External Environmental Monitoring Baseline Survey

Fjarðaál Smelter Project
Reyðarfjörður, IS

Prepared by:

The RETEC Group, Inc.
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RETEC Project Number: BECH1-18321-640

Prepared for:

Fjarðaál sf
Hallveigarstigur 1
101 Reykjavik
Iceland

March 7, 2006

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March 7, 2006

Executive Summary

An external environmental monitoring baseline survey was performed for assessing the impact of emissions that might result from primary aluminium smelting at the Fjarðaál Smelter site located in Reyðarfjörður in Fjarðabyggð municipality, Iceland. The objective of the baseline survey was to develop a data set, prior to smelter start-up, which accurately described the concentration of the naturally occurring and anthropogenic chemicals in the environment that could, at a later date, be associated with aluminium smelter emissions. A detailed and sensitive testing program was developed to evaluate the baseline conditions for soils, surface water, vegetation, and livestock. The scope of work for the baseline survey included the collection of snow, soil, water, and vegetation samples for the analysis of the air pollutants commonly associated with aluminium smelting. In addition, the survey included the characterization of the vegetative cover and composition of plant species at 150 locations, and a survey for signs of pre-existing plant disease and stress that could be confused with chemical exposure and toxicity following smelter start-up.

The following report prepared by The RETEC Group, Inc. (RETEC) provides the results of the field survey of plant health and signs for pre-existing plant disease, and the results from the laboratory analysis of snow, soil, water, and vegetation samples collected from the study area. A detailed description of the study area and description of the field survey methods employed, including the baseline characterization of vegetative cover and composition of plant communities, are provided in a separate report prepared by Náttúrustofa Austurlands.

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1 Introduction

This Baseline Survey Report for external environmental monitoring has been prepared for the Bechtel Overseas Corporation (Bechtel) by The RETEC Group, Inc. (RETEC) and presents the findings of the comprehensive investigation of the baseline environmental conditions at the Fjarðaál smelter site located in Reyðarfjörður, Fjarðabyggð municipality, Iceland. Drs. Alan Davison and Leonard Weinstein directed the Baseline Monitoring program. The environmental impact assessment and the operating license for the Fjarðaál Smelter requires a baseline survey and on-going monitoring of the environment for assessing the impact of emissions resulting from primary aluminium smelting (Umhverfisstofnun, 2003).

1.1 Purpose of Report

The overall goal of the Baseline Survey Report, as indicated in the Work Plan, is to provide the following information (RETEC, 2005):

- Identification of appropriate monitoring sites for conducting the baseline and on-going environmental monitoring.
- Establish environmental sampling and/or monitoring protocols.
- Collect data and interpret results of the baseline ecological survey of plant communities.
- Conduct a survey and interpret the data from the visual inspection of trees, shrubs, and natural vegetation for signs of stress, disease, and effects of smelter emissions.
- Conduct a survey of snow, soil, water, and vegetation for the presence of the air pollutants commonly associated with aluminium smelting.
- Develop recommendations for on-going monitoring during start-up and operation of the smelter.

1.2 Scope of Work

The scope of work performed by the project team (Co-Technical Directors, Drs. Alan Davison and Leonard Weinstein, and RETEC) is presented in this volume of the Baseline Survey Report and includes the following:

- Support for the design, coordination, and technical aspects of the Field Monitoring Program which was implemented by Náttúrustofa Austurlands.

- Support for the coordination and technical aspects related to the chemical analysis of environmental samples by IceTec.
- Design, implementation, and training for the field survey of vegetation for signs of pre-existing disease and plant health.
- Interpretation of findings and recommendations for on-going environmental monitoring.

1.3 Report Organization

This report is organized into six sections following this introduction.

- Section 2 presents the results of the survey of vegetation and plant health.
- Section 3 presents the survey of farms and livestock in the study area.
- Section 4 presents the results and interpretation of the chemical analysis of environmental samples.
- Section 5 provides conclusions of the Baseline Survey.
- Section 6 provides a list of references cited in the report.

Tables and figures are included in the main text of the report.

Appendices to the report include the following:

- Guide to the identification and description of injury caused by exposure to airborne fluoride (Appendix A)
- Analytical Laboratory Reports (Appendix B)
- Fluoride Interlaboratory Study Report (Appendix C)
- Analytical Laboratory Data Quality and Usability Report (Appendix D)
- Detailed photographic record of the plants surveyed and their geographic location – CD (Appendix E)

2 Visual Surveys of Vegetation and Plant Health

A survey of plants and signs of plant disease was conducted around the town of Reyðarfjörður between Áreyjar and Hólmar during September 2004 and August 2005.

The purpose of the survey was to:

- Identify the main species present in the town and in the surrounding forest plantations and farms.
- Record the current state of plant health and any diseases, pests or other environmental stresses, especially those that resemble fluoride injury.
- Select locations and the vegetable, conifer, broadleaved tree and native herbaceous plant species for monitoring plant fluoride content.
- Train Náttúrustofa Austurlands staff to recognize stress symptoms and develop a guide for the identification of plant injury produced by fluorides.
- Train and advise Náttúrustofa Austurlands staff on sampling methods.

The following section provides a summary of the plant surveys. A detailed photographic record of the plants surveyed and their geographic location are provided as Appendix E in electronic format on the attached CD.

2.1 Survey Results – 2004

During September 2004, the area adjacent to the east of the town of Reyðarfjörður, the town itself, and the forested areas to the west and east of the town of Reyðarfjörður were surveyed. In addition, three farms and the horse stables located to the west of the town were surveyed. The following sections report on the observations recorded for each plant species and observations recorded during the inspection of the farms and their stables.

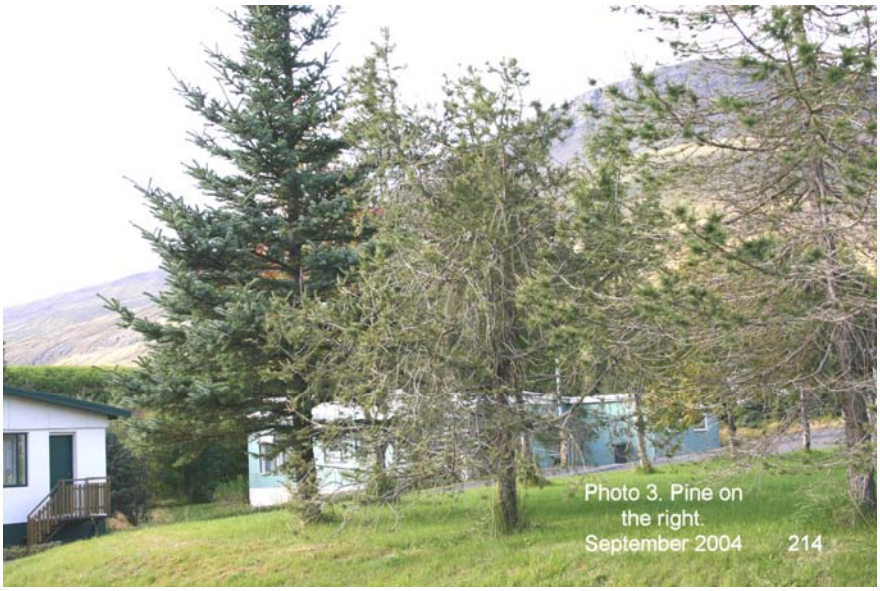
2.1.1 Pines (*Pinus* spp.)

Trees in the Town of Reyðarfjörður

Many small immature pines were found to be growing in the town of Reyðarfjörður. The identity of many plants was difficult due to the age of the

trees. It is often difficult to identify the species of immature pines, especially when they are garden cultivars. The species' names given in the following section should be considered tentative. Several species were growing in the town, including what is believed to be *P. mugo* and *contorta*, two of the most fluoride-sensitive species. Other species growing in the town were thought to be *P. uncinata* and *sibirica*. Most pines in the town were healthy, with good needle retention (up to 4 years in some cases). Two of the trees surveyed in the town were colonized by the woolly aphid but there was no obvious needle loss.

Photograph 1 shows pines in a garden in Vallagerði (Reyðarfjörður). One tree (photograph 2) had patches of necrotic needles, possibly due to the late frost. However, there were a few prominent pines in the town that were not in good condition. Photograph 3, taken in Reyðarfjörður, shows pine, spruce and larch, all in poor condition. The cause may have been late frost and aphids.



The Forest Plantations Around Reyðarfjörður

Pines in the forest plantations were variable in height even within small areas. They had few signs of stress and no needle necrosis that could be confused with fluoride injury. There were many pines growing in the area between the town and the smelter site (photograph 4) and on the hills to the west of the town (photograph 5). Some had pale green needles that may indicate a shortage of nitrogen. The older needles of many pines in the forests were senescent (photograph 6). This is normal in September and it should not be confused with HF injury - see the Guide to Fluoride Injury Symptoms in Appendix A.

2.1.2 Larch (*Larix sibirica*)

Larch is grown in a few gardens and in large quantities on the poorer soils in several of the forest plantations surrounding the town of Reyðarfjörður. In September 2004, the larch had lost most of their needles making it difficult to assess their health. However, many trees in the forest plantation had distorted or dead branches. Photograph 7 shows a stunted larch with dead branches. Photograph 8 shows a close-up of a dead side branch; note the absence of a ring of living green tissue under the bark. The cause may have been late frost in the previous year.

2.1.3 Spruce (*Picea sitchensis & engelmanii*)

Although there were healthy individual spruce trees (photograph 9), many, whether in the town or in the forest plantation, had poor needle retention and often, dead branches. Photographs (10 and 11) show spruce with poor needle retention and dead branches in the town and the forest. Spruce needles older than 2004 were often missing or were uniformly pale brown, or had brown patches (photograph 12). Although there were no aphids present, the symptoms appeared similar to those caused by aphids.


Photo 9. Healthy spruce above smelter site September 2004
128


Photo 10. Spruce in poor condition, Reyðarfjörður September 2004
158

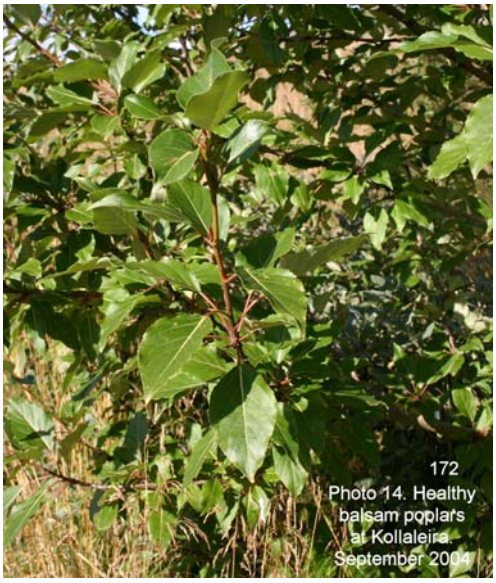

Photo 11. Spruce in poor condition near Sómastaðir September 2004
116


Photo 12. Loss of spruce needles, Árgata, Reyðarfjörður September 2004
155

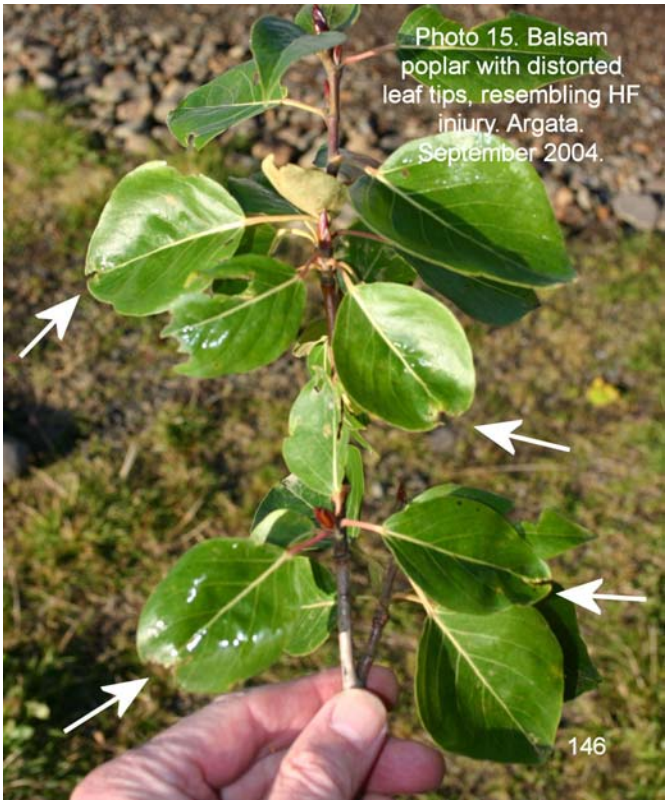
Blue spruce (*Picea engelmanii*) is widely grown as specimen trees in gardens and in some forests. Most were in good condition with good needle retention and no stress symptoms. However, some individuals had poor needle retention and probably suffered from previous aphid infestation. Spruce was not considered to be as suitable for monitoring as pine because of its poor state of health and because it was less common than pine.

2.1.4 Black Cottonwood/Balsam Poplar (*Populus trichocarpa*)

There are many well grown, healthy poplar trees in the town where it is often used as boundary hedging. It appears to be cultivated on the deeper, better soils. Some trees produced 30-50 cm of growth in 2004. One or two individuals showed premature senescence or signs of stress (photograph 13); however, the vast majority of trees were in good condition with no obvious diseases or stress symptoms (photograph 14).



At several locations, a few trees had individual branches with distorted leaves, notably the tips as shown in photograph 15. This was probably due to poor water supply to individual branches. However, it is important to note that the tip distortion is identical to injury in hybrid poplar that can be induced by exposure to hydrogen fluoride as shown in photograph 16. Photograph 16 shows hydrogen fluoride damage to a hybrid poplar leaf observed near a source in the UK.



2.1.5 Rowan, Mountain Ash (*Sorbus aucuparia*)

There are at least three species of *Sorbus* grown in the area (*mougeotti*, *koehneana and aucuparia*). Rowan, S. *aucuparia*, is common and most trees were healthy and showed no stress symptoms (photographs 17 and 18). Because of this, and the fact that this tree has been used in Norway for monitoring, rowan was chosen for fluoride monitoring along the same transect as the pines. *S. aucuparia* is of intermediate tolerance to HF.

2.1.6 Birch (*Betula pubescens*)

Although there were some healthy trees (photograph 19), birch trees in the town or the forests tended to be in poor condition during the September 2004 survey. Rust (a fungal disease) was common (photograph 20) and many trees had a leaf rolling insect (photograph 21). An insect called *Rheumaptera hastata* may have been responsible for damage to birch (and *Vaccinium*) in 2004 in the east and north of Iceland. Birch was particularly badly damaged by this infestation. Although birch is widespread, it was rejected for use as a monitor species for fluoride determinations because of the high risk of pests and diseases damaging the leaves and altering uptake dynamics.


Photo 19. Healthy young birch near Teigageröi September 2004
124

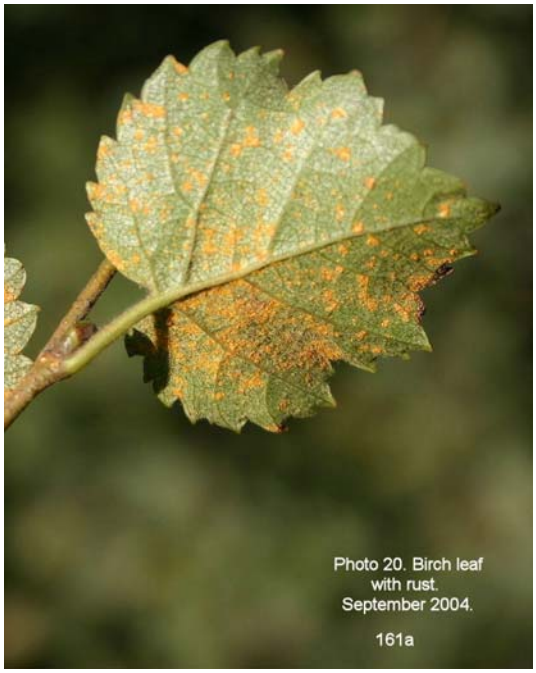
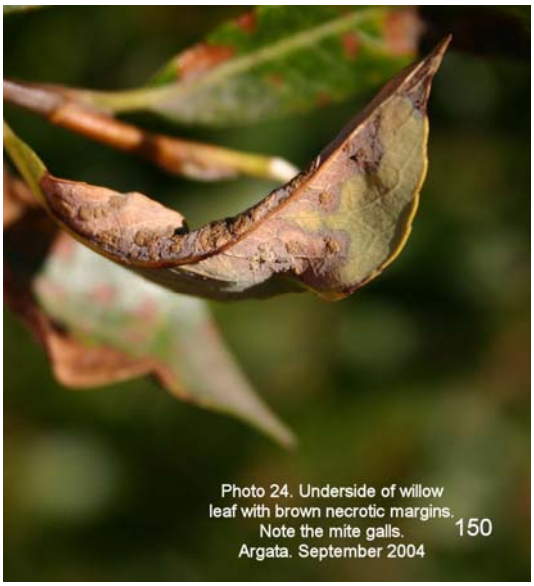


Photo 20. Birch leaf with rust. September 2004.
161a


Photo 21. Birch leaves with a leaf rolling insect, near the cemetary. September 2004.
140a

2.1.7 Willow (*Salix* spp. including *S. caprea*)

There are at least five species of willow in the area, some native, some exotic. It is typical of willows to have populations of leaf-eating insects and the leaves of willows were often marked or partially eaten (photograph 22). Photograph 23 shows an example of willow leaves with brown, dead margins. This was often associated with galls on the undersides of the leaves (photographs 24), probably caused by eriophyid mites, possibly *Aculus sp*. In some cases, the brown necrosis (photograph 23) resembled acute HF injury, particularly because of the dark brown line between the green and dead tissue. Willow species differ in sensitivity to HF; some are very sensitive and others are intermediate in tolerance.



2.1.8 Alder (*Alnus sinuata*)

There were relatively few alder trees in the area and most were free of any stress symptoms. However, a few branches had leaves with buckled, distorted tips, very like fluoride injury (photograph 25). The cause of this distortion is unknown at present.

2.2 Survey Results – 2005

During August 2005, a survey of plants and signs of plant disease was conducted in the gardens and forested areas. Lárus Heiðarsson (forester from Skógrækt ríkisins, the Icelandic Forest Service) and Anna Ragnheiður Gunnarsdóttir (horticulturalist from Sólskógar Plant Nursery) joined the survey to aid in the identification of pines and environmental stress. They identified most of the conifers, deciduous trees, and other garden plants that were unknown to the monitoring team. They also provided useful information about pests and environmental stresses in the study area. For example, they confirmed that the patches of dead needles recorded in 2004 at Vallagerði were due to late frost (photograph 26, below). This is well known to foresters in the area so the symptoms should not be confused with HF injury.

The Teigargerði site has a large stand of older, well grown trees, and a nursery consisting of beds of young trees. In 2004, we noted that many of the trees in the nursery were in poor condition. We were told that the trees were part of the local forest and that, because of the construction of the workers' village, they had been transplanted to this site temporarily. Apparently the intention is to move the trees back into permanent locations when the smelter is built. We discussed this with the forester, Lárus Heiðarsson, and he agreed that most of the trees are in poor condition and that they may never thrive if they are transplanted again. Many may not survive. Planting many poor quality trees will likely be a waste of effort. Photograph 27 shows the location of the nursery in relation to Reyðarfjörður and Photograph 28 shows spruce trees at Teigargerði in poor condition.

Photo 27. Location of the nursery at Teigargerði

Photo 28. Spruce in poor condition at Teigargerði

2.2.1 Conifers

- *Pinus contorta* is the most widely planted species in the forest areas. Lárus Heiðarsson, the forester from Skógrækt ríkisins, identified the deep red colouration in the needles of younger trees as winter damage. This symptom does not usually occur in larger, older trees. *P. contorta* is usually considered to be sensitive to fluoride; however, the sensitivity of all Pinus species may vary with provenance and climate. The sensitivity of this species and its wide distribution mean that it should be a main focus of attention in the On-going Monitoring Program to be conducted in 2007 and 2008.

- *Pinus mugo* is present in gardens and has a wide range in stature. The variable stature of this species may lead to misidentification as another species. *P. mugo* is usually rated as being sensitive to fluoride.

- *Pinus aristata* and *P. uncinata* are present in gardens. Their sensitivity to fluoride is unknown.

- *Picea sitchensis* is present in gardens and forest areas. This species is quite variable in appearance, in some cases with distinctly blue, and in other cases with dark green needles. Many trees were observed to have poor needle retention due to aphid damage. *P. sitchensis* can be confused with other "blue spruce" species, however, its needles are harder and spikier. *P. sitchensis* is probably intermediate to relatively tolerant to HF.

- *Picea engelmannii* is present in gardens. Needles are blue and softer than *P. sitchensis*. *P. engelmannii* is weather sensitive in Iceland so it is only found in sheltered locations. *P. engelmannii* is expected to be intermediate-to-tolerant to HF.

- *Larix sibirica* is found in gardens and on poor soils in the forest areas. Few of these appeared in good condition, probably due to two years of late frosts. Most of the young trees in the forest areas have dead branches, as reported in 2004. The sensitivity of *L. sibirica* to HF is unknown.

- *Taxus baccata* is found occasionally in gardens. The sensitivity of *T. baccata* to HF in Iceland is unknown; however, it is tolerant to HF in the U.S.

2.2.2 Deciduous Trees, Shrubs, and Herbaceous Species

Salix Species:

Willow species vary in sensitivity to HF but even when injured they have a capacity to recover and keep growing. The sensitivity of the species commonly found in the study area is not known.

- *Salix phylicifolia* is a native species used to make hedges and shelter belts in the town. These plants commonly exhibited insect damage and rust. Two sub-species are *planifolia* (prostrate garden plant) and *pulcra*.

- *Salix lanata* is a native species that is also grown in gardens. This species is highly variable in appearance from white and downy leaves to darker rugose and nearly glabrous leaves.

- *Salix caprea* is grown in the town as tall hedges. Almost always infested with insects and sometimes with rust, which is normal for this species.

- *Salix alexensis* is an Alaskan species needing wet soils that is grown as hedging. This species is very vigorous.

- *Salix borealis* is a variable species in hedges.

- *Salix pentandra x lanata* is in a hedge in the town.

Other Trees:

- *Populus trichocarpa* - balsam poplar. As reported in 2004, this species is widely used as a shelter belt. It is vigorous in its growth and has few symptoms of stress. *P. trichocarpa* is moderately tolerant to HF.

- *Sorbus aucuparia* (and some *koehneana*, *x intermedia*) - As described above, *S. aucuparia*, is common and intermediate in sensitivity to HF.

- *Alnus sinuata* is widely planted. The sensitivity of this species to HF is unknown but most species are relatively tolerant to HF.

Shrubs:

There is a wide range of shrub species in the town, most of which are easily identified to the genus. The following were frequent: *Laburnum sp.*, several *Spiraea spp.*, *Berberis sp.*, and *Cotoneaster adpressus*.

3 Survey of Farms and Livestock Management

The air emission dispersion model and animal husbandry practices in the study area indicate that it is very unlikely that the smelter will cause aesthetic or crippling fluorosis in livestock but it is, nevertheless, important to know all the sources of fluoride in livestock diets before smelter start-up and to monitor fluoride during smelter operation. Therefore, in September 2004 and August 2005, the farms in the Reyðarfjörður area were visited with the aim of determining the management practices.

Changes to livestock management practices are underway in Fjarðabyggð municipality as the result of industrial development. A new agreement on livestock captivity has been prepared; however, the draft has not been formally approved by Fjarðabyggð municipality. The draft contains changes to the municipality grazing restrictions, including the prohibition of grazing on the north slopes of Reyðarfjörður adjacent to the smelter site. If this grazing restriction is implemented, the potential for any fluorosis in sheep will be further reduced.

3.1 Livestock

The exact number of livestock in the study area in 2004 is not known; however the number of animals reported in November/December 2002 by Dr. Friðrik Pálmason are substantial.

Farm	Numbers
Búðareyri, stables located 8 km from the smelter site, just west of Reyðarfjörður town	40 horses
Kollaleira is located 6-7 km from the smelter site, just west of Reyðarfjörður town	271 sheep, 2000 poultry[1]
Slétta is located 7-8 km from the smelter site, just southwest of Reyðarfjörður town.	398 sheep, 15 horses
Áreyjar farm is located about 12 km from the smelter site I, west of Reyðarfjörður town	2 horses, cattle unknown

As the numbers were substantial a survey was conducted of each farm to find out where animals were kept, sources of food, and any other practices that might influence their exposure to fluoride.

[1] There have been no poultry at Kollaleira since 2004.

3.1.1 Búðareyri Horse Stables

The Búðareyri horse stables are located 8 km from the smelter site, just west of Reyðarfjörður town. Horses graze the pastures around the stables during the summer and autumn. Grass samples were collected from the Búðareyri pasture per the requirements of the environmental impact assessment and the operating license for the Fjarðaál smelter. In addition to the pasture grasses as a source of feed, hay is purchased during the winter. It appears that during the winter, horses are allowed to feed on hay that has been purchased and placed in the pastures.

3.1.2 Kollaleira Farm

Kollaleira is located 6-7 km from the smelter site, just west of Reyðarfjörður town. Sheep are the primary animals raised on this farm. In the summer, sheep roam freely on the slopes from the farm to the Nature Reserve at Hólmans (east of the smelter site). This large area available for sheep to freely graze greatly reduces the potential for increased exposure to fluoride in their diet, even if animals graze near the smelter for a few days a year.

Hay is baled at all farms for stock use in the winter and is a potential source of dietary fluoride. Livestock are also given access to a salt lick and the farmer has used fishmeal as a diet supplement in the past. Fishmeal in particular may contain enough fluoride to increase the background concentration of fluoride in livestock bones.

The Kollaleira farm also has plantations of conifers and broadleaved tree species scattered on the hillside. Although they are well outside the emission dilution zone, they lie in a direct line west from the smelter site so vegetation samples were taken for fluoride determination.

3.1.3 Slétta Farm

Slétta is located 7-8 km from the smelter site, just southwest of Reyðarfjörður town. The farm currently has sheep and horses. The farmer at Slétta runs his sheep into the mountains and along the south side of the Reyðarfjörður coast to Hjálmeyri so they should not be exposed to any fluoride emissions from the smelter. The animals use salt licks and fishmeal is provided as a dietary supplement.

3.1.4 Áreyjar Farm

Áreyjar farm is located about 12 km from the smelter site I, west of Reyðarfjörður town. This farm is the furthest from the smelter to the west. The farmer sells hay in Iceland and exports it to the Faeroes. She also makes a pelleted product using hay, fishmeal, and vitamins. There should be no influence of the smelter on this farm but we recommend that all of these materials should be analysed for fluoride. The farmer participates in an afforestry project, Austurlandsskógar.

3.1.5 Þernunes Farm

Þernunes farm is located approximately 12 km from the smelter site, southeast and across the fjord from the site. The farm was surveyed in 2005 to determine management practices.

In 2003 between 400 and 500 sheep were at this farm, and a few cattle (less than five). The sheep freely graze along the south side of the Reyðarfjörður coast and sometimes on the beach.

3.2 Food Supplements and Other Sources of Dietary Fluoride

In addition to summer grazing and the use of hay in winter, the other food and food supplements for livestock differ from farm to farm but they include:

- Grazing on the beach, eating seaweed
- Lick stones
- Vitamin and salt blocks
- Fishmeal – blue whiting
- Fishmeal – capelin
- Hay pellets – produced at Áreyjar containing fishmeal. Product sold elsewhere.
- Kjarnfóður – forage mixture for sheep
- Fóðurblanda – forage mixture for sheep
- Þokki – forage mixture for horses
- Reiðhestablanda – forage mixture for horses

3.2.1 Lickstones, Vitamin Blocks, and Forage Mixtures

The farms all use vitamin blocks and/or various lickstones, and some use forage mixtures for their livestocks. Lickstones and forage mixtures are also used at the horse stables. The composition of these food supplements is different depending on the type and manufacturer. Tables 3-1 and 3-2 provide some idea of the composition of lickstones and forage mixtures from the manufacturer, Bústólpi, commonly used by farmers in Reyðarfjörður. The compositional information provided by the manufacturers indicates that some

of the food supplements contain substantial concentrations of phosphate which may be potential sources of fluoride in the animal diets.

3.2.2 Fishmeal and Seaweeds

Fishmeal and seaweed may be significant sources of fluoride in the diet of certain animals. Brown seaweeds in the UK may contain 30-100 mg F kg^{-1}.

3.2.3 Phosphate Fertilizers

Phosphate fertilizers may contain significant concentrations of fluoride, sufficient to increase the fluoride in the surface layers of soil, and in extreme cases, to contribute to the fluoride intake of livestock. However, this is unlikely and phosphate fertilizer use is not expected to have any significant effect on the fluoride intake by livestock.

Table 3-1 Chemical Composition of Lickstones[2]

		Special for Conditions in N Iceland. Effekt	**Standard**	**FB**	**Red**	**For Cows+Sheep BS**	**Bústólpi**	**KNZ**	**Stewart**	**Horse**
		Midi-kurl	Stone	Mg-block	stone	Mg-block	Bleu	Sheep	43	Buckets
Salt	%		99,0	11,5	97,0	20,0	98,9	97,0		
Na	%	7,5				7,0	38,0		10,0	7,0
Ca	%	10,5		3,0		1,0			10,0	8,8
P	**%**	**7,5**		**0,6**		**1,0**			**13,0**	**4,0**
Mg	%	120	2,0	8,5	2,0	125	5,0	2,0	7,0	8,0
Ca/P	ratio	14		50		10			8	22
Fe	mg/kg				3000			500	2300	500
Mn	mg/kg	4000	830	1000	830	300	170	7500	3200	3000
Co	mg/kg	30	18	25	18	25	20	60	10	80
I	mg/kg	150	100	40	50	125	140	300	60	200
Zn	mg/kg	5000	810	1000	810	220	230	20000	1100	3200
Se	mg/kg	30	20	5	10	10		10	10	20
Cu	mg/kg	400	220				140		250	200
Vit A	a.e	400		30					150	400
Vit D3	a.e	100		6					100	100
Vit E	a.e.	1000		250					1000	10
Weight	kg	25	10	20	10	12,5	10	10	25	20

[2] Information from the manufacturer, Bústólpi ehf, is found at: http://www.bustolpi.is/?obj=sidan&id=56&uid=0,56

Table 3-2 Chemical Composition of Livestock Dietary Supplements[3]

Low Protein Mixture 12 110/-45		**Energy Mixture 20 130/ +3**	
Forage Composition			
Maize	65,6%	Maize	38,2%
Barley	11,5%	Barley	24,2%
Fishmeal	**9,4%**	**Fishmeal**	**21,3%**
Soyameal	2,0%	Soyameal	6,0%
Bran	2,5%	Bran	3,0%
Sugar	2,0%	Sugar	3,0%
Hardener	1,5%	Hardener	2,0%
Stewart-42	4,0%	WAFI 1513	1,8%
Seaweed meal	**1,0%**	**Seaweed meal**	**0,2%**
Salt	0,5%	Salt	0,3%
Molasses	4,0%	Molasses	4,0%
Chemical Ingredients			
FEM	1.04/kg	FEM	1.00/kg
Raw protein	12,0%	Raw protein	20,0%
Ash	7,5%	Ash	9,5%
Cellulose	2,0%	Cellulose	3,0%
Fat	3,5%	Fat	4,0%
Calcium	1,2%	Calcium	1,5%
Phosphorus	1,0%	Phosphorus	1,1%
Magnesium	0,35%	Magnesium	0,3%
Potassium	0,5%	Potassium	0,5%
Sodium	0,6%	Sodium	0,5%
AAT	110 g/kg	AAT	130 g/kg
PBV	45 g/kg	PBV	3 g/kg

Note: potential sources of fluoride are indicated by bold type.

[3] Information from the manufacturer, Bústólpi ehf, is found at: http://www.bustolpi.is/?obj=sidan&id=50&uid=0,50

4 Chemical Analyses of Environmental Samples

The baseline monitoring of environmental conditions included the collection of snow, soil, water, and vegetation samples for the analysis of the air pollutants commonly associated with aluminium smelting. The vegetation sampled and analysed for fluoride included conifer needles, broadleaved tree, grass/forage, and a native herbaceous species.

Samples of plants, soil, surface water, and snow were collected for analysis in September 2004 and finished in August 2005. Concentrations of almost all of the elements and compounds were within the ranges expected. Most vegetation samples had low fluoride concentrations that are typical of environments where soil fluoride is in the normal range and there is no measurable fluoride in the air. However, some samples had higher concentrations and these are discussed below.

4.1 Vegetables in Reyðarfjörður

2004 Vegetable Sample Results

The survey of vegetation in the study area identified that very few residents or farmers grow vegetables. In 2004, rhubarb was found in several gardens in the town and at several locations out of town so it was chosen as the main species for fluoride monitoring. Rhubarb is perennial and is expected to be found in future sampling events at the same location. However, rhubarb sometimes shows signs of stress on leaves, probably caused by the weather, that mimic fluoride injury. Strawberry leaves and potatoes were also collected from a few gardens. Potatoes were found growing close to the smelter site; however, they may not be available at the same locations in future years.

Analysis of samples collected in 2004 demonstrated that most vegetation samples had low fluoride concentrations typical of environments where soil fluoride is in the normal range and there is no measurable fluoride in the air (Table 4-1). However, some samples of vegetation (nine in total) were found to have higher fluoride concentrations. Fluoride concentrations in the 10-16 mg kg^{-1} range are considered to be elevated but not unusual even in pristine environments. With the exception of two samples (out of nine samples), the vegetation found to have higher fluoride concentration were all vegetable leaves.

Table 4-1 Moss, Lichen, and Broadleaf Plant Fluoride Concentrations

SAMPLE TYPE	Fluoride (µg)			
	Number of Samples	Number of Detects	Range	
			Min	Max
Moss (*Racomitrium*)	30	18	< 5	29
Lichen (*Cladonia arbuscula*)	30	9	< 5	8
Broadleaf Plant tissue (*Vaccinium uliginosum*)	30	2	< 3	11

Rhubarb stems were found to have low fluoride concentrations (all less than 3 mg kg^{-1}) but all of the leaf samples were found to have elevated levels of fluoride (11-94 mg kg^{-1}). Two samples of strawberry leaves had background levels but the one sample of strawberry fruit had 10 mg F kg^{-1}. Two samples of potato leaves had 15 and 16 mg F kg^{-1}, respectively.

There are several possible causes of elevated foliar fluoride:

1) Contamination during handling, e.g., by washing with fluorine-containing water. This source of fluoride contamination of samples is unlikely because the analysis of surface water samples indicate that the local source of drinking water has a very low fluoride content. If the wash water was contaminated or there was some other source during handling and analysis, values would have been similar for all of the samples. Contamination during handling is unlikely.

2) Surface deposition or uptake from the air. Surface deposits of dust or soil can increase the fluoride content of leaves but it is usually only significant if the dust has a very high fluoride content (several thousand mg kg^{-1}) or if there is a heavy deposit of dust that has a lower fluoride content. The most plausible case where dust or soil may have contributed is the strawberry fruit (10 mg kg^{-1}) because they often lie in contact with the soil. Soil splash may also have contributed to the potato leaf levels of 15 and 16 mg kg^{-1} range. The rhubarb leaves appeared to be clean to the eye and they were given a simple wash to simulate preparation in the kitchen.

3) Sea water contains about 1.4 mg F l^{-1} so it is possible that wind blown marine aerosols might deposit fluoride on leaves. However, if this was the case, all or most of the samples would have been affected to some degree. Some of the rhubarb leaves were in sheltered positions out of the wind. Also, Dr. Davison has extensive experience monitoring a smelter in a coastal locality and has not observed any indication of marine aerosols increasing leaf fluoride contents even when leaves are damaged by sea salt. As such, a deposit would be soluble, the chloride content would also

be high. Also, the fluoride would wash off readily during lab preparation.

