

**Wastewater Freeze Crystallization Feasibility Study: Final Report**

**October 12, 2011**

Grant No. 791N1300085

**To:** Michigan Department of Agriculture  
Mr. Mike DiBernardo  
Grant Administrator  
PO Box 30017  
Lansing, MI 48909  
(p) 517-373-9144 (f) 517-335-0628

**From:** Lakeshore Environmental, Inc.  
Joel Kenyon  
803 Verhoeks Street  
Grand Haven, MI 49417  
(p) 616-844-5050 (f) 616-844-5053  
EIN: 38-3145998

## Contents

1.0 INTRODUCTION .....	3
1.1 Executive Summary .....	3
1.2 Study Objective.....	4
1.3 Background .....	4
1.4 Wastewater Management Challenges .....	5
1.5 Discharging Wastewater to Groundwater .....	5
1.6 Experiment Design.....	5
1.7 Previous Investigation.....	6
1.8 Water Quality Parameters .....	6
1.8.1 Phosphorus (total) .....	7
1.8.2 Sodium (total) .....	7
1.8.3 Specific Conductivity.....	7
1.8.4 Inorganic Nitrogen .....	7
1.8.5 Chemical Oxygen Demand (COD).....	7
1.8.6 Chloride.....	7
1.8.7 pH.....	7
1.8.8 Biochemical Oxygen Demand (BOD) .....	7
1.8.9 Dissolved Organic Carbon (DOC).....	8
1.9 Study Goals.....	8
2.0 METHODS .....	8
2.1 Pilot Scale System Installation.....	8
2.2 Snow Making .....	9
2.3 Snowpack Sampling.....	9
2.3.1 Pre-determined Depth Grab Sampling .....	9
2.3.2 Deliberate Interval Sampling .....	10
2.4 Meltwater Sampling .....	10
2.5 Residuals Sampling.....	10
3.0 RESULTS .....	10
3.1 System Influent and Fresh Wastewater Snow Characterization .....	10
3.2 Snowpack Sampling.....	11
3.2.1 Pre-determined Interval Sampling .....	12
3.2.2 Deliberate Interval Sampling .....	13

3.3 Meltwater Analysis .....	14
3.3.1 Meltwater Samples Collected During Periods of Sub-freezing Air Temperatures .....	15
3.3.2 Melt Event #2 and Melt Event #3 .....	16
3.4 Water Balance and Water Recovery Analysis .....	17
3.5 Wastewater Constituent Recovery Analysis .....	18
3.6 Specific Conductivity of Meltwater .....	18
3.7 Residuals Analysis .....	19
4.0 CONCLUSIONS.....	20
4.1 Primary Sublimation .....	20
4.2 Snowpack Aging .....	20
4.3 Snowpack Melting .....	20
5.0 IMPLICATIONS FOR MICHIGAN SPECIALTY CROP PROCESSORS .....	21
5.1 Using Real-Time Specific Conductivity Data to Isolate High-strength Meltwater .....	21
5.2 Designing and Managing Spray Irrigation Systems for Winter Operation .....	22
6.0 STUDY PERFORMANCE AND MEASUREABLE OUTCOMES.....	23
6.1 Study Performance .....	23
6.2 Measureable Outcomes .....	23

## List of Appendices

Appendix A: Photographs

Appendix B: Wastewater and Snow Analysis Summary

Appendix C: Melt Event Data

Appendix D: Weather Data

Appendix E: Laboratory Reports

## **1.0 INTRODUCTION**

### **1.1 Executive Summary**

Freeze crystallization and fractional melting are phenomena that occur when chemicals are dissolved in water, affecting the temperature at which the solution freezes and melts. A pilot-scale experiment was completed during the winter of 2010/2011 to test the applications of these phenomena to the treatment of wastewaters generated by processors of specialty crops in Michigan. It was theorized that by using snow-making equipment to make artificial snow from wastewater, and allowing the snow to melt naturally, high-strength wastewater could be isolated from low-strength wastewater, thereby reducing wastewater management costs for processors of specialty crops during winter months.

The data generated during the study indicate that wastewater constituents are vertically mobile in snow consisting of natural and artificial snow (made from wastewater) when air temperatures are below freezing. The data also indicates that snow containing wastewater does not melt homogeneously, and that meltwater strength (with regard to oxygen demand and chemical load) from the pilot-scale system was relatively high during periods of sustained sub-freezing air temperatures. Fractional melting of snow containing wastewater constituents is the proposed mechanism .

Empirical investigation observations indicate that meltwater specific conductivity is an indicator of meltwater oxygen demand. It is being proposed that Michigan specialty crop processors could capitalize on the fractional melting phenomenon and this observation to improve the cost efficiency of wastewater management during winter months. This could be accomplished with freeze crystallization and fractional melting by isolating high-strength meltwater (i.e., wastewater requiring additional treatment) from low-strength wastewater. The study has implications for managing traditional wastewater irrigation systems for winter operation, as the study data indicate that the melting of snow containing frozen wastewater may be somewhat self-regulating with respect to the release of wastewater constituents in meltwater. The data indicate that when snow melting rates are high, meltwater strength is low; and when melting rates are low, meltwater strength is high.

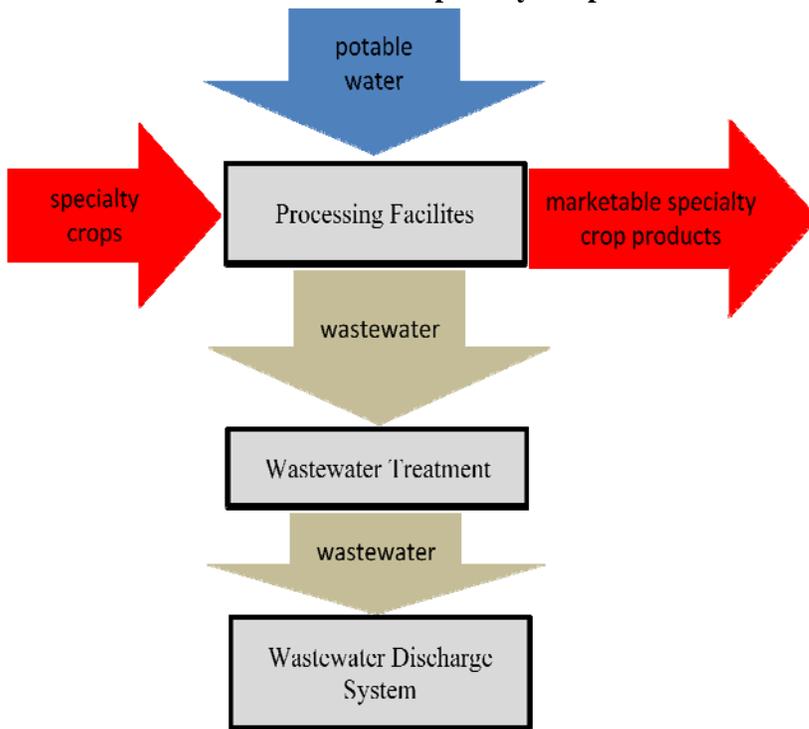
### **1.2 Study Objective**

The purpose of the project described in this report was to evaluate the feasibility of using freeze crystallization and fractional melting (FC&FM) wastewater treatment methods to treat specialty crop processing wastewater in Michigan.

### **1.3 Background**

Specialty crop processing wastewater is generated by cutting, coring, pitting, peeling, blanching, cooling, juicing, rinsing, and fluming fruits and vegetables within processing facilities. Figure 1.3 illustrates a generalized flow schematic typical of Michigan specialty crop processors.

**Figure 1.3**  
**Generalized Wastewater Flow of Specialty Crop Processors**



Processors who discharge wastewater to groundwater (via irrigation) or surface waters are responsible for maintaining compliance with Michigan Department of Environmental Quality (DEQ)-enforced wastewater quality regulations. Regulations that pertain to the volume and quality of discharged wastewater generally control processor-specific wastewater management costs. Many specialty crop processors are subject to regulations that establish maximum *concentrations*, in units of mass per volume (e.g., mg/L) of discharged wastewater constituents. Many processors are also regulated with maximum loading rates, in units of mass per acre per unit time, of wastewater constituents (e.g., pounds/acre/day). For example, a processor

may be permitted to discharge wastewater with a maximum phosphorus concentration of 1.0 mg/L. Concurrently, the processor may not be permitted to discharge more than 70 pounds of phosphorus per acre per year.

#### 1.4 Wastewater Management Challenges

To comply with regulations, processors utilize a variety of treatment methods. A processor may utilize a biological wastewater treatment system to remove organic material from wastewater (to comply with loading rate limits), and concurrently utilize a chemical wastewater treatment process to remove phosphorus from wastewater (to comply with a concentration limit).

#### 1.5 Discharging Wastewater to Groundwater

For many specialty crop processors, *discharge to groundwater* via spray irrigation, subsurface irrigation, or soil infiltration is the preferred discharge method. Discharging wastewater to groundwater is often the preferred discharge method for specialty crop processors in consideration of the following:

- Discharging wastewater to groundwater can recharge groundwater resources.
- Reusing process wastewater on-site for the irrigation of harvestable crops can promote crop yields and reduce costs associated with irrigating and fertilizing.
- Regulated chemical constituents that are present in the wastewaters of specialty crop processors can be effectively and efficiently treated within the soil of well-managed wastewater irrigation fields.
- For many processors, recycling wastewater on-site is the most cost-effective discharge method.

- The geographic location of many Michigan specialty crop processors is prohibitive of discharging to surface waters and municipality-maintained treatment works.

## 1.6 Experiment Design

The experiment described in this report was designed to generate data that would facilitate an evaluation of using FC&FM methods by specialty crop processors to minimize or reduce wastewater management costs and protect water resources. The hypothesized FC&FM process that the experiment was designed to test is described below:

- 1) **Aerosolization of wastewater when air temperatures are below freezing.** Pressurized wastewater is discharged such that the wastewater becomes an aerosol.
- 2) **Sublimation.** Some aerosolized wastewater immediately sublimates, and becomes water vapor.
- 3) **Crystallization of water.** Water particles crystallize (freeze), and fall as snow.
- 4) **Precipitation of salts, nutrients, metals, and organic material.** Poorly-soluble salts, nutrients, metals, and organic material is not incorporated into water as it freezes. Rather, this matter precipitates as solids, and is incorporated into the snow pack as particulate matter.
- 5) **Snowpack aging.** The snowpack undergoes physical and chemical changes, resulting from daily to seasonal fluctuations in temperature, humidity, precipitation, and solar radiation.
- 6) **Sublimation and melting.** The snow pack continues to sublimate, and one or more thaw events occur. When the thaw events occur, precipitates are left on the soil surface, and melted water infiltrates the soil. When a thaw event occurs, the uppermost snow melts and infiltrates vertically through the snowpack, dissolving highly-soluble salts and entraining some particulates of poorly-soluble compounds. As such, the initial melt water (primary melt water) contains a disproportionately high chemical load.
- 7) **Collection, treatment, and/or discharge of primary melt water (if necessary).** As noted above, the first portion of melt water from the snowpack contains a disproportionately high portion of the chemical load. To meet certain discharge standards (especially those for sodium, chloride, and nutrients), the first fraction of melt water (i.e., primary melt water) may require collection and additional treatment and/or dilution prior to discharge. Primary melt water can be collected with a drain system.
- 8) **Discharge of secondary melt water.** After primary melt water is released from the snow pack, secondary melt water is anticipated to be relatively-low strength, as readily-soluble compounds were physically removed in the primary melt water. This secondary melt water can be potentially discharged in-place, and the freeze crystallization discharge area can operate in the same manner as a rapid infiltration basin.
- 9) **Utilization of residue.** The non-soluble residue will contain precipitates of phosphorus and nitrogen compounds, as well as salts, oxides of metals, and organic solids. The residue can be collected and marketed as soil amendment, or utilized in-place for field crop production and harvest during non-winter months.

## 1.7 Previous Investigation

Previous investigations sponsored by the Government of Alberta, Canada: Agriculture and Rural Development were completed in 1997 and 1998<sup>1</sup> to test the feasibility of a variation of the above-described process for treatment of malting wastewater (i.e., wastewater from the production of alcoholic beverages), which has similar chemical characteristics as Michigan specialty crop processing wastewater. Directly relevant to the study summarized in this report, the Canadian investigators documented and/or observed the following:

- Significant nutrient and BOD removal from wastewater can occur with the FC&FM process.

<sup>1</sup> [http://www1.agric.gov.ab.ca/\\$department/deptdocs.nsf/all/agdex2416/\\$file/716h31.pdf?OpenElement](http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/agdex2416/$file/716h31.pdf?OpenElement)

- Concentrations of constituents in freshly-made snow were higher than concentrations in system influent. It was proposed that this was due to a net loss of water via sublimation.
- Making artificial snow on irrigation areas where frost has not penetrated deeply (in the early winter) can insulate soils, preserving wastewater infiltration capacity. Relatively uninhibited wastewater infiltration to soil reduces the likelihood for wastewater constituent precipitates to dissolve in meltwater, and be transported to the subsoil.
- An insulating layer of artificial snow on areas where frost *has* penetrated deeply into soils can delay the thawing of soils in spring months, which can effectively inhibit wastewater infiltration.

## **1.8 Water Quality Parameters**

The investigation detailed in this report focused on the treatment, removal, and/or chemical concentration of the following wastewater constituents or chemistry indicators: phosphorus (total), sodium (total), specific conductivity, inorganic nitrogen (ammonia, nitrite, and nitrate), chemical oxygen demand (COD), chloride, pH, biochemical oxygen demand (BOD), and dissolved organic carbon (DOC). The significance of these analytical parameters is detailed below.

### **1.8.1 Phosphorus (total)**

Phosphorus concentrations in discharged wastewater are regulated for wastewater discharges of Michigan specialty crop processors. As a nutrient that stimulates plant and microbial growth in surface waters, phosphorus concentrations in surface runoff from irrigation fields is an environmental concern.

### **1.8.2 Sodium (total)**

Sodium concentrations in discharged specialty crop wastewaters are regulated. Compliance with regulations and/or discharge permit limitations regarding sodium concentrations can be problematic for Michigan specialty crop processors, especially those that make deliberate efforts to minimize water use in processing facilities, thereby concentrating wastewater without increasing mass loading.

### **1.8.3 Specific Conductivity**

Specific conductivity is an indicator of the chemical strength of wastewater containing dissolved metals and other ions (e.g., sodium, phosphorus, chloride, etc...). Because specific conductivity can be measured “in the field” as a general indicator of the chemical load contained in a wastewater, this parameter has significance for the real-time monitoring of engineered systems.

### **1.8.4 Inorganic Nitrogen**

Inorganic nitrogen concentrations (as ammonia, nitrite, nitrate, and/or total inorganic nitrogen) are regulated for wastewater discharges of Michigan specialty crop processors. Concentration-based and/or mass loading-based regulations/permit limits can be applied to inorganic nitrogen. Because inorganic nitrogen is present in natural precipitation, the pilot-scale system was not closed with regarding to inorganic nitrogen. Subsequently, this monitoring parameter had limited significance for monitoring the performance of the pilot-scale system.

### **1.8.5 Chemical Oxygen Demand (COD)**

The COD of discharged specialty crop wastewaters (as a concentration or mass load) are not generally monitored for compliance monitoring purposes for discharges to groundwater. The COD of discharges to surface water is typically monitored as required by regulation and/or discharge permit conditions. COD is generally regarded as an excellent indicator of the overall oxygen demand of a wastewater because of the repeatability and consistency of laboratory analysis of this parameter.

### **1.8.6 Chloride**

Concentration and/or mass loading regulations and/or permit limitations can be applied to the chloride in specialty processor wastewater discharges. Chloride concentration limits can be especially problematic for Michigan specialty crop processors who deliberately concentrate wastewaters and discharge wastewaters to groundwater.

### **1.8.7 pH**

The pH (i.e., ‘acidity’) of specialty crop wastewaters is regulated for all discharge types.

### **1.8.8 Biochemical Oxygen Demand (BOD)**

The BOD of discharged wastewaters is typically regulated or monitored for all types of specialty crop wastewater discharges in Michigan.

### **1.8.9 Dissolved Organic Carbon (DOC)**

DOC concentrations are not generally monitored or regulated in wastewater discharges of specialty crop processor wastewaters. For high-strength wastewaters (loosely defined as those with a BOD concentration greater than 350 mg/L), especially those with significant concentrations of simple and complex sugars (e.g., fruit juices), DOC concentrations can be interpreted as a proxy for BOD or COD. Because DOC analysis provides superb resolution relative to BOD analysis, and laboratory methods are repeatable and consistent, DOC analysis has significance for the investigation detailed in this report. DOC has special significance for monitoring land application treatment systems and discharges to groundwater, as DOC can be detected in groundwater at low concentrations, facilitating the performance evaluation of such systems in consideration of wastewater chemistry and groundwater chemistry data.

## **1.9 Study Goals**

The goal of the study was to reduce wastewater treatment and management costs for processors of specialty crops by analyzing three (3) aspects of the wastewater freeze crystallization and fractional melting process. For each aspect of the freeze crystallization process, the study was designed to answer specific questions, summarized below:

### **Primary sublimation**

Are wastewater constituents concentrated when wastewater is made into snow?

Do any wastewater constituents volatilize when wastewater is made into snow, resulting in a net loss to the atmosphere?

### **Snowpack aging**

Are wastewater constituents vertically mobile within a snowpack consisting of natural and artificial (wastewater) snow?

Are some wastewater constituents of concern more mobile than others?

Is there evidence of fractional melting within the snowpack?

### **Snowpack melting**

Chemically, does the snowpack melt homogenously, or preferentially?

During a melt event, does the primary meltwater contain a disproportionate chemical load?

## **2.0 METHODS**

### **2.1 Pilot Scale System Installation**

A pilot-scale freeze crystallization system was installed in Shelby, Michigan at a facility operated by a Michigan specialty crop processor. A concrete, sloped, cherry-cooling pad was selected for the study due to its drainage characteristics and proximity to a wastewater drain and electricity. Four (4), 50-foot lengths of coupled 2-inch, schedule 40 polyvinyl chloride (PVC) piping were installed in the shape of a square. A textured PVC geotextile was installed above the square forming a large impermeable surface, with the edges anchored by 50-pound bags of silica sand.

In the downslope corner of the system, the geomembrane was punctured and a 2-inch diameter PVC pipe was installed and sealed into the bottom of the geomembrane, such that the invert of the pipe was installed at the lowest point of the system. All liquid that exited the system drained through the 2-inch pipe. In-line with the drain pipe, a series of volumetric flow totalizers were installed to document the drainage of the system during melting events.

The drain pipe emptied in a manhole/wet well that pumped to the on-site wastewater lagoon. At the termination of the drainpipe, a 1-liter stormwater sampler was installed to collect meltwater samples. The stormwater sampler was fitted with a float valve, such that subsequent to the filling of the dedicated sampling bottle, no additional water would be collected. As such, the collected melt water samples were representative of the melt water at distinct sampling intervals.

Immediately upstream of the termination of the drainage pipe, a specific conductivity datalogger was installed for a portion of the study. The datalogger probe was installed approximately 1/8" higher than a weep hole, such that the logger conductivity readings were representative of recently-melted wastewater (and not stagnant melt water). The specific conductivity of very low-rate (< approx. 0.2 GPM) flows were not recorded. The entire drainage assembly, from the drainage pipe invert to the datalogger and sampling bottle, was heated with electric tape, to ensure the proper function of the datalogger and flow totalizers.

### **2.2 Snow Making**

On four (4) events, snow was made from wastewater and discharged to the test area. Wastewater was pumped from the on-site equalization lagoon, and transported via a plastic 200-gallon tank to the test area. The

wastewater used in the study was produced mainly from the processing of apples. A grab sample of wastewater was collected prior to each snow-making event to chemically characterize the wastewater that was introduced to the system. Immediately after snow making, a sample of fresh snow was also collected and analyzed. Wastewater was discharged to the system in 200-gallon increments; the volume of wastewater discharged to the system was recorded for each event.

Snow was made using an un-modified, commercially-available snowmaking system. The system generally consisted of a trailer-mounted, diesel-powered air compressor, a gasoline-powered firefighting water pump, and a tripod-mounted snow making gun.

## **2.3 Snowpack Sampling**

The composite snowpack consisting of both artificial and natural snow was sampled using two (2) distinctly different methods, described below:

### **2.3.1 Pre-determined Depth Grab Sampling**

Samples were collected from the deepest snow within the system, and from a location where the snow depth was approximately 75% of the maximum depth. At each sampling location, samples were collected at the maximum depth, mid-depth, and at the bottom of the snow pack.

### **2.3.2 Deliberate Interval Sampling**

Snow samples were collected from deliberate intervals that were determined from the thickness of the observed alternating layers of natural snow and artificial snow. At each sampling location, a composite snow sample was collected from each distinct snow layer, and submitted for laboratory analysis. The physical characteristics, thickness, and depth of each snow layer were noted.

## **2.4 Meltwater Sampling**

Samples of meltwater leaving the system were collected from the 1.0-liter stormwater sampler. When sustained air temperatures were not above freezing, meltwater samples were collected at each snow-making event, and were thus representative of the chemical character of the water that exited the system in relatively low volumes. During melting events, meltwater samples were collected more frequently, and meltwater flow rates were recorded.

## **2.5 Residuals Sampling**

Four grab samples of the residuals were collected subsequent to snowpack melting. The samples were analyzed for wastewater constituents to determine their chemical character.

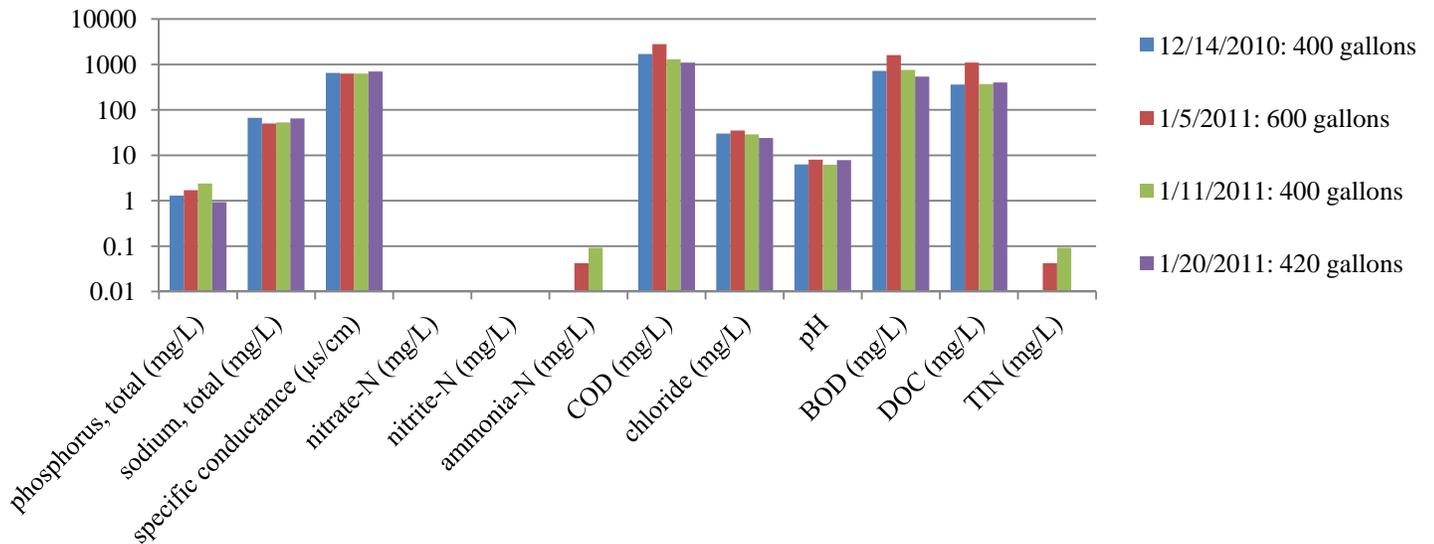
## **3.0 RESULTS**

### **3.1 System Influent and Fresh Wastewater Snow Characterization**

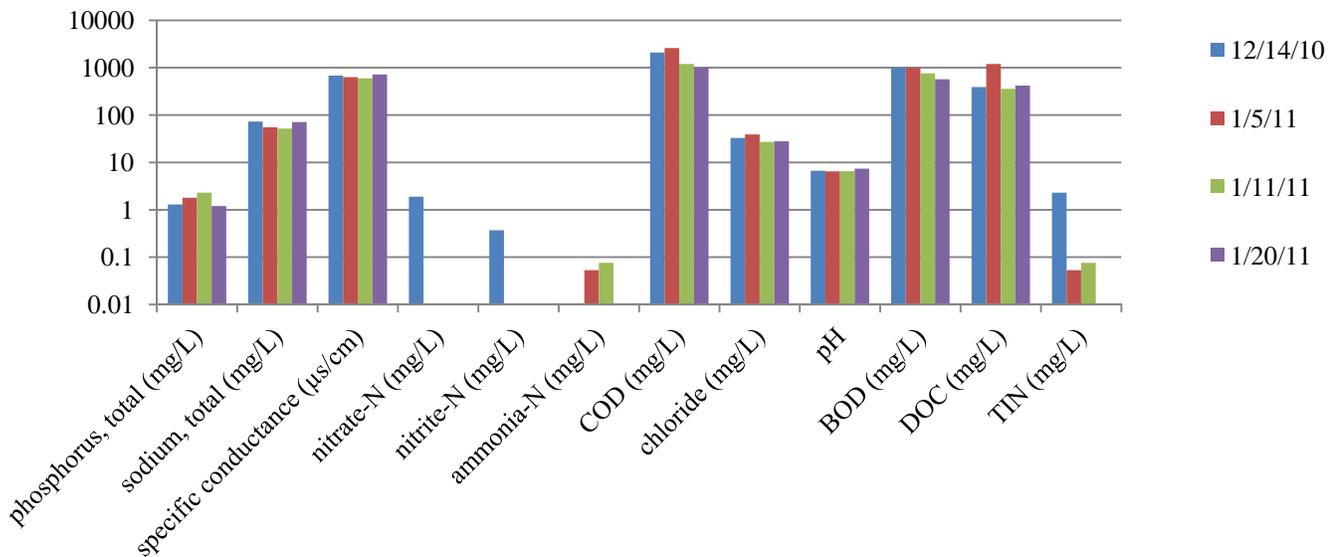
Wastewater was made into snow and discharged to the system on four (4) occasions. The chemical character of the system influent is summarized in Figure 3.1a. The chemical characterization of fresh snow samples is summarized in Figure 3.1b.

The chemical character of the wastewater introduced to the system on the four occasions was relatively consistent. Similarly, the chemical character of the fresh wastewater snow sampled on all occasions was relatively consistent. The data does not indicate that analyzed constituents were effectively volatilized by making wastewater into snow.

**Figure 3.1a: System Influent Characterization**



**Figure 3.1b: Fresh Wastewater Snow Characterization**



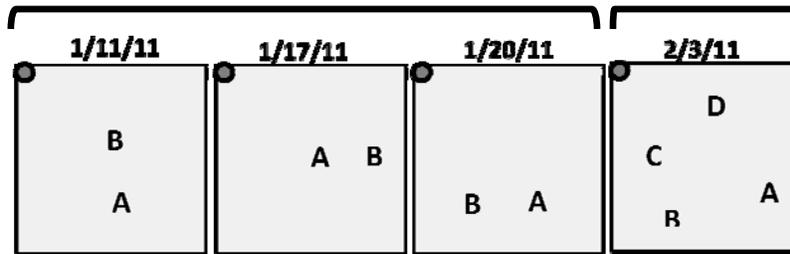
### 3.2 Snowpack Sampling

The snowpack was sampled on four (4) occasions using two (2) different sampling methods. During the first three (3) snowpack sampling events, snow samples were collected from pre-determined intervals that corresponded to the top of the snowpack, the middle of the snowpack, the bottom of the snowpack and/or a vertical composite of the snowpack. On one (1) occasion, samples were collected at intervals as dictated by

snow texture heterogeneities. Distinct layers of snow were described and sampled. Snow sample locations are illustrated below in Figure 3.2a.

**Figure 3.2a: Snow Sampling Locations**

Pre-determined interval (i.e., max-, mid-, and min- depth) sampling      Deliberate (i.e., dictated by snow texture) sampling

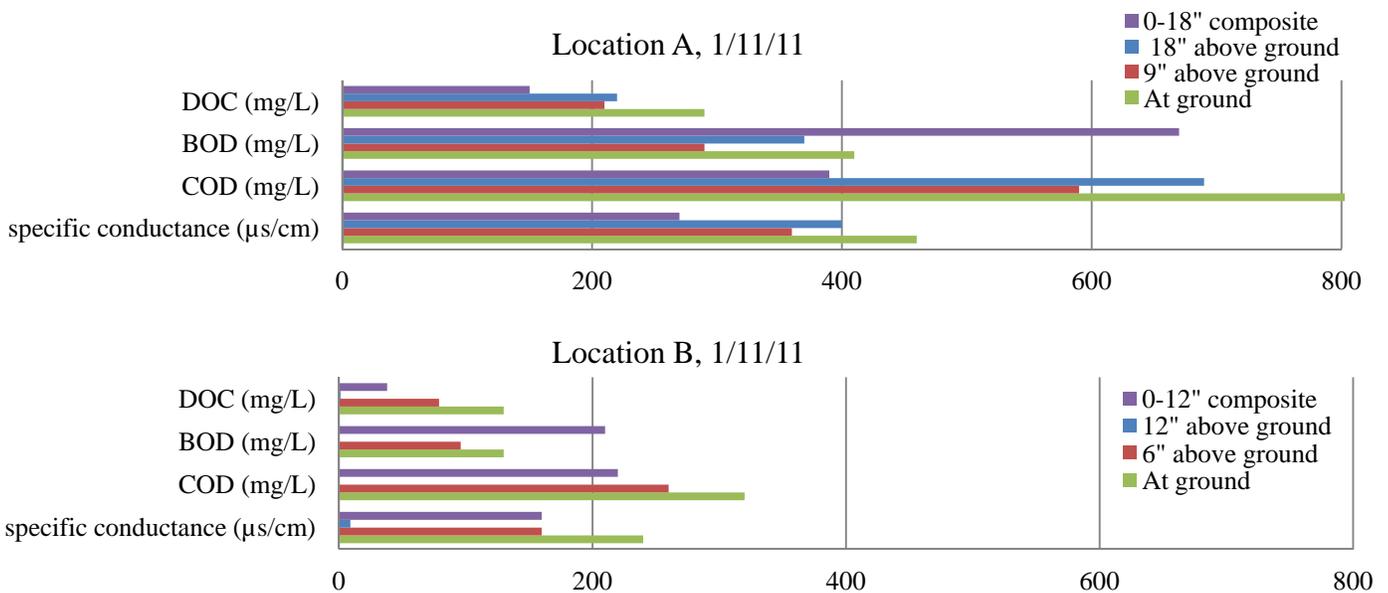


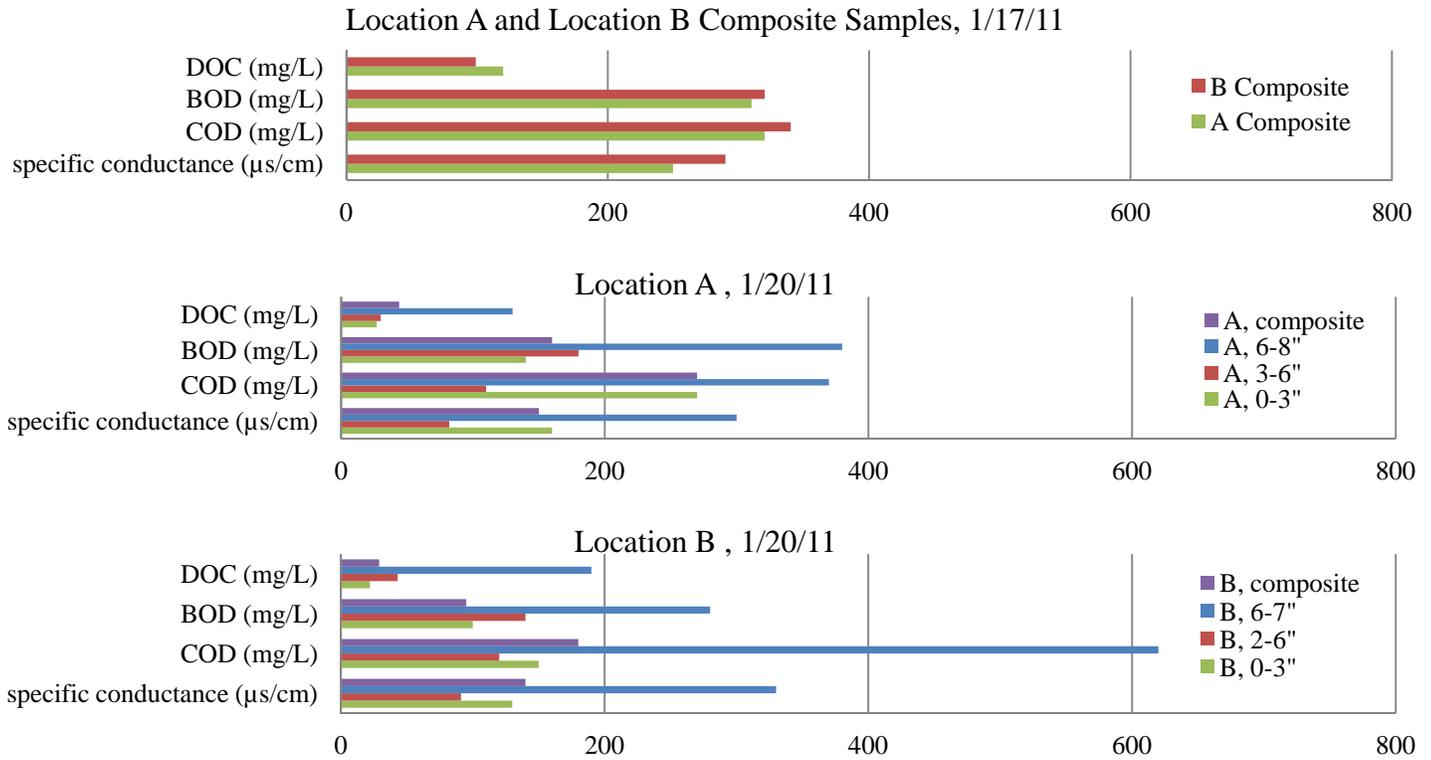
Plan View: Letters correspond to sample collection locations. On all sampling events, location “A” corresponded to the deepest snow in the study area. The darkened circle represents the location of the drain (i.e., the 50’x50’ study area was sloped to upper left corner of the above sketches).

**3.2.1 Pre-determined Interval Sampling**

Figure 3.2.b illustrates the distribution of wastewater constituents at pre-determined grab sampling depths. On all sampling occasions, a significant fraction of wastewater constituents were detected in samples collected from the bottom of the snowpack.

**Figure 3.2b: Pre-Determined Depth Snowpack Sampling Results**

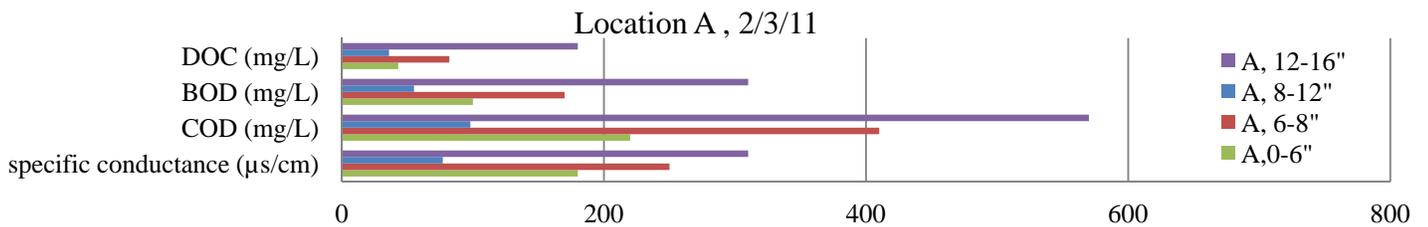




### 3.2.2 Deliberate Interval Sampling

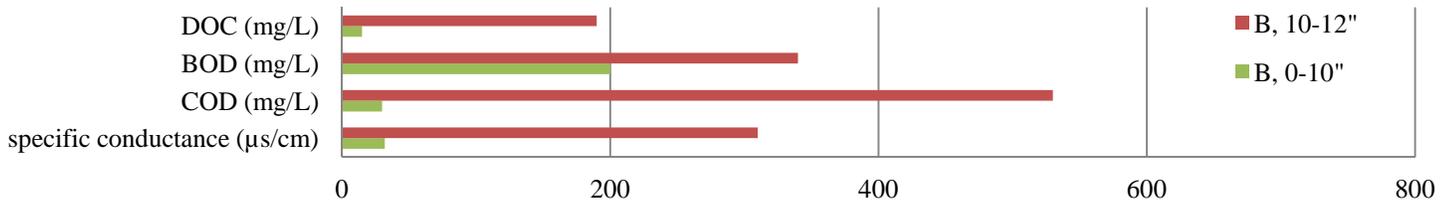
Figure 3.2c illustrates the results of the deliberate interval sampling completed on February 3, 2011. The results are generally consistent with those from other snowpack sampling events. Wastewater constituents were detected at significant concentrations throughout the snowpack, but were concentrated at the bottom of the snowpack and in snow layers that were visually identified as “artificial”.

**Figure 3.2c: Deliberate Interval Snowpack Sampling Results**



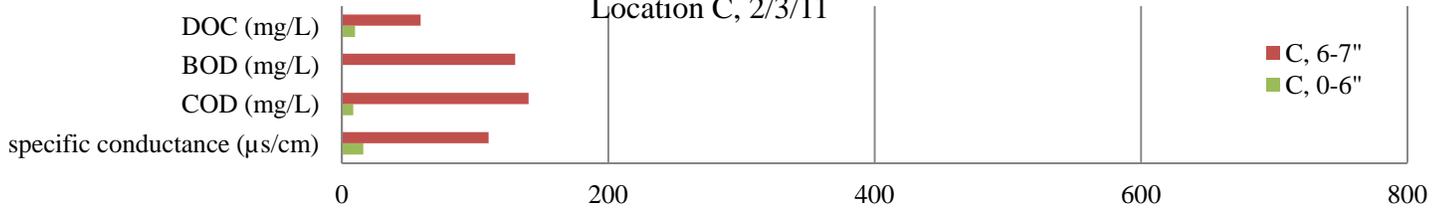
Depth Above Ground at Location A (inches)	Physical Description of Snow
12-16	artificial snow
8-12	natural snow
6-8	artificial snow
0-6	powder, large crystals, and slush

Location B, 2/3/11



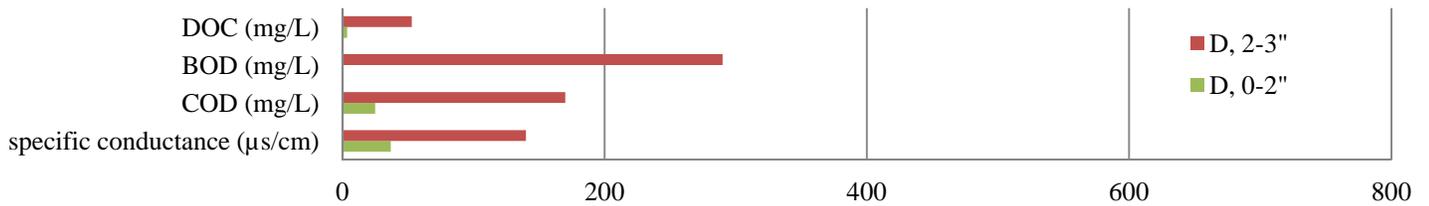
Depth Above Ground at Location B (inches)	Physical Description of Snow
10-12	artificial snow
0-10	powder, large crystals, and slush

Location C, 2/3/11



Depth Above Ground at Location C (inches)	Physical Description of Snow
6-7	artificial snow
0-6	powder, large crystals, and slush

Location D, 2/3/11



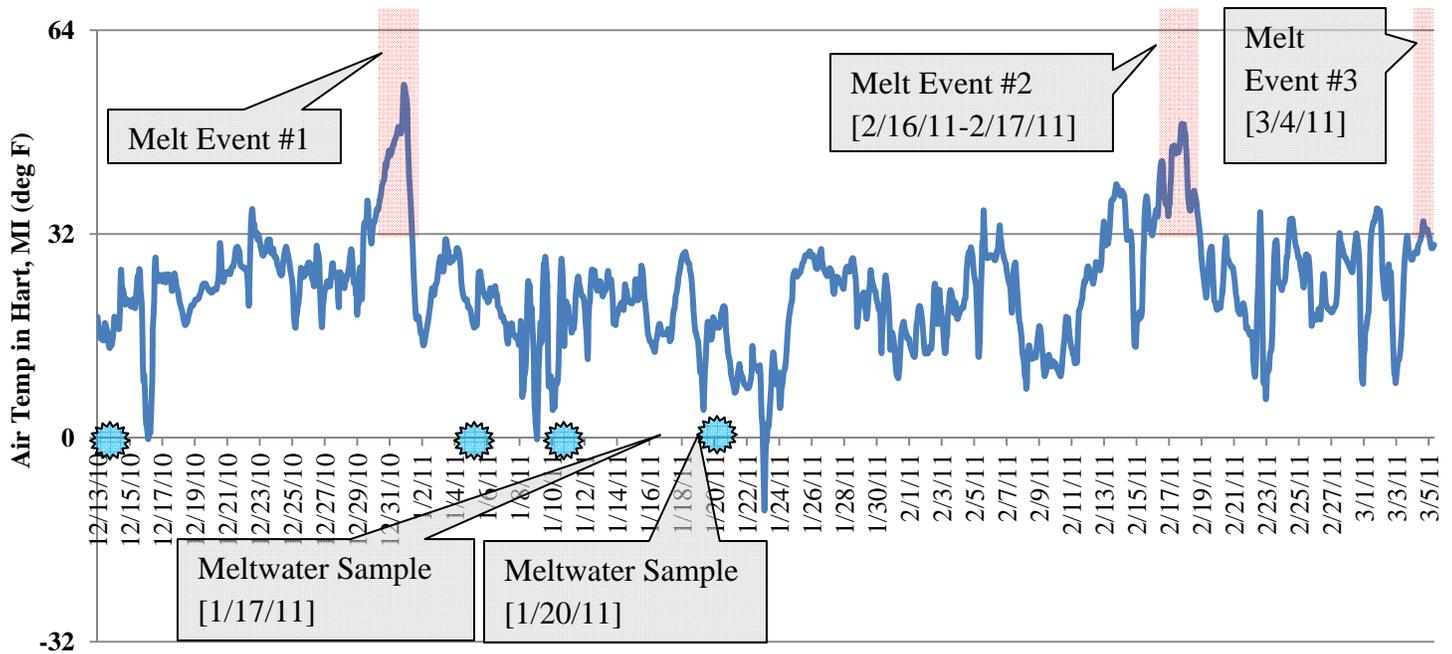
Depth Above Ground at Location D (inches)	Physical Description of Snow
2-3	artificial snow
0-2	powder, large crystals, and slush

### 3.3 Meltwater Analysis

Meltwater samples were collected during periods of sustained sub-freezing temperatures, and during two (2) melt events. Figure 3.3 illustrates the temporal relationship between air temperatures, thaw events, snow making events, and meltwater sampling events.

**Figure 3.3:**  
**Air Temperatures, Snow Making Events, Melt Events, and Meltwater Sampling**

☀ = Snow Making Event



Immediately subsequent to Melt Event #1, no appreciable snow, natural or artificial, was present in the study area. Meltwater samples were not collected during Melt Event #1. Two meltwater samples were collected during extended periods of sub-freezing air temperatures subsequent to Melt Event #1. Several samples were collected during Melt Event #2 and Melt Event #3. Results are detailed below.

### 3.3.1 Meltwater Samples Collected During Periods of Sub-freezing Air Temperatures

Two (2) meltwater samples were collected when sustained air temperatures were below freezing. Laboratory analytical results are detailed in Table 3.3. The first meltwater sample, collected on 1/17/11, was relatively high-strength (i.e., BOD= 500 mg/L, COD= 860 mg/L). The sample collected three days later on 1/20/11 was significantly more dilute (i.e., BOD= 24 mg/L, COD= 63 mg/L). With respect to oxygen demand (BOD and COD), DOC, and total phosphorus, the two meltwater samples collected *before* melt events and during periods of extended below-freezing air temperatures were higher-strength than any meltwater samples collected *during* melt events.

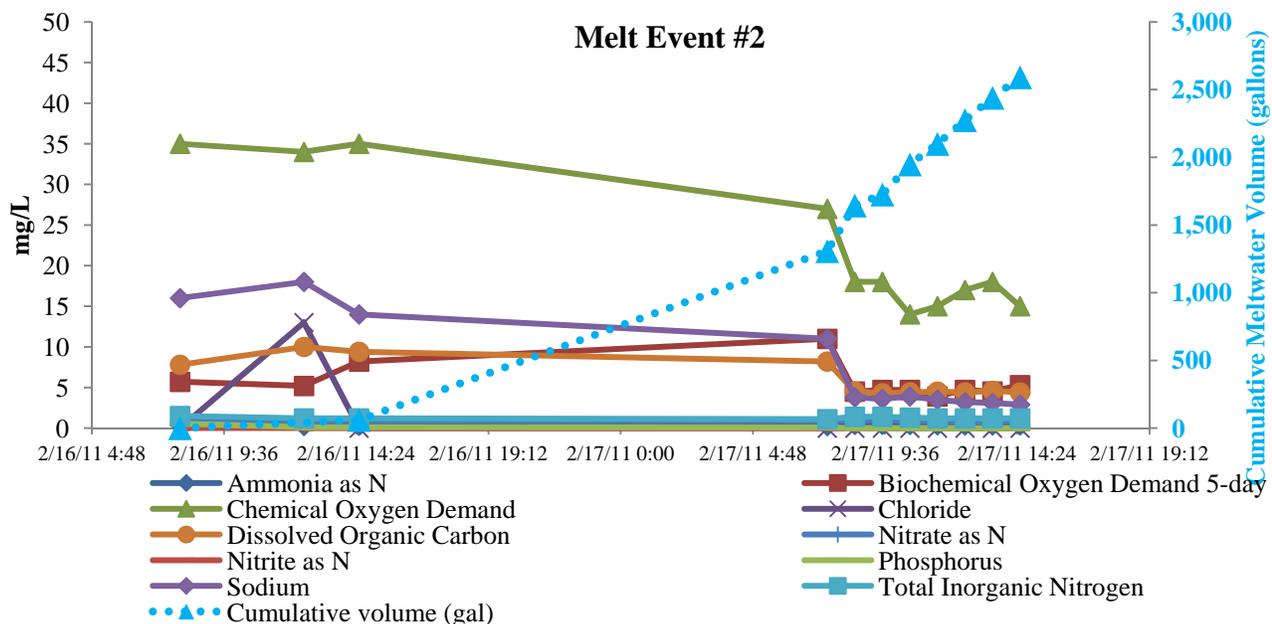
**Table 3.3: Summary of Meltwater Analysis (non-melt events)**

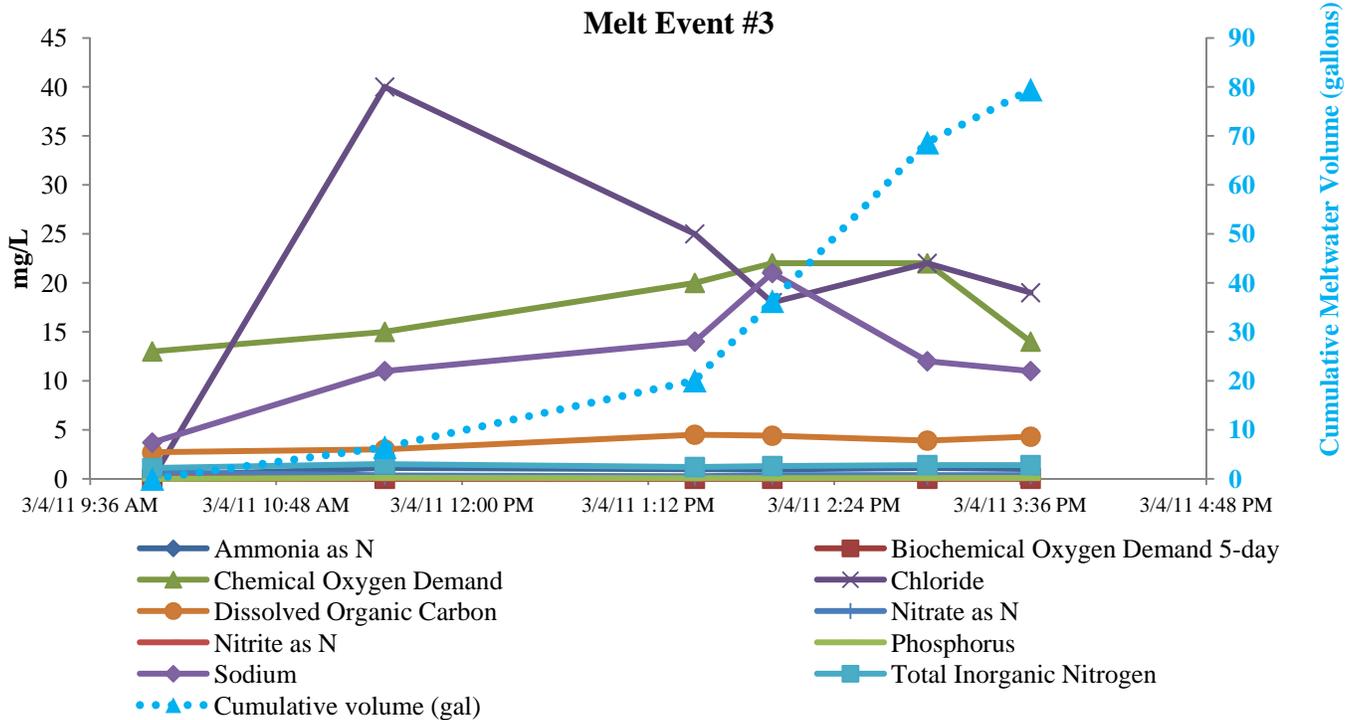
Wastewater Constituent	1/17/2011	1/20/2011
phosphorus, total (mg/L)	0.2	0.08
sodium, total (mg/L)	60	11
specific conductance ( $\mu\text{s}/\text{cm}$ )	650	210
nitrate-N (mg/L)	<0.10	0.28
nitrite-N (mg/L)	<0.10	<0.10
ammonia-N (mg/L)	0.022	0.018
COD (mg/L)	860	63
chloride (mg/L)	30	<10
pH	7.09	7.82
BOD (mg/L)	500	24
DOC (mg/L)	350	25
TIN (mg/L)	0.022	0.3

### 3.3.2 Melt Event #2 and Melt Event #3

Several meltwater grab samples were collected during Melt Event #2 and Melt Event #3. At each sample collection, a cumulative meltwater volume for the melt event was recorded. Figure 3.3.2 illustrates meltwater chemistry changes during the melt events as a function of time and cumulative meltwater volume. During melt Event #2, a distinct correlation between cumulative meltwater flow (total gallons) and wastewater constituent concentrations (mg/L) was observed. As the melt event progressed, the meltwater from the pilot-scale system became more dilute. This relationship was not observed during Melt Event #3; however, the Melt Event #3 was characterized by lesser cumulative meltwater flow and significantly more dilute meltwater.

