ra-226 activities or loads in the future, but rather was used as a tool to test the reasonableness of the observed loads and to illustrate potential future trends for Ra-226 loads.

The sediment model predicted a cumulative load of 3,420 MBq/a in 2009 that was expected to decrease with time. Accounting for the decrease in loads with time, the results from the model agreed well with the average load at D-5 of 5,300 MBq/a for the 2003 through 2006 time period calculated in the 2008 State of the Environment report. This result indicates that the Ra-226 load at D-5 can be explained by the recovery of historically accumulated Ra-226 in the sediments and its diffusive transport of Ra-226 from the porewater to the surface water.

The sediment model was used to illustrate potential future trends for Ra-226 loads for the 2009 through 2012 time period. The model indicated that over time the recovery of Ra-226 from the sediment will result in decreased loads at D-5.

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1.0 INTRODUCTION

The Denison Site (the Site) is a decommissioned uranium mine property located approximately 12 km north of Elliot Lake and immediately west of Quirke Lake and east of the Serpent River (**Figure 1.1**). The Site is owned by Denison Mines Inc. (DMI) and care and maintenance for the Site is provided by Denison Environmental Services (DES), a division of DMI.

EcoMetrix Incorporated (EcoMetrix) was retained by DMI to complete a directed study that focused on the hypothesis that historic accumulation of Ra-226 in the Serpent River sediments and the subsequent release of Ra-226 from the sediment to the surface water have resulted in the majority of the observed load at D-5 that were reported in the State of the Environment (SOE) report (Minnow, 2008).

Routine monitoring at the Denison Mine Site is conducted as three directed studies. The Serpent River Watershed Monitoring Program (SRWMP) is a comprehensive watershed monitoring program that was implemented to replace the various, mine-specific environmental monitoring programs at each mine site. The Source Area Monitoring Program (SAMP) was developed to monitor the nature and quantity of constituents that discharge from the Tailings Management Areas (TMAs) to the Serpent River Watershed. The TMA Operational Monitoring Program (TOMP) was designed to evaluate the performance of the TMAs.

EcoMetrix completed a performance evaluation of the SAMP and TOMP results to 2006 (EcoMetrix, 2008). As part of the review, and where appropriate, special studies were recommended to complement the monitoring programs as well as to refine our understanding of the long-term performances of the tailings facilities. Specifically, it was recommended that a special study be conducted in the Serpent River to verify the hypothesis that the historic accumulation of Ra-226 in the sediment and its subsequent release could be responsible for the observed increase in loads at D-5 downstream of the Denison Site.

1.1 Objectives and Scope of Work

The main objective of this study was to evaluate Ra-226 activities in sediments, porewater and surface water from the Serpent River to develop an understanding of the source of Ra-226 load differences between monitoring stations D-4 and D-5. The second objective was to evaluate future load trends in the Serpent River.

The scope of work for the Serpent River Study included the following:

- collection and analysis of sediment cores, porewater and surface water from four locations between monitoring stations D-4 and D-5;

- data assessment to determine potential reasons for the loading differences between D-4 and D-5; and
- modeling of the key constituents to investigate trends of future loadings and recovery.

2.0 BACKGROUND

The Denison Mine and Mill operated from 1957 to 1992, producing about 63 million tonnes of tailings. Approximately 60 million tonnes of tailings were deposited in TMA-1, formerly Bear Cub Lake and Long Lake, and 3 million tonnes of tailings deposited in TMA-2, formerly Upper Williams Lake (**Figure 2.1**). Following closure, decommissioning of the Denison TMAs included flooding the tailings (Minnow, 2008).

Overlying water from TMA-2 flows into TMA-1 via a constructed spillway. Effluent from TMA-1 is treated at the Denison Effluent Treatment Plant (ETP). Treatment at the Denison ETP consists of barium chloride addition for removal of Ra-226 and sodium hydroxide addition for pH adjustment. Treated water is released into the Stollery Settling Pond where treatment solids settle out prior to discharge into the Serpent River (**Figure 2.1**). The outflow from the Stollery Settling Pond is continuously monitored by DES at station D-2.

Seepage from TMA-2 is treated at the Lower Williams Lake Treatment Plant. Treatment includes the addition of barium chloride for removal of Ra-226 (Minnow, 2008). Effluent from the treatment plant is directed to the Lower Williams Settling Pond, where treatment solids settle out. The overflow from the pond discharges into the Serpent River as shown in **Figure 2.1** (Minnow, 2008). The outflow from the Lower Williams Settling Pond is monitored by DES at Station D-3.

Two monitoring stations, D-4 and D-5 are located in the Serpent River upstream and downstream of the Denison TMAs, respectively (**Figure 2.1**). These stations are sampled as part of the SRWMP in order to monitor the influences on the receiving environment from the discharge waters from the Denison TMA.

The monitoring data, to date, have demonstrated excellent performance and recovery of the Denison TMA. However, it was noted that loadings of Ra-226 in excess of the Ra-226 loads exiting the Denison TMAs have been observed in the Serpent River, adjacent to the Denison facilities (Minnow, 2008). The calculated Ra-226 loadings were estimated in 2008 to be approximately 300 MBq/a upstream of Denison at D-4 and approximately 5,300 MBq/a downstream from the TMAs at D-5 (**Figure 2.2**). It was hypothesized that Ra-226 present in the sediments as a result of historic loadings, prior to effective water treatment facilities, may be responsible for the observed loadings difference between stations. If historic loadings of Ra-226 were high, substantial accumulation of Ra-226 in the sediments might have occurred as a result of Ra-226 adsorption to, and deposition of, sediment materials. The treated waters that currently discharge from the Denison TMAs have low Ra-226 activities (**Figure 2.3**) and account for a Ra-226 load of approximately 200 MBq/a (**Figure 2.2**). The decrease in Ra-226 activities in the present discharge, with high concentrations in the sediment due to historic accumulation, could have initiated recovery of the sediment via release of Ra-226 into the water column. This behaviour is typical for sediment-water interactions. As recovery of the sediment occurs, the Ra-226 activity in the water will increase above the values entering the river from upstream. In this case, the Ra-

226 activities increased from values of less than 0.02 Bq/L at station D-4 to values close to 0.15 Bq/L at station D-5 (**Figure 2.3**) to account for a loadings difference of about 5,000 MBq/a between stations.

A compilation of the routine monitoring data for Ra-226 activities at sampling stations D-2, D-3, D-4, D-5 and D-6 is provided in **Appendix 1**.

3.0 SAMPLE COLLECTION AND PROCESSING

Sampling was conducted along the main flow path of the Serpent River near quiescent bays between stations D-4 and D-5 (**Figure 2.1**). Four stations were established to obtain representative samples to quantify the changes in Ra-226 activities in the sediments between D-4 and D-5. The first station (SR-1) was located upstream of the Stollery Settling Pond outflow confluence with the Serpent River. The second (SR-2) and third (SR-3) stations represented locations downstream of D-2, the discharge area from the Stollery Settling Pond. The fourth station (SR-4) was located downstream of the outflow from the Williams Settling Pond (D-3) and close to station D-5. A map illustrating the sampling locations is provided in **Figure 2.1**. A photographic log of the sampling stations and core samples collected at SR-3 and SR-4 are provided in **Appendix 2**.

3.1 Sediment Samples

Sediment samples were collected using a 4-inch diameter K-B coring device. At each location a total of four cores were collected to achieve sufficient sample volume for porewater extraction from the sediments.

The cores were sectioned at 5 cm intervals to depths of 15 or 20 cm. The corresponding intervals from the core sets at each sampling station were composited and placed into dedicated Ziploc bags and stored at 4°C until the porewater samples were extracted. Sub-samples of the sediments, pre-porewater extraction, were collected and transported to the EcoMetrix Laboratory for moisture content testing.

After the porewater was extracted (described in **Section 3.2**) the sediment samples were placed into dedicated Ziploc bags and stored at 4°C until analysed. Sediment samples were sent to SGS Lakefield Laboratories for chemical analysis that included Ra-226, metals, major ions, sulphate, sulphur and carbon. The Ra-226 analyses were completed by Becquerel Laboratories under subcontract to SGS Lakefield.

3.2 Porewater Samples

Porewater samples were extracted from the core samples in a field-based laboratory facility within 24 hours of collection. Each 5 cm interval from the composited core sets collected at each sampling station was transferred into 750 mL centrifuge bottles. The samples were centrifuged at approximately 3,500 rpm for 45 to 50 minutes. After centrifugation, the porewater was decanted and filtered through a 0.45μm nylon filter. The pH values of the filtered porewater samples were measured and recorded. The samples were then transferred into sample bottles supplied by SGS Lakefield and samples to be analysed for metals and Ra-226 were preserved with nitric acid. All samples were stored at 4°C until analysis.

Porewater samples were sent to SGS Lakefield Laboratories for chemical analysis that included Ra-226, metals, major ions, sulphate, dissolved organic carbon (DOC), and acidity or alkalinity. One sample, PW09-SR-2 (10-15), had insufficient volume and therefore was only submitted for Ra-226, metals and major ions analysis. The Ra-226 analyses were completed by Becquerel Laboratories under subcontract to SGS Lakefield.

3.3 Surface Water Samples

Surface water samples were collected at each of the four stations from the top of the water column and at the sediment/water interface. Surface water samples were collected as grab samples from the top of the water column. The sediment/water interface samples were collected and composited by siphoning the water above the sediments in the core tubes.

All water samples were field filtered through a 0.45μm disposable nylon filter and the pH values were measured and recorded. Water samples were then transferred into sample bottles supplied by SGS Lakefield and samples to be analysed for metals and Ra-226 were preserved with nitric acid. All samples were stored at 4°C until analysis.

Surface water samples were sent to SGS Lakefield Laboratories for chemical analysis, which included Ra-226, metals, major ions, sulphate, DOC and alkalinity. The Ra-226 analyses were completed by Becquerel Laboratories under subcontract to SGS Lakefield.

4.0 QUALITY ASSURANCE/QUALITY CONTROL

The field campaign that was conducted by EcoMetrix personnel in September 2009 included the collection of samples from three different decommissioned mine sites (Panel, Quirke and Denison) in the Elliot Lake area. The field campaign was carried out to help gain a further understanding of the knowledge gaps identified in the Cycle III SAMP and TOMP performance evaluation.

A detailed data quality assessment (DQA) was completed by EcoMetrix to evaluate the quality of the data collected during Cycle III Special Studies Field Campaign. Similar sampling methods and procedures were used at each mine site therefore the data quality assessment incorporated all of the QA/QC data collected during the field sampling campaign. This section provides a summary of the QA/QC for selected constituents that are discussed in this report. Data quality results for the selected constituents are summarized in **Tables 4.1 to 4.3**. Data quality results for all of the constituents analysed and for duplicates and replicates from all studies are provided **Appendix 3**.

The precision of the duplicate and replicate samples were evaluated by calculating the relative percent difference (RPD) as follows:

$$RPD = \frac{2\left|C_1 - C_2\right|}{C_1 + C_2} \times 100\%$$

where: C_1 = sample concentration; and

C_2 = replicate (or duplicate) concentration.

The Data Quality Objectives (DQO) for solids samples were less than or equal to a RPD value of 40%. The DQO for water samples were less than or equal to a RPD value of 20%.

For duplicate/replicate samples having concentrations less than five times the detection limit, the DQO was the absolute difference (AD) between the sample and duplicate/replicate that should not have been greater than the detection limit value.

Blind duplicates and replicates of solids and water samples, as well as laboratory blank sample (de-ionized water), were submitted to SGS Lakefield. Duplicate samples were labeled as EC-1 and replicate samples were labeled as EC-2. The duplicate samples are split samples of solids, porewater or basin water collected from a selected core section or sampling station. The solids replicate samples are replicate core sets from sampling station QC14-2 and were sectioned in accordance with study protocols. Replicate water samples were collected from porewater generated from replicate core sections or from replicate basin water sampling. The calculated RPD or AD values for selected constituents are presented in **Tables 4.1** to **4.2**.

4.1 Solids Sample Data Quality Assessment

The DQA for selected constituents in field duplicates from Cores 09-PSB-2 and 09-SR-4 are summarized in **Table 4.1a**. On average, the DQO of 40% was achieved for all selected constituents (Ra-226, barium, sulphate), with the exception of two exceedances observed in the Core09-PSB-2 duplicate. Barium that had RPD value of 52% and sulphate had an AD value of 0.3. As these individual values were only marginally above the data quality objectives, there are no impacts on the interpretation of the results.

The DQA for selected constituents in replicate core section intervals of Core09-QC14-2 (0-2.5), (2.5-5) and (5-7.5) are summarized in **Table 4.1b**. On average, the DQO of 40% was achieved for all selected constituents, except for Ra-226 where the average RPD was 48%. For Ra-226 the DQO of 40% was exceeded twice with RPD values of 73% and 48%. For barium the DQO was exceeded twice with RPD values of 51% and 60%. As these individual values were only marginally above the data quality objectives, there are no impacts on the interpretation of the results.

4.2 Water Sample Data Quality Assessment

Two duplicate and 5 replicate water samples were collected and analysed. The duplicate and replicate RPD values were compared to a DQO of ≤20%. The DQA for selected constituents in the water samples are presented in **Tables 4.2 a and b**.

As shown on **Table 4.2a**, the DQO of 20% in duplicate water samples was achieved for Ra-226 and barium. Duplicate water samples are sample splits of basin water or porewater extracted from sectioned cores. The Ra-266 duplicate sample identification is PW09-EC-1 (5-10) and corresponds to sample PW09-QC14-4 (0-5). The barium duplicate sample identification PW09-EC-1 (5-10) and corresponds to sample PW09-QC14-3 (0-5). Sulphate duplicates were not analysed because of insufficient sample volume.

As shown on **Table 4.2b**, the DQO of 20% in replicate water samples was achieved on average for Ra-226 and barium, with one DQO exceedance for Ra-226 with an RPD value of 22% in a replicate porewater sample. The average RPD of 21% for sulphate is marginally above the DQO. One DQO exceedance for sulphate had an RPD 40% in a replicate porewater sample.

4.3 Blank Sample Data Quality Assessment

One blank sample was subjected to the porewater extraction process that included centrifugation followed by filtration to determine potential for cross-contamination between samples. The results for selected constituents in the blank are provided **Table 4.3**. The Ra-226 activities and sulphate concentrations were below detection limits of 0.01 Bq/L and 2 mg/L, respectively. The dissolved barium concentration in the blank was 0.00216 mg/L and exceeded the DQO of 0.00002 mg/L. Barium concentrations measured in most of the water samples for the DQA (**Table 4.3**) are at least two orders of magnitude greater than the barium concentration measured in the blank. Therefore, the barium concentration that may be attributed to cross-contamination was negligible.

4.4 Anomalous pH Values in Surface Water Samples

The pH values measured in the surface water samples collected in the Serpent River by EcoMetrix in September 2009 are summarized in **Table 4.4**. Upon review of the pH data, DES personnel were concerned that the results were anomalous compared to all other pH measurements at D-4 and D-5 recorded in the past as part the routine monitoring. The results show that the pH is anomalously low with an average of 5.4 compared to the routine monitoring data at D-4 and D-5 that exhibited average pH values of 6.8 and 6.9 from 2003 through 2006. In response to the anomalous pH values, DES personnel measured pH at the top and bottom of the water column at each station in the Serpent River that were sampled by EcoMetrix. The pH values measured were by DES in June 2010 and are also summarized in **Table 4.4**. The results provided further indication that the pH values measured by EcoMetrix personnel (average pH 5.4) in September 2009 were anomalously low compared to an average of 6.8 measured by DES in June 2010 at the same sample stations.

Upon further investigation, the source of the anomalous pH values was found. The surface water samples were collected in sample bottles that were previously acidified with nitric acid in preparation for storage of samples for metals analysis. The bottles were rinsed three times in the field before collection of the samples for pH. However this rinsing was insufficient to remove all traces of acid. The pH values do not affect the interpretation of Ra-226 mobility in this investigation and therefore measured pH values were not used or discussed in this report.

4.5 Laboratory Quality Assurance and Quality Control

Laboratory Quality Assurance/Quality Control (QA/QC) included analysis of laboratory blanks and laboratory duplicate sample analyses. The Certificates of Analysis, including internal laboratory QA/QC results, are provided in **Appendix 4** and indicate that the data have acceptable accuracy and precision.

5.0 FIELD SAMPLE RESULTS

Selected results from the September 2009 field sampling program are presented in **Figures 5.1** and **5.2** and are summarized in **Tables 5.1** and **5.2**. Activities/concentrations of selected constituents in the sediments are provided in **Figure 5.1** as depth profiles. **Figure 5.2** presents the activities/concentrations in the surface water from each sampling station, as well as the porewater samples with depths that correspond to the depth of the core sample intervals. The surface water samples plotted above the sediment-water interface are not to scale. The actual depths below surface for these samples are provided in **Table 5.2**. The analytical data for all of the constituents analysed are provided as Certificates of Analysis in **Appendix 4**.

5.1 Sediment Samples

The results for selected constituents in the sediments are presented in **Table 5.1**. Results show that elevated Ra-226 activities are present in the sediments of the Serpent River. Depth profiles for Ra-226, barium and sulphate are presented in **Figure 5.1** and show similar trends.

Sample SR-1 was collected upstream of the Denison Mine Site at a location that was expected to have little to no influence from historical TMA operations. This station exhibited low Ra-226 activities that were in the range of 0.02 to 0.16 Bq/g and remained generally constant throughout the depth profile. The same trend was observed for barium and sulphate, with values in the ranges of 47 to 75 mg/kg and less than the detection limit of 0.1% to 0.1%, respectively.

Sample Station SR-2 was located downstream of D-2 and Dyke 8 at a location that may have been influenced by historical TMA operations. Dyke 8 separates the Stollery Settling Pond from the Serpent River. The highest Ra-226 activity of 14 Bq/g was measured in the shallowest sample (0 to 5 cm), with activities decreasing to 0.06 Bq/g at depth. Similar trends were observed for barium and sulphate, concentrations decreasing at depth from 6,400 to 200 mg/kg and 0.5 to <0.1%, respectively.

Sample SR-3 was collected further downstream from D-2 at a location upstream of D-3. The Ra-226 activities in the sediments at this Station increased from 8.2 to 20 Bq/g over the depth profile. Similar increases in concentrations were observed for barium and sulphate with concentrations increasing with depth from 2,300 to 4,100 mg/kg and 0.2 to 1.0%, respectively.

Sample Station SR-4 was located downstream from D-3, immediately upstream from D-5. Radium-226 activities at SR-4 were generally low and marginally higher in the top sediments compared to the lower sediments. Radium -226 activities in the 0 to 5 and 5 to 10 cm layers were 2.6 and 2.7 Bq/g, respectively. The Ra-226 activity in the 10 to15 cm section was 2.1 Bq/g. Barium concentrations exhibited a decreasing trend with depth from 770 to 440 mg/kg. Sulphate concentrations were constant at 0.2% over the depth profile.

In summary, the spatial trends for Ra-226, barium and sulphate showed higher acitivities/concentrations in sediments at SR-3 and SR-2, with lower values measured at SR-1 and SR-4. Radium-226 and barium activites/concentrations at SR-2 showed dramatically different trends compared to those for the same constituents at SR-3. Ra-226, barium and sulphate activities/concentrations at SR-2 decreased with depth, while the same constituents at SR-3 increased with depth.

5.2 Porewater and Surface Water Samples

The results for selected constituents in porewater and surface water are summarized in **Table 5.2** and are presented as depth profiles in **Figure 5.2**. Results show that Ra-226 activities in the porewater and surface water were higher at the sampling stations that exhibited higher concentrations in the sediments. The trends observed for Ra-226 in **Figure 5.2** are also observed for barium, while inverse trends were observed for sulphate concentrations in the sediment porewater.

The Ra-226 and barium concentrations in the porewater and surface water at SR-1 were low and generally constant over the depth profile. Radium-226 activities and barium concentrations ranged from less than 0.01 to 0.02 Bq/L and from 0.01 to 0.03 mg/L, respectively. The highest sulphate concentration of 8.5 mg/L was measured at the top of water column, with the concentration decreasing to 5.6 mg/L at the sediment water interface. Sulphate concentrations in the porewater were 2.6 in the topmost sample and decreased to less the detection limit of 2 mg/L at depth.

The trend for Ra-226 activities at Stations SR-2 and SR-3 exhibited the lowest activities in the surface waters, with higher Ra-226 activities in the porewaters. Radium-226 activities at the top of the water column were 0.11 and 0.15 Bq/L at SR-2 and SR-3, respectively. Radium-226 activities at the sediment-water interface were 0.28 and 0.80 Bq/L at SR-2 and SR-3, respectively. Porewater samples collected at SR-2 and SR-3 exhibited peak activities in the top 10 cm, with Ra-226 activities decreasing with depth. The highest Ra-226 activities in the porewaters were 2.4 and 6.0 Bq/L that were measured from samples SR-2 (0-5) and SR-3 (5-10), respectively. Radium-226 activities in the porewaters decreased with depth to values of 0.87 and 4.5 Bq/L at SR-2 and SR-3, respectively.

Barium concentrations exhibited similar trends to those noted for Ra-226 at Stations SR-2 and SR-3, with lower concentrations measured in the surface waters compared to those measured in the porewaters. Barium concentrations in the surface waters ranged from 0.12 to 0.29 mg/L and from 0.15 to 0.33 mg/L at SR-2 and SR-3, respectively. Peak barium concentrations in the porewaters were measured in the middle of the depth profiles at SR-2 and SR-3, with values decreasing above and below. The highest barium concentration was measured in the top 10 cm at SR-2, with a maximum concentration of 2.4 mg/L. The highest barium concentration at SR-3 was 3.75 mg/L from the 10 to 15 cm depth interval.

The depth-trends for sulphate concentrations at SR-2 and SR-3 were generally inverse to those observed for Ra-226 and barium. The highest concentrations of sulphate were observed in the surface waters, with lower sulphate concentrations measured in the porewaters. The highest sulphate concentration at SR-2 was from the sediment-water interface with a value of 45 mg/L. The highest concentration at SR-3 was from the top of the water column with a value of 30 mg/L. Porewater concentrations decreased with depth from 16 to 14 mg/L at SR-2 and from 7.9 to less than 2 mg/L at SR-3.

The Ra-226 and barium concentrations in the porewater and surface waters at SR-4 were lower than those observed at SR-2 and SR-3, but exhibited similar trends, with the lowest values measured in the surface water and higher values measured in the porewater. Radium-226 activities and barium concentrations in the surface water ranged from 0.19 to 0.30 Bq/L and 0.19 to 0.22 mg/L, respectively. Higher Ra-226 that ranged from 0.87 to 1.4 Bq/L were measured in the porewater, with values increasing slightly with depth. Barium concentrations in porewater were generally constant with depth and ranged from 0.56 mg/L to 0.62 mg/L. Sulphate trends were inverse to those observed for Ra-226 and barium, with a maximum concentration of 25 mg/L measured in the surface water and a minimum concentration of 4.9 mg/L measured at depth in the sediment porewater.

In summary, the depth profile trends showed the highest Ra-226 and barium activities/concentrations in the porewater, with the lower values measured in the surface waters, while the depth profiles for sulphate showed inverse trends to those for barium and Ra-226. The spatial trends for Ra-226 and barium showed the highest acitivities/concentrations in porewater at SR-3 and SR-2, with lower values at SR-1 and SR-4. These spatial trends are consistent with the spatial trends observed for Ra-226 and barium for sediment samples.

6.0 SEDIMENT MODELING OF RADIUM-226 RELEASE FROM THE SERPENT RIVER

6.1 Introduction

Recovery of metals from sediments involves the processes of metals partitioning from the solid phase to the dissolved phase, and subsequent diffusion through the porewater to the surface water. Diffusive processes and mass transport are well understood and can be modeled mathematically. A sediment model that includes diffusive processes as the primary mechanism for sediment recovery was applied to the field data to estimate Ra-226 loads from sediment to surface water and to evaluate the recovery of the sediments. The purpose of the modeling exercise was to verify whether the loadings calculated at D-5 by Minnow (2008) could be the result of Ra-226 recovery via diffusive processes from the sediments of the Serpent River. The model was not used to definitively predict Ra-226 activities or loads in the future, but rather was used as a tool to test the reasonableness of the observed loads and to illustrate potential future trends for Ra-226 loads.

6.1.1 Conceptual Model

The conceptual model for sediment-solute interaction in lakes is well known and is shown schematically in **Figure 6.1**. Although the water bodies being investigated are in the Serpent River, the slow flow and the deposition and accumulation of sediment in these wider reaches of the river behave as lakes.

Metals in the water column partition in equilibrium with suspended particulates, via sorption reactions. In this manner, the concentration in the water column controls the concentration of metals in the particulate matter. Sorption of constituents onto suspended particulates occurs and sedimentation results in the accumulation of metals in the sediment profile over time.

Chemical partitioning also occurs between the deposited sediments and the porewater in the sediment. The dissolved metals in porewater can exchange with the water column above the sediment. This exchange is controlled by the diffusion coefficient of the sediment-porewater system and the concentration gradient or difference between the porewater and the water column above the sediment. The metals can then be redistributed in the profile as a result of diffusion over time. Accumulation of constituents occurs when concentrations in the water column are greater than in the sediment porewater.

Sediment recovery occurs when concentrations in the water column decline, as a result of decreased loadings from upstream sources, for example. The higher concentrations in the porewater than in the water column results in a reversal of chemical gradients, and diffusive releases of constituents from the porewater to the water column. As constituents are released to the water column, concentrations in the porewater are replenished by the release of constituents from the sediments via de-sorption reactions, and the sediment recovery over time. As sediments recover, concentrations in the porewater slowly decrease, resulting in smaller concentration gradients between porewater and overlying water. Over time, the loads the porewater to overlying water decrease. Overall, these reactions result in a contribution of loadings from the sediment to the water column during recovery.

The conceptual model is presented mathematically in **Appendix 5**.

6.2 Model Parameterization

The key variables in the sediment accumulation model are:

- sediment accumulation rate (mm/a) – this variable is usually in the range of 1 to 5 mm/a, but can be constrained by the concentrations of total suspended solids in the water column;
- sediment-water partition coefficient or K_d (L/kg) – this variable describes a reversible sorption of a constituents onto the solids or particles that accumulate on the bottom of the river;
- effective diffusion coefficient (m^2/s) – this variable has a relatively narrow range and describes the diffusion of a dissolved constituent in the sediment porewater;
- total suspended solids or TSS (mg/L) – the total concentration of organic and inorganic substances suspended in a volume. The particle size is operationally defined to be greater than 0.2 μm ;
- activity in the water column (Bq/L) – obtained from the field data collected in 2009 (**Table 5.2**); and
- activity in the sediment (Bq/g) – obtained the field data collected in 2009 and represent historical concentrations that are present in deeper core sections (**Table 5.1**).

The physical properties of the material including moisture content and bulk density can be estimated for sediment and were based on laboratory data. Values for partitioning coefficients were also estimated using field and laboratory data from the current study.

Typical values for diffusion coefficients (D) in aqueous solutions in a porous medium neglecting porosity were obtained from the literature (Spitz and Moreno, 1996) and an average value of 8.43×10^{-10} m^2/s for silty clay were considered reasonable for this investigation. In porous media, such as sediment, the effective diffusion coefficient is smaller than that in aqueous solution because ions follow a longer path of diffusion through the pore spaces and do not migrate through the solid particles. Therefore, the effective diffusion coefficient, D_e, should be used for sediment and can be represented by:

$$D_e = D \bullet \eta$$

Where: D_e = effective diffusion coefficient in the sediment porewater (m^2/s);

D = diffusion coefficient in an aqueous solution (m^2/s)

η = porosity

Porosity values in sands typically range from 0.26 to 0.53 (Spitz and Moreno, 1996). Porosity values in organic rich sediments may be expected to be as high as 0.9. A porosity of 0.5 was considered a reasonable average value for the Serpent River sediments that consisted of mixtures of organic matter and sandy materials. The value for D_e was then calculated to be 4.22×10^{-10} m^2/s.

The model was constrained with the following limits:

- initial water concentrations – were assumed to be equal to the data (**Table 5.2**) from the top of the water column measured at the upstream sampling stations (SR-2 equals 0.01 Bq/L, SR-3 equals 0.11 Bq/L; SR-4 equals 0.15 Bq/L);
- inflow water concentrations – were assumed to be equal to the data (**Table 5.2**) from the top the of the water column measured at the upstream sampling stations (SR-2 equals 0.01 Bq/L; SR-3 equals 0.11 Bq/L; SR-4 equals 0.15 Bq/L);
- concentrations in sediment – were assumed to be equal to the measured data from the core sections (**Table 5.1**);
- effective diffusion coefficient – this variable calculated using values in the literature and a value of 4.22×10^{-10} m^2/s was considered to be reasonable;
- volume of water in the reaches of the Serpent River – the values for each station were estimated from Google Earth satellite images and were approximately 210,000 m^3 at SR-2, 104,000 m^3 at SR-3 and 104,000 m^3 at SR-4; and
- flow in the Serpent River – was estimated from Archived Hydrometric Data for the Serpent River Above Quirke Lake (Environment Canada, 2010). The flow values at SR-2 and SR-3 were 1,642 L/s and represent approximately 69% of the average flow (2,380 L/s) measured in 2009. The flow value at SR-4 was 1,785 L/s and represents approximately 75% of the average flow (2,380 L/s) measured in 2009.

The model is sensitive to two other critical variables that include the sediment deposition rate and the water-solid partitioning coefficient (K_d). The deposition rate is commonly on the order of 1 to 5 mm/a. In this case, it was assumed that the deposition rate was 2 mm/a a typical value in small lakes. The value of K_d was estimated from a plot of the Ra-226 activities in sediment versus those in porewater. **Figure 6.2** illustrates the linear correlation between the Ra-226 activities in the sediment solids versus those in the porewater in

Serpent River samples collected in this investigation. The slope of the line is equal to the K_d with a value of 2,600 L/kg. The dashed lines in **Figure 6.2** show the lower and upper 95% confidence intervals for the slope of the regression line and indicate a range in K_d values of 1,369 to 3,627 L/kg.

6.3 Load Calculations

Radium-226 loads were calculated using the results from the sediment diffusion model. The loads were calculated in terms of the diffusive flux for a unit area at sample stations SR-2, SR-3 and SR-4 and were calculated as follows:

$$L = F \bullet A$$

Where: L = Load (MBq/a);

F = Mass Flux (MBq/m^2•a);

A = Surface area over which the diffusion is taking place (m^2).

The mass flux was calculated as follows:

$$F = -D_e \bullet \frac{\partial C}{\partial z}$$

Where: F = Mass Flux (MBq/m^2•a);

D_e = effective diffusion coefficient in sediment porewater (m^2/a);

C = concentration (Bq/L); and

z = interface thickness (m).

6.4 Model Calibration

Model calibration involves the adjustment of model parameters within acceptable ranges until the model predictions match measured data. For this case, the measured data were obtained from routine monitoring of Ra-226 activities in water at station D-5. The monitoring data together with Archived Hydrometric Data for the Serpent River (Environment Canada, 2010) were used to calculate annual Ra-226 load values at D-5. These data are plotted in **Figure 6.3** for the years 2002 to 2009 and are shown as solid symbols. These data points represent annual loads that were calculated using the average annual concentrations measured at D-5 times the estimated annual flow rate (75×10^6 m^3/a) for the Serpent River at D-5.

The solid curves in **Figure 6.3** represent the estimated cumulative loads from SR-2, SR-3 and SR-4 for 2009 to 2012 at K_d values of 1,300, 1,700 and 2,600L/kg. The K_d value of 2,600 L/kg represents the best-fit slope of the regression line in **Figure 6.2**, while a K_d of 1,300 represents a value close to the lower 95% confidence interval of the slope of 1,369 L/kg. A K_d value of 1,700 L/kg was chosen to test the sensitivity of the model to K_d values between 1,300 L/kg and 2,600 L/kg.

The condition that provides the best visual fit for the annual loads was a K_d value of 1,300 L/kg. This value was consistent with the lower 95% confidence interval. A K_d value for Ra-226 of about 1,500 L/kg was reported by EcoMetrix (2009) for lake bottom sediments. Therefore, a K_d value of 1,300 L/kg was considered acceptable and used for subsequent the model simulations.

6.5 Model Results

The cumulative Ra-226 load from the sediment to the surface water at D-5 was approximately 3,420 MBq/a in 2009 as presented in **Figure 6.3** for a Kd of 1,300 L/kg. This result agrees well with the calculated annual load of 3,884 MBq/a for 2009 shown on the same plot. The model predicts that the observed annual load at D-5 will continue to decrease over time.

The model was also used to estimate individual loads of Ra-226 released from the sediments in the areas surrounding stations SR-2, SR-3 and SR-4 and the results are presented as time-trend plots in **Figure 6.4**. The results showed that from 2009 to 2012 the loads at stations SR-2, SR-3 and SR-4 should decrease with time. The downward trend was also observed for the calculated loads from 2002 through 2009 in **Figure 6.3**. The results also show that the majority of the cumulative Ra-226 load is from SR-2, while the Ra-226 loads at SR-4 represent much smaller contributions to the cumulative load.

The decreasing trend in Ra-226 loads can be explained by the spatial trends observed in the sediments. **Figure 6.5** illustrates the predicted changes in Ra-226 activities in sediment solids profiles with time. The symbols represent the concentrations measured in the sediment in 2009 and the solids curves represent the estimated concentrations in 2012. The predictions indicate that the Ra-226 activities in the top portions of the sediment will decline with time as sediments recover and release Ra-226 to the water column in the Serpent River.

Figures 6.4 and **6.5** illustrate a more rapid release of Ra-226 at SR-2 than SR-3, even though highest Ra-226 activities were measured at SR-3. This occurs because diffusion is controlled by concentration gradients that can be defined as the change in concentration over distance. Therefore, concentration gradients are inversely proportional to distance. Because the highest Ra-226 activity in the porewater at SR-3 was measured at depth, the concentration gradient would be small; this relationship results in a slower release of Ra-226 to the surface water. The highest Ra-226 activities at SR-2 were measured in the porewater from the topmost sediments and near the sediment-water interface. This condition results in a large concentration gradient and is responsible for the more rapid release of Ra-226 to the surface water at SR-2 than at SR-3.

7.0 DISCUSSION

Results from the chemical characterization of sediments from the Serpent River showed that Ra-226 had accumulated in the sediments in the vicinities of sampling stations SR-2, SR-3 and SR-4 (**Figure 5.1**). Porewater samples generally exhibited trends of higher Ra-226 activities in the 5 to 10 cm sections that decreased with depth (**Figure 5.2**). Together, the results for solids and porewater are consistent with the historic accumulation of Ra-226 in the sediment that likely resulted from elevated Ra-226 activities discharging from the Denison TMA in the past before the water was treated to remove Ra-226.

Radium-226 activities measured upstream of the Denison TMAs at SR-1 were at or below the detection limit of 0.01 Bq/L. These values are consistent with the routine monitoring data that show Ra-226 in the range of 0.01 to 0.02 Bq/L at D-4 that is also located upstream of the Denison TMAs (**Figure 2.3**). **Figure 2.3** also shows moving averages of Ra-226 activities at monitoring stations D-2, D-3 and D-6 that represent outflows from the Stollery and the Williams Settling Ponds, and potential seepage from TMA-1, respectively. The Ra-226 activities at these stations have remained between approximately 0.01 and 0.20 Bq/L since 1993. Because flows from the TMAs are small compared to flow in the Serpent River, Ra-226 activities were expected to decrease in the Serpent River downstream from D-2 and D-3. However, this was not supported by the data from the field study or by the data from the routine monitoring data at D-5. The data from the 2009 field study showed average Ra-226 activities of 0.20, 0.15 and 0.25 Bq/L in the Serpent River downstream of TMAs at SR-2, SR-3 and SR-4. Routine monitoring data at D-5 show average Ra-226 activities have remained between 0.10 and 0.20 Bq/L since 1992.

Average Ra-226 loads exiting the Denison TMAs at D-2, D-3 and D-6 calculated by Minnow (2008) for the 2003 to 2006 time period had values of 175, 31 and 11 MBq/a, while an average Ra-226 load of 5,300 MBq/a was calculated at D-5 (**Figure 2.2**). These average loads from D-2 and D-3 represent only small contributions of Ra-226 to the Serpent River and cannot explain the 5,300 MBq/a calculated at D-5, downstream from the TMAs. The load calculations from Minnow (2008), together with the Ra-226 activities measured in the 2009 field study between D-4 and D-5, indicate that there is a source load of Ra-226 in the Serpent River that has not been accounted for previously.

It was hypothesized that the recovery of Ra-226 in the sediment and its diffusion to the surface water has likely resulted in the observed Ra-226 loads at D-5. The low Ra-226 activities in the present discharge, together with high activities in the sediment from historic accumulation, have likely initiated recovery of the sediment via release of Ra-226 into the water column. This behaviour is typical for sediment-water interactions.

The Ra-226 activities shown in **Figure 5.2** exhibited trends with higher activities in the porewater compared to those measured in the surface water at stations SR-2, SR-3 and SR-4. These results indicate that a concentration gradient has developed and diffusion of Ra-226 from the porewater to the surface water was occurring at the time of sampling.

A sediment model was used to test the theory that the observed loads at D-5 are the result of Ra-226 recovery from sediments in the Serpent River. The model estimated a cumulative load of 3,420 MBq/a in 2009 that was based on a well-supported Ra-226 Kd value in the sediment. These results indicate that the Ra-226 load at D-5 can be explained by the recovery of historically accumulated Ra-226 in the sediments controlled by diffusive transport of Ra-226 from the porewater to the surface water. The model results also indicated that over time the recovery of Ra-226 from the sediment will result in decreasing loads at D-5 into the future.

8.0 SUMMARY OF CONCLUSIONS

The objectives of this study were to evaluate Ra-226 in the solids, porewater and overlying surface water from the Serpent River to determine the source of the load differences between monitoring stations D-4 and D-5 and to evaluate future loading trends in the Serpent River.

The key conclusions from this investigation are as follows:

- Load differences in the Serpent River between D-4 and D-5 cannot be explained by or attributed to the Ra-226 activities and loads that have discharged from the Denison TMA since 1990.
- It was hypothesized that the source of the Ra-226 loads in the Serpent River are related to low Ra-226 activities in the treated waters that discharge from the Denison TMAs, together with high Ra-226 activities in the sediment from historic accumulation that have initiated recovery of the sediment via release of Ra-226 into the water column.
- The results from the chemical characterization of the sediment and porewater were consistent with historic accumulation of Ra-226 in the sediment that likely resulted from elevated Ra-226 activities discharging from the Denison TMA in the past before the water was treated to remove Ra-226.
- The elevated Ra-226 activities in the sediments surrounding stations SR-2 and SR-3 represent the majority of the source load for Ra-226 in the Serpent River.
- The high activities in the sediment from historic accumulation, together with low Ra-226 activities in the present discharge from the Denison TMAs, have likely initiated recovery of the sediment via release of Ra-226 to the water column.
- Chemical characterization of sediment porewater and surface water in the Serpent River showed higher Ra-226 activities in the porewater compared to surface water indicating that concentration gradients have developed.
- Concentration gradients between Ra-226 activities in porewater and surface water imply upward diffusion and mass transport of Ra-226 from the porewater to the overlying water.
- The sediment model predictions verified that the calculated loads at D-5 can be explained by the recovery of historically accumulated Ra-226 in the sediments and its diffusion to the water column.
- The model predictions also showed that the Ra-226 loads at D-5 will continue to decrease as the sediments in the Serpent River recover over time.