4) Plant Senescence. The sampling event in 2004 occurred late in the growing season when many species were exhibiting symptoms of senescence. The potatoes were particularly aged. During senescence, dry matter is lost from the leaf (primarily sugars, starches, proteins) by respiratory processes, and the amount lost is often greater than that of fluoride. This reduces the dry weight without changing the amount of fluoride present. Therefore, there is an apparent increase in fluoride content per unit weight. In barley, senescence can increase the fluoride content by a factor of up to three times, so senescence may have been partly responsible for the elevated levels in potato leaves. Samples of potato leaves were collected in 2005 and were determined to have normal background concentrations of fluoride. As they were collected earlier in the season than the samples collected in 2004, the slightly high concentrations found in 2004 were probably due to dust or senescence.

5) Soil fertilizers. We understand that fishmeal may have been used to improve soil fertility in vegetable plots. This may be significant because fishmeal contains fluoride (because of the bones). Two samples obtained from Slétta farm and analysed by Dr. Davison averaged 187 and 226 mg kg^{-1}. Phosphate fertilizers may contain several thousand mg kg^{-1} so if these are used, it is possible that they might increase the amount of fluoride that is available at the roots, particularly if the soil has a high organic content and a low pH.

6) Unusual fluorine accumulation. Most plants take up only a small amount of fluoride from the soil but a few species are known to be "fluoride accumulators"; that is, they contain relatively high concentrations even when they grow on soils with low fluoride availability. Potato is not a fluoride accumulator and rhubarb has not been previously examined for this property.

2005 Vegetable Sample Results

To investigate the underlying reasons for the elevated fluoride concentrations observed in rhubarb leaves during the 2004 sampling event, additional rhubarb leaves and soil were analysed in summer 2005. The investigation included washing leaves in various ways and analysing the total, water soluble, and labile fluoride content of the rhubarb soils. Some additional potato samples were also analysed.

The fluoride concentration of rhubarb stems and roots found in 2005 were all considered to be within the normal background range (Table 4-2). However, the concentrations of fluoride in eight out of 10 of the leaf samples had concentrations that were comparable to 2004. As in 2004, all rhubarb leaves appeared to be clean, with no obvious sign of dust deposits. The results of washing leaves were more variable than expected but we conclude that they are inconsistent with the high levels of fluoride being due to surface dust deposits on the leaves.

Table 4-2 2004 and 2005 Additional Vegetable Samples

SAMPLE TYPE	Fluoride (µg/g) - 2004				Fluoride (µg/g) - 2005			
	Number of Samples	Number of Detects	Range		Number of Samples	Number of Detects	Range	
			Min	Max			Min	Max
Vegetables TOTAL	23	11	4	94	57	31	<5	111
Rhubarb root	-	-	-	-	10	3	< 5	9
Rhubarb leaves	4	4	11	94	30	27	< 5	111
Rhubarb stems	4	0	< 3	< 3	10	0	< 5	< 5
Potato	5	0	< 3	< 3	1	0	< 5	< 5
Potato leaves	5	4	4	16	6	1	< 5	6
Broadleaf	10	2	< 3	21	1	0	< 5	< 5

At the time of this report, only the concentration of the labile fraction of fluoride in soils growing rhubarb was available (and they must be regarded as being preliminary). All of the labile fluoride concentrations were within the range found in normal mineral soils (about 10-20 mg F kg^{-1}).

The measurement of labile fluoride was developed for use with soils that are predominantly mineral in composition, and for those soils it gives a good estimate of the fluoride that is available to plant roots. However, the uptake of fluoride by plants is dependent on the fluoride species present in soil porewater. Fluoride speciation is affected by pH, the mineralogy of the soil, and the presence of organic compounds such as organic acids. The result is

that in mineral-dominated soils fluoride uptake increases steeply as the soil pH falls below 5-6.

The soils growing rhubarb were determined to have unusually high organic matter content (16-32%). The high organic matter content is probably due to the use of manures as a soil amendment to promote vigorous growth of rhubarb leaves and stems. The high organic matter content of these soils will have an effect on fluoride uptake by the rhubarb, but unfortunately, there is virtually nothing known about the chemistry of fluoride in organic matrices. It is currently impossible to know what effect the amendment of soils with manure has on the uptake of fluoride. The presence of fishmeal in soil would probably increase fluoride availability as well. The IceTec analyses showed that the pH values of the soils ranged from 4.7 to 6.5 but most were in the 5-6 range. Three were less than pH 4. This may give a partial explanation for the high fluoride content of rhubarb because the three soils with pH values of 4.73, 4.91, and 4.96 had the three highest fluoride contents (26, 50, 111 mg F kg^{-1}, respectively). It is possible that the elevated fluorides are due to a combination of fishmeal, high organic content, and low pH. It is also possible the rhubarb is a fluoride accumulator. Investigation of the causes of elevated fluoride will be continued in 2006.

4.2 Conifers

The External Monitoring Plan includes the monitoring of needles of conifers before and after start-up of the smelter. Pine was chosen because it is widely planted and has few pests or diseases. In 2004, needles were collected along a transect running from the forests near the smelter site through the town to the farms at the west end of the valley and analysed for fluoride, nitrogen, sulphur (Table 4-3a) and heavy metal content (Table 4-3b).

All of the samples had background levels of all elements and fluoride concentrations were determined to be less than 4 mg F kg^{-1}, which is what would be expected for a pristine environment. Some needle nitrogen concentrations were low and may indicate a degree of nitrogen limitation.

Table 4-3a Conifer, Broadleaf, Vegetable, and Grass – Fluoride, Nitrogen, and Sulphur

SAMPLE TYPE	Fluoride (µg)				Nitrogen (%)				Sulfur (mg/g)			
	Number of Samples	Number of Detects	Range		Number of Samples	Number of Detects	Range		Number of Samples	Number of Detects	Range	
			Min	Max			Min	Max			Min	Max
Vegetation TOTAL	103	26	< 3	94	99	99	0.6	4.5	99	99	0.2	5.1
Conifer	20	1	4	4	20	20	0.6	1.6	20	20	0.5	1.2
Current growth (*Pinus and Picea*)	10	0	< 3	< 3	10	10	1.1	1.6	10	10	0.7	1.2
Previous year's growth (*Pinus and Picea*)	10	1	4	4	10	10	0.6	1.4	10	10	0.5	1.1
Broadleaf tree tissue (*Sorbus auciparia*)	10	2	< 3	21	10	10	1.6	2.8	10	10	0.9	1.7
Vegetables	23	11	4	94	9	9	0.7	3.1	9	9	0.2	1.6
Strawberries	1	1	10	10	0				0			
Strawberry leaves	2	1	<3	5	1	1	3.0	3.0	1	1	1.6	1.6
Rhubarb	4	0	< 3	< 3	1	1	0.7	0.7	1	1	0.2	0.2
Rhubarb leaves	4	4	11	94	3	3	1.2	1.6	3	3	0.4	1.1
Potato	5	0	< 3	< 3	2	2	1.0	1.7	2	2	0.6	0.6
Potato leaves	5	4	4	16	1	1	1.7	1.7	1	1	1.3	1.3
Grass	60	12	< 3	10	60	60	1.2	4.5	60	60	1.3	5.1

Table 4-3b Conifer, Broadleaf, Vegetable, and Grass – Heavy Metals

SAMPLE TYPE	Copper (µg/g)				Nickel (µg/g)				Lead (µg/g)				Vanadium (µg/g)			
	Number of Samples	Number of Detects	Range		Number of Samples	Number of Detects	Range		Number of Samples	Number of Detects	Range		Number of Samples	Number of Detects	Range	
			Min	Max			µg/g				µg/g				Min	Max
Vegetation TOTAL	83	53	< 4	21	83	35	< 4	10	83	0	< 16	< 16	83	10	< 4	16
Conifer	20	11	< 4	8	20	20	< 4	8	20	0	< 16	< 16	20	2	5	5
Current growth (*Pinus and Picea*)	10	8	4	8	10	10	< 4	8	10	0	< 16	< 16	10	0	< 4	< 4
Previous year's growth (*Pinus and Picea*)	10	3	5	5	10	10	< 4	7	10	0	< 16	< 16	10	2	5	5
Broadleaf tree tissue (*Sorbus auciparia*)	10	9	5	10	10	10	< 4	10	10	0	< 16	< 16	10	2	< 4	6
Vegetables	23	12	< 4	21	23	3	5	8	23	0	< 16	< 16	23	5	5	16
Strawberries	1	1	4.4	4.4	1	0	< 4	< 4	1	0	< 16	< 16	1	1	5	5
Strawberry leaves	2	1	5.0	5.0	2	0	< 4	< 4	2	0	< 16	< 16	2	0	< 4	< 4
Rhubarb	4	1	5.1	5.1	4	0	< 4	< 4	4	0	< 16	< 16	4	0	< 4	< 4
Rhubarb leaves	4	2	6.0	7.0	4	0	< 4	< 4	4	0	< 16	< 16	4	0	< 4	< 4
Potato	5	2	5	7	5	1	5	5	5	0	< 16	< 16	5	0	< 4	< 4
Potato leaves	5	4	5	21	5	2	5	8	5	0	< 16	< 16	5	4	7	16
Grass	30	21	< 4	18	30	2	4.3	5.1	30	0	< 16	< 16	30	1	4.7	4.7

4.3 Deciduous, Broadleaf Trees

Rowan, *Sorbus aucuparia*, was chosen for monitoring because it is widespread and mostly pest and disease free. Nine out of the 10 samples collected in 2004 had less than 3 mg F kg^{-1} (Table 4-3a) but one, collected at Kollaleira farm, had 21 mg F kg^{-1} so the farm was re-visited in 2005. The farmer remarked that the trees were close to a fire where he burns a range of waste materials. Most combustible materials contain some fluoride. An additional sample was collected in 2005, and fluoride concentration was less than 5 mg F kg^{-1} (Table 4-2). It was concluded that the elevated fluoride in 2004 was due to emissions from the fire. Burning waste can be a significant local source of fluoride, therefore, the locations of fires in the town should be noted in future surveys.

4.4 Grass/Forage

The Monitoring Plan requires grass to be sampled early in the year and at hay cut. Because of the late start for the 2004 vegetative sampling it was not

possible to collect two sets of samples in 2004. An early season forage grass sample was collected in 2005. Twenty-four of the 30 samples collected in 2004 contained less than 3 mg F kg^{-1} and the other six contained 4-6 mg kg^{-1}, so all were within the normal background level (Tables 4-3a and 4-3b).

Results for 2005 were very similar, with most <5 and all <10 mg F kg^{-1}.

4.5 A Native Herbaceous Species

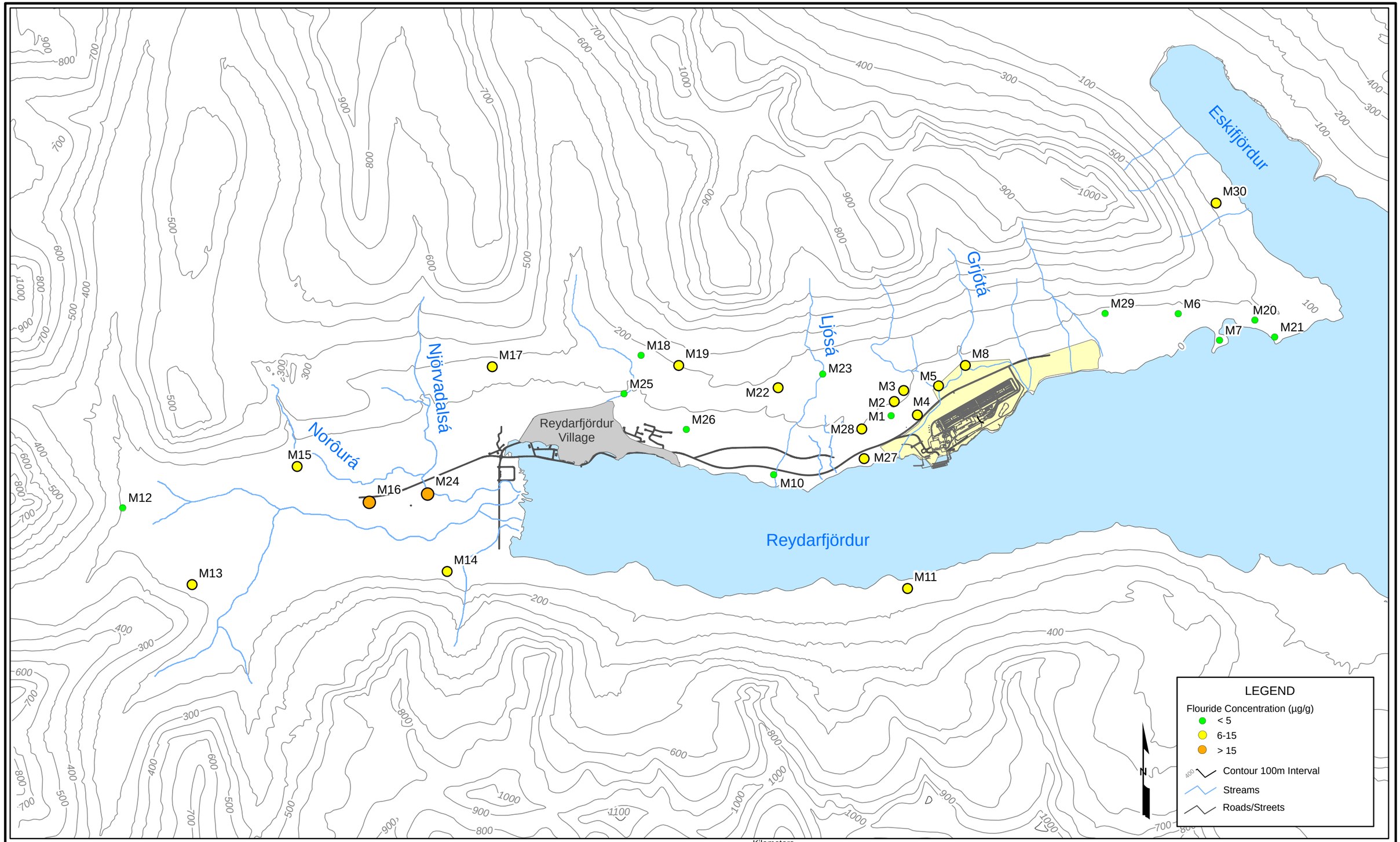
No collection was possible in 2004 because the suitable species were too senescent during the sampling in September. Leaves of the bog bilberry, *Vaccinium uliginosum*, were collected in July 2005. Twenty-eight of the 30 samples collected were found to have less than 5 mg F kg^{-1} and the other two leaf samples were found to have 6 and 11, respectively. Both of these are within the expected range for normal background fluoride concentrations in plant leaves.

4.6 Moss and Lichen

Thirty moss samples were collected between May and July 2005 near each of the 30 ecological stations around Reyðarfjörður. Twelve of the samples had <5 mg F kg^{-1}, 16 had 6-12, and two had 20-30 mg kg^{-1} (Table 4-1). The fluoride concentrations in moss samples were very low to the east and downwind of the smelter construction site, and higher around and downwind of the construction site (Figure 4-1). The two highest sites were west of the town and close to roads. This pattern suggests that the elevated fluoride concentration observed in some moss samples is associated with roadway and construction dust.

The higher fluoride concentration observed in some moss samples and not in other vegetation samples may be the result of two factors. One factor may be the difference in the weather when the different species were collected, particularly rainfall, which might wash dust off leaves. A second, and more likely possibility, is the difference in leaf area/weight ratio between species. Mosses have a leaf area per gram that is about 20x greater than that of grasses and >100x that of conifers. Therefore if the same amount of fluoride dust falls on the same area of a moss, a grass and a conifer, the concentration will be proportionately higher in the moss.

Thirty lichen samples were also collected between May and July 2005 near each of the 30 ecological stations around Reyðarfjörður. Apart from two samples with 8 mg F kg^{-1}, all the lichen samples had <6 mg kg^{-1} (Table 4-1). The fluoride concentrations in the lichen samples are within the expected range for normal background.



Map: Nátturstofa Austurlands, Iceland
Contour and coastline: Landmælingar Islands, Iceland

RETEC

External Environmental Monitoring Baseline Survey.
Bechtel Overseas Corp.

FLUORIDE CONCENTRATIONS IN MOSS SAMPLES

DATE: 1/19/06 | DWN. BY: | FILE: T:/ALCOA_ICELAND/PROJECTS/BaselineSurvey/MossFL.mxd | **FIGURE 4-1**

4.7 Soils

Fluoride concentrations in soil water extracts were all very low (Table 4-4). Fluoride in soil extracts ranged from 0.09 to 0.28 mg/kg dry matter. All pH values were from 5.3-6.9, which is the range over which fluoride has the lowest solubility in soil. This means that any potential fluoride emissions from the smelter will have very low availability to plants from the soil.

Table 4-4 Soil

SAMPLE TYPE	Number of Samples	Range	
		Min	Max
Soil			
Fluoride (mg/kg dry matter)	20	0.09	0.28
SO_4-S (mg/kg dry matter)	20	27.80	460
Chloride (mg/kg dry matter)	20	6.22	105
pH	20	5.3	6.91
Dry Matter (% weight)	10	3.4	38.7
% Sample (> 2mm)	10	1.4	25.3
% Dry Matter (> 2mm)	10	35.8	73.6

4.8 Surface Water

Fluoride concentrations in surface waters were all very low. Fluoride ranged in concentration from 0.01 to 0.03 mg/L. All pH values were from 7.0 to 7.5 and alkalinity ranged from 10.1 to 19.2 mg/L (Table 4-5a).

Concentrations of polycyclic aromatic hydrocarbons (PAHs) in surface and municipal water samples were almost all < 0.2 µg L^{-1} (non-detectable). One river, Grjótá, had measurable PAH concentrations of 2.0 µg L^{-1} (Table 4-5c).

Table 4-5a Water – Major Ions

SAMPLE TYPE	Alkalinity (mg $CaCO_3$/L)			Calcium (mg/L)			Chloride (mg/L)		
	Number of Samples	Range		Number of Samples	Range		Number of Samples	Range	
		Min	Max		Min	Max		Min	Max
Ljósá	4	10.5	18.1	1	3.56		4	2.14	3.60
Grjótá	4	10.3	13.2	1	2.48		4	2.17	2.90
Norðurá	4	11.9	17.4	1	3.78		4	1.87	3.50
Njörvadalsá	4	10.1	15.4	1	2.94		4	1.93	3.37
TAP Water Eskifjörður	4	17.4	19.2	1	4.36		4	2.24	4.59
Vatnsból Eskifjörður	4	17.2	19.2	1	4.32		4	2.76	4.38
TAP Water Reyðarfjörður	4	15.0	17.6	1	3.26		4	1.37	3.88
Vatnsból Reyðarfjörður	4	15.0	17.8	1	3.27		4	2.18	3.97
Water (Total)	32	10.1	19.2	8	2.48	4.36	32	1.37	4.59

SAMPLE TYPE	Fluoride (mg/L)			Magnesium (mg/L)			Potassium (mg/L)	
	Number of Samples	Range		Number of Samples	Range		Number of Samples	Value
		Min	Max		Min	Max		
Ljósá	4	0.014	0.023	1	1.60		1	< 0.3
Grjótá	4	0.012	0.030	1	1.03		1	< 0.3
Norðurá	4	0.012	0.023	1	1.52		1	< 0.3
Njörvadalsá	4	0.011	0.030	1	1.20		1	< 0.3
TAP Water Eskifjörður	4	0.012	0.030	1	0.88		1	< 0.3
Vatnsból Eskifjörður	4	0.013	0.030	1	0.84		1	< 0.3
TAP Water Reyðarfjörður	4	0.046	0.028	1	1.25		1	< 0.3
Vatnsból Reyðarfjörður	4	0.014	0.030	1	1.26		1	< 0.3
Water (Total)	32	0.011	0.030	8	0.84	1.60	8	< 0.3

SAMPLE TYPE	Sodium (mg/L)			Sulfate (mg/L)			Conductance (µS/cm)		
	Number of Samples	Range		Number of Samples	Range		Number of Samples	Range	
		Min	Max		Min	Max		Min	Max
Ljósá	1	3.78		4	0.30	0.51	2	35.3	66.5
Grjótá	1	3.14		4	0.18	0.36	2	36.6	39.8
Norðurá	1	3.55		4	0.28	0.56	2	35.2	49.4
Njörvadalsá	1	3.48		4	0.23	0.44	2	33.7	44.5
TAP Water Eskifjörður	1	4.93		4	0.30	0.37	2	52.7	54.3
Vatnsból Eskifjörður	1	4.89		4	0.32	0.65	2	52.3	53.1
TAP Water Reyðarfjörður	1	4.14		4	0.32	0.43	2	46.3	48.4
Vatnsból Reyðarfjörður	1	4.16		4	0.32	0.45	2	46.4	47.8
Water (Total)	8	3.14	4.93	32	0.18	0.65	16	33.7	66.5

SAMPLE TYPE	pH		
	Number of Samples	Range	
		Min	Max
Ljósá	4	7.3	7.5
Grjótá	4	7.3	7.5
Norðurá	4	7.3	7.5
Njörvadalsá	4	7.3	7.5
TAP Water Eskifjörður	4	7.3	7.4
Vatnsból Eskifjörður	4	7.3	7.5
TAP Water Reyðarfjörður	4	7.0	7.3
Vatnsból Reyðarfjörður	4	7.0	7.2
Water (Total)	32	7.0	7.5

Table 4-5b Water – Trace Metals

SAMPLE TYPE	Arsenic (µg/L)			Cadmium (µg/L)			Chromium (µg/L)		
	Number of Samples	Number of Detects	Value	Number of Samples	Number of Detects	Value	Number of Samples	Number of Detects	Value
Ljósá	4	0	< 1	4	0	< 1	4	0	< 1
Grjótá	4	0	< 1	4	0	< 1	3	1	1.6
Norðurá	4	0	< 1	4	0	< 1	3	0	< 1
Njörvadalsá	4	0	< 1	4	0	< 1	3	0	< 1
TAP Water Eskifjörður	4	0	< 1	4	0	< 1	3	0	< 1
Vatnsból Eskifjörður	4	0	< 1	4	0	< 1	3	0	< 1
TAP Water Reyðarfjörður	4	0	< 1	4	0	< 1	3	0	< 1
Vatnsból Reyðarfjörður	4	0	< 1	4	0	< 1	3	0	< 1
Water (Total)	32	0	< 1	32	0	< 1	26	1	1.6

SAMPLE TYPE	Copper (µg/L)				Lead (µg/L)			Mercury (µg/L)		
	Number of Samples	Number of Detects	Range		Number of Samples	Number of Detects	Value	Number of Samples	Number of Detects	Value
			Min	Max						
Ljósá	4	1	1		4	0	< 1	4	0	< 2
Grjótá	3	0	< 1		4	0	< 1	4	0	< 2
Norðurá	3	1	1		4	0	< 1	4	0	< 2
Njörvadalsá	3	1	1		4	0	< 1	4	0	< 2
TAP Water Eskifjörður	4	4	4	4	4	0	< 1	4	0	< 2
Vatnsból Eskifjörður	3	2	1	3	4	0	< 1	4	0	< 2
TAP Water Reyðarfjörður	3	3	1	3	4	0	< 1	4	0	< 2
Vatnsból Reyðarfjörður	3	2	1	2	4	0	< 1	4	0	< 2
Water (Total)	26	14	1	4	32	0	< 1	32	0	< 2

SAMPLE TYPE	Nickel (µg/L)			Zinc (µg/L)			
	Number of Samples	Number of Detects	Value	Number of Samples	Number of Detects	Range	
						Min	Max
Ljósá	3	0	< 10	4	0	< 5	
Grjótá	3	0	< 10	3	0	< 5	
Norðurá	3	0	< 10	3	0	< 5	
Njörvadalsá	3	0	< 10	3	0	< 5	
TAP Water Eskifjörður	4	0	< 10	4	4	13	19
Vatnsból Eskifjörður	3	0	< 10	3	3	6	7
TAP Water Reyðarfjörður	3	0	< 10	3	3	14	23
Vatnsból Reyðarfjörður	3	0	< 10	3	2	13	14
Water (Total)	26	0	< 10	26	12	6	23

Table 4-5c PAHs

SAMPLE TYPE	Ljósá			Grjótá				Norðurá			
	Number of Samples	Number of Detects	Value	Number of Samples	Number of Detects	Range Min	Range Max	Number of Samples	Number of Detects	Range Min	Range Max
Naphthalene (µg/L)	2	0	< 0.2	2	0	< 0.2		2	0	< 0.2	
Acenaphthylene	2	0	< 0.2	2	0	< 0.2		2	0	< 0.2	
Acenapthene	2	0	< 0.2	2	0	< 0.2		2	0	< 0.2	
Fluorene	2	0	< 0.2	2	0	< 0.2		2	0	< 0.2	
Phenanthrene	2	1	0.05	2	1	0.05		2	1	0.06	
Anthracene	2	0	< 0.2	2	0	< 0.2		2	0	< 0.2	
Fluoranthene	2	0	< 0.2	2	2	0.03	0.03	2	0	< 0.2	
Pyrene	2	0	< 0.2	2	2	0.01	0.03	2	0	< 0.2	
Benzo(a)anthracene (ug/L)	2	0	< 0.2	2	1	0.22		2	1	0.05	
Chrysene	2	0	< 0.2	2	1	0.29		2	1	0.05	
Benzo(b)fluoranthene	2	0	< 0.2	2	1	0.17		2	1	0.05	
Benzo(k)fluoranthene	2	0	< 0.2	2	1	0.28		2	0	< 0.2	
Benzo(a)pyrene	2	0	< 0.2	2	1	0.19		2	0	< 0.2	
Indeno(1,2,3-cd)pyrene	2	0	< 0.2	2	1	0.23		2	0	< 0.2	
Dibenzo(a,h)anthracene	2	0	< 0.2	2	1	0.33		2	0	< 0.2	
Benzo(ghi)perylene	2	0	< 0.2	2	1	0.22		2	0	< 0.2	
Water (Total)	2	1	0.05	2	13	2.02	2.04	2	4	0.21	0.21

SAMPLE TYPE	Njörvadalsá			TAP Water Eskifjörður			Vatnsból Eskifjörður		
	Number of Samples	Number of Detects	Value	Number of Samples	Number of Detects	Value	Number of Samples	Number of Detects	Value
Naphthalene (µg/L)	2	0	< 0.2	2	0	< 0.2	2	0	< 0.2
Acenaphthylene	2	0	< 0.2	2	0	< 0.2	2	0	< 0.2
Acenapthene	2	0	< 0.2	2	0	< 0.2	2	0	< 0.2
Fluorene	2	0	< 0.2	2	0	< 0.2	2	0	< 0.2
Phenanthrene	2	1	0.05	2	1	0.04	2	0	< 0.2
Anthracene	2	0	< 0.2	2	0	< 0.2	2	0	< 0.2
Fluoranthene	2	0	< 0.2	2	0	< 0.2	2	0	< 0.2
Pyrene	2	0	< 0.2	2	0	< 0.2	2	0	< 0.2
Benzo(a)anthracene (ug/L)	2	0	< 0.2	2	0	< 0.2	2	0	< 0.2
Chrysene	2	0	< 0.2	2	0	< 0.2	2	0	< 0.2
Benzo(b)fluoranthene	2	0	< 0.2	2	0	< 0.2	2	0	< 0.2
Benzo(k)fluoranthene	2	0	< 0.2	2	0	< 0.2	2	0	< 0.2
Benzo(a)pyrene	2	0	< 0.2	2	0	< 0.2	2	0	< 0.2
Indeno(1,2,3-cd)pyrene	2	0	< 0.2	2	0	< 0.2	2	0	< 0.2
Dibenzo(a,h)anthracene	2	0	< 0.2	2	0	< 0.2	2	0	< 0.2
Benzo(ghi)perylene	2	0	< 0.2	2	0	< 0.2	2	0	< 0.2
Water (Total)	2	1	0.05	2	1	0.04	2	0	< 0.2

4.9 Snow

Similar to surface water samples, concentrations of PAHs in snow were almost all < 0.2 µg L^{-1} (non-detectable) [Table 4-6]. Some snow samples collected from within the dilution zone did contain measurable levels of PAHs; however, all of the concentrations were consistent with background values.

Table 4-6 Snow PAHs

SAMPLE TYPE	Within Dilution Zone				Outside Dilution Zone			
	Number of	Number of	Range		Number of	Number of	Range	
			Min	Max			Min	Max
Naphthalene (µg/L)	7	0	< 0.2		3	0	< 0.2	
Acenaphthylene	7	0	< 0.2		3	0	< 0.2	
Acenapthene	7	1	0.012		3	0	< 0.2	
Fluorene	7	1	0.024		3	0	< 0.2	
Phenanthrene	7	3	0.05	0.33	3	0	< 0.2	
Anthracene	7	1	0.0074		3	0	< 0.2	
Fluoranthene	7	4	0.0083	0.21	3	1	0.08	
Pyrene	7	3	0.01	0.073	3	1	0.06	
Benzo(a)anthracene (ug/L)	7	2	0.0035	0.22	3	0	< 0.2	
Chrysene	7	2	0.023	0.29	3	1	0.09	
Benzo(b)fluoranthene	7	2	0.0056	0.17	3	1	0.09	
Benzo(k)fluoranthene	7	2	0.0025	0.28	3	0	< 0.2	
Benzo(a)pyrene	7	2	0.0033	0.19	3	0	< 0.2	
Indeno(1,2,3-cd)pyrene	7	1	0.23		3	0	< 0.2	
Dibenzo(a,h)anthracene	7	1	0.33		3	0	< 0.2	
Benzo(ghi)perylene	7	1	0.22		3	0	< 0.2	
Snow (Total)	7	26	0.9296	2.5864	3	4	0.32	0.32

5 Conclusions

The survey of vegetation and plant health for signs and symptoms of disease identified the main species present in the town of Reyðarfjörður and the surrounding forest plantations and farms. Most species were healthy and had few signs of stress. Some specimens did show signs of stress such as poor needle retention, dead branches, and premature senescence. However, these observations were likely due to other environmental factors, and could not be mistaken with fluoride injury. One species (Balsam Poplar, *Populus trichocarpa)*, showed leaf tip distortions identical to injury in hybrid poplar that can be induced by exposure to hydrogen fluoride, but was likely caused by poor water supply to individual branches.

Livestock monitoring found several potential fluoride sources to livestock, including lickstones, vitamin blocks, fishmeal, seaweed, and phosphate fertilizers. Each of these dietary supplements may be potential sources of fluoride in the animal diets.

Chemical analysis of environmental samples generally showed that the concentrations of all the elements and compounds analysed in snow, soil, water, and vegetation were within expected background ranges. Many were near the detection limits for individual elements or compounds.

Higher than expected fluoride concentrations were found in samples of rowan, rhubarb leaves (but not stems), and mosses. These were investigated and it was concluded that the rowan sample was due to contamination from burning waste in a nearby fire. Rhubarb fluoride concentrations were likely high due to the presence of fishmeal in soil and subsequently higher soil fluoride levels; however, these analyses are pending. And in the case of the mosses, probably dust from roads or construction caused the higher fluoride concentrations.

6 References

Bústólpi ehf. http://www.bustolpi.is/?obj=sidan&id=56&uid=0,56

Bústólpi ehf. http://www.bustolpi.is/?obj=sidan&id=50&uid=0,50

RETEC, 2005. External Environmental Monitoring Work Plan Baseline Survey, Fjarðaál Smelter, Reyðarfjörður, Iceland. April 26, 2005.

Umhverfisstofnun 2003 (Icelandic Environment and food agency). Environmental Operating Licence for the operation of Reydaral ehf., Id. No. 600100-2380, at the industrial site at Hraun in Reyðarfjörður.

Appendix A

Guide to Fluoride Injury Symptoms

A Guide to the Identification and Description of Injury Caused by Exposure to Airborne Fluoride.

This guide provides a basic description and photographs of injury caused by uptake of fluoride from the air. Describe symptoms objectively, for example by recording the % of a leaf that is injured and the proportions of leaves that are injured. Accurate diagnosis depends on good observation and accurate description/

How is injury produced?

It is easier to identify and understand injury symptoms with a basic knowledge of what happens to fluoride in leaves. The two key points are: the pathway of movement of fluoride in leaves and its reactions with certain nutrient elements.

Water movement in leaves

In leaves, water moves through the conducting system (veins) into the cell walls. Fluoride enters the leaves, dissolves in the water and is carried by it towards the margins and tip because that is where evaporation is usually at its greatest. This process concentrates the fluoride to produce massive gradients in concentration from the base to the tip and from the centre to the margins. The base or central part of a leaf may have a fluoride concentration that is near to background even when the tip has a concentration a hundred or even a thousand times higher. (Photograph 1).

The consequences of the concentration mechanism

The concentration mechanism explains why symptoms usually appear

Above: Photograph 1. Pathway of water movement in a leaf.

first at the tip and margins and why the base and central parts may function normally even when there is severe injury at the tip or margins. It is also one reason why fluoride is so toxic to some plants.

The mechanism of toxicity

Most of the effects of fluoride can be explained by its strong tendency to react with the nutrient elements, calcium and magnesium (and possibly one or two other elements). Calcium is important in cell walls and in the membranes that surround cells. As fluoride moves through cell walls it reacts with some of the calcium and it interferes with the calcium associated with cell membranes.

Chlorophyll contains magnesium so if fluoride gets into chloroplasts it reacts with the magnesium and destroy the integrity of the chlorophyll molecules and the leaf turns yellow (=chlorosis).

Although the relative sensitivity of many species to fluoride is well known the reasons for differences between species are not fully understood. Differences probably lie in the rates of uptake and movement of the fluoride, and in the calcium and magnesium metabolism of the plants, but much more research is needed on this subject.

Symptoms

1. Necrosis

This means dead tissue. When the fluoride concentration is sufficiently high it disrupts the membranes that surround cells, the contents leak and the surrounding tissue dies. At first the tissue may look “water soaked” as in the *Iris* below, but then it dries and turns shades of brown or black depending on the species. Necrotic tissue is usually at the tip or between the veins.

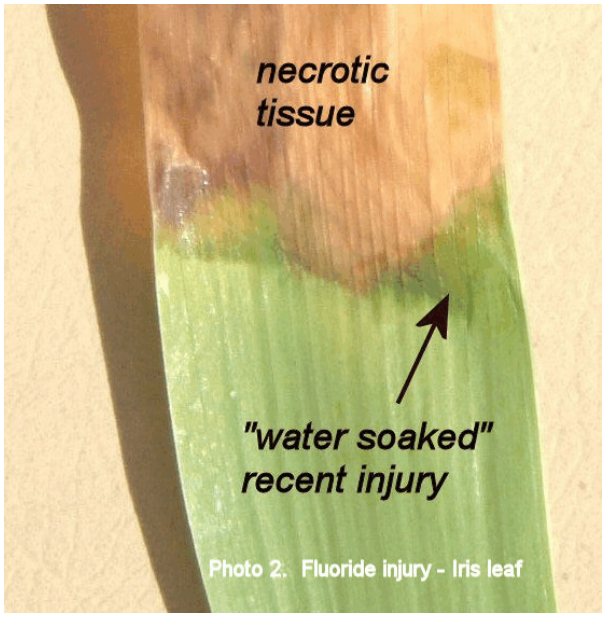


Photo 2. Fluoride injury - Iris leaf

In some cases there may be a distinct dark brown, red or back line between the dead and green tissue. A distinct line can be seen in this *Epilobium* leaf (Photograph 3, above).

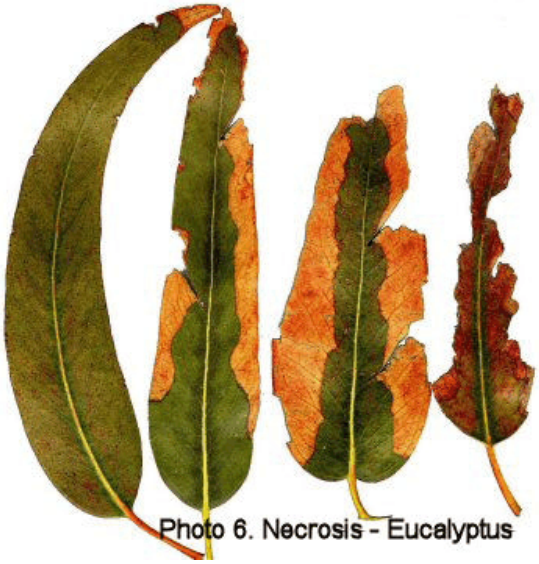

Photo 3. Tip necrosis - Epilobium

When a leaf is subjected to several episodes of HF exposure it may result in a series of dark bands separating sections of the leaf - as in this *Iris*:


Photo 4. Iris leaf

Sometimes exposure of a young, growing leaf leads to the tip being killed, but the rest of the leaf develops normally. Photograph 5 of a willow leaf (*Salix* sp.) shows this. Note that the leaf is also slightly cupped to form a concave shape - see later.