**Figure 3.3.2: Meltwater Chemistry during Melt Events**





### 3.4 Water Balance and Water Recovery Analysis

Detailed meltwater flow rate data were collected during Melt Event #2 and Melt Event #3. Table 3.4 summarizes wastewater loading, precipitation, and water recovery from the pilot-scale system. During the two (2) analyzed melt events, 31 percent of the total water loaded to the system (wastewater plus precipitation) was recovered. Of the water loaded to the system, 17% was wastewater and 83% was natural precipitation. Precipitation data from the Michigan Automated Weather Network (MAWN) was used in the investigation.<sup>2</sup>

**Table 3.4: Water Balance Summary**

Water Introduced to the System After Melt Event #2_	Gallons	Percent of Total Loaded
as liquid wastewater:	1,420	17%
as liquid precipitation:	7,138	83%
<b>Total water added to system</b>	<b>8,558</b>	<b>100%</b>
Water Recovered from the System_	Gallons	Percent of Total Loaded
during Melt Event #2:	2,591	30%
during Melt Event #3:	79	1%
<b>Total water recovered from system</b>	<b>2,670</b>	<b>31%</b>

<sup>2</sup> <http://www.agweather.geo.msu.edu/mawn/>. Data from the "Hart, MI" station was used in the investigation.

### 3.5 Wastewater Constituent Recovery Analysis

During both analyzed melt events (Melt Event #2 and Melt Event #3), the mass of wastewater constituents that was removed from the system as the chemical load of meltwater was calculated by relating concentrations (i.e., mg/L) to measured meltwater volumes. Constituent recovery analysis was not completed for inorganic nitrogen because this constituent was also introduced to the system via precipitation (i.e., the system was not chemically closed to inorganic nitrogen).

For constituent recovery analysis, the mass of constituents introduced during the first snowmaking event (12/14/10) was not considered, as no snow or significant moisture was contained in the system subsequent to Melt Event #1 (i.e., during Melt Event #1, the wastewater constituents introduced on 12/14/10 were removed from the system via meltwater).

Wastewater constituent recovery analysis is detailed in Table 3.5. Between 1.7% and 24.3% of the wastewater constituents that were loaded to the system were recovered during Melt Event #2 and Melt Event #3.

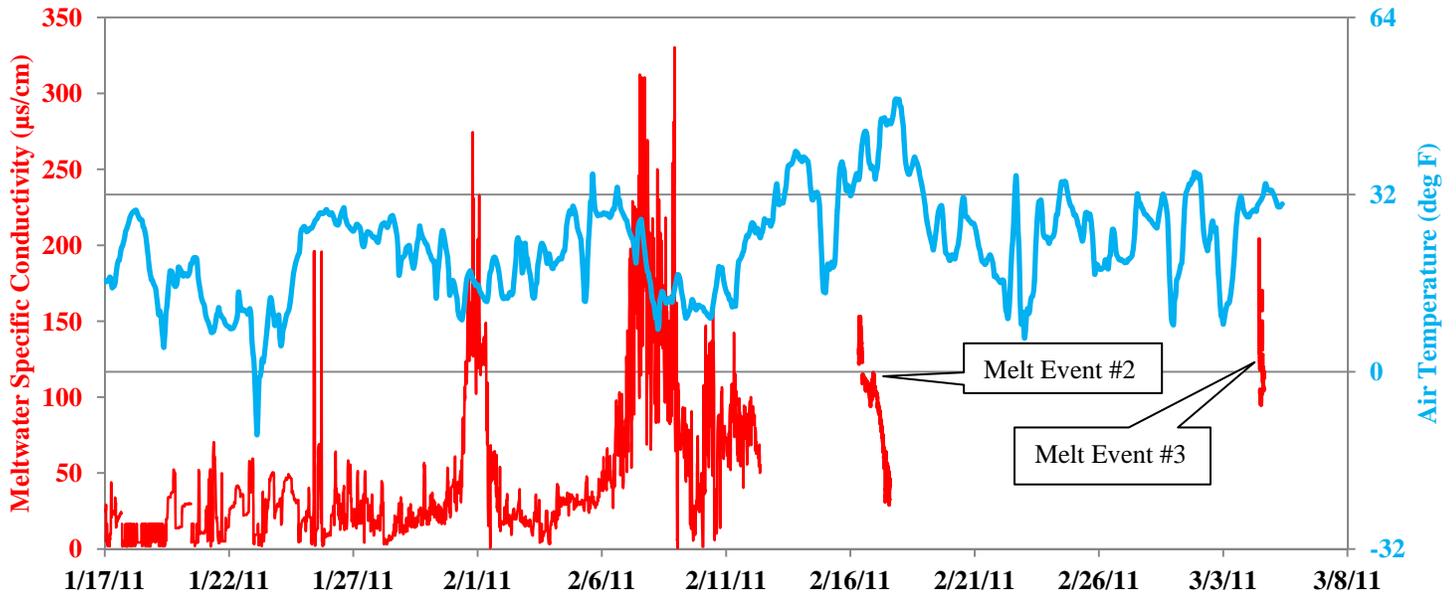
**Table 3.5: Summary of Constituent Recovery**

	Mass Loaded to System via Wastewater AFTER MELT EVENT #1 (g)	Mass Recovered During Melt Event #2 (g)	Mass Recovered During Melt Event #3 (g)	Fraction of Loaded Mass that Was Recovered	Fraction Recovered During Melt Event #2	Fraction Recovered During Melt Event #3
phosphorus, total	9.0	0.4	0.0	4.5%	4.2%	0.2%
sodium, total	296.7	72.0	4.2	26%	24.3%	1.4%
COD	10,062.4	215.2	6.0	2.2%	2.1%	0.1%
chloride	161.3	0.0	6.8	4.2%	0.0%	4.2%
BOD	5,635.2	76.0	0.0	1.3%	1.3%	0.0%
DOC	3,689.3	62.4	1.2	1.7%	1.7%	0.0%

### 3.6 Specific Conductivity of Meltwater

A specific conductivity datalogger was installed on 1/17/11 to document meltwater specific conductivity variations during melt events and non-melt events alike. On 2/12/11, the datalogger failed, and subsequent conductivity data was not continuous. Specific conductivity readings subsequent to this date were measured with a hand-held meter during melt events. The results are summarized on Figure 3.6.

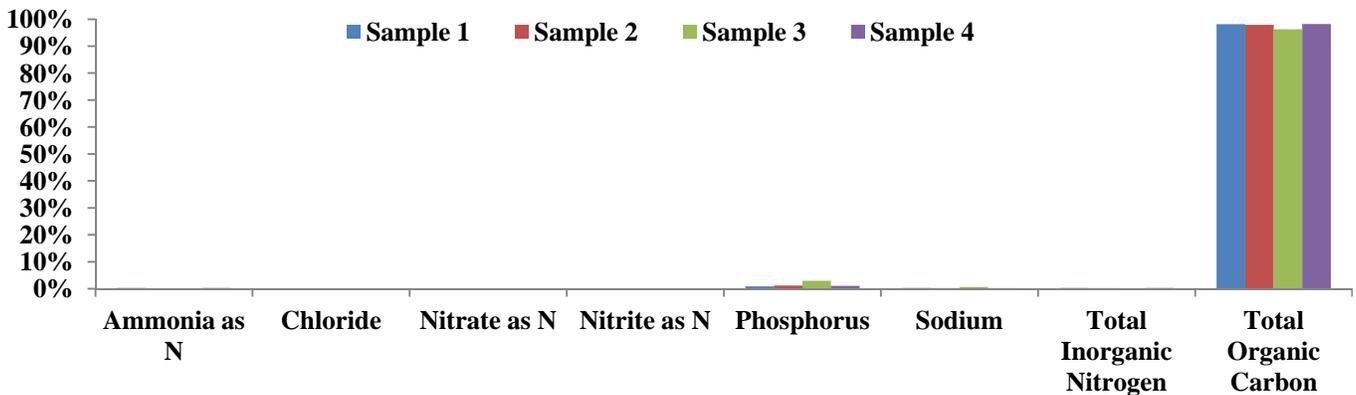
**Figure 3.6: Specific Conductivity and Air Temperatures**



**3.7 Residuals Analysis**

On April 12, 2011, four samples of wastewater residuals were collected from the study area, which was effectively void of water. Only isolated water puddles remained on the study system. Grab samples of residuals were collected from spatially independent dry residuals accumulations, and were submitted for laboratory analysis. A reasonable estimation of the mass of residuals left by the snowpack could not be made, as wind and heavy liquid precipitation removed residuals from the system. Figure 3.7 details the chemical character of the sampled residuals, as a normalized composition of the residuals with respect to the analyzed constituents. The residuals were largely comprised of organic carbon, with appreciable amounts of phosphorus and trace concentrations of chloride, sodium, and inorganic nitrogen.

**Figure 3.7: Summary of Residuals Analysis**



## 4.0 CONCLUSIONS

### 4.1 Primary Sublimation

The results of the investigation do not indicate that the snow making process directly results in the volatilization of any wastewater constituents to the atmosphere, for a net loss of mass. The results of the investigation do not indicate that the snowmaking process results in the concentration of wastewater constituents by the mechanism of sublimating water during the snow making process.

### 4.2 Snowpack Aging

Investigation results indicate that the distribution of wastewater constituents within the snowpack changes as a function of time, even when sustained air temperatures are below freezing. All analyzed wastewater constituents were detected throughout the snowpack, which was comprised of alternating layers of natural and artificial snow. Wastewater constituents were also concentrated at the bottom of the snowpack, and were detected in layers of natural snow that, when deposited, did not contain wastewater constituents. These observations indicate that wastewater constituents are mobile within the snowpack, and migrate downward in solution, even when sustained air temperatures are below-freezing. All analyzed wastewater constituents, with the exception of inorganic nitrogen, exhibited this behavior in the snowpack. Fractional melting is the proposed explanation for the observed behavior.

### 4.3 Snowpack Melting

Investigation results indicate that the snowpack consisting of natural and artificial snow (i.e., “wastewater snow”) did not melt homogeneously. While 31% of the total water introduced to the system (sum of wastewater and precipitation) was recovered during melt event sampling, only 1.7%-23% of each wastewater constituent introduced to the system was recovered during meltwater events. This indicates that approximately 69% of the water and 87-98% of the wastewater constituents loaded to the system drained from the system as meltwater during periods of extended below-freezing air temperatures.

Melt Event #2 marked a period of above-freezing air temperatures, subsequent to an extended period of below-freezing air temperatures and significant chemical loading to the system. The chemistry of meltwater grab samples collected during Melt Event #2, relative to the cumulative measured flow from the system during Melt Event #2, indicate the following:

- The meltwater that was sampled during Melt Event #2 was significantly more dilute than the wastewater that was originally introduced to the system, even when the dilution affect of precipitation is considered.
- The chemical strength of the meltwater was inversely related to the cumulative volume of water that melts *during a melting event* (i.e., The first fraction of the meltwater was relatively high-strength, and the meltwater during Melt Event #2 became progressively more dilute throughout the melt event.).

The observations from Melt Event #2 were not observed during Melt Event #3, as the meltwater during Melt Event #3 was very dilute (i.e., non-detectable BOD concentrations, COD < 35 mg/L, and DOC < 4.5 mg/L) . This observation in itself supports the general observation that the chemical strength of meltwater decreased over time and with cumulative meltwater volume.

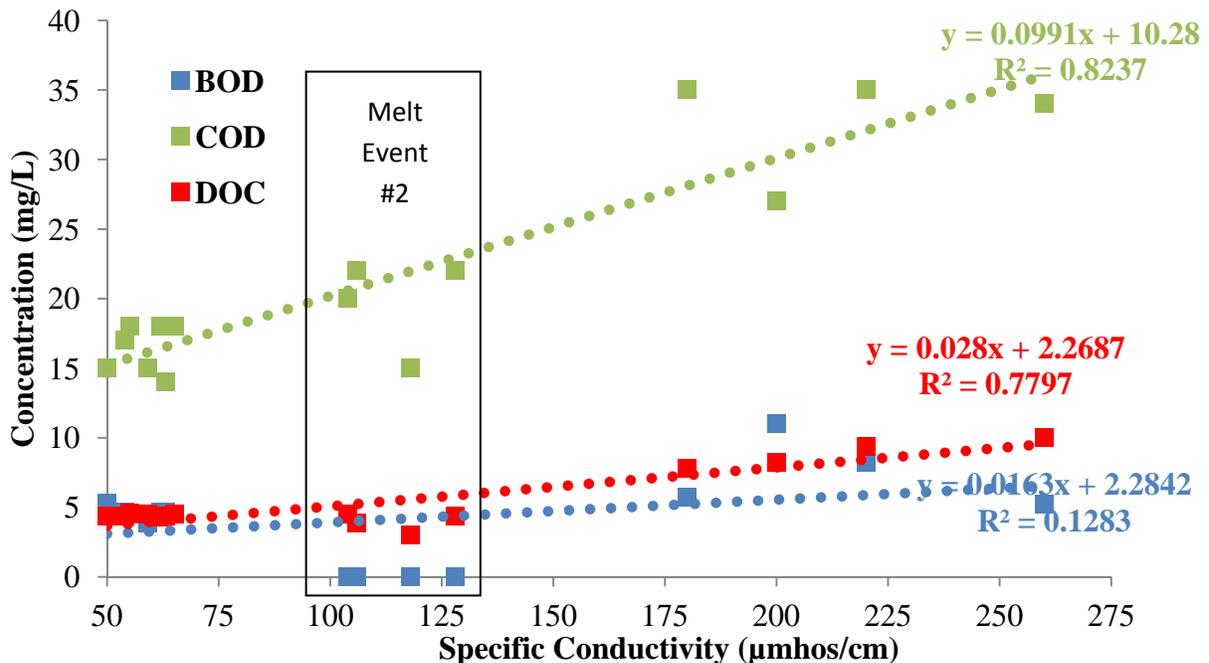
## 5.0 IMPLICATIONS FOR MICHIGAN SPECIALTY CROP PROCESSORS

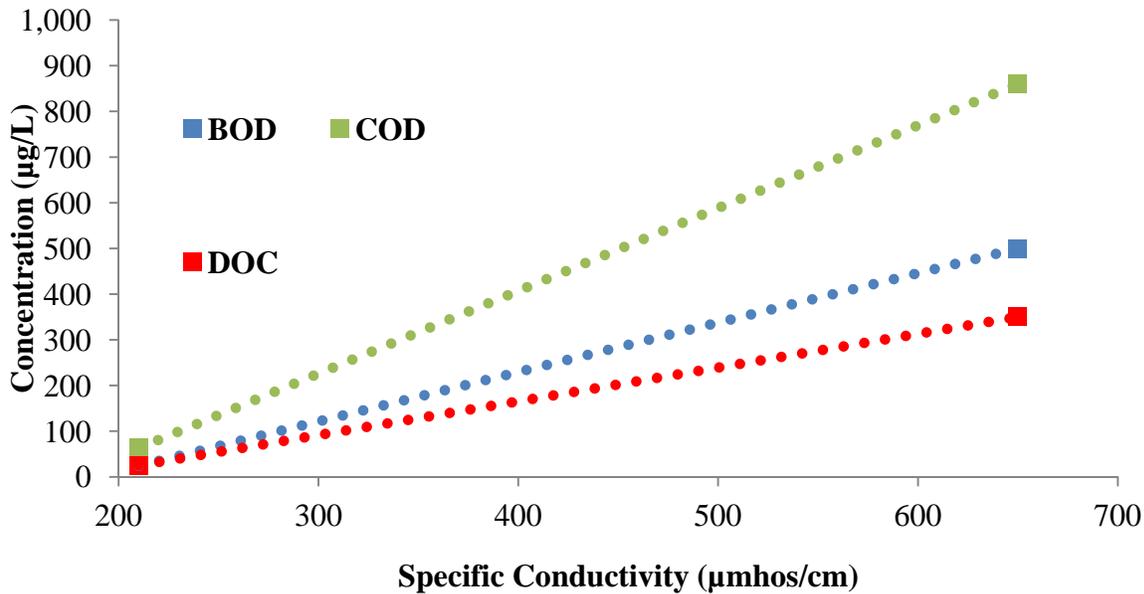
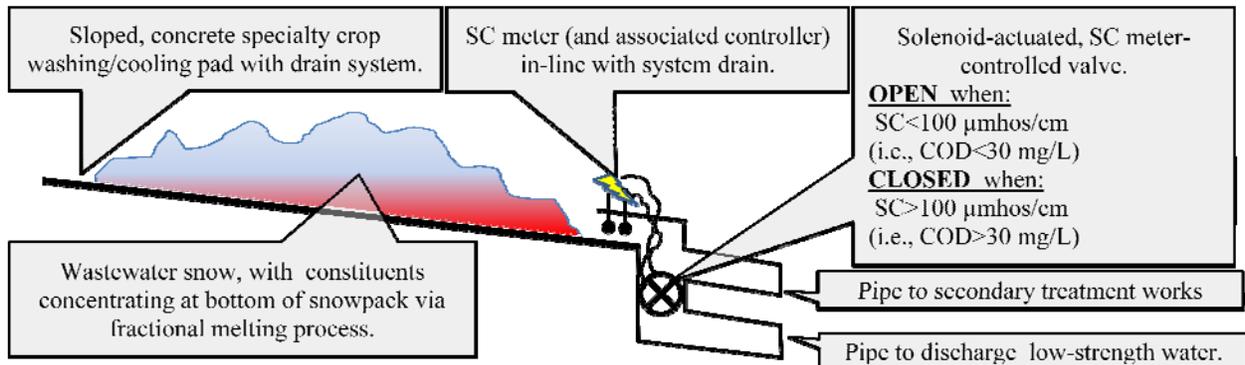
### 5.1 Using Real-Time Specific Conductivity Data to Isolate High-strength Meltwater

Figures 5.1a and 5.1b illustrates the relationship between the specific conductivity of the meltwater collected during melt events and meltwater oxygen demand indicators (i.e., BOD, COD, and DOC). Figure 5.1b illustrates the same relationships for meltwater samples that were not collected during melt events. These data indicate that at relatively low specific conductivity readings (i.e., <300  $\mu\text{mhos/cm}$ ) a linear correlation between SC and COD of the meltwater was observed. The relationship is less pronounced for SC and DOC, and weak for SC and BOD. It is noteworthy that the laboratory detection limit for BOD for the meltwater samples from Melt Event #3 was 200  $\mu\text{g/L}$ . As such, the BOD data from Melt Event #3 does not have enough resolution to establish a linear SC-BOD relationship.

The observation has implications for the cost-effective management of specialty crop processor wastewater during winter months. The data indicates that the oxygen demand or strength of meltwater from the freeze crystallization/fractional melting process can be reasonably estimated in the field with a hand-held specific conductivity meter. This estimation would allow wastewater treatment system operators to capitalize on the fractional melting process described above, and effectively separate dilute meltwater (i.e., the wastewater that can be discharged without further treatment) from relatively high-strength wastewater (i.e., the wastewater that requires additional treatment prior to discharge). Figure 5.1c illustrates a hypothetical wastewater treatment system that capitalized on the fractional melting process to separate high-strength wastewater from low-strength wastewater.

**Figure 5.1a: Specific Conductivity and Oxygen Demand of Meltwater during Melt Events**



**Figure 5.1b: Specific Conductivity and Oxygen Demand of Meltwater (non-melt events)****Figure 5.1c: Conceptual Practical Application of Fractional Melting Wastewater Treatment System**

The system described in Figure 5.1c could be installed at minimal cost to an existing specialty crop washing/cooling pad (i.e., a “cherry pad”). Such pads are commonly installed at Michigan specialty crop processing facilities, and are unused during winter months when the fractional melting process can occur. Snow-making equipment could be temporarily installed. Specialty crop processors could realize wastewater management cost savings by reducing the volume of water requiring treatment and minimizing associated capital and operation and maintenance costs (e.g., lined retention lagoon installation, aeration costs, and secondary treatment costs).

## 5.2 Designing and Managing Spray Irrigation Systems for Winter Operation

Many Michigan specialty crop processors maintain traditional spray irrigation systems for wastewater land application. The investigation summarized in this document indicates that snow comprised of both natural and artificial snow does not melt homogeneously, with respect to the chemical character of meltwater.

The data indicate that the melting of snowpack may be somewhat self-regulating with regard to chemical *loading* from meltwater. The data indicates that the *concentration* of wastewater constituents in meltwater is highest when sustained air temperatures are sub-freezing, and that wastewater becomes progressively more dilute during melting events. As observed, this behavior could have the affect of promoting relatively even or “equalized” wastewater constituent loading to underlying irrigation field soils, while *hydraulic loading rates* to irrigation field subsoil may vary considerably.

## **6.0 STUDY PERFORMANCE AND MEASUREABLE OUTCOMES**

### **6.1 Study Performance**

The goal of the study was to reduce wastewater treatment and management costs for processors of specialty crops. Performance was measured with the analysis of wastewater analytical data from discharged wastewater, snow, and melt water. The study results indicate that freeze crystallization and fractional melting systems can concentrate wastewater constituents such that at least 50 percent of the meltwater is of high enough quality to be discharged in compliance with applicable regulations. This target was established in the project proposal.

### **6.2 Measureable Outcomes**

The study generated data that has direct application to the design, installation, and management of Michigan specialty crop processor wastewater treatment systems. Specifically, the study generated data that indicates that natural, chemical mechanisms can be capitalized on during winter months to isolate regulated wastewater constituents present in specialty crop processing wastewater.

## **Appendix A: Photographs**



Picture 1: Installed geomembrane system.



Picture 2: Drain System

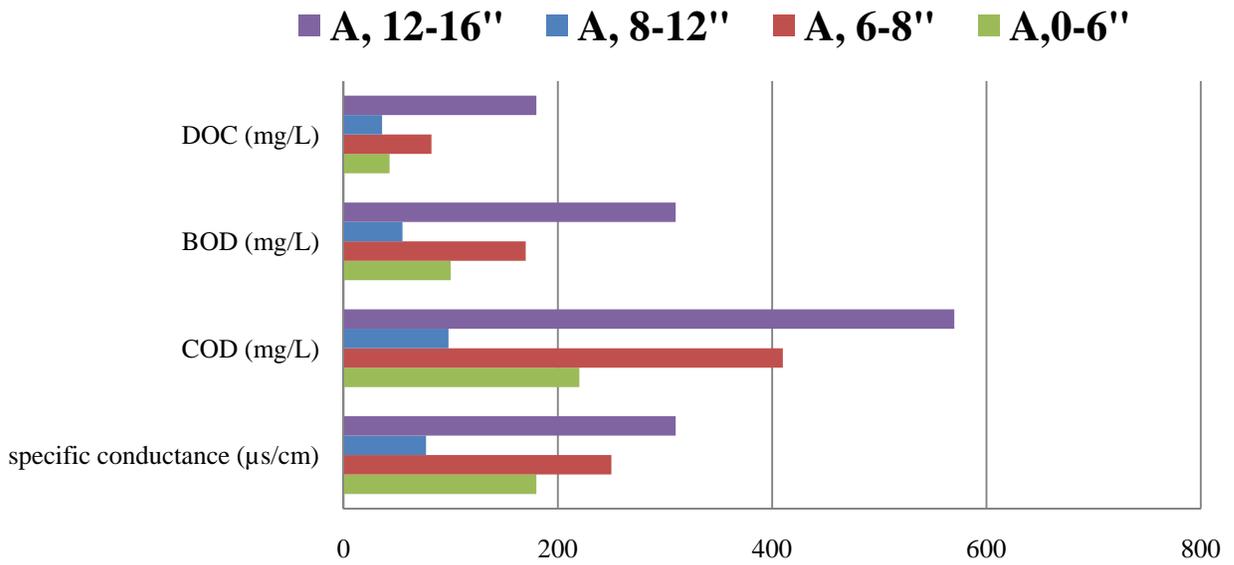
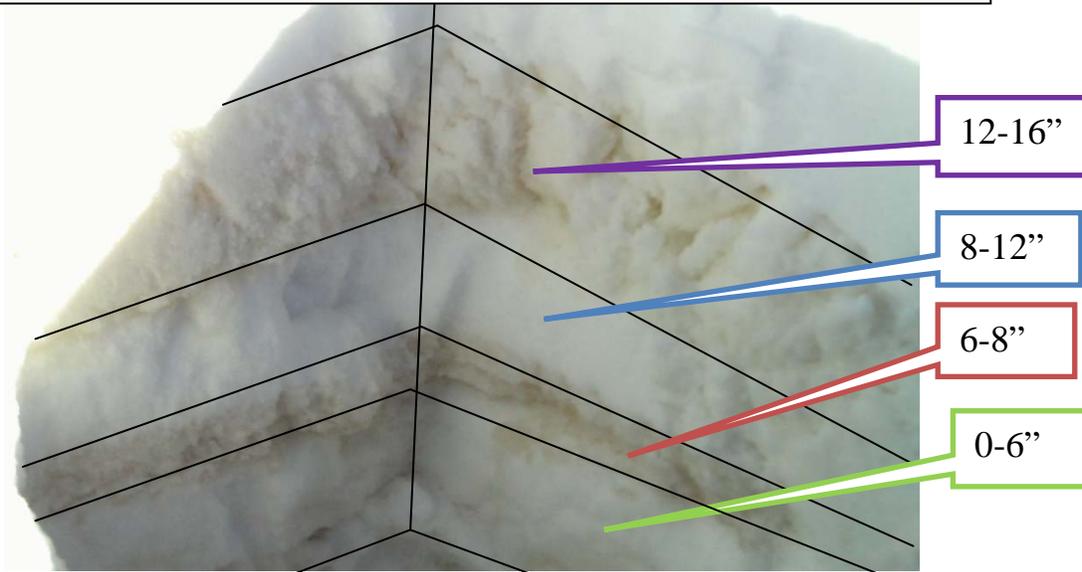


Picture 3: Snow making equipment in operation.



Picture 4: Study area natural snowfall.

Picture 5: Snow layers at Location A on 2/3/11. The associated figure is from the text of the Final Report.



## **Appendix B: Wastewater and Snow Analysis Summary**

	12/14/10	1/5/11	1/11/11	1/20/11	Total
volume of wastewater introduced to system (gallons)	400	600	400	420	1820

system influent analysis	12/14/2010: 400 gallons	1/5/2011: 600 gallons	1/11/2011: 400 gallons	1/20/2011: 420 gallons	Loading After 1st Melt Event (grams)
phosphorus, total (mg/L)	1.3	1.7	2.4	0.93	8.96
sodium, total (mg/L)	67	50	53	65	296.73
specific conductance (µs/cm)	650	630	630	700	3492.72
nitrate-N (mg/L)	<0.10	<0.10	<0.10	<0.10	0.00
nitrite-N (mg/L)	<0.10	<0.10	<0.10	<0.10	0.00
ammonia-N (mg/L)	<0.010	0.042	0.092	<0.010	0.23
COD (mg/L)	1700	2800	1300	1100	10062.36
chloride (mg/L)	30	35	29	24	161.33
pH	6.28	8	6.2	7.82	39.93
BOD (mg/L)	720	1600	760	540	5635.22
DOC (mg/L)	360	1100	370	400	3689.28
TIN (mg/L)	<0.010	0.042	0.092	<0.010	0.23

fresh artificial snow analysis	12/14/10	1/5/11	1/11/11	1/20/11
phosphorus, total (mg/L)	1.3	1.8	2.3	1.2
sodium, total (mg/L)	73	55	52	71
specific conductance (µs/cm)	680	630	600	720
nitrate-N (mg/L)	1.9	<0.10	<0.10	<0.10
nitrite-N (mg/L)	0.37	<0.10	<0.10	<0.10
ammonia-N (mg/L)	<0.010	0.053	0.076	<0.010
COD (mg/L)	2100	2600	1200	1000
chloride (mg/L)	33	39	27	28
pH	6.71	6.46	6.52	7.4
BOD (mg/L)	1,000	1000	760	570
DOC (mg/L)	390	1200	360	420
TIN (mg/L)	2.3	0.053	0.076	<0.010

meltwater	1/17/2011	1/20/2011	2/3/2011
phosphorus, total (mg/L)	0.2	0.08	0.054
sodium, total (mg/L)	60	11	7.8
specific conductance (µs/cm)	650	210	130
nitrate-N (mg/L)	<0.10	0.28	0.52
nitrite-N (mg/L)	<0.10	<0.10	<0.10
ammonia-N (mg/L)	0.022	0.018	0.044
COD (mg/L)	860	63	17
chloride (mg/L)	30	<10	<10
pH	7.09	7.82	7.32
BOD (mg/L)	500	24	<4.0
DOC (mg/L)	350	25	6.7
TIN (mg/L)	0.022	0.3	0.56

date	1/11/2011	1/11/2011	1/11/2011	1/11/2011
sample ID	18" above ground	9" above ground	At ground	0-18" composite
specific conductance (µs/cm)	400	360	460	270
COD (mg/L)	690	590	820	390
BOD (mg/L)	370	290	410	670
DOC (mg/L)	220	210	290	150
TIN (mg/L)	1.6	1.6	2.3	1.4
pH	9.89	9.96	9.89	9.76
nitrate-N (mg/L)	1.5	1.1	1.4	0.87
nitrite-N (mg/L)	<0.10	0.36	0.56	0.3
ammonia-N (mg/L)	0.16	0.13	0.39	0.21
sodium, total (mg/L)	44	38	53	27
phosphorus, total (mg/L)	0.97	0.86	1.3	0.59
chloride (mg/L)	2.6	19	23	13

	1/11/2011	1/11/2011	1/11/2011	1/11/2011
	12" above ground	6" above ground	At ground	0-12" composite
specific conductance (µs/cm)	9	160	240	160
COD (mg/L)	<5.0	260	320	220
BOD (mg/L)	<4.0	96	130	210
DOC (mg/L)	1.2	79	130	38
TIN (mg/L)	0.37	0.64	0.24	0.53
pH	6.32	9.34	9	8.99
nitrate-N (mg/L)	0.26	0.33	0.18	0.25
nitrite-N (mg/L)	<0.10	0.26	0.1	0.23
ammonia-N (mg/L)	0.11	0.053	0.066	0.052
sodium, total (mg/L)	<1.0	15	24	14
phosphorus, total (mg/L)	<0.050	0.55	1.3	0.63
chloride (mg/L)	<0.10	<0.10	11	<10

	1/17/2011	1/17/2011
	A Composite	B Composite
specific conductance (µs/cm)	250	290
COD (mg/L)	320	340
BOD (mg/L)	310	320
DOC (mg/L)	120	99
TIN (mg/L)	0.44	0.18
pH	8.73	8.02
nitrate-N (mg/L)	0.16	0.17
nitrite-N (mg/L)	0.23	<0.10
ammonia-N (mg/L)	0.05	0.019
sodium, total (mg/L)	21	27
phosphorus, total (mg/L)	1.1	0.82
chloride (mg/L)	12	13

	1/20/2011	1/20/2011	1/20/2011	1/20/2011
	A, 6-8"	A, 3-6"	A, 0-3"	A, composite
specific conductance (µs/cm)	300	82	160	150
COD (mg/L)	370	110	270	270
BOD (mg/L)	380	180	140	160
DOC (mg/L)	130	30	27	44
TIN (mg/L)	0.013	0.18	0.015	0.016
pH	8.84	8.67	8.34	9.19
nitrate-N (mg/L)	<0.10	0.17	<0.10	<0.10
nitrite-N (mg/L)	<0.10	<0.10	<0.10	<0.10
ammonia-N (mg/L)	0.013	0.013	0.015	0.016
sodium, total (mg/L)	27	6.4	13	13
phosphorus, total (mg/L)	1.9	0.51	1.9	1.4
chloride (mg/L)	14	<10	<10	<10

	1/20/2011	1/20/2011	1/20/2011	1/20/2011
	B, 6-7"	B, 2-6"	B, 0-3"	B, composite
specific conductance (µs/cm)	330	91	130	140
COD (mg/L)	620	120	150	180
BOD (mg/L)	280	140	100	95
DOC (mg/L)	190	43	22	29
TIN (mg/L)	0.45	0.19	0.13	0.13
pH	9.65	9.37	9.34	9.44
nitrate-N (mg/L)	0.14	0.16	0.11	0.12
nitrite-N (mg/L)	0.26	<0.10	<0.10	<0.10
ammonia-N (mg/L)	0.051	0.027	0.018	0.013
sodium, total (mg/L)	32	6.4	9.3	8.9
phosphorus, total (mg/L)	1.5	0.34	0.92	0.92
chloride (mg/L)	16	<10	<10	<10

	2/3/2011	2/3/2011	2/3/2011	2/3/2011	2/3/2011	2/3/2011
	A, 12-16"	A, 8-12"	A, 6-8"	A, 0-6"	B, 10-12"	B, 0-10"
specific conductance (µs/cm)	310	77	250	180	310	32
COD (mg/L)	570	98	410	220	530	30
BOD (mg/L)	310	55	170	100	340	200
DOC (mg/L)	180	36	82	43	190	15
TIN (mg/L)	0.3	1.2	0.072	0.43	0.66	0.75
pH	9.82	9.07	9.09	6.68	9.94	8.35
nitrate-N (mg/L)	0.25	0.81	<0.10	0.35	0.51	0.53
nitrite-N (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
ammonia-N (mg/L)	<0.10	0.4	0.072	0.079	0.15	0.22
sodium, total (mg/L)	31	5.9	21	14	31	2.4
phosphorus, total (mg/L)	0.69	0.14	1.5	0.7	0.43	<0.050
chloride (mg/L)	13	<0.10	11	<10	12	<10

	2/3/2011	2/3/2011	2/3/2011	2/3/2011
	C, 6-7"	C, 0-6"	D, 2-3"	D, 0-2"
specific conductance (µs/cm)	110	16	140	37
COD (mg/L)	140	8.4	170	25
BOD (mg/L)	130	<4.0	290	<50
DOC (mg/L)	59	9.7	53	3.7
TIN (mg/L)	1.0	0.92	0.48	0.66
pH	9.54	7.65	9.34	7.35
nitrate-N (mg/L)	0.74	0.66	0.4	0.46
nitrite-N (mg/L)	<0.10	<0.10	<0.10	<0.10
ammonia-N (mg/L)	0.27	0.26	0.084	0.2
sodium, total (mg/L)	10	<1.0	11	2.2
phosphorus, total (mg/L)	0.13	<0.050	0.4	<0.050
chloride (mg/L)	<10	<10	<0.10	<10

## **Appendix C: Melt Event Data**

## Melt Event #2

Meltwater Flow Measurements										
	2/16/11 8:00	2/16/11 14:30	2/17/11 7:30	2/17/11 8:30	2/17/11 9:30	2/17/11 10:30	2/17/11 11:30	2/17/11 12:30	2/17/11 13:30	2/17/11 14:30
Volume since last reading (gal)	0	60	1,247	337	81	222	151	174	166	151
Cumulative volume (gal)	0	60	1,308	1,645	1,726	1,948	2,100	2,274	2,440	2,591

Melwater Chemistry (mg/L, unless otherwise noted)												
	Ammonia as N	Biochemical Oxygen Demand 5-day	Chemical Oxygen Demand	Chloride	Dissolved Organic Carbon	Nitrate as N	Nitrite as N	Phosphorus	Sodium	Total Inorganic Nitrogen	Specific Conductance (us/cm)	pH
2/16/11 8:00 AM	0.39	5.7	35	<10	7.8	1.1	<0.1	0.53	16	1.5	180	7.19
2/16/11 12:30 PM	0.28	5.2	34	13	10	0.9	<0.1	0.12	18	1.2	260	7.46
2/16/11 2:30 PM	0.3	8.2	35	<10	9.4	0.89	<0.1	0.11	14	1.2	220	7.59
2/17/11 7:30 AM	0.27	11	27	<10	8.2	0.85	<0.1	0.075	11	1.1	200	7.23
2/17/11 8:30 AM	0.43	4.5	18	<10	4.5	1.0	<0.1	<0.05	3.8	1.4	65	7.08
2/17/11 9:30 AM	0.43	4.7	18	<10	4.3	1.0	<0.1	<0.05	3.6	1.4	62	7.00
2/17/11 10:30 AM	0.41	4.7	14	<10	4.4	0.9	<0.1	<0.05	3.9	1.3	63	6.96
2/17/11 11:30 AM	0.37	3.9	15	<10	4.5	0.84	<0.1	<0.05	3.5	1.2	59	6.95
2/17/11 12:30 PM	0.35	4.7	17	<10	4.4	0.81	<0.1	<0.05	3.2	1.2	54	6.96
2/17/11 1:30 PM	0.34	4.5	18	<10	4.6	0.82	<0.1	<0.05	3.1	1.2	55	6.99
2/17/11 2:30 PM	0.35	5.3	15	<10	4.4	0.87	<0.1	<0.05	2.9	1.2	50	6.98

Mass Recovery Analysis (grams)											
	Ammonia as N	Biochemical Oxygen Demand 5-day	Chemical Oxygen Demand	Chloride	Dissolved Organic Carbon	Nitrate as N	Nitrite as N	Phosphorus	Sodium	Total Inorganic Nitrogen	Gallons Recovered
2/16/11 8:00 AM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
2/16/11 12:30 PM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
2/16/11 2:30 PM	0.07	1.87	7.99	0.00	2.15	0.20	0.00	0.03	3.20	0.27	60
2/17/11 7:30 AM	1.27	51.86	127.29	0.00	38.66	4.01	0.00	0.35	51.86	5.19	1247
2/17/11 8:30 AM	0.55	5.74	22.96	0.00	5.74	1.28	0.00	0.00	4.85	1.79	337
2/17/11 9:30 AM	0.13	1.44	5.51	0.00	1.32	0.31	0.00	0.00	1.10	0.43	81
2/17/11 10:30 AM	0.34	3.95	11.77	0.00	3.70	0.76	0.00	0.00	3.28	1.09	222
2/17/11 11:30 AM	0.21	2.23	8.57	0.00	2.57	0.48	0.00	0.00	2.00	0.69	151
2/17/11 12:30 PM	0.23	3.10	11.21	0.00	2.90	0.53	0.00	0.00	2.11	0.79	174
2/17/11 1:30 PM	0.21	2.83	11.31	0.00	2.89	0.52	0.00	0.00	1.95	0.75	166
2/17/11 2:30 PM	0.20	3.03	8.57	0.00	2.51	0.50	0.00	0.00	1.66	0.69	151
<b>TOTAL:</b>	3.22	76.04	215.18	0.00	62.44	8.57	0.00	0.38	72.00	11.68	2591.31

### Melt Event #3

Meltwater Flow Measurements						
	3/4/2011 10:00	3/4/2011 11:30	3/4/2011 13:30	3/4/2011 14:00	3/4/2011 15:00	3/4/2011 15:40
Volume since last reading (gal)	0	6	14	16	32	11
Cumulative volume (gal)	0	6	20	36	69	79

Melwater Chemistry (mg/L, unless otherwise noted)												
	Ammonia as N	Biochemical Oxygen Demand 5-	Chemical Oxygen Demand	Chloride	Dissolved Organic Carbon	Nitrate as N	Nitrite as N	Phosphorus	Sodium	Total Inorganic Nitrogen	Specific Conductance (us/cm)	pH
3/4/11 10:00 AM	0.31	<2	13	<10	2.7	0.64	0.12	<0.05	3.7	1.1		7.03
3/4/11 11:30 AM	1.1	<2	15	40	3.0	0.35	<0.1	0.092	11	1.5	118	7.06
3/4/11 1:30 PM	0.98	<2	20	25	4.5	0.26	<0.1	0.062	14	1.2	104	6.98
3/4/11 2:00 PM	0.96	<2	22	18	4.4	0.38	<0.1	0.062	21	1.3	128	6.99
3/4/11 3:00 PM	1.1	<2	22	22	3.9	0.38	<0.1	0.08	12	1.4	106	6.99
3/4/11 3:40 PM	1	<2	14	19	4.3	0.38	<0.1	0.08	11	1.4		7.00

Mass Recovery Analysis (grams)											Gallons Recovered
	Ammonia as N	Biochemical Oxygen Demand 5-	Chemical Oxygen Demand	Chloride	Dissolved Organic Carbon	Nitrate as N	Nitrite as N	Phosphorus	Sodium	Total Inorganic Nitrogen	
3/4/11 10:00 AM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
3/4/11 11:30 AM	0.03	0.00	0.37	0.98	0.07	0.01	0.00	0.00	0.27	0.04	6
3/4/11 1:30 PM	0.05	0.00	1.03	1.29	0.23	0.01	0.00	0.00	0.72	0.06	14
3/4/11 2:00 PM	0.06	0.00	1.35	1.10	0.27	0.02	0.00	0.00	1.29	0.08	16
3/4/11 3:00 PM	0.13	0.00	2.69	2.69	0.48	0.05	0.00	0.01	1.47	0.17	32
3/4/11 3:40 PM	0.04	0.00	0.57	0.78	0.18	0.02	0.00	0.00	0.45	0.06	11
TOTAL:	0.31	0.00	6.01	6.84	1.23	0.11	0.00	0.02	4.19	0.41	79.47

## **Appendix D: Weather Data**

Hart, MI

hourly summary

date	time	atmp
12/13/2010	1:00	40525.04 19
12/13/2010	2:00	12/13/2010 2:00 18.2
12/13/2010	3:00	12/13/2010 3:00 17.1
12/13/2010	4:00	12/13/2010 4:00 16.1
12/13/2010	5:00	12/13/2010 5:00 15.9
12/13/2010	6:00	12/13/2010 6:00 15.6
12/13/2010	7:00	12/13/2010 7:00 15.5
12/13/2010	8:00	12/13/2010 8:00 15.5
12/13/2010	9:00	12/13/2010 9:00 15.7
12/13/2010	10:00	12/13/2010 10:00 15.3
12/13/2010	11:00	12/13/2010 11:00 16.4
12/13/2010	12:00	12/13/2010 12:00 18
12/13/2010	13:00	12/13/2010 13:00 17.8
12/13/2010	14:00	12/13/2010 14:00 17.4
12/13/2010	15:00	12/13/2010 15:00 16.9
12/13/2010	16:00	12/13/2010 16:00 16.6
12/13/2010	17:00	12/13/2010 17:00 15.2
12/13/2010	18:00	12/13/2010 18:00 14.4
12/13/2010	19:00	12/13/2010 19:00 14.1
12/13/2010	20:00	12/13/2010 20:00 14.4
12/13/2010	21:00	12/13/2010 21:00 14.5
12/13/2010	22:00	12/13/2010 22:00 14.5
12/13/2010	23:00	12/13/2010 23:00 15
12/13/2010	24:00:00	12/14/2010 0:00 15.9
12/14/2010	1:00	12/14/2010 1:00 17.1
12/14/2010	2:00	12/14/2010 2:00 19
12/14/2010	3:00	12/14/2010 3:00 18.7
12/14/2010	4:00	12/14/2010 4:00 18.5
12/14/2010	5:00	12/14/2010 5:00 17.7
12/14/2010	6:00	12/14/2010 6:00 17.5
12/14/2010	7:00	12/14/2010 7:00 18.2
12/14/2010	8:00	12/14/2010 8:00 17.6
12/14/2010	9:00	12/14/2010 9:00 17.1
12/14/2010	10:00	12/14/2010 10:00 18.9
12/14/2010	11:00	12/14/2010 11:00 23.7
12/14/2010	12:00	12/14/2010 12:00 26.4
12/14/2010	13:00	12/14/2010 13:00 24.1
12/14/2010	14:00	12/14/2010 14:00 23.5
12/14/2010	15:00	12/14/2010 15:00 23.2
12/14/2010	16:00	12/14/2010 16:00 22.7
12/14/2010	17:00	12/14/2010 17:00 21.7
12/14/2010	18:00	12/14/2010 18:00 20.9
12/14/2010	19:00	12/14/2010 19:00 21.4
12/14/2010	20:00	12/14/2010 20:00 21.7
12/14/2010	21:00	12/14/2010 21:00 21.7
12/14/2010	22:00	12/14/2010 22:00 21.4
12/14/2010	23:00	12/14/2010 23:00 21.5
12/14/2010	24:00:00	12/15/2010 0:00 21.3
12/15/2010	1:00	12/15/2010 1:00 21
12/15/2010	2:00	12/15/2010 2:00 20.7

12/15/2010	3:00	12/15/2010 3:00	20.6
12/15/2010	4:00	12/15/2010 4:00	20.6
12/15/2010	5:00	12/15/2010 5:00	21.7
12/15/2010	6:00	12/15/2010 6:00	21.7
12/15/2010	7:00	12/15/2010 7:00	21.3
12/15/2010	8:00	12/15/2010 8:00	20.8
12/15/2010	9:00	12/15/2010 9:00	20.4
12/15/2010	10:00	12/15/2010 10:00	22.1
12/15/2010	11:00	12/15/2010 11:00	23.4
12/15/2010	12:00	12/15/2010 12:00	25.1
12/15/2010	13:00	12/15/2010 13:00	25.5
12/15/2010	14:00	12/15/2010 14:00	25.4
12/15/2010	15:00	12/15/2010 15:00	26.5
12/15/2010	16:00	12/15/2010 16:00	25.9
12/15/2010	17:00	12/15/2010 17:00	22.8
12/15/2010	18:00	12/15/2010 18:00	21.9
12/15/2010	19:00	12/15/2010 19:00	19.5
12/15/2010	20:00	12/15/2010 20:00	12.7
12/15/2010	21:00	12/15/2010 21:00	9
12/15/2010	22:00	12/15/2010 22:00	9.9
12/15/2010	23:00	12/15/2010 23:00	8
12/15/2010	24:00:00	12/16/2010 0:00	4.6
12/16/2010	1:00	12/16/2010 1:00	2.2
12/16/2010	2:00	12/16/2010 2:00	1.8
12/16/2010	3:00	12/16/2010 3:00	0.9
12/16/2010	4:00	12/16/2010 4:00	-0.2
12/16/2010	5:00	12/16/2010 5:00	0.6
12/16/2010	6:00	12/16/2010 6:00	2.8
12/16/2010	7:00	12/16/2010 7:00	0.7
12/16/2010	8:00	12/16/2010 8:00	3.7
12/16/2010	9:00	12/16/2010 9:00	5.1
12/16/2010	10:00	12/16/2010 10:00	9.1
12/16/2010	11:00	12/16/2010 11:00	17.8
12/16/2010	12:00	12/16/2010 12:00	19.1
12/16/2010	13:00	12/16/2010 13:00	22.1
12/16/2010	14:00	12/16/2010 14:00	27.6
12/16/2010	15:00	12/16/2010 15:00	28.3
12/16/2010	16:00	12/16/2010 16:00	26
12/16/2010	17:00	12/16/2010 17:00	25.2
12/16/2010	18:00	12/16/2010 18:00	24.9
12/16/2010	19:00	12/16/2010 19:00	24.6
12/16/2010	20:00	12/16/2010 20:00	25.1
12/16/2010	21:00	12/16/2010 21:00	25.6
12/16/2010	22:00	12/16/2010 22:00	25.3
12/16/2010	23:00	12/16/2010 23:00	25
12/16/2010	24:00:00	12/17/2010 0:00	24.9
12/17/2010	1:00	12/17/2010 1:00	24.6
12/17/2010	2:00	12/17/2010 2:00	24.5
12/17/2010	3:00	12/17/2010 3:00	24.8
12/17/2010	4:00	12/17/2010 4:00	25.6
12/17/2010	5:00	12/17/2010 5:00	25.5
12/17/2010	6:00	12/17/2010 6:00	24.4
12/17/2010	7:00	12/17/2010 7:00	25.2
12/17/2010	8:00	12/17/2010 8:00	25.6
12/17/2010	9:00	12/17/2010 9:00	25.6

12/17/2010	10:00	12/17/2010 10:00	25.5
12/17/2010	11:00	12/17/2010 11:00	25.6
12/17/2010	12:00	12/17/2010 12:00	24.9
12/17/2010	13:00	12/17/2010 13:00	24.9
12/17/2010	14:00	12/17/2010 14:00	24.5
12/17/2010	15:00	12/17/2010 15:00	23.1
12/17/2010	16:00	12/17/2010 16:00	23.1
12/17/2010	17:00	12/17/2010 17:00	24.2
12/17/2010	18:00	12/17/2010 18:00	25.4
12/17/2010	19:00	12/17/2010 19:00	25.8
12/17/2010	20:00	12/17/2010 20:00	25.2
12/17/2010	21:00	12/17/2010 21:00	24.4
12/17/2010	22:00	12/17/2010 22:00	23.7
12/17/2010	23:00	12/17/2010 23:00	23.4
12/17/2010	24:00:00	12/18/2010 0:00	23
12/18/2010	1:00	12/18/2010 1:00	22.4
12/18/2010	2:00	12/18/2010 2:00	21.6
12/18/2010	3:00	12/18/2010 3:00	21.1
12/18/2010	4:00	12/18/2010 4:00	20.8
12/18/2010	5:00	12/18/2010 5:00	20.3
12/18/2010	6:00	12/18/2010 6:00	20
12/18/2010	7:00	12/18/2010 7:00	19.5
12/18/2010	8:00	12/18/2010 8:00	18.8
12/18/2010	9:00	12/18/2010 9:00	18.4
12/18/2010	10:00	12/18/2010 10:00	17.9
12/18/2010	11:00	12/18/2010 11:00	17.7
12/18/2010	12:00	12/18/2010 12:00	17.9
12/18/2010	13:00	12/18/2010 13:00	18
12/18/2010	14:00	12/18/2010 14:00	18.3
12/18/2010	15:00	12/18/2010 15:00	18.8
12/18/2010	16:00	12/18/2010 16:00	19.3
12/18/2010	17:00	12/18/2010 17:00	19.6
12/18/2010	18:00	12/18/2010 18:00	20.2
12/18/2010	19:00	12/18/2010 19:00	20.5
12/18/2010	20:00	12/18/2010 20:00	20.8
12/18/2010	21:00	12/18/2010 21:00	20.7
12/18/2010	22:00	12/18/2010 22:00	20.8
12/18/2010	23:00	12/18/2010 23:00	20.9
12/18/2010	24:00:00	12/19/2010 0:00	21.2
12/19/2010	1:00	12/19/2010 1:00	21.5
12/19/2010	2:00	12/19/2010 2:00	21.7
12/19/2010	3:00	12/19/2010 3:00	21.7
12/19/2010	4:00	12/19/2010 4:00	21.7
12/19/2010	5:00	12/19/2010 5:00	21.8
12/19/2010	6:00	12/19/2010 6:00	21.8
12/19/2010	7:00	12/19/2010 7:00	22
12/19/2010	8:00	12/19/2010 8:00	22.4
12/19/2010	9:00	12/19/2010 9:00	22.6
12/19/2010	10:00	12/19/2010 10:00	23
12/19/2010	11:00	12/19/2010 11:00	23.4
12/19/2010	12:00	12/19/2010 12:00	23.9
12/19/2010	13:00	12/19/2010 13:00	24.1
12/19/2010	14:00	12/19/2010 14:00	24.2
12/19/2010	15:00	12/19/2010 15:00	24.2
12/19/2010	16:00	12/19/2010 16:00	24.2