9.0 REFERENCES

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TABLES

Table 4.1a: Data Quality Assessment Summary for Selected Constituents in Solids - Duplicate Samples

		Parameter		
		Radium-226	**Barium**	**Sulphate**
		(Bq/g)	(mg/kg)	(%)
Method Detection Limit		0.01	0.05	0.1
RPD Data Quality Objective		≤ 40%	≤ 40%	≤ 40%
Sample ID	Core09-PSB-2 (5-10)	4.5	160	0.6
Replicate ID	CORE 09-EC-1 (0-5)	4.1	94	0.3
RPD (%) or AD		9	**52**	**0.3**
Sample ID	Core09-SR-4 (10-15)	2.1	440	0.2
Replicate ID	CORE 09-EC-1 (5-10)	1.6	450	0.1
RPD (%) or AD		27	2	0.1
Average RPD or AD		***18***	***27***	***0.2***
Count		*3*	*3*	*3*

Notes:

RPD - relative percent difference; is calculated for analytes with concentrations greater than or equal to five times the detection limit and should be less than or equal to 40%

AD - absolute difference; for samples having concentrations less than five times the detection limit, the difference between the sample and duplicate, or difference between the sample or duplicate and the detection limit if either the sample or duplicate analyte concentration is below detection limit; should not be greater then the detection limit

BD - Sample and/or replicate had analyte concentrations below detection limit

Boldface type and shaded indicates that Data Quality Objective was not achieved

Table 4.1b: Data Quality Assessment Summary for Selected Constituents in Solids - Replicate Samples

		Parameter		
		Radium-226	Barium	Sulphate
		(Bq/g)	(mg/kg)	(%)
Method Detection Limit		0.01	0.05	0.1
RPD Data Quality Objective		≤ 40%	≤ 40%	≤ 40%
Sample ID	CORE 09-QC14-2 (0-2.5)	4.3	150	0.1
Replicate ID	CORE 09-EC-2 (0-2.5)	7.0	280	0.1
RPD (%) or AD		**48**	**60**	0
Sample ID	CORE 09-QC14-2 (2.5-5)	6.5	220	0.1
Replicate ID	CORE 09-EC-2 (2.5-5)	8.3	370	0.1
RPD (%) or AD		24	**51**	0
Sample ID	CORE 09-QC14-2 (5-7.5)	9.3	330	0.1
Replicate ID	CORE 09-EC-2 (5-7.5)	20.0	310	0.1
RPD (%) or AD		**73**	6	0
Average RPD or AD		***48***	***39***	***0***
Count		*3*	*3*	*3*

Notes:

RPD - relative percent difference; is calculated for analytes with concentrations greater than or equal to five times the detection limit and should be less than or equal to 40%

AD - absolute difference; for samples having concentrations less than five times the detection limit, the difference between the sample and duplicate, or difference between the sample or duplicate and the detection limit if either the sample or duplicate analyte concentration is below detection limit; should not be greater then the detection limit

BD - Sample and/or replicate had analyte concentrations below detection limit

Boldface type and shaded indicates that Data Quality Objective was not achieved

Table 4.2a: Data Quality Assessment Summary for Selected Constituents in Water - Duplicate Samples

		Parameter		
		Radium-226	**Barium**	**Sulphate**
		(Bq/L)	(mg/L)	(mg/L)
Method Detection Limit		0.01	0.00001	0.2
RPD Data Quality Objective		≤ 20%	≤ 20%	≤ 20%
Sample ID	SW09-SR-4B	0.30	0.222	25
Duplicate ID	PW09-EC-1 (0-5)	0.30	0.221	--
RPD (%) or AD		0	0	--
Sample ID	PW09-QC14-3 (0-5)	--	0.333	54
Duplicate ID	PW09-QC14-4 (0-5)	4.1	--	560
Duplicate ID	PW09-EC-1 (5-10)	4.7	0.335	--
RPD (%) or AD		14	1	--
Average RPD or AD		***7***	***1***	**--**
Count		*2*	*2*	--

Notes:

RPD - relative percent difference; is calculated for analytes with concentrations greater than or equal to five times the detection limit and should be less than or equal to 20%

AD - absolute difference; for samples having concentrations less than five times the detection limit, the difference between the sample and duplicate, or difference between the sample or duplicate and the detection limit if either the sample or duplicate analyte concentration is below detection limit; should not be greater then the detection limit

BD - Sample and/or replicate had analyte concentrations below detection limit

Boldface type and shaded indicates that Data Quality Objective was not achieved

Table 4.2b: Data Quality Assessment Summary for Selected Constituents in Water - Replicate Samples

		Parameter		
		Radium-226	**Barium**	**Sulphate**
		(Bq/L)	(mg/L)	(mg/L)
Method Detection Limit		0.01	0.00001	0.2
RPD Data Quality Objective		≤ 20%	≤ 20%	≤ 20%
Sample ID	SW09-QC14-2T	0.82	0.104	72
Replicate ID	SW09-EC-2T	0.78	0.108	85
RPD (%) or AD		5	4	17
Sample ID	SW09-QC14-2B	0.91	0.108	32
Replicate ID	SW09-EC-2B	0.85	0.114	36
RPD (%) or AD		7	5	12
Sample ID	PW09-QC14-2 (0-2.5)	3.6	0.309	32
Replicate ID	PW09-EC-2 (0-2.5)	2.9	0.285	27
RPD (%) or AD		**22**	8	17
Sample ID	PW09-QC14-2 (2.5-5)	2.8	0.308	12
Replicate ID	PW09-EC-2 (2.5-5)	3.3	0.337	18
RPD (%) or AD		16	9	**40**
Sample ID	PW09-QC14-2 (5-7.5)	5.9	0.519	12
Replicate ID	PW09-EC-2 (5-7.5)	5.4	0.487	--
RPD (%) or AD		9	6	--
Average RPD or AD		***12***	***7***	***21***
Count		*5*	*5*	*4*

Notes:
RPD - relative percent difference; is calculated for analytes with concentrations greater than or equal to five times the detection limit and should be less than or equal to 20%
AD - absolute difference; for samples having concentrations less than five times the detection limit, the difference between the sample and duplicate, or difference between the sample or duplicate and the detection limit if either the sample or duplicate analyte concentration is below detection limit; should not be greater then the detection limit
BD - Sample and/or replicate had analyte concentrations below detection limit
Boldface type and shaded indicates that Data Quality Objective was not achieved

Table 4.3: Data Quality Assessment Summary for Selected Constituents in Blank Sample

Analysis	Units	Detection Limit	Data Quality Objective	Blank 1
Radium-226	Bq/L	0.01	0.02	<0.01
Barium	mg/L	0.00001	0.00002	**0.00216**
Sulphate	mg/L	2	4	<2

Notes:

Boldface type and shaded indicates that Data Quality Objective was not achieved

Table 4.4: Surface Water pH Values Measured in the Serpent River by EcoMetrix in September 2009 and by DES in June 2010

Sample ID	Depth Below Surface (m)	GPS Coordinates Northing	GPS Coordinates Easting	pH Measured by EcoMetrix in September 2009 (pH units)	pH Measured by DES in June 2010 (pH units)
SW09-SR-1T	0	5149088	373857	3.9	6.5
SW09-SR-1B	1.4			5.2	--
SW09-SR-2T	0	5149667	374281	4.2	6.8
SW09-SR-2B	1.1			3.5	6.8
SW09-SR-3T	0	5150279	374301	5.6	6.8
SW09-SR-3B	1.3			7.3	6.9
SW09-SR-4T	0	5151193	374131	6.5	7.1
SW09-SR-4B	0.6			6.7	6.9
Average pH Value				**5.4**	**6.8**
Average pH Values Measured in the SRWMP				**D-4**	**6.8**
				D-5	**6.9**

Notes:
"--" pH could not be measured because water level was too low
Average pH Values Measured in the SRWMP were calculated from routine monitoring data from 2003 through 2006 in Minnow (2008)

Table 5.1: Summary of Selected Constituents in Serpent River Sediments Sampled in 2009

Sample ID	Radium-226	Barium	Sulphate
	(Bq/g)	(mg/kg)	(%)
CORE 09-SR-1 (0-5)	0.16	75	0.1
CORE 09-SR-1 (5-10)	0.08	65	<0.1
CORE 09-SR-1 (10-15)	0.02	61	0.1
CORE 09-SR-1 (15-20)	0.04	47	0.1
CORE 09-SR-2 (0-5)	14	6,400	0.5
CORE 09-SR-2 (5-10)	4.6	2,600	0.2
CORE 09-SR-2 (10-15)	0.06	200	<0.1
CORE 09-SR-3 (0-5)	8.2	2,300	0.2
CORE 09-SR-3 (5-10)	9.7	3,000	0.4
CORE 09-SR-3 (10-15)	16	3,600	0.8
CORE 09-SR-3 (15-20)	20	4,100	1.0
CORE 09-SR-4 (0-5)	2.6	770	0.2
CORE 09-SR-4 (5-10)	2.7	580	0.2
CORE 09-SR-4 (10-15)	2.1	440	0.2

Table 5.2: Summary of Selected Constituents in Serpent River Surface Water Sampled in 2009

Sample ID	Depth	Radium-226	Barium	Sulphate
	(cm)	(Bq/L)	(mg/L)	(mg/L)
SW09-SR-1T	0	<0.01	0.01	8.5
SW09-SR-1B	140	<0.01	0.02	5.6
PW09-SR-1 (0-5)	0-5	0.02	0.03	2.6
PW09-SR-1 (5-10)	5-10	<0.02	0.03	<2
PW09-SR-1 (10-15)	10-15	<0.01	0.03	<2
PW09-SR-1 (15-20)	15-20	<0.01	0.02	<2
SW09-SR-2T	0	0.11	0.12	31
SW09-SR-2B	110	0.28	0.294	45
PW09-SR-2 (0-5)	0-5	2.4	2.16	16
PW09-SR-2 (5-10)	5-10	2.3	2.38	14
PW09-SR-2 (10-15)	10-15	0.87	1.5	--
SW09-SR-3T	0	0.15	0.147	30
SW09-SR-3B	130	0.80	0.334	26
PW09-SR-3 (0-5)	0-5	5.1	1.91	7.9
PW09-SR-3 (5-10)	5-10	6.0	3.11	4
PW09-SR-3 (10-15)	10-15	5.4	3.75	<2
PW09-SR-3 (15-20)	15-20	4.5	3.24	<2
SW09-SR-4T	0	0.19	0.191	25
SW09-SR-4B	60	0.30	0.222	25
PW09-SR-4 (0-5)	0-5	0.87	0.561	19
PW09-SR-4 (5-10)	5-10	1.2	0.621	8.1
PW09-SR-4 (10-15)	10-15	1.4	0.602	4.9

Notes:
SW - Surface Water - Depth refers to "below surface"
PW - Porewater - Depth refers to "below sediment-water interface"
T - top of water column
B - bottom of water column

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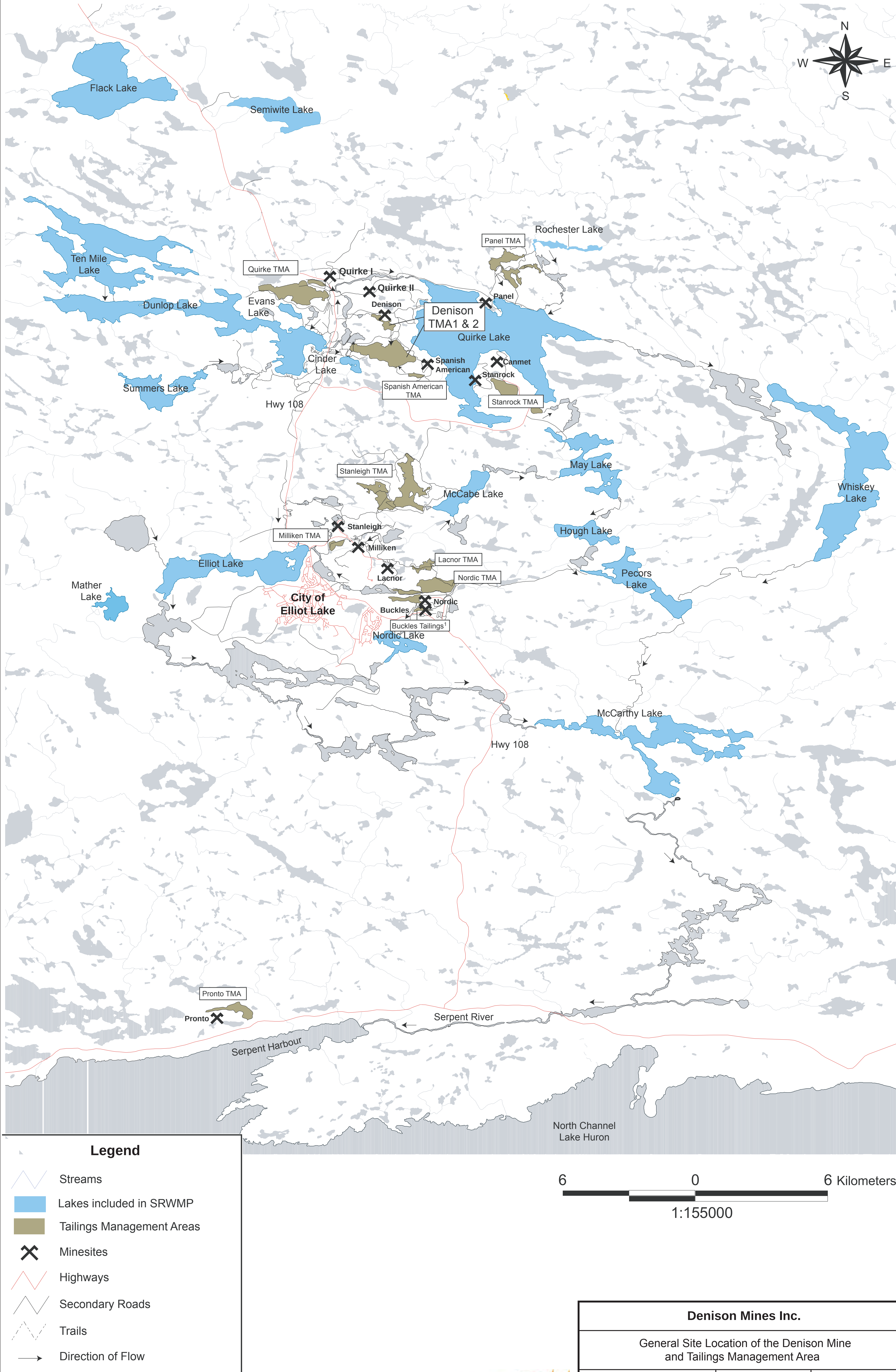
FIGURES



Denison Mines Inc.

General Site Location of the Denison Mine and Tailings Management Area

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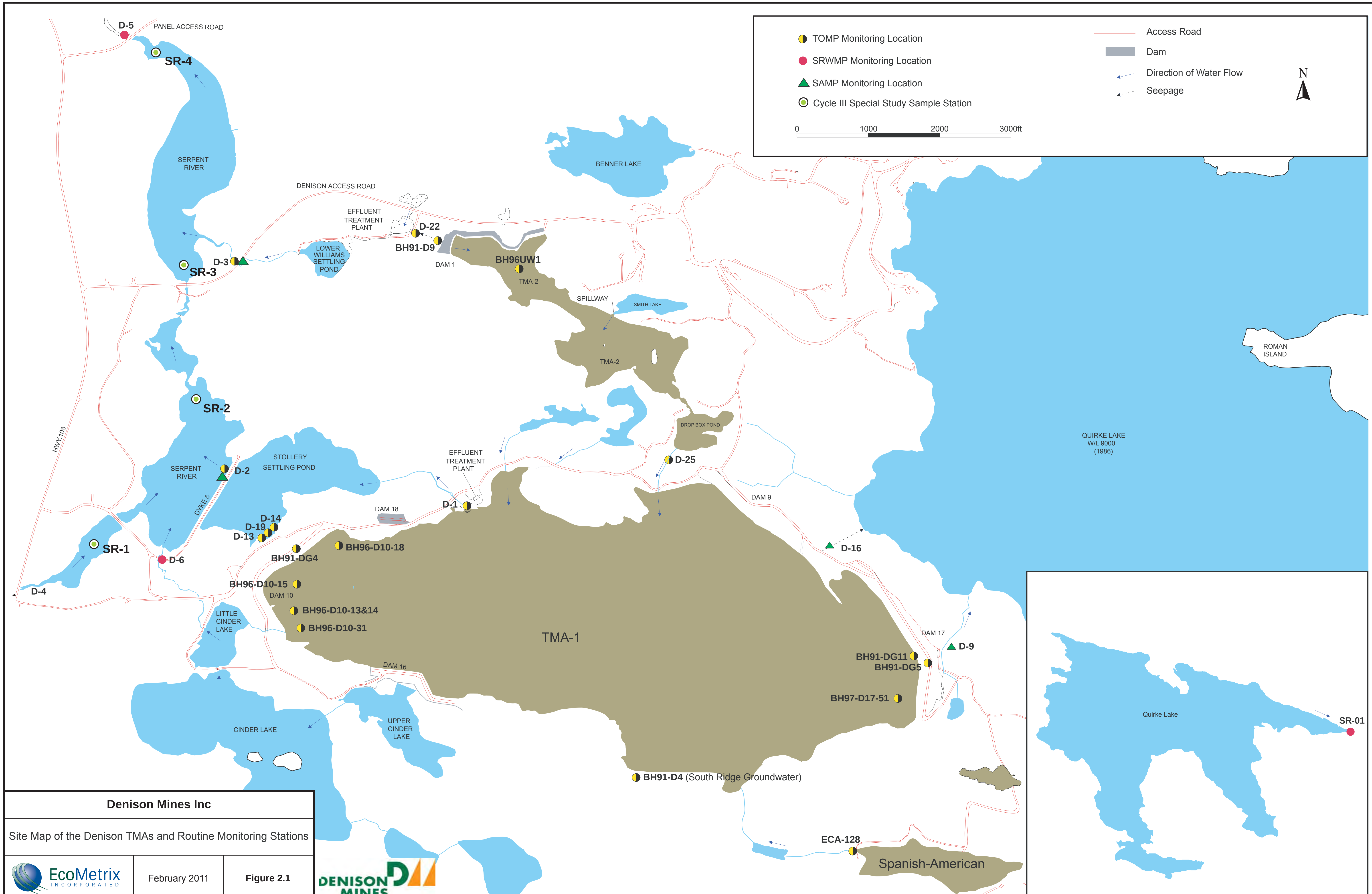
Figure 1.1



Denison Mines Inc

Site Map of the Denison TMAs and Routine Monitoring Stations

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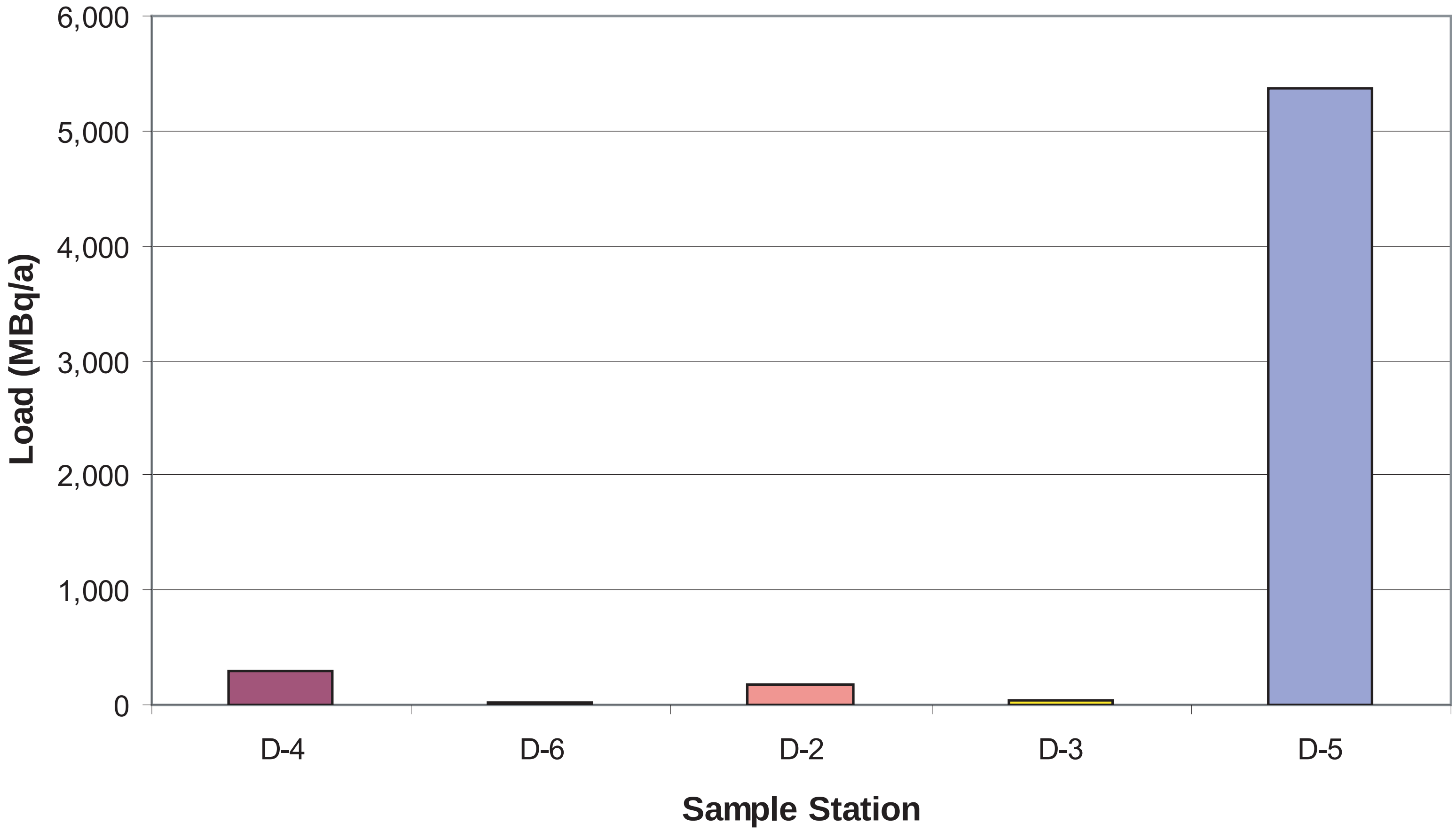
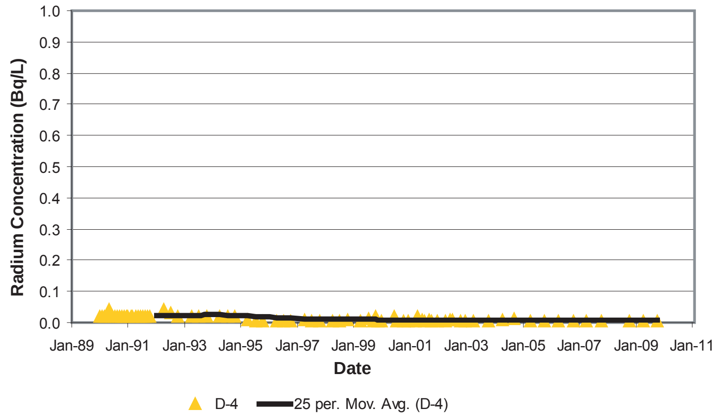
Figure 2.1



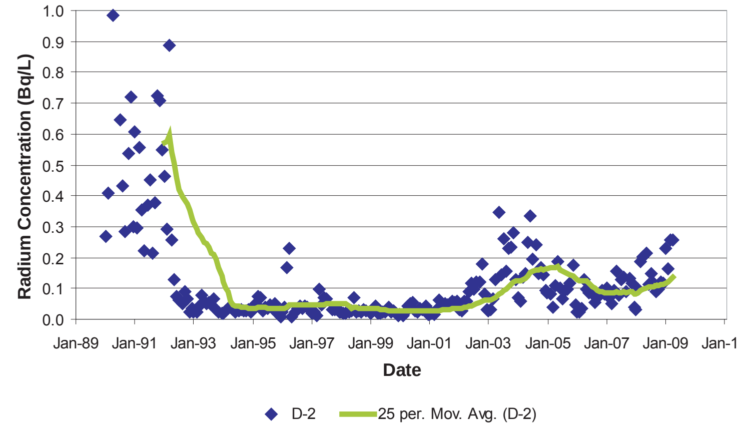
Denison Mines Inc.		
Mean Radium-226 Loadings from Denison Mine and Relative Contributions to Receiving Waters 2003-2006 (Minnow, 2008)		
EcoMetrix INCORPORATED	February 2011	**Figure 2.2**

DENISON MINES

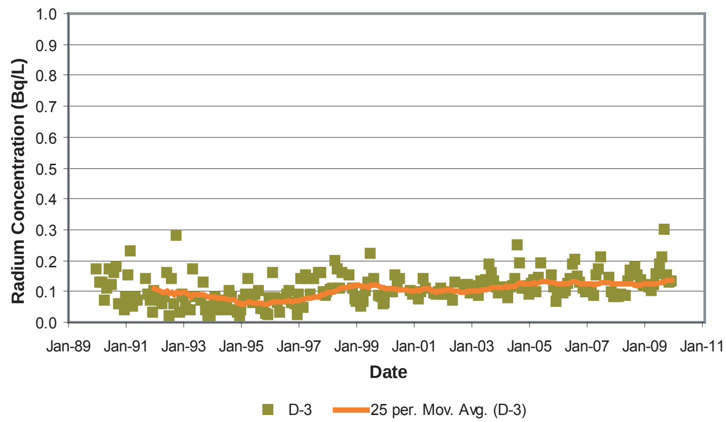
D-4



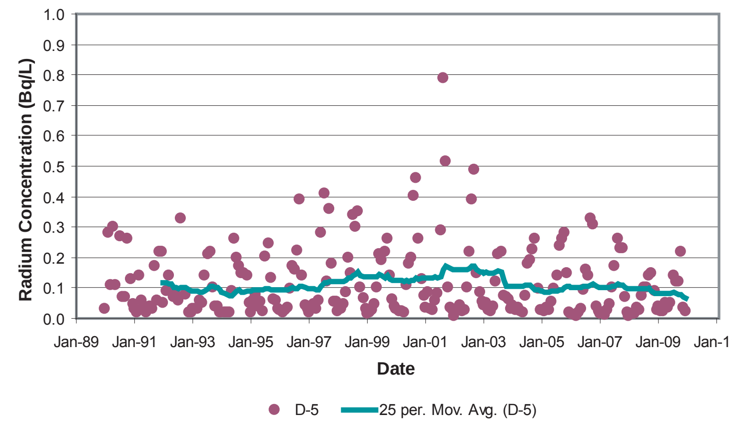
D-2



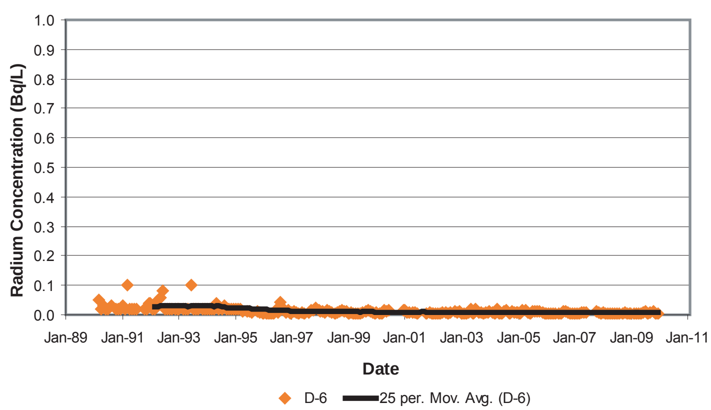
D-3



D-5

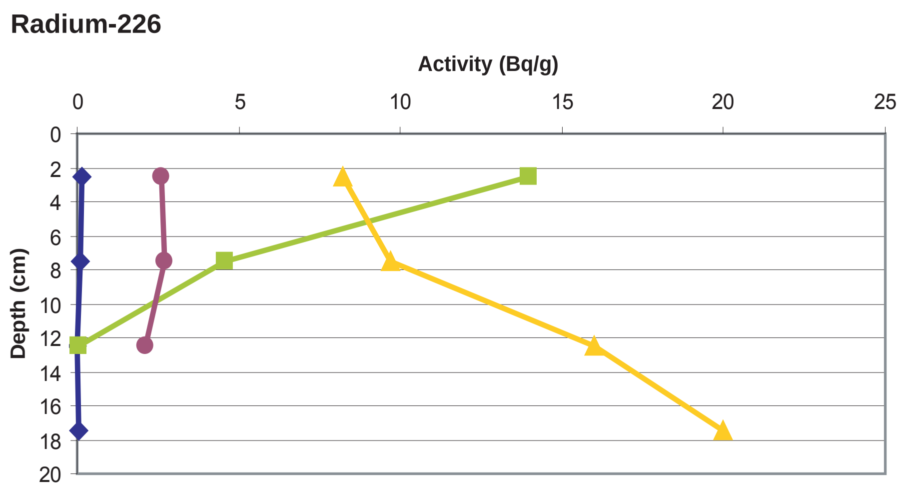


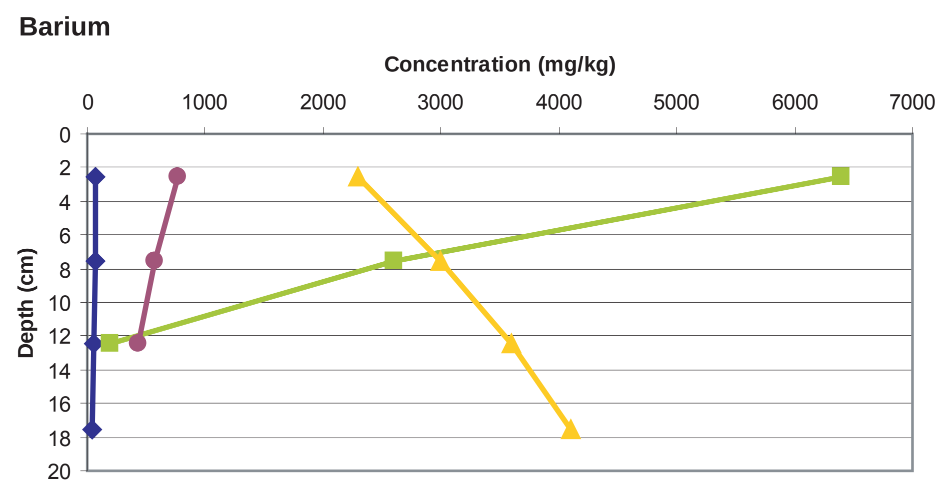
D-6

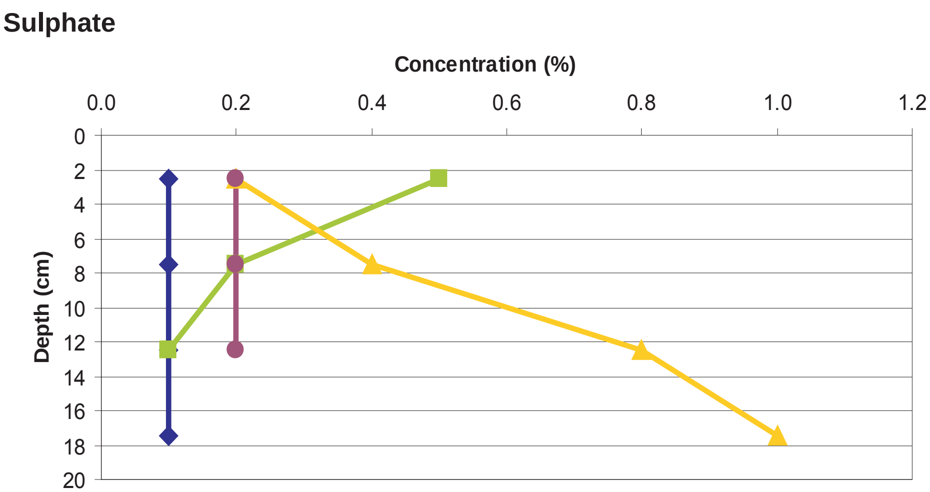


Notes: Some data prior to 1990 not shown for D-2

Denison Mines Inc.		
Routine Monitoring Data for Radium-226 from Selected Stations for the Denison TMAs		
EcoMetrix INCORPORATED	February 2011	**Figure 2.3**







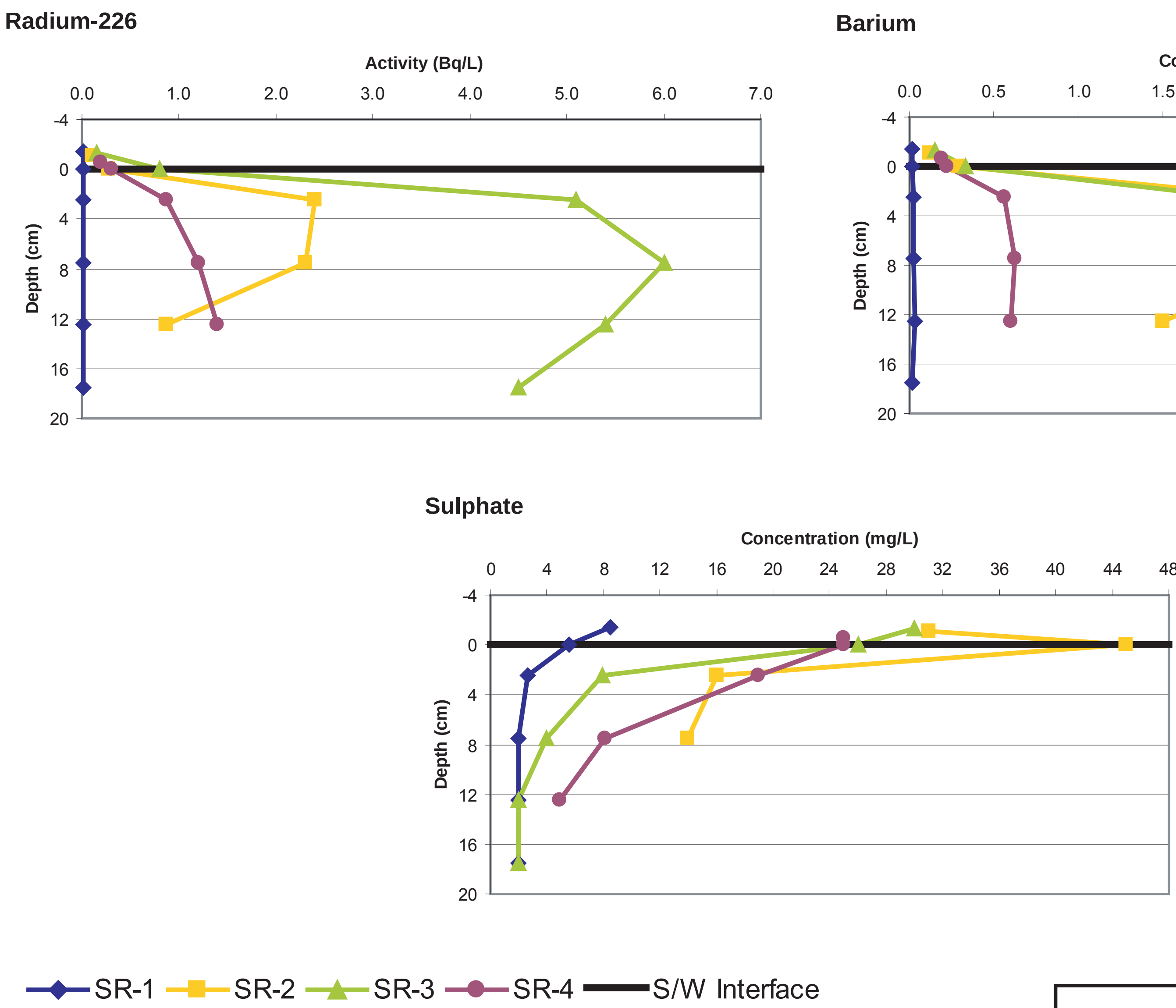
SR-1 SR-2 SR-3 SR-4

DENISON MINES

Denison Mines Inc.

Depth Profiles for Selected Constituents in Sediment

EcoMetrix INCORPORATED	February 2011	**Figure 5.1**



Notes: Sulphate not analysed for the 10 to 15 cm section from SR-2 due to lack of sample volume
Data points above the surface water interface represent Top and Bottom water samples.
See Table 5.2 for actual depth values.

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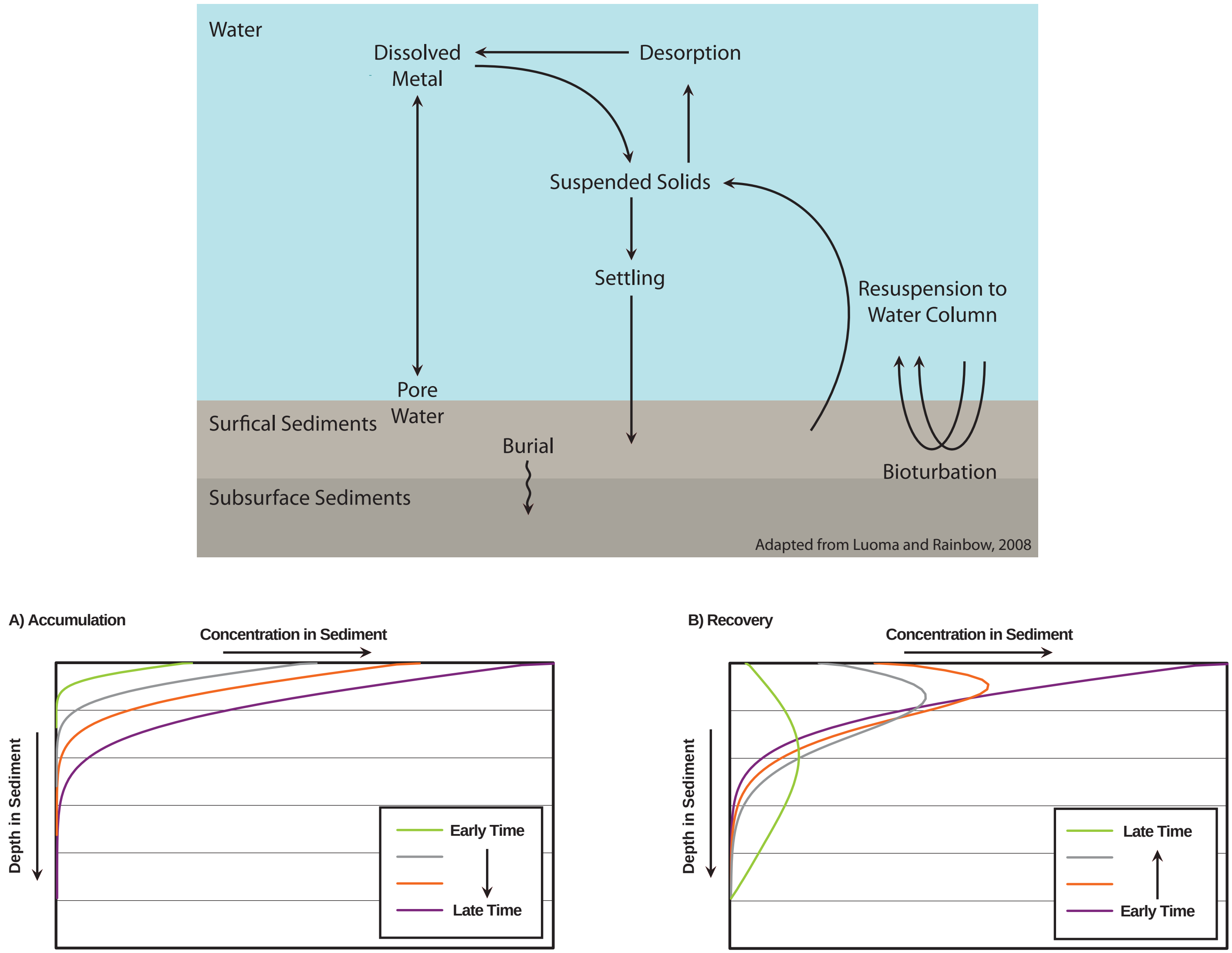
Denison Mines Inc.		
Depth Profiles for Selected Constituents in Surface Water and Porewater		
EcoMetrix INCORPORATED	February 2011	**Figure 5.2**



Denison Mines Inc.