Eventually necrotic tissue may fall off the leaf, leaving it with an indented tip or a ragged or distorted shape, as in these *Eucalyptus* leaves (Photograph 6).



Often the extent of injury varies even within the same branch. This is partly due to differences in age but sometimes even adjacent leaves differ in the degree of

injury, as in this alder (*Alnus glutinosa*)

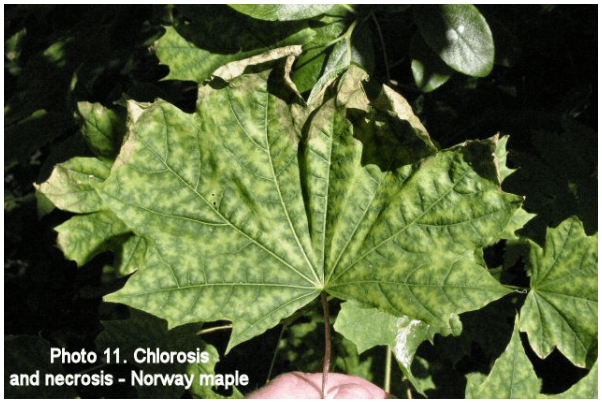
In conifers there may be a difference in the extent of necrosis (Photographs 8 & 9) between needles of different age, which reflects the fluoride concentrations during the period of needle expansion each year.

2. Chlorosis

This is a term used by biologists to indicate that parts of the leaf are yellow or yellow-green. You should note whether the chlorosis is diffuse or has well-defined margins and where it occurs. It is commoner in some species than others.

Chlorosis caused by HF is typically more severe near the margins and between the veins, as in the willow (*Salix* sp) leaves shown in Photograph 10.

Leaves may show both chlorosis and necrosis as in this Norway maple *(Acer platanoides*) leaf (Photograph 11):



In a few species chlorosis may occur as small spots or blotches (eg maize, *Zea*) but this is not common. Also, some species produce a red pigment, probably anthocyanins, at the margins. The Brazilian species (*Tabebouia*) shown in Photograph 12 has patches of red pigmentation and chlorosis

3. Distortion

In a growing leaf, fluoride may reduce the rate of cell extension of cells at the margins and tip where the concentrations

are highest. This leads to distortion of the shape of the leaf because the cells in the mid section continue to expand normally

The leaf may become slightly or markedly convex or concave. It may look “cupped”. The blueberry leaves in Photograph 13 are chlorotic and slightly convex or cupped near the tip..

Look at the two alder *(Alnus glutinosa*) leaves in Photograph 14. One is necrotic but both have areas where the leaf is buckled and distorted. The areas between the veins are concave and

buckled because of differential cell extension.

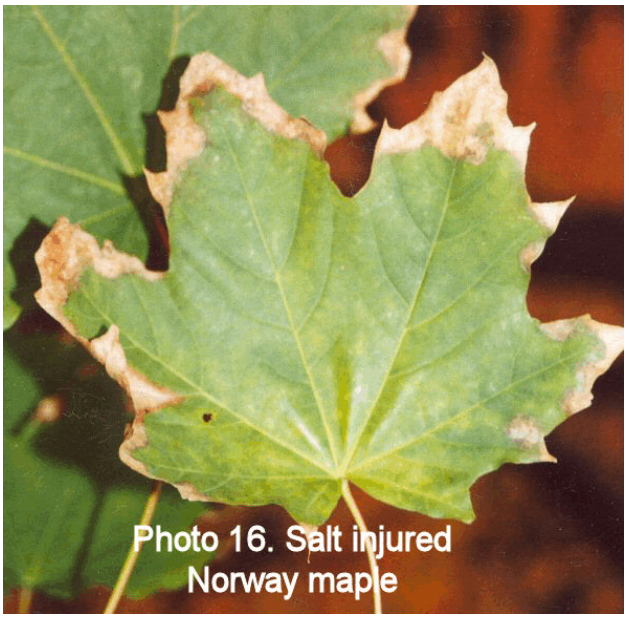
The willow (*Salix* sp.) leaves in Photograph 15 show the whole range of symptoms: necrosis, chlorosis and distortion.

4. Mimicking symptoms

Beware! Many environmental stresses cause symptoms that look identical to those caused by fluoride. Frost, drought, pests and wind may cause necrosis; many nutrient imbalances and viruses cause chlorosis while distortion is frequently caused by exposure to wind, especially near the sea.

The Norway maple (*Acer platanoides*) shown in Photograph 16 was injured by exposure to salt.

Photograph 17 shows leaves an unidentified species damaged by salt-laden winds in Australia. Note the necrosis, chlorosis and distortion:



Clearly, it is important to be aware that symptoms seen in the field may be caused by stresses other than fluoride. If fluoride is responsible there should be a spatial pattern, with greater symptom development in areas where concentrations are highest, decreasing with distance and wind direction. Species that are known to be sensitive should show greater symptom development than more tolerant species. Some species are more reliable indicators of fluoride injury than others.

Diagnosis needs experience and judgement; it is not always possible to identify the causes of injury.

Further reading:

Weinstein., L.H. & Davison, A.W. (2003) FLUORIDES IN THE ENVIRONMENT: Effects on Plants and Animals. CABI Publishing, Wallingford, England, pp. 286.

Appendix B

Analytical Laboratory Reports

2004 Analytical Results - IceTec

efnagreiningar
KELDNAHOLTI

Fjardaal Smelter Project
Bechtel International Inc
Lucy Martin/Robert Gélinas
1500 Univ.Street
Montreal
Quebec, Canada H3A 3S7

Project no.:	**6EM4185**	Date.:	9.9.2005
Project name:	External Environmental Monitoring	Copy:	
Supervision:	Hermann Þórðarson		
Sampling:	By N.Aust.		
Customer representative:	Lucy Martin, Robert Gélinas	Invoice.no.	
Received:	Oct.2004		

According to contract 24956-000-HC4-HA00-00003, External Environmental Monitoring, the following analytical services of testing vegetation, soil, water and snow samples from Reyðarfjörður area taken in 2004 was provided. The results are below.

efnagreiningar KELDNAHOLTI

FJARÐAÁL EXTERNAL ENVIRONMENTAL MONITORING
PROJECT NO. 6EM4185
CCA, IceTec

F, N, S

Conifer and broadleaf

E- nr.	Marking	Marking	Date of sampling	No.cont.	Fluoride µg/g	Nitrogen % wt.	Sulfur mg/g
75401	**CN1**	904	13.9.2004	1	<3	1,11	0,74
75402	**CN3**	904	13.9.2004	1	<3	1,26	1,15
75403	**CN4**	904	13.9.2004	1	<3	1,22	0,70
75404	**CN5**	904	13.9.2004	1	<3	1,35	1,01
75405	**CN6**	904	13.9.2004	1	<3	1,17	0,90
75406	**CN8**	904	14.9.2004	1	<3	1,48	1,11
75407	**CN9**	904	14.9.2004	1	<3	1,42	0,84
75408	**CN10**	904	14.9.2004	1	<3	1,20	0,74
75409	**CN11**	904	14.9.2004	1	<3	1,19	0,83
75410	**CN12**	904	15.9.2004	1	<3	1,63	1,14
75411	**CP1**	904	13.9.2004	1	<3	1,01	0,69
75412	**CP3**	904	13.9.2004	1	<3	1,29	0,73
75413	**CP4**	904	13.9.2004	1	<3	1,06	0,57
75414	**CP5**	904	13.9.2004	1	<3	1,28	0,89
75415	**CP6**	904	13.9.2004	1	<3	1,38	1,09
75416	**CP8**	904	14.9.2004	1	<3	0,61	0,47
75417	**CP9**	904	14.9.2004	1	<3	1,25	1,01
75418	**CP10**	904	14.9.2004	1	4	0,79	0,49
75419	**CP11**	904	14.9.2004	1	<3	0,93	0,57
75420	**CP12**	904	15.9.2004	1	<3	1,30	0,82
75421	**BL1**	904	13.9.2004	1	<3	1,99	1,24
75422	**BL2**	904	13.9.2004	1	<3	1,62	1,07
75423	**BL3**	904	14.9.2004	1	<3	2,82	1,71
75424	**BL4**	904	14.9.2004	1	<3	2,22	0,86
75425	**BL5**	904	14.9.2004	1	3	1,58	1,09
75426	**BL6**	904	14.9.2004	1	<3	1,85	1,03
75427	**BL7**	904	15.9.2004	1	21	2,06	1,04
75428	**BL8**	904	21.9.2004	1	<3	1,76	1,17
75429	**BL9**	904	21.9.2004	1	<3	2,33	1,34
75430	**BL11**	904	21.9.2004	1	<3	2,49	1,33
			LOD		3	0,05	0,05
			LOQ		10	0,2	0,17
GBW07604	Poplar leaves		Certified		22+-4	2,56+-0,04	0,35+-0,03
GBW07604	Poplar leaves		Found		23+-3	2,59	0,31
BCR129	Hay powder		Certified			3,72+-0,04	3,16+-0,04
BCR129	Hay powder		Found			3,63	3,2

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FJARÐAÁL EXTERNAL ENVIRONMENTAL MONITORING
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Trace metals

Conifer and broadleaf

E- nr.	Marking	Marking	Date of sampling	No.cont.	Cu ug/g	Ni ug/g	Pb ug/g	V ug/g
75401	**CN1**	904	13.9.2004	1	4	6	<16	<4
75402	**CN3**	904	13.9.2004	1	4	<4	<16	<4
75403	**CN4**	904	13.9.2004	1	4	<4	<16	<4
75404	**CN5**	904	13.9.2004	1	5	<4	<16	<4
75405	**CN6**	904	13.9.2004	1	8	8	<16	<4
75406	**CN8**	904	14.9.2004	1	6	6	<16	<4
75407	**CN9**	904	14.9.2004	1	<4	5	<16	<4
75408	**CN10**	904	14.9.2004	1	<4	5	<16	<4
75409	**CN11**	904	14.9.2004	1	4	6	<16	<4
75410	**CN12**	904	15.9.2004	1	5	7	<16	<4
75411	**CP1**	904	13.9.2004	1	5	<4	<16	5
75412	**CP3**	904	13.9.2004	1	<4	<4	<16	<4
75413	**CP4**	904	13.9.2004	1	<4	<4	<16	<4
75414	**CP5**	904	13.9.2004	1	5	<4	<16	<4
75415	**CP6**	904	13.9.2004	1	<4	7	<16	<4
75416	**CP8**	904	14.9.2004	1	<4	<4	<16	<4
75417	**CP9**	904	14.9.2004	1	<4	<4	<16	<4
75418	**CP10**	904	14.9.2004	1	<4	<4	<16	<4
75419	**CP11**	904	14.9.2004	1	<4	<4	<16	<4
75420	**CP12**	904	15.9.2004	1	5	<4	<16	5
75421	**BL1**	904	13.9.2004	1	10	5	<16	4
75422	**BL2**	904	13.9.2004	1	9	<4	<16	6
75423	**BL3**	904	14.9.2004	1	9	5	<16	<4
75424	**BL4**	904	14.9.2004	1	<4	<4	<16	<4
75425	**BL5**	904	14.9.2004	1	5	<4	<16	<4
75426	**BL6**	904	14.9.2004	1	8	5	<16	<4
75427	**BL7**	904	15.9.2004	1	5	5	<16	<4
75428	**BL8**	904	21.9.2004	1	8	7	<16	<4
75429	**BL9**	904	21.9.2004	1	10	10	<16	<4
75430	**BL11**	904	21.9.2004	1	6	6	<16	<4
			LOD		4	4	16	4
			LOQ		12	14	52	13
	GBW07604	Poplar leaves	Certified		9,3 +/- 0,5	1,9	1,5	[0,64]
	GBW07604	Poplar leaves	Found		9	< 4	< 4	< 4
	BCR129	Hay powder	Certified		10	*	*	*
	BCR129	Hay powder	Found		9	< 4	< 4	< 4

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FJARÐAÁL EXTERNAL ENVIRONMENTAL MONITORING
PROJECT NO. 6EM4185
CCA, IceTec

Vegetables **F, N, S**

E- nr.	Marking	Marking	Date of sampling		No.cont.	Fluoride µg/g	Nitrogen % wt.	Sulfur mg/g
79157	**V1**	904	13.9.2004	strawberries	1	10	1,64	1,59
79158	**V1**	904	13.9.2004	strawberry leaves	1	<3	1,89	1,39
79159	**V1**	904	13.9.2004	rhubarb leaves	1	11	3,84	2,56
79160	**V1**	904	13.9.2004	rhubarb	1	<3	1,72	1,15
79161	**V1**	904	13.9.2004	potatoes	1	<3	1,77	1,07
79162	**V1**	904	13.9.2004	potato leaves	1	<3	3,98	3,24
79163	**V2**	904	14.9.2004	potatoes	1	<3	0,95	0,55
79164	**V2**	904	14.9.2004	potato leaves	1	4	2,88	4,27
79165	**V3**	904	14.9.2004	rhubarb	1	<3	0,67	0,22
79166	**V3**	904	14.9.2004	rhubarb leaves	1	40	3,41	2,05
79167	**V4**	904	15.9.2004	strawberry leaves	1	5	3,01	1,59
79168	**V5**	904	21.9.2004	potatoes	1	<3	1,74	0,64
79169	**V5**	904	21.9.2004	leaves (no plant type mark)	1	7	3,73	2,89
79170	**V6**	904	21.9.2004	rhubarb	1	<3	1,27	0,37
79171	**V6**	904	21.9.2004	rhubarb leaves	1	94	3,72	1,19
79172	**V7**	904	21.9.2004	(no plant type mark)	1	<3	4,10	7,14
79173	**V7**	904	21.9.2004	potatoes	1	<3	1,65	1,27
79174	**V7**	904	21.9.2004	potato leaves	1	15	4,69	5,38
79175	**V8**	904	21.9.2004	potatoes	1	<3	1,88	1,99
79176	**V8**	904	21.9.2004	rhubarb leaves	1	27	3,23	1,09
79177	**V8**	904	21.9.2004	rhubarb	1	<3	1,17	0,72
79178	**V8**	904	21.9.2004	potato leaves	1	16	4,47	4,82
79179	**V9**	904	21.9.2004	rhubarb leaves	1	17	3,13	1,50
				LOD		3	0,05	0,05
				LOQ		10	0,2	0,17
	GBW07604	Poplar leaves		Certified		22+-4	2,56+-0,04	0,35+-0,03
	GBW07604	Poplar leaves		Found		23+-3	2,59	0,31
	BCR129	Hay powder		Certified			3,72+-0,04	3,16+-0,04
	BCR129	Hay powder		Found			3,63	3,2

efnagreiningar KELDNAHOLTI

FJARÐAÁL EXTERNAL ENVIRONMENTAL MONITORING
PROJECT NO. 6EM4185
CCA, IceTec

Vegetables **Trace metals**

E- nr.	Marking	Marking	Date of sampling		No.cont.	Cu ug/g	Ni ug/g	Pb ug/g	V ug/g
79157	**V1**	904	13.9.2004	strawberries	1	4	<4	<16	5
79158	**V1**	904	13.9.2004	strawb. leaves	1	5	<4	<16	<4
79159	**V1**	904	13.9.2004	rhubarb leaves	1	7	<4	<16	<4
79160	**V1**	904	13.9.2004	rhubarb	1	5	<4	<16	<4
79161	**V1**	904	13.9.2004	potatoes	1	<4	<4	<16	<4
79162	**V1**	904	13.9.2004	potato leaves	1	11	<4	<16	10
79163	**V2**	904	14.9.2004	potatoes	1	<4	5	<16	<4
79164	**V2**	904	14.9.2004	potato leaves	1	5	<4	<16	7
79165	**V3**	904	14.9.2004	rhubarb	1	<4	<4	<16	<4
79166	**V3**	904	14.9.2004	rhubarb leaves	1	6	<4	<16	<4
79167	**V4**	904	15.9.2004	strawb. leaves	1	<4	<4	<16	<4
79168	**V5**	904	21.9.2004	potatoes	1	<4	<4	<16	<4
79169	**V5**	904	21.9.2004	leaves (no plant type mark)	1	10	<4	<16	8
79170	**V6**	904	21.9.2004	rhubarb	1	<4	<4	<16	<4
79171	**V6**	904	21.9.2004	rhubarb leaves	1	<4	<4	<16	<4
79172	**V7**	904	21.9.2004	(no plant type mark)	1	<4	<4	<16	<4
79173	**V7**	904	21.9.2004	potatoes	1	5	<4	<16	<4
79174	**V7**	904	21.9.2004	potato leaves	1	17	5	<16	22
79175	**V8**	904	21.9.2004	potatoes	1	7	<4	<16	<4
79176	**V8**	904	21.9.2004	rhubarb leaves	1	<4	<4	<16	<4
79177	**V8**	904	21.9.2004	rhubarb	1	<4	<4	<16	<4
79178	**V8**	904	21.9.2004	potato leaves	1	21	8	<16	16
79179	**V9**	904	21.9.2004	rhubarb leaves	1	4	<4	<16	<4
				LOD		4	4	16	4
				LOQ		12	14	52	13
	GBW07604	Poplar leaves		Certified		9,3 +/- 0,5	1,9	1,5	[0,64]
	GBW07604	Poplar leaves		Found		9	< 4	< 4	< 4
	BCR129	Hay powder		Certified		10	*	*	*
	BCR129	Hay powder		Found		9	< 4	< 4	< 4

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FJARÐAÁL EXTERNAL ENVIRONMENTAL MONITORING
PROJECT NO. 6EM4185
CCA, IceTec

Grass **F, N, S**

E- nr.	Marking	Marking	Date of sampling	No.cont.	Fluoride µg/g	Nitrogen %	Sulfur mg/g
75451	**G1**	904	13.9.2004	1	<3	2,28	2,50
75452	**G2**	904	13.9.2004	1	6	2,50	3,25
75453	**G3**	904	14.9.2004	1	<3	2,09	2,26
75454	**G4**	904	14.9.2004	1	<3	1,33	1,55
75455	**G5**	904	14.9.2004	1	4	1,65	1,69
75456	**G6**	904	14.9.2004	1	4	1,79	1,93
75457	**G7**	904	15.9.2004	1	<3	3,68	3,46
75458	**G8**	904	21.9.2004	1	<3	1,77	1,59
75459	**G9**	904	21.9.2004	1	5	3,47	2,56
75460	**G10**	904	21.9.2004	1	<3	3,11	3,39
75461	**G11**	904	21.9.2004	1	5	2,38	2,50
75462	**G12**	904	21.9.2004	1	<3	2,56	2,28
75463	**G13**	904	21.9.2004	1	4	3,72	2,83
75464	**G14**	904	21.9.2004	1	<3	1,54	1,43
75465	**G15**	904	21.9.2004	1	<3	2,68	2,57
75466	**G16**	904	22.9.2004	1	<3	1,31	1,70
75467	**G17**	904	22.9.2004	1	<3	2,63	1,97
75468	**G18**	904	22.9.2004	1	<3	4,04	3,63
75469	**G19**	904	22.9.2004	1	3	1,43	1,86
75470	**G20**	904	22.9.2004	1	<3	1,43	1,47
75471	**G21**	904	22.9.2004	1	<3	1,24	1,84
75472	**G22**	904	22.9.2004	1	<3	1,16	2,45
75473	**G23**	904	22.9.2004	1	<3	1,15	1,43
75474	**G24**	904	22.9.2004	1	<3	1,15	1,31
75475	**G25**	904	22.9.2004	1	<3	1,50	1,78
75476	**G26**	904	22.9.2004	1	<3	2,52	1,96
75477	**G27**	904	23.9.2004	1	<3	2,09	1,73
75478	**G28**	904	23.9.2004	1	<3	1,87	1,64
75479	**G29**	904	23.9.2004	1	<3	1,37	1,34
75480	**G30**	904	23.9.2004	1	<3	2,36	2,55
			LOD		3	0,05	0,05
			LOQ		10	0,2	0,17
	GBW07604	Poplar leaves	Certified		22+-4	2,56+-0,04	0,35+-0,03
	GBW07604	Poplar leaves	Found		23+-3	2,59	0,31
	BCR129	Hay powder	Certified			3,72+-0,04	3,16+-0,04
	BCR129	Hay powder	Found			3,63	3,2

FJARÐAÁL EXTERNAL ENVIRONMENTAL MONITORING
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Grass **Trace metals**

E- nr.	Marking	Marking	Date of sampling	No.cont.	Cu ug/g	Ni ug/g	Pb ug/g	V ug/g
75451	**G1**	904	13.9.2004	1	8	<4	<16	<4
75452	**G2**	904	13.9.2004	1	10	<4	<16	<4
75453	**G3**	904	14.9.2004	1	8	4,3	<16	<4
75454	**G4**	904	14.9.2004	1	5	<4	<16	<4
75455	**G5**	904	14.9.2004	1	8	<4	<16	<4
75456	**G6**	904	14.9.2004	1	6	<4	<16	<4
75457	**G7**	904	15.9.2004	1	14	<4	<16	<4
75458	**G8**	904	21.9.2004	1	5	<4	<16	<4
75459	**G9**	904	21.9.2004	1	8	<4	<16	<4
75460	**G10**	904	21.9.2004	1	12	<4	<16	<4
75461	**G11**	904	21.9.2004	1	6	<4	<16	<4
75462	**G12**	904	21.9.2004	1	7	<4	<16	<4
75463	**G13**	904	21.9.2004	1	13	<4	<16	<4
75464	**G14**	904	21.9.2004	1	<4	<4	<16	<4
75465	**G15**	904	21.9.2004	1	6	<4	<16	<4
75466	**G16**	904	22.9.2004	1	<4	<4	<16	<4
75467	**G17**	904	22.9.2004	1	7	<4	<16	<4
75468	**G18**	904	22.9.2004	1	18	<4	<16	<4
75469	**G19**	904	22.9.2004	1	5	<4	<16	<4
75470	**G20**	904	22.9.2004	1	<4	<4	<16	<4
75471	**G21**	904	22.9.2004	1	<4	<4	<16	<4
75472	**G22**	904	22.9.2004	1	<4	<4	<16	<4
75473	**G23**	904	22.9.2004	1	<4	<4	<16	<4
75474	**G24**	904	22.9.2004	1	<4	<4	<16	<4
75475	**G25**	904	22.9.2004	1	4	<4	<16	<4
75476	**G26**	904	22.9.2004	1	8	5,1	<16	<4
75477	**G27**	904	23.9.2004	1	<4	<4	<16	<4
75478	**G28**	904	23.9.2004	1	<4	<4	<16	<4
75479	**G29**	904	23.9.2004	1	5	<4	<16	4,7
75480	**G30**	904	23.9.2004	1	9	<4	<16	<4
			LOD		4	4	16	4
			LOQ		12	14	52	13
	GBW07604	Poplar leaves	Certified		9,3 +/- 0,5	1,9	1,5	[0,64]
	GBW07604	Poplar leaves	Found		9	< 4	< 4	< 4
	BCR129	Hay powder	Certified		10	*	*	*
	BCR129	Hay powder	Found		9	< 4	< 4	< 4

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Soil **Various measurements**

E- nr.	Marking	Marking	Date of sampling	No.cont.
79115	**S1**	1104	8.10.2004	1
79116	**S2**	1104	8.10.2004	1
79117	**S3**	1104	8.10.2004	1
79118	**S4**	1104	8.10.2004	1
79119	**S5**	1104	8.10.2004	1
79120	**S6**	1104	8.10.2004	1
79121	**S7**	1104	8.10.2004	1
79122	**S8**	1104	8.10.2004	1
79123	**S9**	1104	8.10.2004	1
79124	**S10**	1104	8.10.2004	1

		F-	SO4S	Cl-	pH	Dry matter	% sample	% dry matter
		mg/kg d.m.	mg/kg d.m.	mg/kg d.m.		% wt.	> 2 mm	> 2 mm
79115	**S1**	0,09	285	28	5,83	41,8	5,8%	13,9%
79116	**S2**	< 0,06	460	105	6,36	23,3	EM	EM
79117	**S3**	< 0,06	226	41	5,83	51,9	13,5%	25,9%
79118	**S4**	< 0,06	273	52	5,30	31,0	EM	EM
79119	**S5**	< 0,06	45	33	6,91	56,8	7,0%	12,3%
79120	**S6**	< 0,06	49	18	6,48	65,5	3,7%	5,7%
79121	**S7**	< 0,06	74	13	6,41	63,8	9,0%	14,1%
79122	**S8**	< 0,06	60	9,6	6,46	75,0	12,2%	16,3%
79123	**S9**	< 0,06	92	21	6,27	61,6	2,4%	3,8%
79124	**S10**	< 0,06	142	21	6,02	54,9	2,4%	4,3%
	LOD	0,06	8	0,6				
	LOQ	0,21	25	1,9				

No comparable certified sample of comparable matrix available

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Water **Various measurements**

E- nr.	Marking	Marking	Date of sampling	No.cont.	Sample name
75391	**W1**	1004	26.10.2004	4	Ljósá 26.10.04
75392	**W2**	1004	26.10.2004	4	Grjótá 26.10.04
75393	**W3**	1004	26.10.2004	4	Norðurá 26.10.04
75394	**W4**	1004	26.10.2004	4	Njörvadalsá 26.10.04
75395	**W5**	1004	26.10.2004	4	TAP Water Eskifjörður 26.10.04
75396	**W6**	1004	26.10.2004	4	Vatnsból Eskifjörður 26.10.04
75397	**W7**	1004	26.10.2004	4	TAP Water Reyðarfjörður 26.10.04
75398	**W8**	1004	26.10.2004	4	Vatnsból Reyðarfjörður26.10.04

		F	SO4-S	Cl	pH	Conductance	Alkalinity
		µg/L	mg/L	mg/L		µS/cm	*mg CaCO3/L*
75391	**W1**	14	0,41	3,60	7,53	66,5	18,1
75392	**W2**	12	0,30	2,90	7,42	39,8	12,7
75393	**W3**	12	0,29	3,30	7,43	49,4	17,4
75394	**W4**	11	0,35	2,76	7,49	44,5	15,3
75395	**W5**	12	0,30	3,38	7,4	54,3	19,2
75396	**W6**	13	0,32	3,36	7,47	53,1	19,0
75397	**W7**	16	0,33	2,86	7,25	48,4	17,6
75398	**W8**	14	0,33	2,88	7,24	47,8	17,8
	LOD	1	0,03	0,03			
	LOQ	3	0,12	0,12			
Rain 97							
	Certified		0,53+-0,10				
	Measured		0,52				
	Measured		0,50				

		Na	K	Ca	Mg
		mg/L	mg/L	mg/L	mg/L
75391	**W1**	3,78	< 0,3	3,56	1,60
75392	**W2**	3,14	< 0,3	2,48	1,03
75393	**W3**	3,55	< 0,3	3,78	1,52
75394	**W4**	3,48	< 0,3	2,94	1,20
75395	**W5**	4,93	< 0,3	4,36	0,88
75396	**W6**	4,89	< 0,3	4,32	0,84
75397	**W7**	4,14	< 0,3	3,26	1,25
75398	**W8**	4,16	< 0,3	3,27	1,26
	LOD	0,28	0,16	0,02	0,002
	LOQ	0,94	0,54	0,06	0,008
SLRS-3 River water					
	Certified	2,3 +/- 0,2	0,7 +/- 0,1	6,0 +/- 0,4	1,6 +/- 0,2
	Measured	2,46	0,609	5,66	1,57

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FJARÐAÁL EXTERNAL ENVIRONMENTAL MONITORING
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Water **Trace metals and PAH**

E- nr.	Marking	Marking	Date of sampling	Sample name	No.cont.
75391	**W1**	1004	26.10.2004	Ljósá 26.10.04	4
75392	**W2**	1004	26.10.2004	Grjótá 26.10.04	4
75393	**W3**	1004	26.10.2004	Norðurá 26.10.04	4
75394	**W4**	1004	26.10.2004	Njörvadalsá 26.10.04	4
75395	**W5**	1004	26.10.2004	TAP Water Eskifjörður 26.10.04	4
75396	**W6**	1004	26.10.2004	Vatnsból Eskifjörður 26.10.04	4
75397	**W7**	1004	26.10.2004	TAP Water Reyðarfjörður 26.10.04	4
75398	**W8**	1004	26.10.2004	Vatnsból Reyðarfjörður26.10.04	4

Trace metals

ICP TOF MS*		**As µg/L**	**Cd µg/L**	**Cr µg/L**	**Cu µg/L**	**Hg µg/L**	**Ni µg/L**	**Pb µg/L**	**Zn µg/L**
75391	**W1**	<1	<1	<1	1,1	<2	<10	<1	<5
75392	**W2**	<1	<1	1,6	<1	<2	<10	<1	<5
75393	**W3**	<1	<1	<1	1,1	<2	<10	<1	<5
75394	**W4**	<1	<1	<1	<1	<2	<10	<1	<5
75395	**W5**	<1	<1	<1	4,1	<2	<10	<1	19
75396	**W6**	<1	<1	<1	1,4	<2	<10	<1	7
75397	**W7**	<1	<1	<1	2,4	<2	<10	<1	17
75398	**W8**	<1	<1	<1	2,1	<2	<10	<1	13
	LOD	0,1	0,01	0,3	0,2	0,2	0,1	0,1	0,4
	LOQ	0,2	0,04	0,9	0,5	0,6	0,3	0,3	1,4
SPS-SW2 B.108									
Certified		50+-0,3	2,5+-0,02	10+-,05	100+-1	-	50+-0,3	25+-0,1	100+-1
Found in 1:10 dilution		4,7	0,24	1,1	10,6	<2	4,8	2,2	10,0

*Earlier measurement by ICP OES replaced by ICP TOF MS for better sensitivity

PAH		**W1-1004**	**W2-1004**	**W3-1004**	**W4-1004**	**W5-1004**	**W6-1004**	**W7-1004**	**W8-1004**
naftalen	µg/l	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	0,06	<0,05
acenaftylen	µg/l	<0,06	<0,07	<0,06	<0,07	<0,07	<0,07	<0,07	<0,06
acenaften	µg/l	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05
fluoren	µg/l	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05
fenantren	µg/l	<0,02	<0,02	<0,02	<0,02	<0,03	<0,03	<0,02	<0,02
antracen	µg/l	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01
fluoranten	µg/l	<0,01	0,03	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01
pyren	µg/l	<0,01	0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01
*bens(a)antracen	µg/l	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01
*krysen	µg/l	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01
*bens(b)fluoranten	µg/l	<0,02	<0,02	<0,02	<0,02	<0,02	<0,02	<0,02	<0,02
*bens(k)fluoranten	µg/l	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01
*bens(a)pyren	µg/l	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01
*dibens(ah)antracen	µg/l	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01
benso(ghi)perylen	µg/l	<0,02	<0,02	<0,02	<0,02	<0,02	<0,02	<0,02	<0,02
*indeno(123cd)pyren	µg/l	<0,02	<0,02	<0,02	<0,02	<0,02	<0,02	<0,02	<0,02
summa 16 EPA-PAH	µg/l	<0,18	0,04	<0,18	<0,19	<0,20	<0,20	0,06	<0,18
*PAH cancerogenic	µg/l	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05
PAH other	µg/l	<0,14	0,04	<0,14	<0,15	<0,15	<0,15	0,06	<0,14

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Snow **PAH**

E- nr.	Marking	Marking	Date of sampling	No.cont.
78918	**SW1**	105	28.1.2005	1
78919	**SW2**	105	28.1.2005	1
78920	**SW3**	105	28.1.2005	1
78921	**SO1**	105	28.1.2005	1
78922	**SO2**	105	28.1.2005	1
78923	**SO3**	105	28.1.2005	1
Sampling repeated				
79285	**SO2**	105	28.2.2005	1
79286	**SO3**	105	28.2.2005	1

PAH								**Sampling repeated**	
		SW1-105	**SW2-105**	**SW3-105**	**SO1-105**	**SO2-105**	**SO3-105**	**SO2-105**	**SO3-105**
naftalen	µg/l	<0.17	<0.17	<0.17	<0.17	<0.17	Sample	<0,18	<0,18
acenaftylen	µg/l	<0.25	<0.25	<0.25	<0.25	<0.25	container	<0,51	<0,50
acenaften	µg/l	<0.0070	0,012	<0.0070	<0.0070	<0.0070	broken	<0,05	<0,05
fluoren	µg/l	<0.012	0,024	<0.012	<0.012	<0.012	in transp.	<0,05	<0,05
fenantren	µg/l	<0.040	0,33	<0.040	<0.040	<0.040		<0,05	<0,05
antracen	µg/l	<0.0010	0,0074	<0.0010	<0.0010	<0.0010		<0,01	<0,01
fluoranten	µg/l	0,0083	0,21	<0.0050	<0.0050	<0.0050		<0,03	0,08
pyren	µg/l	<0.0050	0,073	<0.0050	<0.0050	<0.0050		<0,02	0,06
^bens(a)antracen	µg/l	<0.0030	0,0035	<0.0030	<0.0030	<0.0030		<0,03	<0,05
^krysen	µg/l	<0.0070	0,023	<0.0070	<0.0070	<0.0070		<0,02	0,09
^bens(b)fluoranten	µg/l	<0.0040	0,0056	<0.0040	<0.0040	<0.0040		<0,03	0,09
^bens(k)fluoranten	µg/l	<0.0020	0,0025	<0.0020	<0.0020	<0.0020		<0,01	<0,01
^bens(a)pyren	µg/l	<0.0020	0,0033	<0.0020	<0.0020	<0.0020		<0,01	<0,01
^dibens(ah)antracen	µg/l	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020		<0,04	<0,04
benso(ghi)perylen	µg/l	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030		<0,09	<0,22
^indeno(123cd)pyren	µg/l	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030		<0,02	<0,02
summa 16 EPA-PAH	µg/l	0,0083	0,69	<0.30	<0.30	<0.30		<0,58	0,32
^PAH cancerogena	µg/l	<0.0090	0,038	<0.0090	<0.0090	<0.0090		<0,08	0,18
PAH övriga	µg/l	0,0083	0,66	<0.30	<0.30	<0.30		<0,50	0,14

Parameter	Aqueous Methods	Soil Methods (aqueous extract)	Biota Methods
Fluoride	SMW&W 4500, ISE	BS1377/1990, Part 3. Extract, ISE	Alk. Fus., ISE, specified by project
Chloride	Tecator AN 63/83	BS1377/1990, Part 3. Tecator AN 63/83	
Sulfates	EMEP/CCC 1/95 Rev.1996	BS1377/1990, Part 3.	
pH	SMW&W 4500	BS1377/1990, Part 3. SMW&W 4500	
Alkalinity	SMW&W 2320.b		
Heavy Metals (Cu, Ni, Pb and V)	SW846 6010B/7470A/6020 EPA 200.7/200.8		SW846 6010B/7470A/6020 EPA 200.7/200.8
PAHs Select Ion Monitoring (PAH-16, Borneff-6)	EPA16 by HPLC with both UV and fluorescence detection acc.to method NEN6524		
Nitrogen determination by CN Dumas analysis			N determination by Variomax Elementaranalysentechnik GmbH (thermoconductive detection after combustion in pure oxygen at 900°C)
Sulfur			EPA 6010B

2005 Analytical Results - IceTec

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Fjardaal Smelter Project
Bechtel International Inc
Lucy Martin/Robert Gélinas
1500 Univ.Street
Montreal
Quebec, Canada H3A 3S7

Project no.:	**6EM05135**	Date.:	28.11.2005
Project name:	External Environmental Monitoring	Copy:	
Supervision:	Malin Sundberg		
Sampling:	By N.Aust.		
Customer representative:	Lucy Martin, Robert Gélinas	Invoice.no.	
Received:	Oct.2004		

According to contract 24956-000-HC4-HA00-00003, External Environmental Monitoring, the following analytical services of testing vegetation, soil, water samples from Reyðarfjörður area taken in 2005 was provided. The results are below.