12/19/2010	17:00	12/19/2010 17:00	24.2
12/19/2010	18:00	12/19/2010 18:00	24
12/19/2010	19:00	12/19/2010 19:00	23.7
12/19/2010	20:00	12/19/2010 20:00	23.5
12/19/2010	21:00	12/19/2010 21:00	23.3
12/19/2010	22:00	12/19/2010 22:00	23.1
12/19/2010	23:00	12/19/2010 23:00	23.2
12/19/2010	24:00:00	12/20/2010 0:00	23
12/20/2010	1:00	12/20/2010 1:00	22.8
12/20/2010	2:00	12/20/2010 2:00	22.9
12/20/2010	3:00	12/20/2010 3:00	22.9
12/20/2010	4:00	12/20/2010 4:00	23.2
12/20/2010	5:00	12/20/2010 5:00	23.1
12/20/2010	6:00	12/20/2010 6:00	23.4
12/20/2010	7:00	12/20/2010 7:00	23.3
12/20/2010	8:00	12/20/2010 8:00	23.3
12/20/2010	9:00	12/20/2010 9:00	23.3
12/20/2010	10:00	12/20/2010 10:00	23.7
12/20/2010	11:00	12/20/2010 11:00	24.5
12/20/2010	12:00	12/20/2010 12:00	25.1
12/20/2010	13:00	12/20/2010 13:00	27.1
12/20/2010	14:00	12/20/2010 14:00	30.5
12/20/2010	15:00	12/20/2010 15:00	29.7
12/20/2010	16:00	12/20/2010 16:00	28.5
12/20/2010	17:00	12/20/2010 17:00	25.6
12/20/2010	18:00	12/20/2010 18:00	25.8
12/20/2010	19:00	12/20/2010 19:00	24.5
12/20/2010	20:00	12/20/2010 20:00	24.8
12/20/2010	21:00	12/20/2010 21:00	25.3
12/20/2010	22:00	12/20/2010 22:00	25.6
12/20/2010	23:00	12/20/2010 23:00	25.7
12/20/2010	24:00:00	12/21/2010 0:00	26
12/21/2010	1:00	12/21/2010 1:00	26
12/21/2010	2:00	12/21/2010 2:00	26
12/21/2010	3:00	12/21/2010 3:00	26.1
12/21/2010	4:00	12/21/2010 4:00	25.8
12/21/2010	5:00	12/21/2010 5:00	25.7
12/21/2010	6:00	12/21/2010 6:00	26
12/21/2010	7:00	12/21/2010 7:00	26.6
12/21/2010	8:00	12/21/2010 8:00	26.8
12/21/2010	9:00	12/21/2010 9:00	26.9
12/21/2010	10:00	12/21/2010 10:00	26.9
12/21/2010	11:00	12/21/2010 11:00	27.5
12/21/2010	12:00	12/21/2010 12:00	28.2
12/21/2010	13:00	12/21/2010 13:00	29.2
12/21/2010	14:00	12/21/2010 14:00	29.8
12/21/2010	15:00	12/21/2010 15:00	29.9
12/21/2010	16:00	12/21/2010 16:00	30
12/21/2010	17:00	12/21/2010 17:00	29.8
12/21/2010	18:00	12/21/2010 18:00	29.5
12/21/2010	19:00	12/21/2010 19:00	29.2
12/21/2010	20:00	12/21/2010 20:00	27.5
12/21/2010	21:00	12/21/2010 21:00	27
12/21/2010	22:00	12/21/2010 22:00	26.9
12/21/2010	23:00	12/21/2010 23:00	26.9

12/21/2010	24:00:00	12/22/2010 0:00	26.8
12/22/2010	1:00	12/22/2010 1:00	26.6
12/22/2010	2:00	12/22/2010 2:00	26.7
12/22/2010	3:00	12/22/2010 3:00	26.7
12/22/2010	4:00	12/22/2010 4:00	26.6
12/22/2010	5:00	12/22/2010 5:00	26.2
12/22/2010	6:00	12/22/2010 6:00	26
12/22/2010	7:00	12/22/2010 7:00	24.8
12/22/2010	8:00	12/22/2010 8:00	23
12/22/2010	9:00	12/22/2010 9:00	20.8
12/22/2010	10:00	12/22/2010 10:00	25.8
12/22/2010	11:00	12/22/2010 11:00	29.6
12/22/2010	12:00	12/22/2010 12:00	33.1
12/22/2010	13:00	12/22/2010 13:00	35.4
12/22/2010	14:00	12/22/2010 14:00	35.9
12/22/2010	15:00	12/22/2010 15:00	34.3
12/22/2010	16:00	12/22/2010 16:00	33.6
12/22/2010	17:00	12/22/2010 17:00	33.5
12/22/2010	18:00	12/22/2010 18:00	31.8
12/22/2010	19:00	12/22/2010 19:00	32.3
12/22/2010	20:00	12/22/2010 20:00	32.2
12/22/2010	21:00	12/22/2010 21:00	32.1
12/22/2010	22:00	12/22/2010 22:00	31.1
12/22/2010	23:00	12/22/2010 23:00	31.9
12/22/2010	24:00:00	12/23/2010 0:00	31.5
12/23/2010	1:00	12/23/2010 1:00	30.9
12/23/2010	2:00	12/23/2010 2:00	30.1
12/23/2010	3:00	12/23/2010 3:00	29.6
12/23/2010	4:00	12/23/2010 4:00	29.2
12/23/2010	5:00	12/23/2010 5:00	28.7
12/23/2010	6:00	12/23/2010 6:00	28.6
12/23/2010	7:00	12/23/2010 7:00	28.8
12/23/2010	8:00	12/23/2010 8:00	29.1
12/23/2010	9:00	12/23/2010 9:00	29.1
12/23/2010	10:00	12/23/2010 10:00	29.4
12/23/2010	11:00	12/23/2010 11:00	30.1
12/23/2010	12:00	12/23/2010 12:00	30.8
12/23/2010	13:00	12/23/2010 13:00	31.1
12/23/2010	14:00	12/23/2010 14:00	31.1
12/23/2010	15:00	12/23/2010 15:00	30.9
12/23/2010	16:00	12/23/2010 16:00	31.1
12/23/2010	17:00	12/23/2010 17:00	29.7
12/23/2010	18:00	12/23/2010 18:00	29
12/23/2010	19:00	12/23/2010 19:00	29.4
12/23/2010	20:00	12/23/2010 20:00	29.7
12/23/2010	21:00	12/23/2010 21:00	29.7
12/23/2010	22:00	12/23/2010 22:00	28.7
12/23/2010	23:00	12/23/2010 23:00	28.4
12/23/2010	24:00:00	12/24/2010 0:00	28.5
12/24/2010	1:00	12/24/2010 1:00	28.3
12/24/2010	2:00	12/24/2010 2:00	27.9
12/24/2010	3:00	12/24/2010 3:00	27.2
12/24/2010	4:00	12/24/2010 4:00	26.9
12/24/2010	5:00	12/24/2010 5:00	26.7
12/24/2010	6:00	12/24/2010 6:00	26.2

12/24/2010	7:00	12/24/2010 7:00	25.8
12/24/2010	8:00	12/24/2010 8:00	25.6
12/24/2010	9:00	12/24/2010 9:00	25.5
12/24/2010	10:00	12/24/2010 10:00	25.7
12/24/2010	11:00	12/24/2010 11:00	27.1
12/24/2010	12:00	12/24/2010 12:00	27.9
12/24/2010	13:00	12/24/2010 13:00	28.6
12/24/2010	14:00	12/24/2010 14:00	29.3
12/24/2010	15:00	12/24/2010 15:00	29.7
12/24/2010	16:00	12/24/2010 16:00	30
12/24/2010	17:00	12/24/2010 17:00	29.6
12/24/2010	18:00	12/24/2010 18:00	29
12/24/2010	19:00	12/24/2010 19:00	28.7
12/24/2010	20:00	12/24/2010 20:00	28
12/24/2010	21:00	12/24/2010 21:00	27.3
12/24/2010	22:00	12/24/2010 22:00	26.6
12/24/2010	23:00	12/24/2010 23:00	25.9
12/24/2010	24:00:00	12/25/2010 0:00	25.2
12/25/2010	1:00	12/25/2010 1:00	24.6
12/25/2010	2:00	12/25/2010 2:00	23.2
12/25/2010	3:00	12/25/2010 3:00	20.4
12/25/2010	4:00	12/25/2010 4:00	18.4
12/25/2010	5:00	12/25/2010 5:00	17.5
12/25/2010	6:00	12/25/2010 6:00	17.3
12/25/2010	7:00	12/25/2010 7:00	19
12/25/2010	8:00	12/25/2010 8:00	19.4
12/25/2010	9:00	12/25/2010 9:00	20.5
12/25/2010	10:00	12/25/2010 10:00	21
12/25/2010	11:00	12/25/2010 11:00	21.8
12/25/2010	12:00	12/25/2010 12:00	23.6
12/25/2010	13:00	12/25/2010 13:00	25.5
12/25/2010	14:00	12/25/2010 14:00	26.7
12/25/2010	15:00	12/25/2010 15:00	25.4
12/25/2010	16:00	12/25/2010 16:00	25.2
12/25/2010	17:00	12/25/2010 17:00	25.4
12/25/2010	18:00	12/25/2010 18:00	25.3
12/25/2010	19:00	12/25/2010 19:00	25.7
12/25/2010	20:00	12/25/2010 20:00	25.6
12/25/2010	21:00	12/25/2010 21:00	25.7
12/25/2010	22:00	12/25/2010 22:00	26.7
12/25/2010	23:00	12/25/2010 23:00	26.8
12/25/2010	24:00:00	12/26/2010 0:00	27.3
12/26/2010	1:00	12/26/2010 1:00	27.5
12/26/2010	2:00	12/26/2010 2:00	27.5
12/26/2010	3:00	12/26/2010 3:00	27.4
12/26/2010	4:00	12/26/2010 4:00	27.2
12/26/2010	5:00	12/26/2010 5:00	26.3
12/26/2010	6:00	12/26/2010 6:00	25.2
12/26/2010	7:00	12/26/2010 7:00	24.8
12/26/2010	8:00	12/26/2010 8:00	24.5
12/26/2010	9:00	12/26/2010 9:00	23.8
12/26/2010	10:00	12/26/2010 10:00	24.1
12/26/2010	11:00	12/26/2010 11:00	23.9
12/26/2010	12:00	12/26/2010 12:00	26.6
12/26/2010	13:00	12/26/2010 13:00	30.1

12/26/2010	14:00	12/26/2010 14:00	29.5
12/26/2010	15:00	12/26/2010 15:00	29.1
12/26/2010	16:00	12/26/2010 16:00	28.6
12/26/2010	17:00	12/26/2010 17:00	27.5
12/26/2010	18:00	12/26/2010 18:00	23.2
12/26/2010	19:00	12/26/2010 19:00	20.8
12/26/2010	20:00	12/26/2010 20:00	18.5
12/26/2010	21:00	12/26/2010 21:00	17.4
12/26/2010	22:00	12/26/2010 22:00	19.7
12/26/2010	23:00	12/26/2010 23:00	21.3
12/26/2010	24:00:00	12/27/2010 0:00	22.2
12/27/2010	1:00	12/27/2010 1:00	23.2
12/27/2010	2:00	12/27/2010 2:00	23.3
12/27/2010	3:00	12/27/2010 3:00	23.9
12/27/2010	4:00	12/27/2010 4:00	24.4
12/27/2010	5:00	12/27/2010 5:00	24.6
12/27/2010	6:00	12/27/2010 6:00	24.4
12/27/2010	7:00	12/27/2010 7:00	24.1
12/27/2010	8:00	12/27/2010 8:00	24.1
12/27/2010	9:00	12/27/2010 9:00	23.8
12/27/2010	10:00	12/27/2010 10:00	24.9
12/27/2010	11:00	12/27/2010 11:00	26
12/27/2010	12:00	12/27/2010 12:00	27.3
12/27/2010	13:00	12/27/2010 13:00	27.4
12/27/2010	14:00	12/27/2010 14:00	26.2
12/27/2010	15:00	12/27/2010 15:00	25.5
12/27/2010	16:00	12/27/2010 16:00	25.3
12/27/2010	17:00	12/27/2010 17:00	25.4
12/27/2010	18:00	12/27/2010 18:00	25.7
12/27/2010	19:00	12/27/2010 19:00	25.9
12/27/2010	20:00	12/27/2010 20:00	24.3
12/27/2010	21:00	12/27/2010 21:00	21.4
12/27/2010	22:00	12/27/2010 22:00	20.6
12/27/2010	23:00	12/27/2010 23:00	25.6
12/27/2010	24:00:00	12/28/2010 0:00	26
12/28/2010	1:00	12/28/2010 1:00	25.6
12/28/2010	2:00	12/28/2010 2:00	25.6
12/28/2010	3:00	12/28/2010 3:00	25.2
12/28/2010	4:00	12/28/2010 4:00	25.3
12/28/2010	5:00	12/28/2010 5:00	24.5
12/28/2010	6:00	12/28/2010 6:00	23.5
12/28/2010	7:00	12/28/2010 7:00	24.3
12/28/2010	8:00	12/28/2010 8:00	25
12/28/2010	9:00	12/28/2010 9:00	24.8
12/28/2010	10:00	12/28/2010 10:00	25.3
12/28/2010	11:00	12/28/2010 11:00	25.7
12/28/2010	12:00	12/28/2010 12:00	26.3
12/28/2010	13:00	12/28/2010 13:00	26.9
12/28/2010	14:00	12/28/2010 14:00	27.9
12/28/2010	15:00	12/28/2010 15:00	28.9
12/28/2010	16:00	12/28/2010 16:00	29.6
12/28/2010	17:00	12/28/2010 17:00	29.4
12/28/2010	18:00	12/28/2010 18:00	27.4
12/28/2010	19:00	12/28/2010 19:00	25.8
12/28/2010	20:00	12/28/2010 20:00	24.3

12/28/2010	21:00	12/28/2010 21:00	24.5
12/28/2010	22:00	12/28/2010 22:00	24.8
12/28/2010	23:00	12/28/2010 23:00	22.5
12/28/2010	24:00:00	12/29/2010 0:00	23.6
12/29/2010	1:00	12/29/2010 1:00	19.3
12/29/2010	2:00	12/29/2010 2:00	23.9
12/29/2010	3:00	12/29/2010 3:00	21
12/29/2010	4:00	12/29/2010 4:00	25.7
12/29/2010	5:00	12/29/2010 5:00	26.7
12/29/2010	6:00	12/29/2010 6:00	26.8
12/29/2010	7:00	12/29/2010 7:00	22.4
12/29/2010	8:00	12/29/2010 8:00	21.8
12/29/2010	9:00	12/29/2010 9:00	25.7
12/29/2010	10:00	12/29/2010 10:00	31.1
12/29/2010	11:00	12/29/2010 11:00	33.2
12/29/2010	12:00	12/29/2010 12:00	33.8
12/29/2010	13:00	12/29/2010 13:00	33.7
12/29/2010	14:00	12/29/2010 14:00	33.1
12/29/2010	15:00	12/29/2010 15:00	34.4
12/29/2010	16:00	12/29/2010 16:00	37.2
12/29/2010	17:00	12/29/2010 17:00	36.7
12/29/2010	18:00	12/29/2010 18:00	34.3
12/29/2010	19:00	12/29/2010 19:00	33.6
12/29/2010	20:00	12/29/2010 20:00	32.3
12/29/2010	21:00	12/29/2010 21:00	31.4
12/29/2010	22:00	12/29/2010 22:00	30.5
12/29/2010	23:00	12/29/2010 23:00	31.7
12/29/2010	24:00:00	12/30/2010 0:00	32.8
12/30/2010	1:00	12/30/2010 1:00	33.9
12/30/2010	2:00	12/30/2010 2:00	33.8
12/30/2010	3:00	12/30/2010 3:00	34.1
12/30/2010	4:00	12/30/2010 4:00	34.6
12/30/2010	5:00	12/30/2010 5:00	35.1
12/30/2010	6:00	12/30/2010 6:00	35.8
12/30/2010	7:00	12/30/2010 7:00	36
12/30/2010	8:00	12/30/2010 8:00	35.8
12/30/2010	9:00	12/30/2010 9:00	36.4
12/30/2010	10:00	12/30/2010 10:00	37.2
12/30/2010	11:00	12/30/2010 11:00	37.7
12/30/2010	12:00	12/30/2010 12:00	38.2
12/30/2010	13:00	12/30/2010 13:00	39.1
12/30/2010	14:00	12/30/2010 14:00	39.7
12/30/2010	15:00	12/30/2010 15:00	40
12/30/2010	16:00	12/30/2010 16:00	40.3
12/30/2010	17:00	12/30/2010 17:00	40.7
12/30/2010	18:00	12/30/2010 18:00	42
12/30/2010	19:00	12/30/2010 19:00	43.1
12/30/2010	20:00	12/30/2010 20:00	42.5
12/30/2010	21:00	12/30/2010 21:00	43.3
12/30/2010	22:00	12/30/2010 22:00	44
12/30/2010	23:00	12/30/2010 23:00	44.4
12/30/2010	24:00:00	12/31/2010 0:00	45.1
12/31/2010	1:00	12/31/2010 1:00	44.5
12/31/2010	2:00	12/31/2010 2:00	44.3
12/31/2010	3:00	12/31/2010 3:00	44.6

12/31/2010	4:00	12/31/2010 4:00	44.8
12/31/2010	5:00	12/31/2010 5:00	45.5
12/31/2010	6:00	12/31/2010 6:00	45.9
12/31/2010	7:00	12/31/2010 7:00	46
12/31/2010	8:00	12/31/2010 8:00	46.6
12/31/2010	9:00	12/31/2010 9:00	46.8
12/31/2010	10:00	12/31/2010 10:00	47.1
12/31/2010	11:00	12/31/2010 11:00	47.4
12/31/2010	12:00	12/31/2010 12:00	47.8
12/31/2010	13:00	12/31/2010 13:00	48.5
12/31/2010	14:00	12/31/2010 14:00	48.8
12/31/2010	15:00	12/31/2010 15:00	48.3
12/31/2010	16:00	12/31/2010 16:00	48.2
12/31/2010	17:00	12/31/2010 17:00	47.9
12/31/2010	18:00	12/31/2010 18:00	47.8
12/31/2010	19:00	12/31/2010 19:00	48.4
12/31/2010	20:00	12/31/2010 20:00	50.7
12/31/2010	21:00	12/31/2010 21:00	53.2
12/31/2010	22:00	12/31/2010 22:00	55.4
12/31/2010	23:00	12/31/2010 23:00	55.2
12/31/2010	24:00:00	1/1/2011 0:00	54.4
1/1/2011	1:00	1/1/2011 1:00	53.7
1/1/2011	2:00	1/1/2011 2:00	53.2
1/1/2011	3:00	1/1/2011 3:00	51.9
1/1/2011	4:00	1/1/2011 4:00	46.3
1/1/2011	5:00	1/1/2011 5:00	43.2
1/1/2011	6:00	1/1/2011 6:00	40.6
1/1/2011	7:00	1/1/2011 7:00	38.5
1/1/2011	8:00	1/1/2011 8:00	37
1/1/2011	9:00	1/1/2011 9:00	34.4
1/1/2011	10:00	1/1/2011 10:00	32.5
1/1/2011	11:00	1/1/2011 11:00	30.4
1/1/2011	12:00	1/1/2011 12:00	27.4
1/1/2011	13:00	1/1/2011 13:00	24.4
1/1/2011	14:00	1/1/2011 14:00	22.4
1/1/2011	15:00	1/1/2011 15:00	20.1
1/1/2011	16:00	1/1/2011 16:00	18.9
1/1/2011	17:00	1/1/2011 17:00	18.6
1/1/2011	18:00	1/1/2011 18:00	18.9
1/1/2011	19:00	1/1/2011 19:00	19.1
1/1/2011	20:00	1/1/2011 20:00	18.9
1/1/2011	21:00	1/1/2011 21:00	18
1/1/2011	22:00	1/1/2011 22:00	17.2
1/1/2011	23:00	1/1/2011 23:00	16.4
1/1/2011	24:00:00	1/2/2011 0:00	16.2
1/2/2011	1:00	1/2/2011 1:00	15.9
1/2/2011	2:00	1/2/2011 2:00	14.9
1/2/2011	3:00	1/2/2011 3:00	14.5
1/2/2011	4:00	1/2/2011 4:00	14.9
1/2/2011	5:00	1/2/2011 5:00	15.3
1/2/2011	6:00	1/2/2011 6:00	15.9
1/2/2011	7:00	1/2/2011 7:00	16.7
1/2/2011	8:00	1/2/2011 8:00	17.2
1/2/2011	9:00	1/2/2011 9:00	17.8
1/2/2011	10:00	1/2/2011 10:00	18.5

1/2/2011	11:00	1/2/2011 11:00	19.4
1/2/2011	12:00	1/2/2011 12:00	20
1/2/2011	13:00	1/2/2011 13:00	20.8
1/2/2011	14:00	1/2/2011 14:00	22
1/2/2011	15:00	1/2/2011 15:00	22.9
1/2/2011	16:00	1/2/2011 16:00	23.5
1/2/2011	17:00	1/2/2011 17:00	23.3
1/2/2011	18:00	1/2/2011 18:00	22.4
1/2/2011	19:00	1/2/2011 19:00	22.5
1/2/2011	20:00	1/2/2011 20:00	23.4
1/2/2011	21:00	1/2/2011 21:00	24.1
1/2/2011	22:00	1/2/2011 22:00	24.2
1/2/2011	23:00	1/2/2011 23:00	24.5
1/2/2011	24:00:00	1/3/2011 0:00	25.4
1/3/2011	1:00	1/3/2011 1:00	26.5
1/3/2011	2:00	1/3/2011 2:00	27.4
1/3/2011	3:00	1/3/2011 3:00	27.9
1/3/2011	4:00	1/3/2011 4:00	28.4
1/3/2011	5:00	1/3/2011 5:00	28.4
1/3/2011	6:00	1/3/2011 6:00	27.6
1/3/2011	7:00	1/3/2011 7:00	26.5
1/3/2011	8:00	1/3/2011 8:00	26.1
1/3/2011	9:00	1/3/2011 9:00	26.4
1/3/2011	10:00	1/3/2011 10:00	28
1/3/2011	11:00	1/3/2011 11:00	30.9
1/3/2011	12:00	1/3/2011 12:00	31.2
1/3/2011	13:00	1/3/2011 13:00	30.9
1/3/2011	14:00	1/3/2011 14:00	30.1
1/3/2011	15:00	1/3/2011 15:00	29.5
1/3/2011	16:00	1/3/2011 16:00	29.3
1/3/2011	17:00	1/3/2011 17:00	28.2
1/3/2011	18:00	1/3/2011 18:00	27.5
1/3/2011	19:00	1/3/2011 19:00	27.7
1/3/2011	20:00	1/3/2011 20:00	28.2
1/3/2011	21:00	1/3/2011 21:00	27.9
1/3/2011	22:00	1/3/2011 22:00	27.8
1/3/2011	23:00	1/3/2011 23:00	28.3
1/3/2011	24:00:00	1/4/2011 0:00	28.2
1/4/2011	1:00	1/4/2011 1:00	28.2
1/4/2011	2:00	1/4/2011 2:00	28.5
1/4/2011	3:00	1/4/2011 3:00	28.7
1/4/2011	4:00	1/4/2011 4:00	29.7
1/4/2011	5:00	1/4/2011 5:00	29.8
1/4/2011	6:00	1/4/2011 6:00	29.6
1/4/2011	7:00	1/4/2011 7:00	29.4
1/4/2011	8:00	1/4/2011 8:00	28.7
1/4/2011	9:00	1/4/2011 9:00	28
1/4/2011	10:00	1/4/2011 10:00	26.7
1/4/2011	11:00	1/4/2011 11:00	24.5
1/4/2011	12:00	1/4/2011 12:00	23.4
1/4/2011	13:00	1/4/2011 13:00	22.8
1/4/2011	14:00	1/4/2011 14:00	22.3
1/4/2011	15:00	1/4/2011 15:00	21.9
1/4/2011	16:00	1/4/2011 16:00	21.7
1/4/2011	17:00	1/4/2011 17:00	21.8

1/4/2011	18:00	1/4/2011 18:00	21.6
1/4/2011	19:00	1/4/2011 19:00	21.7
1/4/2011	20:00	1/4/2011 20:00	21.1
1/4/2011	21:00	1/4/2011 21:00	20.5
1/4/2011	22:00	1/4/2011 22:00	20.6
1/4/2011	23:00	1/4/2011 23:00	20.3
1/4/2011	24:00:00	1/5/2011 0:00	20.2
1/5/2011	1:00	1/5/2011 1:00	19.7
1/5/2011	2:00	1/5/2011 2:00	19.1
1/5/2011	3:00	1/5/2011 3:00	18.5
1/5/2011	4:00	1/5/2011 4:00	17.9
1/5/2011	5:00	1/5/2011 5:00	17.6
1/5/2011	6:00	1/5/2011 6:00	17.3
1/5/2011	7:00	1/5/2011 7:00	17.5
1/5/2011	8:00	1/5/2011 8:00	17.5
1/5/2011	9:00	1/5/2011 9:00	17.6
1/5/2011	10:00	1/5/2011 10:00	17.7
1/5/2011	11:00	1/5/2011 11:00	20.5
1/5/2011	12:00	1/5/2011 12:00	24.7
1/5/2011	13:00	1/5/2011 13:00	26
1/5/2011	14:00	1/5/2011 14:00	25.2
1/5/2011	15:00	1/5/2011 15:00	26.1
1/5/2011	16:00	1/5/2011 16:00	25
1/5/2011	17:00	1/5/2011 17:00	24.7
1/5/2011	18:00	1/5/2011 18:00	23.7
1/5/2011	19:00	1/5/2011 19:00	23.2
1/5/2011	20:00	1/5/2011 20:00	22.7
1/5/2011	21:00	1/5/2011 21:00	22.6
1/5/2011	22:00	1/5/2011 22:00	22.1
1/5/2011	23:00	1/5/2011 23:00	22.2
1/5/2011	24:00:00	1/6/2011 0:00	22
1/6/2011	1:00	1/6/2011 1:00	21.8
1/6/2011	2:00	1/6/2011 2:00	21.3
1/6/2011	3:00	1/6/2011 3:00	21.4
1/6/2011	4:00	1/6/2011 4:00	21.5
1/6/2011	5:00	1/6/2011 5:00	23.1
1/6/2011	6:00	1/6/2011 6:00	23.5
1/6/2011	7:00	1/6/2011 7:00	23.2
1/6/2011	8:00	1/6/2011 8:00	22.7
1/6/2011	9:00	1/6/2011 9:00	22.4
1/6/2011	10:00	1/6/2011 10:00	22.3
1/6/2011	11:00	1/6/2011 11:00	22.4
1/6/2011	12:00	1/6/2011 12:00	23.5
1/6/2011	13:00	1/6/2011 13:00	23.8
1/6/2011	14:00	1/6/2011 14:00	23
1/6/2011	15:00	1/6/2011 15:00	22.7
1/6/2011	16:00	1/6/2011 16:00	22.1
1/6/2011	17:00	1/6/2011 17:00	20.7
1/6/2011	18:00	1/6/2011 18:00	20.5
1/6/2011	19:00	1/6/2011 19:00	20.4
1/6/2011	20:00	1/6/2011 20:00	20.1
1/6/2011	21:00	1/6/2011 21:00	19.6
1/6/2011	22:00	1/6/2011 22:00	19
1/6/2011	23:00	1/6/2011 23:00	18.9
1/6/2011	24:00:00	1/7/2011 0:00	19.1

1/7/2011	1:00	1/7/2011 1:00	18.9
1/7/2011	2:00	1/7/2011 2:00	18.2
1/7/2011	3:00	1/7/2011 3:00	18.2
1/7/2011	4:00	1/7/2011 4:00	18.1
1/7/2011	5:00	1/7/2011 5:00	17.6
1/7/2011	6:00	1/7/2011 6:00	15.9
1/7/2011	7:00	1/7/2011 7:00	15.1
1/7/2011	8:00	1/7/2011 8:00	14.8
1/7/2011	9:00	1/7/2011 9:00	16
1/7/2011	10:00	1/7/2011 10:00	16.5
1/7/2011	11:00	1/7/2011 11:00	16.7
1/7/2011	12:00	1/7/2011 12:00	17.9
1/7/2011	13:00	1/7/2011 13:00	17.5
1/7/2011	14:00	1/7/2011 14:00	17.9
1/7/2011	15:00	1/7/2011 15:00	16.5
1/7/2011	16:00	1/7/2011 16:00	16.2
1/7/2011	17:00	1/7/2011 17:00	16.1
1/7/2011	18:00	1/7/2011 18:00	16.1
1/7/2011	19:00	1/7/2011 19:00	15.8
1/7/2011	20:00	1/7/2011 20:00	15.7
1/7/2011	21:00	1/7/2011 21:00	15.8
1/7/2011	22:00	1/7/2011 22:00	15.5
1/7/2011	23:00	1/7/2011 23:00	15.2
1/7/2011	24:00:00	1/8/2011 0:00	14.6
1/8/2011	1:00	1/8/2011 1:00	15.3
1/8/2011	2:00	1/8/2011 2:00	16.3
1/8/2011	3:00	1/8/2011 3:00	18.3
1/8/2011	4:00	1/8/2011 4:00	14.1
1/8/2011	5:00	1/8/2011 5:00	6.5
1/8/2011	6:00	1/8/2011 6:00	7.4
1/8/2011	7:00	1/8/2011 7:00	7.4
1/8/2011	8:00	1/8/2011 8:00	9.6
1/8/2011	9:00	1/8/2011 9:00	10.1
1/8/2011	10:00	1/8/2011 10:00	11.2
1/8/2011	11:00	1/8/2011 11:00	13.9
1/8/2011	12:00	1/8/2011 12:00	18
1/8/2011	13:00	1/8/2011 13:00	23.9
1/8/2011	14:00	1/8/2011 14:00	24.6
1/8/2011	15:00	1/8/2011 15:00	21.8
1/8/2011	16:00	1/8/2011 16:00	24
1/8/2011	17:00	1/8/2011 17:00	21.3
1/8/2011	18:00	1/8/2011 18:00	19.3
1/8/2011	19:00	1/8/2011 19:00	20.4
1/8/2011	20:00	1/8/2011 20:00	17.3
1/8/2011	21:00	1/8/2011 21:00	16
1/8/2011	22:00	1/8/2011 22:00	12.6
1/8/2011	23:00	1/8/2011 23:00	5.5
1/8/2011	24:00:00	1/9/2011 0:00	4
1/9/2011	1:00	1/9/2011 1:00	1.7
1/9/2011	2:00	1/9/2011 2:00	1.1
1/9/2011	3:00	1/9/2011 3:00	-0.1
1/9/2011	4:00	1/9/2011 4:00	4.4
1/9/2011	5:00	1/9/2011 5:00	9.8
1/9/2011	6:00	1/9/2011 6:00	13.2
1/9/2011	7:00	1/9/2011 7:00	15.2

1/9/2011	8:00	1/9/2011 8:00	18.1
1/9/2011	9:00	1/9/2011 9:00	14.9
1/9/2011	10:00	1/9/2011 10:00	15.4
1/9/2011	11:00	1/9/2011 11:00	21.4
1/9/2011	12:00	1/9/2011 12:00	25.1
1/9/2011	13:00	1/9/2011 13:00	27.4
1/9/2011	14:00	1/9/2011 14:00	26.3
1/9/2011	15:00	1/9/2011 15:00	28.4
1/9/2011	16:00	1/9/2011 16:00	27.2
1/9/2011	17:00	1/9/2011 17:00	25.9
1/9/2011	18:00	1/9/2011 18:00	23.5
1/9/2011	19:00	1/9/2011 19:00	14.9
1/9/2011	20:00	1/9/2011 20:00	8.1
1/9/2011	21:00	1/9/2011 21:00	8
1/9/2011	22:00	1/9/2011 22:00	8
1/9/2011	23:00	1/9/2011 23:00	9.7
1/9/2011	24:00:00	1/10/2011 0:00	8.2
1/10/2011	1:00	1/10/2011 1:00	7.2
1/10/2011	2:00	1/10/2011 2:00	4.4
1/10/2011	3:00	1/10/2011 3:00	5.6
1/10/2011	4:00	1/10/2011 4:00	6.6
1/10/2011	5:00	1/10/2011 5:00	4.8
1/10/2011	6:00	1/10/2011 6:00	7.8
1/10/2011	7:00	1/10/2011 7:00	9.1
1/10/2011	8:00	1/10/2011 8:00	8.5
1/10/2011	9:00	1/10/2011 9:00	8.8
1/10/2011	10:00	1/10/2011 10:00	9.8
1/10/2011	11:00	1/10/2011 11:00	13.3
1/10/2011	12:00	1/10/2011 12:00	18.3
1/10/2011	13:00	1/10/2011 13:00	23.3
1/10/2011	14:00	1/10/2011 14:00	25.8
1/10/2011	15:00	1/10/2011 15:00	28.1
1/10/2011	16:00	1/10/2011 16:00	26.5
1/10/2011	17:00	1/10/2011 17:00	25.4
1/10/2011	18:00	1/10/2011 18:00	19.3
1/10/2011	19:00	1/10/2011 19:00	14.4
1/10/2011	20:00	1/10/2011 20:00	19.2
1/10/2011	21:00	1/10/2011 21:00	21.2
1/10/2011	22:00	1/10/2011 22:00	21.4
1/10/2011	23:00	1/10/2011 23:00	21
1/10/2011	24:00:00	1/11/2011 0:00	20.4
1/11/2011	1:00	1/11/2011 1:00	20.6
1/11/2011	2:00	1/11/2011 2:00	19.1
1/11/2011	3:00	1/11/2011 3:00	18
1/11/2011	4:00	1/11/2011 4:00	17.8
1/11/2011	5:00	1/11/2011 5:00	17.6
1/11/2011	6:00	1/11/2011 6:00	16.5
1/11/2011	7:00	1/11/2011 7:00	17.8
1/11/2011	8:00	1/11/2011 8:00	17.4
1/11/2011	9:00	1/11/2011 9:00	17.1
1/11/2011	10:00	1/11/2011 10:00	18
1/11/2011	11:00	1/11/2011 11:00	19.5
1/11/2011	12:00	1/11/2011 12:00	22.3
1/11/2011	13:00	1/11/2011 13:00	23.5
1/11/2011	14:00	1/11/2011 14:00	24.2

1/11/2011	15:00	1/11/2011 15:00	25.1
1/11/2011	16:00	1/11/2011 16:00	25.3
1/11/2011	17:00	1/11/2011 17:00	24.3
1/11/2011	18:00	1/11/2011 18:00	23.8
1/11/2011	19:00	1/11/2011 19:00	23.3
1/11/2011	20:00	1/11/2011 20:00	22.6
1/11/2011	21:00	1/11/2011 21:00	22.3
1/11/2011	22:00	1/11/2011 22:00	22.2
1/11/2011	23:00	1/11/2011 23:00	22.2
1/11/2011	24:00:00	1/12/2011 0:00	21.8
1/12/2011	1:00	1/12/2011 1:00	21
1/12/2011	2:00	1/12/2011 2:00	19.4
1/12/2011	3:00	1/12/2011 3:00	17.6
1/12/2011	4:00	1/12/2011 4:00	16.3
1/12/2011	5:00	1/12/2011 5:00	13.6
1/12/2011	6:00	1/12/2011 6:00	12.5
1/12/2011	7:00	1/12/2011 7:00	18.7
1/12/2011	8:00	1/12/2011 8:00	20.9
1/12/2011	9:00	1/12/2011 9:00	21.4
1/12/2011	10:00	1/12/2011 10:00	23.8
1/12/2011	11:00	1/12/2011 11:00	25.6
1/12/2011	12:00	1/12/2011 12:00	26.4
1/12/2011	13:00	1/12/2011 13:00	26.1
1/12/2011	14:00	1/12/2011 14:00	26.3
1/12/2011	15:00	1/12/2011 15:00	26.1
1/12/2011	16:00	1/12/2011 16:00	26.2
1/12/2011	17:00	1/12/2011 17:00	25
1/12/2011	18:00	1/12/2011 18:00	24.2
1/12/2011	19:00	1/12/2011 19:00	23.4
1/12/2011	20:00	1/12/2011 20:00	23.1
1/12/2011	21:00	1/12/2011 21:00	23.3
1/12/2011	22:00	1/12/2011 22:00	24.3
1/12/2011	23:00	1/12/2011 23:00	24.5
1/12/2011	24:00:00	1/13/2011 0:00	24.6
1/13/2011	1:00	1/13/2011 1:00	24.4
1/13/2011	2:00	1/13/2011 2:00	23.4
1/13/2011	3:00	1/13/2011 3:00	22.6
1/13/2011	4:00	1/13/2011 4:00	22.2
1/13/2011	5:00	1/13/2011 5:00	22.6
1/13/2011	6:00	1/13/2011 6:00	23.5
1/13/2011	7:00	1/13/2011 7:00	23.5
1/13/2011	8:00	1/13/2011 8:00	23.1
1/13/2011	9:00	1/13/2011 9:00	23.4
1/13/2011	10:00	1/13/2011 10:00	24.3
1/13/2011	11:00	1/13/2011 11:00	25.4
1/13/2011	12:00	1/13/2011 12:00	26.2
1/13/2011	13:00	1/13/2011 13:00	24.7
1/13/2011	14:00	1/13/2011 14:00	25
1/13/2011	15:00	1/13/2011 15:00	24.5
1/13/2011	16:00	1/13/2011 16:00	24.9
1/13/2011	17:00	1/13/2011 17:00	24.1
1/13/2011	18:00	1/13/2011 18:00	22.9
1/13/2011	19:00	1/13/2011 19:00	21.2
1/13/2011	20:00	1/13/2011 20:00	18
1/13/2011	21:00	1/13/2011 21:00	18.8

1/13/2011	22:00	1/13/2011 22:00	18.8
1/13/2011	23:00	1/13/2011 23:00	17.7
1/13/2011	24:00:00	1/14/2011 0:00	18.8
1/14/2011	1:00	1/14/2011 1:00	19.1
1/14/2011	2:00	1/14/2011 2:00	19.4
1/14/2011	3:00	1/14/2011 3:00	19.9
1/14/2011	4:00	1/14/2011 4:00	20.4
1/14/2011	5:00	1/14/2011 5:00	20.5
1/14/2011	6:00	1/14/2011 6:00	20.9
1/14/2011	7:00	1/14/2011 7:00	21.1
1/14/2011	8:00	1/14/2011 8:00	21.2
1/14/2011	9:00	1/14/2011 9:00	20.7
1/14/2011	10:00	1/14/2011 10:00	20.2
1/14/2011	11:00	1/14/2011 11:00	20.1
1/14/2011	12:00	1/14/2011 12:00	22.3
1/14/2011	13:00	1/14/2011 13:00	24.1
1/14/2011	14:00	1/14/2011 14:00	22.9
1/14/2011	15:00	1/14/2011 15:00	23.2
1/14/2011	16:00	1/14/2011 16:00	22.5
1/14/2011	17:00	1/14/2011 17:00	22
1/14/2011	18:00	1/14/2011 18:00	21.6
1/14/2011	19:00	1/14/2011 19:00	21.3
1/14/2011	20:00	1/14/2011 20:00	21.4
1/14/2011	21:00	1/14/2011 21:00	21.5
1/14/2011	22:00	1/14/2011 22:00	21.3
1/14/2011	23:00	1/14/2011 23:00	21.1
1/14/2011	24:00:00	1/15/2011 0:00	21.3
1/15/2011	1:00	1/15/2011 1:00	21.4
1/15/2011	2:00	1/15/2011 2:00	21.5
1/15/2011	3:00	1/15/2011 3:00	22.1
1/15/2011	4:00	1/15/2011 4:00	24.7
1/15/2011	5:00	1/15/2011 5:00	24.9
1/15/2011	6:00	1/15/2011 6:00	23
1/15/2011	7:00	1/15/2011 7:00	22
1/15/2011	8:00	1/15/2011 8:00	21.6
1/15/2011	9:00	1/15/2011 9:00	21.7
1/15/2011	10:00	1/15/2011 10:00	22.3
1/15/2011	11:00	1/15/2011 11:00	23.3
1/15/2011	12:00	1/15/2011 12:00	24.8
1/15/2011	13:00	1/15/2011 13:00	27
1/15/2011	14:00	1/15/2011 14:00	26.8
1/15/2011	15:00	1/15/2011 15:00	26.1
1/15/2011	16:00	1/15/2011 16:00	24.7
1/15/2011	17:00	1/15/2011 17:00	23
1/15/2011	18:00	1/15/2011 18:00	21.7
1/15/2011	19:00	1/15/2011 19:00	21
1/15/2011	20:00	1/15/2011 20:00	19.7
1/15/2011	21:00	1/15/2011 21:00	18.7
1/15/2011	22:00	1/15/2011 22:00	17.3
1/15/2011	23:00	1/15/2011 23:00	16.2
1/15/2011	24:00:00	1/16/2011 0:00	15.9
1/16/2011	1:00	1/16/2011 1:00	15.4
1/16/2011	2:00	1/16/2011 2:00	15.1
1/16/2011	3:00	1/16/2011 3:00	15.1
1/16/2011	4:00	1/16/2011 4:00	14.9

1/16/2011	5:00	1/16/2011 5:00	14.5
1/16/2011	6:00	1/16/2011 6:00	14.3
1/16/2011	7:00	1/16/2011 7:00	14
1/16/2011	8:00	1/16/2011 8:00	13.7
1/16/2011	9:00	1/16/2011 9:00	13.5
1/16/2011	10:00	1/16/2011 10:00	14.3
1/16/2011	11:00	1/16/2011 11:00	15.3
1/16/2011	12:00	1/16/2011 12:00	15.6
1/16/2011	13:00	1/16/2011 13:00	16.3
1/16/2011	14:00	1/16/2011 14:00	17.1
1/16/2011	15:00	1/16/2011 15:00	17.7
1/16/2011	16:00	1/16/2011 16:00	17.9
1/16/2011	17:00	1/16/2011 17:00	17.7
1/16/2011	18:00	1/16/2011 18:00	17
1/16/2011	19:00	1/16/2011 19:00	16.5
1/16/2011	20:00	1/16/2011 20:00	16.4
1/16/2011	21:00	1/16/2011 21:00	16.2
1/16/2011	22:00	1/16/2011 22:00	16.3
1/16/2011	23:00	1/16/2011 23:00	16.3
1/16/2011	24:00:00	1/17/2011 0:00	16.4
1/17/2011	1:00	1/17/2011 1:00	16.3
1/17/2011	2:00	1/17/2011 2:00	16.3
1/17/2011	3:00	1/17/2011 3:00	16.5
1/17/2011	4:00	1/17/2011 4:00	16.8
1/17/2011	5:00	1/17/2011 5:00	17.1
1/17/2011	6:00	1/17/2011 6:00	16.6
1/17/2011	7:00	1/17/2011 7:00	15.2
1/17/2011	8:00	1/17/2011 8:00	15.5
1/17/2011	9:00	1/17/2011 9:00	15.5
1/17/2011	10:00	1/17/2011 10:00	16.2
1/17/2011	11:00	1/17/2011 11:00	17.9
1/17/2011	12:00	1/17/2011 12:00	19.3
1/17/2011	13:00	1/17/2011 13:00	20.1
1/17/2011	14:00	1/17/2011 14:00	20.2
1/17/2011	15:00	1/17/2011 15:00	21.3
1/17/2011	16:00	1/17/2011 16:00	22.4
1/17/2011	17:00	1/17/2011 17:00	22.7
1/17/2011	18:00	1/17/2011 18:00	23.4
1/17/2011	19:00	1/17/2011 19:00	24.1
1/17/2011	20:00	1/17/2011 20:00	25.3
1/17/2011	21:00	1/17/2011 21:00	25.8
1/17/2011	22:00	1/17/2011 22:00	26.3
1/17/2011	23:00	1/17/2011 23:00	27
1/17/2011	24:00:00	1/18/2011 0:00	27.7
1/18/2011	1:00	1/18/2011 1:00	28.2
1/18/2011	2:00	1/18/2011 2:00	28.6
1/18/2011	3:00	1/18/2011 3:00	28.8
1/18/2011	4:00	1/18/2011 4:00	29
1/18/2011	5:00	1/18/2011 5:00	28.9
1/18/2011	6:00	1/18/2011 6:00	29.2
1/18/2011	7:00	1/18/2011 7:00	28.8
1/18/2011	8:00	1/18/2011 8:00	28.3
1/18/2011	9:00	1/18/2011 9:00	27.8
1/18/2011	10:00	1/18/2011 10:00	27.5
1/18/2011	11:00	1/18/2011 11:00	27.5

1/18/2011	12:00	1/18/2011 12:00	27.3
1/18/2011	13:00	1/18/2011 13:00	26.2
1/18/2011	14:00	1/18/2011 14:00	25.9
1/18/2011	15:00	1/18/2011 15:00	25
1/18/2011	16:00	1/18/2011 16:00	23.9
1/18/2011	17:00	1/18/2011 17:00	22.1
1/18/2011	18:00	1/18/2011 18:00	20.6
1/18/2011	19:00	1/18/2011 19:00	18.5
1/18/2011	20:00	1/18/2011 20:00	17.6
1/18/2011	21:00	1/18/2011 21:00	16.6
1/18/2011	22:00	1/18/2011 22:00	16.5
1/18/2011	23:00	1/18/2011 23:00	15.9
1/18/2011	24:00:00	1/19/2011 0:00	15.5
1/19/2011	1:00	1/19/2011 1:00	15.1
1/19/2011	2:00	1/19/2011 2:00	13.6
1/19/2011	3:00	1/19/2011 3:00	12
1/19/2011	4:00	1/19/2011 4:00	10.3
1/19/2011	5:00	1/19/2011 5:00	11
1/19/2011	6:00	1/19/2011 6:00	10.4
1/19/2011	7:00	1/19/2011 7:00	8.1
1/19/2011	8:00	1/19/2011 8:00	6.1
1/19/2011	9:00	1/19/2011 9:00	4.4
1/19/2011	10:00	1/19/2011 10:00	7
1/19/2011	11:00	1/19/2011 11:00	10.5
1/19/2011	12:00	1/19/2011 12:00	11.8
1/19/2011	13:00	1/19/2011 13:00	14.3
1/19/2011	14:00	1/19/2011 14:00	16.8
1/19/2011	15:00	1/19/2011 15:00	18.2
1/19/2011	16:00	1/19/2011 16:00	18.2
1/19/2011	17:00	1/19/2011 17:00	18
1/19/2011	18:00	1/19/2011 18:00	16.6
1/19/2011	19:00	1/19/2011 19:00	15.7
1/19/2011	20:00	1/19/2011 20:00	15.4
1/19/2011	21:00	1/19/2011 21:00	15.6
1/19/2011	22:00	1/19/2011 22:00	16.3
1/19/2011	23:00	1/19/2011 23:00	18.9
1/19/2011	24:00:00	1/20/2011 0:00	18.8
1/20/2011	1:00	1/20/2011 1:00	18.4
1/20/2011	2:00	1/20/2011 2:00	18.1
1/20/2011	3:00	1/20/2011 3:00	17.4
1/20/2011	4:00	1/20/2011 4:00	17.3
1/20/2011	5:00	1/20/2011 5:00	17.6
1/20/2011	6:00	1/20/2011 6:00	17.7
1/20/2011	7:00	1/20/2011 7:00	17.4
1/20/2011	8:00	1/20/2011 8:00	17.3
1/20/2011	9:00	1/20/2011 9:00	17.6
1/20/2011	10:00	1/20/2011 10:00	18.1
1/20/2011	11:00	1/20/2011 11:00	19.5
1/20/2011	12:00	1/20/2011 12:00	19.5
1/20/2011	13:00	1/20/2011 13:00	20.2
1/20/2011	14:00	1/20/2011 14:00	20.6
1/20/2011	15:00	1/20/2011 15:00	20.5
1/20/2011	16:00	1/20/2011 16:00	20.6
1/20/2011	17:00	1/20/2011 17:00	20.2
1/20/2011	18:00	1/20/2011 18:00	17.4

1/20/2011	19:00	1/20/2011 19:00	15.9
1/20/2011	20:00	1/20/2011 20:00	14.9
1/20/2011	21:00	1/20/2011 21:00	13.6
1/20/2011	22:00	1/20/2011 22:00	12.9
1/20/2011	23:00	1/20/2011 23:00	12.4
1/20/2011	24:00:00	1/21/2011 0:00	12
1/21/2011	1:00	1/21/2011 1:00	10.7
1/21/2011	2:00	1/21/2011 2:00	9.8
1/21/2011	3:00	1/21/2011 3:00	9.3
1/21/2011	4:00	1/21/2011 4:00	8.9
1/21/2011	5:00	1/21/2011 5:00	8.3
1/21/2011	6:00	1/21/2011 6:00	7.7
1/21/2011	7:00	1/21/2011 7:00	7.1
1/21/2011	8:00	1/21/2011 8:00	7.2
1/21/2011	9:00	1/21/2011 9:00	7.3
1/21/2011	10:00	1/21/2011 10:00	8
1/21/2011	11:00	1/21/2011 11:00	8.9
1/21/2011	12:00	1/21/2011 12:00	10.3
1/21/2011	13:00	1/21/2011 13:00	10.6
1/21/2011	14:00	1/21/2011 14:00	11.6
1/21/2011	15:00	1/21/2011 15:00	10.5
1/21/2011	16:00	1/21/2011 16:00	10.3
1/21/2011	17:00	1/21/2011 17:00	9.9
1/21/2011	18:00	1/21/2011 18:00	9.7
1/21/2011	19:00	1/21/2011 19:00	9.4
1/21/2011	20:00	1/21/2011 20:00	8.8
1/21/2011	21:00	1/21/2011 21:00	8.5
1/21/2011	22:00	1/21/2011 22:00	8.3
1/21/2011	23:00	1/21/2011 23:00	8.2
1/21/2011	24:00:00	1/22/2011 0:00	8.1
1/22/2011	1:00	1/22/2011 1:00	7.8
1/22/2011	2:00	1/22/2011 2:00	7.8
1/22/2011	3:00	1/22/2011 3:00	7.8
1/22/2011	4:00	1/22/2011 4:00	7.9
1/22/2011	5:00	1/22/2011 5:00	8.3
1/22/2011	6:00	1/22/2011 6:00	8.7
1/22/2011	7:00	1/22/2011 7:00	9.3
1/22/2011	8:00	1/22/2011 8:00	10.1
1/22/2011	9:00	1/22/2011 9:00	14.3
1/22/2011	10:00	1/22/2011 10:00	13.2
1/22/2011	11:00	1/22/2011 11:00	11.8
1/22/2011	12:00	1/22/2011 12:00	11.1
1/22/2011	13:00	1/22/2011 13:00	11.1
1/22/2011	14:00	1/22/2011 14:00	11.2
1/22/2011	15:00	1/22/2011 15:00	11
1/22/2011	16:00	1/22/2011 16:00	11
1/22/2011	17:00	1/22/2011 17:00	10.9
1/22/2011	18:00	1/22/2011 18:00	10.4
1/22/2011	19:00	1/22/2011 19:00	10.8
1/22/2011	20:00	1/22/2011 20:00	11.4
1/22/2011	21:00	1/22/2011 21:00	10.5
1/22/2011	22:00	1/22/2011 22:00	5.8
1/22/2011	23:00	1/22/2011 23:00	3.6
1/22/2011	24:00:00	1/23/2011 0:00	1.9
1/23/2011	1:00	1/23/2011 1:00	-2.1