Conceptual Model for Accumulation and Recovery for Ra-226 in Sediments

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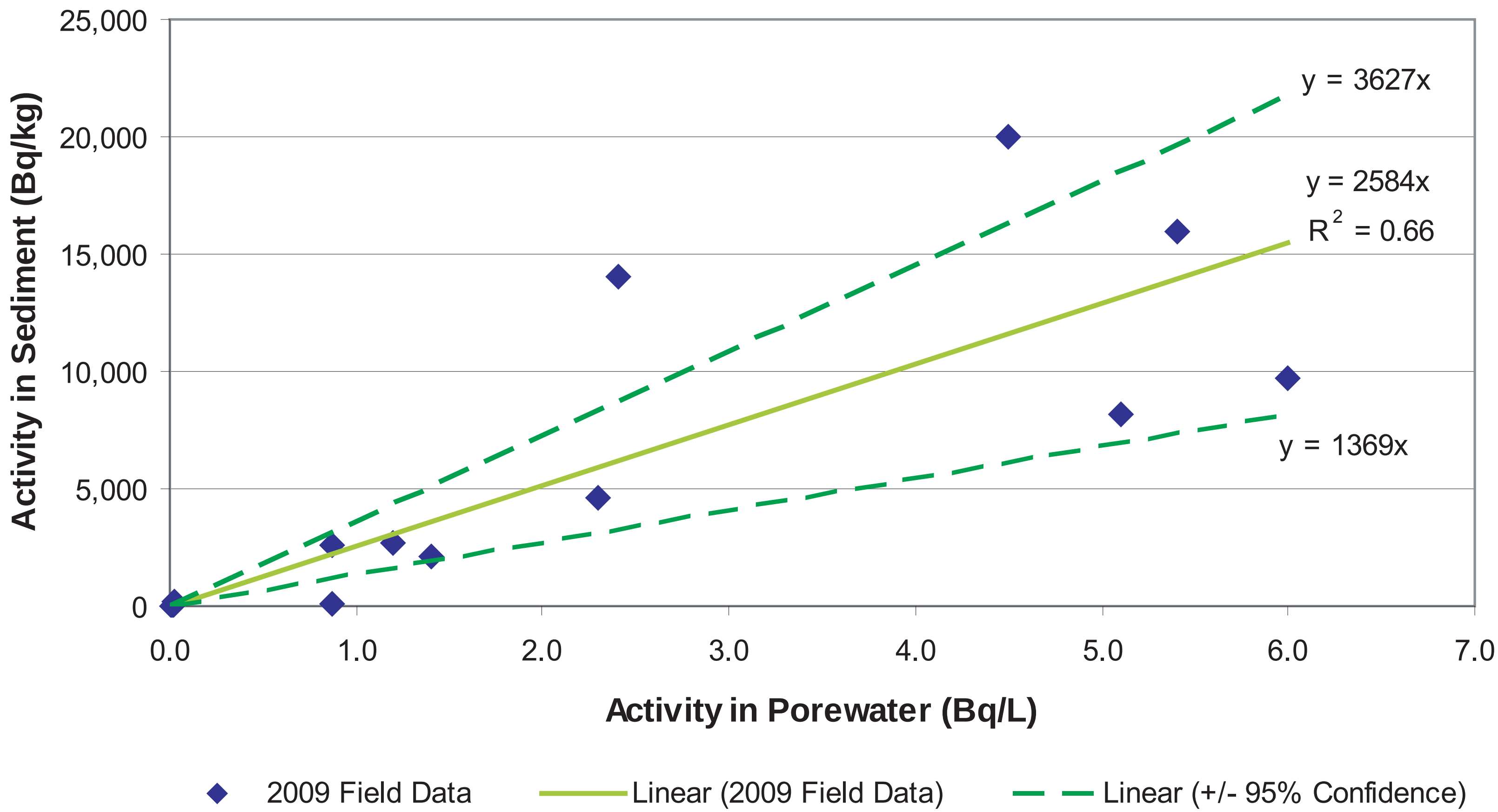
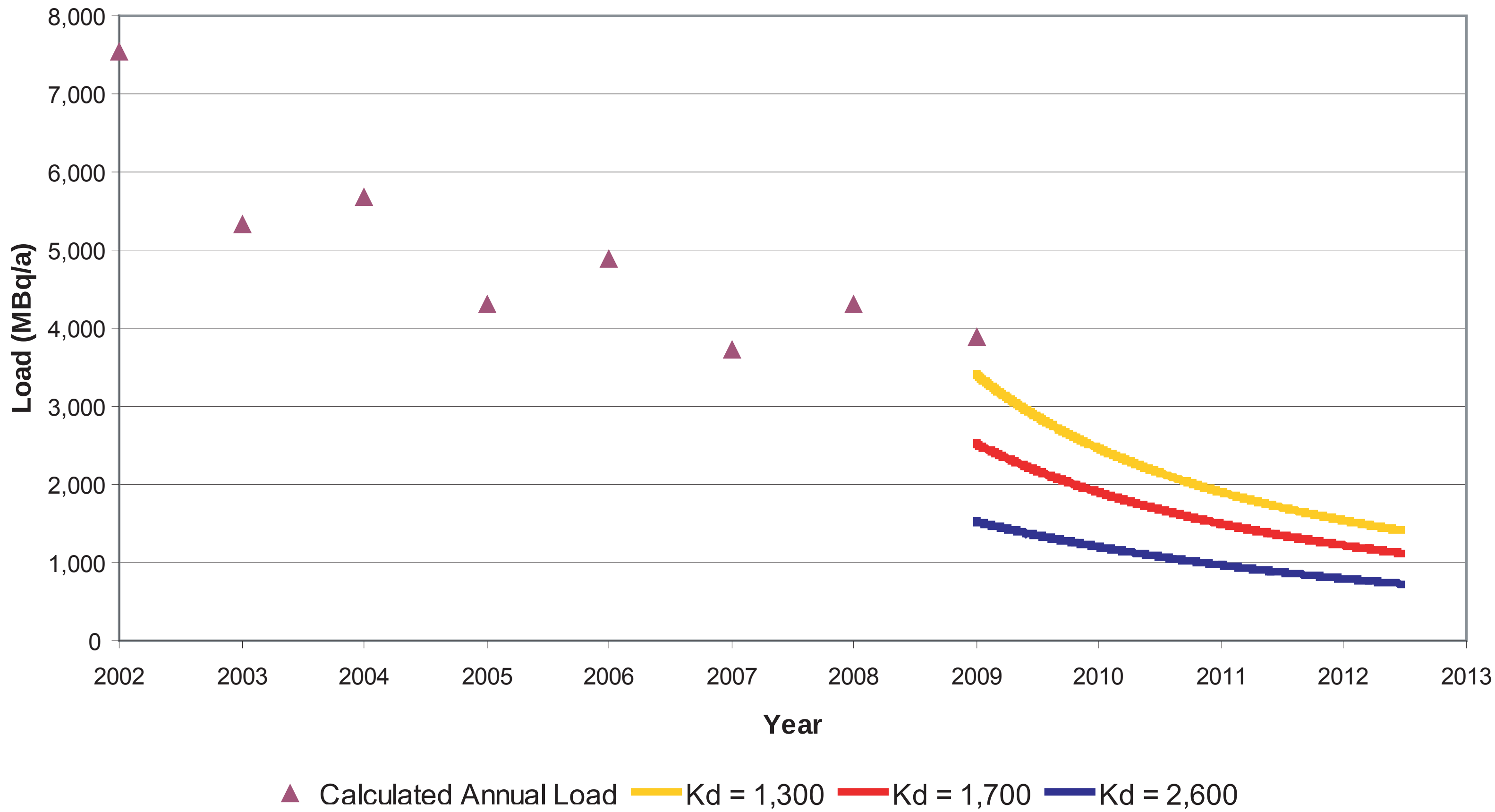
Figure 6.1



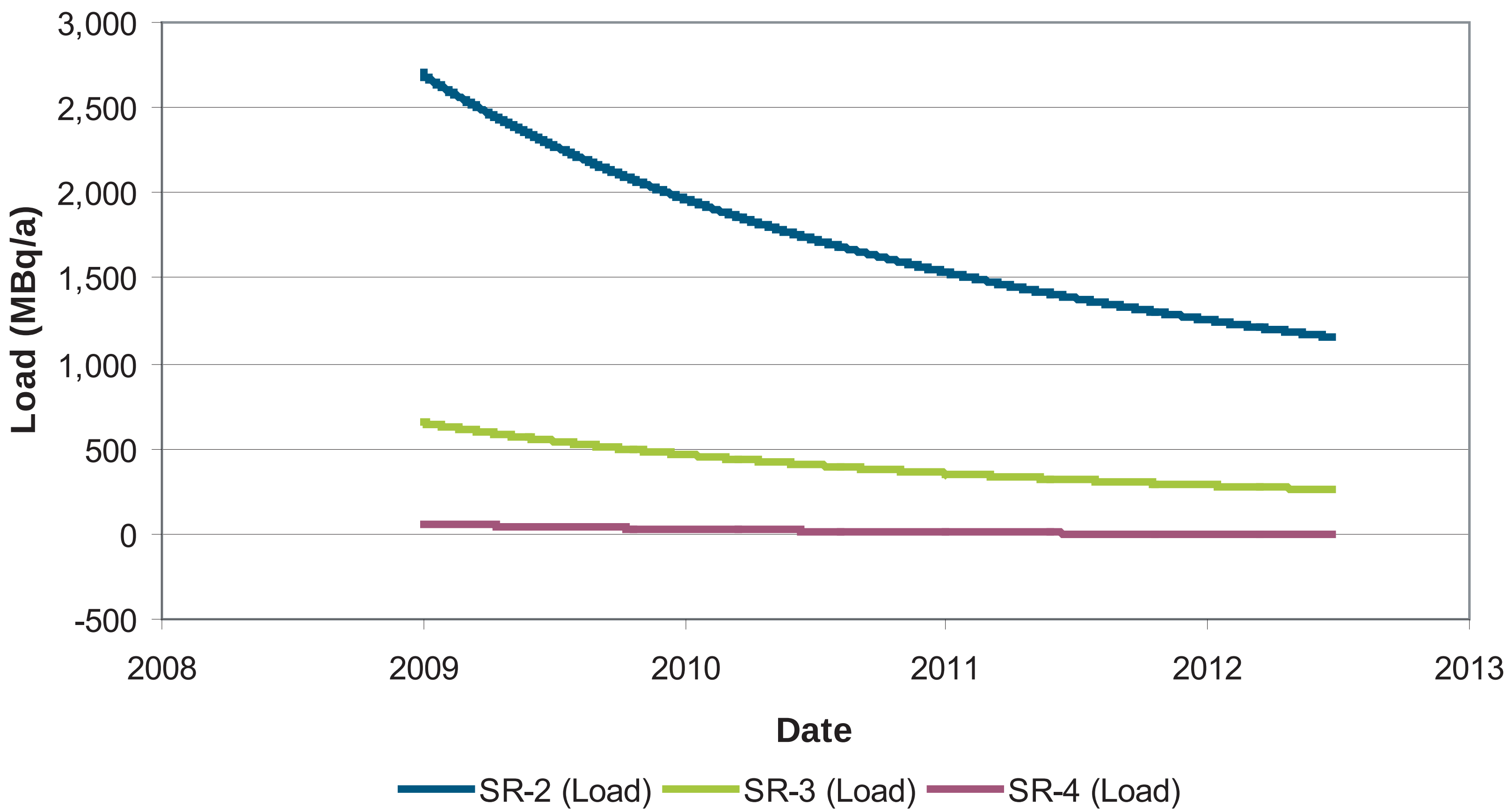
Denison Mines Inc.		
Kd Plot for Radium-226 in Serpent River Sediment Samples		
EcoMetrix INCORPORATED	February 2011	**Figure 6.2**



Denison Mines Inc.

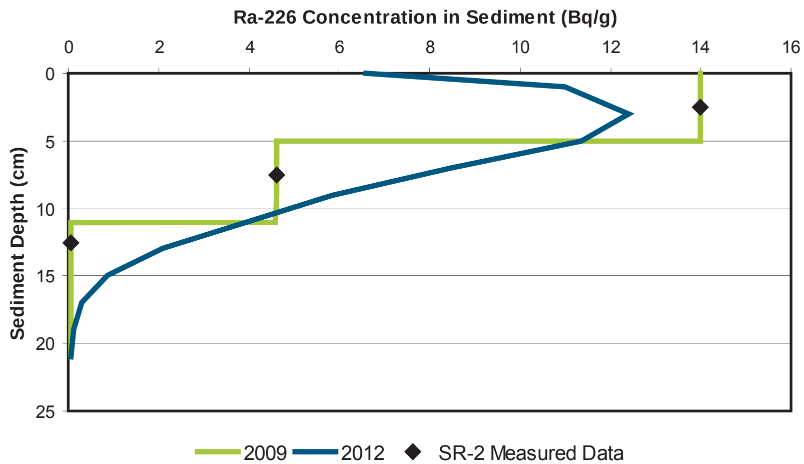
Calculated Annual Loads and Modeled Cumulative Loads
at D-5 in the Serpent River

EcoMetrix INCORPORATED | February 2011 | **Figure 6.3**

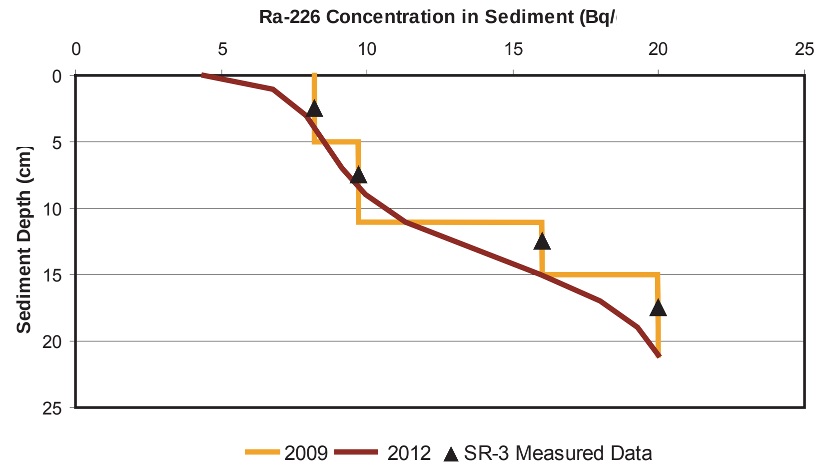


Denison Mines Inc.		
Predicted Loads at SR-2, SR-3 and SR-4		
EcoMetrix INCORPORATED	February 2011	Figure 6.4

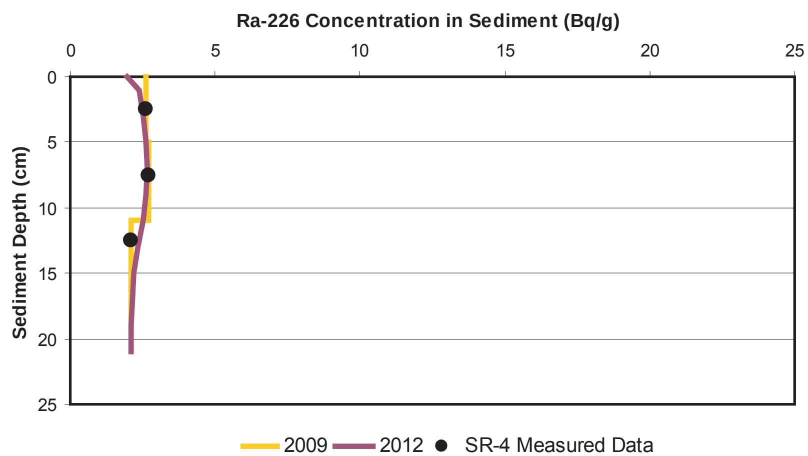
SR-2



SR-3



SR-4



Note: Measured data from 2009 field study (Table 5.1).

Denison Mines Inc.		
Depth Profiles for Ra-226 Recovery		
EcoMetrix INCORPORATED	February 2011	**Figure 6.5**

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APPENDIX 1

Compilation of Routine Monitoring Data for Radium-226 at the Denison TMA

Table A1.1: Routine Monitoring Data for Radium-226 Activities at the Denison TMA

D2		D3		D4		D5		D6	
Sample Date	Radium-226 Activity (Bq/L)	Sample Date	Radium-226 Activity (Bq/L)	Sample Date	Radium-226 Activity (Bq/L)	Sample Date	Radium-226 Activity (Bq/L)	Sample Date	Radium-226 Activity (Bq/L)
Jan-90	0.268	Jan-90	0.17	Jan-90	<0.02	Jan-90	0.03	Mar-90	0.05
Feb-90	0.407	Feb-90	0.13	Feb-90	<0.02	Feb-90	0.28	Apr-90	<0.02
Mar-90	1.58	Mar-90	0.13	Mar-90	<0.02	Mar-90	0.11	May-90	0.03
Apr-90	0.985	Apr-90	0.07	Apr-90	0.02	Apr-90	0.3	Jun-90	<0.02
May-90	1.26	May-90	0.11	May-90	0.04	May-90	0.11	Jul-90	0.02
Jun-90	1.013	Jun-90	0.17	Jun-90	<0.02	Jun-90		Aug-90	0.03
Jul-90	0.646	Jul-90	0.12	Jul-90	<0.02	Jul-90	0.27	Sep-90	
Aug-90	0.433	Aug-90	0.16	Aug-90	<0.02	Aug-90	0.07	Oct-90	<0.02
Sep-90	0.285	Sep-90	0.18	Sep-90	<0.02	Sep-90	0.07	Nov-90	<0.02
Oct-90	0.536	Oct-90	0.06	Oct-90	<0.02	Oct-90	0.26	Dec-90	0.02
Nov-90	0.72	Nov-90	0.06	Nov-90	<0.02	Nov-90	0.13	Jan-91	0.03
Dec-90	0.3	Dec-90	0.04	Dec-90	<0.02	Dec-90	0.045	Feb-91	<0.02
Jan-91	0.608	Jan-91	0.08	Jan-91	<0.02	Jan-91	0.03	Mar-91	0.1
Feb-91	0.297	Feb-91	0.15	Feb-91	0.02	Feb-91	0.02	Apr-91	<0.02
Mar-91	0.558	Mar-91	0.23	Mar-91	0.02	Mar-91	0.14	May-91	<0.02
Apr-91	0.356	Apr-91	0.05	Apr-91	<0.02	Apr-91	0.06	Jun-91	0.02
May-91	0.22	May-91	0.08	May-91	0.02	May-91	0.04	Jul-91	0.02
Jun-91	0.37	Jun-91	0.07	Jun-91	<0.02	Jun-91	<0.02	Aug-91	
Jul-91	0.452	Jul-91		Jul-91	<0.02	Jul-91	0.04	Sep-91	
Aug-91	0.215	Aug-91		Aug-91	<0.02	Aug-91	0.03	Oct-91	<0.02
Sep-91	0.378	Sep-91	0.14	Sep-91	<0.02	Sep-91	0.17	Nov-91	<0.02
Oct-91	0.724	Oct-91	0.09	Oct-91	0.02	Oct-91	0.06	Dec-91	0.04
Nov-91	0.71	Nov-91	0.07	Nov-91		Nov-91	0.22	Jan-92	0.04
Dec-91	0.55	Dec-91	0.03	Dec-91		Dec-91	0.22	Feb-92	0.02
Jan-92	0.462	Jan-92	0.1	Jan-92		Jan-92	0.05	Mar-92	<0.02
Feb-92	0.292	Feb-92	0.08	Feb-92		Feb-92	0.09	Apr-92	0.05
Mar-92	0.886	Mar-92	0.07	Mar-92		Mar-92	0.14	May-92	0.06
Apr-92	0.258	Apr-92	0.06	Apr-92	0.04	Apr-92	0.09	Jun-92	0.08
May-92	0.13	May-92	0.08	May-92		May-92	0.07	Jul-92	<0.02
Jun-92	0.074	Jun-92	0.16	Jun-92		Jun-92	0.08	Aug-92	0.02
Jul-92	0.062	Jul-92	<0.02	Jul-92	0.03	Jul-92	0.06	Sep-92	<0.02
Aug-92	0.052	Aug-92	0.14	Aug-92		Aug-92	0.33	Oct-92	<0.02
Sep-92	0.088	Sep-92	0.06	Sep-92		Sep-92		Nov-92	<0.02
Oct-92	0.068	Oct-92	0.28	Oct-92	<0.02	Oct-92	0.08	Dec-92	<0.02
Nov-92	0.025	Nov-92	0.03	Nov-92		Nov-92	0.02	Jan-93	<0.02
Dec-92	0.034	Dec-92	0.09	Dec-92		Dec-92	0.02	Mar-93	0.02
Jan-93	0.023	Jan-93	0.08	Jan-93		Jan-93	0.03	Apr-93	0.02
Feb-93	0.023	Feb-93	0.05	Feb-93		Feb-93	0.03	May-93	0.02
Mar-93	0.04	Mar-93	0.04	Mar-93		Mar-93	0.03	Jun-93	0.1
Apr-93	0.077	Apr-93	0.04	Apr-93	<0.02	Apr-93	0.06	Jul-93	<0.02
May-93	0.06	May-93	0.17	May-93		May-93	0.05	Aug-93	0.02
Jun-93	0.052	Jun-93	0.08	Jun-93		Jun-93	0.14	Sep-93	<0.02
Jul-93	0.055	Jul-93		Jul-93	<0.02	Jul-93	0.21	Nov-93	0.02
Aug-93	0.046	Aug-93	0.07	Aug-93		Aug-93	0.22	Dec-93	<0.02
Sep-93	0.065	Sep-93	0.13	Sep-93		Sep-93	0.1	Jan-94	<0.02
Oct-93	0.033	Oct-93	0.04	Oct-93	0.02	Oct-93	0.04	Feb-94	<0.02
Nov-93	0.024	Nov-93	0.02	Apr-94	<0.02	Nov-93	0.04	Mar-94	<0.02
Dec-93	0.02	Dec-93	0.02	Jul-94	<0.02	Dec-93	<0.02	Apr-94	<0.02
Jan-94	0.02	Jan-94	0.05	Sep-94		Jan-94	<0.02	May-94	0.04
Feb-94	0.028	Feb-94	0.08	Oct-94	<0.02	Feb-94	<0.02	Jun-94	<0.02
Mar-94	0.034	Mar-94	0.04	Apr-95	0.007	Mar-94	<0.02	Jul-94	<0.02
Apr-94	0.04	Apr-94	0.07	Jul-95	<0.005	Apr-94	<0.02	Aug-94	0.03
May-94	0.03	May-94	0.05	Oct-95	<0.005	May-94	0.09	Sep-94	<0.02
Jun-94	0.025	Jun-94	0.04	Jan-96		Jun-94	0.26	Oct-94	<0.02
Jul-94	0.028	Jul-94	0.05	Apr-96	<0.005	Jul-94	0.2	Nov-94	<0.02
Aug-94	0.03	Aug-94	0.1	Jul-96	<0.005	Aug-94	0.17	Dec-94	0.02
Sep-94	0.028	Sep-94	0.08	Oct-96	<0.005	Sep-94	0.15	Jan-95	<0.02
Oct-94	0.028	Oct-94	0.04	Apr-97	0.006	Oct-94	0.15	Feb-95	<0.02
Nov-94	0.032	Nov-94	0.03	Jul-97	<0.005	Nov-94	0.14	Mar-95	<0.02
Dec-94	0.023	Dec-94	0.02	Oct-97	<0.005	Dec-94	0.05	Apr-95	0.01
Jan-95	0.026	Jan-95	0.04	Apr-98	<0.005	Jan-95	0.02	May-95	
Feb-95	0.05	Feb-95	0.07	Jul-98	<0.005	Feb-95	0.06	Jun-95	0.01
Mar-95	0.073	Mar-95	0.09	Oct-98	0.006	Mar-95	0.08	Jul-95	0.011
Apr-95	0.07	Apr-95	0.14	Apr-99	<0.005	Apr-95	0.041	Aug-95	0.009
May-95	0.027	May-95	0.078	Jul-99	0.013	May-95	0.054	Oct-95	0.013
Jun-95	0.04	Jun-95	0.063	Sep-99	<0.005	Jun-95	0.024	Nov-95	0.007
Jul-95	0.035	Jul-95	0.091	Oct-99	0.017	Jul-95	0.203	Jan-96	<0.005
Aug-95	0.048	Aug-95	0.101	Nov-99	<0.005	Aug-95	0.245	Feb-96	<0.005
Sep-95	0.035	Sep-95	0.042	Jan-00	<0.005	Sep-95	0.133	Mar-96	<0.005
Oct-95	0.05	Oct-95	0.044	Jun-00	0.018	Oct-95	0.063	Apr-96	<0.005
Nov-95	0.014	Nov-95	0.026	Jul-00	<0.005	Nov-95	0.06	May-96	<0.005
Dec-95	0.009	Dec-95	0.025	Oct-00	<0.005	Dec-95	0.032	Jun-96	0.016
Jan-96	0.024	Jan-96	0.076	Dec-00	<0.005	Jan-96	0.029	Jul-96	0.006
Feb-96	0.039	Feb-96	0.16	Mar-01	<0.005	Feb-96	0.019	Aug-96	0.041
Mar-96	0.166	Mar-96	0.077	Apr-01	0.017	Mar-96	0.026	Sep-96	0.023
Apr-96	0.23	Apr-96	0.064	Jun-01	0.007	Apr-96	0.034	Oct-96	0.007
May-96	0.008	May-96	0.031	Jul-01	<0.005	May-96	0.098	Nov-96	0.014
Jun-96	0.022	Jun-96		Sep-01	0.008	Jun-96	0.17	Dec-96	<0.005
Jul-96	0.034	Jul-96	0.072	Oct-01	<0.005	Jul-96	0.161	Jan-97	0.006
Aug-96	0.042	Aug-96	0.091	Dec-01	<0.005	Aug-96	0.221	Feb-97	0.011
Sep-96	0.035	Sep-96	0.1	Apr-02	<0.005	Sep-96	0.39	Mar-97	0.009
Oct-96	0.041	Oct-96	0.061	Jun-02	0.007	Oct-96	0.14	Apr-97	<0.005

Table A1.1: Routine Monitoring Data for Radium-226 Activities at the Denison TMA

D2		D3		D4		D5		D6	
Sample Date	Radium-226 Activity (Bq/L)	Sample Date	Radium-226 Activity (Bq/L)	Sample Date	Radium-226 Activity (Bq/L)	Sample Date	Radium-226 Activity (Bq/L)	Sample Date	Radium-226 Activity (Bq/L)
Nov-96	0.04	*Nov-96*	0.06	*Jul-02*	0.007	*Nov-96*	0.043	*May-97*	0.008
Dec-96	0.032	*Dec-96*	0.022	*Oct-02*	<0.005	*Dec-96*	0.03	*Jun-97*	<0.005
Jan-97	0.02	*Jan-97*	0.091	*Dec-02*	<0.005	*Jan-97*	0.02	*Jul-97*	
Feb-97	0.022	*Feb-97*	0.14	*Apr-03*	<0.005	*Feb-97*	0.034	*Aug-97*	0.008
Mar-97	0.013	*Mar-97*	0.047	*Oct-03*	<0.005	*Mar-97*	0.045	*Sep-97*	0.015
Apr-97	0.097	*Apr-97*	0.15	*Apr-04*	0.009	*Apr-97*	0.032	*Oct-97*	0.014
May-97	0.047	*May-97*	0.14	*Sep-04*	0.01	*May-97*	0.057	*Nov-97*	0.025
Jun-97	0.07	*Jun-97*	0.09	*Apr-05*	<0.005	*Jun-97*	0.28	*Dec-97*	0.014
Jul-97	0.066	*Jul-97*	0.14	*Oct-05*	<0.005	*Jul-97*	0.41	*Jan-98*	0.011
Aug-97		*Aug-97*		*Apr-06*	<0.005	*Aug-97*	0.12	*Feb-98*	0.01
Sep-97	0.033	*Sep-97*	0.16	*Oct-06*	<0.005	*Sep-97*	0.36	*Mar-98*	0.006
Oct-97	0.032	*Oct-97*	0.16	*Apr-07*	<0.005	*Oct-97*	0.18	*Apr-98*	0.016
Nov-97	0.033	*Nov-97*	0.097	*Oct-07*	<0.005	*Nov-97*	0.054	*May-98*	0.011
Dec-97	0.022	*Dec-97*	0.087	*Apr-08*		*Dec-97*	0.055	*Jun-98*	0.006
Jan-98	0.025	*Jan-98*	0.099	*Oct-08*	<0.005	*Jan-98*	0.023	*Jul-98*	<0.005
Feb-98	0.021	*Feb-98*	0.105	*Apr-09*	<0.005	*Feb-98*	0.03	*Aug-98*	0.008
Mar-98	0.021	*Mar-98*	0.11	*Oct-09*	<0.005	*Mar-98*	0.047	*Sep-98*	0.011
Apr-98	0.023	*Apr-98*	0.2			*Apr-98*	0.086	*Oct-98*	0.015
May-98	0.029	*May-98*	0.17			*May-98*	0.201	*Nov-98*	0.01
Jun-98	0.071	*Jun-98*	0.11			*Jun-98*	0.15	*Dec-98*	0.01
Jul-98	0.023	*Jul-98*	0.16			*Jul-98*	0.34	*Jan-99*	<0.005
Aug-98	0.026	*Aug-98*				*Aug-98*	0.3	*Feb-99*	0.006
Sep-98	0.024	*Sep-98*				*Sep-98*	0.35	*Mar-99*	0.005
Oct-98	0.03	*Oct-98*	0.15			*Oct-98*	0.101	*Apr-99*	<0.005
Nov-98	0.027	*Nov-98*	0.11			*Nov-98*	0.068	*May-99*	<0.005
Dec-98	0.023	*Dec-98*	0.075			*Dec-98*	0.033	*Jun-99*	<0.005
Jan-99	0.02	*Jan-99*	0.068			*Jan-99*	0.014	*Jul-99*	0.008
Feb-99	0.028	*Feb-99*	0.082			*Feb-99*	0.021	*Aug-99*	0.01
Mar-99	0.043	*Mar-99*	0.051			*Mar-99*	0.028	*Sep-99*	0.017
Apr-99	0.021	*Apr-99*	0.067			*Apr-99*	0.048	*Oct-99*	0.012
May-99	0.021	*May-99*	0.1			*May-99*	0.1	*Nov-99*	0.008
Jun-99	0.022	*Jun-99*	0.13			*Jun-99*	0.21	*Dec-99*	<0.005
Jul-99	0.022	*Jul-99*	0.22			*Jul-99*	0.19	*Jan-00*	0.007
Aug-99	0.039	*Aug-99*	0.14			*Aug-99*	0.22	*Feb-00*	0.005
Sep-99	0.025	*Sep-99*				*Sep-99*	0.26	*Mar-00*	<0.005
Oct-99	0.029	*Oct-99*	0.085			*Oct-99*	0.14	*Apr-00*	0.014
Nov-99	0.021	*Nov-99*	0.082			*Nov-99*	0.063	*May-00*	0.013
Dec-99	0.012	*Dec-99*	0.06			*Dec-99*	0.041	*Jun-00*	0.015
Jan-00	0.017	*Jan-00*	0.061			*Jan-00*	0.03	*Jul-00*	
Feb-00	0.012	*Feb-00*	0.097			*Feb-00*	0.024	*Aug-00*	
Mar-00	0.025	*Mar-00*	0.098			*Mar-00*	0.022	*Sep-00*	
Apr-00	0.043	*Apr-00*	0.096			*Apr-00*	0.019	*Oct-00*	
May-00	0.049	*May-00*	0.15			*May-00*	0.11	*Nov-00*	
Jun-00	0.054	*Jun-00*	0.13			*Jun-00*	0.18	*Dec-00*	0.015
Jul-00	0.028	*Jul-00*	0.14			*Jul-00*	0.2	*Jan-01*	0.015
Aug-00	0.022	*Aug-00*				*Aug-00*	0.401	*Feb-01*	0.006
Sep-00	0.034	*Sep-00*				*Sep-00*	0.461	*Mar-01*	0.009
Oct-00	0.031	*Oct-00*				*Oct-00*	0.261	*Apr-01*	0.007
Nov-00	0.041	*Nov-00*	0.103			*Nov-00*	0.13	*May-01*	0.007
Dec-00	0.015	*Dec-00*	0.089			*Dec-00*	0.074	*Jun-01*	<0.005
Jan-01	0.017	*Jan-01*	0.092			*Jan-01*	0.035	*Jul-01*	
Feb-01	0.02	*Feb-01*	0.094			*Feb-01*	0.084	*Aug-01*	
Mar-01	0.016	*Mar-01*	0.073			*Mar-01*	0.032	*Sep-01*	
Apr-01	0.03	*Apr-01*	0.099			*Apr-01*	0.028	*Oct-01*	<0.005
May-01	0.062	*May-01*	0.14			*May-01*	0.06	*Nov-01*	0.008
Jun-01	0.045	*Jun-01*	0.11			*Jun-01*	0.081	*Dec-01*	<0.005
Jul-01	0.052	*Jul-01*				*Jul-01*	0.29	*Jan-02*	<0.005
Aug-01	0.045	*Aug-01*				*Aug-01*	0.79	*Feb-02*	<0.005
Sep-01	0.052	*Sep-01*	0.093			*Sep-01*	0.515	*Mar-02*	<0.005
Oct-01	0.058	*Oct-01*	0.09			*Oct-01*	0.1	*Apr-02*	<0.005
Nov-01	0.053	*Nov-01*	0.098			*Nov-01*	0.035	*May-02*	0.007
Dec-01	0.059	*Dec-01*	0.11			*Dec-01*	0.029	*Jun-02*	0.007
Jan-02	0.031	*Jan-02*	0.09			*Jan-02*	0.009	*Jul-02*	<0.005
Feb-02	0.026	*Feb-02*	0.088			*Feb-02*	0.032	*Aug-02*	0.008
Mar-02	0.06	*Mar-02*	0.096			*Mar-02*	0.042	*Sep-02*	
Apr-02	0.058	*Apr-02*	0.09			*Apr-02*	0.024	*Oct-02*	0.011
May-02	0.09	*May-02*	0.071			*May-02*	0.026	*Nov-02*	0.006
Jun-02	0.115	*Jun-02*	0.13			*Jun-02*	0.1	*Dec-02*	0.011
Jul-02	0.098	*Jul-02*				*Jul-02*	0.22	*Jan-03*	<0.005
Aug-02	0.119	*Aug-02*				*Aug-02*	0.39	*Feb-03*	<0.005
Sep-02	0.122	*Sep-02*				*Sep-02*	0.49	*Mar-03*	<0.005
Oct-02	0.178	*Oct-02*	0.122			*Oct-02*	0.15	*Apr-03*	0.006
Nov-02	0.082	*Nov-02*	0.12			*Nov-02*	0.084	*May-03*	0.021
Dec-02	0.03	*Dec-02*	0.095			*Dec-02*	0.056	*Jun-03*	<0.005
Jan-03	0.027	*Jan-03*	0.109			*Jan-03*	0.042	*Jul-03*	0.019
Feb-03	0.033	*Feb-03*	0.105			*Feb-03*	0.052	*Aug-03*	0.007
Mar-03	0.068	*Mar-03*	0.116			*Mar-03*	0.027	*Sep-03*	0.009
Apr-03	0.127	*Apr-03*	0.086			*Apr-03*	0.025	*Oct-03*	0.005
May-03	0.345	*May-03*	0.131			*May-03*	0.039	*Nov-03*	0.008
Jun-03	0.145	*Jun-03*	0.118			*Jun-03*	0.12	*Dec-03*	0.009
Jul-03	0.262	*Jul-03*	0.137			*Jul-03*	0.21	*Jan-04*	0.011
Aug-03	0.155	*Aug-03*	0.185			*Aug-03*	0.22	*Feb-04*	0.009