FJARÐAÁL EXTERNAL ENVIRONMENTAL MONITORING
PROJECT NO. 6EM5135
CCA, IceTec

Dried Moss **F**

E- nr.	Marking	Marking	Date of sampling	No.cont.	Fluoride µg/g
80255	**M1**	1004	9.5.2005	1	<5
80256	**M2**	1004	9.5.2005	1	11
80257	**M3**	1004	9.5.2005	1	12
80258	**M4**	1004	9.5.2005	1	9
80259	**M5**	1004	9.5.2005	1	11
80260	**M6**	1004	9.5.2005	1	<5
80261	**M7**	1004	9.5.2005	1	<5
80262	**M8**	1004	9.5.2005	1	12
80263	**M9**	1004	9.5.2005	1	7
80264	**M10**	1004	9.5.2005	1	<5
80597	**M11**	605	15.6.2005	1	10
80598	**M12**	605	15.6.2005	1	<5
80599	**M13**	605	15.6.2005	1	10
80600	**M14**	605	16.6.2005	1	6
80601	**M15**	605	16.6.2005	1	10
80602	**M16**	605	16.6.2005	1	21
80603	**M17**	605	16.6.2005	1	7
80608	**M18**	605	28.6.2005	1	<5
80605	**M19**	605	28.6.2005	1	6
80604	**M20**	605	29.6.2005	1	<5
80610	**M21**	605	29.6.2005	1	<5
80607	**M22**	705	7.7.2005	1	7
80606	**M23**	705	7.7.2005	1	<5
80609	**M24**	705	12.7.2005	1	29
80712	**M25**	705	13.7.2005	1	<5
80735	**M26**	705	13.7.2005	1	<5
80713	**M27**	705	13.7.2005	1	9
80710	**M28**	705	13.7.2005	1	9
80725	**M29**	705	14.7.2005	1	<5
80721	**M30**	705	13.7.2005	1	10

LOD		5
LOQ		10

GBW07604	Poplar leaves	Certified	22+-4
GBW07604	Poplar leaves	Found	22+-6

FJARÐAÁL EXTERNAL ENVIRONMENTAL MONITORING
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Lichen **F**

E- nr.	Marking	Marking	Date of sampling	No.cont.	Fluoride µg/g
80265	**L1**	1004	9.5.2005	1	5
80266	**L2**	1004	9.5.2005	1	<5
80267	**L3**	1004	9.5.2005	1	<5
80268	**L4**	1004	9.5.2005	1	<5
80269	**L5**	1004	9.5.2005	1	<5
80270	**L6**	1004	9.5.2005	1	<5
80271	**L7**	1004	9.5.2005	1	<5
80272	**L8**	1004	9.5.2005	1	<5
80273	**L9**	1004	9.5.2005	1	<5
80274	**L10**	1004	9.5.2005	1	6
80611	**L11**	605	15.6.2005	1	5
80612	**L12**	605	15.6.2005	1	<5
80613	**L13**	605	15.6.2005	1	<5
80614	**L14**	605	16.6.2005	1	<5
80615	**L15**	605	16.6.2005	1	<5
80616	**L16**	605	16.6.2005	1	5
80617	**L17**	605	16.6.2005	1	<5
80624	**L18**	605	28.6.2005	1	<5
80620	**L19**	605	28.6.2005	1	<5
80618	**L20**	605	29.6.2005	1	<5
80619	**L21**	605	29.6.2005	1	<5
80621	**L22**	705	7.7.2005	1	<5
80622	**L23**	705	7.7.2005	1	<5
80623	**L24**	705	12.7.2005	1	6
80714	**L25**	705	13.7.2005	1	<5
80706	**L26**	705	13.7.2005	1	5
80708	**L27**	705	13.7.2005	1	8
80705	**L28**	705	13.7.2005	1	5
80726	**L29**	705	14.7.2005	1	<5
80720	**L30**	705	14.7.2005	1	8

LOD		5
LOQ		10

GBW07604	Poplar leaves	Certified	22+-4
GBW07604	Poplar leaves	Found	22+-6

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Broadleaf Plant Tissue **F**

E- nr.	Marking	Marking	Date of sampling		No.cont.	Fluoride µg/g
80626	**BP1**	705	11.7.2005		1	<5
80731	**BP2**	705	14.7.2005		1	<5
80730	**BP3**	705	14.7.2005		1	<5
80627	**BP4**	705	11.7.2005		1	<5
80729	**BP5**	705	14.7.2005		1	<5
80722	**BP6**	705	14.7.2005		1	<5
80733	**BP7**	705	18.7.2005		1	<5
80728	**BP8**	705	14.7.2005		1	<5
80727	**BP9**	705	14.7.2005		1	<5
80630	**BP10**	705	12.7.2005		1	<5
80628	**BP11**	705	12.7.2005		1	<5
80634	**BP12**	705	12.7.2005		1	<5
80633	**BP13**	705	12.7.2005		1	<5
80631	**BP14**	705	12.7.2005		1	<5
80625	**BP15**	705	12.7.2005		1	<5
80635	**BP16**	705	12.7.2005		1	<5
80629	**BP17**	705	12.7.2005		1	11
80716	**BP18**	705	13.7.2005		1	<5
80715	**BP19**	705	13.7.2005		1	<5
80732	**BP20**	705	18.7.2005		1	<5
80734	**BP21**	705	18.7.2005		1	<5
80717	**BP22**	705	13.7.2005		1	<5
80719	**BP23**	705	13.7.2005		1	<5
80632	**BP24**	705	12.7.2005		1	6
80707	**BP25**	705	13.7.2005		1	<5
80711	**BP26**	705	13.7.2005		1	<5
80718	**BP27**	705	13.7.2005		1	<5
80709	**BP28**	705	13.7.2005		1	<5
80724	**BP29**	705	14.7.2005		1	<5
80723	**BP30**	705	14.7.2005		1	<5
				LOD		5
				LOQ		10

GBW07604	Poplar leaves	Certified	22+-4
GBW07604	Poplar leaves	Found	22+-6

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Grass **F, N, S**

E- nr.	Marking	Marking	Date of sampling	No.cont.	Fluoride µg/g	Nitrogen %	Sulfur mg/g
80636	**G1**	605	13.6.2005	1	<5	4.53	5.12
80637	**G2**	605	13.6.2005	1	<5	3.07	2.85
80638	**G3**	605	13.6.2005	1	<5	3.12	3.10
80660	**G4**	705	5.7.2005	1	<5	3.03	2.73
80639	**G5**	605	13.6.2005	1	<5	3.48	3.21
80656	**G6**	705	5.7.2005	1	<5	2.68	2.36
80640	**G7**	605	13.6.2005	1	8	3.16	2.60
80641	**G8**	605	13.6.2005	1	5	3.59	2.78
80642	**G9**	605	13.6.2005	1	7	3.39	3.03
80643	**G10**	605	13.6.2005	1	9	3.50	3.00
80644	**G11**	605	13.6.2005	1	<5	2.52	2.04
80645	**G12**	605	13.6.2005	1	10	2.81	2.20
80646	**G13**	605	13.6.2005	1	<5	2.05	1.83
80647	**G14**	904	13.6.2005	1	<5	2.22	1.74
80648	**G15**	904	13.6.2005	1	<5	2.61	2.14
80658	**G16**	705	5.7.2005	1	<5	2.20	1.85
80661	**G17**	705	5.7.2005	1	<5	2.85	2.74
80651	**G18**	605	15.6.2005	1	<5	3.62	2.74
80652	**G19**	605	21.5.2005	1	<5	2.97	2.54
80657	**G20**	705	5.7.2005	1	<5	3.15	2.64
80655	**G21**	705	5.7.2005	1	<5	2.34	2.39
80654	**G22**	705	5.7.2005	1	<5	1.91	1.94
80653	**G23**	705	5.7.2005	1	<5	2.32	2.16
80664	**G24**	705	7.7.2005	1	<5	1.95	2.11
80659	**G25**	705	5.7.2005	1	<5	2.03	2.92
80649	**G26**	605	13.6.2005	1	<5	1.86	1.76
80662	**G27**	705	7.7.2005	1	<5	2.89	2.70
80665	**G28**	705	7.7.2005	1	<5	2.37	2.10
80663	**G29**	705	7.7.2005	1	<5	1.98	2.35
80650	**G30**	605	13.6.2005	1	<5	2.51	2.12
				LOD	5	0.12	0.17
				LOQ	10	0.4	0.57
					µg/g		%
GBW07604	Poplar leaves		Certified		22+-4		0.35+-0.04
GBW07604	Poplar leaves		Found		22+-6		0.40
							mg/g
BCR129	Hay powder		Certified				3.16+-0.04
BCR129	Hay powder		Found				3.6
						% N	
BHA laboratory q.c.sample as			Average N% in 31 measurements			2.81+-0.04	
meas.by Dumas CN analysis			RSD %			1.41%	
BHA			Measured			2.819	
BHA			Measured			2.839	

FJARÐAÁL EXTERNAL ENVIRONMENTAL MONITORING
PROJECT NO. 6EM5135
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Water **Various measurements**

Enr	Marking	Marking	Date of sampling	No.cont.	Sample name
80164	**W1**	405	26.4.2005	4	Ljósá
80165	**W2**	405	26.4.2005	4	Grjótá
80166	**W3**	405	26.4.2005	4	Norðurá
80167	**W4**	405	26.4.2005	4	Njörvadalsá
80168	**W5**	405	26.4.2005	4	Mjóeyri
80169	**W6**	405	26.4.2005	4	Tankur Eskifjörður
80170	**W7**	405	26.4.2005	4	Olís Reyðarfjörður
80171	**W8**	405	26.4.2005	4	Tankur Reyðarfjörður

		F- mg/L	SO4S mg/L	Cl- mg/L	pH	Alkalinity mg CaCO3/L	Conductivity µS/cm
80164	**W1**	0.022	0.51	3.45	7.34	10.5	35.3
80165	**W2**	0.024	0.18	2.17	7.33	10.3	36.6
80166	**W3**	0.021	0.56	3.50	7.32	11.9	35.2
80167	**W4**	0.020	0.44	3.37	7.31	10.1	33.7
80168	**W5**	0.028	0.33	4.59	7.36	17.4	52.7
80169	**W6**	0.030	0.65	4.38	7.33	17.2	52.3
80170	**W7**	0.028	0.43	3.88	7.00	15.0	46.3
80171	**W8**	0.025	0.45	3.97	7.03	15.0	46.4
	LOD	0.004	0.24	0.26			
	LOQ	0.013	0.78	0.84			

			As sulphate	
Rain 97	Certified		5.28+-0.73	0.526+-0.094
	Measured		5.29	0.64
Chicago 94	Certified	0.83+-0.01	23.7+-0.2	11.3+-0.1
	Measured	0.78	24.3	12.3
ION 96.3	Certified	0.16+-0.01		
	Measured	0.13		

FJARÐAÁL EXTERNAL ENVIRONMENTAL MONITORING
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Water **Various measurements**

E- nr.	Marking	Marking	Date of sampling	No.cont.	Sample name
80667	**W1**	705	15.7.2005	4	Ljósá
80668	**W2**	705	15.7.2005	4	Grjótá
80669	**W3**	705	15.7.2005	4	Norðurá
80670	**W4**	705	15.7.2005	4	Njörvadalsá
80671	**W5**	705	15.7.2005	4	Mjóeyri
80672	**W6**	705	15.7.2005	4	Tankur Eskifjörður
80673	**W7**	705	15.7.2005	4	Olís Reyðarfjörður
80674	**W8**	705	15.7.2005	4	Tankur Reyðarfjörður

		F µg/L	SO4-S mg/L	Cl mg/L	pH	Alkalinity *mg CaCO3/L*
80667	**W1**	0.023	0.30	2.48	7.50	12.7
80668	**W2**	0.023	0.34	2.82	7.49	12.5
80669	**W3**	0.023	0.28	2.43	7.50	15.6
80670	**W4**	0.017	0.23	1.97	7.40	11.0
80671	**W5**	0.022	0.32	3.87	7.42	19.0
80672	**W6**	0.023	0.35	3.95	7.45	19.1
80673	**W7**	0.022	0.32	2.50	7.11	15.7
80674	**W8**	0.020	0.32	2.46	7.12	15.8
	LOD	0.004	0.08	0.12		
	LOQ	0.012	0.26	0.39		

			As sulphate	
Rain 97	Certified		5.28+-0.73	0.526+-0.094
	Measured		5.29	0.637
Chicago 94	Certified		23.7+-0.2	11.3+-0.1
	Measured		25.3	12.8
ION 96.3	Certified	0.16+-0.01		
	Measured	0.14		

FJARÐAÁL EXTERNAL ENVIRONMENTAL MONITORING
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Water **Various measurements**

E- nr.	Marking	Marking	Date of sampling	No.cont.	Sample name
82110	**W1**	1005	11.10.2005	4	Ljósá
82111	**W2**	1005	11.10.2005	4	Grjótá
82112	**W3**	1005	11.10.2005	4	Norðurá
82113	**W4**	1005	11.10.2005	4	Njörvadalsá
82114	**W5**	1005	11.10.2005	4	Mjóeyri
82115	**W6**	1005	11.10.2005	4	Tankur Eskifjörður
82116	**W7**	1005	11.10.2005	4	Olís Reyðarfjörður
82117	**W8**	1005	11.10.2005	4	Tankur Reyðarfjörður

		F mg/L	SO4-S mg/L	Cl mg/L	pH	Alkalinity *mg CaCO3/L*
82110	**W1**	0.025	0.33	2.14	7.39	13.3
82111	**W2**	0.027	0.36	2.70	7.39	13.2
82112	**W3**	0.023	0.31	1.87	7.40	15.3
82113	**W4**	0.025	0.33	1.93	7.37	15.4
82114	**W5**	0.028	0.37	2.24	7.30	18.8
82115	**W6**	0.027	0.40	2.76	7.38	19.2
82116	**W7**	0.023	0.37	1.37	6.99	16.0
82117	**W8**	0.025	0.37	2.18	7.14	16.1
	LOD	0.004	0.07	0.24		
	LOQ	0.013	0.24	0.80		

			As sulphate	
Rain 97	Certified		5.28+-0.73	0.526+-0.10
	Measured		5.73	0.47
Chicago 94	Certified	0.83+-0.01		11.3+-0.1
	Measured	0.78		11.6
ION 96.3	Certified	0.16+-0.01		
	Measured	0.13		

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FJARÐAÁL EXTERNAL ENVIRONMENTAL MONITORING
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Water **Trace metals**

E- nr.	Marking	Marking	Date of sampling	Sample name	No.cont.
80667	W1	705	15.7.2005	Ljósá	4
80668	W2	705	15.7.2005	Grjótá	4
80669	W3	705	15.7.2005	Norðurá	4
80670	W4	705	15.7.2005	Njörvadalsá	4
80671	W5	705	15.7.2005	Mjóeyri	4
80672	W6	705	15.7.2005	Tankur Eskifjörður	4
80673	W7	705	15.7.2005	Olís Reyðarfjörður	4
80674	W8	705	15.7.2005	Tankur Reyðarfjörður	4

ICP TOF MS		As	Cd	Cr	Cu	Hg	Ni	Pb	Zn
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
80667	W1	<1	<1	<1	<1	<2	<10	<1	<5
80668	W2	<1	<1	<1	<1	<2	<10	<1	<5
80669	W3	<1	<1	<1	<1	<2	<10	<1	<5
80670	W4	<1	<1	<1	<1	<2	<10	<1	<5
80671	W5	<1	<1	<1	4.1	<2	<10	<1	15.0
80672	W6	<1	<1	<1	<1	<2	<10	<1	6.3
80673	W7	<1	<1	<1	1.1	<2	<10	<1	22.8
80674	W8	<1	<1	<1	<1	<2	<10	<1	14.3
	LOD	0.3	0.1	0.6	0.1	0.7	1.1	0.1	0.4
	LOQ	1.0	0.3	2.0	0.3	2.3	3.6	0.3	1.4
SPS-SW2 B.108									
	Certified	50+-0.3	2.5+-0.02	10+-0.05	100+-1	-	50+-0.3	25+-0.1	100+-1
Found in 1:10 dilution		4.9	0.24	0.74	10.5	-	5.0	2.6	9.7

E- nr.	Marking	Marking	Date of sampling	Sample name	No.cont.
82110	W1	1005	11.10.2005	Ljósá	4
82111	W2	1005	11.10.2005	Grjótá	4
82112	W3	1005	11.10.2005	Norðurá	4
82113	W4	1005	11.10.2005	Njörvadalsá	4
82114	W5	1005	11.10.2005	Mjóeyri	4
82115	W6	1005	11.10.2005	Tankur Eskifjörður	4
82116	W7	1005	11.10.2005	Olís Reyðarfjörður	4
82117	W8	1005	11.10.2005	Tankur Reyðarfjörður	4

ICP TOF MS		As	Cd	Cr	Cu	Hg	Ni	Pb	Zn
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
82110	W1	<1	<1	<1	<1	<2	<10	<1	<5
82111	W2	<1	<1	<1	<1	<2	<10	<1	<5
82112	W3	<1	<1	<1	<1	<2	<10	<1	<5
82113	W4	<1	<1	<1	1.0	<2	<10	<1	<5
82114	W5	<1	<1	<1	3.9	<2	<10	<1	13.3
82115	W6	<1	<1	<1	2.5	<2	<10	<1	6.6
82116	W7	<1	<1	<1	2.5	<2	<10	<1	13.5
82117	W8	<1	<1	<1	1.0	<2	<10	<1	<5
82110	W1	<1	<1	<1	<1	<2	<10	<1	<5
82114	W5	<1	<1	<1	3.7	<2	<10	<1	12.5
	LOD	0.1	0.02	0.10	0.02	0.7	1.1	0.01	0.5
	LOQ	0.3	0.1	0.3	0.1	2.2	3.6	0.03	1.7
SPS-SW2 B.108									
	Certified	50+-0.3	2.5+-0.02	10+-0.05	100+-1	-	50+-0.3	25+-0.1	100+-1
Found in 1:10 dilution		4.8	0.25	1.1	9.6	-	3.6	2.2	9.5

Parameter	Aqueous Methods	Soil Methods (aqueous extract)	Biota Methods
Fluoride	SMW&W 4500, ISE	BS1377/1990, Part 3. Extract, ISE	Alk. Fus., ISE, specified by project
Chloride	Tecator AN 63/83	BS1377/1990, Part 3. Tecator AN 63/83	
Sulfates	EMEP/CCC 1/95 Rev.1996	BS1377/1990, Part 3.	
pH	SMW&W 4500	BS1377/1990, Part 3. SMW&W 4500	
Alkalinity	SMW&W 2320.b		
Trace Metals (As, Cd, Cr, Cu, Hg, Ni, Pb, Zn)	SW846 6010B/7470A/6020 EPA 200.7/200.8		SW846 6010B/7470A/6020 EPA 200.7/200.8
PAHs Select Ion Monitoring (PAH-16, Borneff-6)	EPA16 by HPLC with both UV and fluorescence detection acc.to method NEN6524		
Nitrogen determination by CN Dumas analysis			N determination by Variomax Elementaranalysentechnik GmbH (thermoconductive detection after combustion in pure oxygen at 900°C)
Sulfur			EPA 6010B

2005 PAH Analytical Results – Severn Trent Laboratories

STL Pittsburgh
301 Alpha Drive
Pittsburgh, PA 15238

Tel: 412 963 7058 Fax: 412 963 2468
www.stl-inc.com

ANALYTICAL REPORT

PROJECT NO. BECH1-18321

RETEC, Fjardaal Smelter

Lot #: C5J170196

Greg Malzone

The RETEC Group, Inc.

SEVERN TRENT LABORATORIES, INC.

Dave Dunlap
Project Manager

November 23, 2005

SEVERN TRENT STL

ACCREDITED IN ACCORDANCE WITH nelac

NELAC REPORTING:

The format and content of the attached report meets NELAC standards and guidelines except as noted in the narrative. The table below presents a summary of the certifications held by STL Pittsburgh. Our primary accreditation authority for the Non-potable water and Solid & Hazardous waste programs is Pennsylvania DEP. A more detailed parameter list is available upon request. Please ask your project manager for this information when required.

Certifying State/Program	Certificate #	Program Types	STL Pittsburgh
NFESC	NA	NAVY	X
USACE	NA	Corps of Engineers	X
US Dept of Agriculture	(#S-46425)	Foreign Soil Import Permit	X
Arkansas	(#03-022-1)	WW	X
		HW	X
California – nelac	04224CA	WW	X
		HW	X
Connecticut	(#PH-0688)	WW	X
		HW	X
Florida – nelac	(#E87660)	WW	X
		HW	X
Illinois – nelac	(#200005)	WW	X
		HW	X
Kansas – nelac	(#E-10350)	WW	X
		HW	X
Louisiana – nelac	(#93200)	WW	X
		HW	X
New Hampshire – nelac	(#203002)	WW	X
		--	--
New Jersey – nelac	(PA-005)	WW	X
		HW	X
New York – nelac	(#11182)	WW	X
		HW	X
North Carolina	(#434)	WW	X
		HW	X
North Dakota	R-075	WW	X
		HW	X
Ohio Vap	(#CL0063)	WW	X
		HW	X
Pennsylvania - nelac	(#02-00416)	WW	X
		HW	X
South Carolina	(#89014001)	WW	X
		HW	X
Utah – nelac	(STLP)	WW	X
		HW	X
West Virginia	(#142)	WW	X
		HW	X
Wisconsin	998027800	WW	X
		HW	X

The codes utilized for program types are described below:

HW Hazardous Waste certification
WW Non-potable Water and/or Wastewater certification
X Laboratory has some form of certification under the specific program. Many states certify laboratories for specific parameters or tests within a category. The information in the table indicates the lab is certified in a general category of testing. Please contact the laboratory if parameter specific certification information is required.

CASE NARRATIVE

Retec Group
Fjardaal Smelter

STL Lot # C5J170196

Sample Receiving:
Samples were received at STL Pittsburgh on October 17, 2005. The cooler was received at 14.1 °C.

Sample labeled 'BL BOTTLE" was received broken.

If project specific QC was not required for samples contained in this report and batch QC was completed on these samples, anomalous results will be discussed below.

GC/MS Semivolatiles:
There were no problems associated with the analysis.

GC/MS Semivolatiles(SIM):
The samples required both 8270C and 8270C SIM analysis. The samples were spiked with routine 8270C surrogates and spiking solution; therefore the 8270C analysis is used to evaluate the surrogate, matrix spike, and laboratory control sample QC recoveries since the concentrations of the surrogates and spikes are above the calibration level of the SIM curve. Reextraction of the samples due to surrogate recoveries would be based on the routine 8270C analysis, not the 8270C SIM analysis.

METHODS SUMMARY

C5J170196

PARAMETER	ANALYTICAL METHOD	PREPARATION METHOD
Semivolatile Organic Compounds by GC/MS	SW846 8270C	SW846 3520C
8270C (SIM)	SW846 8270C SIM	SW846 3520C

References:

SW846 "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 and its updates.

SAMPLE SUMMARY

C5J170196

WO #	SAMPLE#	CLIENT SAMPLE ID	SAMPLED DATE	SAMP TIME
HMW8C	001	W1-1005	10/11/05	10:35
HMW8W	002	W2-1005	10/11/05	10:11
HMW80	003	W3-1005	10/11/05	11:15
HMW84	004	W4-1005	10/11/05	11:03
HMW86	005	W5-1005	10/11/05	09:44
HMW87	006	W6-1005	10/11/05	09:26
HMW88	007	W7-1005	10/11/05	11:26
HMW9A	008	W8-1005	10/11/05	11:08

NOTE(S):

- The analytical results of the samples listed above are presented on the following pages.
- All calculations are performed before rounding to avoid round-off errors in calculated results.
- Results noted as "ND" were not detected at or above the stated limit.
- This report must not be reproduced, except in full, without the written approval of the laboratory.
- Results for the following parameters are never reported on a dry weight basis: color, corrosivity, density, flashpoint, ignitability, layers, odor, paint filter test, pH, porosity pressure, reactivity, redox potential, specific gravity, spot tests, solids, solubility, temperature, viscosity, and weight.

Chain of Custody Record

№ 0601

The RETEC Group, Inc.
1001 W. Seneca Street, Suite 204 • Ithaca, NY 14850-3342
(607) 277-5716 Phone • (607) 277-9057 Fax
www.retec.com

RETEC

Project Name: ERLIN RAF	Project Number:
Send Report To: SAMPLES, ICENTAKNISTOFNUM	Sampler (Print Name): ERLIN JOHANNSD
Address: ISLANDS	Sampler (Print Name): KRISTIN AGUSTSD
KRINGLUNNI 12E	Shipment Method: BY FLIGHT - 337
112 REYKJAVIK	Airbill Number: 21433
Phone: 570 7100	Laboratory Receiving:
Fax:	

SEE LABELS ON BOTTLES

Page 1 of 1

Purchase Order #:

Field Sample ID	Sample Date	Sample Time	Sample Matrix	Number of Containers	Analysis Requested: 24 HR	1 WEEK	PAH	Comments, Special Instructions, etc.	Lab Sample ID (to be completed by lab)
W1 - 1005	11.10.05	10:35		4 bottles			✓		
W2 - 1005	"	10:11		"			✓		
W3 - 1005	"	11:15		"			✓		
W4 - 1005	"	11:03		"			✓		
W5 - 1005	"	9:44		"			✓		
W6 - 1005	"	9:26		"			✓		
W7 - 1005	"	11:26		"			✓		
W8 - 1005	"	11:08		"			✓		
BL. BOTTLE							✓		

Relinquished by: (Signature) Kristin Agustsd	Received by: (Signature)	Date: 11.10.05	Time: 12:10
Relinquished by: (Signature)	Received by: (Signature)	Date: 11/10/05	Time: 17:45
Relinquished by: (Signature)	Received by: (Signature)	Date: 10-17-05	Time: 13:45

Sample Custodian Remarks (Completed By Laboratory):

QA/QC Level	Turnaround
Level I ☐	Routine ☐
Level II ☐	24 Hour ☐
Level III ☐	1 Week ☐
Other ☐	Other ____

Sample Receipt	
Total # Containers Received?	
COC Seals Present?	
COC Seals Intact?	
Received Containers Intact?	
Temperature?	

White: Lab Copy Yellow: PM Copy Pink: Field Copy Gold: PM/QA/QC Copy

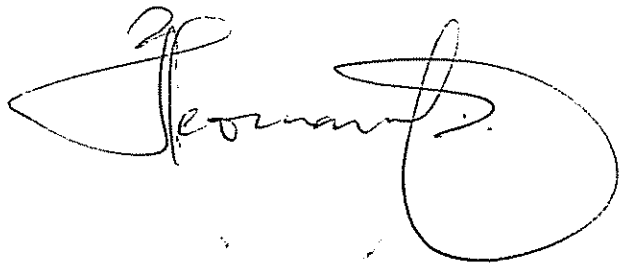
Severn Trent Laboratories
310 Alpha Drive
Pittsburgh, PA 15238
c/o David A.Dunlap

Please analyze these 9 water samples for PAH.

Our ref. no.
6EM 05135

Hermann Thordarson, herth@iti.is
Center of Chemical Analysis
Technological Institute of Iceland (IceTec)
Keldnaholt
112 Reykjavík
ICELAND

Tel. 570 7100
Fax 570 7111



Severn Trent Laboratories
310 Alpha Drive
Pittsburgh, PA 15238
c/o David A.Dunlap

FRESHWATER SAMPLES FOR PAH ANALYSIS

Cooler Receipt Form

STL Pittsburgh

Client: Retec Project: _____ Quote: 67260

Cooler Rec'd & Opened for Temp. Check on: 10-17-05

Coolers Opened and Unpacked on: 10-17-05 By: _____ (Signature)

STL Pittsburgh Lot Number: CSU170196

		Yes	No
1.	Were custody seals on the outside of the cooler?		✓
	If YES, how many and where? Quantity ___ Location		
	Were signatures and date correct?		✓
2.	Were custody papers included inside the cooler?		✓
3.	Were custody papers properly filled out (ink, signed, match labels)?	✓	
4.	Did you sign the custody papers in the appropriate place?	✓	
5.	Was shippers packing slip attached to this form?		✓
6.	Were packing materials used?	✓	
	If YES, what type? PAPER		
7.	Were the samples chilled? (Record temperatures on reverse side.)	✓	
8.	Were the samples appropriately preserved?	N/A	
9.	Were all bottles sealed in separate plastic bags?		✓
10.	Did all bottles arrive in good condition (unbroken)?	✓	
11.	Were all bottle labels complete (sample ID, preservatives, etc.)?	✓	
12.	Did all bottle labels and/or tags agree with custody papers?	✓	
13.	Were correct bottles used for tests indicated?	✓	
14.	Were all VOA vials checked for the presence of air bubbles?	N/A	✓
15.	Was a sufficient amount of sample sent in each bottle?		

16. Samples received by: FEDEX UPS CLIENT DROP-OFF OTHER DHL

Explain any discrepancies: _____

Level 2 Review _____

Was contacted on _____ by _____ to resolve discrepancies.

Cooler Receipt Form

STL Pittsburgh

P: Preserved

UP: Unpreserved

Sample ID	TMET PH<2	DMET PH<2	HG PH<2	NUT(1) PH<2	CN PH ≥12	OG TPHC PH<2	PHEN PH<2	SULF PH ≥12	TOC PH<2	TOX PH<2	VOA P/UP	hrdnss PH<2	Cl_2 RES		

(1) "NUT" could include sample bottles for ammonia, chemical oxygen demand, nitrate/nitrite, TKN, or total phosphorus

Comments: _____

_____

_____

Cooler Number	Temperature*	Thermometer
1	14.1	3

*Acceptable Temperature Range: 4°C ± 2°C

Sample	Lot Number**

**Please use an asterisk if bottle lot number was covered by the label

Work Order No.: _____

Condition Upon Receipt Variance Report
STL Pittsburgh Laboratory

Client: Reface
Project No.: _____
Analysis Requested: _____
Client Sample Numbers Affected: _____

Date: 10-17-05
Initiated by: AP
RFA/COC: _____

Condition/Variance (Check all that apply):

1. ☐ Not enough sample received for proper analysis. Received approx. _____
2. ☑ Sample received broken/leaking.
3. ☐ Sample received without proper preservative.
   ☑ Cooler temperature not within 4°C ± 2°C.
   Record temperature: 4.1
   ☐ pH _____
   ☐ other: _____
4. ☐ Sample received in improper container.
5. ☐ Sample received without proper paperwork.
6. ☐ Paperwork received without sample.
7. ☐ No sample ID on sample container.
8. ☐ Custody tape disturbed/broken/missing.
9. ☐ Sample splits performed by lab.
10. ☐ Volatile sample received with approximately _____ mm headspace.
11. ☐ Sample ID on container does not match on paperwork. Explain:
12. ☐ All coolers on airbill not received with
13. ☐ Other (explain below):

Notes: 1 Liter Bottle Broken in cooler it was the 8-Hle Blank

Corrective Action:

☑ Client's Name: _____ Informed verbally on: _____ By: _____

☐ Client's Name: Greg Madzone Informed in writing on: 10/17/05 By: [signature]

☐ Sample(s) processed "as is" _____

☐ Sample(s) on hold until: _____ If released: _____

Sample Control Supervisor Review: [signature] Date: 10-17-05

Project Management Review: [signature] Date: 10/17/05

SIGNED ORIGINAL MUST BE RETAINED IN THE PROJECT FILE

STOMER SERVICE AIRBILL SUMMARY

AB# 0855 REK -> BSI
*TD: BS PROD=SMPX
PICKUP: 10 1/05 12:00 LOC: RT: MFST: MOVED:
EXP DL:
SNDR: 000000 00000 RCVR: 00000000000
SEVERN TRENT LAB

150 WILLIAM PITT Way

00000 00000

REF: NA
BY: ATTN:
CDC: LIC:

TTL CHRG: 0.00 ACT WT: 17 PCS: 1
CHG WT:

AB#: 04410800855 ORG: DEST: P/U DTE: TO:
SNDR: RCVR: DRP BOX: REF: SVC:
GOTO: 5=SERV 15=MSG 19=CH 20=HI 21=TX 22=ABDO 10=POD 12=PR @
11=HELP

E3747 THIS MAY BE A DHL SHIPMENT.

15238

CERT # 12,9 SPILL # 4

DATE 10/10-05

PRODUCT WATER SAMPLES

NO BELTS

DTP

9-6

~~AWK~~

REK 4/10 800 955

DATA SUMMARY PACKAGE

GC/MS SEMIVOLATILE SUMMARY

The RETEC Group, Inc.

Client Sample ID: W1-1005

GC/MS Semivolatiles

Lot-Sample #...:	C5J170196-001	**Work Order #...:**	HMW8C1AA	**Matrix.....:**	WATER
Date Sampled...:	10/11/05 10:35	**Date Received..:**	10/17/05 13:45	**MS Run #.....:**	
Prep Date.....:	10/18/05	**Analysis Date..:**	11/04/05		
Prep Batch #...:	5291270	**Analysis Time..:**	11:21		
Dilution Factor:	1	**Initial Wgt/Vol:**	1000 mL	**Final Wgt/Vol..:**	1 mL
Analyst ID.....:	003200	**Instrument ID..:**	731		
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Naphthalene	ND	10	ug/L	2.4
Acenaphthylene	ND	10	ug/L	4.5
Acenaphthene	ND	10	ug/L	6.4
Fluorene	ND	10	ug/L	1.5
Phenanthrene	ND	10	ug/L	6.0
Anthracene	ND	10	ug/L	1.5
Fluoranthene	ND	10	ug/L	1.8
Pyrene	ND	10	ug/L	3.9
Benzo(a)anthracene	ND	10	ug/L	1.4
Chrysene	ND	10	ug/L	1.3
Benzo(b)fluoranthene	ND	10	ug/L	1.4
Benzo(k)fluoranthene	ND	10	ug/L	2.6
Benzo(a)pyrene	ND	10	ug/L	3.6
Indeno(1,2,3-cd)pyrene	ND	10	ug/L	2.3
Dibenzo(a,h)anthracene	ND	10	ug/L	0.38
Benzo(ghi)perylene	ND	10	ug/L	2.7

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
2,4,6-Tribromophenol	75	(19 - 138)
2-Fluorobiphenyl	65	(35 - 115)
2-Fluorophenol	62	(10 - 118)
Nitrobenzene-d5	66	(39 - 115)
Phenol-d5	64	(18 - 115)
Terphenyl-d14	75	(17 - 129)

The RETEC Group, Inc.

Client Sample ID: W2-1005

GC/MS Semivolatiles

Lot-Sample #...:	C5J170196-002	Work Order #...:	HMW8W1AA	Matrix.....:	WATER
Date Sampled...:	10/11/05 10:11	Date Received..:	10/17/05 13:45	MS Run #.....:	
Prep Date.....:	10/18/05	Analysis Date..:	11/04/05		
Prep Batch #...:	5291270	Analysis Time..:	11:49		
Dilution Factor:	1	Initial Wgt/Vol:	1000 mL	Final Wgt/Vol..:	1 mL
Analyst ID.....:	003200	Instrument ID..:	731		
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Naphthalene	ND	10	ug/L	2.4
Acenaphthylene	ND	10	ug/L	4.5
Acenaphthene	ND	10	ug/L	6.4
Fluorene	ND	10	ug/L	1.5
Phenanthrene	ND	10	ug/L	6.0
Anthracene	ND	10	ug/L	1.5
Fluoranthene	ND	10	ug/L	1.8
Pyrene	ND	10	ug/L	3.9
Benzo(a)anthracene	ND	10	ug/L	1.4
Chrysene	ND	10	ug/L	1.3
Benzo(b)fluoranthene	ND	10	ug/L	1.4
Benzo(k)fluoranthene	ND	10	ug/L	2.6
Benzo(a)pyrene	ND	10	ug/L	3.6
Indeno(1,2,3-cd)pyrene	ND	10	ug/L	2.3
Dibenzo(a,h)anthracene	ND	10	ug/L	0.38
Benzo(ghi)perylene	ND	10	ug/L	2.7

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
2,4,6-Tribromophenol	69	(19 - 138)
2-Fluorobiphenyl	61	(35 - 115)
2-Fluorophenol	60	(10 - 118)
Nitrobenzene-d5	63	(39 - 115)
Phenol-d5	65	(18 - 115)
Terphenyl-d14	68	(17 - 129)

The RETEC Group, Inc.