1/23/2011	2:00	1/23/2011 2:00	-7.4
1/23/2011	3:00	1/23/2011 3:00	-11.4
1/23/2011	4:00	1/23/2011 4:00	-6.7
1/23/2011	5:00	1/23/2011 5:00	-1.2
1/23/2011	6:00	1/23/2011 6:00	-0.8
1/23/2011	7:00	1/23/2011 7:00	0.2
1/23/2011	8:00	1/23/2011 8:00	2.3
1/23/2011	9:00	1/23/2011 9:00	1.7
1/23/2011	10:00	1/23/2011 10:00	3.1
1/23/2011	11:00	1/23/2011 11:00	4.8
1/23/2011	12:00	1/23/2011 12:00	6.5
1/23/2011	13:00	1/23/2011 13:00	8.1
1/23/2011	14:00	1/23/2011 14:00	10.8
1/23/2011	15:00	1/23/2011 15:00	12.4
1/23/2011	16:00	1/23/2011 16:00	13.4
1/23/2011	17:00	1/23/2011 17:00	12.9
1/23/2011	18:00	1/23/2011 18:00	11.4
1/23/2011	19:00	1/23/2011 19:00	10.3
1/23/2011	20:00	1/23/2011 20:00	8.4
1/23/2011	21:00	1/23/2011 21:00	8.4
1/23/2011	22:00	1/23/2011 22:00	9.1
1/23/2011	23:00	1/23/2011 23:00	9.6
1/23/2011	24:00:00	1/24/2011 0:00	10.2
1/24/2011	1:00	1/24/2011 1:00	6.4
1/24/2011	2:00	1/24/2011 2:00	4.7
1/24/2011	3:00	1/24/2011 3:00	5.3
1/24/2011	4:00	1/24/2011 4:00	7.5
1/24/2011	5:00	1/24/2011 5:00	8.1
1/24/2011	6:00	1/24/2011 6:00	8.9
1/24/2011	7:00	1/24/2011 7:00	9.9
1/24/2011	8:00	1/24/2011 8:00	10.5
1/24/2011	9:00	1/24/2011 9:00	10.8
1/24/2011	10:00	1/24/2011 10:00	11.4
1/24/2011	11:00	1/24/2011 11:00	12.5
1/24/2011	12:00	1/24/2011 12:00	14.2
1/24/2011	13:00	1/24/2011 13:00	15.9
1/24/2011	14:00	1/24/2011 14:00	17.4
1/24/2011	15:00	1/24/2011 15:00	18.6
1/24/2011	16:00	1/24/2011 16:00	19.5
1/24/2011	17:00	1/24/2011 17:00	20.1
1/24/2011	18:00	1/24/2011 18:00	20.8
1/24/2011	19:00	1/24/2011 19:00	21.2
1/24/2011	20:00	1/24/2011 20:00	21.7
1/24/2011	21:00	1/24/2011 21:00	24.8
1/24/2011	22:00	1/24/2011 22:00	25.7
1/24/2011	23:00	1/24/2011 23:00	25.9
1/24/2011	24:00:00	1/25/2011 0:00	26.2
1/25/2011	1:00	1/25/2011 1:00	26.2
1/25/2011	2:00	1/25/2011 2:00	25.7
1/25/2011	3:00	1/25/2011 3:00	25.3
1/25/2011	4:00	1/25/2011 4:00	25.6
1/25/2011	5:00	1/25/2011 5:00	25.6
1/25/2011	6:00	1/25/2011 6:00	25.9
1/25/2011	7:00	1/25/2011 7:00	25.9
1/25/2011	8:00	1/25/2011 8:00	26

1/25/2011	9:00	1/25/2011 9:00	26.4
1/25/2011	10:00	1/25/2011 10:00	26.8
1/25/2011	11:00	1/25/2011 11:00	27.3
1/25/2011	12:00	1/25/2011 12:00	27.5
1/25/2011	13:00	1/25/2011 13:00	27.7
1/25/2011	14:00	1/25/2011 14:00	28.1
1/25/2011	15:00	1/25/2011 15:00	28.5
1/25/2011	16:00	1/25/2011 16:00	28.7
1/25/2011	17:00	1/25/2011 17:00	28.6
1/25/2011	18:00	1/25/2011 18:00	28.7
1/25/2011	19:00	1/25/2011 19:00	28.6
1/25/2011	20:00	1/25/2011 20:00	28.8
1/25/2011	21:00	1/25/2011 21:00	29.1
1/25/2011	22:00	1/25/2011 22:00	29.3
1/25/2011	23:00	1/25/2011 23:00	29
1/25/2011	24:00:00	1/26/2011 0:00	28.6
1/26/2011	1:00	1/26/2011 1:00	28.4
1/26/2011	2:00	1/26/2011 2:00	28.4
1/26/2011	3:00	1/26/2011 3:00	28.7
1/26/2011	4:00	1/26/2011 4:00	28.4
1/26/2011	5:00	1/26/2011 5:00	27.9
1/26/2011	6:00	1/26/2011 6:00	27.3
1/26/2011	7:00	1/26/2011 7:00	26.7
1/26/2011	8:00	1/26/2011 8:00	26.6
1/26/2011	9:00	1/26/2011 9:00	26.5
1/26/2011	10:00	1/26/2011 10:00	26.8
1/26/2011	11:00	1/26/2011 11:00	27.8
1/26/2011	12:00	1/26/2011 12:00	28.3
1/26/2011	13:00	1/26/2011 13:00	29
1/26/2011	14:00	1/26/2011 14:00	29.3
1/26/2011	15:00	1/26/2011 15:00	29.6
1/26/2011	16:00	1/26/2011 16:00	28
1/26/2011	17:00	1/26/2011 17:00	27.4
1/26/2011	18:00	1/26/2011 18:00	26.7
1/26/2011	19:00	1/26/2011 19:00	26.4
1/26/2011	20:00	1/26/2011 20:00	26.2
1/26/2011	21:00	1/26/2011 21:00	25.9
1/26/2011	22:00	1/26/2011 22:00	25.7
1/26/2011	23:00	1/26/2011 23:00	25.5
1/26/2011	24:00:00	1/27/2011 0:00	25.4
1/27/2011	1:00	1/27/2011 1:00	25.7
1/27/2011	2:00	1/27/2011 2:00	26.1
1/27/2011	3:00	1/27/2011 3:00	26.6
1/27/2011	4:00	1/27/2011 4:00	26.6
1/27/2011	5:00	1/27/2011 5:00	26.3
1/27/2011	6:00	1/27/2011 6:00	26.2
1/27/2011	7:00	1/27/2011 7:00	25.6
1/27/2011	8:00	1/27/2011 8:00	23.9
1/27/2011	9:00	1/27/2011 9:00	22.8
1/27/2011	10:00	1/27/2011 10:00	22.6
1/27/2011	11:00	1/27/2011 11:00	23.3
1/27/2011	12:00	1/27/2011 12:00	24.5
1/27/2011	13:00	1/27/2011 13:00	25.1
1/27/2011	14:00	1/27/2011 14:00	25.3
1/27/2011	15:00	1/27/2011 15:00	25

1/27/2011	16:00	1/27/2011 16:00	25.1
1/27/2011	17:00	1/27/2011 17:00	24.8
1/27/2011	18:00	1/27/2011 18:00	24.5
1/27/2011	19:00	1/27/2011 19:00	24.3
1/27/2011	20:00	1/27/2011 20:00	24.2
1/27/2011	21:00	1/27/2011 21:00	24.3
1/27/2011	22:00	1/27/2011 22:00	23.8
1/27/2011	23:00	1/27/2011 23:00	23.5
1/27/2011	24:00:00	1/28/2011 0:00	23.4
1/28/2011	1:00	1/28/2011 1:00	24.5
1/28/2011	2:00	1/28/2011 2:00	25.6
1/28/2011	3:00	1/28/2011 3:00	26.3
1/28/2011	4:00	1/28/2011 4:00	26.7
1/28/2011	5:00	1/28/2011 5:00	26.7
1/28/2011	6:00	1/28/2011 6:00	26.9
1/28/2011	7:00	1/28/2011 7:00	26.5
1/28/2011	8:00	1/28/2011 8:00	26.2
1/28/2011	9:00	1/28/2011 9:00	26.1
1/28/2011	10:00	1/28/2011 10:00	26.6
1/28/2011	11:00	1/28/2011 11:00	27.3
1/28/2011	12:00	1/28/2011 12:00	28
1/28/2011	13:00	1/28/2011 13:00	28.1
1/28/2011	14:00	1/28/2011 14:00	28.2
1/28/2011	15:00	1/28/2011 15:00	27.5
1/28/2011	16:00	1/28/2011 16:00	26.6
1/28/2011	17:00	1/28/2011 17:00	25.8
1/28/2011	18:00	1/28/2011 18:00	24.7
1/28/2011	19:00	1/28/2011 19:00	22.9
1/28/2011	20:00	1/28/2011 20:00	17.5
1/28/2011	21:00	1/28/2011 21:00	18.2
1/28/2011	22:00	1/28/2011 22:00	19.8
1/28/2011	23:00	1/28/2011 23:00	20.5
1/28/2011	24:00:00	1/29/2011 0:00	20.7
1/29/2011	1:00	1/29/2011 1:00	20.9
1/29/2011	2:00	1/29/2011 2:00	21.3
1/29/2011	3:00	1/29/2011 3:00	22.3
1/29/2011	4:00	1/29/2011 4:00	22.6
1/29/2011	5:00	1/29/2011 5:00	22.7
1/29/2011	6:00	1/29/2011 6:00	22.8
1/29/2011	7:00	1/29/2011 7:00	21.5
1/29/2011	8:00	1/29/2011 8:00	20.4
1/29/2011	9:00	1/29/2011 9:00	19.5
1/29/2011	10:00	1/29/2011 10:00	18.7
1/29/2011	11:00	1/29/2011 11:00	19.3
1/29/2011	12:00	1/29/2011 12:00	20.7
1/29/2011	13:00	1/29/2011 13:00	22.3
1/29/2011	14:00	1/29/2011 14:00	23.5
1/29/2011	15:00	1/29/2011 15:00	24.3
1/29/2011	16:00	1/29/2011 16:00	26.3
1/29/2011	17:00	1/29/2011 17:00	25.5
1/29/2011	18:00	1/29/2011 18:00	24.8
1/29/2011	19:00	1/29/2011 19:00	24.2
1/29/2011	20:00	1/29/2011 20:00	23.9
1/29/2011	21:00	1/29/2011 21:00	23.5
1/29/2011	22:00	1/29/2011 22:00	23.1

1/29/2011	23:00	1/29/2011 23:00	23
1/29/2011	24:00:00	1/30/2011 0:00	22.3
1/30/2011	1:00	1/30/2011 1:00	21.6
1/30/2011	2:00	1/30/2011 2:00	21.2
1/30/2011	3:00	1/30/2011 3:00	20.7
1/30/2011	4:00	1/30/2011 4:00	20.2
1/30/2011	5:00	1/30/2011 5:00	20
1/30/2011	6:00	1/30/2011 6:00	20
1/30/2011	7:00	1/30/2011 7:00	17.3
1/30/2011	8:00	1/30/2011 8:00	13.3
1/30/2011	9:00	1/30/2011 9:00	16.3
1/30/2011	10:00	1/30/2011 10:00	18.6
1/30/2011	11:00	1/30/2011 11:00	20.4
1/30/2011	12:00	1/30/2011 12:00	22.7
1/30/2011	13:00	1/30/2011 13:00	24.7
1/30/2011	14:00	1/30/2011 14:00	25.5
1/30/2011	15:00	1/30/2011 15:00	25
1/30/2011	16:00	1/30/2011 16:00	24
1/30/2011	17:00	1/30/2011 17:00	22.8
1/30/2011	18:00	1/30/2011 18:00	21.7
1/30/2011	19:00	1/30/2011 19:00	20.7
1/30/2011	20:00	1/30/2011 20:00	18.1
1/30/2011	21:00	1/30/2011 21:00	13.9
1/30/2011	22:00	1/30/2011 22:00	14.5
1/30/2011	23:00	1/30/2011 23:00	16.1
1/30/2011	24:00:00	1/31/2011 0:00	16.5
1/31/2011	1:00	1/31/2011 1:00	16.1
1/31/2011	2:00	1/31/2011 2:00	15.4
1/31/2011	3:00	1/31/2011 3:00	14.2
1/31/2011	4:00	1/31/2011 4:00	13.4
1/31/2011	5:00	1/31/2011 5:00	11.1
1/31/2011	6:00	1/31/2011 6:00	10.1
1/31/2011	7:00	1/31/2011 7:00	9.7
1/31/2011	8:00	1/31/2011 8:00	9.6
1/31/2011	9:00	1/31/2011 9:00	9.4
1/31/2011	10:00	1/31/2011 10:00	10.5
1/31/2011	11:00	1/31/2011 11:00	11.8
1/31/2011	12:00	1/31/2011 12:00	14
1/31/2011	13:00	1/31/2011 13:00	16
1/31/2011	14:00	1/31/2011 14:00	17.1
1/31/2011	15:00	1/31/2011 15:00	17.6
1/31/2011	16:00	1/31/2011 16:00	18
1/31/2011	17:00	1/31/2011 17:00	18.2
1/31/2011	18:00	1/31/2011 18:00	17.4
1/31/2011	19:00	1/31/2011 19:00	17
1/31/2011	20:00	1/31/2011 20:00	16.3
1/31/2011	21:00	1/31/2011 21:00	16.3
1/31/2011	22:00	1/31/2011 22:00	15.6
1/31/2011	23:00	1/31/2011 23:00	15.6
1/31/2011	24:00:00	2/1/2011 0:00	15.7
2/1/2011	1:00	2/1/2011 1:00	15.5
2/1/2011	2:00	2/1/2011 2:00	14.6
2/1/2011	3:00	2/1/2011 3:00	14.3
2/1/2011	4:00	2/1/2011 4:00	13.9
2/1/2011	5:00	2/1/2011 5:00	13.6

2/1/2011	6:00	2/1/2011 6:00	13.3
2/1/2011	7:00	2/1/2011 7:00	12.9
2/1/2011	8:00	2/1/2011 8:00	12.8
2/1/2011	9:00	2/1/2011 9:00	12.7
2/1/2011	10:00	2/1/2011 10:00	13.5
2/1/2011	11:00	2/1/2011 11:00	16.1
2/1/2011	12:00	2/1/2011 12:00	17.9
2/1/2011	13:00	2/1/2011 13:00	18.3
2/1/2011	14:00	2/1/2011 14:00	19.6
2/1/2011	15:00	2/1/2011 15:00	20.4
2/1/2011	16:00	2/1/2011 16:00	20.7
2/1/2011	17:00	2/1/2011 17:00	20.6
2/1/2011	18:00	2/1/2011 18:00	20.1
2/1/2011	19:00	2/1/2011 19:00	19.3
2/1/2011	20:00	2/1/2011 20:00	18.6
2/1/2011	21:00	2/1/2011 21:00	17.5
2/1/2011	22:00	2/1/2011 22:00	16
2/1/2011	23:00	2/1/2011 23:00	14.3
2/1/2011	24:00:00	2/2/2011 0:00	13.5
2/2/2011	1:00	2/2/2011 1:00	13.2
2/2/2011	2:00	2/2/2011 2:00	13.4
2/2/2011	3:00	2/2/2011 3:00	13.5
2/2/2011	4:00	2/2/2011 4:00	13.3
2/2/2011	5:00	2/2/2011 5:00	13.3
2/2/2011	6:00	2/2/2011 6:00	13.8
2/2/2011	7:00	2/2/2011 7:00	14.3
2/2/2011	8:00	2/2/2011 8:00	14.2
2/2/2011	9:00	2/2/2011 9:00	13.9
2/2/2011	10:00	2/2/2011 10:00	14.3
2/2/2011	11:00	2/2/2011 11:00	16.4
2/2/2011	12:00	2/2/2011 12:00	18.3
2/2/2011	13:00	2/2/2011 13:00	20.5
2/2/2011	14:00	2/2/2011 14:00	23.8
2/2/2011	15:00	2/2/2011 15:00	24.2
2/2/2011	16:00	2/2/2011 16:00	23.4
2/2/2011	17:00	2/2/2011 17:00	23.4
2/2/2011	18:00	2/2/2011 18:00	22.1
2/2/2011	19:00	2/2/2011 19:00	17.9
2/2/2011	20:00	2/2/2011 20:00	18.5
2/2/2011	21:00	2/2/2011 21:00	23
2/2/2011	22:00	2/2/2011 22:00	23.2
2/2/2011	23:00	2/2/2011 23:00	20.4
2/2/2011	24:00:00	2/3/2011 0:00	20.5
2/3/2011	1:00	2/3/2011 1:00	19
2/3/2011	2:00	2/3/2011 2:00	18.2
2/3/2011	3:00	2/3/2011 3:00	17.2
2/3/2011	4:00	2/3/2011 4:00	15.6
2/3/2011	5:00	2/3/2011 5:00	13.8
2/3/2011	6:00	2/3/2011 6:00	13.3
2/3/2011	7:00	2/3/2011 7:00	13.5
2/3/2011	8:00	2/3/2011 8:00	15.6
2/3/2011	9:00	2/3/2011 9:00	16
2/3/2011	10:00	2/3/2011 10:00	19
2/3/2011	11:00	2/3/2011 11:00	20.2
2/3/2011	12:00	2/3/2011 12:00	21.5

2/3/2011	13:00	2/3/2011 13:00	22.8
2/3/2011	14:00	2/3/2011 14:00	23.2
2/3/2011	15:00	2/3/2011 15:00	23
2/3/2011	16:00	2/3/2011 16:00	22.5
2/3/2011	17:00	2/3/2011 17:00	22
2/3/2011	18:00	2/3/2011 18:00	20.9
2/3/2011	19:00	2/3/2011 19:00	19.6
2/3/2011	20:00	2/3/2011 20:00	20.3
2/3/2011	21:00	2/3/2011 21:00	21.3
2/3/2011	22:00	2/3/2011 22:00	20.5
2/3/2011	23:00	2/3/2011 23:00	19.3
2/3/2011	24:00:00	2/4/2011 0:00	18.7
2/4/2011	1:00	2/4/2011 1:00	18.7
2/4/2011	2:00	2/4/2011 2:00	19.5
2/4/2011	3:00	2/4/2011 3:00	19.4
2/4/2011	4:00	2/4/2011 4:00	19.8
2/4/2011	5:00	2/4/2011 5:00	20
2/4/2011	6:00	2/4/2011 6:00	20.3
2/4/2011	7:00	2/4/2011 7:00	20.5
2/4/2011	8:00	2/4/2011 8:00	20.5
2/4/2011	9:00	2/4/2011 9:00	20.4
2/4/2011	10:00	2/4/2011 10:00	21.2
2/4/2011	11:00	2/4/2011 11:00	21.8
2/4/2011	12:00	2/4/2011 12:00	21.9
2/4/2011	13:00	2/4/2011 13:00	23.8
2/4/2011	14:00	2/4/2011 14:00	26.6
2/4/2011	15:00	2/4/2011 15:00	27.6
2/4/2011	16:00	2/4/2011 16:00	28.4
2/4/2011	17:00	2/4/2011 17:00	29.1
2/4/2011	18:00	2/4/2011 18:00	28.5
2/4/2011	19:00	2/4/2011 19:00	28.8
2/4/2011	20:00	2/4/2011 20:00	29.9
2/4/2011	21:00	2/4/2011 21:00	29.5
2/4/2011	22:00	2/4/2011 22:00	29
2/4/2011	23:00	2/4/2011 23:00	28
2/4/2011	24:00:00	2/5/2011 0:00	26.5
2/5/2011	1:00	2/5/2011 1:00	25.5
2/5/2011	2:00	2/5/2011 2:00	25
2/5/2011	3:00	2/5/2011 3:00	24.4
2/5/2011	4:00	2/5/2011 4:00	23.5
2/5/2011	5:00	2/5/2011 5:00	20.2
2/5/2011	6:00	2/5/2011 6:00	17.9
2/5/2011	7:00	2/5/2011 7:00	12.9
2/5/2011	8:00	2/5/2011 8:00	12.7
2/5/2011	9:00	2/5/2011 9:00	14.3
2/5/2011	10:00	2/5/2011 10:00	19
2/5/2011	11:00	2/5/2011 11:00	23.5
2/5/2011	12:00	2/5/2011 12:00	26.4
2/5/2011	13:00	2/5/2011 13:00	30.7
2/5/2011	14:00	2/5/2011 14:00	30.8
2/5/2011	15:00	2/5/2011 15:00	35.7
2/5/2011	16:00	2/5/2011 16:00	32.7
2/5/2011	17:00	2/5/2011 17:00	29.9
2/5/2011	18:00	2/5/2011 18:00	29
2/5/2011	19:00	2/5/2011 19:00	28.6

2/5/2011	20:00	2/5/2011 20:00	28.2
2/5/2011	21:00	2/5/2011 21:00	28.4
2/5/2011	22:00	2/5/2011 22:00	28.4
2/5/2011	23:00	2/5/2011 23:00	28.3
2/5/2011	24:00:00	2/6/2011 0:00	28.4
2/6/2011	1:00	2/6/2011 1:00	28.6
2/6/2011	2:00	2/6/2011 2:00	28.7
2/6/2011	3:00	2/6/2011 3:00	28.5
2/6/2011	4:00	2/6/2011 4:00	28.4
2/6/2011	5:00	2/6/2011 5:00	28.6
2/6/2011	6:00	2/6/2011 6:00	28.3
2/6/2011	7:00	2/6/2011 7:00	28
2/6/2011	8:00	2/6/2011 8:00	27.9
2/6/2011	9:00	2/6/2011 9:00	28.3
2/6/2011	10:00	2/6/2011 10:00	29
2/6/2011	11:00	2/6/2011 11:00	29.4
2/6/2011	12:00	2/6/2011 12:00	29.4
2/6/2011	13:00	2/6/2011 13:00	31.1
2/6/2011	14:00	2/6/2011 14:00	32.4
2/6/2011	15:00	2/6/2011 15:00	33.3
2/6/2011	16:00	2/6/2011 16:00	31.2
2/6/2011	17:00	2/6/2011 17:00	31
2/6/2011	18:00	2/6/2011 18:00	29.6
2/6/2011	19:00	2/6/2011 19:00	29.1
2/6/2011	20:00	2/6/2011 20:00	28.7
2/6/2011	21:00	2/6/2011 21:00	28.3
2/6/2011	22:00	2/6/2011 22:00	27.9
2/6/2011	23:00	2/6/2011 23:00	27.5
2/6/2011	24:00:00	2/7/2011 0:00	27.3
2/7/2011	1:00	2/7/2011 1:00	26.4
2/7/2011	2:00	2/7/2011 2:00	25.5
2/7/2011	3:00	2/7/2011 3:00	25.1
2/7/2011	4:00	2/7/2011 4:00	24.6
2/7/2011	5:00	2/7/2011 5:00	24.1
2/7/2011	6:00	2/7/2011 6:00	23.8
2/7/2011	7:00	2/7/2011 7:00	22.8
2/7/2011	8:00	2/7/2011 8:00	21
2/7/2011	9:00	2/7/2011 9:00	19.7
2/7/2011	10:00	2/7/2011 10:00	22.9
2/7/2011	11:00	2/7/2011 11:00	25.9
2/7/2011	12:00	2/7/2011 12:00	26.9
2/7/2011	13:00	2/7/2011 13:00	27.3
2/7/2011	14:00	2/7/2011 14:00	27.5
2/7/2011	15:00	2/7/2011 15:00	25.9
2/7/2011	16:00	2/7/2011 16:00	24.2
2/7/2011	17:00	2/7/2011 17:00	22.4
2/7/2011	18:00	2/7/2011 18:00	21
2/7/2011	19:00	2/7/2011 19:00	19.1
2/7/2011	20:00	2/7/2011 20:00	18.1
2/7/2011	21:00	2/7/2011 21:00	17.8
2/7/2011	22:00	2/7/2011 22:00	16.7
2/7/2011	23:00	2/7/2011 23:00	15.9
2/7/2011	24:00:00	2/8/2011 0:00	13.9
2/8/2011	1:00	2/8/2011 1:00	12.8
2/8/2011	2:00	2/8/2011 2:00	12.4

2/8/2011	3:00	2/8/2011 3:00	11.3
2/8/2011	4:00	2/8/2011 4:00	9.7
2/8/2011	5:00	2/8/2011 5:00	9.9
2/8/2011	6:00	2/8/2011 6:00	7.7
2/8/2011	7:00	2/8/2011 7:00	8.3
2/8/2011	8:00	2/8/2011 8:00	12.8
2/8/2011	9:00	2/8/2011 9:00	13.7
2/8/2011	10:00	2/8/2011 10:00	14.5
2/8/2011	11:00	2/8/2011 11:00	14.3
2/8/2011	12:00	2/8/2011 12:00	13.3
2/8/2011	13:00	2/8/2011 13:00	13.1
2/8/2011	14:00	2/8/2011 14:00	12.4
2/8/2011	15:00	2/8/2011 15:00	12.5
2/8/2011	16:00	2/8/2011 16:00	12.8
2/8/2011	17:00	2/8/2011 17:00	13.3
2/8/2011	18:00	2/8/2011 18:00	12.9
2/8/2011	19:00	2/8/2011 19:00	12.6
2/8/2011	20:00	2/8/2011 20:00	12.6
2/8/2011	21:00	2/8/2011 21:00	13.7
2/8/2011	22:00	2/8/2011 22:00	14.9
2/8/2011	23:00	2/8/2011 23:00	15.7
2/8/2011	24:00:00	2/9/2011 0:00	16.5
2/9/2011	1:00	2/9/2011 1:00	17.5
2/9/2011	2:00	2/9/2011 2:00	17.5
2/9/2011	3:00	2/9/2011 3:00	17
2/9/2011	4:00	2/9/2011 4:00	16
2/9/2011	5:00	2/9/2011 5:00	14.3
2/9/2011	6:00	2/9/2011 6:00	13.5
2/9/2011	7:00	2/9/2011 7:00	12.1
2/9/2011	8:00	2/9/2011 8:00	10.7
2/9/2011	9:00	2/9/2011 9:00	9.7
2/9/2011	10:00	2/9/2011 10:00	9.9
2/9/2011	11:00	2/9/2011 11:00	10.2
2/9/2011	12:00	2/9/2011 12:00	10.8
2/9/2011	13:00	2/9/2011 13:00	11.2
2/9/2011	14:00	2/9/2011 14:00	11.9
2/9/2011	15:00	2/9/2011 15:00	13
2/9/2011	16:00	2/9/2011 16:00	12.8
2/9/2011	17:00	2/9/2011 17:00	12.2
2/9/2011	18:00	2/9/2011 18:00	11.5
2/9/2011	19:00	2/9/2011 19:00	11.2
2/9/2011	20:00	2/9/2011 20:00	11.6
2/9/2011	21:00	2/9/2011 21:00	12
2/9/2011	22:00	2/9/2011 22:00	12
2/9/2011	23:00	2/9/2011 23:00	11.8
2/9/2011	24:00:00	2/10/2011 0:00	11.7
2/10/2011	1:00	2/10/2011 1:00	11.7
2/10/2011	2:00	2/10/2011 2:00	11.5
2/10/2011	3:00	2/10/2011 3:00	10.9
2/10/2011	4:00	2/10/2011 4:00	10.8
2/10/2011	5:00	2/10/2011 5:00	10.6
2/10/2011	6:00	2/10/2011 6:00	10.2
2/10/2011	7:00	2/10/2011 7:00	10.1
2/10/2011	8:00	2/10/2011 8:00	9.8
2/10/2011	9:00	2/10/2011 9:00	9.7

2/10/2011	10:00	2/10/2011 10:00	10.2
2/10/2011	11:00	2/10/2011 11:00	11.7
2/10/2011	12:00	2/10/2011 12:00	12.8
2/10/2011	13:00	2/10/2011 13:00	14.1
2/10/2011	14:00	2/10/2011 14:00	14.9
2/10/2011	15:00	2/10/2011 15:00	16.3
2/10/2011	16:00	2/10/2011 16:00	17.7
2/10/2011	17:00	2/10/2011 17:00	19
2/10/2011	18:00	2/10/2011 18:00	18.3
2/10/2011	19:00	2/10/2011 19:00	18.1
2/10/2011	20:00	2/10/2011 20:00	18.8
2/10/2011	21:00	2/10/2011 21:00	17.2
2/10/2011	22:00	2/10/2011 22:00	16.1
2/10/2011	23:00	2/10/2011 23:00	15.2
2/10/2011	24:00:00	2/11/2011 0:00	14.6
2/11/2011	1:00	2/11/2011 1:00	14.1
2/11/2011	2:00	2/11/2011 2:00	14
2/11/2011	3:00	2/11/2011 3:00	13.1
2/11/2011	4:00	2/11/2011 4:00	13.1
2/11/2011	5:00	2/11/2011 5:00	12.3
2/11/2011	6:00	2/11/2011 6:00	11.7
2/11/2011	7:00	2/11/2011 7:00	12.5
2/11/2011	8:00	2/11/2011 8:00	12.7
2/11/2011	9:00	2/11/2011 9:00	11.9
2/11/2011	10:00	2/11/2011 10:00	15.1
2/11/2011	11:00	2/11/2011 11:00	18
2/11/2011	12:00	2/11/2011 12:00	19.9
2/11/2011	13:00	2/11/2011 13:00	20.2
2/11/2011	14:00	2/11/2011 14:00	20.5
2/11/2011	15:00	2/11/2011 15:00	20.9
2/11/2011	16:00	2/11/2011 16:00	21.5
2/11/2011	17:00	2/11/2011 17:00	21.9
2/11/2011	18:00	2/11/2011 18:00	23.3
2/11/2011	19:00	2/11/2011 19:00	23.9
2/11/2011	20:00	2/11/2011 20:00	24.6
2/11/2011	21:00	2/11/2011 21:00	24.4
2/11/2011	22:00	2/11/2011 22:00	24.9
2/11/2011	23:00	2/11/2011 23:00	25.4
2/11/2011	24:00:00	2/12/2011 0:00	26.5
2/12/2011	1:00	2/12/2011 1:00	26.9
2/12/2011	2:00	2/12/2011 2:00	26.8
2/12/2011	3:00	2/12/2011 3:00	26.5
2/12/2011	4:00	2/12/2011 4:00	25.2
2/12/2011	5:00	2/12/2011 5:00	25.1
2/12/2011	6:00	2/12/2011 6:00	25.9
2/12/2011	7:00	2/12/2011 7:00	25.5
2/12/2011	8:00	2/12/2011 8:00	24.6
2/12/2011	9:00	2/12/2011 9:00	24.2
2/12/2011	10:00	2/12/2011 10:00	24.9
2/12/2011	11:00	2/12/2011 11:00	25.3
2/12/2011	12:00	2/12/2011 12:00	26.4
2/12/2011	13:00	2/12/2011 13:00	27.6
2/12/2011	14:00	2/12/2011 14:00	27.1
2/12/2011	15:00	2/12/2011 15:00	27
2/12/2011	16:00	2/12/2011 16:00	27

2/12/2011	17:00	2/12/2011 17:00	27.3
2/12/2011	18:00	2/12/2011 18:00	26.9
2/12/2011	19:00	2/12/2011 19:00	26.3
2/12/2011	20:00	2/12/2011 20:00	26.8
2/12/2011	21:00	2/12/2011 21:00	27.4
2/12/2011	22:00	2/12/2011 22:00	29.9
2/12/2011	23:00	2/12/2011 23:00	31.5
2/12/2011	24:00:00	2/13/2011 0:00	33.2
2/13/2011	1:00	2/13/2011 1:00	33.9
2/13/2011	2:00	2/13/2011 2:00	31.8
2/13/2011	3:00	2/13/2011 3:00	30.2
2/13/2011	4:00	2/13/2011 4:00	30.4
2/13/2011	5:00	2/13/2011 5:00	30.5
2/13/2011	6:00	2/13/2011 6:00	30.6
2/13/2011	7:00	2/13/2011 7:00	30.5
2/13/2011	8:00	2/13/2011 8:00	31.6
2/13/2011	9:00	2/13/2011 9:00	32.6
2/13/2011	10:00	2/13/2011 10:00	33.8
2/13/2011	11:00	2/13/2011 11:00	36.2
2/13/2011	12:00	2/13/2011 12:00	37.2
2/13/2011	13:00	2/13/2011 13:00	37.3
2/13/2011	14:00	2/13/2011 14:00	37.5
2/13/2011	15:00	2/13/2011 15:00	37.5
2/13/2011	16:00	2/13/2011 16:00	37.8
2/13/2011	17:00	2/13/2011 17:00	38.5
2/13/2011	18:00	2/13/2011 18:00	39.1
2/13/2011	19:00	2/13/2011 19:00	39.8
2/13/2011	20:00	2/13/2011 20:00	39.6
2/13/2011	21:00	2/13/2011 21:00	39.5
2/13/2011	22:00	2/13/2011 22:00	39
2/13/2011	23:00	2/13/2011 23:00	38.4
2/13/2011	24:00:00	2/14/2011 0:00	38.7
2/14/2011	1:00	2/14/2011 1:00	38
2/14/2011	2:00	2/14/2011 2:00	38.2
2/14/2011	3:00	2/14/2011 3:00	38.8
2/14/2011	4:00	2/14/2011 4:00	38.5
2/14/2011	5:00	2/14/2011 5:00	38.5
2/14/2011	6:00	2/14/2011 6:00	38.1
2/14/2011	7:00	2/14/2011 7:00	38
2/14/2011	8:00	2/14/2011 8:00	36.6
2/14/2011	9:00	2/14/2011 9:00	34.3
2/14/2011	10:00	2/14/2011 10:00	32.3
2/14/2011	11:00	2/14/2011 11:00	31.1
2/14/2011	12:00	2/14/2011 12:00	31.1
2/14/2011	13:00	2/14/2011 13:00	32.3
2/14/2011	14:00	2/14/2011 14:00	31.7
2/14/2011	15:00	2/14/2011 15:00	32.3
2/14/2011	16:00	2/14/2011 16:00	32.4
2/14/2011	17:00	2/14/2011 17:00	31.7
2/14/2011	18:00	2/14/2011 18:00	30.5
2/14/2011	19:00	2/14/2011 19:00	26.3
2/14/2011	20:00	2/14/2011 20:00	22.1
2/14/2011	21:00	2/14/2011 21:00	17.3
2/14/2011	22:00	2/14/2011 22:00	14.5
2/14/2011	23:00	2/14/2011 23:00	14.4

2/14/2011	24:00:00	2/15/2011 0:00	14.3
2/15/2011	1:00	2/15/2011 1:00	17
2/15/2011	2:00	2/15/2011 2:00	19.4
2/15/2011	3:00	2/15/2011 3:00	19
2/15/2011	4:00	2/15/2011 4:00	18.5
2/15/2011	5:00	2/15/2011 5:00	19.2
2/15/2011	6:00	2/15/2011 6:00	19.8
2/15/2011	7:00	2/15/2011 7:00	18.9
2/15/2011	8:00	2/15/2011 8:00	19.1
2/15/2011	9:00	2/15/2011 9:00	19.7
2/15/2011	10:00	2/15/2011 10:00	23.5
2/15/2011	11:00	2/15/2011 11:00	28
2/15/2011	12:00	2/15/2011 12:00	31.3
2/15/2011	13:00	2/15/2011 13:00	34.6
2/15/2011	14:00	2/15/2011 14:00	36.8
2/15/2011	15:00	2/15/2011 15:00	37.6
2/15/2011	16:00	2/15/2011 16:00	37.9
2/15/2011	17:00	2/15/2011 17:00	37
2/15/2011	18:00	2/15/2011 18:00	36.3
2/15/2011	19:00	2/15/2011 19:00	34
2/15/2011	20:00	2/15/2011 20:00	32.7
2/15/2011	21:00	2/15/2011 21:00	33.5
2/15/2011	22:00	2/15/2011 22:00	33.6
2/15/2011	23:00	2/15/2011 23:00	32.7
2/15/2011	24:00:00	2/16/2011 0:00	31.8
2/16/2011	1:00	2/16/2011 1:00	32.1
2/16/2011	2:00	2/16/2011 2:00	32.7
2/16/2011	3:00	2/16/2011 3:00	33.6
2/16/2011	4:00	2/16/2011 4:00	34.5
2/16/2011	5:00	2/16/2011 5:00	35.2
2/16/2011	6:00	2/16/2011 6:00	35.8
2/16/2011	7:00	2/16/2011 7:00	35.6
2/16/2011	8:00	2/16/2011 8:00	34.7
2/16/2011	9:00	2/16/2011 9:00	35.6
2/16/2011	10:00	2/16/2011 10:00	38.3
2/16/2011	11:00	2/16/2011 11:00	40.7
2/16/2011	12:00	2/16/2011 12:00	41.9
2/16/2011	13:00	2/16/2011 13:00	43
2/16/2011	14:00	2/16/2011 14:00	43.4
2/16/2011	15:00	2/16/2011 15:00	43.4
2/16/2011	16:00	2/16/2011 16:00	42.8
2/16/2011	17:00	2/16/2011 17:00	39.8
2/16/2011	18:00	2/16/2011 18:00	37.9
2/16/2011	19:00	2/16/2011 19:00	37.4
2/16/2011	20:00	2/16/2011 20:00	36.7
2/16/2011	21:00	2/16/2011 21:00	37.1
2/16/2011	22:00	2/16/2011 22:00	36.7
2/16/2011	23:00	2/16/2011 23:00	36.2
2/16/2011	24:00:00	2/17/2011 0:00	34.8
2/17/2011	1:00	2/17/2011 1:00	36.2
2/17/2011	2:00	2/17/2011 2:00	36.7
2/17/2011	3:00	2/17/2011 3:00	39.3
2/17/2011	4:00	2/17/2011 4:00	40.9
2/17/2011	5:00	2/17/2011 5:00	44.8
2/17/2011	6:00	2/17/2011 6:00	45.7

2/17/2011	7:00	2/17/2011 7:00	45.4
2/17/2011	8:00	2/17/2011 8:00	45.3
2/17/2011	9:00	2/17/2011 9:00	45.9
2/17/2011	10:00	2/17/2011 10:00	45.2
2/17/2011	11:00	2/17/2011 11:00	44.6
2/17/2011	12:00	2/17/2011 12:00	44.9
2/17/2011	13:00	2/17/2011 13:00	45.3
2/17/2011	14:00	2/17/2011 14:00	45.3
2/17/2011	15:00	2/17/2011 15:00	44.8
2/17/2011	16:00	2/17/2011 16:00	45.2
2/17/2011	17:00	2/17/2011 17:00	46.1
2/17/2011	18:00	2/17/2011 18:00	47.3
2/17/2011	19:00	2/17/2011 19:00	49
2/17/2011	20:00	2/17/2011 20:00	49.3
2/17/2011	21:00	2/17/2011 21:00	49
2/17/2011	22:00	2/17/2011 22:00	48.8
2/17/2011	23:00	2/17/2011 23:00	49.2
2/17/2011	24:00:00	2/18/2011 0:00	48
2/18/2011	1:00	2/18/2011 1:00	47.8
2/18/2011	2:00	2/18/2011 2:00	45.8
2/18/2011	3:00	2/18/2011 3:00	44.5
2/18/2011	4:00	2/18/2011 4:00	41.1
2/18/2011	5:00	2/18/2011 5:00	38.4
2/18/2011	6:00	2/18/2011 6:00	37
2/18/2011	7:00	2/18/2011 7:00	36.2
2/18/2011	8:00	2/18/2011 8:00	35.7
2/18/2011	9:00	2/18/2011 9:00	35.7
2/18/2011	10:00	2/18/2011 10:00	36.4
2/18/2011	11:00	2/18/2011 11:00	36.8
2/18/2011	12:00	2/18/2011 12:00	37.4
2/18/2011	13:00	2/18/2011 13:00	38.3
2/18/2011	14:00	2/18/2011 14:00	38.8
2/18/2011	15:00	2/18/2011 15:00	38.3
2/18/2011	16:00	2/18/2011 16:00	37.8
2/18/2011	17:00	2/18/2011 17:00	37.4
2/18/2011	18:00	2/18/2011 18:00	36.6
2/18/2011	19:00	2/18/2011 19:00	35.3
2/18/2011	20:00	2/18/2011 20:00	34.5
2/18/2011	21:00	2/18/2011 21:00	33.8
2/18/2011	22:00	2/18/2011 22:00	32.6
2/18/2011	23:00	2/18/2011 23:00	31.4
2/18/2011	24:00:00	2/19/2011 0:00	30.2
2/19/2011	1:00	2/19/2011 1:00	28.4
2/19/2011	2:00	2/19/2011 2:00	27
2/19/2011	3:00	2/19/2011 3:00	26.2
2/19/2011	4:00	2/19/2011 4:00	25.1
2/19/2011	5:00	2/19/2011 5:00	24.4
2/19/2011	6:00	2/19/2011 6:00	23.6
2/19/2011	7:00	2/19/2011 7:00	23
2/19/2011	8:00	2/19/2011 8:00	22
2/19/2011	9:00	2/19/2011 9:00	23
2/19/2011	10:00	2/19/2011 10:00	24.4
2/19/2011	11:00	2/19/2011 11:00	25.7
2/19/2011	12:00	2/19/2011 12:00	27.6
2/19/2011	13:00	2/19/2011 13:00	29

2/19/2011	14:00	2/19/2011 14:00	29.5
2/19/2011	15:00	2/19/2011 15:00	29.9
2/19/2011	16:00	2/19/2011 16:00	30
2/19/2011	17:00	2/19/2011 17:00	28.6
2/19/2011	18:00	2/19/2011 18:00	25.7
2/19/2011	19:00	2/19/2011 19:00	23.4
2/19/2011	20:00	2/19/2011 20:00	21.5
2/19/2011	21:00	2/19/2011 21:00	21.3
2/19/2011	22:00	2/19/2011 22:00	21
2/19/2011	23:00	2/19/2011 23:00	20.4
2/19/2011	24:00:00	2/20/2011 0:00	20.1
2/20/2011	1:00	2/20/2011 1:00	20.4
2/20/2011	2:00	2/20/2011 2:00	21.1
2/20/2011	3:00	2/20/2011 3:00	21
2/20/2011	4:00	2/20/2011 4:00	20.8
2/20/2011	5:00	2/20/2011 5:00	20.4
2/20/2011	6:00	2/20/2011 6:00	21.4
2/20/2011	7:00	2/20/2011 7:00	22.3
2/20/2011	8:00	2/20/2011 8:00	22.9
2/20/2011	9:00	2/20/2011 9:00	24.3
2/20/2011	10:00	2/20/2011 10:00	26.2
2/20/2011	11:00	2/20/2011 11:00	28.7
2/20/2011	12:00	2/20/2011 12:00	30.8
2/20/2011	13:00	2/20/2011 13:00	31.5
2/20/2011	14:00	2/20/2011 14:00	31.1
2/20/2011	15:00	2/20/2011 15:00	28.1
2/20/2011	16:00	2/20/2011 16:00	28
2/20/2011	17:00	2/20/2011 17:00	27.9
2/20/2011	18:00	2/20/2011 18:00	27.5
2/20/2011	19:00	2/20/2011 19:00	27.3
2/20/2011	20:00	2/20/2011 20:00	27.1
2/20/2011	21:00	2/20/2011 21:00	26.8
2/20/2011	22:00	2/20/2011 22:00	26.8
2/20/2011	23:00	2/20/2011 23:00	26.8
2/20/2011	24:00:00	2/21/2011 0:00	26.4
2/21/2011	1:00	2/21/2011 1:00	25.7
2/21/2011	2:00	2/21/2011 2:00	24.6
2/21/2011	3:00	2/21/2011 3:00	23.7
2/21/2011	4:00	2/21/2011 4:00	22.5
2/21/2011	5:00	2/21/2011 5:00	22
2/21/2011	6:00	2/21/2011 6:00	20.9
2/21/2011	7:00	2/21/2011 7:00	20
2/21/2011	8:00	2/21/2011 8:00	20
2/21/2011	9:00	2/21/2011 9:00	19.6
2/21/2011	10:00	2/21/2011 10:00	19.4
2/21/2011	11:00	2/21/2011 11:00	19.6
2/21/2011	12:00	2/21/2011 12:00	20.3
2/21/2011	13:00	2/21/2011 13:00	20.4
2/21/2011	14:00	2/21/2011 14:00	20.9
2/21/2011	15:00	2/21/2011 15:00	21.1
2/21/2011	16:00	2/21/2011 16:00	20.6
2/21/2011	17:00	2/21/2011 17:00	20.1
2/21/2011	18:00	2/21/2011 18:00	19.1
2/21/2011	19:00	2/21/2011 19:00	17.2
2/21/2011	20:00	2/21/2011 20:00	17.4

2/21/2011	21:00	2/21/2011 21:00	17.3
2/21/2011	22:00	2/21/2011 22:00	16.8
2/21/2011	23:00	2/21/2011 23:00	16.6
2/21/2011	24:00:00	2/22/2011 0:00	16.3
2/22/2011	1:00	2/22/2011 1:00	16.1
2/22/2011	2:00	2/22/2011 2:00	16.2
2/22/2011	3:00	2/22/2011 3:00	16.6
2/22/2011	4:00	2/22/2011 4:00	16.4
2/22/2011	5:00	2/22/2011 5:00	14.1
2/22/2011	6:00	2/22/2011 6:00	11.3
2/22/2011	7:00	2/22/2011 7:00	10.6
2/22/2011	8:00	2/22/2011 8:00	9.6
2/22/2011	9:00	2/22/2011 9:00	10.4
2/22/2011	10:00	2/22/2011 10:00	14
2/22/2011	11:00	2/22/2011 11:00	18.3
2/22/2011	12:00	2/22/2011 12:00	22.1
2/22/2011	13:00	2/22/2011 13:00	24.4
2/22/2011	14:00	2/22/2011 14:00	28.6
2/22/2011	15:00	2/22/2011 15:00	33.1
2/22/2011	16:00	2/22/2011 16:00	35.4
2/22/2011	17:00	2/22/2011 17:00	31.7
2/22/2011	18:00	2/22/2011 18:00	25.3
2/22/2011	19:00	2/22/2011 19:00	21
2/22/2011	20:00	2/22/2011 20:00	12.4
2/22/2011	21:00	2/22/2011 21:00	8.6
2/22/2011	22:00	2/22/2011 22:00	10.2
2/22/2011	23:00	2/22/2011 23:00	10.7
2/22/2011	24:00:00	2/23/2011 0:00	6.2
2/23/2011	1:00	2/23/2011 1:00	7.4
2/23/2011	2:00	2/23/2011 2:00	10
2/23/2011	3:00	2/23/2011 3:00	11.4
2/23/2011	4:00	2/23/2011 4:00	10.5
2/23/2011	5:00	2/23/2011 5:00	10.9
2/23/2011	6:00	2/23/2011 6:00	12.8
2/23/2011	7:00	2/23/2011 7:00	13.5
2/23/2011	8:00	2/23/2011 8:00	13.7
2/23/2011	9:00	2/23/2011 9:00	14.6
2/23/2011	10:00	2/23/2011 10:00	17.6
2/23/2011	11:00	2/23/2011 11:00	22.7
2/23/2011	12:00	2/23/2011 12:00	26.4
2/23/2011	13:00	2/23/2011 13:00	29.2
2/23/2011	14:00	2/23/2011 14:00	30.7
2/23/2011	15:00	2/23/2011 15:00	30.8
2/23/2011	16:00	2/23/2011 16:00	31
2/23/2011	17:00	2/23/2011 17:00	29.2
2/23/2011	18:00	2/23/2011 18:00	25.4
2/23/2011	19:00	2/23/2011 19:00	24.5
2/23/2011	20:00	2/23/2011 20:00	24.2
2/23/2011	21:00	2/23/2011 21:00	24.3
2/23/2011	22:00	2/23/2011 22:00	24.3
2/23/2011	23:00	2/23/2011 23:00	23.5
2/23/2011	24:00:00	2/24/2011 0:00	23.2
2/24/2011	1:00	2/24/2011 1:00	23.8
2/24/2011	2:00	2/24/2011 2:00	24.2
2/24/2011	3:00	2/24/2011 3:00	24.3

2/24/2011	4:00	2/24/2011 4:00	24.5
2/24/2011	5:00	2/24/2011 5:00	25.2
2/24/2011	6:00	2/24/2011 6:00	26.7
2/24/2011	7:00	2/24/2011 7:00	28.4
2/24/2011	8:00	2/24/2011 8:00	28.4
2/24/2011	9:00	2/24/2011 9:00	30.2
2/24/2011	10:00	2/24/2011 10:00	31.6
2/24/2011	11:00	2/24/2011 11:00	33.3
2/24/2011	12:00	2/24/2011 12:00	34.3
2/24/2011	13:00	2/24/2011 13:00	34.1
2/24/2011	14:00	2/24/2011 14:00	33.9
2/24/2011	15:00	2/24/2011 15:00	34.4
2/24/2011	16:00	2/24/2011 16:00	34.2
2/24/2011	17:00	2/24/2011 17:00	33
2/24/2011	18:00	2/24/2011 18:00	32.1
2/24/2011	19:00	2/24/2011 19:00	31
2/24/2011	20:00	2/24/2011 20:00	30.3
2/24/2011	21:00	2/24/2011 21:00	29.9
2/24/2011	22:00	2/24/2011 22:00	29.7
2/24/2011	23:00	2/24/2011 23:00	29
2/24/2011	24:00:00	2/25/2011 0:00	28.3
2/25/2011	1:00	2/25/2011 1:00	28.4
2/25/2011	2:00	2/25/2011 2:00	28
2/25/2011	3:00	2/25/2011 3:00	27.3
2/25/2011	4:00	2/25/2011 4:00	26.4
2/25/2011	5:00	2/25/2011 5:00	26
2/25/2011	6:00	2/25/2011 6:00	25.2
2/25/2011	7:00	2/25/2011 7:00	24.3
2/25/2011	8:00	2/25/2011 8:00	23.6
2/25/2011	9:00	2/25/2011 9:00	24.2
2/25/2011	10:00	2/25/2011 10:00	26.7
2/25/2011	11:00	2/25/2011 11:00	28.6
2/25/2011	12:00	2/25/2011 12:00	28.8
2/25/2011	13:00	2/25/2011 13:00	28.5
2/25/2011	14:00	2/25/2011 14:00	27.6
2/25/2011	15:00	2/25/2011 15:00	28.5
2/25/2011	16:00	2/25/2011 16:00	27.9
2/25/2011	17:00	2/25/2011 17:00	26.2
2/25/2011	18:00	2/25/2011 18:00	24.1
2/25/2011	19:00	2/25/2011 19:00	20.7
2/25/2011	20:00	2/25/2011 20:00	17.6
2/25/2011	21:00	2/25/2011 21:00	19.4
2/25/2011	22:00	2/25/2011 22:00	19.4
2/25/2011	23:00	2/25/2011 23:00	19.2
2/25/2011	24:00:00	2/26/2011 0:00	18.6
2/26/2011	1:00	2/26/2011 1:00	18.6
2/26/2011	2:00	2/26/2011 2:00	18.5
2/26/2011	3:00	2/26/2011 3:00	18.6
2/26/2011	4:00	2/26/2011 4:00	18.8
2/26/2011	5:00	2/26/2011 5:00	19
2/26/2011	6:00	2/26/2011 6:00	20.2
2/26/2011	7:00	2/26/2011 7:00	19.9
2/26/2011	8:00	2/26/2011 8:00	18.8
2/26/2011	9:00	2/26/2011 9:00	18.6
2/26/2011	10:00	2/26/2011 10:00	20.7