Table A1.1: Routine Monitoring Data for Radium-226 Activities at the Denison TMA

D2		D3		D4		D5		D6	
Sample Date	Radium-226 Activity (Bq/L)	Sample Date	Radium-226 Activity (Bq/L)	Sample Date	Radium-226 Activity (Bq/L)	Sample Date	Radium-226 Activity (Bq/L)	Sample Date	Radium-226 Activity (Bq/L)
Sep-03	0.228	*Sep-03*	0.16			*Sep-03*	0.076	*Mar-04*	<0.005
Oct-03	0.232	*Oct-03*	0.134			*Oct-03*	0.072	*Apr-04*	0.021
Nov-03	0.282	*Nov-03*	0.114			*Nov-03*	0.063	*May-04*	0.005
Dec-03	0.127	*Dec-03*	0.092			*Dec-03*	0.032	*Jun-04*	<0.005
Jan-04	0.071	*Jan-04*	0.106			*Jan-04*	0.044	*Jul-04*	0.01
Feb-04	0.059	*Feb-04*	0.111			*Feb-04*	0.028	*Aug-04*	0.014
Mar-04	0.137	*Mar-04*	0.111			*Mar-04*	0.037	*Sep-04*	<0.005
Apr-04	0.146	*Apr-04*	0.077			*Apr-04*	0.024	*Oct-04*	0.01
May-04	0.25	*May-04*	0.111			*May-04*	0.021	*Nov-04*	0.007
Jun-04	0.334	*Jun-04*	0.116			*Jun-04*	0.074	*Dec-04*	0.008
Jul-04	0.193	*Jul-04*	0.142			*Jul-04*	0.18	*Jan-05*	0.008
Aug-04	0.242	*Aug-04*	0.25			*Aug-04*	0.19	*Feb-05*	<0.005
Sep-04	0.148	*Sep-04*	0.19			*Sep-04*	0.225	*Mar-05*	0.015
Oct-04	0.168	*Oct-04*	0.109			*Oct-04*	0.26	*Apr-05*	0.015
Nov-04	0.144	*Nov-04*	0.11			*Nov-04*	0.098	*May-05*	0.006
Dec-04	0.092	*Dec-04*	0.116			*Dec-04*	0.028	*Jun-05*	<0.005
Jan-05	0.087	*Jan-05*	0.091			*Jan-05*	0.029	*Jul-05*	0.011
Feb-05	0.08	*Feb-05*	0.124			*Feb-05*	0.023	*Aug-05*	0.011
Mar-05	0.039	*Mar-05*	0.136			*Mar-05*	0.035	*Sep-05*	0.011
Apr-05	0.109	*Apr-05*	0.098			*Apr-05*	0.029	*Oct-05*	0.012
May-05	0.186	*May-05*	0.144			*May-05*	0.055	*Nov-05*	0.007
Jun-05	0.1	*Jun-05*	0.19			*Jun-05*	0.099	*Dec-05*	<0.005
Jul-05	0.067	*Jul-05*				*Jul-05*	0.14	*Jan-06*	<0.005
Aug-05	0.095	*Aug-05*				*Aug-05*	0.24	*Feb-06*	<0.005
Sep-05	0.096	*Sep-05*				*Sep-05*	0.26	*Mar-06*	<0.005
Oct-05	0.115	*Oct-05*	0.15			*Oct-05*	0.28	*Apr-06*	0.005
Nov-05	0.176	*Nov-05*	0.112			*Nov-05*	0.15	*May-06*	0.005
Dec-05	0.046	*Dec-05*	0.068			*Dec-05*	0.02	*Jun-06*	0.005
Jan-06	0.022	*Jan-06*	0.099			*Jan-06*	0.017	*Jul-06*	<0.005
Feb-06	0.025	*Feb-06*	0.101			*Feb-06*	0.012	*Aug-06*	0.011
Mar-06	0.034	*Mar-06*	0.094			*Mar-06*	0.009	*Sep-06*	0.013
Apr-06	0.128	*Apr-06*	0.102			*Apr-06*	0.018	*Oct-06*	0.008
May-06	0.097	*May-06*	0.126			*May-06*	0.03	*Nov-06*	<0.005
Jun-06	0.086	*Jun-06*	0.14			*Jun-06*	0.095	*Dec-06*	<0.005
Jul-06	0.082	*Jul-06*	0.185			*Jul-06*	0.16	*Jan-07*	<0.005
Aug-06	0.053	*Aug-06*	0.203			*Aug-06*	0.14	*Feb-07*	0.005
Sep-06	0.072	*Sep-06*	0.149			*Sep-06*	0.33	*Mar-07*	<0.005
Oct-06	0.079	*Oct-06*	0.13			*Oct-06*	0.31	*Apr-07*	0.007
Nov-06	0.092	*Nov-06*	0.11			*Nov-06*	0.041	*May-07*	0.007
Dec-06	0.082	*Dec-06*	0.097			*Dec-06*	0.024	*Jun-07*	0.007
Jan-07	0.103	*Jan-07*	0.099			*Jan-07*	0.015	*Jul-07*	
Feb-07	0.071	*Feb-07*	0.112			*Feb-07*	0.019	*Aug-07*	
Mar-07	0.049	*Mar-07*	0.099			*Mar-07*	0.013	*Sep-07*	
Apr-07	0.092	*Apr-07*	0.086			*Apr-07*	0.027	*Oct-07*	0.013
May-07	0.156	*May-07*	0.15			*May-07*	0.048	*Nov-07*	0.007
Jun-07	0.079	*Jun-07*	0.173			*Jun-07*	0.1	*Dec-07*	<0.005
Jul-07	0.128	*Jul-07*	0.21			*Jul-07*	0.17	*Jan-08*	0.007
Aug-07	0.136	*Aug-07*				*Aug-07*	0.26	*Feb-08*	<0.005
Sep-07	0.088	*Sep-07*				*Sep-07*	0.23	*Mar-08*	<0.005
Oct-07	0.134	*Oct-07*	0.143			*Oct-07*	0.23	*Apr-08*	<0.005
Nov-07	0.118	*Nov-07*	0.096			*Nov-07*	0.071	*May-08*	<0.005
Dec-07	0.038	*Dec-07*	0.083			*Dec-07*	0.02	*Jun-08*	<0.005
Jan-08	0.031	*Jan-08*	0.088			*Jan-08*	0.009	*Jul-08*	<0.005
Feb-08	0.097	*Feb-08*	0.082			*Feb-08*	0.015	*Aug-08*	0.005
Mar-08	0.185	*Mar-08*	0.089			*Mar-08*	0.015	*Sep-08*	<0.005
Apr-08	0.202	*Apr-08*	0.085			*Apr-08*	0.035	*Oct-08*	0.007
May-08	0.215	*May-08*	0.087			*May-08*	0.027	*Nov-08*	<0.005
Jun-08	0.112	*Jun-08*	0.131			*Jun-08*	0.074	*Dec-08*	<0.005
Jul-08	0.146	*Jul-08*	0.168			*Jul-08*	0.1	*Jan-09*	<0.005
Aug-08	0.117	*Aug-08*	0.16			*Aug-08*	0.1	*Feb-09*	0.005
Sep-08	0.089	*Sep-08*	0.18			*Sep-08*	0.14	*Mar-09*	<0.005
Oct-08	0.099	*Oct-08*	0.153			*Oct-08*	0.15	*Apr-09*	<0.005
Nov-08	0.12	*Nov-08*	0.135			*Nov-08*	0.089	*May-09*	<0.005
Dec-08	0.117	*Dec-08*	0.122			*Dec-08*	0.029	*Jun-09*	0.007
Jan-09	0.23	*Jan-09*	0.117			*Jan-09*	0.038	*Jul-09*	0.013
Feb-09	0.165	*Feb-09*	0.115			*Feb-09*	0.022	*Aug-09*	<0.005
Mar-09	0.258	*Mar-09*	0.113			*Mar-09*	0.023	*Sep-09*	0.009
Apr-09	0.258	*Apr-09*	0.101			*Apr-09*	0.052	*Oct-09*	0.012
		May-09	0.12			*May-09*	0.037	*Nov-09*	<0.005
		Jun-09	0.154			*Jun-09*	0.051	*Dec-09*	<0.005
		Jul-09	0.188			*Jul-09*	0.14		
		Aug-09	0.21			*Aug-09*	0.12		
		Sep-09	0.3			*Sep-09*	0.12		
		Oct-09	0.153			*Oct-09*	0.22		
		Nov-09	0.128			*Nov-09*	0.035		
		Dec-09	0.132			*Dec-09*	0.025		

EcoMetrix INCORPORATED

APPENDIX 2

Photographic Log of Field Sampling in 2009

Core Sample: Core09-SR-3

Core Sample: Core09-SR-4

Denison Mines Inc		
Photographs from the Serpent River Field Sampling Program		
EcoMetrix INCORPORATED	February 2011	**Figure A2.1**

Serpent River Sampling Location SR-1

Denison Mines Inc

Photographs from the Serpent River Field Sampling Program

EcoMetrix Incorporated	February 2011	**Figure A2.2**

Serpent River Sampling Location SR-2

Denison Mines Inc

Photographs from the Serpent River Field Sampling Program

EcoMetrix INCORPORATED | February 2011 | **Figure A2.3**


Serpent River Sampling Location SR-3

Denison Mines Inc

Photographs from the Serpent River Field Sampling Program

EcoMetrix Incorporated	February 2011	**Figure A2.4**

APPENDIX 3

Detailed Data Quality Assessment

Table A3.1: Detailed Data Quality Assessment for Constituents in Solids

Analysis	Units	Method Detection Limit	RPD Data Quality Objective	Sample ID CORE 09-PSB-2 (5-10)	Duplicate ID CORE 09-EC-1 (0-5)	RPD (%) or AD	Sample ID CORE 09-SR-4 (10-15)	Duplicate ID CORE 09-EC-1 (5-10)	RPD (%) or AD	Sample ID CORE 09-QC14-2 (0-2.5)	Replicate ID CORE 09-EC-2 (0-2.5)	RPD (%) or AD	Sample ID CORE 09-QC14-2 (2.5-5)	Replicate ID CORE 09-EC-2 (2.5-5)	RPD (%) or AD	Sample ID CORE 09-QC14-2 (5-7.5)	Replicate ID CORE 09-EC-2 (5-7.5)	RPD (%) or AD
Conventional Parameters																		
Sulphur (S)	%	0.005	≤ 40%	1.57	1.17	29	1.00	0.762	27	0.633	0.628	1	0.885	1.03	15	0.871	1.18	30
Carbonate (CO_3)	%	0.005	≤ 40%	0.097	0.058	**50**	0.419	0.280	40	<0.005	<0.005	BD	<0.005	<0.005	BD	<0.005	<0.005	BD
Total Organic Carbon (TOC)	%	0.01	≤ 40%	9.78	10.5	7	16.8	16.7	1	0.519	0.617	17	0.289	0.206	34	0.121	0.090	29
Total Carbon (C)	%	0.005	≤ 40%	9.80	10.5	7	16.9	16.8	1	0.519	0.616	17	0.289	0.207	33	0.121	0.089	30
Sulphide	%	0.01	≤ 40%	0.36	0.47	27	0.65	0.70	7	0.52	0.53	2	0.77	1.04	30	0.84	1.07	24
Sulphate (SO_4)	%	0.1	≤ 40%	0.6	0.3	**0.3**	0.2	0.1	0.1	0.1	0.1	0	0.1	0.1	0	0.1	0.1	0
Metals																		
Radium-226 (Ra-226)	Bq/g	0.01	≤ 40%	4.5	4.1	9	2.1	1.6	27	4.3	7.0	**48**	6.5	8.3	24	9.3	20.0	**73**
Silver (Ag)	mg/kg	0.7	≤ 40%	<0.7	<0.7	BD	<0.7	<0.7	BD	0.8	1.5	**1**	1.0	1.2	0.2	1.1	1.1	0
Aluminum (Al)	mg/kg	1	≤ 40%	3600	3800	5	5600	5800	4	830	1500	**58**	690	1200	**54**	850	890	5
Arsenic (As)	mg/kg	1	≤ 40%	14	14	0	26	26	0	17	22	26	19	24	23	21	24	13
Barium (Ba)	mg/kg	0.05	≤ 40%	160	94	**52**	440	450	2	150	280	**60**	220	370	**51**	330	310	6
Beryllium (Be)	mg/kg	0.1	≤ 40%	0.34	0.35	0.01	0.12	0.13	0.01	0.28	0.51	**0.23**	0.28	0.41	0.1	0.34	0.34	0
Bismuth (Bi)	mg/kg	0.5	≤ 40%	11	12	9	<0.5	<0.5	BD	7.5	11	38	9.2	8.6	7	8.5	7.8	9
Calcium (Ca)	mg/kg	1	≤ 40%	7600	4600	**49**	7300	7400	1	190	230	19	130	110	17	79	63	23
Cadmium (Cd)	mg/kg	0.05	≤ 40%	4.5	4.0	12	1.8	1.8	0	0.18	0.25	33	0.22	0.27	20	0.22	0.29	27
Cerium (Ce)	mg/kg	0.006	≤ 40%	220	240	9	840	800	5	300	340	13	290	300	3	280	240	15
Cobalt (Co)	mg/kg	0.3	≤ 40%	15	15	0	16	17	6	15	16	6	18	21	15	17	22	26
Chromium (Cr)	mg/kg	0.5	≤ 40%	6.5	7.8	18	17	17	0	4.7	8.2	**54**	4.9	6.5	28	5.7	5.8	2
Cesium (Cs)	mg/kg	0.01	≤ 40%	0.97	1.1	13	0.87	0.90	3	0.18	0.32	**56**	0.22	0.20	10	0.31	0.19	**48**
Copper (Cu)	mg/kg	0.1	≤ 40%	14	15	7	56	56	0	43	50	15	46	54	16	42	54	25
Iron (Fe)	mg/kg	0.5	≤ 40%	240000	240000	0	12000	16000	29	10000	13000	26	12000	17000	34	13000	19000	38
Gallium (Ga)	mg/kg	0.03	≤ 40%	2.4	2.7	12	6.6	6.5	2	2.1	2.8	29	2.1	2.4	13	2.0	1.9	5
Germanium (Ge)	mg/kg	0.3	≤ 40%	7.2	7.2	0	3.8	4.0	5	1.2	1.4	0.2	1.2	1.4	0.2	1.2	1.2	0
Hafnium (Hf)	mg/kg	0.1	≤ 40%	0.1	0.1	0	0.6	0.9	40	0.3	0.5	**0.2**	0.6	0.7	15	1.0	0.7	35
Indium (In)	mg/kg	0.01	≤ 40%	<0.01	<0.01	BD	<0.01	0.01	BD	<0.01	0.02	BD	<0.01	0.01	BD	0.01	0.01	0
Potassium (K)	mg/kg	1	≤ 40%	190	210	10	270	270	0	210	330	44	230	300	26	250	230	8
Lanthanum (La)	mg/kg	0.001	≤ 40%	110	130	17	430	420	2	170	190	11	170	170	0	160	140	13
Lithium (Li)	mg/kg	0.1	≤ 40%	0.9	0.9	0	1.1	1.3	17	0.2	0.8	**120**	0.1	0.5	**0.4**	0.4	0.2	**0.2**
Lutetium (Lu)	mg/kg	0.001	≤ 40%	0.98	1.1	12	5.3	5.3	0	0.081	0.14	**53**	0.048	0.060	22	0.031	0.038	20
Magnesium (Mg)	mg/kg	1	≤ 40%	360	240	40	1400	1500	7	88	110	22	46	38	19	25	18	33
Manganese (Mn)	mg/kg	0.05	≤ 40%	89	84	6	180	180	0	13	18	32	8.6	7.6	12	4.7	4.6	2
Molybdenum (Mo)	mg/kg	0.5	≤ 40%	10	10	0	3.6	3.9	8	5.3	6.4	19	5.2	6.1	16	7.9	5.5	36
Sodium (Na)	mg/kg	1	≤ 40%	35	40	13	59	55	7	8	11	32	7	8	13	6	5	1
Niobium (Nb)	mg/kg	0.7	≤ 40%	2.8	2.7	4	0.8	<0.7	BD	7.0	9.7	32	8.2	7.8	5	8.4	7.5	11
Nickel (Ni)	mg/kg	1	≤ 40%	17	19	11	43	43	0	8	9	12	8	10	22	8	11	32
Lead (Pb)	mg/kg	0.7	≤ 40%	270	280	4	640	640	0	180	240	29	260	270	4	270	310	14
Phosphorous (P)	mg/kg	5	≤ 40%	740	810	9	340	360	6	260	400	**42**	300	360	18	360	330	9
Rubidium (Rb)	mg/kg	0.004	≤ 40%	2.1	2.5	17	4.0	4.0	0	1.9	2.6	31	1.9	2.0	5	1.8	1.4	25
Antimony (Sb)	mg/kg	1	≤ 40%	<1	<1	BD	<1	<1	BD	<1	1	BD	<1	<1	BD	<1	<1	BD
Scandium (Sc)	mg/kg	0.2	≤ 40%	1.3	1.6	21	2.7	3.0	11	0.5	0.9	**57**	0.4	0.8	**67**	0.5	0.6	0.1
Selenium (Se)	mg/kg	1	≤ 40%	<1	<2	BD	<1	<2	BD	<2	<2	BD	<2	<2	BD	<2	<2	BD
Tin (Sn)	mg/kg	6	≤ 40%	<6	<6	BD	<6	<6	BD	<6	<6	BD	<6	<6	BD	<6	<6	BD
Strontium (Sr)	mg/kg	0.01	≤ 40%	7.6	7.9	4	14	14	0	3.6	5.1	34	4.1	5.4	27	4.8	4.6	4
Sulphur (S)	mg/kg	1	≤ 40%	--	15000	--	11000	11000	0	6500	6700	3	8700	11000	23	8600	12000	33
Tantalum (Ta)	mg/kg	0.01	≤ 40%	0.05	0.05	0	0.15	0.23	**42**	0.04	0.07	**55**	0.05	0.12	**82**	0.12	0.28	**80**
Terbium (Tb)	mg/kg	0.01	≤ 40%	3.9	4.3	10	35	33	6	0.97	1.4	36	0.83	0.90	8	0.68	0.67	1
Tellurium (Te)	mg/kg	0.1	≤ 40%	0.1	0.1	0	<0.1	<0.1	BD	0.1	0.2	0.1	0.2	0.2	0	0.2	0.2	0
Thorium (Th)	mg/kg	0.01	≤ 40%	110	120	9	85	89	5	310	560	**57**	310	470	41	360	380	5
Titanium (Ti)	mg/kg	0.2	≤ 40%	82	91	10	210	220	5	210	330	**44**	250	260	4	260	240	8
Thallium (Tl)	mg/kg	3	≤ 40%	<3	<3	BD	<3	<3	BD	<3	<3	BD	<3	<3	BD	<3	<3	BD
Uranium (U)	mg/kg	3	≤ 40%	210	230	9	110	150	31	17	23	30	17	18	6	13	15	2
Vanadium (V)	mg/kg	0.1	≤ 40%	25	26	4	16	17	6	2.7	4.0	39	2.7	2.7	0	2.7	2.4	12
Tungsten (W)	mg/kg	1	≤ 40%	2	79	**190**	<1	5	BD	3	5	**2**	4	5	1	5	6	18
Yttrium (Y)	mg/kg	0.1	≤ 40%	78	84	7	740	750	1	9.1	12	27	6.8	6.7	1	5.5	5.2	6
Ytterbium (Yb)	mg/kg	0.1	≤ 40%	7.4	8.7	16	45	46	2	0.74	1.2	**47**	0.46	0.57	21	0.33	0.40	0.07
Zinc (Zn)	mg/kg	0.1	≤ 40%	64	65	2	55	58	5	8.8	8.9	1	6.9	8.0	15	4.7	5.8	21
Zirconium (Zr)	mg/kg	5	≤ 40%	6	6	0	6	<5	BD	20	30	40	26	27	4	28	26	7

Notes:
RPD - relative percent difference; is calculated for analytes with concentrations greater than or equal to five times the detection limit and should be less than or equal to 40%
AD - absolute difference; for samples having concentrations less than five times the detection limit, the difference between the sample and duplicate, or difference between the sample or duplicate and the detection limit if either the sample or duplicate analyte concentration is below detection limit; should not be greater then the detection limit
BD - Sample and/or replicate had analyte concentrations below detection limit
Boldface type and shaded indicates that Data Quality Objective was not achieved

Table A3.2: Detailed Data Quality Assessment for Constituents in Waters

Analysis	Units	Method Detection Limit	RPD Data Quality Objective	Sample ID	Duplicate ID	RPD (%) or AD	Sample ID	Duplicate ID	Dupicate ID	RPD (%) or AD
				SW09-SR-4B	PW09-EC-1 (0-5)		PW09-QC14-3 (0-5)	PW09-QC14-4 (0-5)	PW09-EC-1 (5-10)	
Conventional Parameters										
Acidity (as $CaCO_3$)	mg/L	2	≤ 20%	<2.0	--	--	6	19	--	--
Dissolved Inorganic Carbon (DIC)	mg/L	0.2	≤ 20%	1.4	--	--	2.0	<1.0	--	BD
Dissolved Organic Carbon (DOC)	mg/L	0.2	≤ 20%	2.0	--	--	3.5	9.3	--	--
Sulphate (SO_4)	mg/L	0.2	≤ 20%	25	--	--	5.6	512	--	--
Hardness (as $CaCO_3$)	mg/L	0.5	≤ 20%	33.4	33.9	1	18	NC	17.8	1
Metals										
Radium-226 (Ra-226)	Bq/L	0.01	≤ 20%	0.30	0.30	0	NC	4.1	4.7	14
Aluminum (Al)	mg/L	0.01	≤ 20%	<0.01	<0.01	BD	<0.01	NC	<0.01	BD
Arsenic (As)	mg/L	0.0002	≤ 20%	0.0007	0.0006	0.0001	0.0026	NC	0.0024	8
Barium (Ba)	mg/L	0.00001	≤ 20%	0.222	0.221	0	0.333	NC	0.335	1
Beryllium (Be)	mg/L	0.00002	≤ 20%	<0.00002	<0.00002	BD	0.00013	NC	<0.00002	BD
Boron (B)	mg/L	0.0002	≤ 20%	0.0089	0.0082	8	0.0026	NC	0.0028	0.0002
Bismuth (Bi)	mg/L	0.00001	≤ 20%	0.00001	<0.00001	BD	0.00012	NC	<0.00001	BD
Calcium (Ca)	mg/L	0.03	≤ 20%	11.2	11.4	2	6.12	NC	6.06	1
Cadmium (Cd)	mg/L	0.000003	≤ 20%	0.000028	0.000012	0.000016	0.000112	NC	<0.000003	BD
Cobalt (Co)	mg/L	0.000002	≤ 20%	0.00031	0.000321	3	0.00189	NC	0.00192	2
Chromium (Cr)	mg/L	0.0005	≤ 20%	<0.0005	<0.0005	BD	<0.0005	NC	<0.0005	BD
Copper (Cu)	mg/L	0.0005	≤ 20%	0.0011	0.001	0.0001	<0.0005	NC	<0.0005	BD
Iron (Fe)	mg/L	0.01	≤ 20%	0.08	0.07	13	7.18	NC	6.63	8
Potassium (K)	mg/L	0.01	≤ 20%	0.80	0.80	0	0.37	NC	0.58	**44**
Lithium (Li)	mg/L	0.002	≤ 20%	<0.002	<0.002	BD	<0.002	NC	<0.002	BD
Magnesium (Mg)	mg/L	0.003	≤ 20%	1.29	1.31	2	0.67	NC	0.655	2
Manganese (Mn)	mg/L	0.00001	≤ 20%	0.119	0.12	1	0.143	NC	0.142	1
Molybdenum (Mo)	mg/L	0.00001	≤ 20%	0.00032	0.00029	10	0.00045	NC	0.00051	13
Sodium (Na)	mg/L	0.01	≤ 20%	2.79	2.75	1	1.3	NC	1.24	5
Nickel (Ni)	mg/L	0.0001	≤ 20%	0.0006	0.0008	**29**	0.001	NC	0.001	0
Lead (Pb)	mg/L	0.00002	≤ 20%	0.00043	0.00023	**61**	0.00029	NC	0.00016	**58**
Phosphorous (P)	mg/L	0.01	≤ 20%	<0.01	<0.01	BD	<0.01	NC	<0.01	BD
Antimony (Sb)	mg/L	0.0002	≤ 20%	0.0002	<0.0002	BD	<0.0002	NC	<0.0002	BD
Selenium (Se)	mg/L	0.001	≤ 20%	<0.001	<0.001	BD	<0.001	NC	<0.001	BD
Sulphur (S)	mg/L	0.01	≤ 20%	8.58	7.26	17	1.67	NC	1.58	6
Silicon (Si)	mg/L	0.01	≤ 20%	0.73	0.72	1	5.18	NC	5.07	2
Tin (Sn)	mg/L	0.00001	≤ 20%	0.00016	<0.00001	BD	<0.00001	NC	0.00002	BD
Strontium (Sr)	mg/L	0.0001	≤ 20%	0.0268	0.0269	0	0.017	NC	0.0168	1
Titanium (Ti)	mg/L	0.0001	≤ 20%	0.0001	<0.0001	BD	0.0003	NC	0.0003	0
Thallium (Tl)	mg/L	0.0002	≤ 20%	<0.0002	<0.0002	BD	<0.0002	NC	<0.0002	BD
Uranium (U)	mg/L	0.000001	≤ 20%	0.00122	0.000835	**37**	0.000744	NC	0.000671	10
Vanadium (V)	mg/L	0.00003	≤ 20%	0.00008	0.00007	0.00001	0.00019	NC	0.00005	**0.00014**
Zinc (Zn)	mg/L	0.001	≤ 20%	0.004	0.003	0.001	0.002	NC	0.001	0.001

Analysis	Sample ID	Replicate ID	RPD (%) or AD	Sample ID	Replicate ID	RPD (%) or AD	Sample ID	Replicate ID	RPD (%) or AD	Sample ID	Replicate ID	RPD (%) or AD	Sample ID	Replicate ID	RPD (%) or AD
	SW09-QC14-2T	SW09-EC-2T		SW09-QC14-2B	SW09-EC-2B		PW09-QC14-2 (0-2.5)	PW09-EC-2 (0-2.5)		PW09-QC14-2 (2.5-5)	PW09-EC-2 (2.5-5)		PW09-QC14-2 (5-7.5)	PW09-EC-2 (5-7.5)	
Conventional Parameters															
Acidity (as $CaCO_3$)	56	67	18	15	16	6	21	17	**21**	15	16	6	16	--	--
Dissolved Inorganic Carbon (DIC)	<1.0	<1.0	BD	<1.0	<1.0	BD	<1.0	4.2	BD	<1.0	1.1	BD	<1.0	--	BD
Dissolved Organic Carbon (DOC)	14.4	11.4	**23**	19.4	11.7	**50**	28	19	**38**	18.3	14.3	**25**	17.9	--	--
Sulphate (SO_4)	72	85	17	32	36	12	32	27	17	12	18	**40**	12	--	--
Hardness (as $CaCO_3$)	16.9	17	1	16.6	16.8	1	26.2	21.7	19	16.9	16	5	17.9	16.4	9
Metals															
Radium-226 (Ra-226)	0.82	0.78	5	0.91	0.85	7	3.6	2.9	**22**	2.8	3.3	16	5.9	5.4	9
Aluminum (Al)	<0.01	0.03	BD	<0.01	<0.01	BD	<0.01	<0.01	BD	0.03	<0.01	BD	<0.01	<0.01	BD
Arsenic (As)	0.0006	0.0007	0.0001	0.0011	0.0007	**0.0004**	0.0064	0.0058	10	0.0084	0.0046	**58**	0.0066	0.0065	2
Barium (Ba)	0.104	0.108	4	0.108	0.114	5	0.309	0.285	8	0.308	0.337	9	0.519	0.487	6
Beryllium (Be)	<0.00002	0.00003	BD	<0.00002	0.00002	BD	<0.00002	<0.00002	BD	<0.00002	<0.00002	BD	<0.00002	<0.00002	BD
Boron (B)	0.0045	0.0076	**51**	0.0056	0.0072	**25**	0.0054	0.0039	**32**	0.0047	0.0034	**32**	0.0051	0.0039	**27**
Bismuth (Bi)	<0.00001	0.00002	BD	<0.00001	0.00002	BD	0.00003	0.00003	0	0.00024	0.00006	**120**	0.00006	0.00003	**0.00003**
Calcium (Ca)	5.69	5.69	0	5.55	5.63	1	8.79	7.28	19	5.68	5.35	6	6.06	5.54	9
Cadmium (Cd)	0.000023	0.000046	**67**	0.000023	0.000056	**84**	0.000055	0.000031	**56**	<0.000003	0.000012	BD	0.000005	0.000009	**0.000004**
Cobalt (Co)	0.00549	0.00655	18	0.00169	0.00196	15	0.00521	0.00289	**57**	0.000917	0.0012	**27**	0.000766	0.00183	**82**
Chromium (Cr)	<0.0005	<0.0005	BD	<0.0005	<0.0005	BD	<0.0005	<0.0005	BD	<0.0005	<0.0005	BD	<0.0005	<0.0005	BD
Copper (Cu)	0.0038	0.0037	3	0.0023	0.0029	**23**	0.0043	0.0018	**0.0025**	0.0025	0.0018	**0.0007**	0.0015	0.0011	**31**
Iron (Fe)	0.04	0.07	**55**	0.01	0.04	**0.03**	0.03	0.44	**174**	0.52	3.3	**146**	2.46	5.71	**80**
Potassium (K)	0.32	0.31	3	0.26	0.32	**21**	0.34	0.3	13	0.4	0.34	16	0.62	0.48	**25**
Lithium (Li)	<0.002	<0.002	BD	<0.002	<0.002	BD	<0.002	<0.002	BD	<0.002	<0.002	BD	<0.002	<0.002	BD
Magnesium (Mg)	0.663	0.67	1	0.657	0.663	1	1.02	0.864	17	0.664	0.634	5	0.675	0.632	7
Manganese (Mn)	0.0288	0.0315	9	0.0353	0.0319	10	0.282	0.217	**26**	0.133	0.134	1	0.133	0.132	1
Molybdenum (Mo)	<0.00001	0.00018	BD	0.00002	0.00008	**120**	0.00029	0.00015	**64**	0.00133	0.00116	14	0.00107	0.00149	**33**
Sodium (Na)	1.82	1.59	13	1.83	1.58	15	2.35	2.2	7	1.98	1.87	6	1.79	1.5	18
Nickel (Ni)	0.0025	0.0022	13	0.0024	0.0022	9	0.0044	0.0024	**59**	0.0012	0.0013	8	0.0012	0.0017	**34**
Lead (Pb)	0.00717	0.00699	3	0.00597	0.00391	**42**	0.0242	0.00216	**167**	0.00596	0.0009	**148**	0.00098	0.00049	**67**
Phosphorous (P)	0.01	<0.01	BD	<0.01	<0.01	BD	<0.01	0.07	BD	0.01	0.01	0	0.01	<0.01	BD
Antimony (Sb)	0.0077	0.0086	11	0.0007	0.0016	**78**	0.0002	0.0003	0.0001	0.0006	<0.0002	BD	0.0004	<0.0002	BD
Selenium (Se)	<0.001	<0.001	BD	<0.001	<0.001	BD	<0.001	<0.001	BD	<0.001	<0.001	BD	<0.001	<0.001	BD
Sulphur (S)	4.69	4.64	1	4.74	4.63	2	8.28	6.26	**28**	3.87	3.35	14	3.61	4.21	15
Silicon (Si)	0.58	0.59	2	0.59	0.6	2	1.23	1.42	14	1.71	1.86	8	2.15	2.71	**23**
Tin (Sn)	<0.00001	<0.00001	BD	<0.00001	<0.00001	BD	0.00004	0.00017	**124**	<0.00001	<0.00001	BD	<0.00001	0.00001	BD
Strontium (Sr)	0.0121	0.0122	1	0.012	0.0122	2	0.0205	0.0168	20	0.0154	0.0149	3	0.0204	0.0187	9
Titanium (Ti)	0.0003	0.0004	0.0001	<0.0001	0.0001	BD	0.0003	0.0007	**80**	0.0062	0.0004	**0.0058**	0.0005	0.0002	**0.0003**
Thallium (Tl)	<0.0002	<0.0002	BD	<0.0002	<0.0002	BD	<0.0002	<0.0002	BD	<0.0002	<0.0002	BD	<0.0002	<0.0002	BD
Uranium (U)	0.000535	0.000654	20	0.000338	0.00079	**80**	0.000946	0.000173	**138**	0.000524	0.000115	**128**	0.000143	0.000105	**31**
Vanadium (V)	0.00006	0.00007	0.00001	0.00005	0.00007	0.00002	0.00007	0.00008	0.00001	0.00013	0.00007	**0.00006**	0.00006	0.00004	0.00002
Zinc (Zn)	0.002	0.004	0.002	0.005	0.005	0	0.005	0.005	0	0.003	0.004	0.001	0.002	0.003	0.001

Notes:

RPD - relative percent difference; is calculated for analytes with concentrations greater than or equal to five times the detection limit and should be less than or equal to 40%

AD - absolute difference; for samples having concentrations less than five times the detection limit, the difference between the sample and duplicate, or difference between the sample or duplicate and the detection limit if either the sample or duplicate analyte concentration is below detection limit; should not be greater then the detection limit

BD - Sample and/or replicate had analyte concentrations below detection limit

"--" Indicates parameter was not analysed

"NC" Indicates that parameter in the sample was not compared to the duplicate/replicate sample in the data quality assessment

Boldface type and shaded indicates that Data Quality Objective was not achieved

Table A3.3: Detailed Data Quality Assessment for Constituents in the Blank Sample

Analysis	Units	Detection Limit	Data Quality Objective	Blank
Convential Parameters				
Acidity (as $CaCO_3$)	mg/L	2	4	**7**
Total Inorganic Carbon (DIC)	mg/L	1.0	2.0	<1.0
Total Organic Carbon (DOC)	mg/L	1.0	2.0	**2.4**
Sulphate (SO_4)	mg/L	2	4	<2
Hardness (as $CaCO_3$)	mg/L	0.5	1.0	<0.5
Metals				
Radium-226 (Ra-226)	Bq/L	0.01	0.02	<0.01
Aluminum (Al)	mg/L	0.01	0.02	<0.01
Arsenic (As)	mg/L	0.0002	0.0004	<0.0002
Barium (Ba)	mg/L	0.00001	0.00002	**0.00216**
Beryllium (Be)	mg/L	0.00002	0.00004	<0.00002
Boron (B)	mg/L	0.0002	0.0004	<0.0002
Bismuth (Bi)	mg/L	0.00001	0.00002	<0.00001
Calcium (Ca)	mg/L	0.03	0.06	0.03
Cadmium (Cd)	mg/L	0.000003	0.000006	<0.000003
Cobalt (Co)	mg/L	0.000002	0.000004	0.000003
Chromium (Cr)	mg/L	0.0005	0.0010	<0.0005
Copper (Cu)	mg/L	0.0005	0.0010	**0.0053**
Iron (Fe)	mg/L	0.01	0.02	<0.01
Potassium (K)	mg/L	0.01	0.02	<0.01
Lithium (Li)	mg/L	0.002	0.004	<0.002
Magnesium (Mg)	mg/L	0.003	0.006	<0.003
Manganese (Mn)	mg/L	0.00001	0.00002	**0.00034**
Molybdenum (Mo)	mg/L	0.00001	0.00002	<0.00001
Sodium (Na)	mg/L	0.01	0.02	**0.15**
Nickel (Ni)	mg/L	0.0001	0.0002	**0.0003**
Lead (Pb)	mg/L	0.00002	0.00004	<0.00002
Phosphorous (P)	mg/L	0.01	0.02	<0.01
Antimony (Sb)	mg/L	0.0002	0.0004	<0.0002
Selenium (Se)	mg/L	0.001	0.002	<0.001
Sulphur (S)	mg/L	0.01	0.02	**0.05**
Silicon (Si)	mg/L	0.01	0.02	<0.01
Tin (Sn)	mg/L	0.00001	0.00002	<0.00001
Strontium (Sr)	mg/L	0.0001	0.0002	0.0001
Titanium (Ti)	mg/L	0.0001	0.0002	<0.0001
Thallium (Tl)	mg/L	0.0002	0.0004	<0.0002
Uranium (U)	mg/L	0.000001	0.000002	<0.000001
Vanadium (V)	mg/L	0.00003	0.00006	<0.00003
Zinc (Zn)	mg/L	0.001	0.002	<0.001

Notes:

Boldface type and shaded indicates that Data Quality Objective was not achieved

APPENDIX 4

Certificates of Analysis for the 2009 Field Data

ANALYSIS REPORT

Becquerel Laboratories Inc.
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Batch: T09-01486.0

Date: 30-Nov-2009

Lakefield Research Ltd.

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attn: Brian Graham

Phone: (705) 652-2038
FAX: (705) 652-1918

Client Ref.
Oct 10521.R09
P.O: 17820

14 solid samples   Sampled: 26-Sep-2009   Received: 21-Oct-2009   Page 1 of 1

Results of Analysis

Sample	Test	Result	Units	Date	Method
CORE 09-SR-1 (0-5)	Ra-226	0.16	Bq/g	23-Nov-2009	ALPHA
CORE 09-SR-1 (5-10)	Ra-226	0.08	Bq/g	23-Nov-2009	ALPHA
CORE 09-SR-1 (10-15)	Ra-226	0.02	Bq/g	23-Nov-2009	ALPHA
CORE 09-SR-1 (15-20)	Ra-226	0.04	Bq/g	29-Nov-2009	ALPHA
CORE 09-SR-2 (0-5)	Ra-226	14	Bq/g	29-Nov-2009	ALPHA
CORE 09-SR-2 (5-10)	Ra-226	4.6	Bq/g	29-Nov-2009	ALPHA
CORE 09-SR-2 (10-15)	Ra-226	0.06	Bq/g	29-Nov-2009	ALPHA
CORE 09-SR-3 (0-5)	Ra-226	8.2	Bq/g	29-Nov-2009	ALPHA
CORE 09-SR-3 (5-10)	Ra-226	9.7	Bq/g	29-Nov-2009	ALPHA
CORE 09-SR-3 (10-15)	Ra-226	16	Bq/g	29-Nov-2009	ALPHA
CORE 09-SR-3 (15-20)	Ra-226	20	Bq/g	29-Nov-2009	ALPHA
CORE 09-SR-4 (0-5)	Ra-226	2.6	Bq/g	29-Nov-2009	ALPHA
CORE 09-SR-4 (5-10)	Ra-226	2.7	Bq/g	29-Nov-2009	ALPHA
CORE 09-SR-4 (10-15)	Ra-226	2.1	Bq/g	29-Nov-2009	ALPHA

Methods: ALPHA BQ-RAD-ALPHA alpha-particle spectrometry

Units: Bq/g Becquerels per gram

These results relate only to the samples analysed and only to the items tested.