Client Sample ID: W3-1005

GC/MS Semivolatiles

Lot-Sample #...:	C5J170196-003	**Work Order #...:**	HMW801AA	**Matrix.....:**	WATER
Date Sampled...:	10/11/05 11:15	**Date Received..:**	10/17/05 13:45	**MS Run #.....:**	
Prep Date.....:	10/18/05	**Analysis Date..:**	11/04/05		
Prep Batch #...:	5291270	**Analysis Time..:**	12:43		
Dilution Factor:	1	**Initial Wgt/Vol:**	1000 mL	**Final Wgt/Vol..:**	1 mL
Analyst ID.....:	003200	**Instrument ID..:**	731		
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Naphthalene	ND	10	ug/L	2.4
Acenaphthylene	ND	10	ug/L	4.5
Acenaphthene	ND	10	ug/L	6.4
Fluorene	ND	10	ug/L	1.5
Phenanthrene	ND	10	ug/L	6.0
Anthracene	ND	10	ug/L	1.5
Fluoranthene	ND	10	ug/L	1.8
Pyrene	ND	10	ug/L	3.9
Benzo(a)anthracene	ND	10	ug/L	1.4
Chrysene	ND	10	ug/L	1.3
Benzo(b)fluoranthene	ND	10	ug/L	1.4
Benzo(k)fluoranthene	ND	10	ug/L	2.6
Benzo(a)pyrene	ND	10	ug/L	3.6
Indeno(1,2,3-cd)pyrene	ND	10	ug/L	2.3
Dibenzo(a,h)anthracene	ND	10	ug/L	0.38
Benzo(ghi)perylene	ND	10	ug/L	2.7

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
2,4,6-Tribromophenol	89	(19 - 138)
2-Fluorobiphenyl	76	(35 - 115)
2-Fluorophenol	73	(10 - 118)
Nitrobenzene-d5	78	(39 - 115)
Phenol-d5	79	(18 - 115)
Terphenyl-d14	91	(17 - 129)

The RETEC Group, Inc.

Client Sample ID: W4-1005

GC/MS Semivolatiles

Lot-Sample #...:	C5J170196-004	**Work Order #...:**	HMW841AA	**Matrix.....:**	WATER
Date Sampled...:	10/11/05 11:03	**Date Received..:**	10/17/05 13:45	**MS Run #.....:**	
Prep Date.....:	10/18/05	**Analysis Date..:**	11/04/05		
Prep Batch #...:	5291270	**Analysis Time..:**	13:11		
Dilution Factor:	1	**Initial Wgt/Vol:**	1000 mL	**Final Wgt/Vol..:**	1 mL
Analyst ID.....:	003200	**Instrument ID..:**	731		
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Naphthalene	ND	10	ug/L	2.4
Acenaphthylene	ND	10	ug/L	4.5
Acenaphthene	ND	10	ug/L	6.4
Fluorene	ND	10	ug/L	1.5
Phenanthrene	ND	10	ug/L	6.0
Anthracene	ND	10	ug/L	1.5
Fluoranthene	ND	10	ug/L	1.8
Pyrene	ND	10	ug/L	3.9
Benzo(a)anthracene	ND	10	ug/L	1.4
Chrysene	ND	10	ug/L	1.3
Benzo(b)fluoranthene	ND	10	ug/L	1.4
Benzo(k)fluoranthene	ND	10	ug/L	2.6
Benzo(a)pyrene	ND	10	ug/L	3.6
Indeno(1,2,3-cd)pyrene	ND	10	ug/L	2.3
Dibenzo(a,h)anthracene	ND	10	ug/L	0.38
Benzo(ghi)perylene	ND	10	ug/L	2.7

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
2,4,6-Tribromophenol	82	(19 - 138)
2-Fluorobiphenyl	68	(35 - 115)
2-Fluorophenol	69	(10 - 118)
Nitrobenzene-d5	72	(39 - 115)
Phenol-d5	75	(18 - 115)
Terphenyl-d14	87	(17 - 129)

The RETEC Group, Inc.

Client Sample ID: W5-1005

GC/MS Semivolatiles

Lot-Sample #...:	C5J170196-005	**Work Order #...:**	HMW861AA	**Matrix.....:**	WATER
Date Sampled...:	10/11/05 09:44	**Date Received..:**	10/17/05 13:45	**MS Run #.....:**	
Prep Date.....:	10/18/05	**Analysis Date..:**	11/04/05		
Prep Batch #...:	5291270	**Analysis Time..:**	13:39		
Dilution Factor:	1	**Initial Wgt/Vol:**	1000 mL	**Final Wgt/Vol..:**	1 mL
Analyst ID.....:	003200	**Instrument ID..:**	731		
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Naphthalene	ND	10	ug/L	2.4
Acenaphthylene	ND	10	ug/L	4.5
Acenaphthene	ND	10	ug/L	6.4
Fluorene	ND	10	ug/L	1.5
Phenanthrene	ND	10	ug/L	6.0
Anthracene	ND	10	ug/L	1.5
Fluoranthene	ND	10	ug/L	1.8
Pyrene	ND	10	ug/L	3.9
Benzo(a)anthracene	ND	10	ug/L	1.4
Chrysene	ND	10	ug/L	1.3
Benzo(b)fluoranthene	ND	10	ug/L	1.4
Benzo(k)fluoranthene	ND	10	ug/L	2.6
Benzo(a)pyrene	ND	10	ug/L	3.6
Indeno(1,2,3-cd)pyrene	ND	10	ug/L	2.3
Dibenzo(a,h)anthracene	ND	10	ug/L	0.38
Benzo(ghi)perylene	ND	10	ug/L	2.7

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
2,4,6-Tribromophenol	75	(19 - 138)
2-Fluorobiphenyl	62	(35 - 115)
2-Fluorophenol	65	(10 - 118)
Nitrobenzene-d5	68	(39 - 115)
Phenol-d5	69	(18 - 115)
Terphenyl-d14	74	(17 - 129)

The RETEC Group, Inc.

Client Sample ID: W6-1005

GC/MS Semivolatiles

Lot-Sample #...:	C5J170196-006	**Work Order #...:**	HMW871AA	**Matrix.....:**	WATER
Date Sampled...:	10/11/05 09:26	**Date Received..:**	10/17/05 13:45	**MS Run #.....:**	
Prep Date.....:	10/18/05	**Analysis Date..:**	11/04/05		
Prep Batch #...:	5291270	**Analysis Time..:**	14:07		
Dilution Factor:	1	**Initial Wgt/Vol:**	1000 mL	**Final Wgt/Vol..:**	1 mL
Analyst ID.....:	003200	**Instrument ID..:**	731		
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Naphthalene	ND	10	ug/L	2.4
Acenaphthylene	ND	10	ug/L	4.5
Acenaphthene	ND	10	ug/L	6.4
Fluorene	ND	10	ug/L	1.5
Phenanthrene	ND	10	ug/L	6.0
Anthracene	ND	10	ug/L	1.5
Fluoranthene	ND	10	ug/L	1.8
Pyrene	ND	10	ug/L	3.9
Benzo(a)anthracene	ND	10	ug/L	1.4
Chrysene	ND	10	ug/L	1.3
Benzo(b)fluoranthene	ND	10	ug/L	1.4
Benzo(k)fluoranthene	ND	10	ug/L	2.6
Benzo(a)pyrene	ND	10	ug/L	3.6
Indeno(1,2,3-cd)pyrene	ND	10	ug/L	2.3
Dibenzo(a,h)anthracene	ND	10	ug/L	0.38
Benzo(ghi)perylene	ND	10	ug/L	2.7

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
2,4,6-Tribromophenol	74	(19 - 138)
2-Fluorobiphenyl	63	(35 - 115)
2-Fluorophenol	64	(10 - 118)
Nitrobenzene-d5	66	(39 - 115)
Phenol-d5	68	(18 - 115)
Terphenyl-d14	76	(17 - 129)

The RETEC Group, Inc.

Client Sample ID: W7-1005

GC/MS Semivolatiles

Lot-Sample #...:	C5J170196-007	**Work Order #...:**	HMW881AA	**Matrix.....:**	WATER
Date Sampled...:	10/11/05 11:26	**Date Received..:**	10/17/05 13:45	**MS Run #.....:**	
Prep Date.....:	10/18/05	**Analysis Date..:**	11/04/05		
Prep Batch #...:	5291270	**Analysis Time..:**	14:35		
Dilution Factor:	1	**Initial Wgt/Vol:**	1000 mL	**Final Wgt/Vol..:**	1 mL
Analyst ID.....:	003200	**Instrument ID..:**	731		
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Naphthalene	ND	10	ug/L	2.4
Acenaphthylene	ND	10	ug/L	4.5
Acenaphthene	ND	10	ug/L	6.4
Fluorene	ND	10	ug/L	1.5
Phenanthrene	ND	10	ug/L	6.0
Anthracene	ND	10	ug/L	1.5
Fluoranthene	ND	10	ug/L	1.8
Pyrene	ND	10	ug/L	3.9
Benzo(a)anthracene	ND	10	ug/L	1.4
Chrysene	ND	10	ug/L	1.3
Benzo(b)fluoranthene	ND	10	ug/L	1.4
Benzo(k)fluoranthene	ND	10	ug/L	2.6
Benzo(a)pyrene	ND	10	ug/L	3.6
Indeno(1,2,3-cd)pyrene	ND	10	ug/L	2.3
Dibenzo(a,h)anthracene	ND	10	ug/L	0.38
Benzo(ghi)perylene	ND	10	ug/L	2.7

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
2,4,6-Tribromophenol	77	(19 - 138)
2-Fluorobiphenyl	70	(35 - 115)
2-Fluorophenol	72	(10 - 118)
Nitrobenzene-d5	74	(39 - 115)
Phenol-d5	77	(18 - 115)
Terphenyl-d14	78	(17 - 129)

The RETEC Group, Inc.

Client Sample ID: W8-1005

GC/MS Semivolatiles

Lot-Sample #...:	C5J170196-008	**Work Order #...:**	HMW9A1AA	**Matrix.....:**	WATER
Date Sampled...:	10/11/05 11:08	**Date Received..:**	10/17/05 13:45	**MS Run #.....:**	
Prep Date.....:	10/18/05	**Analysis Date..:**	11/04/05		
Prep Batch #...:	5291270	**Analysis Time..:**	15:03		
Dilution Factor:	1	**Initial Wgt/Vol:**	1000 mL	**Final Wgt/Vol..:**	1 mL
Analyst ID.....:	003200	**Instrument ID..:**	731		
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Naphthalene	ND	10	ug/L	2.4
Acenaphthylene	ND	10	ug/L	4.5
Acenaphthene	ND	10	ug/L	6.4
Fluorene	ND	10	ug/L	1.5
Phenanthrene	ND	10	ug/L	6.0
Anthracene	ND	10	ug/L	1.5
Fluoranthene	ND	10	ug/L	1.8
Pyrene	ND	10	ug/L	3.9
Benzo(a)anthracene	ND	10	ug/L	1.4
Chrysene	ND	10	ug/L	1.3
Benzo(b)fluoranthene	ND	10	ug/L	1.4
Benzo(k)fluoranthene	ND	10	ug/L	2.6
Benzo(a)pyrene	ND	10	ug/L	3.6
Indeno(1,2,3-cd)pyrene	ND	10	ug/L	2.3
Dibenzo(a,h)anthracene	ND	10	ug/L	0.38
Benzo(ghi)perylene	ND	10	ug/L	2.7

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
2,4,6-Tribromophenol	73	(19 - 138)
2-Fluorobiphenyl	66	(35 - 115)
2-Fluorophenol	63	(10 - 118)
Nitrobenzene-d5	67	(39 - 115)
Phenol-d5	69	(18 - 115)
Terphenyl-d14	77	(17 - 129)

SW846 8270C SURROGATE RECOVERY

Lab Name: Severn Trent Laboratories, Inc. Client: The RETEC Group, Inc.

Lab Code: STLPIT SDG No:

Lot #: C5J170196

Extraction: XXI51QL01

	CLIENT ID.	SRG01	SRG02	SRG03	SRG04	SRG05	SRG06	TOT OUT
01	W1-1005	75	65	62	66	64	75	00
02	W2-1005	69	61	60	63	65	68	00
03	W3-1005	89	76	73	78	79	91	00
04	W4-1005	82	68	69	72	75	87	00
05	W5-1005	75	62	65	68	69	74	00
06	W6-1005	74	63	64	66	68	76	00
07	W7-1005	77	70	72	74	77	78	00
08	W8-1005	73	66	63	67	69	77	00
09	METHOD BLK. HM0RJ1AA	82	76	73	74	77	83	00
10	LCS HM0RJ1AC	88	75	72	72	74	77	00
11	LCSD HM0RJ1AD	90	78	73	74	75	78	00

SURROGATES		QC LIMITS
SRG01	= 2,4,6-Tribromophenol	(19-138)
SRG02	= 2-Fluorobiphenyl	(35-115)
SRG03	= 2-Fluorophenol	(10-118)
SRG04	= Nitrobenzene-d5	(39-115)
SRG05	= Phenol-d5	(18-115)
SRG06	= Terphenyl-d14	(17-129)

\# Column to be used to flag recovery values
* Values outside of required QC Limits
D System monitoring Compound diluted out

SW846 8270C CHECK SAMPLE RECOVERY

Lab Name: Severn Trent Laboratories, Inc. Client: The RETEC Group, Inc.

Lab Code: STLPIT SDG No:

Lot #: C5J180000 WO #: HM0RJ1AC
BATCH: 5291270

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONCENT. (ug/L)	% REC	QC LIMITS REC	QUAL
1,2,4-Trichlorobenzene	50.0	38.8	78	38- 115	
1,4-Dichlorobenzene	50.0	37.7	75	37- 115	
2,4-Dinitrotoluene	50.0	39.1	78	40- 115	
2-Chlorophenol	50.0	38.4	77	37- 115	
4-Chloro-3-methylphenol	50.0	39.1	78	39- 115	
4-Nitrophenol	50.0	37.5	75	33- 124	
Acenaphthene	50.0	37.7	75	41- 115	
N-Nitrosodi-n-propylamine	50.0	38.0	76	38- 115	
Pentachlorophenol	50.0	37.4	75	16- 140	
Phenol	50.0	37.9	76	38- 115	
Pyrene	50.0	42.4	85	35- 127	
Butyl benzyl phthalate	50.0	41.1	82	37- 119	
4-Bromophenyl phenyl ethe	50.0	42.4	85	36- 120	
4-Methylphenol	100	73.4	73	13- 139	
Hexachloroethane	50.0	36.9	74	33- 115	
Naphthalene	50.0	38.3	77	33- 118	

NOTES(S):

* Values outside of QC limits

Spike Recovery: 0 out of 16 outside limits

COMMENTS:

SW846 8270C CHECK SAMPLE DUPLICATE RECOVERY

Lab Name: Severn Trent Laboratories, Inc. Client: The RETEC Group, Inc.

Lab Code: STLPIT SDG No:

Lot #: C5J180000 WO #: HM0RJ1AD
BATCH: 5291270

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONCENT. (ug/L)	% REC	QC LIMITS REC	QUAL
1,2,4-Trichlorobenzene	50.0	39.6	79	38- 115	
1,4-Dichlorobenzene	50.0	38.2	76	37- 115	
2,4-Dinitrotoluene	50.0	39.8	80	40- 115	
2-Chlorophenol	50.0	38.9	78	37- 115	
4-Chloro-3-methylphenol	50.0	39.5	79	39- 115	
4-Nitrophenol	50.0	37.8	76	33- 124	
Acenaphthene	50.0	38.4	77	41- 115	
N-Nitrosodi-n-propylamine	50.0	38.8	78	38- 115	
Pentachlorophenol	50.0	38.3	77	16- 140	
Phenol	50.0	38.5	77	38- 115	
Pyrene	50.0	43.0	86	35- 127	
Butyl benzyl phthalate	50.0	41.8	84	37- 119	
4-Bromophenyl phenyl ethe	50.0	43.1	86	36- 120	
4-Methylphenol	100	74.9	75	13- 139	
Hexachloroethane	50.0	37.4	75	33- 115	
Naphthalene	50.0	38.9	78	33- 118	

NOTES(S):

* Values outside of QC limits

Spike Recovery: 0 out of 16 outside limits

COMMENTS:

SW846 8270C METHOD BLANK SUMMARY

BLANK WORKORDER NO.: HM0RJ1AA

Lab Name: Severn Trent Laboratories, Inc.

Lab Code: STLPIT

SDG Number:

Lab File ID: V1104001.

Lot Number: C5J170196

Date Analyzed: 11/04/05

Time Analyzed: 09:58

Matrix: WATER

Date Extracted:10/18/05

GC Column: DB5 ID: .25

Extraction Method: 3520C

Instrument ID: 731

Level:(low/med) LOW

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, LCS, LCSD, MS , MSD:

	CLIENT ID.	SAMPLE WORK ORDER #	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	W1-1005	HMW8C1AA	V1104004.	11/04/05	11:21
02	W2-1005	HMW8W1AA	V1104005.	11/04/05	11:49
03	W3-1005	HMW801AA	V1104006.	11/04/05	12:43
04	W4-1005	HMW841AA	V1104007.	11/04/05	13:11
05	W5-1005	HMW861AA	V1104008.	11/04/05	13:39
06	W6-1005	HMW871AA	V1104009.	11/04/05	14:07
07	W7-1005	HMW881AA	V1104010.	11/04/05	14:35
08	W8-1005	HMW9A1AA	V1104011.	11/04/05	15:03
09	CHECK SAMPLE	HM0RJ1AC C	V1104002.	11/04/05	10:26
10	DUPLICATE CHECK	HM0RJ1AD L	V1104003.	11/04/05	10:53
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					

COMMENTS:

METHOD BLANK REPORT

GC/MS Semivolatiles

Client Lot #...: C5J170196 **Work Order #...:** HM0RJ1AA **Matrix.....:** WATER
MB Lot-Sample #: C5J180000-270

Prep Date.....: 10/18/05 **Analysis Time..:** 09:58
Analysis Date..: 11/04/05 **Prep Batch #...:** 5291270 **Final Wgt/Vol..:** 1 mL
Dilution Factor: 1 **Initial Wgt/Vol:** 1000 mL **Instrument ID..:** 731
Analyst ID.....: 003200

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD
Naphthalene	ND	10	ug/L	SW846 8270C
Acenaphthylene	ND	10	ug/L	SW846 8270C
Acenaphthene	ND	10	ug/L	SW846 8270C
Fluorene	ND	10	ug/L	SW846 8270C
Phenanthrene	ND	10	ug/L	SW846 8270C
Anthracene	ND	10	ug/L	SW846 8270C
Fluoranthene	ND	10	ug/L	SW846 8270C
Pyrene	ND	10	ug/L	SW846 8270C
Benzo(a)anthracene	ND	10	ug/L	SW846 8270C
Chrysene	ND	10	ug/L	SW846 8270C
Benzo(b)fluoranthene	ND	10	ug/L	SW846 8270C
Benzo(k)fluoranthene	ND	10	ug/L	SW846 8270C
Benzo(a)pyrene	ND	10	ug/L	SW846 8270C
Indeno(1,2,3-cd)pyrene	ND	10	ug/L	SW846 8270C
Dibenzo(a,h)anthracene	ND	10	ug/L	SW846 8270C
Benzo(ghi)perylene	ND	10	ug/L	SW846 8270C

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
2,4,6-Tribromophenol	82	(19 - 138)
2-Fluorobiphenyl	76	(35 - 115)
2-Fluorophenol	73	(10 - 118)
Nitrobenzene-d5	74	(39 - 115)
Phenol-d5	77	(18 - 115)
Terphenyl-d14	83	(17 - 129)

NOTE(S):

Calculations are performed before rounding to avoid round-off errors in calculated results.

FORM 8
SEMIVOLATILE INTERNAL STANDARD AREA AND RT SUMMARY

Lab Name: STL-PITTSBURGH Contract:

Lab Code: STLPIT Case No.: SAS No.: SDG No.: C5J170196

Lab File ID (Standard): V11040CC Date Analyzed: 11/04/05

Instrument ID: 731 Time Analyzed: 0930

		IS1 (DCB) AREA	#	RT	#	IS2 (NPT) AREA	#	RT	#	IS3 (ANT) AREA	#	RT	#
	12 HOUR STD	143277		4.99		575203		6.46		354705		9.07	
	UPPER LIMIT	286554		5.49		1150406		6.96		709410		9.57	
	LOWER LIMIT	71639		4.49		287602		5.96		177353		8.57	
	CLIENT SAMPLE NO.												
01	INTRA-LAB BL	139470		4.98		574342		6.45		372417		9.07	
02	INTRA-LAB CH	134942		4.98		555753		6.46		355289		9.07	
03	INTRA-LAB CH	135711		4.99		554746		6.46		352790		9.08	
04	W1-1005	154346		4.98		628602		6.46		404554		9.07	
05	W2-1005	155705		4.98		634347		6.46		405764		9.08	
06	W3-1005	149593		4.98		613718		6.46		389106		9.07	
07	W4-1005	150617		4.98		625896		6.46		399704		9.07	
08	W5-1005	138230		4.99		562890		6.47		361870		9.08	
09	W6-1005	144497		4.99		594177		6.47		381393		9.09	
10	W7-1005	138094		4.98		564297		6.46		361584		9.07	
11	W8-1005	141820		4.99		575126		6.47		370653		9.08	
12													
13													
14													
15													
16													
17													
18													
19													
20													
21													
22													

IS1 (DCB) = 1,4-Dichlorobenzene-d4
IS2 (NPT) = Naphthalene-d8
IS3 (ANT) = Acenaphthene-d10

AREA UPPER LIMIT = +100% of internal standard area
AREA LOWER LIMIT = - 50% of internal standard area
RT UPPER LIMIT = + 0.50 minutes of internal standard RT
RT LOWER LIMIT = - 0.50 minutes of internal standard RT

Column used to flag internal standard area values with an asterisk.
* Values outside of QC limits.

FORM 8
SEMIVOLATILE INTERNAL STANDARD AREA AND RT SUMMARY

Lab Name: STL-PITTSBURGH Contract:

Lab Code: STLPIT Case No.: SAS No.: SDG No.: C5J170196

Lab File ID (Standard): V11040CC Date Analyzed: 11/04/05

Instrument ID: 731 Time Analyzed: 0930

		IS4(PHN) AREA #	RT #	IS5(CRY) AREA #	RT #	IS6(PRY) AREA #	RT #
	12 HOUR STD	661510	11.64	754759	16.44	786738	18.98
	UPPER LIMIT	1323020	12.14	1509518	16.94	1573476	19.48
	LOWER LIMIT	330755	11.14	377380	15.94	393369	18.48
	CLIENT SAMPLE NO.						
01	INTRA-LAB BL	651956	11.64	689225	16.43	724273	18.97
02	INTRA-LAB CH	628308	11.64	714242	16.44	731992	18.98
03	INTRA-LAB CH	616937	11.65	706176	16.44	715549	18.99
04	W1-1005	711086	11.64	783972	16.43	833208	18.97
05	W2-1005	713676	11.65	787399	16.44	861276	18.98
06	W3-1005	685487	11.64	750780	16.44	802094	18.98
07	W4-1005	700522	11.64	765296	16.43	820237	18.97
08	W5-1005	629193	11.66	678141	16.45	732626	19.00
09	W6-1005	666134	11.66	726764	16.45	781165	19.00
10	W7-1005	635723	11.64	702419	16.44	741484	18.98
11	W8-1005	648357	11.66	709884	16.45	761648	19.00
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							

IS4 (PHN) = Phenanthrene-d10
IS5 (CRY) = Chrysene-d12
IS6 (PRY) = Perylene-d12

AREA UPPER LIMIT = +100% of internal standard area
AREA LOWER LIMIT = - 50% of internal standard area
RT UPPER LIMIT = + 0.50 minutes of internal standard RT
RT LOWER LIMIT = - 0.50 minutes of internal standard RT

Column used to flag internal standard area values with an asterisk.
* Values outside of QC limits.

SIM
GC/MS SEMIVOLATILE SUMMARY

The RETEC Group, Inc.

Client Sample ID: W1-1005

GC/MS Semivolatiles

Lot-Sample #...:	C5J170196-001	**Work Order #...:**	HMW8C1AC	**Matrix.....:**	WATER
Date Sampled...:	10/11/05 10:35	**Date Received..:**	10/17/05 13:45	**MS Run #.....:**	
Prep Date.....:	10/18/05	**Analysis Date..:**	11/07/05		
Prep Batch #...:	5291275	**Analysis Time..:**	19:59		
Dilution Factor:	1	**Initial Wgt/Vol:**	1000 mL	**Final Wgt/Vol..:**	1 mL
Analyst ID.....:	003200	**Instrument ID..:**	MSD7		
		Method.....:	SW846 8270C SIM		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Naphthalene	ND	0.20	ug/L	0.038
Acenaphthylene	ND	0.20	ug/L	0.035
Acenaphthene	ND	0.20	ug/L	0.038
Fluorene	ND	0.20	ug/L	0.036
Phenanthrene	**0.051 J**	**0.20**	**ug/L**	**0.041**
Anthracene	ND	0.20	ug/L	0.036
Fluoranthene	ND	0.20	ug/L	0.027
Pyrene	ND	0.20	ug/L	0.024
Benzo(a)anthracene	ND	0.20	ug/L	0.022
Chrysene	ND	0.20	ug/L	0.034
Benzo(b)fluoranthene	ND	0.20	ug/L	0.042
Benzo(k)fluoranthene	ND	0.20	ug/L	0.060
Benzo(a)pyrene	ND	0.20	ug/L	0.076
Indeno(1,2,3-cd)pyrene	ND	0.20	ug/L	0.10
Dibenzo(a,h)anthracene	ND	0.20	ug/L	0.15
Benzo(ghi)perylene	ND	0.20	ug/L	0.12

NOTE(S):

J Estimated result. Result is less than RL.

The RETEC Group, Inc.

Client Sample ID: W2-1005

GC/MS Semivolatiles

Lot-Sample #...:	C5J170196-002	Work Order #...:	HMW8W1AC	Matrix.....:	WATER
Date Sampled...:	10/11/05 10:11	Date Received..:	10/17/05 13:45	MS Run #.....:	
Prep Date.....:	10/18/05	Analysis Date..:	11/07/05		
Prep Batch #...:	5291275	Analysis Time..:	20:26		
Dilution Factor:	1	Initial Wgt/Vol:	1000 mL	Final Wgt/Vol..:	1 mL
Analyst ID.....:	003200	Instrument ID..:	MSD7		
		Method.....:	SW846 8270C SIM		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Naphthalene	ND	0.20	ug/L	0.038
Acenaphthylene	ND	0.20	ug/L	0.035
Acenaphthene	ND	0.20	ug/L	0.038
Fluorene	ND	0.20	ug/L	0.036
Phenanthrene	0.048 J	0.20	ug/L	0.041
Anthracene	ND	0.20	ug/L	0.036
Fluoranthene	0.029 J	0.20	ug/L	0.027
Pyrene	0.025 J	0.20	ug/L	0.024
Benzo(a)anthracene	0.22	0.20	ug/L	0.022
Chrysene	0.29	0.20	ug/L	0.034
Benzo(b)fluoranthene	0.17 J	0.20	ug/L	0.042
Benzo(k)fluoranthene	0.28	0.20	ug/L	0.060
Benzo(a)pyrene	0.19 J	0.20	ug/L	0.076
Indeno(1,2,3-cd)pyrene	0.23	0.20	ug/L	0.10
Dibenzo(a,h)anthracene	0.33	0.20	ug/L	0.15
Benzo(ghi)perylene	0.22	0.20	ug/L	0.12

NOTE(S):

J Estimated result. Result is less than RL.

The RETEC Group, Inc.

Client Sample ID: W3-1005

GC/MS Semivolatiles

Lot-Sample #...:	C5J170196-003	Work Order #...:	HMW801AC	Matrix.....:	WATER
Date Sampled...:	10/11/05 11:15	Date Received..:	10/17/05 13:45	MS Run #.....:	
Prep Date.....:	10/18/05	Analysis Date..:	11/07/05		
Prep Batch #...:	5291275	Analysis Time..:	20:53		
Dilution Factor:	1	Initial Wgt/Vol:	1000 mL	Final Wgt/Vol..:	1 mL
Analyst ID.....:	003200	Instrument ID..:	MSD7		
		Method.....:	SW846 8270C SIM		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Naphthalene	ND	0.20	ug/L	0.038
Acenaphthylene	ND	0.20	ug/L	0.035
Acenaphthene	ND	0.20	ug/L	0.038
Fluorene	ND	0.20	ug/L	0.036
Phenanthrene	**0.059 J**	**0.20**	**ug/L**	**0.041**
Anthracene	ND	0.20	ug/L	0.036
Fluoranthene	ND	0.20	ug/L	0.027
Pyrene	ND	0.20	ug/L	0.024
Benzo(a)anthracene	**0.048 J**	**0.20**	**ug/L**	**0.022**
Chrysene	**0.048 J**	**0.20**	**ug/L**	**0.034**
Benzo(b)fluoranthene	**0.050 J**	**0.20**	**ug/L**	**0.042**
Benzo(k)fluoranthene	ND	0.20	ug/L	0.060
Benzo(a)pyrene	ND	0.20	ug/L	0.076
Indeno(1,2,3-cd)pyrene	ND	0.20	ug/L	0.10
Dibenzo(a,h)anthracene	ND	0.20	ug/L	0.15
Benzo(ghi)perylene	ND	0.20	ug/L	0.12

NOTE(S):

J Estimated result. Result is less than RL.

The RETEC Group, Inc.

Client Sample ID: W4-1005

GC/MS Semivolatiles

Lot-Sample #...:	C5J170196-004	**Work Order #...:**	HMW841AC	**Matrix.....:**	WATER
Date Sampled...:	10/11/05 11:03	**Date Received..:**	10/17/05 13:45	**MS Run #.....:**	
Prep Date.....:	10/18/05	**Analysis Date..:**	11/07/05		
Prep Batch #...:	5291275	**Analysis Time..:**	21:20		
Dilution Factor:	1	**Initial Wgt/Vol:**	1000 mL	**Final Wgt/Vol..:**	1 mL
Analyst ID.....:	003200	**Instrument ID..:**	MSD7		
		Method.....:	SW846 8270C SIM		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Naphthalene	ND	0.20	ug/L	0.038
Acenaphthylene	ND	0.20	ug/L	0.035
Acenaphthene	ND	0.20	ug/L	0.038
Fluorene	ND	0.20	ug/L	0.036
Phenanthrene	**0.047 J**	**0.20**	**ug/L**	**0.041**
Anthracene	ND	0.20	ug/L	0.036
Fluoranthene	ND	0.20	ug/L	0.027
Pyrene	ND	0.20	ug/L	0.024
Benzo(a)anthracene	ND	0.20	ug/L	0.022
Chrysene	ND	0.20	ug/L	0.034
Benzo(b)fluoranthene	ND	0.20	ug/L	0.042
Benzo(k)fluoranthene	ND	0.20	ug/L	0.060
Benzo(a)pyrene	ND	0.20	ug/L	0.076
Indeno(1,2,3-cd)pyrene	ND	0.20	ug/L	0.10
Dibenzo(a,h)anthracene	ND	0.20	ug/L	0.15
Benzo(ghi)perylene	ND	0.20	ug/L	0.12

NOTE(S):

J Estimated result. Result is less than RL.

The RETEC Group, Inc.

Client Sample ID: W5-1005

GC/MS Semivolatiles

Lot-Sample #...:	C5J170196-005	**Work Order #...:**	HMW861AC	**Matrix.....:**	WATER
Date Sampled...:	10/11/05 09:44	**Date Received..:**	10/17/05 13:45	**MS Run #.....:**	
Prep Date.....:	10/18/05	**Analysis Date..:**	11/07/05		
Prep Batch #...:	5291275	**Analysis Time..:**	21:47		
Dilution Factor:	1	**Initial Wgt/Vol:**	1000 mL	**Final Wgt/Vol..:**	1 mL
Analyst ID.....:	003200	**Instrument ID..:**	MSD7		
		Method.....:	SW846 8270C SIM		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Naphthalene	ND	0.20	ug/L	0.038
Acenaphthylene	ND	0.20	ug/L	0.035
Acenaphthene	ND	0.20	ug/L	0.038
Fluorene	ND	0.20	ug/L	0.036
Phenanthrene	**0.042 J**	**0.20**	**ug/L**	**0.041**
Anthracene	ND	0.20	ug/L	0.036
Fluoranthene	ND	0.20	ug/L	0.027
Pyrene	ND	0.20	ug/L	0.024
Benzo(a)anthracene	ND	0.20	ug/L	0.022
Chrysene	ND	0.20	ug/L	0.034
Benzo(b)fluoranthene	ND	0.20	ug/L	0.042
Benzo(k)fluoranthene	ND	0.20	ug/L	0.060
Benzo(a)pyrene	ND	0.20	ug/L	0.076
Indeno(1,2,3-cd)pyrene	ND	0.20	ug/L	0.10
Dibenzo(a,h)anthracene	ND	0.20	ug/L	0.15
Benzo(ghi)perylene	ND	0.20	ug/L	0.12

NOTE(S):

J Estimated result. Result is less than RL.

The RETEC Group, Inc.

Client Sample ID: W6-1005

GC/MS Semivolatiles

Lot-Sample #...:	C5J170196-006	**Work Order #...:**	HMW871AC	**Matrix.....:**	WATER
Date Sampled...:	10/11/05 09:26	**Date Received..:**	10/17/05 13:45	**MS Run #.....:**	
Prep Date.....:	10/18/05	**Analysis Date..:**	11/07/05		
Prep Batch #...:	5291275	**Analysis Time..:**	22:14		
Dilution Factor:	1	**Initial Wgt/Vol:**	1000 mL	**Final Wgt/Vol..:**	1 mL
Analyst ID.....:	003200	**Instrument ID..:**	MSD7		
		Method.....:	SW846 8270C SIM		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Naphthalene	ND	0.20	ug/L	0.038
Acenaphthylene	ND	0.20	ug/L	0.035
Acenaphthene	ND	0.20	ug/L	0.038
Fluorene	ND	0.20	ug/L	0.036
Phenanthrene	ND	0.20	ug/L	0.041
Anthracene	ND	0.20	ug/L	0.036
Fluoranthene	ND	0.20	ug/L	0.027
Pyrene	ND	0.20	ug/L	0.024
Benzo(a)anthracene	ND	0.20	ug/L	0.022
Chrysene	ND	0.20	ug/L	0.034
Benzo(b)fluoranthene	ND	0.20	ug/L	0.042
Benzo(k)fluoranthene	ND	0.20	ug/L	0.060
Benzo(a)pyrene	ND	0.20	ug/L	0.076
Indeno(1,2,3-cd)pyrene	ND	0.20	ug/L	0.10
Dibenzo(a,h)anthracene	ND	0.20	ug/L	0.15
Benzo(ghi)perylene	ND	0.20	ug/L	0.12

The RETEC Group, Inc.