2/26/2011	11:00	2/26/2011 11:00	21.1
2/26/2011	12:00	2/26/2011 12:00	23.8
2/26/2011	13:00	2/26/2011 13:00	25.7
2/26/2011	14:00	2/26/2011 14:00	25.7
2/26/2011	15:00	2/26/2011 15:00	24.7
2/26/2011	16:00	2/26/2011 16:00	22.5
2/26/2011	17:00	2/26/2011 17:00	21.2
2/26/2011	18:00	2/26/2011 18:00	20.8
2/26/2011	19:00	2/26/2011 19:00	20.4
2/26/2011	20:00	2/26/2011 20:00	20.2
2/26/2011	21:00	2/26/2011 21:00	20.3
2/26/2011	22:00	2/26/2011 22:00	20.1
2/26/2011	23:00	2/26/2011 23:00	20.1
2/26/2011	24:00:00	2/27/2011 0:00	19.9
2/27/2011	1:00	2/27/2011 1:00	19.7
2/27/2011	2:00	2/27/2011 2:00	19.9
2/27/2011	3:00	2/27/2011 3:00	19.8
2/27/2011	4:00	2/27/2011 4:00	20.3
2/27/2011	5:00	2/27/2011 5:00	20.3
2/27/2011	6:00	2/27/2011 6:00	20.5
2/27/2011	7:00	2/27/2011 7:00	20.7
2/27/2011	8:00	2/27/2011 8:00	21
2/27/2011	9:00	2/27/2011 9:00	22.1
2/27/2011	10:00	2/27/2011 10:00	23.7
2/27/2011	11:00	2/27/2011 11:00	27
2/27/2011	12:00	2/27/2011 12:00	30
2/27/2011	13:00	2/27/2011 13:00	32.1
2/27/2011	14:00	2/27/2011 14:00	31.4
2/27/2011	15:00	2/27/2011 15:00	30.2
2/27/2011	16:00	2/27/2011 16:00	30.4
2/27/2011	17:00	2/27/2011 17:00	29.7
2/27/2011	18:00	2/27/2011 18:00	29.5
2/27/2011	19:00	2/27/2011 19:00	29
2/27/2011	20:00	2/27/2011 20:00	28.5
2/27/2011	21:00	2/27/2011 21:00	28.4
2/27/2011	22:00	2/27/2011 22:00	28.3
2/27/2011	23:00	2/27/2011 23:00	28
2/27/2011	24:00:00	2/28/2011 0:00	27.8
2/28/2011	1:00	2/28/2011 1:00	27.5
2/28/2011	2:00	2/28/2011 2:00	27.4
2/28/2011	3:00	2/28/2011 3:00	27.1
2/28/2011	4:00	2/28/2011 4:00	26.8
2/28/2011	5:00	2/28/2011 5:00	26.6
2/28/2011	6:00	2/28/2011 6:00	26.3
2/28/2011	7:00	2/28/2011 7:00	26.2
2/28/2011	8:00	2/28/2011 8:00	26
2/28/2011	9:00	2/28/2011 9:00	26.9
2/28/2011	10:00	2/28/2011 10:00	28.5
2/28/2011	11:00	2/28/2011 11:00	29.3
2/28/2011	12:00	2/28/2011 12:00	30.2
2/28/2011	13:00	2/28/2011 13:00	31.5
2/28/2011	14:00	2/28/2011 14:00	32.1
2/28/2011	15:00	2/28/2011 15:00	31.4
2/28/2011	16:00	2/28/2011 16:00	30.6
2/28/2011	17:00	2/28/2011 17:00	29.8

2/28/2011	18:00	2/28/2011 18:00	28.6
2/28/2011	19:00	2/28/2011 19:00	24.9
2/28/2011	20:00	2/28/2011 20:00	18.3
2/28/2011	21:00	2/28/2011 21:00	14.3
2/28/2011	22:00	2/28/2011 22:00	9.6
2/28/2011	23:00	2/28/2011 23:00	8.7
2/28/2011	24:00:00	3/1/2011 0:00	8.5
3/1/2011	1:00	3/1/2011 1:00	12.8
3/1/2011	2:00	3/1/2011 2:00	13.6
3/1/2011	3:00	3/1/2011 3:00	16.6
3/1/2011	4:00	3/1/2011 4:00	16.9
3/1/2011	5:00	3/1/2011 5:00	17.6
3/1/2011	6:00	3/1/2011 6:00	18.4
3/1/2011	7:00	3/1/2011 7:00	19.3
3/1/2011	8:00	3/1/2011 8:00	19.7
3/1/2011	9:00	3/1/2011 9:00	22.6
3/1/2011	10:00	3/1/2011 10:00	27.1
3/1/2011	11:00	3/1/2011 11:00	30.4
3/1/2011	12:00	3/1/2011 12:00	32.2
3/1/2011	13:00	3/1/2011 13:00	32.7
3/1/2011	14:00	3/1/2011 14:00	33.2
3/1/2011	15:00	3/1/2011 15:00	33.9
3/1/2011	16:00	3/1/2011 16:00	33.8
3/1/2011	17:00	3/1/2011 17:00	34.1
3/1/2011	18:00	3/1/2011 18:00	34.8
3/1/2011	19:00	3/1/2011 19:00	34.7
3/1/2011	20:00	3/1/2011 20:00	36
3/1/2011	21:00	3/1/2011 21:00	35.9
3/1/2011	22:00	3/1/2011 22:00	35.9
3/1/2011	23:00	3/1/2011 23:00	35.1
3/1/2011	24:00:00	3/2/2011 0:00	35.3
3/2/2011	1:00	3/2/2011 1:00	35.6
3/2/2011	2:00	3/2/2011 2:00	34.4
3/2/2011	3:00	3/2/2011 3:00	31.8
3/2/2011	4:00	3/2/2011 4:00	28.3
3/2/2011	5:00	3/2/2011 5:00	25.7
3/2/2011	6:00	3/2/2011 6:00	23.9
3/2/2011	7:00	3/2/2011 7:00	23.1
3/2/2011	8:00	3/2/2011 8:00	22.5
3/2/2011	9:00	3/2/2011 9:00	21.9
3/2/2011	10:00	3/2/2011 10:00	23.6
3/2/2011	11:00	3/2/2011 11:00	23.9
3/2/2011	12:00	3/2/2011 12:00	25.5
3/2/2011	13:00	3/2/2011 13:00	26.8
3/2/2011	14:00	3/2/2011 14:00	27.2
3/2/2011	15:00	3/2/2011 15:00	25.5
3/2/2011	16:00	3/2/2011 16:00	26
3/2/2011	17:00	3/2/2011 17:00	26
3/2/2011	18:00	3/2/2011 18:00	23.2
3/2/2011	19:00	3/2/2011 19:00	18.6
3/2/2011	20:00	3/2/2011 20:00	16
3/2/2011	21:00	3/2/2011 21:00	12.6
3/2/2011	22:00	3/2/2011 22:00	10.1
3/2/2011	23:00	3/2/2011 23:00	9.8
3/2/2011	24:00:00	3/3/2011 0:00	8.6

3/3/2011	1:00	3/3/2011 1:00	9.5
3/3/2011	2:00	3/3/2011 2:00	10.7
3/3/2011	3:00	3/3/2011 3:00	11.6
3/3/2011	4:00	3/3/2011 4:00	12.3
3/3/2011	5:00	3/3/2011 5:00	12.3
3/3/2011	6:00	3/3/2011 6:00	12.6
3/3/2011	7:00	3/3/2011 7:00	13.8
3/3/2011	8:00	3/3/2011 8:00	15.1
3/3/2011	9:00	3/3/2011 9:00	16.7
3/3/2011	10:00	3/3/2011 10:00	19
3/3/2011	11:00	3/3/2011 11:00	21.8
3/3/2011	12:00	3/3/2011 12:00	24.9
3/3/2011	13:00	3/3/2011 13:00	27.1
3/3/2011	14:00	3/3/2011 14:00	29.1
3/3/2011	15:00	3/3/2011 15:00	30.2
3/3/2011	16:00	3/3/2011 16:00	30.9
3/3/2011	17:00	3/3/2011 17:00	31.7
3/3/2011	18:00	3/3/2011 18:00	31.1
3/3/2011	19:00	3/3/2011 19:00	29.8
3/3/2011	20:00	3/3/2011 20:00	29
3/3/2011	21:00	3/3/2011 21:00	28.6
3/3/2011	22:00	3/3/2011 22:00	28.3
3/3/2011	23:00	3/3/2011 23:00	28
3/3/2011	24:00:00	3/4/2011 0:00	28
3/4/2011	1:00	3/4/2011 1:00	28
3/4/2011	2:00	3/4/2011 2:00	28.6
3/4/2011	3:00	3/4/2011 3:00	28.8
3/4/2011	4:00	3/4/2011 4:00	28.9
3/4/2011	5:00	3/4/2011 5:00	29.2
3/4/2011	6:00	3/4/2011 6:00	29.2
3/4/2011	7:00	3/4/2011 7:00	29.2
3/4/2011	8:00	3/4/2011 8:00	29
3/4/2011	9:00	3/4/2011 9:00	30
3/4/2011	10:00	3/4/2011 10:00	30.3
3/4/2011	11:00	3/4/2011 11:00	30.6
3/4/2011	12:00	3/4/2011 12:00	30.9
3/4/2011	13:00	3/4/2011 13:00	31.2
3/4/2011	14:00	3/4/2011 14:00	31.6
3/4/2011	15:00	3/4/2011 15:00	32.2
3/4/2011	16:00	3/4/2011 16:00	33.4
3/4/2011	17:00	3/4/2011 17:00	34
3/4/2011	18:00	3/4/2011 18:00	33.4
3/4/2011	19:00	3/4/2011 19:00	32.9
3/4/2011	20:00	3/4/2011 20:00	32.8
3/4/2011	21:00	3/4/2011 21:00	32.7
3/4/2011	22:00	3/4/2011 22:00	32.8
3/4/2011	23:00	3/4/2011 23:00	32.7
3/4/2011	24:00:00	3/5/2011 0:00	32.3
3/5/2011	1:00	3/5/2011 1:00	31.9
3/5/2011	2:00	3/5/2011 2:00	31.5
3/5/2011	3:00	3/5/2011 3:00	30.9
3/5/2011	4:00	3/5/2011 4:00	30.2
3/5/2011	5:00	3/5/2011 5:00	29.8
3/5/2011	6:00	3/5/2011 6:00	29.8
3/5/2011	7:00	3/5/2011 7:00	29.8

3/5/2011	8:00	3/5/2011 8:00	30.1
3/5/2011	9:00	3/5/2011 9:00	30.3

Variable Ids:

atmp: Air Temperature (degrees F)

=====  
Data provided by the Michigan Automated Weather Network (MAWN)  
and Enviro-weather Program.

Please direct bug report: comments  
email address: [agwxinfo@www.agweather.geo.msu.edu](mailto:agwxinfo@www.agweather.geo.msu.edu)

and suggestions to the following

Source:

<http://www.ncdc.noaa.gov/oa/ncdc.html>

Hart, MI

Anomalous data was removed (yellow highlighting)

Y e a	M o n	D a y			Temperature (?F)			Precipitation (see **)		
					24 hrs. ending at observation time		at O b s e r v a t i o n	24 Hour Amounts ending at observation time		At Observation Time
					Max.	Min.		Rain, melted snow, etc.  (Inches & hundredths)	Snow, ice pellets  (Inches & tenths)	Snow, ice pellets, hail, ice on ground  (Inches)
2010	12	14	12/14/2010	12/14/2010	20	14	18	0.09	2.2	12
2010	12	15	12/15/2010	12/15/2010	24	17	21	0.08	1.4	12
2010	12	16	12/16/2010	12/16/2010	28	-1	0	0	0	
2010	12	17	12/17/2010	12/17/2010	28	-2	25	0	0	
2010	12	18	12/18/2010	12/18/2010	29	19	19	0	0	10
2010	12	19	12/19/2010	12/19/2010	22	18	22	0.02	0.5	10
2010	12	20	12/20/2010	12/20/2010	25	22	24	0	0	10
2010	12	21	12/21/2010	12/21/2010	30	24	27	0	0	10
2010	12	22	12/22/2010	12/22/2010	30	25	25			
2010	12	23	12/23/2010	12/23/2010	35	17	29	0	0	8
2010	12	24	12/24/2010	12/24/2010	32	26	26	0	0	6
2010	12	25	12/25/2010	12/25/2010	31	16	19	0	0	6
2010	12	26	12/26/2010	12/26/2010	28	19	25	0	0	6
2010	12	27	12/27/2010	12/27/2010	30	15	24	0	0	6
2010	12	28	12/28/2010	12/28/2010	31	19	25	0	0	5
2010	12	29	12/29/2010	12/29/2010	30	19	25	0	0	5
2010	12	30	12/30/2010	12/30/2010						
2010	12	31	12/31/2010	12/31/2010	46	36	45	0.03	0	0
2011	1	1	1/1/2011	1/1/2011	55	37	38	0.05	0	0
2011	1	2	1/2/2011	1/2/2011	37	15	17	0	0	0
2011	1	3	1/3/2011	1/3/2011	29	17	27	0	0	0
2011	1	4	1/4/2011	1/4/2011	31	26	29	0.23	2.4	2
2011	1	5	1/5/2011	1/5/2011	29	18	18	0.05	0.9	3
2011	1	6	1/6/2011	1/6/2011	27	15	22	0.1	2.3	5
2011	1	7	1/7/2011	1/7/2011	24			0.08	1.5	6
2011	1	8	1/8/2011	1/8/2011	21	7	10	0.23	5.4	10
2011	1	9	1/9/2011	1/9/2011	26	4	17	0.09	1.7	10
2011	1	10	1/10/2011	1/10/2011	31	2	13	0	0	9
2011	1	11	1/11/2011	1/11/2011	29	5	18	0	0	8
2011	1	12	1/12/2011	1/12/2011	25	11	12	0.11	1.7	8
2011	1	13	1/13/2011	1/13/2011	27	12	24	0.11	1.9	9
2011	1	14	1/14/2011	1/14/2011	27	17	22	0.13	2.8	11

2011	1	15	1/15/2011	1/15/2011	26	20	22	0.27	3.6	12
2011	1	16	1/16/2011	1/16/2011	27	14	14	0.08	1	12
2011	1	17	1/17/2011	1/17/2011	19	13	15	0	0	11
2011	1	18	1/18/2011	1/18/2011	30	15	29	0.35	5	15
2011	1	19	1/19/2011	1/19/2011	29	7	7	0	0	13
2011	1	20	1/20/2011	1/20/2011	19	5	17	0	0	12
2011	1	21	1/21/2011	1/21/2011	22	7	7	0.04	0.9	12
2011	1	22	1/22/2011	1/22/2011	15	7	15	0.09	2.5	14
2011	1	23	1/23/2011	1/23/2011	15	-10		0.09	1.7	15
2011	1	24	1/24/2011	1/24/2011	13		10	0	0	15
2011	1	25	1/25/2011	1/25/2011	26	10	26	0	0	13
2011	1	26	1/26/2011	1/26/2011	30	26	26	0	0	12
2011	1	27	1/27/2011	1/27/2011	30	25	26	0	0	12
2011	1	28	1/28/2011	1/28/2011	27	23	27	0.1	1.6	12
2011	1	29	1/29/2011	1/29/2011	29	18	23	0.16	2.2	14
2011	1	30	1/30/2011	1/30/2011	26	19	19	0	0	14
2011	1	31	1/31/2011	1/31/2011	26	9	9	0	0	12
2011	2	1	2/1/2011	2/1/2011	19	9	13	0.08	1.5	13
2011	2	2	2/2/2011	2/2/2011	22	12	14	0.63	14	
2011	2	3	2/3/2011	2/3/2011	22	7	13	0.07	1	21
2011	2	4	2/4/2011	2/4/2011	22	13	20	0	0	20
2011	2	5	2/5/2011	2/5/2011	30	12	12	0	0	18
2011	2	6	2/6/2011	2/6/2011	36	11	28	0	0	17
2011	2	7	2/7/2011	2/7/2011	32	22	22	0.11	1.5	17
2011	2	8	2/8/2011	2/8/2011	30	11	13	0.03	0.3	15
2011	2	9	2/9/2011	2/9/2011	18	12	12	0	0	15
2011	2	10	2/10/2011	2/10/2011	19	10	10	0	0	15
2011	2	11	2/11/2011	2/11/2011	19	9	13	0	0	15
2011	2	12	2/12/2011	2/12/2011	27	11	25	0.06	1	15
2011	2	13	2/13/2011	2/13/2011	34	23	32	0.13	1.3	15
2011	2	14	2/14/2011	2/14/2011	40	32	37	0	0	12
2011	2	15	2/15/2011	2/15/2011	37	14	21	0	0	12
2011	2	16	2/16/2011	2/16/2011	37	20	35	0.02	0	12
2011	2	17	2/17/2011	2/17/2011	46	34	45	0	0	8
2011	2	18	2/18/2011	2/18/2011	50	36	36	0.07	0	0
2011	2	19	2/19/2011	2/19/2011	42	22	23	0	0	0
2011	2	20	2/20/2011	2/20/2011	33	20	23	0	0	0
2011	2	21	2/21/2011	2/21/2011	32	20	20	0.7	10.2	10
2011	2	22	2/22/2011	2/22/2011	21	11	11	0	0	8
2011	2	23	2/23/2011	2/23/2011	35	7	17	0	0	8
2011	2	24	2/24/2011	2/24/2011	30	17	30	0	0	8
2011	2	25	2/25/2011	2/25/2011	35	24	24	0	0	6
2011	2	26	2/26/2011	2/26/2011	31	17	20	0.18	3.2	8
2011	2	27	2/27/2011	2/27/2011	27	18	22	0.09	3	10
2011	2	28	2/28/2011	2/28/2011	32	21	26	0	0	8
2011	3	1	3/1/2011	3/1/2011	35	8	21	0	0	8
2011	3	2	3/2/2011	3/2/2011	35	21	23	0	0	6
2011	3	3	3/3/2011	3/3/2011	30	12	15	0	0	6
2011	3	4	3/4/2011	3/4/2011	32	15	30	0.1	0	6
2011	3	5	3/5/2011	3/5/2011	35	29	30	0.41	1.7	6
2011	3	6	3/6/2011	3/6/2011	34	10	13	0	0	6

## **Appendix E: Laboratory Reports**

April 19, 2011

Mr. Joel Kenyon  
Lakeshore Environmental, Inc.  
803 Verhoeks Street  
Grand Haven, MI 49417

Phone: (616) 844-5050  
Fax: (616) 844-5053

RE: Trace Project T11D144  
Client Project LEI Snow Study 10-600 USDA

Dear Mr. Kenyon:

Enclosed are your analytical results. The results of this report relate only to the samples listed in the body of this report.

All reports were examined through Trace's validation process to ensure that requirements for quality and completeness were satisfied. All reported analytical results were obtained in accordance with the methods referenced on the reports. Every practical effort was made to meet the reporting limit specifications for this work, however, some results may have raised reporting limits to correct for percent solids.

For clients that require NELAC Accreditation, Trace certifies that these test results meet all requirements of the NELAC Standard, except for those analytes with a "N" notation. These analytes have not been evaluated by NELAC at Trace's discretion and will not be reported unless requested by client.

If you have questions concerning this report, please contact me at 231.773.5998 or by email at [jmink@trace-labs.com](mailto:jmink@trace-labs.com).

Sincerely,



Jon Mink  
Project Manager

Enclosures



NJDEP Accreditation No. MI008 PADEP Accreditation No. 68-04471

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.



phone 231.773.5998  
toll-free 800.733.5998  
fax 231.773.6537

Trace Analytical Laboratories, Inc.  
2241 Black Creek Road  
Muskegon, MI 49444-2673  
info@trace-labs.com  
www.trace-labs.com

### SAMPLE SUMMARY

Trace Project ID: T11D144  
Client Project ID: LEI Snow Study 10-600 USDA

Trace ID	Sample ID	Matrix	Collected By	Date Collected	Date Received
T11D144-01	RSS-1	Solid	jp	04/12/11 14:50	04/12/11 16:36
T11D144-02	RSS-2	Solid	jp	04/12/11 14:58	04/12/11 16:36
T11D144-03	RSS-3	Solid	jp	04/12/11 15:08	04/12/11 16:36
T11D144-04	RSS-4	Solid	jp	04/12/11 15:15	04/12/11 16:36

### CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.

**AN EXPLANATION OF TERMS AND SYMBOLS WHICH MAY OCCUR IN THIS REPORT**

**DEFINITIONS**

LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
MS	Matrix Spike
MSD	Matrix Spike Duplicate
RPD	Relative Percent Difference
DUP	Matrix Duplicate
RDL	Reporting Detection Limit
MCL	Maximum Contamination Limit
TIC	Tentatively Identified Compound
<, ND or U	Indicates the compound was analyzed for but not detected
*	Indicates a result that exceeds its associated MCL or Surrogate control limits
N	Indicates that the compound has not been evaluated by NELAC
NA	Indicates that the compound is not available.

**CERTIFICATE OF ANALYSIS**

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.

### ANALYTICAL RESULTS

Trace Project ID: T11D144  
Client Project ID: LEI Snow Study 10-600 USDA

Trace ID: T11D144-01 Date Collected: 04/12/11 14:50 Matrix: Solid  
Sample ID: RSS-1 Date Received: 04/12/11 16:36

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
------------	---------------	-----	----------	----------	----	----------	----	-------	-----

#### METALS, TOTAL

Analysis Method: EPA 6010B

Batch: T022388

Phosphorus	340 mg/kg dry	6.0	1	04/14/11	ns	04/15/11	jlm	N	
Sodium	110 mg/kg dry	10	1	04/14/11	ns	04/15/11	jlm		

#### WET CHEMISTRY

Analysis Method: % Calculation

Batch: T022397

% Solids	90 % by Wt.	0.10	1	04/14/11	as	04/14/11	as	N	
----------	-------------	------	---	----------	----	----------	----	---	--

Analysis Method: EPA 300.0 Rev. 2.1

Batch: T022374

Chloride	<200 mg/kg dry	200	5	04/13/11	bd	04/13/11	bd		
Nitrate as N	11 mg/kg dry	2.5	5	04/13/11	bd	04/13/11	bd		
Nitrite as N	<1.0 mg/kg dry	1.0	5	04/13/11	bd	04/13/11	bd		

Analysis Method: EPA 350.1 Rev. 2.0

Batch: T022477

Ammonia as N	110 mg/kg dry	4.8	5	04/18/11	sm	04/18/11	sm	N	
--------------	---------------	-----	---	----------	----	----------	----	---	--

Analysis Method: WALKLEY BLACK

Batch: T022489

Total Organic Carbon	37000 mg/kg dry	1000	1	04/18/11	da	04/18/11	da	N	
----------------------	-----------------	------	---	----------	----	----------	----	---	--

#### WET CHEMISTRY

Analysis Method: Calculation

Batch: [CALC]

Total Inorganic Nitrogen	120 mg/kg dry	1.0	5	04/18/11		04/18/11	bd	N	
--------------------------	---------------	-----	---	----------	--	----------	----	---	--

### CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.

### ANALYTICAL RESULTS

Trace Project ID: T11D144  
Client Project ID: LEI Snow Study 10-600 USDA

Trace ID: T11D144-02 Date Collected: 04/12/11 14:58 Matrix: Solid  
Sample ID: RSS-2 Date Received: 04/12/11 16:36

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
------------	---------------	-----	----------	----------	----	----------	----	-------	-----

#### METALS, TOTAL

Analysis Method: EPA 6010B

Batch: T022388

Phosphorus	1200 mg/kg dry	6.2	1	04/14/11	ns	04/15/11	jlm	N	
Sodium	230 mg/kg dry	10	1	04/14/11	ns	04/15/11	jlm		

#### WET CHEMISTRY

Analysis Method: % Calculation

Batch: T022397

% Solids	100 % by Wt.	0.10	1	04/14/11	as	04/14/11	as	N	
----------	--------------	------	---	----------	----	----------	----	---	--

Analysis Method: EPA 300.0 Rev. 2.1

Batch: T022374

Chloride	200 mg/kg dry	200	5	04/13/11	bd	04/13/11	bd		
Nitrate as N	150 mg/kg dry	2.5	5	04/13/11	bd	04/13/11	bd		
Nitrite as N	2.4 mg/kg dry	1.0	5	04/13/11	bd	04/13/11	bd		

Analysis Method: EPA 350.1 Rev. 2.0

Batch: T022477

Ammonia as N	69 mg/kg dry	1.0	1	04/18/11	sm	04/18/11	sm	N	
--------------	--------------	-----	---	----------	----	----------	----	---	--

Analysis Method: WALKLEY BLACK

Batch: T022489

Total Organic Carbon	97000 mg/kg dry	1000	1	04/18/11	da	04/18/11	da	N	
----------------------	-----------------	------	---	----------	----	----------	----	---	--

#### WET CHEMISTRY

Analysis Method: Calculation

Batch: [CALC]

Total Inorganic Nitrogen	230 mg/kg dry	1.0	5	04/18/11		04/18/11	bd	N	
--------------------------	---------------	-----	---	----------	--	----------	----	---	--

### CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.

### ANALYTICAL RESULTS

Trace Project ID: T11D144  
Client Project ID: LEI Snow Study 10-600 USDA

Trace ID: T11D144-03 Date Collected: 04/12/11 15:08 Matrix: Solid  
Sample ID: RSS-3 Date Received: 04/12/11 16:36

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
------------	---------------	-----	----------	----------	----	----------	----	-------	-----

#### METALS, TOTAL

Analysis Method: EPA 6010B

Batch: T022388

Phosphorus	460 mg/kg dry	5.8	1	04/14/11	ns	04/15/11	jlm	N	
Sodium	100 mg/kg dry	10	1	04/14/11	ns	04/15/11	jlm		

#### WET CHEMISTRY

Analysis Method: % Calculation

Batch: T022397

% Solids	99 % by Wt.	0.10	1	04/14/11	as	04/14/11	as	N	
----------	-------------	------	---	----------	----	----------	----	---	--

Analysis Method: EPA 300.0 Rev. 2.1

Batch: T022374

Chloride	<200 mg/kg dry	200	5	04/13/11	bd	04/13/11	bd		
Nitrate as N	<2.5 mg/kg dry	2.5	5	04/13/11	bd	04/13/11	bd		
Nitrite as N	<1.0 mg/kg dry	1.0	5	04/13/11	bd	04/13/11	bd		

Analysis Method: EPA 350.1 Rev. 2.0

Batch: T022477

Ammonia as N	10 mg/kg dry	1.0	1	04/18/11	sm	04/18/11	sm	N	
--------------	--------------	-----	---	----------	----	----------	----	---	--

Analysis Method: WALKLEY BLACK

Batch: T022489

Total Organic Carbon	15000 mg/kg dry	1000	1	04/18/11	da	04/18/11	da	N	
----------------------	-----------------	------	---	----------	----	----------	----	---	--

#### WET CHEMISTRY

Analysis Method: Calculation

Batch: [CALC]

Total Inorganic Nitrogen	10 mg/kg dry	1.0	5	04/18/11		04/18/11	bd	N	
--------------------------	--------------	-----	---	----------	--	----------	----	---	--

### CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.





the science of compliance

phone 231.773.5998  
 toll-free 800.733.5998  
 fax 231.773.6537

Trace Analytical Laboratories, Inc.  
 2241 Black Creek Road  
 Muskegon, MI 49444-2673  
 info@trace-labs.com  
 www.trace-labs.com



the science of compliance

phone 231.773.5998  
 toll-free 800.733.5998  
 fax 231.773.6537

Trace Analytical Laboratories, Inc.  
 2241 Black Creek Road  
 Muskegon, MI 49444-2673  
 www.trace-labs.com

CHAIN-OF-CUSTODY RECORD

TRACE ID NO. T11D144

Page 1 of 1

**Client Name:** LaKoshore Environmental  
**Contact Person:** Joel Kenyon  
**Mailing Address:** 803 Van Hooks ST.  
 City, State, Zip Code: 6d Haven MI 49417  
**Phone:** 616.974.5250 **Fax:**  
**Email Address:** Joel.K@LaKoshoreEnvironmental.com  
**Cell #:**  
**Project Name & #:** Study 10-600-USDA  
**Sampled by:** JP

**Bill To:**  
 Billing Address (if different):  
 City, State, Zip Code:  
 Attn:  
 Phone:  
 PO #:

**Report Results To:**

**Regulatory Requirements:**  
 MERA TMDLs   
 Drinking Water   
 NPDES   
 USACE   
 Special

**Turnaround Requirements:**  
 Standard   
 3-4 Day (RUSH)\*   
 24-48 Hour (RUSH)\*   
 \* Requires prior approval

**Matrix Key:**  
 S = Soil  
 W = Water  
 SE = Sediment  
 OI = Oil  
 SO = Solid Waste  
 LW = Wipes  
 LW = Liquid Waste  
 A = Air  
 D = Drinking Water  
 SL = Sludge

**ANALYSIS REQUESTED**

**TRACE USE ONLY**

Logged By: [Signature]  
 Received on: [Date]  
 Soil Volatiles Preserved: MeOH Low Level Lab Sampling Time:  
 Preservative Checked: Yes No  
 Checked By: [Signature]  
 N/A

TRACE NO.	DATE TAKEN	TIME TAKEN	METALS FIELD FILTERED	CLIENT SAMPLE ID	MATRIX	NUMBER OF CONTAINERS	REMARKS
01	4/12/11	1450	N	RSS-1	S	1	
02		1458		RSS-2	X	1	
03		1508		RSS-3	X	1	
04		1515		RSS-4	X	1	Short sample?

**Please Sign**

Item #	RELEASED BY	RECEIVED BY	DATE	TIME	Item #	RELEASED BY	RECEIVED BY	DATE	TIME
1)	[Signature]	[Signature]	4/12/11	16:30	3)				
2)					4)				

In executing this Chain of Custody, the client acknowledges acceptance of the terms and conditions of the agreement as set forth at <http://www.trace-labs.com/cocterm.php>

CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.



the science of compliance

phone 231.773.5998
toll-free 800.733.5998
fax 231.773.6537

Trace Analytical Laboratories, Inc.
2241 Black Creek Road
Muskegon, MI 49444-2673
info@trace-labs.com
www.trace-labs.com

SAMPLE LOG IN CHECKLIST

Date: 4-12-11 Client Name: LFI # of Coolers: 1
Trace ID # T11D143 Project Name: [Signature] Cooler #:
T11D144 Logged in by: [Signature] Cooler #s:

Cooler Receipt

Trace courier [ ]
Cooler/samples delivered by: Hand delivered [X] Name of delivery person:
Commercial courier [ ] UPS [ ] DHL [ ] FED EX [ ] US Mail [ ]
Did cooler come with a bill of lading? No [ ] Not Applicable [X]
Yes [ ] Way Bill or Tracking #:
COC Seals present and intact on cooler? No [ ] Not Applicable [X]
Yes [ ]
Custody seals signed by Client? No [ ] Client custody seal # (if applicable):
Yes [ ]

Coolant and Temperature

Type of Coolant Used: Slurry w/ crushed, cubed, or chip ice? [ ]
Multiple bags of ice around samples? [X]
Ice Packs/ Blue Ice: [ ]
No Coolant Present: [ ]
Cooler Temperature: Date: 4-12-11 Time: 16:30
Temperature Blank: °C
Range of 3 samples: 4 °C
Melt Water: °C
Ice still present upon receipt: [X] Yes [ ] No

General

Table with 3 columns: Question, Yes, No, NA. Rows include: COC taped to inside of cooler lid, All bottles arrived unbroken with labels in good condition, Each sample point is in a sealed plastic bag, Labels filled out completely, All bottle labels agree with Chain of Custody (COC), Sufficient sample to run tests requested, pH checked and samples at correct pH, Correct preservative added to samples, DRO/GRO samples received and appropriate check in form completed, Air bubbles absent from VOAs, COC filled out properly and signed by client, COC signed in by TRACE sample custodian, Was project manager called and samples discussed.

Notes:

LOGIN4

TRACE Analytical Laboratories, Inc

Rev 8 11/21/05

CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.

March 11, 2011

Mr. Joel Kenyon  
Lakeshore Environmental, Inc.  
803 Verhoeks Street  
Grand Haven, MI 49417

Phone: (616) 844-5050  
Fax: (616) 844-5053

RE: Trace Project T11C077  
Client Project LEI Snow Study 10-600 USDA

Dear Mr. Kenyon:

Enclosed are your analytical results. The results of this report relate only to the samples listed in the body of this report.

All reports were examined through Trace's validation process to ensure that requirements for quality and completeness were satisfied. All reported analytical results were obtained in accordance with the methods referenced on the reports. Every practical effort was made to meet the reporting limit specifications for this work, however, some results may have raised reporting limits to correct for percent solids.

For clients that require NELAC Accreditation, Trace certifies that these test results meet all requirements of the NELAC Standard, except for those analytes with a "N" notation. These analytes have not been evaluated by NELAC at Trace's discretion and will not be reported unless requested by client.

If you have questions concerning this report, please contact me at 231.773.5998 or by email at [jmink@trace-labs.com](mailto:jmink@trace-labs.com).

Sincerely,



Jon Mink  
Project Manager

Enclosures



ILEPA Accreditation No. 100318 NJDEP Accreditation No. MI008 PADEP Accreditation No. 68-04471

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.



phone 231.773.5998  
toll-free 800.733.5998  
fax 231.773.6537

Trace Analytical Laboratories, Inc.  
2241 Black Creek Road  
Muskegon, MI 49444-2673  
info@trace-labs.com  
www.trace-labs.com

### SAMPLE SUMMARY

Trace Project ID: T11C077  
Client Project ID: LEI Snow Study 10-600 USDA

Trace ID	Sample ID	Matrix	Collected By	Date Collected	Date Received
T11C077-01	Melt 1130	Wastewater	jp	03/04/11 11:30	03/04/11 16:32
T11C077-02	Melt 1330	Wastewater	jp	03/04/11 13:30	03/04/11 16:32
T11C077-03	Melt 1400	Wastewater	jp	03/04/11 14:00	03/04/11 16:32
T11C077-04	Melt 1500	Wastewater	jp	03/04/11 15:00	03/04/11 16:32
T11C077-05	Melt 1540	Wastewater	jp	03/04/11 15:40	03/04/11 16:32
T11C077-06	Melt 1000	Wastewater	jp	03/04/11 10:00	03/04/11 16:32

### CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.

**AN EXPLANATION OF TERMS AND SYMBOLS WHICH MAY OCCUR IN THIS REPORT**

**DEFINITIONS**

LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
MS	Matrix Spike
MSD	Matrix Spike Duplicate
RPD	Relative Percent Difference
DUP	Matrix Duplicate
RDL	Reporting Detection Limit
MCL	Maximum Contamination Limit
TIC	Tentatively Identified Compound
<, ND or U	Indicates the compound was analyzed for but not detected
*	Indicates a result that exceeds its associated MCL or Surrogate control limits
N	Indicates that the compound has not been evaluated by NELAC
NA	Indicates that the compound is not available.

**DATA QUALIFIERS**

Trace ID: T11C077-01

**Analysis: EPA 300.0 Rev. 2.1**

**Nitrite as N** Note 105 : The LCS recovery was out of control low. The result and reporting limit for this analyte, in this quality control batch, must be considered estimated.

Trace ID: T11C077-02

**Analysis: EPA 300.0 Rev. 2.1**

**Nitrite as N** Note 105 : The LCS recovery was out of control low. The result and reporting limit for this analyte, in this quality control batch, must be considered estimated.

Trace ID: T11C077-03

**Analysis: EPA 300.0 Rev. 2.1**

**Nitrite as N** Note 105 : The LCS recovery was out of control low. The result and reporting limit for this analyte, in this quality control batch, must be considered estimated.

Trace ID: T11C077-04

**Analysis: EPA 300.0 Rev. 2.1**

**Nitrite as N** Note 105 : The LCS recovery was out of control low. The result and reporting limit for this analyte, in this quality control batch, must be considered estimated.

Trace ID: T11C077-05

**Analysis: EPA 300.0 Rev. 2.1**

**Nitrite as N** Note 105 : The LCS recovery was out of control low. The result and reporting limit for this analyte, in this quality control batch, must be considered estimated.

Trace ID: T11C077-06

**Analysis: EPA 300.0 Rev. 2.1**

**CERTIFICATE OF ANALYSIS**

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.

**Nitrite as N**

Note 105 : The LCS recovery was out of control low. The result and reporting limit for this analyte, in this quality control batch, must be considered estimated.

**CERTIFICATE OF ANALYSIS**

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.

### ANALYTICAL RESULTS

Trace Project ID: T11C077  
Client Project ID: LEI Snow Study 10-600 USDA

Trace ID: T11C077-01 Date Collected: 03/04/11 11:30 Matrix: Wastewater  
Sample ID: Melt 1130 Date Received: 03/04/11 16:32

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
<b>METALS, TOTAL</b>									
<i>Analysis Method: EPA 200.7 Rev. 4.4</i>									
<i>Batch: T021750</i>									
Phosphorus	0.092 mg/L	0.050	1	03/08/11	ns	03/09/11	jlm		
Sodium	11 mg/L	1.0	1	03/08/11	ns	03/09/11	jlm		
<b>WET CHEMISTRY</b>									
<i>Analysis Method: EPA 300.0 Rev. 2.1</i>									
<i>Batch: T021723</i>									
Nitrate as N	0.35 mg/L	0.10	5	03/04/11	da	03/04/11	bd		
Nitrite as N	<0.10 mg/L	0.10	5	03/04/11	da	03/04/11	bd	105	
<i>Analysis Method: EPA 350.1 Rev. 2.0</i>									
<i>Batch: T021738</i>									
Ammonia as N	1.1 mg/L	0.010	1	03/07/11	bd	03/07/11	labof		
<i>Analysis Method: EPA 410.4 Rev. 2.0</i>									
<i>Batch: T021768</i>									
Chemical Oxygen Demand	15 mg/L	5.0	1	03/10/11	sm	03/11/11	sm		
<i>Analysis Method: EPA 9040C</i>									
<i>Batch: T021731</i>									
Corrosivity-pH	7.06 pH Units		1	03/07/11	sm	03/07/11	sm	N	
<i>Analysis Method: SM 4500-Cl- E, 20th</i>									
<i>Batch: T021739</i>									
Chloride	40 mg/L	10	1	03/07/11	da	03/07/11	da	N	
<i>Analysis Method: SM 5210 B-01</i>									
<i>Batch: T021715</i>									
Biochemical Oxygen Demand 5-day	<2.0 mg/L	2.0	1	03/04/11	sm	03/09/11	sm		
<i>Analysis Method: SM 5310 D-00</i>									
<i>Batch: T021741</i>									
Dissolved Organic Carbon	3.0 mg/L	0.50	1	03/07/11	sm	03/07/11	sm	N	

### CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.



### ANALYTICAL RESULTS

Trace Project ID: T11C077  
Client Project ID: LEI Snow Study 10-600 USDA

Trace ID: T11C077-02 Date Collected: 03/04/11 13:30 Matrix: Wastewater  
Sample ID: Melt 1330 Date Received: 03/04/11 16:32

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
------------	---------------	-----	----------	----------	----	----------	----	-------	-----

#### METALS, TOTAL

Analysis Method: EPA 200.7 Rev. 4.4

Batch: T021750

Phosphorus	0.062 mg/L	0.050	1	03/08/11	ns	03/09/11	jlm		
Sodium	14 mg/L	1.0	1	03/08/11	ns	03/09/11	jlm		

#### WET CHEMISTRY

Analysis Method: EPA 300.0 Rev. 2.1

Batch: T021723

Nitrate as N	0.26 mg/L	0.10	5	03/04/11	da	03/04/11	bd		
Nitrite as N	<0.10 mg/L	0.10	5	03/04/11	da	03/04/11	bd	105	

Analysis Method: EPA 350.1 Rev. 2.0

Batch: T021738

Ammonia as N	0.98 mg/L	0.010	1	03/07/11	bd	03/07/11	labof		
--------------	-----------	-------	---	----------	----	----------	-------	--	--

Analysis Method: EPA 410.4 Rev. 2.0

Batch: T021768

Chemical Oxygen Demand	20 mg/L	5.0	1	03/10/11	sm	03/11/11	sm		
------------------------	---------	-----	---	----------	----	----------	----	--	--

Analysis Method: EPA 9040C

Batch: T021731

Corrosivity-pH	6.98 pH Units		1	03/07/11	sm	03/07/11	sm	N	
----------------	---------------	--	---	----------	----	----------	----	---	--

Analysis Method: SM 4500-Cl- E, 20th

Batch: T021739

Chloride	25 mg/L	10	1	03/07/11	da	03/07/11	da	N	
----------	---------	----	---	----------	----	----------	----	---	--

Analysis Method: SM 5210 B-01

Batch: T021715

Biochemical Oxygen Demand 5-day	<2.0 mg/L	2.0	1	03/04/11	sm	03/09/11	sm		
---------------------------------	-----------	-----	---	----------	----	----------	----	--	--

Analysis Method: SM 5310 D-00

Batch: T021741

Dissolved Organic Carbon	4.5 mg/L	0.50	1	03/07/11	sm	03/07/11	sm	N	
--------------------------	----------	------	---	----------	----	----------	----	---	--

### CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.



### ANALYTICAL RESULTS

Trace Project ID: T11C077  
Client Project ID: LEI Snow Study 10-600 USDA

Trace ID: T11C077-03 Date Collected: 03/04/11 14:00 Matrix: Wastewater  
Sample ID: Melt 1400 Date Received: 03/04/11 16:32

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
<b>METALS, TOTAL</b>									
<i>Analysis Method: EPA 200.7 Rev. 4.4</i>									
<i>Batch: T021750</i>									
Phosphorus	0.062 mg/L	0.050	1	03/08/11	ns	03/09/11	jlm		
Sodium	21 mg/L	1.0	1	03/08/11	ns	03/09/11	jlm		
<b>WET CHEMISTRY</b>									
<i>Analysis Method: EPA 300.0 Rev. 2.1</i>									
<i>Batch: T021723</i>									
Nitrate as N	0.38 mg/L	0.10	5	03/04/11	da	03/04/11	bd		
Nitrite as N	<0.10 mg/L	0.10	5	03/04/11	da	03/04/11	bd	105	
<i>Analysis Method: EPA 350.1 Rev. 2.0</i>									
<i>Batch: T021738</i>									
Ammonia as N	0.96 mg/L	0.010	1	03/07/11	bd	03/07/11	labof		
<i>Analysis Method: EPA 410.4 Rev. 2.0</i>									
<i>Batch: T021768</i>									
Chemical Oxygen Demand	22 mg/L	5.0	1	03/10/11	sm	03/11/11	sm		
<i>Analysis Method: EPA 9040C</i>									
<i>Batch: T021731</i>									
Corrosivity-pH	6.99 pH Units		1	03/07/11	sm	03/07/11	sm	N	
<i>Analysis Method: SM 4500-Cl- E, 20th</i>									
<i>Batch: T021739</i>									
Chloride	18 mg/L	10	1	03/07/11	da	03/07/11	da	N	
<i>Analysis Method: SM 5210 B-01</i>									
<i>Batch: T021715</i>									
Biochemical Oxygen Demand 5-day	<2.0 mg/L	2.0	1	03/04/11	sm	03/09/11	sm		
<i>Analysis Method: SM 5310 D-00</i>									
<i>Batch: T021741</i>									
Dissolved Organic Carbon	4.4 mg/L	0.50	1	03/07/11	sm	03/07/11	sm	N	

### CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.



### ANALYTICAL RESULTS

Trace Project ID: T11C077  
Client Project ID: LEI Snow Study 10-600 USDA

Trace ID: T11C077-04      Date Collected: 03/04/11 15:00      Matrix: Wastewater  
Sample ID: Melt 1500      Date Received: 03/04/11 16:32

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
<b>METALS, TOTAL</b>									
<i>Analysis Method: EPA 200.7 Rev. 4.4</i>									
<i>Batch: T021750</i>									
Phosphorus	0.080 mg/L	0.050	1	03/08/11	ns	03/09/11	jlm		
Sodium	12 mg/L	1.0	1	03/08/11	ns	03/09/11	jlm		
<b>WET CHEMISTRY</b>									
<i>Analysis Method: EPA 300.0 Rev. 2.1</i>									
<i>Batch: T021723</i>									
Nitrate as N	0.38 mg/L	0.10	5	03/04/11	da	03/04/11	bd		
Nitrite as N	<0.10 mg/L	0.10	5	03/04/11	da	03/04/11	bd	105	
<i>Analysis Method: EPA 350.1 Rev. 2.0</i>									
<i>Batch: T021738</i>									
Ammonia as N	1.1 mg/L	0.010	1	03/07/11	bd	03/07/11	labof		
<i>Analysis Method: EPA 410.4 Rev. 2.0</i>									
<i>Batch: T021768</i>									
Chemical Oxygen Demand	22 mg/L	5.0	1	03/10/11	sm	03/11/11	sm		
<i>Analysis Method: EPA 9040C</i>									
<i>Batch: T021731</i>									
Corrosivity-pH	6.99 pH Units		1	03/07/11	sm	03/07/11	sm	N	
<i>Analysis Method: SM 4500-Cl- E, 20th</i>									
<i>Batch: T021739</i>									
Chloride	22 mg/L	10	1	03/07/11	da	03/07/11	da	N	
<i>Analysis Method: SM 5210 B-01</i>									
<i>Batch: T021715</i>									
Biochemical Oxygen Demand 5-day	<2.0 mg/L	2.0	1	03/04/11	sm	03/09/11	sm		
<i>Analysis Method: SM 5310 D-00</i>									
<i>Batch: T021741</i>									
Dissolved Organic Carbon	3.9 mg/L	0.50	1	03/07/11	sm	03/07/11	sm	N	

### CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.



phone 231.773.5998  
 toll-free 800.733.5998  
 fax 231.773.6537

Trace Analytical Laboratories, Inc.  
 2241 Black Creek Road  
 Muskegon, MI 49444-2673  
 info@trace-labs.com  
 www.trace-labs.com

**ANALYTICAL RESULTS**

Trace Project ID: T11C077  
 Client Project ID: LEI Snow Study 10-600 USDA

Trace ID: T11C077-04 Date Collected: 03/04/11 15:00 Matrix: Wastewater  
 Sample ID: Melt 1500 Date Received: 03/04/11 16:32

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED BY	ANALYZED BY	NOTES	MCL
------------	---------------	-----	----------	-------------	-------------	-------	-----

**WET CHEMISTRY**

Analysis Method: Calculation

Batch: [CALC]

Total Inorganic Nitrogen	1.4 mg/L	0.010	5	03/07/11	03/07/11	bd	N
--------------------------	----------	-------	---	----------	----------	----	---

**CERTIFICATE OF ANALYSIS**

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.

### ANALYTICAL RESULTS

Trace Project ID: T11C077  
Client Project ID: LEI Snow Study 10-600 USDA

Trace ID: T11C077-05      Date Collected: 03/04/11 15:40      Matrix: Wastewater  
Sample ID: Melt 1540      Date Received: 03/04/11 16:32

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
------------	---------------	-----	----------	----------	----	----------	----	-------	-----

#### METALS, TOTAL

Analysis Method: EPA 200.7 Rev. 4.4

Batch: T021750

Phosphorus	0.080 mg/L	0.050	1	03/08/11	ns	03/09/11	jlm		
Sodium	11 mg/L	1.0	1	03/08/11	ns	03/09/11	jlm		

#### WET CHEMISTRY

Analysis Method: EPA 300.0 Rev. 2.1

Batch: T021723

Nitrate as N	0.38 mg/L	0.10	5	03/04/11	da	03/04/11	bd		
Nitrite as N	<0.10 mg/L	0.10	5	03/04/11	da	03/04/11	bd	105	

Analysis Method: EPA 350.1 Rev. 2.0

Batch: T021738

Ammonia as N	1.0 mg/L	0.010	1	03/07/11	bd	03/07/11	labof		
--------------	----------	-------	---	----------	----	----------	-------	--	--

Analysis Method: EPA 410.4 Rev. 2.0

Batch: T021768

Chemical Oxygen Demand	14 mg/L	5.0	1	03/10/11	sm	03/11/11	sm		
------------------------	---------	-----	---	----------	----	----------	----	--	--

Analysis Method: EPA 9040C

Batch: T021731

Corrosivity-pH	7.00 pH Units		1	03/07/11	sm	03/07/11	sm	N	
----------------	---------------	--	---	----------	----	----------	----	---	--

Analysis Method: SM 4500-Cl- E, 20th

Batch: T021739

Chloride	19 mg/L	10	1	03/07/11	da	03/07/11	da	N	
----------	---------	----	---	----------	----	----------	----	---	--

Analysis Method: SM 5210 B-01

Batch: T021715

Biochemical Oxygen Demand 5-day	<2.0 mg/L	2.0	1	03/04/11	sm	03/09/11	sm		
---------------------------------	-----------	-----	---	----------	----	----------	----	--	--

Analysis Method: SM 5310 D-00

Batch: T021741

Dissolved Organic Carbon	4.3 mg/L	0.50	1	03/07/11	sm	03/07/11	sm	N	
--------------------------	----------	------	---	----------	----	----------	----	---	--

### CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.



### ANALYTICAL RESULTS

Trace Project ID: T11C077  
Client Project ID: LEI Snow Study 10-600 USDA

Trace ID: T11C077-06 Date Collected: 03/04/11 10:00 Matrix: Wastewater  
Sample ID: Melt 1000 Date Received: 03/04/11 16:32

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
<b>METALS, TOTAL</b>									
<i>Analysis Method: EPA 200.7 Rev. 4.4</i>									
<i>Batch: T021750</i>									
Phosphorus	<0.050 mg/L	0.050	1	03/08/11	ns	03/09/11	jlm		
Sodium	3.7 mg/L	1.0	1	03/08/11	ns	03/09/11	jlm		
<b>WET CHEMISTRY</b>									
<i>Analysis Method: EPA 300.0 Rev. 2.1</i>									
<i>Batch: T021723</i>									
Nitrate as N	0.64 mg/L	0.10	5	03/04/11	da	03/04/11	bd		
Nitrite as N	0.12 mg/L	0.10	5	03/04/11	da	03/04/11	bd	105	
<i>Analysis Method: EPA 350.1 Rev. 2.0</i>									
<i>Batch: T021738</i>									
Ammonia as N	0.31 mg/L	0.010	1	03/07/11	bd	03/07/11	labof		
<i>Analysis Method: EPA 410.4 Rev. 2.0</i>									
<i>Batch: T021768</i>									
Chemical Oxygen Demand	13 mg/L	5.0	1	03/10/11	sm	03/11/11	sm		
<i>Analysis Method: EPA 9040C</i>									
<i>Batch: T021731</i>									
Corrosivity-pH	7.03 pH Units		1	03/07/11	sm	03/07/11	sm	N	
<i>Analysis Method: SM 4500-Cl- E, 20th</i>									
<i>Batch: T021739</i>									
Chloride	<10 mg/L	10	1	03/07/11	da	03/07/11	da	N	
<i>Analysis Method: SM 5210 B-01</i>									
<i>Batch: T021715</i>									
Biochemical Oxygen Demand 5-day	<2.0 mg/L	2.0	1	03/04/11	sm	03/09/11	sm		
<i>Analysis Method: SM 5310 D-00</i>									
<i>Batch: T021741</i>									
Dissolved Organic Carbon	2.7 mg/L	0.50	1	03/07/11	sm	03/07/11	sm	N	

### CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.





the science of compliance

phone 231.773.5998  
 toll-free 800.733.5998  
 fax 231.773.6537

Trace Analytical Laboratories, Inc.  
 2241 Black Creek Road  
 Muskegon, MI 49444-2673  
 info@trace-labs.com  
 www.trace-labs.com



phone 231.773.5998  
 toll-free 800.733.5998  
 fax 231.773.6537

Trace Analytical Laboratories, Inc.  
 2241 Black Creek Road  
 Muskegon, MI 49444-2673  
 www.trace-labs.com

CHAIN-OF-CUSTODY RECORD

TRACE ID NO.