30-Nov-2009 approved by: Donald D. Burgess PhD
Senior Scientist, Division Supervisor

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Tuesday, October 27, 2009

Date Rec. : 30 September 2009
LR. Ref. : **CA10521-SEP09**
Project : 09-1663

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CERTIFICATE OF ANALYSIS

Final Report

Analysis	**3: Analysis Approval Date**	**4: Analysis Approval Time**	**5: CORE 09-SR-1 (0-5)**	**6: CORE 09-SR-1 (5-10)**	**7: CORE 09-SR-1 (10-15)**	**8: CORE 09-SR-1 (15-20)**	**9: CORE 09-SR-2 (0-5)**	**10: CORE 09-SR-2 (5-10)**
Sample Date & Time			26-Sep-09	26-Sep-09	26-Sep-09	26-Sep-09	26-Sep-09	26-Sep-09
BaSO4 Calc. using Ba* [µg/g]	---	---	130	110	100	80	10900	4420
BaSO4 Calc. using SO4** [µg/g]	---	---	2430	<2430	2430	2430	12100	4860
Total Sulphur [%]	06-Oct-09	14:45	0.130	0.130	0.184	0.224	0.235	0.114
Carbonate (CO3) [%]	06-Oct-09	14:42	0.105	0.048	0.048	0.033	0.040	0.011
Total Organic Carbon [%]	06-Oct-09	14:45	5.34	4.23	5.87	5.94	2.05	0.820
Total Carbon [%]	06-Oct-09	14:45	5.36	4.24	5.88	5.95	2.05	0.825
Sulphide [%]	07-Oct-09	15:59	< 0.01	< 0.01	0.04	0.05	< 0.01	< 0.01
Sulphate [%]	23-Oct-09	14:22	0.1	< 0.1	0.1	0.1	0.5	0.2
Silver [µg/g]	14-Oct-09	14:05	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7
Aluminum [µg/g]	14-Oct-09	14:05	7600	6700	5300	4100	4400	2600
Arsenic [µg/g]	14-Oct-09	14:05	5	5	4	3	10	4
Barium [µg/g]	14-Oct-09	14:05	75	65	61	47	6400	2600
Beryllium [µg/g]	14-Oct-09	14:05	0.47	0.37	0.32	0.24	0.21	0.12
Bismuth [µg/g]	14-Oct-09	14:05	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Calcium [µg/g]	14-Oct-09	14:05	1900	1600	1500	1500	1100	720
Cadmium [µg/g]	14-Oct-09	14:05	1.2	0.96	1.2	1.1	0.42	0.18
Cerium [µg/g]	13-Oct-09	15:44	48	41	34	20	62	30
Cobalt [µg/g]	14-Oct-09	14:05	8.5	7.8	6.1	3.7	20	8.2
Chromium [µg/g]	14-Oct-09	14:05	19	18	15	12	9.8	6.8
Cesium [µg/g]	13-Oct-09	15:44	0.63	0.45	0.36	0.30	0.56	0.38
Copper [µg/g]	14-Oct-09	14:05	34	31	23	14	20	8.3
Iron [µg/g]	14-Oct-09	14:05	12000	9800	8100	6800	15000	7300
Gallium [µg/g]	13-Oct-09	15:44	2.9	2.6	2.0	1.6	2.8	1.4
Germanium [µg/g]	13-Oct-09	15:44	0.6	0.5	0.5	0.4	0.8	0.4
Hafnium [µg/g]	13-Oct-09	15:44	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Indium [µg/g]	13-Oct-09	15:44	0.05	0.02	0.01	< 0.01	< 0.01	< 0.01
Potassium [µg/g]	14-Oct-09	14:05	270	250	210	180	270	170
Lanthanum [µg/g]	13-Oct-09	15:44	25	21	18	12	33	16
Lithium [µg/g]	14-Oct-09	14:05	2.7	2.4	1.6	1.1	1.4	0.3

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LR Report : CA10521-SEP09

Analysis	**3: Analysis Approval Date**	**4: Analysis Approval Time**	**5: CORE 09-SR-1 (0-5)**	**6: CORE 09-SR-1 (5-10)**	**7: CORE 09-SR-1 (10-15)**	**8: CORE 09-SR-1 (15-20)**	**9: CORE 09-SR-2 (0-5)**	**10: CORE 09-SR-2 (5-10)**
Lutetium [µg/g]	13-Oct-09	15:44	0.10	0.081	0.063	0.054	0.49	0.21
Magnesium [µg/g]	14-Oct-09	14:04	2100	1900	1500	1200	840	590
Manganese [µg/g]	14-Oct-09	14:04	250	180	200	230	1600	160
Molybdenum [µg/g]	14-Oct-09	14:04	< 0.5	< 0.5	< 0.5	< 0.5	2.8	1.3
Sodium [µg/g]	14-Oct-09	14:04	52	45	38	32	36	23
Niobuim [µg/g]	13-Oct-09	15:44	0.8	0.8	0.7	< 0.7	< 0.7	< 0.7
Nickel [µg/g]	14-Oct-09	14:04	15	13	11	7	19	8
Lead [µg/g]	14-Oct-09	14:04	61	44	32	19	100	38
Phosphorus [µg/g]	14-Oct-09	14:04	450	350	260	210	270	130
Rubidium [µg/g]	13-Oct-09	15:44	3.6	3.2	2.6	2.3	2.5	1.5
Antimony [µg/g]	14-Oct-09	14:04	< 1	< 1	< 1	< 1	< 1	< 1
Scandium [µg/g]	13-Oct-09	15:44	1.7	1.5	1.1	0.9	1.1	0.6
Selenium [µg/g]	14-Oct-09	14:04	< 1	< 1	< 1	< 1	< 1	< 1
Tin [µg/g]	14-Oct-09	14:04	< 6	< 6	< 6	< 6	< 6	< 6
Strontium [µg/g]	14-Oct-09	14:04	7.6	6.3	6.2	6.5	72	27
Sulphur [µg/g]	14-Oct-09	14:04	1100	1400	2000	2500	2400	1200
Tantalum [µg/g]	13-Oct-09	15:44	0.03	0.03	0.04	0.04	0.01	< 0.01
Terbium [µg/g]	13-Oct-09	15:44	0.47	0.33	0.22	0.16	2.0	0.87
Tellerium [µg/g]	13-Oct-09	15:44	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Thorium [µg/g]	13-Oct-09	15:44	9.5	7.7	7.0	3.4	33	12
Titanium [µg/g]	14-Oct-09	14:04	340	350	300	270	190	160
Thallium [µg/g]	14-Oct-09	14:04	< 3	< 3	< 3	< 3	< 3	< 3
Uranium [µg/g]	13-Oct-09	15:43	7.9	5.6	3.1	1.7	84	29
Vanadium [µg/g]	14-Oct-09	14:04	24	21	17	13	12	7.9
Tungsten [µg/g]	14-Oct-09	14:04	< 1	< 1	< 1	< 1	2	< 1
Yttrium [µg/g]	14-Oct-09	14:04	10	7.8	5.9	4.5	43	18
Ytterbium [µg/g]	13-Oct-09	15:43	0.76	0.59	0.46	0.37	4.0	1.6
Zinc [µg/g]	14-Oct-09	14:04	100	83	73	49	74	34
Zirconium [µg/g]	14-Oct-09	14:04	< 5	< 5	< 5	< 5	< 5	< 5

Ra226 subcontracted to Becquerel Labs.
* BaSO4 Calculation based on Ba values and assumes all Ba is in BaSO4 form.
** BaSO4 Calculation based on SO4 values and assumes all SO4 is in BaSO4 form.

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Environmental Services, Analytical

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Tuesday, October 27, 2009

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CERTIFICATE OF ANALYSIS

Final Report

Analysis	**11: CORE 09-SR-2 (10-15)**	**12: CORE 09-SR-3 (0-5)**	**13: CORE 09-SR-3 (5-10)**	**14: CORE 09-SR-3 (10-15)**	**15: CORE 09-SR-3 (15-20)**	**16: CORE 09-SR-4 (0-5)**	**17: CORE 09-SR-4 (5-10)**	**18: CORE 09-SR-4 (10-15)**
Sample Date & Time	26-Sep-09	27-Sep-09	27-Sep-09	27-Sep-09	27-Sep-09	27-Sep-09	27-Sep-09	27-Sep-09
BaSO4 Calc. using Ba* [µg/g]	340	3910	5100	6120	6970	1310	990	750
BaSO4 Calc. using SO4** [µg/g]	<2430	4860	9720	19400	24300	4860	4860	4860
Total Sulphur [%]	0.015	0.607	0.917	1.15	1.12	1.03	1.06	1.00
Carbonate (CO3) [%]	< 0.005	0.090	0.097	0.088	0.229	0.159	0.181	0.419
Total Organic Carbon [%]	0.330	13.9	14.6	13.3	10.7	16.8	17.6	16.8
Total Carbon [%]	0.326	13.9	14.6	13.3	10.7	16.8	17.6	16.9
Sulphide [%]	< 0.01	< 0.01	< 0.01	0.10	0.07	0.39	0.65	0.65
Sulphate [%]	< 0.1	0.2	0.4	0.8	1.0	0.2	0.2	0.2
Silver [µg/g]	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7
Aluminum [µg/g]	2000	8500	8300	9600	13000	7100	6000	5600
Arsenic [µg/g]	1	21	23	28	29	22	24	26
Barium [µg/g]	200	2300	3000	3600	4100	770	580	440
Beryllium [µg/g]	0.12	0.57	0.47	0.42	0.66	0.27	0.18	0.12
Bismuth [µg/g]	< 0.5	0.8	< 0.5	< 0.5	0.6	< 0.5	< 0.5	< 0.5
Calcium [µg/g]	420	3800	4600	4300	5100	6200	6700	7300
Cadmium [µg/g]	0.09	1.9	1.6	1.5	1.3	1.7	1.7	1.8
Cerium [µg/g]	15	170	200	240	310	590	680	840
Cobalt [µg/g]	2.6	59	60	64	48	28	21	16
Chromium [µg/g]	5.3	18	16	18	26	20	18	17
Cesium [µg/g]	0.21	0.70	0.81	1.1	1.6	0.86	0.82	0.87
Copper [µg/g]	2.3	57	64	84	98	61	58	56
Iron [µg/g]	5200	39000	34000	35000	50000	21000	16000	12000
Gallium [µg/g]	0.66	5.3	6.0	7.9	9.5	6.9	6.4	6.6
Germanium [µg/g]	0.3	1.7	1.8	2.0	2.6	3.1	3.3	3.8
Hafnium [µg/g]	< 0.1	0.2	0.2	0.3	0.3	0.5	0.6	0.6
Indium [µg/g]	< 0.01	< 0.01	< 0.01	< 0.01	0.02	0.01	< 0.01	< 0.01
Potassium [µg/g]	130	370	290	320	430	350	280	270
Lanthanum [µg/g]	8.9	87	110	120	140	300	360	430
Lithium [µg/g]	< 0.1	2.1	3.0	6.4	10	1.5	1.2	1.1

OnLine LIMS

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LR Report : **CA10521-SEP09**

Analysis	**11: CORE 09-SR-2 (10-15)**	**12: CORE 09-SR-3 (0-5)**	**13: CORE 09-SR-3 (5-10)**	**14: CORE 09-SR-3 (10-15)**	**15: CORE 09-SR-3 (15-20)**	**16: CORE 09-SR-4 (0-5)**	**17: CORE 09-SR-4 (5-10)**	**18: CORE 09-SR-4 (10-15)**
Lutetium [µg/g]	0.055	1.3	1.6	2.0	2.9	4.1	4.5	5.3
Magnesium [µg/g]	420	1300	1200	1300	1500	1400	1400	1400
Manganese [µg/g]	75	4200	2900	1100	480	550	280	180
Molybdenum [µg/g]	< 0.5	9.0	11	18	18	5.8	4.7	3.6
Sodium [µg/g]	18	53	43	43	54	64	58	59
Niobuim [µg/g]	< 0.7	0.9	1.0	1.1	1.4	1.0	0.9	0.8
Nickel [µg/g]	3	38	40	54	52	37	39	43
Lead [µg/g]	5.2	230	220	240	520	540	550	640
Phosphorus [µg/g]	68	650	580	650	660	470	380	340
Rubidium [µg/g]	1.00	3.8	3.3	3.9	5.1	4.1	3.8	4.0
Antimony [µg/g]	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Scandium [µg/g]	0.5	2.4	2.2	2.3	2.8	2.7	2.7	2.7
Selenium [µg/g]	< 1	1	1	< 1	< 1	< 1	< 1	< 1
Tin [µg/g]	< 6	< 6	< 6	< 6	< 6	< 6	< 6	< 6
Strontium [µg/g]	3.3	21	37	63	77	15	14	14
Sulphur [µg/g]	170	5500	7300	7900	7000	10000	11000	11000
Tantalum [µg/g]	< 0.01	0.04	0.07	0.07	0.09	0.11	0.13	0.15
Terbium [µg/g]	0.21	5.9	7.6	9.1	14	25	28	35
Tellerium [µg/g]	< 0.1	< 0.1	< 0.1	< 0.1	0.1	< 0.1	< 0.1	< 0.1
Thorium [µg/g]	3.4	85	120	160	490	180	120	85
Titanium [µg/g]	140	210	200	230	280	210	210	210
Thallium [µg/g]	< 3	5	< 3	< 3	< 3	< 3	< 3	< 3
Uranium [µg/g]	3.8	270	360	500	270	220	160	110
Vanadium [µg/g]	6.3	20	17	18	21	17	16	16
Tungsten [µg/g]	< 1	6	6	8	8	3	2	< 1
Yttrium [µg/g]	6.1	120	160	200	260	500	600	740
Ytterbium [µg/g]	0.41	11	14	16	24	34	38	45
Zinc [µg/g]	18	210	170	160	150	98	72	55
Zirconium [µg/g]	< 5	< 5	< 5	< 5	6	< 5	5	6

Ra226 subcontracted to Becquerel Labs.
* BaSO4 Calculation based on Ba values and assumes all Ba is in BaSO4 form.
** BaSO4 Calculation based on SO4 values and assumes all SO4 is in BaSO4 form.

Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

OnLine LIMS

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : 09-1663

October 7, 2010

Ecometrix
Attn : Erin Clyde

6800 Campobello Road, Mississauga
Canada, L5N 2L8
Phone: 905-794-2325, Fax:905-794-2338

Date Rec. : 30 September 2009
LR Report: **CA10521-SEP09**

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CERTIFICATE OF ANALYSIS
Final Report (QC Report)

Analysis	19: MDL QC - Blank QC - STD % Recovery	20: QC - Blank	21: QC - STD % Recovery	22: QC - DUP % Recovery
BaSO4 Calc. using Ba* [µg/g]	---	---	---	---
BaSO4 Calc. using SO4** [µg/g]	---	---	---	---
Total Sulphur [%]	0.005	< 0.005	102%	---
Carbonate (CO3) [%]	0.005	< 0.005	100%	140%
Total Organic Carbon [%]	0.01	< 0.01	---	100%
Total Carbon [%]	0.005	< 0.005	100%	---
Sulphide [%]	0.01	< 0.01	90%	---
Sulphate [%]	0.1	< 0.1	100%	107%
Silver [µg/g]	0.7	< 0.7	93%	100%
Aluminum [µg/g]	1	< 1	97%	100%
Arsenic [µg/g]	1	< 1	99%	94%
Barium [µg/g]	0.05	< 0.05	96%	100%
Beryllium [µg/g]	0.1	< 0.1	98%	102%
Bismuth [µg/g]	0.5	< 0.5	98%	104%
Calcium [µg/g]	1	< 1	98%	100%
Cadmium [µg/g]	0.05	< 0.05	97%	99%
Cerium [µg/g]	0.006	< 0.006	94%	100%
Cobalt [µg/g]	0.3	< 0.3	97%	103%
Chromium [µg/g]	0.5	< 0.5	98%	103%
Cesium [µg/g]	0.01	< 0.01	---	107%
Copper [µg/g]	0.1	< 0.1	98%	102%
Iron [µg/g]	0.5	< 0.5	98%	100%
Gallium [µg/g]	0.03	< 0.03	---	99%
Germanium [µg/g]	0.3	< 0.3	103%	105%
Hafnium [µg/g]	0.1	< 0.1	96%	150%
Indium [µg/g]	0.01	< 0.01	100%	100%
Potassium [µg/g]	1	< 1	100%	100%

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Project : 09-1663

LR Report : **CA10521-SEP09**

Analysis	19: MDL QC - Blank QC - STD % Recovery	20: QC - Blank	21: QC - STD % Recovery	22: QC - DUP % Recovery
Lanthanum [µg/g]	0.001	0.001	94%	110%
Lithium [µg/g]	0.1	< 0.1	97%	107%
Lutetium [µg/g]	0.001	0.001	95%	102%
Magnesium [µg/g]	1	< 1	87%	100%
Manganese [µg/g]	0.05	< 0.05	97%	100%
Molybdenum [µg/g]	0.5	< 0.5	100%	154%
Sodium [µg/g]	1	< 1	97%	104%
Niobuim [µg/g]	0.7	< 0.7	99%	118%
Nickel [µg/g]	1	< 1	97%	101%
Lead [µg/g]	0.7	< 0.7	98%	100%
Phosphorus [µg/g]	5	< 5	98%	100%
Rubidium [µg/g]	0.004	< 0.004	---	105%
Antimony [µg/g]	1	< 1	98%	100%
Scandium [µg/g]	0.2	< 0.2	100%	99%
Selenium [µg/g]	1	< 1	99%	100%
Tin [µg/g]	6	< 6	100%	1235
Strontium [µg/g]	0.01	< 0.01	97%	103%
Sulphur [µg/g]	1	< 1	100%	100%
Tantalum [µg/g]	0.01	< 0.01	97%	108%
Terbium [µg/g]	0.001	< 0.001	96%	93%
Tellerium [µg/g]	0.1	< 0.1	99%	101%
Thorium [µg/g]	0.01	< 0.01	114%	100%
Titanium [µg/g]	0.2	< 0.2	98%	104%
Thallium [µg/g]	3	< 3	99%	76%
Uranium [µg/g]	0.002	0.006	100%	100%
Vanadium [µg/g]	0.1	< 0.1	99%	102%
Tungsten [µg/g]	1	< 1	97%	93%
Yttrium [µg/g]	0.1	< 0.1	96%	100%
Ytterbium [µg/g]	0.001	0.002	98%	105%
Zinc [µg/g]	0.1	< 0.1	97%	103%
Zirconium [µg/g]	5	< 5	100%	107%

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LR Report : **CA10521-SEP09**

Ra226 subcontracted to Becquerel Labs.
* BaSO4 Calculation based on Ba values and assumes all Ba is in BaSO4 form.
** BaSO4 Calculation based on SO4 values and assumes all SO4 is in BaSO4 form.

Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

ANALYSIS REPORT

Becquerel Laboratories Inc.
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Mississauga, Ontario
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Phone: (905) 826-3080
FAX: (905) 826-4151

Batch: T09-01386.0

Date: 12-Nov-2009

Lakefield Research Ltd.

185 Concession St., Postal Bag 4300
Lakefield, ON, K0L 2H0

attn: Brian Graham

Phone: (705) 652-2038
FAX: (705) 652-1918

Client Ref.Sep 10526
P.O: 17820

14 water samples   Received: 06-Oct-2009   Page 1 of 1

Results of Analysis

Sample	Test		Result	Units	Date	Method
PW09-SR-1 (0-5)	Ra-226		0.02	Bq/l	08-Nov-2009	ALPHA
PW09-SR-1 (5-10)	Ra-226	<	0.02	Bq/l	08-Nov-2009	ALPHA
PW09-SR-1 (10-15)	Ra-226	<	0.01	Bq/l	08-Nov-2009	ALPHA
PW09-SR-1 (15-20)	Ra-226	<	0.01	Bq/l	08-Nov-2009	ALPHA
PW09-SR-2 (0-5)	Ra-226		2.4	Bq/l	08-Nov-2009	ALPHA
PW09-SR-2 (5-10)	Ra-226		2.3	Bq/l	08-Nov-2009	ALPHA
PW09-SR-2 (10-15)	Ra-226		0.87	Bq/l	08-Nov-2009	ALPHA
PW09-SR-3 (0-5)	Ra-226		5.1	Bq/l	08-Nov-2009	ALPHA
PW09-SR-3 (5-10)	Ra-226		6.0	Bq/l	08-Nov-2009	ALPHA
PW09-SR-3 (10-15)	Ra-226		5.4	Bq/l	08-Nov-2009	ALPHA
PW09-SR-3 (15-20)	Ra-226		4.5	Bq/l	08-Nov-2009	ALPHA
PW09-SR-4 (0-5)	Ra-226		0.87	Bq/l	08-Nov-2009	ALPHA
PW09-SR-4 (5-10)	Ra-226		1.2	Bq/l	08-Nov-2009	ALPHA
PW09-SR-4 (10-15)	Ra-226		1.4	Bq/l	08-Nov-2009	ALPHA

Methods: ALPHA BQ-RAD-ALPHA alpha-particle spectrometry

Units: Bq/l Becquerels per litre

These results relate only to the samples analysed and only to the items tested.

12-Nov-2009 approved by: Donald D. Burgess PhD
Senior Scientist, Division Supervisor

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October 14, 2009

Date Rec. : 30 September 2009
LR Report : **CA10526-SEP09**
Project : 09-1663

CERTIFICATE OF ANALYSIS

Final Report

Analysis	**1: Analysis Start Date**	**2: Analysis Start Time**	**3: Analysis Approval Date**	**4: Analysis Approval Time**	**5: PW09-SR-1 (0-5)**	**6: PW09-SR-1 (5-10)**	**7: PW09-SR-1 (10-15)**	**8: PW09-SR-1 (15-20)**	**9: PW09-SR-2 (0-5)**
Sample Date & Time					26-Sep-09	26-Sep-09	26-Sep-09	26-Sep-09	26-Sep-09
Temperature Upon Receipt [°C]	---	---	---	---	4.0	4.0	4.0	4.0	4.0
Sulphate [mg/L]	02-Oct-09	15:00	07-Oct-09	09:19	2.6	< 2	< 2	< 2	16
Dissolved Organic Carbon [mg/L]	02-Oct-09	10:00	07-Oct-09	09:23	14.5	19.6	20.0	22.9	10.5
Dissolved Inorganic Carbon [mg/L]	05-Oct-09	14:35	08-Oct-09	12:47	< 1.0	< 1.0	3.1	2.7	2.4
Alkalinity [mg/L as CaCO3]	02-Oct-09	15:19	05-Oct-09	15:10	9	24	8	2	25
Acidity [mg/L as CaCO3]	02-Oct-09	15:19	05-Oct-09	15:10	6	< 2	3	6	< 2
Hardness [mg/L as CaCO3]	05-Oct-09	09:00	05-Oct-09	13:18	11.1	9.5	5.3	5.3	28.8
Aluminum [mg/L]	05-Oct-09	09:00	05-Oct-09	13:18	< 0.01	0.02	0.02	0.03	0.02
Arsenic [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.0014	0.0034	0.0054	0.0050	0.0015
Barium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.0271	0.0274	0.0313	0.0172	2.16
Beryllium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Boron [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.0052	0.0036	0.0057	0.0089	0.0046
Bismuth [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Calcium [mg/L]	05-Oct-09	09:00	05-Oct-09	13:18	3.54	3.00	1.68	1.71	9.60
Cadmium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.000017	0.000016	0.000025	0.000056	0.000003
Cobalt [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.000762	0.000476	0.000120	0.000079	0.00216
Chromium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Copper [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.0025	0.0037	0.0023	0.0051	0.0021
Iron [mg/L]	05-Oct-09	09:00	05-Oct-09	13:18	0.29	0.81	0.06	0.08	0.01
Potassium [mg/L]	05-Oct-09	09:00	05-Oct-09	13:18	0.24	0.26	0.34	0.38	0.79
Lithium [mg/L]	05-Oct-09	09:00	05-Oct-09	13:18	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Magnesium [mg/L]	05-Oct-09	09:00	05-Oct-09	13:18	0.538	0.492	0.277	0.255	1.16

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LR Report : **CA10526-SEP09**

Analysis	**1: Analysis Start Date**	**2: Analysis Start Time**	**3: Analysis Approval Date**	**4: Analysis Approval Time**	**5: PW09-SR-1 (0-5)**	**6: PW09-SR-1 (5-10)**	**7: PW09-SR-1 (10-15)**	**8: PW09-SR-1 (15-20)**	**9: PW09-SR-2 (0-5)**
Manganese [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.365	0.305	0.245	0.325	3.91
Molybdenum [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.00069	0.00037	0.00024	0.00031	0.00064
Sodium [mg/L]	05-Oct-09	09:00	05-Oct-09	13:18	1.85	1.83	1.64	2.17	2.57
Nickel [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.0007	0.0009	0.0006	0.0009	0.0011
Phosphorus [mg/L]	05-Oct-09	09:00	05-Oct-09	13:18	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Lead [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.00087	0.00213	0.00036	0.00124	0.00037
Sulphur [mg/L]	05-Oct-09	09:00	05-Oct-09	13:18	1.05	0.78	0.46	0.74	4.67
Antimony [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Selenium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Silica [mg/L]	05-Oct-09	09:00	05-Oct-09	13:18	1.52	1.96	2.35	2.84	1.63
Tin [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.00007	0.00022	< 0.00001	< 0.00001	< 0.00001
Strontium [mg/L]	05-Oct-09	09:00	05-Oct-09	13:18	0.0121	0.0104	0.0064	0.0068	0.0668
Titanium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.0007	0.0011	0.0007	0.0012	0.0001
Thallium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Uranium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.000186	0.000137	0.000380	0.000250	0.00266
Vanadium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.00016	0.00026	0.00014	0.00029	0.00008
Zinc [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.002	0.002	0.002	0.003	0.002

Samples are field filtered
Ra226 subcontracted to Becquerel Labs.

Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

OnLine LIMS

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CERTIFICATE OF ANALYSIS

Final Report

Analysis	**10: PW09-SR-2 (5-10)**	**11: PW09-SR-2 (10-15)**	**12: PW09-SR-3 (0-5)**	**13: PW09-SR-3 (5-10)**	**14: PW09-SR-3 (10-15)**	**15: PW09-SR-3 (15-20)**	**16: PW09-SR-4 (0-5)**	**17: PW09-SR-4 (5-10)**	**18: PW09-SR-4 (10-15)**
Sample Date & Time	26-Sep-09	26-Sep-09	27-Sep-09	27-Sep-09	27-Sep-09	27-Sep-09	27-Sep-09	27-Sep-09	27-Sep-09
Temperature Upon Receipt [°C]	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Sulphate [mg/L]	14	---	7.9	4.0	< 2	< 2	19	8.1	4.9
Dissolved Organic Carbon [mg/L]	26.5	---	9.9	18.8	13.2	---	---	---	---
Dissolved Inorganic Carbon [mg/L]	5.0	---	14.0	26.5	32.7	---	---	---	---
Alkalinity [mg/L as CaCO3]	5	---	69	99	135	177	33	---	87
Acidity [mg/L as CaCO3]	6	---	---	---	---	---	---	< 2	---
Hardness [mg/L as CaCO3]	25.6	31.5	42.6	67.1	87.2	130	45.2	63.4	78.8
Aluminum [mg/L]	0.07	0.07	< 0.01	< 0.01	< 0.01	0.02	< 0.01	0.01	0.02
Arsenic [mg/L]	0.0030	0.0027	0.0012	0.0014	0.0039	0.0027	0.0012	0.0022	0.0051
Barium [mg/L]	2.38	1.50	1.91	3.11	3.75	3.24	0.561	0.621	0.602
Beryllium [mg/L]	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Boron [mg/L]	0.0068	0.0090	0.0095	0.0146	0.0356	0.0758	0.0192	0.0424	0.0817
Bismuth [mg/L]	0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Calcium [mg/L]	8.74	10.5	14.7	23.8	31.6	47.6	15.7	22.3	27.8
Cadmium [mg/L]	0.000010	0.000010	0.000004	0.000005	0.000008	0.000007	0.000008	0.000007	0.000015
Cobalt [mg/L]	0.000948	0.000863	0.00704	0.00374	0.00264	0.00253	0.000880	0.000284	0.000291
Chromium [mg/L]	< 0.0005	0.0007	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Copper [mg/L]	0.0046	0.0049	0.0010	0.0010	0.0015	0.0014	0.0015	0.0016	0.0019
Iron [mg/L]	0.08	0.27	3.54	4.19	6.18	0.51	1.05	0.26	0.02
Potassium [mg/L]	0.95	2.11	1.03	1.86	3.28	6.21	0.96	1.57	2.77
Lithium [mg/L]	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	0.004	< 0.002	< 0.002	< 0.002
Magnesium [mg/L]	0.926	1.26	1.45	1.84	1.99	2.84	1.46	1.88	2.28

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LR Report : CA10526-SEP09

Analysis	10: PW09-SR-2 (5-10)	11: PW09-SR-2 (10-15)	12: PW09-SR-3 (0-5)	13: PW09-SR-3 (5-10)	14: PW09-SR-3 (10-15)	15: PW09-SR-3 (15-20)	16: PW09-SR-4 (0-5)	17: PW09-SR-4 (5-10)	18: PW09-SR-4 (10-15)
Manganese [mg/L]	1.82	1.34	10.8	8.04	5.58	2.89	1.24	0.613	0.341
Molybdenum [mg/L]	0.00150	0.00282	0.00065	0.00035	0.00369	0.00475	0.00056	0.00238	0.00909
Sodium [mg/L]	2.81	2.81	2.35	2.95	3.63	5.23	3.15	3.27	3.93
Nickel [mg/L]	0.0013	0.0012	0.0016	0.0018	0.0018	0.0019	0.0014	0.0009	0.0009
Phosphorus [mg/L]	0.02	0.02	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.01	< 0.01
Lead [mg/L]	0.00198	0.00084	0.00018	0.00008	0.00023	0.00004	0.00054	0.00091	0.00192
Sulphur [mg/L]	4.45	5.89	2.65	1.74	0.88	1.07	5.53	2.88	2.10
Antimony [mg/L]	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Selenium [mg/L]	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Silica [mg/L]	2.68	4.19	3.02	5.36	6.12	6.22	3.01	6.24	9.87
Tin [mg/L]	0.00004	< 0.00001	0.00003	< 0.00001	0.00007	< 0.00001	0.00002	< 0.00001	< 0.00001
Strontium [mg/L]	0.0685	0.0607	0.0508	0.0866	0.117	0.151	0.0328	0.0425	0.0515
Titanium [mg/L]	0.0012	0.0024	0.0002	0.0003	0.0004	0.0004	0.0002	0.0006	0.0008
Thallium [mg/L]	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Uranium [mg/L]	0.00258	0.000877	0.0113	0.00514	0.0400	0.0379	0.00413	0.00669	0.0110
Vanadium [mg/L]	0.00022	0.00082	0.00017	0.00033	0.00038	0.00071	0.00014	0.00032	0.00095
Zinc [mg/L]	0.004	0.005	0.002	0.004	0.003	0.003	0.003	0.002	0.002

Samples are field filtered
Ra226 subcontracted to Becquerel Labs.

Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

OnLine LIMS

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SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : 09-1663

October 7, 2010

Ecometrix
Attn : Erin Clyde

6800 Campobello Road
Mississauga, Ontario
L5N 2L8, Canada

Phone: 905-794-2325
Fax:905-794-2338

Date Rec. : 30 September 2009
LR Report: **CA10526-SEP09**

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CERTIFICATE OF ANALYSIS

Final Report - (QC Report)

Analysis	**19: MDL**	**20: QC - Blank**	**21: QC - STD % Recovery**	**22: QC - DUP % Recovery**
Temperature Upon Receipt [°C]	---	---	---	---
Sulphate [mg/L]	0.2	< 0.2	105%	100%
Dissolved Organic Carbon [mg/L]	0.2	< 0.2	105%	98%
Dissolved Inorganic Carbon [mg/L]	0.2	0.2	97%	100%
Alkalinity [mg/L as CaCO3]	2	< 2	101%	98%
Acidity [mg/L as CaCO3]	2	3	98%	102%
Hardness [mg/L as CaCO3]	0.5	< 0.5	---	---
Aluminum [mg/L]	0.01	< 0.01	98%	---
Arsenic [mg/L]	0.0002	< 0.0002	106%	---
Barium [mg/L]	0.00001	< 0.00001	122%	---
Beryllium [mg/L]	0.00002	< 0.00002	104%	---
Boron [mg/L]	0.0002	< 0.0002	96%	---
Bismuth [mg/L]	0.00001	< 0.00001	109%	---
Calcium [mg/L]	0.03	< 0.03	101%	---
Cadmium [mg/L]	0.000003	0.000003	99%	---
Cobalt [mg/L]	0.000002	< 0.000002	102%	---
Chromium [mg/L]	0.0005	< 0.0005	102%	---
Copper [mg/L]	0.0005	< 0.0005	102%	---
Iron [mg/L]	0.01	< 0.01	102%	---
Potassium [mg/L]	0.01	< 0.01	98%	---
Lithium [mg/L]	0.002	< 0.002	98%	---
Magnesium [mg/L]	0.003	< 0.003	99%	---
Manganese [mg/L]	0.00001	< 0.00001	107%	---
Molybdenum [mg/L]	0.00001	< 0.00001	99%	---
Sodium [mg/L]	0.01	< 0.01	94%	---
Nickel [mg/L]	0.0001	< 0.0001	100%	---
Phosphorus [mg/L]	0.01	< 0.01	100%	---
Lead [mg/L]	0.00002	< 0.00002	106%	---
Sulphur [mg/L]	0.01	< 0.01	100%	---
Antimony [mg/L]	0.0002	< 0.0002	101%	---

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Project : 09-1663

LR Report : **CA10526-SEP09**

Analysis	19: MDL	20: QC - Blank	21: QC - STD % Recovery	22: QC - DUP % Recovery
Selenium [mg/L]	0.001	< 0.001	102%	---
Silica [mg/L]	0.01	< 0.01	104%	---
Tin [mg/L]	0.00001	< 0.00001	96%	---
Strontium [mg/L]	0.0001	< 0.0001	100%	---
Titanium [mg/L]	0.0001	< 0.0001	96%	---
Thallium [mg/L]	0.0002	< 0.0002	107%	---
Uranium [mg/L]	0.000001	0.000001	106%	---
Vanadium [mg/L]	0.00003	< 0.00003	107%	---
Zinc [mg/L]	0.001	< 0.001	104%	---

Samples are field filtered
Ra226 subcontracted to Becquerel Labs.
Revised to include Ra226 results from Becquerel.

Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

OnLine LIMS

ANALYSIS REPORT

Becquerel Laboratories

Becquerel Laboratories Inc.
6790 Kitimat Rd., Unit 4
Mississauga, Ontario
Canada, L5N 5L9

Phone: (905) 826-3080
FAX: (905) 826-4151

Batch: T09-01385.0

Date: 09-Nov-2009

Lakefield Research Ltd.

185 Concession St., Postal Bag 4300
Lakefield, ON, K0L 2H0

attn: Brian Graham

Phone: (705) 652-2038
FAX: (705) 652-1918

Client Ref.Sep 10525
P.O: 17820

9 water samples

Received: 06-Oct-2009

Results of Analysis

Sample	Test	Result	Units	Date	Method
SW09-SR-1T	Ra-226	< 0.01	Bq/l	06-Nov-2009	ALPHA
SW09-SR-1B	Ra-226	< 0.01	Bq/l	06-Nov-2009	ALPHA
SW09-SR-2T	Ra-226	0.11	Bq/l	06-Nov-2009	ALPHA
SW09-SR-2B	Ra-226	0.28	Bq/l	06-Nov-2009	ALPHA
SW09-SR-3T	Ra-226	0.15	Bq/l	06-Nov-2009	ALPHA
SW09-SR-3B	Ra-226	0.80	Bq/l	06-Nov-2009	ALPHA
SW09-SR-4T	Ra-226	0.19	Bq/l	06-Nov-2009	ALPHA
SW09-SR-4B	Ra-226	0.30	Bq/l	06-Nov-2009	ALPHA
Blank 1	Ra-226	< 0.01	Bq/l	06-Nov-2009	ALPHA

Methods: ALPHA BQ-RAD-ALPHA alpha-particle spectrometry

Units: Bq/l Becquerels per litre

These results relate only to the samples analysed and only to the items tested.

09-Nov-2009 approved by: Donald D. Burgess
Donald D. Burgess PhD
Senior Scientist, Division Supervisor

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Ecometrix
Attn : Erin Clyde

6800 Campobello Road, Mississauga
Canada, L5N 2L8
Phone: 905-794-2325, Fax:905-794-2338

October 14, 2009

Date Rec. : 30 September 2009
LR Report : **CA10525-SEP09**
Project : 09-1663

CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	5: SW09-SR-1T	6: SW09-SR-1B	7: SW09-SR-2T
Sample Date & Time					24-Sep-09	25-Sep-09	24-Sep-09
Temperature Upon Receipt [°C]	---	---	---	---	4.0	4.0	4.0
Sulphate [mg/L]	02-Oct-09	15:00	05-Oct-09	16:12	8.5	5.6	31
Total Organic Carbon [mg/L]	02-Oct-09	10:00	05-Oct-09	13:41	2.7	5.4	2.3
Total Inorganic Carbon [mg/L]	05-Oct-09	14:35	08-Oct-09	12:46	< 1.0	< 1.0	< 1.0
Alkalinity [mg/L as CaCO3]	02-Oct-09	15:19	05-Oct-09	15:13	---	---	---
Acidity [mg/L as CaCO3]	02-Oct-09	15:19	05-Oct-09	15:13	11	9	9
Hardness [mg/L as CaCO3]	02-Oct-09	09:00	02-Oct-09	12:09	10.4	10.2	34.8
Aluminum [mg/L]	02-Oct-09	09:00	02-Oct-09	12:09	0.02	0.02	< 0.01
Arsenic [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.0004	0.0003	0.0005
Barium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.0144	0.0155	0.120
Beryllium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	< 0.00002	< 0.00002	< 0.00002
Boron [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.0059	0.0050	0.0084
Bismuth [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	< 0.00001	< 0.00001	< 0.00001
Calcium [mg/L]	02-Oct-09	09:00	02-Oct-09	12:09	3.26	3.21	11.8
Cadmium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.000013	0.000061	< 0.000003
Cobalt [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.00298	0.00250	0.00184
Chromium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	< 0.0005	< 0.0005	< 0.0005
Copper [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.0015	0.0016	0.0007
Iron [mg/L]	02-Oct-09	09:00	02-Oct-09	12:09	0.03	0.03	0.02
Potassium [mg/L]	02-Oct-09	09:00	02-Oct-09	12:09	0.25	0.24	0.78
Lithium [mg/L]	02-Oct-09	09:00	02-Oct-09	12:09	< 0.002	< 0.002	< 0.002
Magnesium [mg/L]	02-Oct-09	09:00	02-Oct-09	12:09	0.542	0.524	1.31

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LR Report : **CA10525-SEP09**

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	5: SW09-SR-1T	6: SW09-SR-1B	7: SW09-SR-2T
Manganese [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.0313	0.0284	0.0545
Molybdenum [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.00007	0.00008	0.00022
Sodium [mg/L]	02-Oct-09	09:00	02-Oct-09	12:09	1.83	1.89	2.06
Nickel [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.0004	0.0004	0.0005
Phosphorus [mg/L]	02-Oct-09	09:00	02-Oct-09	12:09	< 0.01	< 0.01	< 0.01
Lead [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.00031	0.00056	0.00031
Sulphur [mg/L]	02-Oct-09	09:00	02-Oct-09	12:09	1.66	1.67	9.17
Antimony [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.0045	0.0037	0.0028
Selenium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	< 0.001	< 0.001	< 0.001
Silica [mg/L]	02-Oct-09	09:00	02-Oct-09	12:09	0.63	0.63	0.63
Tin [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.00006	0.00019	0.00019
Strontium [mg/L]	02-Oct-09	09:00	02-Oct-09	12:09	0.0117	0.0115	0.0270
Titanium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.0002	0.0002	0.0001
Thallium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	< 0.0002	< 0.0002	< 0.0002
Uranium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.000257	0.000138	0.00154
Vanadium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.00005	0.00012	0.00004
Zinc [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.003	0.003	< 0.001

Ra226 subcontracted to Becquerel Labs.

Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

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Ecometrix
Attn : Erin Clyde

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Phone: 905-794-2325, Fax:905-794-2338

October 14, 2009

Date Rec. : 30 September 2009
LR Report : **CA10525-SEP09**
Project : 09-1663

CERTIFICATE OF ANALYSIS
Final Report

Analysis	8: SW09-SR-2B	9: SW09-SR-3T	10: SW09-SR-3B	11: SW09-SR-4T	12: SW09-SR-4B	13: Blank 1
Sample Date & Time	25-Sep-09	25-Sep-09	25-Sep-09	25-Sep-09	25-Sep-09	27-Sep-09
Temperature Upon Receipt [°C]	4.0	4.0	4.0	4.0	4.0	4.0
Sulphate [mg/L]	45	30	26	25	25	< 2
Total Organic Carbon [mg/L]	2.2	4.6	2.2	4.6	2.0	2.4
Total Inorganic Carbon [mg/L]	< 1.0	< 1.0	< 1.0	< 1.0	1.4	< 1.0
Alkalinity [mg/L as CaCO3]	---	---	7	---	---	---
Acidity [mg/L as CaCO3]	7	8	---	---	< 2	7
Hardness [mg/L as CaCO3]	36.5	33.7	32.7	33.0	33.4	< 0.5
Aluminum [mg/L]	0.04	< 0.01	< 0.01	0.01	< 0.01	< 0.01
Arsenic [mg/L]	0.0007	0.0004	0.0008	0.0004	0.0007	< 0.0002
Barium [mg/L]	0.294	0.147	0.334	0.191	0.222	0.00216
Beryllium [mg/L]	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Boron [mg/L]	0.0093	0.0079	0.0090	0.0081	0.0089	< 0.0002
Bismuth [mg/L]	< 0.00001	< 0.00001	< 0.00001	< 0.00001	0.00001	< 0.00001
Calcium [mg/L]	12.4	11.4	11.1	11.1	11.2	0.03
Cadmium [mg/L]	0.000045	0.000006	0.000011	0.000009	0.000028	< 0.000003
Cobalt [mg/L]	0.00270	0.00148	0.00178	0.000944	0.000310	0.000003
Chromium [mg/L]	0.0012	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Copper [mg/L]	0.0015	0.0012	0.0017	0.0009	0.0011	0.0053
Iron [mg/L]	0.02	0.02	0.40	0.02	0.08	< 0.01
Potassium [mg/L]	0.86	0.75	0.74	0.72	0.80	< 0.01
Lithium [mg/L]	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Magnesium [mg/L]	1.36	1.28	1.24	1.28	1.29	< 0.003

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LR Report : **CA10525-SEP09**

Analysis	8: SW09-SR-2B	9: SW09-SR-3T	10: SW09-SR-3B	11: SW09-SR-4T	12: SW09-SR-4B	13: Blank 1
Manganese [mg/L]	0.253	0.0424	0.752	0.0251	0.119	0.00034
Molybdenum [mg/L]	0.00013	0.00026	0.00036	0.00029	0.00032	< 0.00001
Sodium [mg/L]	2.13	2.16	2.17	2.65	2.79	0.15
Nickel [mg/L]	0.0016	0.0006	0.0010	0.0005	0.0006	0.0003
Phosphorus [mg/L]	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Lead [mg/L]	0.00151	0.00029	0.00031	0.00027	0.00043	< 0.00002
Sulphur [mg/L]	9.22	8.86	8.73	8.40	8.58	0.05
Antimony [mg/L]	0.0041	0.0021	0.0006	0.0013	0.0002	< 0.0002
Selenium [mg/L]	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Silica [mg/L]	0.62	0.62	0.77	0.65	0.73	< 0.01
Tin [mg/L]	0.00029	0.00052	0.00009	0.00007	0.00016	< 0.00001
Strontium [mg/L]	0.0302	0.0267	0.0275	0.0266	0.0268	0.0001
Titanium [mg/L]	0.0001	0.0001	0.0002	0.0002	0.0001	< 0.0001
Thallium [mg/L]	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Uranium [mg/L]	0.00345	0.00131	0.00137	0.00146	0.00122	< 0.000001
Vanadium [mg/L]	0.00003	0.00007	0.00005	0.00005	0.00008	< 0.00003
Zinc [mg/L]	0.009	0.002	0.002	< 0.001	0.004	< 0.001

Ra226 subcontracted to Becquerel Labs.

Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

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OnLine LIMS

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Project : 09-1663

October 7, 2010

Ecometrix
Attn : Erin Clyde

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Phone: 905-794-2325, Fax:905-794-2338

Date Rec. : 30 September 2009
LR Report: **CA10525-SEP09**

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report - (QC Report)

Analysis	**14: MDL**	**15: QC - Blank**	**16: QC - STD % Recovery**	**17: QC - DUP % Recovery**
Sulphate [mg/L]	0.2	< 0.2	105%	100%
Total Organic Carbon [mg/L]	0.2	< 0.2	105%	98%
Total Inorganic Carbon [mg/L]	0.2	0.2	97%	100%
Alkalinity [mg/L as CaCO3]	2	< 2	101%	98%
Acidity [mg/L as CaCO3]	2	3	98%	102%
Hardness [mg/L as CaCO3]	0.5	---	---	---
Aluminum [mg/L]	0.01	< 0.01	95%	100%
Arsenic [mg/L]	0.0002	< 0.0002	106%	111%
Barium [mg/L]	0.00001	< 0.00001	105%	100%
Beryllium [mg/L]	0.00002	< 0.00002	103%	94%
Boron [mg/L]	0.0002	< 0.0002	99%	97%
Bismuth [mg/L]	0.00001	0.00001	105%	82%
Calcium [mg/L]	0.03	---	98%	100%
Cadmium [mg/L]	0.000003	< 0.000003	102%	107%
Cobalt [mg/L]	0.000002	< 0.000002	105%	99%
Chromium [mg/L]	0.0005	< 0.0005	103%	170%
Copper [mg/L]	0.0005	< 0.0005	106%	85%
Iron [mg/L]	0.01	---	96.8	122
Potassium [mg/L]	0.01	< 0.01	98%	99.1
Lithium [mg/L]	0.002	< 0.002	94.2	120
Magnesium [mg/L]	0.003	---	95%	100%
Manganese [mg/L]	0.00001	< 0.00001	104%	99%
Molybdenum [mg/L]	0.00001	< 0.00001	95%	155%
Sodium [mg/L]	0.01	---	95%	99%
Nickel [mg/L]	0.0001	< 0.0001	105%	87%
Phosphorus [mg/L]	0.01	< 0.01	95%	100%
Lead [mg/L]	0.00002	< 0.00002	102%	30%
Sulphur [mg/L]	0.01	---	100%	101%
Antimony [mg/L]	0.0002	< 0.0002	94%	124%
Selenium [mg/L]	0.001	< 0.001	108%	100%

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Phone: 705-652-2000 FAX: 705-652-6365

Project : 09-1663

LR Report : **CA10525-SEP09**

Analysis	14: MDL	15: QC - Blank	16: QC - STD % Recovery	17: QC - DUP % Recovery
Silica [mg/L]	0.01	< 0.01	103%	101%
Tin [mg/L]	0.00001	< 0.00001	96%	140%
Strontium [mg/L]	0.0001	---	98%	100%
Titanium [mg/L]	0.0001	< 0.0001	95%	130%
Thallium [mg/L]	0.0002	< 0.0002	105%	106%
Uranium [mg/L]	0.000001	< 0.000001	102%	94%
Vanadium [mg/L]	0.00003	< 0.00003	106%	150%
Zinc [mg/L]	0.001	< 0.001	106%	90%

Ra226 subcontracted to Becquerel Labs.
Revised to include Ra226 results from Becquerel

Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

OnLine LIMS

Becquerel LABORATORIES

ANALYSIS REPORT

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FAX: (905) 826-4151

Batch: T09-01383.0

Date: 20-Oct-2009

Lakefield Research Ltd.

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Client Ref.Oct 10069
P.O: 17820

5 water samples Sampled: 29-Sep-2009 Received: 06-Oct-2009 Page 1 of 1

Results of Analysis

Sample	Test	Result	Units	Date	Method
PW09 EC2 0-2.5	Ra-226	2.9	Bq/l	18-Oct-2009	ALPHA
PW09 EC2 2.5-5	Ra-226	3.3	Bq/l	18-Oct-2009	ALPHA
PW09 EC2 5-7.5	Ra-226	5.4	Bq/l	18-Oct-2009	ALPHA
PW09 EC1 0-5	Ra-226	0.30	Bq/l	18-Oct-2009	ALPHA
PW09 EC1 5-10	Ra-226	4.7	Bq/l	18-Oct-2009	ALPHA

Methods: ALPHA BQ-RAD-ALPHA alpha-particle spectrometry

Units: Bq/l Becquerels per litre

These results relate only to the samples analysed and only to the items tested.

20-Oct-2009 approved by: Donald D. Burgess PhD
Senior Scientist, Division Supervisor

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October 14, 2009

Date Rec. : 01 October 2009
LR Report : **CA10069-OCT09**
Project : 09-1663

CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	5: PW09 EC2 0-2.5	6: PW09 EC2 2.5-5	7: PW09 EC2 5-7.5	8: PW09 EC1 0-5	9: PW09 EC1 5-10
Sample Date & Time					29-Sep-09	29-Sep-09	29-Sep-09	29-Sep-09	29-Sep-09
Temperature Upon Receipt [°C]	---	---	---	---	9.0	9.0	9.0	9.0	9.0
Sulphate [mg/L]	02-Oct-09	19:39	06-Oct-09	12:35	27	18	---	---	---
Dissolved Organic Carbon [mg/L]	05-Oct-09	09:40	06-Oct-09	13:53	19.0	14.3	---	---	---
Dissolved Inorganic Carbon [mg/L]	06-Oct-09	08:15	07-Oct-09	12:40	4.2	1.1	---	---	---
Acidity [mg/L as CaCO3]	02-Oct-09	15:00	06-Oct-09	11:07	17	16	---	---	---
Hardness [mg/L as CaCO3]	05-Oct-09	09:00	05-Oct-09	13:17	21.7	16.0	16.4	33.9	17.8
Aluminum [mg/L]	05-Oct-09	09:00	05-Oct-09	13:17	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Arsenic [mg/L]	02-Oct-09	14:45	05-Oct-09	13:17	0.0058	0.0046	0.0065	0.0006	0.0024
Barium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:17	0.285	0.337	0.487	0.221	0.335
Beryllium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:17	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Boron [mg/L]	02-Oct-09	14:45	05-Oct-09	13:17	0.0039	0.0034	0.0039	0.0082	0.0028
Bismuth [mg/L]	02-Oct-09	14:45	05-Oct-09	13:17	0.00003	0.00006	0.00003	< 0.00001	< 0.00001
Calcium [mg/L]	05-Oct-09	09:00	05-Oct-09	13:17	7.28	5.35	5.54	11.4	6.06
Cadmium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:17	0.000031	0.000012	0.000009	0.000012	< 0.000003
Cobalt [mg/L]	02-Oct-09	14:45	05-Oct-09	13:17	0.00289	0.00120	0.00183	0.000321	0.00192
Chromium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:17	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Copper [mg/L]	02-Oct-09	14:45	05-Oct-09	13:17	0.0018	0.0018	0.0011	0.0010	< 0.0005
Iron [mg/L]	05-Oct-09	09:00	05-Oct-09	13:17	0.44	3.30	5.71	0.07	6.63
Potassium [mg/L]	05-Oct-09	09:00	05-Oct-09	13:17	0.30	0.34	0.48	0.80	0.58
Lithium [mg/L]	05-Oct-09	09:00	05-Oct-09	13:17	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Magnesium [mg/L]	05-Oct-09	09:00	05-Oct-09	13:17	0.864	0.634	0.632	1.31	0.655

SGS Lakefield Research Limited
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

LR Report : CA10069-OCT09

Analysis	**1: Analysis Start Date**	**2: Analysis Start Time**	**3: Analysis Approval Date**	**4: Analysis Approval Time**	**5: PW09 EC2 0-2.5**	**6: PW09 EC2 2.5-5**	**7: PW09 EC2 5-7.5**	**8: PW09 EC1 0-5**	**9: PW09 EC1 5-10**
Manganese [mg/L]	02-Oct-09	14:45	05-Oct-09	13:17	0.217	0.134	0.132	0.120	0.142
Molybdenum [mg/L]	02-Oct-09	14:45	05-Oct-09	13:17	0.00015	0.00116	0.00149	0.00029	0.00051
Sodium [mg/L]	05-Oct-09	09:00	05-Oct-09	13:17	2.20	1.87	1.50	2.75	1.24
Nickel [mg/L]	02-Oct-09	14:45	05-Oct-09	13:17	0.0024	0.0013	0.0017	0.0008	0.0010
Phosphorus [mg/L]	05-Oct-09	09:00	05-Oct-09	13:17	0.07	0.01	< 0.01	< 0.01	< 0.01
Lead [mg/L]	02-Oct-09	14:45	05-Oct-09	13:17	0.00216	0.00090	0.00049	0.00023	0.00016
Sulphur [mg/L]	05-Oct-09	09:00	05-Oct-09	13:17	6.26	3.35	4.21	7.26	1.58
Antimony [mg/L]	02-Oct-09	14:45	05-Oct-09	13:17	0.0003	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Selenium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:17	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Silica [mg/L]	05-Oct-09	09:00	05-Oct-09	13:17	1.42	1.86	2.71	0.72	5.07
Tin [mg/L]	02-Oct-09	14:45	05-Oct-09	13:17	0.00017	< 0.00001	0.00001	< 0.00001	0.00002
Strontium [mg/L]	05-Oct-09	09:00	05-Oct-09	13:17	0.0168	0.0149	0.0187	0.0269	0.0168
Titanium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:17	0.0007	0.0004	0.0002	< 0.0001	0.0003
Thallium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:17	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Uranium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:17	0.000173	0.000115	0.000105	0.000835	0.000671
Vanadium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:17	0.00008	0.00007	0.00004	0.00007	0.00005
Zinc [mg/L]	02-Oct-09	14:45	05-Oct-09	13:17	0.005	0.004	0.003	0.003	0.001

Samples are field filtered
Ra226 subcontracted to Becquerel Labs.

Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

OnLine LIMS

SGS Lakefield Research Limited
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
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LR Report : **CA10069-OCT09**

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OnLine LIMS

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Phone: 705-652-2000 FAX: 705-652-6365

Env ICP-MS Metals

Project : 09-1663

October 7, 2010

Ecometrix
Attn : Erin Clyde

6800 Campobello Road, Mississauga
Canada, L5N 2L8
Phone: 905-794-2325, Fax:905-794-2338

Date Rec. : 01 October 2009
LR Report: **CA10069-OCT09**

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CERTIFICATE OF ANALYSIS
Final Report

Analysis	10: MDL	11: QC - Blank	12: QC - STD % Recovery	13: QC - DUP % Recovery
Sulphate [mg/L]	0.2	< 0.2	100%	110%
Dissolved Organic Carbon [mg/L]	0.2	< 0.2	91%	100%
Dissolved Inorganic Carbon [mg/L]	0.2	0.7	107%	100%
Acidity [mg/L as CaCO3]	2	3	98%	102%
Hardness [mg/L as CaCO3]	0.5	< 0.5	---	---
Aluminum [mg/L]	0.01	< 0.01	98%	---
Arsenic [mg/L]	0.0002	< 0.0002	106%	---
Barium [mg/L]	0.00001	< 0.00001	122%	---
Beryllium [mg/L]	0.00002	< 0.00002	104%	---
Boron [mg/L]	0.0002	< 0.0002	96%	---
Bismuth [mg/L]	0.00001	< 0.00001	109%	---
Calcium [mg/L]	0.03	< 0.03	101%	---
Cadmium [mg/L]	0.000003	0.000003	99%	---
Cobalt [mg/L]	0.000002	< 0.000002	102%	---
Chromium [mg/L]	0.0005	< 0.0005	102%	---
Copper [mg/L]	0.0005	< 0.0005	102%	---
Iron [mg/L]	0.01	< 0.01	102%	---
Potassium [mg/L]	0.01	< 0.01	98%	---
Lithium [mg/L]	0.002	< 0.002	98%	---
Magnesium [mg/L]	0.003	< 0.003	98%	---
Manganese [mg/L]	0.00001	< 0.00001	107%	---
Molybdenum [mg/L]	0.00001	< 0.00001	99%	---
Sodium [mg/L]	0.01	< 0.01	94%	---
Nickel [mg/L]	0.0001	< 0.0001	100%	---
Phosphorus [mg/L]	0.01	< 0.01	100%	---
Lead [mg/L]	0.00002	< 0.00002	106%	---
Sulphur [mg/L]	0.01	< 0.01	98%	---
Antimony [mg/L]	0.0002	< 0.0002	101%	---

OnLine LIMS

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Env ICP-MS Metals

Project : 09-1663

LR Report : **CA10069-OCT09**

Analysis	10: MDL	11: QC - Blank	12: QC - STD % Recovery	13: QC - DUP % Recovery
Selenium [mg/L]	0.001	< 0.001	102%	---
Silica [mg/L]	0.01	< 0.01	104%	---
Tin [mg/L]	0.00001	< 0.00001	96%	---
Strontium [mg/L]	0.0001	< 0.0001	100%	---
Titanium [mg/L]	0.0001	< 0.0001	96%	---
Thallium [mg/L]	0.0002	< 0.0002	107%	---
Uranium [mg/L]	0.000001	0.000001	107%	---
Vanadium [mg/L]	0.00003	< 0.00003	107%	---
Zinc [mg/L]	0.001	< 0.001	104%	---

Samples are field filtered
Ra226 subcontracted to Becquerel Labs.

Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

OnLine LIMS

ANALYSIS REPORT

Becquerel Laboratories Inc.
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Mississauga, Ontario
Canada, L5N 5L9

Phone: (905) 826-3080
FAX: (905) 826-4151

Batch: T09-01382.0

Date: 20-Oct-2009

Lakefield Research Ltd.

185 Concession St., Postal Bag 4300
Lakefield, ON, K0L 2H0

attn: Brian Graham

Phone: (705) 652-2038
FAX: (705) 652-1918

Client Ref.Oct 10064
P.O: 17820

6 water samples Sampled: 28-Sep-2009 Received: 06-Oct-2009 Page 1 of 1

Results of Analysis

Sample	Test	Result	Units	Date	Method
SW09 QC15-1	Ra-226	0.42	Bq/l	17-Oct-2009	ALPHA
SW09 QC15-2	Ra-226	0.45	Bq/l	18-Oct-2009	ALPHA
SW09 QC15-3	Ra-226	0.46	Bq/l	18-Oct-2009	ALPHA
SW09 QC15-4	Ra-226	0.45	Bq/l	18-Oct-2009	ALPHA
SW09 EC-2T	Ra-226	0.78	Bq/l	18-Oct-2009	ALPHA
SW09 EC-2B	Ra-226	0.85	Bq/l	18-Oct-2009	ALPHA

Methods: ALPHA BQ-RAD-ALPHA alpha-particle spectrometry

Units: Bq/l Becquerels per litre

These results relate only to the samples analysed and only to the items tested.

20-Oct-2009 approved by: Donald D. Burgess

Donald D. Burgess PhD
Senior Scientist, Division Supervisor

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October 14, 2009

Date Rec. : 01 October 2009
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Project : 09-1663

CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	5: SW09 QC15-1	6: SW09 QC15-2	7: SW09 QC15-3	8: SW09 QC15-4	9: SW09 EC-2T	10: SW09 EC-2B
Sample Date & Time					28-Sep-09	28-Sep-09	28-Sep-09	28-Sep-09	28-Sep-09	28-Sep-09
Temperature Upon Receipt [°C]	---	---	---	---	9.0	9.0	9.0	9.0	9.0	9.0
Sulphate [mg/L]	02-Oct-09	19:39	06-Oct-09	14:22	570	570	570	600	85	36
Acidity [mg/L as CaCO3]	02-Oct-09	15:00	05-Oct-09	15:14	22	27	44	50	67	16
Total Organic Carbon [mg/L]	05-Oct-09	09:40	06-Oct-09	13:53	---	---	---	---	11.4	11.7
Total Inorganic Carbon [mg/L]	05-Oct-09	14:35	08-Oct-09	12:46	---	---	---	---	< 1.0	< 1.0
Hardness [mg/L as CaCO3]	05-Oct-09	09:00	05-Oct-09	13:19	529	535	532	549	17.0	16.8
Aluminum [mg/L]	05-Oct-09	09:00	05-Oct-09	13:19	< 0.01	< 0.01	< 0.01	0.02	0.03	< 0.01
Arsenic [mg/L]	02-Oct-09	14:45	05-Oct-09	13:19	0.0010	0.0009	0.0009	0.0011	0.0007	0.0007
Barium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:19	0.0334	0.0301	0.0300	0.0296	0.108	0.114
Beryllium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:19	0.00006	< 0.00002	0.00002	< 0.00002	0.00003	0.00002
Boron [mg/L]	02-Oct-09	14:45	05-Oct-09	13:19	0.113	0.113	0.115	0.116	0.0076	0.0072
Bismuth [mg/L]	02-Oct-09	14:45	05-Oct-09	13:19	0.00004	0.00002	0.00001	< 0.00001	0.00002	0.00002
Calcium [mg/L]	05-Oct-09	09:00	05-Oct-09	13:19	202	205	204	210	5.69	5.63
Cadmium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:19	0.000074	0.000051	0.000039	0.000031	0.000046	0.000056
Cobalt [mg/L]	02-Oct-09	14:45	05-Oct-09	13:19	0.00558	0.00464	0.0106	0.0122	0.00655	0.00196
Chromium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:19	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Copper [mg/L]	02-Oct-09	14:45	05-Oct-09	13:19	0.0017	0.0014	0.0013	0.0016	0.0037	0.0029
Iron [mg/L]	05-Oct-09	09:00	05-Oct-09	13:19	0.10	0.06	0.16	0.18	0.07	0.04
Potassium [mg/L]	05-Oct-09	09:00	05-Oct-09	13:19	10.8	11.0	10.9	11.9	0.31	0.32
Lithium [mg/L]	05-Oct-09	09:00	05-Oct-09	13:19	0.008	0.008	0.008	0.009	< 0.002	< 0.002
Magnesium [mg/L]	05-Oct-09	09:00	05-Oct-09	13:19	5.69	5.79	5.77	6.19	0.670	0.663

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LR Report : **CA10064-OCT09**

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	5: SW09 QC15-1	6: SW09 QC15-2	7: SW09 QC15-3	8: SW09 QC15-4	9: SW09 EC-2T	10: SW09 EC-2B
Manganese [mg/L]	02-Oct-09	14:45	05-Oct-09	13:19	0.207	0.214	0.214	0.310	0.0315	0.0319
Molybdenum [mg/L]	02-Oct-09	14:45	05-Oct-09	13:19	0.00319	0.00409	0.00368	0.00533	0.00018	0.00008
Sodium [mg/L]	05-Oct-09	09:00	05-Oct-09	13:19	2.38	2.42	2.37	2.59	1.59	1.58
Nickel [mg/L]	02-Oct-09	14:45	05-Oct-09	13:19	0.0067	0.0067	0.0067	0.0068	0.0022	0.0022
Phosphorus [mg/L]	05-Oct-09	09:00	05-Oct-09	13:19	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Lead [mg/L]	02-Oct-09	14:45	05-Oct-09	13:19	0.00151	0.00098	0.00194	0.00548	0.00699	0.00391
Sulphur [mg/L]	05-Oct-09	09:00	05-Oct-09	13:19	157	160	160	166	4.64	4.63
Antimony [mg/L]	02-Oct-09	14:45	05-Oct-09	13:19	0.0017	0.0010	0.0093	0.0106	0.0086	0.0016
Selenium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:19	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Silica [mg/L]	05-Oct-09	09:00	05-Oct-09	13:19	5.46	5.55	5.54	5.55	0.59	0.60
Tin [mg/L]	02-Oct-09	14:45	05-Oct-09	13:19	0.00002	0.00012	0.00002	0.00025	< 0.00001	< 0.00001
Strontium [mg/L]	05-Oct-09	09:00	05-Oct-09	13:19	0.159	0.161	0.160	0.166	0.0122	0.0122
Titanium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:19	0.0005	0.0004	0.0005	0.0004	0.0004	0.0001
Thallium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:19	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Uranium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:19	0.0143	0.0116	0.0144	0.0219	0.000654	0.00079
Vanadium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:19	0.00009	0.00004	0.00004	< 0.00003	0.00007	0.00007
Zinc [mg/L]	02-Oct-09	14:45	05-Oct-09	13:19	0.005	0.004	0.004	0.004	0.004	0.005

Ra226 subcontracted to Becquerel Labs.

Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

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Env ICP-MS Metals

Project : 09-1663

October 7, 2010

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LR Report: **CA10064-OCT09**

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CERTIFICATE OF ANALYSIS
Final Report (QC Report)

Analysis	11: MDL	12: QC - Blank	13: QC - STD % Recovery	14: QC - DUP % Recovery
Sulphate [mg/L]	0.2	< 0.2	98%	102%
Acidity [mg/L as CaCO3]	2	3	98%	102%
Total Organic Carbon [mg/L]	1	< 1	91%	100%
Total Inorganic Carbon [mg/L]	0.2	0.2	97%	100%
Hardness [mg/L as CaCO3]	0.5	< 0.5	---	---
Aluminum [mg/L]	0.01	< 0.01	99%	---
Arsenic [mg/L]	0.0002	< 0.0002	106%	---
Barium [mg/L]	0.00001	< 0.00001	122%	---
Beryllium [mg/L]	0.00002	< 0.00002	104%	---
Boron [mg/L]	0.0002	< 0.0002	96%	---
Bismuth [mg/L]	0.00001	< 0.00001	109%	---
Calcium [mg/L]	0.03	< 0.03	101%	---
Cadmium [mg/L]	0.000003	0.000003	99%	---
Cobalt [mg/L]	0.000002	< 0.000002	102%	---
Chromium [mg/L]	0.0005	< 0.0005	102%	---
Copper [mg/L]	0.0005	< 0.0005	102%	---
Iron [mg/L]	0.01	< 0.01	102%	---
Potassium [mg/L]	0.01	< 0.01	98%	---
Lithium [mg/L]	0.002	< 0.002	98%	---
Magnesium [mg/L]	0.003	< 0.003	99%	---
Manganese [mg/L]	0.00001	< 0.00001	107%	---
Molybdenum [mg/L]	0.00001	< 0.00001	99%	---
Sodium [mg/L]	0.01	< 0.01	93%	---
Nickel [mg/L]	0.0001	< 0.0001	100%	---
Phosphorus [mg/L]	0.01	< 0.01	100%	---
Lead [mg/L]	0.00002	< 0.00002	106%	---
Sulphur [mg/L]	0.01	< 0.01	98%	---
Antimony [mg/L]	0.0002	< 0.0002	101%	---
Selenium [mg/L]	0.001	< 0.001	102%	---
Silica [mg/L]	0.01	< 0.01	104%	---
Tin [mg/L]	0.00001	< 0.00001	96%	---
Strontium [mg/L]	0.0001	< 0.0001	100%	---
Titanium [mg/L]	0.0001	< 0.0001	96%	---
Thallium [mg/L]	0.0002	< 0.0002	107%	---

OnLine LIMS

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Env ICP-MS Metals

Project : 09-1663

LR Report : **CA10064-OCT09**

Analysis	11: MDL	12: QC - Blank	13: QC - STD % Recovery	14: QC - DUP % Recovery
Uranium [mg/L]	0.000001	0.000001	1065	---
Vanadium [mg/L]	0.00003	< 0.00003	107%	---
Zinc [mg/L]	0.001	< 0.001	104%	---

Ra226 subcontracted to Becquerel Labs.

Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

OnLine LIMS

ANALYSIS REPORT

Becquerel Laboratories Inc.
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FAX: (905) 826-4151

Batch: T09-01485.0

Date: 12-Nov-2009

Lakefield Research Ltd.

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Sep 10524.R09
P.O: 17820

9 rock samples   Sampled: 22-Sep-2009   Received: 21-Oct-2009   Page 1 of 1

Results of Analysis

Sample	Test	Result	Units	Date	Method
CORE 09-PSB-1 0-2.5	Ra-226	12	Bq/g	07-Nov-2009	ALPHA
CORE 09-PSB-1 2.5-5	Ra-226	4.9	Bq/g	07-Nov-2009	ALPHA
CORE 09-PSB-1 5-7.5	Ra-226	1.6	Bq/g	07-Nov-2009	ALPHA
CORE 09-PSB-1 7.5-10	Ra-226	2.8	Bq/g	07-Nov-2009	ALPHA
CORE 09-PSB-1 10-15	Ra-226	2.2	Bq/g	08-Nov-2009	ALPHA
CORE 09-PSB-2 0-5	Ra-226	16	Bq/g	08-Nov-2009	ALPHA
CORE 09-PSB-2 5-10	Ra-226	4.5	Bq/g	08-Nov-2009	ALPHA
CORE 09-PSB-2 10-15	Ra-226	5.6	Bq/g	08-Nov-2009	ALPHA
CORE 09-PSB-2 15-20	Ra-226	14	Bq/g	08-Nov-2009	ALPHA

Methods: ALPHA BQ-RAD-ALPHA alpha-particle spectrometry

Units: Bq/g Becquerels per gram

These results relate only to the samples analysed and only to the items tested.

12-Nov-2009 approved by: S. Se...
Donald D. Burgess PhD
Senior Scientist, Division Supervisor

NOV 24 2009

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Ecometrix
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Fax:905-794-2338

Tuesday, October 27, 2009

Date Rec. : 30 September 2009
LR. Ref. : **CA10524-SEP09**
Project : 09-1663

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CERTIFICATE OF ANALYSIS

Final Report

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: CORE 09-PSB-1 0-2.5	6: CORE 09-PSB-1 2.5-5	7: CORE 09-PSB-1 5-7.5	8: CORE 09-PSB-1 7.5-10
Sample Date & Time			22-Sep-09	22-Sep-09	22-Sep-09	22-Sep-09
BaSO4 Calc. using Ba* [µg/g]	---	---	2210	870	680	610
BaSO4 Calc. using SO4** [µg/g]	---	---	14600	238000	330000	381000
Total Sulphur [%]	06-Oct-09	14:44	0.698	3.33	4.55	5.14
Carbonate (CO3) [%]	06-Oct-09	14:42	9.43	11.7	6.45	10.7
Total Organic Carbon [%]	06-Oct-09	14:42	2.25	0.940	0.380	0.260
Total Carbon [%]	06-Oct-09	14:45	4.14	3.27	1.67	2.41
Sulphide [%]	07-Oct-09	16:00	0.43	0.18	0.11	< 0.01
Sulphate [%]	23-Oct-09	10:29	0.6	9.8	14	16
Silver [µg/g]	14-Oct-09	14:09	< 0.7	< 0.7	< 0.7	< 0.7
Aluminum [µg/g]	14-Oct-09	14:09	15000	11000	13000	8400
Arsenic [µg/g]	14-Oct-09	14:09	37	24	27	18
Barium [µg/g]	14-Oct-09	14:09	1300	510	400	360
Beryllium [µg/g]	14-Oct-09	14:09	1.1	0.88	1.2	0.82
Bismuth [µg/g]	14-Oct-09	14:09	13	8.9	6.6	5.4
Calcium [µg/g]	14-Oct-09	14:09	67000	140000	140000	180000
Cadmium [µg/g]	14-Oct-09	14:09	3.8	2.5	2.5	2.0
Cerium [µg/g]	13-Oct-09	15:45	690	510	690	440
Cobalt [µg/g]	14-Oct-09	14:09	98	79	100	69
Chromium [µg/g]	14-Oct-09	14:09	16	13	15	10
Cesium [µg/g]	13-Oct-09	15:45	19	0.55	0.24	0.19
Copper [µg/g]	14-Oct-09	14:09	55	33	43	26
Iron [µg/g]	14-Oct-09	14:09	190000	140000	140000	110000
Gallium [µg/g]	13-Oct-09	15:45	7.3	4.5	4.3	2.8
Germanium [µg/g]	13-Oct-09	15:45	6.5	4.9	5.5	4.0
Hafnium [µg/g]	13-Oct-09	15:45	0.5	0.5	0.4	0.3
Indium [µg/g]	13-Oct-09	15:45	0.01	< 0.01	0.01	< 0.01
Potassium [µg/g]	14-Oct-09	14:09	310	220	130	150
Lanthanum [µg/g]	13-Oct-09	15:45	380	280	380	240
Lithium [µg/g]	14-Oct-09	14:09	9.9	7.3	3.6	4.5

OnLine LIMS

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LR Report : CA10524-SEP09

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: CORE 09-PSB-1 0-2.5	6: CORE 09-PSB-1 2.5-5	7: CORE 09-PSB-1 5-7.5	8: CORE 09-PSB-1 7.5-10
Lutetium [µg/g]	13-Oct-09	15:45	3.0	2.6	3.3	2.2
Magnesium [µg/g]	14-Oct-09	14:09	9900	13000	9900	9000
Manganese [µg/g]	14-Oct-09	14:09	1600	750	770	660
Molybdenum [µg/g]	14-Oct-09	14:09	34	11	1.5	0.6
Sodium [µg/g]	14-Oct-09	14:09	62	48	29	40
Niobuim [µg/g]	13-Oct-09	15:45	3.3	2.3	1.7	1.3
Nickel [µg/g]	14-Oct-09	14:09	90	63	64	44
Lead [µg/g]	14-Oct-09	14:09	280	150	96	78
Phosphorus [µg/g]	14-Oct-09	14:09	280	150	110	120
Rubidium [µg/g]	13-Oct-09	15:44	2.5	1.4	0.63	0.58
Antimony [µg/g]	14-Oct-09	14:08	< 1	< 1	< 1	< 1
Scandium [µg/g]	13-Oct-09	15:44	2.1	1.4	1.4	1.0
Selenium [µg/g]	14-Oct-09	14:08	< 1	< 1	< 1	< 1
Tin [µg/g]	14-Oct-09	14:08	< 6	< 6	< 6	< 6
Strontium [µg/g]	14-Oct-09	14:08	30	30	23	35
Tantalum [µg/g]	13-Oct-09	15:44	0.10	0.09	0.07	0.06
Terbium [µg/g]	13-Oct-09	15:44	12	9.8	12	8.2
Tellerium [µg/g]	13-Oct-09	15:44	0.2	0.1	0.1	< 0.1
Thorium [µg/g]	13-Oct-09	15:44	350	300	420	290
Titanium [µg/g]	14-Oct-09	14:08	230	150	100	73
Thallium [µg/g]	14-Oct-09	14:08	< 3	< 3	< 3	< 3
Uranium [µg/g]	13-Oct-09	15:44	370	160	110	75
Vanadium [µg/g]	14-Oct-09	14:08	15	9.2	8.0	5.8
Tungsten [µg/g]	14-Oct-09	14:05	5	2	< 1	< 1
Yttrium [µg/g]	14-Oct-09	14:05	270	220	280	200
Ytterbium [µg/g]	13-Oct-09	15:44	23	20	25	17
Zinc [µg/g]	14-Oct-09	14:05	210	130	110	87
Zirconium [µg/g]	15-Oct-09	10:44	14	10	8	6

Ra226 subcontracted to Becquerel Labs.
* BaSO4 Calculation based on Ba values and assumes all Ba is in BaSO4 form.
** BaSO4 Calculation based on SO4 values and assumes all SO4 is in BaSO4 form.

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Project Specialist
Environmental Services, Analytical

OnLine LIMS

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Tuesday, October 27, 2009

Date Rec. : 30 September 2009
LR. Ref. : **CA10524-SEP09**
Project : 09-1663

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CERTIFICATE OF ANALYSIS

Final Report

Analysis	**9: CORE 09-PSB-1 10-15**	**10: CORE 09-PSB-2 0-5**	**11: CORE 09-PSB-2 5-10**	**12: CORE 09-PSB-2 10-15**	**13: CORE 09-PSB-2 15-20**
Sample Date & Time	22-Sep-09	23-Sep-09	23-Sep-09	23-Sep-09	23-Sep-09
BaSO4 Calc. using Ba* [µg/g]	540	580	270	310	320
BaSO4 Calc. using SO4** [µg/g]	418000	19400	14600	12100	14600
Total Sulphur [%]	5.96	1.31	1.57	2.00	2.23
Carbonate (CO3) [%]	9.65	0.170	0.097	0.052	0.071
Total Organic Carbon [%]	0.130	6.97	9.78	15.2	9.61
Total Carbon [%]	2.06	7.00	9.80	15.2	9.63
Sulphide [%]	< 0.01	0.18	0.36	0.88	1.82
Sulphate [%]	17	0.8	0.6	0.5	0.6
Silver [µg/g]	< 0.7	1.0	< 0.7	< 0.7	1.0
Aluminum [µg/g]	6800	8400	3600	3000	3300
Arsenic [µg/g]	15	30	14	12	19
Barium [µg/g]	320	340	160	180	190
Beryllium [µg/g]	0.66	0.75	0.34	0.37	0.66
Bismuth [µg/g]	4.5	13	11	14	21
Calcium [µg/g]	190000	9600	7600	9400	7600
Cadmium [µg/g]	1.6	5.7	4.5	0.86	0.96
Cerium [µg/g]	360	250	220	230	290
Cobalt [µg/g]	61	20	15	25	46
Chromium [µg/g]	8.6	15	6.5	13	17
Cesium [µg/g]	0.34	0.47	0.97	1.1	0.74
Copper [µg/g]	22	110	14	29	64
Iron [µg/g]	87000	290000	240000	45000	30000
Gallium [µg/g]	2.3	11	2.4	2.1	2.7
Germanium [µg/g]	3.5	8.1	7.2	2.1	1.9
Hafnium [µg/g]	0.3	0.2	0.1	0.1	0.3
Indium [µg/g]	< 0.01	0.02	< 0.01	< 0.01	0.01
Potassium [µg/g]	170	230	190	470	610
Lanthanum [µg/g]	200	130	110	110	140
Lithium [µg/g]	4.5	0.9	0.9	< 0.1	1.1

OnLine LIMS

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LR Report : CA10524-SEP09

Analysis	9: CORE 09-PSB-1 10-15	10: CORE 09-PSB-2 0-5	11: CORE 09-PSB-2 5-10	12: CORE 09-PSB-2 10-15	13: CORE 09-PSB-2 15-20
Lutetium [µg/g]	1.8	1.2	0.98	0.79	0.81
Magnesium [µg/g]	9900	540	360	510	410
Manganese [µg/g]	610	430	89	75	51
Molybdenum [µg/g]	< 0.5	128	10	4.3	3.9
Sodium [µg/g]	47	28	35	80	74
Niobuim [µg/g]	1.0	2.7	2.8	7.8	12
Nickel [µg/g]	39	22	17	22	30
Lead [µg/g]	80	270	270	190	410
Phosphorus [µg/g]	75	590	740	480	510
Rubidium [µg/g]	0.61	2.1	2.1	4.3	4.8
Antimony [µg/g]	< 1	< 1	< 1	< 1	< 1
Scandium [µg/g]	0.8	2.2	1.3	2.3	2.2
Selenium [µg/g]	< 1	< 1	< 1	< 1	< 1
Tin [µg/g]	< 6	< 6	< 6	< 6	< 6
Strontium [µg/g]	27	9.0	7.6	12	10
Tantalum [µg/g]	0.05	0.09	0.05	0.08	0.09
Terbium [µg/g]	6.8	5.1	3.9	3.0	3.5
Tellerium [µg/g]	< 0.1	0.1	0.1	0.1	0.3
Thorium [µg/g]	220	560	110	250	550
Titanium [µg/g]	60	81	82	140	240
Thallium [µg/g]	< 3	< 3	< 3	< 3	< 3
Uranium [µg/g]	68	480	210	84	94
Vanadium [µg/g]	4.6	11	25	9.4	11
Tungsten [µg/g]	< 1	14	2	< 1	1
Yttrium [µg/g]	170	97	78	51	61
Ytterbium [µg/g]	14	9.3	7.4	6.3	6.7
Zinc [µg/g]	83	170	64	27	76
Zirconium [µg/g]	5	8	6	8	18

Ra226 subcontracted to Becquerel Labs.
* BaSO4 Calculation based on Ba values and assumes all Ba is in BaSO4 form.
** BaSO4 Calculation based on SO4 values and assumes all SO4 is in BaSO4 form.