Client Sample ID: W7-1005

GC/MS Semivolatiles

Lot-Sample #...:	C5J170196-007	**Work Order #...:**	HMW881AC	**Matrix.....:**	WATER
Date Sampled...:	10/11/05 11:26	**Date Received..:**	10/17/05 13:45	**MS Run #.....:**	
Prep Date.....:	10/18/05	**Analysis Date..:**	11/07/05		
Prep Batch #...:	5291275	**Analysis Time..:**	22:41		
Dilution Factor:	1	**Initial Wgt/Vol:**	1000 mL	**Final Wgt/Vol..:**	1 mL
Analyst ID.....:	003200	**Instrument ID..:**	MSD7		
		Method.....:	SW846 8270C SIM		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Naphthalene	ND	0.20	ug/L	0.038
Acenaphthylene	ND	0.20	ug/L	0.035
Acenaphthene	ND	0.20	ug/L	0.038
Fluorene	ND	0.20	ug/L	0.036
Phenanthrene	**0.067 J**	**0.20**	**ug/L**	**0.041**
Anthracene	ND	0.20	ug/L	0.036
Fluoranthene	ND	0.20	ug/L	0.027
Pyrene	ND	0.20	ug/L	0.024
Benzo(a)anthracene	ND	0.20	ug/L	0.022
Chrysene	ND	0.20	ug/L	0.034
Benzo(b)fluoranthene	ND	0.20	ug/L	0.042
Benzo(k)fluoranthene	ND	0.20	ug/L	0.060
Benzo(a)pyrene	ND	0.20	ug/L	0.076
Indeno(1,2,3-cd)pyrene	ND	0.20	ug/L	0.10
Dibenzo(a,h)anthracene	ND	0.20	ug/L	0.15
Benzo(ghi)perylene	ND	0.20	ug/L	0.12

NOTE(S):

J Estimated result. Result is less than RL.

The RETEC Group, Inc.

Client Sample ID: W8-1005

GC/MS Semivolatiles

Lot-Sample #...:	C5J170196-008	**Work Order #...:**	HMW9A1AC	**Matrix.....:**	WATER
Date Sampled...:	10/11/05 11:08	**Date Received..:**	10/17/05 13:45	**MS Run #.....:**	
Prep Date.....:	10/18/05	**Analysis Date..:**	11/07/05		
Prep Batch #...:	5291275	**Analysis Time..:**	23:08		
Dilution Factor:	1	**Initial Wgt/Vol:**	1000 mL	**Final Wgt/Vol..:**	1 mL
Analyst ID.....:	003200	**Instrument ID..:**	MSD7		
		Method.....:	SW846 8270C SIM		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Naphthalene	ND	0.20	ug/L	0.038
Acenaphthylene	ND	0.20	ug/L	0.035
Acenaphthene	ND	0.20	ug/L	0.038
Fluorene	ND	0.20	ug/L	0.036
Phenanthrene	ND	0.20	ug/L	0.041
Anthracene	ND	0.20	ug/L	0.036
Fluoranthene	ND	0.20	ug/L	0.027
Pyrene	ND	0.20	ug/L	0.024
Benzo(a)anthracene	ND	0.20	ug/L	0.022
Chrysene	ND	0.20	ug/L	0.034
Benzo(b)fluoranthene	ND	0.20	ug/L	0.042
Benzo(k)fluoranthene	ND	0.20	ug/L	0.060
Benzo(a)pyrene	ND	0.20	ug/L	0.076
Indeno(1,2,3-cd)pyrene	ND	0.20	ug/L	0.10
Dibenzo(a,h)anthracene	ND	0.20	ug/L	0.15
Benzo(ghi)perylene	ND	0.20	ug/L	0.12

SW846 8270C SIM METHOD BLANK SUMMARY

BLANK WORKORDER NO.: HM0R91AA

Lab Name: Severn Trent Laboratories, Inc.

Lab Code: STLPIT

SDG Number:

Lab File ID: M1107S06.

Lot Number: C5J170196

Date Analyzed: 11/07/05

Time Analyzed: 19:32

Matrix: WATER

Date Extracted:10/18/05

GC Column: DB5MS ID: .25

Extraction Method:

Instrument ID: MSD7

Level:(low/med) LOW

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, LCS, LCSD, MS , MSD:

	CLIENT ID.	SAMPLE WORK ORDER #	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	W1-1005	HMW8C1AC	M1107S07.	11/07/05	19:59
02	W2-1005	HMW8W1AC	M1107S08.	11/07/05	20:26
03	W3-1005	HMW801AC	M1107S09.	11/07/05	20:53
04	W4-1005	HMW841AC	M1107S10.	11/07/05	21:20
05	W5-1005	HMW861AC	M1107S11.	11/07/05	21:47
06	W6-1005	HMW871AC	M1107S12.	11/07/05	22:14
07	W7-1005	HMW881AC	M1107S13.	11/07/05	22:41
08	W8-1005	HMW9A1AC	M1107S14.	11/07/05	23:08
09					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					

COMMENTS:

METHOD BLANK REPORT

GC/MS Semivolatiles

Client Lot #...: C5J170196	**Work Order #...:** HM0R91AA	**Matrix.....:** WATER
MB Lot-Sample #: C5J180000-275		
	Prep Date.....: 10/18/05	**Analysis Time..:** 19:32
Analysis Date..: 11/07/05	**Prep Batch #...:** 5291275	**Final Wgt/Vol..:** 1 mL
Dilution Factor: 1	**Initial Wgt/Vol:** 1000 mL	**Instrument ID..:** MSD7
	Analyst ID.....: 003200	

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD
Naphthalene	ND	0.20	ug/L	SW846 8270C SIM
Acenaphthylene	ND	0.20	ug/L	SW846 8270C SIM
Acenaphthene	ND	0.20	ug/L	SW846 8270C SIM
Fluorene	ND	0.20	ug/L	SW846 8270C SIM
Phenanthrene	ND	0.20	ug/L	SW846 8270C SIM
Anthracene	ND	0.20	ug/L	SW846 8270C SIM
Fluoranthene	ND	0.20	ug/L	SW846 8270C SIM
Pyrene	ND	0.20	ug/L	SW846 8270C SIM
Benzo(a)anthracene	ND	0.20	ug/L	SW846 8270C SIM
Chrysene	ND	0.20	ug/L	SW846 8270C SIM
Benzo(b)fluoranthene	ND	0.20	ug/L	SW846 8270C SIM
Benzo(k)fluoranthene	ND	0.20	ug/L	SW846 8270C SIM
Benzo(a)pyrene	ND	0.20	ug/L	SW846 8270C SIM
Indeno(1,2,3-cd)pyrene	ND	0.20	ug/L	SW846 8270C SIM
Dibenzo(a,h)anthracene	ND	0.20	ug/L	SW846 8270C SIM
Benzo(ghi)perylene	ND	0.20	ug/L	SW846 8270C SIM

NOTE(S):

Calculations are performed before rounding to avoid round-off errors in calculated results.

FORM 8
SEMIVOLATILE INTERNAL STANDARD AREA AND RT SUMMARY

Lab Name: STL-PITTSBURGH Contract:

Lab Code: STLPIT Case No.: SAS No.: SDG No.: C5J170196

Lab File ID (Standard): M1107NCC Date Analyzed: 11/07/05

Instrument ID: MSD7 Time Analyzed: 1650

		IS1 (DCB) AREA #	RT #	IS2 (NPT) AREA #	RT #	IS3 (ANT) AREA #	RT #
	12 HOUR STD	89776	4.83	278922	6.27	166788	8.83
	UPPER LIMIT	179552	5.33	557844	6.77	333576	9.33
	LOWER LIMIT	44888	4.33	139461	5.77	83394	8.33
	CLIENT SAMPLE NO.						
01	INTRA-LAB BL	128550	4.83	417382	6.26	247197	8.82
02	W1-1005	129322	4.83	407085	6.26	238945	8.82
03	W2-1005	131297	4.83	397600	6.27	239898	8.83
04	W3-1005	138200	4.83	408797	6.27	243976	8.83
05	W4-1005	124369	4.83	389775	6.25	235778	8.82
06	W5-1005	135726	4.83	423188	6.25	254123	8.82
07	W6-1005	142026	4.83	418033	6.27	252275	8.83
08	W7-1005	129222	4.81	402132	6.25	238797	8.82
09	W8-1005	133497	4.83	400844	6.27	239822	8.83
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							

IS1 (DCB) = 1,4-Dichlorobenzene-d4
IS2 (NPT) = Naphthalene-d8
IS3 (ANT) = Acenaphthene-d10

AREA UPPER LIMIT = +100% of internal standard area
AREA LOWER LIMIT = - 50% of internal standard area
RT UPPER LIMIT = + 0.50 minutes of internal standard RT
RT LOWER LIMIT = - 0.50 minutes of internal standard RT

Column used to flag internal standard area values with an asterisk.
* Values outside of QC limits.

FORM 8
SEMIVOLATILE INTERNAL STANDARD AREA AND RT SUMMARY

Lab Name: STL-PITTSBURGH Contract:

Lab Code: STLPIT Case No.: SAS No.: SDG No.: C5J170196

Lab File ID (Standard): M1107NCC Date Analyzed: 11/07/05

Instrument ID: MSD7 Time Analyzed: 1650

		IS4(PHN) AREA #	RT #	IS5(CRY) AREA #	RT #	IS6(PRY) AREA #	RT #
	12 HOUR STD	298050	11.37	320530	16.14	308807	18.61
	UPPER LIMIT	596100	11.87	641060	16.64	617614	19.11
	LOWER LIMIT	149025	10.87	160265	15.64	154404	18.11
	CLIENT SAMPLE NO.						
01	INTRA-LAB BL	423258	11.35	452643	16.13	438626	18.59
02	W1-1005	414512	11.35	447439	16.13	419495	18.59
03	W2-1005	421559	11.37	444940	16.14	418358	18.62
04	W3-1005	424974	11.37	466141	16.14	445186	18.61
05	W4-1005	417159	11.35	456419	16.14	434588	18.60
06	W5-1005	433266	11.37	458518	16.14	425701	18.60
07	W6-1005	437253	11.37	464919	16.14	438956	18.61
08	W7-1005	414814	11.35	441159	16.13	411711	18.59
09	W8-1005	420839	11.37	451403	16.14	418698	18.61
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							

IS4 (PHN) = Phenanthrene-d10
IS5 (CRY) = Chrysene-d12
IS6 (PRY) = Perylene-d12

AREA UPPER LIMIT = +100% of internal standard area
AREA LOWER LIMIT = - 50% of internal standard area
RT UPPER LIMIT = + 0.50 minutes of internal standard RT
RT LOWER LIMIT = - 0.50 minutes of internal standard RT

Column used to flag internal standard area values with an asterisk.
* Values outside of QC limits.

Appendix C

Fluoride Interlaboratory Study Report

Fjarðaál Fluoride Intercomparison Study

Fjarðaál Smelter Project
Reyðarfjörður, IS

Prepared by:

The RETEC Group, Inc.
4075 Monroeville Boulevard
Building II, Suite 400
Monroeville, Pennsylvania 15146

RETEC Project Number: BECH1-18321-518

Prepared for:

Lucy Martin
Bechtel Overseas Corporation
1500 rue University, Suite 400
Montreal, Quebec
CANADA H3A 3S7

Pat Grover
Alcoa
6603 W. Broad St.
Richmond, VA 23230

September 30, 2005

Fjarðaál Fluoride Intercomparison Study

Fjarðaál Smelter Project
Reyðarfjörður, IS

Prepared by:

The RETEC Group, Inc.
4075 Monroeville Boulevard
Building II, Suite 400
Monroeville, Pennsylvania 15146

RETEC Project Number: BECH1-18321-518

Prepared for:

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Bechtel Overseas Corporation
1500 rue University, Suite 400
Montreal, Quebec
CANADA H3A 3S7

Pat Grover
Alcoa
6603 W. Broad St.
Richmond, VA 23230

September 30, 2005

Table of Contents

List of Tables

1 Project Description

The Environmental Impact Assessment and the Operating License for the Fjarðaál Smelter requires a baseline survey and on-going monitoring of the environment for signs of impact from air emissions resulting from primary aluminum smelting at the Fjarðaál Smelter, located adjacent to Reyðarfjörður in Fjardabyggd, Iceland. The scope of work for the baseline survey and on-going monitoring includes the collection of soil, water, and vegetation samples for the analysis of the air pollutants commonly associated with aluminum smelting and a survey for signs of chemical exposure and toxicity to plant species and plant communities.

The objective of the assessment is to develop a data set, prior to the Smelter startup, which accurately describes the concentrations of the naturally occurring and anthropogenic chemicals in the environment that could, at a later date, be associated with aluminum smelter emissions. The goal of the External Environmental Monitoring Program is to protect human health and the environment.

An External Environmental Monitoring Work Plan was developed that describes the strategies and methodologies that will be implemented to determine the environmental conditions in the area-wide setting of the smelter prior to start up. The work plan also describes the baseline survey and on-going monitoring of snow, soil, water, and vegetation for the analysis of fluoride and other airborne pollutants commonly associated with aluminum smelting.

The purpose of this Fluoride Intercomparison Study is to evaluate the performance of the laboratories that will be handling and analyzing the samples. This study was designed to measure the laboratories' accuracy and precision capabilities in analyzing fluoride from a variety of vegetation matrices, including samples with known concentrations. The data generated from this study are intended to demonstrate the ability of the primary and referee laboratory to conform to uniform quality assurance standards.

The samples collected from the baseline survey and the on-going monitoring will be submitted to the primary laboratory for analysis. As a quality assurance check, 5% to 10% of the samples will also be submitted to a referee laboratory for analysis. Both the primary and referee laboratories are designated below.

2 Study Parameters

Two laboratories were chosen to participate in the study: Technological Institute of Iceland (IceTec), the primary lab, and Environmental Strategies, Incorporated (ESI), the referee lab.

IceTec
Technological Institute of Iceland
Keldnaholt
IS - 112 Reykjavik
Iceland

ESI
Box 1039, Suite 285
95 Brown Road
Ithaca, New York 14850

Samples of vegetation, forage, grass, loblolly pine, baled hay, and pasture grass were initially prepared and characterized by the Boyce Thompson Institute for Plant Research at Cornell University. The samples were re-homogenized for this study, split, and submitted to each laboratory with two fluoride standard reference materials (SRMs), one high level and one low level, from the National Institute of Standards and Technology (NIST).

Each laboratory received an identical set of samples to be analyzed. Prior to analysis, both labs prepared the samples using the alkali fusion digestion method, which extracts fluoride from the vegetation samples. After the extraction, IceTec measured the fluoride concentrations using an ion selective electrode, which is a potentiometric method. ESI measured the fluoride concentrations using a spectrophotometer, which is a colorimetric method that measures light absorbance at a wavelength of 624 nanometers.

3 Data Analysis

The table below shows the results reported by both laboratories from the samples that were prepared by NIST and Cornell University. All sample results are in micrograms per gram of dry sample. The relative percent difference (RPD) as shown in Table 1-1 below shows the difference between each result as compared to their respective mean.

Table 3-1

Sample	IceTec Results (ug/g)	ESI Results (ug/g)	RPD (%)
Forage	16.3	20	20
NIST SRM (high)	287	283	1.4
Grass	39.2	40	2.0
Loblolly Pine	104.7	95	9.7
NIST SRM (low)	67.2	64	4.9
Baled hay	3	3	<1
Hay (ES) Std.	17	19	11
Pasture grass	30.1	30	<1

Evaluation of the data produced from this study will help determine if the primary and referee laboratories can accurately and precisely perform the analysis. The RPD in the above table will show that both laboratories reported similar values for each of the samples delivered, as noted by a low RPD.

The NIST standard samples (SRM Number 2695) consisted of two samples of dried and powdered timothy grass, one each at a high and low fluoride level. The SRMs were analyzed to assess data accuracy.

Table 3-2

NIST SRM 2695	IceTec Results (ug/g)	ESI Results (ug/g)	NIST-Certified Value (ug/g)	95% Tolerance Interval (ug/g)
NIST High Std.	287	283	277	250 - 304
NIST Low Std.	67.2	64	64.0	55.6 - 72.4

Table 2-1 shows that both laboratories successfully measured the fluoride in the NIST SRM. The 95% tolerance intervals include both material variability and measurement error. The intervals cover the true concentration of fluoride in 95% of the samples with 95% confidence. Both reported values within 5% for each respective certified concentration, and were within the 95% confidence interval for the SRM.

Statistical analysis was performed on both data sets to determine how different each was from the other. There is no basis to assume that there may be a significant difference (i.e., high or low bias between the groups) since a two tailed model was used. The T-test (Two Sample Assuming Unequal Variances) was done to determine if the means of both data sets are statistically different. The tested hypothesis is that both data sets are not different and are statistically similar based on their means.

The results of the T-test are presented below in Table 3-1.

Table 3-3

Statistic	ESI	IceTec
Mean	70.5625	69.25
Variance	8717.248	8302.214
Observations	8	8
-	-	-
Degrees of Freedom	14	-
t Stat	0.028456	-
P(T<=t) two tail	0.9777	-
t Critical two tail	2.144789	-
alpha	0.05	-
p value	0.9777	-

The t value calculated for the comparison was 0.028456, which is less than the t critical value of 2.144. Also, when the p value is compared to alpha, we find the p value to be greater.

4 Conclusion

Based on the RPD data shown in Table 1-1, it can be concluded that there is little difference between the data sets reported, and the methods used to measure the fluoride concentrations. None of the RPDs between the results were greater than 20%. This evaluation shows that, at the sample concentrations provided, both laboratories and methods share a similar degree of accuracy and precision.

NIST SRMs were distributed to test both laboratories' ability to analyze and report a known concentration, which served as the "reality" check. Both laboratories, using different techniques of analysis, successfully measured and reported concentrations for the SRMs that were within the 95% tolerance intervals.

The results of the T-test showed t Stat was less than t Critical and the p Value was greater than alpha. As a result, with 95% confidence, the original hypothesis that both data sets are not different and are statistically similar based on their means, should not be rejected. Both laboratories have demonstrated their capability to measure fluoride in vegetation samples using their respective determinative methods with a high degree of accuracy and precision.

Appendix D

Analytical Laboratory Data Quality and Usability Report

2004 Data Quality and Usability Report

Data Usability Summary Report

DATE: November 30, 2005

TO: Lucy Martin
Bechtel Overseas Corporation
1500 rue University, Suite 400
Montreal, Quebec Canada
H3A 3S7

FROM: Gregory A. Malzone, Jon Livingston
Data Validators

SUBJECT: Fjardaal Smelter Project 2004 Data Evaluation

Data Validation:

Participating Laboratories:

IceTek,
Center of Chemical Analysis
Keldnaholt, 112
Reykjavik, IS

OMEGAM(subcontractor)
Amsterdam, Holland

Overview

A series of vegetation, soil, water, and snow samples were collected for the background study for the Fjardaal Smelter Project. The following samples were collected in 2004.

Vegetation : Conifer and Broadleaf, Vegetables, and Grass					
Field Sample ID	**Lab Sample ID**	**Sample Date**	**Field Sample ID**	**Lab Sample ID**	**Sample Date**
CN1904	75401	9/13/2004	V1904[6]	79161	9/13/2004
CN3904	75402	9/13/2004	V2904[5]	79162	9/14/2004
CN4904	75403	9/13/2004	V2904[6]	79163	9/14/2004
CN5904	75404	9/13/2004	V3904[3]	79164	9/14/2004
CN6904	75405	9/13/2004	V3904[4]	79165	9/14/2004
CN8904	75406	9/14/2004	V4904	79166	9/15/2004
CN9904	75407	9/14/2004	V5904[5]	79167	9/21/2004
CN10904	75408	9/14/2004	V5904	79168	9/21/2004
CN11904	75410	9/14/2004	V6904[3]	79169	9/21/2004
CN12904	75411	9/15/2004	V6904[4]	79170	9/21/2004
CP1904	75412	9/13/2004	V7904	79171	9/21/2004
CP3904	75413	9/13/2004	V7904[5]	79172	9/21/2004
CP4904	75414	9/13/2004	V7904[6]	79173	9/21/2004
CP5904	75415	9/13/2004	V8904[5]	79174	9/21/2004
CP6904	75416	9/13/2004	V8904[4]	79175	9/21/2004
CP8904	75417	9/14/2004	V8904[3]	79176	9/21/2004
CP9904	75418	9/14/2004	V8904[6]	79177	9/21/2004
CP10904	75419	9/14/2004	V9904[4]	79178	9/21/2004
CP11904	75420	9/14/2004	G1904	75451	9/13/2004
CP12904	75421	9/15/2004	G2904	75452	9/13/2004
BL1904	75422	9/13/2004	G3904	75453	9/14/2004
BL2904	75423	9/13/2004	G4904	75454	9/14/2004
BL3904	75424	9/14/2004	G5904	75455	9/14/2004
BL4904	75425	9/14/2004	G6904	75456	9/14/2004
BL5904	75426	9/14/2004	G7904	75457	9/15/2004
BL6904	75427	9/14/2004	G8904	75458	9/21/2004
BL7904	75428	9/15/2004	G9904	75459	9/21/2004
BL8904	75429	9/21/2004	G10904	75460	9/21/2004
BL9904	75430	9/21/2004	G11904	75461	9/21/2004
BL11904	75431	9/21/2004	G12904	75462	9/21/2004
V1904[1]	79157	9/13/2004	G13904	75463	9/21/2004
V1904[2]	79158	9/13/2004	G14904	75464	9/21/2004
V1904[3]	79159	9/13/2004	G15904	75465	9/21/2004
V1904[4]	79160	9/13/2004	G16904	75466	9/22/2004
V1904[5]	79161	9/13/2004	G17904	75467	9/22/2004

Strawberries[1] ; strawberry leaves[2] ; rhubarb[3] ; rhubarb leaves[4] ; potatoes[5] ; potato leaves[6]

Vegetation : Conifer and Broadleaf, Vegetables, and Grass					
Field Sample ID	**Lab Sample ID**	**Sample Date**	**Field Sample ID**	**Lab Sample ID**	**Sample Date**
G18904	75468	9/22/2004	G25904	75475	9/22/2004
G19904	75469	9/22/2004	G26904	75476	9/22/2004
G20904	75470	9/22/2004	G27904	75477	9/23/2004
G21904	75471	9/22/2004	G28904	75478	9/23/2004
G22904	75472	9/22/2004	G29904	75479	9/23/2004
G23904	75473	9/22/2004	G30904	75460	9/23/2004
G24904	75474	9/22/2004			

Soil					
Field Sample ID	**Lab Sample ID**	**Sample Date**	**Field Sample ID**	**Lab Sample ID**	**Sample Date**
S11104	79115	10/8/2004	S61104	79120	10/8/2004
S21104	79116	10/8/2004	S71104	79121	10/8/2004
S31104	79117	10/8/2004	S81104	79122	10/8/2004
S41104	79118	10/8/2004	S91104	79123	10/8/2004
S51104	79119	10/8/2004	S101104	79124	10/8/2004

Water and Snow					
Field Sample ID	**Lab Sample ID**	**Sample Date**	**Field Sample ID**	**Lab Sample ID**	**Sample Date**
W11004[1]	75391	10/26/2005	SW1105	78918	1/28/2005
W21004[2]	75392	10/26/2005	SW2105	78919	1/28/2005
W31004[3]	79393	10/26/2005	SW3105	78920	1/28/2005
W41004[4]	79394	10/26/2005	SO1105	78921	1/28/2005
W51004[5]	79395	10/26/2005	SO2105	78922	1/28/2005
W61004[6]	79396	10/26/2005	SO3105	78923	1/28/2005
W71004[7]	79397	10/26/2005	SO2105	79285	2/28/2005
W81004[8]	79398	10/26/2005	SO3105	79286	2/28/2005

Ljósá[1] ; Grjótá[2] ; Norðurá[3] ; Njörvadalsá[4] ; TAP Water Eskifjörður[5] ; Vatnsból Eskifjörður[6] ; TAP Water Reyðarfjörður[7] Vatnsból Reyðarfjörður[8]

The vegetation samples were analyzed by IceTek, IS for the following:

- Fluoride by Alkaline Fusion, ISE, specified by project
- Nitrogen(Dumas analysis) by thermoconductive detection after combustion
- Sulfur by EPA 6010B
- Trace Metals by USEPA SW846 6010B, 7470A, 6020, 200.7, 200.8

The soil samples were analyzed by IceTek for the following:

- Fluoride by BS1377/1990, Part 3, Extract, ISE
- Chloride by BS1377/1990, Part 3, Tecator AN 63/83
- Sulfate by BS1377/1990, Part 3, EMEP/CCC 1/95, Rev. 1996
- pH by BS1377/1990, Part 3 SMW&W 4500
- Percent Solids

The aqueous and snow samples were analyzed by IceTek for the following:

- Fluoride by SMW&W 4500, ISE
- Chloride by Tecator AN 63/83
- Sulfate by EMEP/CCC 1/95, Rev. 1996
- pH by SMW&W 4500
- Alkalinity by SMW&W2320.b
- Trace Metals by EPA SW846 6010B, 7470A, 6020, 200.7, 200.8

Aqueous and snow samples were subcontracted to OMEGAM, Amsterdam, Holland for the following analysis:

- Semivolatile analysis (PAHs) using HPLC with both UV and fluorescence detection according to method NEN6524.

Summary

Data quality for the organic analyses was evaluated by reviewing the hold times and method of analysis.

Inorganic data quality was evaluated by reviewing the following parameters: holding times, laboratory control standards, laboratory and/or field blanks, and analyte quantitation.

The data summary pages attached as Appendix A of this report were revised to include the data validation qualifiers. All USEPA-defined data qualifiers and changes made by the data evaluators were added in red ink. A glossary of data qualifier definitions is included as Attachment 1 of this report.

For the vegetation, soil, and aqueous samples, all of the data received from the laboratory were usable, with some qualification. The nondetect, aqueous PAH results were rejected as unusable because the holding time was grossly exceeded. Completeness of the data set is 76%. Each specific issue of concern with respect to data usability is addressed below.

Semivolatile Organic Compounds (PAHs)

The water and snow samples collected for PAH analysis were subcontracted to two different laboratories, making it difficult to evaluate sample integrity and temperatures upon receipt. There were no chains of custody showing the dates of receipt to either lab. Evaluation of holding time was limited to the date of analysis, which was within the method specified 40 days. No qualifications were assigned based on sample temperatures or holding times.

The method used to analyze PAHs was inconsistent with project quality manual that specifies analysis by GC/MS in SIM mode, USEPA8270C SIM or comparable. Instead, OMEGAM used a HPLC method and was unable to meet the contract required detection limits. Due to a lack of sensitivity, all non-detected compounds for all samples analyzed were qualified as unreliable and unusable “R.”

Quality control samples, including but not limited to laboratory control samples, method blanks, continuing calibration standards, initial calibration data, matrix spikes, duplicate analysis, and sample chromatograms were not included with the data received by RETEC. Therefore, it was not possible to determine the quality of the data submitted by OMEGAM. All positive results were qualified as estimates “J.”

Total Trace Metals

Water: The potassium results were qualified due to an elevated reporting limit for unknown reasons. All the results were nondetect and qualified with "UJ" as estimates. Chromium recovered less than lower CRM limit of 90% in the certified check standard. The results for chromium were qualified "J" and "UJ" as estimated and bias low due to a low standard recovery. Lead recovered less than the lower CRM limit of 90% in the certified check standard. The results for lead were qualified "J-" and "UJ" as estimated and bias low due to the low recovery. There were no CRM limits established for mercury, but the results were qualified based on the 90-110% CRM recovery limits. The results for mercury were all nondetect and qualified as estimated and biased low "UJ."

Vegetation: The results for nickel, lead, and vanadium could not be qualified based on the CRM values. The CRM concentrations were less than the levels of detection (LODs). All positive results reported between the LODs and the limits of quantitation (LOQs) were qualified as estimated "J" because of uncertainty near the detection limit.

Fluoride, Nitrogen, and Sulfur

Vegetation: The results for nitrogen and sulfur were evaluated based on holding times and CRM percent recovery. Fluoride results were evaluated based on CRM percent recovery. All positive results that were reported between the LOD and the LOQ were qualified as estimated "J" because of uncertainty near the detection limit.

General Chemistry

Water: Fluoride, chloride, and sulfate were evaluated based on holding times and CRM percent recoveries. All positive results for fluoride, chloride, and sulfate were qualified "J-" as estimated and biased low due to the holding times exceeding the method specifications.

Soil: Fluoride, chloride, and sulfate were evaluated based on holding times. All positive results were qualified "J-" as estimated bias low based on holding time exceedences. All nondetect results we qualified as "UJ" as estimates, biased low. All of the pH data was qualified as rejected "R" because the holding time was grossly exceeded for soil pH.

Notes

Organic and inorganic results were adjusted based on sample aliquots and required dilutions. The soil and vegetation sample results were reported on a dry weight basis.

Positive organic results less than the reporting limits, but greater than the method detection limits (MDLs) were qualified "J," as estimated concentrations, by the validator due to uncertainty near the detection limit.

Inorganic concentrations, estimated between the LODs and the LOQs, were flagged "J" by the validator because of the variability below the LOQ. Certified Reference Materials were analyzed instead of matrix spike and matrix spike duplicates. CRM acceptance limits, for the purpose of data assessment, were established at 90-100%.

Data were validated according to method specifications and the *USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review*, EPA540/R-99/008, October 1999 and *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review*, EPA540-R-04-004, October 2004, as they apply to the analytical methods employed.

Attachments

1. Glossary of USEPA-defined data qualifier codes.

Appendices

1. Appendix A – Data Summary Reports

Attachment 1 of 1

Glossary of Data Qualifier Codes

GLOSSARY OF DATA QUALIFIER CODES

U	-	The analyte was analyzed for, but was not detected above the level of the reported samples quantitation limit.
J	-	The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.
J-	-	The result is an estimated quantity, likely to be biased low. The associated numerical value is the approximate concentration of the analyte in the sample.
J+	-	The result is an estimated quantity, likely to be biased high. The associated numerical value is the approximate concentration of the analyte in the sample.
UJ	-	The analyte was analyzed for, but was not detected. The reported quantitation limit is approximated and may be inaccurate or imprecise.
R	-	The data are unusable. The sample results are rejected due to serious deficiencies in the ability to meet quality control criteria. The presence or absence of the analyte cannot be verified.

Appendix A

Data Summary Reports

efnagreiningar
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FJARÐAÁL EXTERNAL ENVIRONMENTAL MONITORING
PROJECT NO. 6EM4185
CCA, IceTec

F, N, S

Conifer and broadleaf

E- nr.	Marking	Marking	Date of sampling	No.cont.	Fluoride µg/g	Nitrogen % wt.	Sulfur mg/g
75401	**CN1**	904	13.9.2004	1	<3	1,11	0,74
75402	**CN3**	904	13.9.2004	1	<3	1,26	1,15
75403	**CN4**	904	13.9.2004	1	<3	1,22	0,70
75404	**CN5**	904	13.9.2004	1	<3	1,35	1,01
75405	**CN6**	904	13.9.2004	1	<3	1,17	0,90
75406	**CN8**	904	14.9.2004	1	<3	1,48	1,11
75407	**CN9**	904	14.9.2004	1	<3	1,42	0,84
75408	**CN10**	904	14.9.2004	1	<3	1,20	0,74
75409	**CN11**	904	14.9.2004	1	<3	1,19	0,83
75410	**CN12**	904	15.9.2004	1	<3	1,63	1,14
75411	**CP1**	904	13.9.2004	1	<3	1,01	0,69
75412	**CP3**	904	13.9.2004	1	<3	1,29	0,73
75413	**CP4**	904	13.9.2004	1	<3	1,06	0,57
75414	**CP5**	904	13.9.2004	1	<3	1,28	0,89
75415	**CP6**	904	13.9.2004	1	<3	1,38	1,09
75416	**CP8**	904	14.9.2004	1	<3	0,61	0,47
75417	**CP9**	904	14.9.2004	1	<3	1,25	1,01
75418	**CP10**	904	14.9.2004	1	4 J	0,79	0,49
75419	**CP11**	904	14.9.2004	1	<3	0,93	0,57
75420	**CP12**	904	15.9.2004	1	<3	1,30	0,82
75421	**BL1**	904	13.9.2004	1	<3	1,99	1,24
75422	**BL2**	904	13.9.2004	1	<3	1,62	1,07
75423	**BL3**	904	14.9.2004	1	<3	2,82	1,71
75424	**BL4**	904	14.9.2004	1	<3	2,22	0,86
75425	**BL5**	904	14.9.2004	1	3 J	1,58	1,09
75426	**BL6**	904	14.9.2004	1	<3	1,85	1,03
75427	**BL7**	904	15.9.2004	1	21	2,06	1,04
75428	**BL8**	904	21.9.2004	1	<3	1,76	1,17
75429	**BL9**	904	21.9.2004	1	<3	2,33	1,34
75430	**BL11**	904	21.9.2004	1	<3	2,49	1,33
			LOD		3	0,05	0,05
			LOQ		10	0,2	0,17

GBW07604	Poplar leaves	Certified	22+-4	2,56+-0,04	0,35+-0,03
GBW07604	Poplar leaves	Found	23+-3	2,59	0,31
BCR129	Hay powder	Certified		3,72+-0,04	3,16+-0,04
BCR129	Hay powder	Found		3,63	3,2

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FJARÐAÁL EXTERNAL ENVIRONMENTAL MONITORING
PROJECT NO. 6EM4185
CCA, IceTec

Trace metals

Conifer and broadleaf

E- nr.	Marking	Marking	Date of sampling	No.cont.	Cu ug/g	Ni ug/g	Pb ug/g	V ug/g
75401	**CN1**	904	13.9.2004	1	4 J	6 J	<16	<4
75402	**CN3**	904	13.9.2004	1	4 J	<4	<16	<4
75403	**CN4**	904	13.9.2004	1	4 J	<4	<16	<4
75404	**CN5**	904	13.9.2004	1	5 J	<4	<16	<4
75405	**CN6**	904	13.9.2004	1	8 J	8 J	<16	<4
75406	**CN8**	904	14.9.2004	1	6 J	6 J	<16	<4
75407	**CN9**	904	14.9.2004	1	<4	5 J	<16	<4
75408	**CN10**	904	14.9.2004	1	<4	5 J	<16	<4
75409	**CN11**	904	14.9.2004	1	4 J	6 J	<16	<4
75410	**CN12**	904	15.9.2004	1	5 J	7 J	<16	<4
75411	**CP1**	904	13.9.2004	1	5 J	<4	<16	5 J
75412	**CP3**	904	13.9.2004	1	<4	<4	<16	<4
75413	**CP4**	904	13.9.2004	1	<4	<4	<16	<4
75414	**CP5**	904	13.9.2004	1	5 J	<4	<16	<4
75415	**CP6**	904	13.9.2004	1	<4	7 J	<16	<4
75416	**CP8**	904	14.9.2004	1	<4	<4	<16	<4
75417	**CP9**	904	14.9.2004	1	<4	<4	<16	<4
75418	**CP10**	904	14.9.2004	1	<4	<4	<16	<4
75419	**CP11**	904	14.9.2004	1	<4	<4	<16	<4
75420	**CP12**	904	15.9.2004	1	5 J	<4	<16	5 J
75421	**BL1**	904	13.9.2004	1	10 J	5 J	<16	4 J
75422	**BL2**	904	13.9.2004	1	9 J	<4	<16	6 J
75423	**BL3**	904	14.9.2004	1	9 J	5 J	<16	<4
75424	**BL4**	904	14.9.2004	1	<4	<4	<16	<4
75425	**BL5**	904	14.9.2004	1	5 J	<4	<16	<4
75426	**BL6**	904	14.9.2004	1	8 J	5 J	<16	<4
75427	**BL7**	904	15.9.2004	1	5 J	5 J	<16	<4
75428	**BL8**	904	21.9.2004	1	8 J	7 J	<16	<4
75429	**BL9**	904	21.9.2004	1	10 J	10 J	<16	<4
75430	**BL11**	904	21.9.2004	1	6 J	6 J	<16	<4
				LOD	4	4	16	4
				LOQ	12	14	52	13
	GBW07604	Poplar leaves	Certified		9,3 +/- 0,5	1,9	1,5	[0,64]
	GBW07604	Poplar leaves	Found		9	< 4	< 4	< 4
	BCR129	Hay powder	Certified		10	*	*	*
	BCR129	Hay powder	Found		9	< 4	< 4	< 4

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PROJECT NO. 6EM4185
CCA, IceTec