Page 1 of 1  
 T11C077

**Client Name:** Lakeshore Environmental  
**Contact Person:** Jay Pohl  
**Mailing Address:** 803 Van Hook  
 City, State, Zip Code: Gt MI 49417  
**Phone:** 616-844-5050 **Fax:** 616-844-5053  
**Email Address:** jay.pohl@lakeshoreenvironmental.com  
**Project #:** 10-600-USD4 **PO #:**  
**Project Name:** USDA Peterson Stream **Sampled by:** JP

**Bill To:**  
 Billing Address: (if different)  
 City, State, Zip Code  
 Attn:  
 Phone:  
 Fax:

**Report Results To:**

**Regulatory Requirements:**  
 MERA TMDLs   
 Drinking Water   
 NPDES   
 USACE   
 Special

**Turnaround Requirements:**  
 Standard (2 wk)   
 \* 5 Day   
 \* 2-4 Day (RUSH)   
 \* 24 Hour (RUSH)   
 \* Requires prior approval

**Matrix Key:**  
 S = Soil  
 W = Water  
 SE = Sediment  
 OI = Oil  
 SO = Solid Waste

**WI = Wipes**  
**LW = Liquid Waste**  
**A = Air**  
**D = Drinking Water**  
**SL = Sludge**

**ANALYSIS REQUESTED**

Request for Analytical Services				Please Sign	
TRACE NO.	DATE TAKEN	TIME TAKEN	METALS FIELD FILTERED	CLIENT SAMPLE ID	Item #
41	3/4/11	1130	N	MELT-1130	1
42	1	1330	1	MELT-1330	1
43	1	1400	1	MELT-1400	1
44	1	1500	1	MELT-1500	1
45	1	1540	1	MELT-1540	1
46	1	1000	1	MELT-1000	1

Item #	RELEASED BY	RECEIVED BY	DATE	TIME	Item #	RELEASED BY	RECEIVED BY	DATE	TIME
2)	[Signature]	[Signature]	3/4/11	16:32	3)				
					4)				

REMARKS  
 BOD  
 COD  
 T-TEST  
 T-TEST Na  
 DOC  
 pH  
 Cl

**TRACE USE ONLY**

Logged By: RAS  
 Received on job: Yes No  
 Preservative Checked: Yes No N/A  
 Soil Volatiles Preserved: MeOH En Core Low Level Lab

CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.



the science of compliance

phone 231.773.5998
toll-free 800.733.5998
fax 231.773.6537

Trace Analytical Laboratories, Inc.
2241 Black Creek Road
Muskegon, MI 49444-2673
info@trace-labs.com
www.trace-labs.com

SAMPLE LOG IN CHECKLIST

Date: 3/4/11 Client Name: LET # of Coolers: 1
Trace ID #: T11C077 Project Name: SNOW STUDY Cooler #:
Logged in by: RAS Cooler #s:

Cooler Receipt

Cooler/samples delivered by: Trace courier [ ] Hand delivered [X] Commercial courier [ ] Name of delivery person: JP
Did cooler come with a bill of lading? No [ ] Yes [ ] Not Applicable [X]
COC Seals present and intact on cooler? No [ ] Yes [ ] Not Applicable [X]
Custody seals signed by Client? No [ ] Yes [ ] Client custody seal # (if applicable):

Coolant and Temperature

Type of Coolant Used: Slurry w/ crushed, cubed, or chip ice? [X] Yes [ ] No
Cooler Temperature Correction Factor: Date: Time:
Temperature Blank: °C
Range of 3 samples: °C
Melt Water: °C
Ice still present upon receipt: [X] Yes [ ] No

General

Table with 3 columns: Question, Yes, No, NA. Rows include: COC taped to inside of cooler lid?, All bottles arrived unbroken with labels in good condition?, Each sample point is in a sealed plastic bag?, Labels filled out completely?, All bottle labels agree with Chain of Custody (COC)?, Sufficient sample to run tests requested?, pH checked and samples at correct pH?, Correct preservative added to samples?, DRO/GRO samples received and appropriate check in form completed?, Air bubbles absent from VOAs?, COC filled out properly and signed by client?, COC signed in by TRACE sample custodian?, Was project manager called and samples discussed?
Contact: Date:

Notes:

LOGIN4

TRACE Analytical Laboratories, Inc.

Rev.8 11/21/06

CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.

February 23, 2011

Mr. Joel Kenyon  
Lakeshore Environmental, Inc.  
803 Verhoeks Street  
Grand Haven, MI 49417

Phone: (616) 844-5050  
Fax: (616) 844-5053

RE: Trace Project T11B152  
Client Project LEI Snow Study 10-600 USDA

Dear Mr. Kenyon:

Enclosed are your analytical results. The results of this report relate only to the samples listed in the body of this report.

All reports were examined through Trace's validation process to ensure that requirements for quality and completeness were satisfied. All reported analytical results were obtained in accordance with the methods referenced on the reports. Every practical effort was made to meet the reporting limit specifications for this work, however, some results may have raised reporting limits to correct for percent solids.

For clients that require NELAC Accreditation, Trace certifies that these test results meet all requirements of the NELAC Standard, except for those analytes with a "N" notation. These analytes have not been evaluated by NELAC at Trace's discretion and will not be reported unless requested by client.

If you have questions concerning this report, please contact me at 231.773.5998 or by email at [jmink@trace-labs.com](mailto:jmink@trace-labs.com).

Sincerely,



Jon Mink  
Project Manager

Enclosures



ILEPA Accreditation No. 100318 NJDEP Accreditation No. MI008 PADEP Accreditation No. 68-04471

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.



phone 231.773.5998  
toll-free 800.733.5998  
fax 231.773.6537

*Trace Analytical Laboratories, Inc.*  
2241 Black Creek Road  
Muskegon, MI 49444-2673  
info@trace-labs.com  
www.trace-labs.com

**SAMPLE SUMMARY**

Trace Project ID: T11B152  
Client Project ID: LEI Snow Study 10-600 USDA

Trace ID	Sample ID	Matrix	Collected By	Date Collected	Date Received
T11B152-01	Melt Water	Wastewater	awg	02/16/11 08:00	02/16/11 15:13
T11B152-02	Melt Water	Wastewater	awg	02/16/11 12:30	02/16/11 15:13
T11B152-03	Melt Water	Wastewater	awg	02/16/11 14:30	02/16/11 15:13
T11B152-04	Melt Water	Wastewater	ag	02/17/11 07:30	02/17/11 15:01
T11B152-05	Melt Water	Wastewater	ag	02/17/11 08:30	02/17/11 15:01
T11B152-06	Melt Water	Wastewater	ag	02/17/11 09:30	02/17/11 15:01
T11B152-07	Melt Water	Wastewater	ag	02/17/11 10:30	02/17/11 15:01
T11B152-08	Melt Water	Wastewater	ag	02/17/11 11:30	02/17/11 15:01
T11B152-09	Melt Water	Wastewater	ag	02/17/11 12:30	02/17/11 15:01
T11B152-10	Melt Water	Wastewater	ag	02/17/11 13:30	02/17/11 15:01
T11B152-11	Melt Water	Wastewater	ag	02/17/11 14:30	02/17/11 15:01

**CERTIFICATE OF ANALYSIS**

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.

## AN EXPLANATION OF TERMS AND SYMBOLS WHICH MAY OCCUR IN THIS REPORT

### DEFINITIONS

LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
MS	Matrix Spike
MSD	Matrix Spike Duplicate
RPD	Relative Percent Difference
DUP	Matrix Duplicate
RDL	Reporting Detection Limit
MCL	Maximum Contamination Limit
TIC	Tentatively Identified Compound
<, ND or U	Indicates the compound was analyzed for but not detected
*	Indicates a result that exceeds its associated MCL or Surrogate control limits
N	Indicates that the compound has not been evaluated by NELAC
NA	Indicates that the compound is not available.

### DATA QUALIFIERS

### CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.

### ANALYTICAL RESULTS

Trace Project ID: T11B152  
Client Project ID: LEI Snow Study 10-600 USDA

Trace ID: T11B152-01 Date Collected: 02/16/11 08:00 Matrix: Wastewater  
Sample ID: Melt Water Date Received: 02/16/11 15:13

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
------------	---------------	-----	----------	----------	----	----------	----	-------	-----

#### METALS, TOTAL

Analysis Method: EPA 200.7 Rev. 4.4

Batch: T021485

Phosphorus	0.53 mg/L	0.050	1	02/21/11	ns	02/22/11	jlm		
Sodium	16 mg/L	1.0	1	02/21/11	ns	02/22/11	jlm		

#### WET CHEMISTRY

Analysis Method: EPA 120.1

Batch: T021429

Specific Conductance (EC)	180 umhos/cm	1.0	1	02/17/11	as	02/17/11	as		
---------------------------	--------------	-----	---	----------	----	----------	----	--	--

Analysis Method: EPA 300.0 Rev. 2.1

Batch: T021414

Nitrate as N	1.1 mg/L	0.10	5	02/16/11	bd	02/16/11	bd		
Nitrite as N	<0.10 mg/L	0.10	5	02/16/11	bd	02/16/11	bd		

Analysis Method: EPA 350.1 Rev. 2.0

Batch: T021428

Ammonia as N	0.39 mg/L	0.010	1	02/17/11	sm	02/17/11	sm		
--------------	-----------	-------	---	----------	----	----------	----	--	--

Analysis Method: EPA 410.4 Rev. 2.0

Batch: T021486

Chemical Oxygen Demand	35 mg/L	5.0	1	02/21/11	da	02/22/11	da		
------------------------	---------	-----	---	----------	----	----------	----	--	--

Analysis Method: EPA 9040C

Batch: T021409

Corrosivity-pH	7.19 pH Units		1	02/16/11	as	02/16/11	as	N	
----------------	---------------	--	---	----------	----	----------	----	---	--

Analysis Method: SM 4500-Cl- E, 20th

Batch: T021464

Chloride	<10 mg/L	10	1	02/18/11	da	02/18/11	da	N	
----------	----------	----	---	----------	----	----------	----	---	--

Analysis Method: SM 5210 B-01

Batch: T021401

Biochemical Oxygen Demand 5-day	5.7 mg/L	2.0	1	02/16/11	sm	02/21/11	sm		
---------------------------------	----------	-----	---	----------	----	----------	----	--	--

Analysis Method: SM 5310 D-00

Batch: T021477

Dissolved Organic Carbon	7.8 mg/L	0.50	1	02/21/11	da	02/21/11	da	N	
--------------------------	----------	------	---	----------	----	----------	----	---	--

### CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.



phone 231.773.5998  
 toll-free 800.733.5998  
 fax 231.773.6537

Trace Analytical Laboratories, Inc.  
 2241 Black Creek Road  
 Muskegon, MI 49444-2673  
 info@trace-labs.com  
 www.trace-labs.com

**ANALYTICAL RESULTS**

Trace Project ID: T11B152  
 Client Project ID: LEI Snow Study 10-600 USDA

Trace ID: T11B152-01 Date Collected: 02/16/11 08:00 Matrix: Wastewater  
 Sample ID: Melt Water Date Received: 02/16/11 15:13

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED BY	ANALYZED BY	NOTES	MCL
------------	---------------	-----	----------	-------------	-------------	-------	-----

**WET CHEMISTRY**

Analysis Method: Calculation

Batch: [CALC]

Total Inorganic Nitrogen	1.5 mg/L	0.010	5	02/17/11	02/17/11	bd	N
--------------------------	----------	-------	---	----------	----------	----	---

**CERTIFICATE OF ANALYSIS**

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.

### ANALYTICAL RESULTS

Trace Project ID: T11B152  
Client Project ID: LEI Snow Study 10-600 USDA

Trace ID: T11B152-02 Date Collected: 02/16/11 12:30 Matrix: Wastewater  
Sample ID: Melt Water Date Received: 02/16/11 15:13

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
------------	---------------	-----	----------	----------	----	----------	----	-------	-----

#### METALS, TOTAL

Analysis Method: EPA 200.7 Rev. 4.4

Batch: T021485

Phosphorus	0.12 mg/L	0.050	1	02/21/11	ns	02/22/11	jlm		
Sodium	18 mg/L	1.0	1	02/21/11	ns	02/22/11	jlm		

#### WET CHEMISTRY

Analysis Method: EPA 120.1

Batch: T021429

Specific Conductance (EC)	260 umhos/cm	1.0	1	02/17/11	as	02/17/11	as		
---------------------------	--------------	-----	---	----------	----	----------	----	--	--

Analysis Method: EPA 300.0 Rev. 2.1

Batch: T021414

Nitrate as N	0.90 mg/L	0.10	5	02/16/11	bd	02/16/11	bd		
Nitrite as N	<0.10 mg/L	0.10	5	02/16/11	bd	02/16/11	bd		

Analysis Method: EPA 350.1 Rev. 2.0

Batch: T021428

Ammonia as N	0.28 mg/L	0.010	1	02/17/11	sm	02/17/11	sm		
--------------	-----------	-------	---	----------	----	----------	----	--	--

Analysis Method: EPA 410.4 Rev. 2.0

Batch: T021486

Chemical Oxygen Demand	34 mg/L	5.0	1	02/21/11	da	02/22/11	da		
------------------------	---------	-----	---	----------	----	----------	----	--	--

Analysis Method: EPA 9040C

Batch: T021409

Corrosivity-pH	7.46 pH Units		1	02/16/11	as	02/16/11	as	N	
----------------	---------------	--	---	----------	----	----------	----	---	--

Analysis Method: SM 4500-Cl- E, 20th

Batch: T021464

Chloride	13 mg/L	10	1	02/18/11	da	02/18/11	da	N	
----------	---------	----	---	----------	----	----------	----	---	--

Analysis Method: SM 5210 B-01

Batch: T021401

Biochemical Oxygen Demand 5-day	5.2 mg/L	2.0	1	02/16/11	sm	02/21/11	sm		
---------------------------------	----------	-----	---	----------	----	----------	----	--	--

Analysis Method: SM 5310 D-00

Batch: T021477

Dissolved Organic Carbon	10 mg/L	0.50	1	02/21/11	da	02/21/11	da	N	
--------------------------	---------	------	---	----------	----	----------	----	---	--

### CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.



### ANALYTICAL RESULTS

Trace Project ID: T11B152  
Client Project ID: LEI Snow Study 10-600 USDA

Trace ID: T11B152-03 Date Collected: 02/16/11 14:30 Matrix: Wastewater  
Sample ID: Melt Water Date Received: 02/16/11 15:13

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
------------	---------------	-----	----------	----------	----	----------	----	-------	-----

#### METALS, TOTAL

Analysis Method: EPA 200.7 Rev. 4.4

Batch: T021485

Phosphorus	0.11 mg/L	0.050	1	02/21/11	ns	02/22/11	jlm		
Sodium	14 mg/L	1.0	1	02/21/11	ns	02/22/11	jlm		

#### WET CHEMISTRY

Analysis Method: EPA 120.1

Batch: T021429

Specific Conductance (EC)	220 umhos/cm	1.0	1	02/17/11	as	02/17/11	as		
---------------------------	--------------	-----	---	----------	----	----------	----	--	--

Analysis Method: EPA 300.0 Rev. 2.1

Batch: T021414

Nitrate as N	0.89 mg/L	0.10	5	02/16/11	bd	02/16/11	bd		
Nitrite as N	<0.10 mg/L	0.10	5	02/16/11	bd	02/16/11	bd		

Analysis Method: EPA 350.1 Rev. 2.0

Batch: T021428

Ammonia as N	0.30 mg/L	0.010	1	02/17/11	sm	02/17/11	sm		
--------------	-----------	-------	---	----------	----	----------	----	--	--

Analysis Method: EPA 410.4 Rev. 2.0

Batch: T021486

Chemical Oxygen Demand	35 mg/L	5.0	1	02/21/11	da	02/22/11	da		
------------------------	---------	-----	---	----------	----	----------	----	--	--

Analysis Method: EPA 9040C

Batch: T021409

Corrosivity-pH	7.59 pH Units		1	02/16/11	as	02/16/11	as	N	
----------------	---------------	--	---	----------	----	----------	----	---	--

Analysis Method: SM 4500-Cl- E, 20th

Batch: T021464

Chloride	<10 mg/L	10	1	02/18/11	da	02/18/11	da	N	
----------	----------	----	---	----------	----	----------	----	---	--

Analysis Method: SM 5210 B-01

Batch: T021401

Biochemical Oxygen Demand 5-day	8.2 mg/L	2.0	1	02/16/11	sm	02/21/11	sm		
---------------------------------	----------	-----	---	----------	----	----------	----	--	--

Analysis Method: SM 5310 D-00

Batch: T021477

Dissolved Organic Carbon	9.4 mg/L	0.50	1	02/21/11	da	02/21/11	da	N	
--------------------------	----------	------	---	----------	----	----------	----	---	--

### CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.



### ANALYTICAL RESULTS

Trace Project ID: T11B152  
Client Project ID: LEI Snow Study 10-600 USDA

Trace ID: T11B152-04 Date Collected: 02/17/11 07:30 Matrix: Wastewater  
Sample ID: Melt Water Date Received: 02/17/11 15:01

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
------------	---------------	-----	----------	----------	----	----------	----	-------	-----

#### METALS, TOTAL

Analysis Method: EPA 200.7 Rev. 4.4

Batch: T021485

Phosphorus	0.075 mg/L	0.050	1	02/21/11	ns	02/22/11	jlm		
Sodium	11 mg/L	1.0	1	02/21/11	ns	02/22/11	jlm		

#### WET CHEMISTRY

Analysis Method: EPA 120.1

Batch: T021456

Specific Conductance (EC)	200 umhos/cm	1.0	1	02/18/11	as	02/18/11	as		
---------------------------	--------------	-----	---	----------	----	----------	----	--	--

Analysis Method: EPA 300.0 Rev. 2.1

Batch: T021457

Nitrate as N	0.85 mg/L	0.10	5	02/18/11	da	02/18/11	da		
Nitrite as N	<0.10 mg/L	0.10	5	02/17/11	da	02/17/11	bd		

Analysis Method: EPA 350.1 Rev. 2.0

Batch: T021474

Ammonia as N	0.27 mg/L	0.010	1	02/21/11	sm	02/21/11	sm		
--------------	-----------	-------	---	----------	----	----------	----	--	--

Analysis Method: EPA 410.4 Rev. 2.0

Batch: T021486

Chemical Oxygen Demand	27 mg/L	5.0	1	02/21/11	da	02/22/11	da		
------------------------	---------	-----	---	----------	----	----------	----	--	--

Analysis Method: EPA 9040C

Batch: T021448

Corrosivity-pH	7.23 pH Units		1	02/17/11	sm	02/17/11	sm	N	
----------------	---------------	--	---	----------	----	----------	----	---	--

Analysis Method: SM 4500-Cl- E, 20th

Batch: T021464

Chloride	<10 mg/L	10	1	02/18/11	da	02/18/11	da	N	
----------	----------	----	---	----------	----	----------	----	---	--

Analysis Method: SM 5210 B-01

Batch: T021459

Biochemical Oxygen Demand 5-day	11 mg/L	2.0	1	02/18/11	sm	02/23/11	sm		
---------------------------------	---------	-----	---	----------	----	----------	----	--	--

Analysis Method: SM 5310 D-00

Batch: T021477

Dissolved Organic Carbon	8.2 mg/L	0.50	1	02/21/11	da	02/21/11	da	N	
--------------------------	----------	------	---	----------	----	----------	----	---	--

### CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.



### ANALYTICAL RESULTS

Trace Project ID: T11B152  
Client Project ID: LEI Snow Study 10-600 USDA

Trace ID: T11B152-05 Date Collected: 02/17/11 08:30 Matrix: Wastewater  
Sample ID: Melt Water Date Received: 02/17/11 15:01

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
------------	---------------	-----	----------	----------	----	----------	----	-------	-----

#### METALS, TOTAL

Analysis Method: EPA 200.7 Rev. 4.4

Batch: T021485

Phosphorus	<0.050 mg/L	0.050	1	02/21/11	ns	02/22/11	jlm		
Sodium	3.8 mg/L	1.0	1	02/21/11	ns	02/22/11	jlm		

#### WET CHEMISTRY

Analysis Method: EPA 120.1

Batch: T021456

Specific Conductance (EC)	65 umhos/cm	1.0	1	02/18/11	as	02/18/11	as		
---------------------------	-------------	-----	---	----------	----	----------	----	--	--

Analysis Method: EPA 300.0 Rev. 2.1

Batch: T021457

Nitrate as N	1.0 mg/L	0.10	5	02/18/11	da	02/18/11	da		
Nitrite as N	<0.10 mg/L	0.10	5	02/17/11	da	02/17/11	bd		

Analysis Method: EPA 350.1 Rev. 2.0

Batch: T021474

Ammonia as N	0.43 mg/L	0.010	1	02/21/11	sm	02/21/11	sm		
--------------	-----------	-------	---	----------	----	----------	----	--	--

Analysis Method: EPA 410.4 Rev. 2.0

Batch: T021486

Chemical Oxygen Demand	18 mg/L	5.0	1	02/21/11	da	02/22/11	da		
------------------------	---------	-----	---	----------	----	----------	----	--	--

Analysis Method: EPA 9040C

Batch: T021448

Corrosivity-pH	7.08 pH Units		1	02/17/11	sm	02/17/11	sm		N
----------------	---------------	--	---	----------	----	----------	----	--	---

Analysis Method: SM 4500-Cl- E, 20th

Batch: T021464

Chloride	<10 mg/L	10	1	02/18/11	da	02/18/11	da		N
----------	----------	----	---	----------	----	----------	----	--	---

Analysis Method: SM 5210 B-01

Batch: T021459

Biochemical Oxygen Demand 5-day	4.5 mg/L	2.0	1	02/18/11	sm	02/23/11	sm		
---------------------------------	----------	-----	---	----------	----	----------	----	--	--

Analysis Method: SM 5310 D-00

Batch: T021477

Dissolved Organic Carbon	4.5 mg/L	0.50	1	02/21/11	da	02/21/11	da		N
--------------------------	----------	------	---	----------	----	----------	----	--	---

### CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.



### ANALYTICAL RESULTS

Trace Project ID: T11B152  
Client Project ID: LEI Snow Study 10-600 USDA

Trace ID: T11B152-06 Date Collected: 02/17/11 09:30 Matrix: Wastewater  
Sample ID: Melt Water Date Received: 02/17/11 15:01

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
------------	---------------	-----	----------	----------	----	----------	----	-------	-----

#### METALS, TOTAL

Analysis Method: EPA 200.7 Rev. 4.4

Batch: T021485

Phosphorus	<0.050 mg/L	0.050	1	02/21/11	ns	02/22/11	jlm		
Sodium	3.6 mg/L	1.0	1	02/21/11	ns	02/22/11	jlm		

#### WET CHEMISTRY

Analysis Method: EPA 120.1

Batch: T021456

Specific Conductance (EC)	62 umhos/cm	1.0	1	02/18/11	as	02/18/11	as		
---------------------------	-------------	-----	---	----------	----	----------	----	--	--

Analysis Method: EPA 300.0 Rev. 2.1

Batch: T021457

Nitrate as N	1.0 mg/L	0.10	5	02/18/11	da	02/18/11	da		
Nitrite as N	<0.10 mg/L	0.10	5	02/17/11	da	02/17/11	bd		

Analysis Method: EPA 350.1 Rev. 2.0

Batch: T021474

Ammonia as N	0.43 mg/L	0.010	1	02/21/11	sm	02/21/11	sm		
--------------	-----------	-------	---	----------	----	----------	----	--	--

Analysis Method: EPA 410.4 Rev. 2.0

Batch: T021486

Chemical Oxygen Demand	18 mg/L	5.0	1	02/21/11	da	02/22/11	da		
------------------------	---------	-----	---	----------	----	----------	----	--	--

Analysis Method: EPA 9040C

Batch: T021448

Corrosivity-pH	7.00 pH Units		1	02/17/11	sm	02/17/11	sm		N
----------------	---------------	--	---	----------	----	----------	----	--	---

Analysis Method: SM 4500-Cl- E, 20th

Batch: T021464

Chloride	<10 mg/L	10	1	02/18/11	da	02/18/11	da		N
----------	----------	----	---	----------	----	----------	----	--	---

Analysis Method: SM 5210 B-01

Batch: T021459

Biochemical Oxygen Demand 5-day	4.7 mg/L	2.0	1	02/18/11	sm	02/23/11	sm		
---------------------------------	----------	-----	---	----------	----	----------	----	--	--

Analysis Method: SM 5310 D-00

Batch: T021477

Dissolved Organic Carbon	4.3 mg/L	0.50	1	02/21/11	da	02/21/11	da		N
--------------------------	----------	------	---	----------	----	----------	----	--	---

### CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.



### ANALYTICAL RESULTS

Trace Project ID: T11B152  
Client Project ID: LEI Snow Study 10-600 USDA

Trace ID: T11B152-07 Date Collected: 02/17/11 10:30 Matrix: Wastewater  
Sample ID: Melt Water Date Received: 02/17/11 15:01

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
------------	---------------	-----	----------	----------	----	----------	----	-------	-----

#### METALS, TOTAL

Analysis Method: EPA 200.7 Rev. 4.4

Batch: T021485

Phosphorus	<0.050 mg/L	0.050	1	02/21/11	ns	02/22/11	jlm		
Sodium	3.9 mg/L	1.0	1	02/21/11	ns	02/22/11	jlm		

#### WET CHEMISTRY

Analysis Method: EPA 120.1

Batch: T021456

Specific Conductance (EC)	63 umhos/cm	1.0	1	02/18/11	as	02/18/11	as		
---------------------------	-------------	-----	---	----------	----	----------	----	--	--

Analysis Method: EPA 300.0 Rev. 2.1

Batch: T021457

Nitrate as N	0.90 mg/L	0.10	5	02/18/11	da	02/18/11	da		
Nitrite as N	<0.10 mg/L	0.10	5	02/17/11	da	02/17/11	bd		

Analysis Method: EPA 350.1 Rev. 2.0

Batch: T021474

Ammonia as N	0.41 mg/L	0.010	1	02/21/11	sm	02/21/11	sm		
--------------	-----------	-------	---	----------	----	----------	----	--	--

Analysis Method: EPA 410.4 Rev. 2.0

Batch: T021486

Chemical Oxygen Demand	14 mg/L	5.0	1	02/21/11	da	02/22/11	da		
------------------------	---------	-----	---	----------	----	----------	----	--	--

Analysis Method: EPA 9040C

Batch: T021448

Corrosivity-pH	6.96 pH Units		1	02/17/11	sm	02/17/11	sm	N	
----------------	---------------	--	---	----------	----	----------	----	---	--

Analysis Method: SM 4500-Cl- E, 20th

Batch: T021464

Chloride	<10 mg/L	10	1	02/18/11	da	02/18/11	da	N	
----------	----------	----	---	----------	----	----------	----	---	--

Analysis Method: SM 5210 B-01

Batch: T021459

Biochemical Oxygen Demand 5-day	4.7 mg/L	2.0	1	02/18/11	sm	02/23/11	sm		
---------------------------------	----------	-----	---	----------	----	----------	----	--	--

Analysis Method: SM 5310 D-00

Batch: T021477

Dissolved Organic Carbon	4.4 mg/L	0.50	1	02/21/11	da	02/21/11	da	N	
--------------------------	----------	------	---	----------	----	----------	----	---	--

### CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.



### ANALYTICAL RESULTS

Trace Project ID: T11B152  
Client Project ID: LEI Snow Study 10-600 USDA

Trace ID: T11B152-08 Date Collected: 02/17/11 11:30 Matrix: Wastewater  
Sample ID: Melt Water Date Received: 02/17/11 15:01

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
------------	---------------	-----	----------	----------	----	----------	----	-------	-----

#### METALS, TOTAL

Analysis Method: EPA 200.7 Rev. 4.4

Batch: T021485

Phosphorus	<0.050 mg/L	0.050	1	02/21/11	ns	02/22/11	jlm		
Sodium	3.5 mg/L	1.0	1	02/21/11	ns	02/22/11	jlm		

#### WET CHEMISTRY

Analysis Method: EPA 120.1

Batch: T021456

Specific Conductance (EC)	59 umhos/cm	1.0	1	02/18/11	as	02/18/11	as		
---------------------------	-------------	-----	---	----------	----	----------	----	--	--

Analysis Method: EPA 300.0 Rev. 2.1

Batch: T021457

Nitrate as N	0.84 mg/L	0.10	5	02/18/11	da	02/18/11	da		
Nitrite as N	<0.10 mg/L	0.10	5	02/17/11	da	02/17/11	bd		

Analysis Method: EPA 350.1 Rev. 2.0

Batch: T021474

Ammonia as N	0.37 mg/L	0.010	1	02/21/11	sm	02/21/11	sm		
--------------	-----------	-------	---	----------	----	----------	----	--	--

Analysis Method: EPA 410.4 Rev. 2.0

Batch: T021486

Chemical Oxygen Demand	15 mg/L	5.0	1	02/21/11	da	02/22/11	da		
------------------------	---------	-----	---	----------	----	----------	----	--	--

Analysis Method: EPA 9040C

Batch: T021448

Corrosivity-pH	6.95 pH Units		1	02/17/11	sm	02/17/11	sm	N	
----------------	---------------	--	---	----------	----	----------	----	---	--

Analysis Method: SM 4500-Cl- E, 20th

Batch: T021464

Chloride	<10 mg/L	10	1	02/18/11	da	02/18/11	da	N	
----------	----------	----	---	----------	----	----------	----	---	--

Analysis Method: SM 5210 B-01

Batch: T021459

Biochemical Oxygen Demand 5-day	3.9 mg/L	2.0	1	02/18/11	sm	02/23/11	sm		
---------------------------------	----------	-----	---	----------	----	----------	----	--	--

Analysis Method: SM 5310 D-00

Batch: T021477

Dissolved Organic Carbon	4.5 mg/L	0.50	1	02/21/11	da	02/21/11	da	N	
--------------------------	----------	------	---	----------	----	----------	----	---	--

### CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.



### ANALYTICAL RESULTS

Trace Project ID: T11B152  
Client Project ID: LEI Snow Study 10-600 USDA

Trace ID: T11B152-09 Date Collected: 02/17/11 12:30 Matrix: Wastewater  
Sample ID: Melt Water Date Received: 02/17/11 15:01

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
------------	---------------	-----	----------	----------	----	----------	----	-------	-----

#### METALS, TOTAL

Analysis Method: EPA 200.7 Rev. 4.4

Batch: T021485

Phosphorus	<0.050 mg/L	0.050	1	02/21/11	ns	02/22/11	jlm		
Sodium	3.2 mg/L	1.0	1	02/21/11	ns	02/22/11	jlm		

#### WET CHEMISTRY

Analysis Method: EPA 120.1

Batch: T021456

Specific Conductance (EC)	54 umhos/cm	1.0	1	02/18/11	as	02/18/11	as		
---------------------------	-------------	-----	---	----------	----	----------	----	--	--

Analysis Method: EPA 300.0 Rev. 2.1

Batch: T021457

Nitrate as N	0.81 mg/L	0.10	5	02/18/11	da	02/18/11	da		
Nitrite as N	<0.10 mg/L	0.10	5	02/17/11	da	02/17/11	bd		

Analysis Method: EPA 350.1 Rev. 2.0

Batch: T021474

Ammonia as N	0.35 mg/L	0.010	1	02/21/11	sm	02/21/11	sm		
--------------	-----------	-------	---	----------	----	----------	----	--	--

Analysis Method: EPA 410.4 Rev. 2.0

Batch: T021486

Chemical Oxygen Demand	17 mg/L	5.0	1	02/21/11	da	02/22/11	da		
------------------------	---------	-----	---	----------	----	----------	----	--	--

Analysis Method: EPA 9040C

Batch: T021448

Corrosivity-pH	6.96 pH Units		1	02/17/11	sm	02/17/11	sm		N
----------------	---------------	--	---	----------	----	----------	----	--	---

Analysis Method: SM 4500-Cl- E, 20th

Batch: T021464

Chloride	<10 mg/L	10	1	02/18/11	da	02/18/11	da		N
----------	----------	----	---	----------	----	----------	----	--	---

Analysis Method: SM 5210 B-01

Batch: T021459

Biochemical Oxygen Demand 5-day	4.7 mg/L	2.0	1	02/18/11	sm	02/23/11	sm		
---------------------------------	----------	-----	---	----------	----	----------	----	--	--

Analysis Method: SM 5310 D-00

Batch: T021477

Dissolved Organic Carbon	4.4 mg/L	0.50	1	02/21/11	da	02/21/11	da		N
--------------------------	----------	------	---	----------	----	----------	----	--	---

### CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.



### ANALYTICAL RESULTS

Trace Project ID: T11B152  
Client Project ID: LEI Snow Study 10-600 USDA

Trace ID: T11B152-10 Date Collected: 02/17/11 13:30 Matrix: Wastewater  
Sample ID: Melt Water Date Received: 02/17/11 15:01

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
------------	---------------	-----	----------	----------	----	----------	----	-------	-----

#### METALS, TOTAL

Analysis Method: EPA 200.7 Rev. 4.4

Batch: T021485

Phosphorus	<0.050 mg/L	0.050	1	02/21/11	ns	02/22/11	jlm		
Sodium	3.1 mg/L	1.0	1	02/21/11	ns	02/22/11	jlm		

#### WET CHEMISTRY

Analysis Method: EPA 120.1

Batch: T021456

Specific Conductance (EC)	55 umhos/cm	1.0	1	02/18/11	as	02/18/11	as		
---------------------------	-------------	-----	---	----------	----	----------	----	--	--

Analysis Method: EPA 300.0 Rev. 2.1

Batch: T021457

Nitrate as N	0.82 mg/L	0.10	5	02/18/11	da	02/18/11	da		
Nitrite as N	<0.10 mg/L	0.10	5	02/17/11	da	02/17/11	bd		

Analysis Method: EPA 350.1 Rev. 2.0

Batch: T021474

Ammonia as N	0.34 mg/L	0.010	1	02/21/11	sm	02/21/11	sm		
--------------	-----------	-------	---	----------	----	----------	----	--	--

Analysis Method: EPA 410.4 Rev. 2.0

Batch: T021486

Chemical Oxygen Demand	18 mg/L	5.0	1	02/21/11	da	02/22/11	da		
------------------------	---------	-----	---	----------	----	----------	----	--	--

Analysis Method: EPA 9040C

Batch: T021448

Corrosivity-pH	6.99 pH Units		1	02/17/11	sm	02/17/11	sm		N
----------------	---------------	--	---	----------	----	----------	----	--	---

Analysis Method: SM 4500-Cl- E, 20th

Batch: T021464

Chloride	<10 mg/L	10	1	02/18/11	da	02/18/11	da		N
----------	----------	----	---	----------	----	----------	----	--	---

Analysis Method: SM 5210 B-01

Batch: T021459

Biochemical Oxygen Demand 5-day	4.5 mg/L	2.0	1	02/18/11	sm	02/23/11	sm		
---------------------------------	----------	-----	---	----------	----	----------	----	--	--

Analysis Method: SM 5310 D-00

Batch: T021477

Dissolved Organic Carbon	4.6 mg/L	0.50	1	02/21/11	da	02/21/11	da		N
--------------------------	----------	------	---	----------	----	----------	----	--	---

### CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.



### ANALYTICAL RESULTS

Trace Project ID: T11B152  
Client Project ID: LEI Snow Study 10-600 USDA

Trace ID: T11B152-11 Date Collected: 02/17/11 14:30 Matrix: Wastewater  
Sample ID: Melt Water Date Received: 02/17/11 15:01

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
------------	---------------	-----	----------	----------	----	----------	----	-------	-----

#### METALS, TOTAL

Analysis Method: EPA 200.7 Rev. 4.4

Batch: T021485

Phosphorus	<0.050 mg/L	0.050	1	02/21/11	ns	02/22/11	jlm		
Sodium	2.9 mg/L	1.0	1	02/21/11	ns	02/22/11	jlm		

#### WET CHEMISTRY

Analysis Method: EPA 120.1

Batch: T021456

Specific Conductance (EC)	50 umhos/cm	1.0	1	02/18/11	as	02/18/11	as		
---------------------------	-------------	-----	---	----------	----	----------	----	--	--

Analysis Method: EPA 300.0 Rev. 2.1

Batch: T021457

Nitrate as N	0.87 mg/L	0.10	5	02/18/11	da	02/18/11	da		
Nitrite as N	<0.10 mg/L	0.10	5	02/17/11	da	02/17/11	bd		

Analysis Method: EPA 350.1 Rev. 2.0

Batch: T021474

Ammonia as N	0.35 mg/L	0.010	1	02/21/11	sm	02/21/11	sm		
--------------	-----------	-------	---	----------	----	----------	----	--	--

Analysis Method: EPA 410.4 Rev. 2.0

Batch: T021486

Chemical Oxygen Demand	15 mg/L	5.0	1	02/21/11	da	02/22/11	da		
------------------------	---------	-----	---	----------	----	----------	----	--	--

Analysis Method: EPA 9040C

Batch: T021448

Corrosivity-pH	6.98 pH Units		1	02/17/11	sm	02/17/11	sm		N
----------------	---------------	--	---	----------	----	----------	----	--	---

Analysis Method: SM 4500-Cl- E, 20th

Batch: T021464

Chloride	<10 mg/L	10	1	02/18/11	da	02/18/11	da		N
----------	----------	----	---	----------	----	----------	----	--	---

Analysis Method: SM 5210 B-01

Batch: T021459

Biochemical Oxygen Demand 5-day	5.3 mg/L	2.0	1	02/18/11	sm	02/23/11	sm		
---------------------------------	----------	-----	---	----------	----	----------	----	--	--

Analysis Method: SM 5310 D-00

Batch: T021477

Dissolved Organic Carbon	4.4 mg/L	0.50	1	02/21/11	da	02/21/11	da		N
--------------------------	----------	------	---	----------	----	----------	----	--	---

### CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.



phone 231.773.5998  
 toll-free 800.733.5998  
 fax 231.773.6537

Trace Analytical Laboratories, Inc.  
 2241 Black Creek Road  
 Muskegon, MI 49444-2673  
 info@trace-labs.com  
 www.trace-labs.com

**ANALYTICAL RESULTS**

Trace Project ID: T11B152  
 Client Project ID: LEI Snow Study 10-600 USDA

Trace ID: T11B152-11 Date Collected: 02/17/11 14:30 Matrix: Wastewater  
 Sample ID: Melt Water Date Received: 02/17/11 15:01

PARAMETERS	RESULTS	UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
------------	---------	-------	-----	----------	----------	----	----------	----	-------	-----

**WET CHEMISTRY**

Analysis Method: Calculation

Batch: [CALC]

Total Inorganic Nitrogen	1.2 mg/L	0.010	5	02/21/11	02/21/11	da	N			
--------------------------	----------	-------	---	----------	----------	----	---	--	--	--

**CERTIFICATE OF ANALYSIS**

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.





the science of compliance

phone 231.773.5998  
 toll-free 800.733.5998  
 fax 231.773.6537

Trace Analytical Laboratories, Inc.  
 2241 Black Creek Road  
 Muskegon, MI 49444-2673  
 info@trace-labs.com  
 www.trace-labs.com



the science of compliance

phone 231.773.5998  
 toll-free 800.733.5998  
 fax 231.773.6537

Trace Analytical Laboratories, Inc.  
 2241 Black Creek Road  
 Muskegon, MI 49444-2673  
 www.trace-labs.com

CHAIN-OF-CUSTODY RECORD

Page 1 of 1

TRACE ID NO. T11B152

Client Name: LEI  
 Contact Person: JUEL KEUHOH

Mailing Address:

City, State, Zip Code:

Phone:

Fax:

Email Address:

Project #: 18-608

PO #:

Trace Quote #:

Project Name: SUELV STUDY

Sampled by: AGLK

Billing Address (if different):

City, State, Zip Code:

Attn:

Phone:

Fax:

Report Results To:

TRACE USE ONLY

Logged By: J. S. [Signature]  
 Received on: [ ] Yes [ ] No  
 Checked By: [Signature]  
 Preservative Checked: [ ] Yes [ ] No [ ] N/A  
 Soil Volatiles Preserved: MeOH En Core Low Level Lab

Regulatory Requirements: MEPA TMDLs  Drinking Water  NPDES  USACE  Special   
 Turnaround Requirements: Standard (2 wk)  \* 5 Day  \* 24 Day (RUSH)  \* 24 Hour (RUSH)  \* Requires prior approval   
 Matrix Key: S = Soil  W = Water  SE = Sediment  OI = Oil  SO = Solid Waste   
 ANALYSIS REQUESTED: WI = Wipes  LW = Liquid Waste  A = Air  D = Drinking Water  SL = Sludge

Request for Analytical Services				Bill To:		Report Results To:			
Item #	RELEASED BY	RECEIVED BY	DATE	TIME	Item #	RELEASED BY	RECEIVED BY	DATE	TIME
21	[Signature]	[Signature]	2/7/11	15:01	3)	[Signature]	[Signature]		
22					4)				
23									
24									
25									
26									
27									
28									
29									
30									
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									
41									
42									
43									
44									
45									
46									
47									
48									
49									
50									
51									
52									
53									
54									
55									
56									
57									
58									
59									
60									
61									
62									
63									
64									
65									
66									
67									
68									
69									
70									
71									
72									
73									
74									
75									
76									
77									
78									
79									
80									
81									
82									
83									
84									
85									
86									
87									
88									
89									
90									
91									
92									
93									
94									
95									
96									
97									
98									
99									
100									

In executing this agreement, the client acknowledges acceptance of the terms of the agreement as listed on the reverse side.

CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.

**SAMPLE LOG IN CHECKLIST**

Date: 2/16/11 Client Name: LEI # of Coolers: -  
Trace ID #: T11B152 Project Name: SNOW STUDY Cooler #s: \_\_\_\_\_  
Logged in by: RAB Cooler #s: \_\_\_\_\_

**Cooler Receipt**

Cooler/samples delivered by: Trace courier   
Hand delivered  Name of delivery person: AL Gardner  
Commercial courier  UPS  DHL  FED EX  US Mail   
Did cooler come with a bill of lading? No  Not Applicable   
Yes  Way Bill or Tracking #: \_\_\_\_\_  
COC Seals present and intact on cooler? No  Not Applicable   
Yes   
Custody seals signed by Client? No  Client custody seal # (if applicable): \_\_\_\_\_  
Yes

**Coolant and Temperature**

Type of Coolant Used		Cooler Temperature		Correction Factor
	Yes	No		0.1 °C
Slurry w/ crushed, cubed, or chip ice?	<input type="checkbox"/>	<input type="checkbox"/>	Date: <u>2/16/11</u>	Time: <u>15:15</u>
Multiple bags of ice around samples?	<input type="checkbox"/>	<input type="checkbox"/>	Temperature Blank: _____ °C	
Ice Packs/ Blue Ice :	<input type="checkbox"/>	<input type="checkbox"/>	Range of 3 samples: <u>4-7</u> °C	
No Coolant Present:	<input type="checkbox"/>	<input type="checkbox"/>	Melt Water: _____ °C	
			Ice still present upon receipt: <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	

**General**

	Yes	No	NA
COC taped to inside of cooler lid?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
All bottles arrived unbroken with labels in good condition?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Each sample point is in a sealed plastic bag?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Labels filled out completely?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
All bottle labels agree with Chain of Custody (COC)?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sufficient sample to run tests requested?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
pH checked and samples at correct pH?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Correct preservative added to samples?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
DRO/GRO samples received and appropriate check in form completed?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Air bubbles absent from VOAs?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
COC filled out properly and signed by client?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
COC signed in by TRACE sample custodian?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Was project manager called and samples discussed?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Contact: \_\_\_\_\_ Date: \_\_\_\_\_

**Notes:**

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**CERTIFICATE OF ANALYSIS**

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.



the science of compliance

phone 231.773.5998
toll-free 800.733.5998
fax 231.773.6537

Trace Analytical Laboratories, Inc.
2241 Black Creek Road
Muskegon, MI 49444-2673
info@trace-labs.com
www.trace-labs.com

SAMPLE LOG IN CHECKLIST

Date: 2-17-11 Client Name: LEO # of Coolers: 1
Trace ID #: T11B15 2 Project Name: Logged in by: Cooler #s:

Cooler Receipt

Cooler/samples delivered by: Trace courier, Hand delivered, Commercial courier, Name of delivery person, UPS, DHL, FED EX, US Mail, Did cooler come with a bill of lading?, COC Seals present and intact on cooler?, Custody seals signed by Client?

Coolant and Temperature

Type of Coolant Used, Cooler Temperature, Correction Factor, Slurry w/ crushed, cubed, or chip ice?, Multiple bags of ice around samples?, Ice Packs/ Blue Ice, No Coolant Present, Date: 2-17-11, Time: 15:01, Temperature Blank, Range of 3 samples, Melt Water, Ice still present upon receipt?

General

COC taped to inside of cooler lid?, All bottles arrived unbroken with labels in good condition?, Each sample point is in a sealed plastic bag?, Labels filled out completely?, All bottle labels agree with Chain of Custody (COC)?, Sufficient sample to run tests requested?, pH checked and samples at correct pH?, Correct preservative added to samples?, DRO/GRO samples received and appropriate check in form completed?, Air bubbles absent from VOAs?, COC filled out properly and signed by client?, COC signed in by TRACE sample custodian?, Was project manager called and samples discussed?, Contact, Date

Notes:

LOGIN4

TRACE Analytical Laboratories, Inc.

Rev.8 11/21/06

CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.

February 10, 2011

Mr. Joel Kenyon  
Lakeshore Environmental, Inc.  
803 Verhoeks Street  
Grand Haven, MI 49417

Phone: (616) 844-5050  
Fax: (616) 844-5053

RE: Trace Project T11B033  
Client Project LEI Snow Study 10-600 USDA

Dear Mr. Kenyon:

Enclosed are your analytical results. The results of this report relate only to the samples listed in the body of this report.

All reports were examined through Trace's validation process to ensure that requirements for quality and completeness were satisfied. All reported analytical results were obtained in accordance with the methods referenced on the reports. Every practical effort was made to meet the reporting limit specifications for this work, however, some results may have raised reporting limits to correct for percent solids.

For clients that require NELAC Accreditation, Trace certifies that these test results meet all requirements of the NELAC Standard, except for those analytes with a "N" notation. These analytes have not been evaluated by NELAC at Trace's discretion and will not be reported unless requested by client.

If you have questions concerning this report, please contact me at 231.773.5998 or by email at [jmink@trace-labs.com](mailto:jmink@trace-labs.com).

Sincerely,



Jon Mink  
Project Manager

Enclosures



ILEPA Accreditation No. 100318 NJDEP Accreditation No. MI008 PADEP Accreditation No. 68-04471

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.



phone 231.773.5998  
toll-free 800.733.5998  
fax 231.773.6537

Trace Analytical Laboratories, Inc.  
2241 Black Creek Road  
Muskegon, MI 49444-2673  
info@trace-labs.com  
www.trace-labs.com

### SAMPLE SUMMARY

Trace Project ID: T11B033  
Client Project ID: LEI Snow Study 10-600 USDA

Trace ID	Sample ID	Matrix	Collected By	Date Collected	Date Received
T11B033-01	A 0-6"	Aqueous	awg	02/03/11 11:00	02/04/11 10:03
T11B033-02	A 6-8"	Aqueous	awg	02/03/11 10:45	02/04/11 10:03
T11B033-03	A 8-12"	Aqueous	awg	02/03/11 10:30	02/04/11 10:03
T11B033-04	A 12-16"	Aqueous	awg	02/03/11 10:15	02/04/11 10:03
T11B033-05	B 0-10"	Aqueous	awg	02/03/11 11:15	02/04/11 10:03
T11B033-06	B 10-12"	Aqueous	awg	02/03/11 11:05	02/04/11 10:03
T11B033-07	C 0-6"	Aqueous	awg	02/03/11 12:15	02/04/11 10:03
T11B033-08	C 6-7"	Aqueous	awg	02/03/11 12:00	02/04/11 10:03
T11B033-09	D 0-2"	Aqueous	awg	02/03/11 12:45	02/04/11 10:03
T11B033-10	D 2-3"	Aqueous	awg	02/03/11 12:30	02/04/11 10:03
T11B033-11	Melt Water	Aqueous	awg	02/03/11 11:20	02/04/11 10:03

### CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.

## AN EXPLANATION OF TERMS AND SYMBOLS WHICH MAY OCCUR IN THIS REPORT

### DEFINITIONS

LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
MS	Matrix Spike
MSD	Matrix Spike Duplicate
RPD	Relative Percent Difference
DUP	Matrix Duplicate
RDL	Reporting Detection Limit
MCL	Maximum Contamination Limit
TIC	Tentatively Identified Compound
<, ND or U	Indicates the compound was analyzed for but not detected
*	Indicates a result that exceeds its associated MCL or Surrogate control limits
N	Indicates that the compound has not been evaluated by NELAC
NA	Indicates that the compound is not available.