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Project Specialist
Environmental Services, Analytical

OnLine LIMS

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Project : 09-1663

October 7, 2010

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Date Rec. : 30 September 2009
LR Report: **CA10524-SEP09**

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CERTIFICATE OF ANALYSIS

Final Report (QC Report)

Analysis	14: MDL	15: QC - Blank	16: QC - STD % Recovery	17: QC - DUP % Recovery
BaSO4 Calc. using Ba* [µg/g]	---	---	---	---
BaSO4 Calc. using SO4** [µg/g]	---	---	---	---
Total Sulphur [%]	0.005	< 0.005	102%	100%
Carbonate (CO3) [%]	0.005	< 0.005	100%	140%
Total Organic Carbon [%]	0.01	< 0.01	---	100%
Total Carbon [%]	0.005	< 0.005	100%	100%
Sulphide [%]	0.01	< 0.01	90%	106%
Sulphate [%]	0.1	< 0.1	100%	107%
Silver [µg/g]	0.7	< 0.7	93%	100%
Aluminum [µg/g]	1	< 1	97%	100%
Arsenic [µg/g]	1	< 1	99%	94%
Barium [µg/g]	0.05	< 0.05	96%	100%
Beryllium [µg/g]	0.1	< 0.1	98%	102%
Bismuth [µg/g]	0.5	< 0.5	98%	104%
Calcium [µg/g]	1	< 1	98%	100%
Cadmium [µg/g]	0.05	< 0.05	97%	99%
Cerium [µg/g]	0.006	< 0.006	94%	110%
Cobalt [µg/g]	0.3	< 0.3	97%	100%
Chromium [µg/g]	0.5	< 0.5	98%	103%
Cesium [µg/g]	0.01	< 0.01	100%	107%
Copper [µg/g]	0.1	< 0.1	98%	100%
Iron [µg/g]	0.5	< 0.5	98%	100%
Gallium [µg/g]	0.03	< 0.03	100%	99%
Germanium [µg/g]	0.3	< 0.3	103%	105%
Hafnium [µg/g]	0.1	< 0.1	96%	150%
Indium [µg/g]	0.01	< 0.01	---	100%
Potassium [µg/g]	1	< 1	100%	100%
Lanthanum [µg/g]	0.001	0.001	94%	110%
Lithium [µg/g]	0.1	< 0.1	97%	107%
Lutetium [µg/g]	0.001	0.001	95%	102%

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Project : 09-1663

LR Report : **CA10524-SEP09**

Analysis	14: MDL	15: QC - Blank	16: QC - STD % Recovery	17: QC - DUP % Recovery
Magnesium [μg/g]	1	< 1	96%	---
Manganese [μg/g]	0.05	< 0.05	98%	100%
Molybdenum [μg/g]	0.5	< 0.5	100%	154%
Sodium [μg/g]	1	< 1	97%	104%
Niobuim [μg/g]	0.7	< 0.7	99%	118%
Nickel [μg/g]	1	< 1	97%	101%
Lead [μg/g]	0.7	< 0.7	98%	100%
Phosphorus [μg/g]	5	< 5	98%	100%
Rubidium [μg/g]	0.004	< 0.004	---	105
Antimony [μg/g]	1	< 1	98	100%
Scandium [μg/g]	0.2	< 0.2	100%	99%
Selenium [μg/g]	1	< 1	99%	100%
Tin [μg/g]	6	< 6	100%	123%
Strontium [μg/g]	0.01	< 0.01	97%	103%
Tantalum [μg/g]	0.01	< 0.01	97%	108%
Terbium [μg/g]	0.01	< 0.001	96%	93%
Tellerium [μg/g]	0.1	< 0.1	99%	101%
Thorium [μg/g]	0.01	< 0.01	114%	100%
Titanium [μg/g]	0.2	< 0.2	98%	100%
Thallium [μg/g]	3	< 3	99%	76%
Uranium [μg/g]	3	< 3	---	100%
Vanadium [μg/g]	0.1	< 0.1	99%	102%
Tungsten [μg/g]	1	< 1	97%	93%
Yttrium [μg/g]	0.1	< 0.1	96%	100%
Ytterbium [μg/g]	0.1	< 0.1	98%	105%
Zinc [μg/g]	0.1	< 0.1	97%	100%
Zirconium [μg/g]	5	< 5	100%	107%

Ra226 subcontracted to Becquerel Labs.
* BaSO4 Calculation based on Ba values and assumes all Ba is in BaSO4 form.
** BaSO4 Calculation based on SO4 values and assumes all SO4 is in BaSO4 form.

Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

OnLine LIMS

ANALYSIS REPORT

Becquerel LABORATORIES

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Batch: T09-01387.0

Date: 09-Nov-2009

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Client Ref.Sep 10523
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9 water samples

Received: 06-Oct-2009

Results of Analysis

Sample	Test		Result	Units	Date	Method
PW09-PSB-1 0-2.5	Ra-226		0.76	Bq/l	06-Nov-2009	ALPHA
PW09-PSB-1 2.5-5	Ra-226		0.12	Bq/l	06-Nov-2009	ALPHA
PW09-PSB-1 5-7.5	Ra-226		0.02	Bq/l	06-Nov-2009	ALPHA
PW09-PSB-1 7.5-10	Ra-226	<	0.01	Bq/l	06-Nov-2009	ALPHA
PW09-PSB-1 10-15	Ra-226	<	0.01	Bq/l	06-Nov-2009	ALPHA
PW09-PSB-2 0-5	Ra-226		3.2	Bq/l	06-Nov-2009	ALPHA
PW09-PSB-2 5-10	Ra-226		1.8	Bq/l	06-Nov-2009	ALPHA
PW09-PSB-2 10-15	Ra-226		1.1	Bq/l	06-Nov-2009	ALPHA
PW09-PSB-2 15-20	Ra-226		1.4	Bq/l	06-Nov-2009	ALPHA

Methods: ALPHA BQ-RAD-ALPHA alpha-particle spectrometry

Units: Bq/l Becquerels per litre

These results relate only to the samples analysed and only to the items tested.

09-Nov-2009 approved by: Donald D. Burgess

Donald D. Burgess PhD
Senior Scientist, Division Supervisor

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October 14, 2009

Date Rec. : 30 September 2009
LR Report : **CA10523-SEP09**
Project : 09-1663

CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	5: PW09-PSB-1 0-2.5	6: PW09-PSB-1 2.5-5	7: PW09-PSB-1 5-7.5
Sample Date & Time					22-Sep-09	22-Sep-09	22-Sep-09
Temperature Upon Receipt [°C]	---	---	---	---	4.0	4.0	4.0
Sulphate [mg/L]	02-Oct-09	15:00	06-Oct-09	14:01	410	1100	1300
Dissolved Organic Carbon [mg/L]	02-Oct-09	10:00	06-Oct-09	13:52	10.7	9.9	12.2
Dissolved Inorganic Carbon [mg/L]	05-Oct-09	14:35	08-Oct-09	12:46	1.7	< 1.0	< 1.0
Alkalinity [mg/L as CaCO3]	02-Oct-09	15:19	05-Oct-09	15:11	24	24	33
Acidity [mg/L as CaCO3]	02-Oct-09	15:19	05-Oct-09	15:11	---	---	---
Hardness [mg/L as CaCO3]	02-Oct-09	09:00	08-Oct-09	16:00	504	934	1270
Aluminum [mg/L]	02-Oct-09	09:00	02-Oct-09	12:08	0.03	0.12	0.04
Arsenic [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	0.0018	0.0047	0.0059
Barium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	0.0167	0.00872	0.00558
Beryllium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	< 0.00002	< 0.00002	< 0.00002
Boron [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	0.0287	0.0284	0.0078
Bismuth [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	< 0.00001	0.00001	< 0.00001
Calcium [mg/L]	02-Oct-09	09:00	08-Oct-09	16:00	193	373	506
Cadmium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.000014	0.000017	0.000007
Cobalt [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.000458	0.000560	0.000695
Chromium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	< 0.0005	0.0006	0.0009
Copper [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.0014	0.0012	0.0014
Iron [mg/L]	02-Oct-09	09:00	02-Oct-09	12:09	< 0.01	< 0.01	0.01
Potassium [mg/L]	02-Oct-09	09:00	02-Oct-09	12:09	10.3	17.3	23.3
Lithium [mg/L]	02-Oct-09	09:00	02-Oct-09	12:09	< 0.002	< 0.002	0.003
Magnesium [mg/L]	02-Oct-09	09:00	02-Oct-09	12:09	5.17	0.966	0.296

OnLine LIMS

SGS Lakefield Research Limited
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

LR Report : **CA10523-SEP09**

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	5: PW09-PSB-1 0-2.5	6: PW09-PSB-1 2.5-5	7: PW09-PSB-1 5-7.5
Manganese [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.0679	0.00194	0.00031
Molybdenum [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.00679	0.0118	0.00655
Sodium [mg/L]	02-Oct-09	09:00	02-Oct-09	12:09	6.60	10.0	13.0
Nickel [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.0043	0.0093	0.0126
Phosphorus [mg/L]	02-Oct-09	09:00	02-Oct-09	12:09	< 0.01	< 0.01	< 0.01
Lead [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.00025	0.00017	0.00008
Sulphur [mg/L]	02-Oct-09	09:00	02-Oct-09	12:09	179	331	449
Antimony [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	< 0.0002	< 0.0002	< 0.0002
Selenium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	< 0.001	< 0.001	< 0.001
Silica [mg/L]	02-Oct-09	09:00	02-Oct-09	12:09	0.44	0.22	0.13
Tin [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.00018	0.00026	0.00043
Strontium [mg/L]	02-Oct-09	09:00	02-Oct-09	12:09	0.115	0.156	0.170
Titanium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.0002	0.0002	0.0003
Thallium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	< 0.0002	< 0.0002	< 0.0002
Uranium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.0636	0.00363	0.000341
Vanadium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.00005	0.00006	0.00019
Zinc [mg/L]	01-Oct-09	16:00	02-Oct-09	12:09	0.002	< 0.001	< 0.001

Samples are field filtered
Ra226 subcontracted to Becquerel Labs.

Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

OnLine LIMS

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SGS Lakefield Research Limited
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Ecometrix
Attn : Erin Clyde

6800 Campobello Road, Mississauga
Canada, L5N 2L8
Phone: 905-794-2325, Fax:905-794-2338

October 14, 2009

Date Rec. : 30 September 2009
LR Report : **CA10523-SEP09**
Project : 09-1663

CERTIFICATE OF ANALYSIS
Final Report

Analysis	**8: PW09-PSB-1 7.5-10**	**9: PW09-PSB-1 10-15**	**10: PW09-PSB-2 0-5**	**11: PW09-PSB-2 5-10**	**12: PW09-PSB-2 10-15**	**13: PW09-PSB-2 15-20**
Sample Date & Time	22-Sep-09	22-Sep-09	23-Sep-09	23-Sep-09	23-Sep-09	23-Sep-09
Temperature Upon Receipt [°C]	4.0	4.0	4.0	4.0	4.0	4.0
Sulphate [mg/L]	1600	1800	190	250	---	---
Dissolved Organic Carbon [mg/L]	14.6	12.0	5.5	21.8	---	---
Dissolved Inorganic Carbon [mg/L]	< 1.0	< 1.0	8.6	14.6	---	---
Alkalinity [mg/L as CaCO3]	45	36	---	---	---	---
Acidity [mg/L as CaCO3]	---	---	< 2	< 2	---	---
Hardness [mg/L as CaCO3]	1970	1810	217	312	415	875
Aluminum [mg/L]	0.01	0.04	< 0.01	< 0.01	< 0.01	0.01
Arsenic [mg/L]	0.0069	0.0059	0.0012	0.0015	0.0028	0.0064
Barium [mg/L]	0.00624	0.00582	0.0443	0.0344	0.0266	0.0380
Beryllium [mg/L]	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Boron [mg/L]	0.0023	0.0077	0.0232	0.0422	0.0889	0.118
Bismuth [mg/L]	0.00001	< 0.00001	< 0.00001	< 0.00001	0.00001	< 0.00001
Calcium [mg/L]	787	723	76.4	106	138	297
Cadmium [mg/L]	0.000006	0.000013	0.000011	< 0.000003	0.000012	0.000010
Cobalt [mg/L]	0.000763	0.000834	0.00271	0.000540	0.000530	0.00114
Chromium [mg/L]	< 0.0005	0.0011	< 0.0005	< 0.0005	0.0010	0.0009
Copper [mg/L]	0.0021	0.0022	0.0008	0.0012	0.0022	0.0023
Iron [mg/L]	< 0.01	0.02	8.19	12.1	6.95	16.1
Potassium [mg/L]	29.7	35.8	7.51	11.8	17.4	29.2
Lithium [mg/L]	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	0.007
Magnesium [mg/L]	0.213	0.713	6.39	11.8	17.0	32.7

OnLine LIMS

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LR Report : **CA10523-SEP09**

Analysis	8: PW09-PSB-1 7.5-10	9: PW09-PSB-1 10-15	10: PW09-PSB-2 0-5	11: PW09-PSB-2 5-10	12: PW09-PSB-2 10-15	13: PW09-PSB-2 15-20
Manganese [mg/L]	0.00012	0.00100	1.85	0.753	0.790	1.67
Molybdenum [mg/L]	0.00633	0.00445	0.00113	0.00071	0.00437	0.00563
Sodium [mg/L]	15.9	17.5	5.62	10.2	16.1	24.2
Nickel [mg/L]	0.0151	0.0132	0.0026	0.0028	0.0035	0.0046
Phosphorus [mg/L]	0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.01
Lead [mg/L]	0.00016	0.00018	0.00012	0.00022	0.00025	0.00023
Sulphur [mg/L]	503	560	63.7	87.8	123	311
Antimony [mg/L]	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	0.0004
Selenium [mg/L]	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Silica [mg/L]	0.22	0.43	4.34	7.44	11.3	12.0
Tin [mg/L]	0.00055	0.00046	0.00017	0.00031	0.00017	0.00009
Strontium [mg/L]	0.193	0.216	0.0915	0.131	0.177	0.347
Titanium [mg/L]	0.0002	0.0004	0.0003	0.0006	0.0012	0.0012
Thallium [mg/L]	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Uranium [mg/L]	0.000330	0.000201	0.00706	0.0241	0.0330	0.0214
Vanadium [mg/L]	0.00011	0.00029	< 0.00003	0.00008	0.00041	0.00060
Zinc [mg/L]	< 0.001	< 0.001	0.002	0.002	0.002	0.003

Samples are field filtered
Ra226 subcontracted to Becquerel Labs.

Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

OnLine LIMS

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SGS Canada Inc.
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Project : 09-1663

October 7, 2010

Ecometrix
Attn : Erin Clyde

6800 Campobello Road, Mississauga
Canada, L5N 2L8
Phone: 905-794-2325, Fax:905-794-2338

Date Rec. : 30 September 2009
LR Report: **CA10523-SEP09**

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CERTIFICATE OF ANALYSIS
Final Report - (QC Report)

Analysis	14: MDL	15: QC - Blank	16: QC - STD % Recovery	17: QC - DUP % Recovery
Sulphate [mg/L]	0.2	< 0.2	98%	102%
Dissolved Organic Carbon [mg/L]	0.2	< 0.2	105%	98%
Dissolved Inorganic Carbon [mg/L]	0.2	0.2	97%	110%
Alkalinity [mg/L as CaCO3]	2	< 2	101%	98%
Acidity [mg/L as CaCO3]	2	3	98%	102%
Hardness [mg/L as CaCO3]	0.5	---	---	---
Aluminum [mg/L]	0.01	< 0.01	95%	100%
Arsenic [mg/L]	0.0002	< 0.0002	106%	111%
Barium [mg/L]	0.00001	< 0.00001	105%	100%
Beryllium [mg/L]	0.00002	< 0.00002	103%	94%
Boron [mg/L]	0.0002	< 0.0002	99%	97%
Bismuth [mg/L]	0.00001	0.00001	105%	82%
Calcium [mg/L]	0.03	---	98%	100%
Cadmium [mg/L]	0.000003	< 0.000003	102%	107%
Cobalt [mg/L]	0.000002	< 0.000002	105%	99%
Chromium [mg/L]	0.0005	< 0.0005	103%	170%
Copper [mg/L]	0.0005	< 0.0005	106%	85%
Iron [mg/L]	0.01	---	97%	122%
Potassium [mg/L]	0.01	< 0.01	98%	99%
Lithium [mg/L]	0.002	< 0.002	94%	120%
Magnesium [mg/L]	0.003	---	95%	100%
Manganese [mg/L]	0.00001	< 0.00001	104%	99%
Molybdenum [mg/L]	0.00001	< 0.00001	95%	155%
Sodium [mg/L]	0.01	---	94.8	99.3
Nickel [mg/L]	0.0001	< 0.0001	105%	87%
Phosphorus [mg/L]	0.01	< 0.01	95%	100%
Lead [mg/L]	0.00002	< 0.00002	102%	30%
Sulphur [mg/L]	0.01	---	100%	101%
Antimony [mg/L]	0.0002	< 0.0002	94%	124%
Selenium [mg/L]	0.001	< 0.001	108%	100%

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Project : 09-1663

LR Report : **CA10523-SEP09**

Analysis	14: MDL	15: QC - Blank	16: QC - STD % Recovery	17: QC - DUP % Recovery
Silica [mg/L]	0.01	< 0.01	103%	101%
Tin [mg/L]	0.00001	< 0.00001	96%	140%
Strontium [mg/L]	0.0001	---	98%	100%
Titanium [mg/L]	0.0001	< 0.0001	95%	130%
Thallium [mg/L]	0.0002	< 0.0002	105%	106%
Uranium [mg/L]	0.000001	< 0.000001	102%	94%
Vanadium [mg/L]	0.00003	< 0.00003	106%	150%
Zinc [mg/L]	0.001	< 0.001	106%	90%

Samples are field filtered
Ra226 subcontracted to Becquerel Labs.
Revised to include Ra226 results from Becquerel.

Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

OnLine LIMS

Becquerel LABORATORIES

ANALYSIS REPORT

Becquerel Laboratories Inc.
6790 Kitimat Rd., Unit 4
Mississauga, Ontario
Canada, L5N 5L9

Phone: (905) 826-3080
FAX: (905) 826-4151

Batch: T09-01381.0

Date: 20-Oct-2009

Lakefield Research Ltd.

185 Concession St., Postal Bag 4300
Lakefield, ON, K0L 2H0

attn: Brian Graham

Phone: (705) 652-2038
FAX: (705) 652-1918

Client Ref.Sept 10522
P.O: 17820

4 water samples Sampled: 22-Sep-2009 Received: 06-Oct-2009

Results of Analysis

Sample	Test	Result	Units	Date	Method
SW09-PSB-1T	Ra-226	0.34	Bq/l	17-Oct-2009	ALPHA
SW09-PSB-1B	Ra-226	0.65	Bq/l	17-Oct-2009	ALPHA
SW09-PSB-2T	Ra-226	0.31	Bq/l	17-Oct-2009	ALPHA
SW09-PSB-2B	Ra-226	0.39	Bq/l	17-Oct-2009	ALPHA

Methods: ALPHA BQ-RAD-ALPHA alpha-particle spectrometry

Units: Bq/l Becquerels per litre

These results relate only to the samples analysed and only to the items tested.

20-Oct-2009 approved by: [signature]
Donald D. Burgess PhD
Senior Scientist, Division Supervisor

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October 14, 2009

Date Rec. : 30 September 2009
LR Report : **CA10522-SEP09**
Project : 09-1663

CERTIFICATE OF ANALYSIS

Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	5: SW09-PSB-1T	6: SW09-PSB-1B	7: SW09-PSB-2T	8: SW09-PSB-2B
Sample Date & Time					22-Sep-09	22-Sep-09	23-Sep-09	23-Sep-09
Temperature Upon Receipt [°C]	---	---	---	---	4.0	4.0	4.0	4.0
Sulphate [mg/L]	02-Oct-09	15:00	06-Oct-09	14:19	180	410	180	180
Total Organic Carbon [mg/L]	02-Oct-09	10:00	05-Oct-09	13:41	2.1	4.6	2.2	4.0
Total Inorganic Carbon [mg/L]	05-Oct-09	14:35	08-Oct-09	12:45	3.5	< 1.0	2.9	< 1.0
Alkalinity [mg/L as CaCO3]	02-Oct-09	15:19	05-Oct-09	15:10	12	---	---	---
Acidity [mg/L as CaCO3]	02-Oct-09	15:19	05-Oct-09	15:10	---	20	< 2	15
Hardness [mg/L as CaCO3]	02-Oct-09	09:00	02-Oct-09	12:08	173	209	179	179
Aluminum [mg/L]	02-Oct-09	09:00	02-Oct-09	12:08	< 0.01	0.53	< 0.01	< 0.01
Arsenic [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	0.0005	0.0014	0.0004	0.0005
Barium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	0.0134	0.0196	0.0137	0.0160
Beryllium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	0.00007	0.00009	0.00002	< 0.00002
Boron [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	0.0249	0.0314	0.0252	0.0243
Bismuth [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	0.00007	0.00003	< 0.00001	0.00001
Calcium [mg/L]	02-Oct-09	09:00	02-Oct-09	12:08	62.2	74.4	64.5	64.1
Cadmium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	0.000079	0.000082	0.000005	0.000015
Cobalt [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	0.000281	0.0186	0.000319	0.00120
Chromium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Copper [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	0.0025	0.0019	0.0015	0.0009
Iron [mg/L]	02-Oct-09	09:00	02-Oct-09	12:08	0.03	1.61	< 0.01	0.02
Potassium [mg/L]	02-Oct-09	09:00	02-Oct-09	12:08	6.11	6.53	6.18	6.14
Lithium [mg/L]	02-Oct-09	09:00	02-Oct-09	12:08	< 0.002	< 0.002	< 0.002	< 0.002

OnLine LIMS

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Lakefield - Ontario - KOL 2HO
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LR Report : **CA10522-SEP09**

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	5: SW09-PSB-1T	6: SW09-PSB-1B	7: SW09-PSB-2T	8: SW09-PSB-2B
Magnesium [mg/L]	02-Oct-09	09:00	02-Oct-09	12:08	4.30	5.53	4.45	4.47
Manganese [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	0.00475	0.203	0.00313	0.0273
Molybdenum [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	0.00017	0.00043	0.00008	0.00025
Sodium [mg/L]	02-Oct-09	09:00	02-Oct-09	12:08	3.99	4.35	4.04	4.14
Nickel [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	0.0017	0.0101	0.0015	0.0025
Phosphorus [mg/L]	02-Oct-09	09:00	02-Oct-09	12:08	< 0.01	< 0.01	< 0.01	< 0.01
Lead [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	0.00057	0.00647	0.00013	0.00088
Sulphur [mg/L]	02-Oct-09	09:00	02-Oct-09	12:08	57.9	67.4	60.2	60.5
Antimony [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	< 0.0002	0.0084	0.0003	0.0015
Selenium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	< 0.001	< 0.001	< 0.001	< 0.001
Silica [mg/L]	02-Oct-09	09:00	02-Oct-09	12:08	0.99	1.14	1.01	1.12
Tin [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	0.00011	0.00035	0.00017	0.00020
Strontium [mg/L]	02-Oct-09	09:00	02-Oct-09	12:08	0.0715	0.0765	0.0736	0.0742
Titanium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	0.0003	0.0002	0.0002	0.0002
Thallium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Uranium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	0.00245	0.0557	0.00273	0.00317
Vanadium [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	0.00008	0.00004	< 0.00003	0.00007
Zinc [mg/L]	01-Oct-09	16:00	02-Oct-09	12:08	0.009	0.024	< 0.001	0.002

Ra226 subcontracted to Becquerel Labs.

Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

OnLine LIMS

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Env ICP-MS Metals

Project : 09-1663

October 7, 2010

Ecometrix
Attn : Erin Clyde

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Phone: 905-794-2325, Fax:905-794-2338

Date Rec. : 30 September 2009
LR Report: **CA10522-SEP09**

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CERTIFICATE OF ANALYSIS

Final Report

Analysis	9: MDL	10: QC - Blank	11: QC - STD % Recovery	12: QC - DUP % Recovery
Sulphate [mg/L]	0.2	< 0.2	98%	102%
Total Organic Carbon [mg/L]	0.2	< 0.2	105%	98%
Total Inorganic Carbon [mg/L]	0.2	< 0.2	110%	100%
Alkalinity [mg/L as CaCO3]	2	< 2	101%	98%
Acidity [mg/L as CaCO3]	2	2	98%	102%
Hardness [mg/L as CaCO3]	0.5	---	---	---
Aluminum [mg/L]	0.01	< 0.01	95%	100%
Arsenic [mg/L]	0.0002	< 0.0002	106%	111%
Barium [mg/L]	0.00001	< 0.00001	105%	100%
Beryllium [mg/L]	0.00002	< 0.00002	103%	94%
Boron [mg/L]	0.0002	< 0.0002	99%	97%
Bismuth [mg/L]	0.00001	0.00001	105%	82%
Calcium [mg/L]	0.03	---	97%	100%
Cadmium [mg/L]	0.000003	< 0.000003	102%	107%
Cobalt [mg/L]	0.000002	< 0.000002	105%	99%
Chromium [mg/L]	0.00005	< 0.0005	103%	170%
Copper [mg/L]	0.0005	< 0.0005	106%	85%
Iron [mg/L]	0.01	---	96.8	122
Potassium [mg/L]	0.01	< 0.01	98%	99.1
Lithium [mg/L]	0.002	< 0.002	94.2	120
Magnesium [mg/L]	0.003	---	94.8	100
Manganese [mg/L]	0.00001	< 0.00001	104%	99%
Molybdenum [mg/L]	0.00001	< 0.00001	95%	155%
Sodium [mg/L]	0.01	---	94.8	99.3
Nickel [mg/L]	0.0001	< 0.0001	105%	87%
Phosphorus [mg/L]	0.01	< 0.01	95%	100%
Lead [mg/L]	0.00002	< 0.00002	102%	30%
Sulphur [mg/L]	0.01	---	100%	101

OnLine LIMS

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Env ICP-MS Metals

Project : 09-1663

LR Report : **CA10522-SEP09**

Analysis	9: MDL	10: QC - Blank	11: QC - STD % Recovery	12: QC - DUP % Recovery
Antimony [mg/L]	0.0002	< 0.0002	94%	124%
Selenium [mg/L]	0.001	< 0.001	108%	100%
Silica [mg/L]	0.01	< 0.01	103%	101%
Tin [mg/L]	0.00001	< 0.00001	96%	140%
Strontium [mg/L]	0.0001	---	98%	99.7
Titanium [mg/L]	0.0001	< 0.0001	95%	130%
Thallium [mg/L]	0.0002	< 0.0002	105%	106%
Uranium [mg/L]	0.000001	< 0.000001	102%	94%
Vanadium [mg/L]	0.00003	< 0.00003	106%	150%
Zinc [mg/L]	0.001	< 0.001	106%	90%

Ra226 subcontracted to Becquerel Labs.

Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

OnLine LIMS

ANALYSIS REPORT

Becquerel Laboratories Inc.
6790 Kitimat Rd., Unit 4
Mississauga, Ontario
Canada, L5N 5L9

Phone: (905) 826-3080
FAX: (905) 826-4151

Batch: T09-01487.0

Date: 13-Nov-2009

Lakefield Research Ltd.

185 Concession St., Postal Bag 4300
Lakefield, ON, K0L 2H0

Phone: (705) 652-2038
FAX: (705) 652-1918

Client Ref.
Oct 10063.R09
P.O: 17820

attn: Brian Graham

20 solid samples   Sampled: 28-Sep-2009   Received: 21-Oct-2009

Results of Analysis

Sample	Test	Result	Units	Date	Method
CORE 09-EC-1 (0-5)	Ra-226	4.1	Bq/g	11-Nov-2009	ALPHA
CORE 09-EC-1 (5-10)	Ra-226	1.6	Bq/g	11-Nov-2009	ALPHA
CORE 09-EC-2 (0-2.5)	Ra-226	7.0	Bq/g	11-Nov-2009	ALPHA
CORE 09-EC-2 (2.5-5)	Ra-226	8.3	Bq/g	11-Nov-2009	ALPHA
CORE 09-EC-2 (5-7.5)	Ra-226	9.7	Bq/g	11-Nov-2009	ALPHA
CORE 09-QC14-1 (0-5)	Ra-226	19	Bq/g	11-Nov-2009	ALPHA
CORE 09-QC14-1 (5-10)	Ra-226	13	Bq/g	11-Nov-2009	ALPHA
CORE 09-QC14-1 (10-15)	Ra-226	9.7	Bq/g	11-Nov-2009	ALPHA
CORE 09-QC14-2 (0-2.5)	Ra-226	4.3	Bq/g	12-Nov-2009	ALPHA
CORE 09-QC14-2 (2.5-5)	Ra-226	6.5	Bq/g	12-Nov-2009	ALPHA
CORE 09-QC14-2 (5-7.5)	Ra-226	9.3	Bq/g	12-Nov-2009	ALPHA
CORE 09-QC14-2 (7.5-10)	Ra-226	9.0	Bq/g	12-Nov-2009	ALPHA
CORE 09-QC14-3 (0-5)	Ra-226	16	Bq/g	12-Nov-2009	ALPHA
CORE 09-QC14-3 (5-10)	Ra-226	22	Bq/g	12-Nov-2009	ALPHA
CORE 09-QC14-3 (10-15)	Ra-226	24	Bq/g	12-Nov-2009	ALPHA
CORE 09-QC14-3 (15-20)	Ra-226	23	Bq/g	12-Nov-2009	ALPHA
CORE 09-QC14-4 (0-5)	Ra-226	16	Bq/g	12-Nov-2009	ALPHA
CORE 09-QC14-4 (5-10)	Ra-226	17	Bq/g	12-Nov-2009	ALPHA
CORE 09-QC14-4 (10-15)	Ra-226	22	Bq/g	12-Nov-2009	ALPHA
CORE 09-QC14-4 (15-20)	Ra-226	19	Bq/g	12-Nov-2009	ALPHA

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Batch: T09-01487.0

Date: 13-Nov-2009

Methods: ALPHA BQ-RAD-ALPHA alpha-particle spectrometry

Units: Bq/g Becquerels per gram

These results relate only to the samples analysed and only to the items tested.

13-Nov-2009 approved by:

Donald D. Burgess PhD
Senior Scientist, Division Supervisor

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Ecometrix
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Tuesday, October 27, 2009

Date Rec. : 01 October 2009
LR. Ref. : **CA10063-OCT09**
Project : 09-1663

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CERTIFICATE OF ANALYSIS

Final Report

Analysis	**3: Analysis Approval Date**	**4: Analysis Approval Time**	**5: CORE 09-EC-1 (0-5)**	**6: CORE 09-EC-1 (5-10)**	**7: CORE 09-EC-2 (0-2.5)**	**8: CORE 09-EC-2 (2.5-5)**	**9: CORE 09-EC-2 (5-7.5)**	**10: CORE 09-QC14-1 (0-5)**
Sample Date & Time			28-Sep-09	28-Sep-09	28-Sep-09	28-Sep-09	28-Sep-09	28-Sep-09
Ba as BaSO4 Calc. * [µg/g]	---	---	160	770	480	630	530	940
SO4 as BaSO4 Calc. ** [µg/g]	---	---	7280	2430	2430	2430	2430	14600
Total Sulphur [%]	09-Oct-09	10:07	1.17	0.762	0.628	1.03	1.18	1.21
Carbonate (CO3) [%]	08-Oct-09	10:46	0.058	0.280	< 0.005	< 0.005	< 0.005	< 0.005
Total Organic Carbon [%]	09-Oct-09	10:07	10.5	16.7	0.617	0.206	0.090	0.490
Total Carbon [%]	09-Oct-09	10:07	10.5	16.8	0.616	0.207	0.089	0.489
Sulphide [%]	08-Oct-09	11:47	0.47	0.70	0.53	1.04	1.07	0.96
Sulphate [%]	13-Oct-09	16:45	0.3	0.1	0.1	0.1	0.1	0.6
Silver [µg/g]	14-Oct-09	13:32	< 0.7	< 0.7	1.5	1.2	1.1	3.0
Aluminum [µg/g]	14-Oct-09	13:32	3800	5800	1500	1200	890	6700
Arsenic [µg/g]	14-Oct-09	13:32	14	26	22	24	24	37
Barium [µg/g]	14-Oct-09	13:32	94	450	280	370	310	550
Beryllium [µg/g]	14-Oct-09	13:32	0.35	0.13	0.51	0.41	0.34	1.5
Bismuth [µg/g]	14-Oct-09	13:32	12	< 0.5	11	8.6	7.8	15
Calcium [µg/g]	14-Oct-09	13:32	4600	7400	230	110	63	2400
Cadmium [µg/g]	14-Oct-09	13:32	4.0	1.8	0.25	0.27	0.29	0.45
Cerium [µg/g]	14-Oct-09	13:32	240	800	340	300	240	600
Cobalt [µg/g]	14-Oct-09	13:32	15	17	16	21	22	25
Chromium [µg/g]	14-Oct-09	13:32	7.8	17	8.2	6.5	5.8	16
Cesium [µg/g]	14-Oct-09	13:32	1.1	0.90	0.32	0.20	0.19	1.1
Copper [µg/g]	14-Oct-09	13:32	15	56	50	54	54	120
Iron [µg/g]	14-Oct-09	13:32	240000	16000	13000	17000	19000	22000
Gallium [µg/g]	14-Oct-09	13:32	2.7	6.5	2.8	2.4	1.9	5.3
Germanium [µg/g]	14-Oct-09	13:32	7.2	4.0	1.4	1.4	1.2	2.6
Hafnium [µg/g]	14-Oct-09	13:32	0.1	0.9	0.5	0.7	0.7	1.5
Indium [µg/g]	14-Oct-09	13:32	< 0.01	0.01	0.02	0.01	0.01	0.03
Potassium [µg/g]	14-Oct-09	13:32	210	270	330	300	230	570
Lanthanum [µg/g]	14-Oct-09	13:32	130	420	190	170	140	310
Lithium [µg/g]	14-Oct-09	13:32	0.9	1.3	0.8	0.5	0.2	4.7

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Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: CORE 09-EC-1 (0-5)	6: CORE 09-EC-1 (5-10)	7: CORE 09-EC-2 (0-2.5)	8: CORE 09-EC-2 (2.5-5)	9: CORE 09-EC-2 (5-7.5)	10: CORE 09-QC14-1 (0-5)
Lutetium [µg/g]	14-Oct-09	13:32	1.1	5.3	0.14	0.060	0.038	1.1
Magnesium [µg/g]	14-Oct-09	13:32	240	1500	110	38	18	97
Manganese [µg/g]	14-Oct-09	13:32	84	180	18	7.6	4.6	14
Molybdenum [µg/g]	14-Oct-09	13:32	10	3.9	6.4	6.1	5.5	10
Sodium [µg/g]	14-Oct-09	13:32	40	55	11	8	5	15
Niobuim [µg/g]	14-Oct-09	13:32	2.7	< 0.7	9.7	7.8	7.5	13
Nickel [µg/g]	14-Oct-09	13:32	19	43	9	10	11	20
Lead [µg/g]	14-Oct-09	13:32	280	640	240	270	310	650
Phosphorus [µg/g]	14-Oct-09	13:32	810	360	400	360	330	820
Rubidium [µg/g]	14-Oct-09	13:32	2.5	4.0	2.6	2.0	1.4	4.1
Antimony [µg/g]	14-Oct-09	13:32	< 1	< 1	1	< 1	< 1	2
Scandium [µg/g]	14-Oct-09	13:32	1.6	3.0	0.9	0.8	0.6	2.8
Selenium [µg/g]	14-Oct-09	13:32	< 2	< 2	< 2	< 2	< 2	< 2
Tin [µg/g]	14-Oct-09	13:32	< 6	< 6	< 6	< 6	< 6	< 6
Strontium [µg/g]	14-Oct-09	13:32	7.9	14	5.1	5.4	4.6	11
Sulphur [µg/g]	14-Oct-09	13:32	15000	11000	6700	11000	12000	12000
Tantalum [µg/g]	14-Oct-09	13:32	0.05	0.23	0.07	0.12	0.28	0.30
Terbium [µg/g]	14-Oct-09	13:32	4.3	33	1.4	0.90	0.67	5.6
Tellerium [µg/g]	14-Oct-09	13:32	0.1	< 0.1	0.2	0.2	0.2	0.3
Thorium [µg/g]	14-Oct-09	13:32	120	89	560	470	380	1600
Titanium [µg/g]	14-Oct-09	13:32	91	220	330	260	240	610
Thallium [µg/g]	14-Oct-09	13:32	< 3	< 3	< 3	< 3	< 3	< 3
Uranium [µg/g]	14-Oct-09	13:32	230	150	23	18	15	83
Vanadium [µg/g]	14-Oct-09	13:32	26	17	4.0	2.7	2.4	7.2
Tungsten [µg/g]	14-Oct-09	13:32	79	5	5	5	6	8
Yttrium [µg/g]	14-Oct-09	13:32	84	750	12	6.7	5.2	87
Ytterbium [µg/g]	14-Oct-09	13:31	8.7	46	1.2	0.57	0.40	9.2
Zinc [µg/g]	14-Oct-09	13:32	65	58	8.9	8.0	5.8	23
Zirconium [µg/g]	14-Oct-09	13:32	6	< 5	30	27	26	58

Ra226 subcontracted to Becquerel Labs.
* BaSO4 Calculation based on Ba values and assumes all Ba is in BaSO4 form.
** BaSO4 Calculation based on SO4 values and assumes all SO4 is in BaSO4 form.

Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

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CERTIFICATE OF ANALYSIS

Final Report

Analysis	**11: CORE 09-QC14-1 (5-10)**	**12: CORE 09-QC14-1 (10-15)**	**13: CORE 09-QC14-2 (0-2.5)**	**14: CORE 09-QC14-2 (2.5-5)**	**15: CORE 09-QC14-2 (5-7.5)**	**16: CORE 09-QC14-2 (7.5-10)**	**17: CORE 09-QC14-3 (0-5)**
Sample Date & Time	28-Sep-09	28-Sep-09	28-Sep-09	28-Sep-09	28-Sep-09	28-Sep-09	28-Sep-09
Ba as BaSO4 Calc. * [µg/g]	580	480	260	370	560	540	920
SO4 as BaSO4 Calc. ** [µg/g]	53400	29100	2430	2430	2430	2430	<2430
Total Sulphur [%]	2.33	2.21	0.633	0.885	0.871	1.29	1.35
Carbonate (CO3) [%]	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.005
Total Organic Carbon [%]	0.114	0.065	0.519	0.289	0.121	0.086	0.617
Total Carbon [%]	0.115	0.064	0.519	0.289	0.121	0.086	0.618
Sulphide [%]	1.56	1.80	0.52	0.77	0.84	1.26	1.37
Sulphate [%]	2.2	1.2	0.1	0.1	0.1	0.1	< 0.1
Silver [µg/g]	1.7	1.3	0.8	1.0	1.1	1.3	3.4
Aluminum [µg/g]	3800	2600	830	690	850	1400	7700
Arsenic [µg/g]	33	26	17	19	21	23	36
Barium [µg/g]	340	280	150	220	330	320	540
Beryllium [µg/g]	0.81	0.61	0.28	0.28	0.34	0.51	1.7
Bismuth [µg/g]	10	8.1	7.5	9.2	8.5	7.6	15
Calcium [µg/g]	8900	4900	190	130	79	59	350
Cadmium [µg/g]	0.42	0.43	0.18	0.22	0.22	0.31	0.55
Cerium [µg/g]	610	430	300	290	280	250	770
Cobalt [µg/g]	35	36	15	18	17	24	38
Chromium [µg/g]	8.2	6.2	4.7	4.9	5.7	6.6	18
Cesium [µg/g]	0.49	0.32	0.18	0.22	0.31	0.20	0.55
Copper [µg/g]	100	88	43	46	42	51	140
Iron [µg/g]	21000	21000	10000	12000	13000	18000	22000
Gallium [µg/g]	4.3	3.0	2.1	2.1	2.0	1.9	6.2
Germanium [µg/g]	2.6	2.1	1.2	1.2	1.2	1.2	3.1
Hafnium [µg/g]	1.2	0.9	0.3	0.6	1.0	0.7	1.5
Indium [µg/g]	0.02	0.02	< 0.01	< 0.01	0.01	0.01	0.04
Potassium [µg/g]	440	290	210	230	250	250	600
Lanthanum [µg/g]	310	220	170	170	160	140	390
Lithium [µg/g]	1.8	1.0	0.2	0.1	0.4	0.7	5.7

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Lutetium [µg/g]	1.4	1.1	0.081	0.048	0.031	0.036	1.9
Magnesium [µg/g]	76	65	88	46	25	23	120
Manganese [µg/g]	5.3	5.4	13	8.6	4.7	3.9	20
Molybdenum [µg/g]	7.8	7.3	5.3	5.2	7.9	4.8	8.0
Sodium [µg/g]	12	7	8	7	6	6	16
Niobuim [µg/g]	7.2	4.9	7.0	8.2	8.4	7.7	15
Nickel [µg/g]	25	24	8	8	8	12	32
Lead [µg/g]	490	390	180	260	270	230	650
Phosphorus [µg/g]	490	320	260	300	360	350	830
Rubidium [µg/g]	3.2	2.1	1.9	1.9	1.8	1.6	4.3
Antimony [µg/g]	< 1	< 1	< 1	< 1	< 1	< 1	2
Scandium [µg/g]	1.5	1.0	0.5	0.4	0.5	0.8	3.0
Selenium [µg/g]	< 2	< 2	< 2	< 2	< 2	< 2	< 2
Tin [µg/g]	< 6	< 6	< 6	< 6	< 6	< 6	< 6
Strontium [µg/g]	12	8.5	3.6	4.1	4.8	4.6	7.5
Sulphur [µg/g]	22000	20000	6500	8700	8600	12000	13000
Tantalum [µg/g]	0.15	0.09	0.04	0.05	0.12	0.35	0.45
Terbium [µg/g]	7.5	5.5	0.97	0.83	0.68	0.64	9.5
Tellerium [µg/g]	0.2	0.2	0.1	0.2	0.2	0.2	0.3
Thorium [µg/g]	880	630	310	310	360	580	1800
Titanium [µg/g]	370	240	210	250	260	240	630
Thallium [µg/g]	< 3	< 3	< 3	< 3	< 3	< 3	< 3
Uranium [µg/g]	71	47	17	17	13	15	120
Vanadium [µg/g]	3.7	2.8	2.7	2.7	2.7	2.6	8.0
Tungsten [µg/g]	7	7	3	4	5	6	8
Yttrium [µg/g]	160	100	9.1	6.8	5.5	5.1	180
Ytterbium [µg/g]	12	9.1	0.74	0.46	0.33	0.36	16
Zinc [µg/g]	28	24	8.8	6.9	4.7	5.4	42
Zirconium [µg/g]	38	27	20	26	28	25	57

Ra226 subcontracted to Becquerel Labs.
* BaSO4 Calculation based on Ba values and assumes all Ba is in BaSO4 form.
** BaSO4 Calculation based on SO4 values and assumes all SO4 is in BaSO4 form.

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Sample Date & Time	28-Sep-09	28-Sep-09	28-Sep-09	28-Sep-09	28-Sep-09	28-Sep-09	28-Sep-09
Ba as BaSO4 Calc. * [µg/g]	1090	1120	1070	970	950	990	800
SO4 as BaSO4 Calc. ** [µg/g]	4850	7280	7280	4850	46100	87400	75200
Total Sulphur [%]	1.48	1.39	1.60	1.48	2.00	2.36	2.58
Carbonate (CO3) [%]	< 0.005	< 0.005	< 0.005	0.022	0.100	0.123	0.034
Total Organic Carbon [%]	0.136	0.112	0.097	0.683	0.188	0.178	0.109
Total Carbon [%]	0.136	0.113	0.096	0.688	0.208	0.202	0.116
Sulphide [%]	1.43	1.32	1.48	1.40	1.37	1.08	1.44
Sulphate [%]	0.2	0.3	0.3	0.2	1.9	3.6	3.1
Silver [µg/g]	3.2	3.9	3.7	3.0	2.9	4.0	2.9
Aluminum [µg/g]	7700	11000	9000	6500	6200	10000	7500
Arsenic [µg/g]	45	49	46	40	38	40	38
Barium [µg/g]	640	660	630	570	560	580	470
Beryllium [µg/g]	1.6	2.1	1.9	1.4	1.4	2.0	1.5
Bismuth [µg/g]	15	16	15	15	14	17	14
Calcium [µg/g]	710	940	1300	1400	9900	19000	16000
Cadmium [µg/g]	0.61	0.66	0.58	0.64	0.56	0.64	0.55
Cerium [µg/g]	1100	1200	1000	900	830	1100	890
Cobalt [µg/g]	45	41	38	39	35	38	38
Chromium [µg/g]	17	24	21	16	15	21	16
Cesium [µg/g]	0.77	0.88	0.76	0.54	0.70	0.87	0.81
Copper [µg/g]	140	160	160	130	120	160	130
Iron [µg/g]	24000	25000	24000	23000	22000	24000	23000
Gallium [µg/g]	7.5	8.6	7.5	6.4	6.1	8.0	6.3
Germanium [µg/g]	4.2	4.4	4.1	3.5	3.3	4.0	3.5
Hafnium [µg/g]	2.2	2.4	2.2	1.5	1.8	2.5	2.2
Indium [µg/g]	0.04	0.05	0.06	0.04	0.03	0.05	0.04
Potassium [µg/g]	630	730	690	600	600	760	650
Lanthanum [µg/g]	560	600	520	460	420	540	450
Lithium [µg/g]	5.2	7.7	7.0	4.9	5.7	10	6.2

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LR Report : CA10063-OCT09

Analysis	18: CORE 09-QC14-3 (5-10)	19: CORE 09-QC14-3 (10-15)	20: CORE 09-QC14-3 (15-20)	21: CORE 09-QC14-4 (0-5)	22: CORE 09-QC14-4 (5-10)	23: CORE 09-QC14-4 (10-15)	24: CORE 09-QC14-4 (15-20)
Lutetium [µg/g]	3.1	3.3	2.8	2.3	2.0	3.5	2.6
Magnesium [µg/g]	300	220	120	770	520	1300	400
Manganese [µg/g]	35	31	18	79	53	130	57
Molybdenum [µg/g]	5.8	8.1	8.9	9.0	9.4	8.0	6.6
Sodium [µg/g]	15	18	15	18	16	21	18
Niobuim [µg/g]	9.5	9.0	8.9	13	11	12	10
Nickel [µg/g]	38	39	34	31	28	37	31
Lead [µg/g]	690	720	680	630	550	800	640
Phosphorus [µg/g]	840	930	860	760	740	950	710
Rubidium [µg/g]	4.8	5.8	5.4	4.3	4.3	5.4	5.0
Antimony [µg/g]	< 1	1	1	1	1	1	< 1
Scandium [µg/g]	3.1	4.2	3.6	2.7	2.5	3.8	2.9
Selenium [µg/g]	< 2	< 2	< 2	< 2	< 2	< 2	< 2
Tin [µg/g]	< 6	< 6	< 6	< 6	< 6	< 6	< 6
Strontium [µg/g]	11	14	15	9.2	16	21	18
Sulphur [µg/g]	14000	14000	15000	14000	19000	22000	25000
Tantalum [µg/g]	0.27	0.27	0.28	0.48	0.57	0.55	0.48
Terbium [µg/g]	17	18	14	12	10	18	13
Tellerium [µg/g]	0.3	0.4	0.4	0.3	0.3	0.4	0.3
Thorium [µg/g]	1900	2400	2200	1600	1600	2400	1800
Titanium [µg/g]	660	680	640	590	550	740	570
Thallium [µg/g]	< 3	< 3	< 3	< 3	< 3	< 3	< 3
Uranium [µg/g]	100	110	110	100	100	140	110
Vanadium [µg/g]	7.7	9.3	8.3	7.4	6.4	9.8	6.7
Tungsten [µg/g]	8	9	8	8	8	8	8
Yttrium [µg/g]	370	350	290	240	220	360	260
Ytterbium [µg/g]	26	28	24	19	17	30	22
Zinc [µg/g]	58	59	51	46	42	59	46
Zirconium [µg/g]	64	68	64	56	54	70	58

Ra226 subcontracted to Becquerel Labs.
* BaSO4 Calculation based on Ba values and assumes all Ba is in BaSO4 form.
** BaSO4 Calculation based on SO4 values and assumes all SO4 is in BaSO4 form.

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Environmental Services, Analytical

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Project : 09-1663

October 7, 2010

Ecometrix
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Date Rec. : 01 October 2009
LR Report: **CA10063-OCT09**

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CERTIFICATE OF ANALYSIS

Final Report (QC Report)

Analysis	25: MDL	26: QC - Blank	27: QC - STD % Recovery	28: QC - DUP % Recovery
Ba as BaSO4 Calc. * [µg/g]	---	---	---	---
SO4 as BaSO4 Calc. ** [µg/g]	---	---	---	---
Total Sulphur [%]	0.005	< 0.005	100%	98%
Carbonate (CO3) [%]	0.005	< 0.005	101%	100%
Total Organic Carbon [%]	0.01	---	---	---
Total Carbon [%]	0.005	< 0.005	100%	95%
Sulphide [%]	0.01	< 0.01	103%	100%
Sulphate [%]	0.1	< 0.1	98%	107%
Silver [µg/g]	0.7	< 0.7	98%	93%
Aluminum [µg/g]	1	< 1	99%	114%
Arsenic [µg/g]	1	< 1	98%	96%
Barium [µg/g]	0.05	< 0.05	100%	110%
Beryllium [µg/g]	0.1	< 0.1	100%	111%
Bismuth [µg/g]	0.5	< 0.5	98%	100%
Calcium [µg/g]	1	< 1	99%	103%
Cadmium [µg/g]	0.05	< 0.05	98%	100%
Cerium [µg/g]	0.006	< 0.006	107%	99%
Cobalt [µg/g]	0.3	< 0.3	96%	965
Chromium [µg/g]	0.5	< 0.5	99%	106%
Cesium [µg/g]	0.01	< 0.01	100%	99%
Copper [µg/g]	0.1	< 0.1	101%	110%
Iron [µg/g]	0.5	< 0.5	98%	91%
Gallium [µg/g]	0.03	< 0.03	100%	101%
Germanium [µg/g]	0.3	< 0.3	100%	95%
Hafnium [µg/g]	0.1	< 0.1	100%	120%
Indium [µg/g]	0.01	< 0.01	100%	109%
Potassium [µg/g]	1	< 1	100%	110%
Lanthanum [µg/g]	0.001	< 0.001	101%	99%
Lithium [µg/g]	0.1	< 0.1	99%	100%
Lutetium [µg/g]	0.001	< 0.001	96%	99%
Magnesium [µg/g]	1	< 1	100%	105%
Manganese [µg/g]	0.05	< 0.05	98%	108%
Molybdenum [µg/g]	0.5	< 0.5	101%	74%

OnLine LIMS

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Project : 09-1663

LR Report : **CA10063-OCT09**

Analysis	25: MDL	26: QC - Blank	27: QC - STD % Recovery	28: QC - DUP % Recovery
Sodium [µg/g]	1	< 1	102%	104%
Niobuim [µg/g]	0.7	< 0.7	100%	99%
Nickel [µg/g]	1	< 1	99%	103%
Lead [µg/g]	0.7	< 0.7	98%	110%
Phosphorus [µg/g]	5	< 5	98%	106%
Rubidium [µg/g]	0.004	< 0.004	100%	100%
Antimony [µg/g]	1	< 1	102%	100%
Scandium [µg/g]	0.2	< 0.2	100%	103%
Selenium [µg/g]	1	< 2	97%	100%
Tin [µg/g]	6	< 6	103%	94%
Strontium [µg/g]	0.01	< 0.01	100%	96%
Sulphur [µg/g]	1	< 1	---	90%
Tantalum [µg/g]	0.01	< 0.01	100%	101%
Terbium [µg/g]	0.001	< 0.001	94%	100%
Tellerium [µg/g]	0.1	< 0.1	100%	107%
Thorium [µg/g]	0.01	< 0.01	100%	99%
Titanium [µg/g]	0.2	< 0.2	104%	99%
Thallium [µg/g]	3	< 3	97%	100%
Uranium [µg/g]	0.002	< 0.002	---	97%
Vanadium [µg/g]	0.1	< 0.1	100%	109%
Tungsten [µg/g]	1	< 1	99%	100%
Yttrium [µg/g]	0.1	< 0.1	100%	110%
Ytterbium [µg/g]	0.001	---	100%	100%
Zinc [µg/g]	0.1	< 0.1	98%	103%
Zirconium [µg/g]	5	< 5	102%	105%

Ra226 subcontracted to Becquerel Labs.
* BaSO4 Calculation based on Ba values and assumes all Ba is in BaSO4 form.
** BaSO4 Calculation based on SO4 values and assumes all SO4 is in BaSO4 form.

Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

OnLine LIMS

ANALYSIS REPORT

Becquerel Laboratories Inc.
6790 Kitimat Rd., Unit 4
Mississauga, Ontario
Canada, L5N 5L9

Phone: (905) 826-3080
FAX: (905) 826-4151

Batch: T09-01384.0

Date: 04-Nov-2009

Lakefield Research Ltd.

185 Concession St., Postal Bag 4300
Lakefield, ON, K0L 2H0

attn: Brian Graham

Phone: (705) 652-2038
FAX: (705) 652-1918

Client Ref.Oct 10066
P.O: 17820

23 water samples

Received: 06-Oct-2009

Results of Analysis

Sample	Test	Result	Units	Date	Method
SW09-QC14-1T	Ra-226	0.77	Bq/l	27-Oct-2009	ALPHA
SW09-QC14-1B	Ra-226	1.0	Bq/l	27-Oct-2009	ALPHA
SW09-QC14-2T	Ra-226	0.82	Bq/l	27-Oct-2009	ALPHA
SW09-QC14-2B	Ra-226	0.91	Bq/l	27-Oct-2009	ALPHA
SW09-QC14-3T	Ra-226	0.71	Bq/l	27-Oct-2009	ALPHA
SW09-QC14-3B	Ra-226	0.95	Bq/l	31-Oct-2009	ALPHA
SW09-QC14-4T	Ra-226	0.79	Bq/l	31-Oct-2009	ALPHA
SW09-QC14-4B	Ra-226	0.95	Bq/l	31-Oct-2009	ALPHA
PW09-QC14-1 (0-5)	Ra-226	1.8	Bq/l	31-Oct-2009	ALPHA
PW09-QC14-1 (5-10)	Ra-226	1.4	Bq/l	01-Nov-2009	ALPHA
PW09-QC14-1 (10-15)	Ra-226	0.97	Bq/l	01-Nov-2009	ALPHA
PW09-QC14-2 (0-2.5)	Ra-226	3.6	Bq/l	01-Nov-2009	ALPHA
PW09-QC14-2 (2.5-5)	Ra-226	2.8	Bq/l	01-Nov-2009	ALPHA
PW09-QC14-2 (5-7.5)	Ra-226	5.9	Bq/l	01-Nov-2009	ALPHA
PW09-QC14-2 (7.5-10)	Ra-226	6.9	Bq/l	01-Nov-2009	ALPHA
PW09-QC14-3 (0-5)	Ra-226	4.1	Bq/l	01-Nov-2009	ALPHA
PW09-QC14-3 (5-10)	Ra-226	3.4	Bq/l	01-Nov-2009	ALPHA
PW09-QC14-3 (10-15)	Ra-226	2.6	Bq/l	01-Nov-2009	ALPHA
PW09-QC14-3 (15-20)	Ra-226	2.5	Bq/l	01-Nov-2009	ALPHA
PW09-QC14-4 (0-5)	Ra-226	4.8	Bq/l	01-Nov-2009	ALPHA
PW09-QC14-4 (5-10)	Ra-226	1.6	Bq/l	01-Nov-2009	ALPHA
PW09-QC14-4 (10-15)	Ra-226	2.2	Bq/l	01-Nov-2009	ALPHA
PW09-QC14-4 (15-20)	Ra-226	0.42	Bq/l	01-Nov-2009	ALPHA

ANALYSIS REPORT

Becquerel Laboratories Inc.
6790 Kitimat Rd., Unit 4
Mississauga, Ontario
Canada, L5N 5L9

Phone: (905) 826-3080
FAX: (905) 826-4151

Batch: T09-01384.0

Date: 04-Nov-2009

Methods: ALPHA BQ-RAD-ALPHA alpha-particle spectrometry MDL 0.01 Bq/l

Units: Bq/l Becquerels per litre

These results relate only to the samples analysed and only to the items tested.
These results have not been corrected for blanks

04-Nov-2009 approved by: ____________________
Donald D. Burgess PhD
Senior Scientist, Division Supervisor

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October 14, 2009

Date Rec. : 01 October 2009
LR Report : **CA10066-OCT09**
Project : 09-1663

CERTIFICATE OF ANALYSIS

Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	13: PW09-QC14-1 (0-5)	14: PW09-QC14-1 (5-10)	15: PW09-QC14-1 (10-15)	16: PW09-QC14-2 (0-2.5)	17: PW09-QC14-2 (2.5-5)
Sample Date & Time					27-Sep-09	27-Sep-09	29-Sep-09	28-Sep-09	28-Sep-09
Sulphate [mg/L]	02-Oct-09	19:39	06-Oct-09	14:20	---	---	1500	32	12
Tot. Suspended Solids [mg/L]	05-Oct-09	10:24	06-Oct-09	12:15	---	---	---	---	---
Dissolved Organic Carbon [mg/L]	02-Oct-09	10:00	06-Oct-09	13:53	---	---	4.7	28.0	18.3
Dissolved Inorganic Carbon [mg/L]	05-Oct-09	14:35	07-Oct-09	12:41	---	---	1.0	< 1.0	< 1.0
Total Organic Carbon [mg/L]	02-Oct-09	10:00	05-Oct-09	13:40	---	---	---	---	---
Acidity [mg/L as CaCO3]	02-Oct-09	15:00	08-Oct-09	09:53	---	---	49	21	15
Hardness [mg/L as CaCO3]	05-Oct-09	09:00	05-Oct-09	13:21	731	1294	1335	26.2	16.9
Aluminum [mg/L]	05-Oct-09	09:00	05-Oct-09	13:18	< 0.01	< 0.01	< 0.01	< 0.01	0.03
Arsenic [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.0082	0.0102	0.0064	0.0064	0.0084
Barium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.0577	0.0283	0.0212	0.309	0.308
Beryllium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Boron [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.0048	0.0107	0.0138	0.0054	0.0047
Bismuth [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	< 0.00001	< 0.00001	0.00008	0.00003	0.00024
Calcium [mg/L]	05-Oct-09	09:00	05-Oct-09	13:21	290	516	532	8.79	5.68
Cadmium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.000012	0.000050	0.000118	0.000055	< 0.000003
Cobalt [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.0154	0.0367	0.0438	0.00521	0.000917
Chromium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Copper [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	< 0.0005	0.0008	0.0012	0.0043	0.0025
Iron [mg/L]	05-Oct-09	09:00	05-Oct-09	13:18	63.9	40.0	24.3	0.03	0.52
Potassium [mg/L]	05-Oct-09	09:00	05-Oct-09	13:18	1.21	1.34	1.49	0.34	0.40
Lithium [mg/L]	05-Oct-09	09:00	05-Oct-09	13:18	0.002	0.002	< 0.002	< 0.002	< 0.002
Magnesium [mg/L]	05-Oct-09	09:00	05-Oct-09	13:18	1.63	1.48	1.37	1.02	0.664

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LR Report : **CA10066-OCT09**

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	13: PW09-QC14-1 (0-5)	14: PW09-QC14-1 (5-10)	15: PW09-QC14-1 (10-15)	16: PW09-QC14-2 (0-2.5)	17: PW09-QC14-2 (2.5-5)
Manganese [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.771	0.503	0.346	0.282	0.133
Molybdenum [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.00589	0.0119	0.00918	0.00029	0.00133
Sodium [mg/L]	05-Oct-09	09:00	05-Oct-09	13:18	1.77	2.04	2.08	2.35	1.98
Nickel [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.0050	0.0172	0.0173	0.0044	0.0012
Phosphorus [mg/L]	05-Oct-09	09:00	05-Oct-09	13:18	< 0.01	< 0.01	< 0.01	< 0.01	0.01
Lead [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.00069	0.00078	0.00202	0.0242	0.00596
Sulphur [mg/L]	05-Oct-09	09:00	05-Oct-09	13:18	242	396	399	8.28	3.87
Antimony [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	< 0.0002	< 0.0002	< 0.0002	0.0002	0.0006
Selenium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Silica [mg/L]	05-Oct-09	09:00	05-Oct-09	13:18	8.09	10.3	10.3	1.23	1.71
Tin [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	< 0.00001	0.00004	0.00008	0.00004	< 0.00001
Strontium [mg/L]	05-Oct-09	09:00	05-Oct-09	13:18	0.149	0.260	0.266	0.0205	0.0154
Titanium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.0006	0.0007	0.0007	0.0003	0.0062
Thallium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Uranium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.0136	0.0589	0.0445	0.000946	0.000524
Vanadium [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.00010	0.00011	0.00013	0.00007	0.00013
Zinc [mg/L]	02-Oct-09	14:45	05-Oct-09	13:18	0.011	0.039	0.041	0.005	0.003

Groundwater samples are field filtered
Ra226 subcontracted to Becquerel Labs.

Chris Sullivan, B.Sc., C.Chem
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OnLine LIMS

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October 14, 2009

Date Rec. : 01 October 2009
LR Report : **CA10066-OCT09**
Project : 09-1663

CERTIFICATE OF ANALYSIS
Final Report

Analysis	18: PW09-QC14-2 (5-7.5)	19: PW09-QC14-2 (7.5-10)	20: PW09-QC14-3 (0-5)	21: PW09-QC14-3 (5-10)	22: PW09-QC14-3 (10-15)	23: PW09-QC14-3 (15-20)	24: PW09-QC14-4 (0-5)	25: PW09-QC14-4 (5-10)	26: PW09-QC14-4 (10-15)	27: PW09-QC14-4 (15-20)
Sample Date & Time	28-Sep-09	28-Sep-09	29-Sep-09	29-Sep-09	29-Sep-09	29-Sep-09	29-Sep-09	29-Sep-09	29-Sep-09	29-Sep-09
Sulphate [mg/L]	12	---	5.6	6.8	18	240	560	1400	1400	1400
Tot. Suspended Solids [mg/L]	---	---	---	---	---	---	---	---	---	---
Dissolved Organic Carbon [mg/L]	17.9	---	3.5	3.2	2.8	3.8	9.3	6.6	7.3	4.0
Dissolved Inorganic Carbon [mg/L]	< 1.0	---	2.0	3.0	4.7	3.1	< 1.0	4.7	3.1	5.9
Total Organic Carbon [mg/L]	---	---	---	---	---	---	---	---	---	---
Acidity [mg/L as CaCO3]	16	---	6	< 4	< 4	< 4	19	< 4	---	---
Hardness [mg/L as CaCO3]	17.9	19.1	18.0	24.5	42.8	250	512	1362	1335	1310
Aluminum [mg/L]	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.04	< 0.01
Arsenic [mg/L]	0.0066	0.0066	0.0026	0.0025	0.0040	0.0042	0.0050	0.0054	0.0026	0.0027
Barium [mg/L]	0.519	0.499	0.333	0.233	0.131	0.0762	0.231	0.0657	0.0328	0.0197
Beryllium [mg/L]	< 0.00002	< 0.00002	0.00013	0.00005	0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Boron [mg/L]	0.0051	0.0044	0.0026	0.0070	0.0121	0.0162	0.0220	0.0944	0.0802	0.0387
Bismuth [mg/L]	0.00006	< 0.00001	0.00012	0.00004	0.00001	0.00001	0.00005	0.00002	0.00001	0.00003
Calcium [mg/L]	6.06	6.44	6.12	8.51	15.5	97.4	195	536	527	519
Cadmium [mg/L]	0.000005	0.000006	0.000112	0.000043	0.000034	0.000086	0.000029	0.000016	0.000017	0.000015
Cobalt [mg/L]	0.000766	0.000876	0.00189	0.00766	0.00912	0.0123	0.00473	0.00237	0.00186	0.00185
Chromium [mg/L]	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Copper [mg/L]	0.0015	0.0007	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0009	0.0007	0.0006	0.0008
Iron [mg/L]	2.46	6.07	7.18	6.88	5.66	7.35	23.5	1.62	0.41	0.26
Potassium [mg/L]	0.62	0.53	0.37	0.50	0.60	0.90	0.65	1.06	0.94	0.92
Lithium [mg/L]	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	0.002	0.002	< 0.002	< 0.002
Magnesium [mg/L]	0.675	0.734	0.670	0.801	0.980	1.78	6.05	5.49	4.43	3.52

OnLine LIMS

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LR Report : **CA10066-OCT09**

Analysis	18: PW09-QC14-2 (5-7.5)	19: PW09-QC14-2 (7.5-10)	20: PW09-QC14-3 (0-5)	21: PW09-QC14-3 (5-10)	22: PW09-QC14-3 (10-15)	23: PW09-QC14-3 (15-20)	24: PW09-QC14-4 (0-5)	25: PW09-QC14-4 (5-10)	26: PW09-QC14-4 (10-15)	27: PW09-QC14-4 (15-20)
Manganese [mg/L]	0.133	0.146	0.143	0.161	0.191	0.249	1.27	0.400	0.352	0.251
Molybdenum [mg/L]	0.00107	0.00241	0.00045	0.00042	0.00155	0.00615	0.00339	0.0289	0.0291	0.0149
Sodium [mg/L]	1.79	1.51	1.30	1.20	1.36	1.63	2.05	2.00	1.94	1.80
Nickel [mg/L]	0.0012	0.0011	0.0010	0.0019	0.0020	0.0039	0.0025	0.0020	0.0018	0.0019
Phosphorus [mg/L]	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.02	< 0.01	0.02	< 0.01
Lead [mg/L]	0.00098	0.00018	0.00029	0.00023	0.00027	0.00042	0.00043	0.00047	0.00044	0.00059
Sulphur [mg/L]	3.61	4.46	1.67	2.21	5.91	69.9	155	391	387	385
Antimony [mg/L]	0.0004	0.0005	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	0.0003	0.0003	< 0.0002
Selenium [mg/L]	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.002	< 0.001	< 0.001	< 0.001	0.002
Silica [mg/L]	2.15	3.04	5.18	7.70	8.81	8.23	4.59	3.66	2.45	3.95
Tin [mg/L]	< 0.00001	< 0.00001	< 0.00001	< 0.00001	0.00005	0.00011	0.00004	0.00006	0.00010	0.00022
Strontium [mg/L]	0.0204	0.0211	0.0170	0.0318	0.0499	0.146	0.137	0.277	0.263	0.268
Titanium [mg/L]	0.0005	0.0002	0.0003	0.0005	0.0005	0.0005	0.0004	0.0004	0.0003	0.0003
Thallium [mg/L]	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Uranium [mg/L]	0.000143	0.000072	0.000744	0.000806	0.000839	0.00957	0.0421	0.275	0.242	0.233
Vanadium [mg/L]	0.00006	0.00006	0.00019	0.00012	0.00014	0.00016	0.00013	0.00022	0.00021	0.00023
Zinc [mg/L]	0.002	0.003	0.002	0.005	0.008	0.015	0.006	0.003	0.003	0.003

Groundwater samples are field filtered
Ra226 subcontracted to Becquerel Labs.

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SGS

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Attn : Erin Clyde

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October 14, 2009

Date Rec. : 01 October 2009
LR Report : **CA10066-OCT09**
Project : 09-1663

CERTIFICATE OF ANALYSIS

Final Report

Analysis	**5: SW09-QC14-1T**	**6: SW09-QC14-1B**	**7: SW09-QC14-2T**	**8: SW09-QC14-2B**	**9: SW09-QC14-3T**	**10: SW09-QC14-3B**	**11: SW09-QC14-4T**	**12: SW09-QC14-4B**
Sample Date & Time	26-Sep-09	26-Sep-09	27-Sep-09	27-Sep-09	27-Sep-09	27-Sep-09	27-Sep-09	27-Sep-09
Sulphate [mg/L]	55	32	72	32	54	35	57	25
Tot. Suspended Solids [mg/L]	---	---	---	43	---	---	---	6
Dissolved Organic Carbon [mg/L]	13.3	18.5	14.4	19.4	15.1	16.0	13.4	14.2
Dissolved Inorganic Carbon [mg/L]	2.4	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Organic Carbon [mg/L]	---	---	---	5.3	---	---	---	5.2
Acidity [mg/L as CaCO3]	31	20	56	15	29	15	31	20
Hardness [mg/L as CaCO3]	17.1	18.3	16.9	16.6	16.7	16.9	16.8	16.9
Aluminum [mg/L]	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Arsenic [mg/L]	0.0006	0.0008	0.0006	0.0011	0.0007	0.0009	0.0006	0.0012
Barium [mg/L]	0.109	0.116	0.104	0.108	0.105	0.105	0.0989	0.109
Beryllium [mg/L]	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Boron [mg/L]	0.0044	0.0045	0.0045	0.0056	0.0045	0.0047	0.0043	0.0053
Bismuth [mg/L]	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Calcium [mg/L]	5.72	6.24	5.69	5.55	5.59	5.69	5.63	5.67
Cadmium [mg/L]	0.000023	0.000029	0.000023	0.000023	0.000021	0.000035	0.000017	0.000052
Cobalt [mg/L]	0.00304	0.00143	0.00549	0.00169	0.00246	0.00165	0.00297	0.00144
Chromium [mg/L]	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Copper [mg/L]	0.0051	0.0045	0.0038	0.0023	0.0040	0.0034	0.0030	0.0025
Iron [mg/L]	0.02	0.36	0.04	0.01	0.02	0.07	0.02	0.01
Potassium [mg/L]	0.32	0.30	0.32	0.26	0.31	0.29	0.30	0.27
Lithium [mg/L]	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Magnesium [mg/L]	0.679	0.667	0.663	0.657	0.660	0.658	0.664	0.667

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LR Report : **CA10066-OCT09**

Analysis	**5: SW09-QC14-1T**	**6: SW09-QC14-1B**	**7: SW09-QC14-2T**	**8: SW09-QC14-2B**	**9: SW09-QC14-3T**	**10: SW09-QC14-3B**	**11: SW09-QC14-4T**	**12: SW09-QC14-4B**
Manganese [mg/L]	0.0328	0.0379	0.0288	0.0353	0.0292	0.0337	0.0272	0.0348
Molybdenum [mg/L]	0.00001	0.00002	< 0.00001	0.00002	< 0.00001	< 0.00001	< 0.00001	0.00003
Sodium [mg/L]	1.84	1.87	1.82	1.83	1.81	1.78	1.88	1.73
Nickel [mg/L]	0.0027	0.0025	0.0025	0.0024	0.0024	0.0024	0.0023	0.0026
Phosphorus [mg/L]	0.01	< 0.01	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Lead [mg/L]	0.00375	0.00604	0.00717	0.00597	0.00374	0.00642	0.00386	0.00361
Sulphur [mg/L]	4.72	5.21	4.69	4.74	4.64	4.78	4.74	4.76
Antimony [mg/L]	0.0034	0.0007	0.0077	0.0007	0.0021	0.0009	0.0027	0.0005
Selenium [mg/L]	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Silica [mg/L]	0.59	0.63	0.58	0.59	0.58	0.64	0.58	0.63
Tin [mg/L]	0.00002	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Strontium [mg/L]	0.0122	0.0125	0.0121	0.0120	0.0119	0.0122	0.0120	0.0122
Titanium [mg/L]	< 0.0001	< 0.0001	0.0003	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Thallium [mg/L]	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Uranium [mg/L]	0.00107	0.000679	0.000535	0.000338	0.000489	0.000749	0.000386	0.000459
Vanadium [mg/L]	0.00004	0.00004	0.00006	0.00005	0.00005	0.00004	0.00004	0.00004
Zinc [mg/L]	0.003	0.004	0.002	0.005	0.002	0.004	0.003	0.005

Ra226 subcontracted to Becquerel Labs.

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SGS

Env ICP-MS Metals

Project : 09-1663

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October 7, 2010

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Date Rec. : 01 October 2009
LR Report: **CA10066-OCT09**

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CERTIFICATE OF ANALYSIS
Final Report (QC Report)

Analysis	**28: MDL**	**29: QC - Blank**	**30: QC - STD % Recovery**	**31: QC - DUP % Recovery**
Sulphate [mg/L]	0.2	< 0.2	100%	110%
Tot. Suspended Solids [mg/L]	2	< 2	96%	83%
Dissolved Organic Carbon [mg/L]	0.2	< 0.2	105%	98%
Dissolved Inorganic Carbon [mg/L]	0.2	0.7	107%	100%
Total Organic Carbon [mg/L]	0.2	< 0.2	105%	98%
Acidity [mg/L as CaCO3]	4	< 4	98%	102%
Hardness [mg/L as CaCO3]	0.5	---	---	---
Aluminum [mg/L]	0.01	< 0.01	98%	---
Arsenic [mg/L]	0.0002	< 0.0002	106%	---
Barium [mg/L]	0.00001	< 0.00001	122%	---
Beryllium [mg/L]	0.00002	< 0.00002	104%	---
Boron [mg/L]	0.0002	< 0.0002	96%	---
Bismuth [mg/L]	0.00001	< 0.00001	109%	---
Calcium [mg/L]	0.03	< 0.03	101%	---
Cadmium [mg/L]	0.000003	0.000003	99%	---
Cobalt [mg/L]	0.000002	< 0.000002	102%	---
Chromium [mg/L]	0.0005	< 0.0005	102%	---
Copper [mg/L]	0.0005	< 0.0005	102%	---
Iron [mg/L]	0.01	< 0.01	102%	---
Potassium [mg/L]	0.01	< 0.01	98%	---
Lithium [mg/L]	0.002	< 0.002	98%	---
Magnesium [mg/L]	0.003	< 0.003	98%	---
Manganese [mg/L]	0.00001	< 0.00001	107%	---
Molybdenum [mg/L]	0.00001	< 0.00001	99%	---
Sodium [mg/L]	0.01	< 0.01	94%	---
Nickel [mg/L]	0.0001	< 0.0001	100%	---
Phosphorus [mg/L]	0.01	< 0.01	100%	---
Lead [mg/L]	0.00002	< 0.00002	106%	---

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Env ICP-MS Metals

Project : 09-1663

LR Report : **CA10066-OCT09**

Analysis	28: MDL	29: QC - Blank	30: QC - STD % Recovery	31: QC - DUP % Recovery
Sulphur [mg/L]	0.01	< 0.01	98%	---
Antimony [mg/L]	0.0002	< 0.0002	101%	---
Selenium [mg/L]	0.001	< 0.001	102%	---
Silica [mg/L]	0.01	< 0.01	104%	---
Tin [mg/L]	0.00001	< 0.00001	96%	---
Strontium [mg/L]	0.0001	< 0.0001	100%	---
Titanium [mg/L]	0.0001	< 0.0001	96%	---
Thallium [mg/L]	0.0002	< 0.0002	107%	---
Uranium [mg/L]	0.000001	0.000001	1065	---
Vanadium [mg/L]	0.00003	< 0.00003	107%	---
Zinc [mg/L]	0.001	< 0.001	104%	---

Ra226 subcontracted to Becquerel Labs.

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OnLine LIMS

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APPENDIX 5

Mathematical Description of the Sediment Model

Equation for the surface layer of sediment:

$$\frac{\partial C}{\partial t} = \frac{g_w \cdot f_w \cdot C_w}{z} - \frac{g \cdot C}{z} + \frac{k_{ws}}{z}\left[(1-f_w)\cdot C_w - \frac{(1-f)}{\varepsilon}C\right] + \frac{k_{ss}}{z}\left[\frac{(1-f_a)\cdot C_a}{\varepsilon_a} - \frac{(1-f)}{\varepsilon}C\right]$$

Equation for the layers of sediment below the surface:

$$\frac{\partial C}{\partial t} = \frac{g_s \cdot C_s}{z} - \frac{g \cdot C}{z} + \frac{k_{ss}}{z}\left[\frac{(1-f_s)\cdot C_s}{\varepsilon_s} - \frac{(1-f)}{\varepsilon}C\right] + \frac{k_{ss}}{z}\left[\frac{(1-f_a)\cdot C_a}{\varepsilon_a} - \frac{(1-f)}{\varepsilon}C\right]$$

The fraction of contaminant that is particulate in sediment is given by:

$$f = \frac{K_d \cdot \frac{\rho}{\varepsilon}}{1 + K_d \cdot \frac{\rho}{\varepsilon}}; \quad f_s = \frac{K_{d_s} \cdot \frac{\rho_s}{\varepsilon_s}}{1 + K_{d_s} \cdot \frac{\rho_s}{\varepsilon_s}}; \quad f_a = \frac{K_{d_a} \cdot \frac{\rho_a}{\varepsilon_a}}{1 + K_{da} \cdot \frac{\rho_a}{\varepsilon_a}}$$

The fraction of contaminant that is particulate in water is given by:

$$f_w = \frac{K_{d-w} \cdot S}{1 + K_{d-w} \cdot S}$$

The settling and burial rates are given by:

$$g = \frac{g_w \cdot S}{\rho}; \quad g_s = \frac{g_w \cdot S}{\rho_s}$$

The diffusion transport coefficients are given by:

$$k_{ws} = \frac{D}{z_{\text{int}}}; \quad k_{ss} = \frac{D_a}{z_{\text{int}_A}}$$

where;

C	is the concentration in the sediment layer (mg/L);
C_w	is the concentration in the overlying water layer (mg/L);
q_w	settling rate of particles in water column (m/s);
g	burial rate in sediment layer (m/s);
k_{ws}	water to sediment diffusive transport coefficient (m/s);
k_{ss}	sediment to sediment diffusive transport coefficient (m/s);
f	fraction of contaminant that is particulate in sediment layer ( );
f_w	fraction of contaminant that is particulate in water layer ( );
ε	porosity of sediment ( );

ρ dry bulk density of sediment (kg/L);

z thickness of sediment layer (m);

z_{int} interface thickness (m);

K_d distribution coefficient in sediment layer (L/kg);

S suspended solids concentration in water (kg/L);

D diffusion coefficient for sediment layer (m^2/s);

Subscript ”*w*” denotes water and subscripts ”*s*” and ”*a*” denote upper and lower layers, respectively.