Vegetables **F, N, S**

E- nr.	Marking	Marking	Date of sampling		No.cont.	Fluoride µg/g	Nitrogen % wt.	Sulfur mg/g
79157	V1	904	13.9.2004	strawberries	1	10	1,64	1,59
79158	V1	904	13.9.2004	strawberry leaves	1	<3	1,89	1,39
79159	V1	904	13.9.2004	rhubarb leaves	1	11	3,84	2,56
79160	V1	904	13.9.2004	rhubarb	1	<3	1,72	1,15
79161	V1	904	13.9.2004	potatoes	1	<3	1,77	1,07
79162	V1	904	13.9.2004	potato leaves	1	<3	3,98	3,24
79163	V2	904	14.9.2004	potatoes	1	<3	0,95	0,55
79164	V2	904	14.9.2004	potato leaves	1	4 J	2,88	4,27
79165	V3	904	14.9.2004	rhubarb	1	<3	0,67	0,22
79166	V3	904	14.9.2004	rhubarb leaves	1	40	3,41	2,05
79167	V4	904	15.9.2004	strawberry leaves	1	5 J	3,01	1,59
79168	V5	904	21.9.2004	potatoes	1	<3	1,74	0,64
79169	V5	904	21.9.2004	leaves (no plant type mark)	1	7 J	3,73	2,89
79170	V6	904	21.9.2004	rhubarb	1	<3	1,27	0,37
79171	V6	904	21.9.2004	rhubarb leaves	1	94	3,72	1,19
79172	V7	904	21.9.2004	(no plant type mark)	1	<3	4,10	7,14
79173	V7	904	21.9.2004	potatoes	1	<3	1,65	1,27
79174	V7	904	21.9.2004	potato leaves	1	15	4,69	5,38
79175	V8	904	21.9.2004	potatoes	1	<3	1,88	1,99
79176	V8	904	21.9.2004	rhubarb leaves	1	27	3,23	1,09
79177	V8	904	21.9.2004	rhubarb	1	<3	1,17	0,72
79178	V8	904	21.9.2004	potato leaves	1	16	4,47	4,82
79179	V9	904	21.9.2004	rhubarb leaves	1	17	3,13	1,50
				LOD		3	0,05	0,05
				LOQ		10	0,2	0,17
	GBW07604	Poplar leaves		Certified		22+-4	2,56+-0,04	0,35+-0,03
	GBW07604	Poplar leaves		Found		23+-3	2,59	0,31
	BCR129	Hay powder		Certified			3,72+-0,04	3,16+-0,04
	BCR129	Hay powder		Found			3,63	3,2

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PROJECT NO. 6EM4185
CCA, IceTec

Vegetables **Trace metals**

E- nr.	Marking	Marking	Date of sampling		No.cont.	Cu ug/g	Ni ug/g	Pb ug/g	V ug/g
79157	V1	904	13.9.2004	strawberries	1	4 J	<4	<16	5 J
79158	V1	904	13.9.2004	strawb. leaves	1	5 J	<4	<16	<4
79159	V1	904	13.9.2004	rhubarb leaves	1	7 J	<4	<16	<4
79160	V1	904	13.9.2004	rhubarb	1	5 J	<4	<16	<4
79161	V1	904	13.9.2004	potatoes	1	<4	<4	<16	<4
79162	V1	904	13.9.2004	potato leaves	1	11 J	<4	<16	10 J
79163	V2	904	14.9.2004	potatoes	1	<4	5 J	<16	<4
79164	V2	904	14.9.2004	potato leaves	1	5 J	<4	<16	7 J
79165	V3	904	14.9.2004	rhubarb	1	<4	<4	<16	<4
79166	V3	904	14.9.2004	rhubarb leaves	1	6 J	<4	<16	<4
79167	V4	904	15.9.2004	strawb. leaves	1	<4	<4	<16	<4
79168	V5	904	21.9.2004	potatoes	1	<4	<4	<16	<4
79169	V5	904	21.9.2004	leaves (no plant type mark)	1	10 J	<4	<16	8 J
79170	V6	904	21.9.2004	rhubarb	1	<4	<4	<16	<4
79171	V6	904	21.9.2004	rhubarb leaves	1	<4	<4	<16	<4
79172	V7	904	21.9.2004	(no plant type mark)	1	<4	<4	<16	<4
79173	V7	904	21.9.2004	potatoes	1	5 J	<4	<16	<4
79174	V7	904	21.9.2004	potato leaves	1	17	5 J	<16	22
79175	V8	904	21.9.2004	potatoes	1	7 J	<4	<16	<4
79176	V8	904	21.9.2004	rhubarb leaves	1	<4	<4	<16	<4
79177	V8	904	21.9.2004	rhubarb	1	<4	<4	<16	<4
79178	V8	904	21.9.2004	potato leaves	1	21	8 J	<16	16
79179	V9	904	21.9.2004	rhubarb leaves	1	4 J	<4	<16	<4
				LOD		4	4	16	4
				LOQ		12	14	52	13
	GBW07604	Poplar leaves		Certified		9,3 +/- 0,5	1,9	1,5	[0,64]
	GBW07604	Poplar leaves		Found		9	< 4	< 4	< 4
	BCR129	Hay powder		Certified		10	*	*	*
	BCR129	Hay powder		Found		9	< 4	< 4	< 4

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KELDNAHOLTI

FJARÐAÁL EXTERNAL ENVIRONMENTAL MONITORING
PROJECT NO. 6EM4185
CCA, IceTec

Grass **F, N, S**

E- nr.	Marking	Marking	Date of sampling	No.cont.	Fluoride µg/g	Nitrogen %	Sulfur mg/g
75451	G1	904	13.9.2004	1	<3	2,28	2,50
75452	G2	904	13.9.2004	1	6 J	2,50	3,25
75453	G3	904	14.9.2004	1	<3	2,09	2,26
75454	G4	904	14.9.2004	1	<3	1,33	1,55
75455	G5	904	14.9.2004	1	4 J	1,65	1,69
75456	G6	904	14.9.2004	1	4 J	1,79	1,93
75457	G7	904	15.9.2004	1	<3	3,68	3,46
75458	G8	904	21.9.2004	1	<3	1,77	1,59
75459	G9	904	21.9.2004	1	5 J	3,47	2,56
75460	G10	904	21.9.2004	1	<3	3,11	3,39
75461	G11	904	21.9.2004	1	5 J	2,38	2,50
75462	G12	904	21.9.2004	1	<3	2,56	2,28
75463	G13	904	21.9.2004	1	4 J	3,72	2,83
75464	G14	904	21.9.2004	1	<3	1,54	1,43
75465	G15	904	21.9.2004	1	<3	2,68	2,57
75466	G16	904	22.9.2004	1	<3	1,31	1,70
75467	G17	904	22.9.2004	1	<3	2,63	1,97
75468	G18	904	22.9.2004	1	<3	4,04	3,63
75469	G19	904	22.9.2004	1	3 J	1,43	1,86
75470	G20	904	22.9.2004	1	<3	1,43	1,47
75471	G21	904	22.9.2004	1	<3	1,24	1,84
75472	G22	904	22.9.2004	1	<3	1,16	2,45
75473	G23	904	22.9.2004	1	<3	1,15	1,43
75474	G24	904	22.9.2004	1	<3	1,15	1,31
75475	G25	904	22.9.2004	1	<3	1,50	1,78
75476	G26	904	22.9.2004	1	<3	2,52	1,96
75477	G27	904	23.9.2004	1	<3	2,09	1,73
75478	G28	904	23.9.2004	1	<3	1,87	1,64
75479	G29	904	23.9.2004	1	<3	1,37	1,34
75480	G30	904	23.9.2004	1	<3	2,36	2,55
			LOD		3	0,05	0,05
			LOQ		10	0,2	0,17
	GBW07604	Poplar leaves	Certified		22+-4	2,56+-0,04	0,35+-0,03
	GBW07604	Poplar leaves	Found		23+-3	2,59	0,31
	BCR129	Hay powder	Certified			3,72+-0,04	3,16+-0,04
	BCR129	Hay powder	Found			3,63	3,2

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Grass **Trace metals**

E- nr.	Marking	Marking	Date of sampling	No.cont.	Cu ug/g	Ni ug/g	Pb ug/g	V ug/g
75451	G1	904	13.9.2004	1	8 J	<4	<16	<4
75452	G2	904	13.9.2004	1	10 J	<4	<16	<4
75453	G3	904	14.9.2004	1	8 J	4,3 J	<16	<4
75454	G4	904	14.9.2004	1	5 J	<4	<16	<4
75455	G5	904	14.9.2004	1	8 J	<4	<16	<4
75456	G6	904	14.9.2004	1	6 J	<4	<16	<4
75457	G7	904	15.9.2004	1	14	<4	<16	<4
75458	G8	904	21.9.2004	1	5 J	<4	<16	<4
75459	G9	904	21.9.2004	1	8 J	<4	<16	<4
75460	G10	904	21.9.2004	1	12	<4	<16	<4
75461	G11	904	21.9.2004	1	6 J	<4	<16	<4
75462	G12	904	21.9.2004	1	7 J	<4	<16	<4
75463	G13	904	21.9.2004	1	13	<4	<16	<4
75464	G14	904	21.9.2004	1	<4	<4	<16	<4
75465	G15	904	21.9.2004	1	6 J	<4	<16	<4
75466	G16	904	22.9.2004	1	<4	<4	<16	<4
75467	G17	904	22.9.2004	1	7 J	<4	<16	<4
75468	G18	904	22.9.2004	1	18	<4	<16	<4
75469	G19	904	22.9.2004	1	5 J	<4	<16	<4
75470	G20	904	22.9.2004	1	<4	<4	<16	<4
75471	G21	904	22.9.2004	1	<4	<4	<16	<4
75472	G22	904	22.9.2004	1	<4	<4	<16	<4
75473	G23	904	22.9.2004	1	<4	<4	<16	<4
75474	G24	904	22.9.2004	1	<4	<4	<16	<4
75475	G25	904	22.9.2004	1	4 J	<4	<16	<4
75476	G26	904	22.9.2004	1	8 J	5,1 J	<16	<4
75477	G27	904	23.9.2004	1	<4	<4	<16	<4
75478	G28	904	23.9.2004	1	<4	<4	<16	<4
75479	G29	904	23.9.2004	1	5 J	<4	<16	4,7 J
75480	G30	904	23.9.2004	1	9 J	<4	<16	<4
				LOD	4	4	16	4
				LOQ	12	14	52	13
GBW07604	Poplar leaves		Certified		9,3 +/- 0,5	1,9	1,5	[0,64]
GBW07604	Poplar leaves		Found		9	< 4	< 4	< 4
BCR129	Hay powder		Certified		10	*	*	*
BCR129	Hay powder		Found		9	< 4	< 4	< 4

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Soil **Various measurements**

E- nr.	Marking	Marking	Date of sampling	No.cont.
79115	S1	1104	8.10.2004	1
79116	S2	1104	8.10.2004	1
79117	S3	1104	8.10.2004	1
79118	S4	1104	8.10.2004	1
79119	S5	1104	8.10.2004	1
79120	S6	1104	8.10.2004	1
79121	S7	1104	8.10.2004	1
79122	S8	1104	8.10.2004	1
79123	S9	1104	8.10.2004	1
79124	S10	1104	8.10.2004	1

		F-	SO4S	Cl-	pH	Dry matter	% sample	% dry matter
		mg/kg d.m.	mg/kg d.m.	mg/kg d.m.		% wt.	> 2 mm	> 2 mm
79115	S1	0,09 J-	285 J-	28 J-	~~5,83~~ R	41,8	5,8%	13,9%
79116	S2	~~< 0,06~~ UJ	460	105	~~6,36~~	23,3	EM	EM
79117	S3	~~< 0,06~~	226	41	~~5,83~~	51,9	13,5%	25,9%
79118	S4	~~< 0,06~~	273	52	~~5,30~~	31,0	EM	EM
79119	S5	~~< 0,06~~	45	33	~~6,91~~	56,8	7,0%	12,3%
79120	S6	~~< 0,06~~	49	18	~~6,48~~	65,5	3,7%	5,7%
79121	S7	~~< 0,06~~	74	13	~~6,41~~	63,8	9,0%	14,1%
79122	S8	~~< 0,06~~	60	9,6	~~6,46~~	75,0	12,2%	16,3%
79123	S9	~~< 0,06~~	92	21	~~6,27~~	61,6	2,4%	3,8%
79124	S10	~~< 0,06~~	142	21	~~6,02~~	54,9	2,4%	4,3%
	LOD	0,06	8	0,6				
	LOQ	0,21	25	1,9				

No comparable certified sample of comparable matrix available

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Water **Various measurements**

E- nr.	Marking	Marking	Date of sampling	No.cont.	Sample name
75391	W1	1004	26.10.2004	4	Ljósá 26.10.04
75392	W2	1004	26.10.2004	4	Grjótá 26.10.04
75393	W3	1004	26.10.2004	4	Norðurá 26.10.04
75394	W4	1004	26.10.2004	4	Njörvadalsá 26.10.04
75395	W5	1004	26.10.2004	4	TAP Water Eskifjörður 26.10.04
75396	W6	1004	26.10.2004	4	Vatnsból Eskifjörður 26.10.04
75397	W7	1004	26.10.2004	4	TAP Water Reyðarfjörður 26.10.04
75398	W8	1004	26.10.2004	4	Vatnsból Reyðarfjörður26.10.04

		F	SO4-S	Cl	pH	Conductance	Alkalinity
		µg/L	mg/L	mg/L		µS/cm	*mg CaCO3/L*
75391	W1	14 J-	0,41 J-	3,60 J-	7,53	66,5	18,1
75392	W2	12	0,30	2,90	7,42	39,8	12,7
75393	W3	12	0,29	3,30	7,43	49,4	17,4
75394	W4	11	0,35	2,76	7,49	44,5	15,3
75395	W5	12	0,30	3,38	7,4	54,3	19,2
75396	W6	13	0,32	3,36	7,47	53,1	19,0
75397	W7	16	0,33	2,86	7,25	48,4	17,6
75398	W8	14	0,33	2,88	7,24	47,8	17,8
	LOD	1	0,03	0,03			
	LOQ	3	0,12	0,12			
Rain 97							
	Certified		0,53+-0,10				
	Measured		0,52				
	Measured		0,50				

		Na	K	Ca	Mg
		mg/L	mg/L	mg/L	mg/L
75391	W1	3,78	~~< 0,3~~ UJ	3,56	1,60
75392	W2	3,14	~~< 0,3~~	2,48	1,03
75393	W3	3,55	~~< 0,3~~	3,78	1,52
75394	W4	3,48	~~< 0,3~~	2,94	1,20
75395	W5	4,93	~~< 0,3~~	4,36	0,88
75396	W6	4,89	~~< 0,3~~	4,32	0,84
75397	W7	4,14	~~< 0,3~~	3,26	1,25
75398	W8	4,16	~~< 0,3~~	3,27	1,26
	LOD	0,28	0,16	0,02	0,002
	LOQ	0,94	0,54	0,06	0,008
SLRS-3 River water					
	Certified	2,3 +/- 0,2	0,7 +/- 0,1	6,0 +/- 0,4	1,6 +/- 0,2
	Measured	2,46	0,609	5,66	1,57

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Water **Trace metals and PAH**

E- nr.	Marking	Marking	Date of sampling	Sample name	No.cont.
75391	W1	1004	26.10.2004	Ljósá 26.10.04	4
75392	W2	1004	26.10.2004	Grjótá 26.10.04	4
75393	W3	1004	26.10.2004	Norðurá 26.10.04	4
75394	W4	1004	26.10.2004	Njörvadalsá 26.10.04	4
75395	W5	1004	26.10.2004	TAP Water Eskifjörður 26.10.04	4
75396	W6	1004	26.10.2004	Vatnsból Eskifjörður 26.10.04	4
75397	W7	1004	26.10.2004	TAP Water Reyðarfjörður 26.10.04	4
75398	W8	1004	26.10.2004	Vatnsból Reyðarfjörður26.10.04	4

Trace metals
ICP TOF MS*

		As µg/L	Cd µg/L	Cr µg/L	Cu µg/L	Hg µg/L	Ni µg/L	Pb µg/L	Zn µg/L
75391	W1	<1	<1	~~<1~~ UJ	1,1	~~<2~~ UJ	<10	~~<1~~ UJ	<5
75392	W2	<1	<1	1,6 J	<1	~~<2~~	<10	~~<1~~	<5
75393	W3	<1	<1	~~<1~~ UJ	1,1	~~<2~~	<10	~~<1~~	<5
75394	W4	<1	<1	~~<1~~	<1	~~<2~~	<10	~~<1~~	<5
75395	W5	<1	<1	~~<1~~	4,1	~~<2~~	<10	~~<1~~	19
75396	W6	<1	<1	~~<1~~	1,4	~~<2~~	<10	~~<1~~	7
75397	W7	<1	<1	~~<1~~	2,4	~~<2~~	<10	~~<1~~	17
75398	W8	<1	<1	~~<1~~	2,1	~~<2~~	<10	~~<1~~	13
	LOD	0,1	0,01	0,3	0,2	0,2	0,1	0,1	0,4
	LOQ	0,2	0,04	0,9	0,5	0,6	0,3	0,3	1,4
SPS-SW2 B.108									
Certified		50+-0,3	2,5+-0,02	10+-,05	100+-1	-	50+-0,3	25+-0,1	100+-1
Found in 1:10 dilution		4,7	0,24	1,1	10,6	<2	4,8	2,2	10,0

*Earlier measurement by ICP OES replaced by ICP TOF MS for better sensitivity

PAH		W1-1004	W2-1004	W3-1004	W4-1004	W5-1004	W6-1004	W7-1004	W8-1004
naftalen	µg/l	~~<0,05~~ R	~~<0,05~~ R	~~<0,05~~ R	~~<0,05~~ R	<0,05 R	~~<0,05~~ R	0,06 J	~~<0,05~~ R
acenaftylen	µg/l	~~<0,06~~	~~<0,07~~	<0,06	<0,07	<0,07	~~<0,07~~	<0,07 R	~~<0,06~~
acenaften	µg/l	~~<0,05~~	~~<0,05~~	~~<0,05~~	~~<0,05~~	<0,05	~~<0,05~~	<0,05	~~<0,05~~
fluoren	µg/l	~~<0,05~~	~~<0,05~~	~~<0,05~~	~~<0,05~~	<0,05	~~<0,05~~	<0,05	~~<0,05~~
fenantren	µg/l	~~<0,02~~	~~<0,02~~	~~<0,02~~	~~<0,02~~	<0,03	~~<0,03~~	~~<0,02~~	~~<0,02~~
antracen	µg/l	~~<0,01~~	~~<0,01~~	~~<0,01~~	~~<0,01~~	<0,01	~~<0,01~~	<0,01	~~<0,01~~
fluoranten	µg/l	~~<0,01~~	0,03 J	~~<0,01~~	~~<0,01~~	<0,01	~~<0,01~~	<0,01	~~<0,01~~
pyren	µg/l	~~<0,01~~	0,01 J	~~<0,01~~	~~<0,01~~	<0,01	~~<0,01~~	<0,01	~~<0,01~~
*bens(a)antracen	µg/l	~~<0,01~~	~~<0,01~~ R	<0,01	<0,01	~~<0,01~~	<0,01	<0,01	<0,01
*krysen	µg/l	~~<0,01~~	~~<0,01~~	~~<0,01~~	~~<0,01~~	<0,01	~~<0,01~~	<0,01	~~<0,01~~
*bens(b)fluoranten	µg/l	~~<0,02~~	~~<0,02~~	~~<0,02~~	~~<0,02~~	<0,02	~~<0,02~~	<0,02	~~<0,02~~
*bens(k)fluoranten	µg/l	~~<0,01~~	~~<0,01~~	~~<0,01~~	~~<0,01~~	<0,01	~~<0,01~~	<0,01	~~<0,01~~
*bens(a)pyren	µg/l	~~<0,01~~	~~<0,01~~	~~<0,01~~	~~<0,01~~	<0,01	~~<0,01~~	<0,01	~~<0,01~~
*dibens(ah)antracen	µg/l	~~<0,01~~	~~<0,01~~	~~<0,01~~	~~<0,01~~	<0,01	~~<0,01~~	<0,01	~~<0,01~~
benso(ghi)perylen	µg/l	~~<0,02~~	~~<0,02~~	~~<0,02~~	~~<0,02~~	<0,02	~~<0,02~~	<0,02	~~<0,02~~
*indeno(123cd)pyren	µg/l	~~<0,02~~	~~<0,02~~	~~<0,02~~	~~<0,02~~	<0,02	~~<0,02~~	<0,02	~~<0,02~~
summa 16 EPA-PAH	µg/l	~~<0,18~~	0,04 J	~~<0,18~~	~~<0,19~~	<0,20	~~<0,20~~	0,06 J	~~<0,18~~
*PAH cancerogenic	µg/l	~~<0,05~~	~~<0,05~~ R	~~<0,05~~	~~<0,05~~	<0,05	~~<0,05~~	~~<0,05~~ R	~~<0,05~~
PAH other	µg/l	~~<0,14~~	0,04 J	~~<0,14~~	~~<0,15~~	<0,15	~~<0,15~~	0,06 J	~~<0,14~~

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Snow **PAH**

E- nr.	Marking	Marking	Date of sampling	No.cont.
78918	**SW1**	105	28.1.2005	1
78919	**SW2**	105	28.1.2005	1
78920	**SW3**	105	28.1.2005	1
78921	**SO1**	105	28.1.2005	1
78922	**SO2**	105	28.1.2005	1
78923	**SO3**	105	28.1.2005	1
Sampling repeated				
79285	**SO2**	105	28.2.2005	1
79286	**SO3**	105	28.2.2005	1

PAH

		SW1-105	SW2-105	SW3-105	SO1-105	SO2-105	SO3-105	Sampling repeated SO2-105	SO3-105
naftalen	µg/l	<0.17 R	<0.17 R	<0.17 R	<0.17 R	<0.17	Sample	<0,18 R	<0,18 R
acenaftylen	µg/l	<0.25	<0.25 R	<0.25	<0.25	<0.25	container	<0,51	<0,50
acenaften	µg/l	<0.0070	0,012 J	<0.0070	<0.0070	<0.0070	broken	<0,05	<0,05
fluoren	µg/l	<0.012	0,024 J	<0.012	<0.012	<0.012	in transp.	<0,05	<0,05
fenantren	µg/l	<0.040	0,33 J	<0.040	<0.040	<0.040		<0,05	<0,05
antracen	µg/l	<0.0010	0,0074 J	<0.0010	<0.0010	<0.0010		<0,01	<0,01
fluoranten	µg/l	0,0083 J	0,21 J	<0.0050	<0.0050	<0.0050 R		<0,03	0,08 J
pyren	µg/l	<0.0050 R	0,073 J	<0.0050	<0.0050	<0.0050		<0,02	0,06 J
^bens(a)antracen	µg/l	<0.0030	0,0035 J	<0.0030	<0.0030	<0.0030		<0,03	<0,05 R
^krysen	µg/l	<0.0070	0,023 J	<0.0070	<0.0070	<0.0070		<0,02	0,09 J
^bens(b)fluoranten	µg/l	<0.0040	0,0056 J	<0.0040	<0.0040	<0.0040		<0,03	0,09 J
^bens(k)fluoranten	µg/l	<0.0020	0,0025 J	<0.0020	<0.0020	<0.0020		<0,01	<0,01 R
^bens(a)pyren	µg/l	<0.0020	0,0033 J	<0.0020	<0.0020	<0.0020		<0,01	<0,01
^dibens(ah)antracen	µg/l	<0.0020	<0.0020 R	<0.0020	<0.0020	<0.0020		<0,04	<0,04
benso(ghi)perylen	µg/l	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030		<0,09	<0,22
^indeno(123cd)pyren	µg/l	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030		<0,02	<0,02
summa 16 EPA-PAH	µg/l	0,0083 J	0,69 J	<0.30	<0.30	<0.30		<0,58	0,32 J
^PAH cancerogena	µg/l	<0.0090 R	0,038 J	<0.0090	<0.0090	<0.0090		<0,08	0,18 J
PAH övriga	µg/l	0,0083 J	0,66 J	<0.30	<0.30	<0.30		<0,50	0,14 J

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2005 Data Quality and Usability Report

Data Usability Summary Report

DATE: December 12, 2005

TO: Lucy Martin
Bechtel Overseas Corporation
1500 rue University, Suite 400
Montreal, Quebec Canada
H3A 3S7

FROM: Gregory A. Malzone, Jon Livingston
Data Validators

SUBJECT: Fjardaal Smelter Project 2005 Data Evaluation

Data Validation:

Participating Laboratories:

IceTek,
Center of Chemical Analysis
Keldnaholt, 112
Reykjavik, IS

Severn Trent Laboratories, Inc.
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Overview

A series of vegetation, soil, water, and snow samples were collected from the Fjardaal Smelter site as part of the annual monitoring program. The following samples were collected in 2005.

Vegetation : (M) Moss, (L) Lichen, (BP) Broadleaf Plant, and (G) Grass					
Field Sample ID	**Lab Sample ID**	**Sample Date**	**Field Sample ID**	**Lab Sample ID**	**Sample Date**
M1-1004	80255	5/9/2005	L6-1004	80270	5/9/2005
M2-1004	80256	5/9/2005	L7-1004	80271	5/9/2005
M3-1004	80257	5/9/2005	L8-1004	80272	5/9/2005
M4-1004	80258	5/9/2005	L9-1004	80273	5/9/2005
M5-1004	80259	5/9/2005	L10-1004	80274	5/9/2005
M6-1004	80260	5/9/2005	L11-605	80611	6/15/2005
M7-1004	80261	5/9/2005	L12-605	80612	6/15/2005
M8-1004	80262	5/9/2005	L13-605	80613	6/15/2005
M9-1004	80263	5/9/2005	L14-605	80614	6/16/2005
M10-1004	80264	5/9/2005	L15-605	80615	6/16/2005
M11-605	80597	6/15/2005	L16-605	80616	6/16/2005
M12-605	80598	6/15/2005	L17-605	80617	6/16/2005
M13-605	80599	6/15/2005	L18-605	80624	6/28/2005
M14-605	80600	6/16/2005	L19-605	80620	6/28/2005
M15-605	80601	6/16/2005	L20-605	80618	6/29/2005
M16-605	80602	6/16/2005	L21-605	80619	6/29/2005
M17-605	80603	6/16/2005	L22-705	80621	7/7/2005
M18-605	80608	6/28/2005	L23-705	80622	7/7/2005
M19-605	80605	6/28/2005	L24-705	80623	7/12/2005
M20-605	80604	6/29/2005	L25-705	80714	7/13/2005
M21-605	80610	6/29/2005	L26-705	80706	7/13/2005
M22-705	80607	7/7/2005	L27-705	80708	7/13/2005
M23-705	80606	7/7/2005	L28-705	80705	7/13/2005
M24-705	80609	7/12/2005	L29-705	80726	7/14/2005
M25-705	80712	7/13/2005	L30-705	80720	7/14/2005
M26-705	80735	7/13/2005	BP1-705	80626	7/11/2005
M27-705	80713	7/13/2005	BP2-705	80731	7/14/2005
M28-705	80710	7/13/2005	BP3-705	80730	7/14/2005
M29-705	80725	7/14/2005	BP4-705	80627	7/11/2005
M30-705	80721	7/14/2005	BP5-705	80729	7/14/2005
L1-1004	80265	5/9/2005	BP6-705	80722	7/14/2005
L2-1004	80266	5/9/2005	BP7-705	80733	7/18/2005
L3-1004	80267	5/9/2005	BP8-705	80728	7/14/2005
L4-1004	80268	5/9/2005	BP9-705	80727	7/14/2005
L5-1004	80269	5/9/2005	BP10-705	80630	7/12/2005

Vegetation : (M) Moss, (L) Lichen, (BP) Broadleaf Plant, and (G) Grass					
Field Sample ID	**Lab Sample ID**	**Sample Date**	**Field Sample ID**	**Lab Sample ID**	**Sample Date**
BP11-705	80628	7/12/2005	G6-705	80656	7/5/2005
BP12-705	80634	7/12/2005	G7-605	80640	6/13/2005
BP13-705	80633	7/12/2005	G8-605	80641	6/13/2005
BP14-705	80631	7/12/2005	G9-605	80642	6/13/2005
BP15-705	80625	7/12/2005	G10-605	80643	6/13/2005
BP16-705	80635	7/12/2005	G11-605	80644	6/13/2005
BP17-705	80629	7/12/2005	G12-605	80645	6/13/2005
BP18-705	80716	7/13/2005	G13-605	80646	6/13/2005
BP19-705	80715	7/13/2005	G14-605	80647	6/13/2005
BP20-705	80732	7/18/2005	G15-605	80648	6/13/2005
BP21-705	80734	7/18/2005	G16-705	80658	7/5/2005
BP22-705	80717	7/13/2005	G17-705	80661	7/5/2005
BP23-705	80719	7/13/2005	G18-605	80651	6/15/2005
BP24-705	80632	7/12/2005	G19-605	80652	5/21/2005
BP25-705	80707	7/13/2005	G20-705	80657	7/5/2005
BP26-705	80711	7/13/2005	G21-705	80655	7/5/2005
BP27-705	80718	7/13/2005	G22-705	80654	7/5/2005
BP28-705	80709	7/13/2005	G23-705	80653	7/5/2005
BP29-705	80724	7/14/2005	G24-705	80664	7/7/2005
BP30-705	80723	7/14/2005	G25-705	80659	7/5/2005
G1-605	80636	6/13/2005	G26-605	80649	6/13/2005
G2-605	80637	6/13/2005	G27-705	80662	7/7/2005
G3-605	80638	6/13/2005	G28-705	80665	7/7/2005
G4-705	80660	7/5/2005	G29-705	80663	7/7/2005
G5-605	80639	6/13/2005	G30-605	80650	6/13/2005

Soil					
Field Sample ID	**Lab Sample ID**	**Sample Date**	**Field Sample ID**	**Lab Sample ID**	**Sample Date**
S11005	82118	10/11/2005	S61005	82123	10/11/2005
S21005	82119	10/11/2005	S71005	82124	10/11/2005
S31005	82120	10/11/2005	S81005	82125	10/11/2005
S41005	82121	10/11/2005	S91005	82126	10/11/2005
S51005	82122	10/11/2005	S101005	82127	10/11/2005

Water and Snow					
Field Sample ID	**Lab Sample ID**	**Sample Date**	**Field Sample ID**	**Lab Sample ID**	**Sample Date**
W1405	80164	4/26/2005	W5705	80671	7/15/2005
W2405	80165	4/26/2005	W6705	80672	7/15/2005
W3405	80166	4/26/2005	W7705	80673	7/15/2005
W4405	80167	4/26/2005	W8705	80674	7/15/2005
W5405	80168	4/26/2005	W11005	82110	10/11/2005
W6405	80169	4/26/2005	W21005	82111	10/11/2005
W7405	80170	4/26/2005	W31005	82112	10/11/2005
W8405	80171	4/26/2005	W41005	82113	10/11/2005
W1705	80667	7/15/2005	W51005	82114	10/11/2005
W2705	80668	7/15/2005	W61005	82115	10/11/2005
W3705	80669	7/15/2005	W71005	82116	10/11/2005
W4705	80670	7/15/2005	W81005	82117	10/11/2005

The moss, lichen, and broadleaf plant samples were analyzed by IceTek, IS for the following:

- Fluoride by Alkaline Fusion, ISE, specified by project

The grass samples were analyzed by IceTek for the following:

- Fluoride by Alkaline Fusion, ISE, specified by project
- Nitrogen (Dumas analysis) by thermoconductive detection after combustion
- Sulfur by USEPA 6010B

The soil samples were analyzed by IceTek for the following:

- Fluoride by BS1377/1990, Part 3, Extract, ISE
- Chloride by BS1377/1990, Part 3, Tecator AN 63/83
- Sulfate by BS1377/1990, Part 3, EMEP/CCC 1/95, Rev. 1996
- pH by BS1377/1990, Part 3, SMW&W 4500
- Percent Solids

The April 2005 aqueous samples were analyzed by IceTek for the following:

- Fluoride by SMW&W 4500, ISE
- Chloride by Tecator AN 63/83
- Sulfate by EMEP/CCC 1/95, Rev. 1996
- pH by SMW&W 4500
- Alkalinity by SMW&W 2320 B
- Conductivity by SMW&W 2510 B

The July 2005 aqueous samples were analyzed by IceTek for the following:

- Fluoride by SMW&W 4500, ISE
- Chloride by Tecator AN 63/83
- Sulfate by EMEP/CCC 1/95, Rev. 1996

- pH by SMW&W 4500
- Alkalinity by SMW&W 2320 B
- Trace Metals by USEPA SW846 6010B, 7470A, 6020, 200.7, 200.8

The October 2005 aqueous samples were analyzed by IceTek for the following:

- Fluoride by SMW&W 4500, ISE
- Chloride by Tecator AN 63/83
- Sulfate by EMEP/CCC 1/95, Rev. 1996
- pH by SMW&W 4500
- Alkalinity by SMW&W 2320 B
- Trace Metals by USEPA SW846 6010B, 7470A, 6020, 200.7, 200.8

The October 2005 aqueous and snow samples were subcontracted to Severn Trent Laboratories, Inc. (STL) for the following analysis:

- Semivolatile analysis (PAHs) using USEPA SW-846 GC/MS Method 8270 in Selected Ion Monitoring (SIM) mode.

Summary

Organic data quality was evaluated by reviewing the following parameters: holding times, GC/MS tuning and performance, internal standards, initial and continuing calibrations, surrogate recoveries, MS/MSD recoveries and relative percent differences (RPDs), laboratory control standards (LCSs), laboratory and field blanks, compound identification, and compound quantitation.

Inorganic data quality was evaluated by reviewing the following parameters: holding times, certified reference material (CRM) recoveries, MS/MSD recoveries and relative percent differences, LCSs, laboratory and/or field blanks, and analyte quantitation.

Initial and continuing calibration verifications, laboratory duplicates, and ICP serial dilution and interelement interference checks for inorganic parameters were not provided for review.

The data summary pages attached as Appendix A of this report were revised to include the data validation qualifiers. All USEPA-defined data qualifiers and changes made by the data evaluators were added in red ink. A glossary of data qualifier definitions is included as Attachment 1 of this report.

For the vegetation, soil, and aqueous samples, all of the data received from the laboratory were usable, with some qualification, with the exceptions described below. Completeness of the data set is 100%. Each specific issue of concern with respect to data usability is addressed below.

Semivolatile Organic Compounds (PAHs)

The October 2005 aqueous samples collected for PAH analysis were subcontracted to STL – Pittsburgh. The field blank sample “BL BOTTLE” was received broken at the laboratory. No analyses could be conducted for the field blank. The shipment arrived at 14.1° C on blue ice packs. The samples were placed into cold (4° C) storage upon receipt at STL and the samples were extracted and analyzed within the holding time. Sample integrity was maintained. No data qualifications were necessary based on professional judgment.

The samples were screened for PAHs using full-scan GC/MS analysis. The sample extracts were then analyzed using GC/MS SIM mode to achieve a reporting limit of 0.2 µg/L for each PAH analyte. The surrogate and LCS recoveries from the full-scan analyses were used to assess the SIM analyses. The results of the SIM analyses must be reported for all October 2005 aqueous samples.

STL reported the SIM PAH results down to the limit of detection (LOD). Results estimated between the limits of detection (LODs) and the limits of quantitation (LOQs) were qualified "J," as estimated concentrations, because of the increased uncertainty below the reporting limit.

Total Trace Metals

Water: For metals, the acceptance limits of 90-110% were used for certified reference material (CRM) recoveries. The CRM SPS-SW2 B.108 recovery for chromium was less than the lower limit on 10/05/05. All chromium results for the July 2005 aqueous samples were nondetect and qualified "UJ," as estimates, because of low method bias.

The CRM SPS-SW2 B.108 recoveries for nickel and lead were less than the lower limit on 11/14/05. All nickel and lead results for the October 2005 aqueous samples were nondetect and qualified "UJ," as estimates, because of low method bias.

Fluoride, Nitrogen, and Sulfur

Vegetation: All positive results that were reported between the LOD and the LOQ were qualified as estimated "J" because of the increased uncertainty near the detection limit.

The CRM GBW07604 recovery for fluoride was less than the lower specification limit on 9/16/05. The positive and nondetect results were qualified "J-" and "UJ," respectively, because of low method bias.

The certified reference material (CRM) GBW07604 recovery for fluoride was greater than the upper specification limit on 10/29/05. The positive fluoride results were qualified as estimated concentrations, "J" because of high method bias.