### DATA QUALIFIERS

Trace ID: T11B033-07

***Analysis: SM 5210 B-01***

<b>Biochemical Oxygen Demand 5-day</b>	Note 703 : The oxygen consumption was less than the method recommended amount. The reporting limit has been raised based on the lowest dilution that was analyzed.
--	--

Trace ID: T11B033-09

***Analysis: SM 5210 B-01***

<b>Biochemical Oxygen Demand 5-day</b>	Note 703 : The oxygen consumption was less than the method recommended amount. The reporting limit has been raised based on the lowest dilution that was analyzed.
--	--

Trace ID: T11B033-11

***Analysis: SM 5210 B-01***

<b>Biochemical Oxygen Demand 5-day</b>	Note 703 : The oxygen consumption was less than the method recommended amount. The reporting limit has been raised based on the lowest dilution that was analyzed.
--	--

### CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.

### ANALYTICAL RESULTS

Trace Project ID: T11B033  
Client Project ID: LEI Snow Study 10-600 USDA

Trace ID: T11B033-01 Date Collected: 02/03/11 11:00 Matrix: Aqueous  
Sample ID: A 0-6" Date Received: 02/04/11 10:03

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
------------	---------------	-----	----------	----------	----	----------	----	-------	-----

#### METALS, TOTAL

Analysis Method: EPA 200.7 Rev. 4.4

Batch: T021291

Phosphorus	0.70 mg/L	0.050	1	02/09/11	ns	02/10/11	jlm		
Sodium	14 mg/L	1.0	1	02/09/11	ns	02/10/11	jlm		

#### WET CHEMISTRY

Analysis Method: EPA 120.1

Batch: T021264

Specific Conductance (EC)	180 umhos/cm	1.0	1	02/07/11	as	02/07/11	as		
---------------------------	--------------	-----	---	----------	----	----------	----	--	--

Analysis Method: EPA 300.0 Rev. 2.1

Batch: T021258

Nitrate as N	0.35 mg/L	0.10	5	02/04/11	bd	02/04/11	bd		
Nitrite as N	<0.10 mg/L	0.10	5	02/04/11	bd	02/04/11	bd		

Analysis Method: EPA 350.1 Rev. 2.0

Batch: T021267

Ammonia as N	0.079 mg/L	0.010	1	02/07/11	sm	02/07/11	sm		
--------------	------------	-------	---	----------	----	----------	----	--	--

Analysis Method: EPA 410.4 Rev. 2.0

Batch: T021292

Chemical Oxygen Demand	220 mg/L	19	5	02/08/11	sm	02/09/11	sm		
------------------------	----------	----	---	----------	----	----------	----	--	--

Analysis Method: EPA 9040C

Batch: T021251

Corrosivity-pH	6.68 pH Units		1	02/04/11	as	02/04/11	as	N	
----------------	---------------	--	---	----------	----	----------	----	---	--

Analysis Method: SM 4500-Cl- E, 20th

Batch: T021283

Chloride	<10 mg/L	10	1	02/08/11	da	02/08/11	da	N	
----------	----------	----	---	----------	----	----------	----	---	--

Analysis Method: SM 5210 B-01

Batch: T021246

Biochemical Oxygen Demand 5-day	100 mg/L	2.0	1	02/04/11	sm	02/09/11	sm		
---------------------------------	----------	-----	---	----------	----	----------	----	--	--

Analysis Method: SM 5310 D-00

Batch: T021266

Dissolved Organic Carbon	43 mg/L	8.5	25	02/07/11	da	02/08/11	da	N	
--------------------------	---------	-----	----	----------	----	----------	----	---	--

### CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.



### ANALYTICAL RESULTS

Trace Project ID: T11B033  
Client Project ID: LEI Snow Study 10-600 USDA

Trace ID: T11B033-02 Date Collected: 02/03/11 10:45 Matrix: Aqueous  
Sample ID: A 6-8" Date Received: 02/04/11 10:03

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
------------	---------------	-----	----------	----------	----	----------	----	-------	-----

#### METALS, TOTAL

Analysis Method: EPA 200.7 Rev. 4.4

Batch: T021291

Phosphorus	1.5 mg/L	0.050	1	02/09/11	ns	02/10/11	jlm		
Sodium	21 mg/L	1.0	1	02/09/11	ns	02/10/11	jlm		

#### WET CHEMISTRY

Analysis Method: EPA 120.1

Batch: T021264

Specific Conductance (EC)	250 umhos/cm	1.0	1	02/07/11	as	02/07/11	as		
---------------------------	--------------	-----	---	----------	----	----------	----	--	--

Analysis Method: EPA 300.0 Rev. 2.1

Batch: T021258

Nitrate as N	<0.10 mg/L	0.10	5	02/04/11	bd	02/04/11	bd		
Nitrite as N	<0.10 mg/L	0.10	5	02/04/11	bd	02/04/11	bd		

Analysis Method: EPA 350.1 Rev. 2.0

Batch: T021267

Ammonia as N	0.072 mg/L	0.010	1	02/07/11	sm	02/07/11	sm		
--------------	------------	-------	---	----------	----	----------	----	--	--

Analysis Method: EPA 410.4 Rev. 2.0

Batch: T021292

Chemical Oxygen Demand	410 mg/L	19	5	02/08/11	sm	02/09/11	sm		
------------------------	----------	----	---	----------	----	----------	----	--	--

Analysis Method: EPA 9040C

Batch: T021251

Corrosivity-pH	9.09 pH Units		1	02/04/11	as	02/04/11	as		N
----------------	---------------	--	---	----------	----	----------	----	--	---

Analysis Method: SM 4500-Cl- E, 20th

Batch: T021283

Chloride	11 mg/L	10	1	02/08/11	da	02/08/11	da		N
----------	---------	----	---	----------	----	----------	----	--	---

Analysis Method: SM 5210 B-01

Batch: T021246

Biochemical Oxygen Demand 5-day	170 mg/L	2.0	1	02/04/11	sm	02/09/11	sm		
---------------------------------	----------	-----	---	----------	----	----------	----	--	--

Analysis Method: SM 5310 D-00

Batch: T021266

Dissolved Organic Carbon	82 mg/L	8.5	25	02/07/11	da	02/08/11	da		N
--------------------------	---------	-----	----	----------	----	----------	----	--	---

### CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.



### ANALYTICAL RESULTS

Trace Project ID: T11B033  
Client Project ID: LEI Snow Study 10-600 USDA

Trace ID: T11B033-03 Date Collected: 02/03/11 10:30 Matrix: Aqueous  
Sample ID: A 8-12" Date Received: 02/04/11 10:03

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
------------	---------------	-----	----------	----------	----	----------	----	-------	-----

#### METALS, TOTAL

Analysis Method: EPA 200.7 Rev. 4.4

Batch: T021291

Phosphorus	0.14 mg/L	0.050	1	02/09/11	ns	02/10/11	jlm		
Sodium	5.9 mg/L	1.0	1	02/09/11	ns	02/10/11	jlm		

#### WET CHEMISTRY

Analysis Method: EPA 120.1

Batch: T021264

Specific Conductance (EC)	77 umhos/cm	1.0	1	02/07/11	as	02/07/11	as		
---------------------------	-------------	-----	---	----------	----	----------	----	--	--

Analysis Method: EPA 300.0 Rev. 2.1

Batch: T021258

Nitrate as N	0.81 mg/L	0.10	5	02/04/11	bd	02/04/11	bd		
Nitrite as N	<0.10 mg/L	0.10	5	02/04/11	bd	02/04/11	bd		

Analysis Method: EPA 350.1 Rev. 2.0

Batch: T021267

Ammonia as N	0.40 mg/L	0.010	1	02/07/11	sm	02/07/11	sm		
--------------	-----------	-------	---	----------	----	----------	----	--	--

Analysis Method: EPA 410.4 Rev. 2.0

Batch: T021292

Chemical Oxygen Demand	98 mg/L	5.0	1	02/08/11	sm	02/09/11	sm		
------------------------	---------	-----	---	----------	----	----------	----	--	--

Analysis Method: EPA 9040C

Batch: T021251

Corrosivity-pH	9.07 pH Units		1	02/04/11	as	02/04/11	as	N	
----------------	---------------	--	---	----------	----	----------	----	---	--

Analysis Method: SM 4500-Cl- E, 20th

Batch: T021283

Chloride	<10 mg/L	10	1	02/08/11	da	02/08/11	da	N	
----------	----------	----	---	----------	----	----------	----	---	--

Analysis Method: SM 5210 B-01

Batch: T021246

Biochemical Oxygen Demand 5-day	55 mg/L	2.0	1	02/04/11	sm	02/09/11	sm		
---------------------------------	---------	-----	---	----------	----	----------	----	--	--

Analysis Method: SM 5310 D-00

Batch: T021266

Dissolved Organic Carbon	36 mg/L	8.5	25	02/07/11	da	02/08/11	da	N	
--------------------------	---------	-----	----	----------	----	----------	----	---	--

### CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.



### ANALYTICAL RESULTS

Trace Project ID: T11B033  
Client Project ID: LEI Snow Study 10-600 USDA

Trace ID: T11B033-04 Date Collected: 02/03/11 10:15 Matrix: Aqueous  
Sample ID: A 12-16" Date Received: 02/04/11 10:03

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
------------	---------------	-----	----------	----------	----	----------	----	-------	-----

#### METALS, TOTAL

Analysis Method: EPA 200.7 Rev. 4.4

Batch: T021291

Phosphorus	0.69 mg/L	0.050	1	02/09/11	ns	02/10/11	jlm		
Sodium	31 mg/L	1.0	1	02/09/11	ns	02/10/11	jlm		

#### WET CHEMISTRY

Analysis Method: EPA 120.1

Batch: T021264

Specific Conductance (EC)	310 umhos/cm	1.0	1	02/07/11	as	02/07/11	as		
---------------------------	--------------	-----	---	----------	----	----------	----	--	--

Analysis Method: EPA 300.0 Rev. 2.1

Batch: T021258

Nitrate as N	0.25 mg/L	0.10	5	02/04/11	bd	02/04/11	bd		
Nitrite as N	<0.10 mg/L	0.10	5	02/04/11	bd	02/04/11	bd		

Analysis Method: EPA 350.1 Rev. 2.0

Batch: T021267

Ammonia as N	0.045 mg/L	0.010	1	02/07/11	sm	02/07/11	sm		
--------------	------------	-------	---	----------	----	----------	----	--	--

Analysis Method: EPA 410.4 Rev. 2.0

Batch: T021292

Chemical Oxygen Demand	570 mg/L	19	5	02/08/11	sm	02/09/11	sm		
------------------------	----------	----	---	----------	----	----------	----	--	--

Analysis Method: EPA 9040C

Batch: T021251

Corrosivity-pH	9.82 pH Units		1	02/04/11	as	02/04/11	as	N	
----------------	---------------	--	---	----------	----	----------	----	---	--

Analysis Method: SM 4500-Cl- E, 20th

Batch: T021283

Chloride	13 mg/L	10	1	02/08/11	da	02/08/11	da	N	
----------	---------	----	---	----------	----	----------	----	---	--

Analysis Method: SM 5210 B-01

Batch: T021246

Biochemical Oxygen Demand 5-day	310 mg/L	2.0	1	02/04/11	sm	02/09/11	sm		
---------------------------------	----------	-----	---	----------	----	----------	----	--	--

Analysis Method: SM 5310 D-00

Batch: T021266

Dissolved Organic Carbon	180 mg/L	8.5	25	02/07/11	da	02/08/11	da	N	
--------------------------	----------	-----	----	----------	----	----------	----	---	--

### CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.



### ANALYTICAL RESULTS

Trace Project ID: T11B033  
Client Project ID: LEI Snow Study 10-600 USDA

Trace ID: T11B033-05 Date Collected: 02/03/11 11:15 Matrix: Aqueous  
Sample ID: B 0-10" Date Received: 02/04/11 10:03

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
------------	---------------	-----	----------	----------	----	----------	----	-------	-----

#### METALS, TOTAL

Analysis Method: EPA 200.7 Rev. 4.4

Batch: T021291

Phosphorus	<0.050 mg/L	0.050	1	02/09/11	ns	02/10/11	jlm		
Sodium	2.4 mg/L	1.0	1	02/09/11	ns	02/10/11	jlm		

#### WET CHEMISTRY

Analysis Method: EPA 120.1

Batch: T021264

Specific Conductance (EC)	32 umhos/cm	1.0	1	02/07/11	as	02/07/11	as		
---------------------------	-------------	-----	---	----------	----	----------	----	--	--

Analysis Method: EPA 300.0 Rev. 2.1

Batch: T021258

Nitrate as N	0.53 mg/L	0.10	5	02/04/11	bd	02/04/11	bd		
Nitrite as N	<0.10 mg/L	0.10	5	02/04/11	bd	02/04/11	bd		

Analysis Method: EPA 350.1 Rev. 2.0

Batch: T021267

Ammonia as N	0.22 mg/L	0.010	1	02/07/11	sm	02/07/11	sm		
--------------	-----------	-------	---	----------	----	----------	----	--	--

Analysis Method: EPA 410.4 Rev. 2.0

Batch: T021292

Chemical Oxygen Demand	30 mg/L	5.0	1	02/08/11	sm	02/09/11	sm		
------------------------	---------	-----	---	----------	----	----------	----	--	--

Analysis Method: EPA 9040C

Batch: T021251

Corrosivity-pH	8.35 pH Units		1	02/04/11	as	02/04/11	as		N
----------------	---------------	--	---	----------	----	----------	----	--	---

Analysis Method: SM 4500-Cl- E, 20th

Batch: T021283

Chloride	<10 mg/L	10	1	02/08/11	da	02/08/11	da		N
----------	----------	----	---	----------	----	----------	----	--	---

Analysis Method: SM 5210 B-01

Batch: T021246

Biochemical Oxygen Demand 5-day	200 mg/L	2.0	1	02/04/11	sm	02/09/11	sm		
---------------------------------	----------	-----	---	----------	----	----------	----	--	--

Analysis Method: SM 5310 D-00

Batch: T021266

Dissolved Organic Carbon	15 mg/L	8.5	25	02/07/11	da	02/08/11	da		N
--------------------------	---------	-----	----	----------	----	----------	----	--	---

### CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.



### ANALYTICAL RESULTS

Trace Project ID: T11B033  
Client Project ID: LEI Snow Study 10-600 USDA

Trace ID: T11B033-06 Date Collected: 02/03/11 11:05 Matrix: Aqueous  
Sample ID: B 10-12" Date Received: 02/04/11 10:03

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
------------	---------------	-----	----------	----------	----	----------	----	-------	-----

#### METALS, TOTAL

Analysis Method: EPA 200.7 Rev. 4.4

Batch: T021291

Phosphorus	0.43 mg/L	0.050	1	02/09/11	ns	02/10/11	jlm		
Sodium	31 mg/L	1.0	1	02/09/11	ns	02/10/11	jlm		

#### WET CHEMISTRY

Analysis Method: EPA 120.1

Batch: T021264

Specific Conductance (EC)	310 umhos/cm	1.0	1	02/07/11	as	02/07/11	as		
---------------------------	--------------	-----	---	----------	----	----------	----	--	--

Analysis Method: EPA 300.0 Rev. 2.1

Batch: T021258

Nitrate as N	0.51 mg/L	0.10	5	02/04/11	bd	02/04/11	bd		
Nitrite as N	<0.10 mg/L	0.10	5	02/04/11	bd	02/04/11	bd		

Analysis Method: EPA 350.1 Rev. 2.0

Batch: T021267

Ammonia as N	0.15 mg/L	0.010	1	02/07/11	sm	02/07/11	sm		
--------------	-----------	-------	---	----------	----	----------	----	--	--

Analysis Method: EPA 410.4 Rev. 2.0

Batch: T021292

Chemical Oxygen Demand	530 mg/L	19	5	02/08/11	sm	02/09/11	sm		
------------------------	----------	----	---	----------	----	----------	----	--	--

Analysis Method: EPA 9040C

Batch: T021251

Corrosivity-pH	9.94 pH Units		1	02/04/11	as	02/04/11	as	N	
----------------	---------------	--	---	----------	----	----------	----	---	--

Analysis Method: SM 4500-Cl- E, 20th

Batch: T021283

Chloride	12 mg/L	10	1	02/08/11	da	02/08/11	da	N	
----------	---------	----	---	----------	----	----------	----	---	--

Analysis Method: SM 5210 B-01

Batch: T021246

Biochemical Oxygen Demand 5-day	340 mg/L	2.0	1	02/04/11	sm	02/09/11	sm		
---------------------------------	----------	-----	---	----------	----	----------	----	--	--

Analysis Method: SM 5310 D-00

Batch: T021266

Dissolved Organic Carbon	190 mg/L	8.5	25	02/07/11	da	02/08/11	da	N	
--------------------------	----------	-----	----	----------	----	----------	----	---	--

### CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.



### ANALYTICAL RESULTS

Trace Project ID: T11B033  
Client Project ID: LEI Snow Study 10-600 USDA

Trace ID: T11B033-07 Date Collected: 02/03/11 12:15 Matrix: Aqueous  
Sample ID: C 0-6" Date Received: 02/04/11 10:03

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
------------	---------------	-----	----------	----------	----	----------	----	-------	-----

#### METALS, TOTAL

Analysis Method: EPA 200.7 Rev. 4.4

Batch: T021291

Phosphorus	<0.050 mg/L	0.050	1	02/09/11	ns	02/10/11	jlm		
Sodium	<1.0 mg/L	1.0	1	02/09/11	ns	02/10/11	jlm		

#### WET CHEMISTRY

Analysis Method: EPA 120.1

Batch: T021264

Specific Conductance (EC)	16 umhos/cm	1.0	1	02/07/11	as	02/07/11	as		
---------------------------	-------------	-----	---	----------	----	----------	----	--	--

Analysis Method: EPA 300.0 Rev. 2.1

Batch: T021258

Nitrate as N	0.66 mg/L	0.10	5	02/04/11	bd	02/04/11	bd		
Nitrite as N	<0.10 mg/L	0.10	5	02/04/11	bd	02/04/11	bd		

Analysis Method: EPA 350.1 Rev. 2.0

Batch: T021267

Ammonia as N	0.26 mg/L	0.010	1	02/07/11	sm	02/07/11	sm		
--------------	-----------	-------	---	----------	----	----------	----	--	--

Analysis Method: EPA 410.4 Rev. 2.0

Batch: T021292

Chemical Oxygen Demand	8.4 mg/L	5.0	1	02/08/11	sm	02/09/11	sm		
------------------------	----------	-----	---	----------	----	----------	----	--	--

Analysis Method: EPA 9040C

Batch: T021251

Corrosivity-pH	7.65 pH Units		1	02/04/11	as	02/04/11	as	N	
----------------	---------------	--	---	----------	----	----------	----	---	--

Analysis Method: SM 4500-Cl- E, 20th

Batch: T021283

Chloride	<10 mg/L	10	1	02/08/11	da	02/08/11	da	N	
----------	----------	----	---	----------	----	----------	----	---	--

Analysis Method: SM 5210 B-01

Batch: T021246

Biochemical Oxygen Demand 5-day	<4.0 mg/L	4.0	4	02/04/11	sm	02/09/11	sm	703	
---------------------------------	-----------	-----	---	----------	----	----------	----	-----	--

Analysis Method: SM 5310 D-00

Batch: T021266

Dissolved Organic Carbon	9.7 mg/L	0.50	1	02/07/11	da	02/08/11	da	N	
--------------------------	----------	------	---	----------	----	----------	----	---	--

### CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.



### ANALYTICAL RESULTS

Trace Project ID: T11B033  
Client Project ID: LEI Snow Study 10-600 USDA

Trace ID: T11B033-08 Date Collected: 02/03/11 12:00 Matrix: Aqueous  
Sample ID: C 6-7" Date Received: 02/04/11 10:03

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
------------	---------------	-----	----------	----------	----	----------	----	-------	-----

#### METALS, TOTAL

Analysis Method: EPA 200.7 Rev. 4.4

Batch: T021291

Phosphorus	0.13 mg/L	0.050	1	02/09/11	ns	02/10/11	jlm		
Sodium	10 mg/L	1.0	1	02/09/11	ns	02/10/11	jlm		

#### WET CHEMISTRY

Analysis Method: EPA 120.1

Batch: T021264

Specific Conductance (EC)	110 umhos/cm	1.0	1	02/07/11	as	02/07/11	as		
---------------------------	--------------	-----	---	----------	----	----------	----	--	--

Analysis Method: EPA 300.0 Rev. 2.1

Batch: T021258

Nitrate as N	0.74 mg/L	0.10	5	02/04/11	bd	02/04/11	bd		
Nitrite as N	<0.10 mg/L	0.10	5	02/04/11	bd	02/04/11	bd		

Analysis Method: EPA 350.1 Rev. 2.0

Batch: T021267

Ammonia as N	0.27 mg/L	0.010	1	02/07/11	sm	02/07/11	sm		
--------------	-----------	-------	---	----------	----	----------	----	--	--

Analysis Method: EPA 410.4 Rev. 2.0

Batch: T021292

Chemical Oxygen Demand	140 mg/L	19	5	02/08/11	sm	02/09/11	sm		
------------------------	----------	----	---	----------	----	----------	----	--	--

Analysis Method: EPA 9040C

Batch: T021251

Corrosivity-pH	9.54 pH Units		1	02/04/11	as	02/04/11	as	N	
----------------	---------------	--	---	----------	----	----------	----	---	--

Analysis Method: SM 4500-Cl- E, 20th

Batch: T021283

Chloride	<10 mg/L	10	1	02/08/11	da	02/08/11	da	N	
----------	----------	----	---	----------	----	----------	----	---	--

Analysis Method: SM 5210 B-01

Batch: T021246

Biochemical Oxygen Demand 5-day	130 mg/L	2.0	1	02/04/11	sm	02/09/11	sm		
---------------------------------	----------	-----	---	----------	----	----------	----	--	--

Analysis Method: SM 5310 D-00

Batch: T021266

Dissolved Organic Carbon	59 mg/L	8.5	25	02/07/11	da	02/08/11	da	N	
--------------------------	---------	-----	----	----------	----	----------	----	---	--

### CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.



### ANALYTICAL RESULTS

Trace Project ID: T11B033  
Client Project ID: LEI Snow Study 10-600 USDA

Trace ID: T11B033-09 Date Collected: 02/03/11 12:45 Matrix: Aqueous  
Sample ID: D 0-2" Date Received: 02/04/11 10:03

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
------------	---------------	-----	----------	----------	----	----------	----	-------	-----

#### METALS, TOTAL

Analysis Method: EPA 200.7 Rev. 4.4

Batch: T021291

Phosphorus	<0.050 mg/L	0.050	1	02/09/11	ns	02/10/11	jlm		
Sodium	2.2 mg/L	1.0	1	02/09/11	ns	02/10/11	jlm		

#### WET CHEMISTRY

Analysis Method: EPA 120.1

Batch: T021264

Specific Conductance (EC)	37 umhos/cm	1.0	1	02/07/11	as	02/07/11	as		
---------------------------	-------------	-----	---	----------	----	----------	----	--	--

Analysis Method: EPA 300.0 Rev. 2.1

Batch: T021258

Nitrate as N	0.46 mg/L	0.10	5	02/04/11	bd	02/04/11	bd		
Nitrite as N	<0.10 mg/L	0.10	5	02/04/11	bd	02/04/11	bd		

Analysis Method: EPA 350.1 Rev. 2.0

Batch: T021267

Ammonia as N	0.20 mg/L	0.010	1	02/07/11	sm	02/07/11	sm		
--------------	-----------	-------	---	----------	----	----------	----	--	--

Analysis Method: EPA 410.4 Rev. 2.0

Batch: T021292

Chemical Oxygen Demand	25 mg/L	5.0	1	02/08/11	sm	02/09/11	sm		
------------------------	---------	-----	---	----------	----	----------	----	--	--

Analysis Method: EPA 9040C

Batch: T021251

Corrosivity-pH	7.35 pH Units		1	02/04/11	as	02/04/11	as	N	
----------------	---------------	--	---	----------	----	----------	----	---	--

Analysis Method: SM 4500-Cl- E, 20th

Batch: T021283

Chloride	<10 mg/L	10	1	02/08/11	da	02/08/11	da	N	
----------	----------	----	---	----------	----	----------	----	---	--

Analysis Method: SM 5210 B-01

Batch: T021246

Biochemical Oxygen Demand 5-day	<50 mg/L	50	50	02/04/11	sm	02/09/11	sm	703	
---------------------------------	----------	----	----	----------	----	----------	----	-----	--

Analysis Method: SM 5310 D-00

Batch: T021266

Dissolved Organic Carbon	3.7 mg/L	0.50	1	02/07/11	da	02/08/11	da	N	
--------------------------	----------	------	---	----------	----	----------	----	---	--

### CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.



phone 231.773.5998  
 toll-free 800.733.5998  
 fax 231.773.6537

Trace Analytical Laboratories, Inc.  
 2241 Black Creek Road  
 Muskegon, MI 49444-2673  
 info@trace-labs.com  
 www.trace-labs.com

**ANALYTICAL RESULTS**

Trace Project ID: T11B033  
 Client Project ID: LEI Snow Study 10-600 USDA

Trace ID: T11B033-09 Date Collected: 02/03/11 12:45 Matrix: Aqueous  
 Sample ID: D 0-2" Date Received: 02/04/11 10:03

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED BY	ANALYZED BY	NOTES	MCL
------------	---------------	-----	----------	-------------	-------------	-------	-----

**WET CHEMISTRY**

*Analysis Method: Calculation*

*Batch: [CALC]*

<b>Total Inorganic Nitrogen</b>	<b>0.66 mg/L</b>	<b>0.010</b>	<b>5</b>	<b>02/07/11</b>	<b>02/07/11</b>	<b>bd</b>	<b>N</b>
---------------------------------	------------------	--------------	----------	-----------------	-----------------	-----------	----------

**CERTIFICATE OF ANALYSIS**

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.

### ANALYTICAL RESULTS

Trace Project ID: T11B033  
Client Project ID: LEI Snow Study 10-600 USDA

Trace ID: T11B033-10 Date Collected: 02/03/11 12:30 Matrix: Aqueous  
Sample ID: D 2-3" Date Received: 02/04/11 10:03

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
------------	---------------	-----	----------	----------	----	----------	----	-------	-----

#### METALS, TOTAL

Analysis Method: EPA 200.7 Rev. 4.4

Batch: T021291

Phosphorus	0.40 mg/L	0.050	1	02/09/11	ns	02/10/11	jlm		
Sodium	11 mg/L	1.0	1	02/09/11	ns	02/10/11	jlm		

#### WET CHEMISTRY

Analysis Method: EPA 120.1

Batch: T021264

Specific Conductance (EC)	140 umhos/cm	1.0	1	02/07/11	as	02/07/11	as		
---------------------------	--------------	-----	---	----------	----	----------	----	--	--

Analysis Method: EPA 300.0 Rev. 2.1

Batch: T021258

Nitrate as N	0.40 mg/L	0.10	5	02/04/11	bd	02/04/11	bd		
Nitrite as N	<0.10 mg/L	0.10	5	02/04/11	bd	02/04/11	bd		

Analysis Method: EPA 350.1 Rev. 2.0

Batch: T021267

Ammonia as N	0.084 mg/L	0.010	1	02/07/11	sm	02/07/11	sm		
--------------	------------	-------	---	----------	----	----------	----	--	--

Analysis Method: EPA 410.4 Rev. 2.0

Batch: T021292

Chemical Oxygen Demand	170 mg/L	19	5	02/08/11	sm	02/09/11	sm		
------------------------	----------	----	---	----------	----	----------	----	--	--

Analysis Method: EPA 9040C

Batch: T021251

Corrosivity-pH	9.34 pH Units		1	02/04/11	as	02/04/11	as	N	
----------------	---------------	--	---	----------	----	----------	----	---	--

Analysis Method: SM 4500-Cl- E, 20th

Batch: T021283

Chloride	<10 mg/L	10	1	02/08/11	da	02/08/11	da	N	
----------	----------	----	---	----------	----	----------	----	---	--

Analysis Method: SM 5210 B-01

Batch: T021246

Biochemical Oxygen Demand 5-day	290 mg/L	2.0	1	02/04/11	sm	02/09/11	sm		
---------------------------------	----------	-----	---	----------	----	----------	----	--	--

Analysis Method: SM 5310 D-00

Batch: T021266

Dissolved Organic Carbon	53 mg/L	8.5	25	02/07/11	da	02/08/11	da	N	
--------------------------	---------	-----	----	----------	----	----------	----	---	--

### CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.



### ANALYTICAL RESULTS

Trace Project ID: T11B033  
Client Project ID: LEI Snow Study 10-600 USDA

Trace ID: T11B033-11 Date Collected: 02/03/11 11:20 Matrix: Aqueous  
Sample ID: Melt Water Date Received: 02/04/11 10:03

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
------------	---------------	-----	----------	----------	----	----------	----	-------	-----

#### METALS, TOTAL

Analysis Method: EPA 200.7 Rev. 4.4

Batch: T021291

Phosphorus	0.054 mg/L	0.050	1	02/09/11	ns	02/10/11	jlm		
Sodium	7.8 mg/L	1.0	1	02/09/11	ns	02/10/11	jlm		

#### WET CHEMISTRY

Analysis Method: EPA 120.1

Batch: T021264

Specific Conductance (EC)	130 umhos/cm	1.0	1	02/07/11	as	02/07/11	as		
---------------------------	--------------	-----	---	----------	----	----------	----	--	--

Analysis Method: EPA 300.0 Rev. 2.1

Batch: T021258

Nitrate as N	0.52 mg/L	0.10	5	02/04/11	bd	02/04/11	bd		
Nitrite as N	<0.10 mg/L	0.10	5	02/04/11	bd	02/04/11	bd		

Analysis Method: EPA 350.1 Rev. 2.0

Batch: T021267

Ammonia as N	0.044 mg/L	0.010	1	02/07/11	sm	02/07/11	sm		
--------------	------------	-------	---	----------	----	----------	----	--	--

Analysis Method: EPA 410.4 Rev. 2.0

Batch: T021292

Chemical Oxygen Demand	17 mg/L	5.0	1	02/08/11	sm	02/09/11	sm		
------------------------	---------	-----	---	----------	----	----------	----	--	--

Analysis Method: EPA 9040C

Batch: T021251

Corrosivity-pH	7.32 pH Units		1	02/04/11	as	02/04/11	as	N	
----------------	---------------	--	---	----------	----	----------	----	---	--

Analysis Method: SM 4500-Cl- E, 20th

Batch: T021283

Chloride	<10 mg/L	10	1	02/08/11	da	02/08/11	da	N	
----------	----------	----	---	----------	----	----------	----	---	--

Analysis Method: SM 5210 B-01

Batch: T021246

Biochemical Oxygen Demand 5-day	<4.0 mg/L	4.0	4	02/04/11	sm	02/09/11	sm	703	
---------------------------------	-----------	-----	---	----------	----	----------	----	-----	--

Analysis Method: SM 5310 D-00

Batch: T021266

Dissolved Organic Carbon	6.7 mg/L	0.50	1	02/07/11	da	02/08/11	da	N	
--------------------------	----------	------	---	----------	----	----------	----	---	--

### CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.



phone 231.773.5998  
 toll-free 800.733.5998  
 fax 231.773.6537

Trace Analytical Laboratories, Inc.  
 2241 Black Creek Road  
 Muskegon, MI 49444-2673  
 info@trace-labs.com  
 www.trace-labs.com

**ANALYTICAL RESULTS**

Trace Project ID: T11B033  
 Client Project ID: LEI Snow Study 10-600 USDA

Trace ID: T11B033-11 Date Collected: 02/03/11 11:20 Matrix: Aqueous  
 Sample ID: Melt Water Date Received: 02/04/11 10:03

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED BY	ANALYZED BY	NOTES	MCL
------------	---------------	-----	----------	-------------	-------------	-------	-----

**WET CHEMISTRY**

Analysis Method: Calculation

Batch: [CALC]

Total Inorganic Nitrogen	0.56 mg/L	0.010	5	02/07/11	02/07/11	bd	N
--------------------------	-----------	-------	---	----------	----------	----	---

**CERTIFICATE OF ANALYSIS**

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.



the science of compliance

phone 231.773.5998
toll-free 800.733.5998
fax 231.773.6537

Trace Analytical Laboratories, Inc.
2241 Black Creek Road
Muskegon, MI 49444-2673
info@trace-labs.com
www.trace-labs.com



phone 231-773-5998
toll-free 800-733-5998
fax 231-773-6537

Trace Analytical Laboratories, Inc.
2241 Black Creek Road
Muskegon, MI 49444-2673
www.trace-labs.com

CHAIN-OF-CUSTODY RECORD

Page 1 of 2
TRACE ID NO. T11B033

Logged By: [Signature]
Received on ice: [X]
Preservative Checked: [X]

Client Name: LEI
Contact Person: JEREL KEUPOY
Mailing Address:
City, State, Zip Code:
Phone:
Fax:
Email Address:
Project #: 10-684
PO #:
Trace Quote #:
Sampled by: ALUS

Bill To:
Billing Address (if different):
City, State, Zip Code:
Phone:
Fax:

TRACE USE ONLY
Regulatory Requirements:
MERA TMDIs
Drinking Water
NIPDES
USACE
Special
Turnaround Requirements:
Standard (2 wk)
5 Day
24 Day (RUSH)
24 Hour (RUSH)
Requires prior approval
Matrix Key:
S = Soil
W = Water
SE = Sediment
OI = Oil
SO = Solid Waste
WI = Wipes
LW = Liquid Waste
A = Air
D = Drinking Water
SL = Sludge

Table with columns: TRACE NO., DATE TAKEN, TIME TAKEN, METALS FIELD FILTERED, CLIENT SAMPLE ID, MATRIX, NUMBER OF CONTAINERS, ANALYSIS REQUESTED, REMARKS. Rows 01-10 with handwritten entries.

Please Sign
Item #, RELEASED BY, RECEIVED BY, DATE, TIME, Item #, RELEASED BY, RECEIVED BY, DATE, TIME

In executing this agreement, the client acknowledges acceptance of the terms of the agreement as listed on the reverse side.

CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.



the science of compliance

phone 231.773.5998  
 toll-free 800.733.5998  
 fax 231.773.6537

Trace Analytical Laboratories, Inc.  
 2241 Black Creek Road  
 Muskegon, MI 49444-2673  
 info@trace-labs.com  
 www.trace-labs.com

**TRACE**  
 the science of compliance  
 phone 231.773.5998  
 toll-free 800.733.5998  
 fax 231.773.6537  
 Trace Analytical Laboratories, Inc.  
 2241 Black Creek Road  
 Muskegon, MI 49444-2673  
 www.trace-labs.com

**CHAIN-OF-CUSTODY RECORD**

Page 2 of 2

TRACE ID NO. 711B033

<b>Please Sign</b>		<b>Request for Analytical Services</b>				<b>Bill To:</b>		<b>Report Results To:</b>										
Item #	RELEASED BY	RECEIVED BY	DATE	TIME	Item #	RELEASED BY	RECEIVED BY	DATE	TIME	TRACE NO.	DATE TAKEN	TIME TAKEN	METALS FIELD FILTERED	CLIENT SAMPLE ID	MATRIX	NUMBER OF CONTAINERS	REMARKS	Possible Health Hazard
2)	[Signature]	BML [Signature]	2-4-11	10:03	3)	[Signature]	[Signature]			11	2/3/11	1128		MELT WATER	LW1	X	BAD C&D T.L. P.L.O.S. SPECIFIC C&D: PH D.C. P.L.A. C)	
4)					4)													

In executing this agreement, the client acknowledges acceptance of the terms of the agreement as listed on the reverse side.

**CERTIFICATE OF ANALYSIS**

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.

**SAMPLE LOG IN CHECKLIST**

Date: <u>2-4-11</u>		Client Name: <u>LEI</u>		# of Coolers: _____	
Trace ID #: <u>T11B033</u>		Project Name: <u>SNOW Study</u>		Cooler #s: _____	
		Logged in by: <u>BMCL</u>		Cooler #s: _____	
<b>Cooler Receipt</b>					
Cooler/samples delivered by:		Trace courier <input type="checkbox"/>	Hand delivered <input checked="" type="checkbox"/>	Name of delivery person: _____	
		Commercial courier <input type="checkbox"/>	UPS <input type="checkbox"/>	DHL <input type="checkbox"/>	FED EX <input type="checkbox"/>
Did cooler come with a bill of lading?		No <input type="checkbox"/>	<input checked="" type="checkbox"/> Not Applicable		
		Yes <input type="checkbox"/>	Way Bill or Tracking #: _____		
COC Seals present and intact on cooler?		No <input type="checkbox"/>	<input checked="" type="checkbox"/> Not Applicable		
		Yes <input type="checkbox"/>			
Custody seals signed by Client?		No <input type="checkbox"/>	Client custody seal # (if applicable): _____		
		Yes <input type="checkbox"/>			
<b>Coolant and Temperature</b>					
<b>Type of Coolant Used</b>			<b>Cooler Temperature</b>		
			Correction Factor <u>-0.2</u> °C		
			Date: <u>2-4-11</u> Time: <u>10:03</u>		
Slurry w/ crushed, cubed, or chip ice? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No			Temperature Blank: _____ °C		
Multiple bags of ice around samples? <input type="checkbox"/> Yes <input type="checkbox"/> No			Range of 3 samples: <u>1</u> °C		
Ice Packs/ Blue Ice : <input type="checkbox"/> Yes <input type="checkbox"/> No			Melt Water: _____ °C		
No Coolant Present: <input type="checkbox"/> Yes <input type="checkbox"/> No			Ice still present upon receipt: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		
<b>General</b>					
			Yes	No	NA
COC taped to inside of cooler lid?			<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
All bottles arrived unbroken with labels in good condition?			<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Each sample point is in a sealed plastic bag?			<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Labels filled out completely?			<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
All bottle labels agree with Chain of Custody (COC)?			<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sufficient sample to run tests requested?			<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
pH checked and samples at correct pH?			<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Correct preservative added to samples?			<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DRO/GRO samples received and appropriate check in form completed?			<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Air bubbles absent from VOAs?			<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
COC filled out properly and signed by client?			<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
COC signed in by TRACE sample custodian?			<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Was project manager called and samples discussed?			<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Contact: _____			Date: _____		
Notes:					

**CERTIFICATE OF ANALYSIS**

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.

January 27, 2011

Mr. Joel Kenyon  
Lakeshore Environmental, Inc.  
803 Verhoeks Street  
Grand Haven, MI 49417

Phone: (616) 844-5050  
Fax: (616) 844-5053

RE: Trace Project T11A168  
Client Project LEI Snow Study 10-625

Dear Mr. Kenyon:

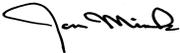
Enclosed are your analytical results. The results of this report relate only to the samples listed in the body of this report.

All reports were examined through Trace's validation process to ensure that requirements for quality and completeness were satisfied. All reported analytical results were obtained in accordance with the methods referenced on the reports. Every practical effort was made to meet the reporting limit specifications for this work, however, some results may have raised reporting limits to correct for percent solids.

For clients that require NELAC Accreditation, Trace certifies that these test results meet all requirements of the NELAC Standard, except for those analytes with a "N" notation. These analytes have not been evaluated by NELAC at Trace's discretion and will not be reported unless requested by client.

If you have questions concerning this report, please contact me at 231.773.5998 or by email at [jmink@trace-labs.com](mailto:jmink@trace-labs.com).

Sincerely,



Jon Mink  
Project Manager

Enclosures



ILEPA Accreditation No. 100318 NJDEP Accreditation No. MI008 PADEP Accreditation No. 68-04471

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.



phone 231.773.5998  
toll-free 800.733.5998  
fax 231.773.6537

Trace Analytical Laboratories, Inc.  
2241 Black Creek Road  
Muskegon, MI 49444-2673  
info@trace-labs.com  
www.trace-labs.com

### SAMPLE SUMMARY

Trace Project ID: T11A168  
Client Project ID: LEI Snow Study 10-625

Trace ID	Sample ID	Matrix	Collected By	Date Collected	Date Received
T11A168-01	A6-8	Aqueous	awg	01/20/11 10:45	01/20/11 14:56
T11A168-02	A3-6	Aqueous	awg	01/20/11 11:00	01/20/11 14:56
T11A168-03	A0-3	Aqueous	awg	01/20/11 11:10	01/20/11 14:56
T11A168-04	B6-7	Aqueous	awg	01/20/11 11:20	01/20/11 14:56
T11A168-05	B3-6	Aqueous	awg	01/20/11 11:30	01/20/11 14:56
T11A168-06	B0-3	Aqueous	awg	01/20/11 11:40	01/20/11 14:56
T11A168-07	Meltwater	Aqueous	awg	01/20/11 11:50	01/20/11 14:56
T11A168-08	Influent	Aqueous	awg	01/20/11 12:20	01/20/11 14:56
T11A168-09	Composite A	Aqueous	awg	01/20/11 12:00	01/20/11 14:56
T11A168-10	Composite B	Aqueous	awg	01/20/11 12:10	01/20/11 14:56
T11A168-11	Fresh	Aqueous	awg	01/20/11 13:30	01/20/11 14:56

### CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.

**AN EXPLANATION OF TERMS AND SYMBOLS WHICH MAY OCCUR IN THIS REPORT**

**DEFINITIONS**

LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
MS	Matrix Spike
MSD	Matrix Spike Duplicate
RPD	Relative Percent Difference
DUP	Matrix Duplicate
RDL	Reporting Detection Limit
MCL	Maximum Contamination Limit
TIC	Tentatively Identified Compound
<, ND or U	Indicates the compound was analyzed for but not detected
*	Indicates a result that exceeds its associated MCL or Surrogate control limits
N	Indicates that the compound has not been evaluated by NELAC
NA	Indicates that the compound is not available.

**CERTIFICATE OF ANALYSIS**

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.

### ANALYTICAL RESULTS

Trace Project ID: T11A168  
Client Project ID: LEI Snow Study 10-625

Trace ID: T11A168-01 Date Collected: 01/20/11 10:45 Matrix: Aqueous  
Sample ID: A6-8 Date Received: 01/20/11 14:56

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
------------	---------------	-----	----------	----------	----	----------	----	-------	-----

#### METALS, TOTAL

Analysis Method: EPA 200.7 Rev. 4.4

Batch: T021125

Phosphorus	1.9 mg/L	0.050	1	01/25/11	ns	01/26/11	jlm		
Sodium	27 mg/L	1.0	1	01/25/11	ns	01/26/11	jlm		

#### WET CHEMISTRY

Analysis Method: EPA 120.1

Batch: T021090

Specific Conductance (EC)	300 umhos/cm	1.0	1	01/21/11	as	01/21/11	as		
---------------------------	--------------	-----	---	----------	----	----------	----	--	--

Analysis Method: EPA 300.0 Rev. 2.1

Batch: T021087

Nitrate as N	<0.10 mg/L	0.10	5	01/21/11	bd	01/21/11	bd		
Nitrite as N	<0.10 mg/L	0.10	5	01/21/11	bd	01/21/11	bd		

Analysis Method: EPA 350.1 Rev. 2.0

Batch: T021108

Ammonia as N	0.013 mg/L	0.010	1	01/24/11	sm	01/24/11	sm		
--------------	------------	-------	---	----------	----	----------	----	--	--

Analysis Method: EPA 410.4 Rev. 2.0

Batch: T021156

Chemical Oxygen Demand	370 mg/L	19	5	01/26/11	sm	01/27/11	sm		
------------------------	----------	----	---	----------	----	----------	----	--	--

Analysis Method: EPA 9040C

Batch: T021085

Corrosivity-pH	8.84 pH Units		1	01/21/11	bd	01/21/11	bd	N	
----------------	---------------	--	---	----------	----	----------	----	---	--

Analysis Method: SM 4500-Cl- E, 20th

Batch: T021111

Chloride	14 mg/L	10	1	01/24/11	bd	01/24/11	bd	N	
----------	---------	----	---	----------	----	----------	----	---	--

Analysis Method: SM 5210 B-01

Batch: T021084

Biochemical Oxygen Demand 5-day	380 mg/L	2.0	1	01/21/11	sm	01/26/11	sm		
---------------------------------	----------	-----	---	----------	----	----------	----	--	--

Analysis Method: SM 5310 D-00

Batch: T021089

Dissolved Organic Carbon	130 mg/L	8.5	25	01/21/11	da	01/27/11	da	N	
--------------------------	----------	-----	----	----------	----	----------	----	---	--

### CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.



### ANALYTICAL RESULTS

Trace Project ID: T11A168  
Client Project ID: LEI Snow Study 10-625

Trace ID: T11A168-02 Date Collected: 01/20/11 11:00 Matrix: Aqueous  
Sample ID: A3-6 Date Received: 01/20/11 14:56

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
------------	---------------	-----	----------	----------	----	----------	----	-------	-----

#### METALS, TOTAL

Analysis Method: EPA 200.7 Rev. 4.4

Batch: T021125

Phosphorus	0.51 mg/L	0.050	1	01/25/11	ns	01/26/11	jlm		
Sodium	6.4 mg/L	1.0	1	01/25/11	ns	01/26/11	jlm		

#### WET CHEMISTRY

Analysis Method: EPA 120.1

Batch: T021090

Specific Conductance (EC)	82 umhos/cm	1.0	1	01/21/11	as	01/21/11	as		
---------------------------	-------------	-----	---	----------	----	----------	----	--	--

Analysis Method: EPA 300.0 Rev. 2.1

Batch: T021087

Nitrate as N	0.17 mg/L	0.10	5	01/21/11	bd	01/21/11	bd		
Nitrite as N	<0.10 mg/L	0.10	5	01/21/11	bd	01/21/11	bd		

Analysis Method: EPA 350.1 Rev. 2.0

Batch: T021108

Ammonia as N	0.013 mg/L	0.010	1	01/24/11	sm	01/24/11	sm		
--------------	------------	-------	---	----------	----	----------	----	--	--

Analysis Method: EPA 410.4 Rev. 2.0

Batch: T021156

Chemical Oxygen Demand	110 mg/L	19	5	01/26/11	sm	01/27/11	sm		
------------------------	----------	----	---	----------	----	----------	----	--	--

Analysis Method: EPA 9040C

Batch: T021085

Corrosivity-pH	8.67 pH Units		1	01/21/11	bd	01/21/11	bd	N	
----------------	---------------	--	---	----------	----	----------	----	---	--

Analysis Method: SM 4500-Cl- E, 20th

Batch: T021111

Chloride	<10 mg/L	10	1	01/24/11	bd	01/24/11	bd	N	
----------	----------	----	---	----------	----	----------	----	---	--

Analysis Method: SM 5210 B-01

Batch: T021084

Biochemical Oxygen Demand 5-day	180 mg/L	2.0	1	01/21/11	sm	01/26/11	sm		
---------------------------------	----------	-----	---	----------	----	----------	----	--	--

Analysis Method: SM 5310 D-00

Batch: T021089

Dissolved Organic Carbon	30 mg/L	8.5	25	01/21/11	da	01/27/11	da	N	
--------------------------	---------	-----	----	----------	----	----------	----	---	--

### CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.



### ANALYTICAL RESULTS

Trace Project ID: T11A168  
Client Project ID: LEI Snow Study 10-625

Trace ID: T11A168-03 Date Collected: 01/20/11 11:10 Matrix: Aqueous  
Sample ID: A0-3 Date Received: 01/20/11 14:56

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
------------	---------------	-----	----------	----------	----	----------	----	-------	-----

#### METALS, TOTAL

Analysis Method: EPA 200.7 Rev. 4.4

Batch: T021125

Phosphorus	1.9 mg/L	0.050	1	01/25/11	ns	01/26/11	jlm		
Sodium	13 mg/L	1.0	1	01/25/11	ns	01/26/11	jlm		

#### WET CHEMISTRY

Analysis Method: EPA 120.1

Batch: T021090

Specific Conductance (EC)	160 umhos/cm	1.0	1	01/21/11	as	01/21/11	as		
---------------------------	--------------	-----	---	----------	----	----------	----	--	--

Analysis Method: EPA 300.0 Rev. 2.1

Batch: T021087

Nitrate as N	<0.10 mg/L	0.10	5	01/21/11	bd	01/21/11	bd		
Nitrite as N	<0.10 mg/L	0.10	5	01/21/11	bd	01/21/11	bd		

Analysis Method: EPA 350.1 Rev. 2.0

Batch: T021108

Ammonia as N	0.015 mg/L	0.010	1	01/24/11	sm	01/24/11	sm		
--------------	------------	-------	---	----------	----	----------	----	--	--

Analysis Method: EPA 410.4 Rev. 2.0

Batch: T021156

Chemical Oxygen Demand	270 mg/L	19	5	01/26/11	sm	01/27/11	sm		
------------------------	----------	----	---	----------	----	----------	----	--	--

Analysis Method: EPA 9040C

Batch: T021085

Corrosivity-pH	8.34 pH Units		1	01/21/11	bd	01/21/11	bd	N	
----------------	---------------	--	---	----------	----	----------	----	---	--

Analysis Method: SM 4500-Cl- E, 20th

Batch: T021111

Chloride	<10 mg/L	10	1	01/24/11	bd	01/24/11	bd	N	
----------	----------	----	---	----------	----	----------	----	---	--

Analysis Method: SM 5210 B-01

Batch: T021084

Biochemical Oxygen Demand 5-day	140 mg/L	2.0	1	01/21/11	sm	01/26/11	sm		
---------------------------------	----------	-----	---	----------	----	----------	----	--	--

Analysis Method: SM 5310 D-00

Batch: T021089

Dissolved Organic Carbon	27 mg/L	8.5	25	01/21/11	da	01/27/11	da	N	
--------------------------	---------	-----	----	----------	----	----------	----	---	--

### CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.



### ANALYTICAL RESULTS

Trace Project ID: T11A168  
Client Project ID: LEI Snow Study 10-625

Trace ID: T11A168-04 Date Collected: 01/20/11 11:20 Matrix: Aqueous  
Sample ID: B6-7 Date Received: 01/20/11 14:56

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
------------	---------------	-----	----------	----------	----	----------	----	-------	-----

#### METALS, TOTAL

Analysis Method: EPA 200.7 Rev. 4.4

Batch: T021125

Phosphorus	1.5 mg/L	0.050	1	01/25/11	ns	01/26/11	jlm		
Sodium	32 mg/L	1.0	1	01/25/11	ns	01/26/11	jlm		

#### WET CHEMISTRY

Analysis Method: EPA 120.1

Batch: T021090

Specific Conductance (EC)	330 umhos/cm	1.0	1	01/21/11	as	01/21/11	as		
---------------------------	--------------	-----	---	----------	----	----------	----	--	--

Analysis Method: EPA 300.0 Rev. 2.1

Batch: T021087

Nitrate as N	0.14 mg/L	0.10	5	01/21/11	bd	01/21/11	bd		
Nitrite as N	0.26 mg/L	0.10	5	01/21/11	bd	01/21/11	bd		