General Chemistry

Water: The certified reference material (CRM) ION-96.3 recovery for fluoride was less than the lower specification limit on 11/28/05. The fluoride results for the April 2005 aqueous samples were positive and were qualified "J-" because of low method bias.

The CRM Chicago-94 recovery for chloride was greater than the upper specification limit on 10/29/05. The chloride results for the April 2005 aqueous samples were positive and were qualified "J," as estimated concentrations, because of high method bias and gross holding time exceedance.

The CRM ION-96.3 recovery for fluoride was less than the lower specification limit on 10/05/05. The fluoride results for the July 2005 aqueous samples were positive and were qualified "J-" because of low method bias.

The CRM Chicago-94 and Rain 97 recoveries for chloride were greater than the upper specification limits on 09/19/05. The chloride results for the July 2005 aqueous samples were positive and were qualified "J," as estimated concentrations, because of high method bias and gross holding time exceedance.

The CRM ION-96.3 recovery for fluoride was less than the lower specification limit on 11/28/05. The

fluoride results for the October 2005 aqueous samples were positive and were qualified "J-" because of low method bias.

Soil: All fluoride samples were analyzed three days outside the holding time. All positive soil results were qualified "J-" as estimates, biased low, based on holding time exceedences. All non-detect results we qualified as "UJ" bias low. All of the pH data was qualified as estimates "J" based on grossly exceeding the holding time for soil pH.

Notes

Organic and inorganic parameter results were adjusted based on sample aliquots and required dilutions. The soil and vegetation sample results were reported on a dry weight basis.

Inorganic parameter concentrations, estimated between the LODs and the LOQs, were flagged "J" by the validator because of the variability below the reporting limit. Certified Reference Materials were analyzed instead of matrix spike and matrix spike duplicates. CRM acceptance limits, for the purpose of data assessment, were established at 90-100%.

No hardcopy data report was received for the soil samples.

Data were validated according to method specifications and the *USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review*, EPA540/R-99/008, October 1999 and *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review*, EPA540-R-04-004, October 2004, as they apply to the analytical methods employed.

Attachments

1. Glossary of USEPA-defined data qualifier codes.

Appendices

1. Appendix A – Data Summary Reports

Attachment 1 of 1

Glossary of Data Qualifier Codes

GLOSSARY OF DATA QUALIFIER CODES

U	-	The analyte was analyzed for, but was not detected above the level of the reported samples quantitation limit.
J	-	The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.
J-	-	The result is an estimated quantity, likely to be biased low. The associated numerical value is the approximate concentration of the analyte in the sample.
J+	-	The result is an estimated quantity, likely to be biased high. The associated numerical value is the approximate concentration of the analyte in the sample.
UJ	-	The analyte was analyzed for, but was not detected. The reported quantitation limit is approximated and may be inaccurate or imprecise.
R	-	The data are unusable. The sample results are rejected due to serious deficiencies in the ability to meet quality control criteria. The presence or absence of the analyte cannot be verified.

Appendix A

Data Summary Reports

efnagreiningar
KELDNAHOLTI

FJARÐAÁL EXTERNAL ENVIRONMENTAL MONITORING
PROJECT NO. 6EM5135
CCA, IceTec

Dried Moss F

E- nr.	Marking	Marking	Date of sampling	No.cont.	Fluoride µg/g
80255	**M1**	1004	9.5.2005	1	<5
80256	**M2**	1004	9.5.2005	1	11
80257	**M3**	1004	9.5.2005	1	12
80258	**M4**	1004	9.5.2005	1	9 J
80259	**M5**	1004	9.5.2005	1	11
80260	**M6**	1004	9.5.2005	1	<5
80261	**M7**	1004	9.5.2005	1	<5
80262	**M8**	1004	9.5.2005	1	12
80263	**M9**	1004	9.5.2005	1	7 J
80264	**M10**	1004	9.5.2005	1	<5
80597	**M11**	605	15.6.2005	1	10 J-
80598	**M12**	605	15.6.2005	1	<5 UJ
80599	**M13**	605	15.6.2005	1	10 J-
80600	**M14**	605	16.6.2005	1	6 J-
80601	**M15**	605	16.6.2005	1	10 J
80602	**M16**	605	16.6.2005	1	21
80603	**M17**	605	16.6.2005	1	7 J-
80608	**M18**	605	28.6.2005	1	<5 UJ
80605	**M19**	605	28.6.2005	1	6 J-
80604	**M20**	605	29.6.2005	1	<5 UJ
80610	**M21**	605	29.6.2005	1	<5 UJ
80607	**M22**	705	7.7.2005	1	7 J-
80606	**M23**	705	7.7.2005	1	<5 UJ
80609	**M24**	705	12.7.2005	1	29
80712	**M25**	705	13.7.2005	1	<5
80735	**M26**	705	13.7.2005	1	<5
80713	**M27**	705	13.7.2005	1	9 J
80710	**M28**	705	13.7.2005	1	9 J
80725	**M29**	705	14.7.2005	1	<5
80721	**M30**	705	13.7.2005	1	10 J
			LOD		5
			LOQ		10

GBW07604	Poplar leaves	Certified	22+-4
GBW07604	Poplar leaves	Found	22+-6

efnagreiningar
KELDNAHOLTI

FJARÐAÁL EXTERNAL ENVIRONMENTAL MONITORING
PROJECT NO. 6EM5135
CCA, IceTec

Lichen F

E- nr.	Marking	Marking	Date of sampling	No.cont.	Fluoride µg/g
80265	L1	1004	9.5.2005	1	5
80266	L2	1004	9.5.2005	1	<5
80267	L3	1004	9.5.2005	1	<5
80268	L4	1004	9.5.2005	1	<5
80269	L5	1004	9.5.2005	1	<5
80270	L6	1004	9.5.2005	1	<5
80271	L7	1004	9.5.2005	1	<5
80272	L8	1004	9.5.2005	1	<5
80273	L9	1004	9.5.2005	1	<5
80274	L10	1004	9.5.2005	1	6
80611	L11	605	15.6.2005	1	5
80612	L12	605	15.6.2005	1	<5
80613	L13	605	15.6.2005	1	<5
80614	L14	605	16.6.2005	1	<5
80615	L15	605	16.6.2005	1	<5
80616	L16	605	16.6.2005	1	5
80617	L17	605	16.6.2005	1	<5
80624	L18	605	28.6.2005	1	<5
80620	L19	605	28.6.2005	1	<5
80618	L20	605	29.6.2005	1	<5
80619	L21	605	29.6.2005	1	<5
80621	L22	705	7.7.2005	1	<5
80622	L23	705	7.7.2005	1	<5
80623	L24	705	12.7.2005	1	6
80714	L25	705	13.7.2005	1	<5
80706	L26	705	13.7.2005	1	5
80708	L27	705	13.7.2005	1	8
80705	L28	705	13.7.2005	1	5
80726	L29	705	14.7.2005	1	<5
80720	L30	705	14.7.2005	1	8

		LOD	5
		LOQ	10
GBW07604	Poplar leaves	Certified	22+-4
GBW07604	Poplar leaves	Found	22+-6

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KELDNAHOLTI

FJARÐAÁL EXTERNAL ENVIRONMENTAL MONITORING
PROJECT NO. 6EM5135
CCA, IceTec

Broadleaf Plant Tissue **F**

E- nr.	Marking	Marking	Date of sampling	No.cont.	Fluoride µg/g
80626	**BP1**	705	11.7.2005	1	<5
80731	**BP2**	705	14.7.2005	1	<5
80730	**BP3**	705	14.7.2005	1	<5
80627	**BP4**	705	11.7.2005	1	<5
80729	**BP5**	705	14.7.2005	1	<5
80722	**BP6**	705	14.7.2005	1	<5
80733	**BP7**	705	18.7.2005	1	<5
80728	**BP8**	705	14.7.2005	1	<5
80727	**BP9**	705	14.7.2005	1	<5
80630	**BP10**	705	12.7.2005	1	<5
80628	**BP11**	705	12.7.2005	1	<5
80634	**BP12**	705	12.7.2005	1	<5
80633	**BP13**	705	12.7.2005	1	<5
80631	**BP14**	705	12.7.2005	1	<5
80625	**BP15**	705	12.7.2005	1	<5
80635	**BP16**	705	12.7.2005	1	<5
80629	**BP17**	705	12.7.2005	1	11
80716	**BP18**	705	13.7.2005	1	<5
80715	**BP19**	705	13.7.2005	1	<5
80732	**BP20**	705	18.7.2005	1	<5
80734	**BP21**	705	18.7.2005	1	<5
80717	**BP22**	705	13.7.2005	1	<5
80719	**BP23**	705	13.7.2005	1	<5
80632	**BP24**	705	12.7.2005	1	6 J
80707	**BP25**	705	13.7.2005	1	<5
80711	**BP26**	705	13.7.2005	1	<5
80718	**BP27**	705	13.7.2005	1	<5
80709	**BP28**	705	13.7.2005	1	<5
80724	**BP29**	705	14.7.2005	1	<5
80723	**BP30**	705	14.7.2005	1	<5

LOD		5
LOQ		10

GBW07604	Poplar leaves	Certified	22+-4
GBW07604	Poplar leaves	Found	22+-6

efnagreiningar
KELDNAHOLTI

FJARÐAÁL EXTERNAL ENVIRONMENTAL MONITORING
PROJECT NO. 6EM5135
CCA, IceTec

Grass **F, N, S**

E- nr.	Marking	Marking	Date of sampling	No.cont.	Fluoride µg/g	Nitrogen %	Sulfur mg/g
80636	G1	605	13.6.2005	1	<5	4.53	5.12 J+
80637	G2	605	13.6.2005	1	<5	3.07	2.85
80638	G3	605	13.6.2005	1	<5	3.12	3.10
80660	G4	705	5.7.2005	1	<5	3.03	2.73
80639	G5	605	13.6.2005	1	<5	3.48	3.21
80656	G6	705	5.7.2005	1	<5	2.68	2.36
80640	G7	605	13.6.2005	1	8 J	3.16	2.60
80641	G8	605	13.6.2005	1	5 J	3.59	2.78
80642	G9	605	13.6.2005	1	7 J	3.39	3.03
80643	G10	605	13.6.2005	1	9 J	3.50	3.00
80644	G11	605	13.6.2005	1	<5	2.52	2.04
80645	G12	605	13.6.2005	1	10	2.81	2.20
80646	G13	605	13.6.2005	1	<5	2.05	1.83
80647	G14	904	13.6.2005	1	<5	2.22	1.74
80648	G15	904	13.6.2005	1	<5	2.61	2.14
80658	G16	705	5.7.2005	1	<5	2.20	1.85
80661	G17	705	5.7.2005	1	<5	2.85	2.74
80651	G18	605	15.6.2005	1	<5	3.62	2.74
80652	G19	605	21.5.2005	1	<5	2.97	2.54
80657	G20	705	5.7.2005	1	<5	3.15	2.64
80655	G21	705	5.7.2005	1	<5	2.34	2.39
80654	G22	705	5.7.2005	1	<5	1.91	1.94
80653	G23	705	5.7.2005	1	<5	2.32	2.16
80664	G24	705	7.7.2005	1	<5	1.95	2.11
80659	G25	705	5.7.2005	1	<5	2.03	2.92
80649	G26	605	13.6.2005	1	<5	1.86	1.76
80662	G27	705	7.7.2005	1	<5	2.89	2.70
80665	G28	705	7.7.2005	1	<5	2.37	2.10
80663	G29	705	7.7.2005	1	<5	1.98	2.35
80650	G30	605	13.6.2005	1	<5	2.51	2.12
				LOD	5	0.12	0.17
				LOQ	10	0.4	0.57

			µg/g		%
GBW07604	Poplar leaves	Certified	22+-4		0.35+-0.04
GBW07604	Poplar leaves	Found	22+-6		0.40
					mg/g
BCR129	Hay powder	Certified			3.16+-0.04
BCR129	Hay powder	Found			3.6
				% N	
BHA laboratory q.c.sample as		Average N% in 31 measurements		2.81+-0.04	
meas.by Dumas CN analysis		RSD %		1.41%	
BHA		Measured		2.819	
BHA		Measured		2.839	

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FJARÐAÁL EXTERNAL ENVIRONMENTAL MONITORING
PROJECT NO. 6EM5135
CCA, IceTec

Water **Various measurements**

Enr	Marking	Marking	Date of sampling	No.cont.	Sample name
80164	W1	405	26.4.2005	4	Ljósá
80165	W2	405	26.4.2005	4	Grjótá
80166	W3	405	26.4.2005	4	Norðurá
80167	W4	405	26.4.2005	4	Njörvadalsá
80168	W5	405	26.4.2005	4	Mjóeyri
80169	W6	405	26.4.2005	4	Tankur Eskifjörður
80170	W7	405	26.4.2005	4	Olís Reyðarfjörður
80171	W8	405	26.4.2005	4	Tankur Reyðarfjörður

		F- mg/L	SO4S mg/L	Cl- mg/L	pH	Alkalinity mg CaCO3/L	Conductivity µS/cm
80164	W1	0.022	0.51	3.45	7.34	10.5	35.3
80165	W2	0.024	0.18	2.17	7.33	10.3	36.6
80166	W3	0.021	0.56	3.50	7.32	11.9	35.2
80167	W4	0.020	0.44	3.37	7.31	10.1	33.7
80168	W5	0.028	0.33	4.59	7.36	17.4	52.7
80169	W6	0.030	0.65	4.38	7.33	17.2	52.3
80170	W7	0.028	0.43	3.88	7.00	15.0	46.3
80171	W8	0.025	0.45	3.97	7.03	15.0	46.4
	LOD	0.004	0.24	0.26			
	LOQ	0.013	0.78	0.84			

			As sulphate	
Rain 97	Certified		5.28+-0.73	0.526+-0.094
	Measured		5.29	0.64
Chicago 94	Certified	0.83+-0.01	23.7+-0.2	11.3+-0.1
	Measured	0.78	24.3	12.3
ION 96.3	Certified	0.16+-0.01		
	Measured	0.13		

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FJARÐAÁL EXTERNAL ENVIRONMENTAL MONITORING
PROJECT NO. 6EM5135
CCA, IceTec

Water **Various measurements**

E- nr.	Marking	Marking	Date of sampling	No.cont.	Sample name
80667	W1	705	15.7.2005	4	Ljósá
80668	W2	705	15.7.2005	4	Grjótá
80669	W3	705	15.7.2005	4	Norðurá
80670	W4	705	15.7.2005	4	Njörvadalsá
80671	W5	705	15.7.2005	4	Mjóeyri
80672	W6	705	15.7.2005	4	Tankur Eskifjörður
80673	W7	705	15.7.2005	4	Olís Reyðarfjörður
80674	W8	705	15.7.2005	4	Tankur Reyðarfjörður

		F µg/L	SO4-S mg/L	Cl mg/L	pH	Alkalinity *mg CaCO3/L*
80667	W1	0.023 J-	0.30	2.48 J	7.50	12.7
80668	W2	0.023	0.34	2.82 J	7.49	12.5
80669	W3	0.023	0.28	2.43 J	7.50	15.6
80670	W4	0.017	0.23 J	1.97 J	7.40	11.0
80671	W5	0.022	0.32	3.87 J	7.42	19.0
80672	W6	0.023	0.35	3.95 J	7.45	19.1
80673	W7	0.022	0.32	2.50 J	7.11	15.7
80674	W8	0.020	0.32	2.46 J	7.12	15.8
	LOD	0.004	0.08	0.12		
	LOQ	0.012	0.26	0.39		

			As sulphate	
Rain 97	Certified		5.28+-0.73	0.526+-0.094
	Measured		5.29	0.637
Chicago 94	Certified		23.7+-0.2	11.3+-0.1
	Measured		25.3	12.8
ION 96.3	Certified	0.16+-0.01		
	Measured	0.14		

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FJARÐAÁL EXTERNAL ENVIRONMENTAL MONITORING
PROJECT NO. 6EM5135
CCA, IceTec

Water **Various measurements**

E- nr.	Marking	Marking	Date of sampling	No.cont.	Sample name
82110	W1	1005	11.10.2005	4	Ljósá
82111	W2	1005	11.10.2005	4	Grjótá
82112	W3	1005	11.10.2005	4	Norðurá
82113	W4	1005	11.10.2005	4	Njörvadalsá
82114	W5	1005	11.10.2005	4	Mjóeyri
82115	W6	1005	11.10.2005	4	Tankur Eskifjörður
82116	W7	1005	11.10.2005	4	Olís Reyðarfjörður
82117	W8	1005	11.10.2005	4	Tankur Reyðarfjörður

		F mg/L	SO4-S mg/L	Cl mg/L	pH	Alkalinity *mg CaCO3/L*
82110	W1	0.025	0.33	2.14	7.39	13.3
82111	W2	0.027	0.36	2.70	7.39	13.2
82112	W3	0.023	0.31	1.87	7.40	15.3
82113	W4	0.025	0.33	1.93	7.37	15.4
82114	W5	0.028	0.37	2.24	7.30	18.8
82115	W6	0.027	0.40	2.76	7.38	19.2
82116	W7	0.023	0.37	1.37	6.99	16.0
82117	W8	0.025	0.37	2.18	7.14	16.1
	LOD	0.004	0.07	0.24		
	LOQ	0.013	0.24	0.80		

			As sulphate	
Rain 97	Certified		5.28+-0.73	0.526+-0.10
	Measured		5.73	0.47
Chicago 94	Certified	0.83+-0.01		11.3+-0.1
	Measured	0.78		11.6
ION 96.3	Certified	0.16+-0.01		
	Measured	0.13		

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FJARÐAÁL EXTERNAL ENVIRONMENTAL MONITORING
PROJECT NO. 6EM5135
CCA, IceTec

Water **Trace metals**

E- nr.	Marking	Marking	Date of sampling	Sample name	No.cont.
80667	W1	705	15.7.2005	Ljósá	4
80668	W2	705	15.7.2005	Grjótá	4
80669	W3	705	15.7.2005	Norðurá	4
80670	W4	705	15.7.2005	Njörvadalsá	4
80671	W5	705	15.7.2005	Mjóeyri	4
80672	W6	705	15.7.2005	Tankur Eskifjörður	4
80673	W7	705	15.7.2005	Olís Reyðarfjörður	4
80674	W8	705	15.7.2005	Tankur Reyðarfjörður	4

ICP TOF MS		As	Cd	Cr	Cu	Hg	Ni	Pb	Zn
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
80667	W1	<1	<1	<1 UJ	<1	<2	<10	<1	<5
80668	W2	<1	<1	<1	<1	<2	<10	<1	<5
80669	W3	<1	<1	<1	<1	<2	<10	<1	<5
80670	W4	<1	<1	<1	<1	<2	<10	<1	<5
80671	W5	<1	<1	<1	4.1	<2	<10	<1	15.0
80672	W6	<1	<1	<1	<1	<2	<10	<1	6.3
80673	W7	<1	<1	<1	1.1	<2	<10	<1	22.8
80674	W8	<1	<1	<1	<1	<2	<10	<1	14.3
	LOD	0.3	0.1	0.6	0.1	0.7	1.1	0.1	0.4
	LOQ	1.0	0.3	2.0	0.3	2.3	3.6	0.3	1.4
SPS-SW2 B.108									
	Certified	50+-0.3	2.5+-0.02	10+-0.05	100+-1	-	50+-0.3	25+-0.1	100+-1
Found in 1:10 dilution		4.9	0.24	0.74	10.5	-	5.0	2.6	9.7

E- nr.	Marking	Marking	Date of sampling	Sample name	No.cont.
82110	W1	1005	11.10.2005	Ljósá	4
82111	W2	1005	11.10.2005	Grjótá	4
82112	W3	1005	11.10.2005	Norðurá	4
82113	W4	1005	11.10.2005	Njörvadalsá	4
82114	W5	1005	11.10.2005	Mjóeyri	4
82115	W6	1005	11.10.2005	Tankur Eskifjörður	4
82116	W7	1005	11.10.2005	Olís Reyðarfjörður	4
82117	W8	1005	11.10.2005	Tankur Reyðarfjörður	4

ICP TOF MS		As	Cd	Cr	Cu	Hg	Ni	Pb	Zn
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
82110	W1	<1	<1	<1	<1	<2	<10 UJ	<1 UJ	<5
82111	W2	<1	<1	<1	<1	<2	<10	<1	<5
82112	W3	<1	<1	<1	<1	<2	<10	<1	<5
82113	W4	<1	<1	<1	1.0	<2	<10	<1	<5
82114	W5	<1	<1	<1	3.9	<2	<10	<1	13.3
82115	W6	<1	<1	<1	2.5	<2	<10	<1	6.6
82116	W7	<1	<1	<1	2.5	<2	<10	<1	13.5
82117	W8	<1	<1	<1	1.0	<2	<10	<1	<5
82110	W1	<1	<1	<1	<1	<2	<10	<1	<5
82114	W5	<1	<1	<1	3.7	<2	<10	<1	12.5
	LOD	0.1	0.02	0.10	0.02	0.7	1.1	0.01	0.5
	LOQ	0.3	0.1	0.3	0.1	2.2	3.6	0.03	1.7
SPS-SW2 B.108									
	Certified	50+-0.3	2.5+-0.02	10+-0.05	100+-1	-	50+-0.3	25+-0.1	100+-1
Found in 1:10 dilution		4.8	0.25	1.1	9.6	-	3.6	2.2	9.5

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The RETEC Group, Inc.

Client Sample ID: W1-1005

GC/MS Semivolatiles

Lot-Sample #...:	C5J170196-001	**Work Order #...:**	HMW8C1AC	**Matrix.....:**	WATER
Date Sampled...:	10/11/05 10:35	**Date Received..:**	10/17/05 13:45	**MS Run #.....:**	
Prep Date.....:	10/18/05	**Analysis Date..:**	11/07/05		
Prep Batch #...:	5291275	**Analysis Time..:**	19:59		
Dilution Factor:	1	**Initial Wgt/Vol:**	1000 mL	**Final Wgt/Vol..:**	1 mL
Analyst ID.....:	003200	**Instrument ID..:**	MSD7		
		Method.....:	SW846 8270C SIM		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Naphthalene	ND	0.20	ug/L	0.038
Acenaphthylene	ND	0.20	ug/L	0.035
Acenaphthene	ND	0.20	ug/L	0.038
Fluorene	ND	0.20	ug/L	0.036
Phenanthrene	**0.051 J**	**0.20**	**ug/L**	**0.041**
Anthracene	ND	0.20	ug/L	0.036
Fluoranthene	ND	0.20	ug/L	0.027
Pyrene	ND	0.20	ug/L	0.024
Benzo(a)anthracene	ND	0.20	ug/L	0.022
Chrysene	ND	0.20	ug/L	0.034
Benzo(b)fluoranthene	ND	0.20	ug/L	0.042
Benzo(k)fluoranthene	ND	0.20	ug/L	0.060
Benzo(a)pyrene	ND	0.20	ug/L	0.076
Indeno(1,2,3-cd)pyrene	ND	0.20	ug/L	0.10
Dibenzo(a,h)anthracene	ND	0.20	ug/L	0.15
Benzo(ghi)perylene	ND	0.20	ug/L	0.12

NOTE(S):

J Estimated result. Result is less than RL.

The RETEC Group, Inc.

Client Sample ID: W2-1005

GC/MS Semivolatiles

Lot-Sample #...:	C5J170196-002	**Work Order #...:**	HMW8W1AC	**Matrix.....:**	WATER
Date Sampled...:	10/11/05 10:11	**Date Received..:**	10/17/05 13:45	**MS Run #.....:**	
Prep Date.....:	10/18/05	**Analysis Date..:**	11/07/05		
Prep Batch #...:	5291275	**Analysis Time..:**	20:26		
Dilution Factor:	1	**Initial Wgt/Vol:**	1000 mL	**Final Wgt/Vol..:**	1 mL
Analyst ID.....:	003200	**Instrument ID..:**	MSD7		
		Method.....:	SW846 8270C SIM		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Naphthalene	ND	0.20	ug/L	0.038
Acenaphthylene	ND	0.20	ug/L	0.035
Acenaphthene	ND	0.20	ug/L	0.038
Fluorene	ND	0.20	ug/L	0.036
Phenanthrene	**0.048 J**	**0.20**	**ug/L**	**0.041**
Anthracene	ND	0.20	ug/L	0.036
Fluoranthene	**0.029 J**	**0.20**	**ug/L**	**0.027**
Pyrene	**0.025 J**	**0.20**	**ug/L**	**0.024**
Benzo(a)anthracene	**0.22**	**0.20**	**ug/L**	**0.022**
Chrysene	**0.29**	**0.20**	**ug/L**	**0.034**
Benzo(b)fluoranthene	**0.17 J**	**0.20**	**ug/L**	**0.042**
Benzo(k)fluoranthene	**0.28**	**0.20**	**ug/L**	**0.060**
Benzo(a)pyrene	**0.19 J**	**0.20**	**ug/L**	**0.076**
Indeno(1,2,3-cd)pyrene	**0.23**	**0.20**	**ug/L**	**0.10**
Dibenzo(a,h)anthracene	**0.33**	**0.20**	**ug/L**	**0.15**
Benzo(ghi)perylene	**0.22**	**0.20**	**ug/L**	**0.12**

NOTE(S):

J Estimated result. Result is less than RL.

The RETEC Group, Inc.

Client Sample ID: W3-1005

GC/MS Semivolatiles

Lot-Sample #...:	C5J170196-003	**Work Order #...:**	HMW801AC	**Matrix.....:**	WATER
Date Sampled...:	10/11/05 11:15	**Date Received..:**	10/17/05 13:45	**MS Run #.....:**	
Prep Date.....:	10/18/05	**Analysis Date..:**	11/07/05		
Prep Batch #...:	5291275	**Analysis Time..:**	20:53		
Dilution Factor:	1	**Initial Wgt/Vol:**	1000 mL	**Final Wgt/Vol..:**	1 mL
Analyst ID.....:	003200	**Instrument ID..:**	MSD7		
		Method.....:	SW846 8270C SIM		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Naphthalene	ND	0.20	ug/L	0.038
Acenaphthylene	ND	0.20	ug/L	0.035
Acenaphthene	ND	0.20	ug/L	0.038
Fluorene	ND	0.20	ug/L	0.036
Phenanthrene	**0.059 J**	**0.20**	**ug/L**	**0.041**
Anthracene	ND	0.20	ug/L	0.036
Fluoranthene	ND	0.20	ug/L	0.027
Pyrene	ND	0.20	ug/L	0.024
Benzo(a)anthracene	**0.048 J**	**0.20**	**ug/L**	**0.022**
Chrysene	**0.048 J**	**0.20**	**ug/L**	**0.034**
Benzo(b)fluoranthene	**0.050 J**	**0.20**	**ug/L**	**0.042**
Benzo(k)fluoranthene	ND	0.20	ug/L	0.060
Benzo(a)pyrene	ND	0.20	ug/L	0.076
Indeno(1,2,3-cd)pyrene	ND	0.20	ug/L	0.10
Dibenzo(a,h)anthracene	ND	0.20	ug/L	0.15
Benzo(ghi)perylene	ND	0.20	ug/L	0.12

NOTE(S):

J Estimated result. Result is less than RL.

The RETEC Group, Inc.

Client Sample ID: W4-1005

GC/MS Semivolatiles

Lot-Sample #...:	C5J170196-004	**Work Order #...:**	HMW841AC	**Matrix.....:**	WATER
Date Sampled...:	10/11/05 11:03	**Date Received..:**	10/17/05 13:45	**MS Run #.....:**	
Prep Date.....:	10/18/05	**Analysis Date..:**	11/07/05		
Prep Batch #...:	5291275	**Analysis Time..:**	21:20		
Dilution Factor:	1	**Initial Wgt/Vol:**	1000 mL	**Final Wgt/Vol..:**	1 mL
Analyst ID.....:	003200	**Instrument ID..:**	MSD7		
		Method.....:	SW846 8270C SIM		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Naphthalene	ND	0.20	ug/L	0.038
Acenaphthylene	ND	0.20	ug/L	0.035
Acenaphthene	ND	0.20	ug/L	0.038
Fluorene	ND	0.20	ug/L	0.036
Phenanthrene	**0.047 J**	**0.20**	**ug/L**	**0.041**
Anthracene	ND	0.20	ug/L	0.036
Fluoranthene	ND	0.20	ug/L	0.027
Pyrene	ND	0.20	ug/L	0.024
Benzo(a)anthracene	ND	0.20	ug/L	0.022
Chrysene	ND	0.20	ug/L	0.034
Benzo(b)fluoranthene	ND	0.20	ug/L	0.042
Benzo(k)fluoranthene	ND	0.20	ug/L	0.060
Benzo(a)pyrene	ND	0.20	ug/L	0.076
Indeno(1,2,3-cd)pyrene	ND	0.20	ug/L	0.10
Dibenzo(a,h)anthracene	ND	0.20	ug/L	0.15
Benzo(ghi)perylene	ND	0.20	ug/L	0.12

NOTE(S):

J Estimated result. Result is less than RL.

The RETEC Group, Inc.

Client Sample ID: W5-1005

GC/MS Semivolatiles

Lot-Sample #...:	C5J170196-005	**Work Order #...:**	HMW861AC	**Matrix.....:**	WATER
Date Sampled...:	10/11/05 09:44	**Date Received..:**	10/17/05 13:45	**MS Run #.....:**	
Prep Date.....:	10/18/05	**Analysis Date..:**	11/07/05		
Prep Batch #...:	5291275	**Analysis Time..:**	21:47		
Dilution Factor:	1	**Initial Wgt/Vol:**	1000 mL	**Final Wgt/Vol..:**	1 mL
Analyst ID.....:	003200	**Instrument ID..:**	MSD7		
		Method.....:	SW846 8270C SIM		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Naphthalene	ND	0.20	ug/L	0.038
Acenaphthylene	ND	0.20	ug/L	0.035
Acenaphthene	ND	0.20	ug/L	0.038
Fluorene	ND	0.20	ug/L	0.036
Phenanthrene	**0.042 J**	**0.20**	**ug/L**	**0.041**
Anthracene	ND	0.20	ug/L	0.036
Fluoranthene	ND	0.20	ug/L	0.027
Pyrene	ND	0.20	ug/L	0.024
Benzo(a)anthracene	ND	0.20	ug/L	0.022
Chrysene	ND	0.20	ug/L	0.034
Benzo(b)fluoranthene	ND	0.20	ug/L	0.042
Benzo(k)fluoranthene	ND	0.20	ug/L	0.060
Benzo(a)pyrene	ND	0.20	ug/L	0.076
Indeno(1,2,3-cd)pyrene	ND	0.20	ug/L	0.10
Dibenzo(a,h)anthracene	ND	0.20	ug/L	0.15
Benzo(ghi)perylene	ND	0.20	ug/L	0.12

NOTE(S):

J Estimated result. Result is less than RL.

The RETEC Group, Inc.

Client Sample ID: W6-1005

GC/MS Semivolatiles

Lot-Sample #...:	C5J170196-006	**Work Order #...:**	HMW871AC	**Matrix.....:**	WATER
Date Sampled...:	10/11/05 09:26	**Date Received..:**	10/17/05 13:45	**MS Run #.....:**	
Prep Date.....:	10/18/05	**Analysis Date..:**	11/07/05		
Prep Batch #...:	5291275	**Analysis Time..:**	22:14		
Dilution Factor:	1	**Initial Wgt/Vol:**	1000 mL	**Final Wgt/Vol..:**	1 mL
Analyst ID.....:	003200	**Instrument ID..:**	MSD7		
		Method.....:	SW846 8270C SIM		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Naphthalene	ND	0.20	ug/L	0.038
Acenaphthylene	ND	0.20	ug/L	0.035
Acenaphthene	ND	0.20	ug/L	0.038
Fluorene	ND	0.20	ug/L	0.036
Phenanthrene	ND	0.20	ug/L	0.041
Anthracene	ND	0.20	ug/L	0.036
Fluoranthene	ND	0.20	ug/L	0.027
Pyrene	ND	0.20	ug/L	0.024
Benzo(a)anthracene	ND	0.20	ug/L	0.022
Chrysene	ND	0.20	ug/L	0.034
Benzo(b)fluoranthene	ND	0.20	ug/L	0.042
Benzo(k)fluoranthene	ND	0.20	ug/L	0.060
Benzo(a)pyrene	ND	0.20	ug/L	0.076
Indeno(1,2,3-cd)pyrene	ND	0.20	ug/L	0.10
Dibenzo(a,h)anthracene	ND	0.20	ug/L	0.15
Benzo(ghi)perylene	ND	0.20	ug/L	0.12

The RETEC Group, Inc.

Client Sample ID: W7-1005

GC/MS Semivolatiles

Lot-Sample #...:	C5J170196-007	**Work Order #...:**	HMW881AC	**Matrix.....:**	WATER
Date Sampled...:	10/11/05 11:26	**Date Received..:**	10/17/05 13:45	**MS Run #.....:**	
Prep Date.....:	10/18/05	**Analysis Date..:**	11/07/05		
Prep Batch #...:	5291275	**Analysis Time..:**	22:41		
Dilution Factor:	1	**Initial Wgt/Vol:**	1000 mL	**Final Wgt/Vol..:**	1 mL
Analyst ID.....:	003200	**Instrument ID..:**	MSD7		
		Method.....:	SW846 8270C SIM		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Naphthalene	ND	0.20	ug/L	0.038
Acenaphthylene	ND	0.20	ug/L	0.035
Acenaphthene	ND	0.20	ug/L	0.038
Fluorene	ND	0.20	ug/L	0.036
Phenanthrene	**0.067 J**	**0.20**	**ug/L**	**0.041**
Anthracene	ND	0.20	ug/L	0.036
Fluoranthene	ND	0.20	ug/L	0.027
Pyrene	ND	0.20	ug/L	0.024
Benzo(a)anthracene	ND	0.20	ug/L	0.022
Chrysene	ND	0.20	ug/L	0.034
Benzo(b)fluoranthene	ND	0.20	ug/L	0.042
Benzo(k)fluoranthene	ND	0.20	ug/L	0.060
Benzo(a)pyrene	ND	0.20	ug/L	0.076
Indeno(1,2,3-cd)pyrene	ND	0.20	ug/L	0.10
Dibenzo(a,h)anthracene	ND	0.20	ug/L	0.15
Benzo(ghi)perylene	ND	0.20	ug/L	0.12

NOTE(S):

J Estimated result. Result is less than RL.

The RETEC Group, Inc.

Client Sample ID: W8-1005

GC/MS Semivolatiles

Lot-Sample #...: C5J170196-008 **Work Order #...:** HMW9A1AC **Matrix.....:** WATER
Date Sampled...: 10/11/05 11:08 **Date Received..:** 10/17/05 13:45 **MS Run #.....:**
Prep Date.....: 10/18/05 **Analysis Date..:** 11/07/05
Prep Batch #...: 5291275 **Analysis Time..:** 23:08
Dilution Factor: 1 **Initial Wgt/Vol:** 1000 mL **Final Wgt/Vol..:** 1 mL
Analyst ID.....: 003200 **Instrument ID..:** MSD7
Method.....: SW846 8270C SIM

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Naphthalene	ND	0.20	ug/L	0.038
Acenaphthylene	ND	0.20	ug/L	0.035
Acenaphthene	ND	0.20	ug/L	0.038
Fluorene	ND	0.20	ug/L	0.036
Phenanthrene	ND	0.20	ug/L	0.041
Anthracene	ND	0.20	ug/L	0.036
Fluoranthene	ND	0.20	ug/L	0.027
Pyrene	ND	0.20	ug/L	0.024
Benzo(a)anthracene	ND	0.20	ug/L	0.022
Chrysene	ND	0.20	ug/L	0.034
Benzo(b)fluoranthene	ND	0.20	ug/L	0.042
Benzo(k)fluoranthene	ND	0.20	ug/L	0.060
Benzo(a)pyrene	ND	0.20	ug/L	0.076
Indeno(1,2,3-cd)pyrene	ND	0.20	ug/L	0.10
Dibenzo(a,h)anthracene	ND	0.20	ug/L	0.15
Benzo(ghi)perylene	ND	0.20	ug/L	0.12

Appendix E

Photographic Record (not included in this draft)