Analysis Method: EPA 350.1 Rev. 2.0

Batch: T021108

Ammonia as N	0.051 mg/L	0.010	1	01/24/11	sm	01/24/11	sm		
--------------	------------	-------	---	----------	----	----------	----	--	--

Analysis Method: EPA 410.4 Rev. 2.0

Batch: T021156

Chemical Oxygen Demand	620 mg/L	97	25	01/26/11	sm	01/27/11	sm		
------------------------	----------	----	----	----------	----	----------	----	--	--

Analysis Method: EPA 9040C

Batch: T021085

Corrosivity-pH	9.65 pH Units		1	01/21/11	bd	01/21/11	bd	N	
----------------	---------------	--	---	----------	----	----------	----	---	--

Analysis Method: SM 4500-Cl- E, 20th

Batch: T021111

Chloride	16 mg/L	10	1	01/24/11	bd	01/24/11	bd	N	
----------	---------	----	---	----------	----	----------	----	---	--

Analysis Method: SM 5210 B-01

Batch: T021084

Biochemical Oxygen Demand 5-day	280 mg/L	2.0	1	01/21/11	sm	01/26/11	sm		
---------------------------------	----------	-----	---	----------	----	----------	----	--	--

Analysis Method: SM 5310 D-00

Batch: T021089

Dissolved Organic Carbon	190 mg/L	8.5	25	01/21/11	da	01/27/11	da	N	
--------------------------	----------	-----	----	----------	----	----------	----	---	--

### CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.



### ANALYTICAL RESULTS

Trace Project ID: T11A168  
Client Project ID: LEI Snow Study 10-625

Trace ID: T11A168-05 Date Collected: 01/20/11 11:30 Matrix: Aqueous  
Sample ID: B3-6 Date Received: 01/20/11 14:56

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
------------	---------------	-----	----------	----------	----	----------	----	-------	-----

#### METALS, TOTAL

Analysis Method: EPA 200.7 Rev. 4.4

Batch: T021125

Phosphorus	0.34 mg/L	0.050	1	01/25/11	ns	01/26/11	jlm		
Sodium	6.4 mg/L	1.0	1	01/25/11	ns	01/26/11	jlm		

#### WET CHEMISTRY

Analysis Method: EPA 120.1

Batch: T021090

Specific Conductance (EC)	91 umhos/cm	1.0	1	01/21/11	as	01/21/11	as		
---------------------------	-------------	-----	---	----------	----	----------	----	--	--

Analysis Method: EPA 300.0 Rev. 2.1

Batch: T021087

Nitrate as N	0.16 mg/L	0.10	5	01/21/11	bd	01/21/11	bd		
Nitrite as N	<0.10 mg/L	0.10	5	01/21/11	bd	01/21/11	bd		

Analysis Method: EPA 350.1 Rev. 2.0

Batch: T021108

Ammonia as N	0.027 mg/L	0.010	1	01/24/11	sm	01/24/11	sm		
--------------	------------	-------	---	----------	----	----------	----	--	--

Analysis Method: EPA 410.4 Rev. 2.0

Batch: T021156

Chemical Oxygen Demand	120 mg/L	19	5	01/26/11	sm	01/27/11	sm		
------------------------	----------	----	---	----------	----	----------	----	--	--

Analysis Method: EPA 9040C

Batch: T021085

Corrosivity-pH	9.37 pH Units		1	01/21/11	bd	01/21/11	bd	N	
----------------	---------------	--	---	----------	----	----------	----	---	--

Analysis Method: SM 4500-Cl- E, 20th

Batch: T021111

Chloride	<10 mg/L	10	1	01/24/11	bd	01/24/11	bd	N	
----------	----------	----	---	----------	----	----------	----	---	--

Analysis Method: SM 5210 B-01

Batch: T021084

Biochemical Oxygen Demand 5-day	140 mg/L	2.0	1	01/21/11	sm	01/26/11	sm		
---------------------------------	----------	-----	---	----------	----	----------	----	--	--

Analysis Method: SM 5310 D-00

Batch: T021089

Dissolved Organic Carbon	43 mg/L	8.5	25	01/21/11	da	01/27/11	da	N	
--------------------------	---------	-----	----	----------	----	----------	----	---	--

### CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.



### ANALYTICAL RESULTS

Trace Project ID: T11A168  
Client Project ID: LEI Snow Study 10-625

Trace ID: T11A168-06 Date Collected: 01/20/11 11:40 Matrix: Aqueous  
Sample ID: B0-3 Date Received: 01/20/11 14:56

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
------------	---------------	-----	----------	----------	----	----------	----	-------	-----

#### METALS, TOTAL

Analysis Method: EPA 200.7 Rev. 4.4

Batch: T021125

Phosphorus	0.92 mg/L	0.050	1	01/25/11	ns	01/26/11	jlm		
Sodium	9.3 mg/L	1.0	1	01/25/11	ns	01/26/11	jlm		

#### WET CHEMISTRY

Analysis Method: EPA 120.1

Batch: T021090

Specific Conductance (EC)	130 umhos/cm	1.0	1	01/21/11	as	01/21/11	as		
---------------------------	--------------	-----	---	----------	----	----------	----	--	--

Analysis Method: EPA 300.0 Rev. 2.1

Batch: T021087

Nitrate as N	0.11 mg/L	0.10	5	01/21/11	bd	01/21/11	bd		
Nitrite as N	<0.10 mg/L	0.10	5	01/21/11	bd	01/21/11	bd		

Analysis Method: EPA 350.1 Rev. 2.0

Batch: T021108

Ammonia as N	0.018 mg/L	0.010	1	01/24/11	sm	01/24/11	sm		
--------------	------------	-------	---	----------	----	----------	----	--	--

Analysis Method: EPA 410.4 Rev. 2.0

Batch: T021156

Chemical Oxygen Demand	150 mg/L	19	5	01/26/11	sm	01/27/11	sm		
------------------------	----------	----	---	----------	----	----------	----	--	--

Analysis Method: EPA 9040C

Batch: T021085

Corrosivity-pH	9.34 pH Units		1	01/21/11	bd	01/21/11	bd	N	
----------------	---------------	--	---	----------	----	----------	----	---	--

Analysis Method: SM 4500-Cl- E, 20th

Batch: T021111

Chloride	<10 mg/L	10	1	01/24/11	bd	01/24/11	bd	N	
----------	----------	----	---	----------	----	----------	----	---	--

Analysis Method: SM 5210 B-01

Batch: T021084

Biochemical Oxygen Demand 5-day	100 mg/L	2.0	1	01/21/11	sm	01/26/11	sm		
---------------------------------	----------	-----	---	----------	----	----------	----	--	--

Analysis Method: SM 5310 D-00

Batch: T021089

Dissolved Organic Carbon	22 mg/L	8.5	25	01/21/11	da	01/27/11	da	N	
--------------------------	---------	-----	----	----------	----	----------	----	---	--

### CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.



### ANALYTICAL RESULTS

Trace Project ID: T11A168  
Client Project ID: LEI Snow Study 10-625

Trace ID: T11A168-07 Date Collected: 01/20/11 11:50 Matrix: Aqueous  
Sample ID: Meltwater Date Received: 01/20/11 14:56

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
------------	---------------	-----	----------	----------	----	----------	----	-------	-----

#### METALS, TOTAL

Analysis Method: EPA 200.7 Rev. 4.4

Batch: T021125

Phosphorus	0.080 mg/L	0.050	1	01/25/11	ns	01/26/11	jlm		
Sodium	11 mg/L	1.0	1	01/25/11	ns	01/26/11	jlm		

#### WET CHEMISTRY

Analysis Method: EPA 120.1

Batch: T021090

Specific Conductance (EC)	210 umhos/cm	1.0	1	01/21/11	as	01/21/11	as		
---------------------------	--------------	-----	---	----------	----	----------	----	--	--

Analysis Method: EPA 300.0 Rev. 2.1

Batch: T021087

Nitrate as N	0.28 mg/L	0.10	5	01/21/11	bd	01/21/11	bd		
Nitrite as N	<0.10 mg/L	0.10	5	01/21/11	bd	01/21/11	bd		

Analysis Method: EPA 350.1 Rev. 2.0

Batch: T021108

Ammonia as N	0.018 mg/L	0.010	1	01/24/11	sm	01/24/11	sm		
--------------	------------	-------	---	----------	----	----------	----	--	--

Analysis Method: EPA 410.4 Rev. 2.0

Batch: T021156

Chemical Oxygen Demand	63 mg/L	5.0	1	01/26/11	sm	01/27/11	sm		
------------------------	---------	-----	---	----------	----	----------	----	--	--

Analysis Method: EPA 9040C

Batch: T021085

Corrosivity-pH	7.82 pH Units		1	01/21/11	bd	01/21/11	bd	N	
----------------	---------------	--	---	----------	----	----------	----	---	--

Analysis Method: SM 4500-Cl- E, 20th

Batch: T021111

Chloride	<10 mg/L	10	1	01/24/11	bd	01/24/11	bd	N	
----------	----------	----	---	----------	----	----------	----	---	--

Analysis Method: SM 5210 B-01

Batch: T021084

Biochemical Oxygen Demand 5-day	24 mg/L	2.0	1	01/21/11	sm	01/26/11	sm		
---------------------------------	---------	-----	---	----------	----	----------	----	--	--

Analysis Method: SM 5310 D-00

Batch: T021089

Dissolved Organic Carbon	25 mg/L	8.5	25	01/21/11	da	01/27/11	da	N	
--------------------------	---------	-----	----	----------	----	----------	----	---	--

### CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.



### ANALYTICAL RESULTS

Trace Project ID: T11A168  
Client Project ID: LEI Snow Study 10-625

Trace ID: T11A168-08 Date Collected: 01/20/11 12:20 Matrix: Aqueous  
Sample ID: Influent Date Received: 01/20/11 14:56

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
------------	---------------	-----	----------	----------	----	----------	----	-------	-----

#### METALS, TOTAL

Analysis Method: EPA 200.7 Rev. 4.4

Batch: T021125

Phosphorus	0.93 mg/L	0.050	1	01/25/11	ns	01/26/11	jlm		
Sodium	65 mg/L	1.0	1	01/25/11	ns	01/26/11	jlm		

#### WET CHEMISTRY

Analysis Method: EPA 120.1

Batch: T021090

Specific Conductance (EC)	700 umhos/cm	1.0	1	01/21/11	as	01/21/11	as		
---------------------------	--------------	-----	---	----------	----	----------	----	--	--

Analysis Method: EPA 300.0 Rev. 2.1

Batch: T021087

Nitrate as N	<0.10 mg/L	0.10	5	01/21/11	bd	01/21/11	bd		
Nitrite as N	<0.10 mg/L	0.10	5	01/21/11	bd	01/21/11	bd		

Analysis Method: EPA 350.1 Rev. 2.0

Batch: T021108

Ammonia as N	<0.010 mg/L	0.010	1	01/24/11	sm	01/24/11	sm		
--------------	-------------	-------	---	----------	----	----------	----	--	--

Analysis Method: EPA 410.4 Rev. 2.0

Batch: T021156

Chemical Oxygen Demand	1100 mg/L	97	25	01/26/11	sm	01/27/11	sm		
------------------------	-----------	----	----	----------	----	----------	----	--	--

Analysis Method: EPA 9040C

Batch: T021085

Corrosivity-pH	6.90 pH Units		1	01/21/11	bd	01/21/11	bd	N	
----------------	---------------	--	---	----------	----	----------	----	---	--

Analysis Method: SM 4500-Cl- E, 20th

Batch: T021111

Chloride	24 mg/L	10	1	01/24/11	bd	01/24/11	bd	N	
----------	---------	----	---	----------	----	----------	----	---	--

Analysis Method: SM 5210 B-01

Batch: T021084

Biochemical Oxygen Demand 5-day	540 mg/L	2.0	1	01/21/11	sm	01/26/11	sm		
---------------------------------	----------	-----	---	----------	----	----------	----	--	--

Analysis Method: SM 5310 D-00

Batch: T021089

Dissolved Organic Carbon	400 mg/L	8.5	25	01/21/11	da	01/27/11	da	N	
--------------------------	----------	-----	----	----------	----	----------	----	---	--

### CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.



### ANALYTICAL RESULTS

Trace Project ID: T11A168  
Client Project ID: LEI Snow Study 10-625

Trace ID: T11A168-09 Date Collected: 01/20/11 12:00 Matrix: Aqueous  
Sample ID: Composite A Date Received: 01/20/11 14:56

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
------------	---------------	-----	----------	----------	----	----------	----	-------	-----

#### METALS, TOTAL

Analysis Method: EPA 200.7 Rev. 4.4

Batch: T021125

Phosphorus	1.4 mg/L	0.050	1	01/25/11	ns	01/26/11	jlm		
Sodium	13 mg/L	1.0	1	01/25/11	ns	01/26/11	jlm		

#### WET CHEMISTRY

Analysis Method: EPA 120.1

Batch: T021090

Specific Conductance (EC)	150 umhos/cm	1.0	1	01/21/11	as	01/21/11	as		
---------------------------	--------------	-----	---	----------	----	----------	----	--	--

Analysis Method: EPA 300.0 Rev. 2.1

Batch: T021087

Nitrate as N	<0.10 mg/L	0.10	5	01/21/11	bd	01/21/11	bd		
Nitrite as N	<0.10 mg/L	0.10	5	01/21/11	bd	01/21/11	bd		

Analysis Method: EPA 350.1 Rev. 2.0

Batch: T021108

Ammonia as N	0.016 mg/L	0.010	1	01/24/11	sm	01/24/11	sm		
--------------	------------	-------	---	----------	----	----------	----	--	--

Analysis Method: EPA 410.4 Rev. 2.0

Batch: T021156

Chemical Oxygen Demand	270 mg/L	19	5	01/26/11	sm	01/27/11	sm		
------------------------	----------	----	---	----------	----	----------	----	--	--

Analysis Method: EPA 9040C

Batch: T021085

Corrosivity-pH	9.19 pH Units		1	01/21/11	bd	01/21/11	bd	N	
----------------	---------------	--	---	----------	----	----------	----	---	--

Analysis Method: SM 4500-Cl- E, 20th

Batch: T021111

Chloride	<10 mg/L	10	1	01/24/11	bd	01/24/11	bd	N	
----------	----------	----	---	----------	----	----------	----	---	--

Analysis Method: SM 5210 B-01

Batch: T021084

Biochemical Oxygen Demand 5-day	160 mg/L	2.0	1	01/21/11	sm	01/26/11	sm		
---------------------------------	----------	-----	---	----------	----	----------	----	--	--

Analysis Method: SM 5310 D-00

Batch: T021089

Dissolved Organic Carbon	44 mg/L	8.5	25	01/21/11	da	01/27/11	da	N	
--------------------------	---------	-----	----	----------	----	----------	----	---	--

### CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.



**ANALYTICAL RESULTS**

Trace Project ID: T11A168  
 Client Project ID: LEI Snow Study 10-625

Trace ID: T11A168-10 Date Collected: 01/20/11 12:10 Matrix: Aqueous  
 Sample ID: Composite B Date Received: 01/20/11 14:56

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
------------	---------------	-----	----------	----------	----	----------	----	-------	-----

**METALS, TOTAL**

Analysis Method: EPA 200.7 Rev. 4.4

Batch: T021125

Phosphorus	0.92 mg/L	0.050	1	01/25/11	ns	01/26/11	jlm		
Sodium	8.9 mg/L	1.0	1	01/25/11	ns	01/26/11	jlm		

**WET CHEMISTRY**

Analysis Method: EPA 120.1

Batch: T021090

Specific Conductance (EC)	140 umhos/cm	1.0	1	01/21/11	as	01/21/11	as		
---------------------------	--------------	-----	---	----------	----	----------	----	--	--

Analysis Method: EPA 300.0 Rev. 2.1

Batch: T021087

Nitrate as N	0.12 mg/L	0.10	5	01/21/11	bd	01/21/11	bd		
Nitrite as N	<0.10 mg/L	0.10	5	01/21/11	bd	01/21/11	bd		

Analysis Method: EPA 350.1 Rev. 2.0

Batch: T021108

Ammonia as N	0.013 mg/L	0.010	1	01/24/11	sm	01/24/11	sm		
--------------	------------	-------	---	----------	----	----------	----	--	--

Analysis Method: EPA 410.4 Rev. 2.0

Batch: T021156

Chemical Oxygen Demand	180 mg/L	19	5	01/26/11	sm	01/27/11	sm		
------------------------	----------	----	---	----------	----	----------	----	--	--

Analysis Method: EPA 9040C

Batch: T021085

Corrosivity-pH	9.44 pH Units		1	01/21/11	bd	01/21/11	bd	N	
----------------	---------------	--	---	----------	----	----------	----	---	--

Analysis Method: SM 4500-Cl- E, 20th

Batch: T021111

Chloride	<10 mg/L	10	1	01/24/11	bd	01/24/11	bd	N	
----------	----------	----	---	----------	----	----------	----	---	--

Analysis Method: SM 5210 B-01

Batch: T021084

Biochemical Oxygen Demand 5-day	95 mg/L	2.0	1	01/21/11	sm	01/26/11	sm		
---------------------------------	---------	-----	---	----------	----	----------	----	--	--

Analysis Method: SM 5310 D-00

Batch: T021089

Dissolved Organic Carbon	29 mg/L	8.5	25	01/21/11	da	01/27/11	da	N	
--------------------------	---------	-----	----	----------	----	----------	----	---	--

**CERTIFICATE OF ANALYSIS**

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.



### ANALYTICAL RESULTS

Trace Project ID: T11A168  
Client Project ID: LEI Snow Study 10-625

Trace ID: T11A168-11 Date Collected: 01/20/11 13:30 Matrix: Aqueous  
Sample ID: Fresh Date Received: 01/20/11 14:56

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
------------	---------------	-----	----------	----------	----	----------	----	-------	-----

#### METALS, TOTAL

Analysis Method: EPA 200.7 Rev. 4.4

Batch: T021125

Phosphorus	1.2 mg/L	0.050	1	01/25/11	ns	01/26/11	jlm		
Sodium	71 mg/L	1.0	1	01/25/11	ns	01/26/11	jlm		

#### WET CHEMISTRY

Analysis Method: EPA 120.1

Batch: T021090

Specific Conductance (EC)	720 umhos/cm	1.0	1	01/21/11	as	01/21/11	as		
---------------------------	--------------	-----	---	----------	----	----------	----	--	--

Analysis Method: EPA 300.0 Rev. 2.1

Batch: T021087

Nitrate as N	<0.10 mg/L	0.10	5	01/21/11	bd	01/21/11	bd		
Nitrite as N	<0.10 mg/L	0.10	5	01/21/11	bd	01/21/11	bd		

Analysis Method: EPA 350.1 Rev. 2.0

Batch: T021108

Ammonia as N	<0.010 mg/L	0.010	1	01/24/11	sm	01/24/11	sm		
--------------	-------------	-------	---	----------	----	----------	----	--	--

Analysis Method: EPA 410.4 Rev. 2.0

Batch: T021156

Chemical Oxygen Demand	1000 mg/L	97	25	01/26/11	sm	01/27/11	sm		
------------------------	-----------	----	----	----------	----	----------	----	--	--

Analysis Method: EPA 9040C

Batch: T021085

Corrosivity-pH	7.40 pH Units		1	01/21/11	bd	01/21/11	bd	N	
----------------	---------------	--	---	----------	----	----------	----	---	--

Analysis Method: SM 4500-Cl- E, 20th

Batch: T021111

Chloride	28 mg/L	10	1	01/24/11	bd	01/24/11	bd	N	
----------	---------	----	---	----------	----	----------	----	---	--

Analysis Method: SM 5210 B-01

Batch: T021084

Biochemical Oxygen Demand 5-day	570 mg/L	2.0	1	01/21/11	sm	01/26/11	sm		
---------------------------------	----------	-----	---	----------	----	----------	----	--	--

Analysis Method: SM 5310 D-00

Batch: T021089

Dissolved Organic Carbon	420 mg/L	8.5	25	01/21/11	da	01/27/11	da	N	
--------------------------	----------	-----	----	----------	----	----------	----	---	--

### CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.





the science of compliance

phone 231.773.5998
toll-free 800.733.5998
fax 231.773.6537

Trace Analytical Laboratories, Inc.
2241 Black Creek Road
Muskegon, MI 49444-2673
info@trace-labs.com
www.trace-labs.com



the science of compliance

phone 231-773-5998
toll-free 800-733-5998
fax 231-773-6537

Trace Analytical Laboratories, Inc.
2241 Black Creek Road
Muskegon, MI 49444-2673
www.trace-labs.com

CHAIN-OF-CUSTODY RECORD

Page 1 of 2

TRACE ID NO. T11A168

Client Name: LEI
Contact Person: JDEE KENYON
Mailing Address:
City, State, Zip Code:
Phone:
Fax:
Email Address:
Cell #:
Project Name & #: LEI SUBV STUDY 10-625
Billing Address (if different):
City, State, Zip Code:
Attn:
Phone:
PO #:

TRACE USE ONLY
Logged By: PJS
Received on ice: Yes
Preservative Checked: Yes
Soil Volatiles Preserved: MeOH Low Level Lab Sampling Time:
Regulatory Requirements:
Turnaround Requirements:
Matrix Key:
ANALYSIS REQUESTED

Table with columns: TRACE NO., DATE TAKEN, TIME TAKEN, METALS FIELD FILTERED, CLIENT SAMPLE ID, MATRIX, NUMBER OF CONTAINERS, RELEASED BY, RECEIVED BY, DATE, TIME. Includes handwritten entries for items 01-10 and remarks like 'BAD COD', 'TIN', 'PH', 'SPECIFIC CONDS', 'PH', 'DAG', 'NAG', 'CI'.

In executing this Chain of Custody the client acknowledges acceptance of the terms and conditions of the agreement as set forth at http://www.trace-labs.com/condterms.htm

CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.



the science of compliance

phone 231.773.5998
toll-free 800.733.5998
fax 231.773.6537

Trace Analytical Laboratories, Inc.
2241 Black Creek Road
Muskegon, MI 49444-2673
info@trace-labs.com
www.trace-labs.com



the science of compliance

phone 231.773.5998
toll-free 800.733.5998
fax 231.773.6537

Trace Analytical Laboratories, Inc.
2241 Black Creek Road
Muskegon, MI 49444-2673
www.trace-labs.com

CHAIN-OF-CUSTODY RECORD

Page 2 of 2

TRACE ID NO. T11A168

Client Name: LEI
Contract Person: JANEL KENYON
Mailing Address:
City, State, Zip Code:
Phone:
Email Address:
Cell #:
Project Name & #: LEI SHOW STUDY 10-625

Bill To:
Billing Address (if different):
City, State, Zip Code:
Attn:
Phone:
PO #:

Table with columns: TRACE NO., DATE TAKEN, TIME TAKEN, METALS FIELD FILTERED, CLIENT SAMPLE ID, MATRIX, NUMBER OF CONTAINERS. Row 1: 11, 1/20/11, 1330, FRESH, 53.

Regulatory Requirements: MEHA TMDL's, Drinking Water, NPDES, USACE, Special. Turnaround Requirements: 3-4 Day (RUSH)\*, 24-48 Hour (RUSH)\*. Matrix Key: S=Soil, W=Water, SE=Sediment, OI=Oil, SO=Solid Waste.

Table with columns: Item #, RELEASED BY, RECEIVED BY, DATE, TIME, Item #, RELEASED BY, RECEIVED BY, DATE, TIME. Includes handwritten signatures and dates.

In executing this Chain of Custody the client acknowledges acceptance of the terms and conditions of the agreement as set forth at http://www.trace-labs.com/forms/nhn

CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.

**SAMPLE LOG IN CHECKLIST**

Date: 1/20/11 Client Name: LET # of Coolers: 1  
Trace ID #: T11A168 Project Name: STUDY - SNOW Cooler #s: \_\_\_\_\_  
Logged in by: RAS Cooler #s: \_\_\_\_\_

**Cooler Receipt**

Cooler/samples delivered by: Trace courier  Hand delivered  Commercial courier  Name of delivery person: AG  
UPS  DHL  FED EX  US Mail   
Did cooler come with a bill of lading? No  Yes   Not Applicable  
Way Bill or Tracking #: \_\_\_\_\_  
COC Seals present and intact on cooler? No  Yes   Not Applicable  
Custody seals signed by Client? No  Yes  Client custody seal # (if applicable): \_\_\_\_\_

**Coolant and Temperature**

Type of Coolant Used	Yes	No	Cooler Temperature	Correction Factor $\pm 0.2$ °C
Slurry w/ crushed, cubed, or chip ice?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Date: <u>1/20/11</u>	Time: <u>14:59</u>
Multiple bags of ice around samples?	<input type="checkbox"/>	<input type="checkbox"/>	Temperature Blank: _____ °C	
Ice Packs/ Blue Ice :	<input type="checkbox"/>	<input type="checkbox"/>	Range of 3 samples: _____ °C	
No Coolant Present:	<input type="checkbox"/>	<input type="checkbox"/>	Melt Water: _____ °C	
			Ice still present upon receipt: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	

**General**

	Yes	No	NA
COC taped to inside of cooler lid?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
All bottles arrived unbroken with labels in good condition?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Each sample point is in a sealed plastic bag?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Labels filled out completely?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
All bottle labels agree with Chain of Custody (COC)?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sufficient sample to run tests requested?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
pH checked and samples at correct pH?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Correct preservative added to samples?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DRO/GRO samples received and appropriate check in form completed?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Air bubbles absent from VOAs?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
COC filled out properly and signed by client?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
COC signed in by TRACE sample custodian?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Was project manager called and samples discussed?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Contact: \_\_\_\_\_ Date: \_\_\_\_\_

**Notes:**

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**CERTIFICATE OF ANALYSIS**

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.

January 25, 2011

Mr. Joel Kenyon  
Lakeshore Environmental, Inc.  
803 Verhoeks Street  
Grand Haven, MI 49417

Phone: (616) 844-5050  
Fax: (616) 844-5053

RE: Trace Project T11A137  
Client Project LEI Snow Study 10-600 USDA

Dear Mr. Kenyon:

Enclosed are your analytical results. The results of this report relate only to the samples listed in the body of this report.

All reports were examined through Trace's validation process to ensure that requirements for quality and completeness were satisfied. All reported analytical results were obtained in accordance with the methods referenced on the reports. Every practical effort was made to meet the reporting limit specifications for this work, however, some results may have raised reporting limits to correct for percent solids.

For clients that require NELAC Accreditation, Trace certifies that these test results meet all requirements of the NELAC Standard, except for those analytes with a "N" notation. These analytes have not been evaluated by NELAC at Trace's discretion and will not be reported unless requested by client.

If you have questions concerning this report, please contact me at 231.773.5998 or by email at [jmink@trace-labs.com](mailto:jmink@trace-labs.com).

Sincerely,



Jon Mink  
Project Manager

Enclosures



ILEPA Accreditation No. 100318 NJDEP Accreditation No. MI008 PADEP Accreditation No. 68-04471

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.



phone 231.773.5998  
toll-free 800.733.5998  
fax 231.773.6537

Trace Analytical Laboratories, Inc.  
2241 Black Creek Road  
Muskegon, MI 49444-2673  
info@trace-labs.com  
www.trace-labs.com

### SAMPLE SUMMARY

Trace Project ID: T11A137  
Client Project ID: LEI Snow Study 10-600 USDA

Trace ID	Sample ID	Matrix	Collected By	Date Collected	Date Received
T11A137-01	Sample A	Wastewater	sjc	01/17/11 16:00	01/18/11 11:25
T11A137-02	Sample B	Wastewater	sjc	01/17/11 16:10	01/18/11 11:25
T11A137-03	Meltwater	Wastewater	sjc	01/17/11 15:30	01/18/11 11:25

### CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.

**AN EXPLANATION OF TERMS AND SYMBOLS WHICH MAY OCCUR IN THIS REPORT**

**DEFINITIONS**

LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
MS	Matrix Spike
MSD	Matrix Spike Duplicate
RPD	Relative Percent Difference
DUP	Matrix Duplicate
RDL	Reporting Detection Limit
MCL	Maximum Contamination Limit
TIC	Tentatively Identified Compound
<, ND or U	Indicates the compound was analyzed for but not detected
*	Indicates a result that exceeds its associated MCL or Surrogate control limits
N	Indicates that the compound has not been evaluated by NELAC
NA	Indicates that the compound is not available.

**DATA QUALIFIERS**

---

Trace ID: T11A137-03

**Analysis: SM 4500-H+ B-00**

---

**pH**                                      Note pH :    The pH was analyzed at 11:32

**CERTIFICATE OF ANALYSIS**

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.

### ANALYTICAL RESULTS

Trace Project ID: T11A137  
Client Project ID: LEI Snow Study 10-600 USDA

Trace ID: T11A137-01 Date Collected: 01/17/11 16:00 Matrix: Wastewater  
Sample ID: Sample A Date Received: 01/18/11 11:25

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
------------	---------------	-----	----------	----------	----	----------	----	-------	-----

#### METALS, TOTAL

Analysis Method: EPA 200.7 Rev. 4.4

Batch: T021030

Phosphorus	1.1 mg/L	0.050	1	01/19/11	ns	01/19/11	jlm		
Sodium	21 mg/L	1.0	1	01/19/11	ns	01/19/11	jlm		

#### WET CHEMISTRY

Analysis Method: EPA 120.1

Batch: T021023

Specific Conductance (EC)	250 umhos/cm	1.0	1	01/19/11	as	01/19/11	as		
---------------------------	--------------	-----	---	----------	----	----------	----	--	--

Analysis Method: EPA 300.0 Rev. 2.1

Batch: T021013

Nitrate as N	0.16 mg/L	0.10	5	01/18/11	bd	01/18/11	bd		
Nitrite as N	0.23 mg/L	0.10	5	01/18/11	bd	01/18/11	bd		

Analysis Method: EPA 350.1 Rev. 2.0

Batch: T021108

Ammonia as N	0.050 mg/L	0.010	1	01/24/11	sm	01/24/11	sm		
--------------	------------	-------	---	----------	----	----------	----	--	--

Analysis Method: EPA 410.4 Rev. 2.0

Batch: T021036

Chemical Oxygen Demand	320 mg/L	39	10	01/19/11	bd	01/20/11	bd		
------------------------	----------	----	----	----------	----	----------	----	--	--

Analysis Method: EPA 9040C

Batch: T021009

Corrosivity-pH	8.73 pH Units		1	01/18/11	sm	01/18/11	sm	N	
----------------	---------------	--	---	----------	----	----------	----	---	--

Analysis Method: SM 4500-Cl- E, 20th

Batch: T021110

Chloride	12 mg/L	10	1	01/24/11	bd	01/24/11	bd	N	
----------	---------	----	---	----------	----	----------	----	---	--

Analysis Method: SM 5210 B-01

Batch: T021015

Biochemical Oxygen Demand 5-day	310 mg/L	2.0	1	01/19/11	sm	01/24/11	sm		
---------------------------------	----------	-----	---	----------	----	----------	----	--	--

Analysis Method: SM 5310 D-00

Batch: T021064

Dissolved Organic Carbon	120 mg/L	3.4	10	01/20/11	bd	01/20/11	bd	N	
--------------------------	----------	-----	----	----------	----	----------	----	---	--

### CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.



### ANALYTICAL RESULTS

Trace Project ID: T11A137  
Client Project ID: LEI Snow Study 10-600 USDA

Trace ID: T11A137-02 Date Collected: 01/17/11 16:10 Matrix: Wastewater  
Sample ID: Sample B Date Received: 01/18/11 11:25

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
------------	---------------	-----	----------	----------	----	----------	----	-------	-----

#### METALS, TOTAL

Analysis Method: EPA 200.7 Rev. 4.4

Batch: T021030

Phosphorus	0.82 mg/L	0.050	1	01/19/11	ns	01/19/11	jlm		
Sodium	27 mg/L	1.0	1	01/19/11	ns	01/19/11	jlm		

#### WET CHEMISTRY

Analysis Method: EPA 120.1

Batch: T021023

Specific Conductance (EC)	290 umhos/cm	1.0	1	01/19/11	as	01/19/11	as		
---------------------------	--------------	-----	---	----------	----	----------	----	--	--

Analysis Method: EPA 300.0 Rev. 2.1

Batch: T021013

Nitrate as N	0.17 mg/L	0.10	5	01/18/11	bd	01/18/11	bd		
Nitrite as N	<0.10 mg/L	0.10	5	01/18/11	bd	01/18/11	bd		

Analysis Method: EPA 350.1 Rev. 2.0

Batch: T021108

Ammonia as N	0.019 mg/L	0.010	1	01/24/11	sm	01/24/11	sm		
--------------	------------	-------	---	----------	----	----------	----	--	--

Analysis Method: EPA 410.4 Rev. 2.0

Batch: T021036

Chemical Oxygen Demand	340 mg/L	19	5	01/19/11	bd	01/20/11	bd		
------------------------	----------	----	---	----------	----	----------	----	--	--

Analysis Method: EPA 9040C

Batch: T021009

Corrosivity-pH	8.02 pH Units		1	01/18/11	sm	01/18/11	sm	N	
----------------	---------------	--	---	----------	----	----------	----	---	--

Analysis Method: SM 4500-Cl- E, 20th

Batch: T021110

Chloride	13 mg/L	10	1	01/24/11	bd	01/24/11	bd	N	
----------	---------	----	---	----------	----	----------	----	---	--

Analysis Method: SM 5210 B-01

Batch: T021015

Biochemical Oxygen Demand 5-day	320 mg/L	2.0	1	01/19/11	sm	01/24/11	sm		
---------------------------------	----------	-----	---	----------	----	----------	----	--	--

Analysis Method: SM 5310 D-00

Batch: T021064

Dissolved Organic Carbon	99 mg/L	3.4	10	01/20/11	bd	01/20/11	bd	N	
--------------------------	---------	-----	----	----------	----	----------	----	---	--

### CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.



phone 231.773.5998  
 toll-free 800.733.5998  
 fax 231.773.6537

Trace Analytical Laboratories, Inc.  
 2241 Black Creek Road  
 Muskegon, MI 49444-2673  
 info@trace-labs.com  
 www.trace-labs.com

**ANALYTICAL RESULTS**

Trace Project ID: T11A137  
 Client Project ID: LEI Snow Study 10-600 USDA

Trace ID: T11A137-02 Date Collected: 01/17/11 16:10 Matrix: Wastewater  
 Sample ID: Sample B Date Received: 01/18/11 11:25

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED BY	ANALYZED BY	NOTES	MCL
------------	---------------	-----	----------	-------------	-------------	-------	-----

**WET CHEMISTRY**

Analysis Method: Calculation

Batch: [CALC]

Total Inorganic Nitrogen	0.18 mg/L	0.010	5	01/24/11	01/24/11	bd	N
--------------------------	-----------	-------	---	----------	----------	----	---

**CERTIFICATE OF ANALYSIS**

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.

### ANALYTICAL RESULTS

Trace Project ID: T11A137  
Client Project ID: LEI Snow Study 10-600 USDA

Trace ID: T11A137-03 Date Collected: 01/17/11 15:30 Matrix: Wastewater  
Sample ID: Meltwater Date Received: 01/18/11 11:25

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
------------	---------------	-----	----------	----------	----	----------	----	-------	-----

#### METALS, TOTAL

Analysis Method: EPA 200.7 Rev. 4.4

Batch: T021030

Phosphorus	0.20 mg/L	0.050	1	01/19/11	ns	01/19/11	jlm		
Sodium	60 mg/L	1.0	1	01/19/11	ns	01/19/11	jlm		

#### WET CHEMISTRY

Analysis Method: EPA 120.1

Batch: T021023

Specific Conductance (EC)	650 umhos/cm	1.0	1	01/19/11	as	01/19/11	as		
---------------------------	--------------	-----	---	----------	----	----------	----	--	--

Analysis Method: EPA 300.0 Rev. 2.1

Batch: T021013

Nitrate as N	<0.10 mg/L	0.10	5	01/18/11	bd	01/18/11	bd		
Nitrite as N	<0.10 mg/L	0.10	5	01/18/11	bd	01/18/11	bd		

Analysis Method: EPA 350.1 Rev. 2.0

Batch: T021108

Ammonia as N	0.022 mg/L	0.010	1	01/24/11	sm	01/24/11	sm		
--------------	------------	-------	---	----------	----	----------	----	--	--

Analysis Method: EPA 410.4 Rev. 2.0

Batch: T021036

Chemical Oxygen Demand	860 mg/L	97	25	01/19/11	bd	01/20/11	bd		
------------------------	----------	----	----	----------	----	----------	----	--	--

Analysis Method: SM 4500-Cl- E, 20th

Batch: T021110

Chloride	30 mg/L	10	1	01/24/11	bd	01/24/11	bd	N	
----------	---------	----	---	----------	----	----------	----	---	--

Analysis Method: SM 4500-H+ B-00

Batch: T021016

pH	7.09 pH Units		1	01/19/11	js	01/18/11	js	pH	
----	---------------	--	---	----------	----	----------	----	----	--

Analysis Method: SM 5210 B-01

Batch: T021015

Biochemical Oxygen Demand 5-day	500 mg/L	2.0	1	01/19/11	sm	01/24/11	sm		
---------------------------------	----------	-----	---	----------	----	----------	----	--	--

Analysis Method: SM 5310 D-00

Batch: T021064

Dissolved Organic Carbon	350 mg/L	17	50	01/20/11	bd	01/20/11	bd	N	
--------------------------	----------	----	----	----------	----	----------	----	---	--

### CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.



phone 231.773.5998  
 toll-free 800.733.5998  
 fax 231.773.6537

Trace Analytical Laboratories, Inc.  
 2241 Black Creek Road  
 Muskegon, MI 49444-2673  
 info@trace-labs.com  
 www.trace-labs.com

**ANALYTICAL RESULTS**

Trace Project ID: T11A137  
 Client Project ID: LEI Snow Study 10-600 USDA

Trace ID: T11A137-03 Date Collected: 01/17/11 15:30 Matrix: Wastewater  
 Sample ID: Meltwater Date Received: 01/18/11 11:25

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED BY	ANALYZED BY	NOTES	MCL
------------	---------------	-----	----------	-------------	-------------	-------	-----

**WET CHEMISTRY**

Analysis Method: Calculation

Batch: [CALC]

Total Inorganic Nitrogen	0.022 mg/L	0.010	5	01/24/11	01/24/11	bd	N
--------------------------	------------	-------	---	----------	----------	----	---

**CERTIFICATE OF ANALYSIS**

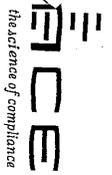
This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.



the science of compliance

phone 231.773.5998
toll-free 800.733.5998
fax 231.773.6537

Trace Analytical Laboratories, Inc.
2241 Black Creek Road
Muskegon, MI 49444-2673
info@trace-labs.com
www.trace-labs.com



phone 231.773.5998
toll-free 800.733.5998
fax 231.773.6537

Trace Analytical Laboratories, Inc.
2241 Black Creek Road
Muskegon, MI 49444-2673
www.trace-labs.com

CHAIN-OF-CUSTODY RECORD

TRACE ID NO. T11A137

Page 1 of 1

Client Name: LAKE SHORE ENVIRONMENTAL
Contact Person: JOEL KEYSON
Mailing Address: 803 WOODHURST
City, State, Zip Code: GRAND HAVEN, MI 49417
Phone: 616.844.5050 Fax:
Email Address: JOELKEYSON@LAKEHARBORENVIRONMENTAL.COM
Cell #: 517-242-8803
Project Name & #:
Billing Address: (if different)
City, State, Zip Code
Attn:
Phone:
PO #:

Report Results To:

Sampled by: SJC

TRACE USE ONLY
Logged By: [Signature]
Received on Ice: Yes No
Preservative Checked: Yes No N/A
Soil Volatiles Preserved: MeOH Low Level Lab Sampling Time:

Regulatory Requirements
MEPA TMDLs
Drinking Water
NPDES
USACE
Special
Turnaround Requirements
Standard
3-4 Day (RUSH)\*
24-48 Hour (RUSH)\*
Requires prior approval
Matrix Key
S = Soil
W = Water
SE = Sediment
OI = Oil
SO = Solid Waste
WI = Wipes
LW = Liquid Waste
A = Air
D = Drinking Water
SL = Sludge

ANALYSIS REQUESTED

Table with columns: TRACE NO., DATE TAKEN, TIME TAKEN, METALS FIELD FILTERED, CLIENT SAMPLE ID, MATRIX, NUMBER OF CONTAINERS, REMARKS, Possible Health Hazard, RELEASED BY, RECEIVED BY, DATE, TIME.

CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.

In executing this Chain of Custody, the client acknowledges acceptance of the terms and conditions of the agreement as set forth at http://www.trace-labs.com/loc/terms.php

**SAMPLE LOG IN CHECKLIST**

Date: 1/18/11 Client Name: LEI # of Coolers: \_\_\_\_\_  
Trace ID #: T11A137 Project Name: Snow Study Cooler #s: \_\_\_\_\_  
Logged in by: DS Cooler #s: \_\_\_\_\_

**Cooler Receipt**

Cooler/samples delivered by: Trace courier   
Hand delivered  Name of delivery person: \_\_\_\_\_  
Commercial courier  UPS  DHL  FED EX  US Mail   
Did cooler come with a bill of lading? No  Yes  Not Applicable   
Way Bill or Tracking #: \_\_\_\_\_  
COC Seals present and intact on cooler? No  Yes  Not Applicable   
Custody seals signed by Client? No  Yes  Client custody seal # (if applicable): \_\_\_\_\_

**Coolant and Temperature**

Type of Coolant Used		Cooler Temperature	Correction Factor
Slurry w/ crushed, cubed, or chip ice?	Yes <input type="checkbox"/> No <input type="checkbox"/>	Date: <u>1/18/11</u>	Time: <u>11:25</u> °C
Multiple bags of ice around samples?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/>	Temperature Blank: _____ °C	Range of 3 samples: <u>8</u> °C
Ice Packs/ Blue Ice :	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/>	Melt Water: _____ °C	Ice still present upon receipt: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
No Coolant Present:	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/>		

**General**

	Yes	No	NA
COC taped to inside of cooler lid?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
All bottles arrived unbroken with labels in good condition?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Each sample point is in a sealed plastic bag?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Labels filled out completely?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
All bottle labels agree with Chain of Custody (COC)?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sufficient sample to run tests requested?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
pH checked and samples at correct pH?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Correct preservative added to samples?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DRO/GRO samples received and appropriate check in form completed?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Air bubbles absent from VOAs?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
COC filled out properly and signed by client?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
COC signed in by TRACE sample custodian?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Was project manager called and samples discussed?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Contact: \_\_\_\_\_ Date: \_\_\_\_\_

**Notes:**

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**CERTIFICATE OF ANALYSIS**

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.

January 18, 2011

Mr. Joel Kenyon  
Lakeshore Environmental, Inc.  
803 Verhoeks Street  
Grand Haven, MI 49417

Phone: (616) 844-5050  
Fax: (616) 844-5053

RE: Trace Project T11A085  
Client Project LEI Snow Study 10-600 USDA

Dear Mr. Kenyon:

Enclosed are your analytical results. The results of this report relate only to the samples listed in the body of this report.

All reports were examined through Trace's validation process to ensure that requirements for quality and completeness were satisfied. All reported analytical results were obtained in accordance with the methods referenced on the reports. Every practical effort was made to meet the reporting limit specifications for this work, however, some results may have raised reporting limits to correct for percent solids.

For clients that require NELAC Accreditation, Trace certifies that these test results meet all requirements of the NELAC Standard, except for those analytes with a "N" notation. These analytes have not been evaluated by NELAC at Trace's discretion and will not be reported unless requested by client.

If you have questions concerning this report, please contact me at 231.773.5998 or by email at [jmink@trace-labs.com](mailto:jmink@trace-labs.com).

Sincerely,



Jon Mink  
Project Manager

Enclosures



ILEPA Accreditation No. 100318 NJDEP Accreditation No. MI008 PADEP Accreditation No. 68-04471

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.



phone 231.773.5998  
toll-free 800.733.5998  
fax 231.773.6537

Trace Analytical Laboratories, Inc.  
2241 Black Creek Road  
Muskegon, MI 49444-2673  
info@trace-labs.com  
www.trace-labs.com

### SAMPLE SUMMARY

Trace Project ID: T11A085  
Client Project ID: LEI Snow Study 10-600 USDA

Trace ID	Sample ID	Matrix	Collected By	Date Collected	Date Received
T11A085-01	A18	Aqueous	awg	01/11/11 10:40	01/11/11 14:52
T11A085-02	A9	Aqueous	awg	01/11/11 10:45	01/11/11 14:52
T11A085-03	A0	Aqueous	awg	01/11/11 10:50	01/11/11 14:52
T11A085-04	B1.0	Aqueous	awg	01/11/11 10:55	01/11/11 14:52
T11A085-05	B.6	Aqueous	awg	01/11/11 11:00	01/11/11 14:52
T11A085-06	B0	Aqueous	awg	01/11/11 11:05	01/11/11 14:52
T11A085-07	Influent	Aqueous	awg	01/11/11 12:50	01/11/11 14:52
T11A085-08	Fresh	Aqueous	awg	01/11/11 13:30	01/11/11 14:52
T11A085-09	Combined A	Aqueous	awg	01/11/11 11:55	01/11/11 14:52
T11A085-10	Combined B	Aqueous	awg	01/11/11 12:00	01/11/11 14:52

### CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.

## AN EXPLANATION OF TERMS AND SYMBOLS WHICH MAY OCCUR IN THIS REPORT

### DEFINITIONS

LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
MS	Matrix Spike
MSD	Matrix Spike Duplicate
RPD	Relative Percent Difference
DUP	Matrix Duplicate
RDL	Reporting Detection Limit
MCL	Maximum Contamination Limit
TIC	Tentatively Identified Compound
<, ND or U	Indicates the compound was analyzed for but not detected
*	Indicates a result that exceeds its associated MCL or Surrogate control limits
N	Indicates that the compound has not been evaluated by NELAC
NA	Indicates that the compound is not available.

### DATA QUALIFIERS

### CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.

### ANALYTICAL RESULTS

Trace Project ID: T11A085  
Client Project ID: LEI Snow Study 10-600 USDA

Trace ID: T11A085-01 Date Collected: 01/11/11 10:40 Matrix: Aqueous  
Sample ID: A18 Date Received: 01/11/11 14:52

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
------------	---------------	-----	----------	----------	----	----------	----	-------	-----

#### METALS, TOTAL

Analysis Method: EPA 200.7 Rev. 4.4

Batch: T020928

Phosphorus	0.97 mg/L	0.050	1	01/12/11	ns	01/13/11	jlm		
Sodium	44 mg/L	1.0	1	01/12/11	ns	01/13/11	jlm		

#### WET CHEMISTRY

Analysis Method: EPA 120.1

Batch: T020930

Specific Conductance (EC)	400 umhos/cm	1.0	1	01/12/11	sm	01/12/11	sm		
---------------------------	--------------	-----	---	----------	----	----------	----	--	--

Analysis Method: EPA 300.0 Rev. 2.1

Batch: T020916

Nitrate as N	1.5 mg/L	0.10	5	01/12/11	bd	01/12/11	bd		
Nitrite as N	<0.10 mg/L	0.10	5	01/12/11	bd	01/12/11	bd		

Analysis Method: EPA 350.1 Rev. 2.0

Batch: T020987

Ammonia as N	0.16 mg/L	0.010	1	01/17/11	da	01/17/11	da		
--------------	-----------	-------	---	----------	----	----------	----	--	--

Analysis Method: EPA 410.4 Rev. 2.0

Batch: T020939

Chemical Oxygen Demand	690 mg/L	390	100	01/12/11	sm	01/13/11	sm		
------------------------	----------	-----	-----	----------	----	----------	----	--	--

Analysis Method: EPA 9040C

Batch: T020933

Corrosivity-pH	9.89 pH Units		1	01/12/11	as	01/12/11	as	N	
----------------	---------------	--	---	----------	----	----------	----	---	--

Analysis Method: SM 4500-Cl- E, 20th

Batch: T020965

Chloride	26 mg/L	10	1	01/14/11	bd	01/14/11	bd	N	
----------	---------	----	---	----------	----	----------	----	---	--

Analysis Method: SM 5210 B-01

Batch: T020917

Biochemical Oxygen Demand 5-day	370 mg/L	2.0	1	01/12/11	sm	01/17/11	sm		
---------------------------------	----------	-----	---	----------	----	----------	----	--	--

Analysis Method: SM 5310 D-00

Batch: T020919

Dissolved Organic Carbon	220 mg/L	34	100	01/12/11	da	01/12/11	da	N	
--------------------------	----------	----	-----	----------	----	----------	----	---	--

### CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.



### ANALYTICAL RESULTS

Trace Project ID: T11A085  
Client Project ID: LEI Snow Study 10-600 USDA

Trace ID: T11A085-02 Date Collected: 01/11/11 10:45 Matrix: Aqueous  
Sample ID: A9 Date Received: 01/11/11 14:52

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
------------	---------------	-----	----------	----------	----	----------	----	-------	-----

#### METALS, TOTAL

Analysis Method: EPA 200.7 Rev. 4.4

Batch: T020928

Phosphorus	0.86 mg/L	0.050	1	01/12/11	ns	01/13/11	jlm		
Sodium	38 mg/L	1.0	1	01/12/11	ns	01/13/11	jlm		

#### WET CHEMISTRY

Analysis Method: EPA 120.1

Batch: T020930

Specific Conductance (EC)	360 umhos/cm	1.0	1	01/12/11	sm	01/12/11	sm		
---------------------------	--------------	-----	---	----------	----	----------	----	--	--

Analysis Method: EPA 300.0 Rev. 2.1

Batch: T020916

Nitrate as N	1.1 mg/L	0.10	5	01/12/11	bd	01/12/11	bd		
Nitrite as N	0.36 mg/L	0.10	5	01/12/11	bd	01/12/11	bd		

Analysis Method: EPA 350.1 Rev. 2.0

Batch: T020987

Ammonia as N	0.13 mg/L	0.010	1	01/17/11	da	01/17/11	da		
--------------	-----------	-------	---	----------	----	----------	----	--	--

Analysis Method: EPA 410.4 Rev. 2.0

Batch: T020939

Chemical Oxygen Demand	590 mg/L	390	100	01/12/11	sm	01/13/11	sm		
------------------------	----------	-----	-----	----------	----	----------	----	--	--

Analysis Method: EPA 9040C

Batch: T020933

Corrosivity-pH	9.96 pH Units		1	01/12/11	as	01/12/11	as	N	
----------------	---------------	--	---	----------	----	----------	----	---	--

Analysis Method: SM 4500-Cl- E, 20th

Batch: T020965

Chloride	19 mg/L	10	1	01/14/11	bd	01/14/11	bd	N	
----------	---------	----	---	----------	----	----------	----	---	--

Analysis Method: SM 5210 B-01

Batch: T020917

Biochemical Oxygen Demand 5-day	290 mg/L	2.0	1	01/12/11	sm	01/17/11	sm		
---------------------------------	----------	-----	---	----------	----	----------	----	--	--

Analysis Method: SM 5310 D-00

Batch: T020919

Dissolved Organic Carbon	210 mg/L	34	100	01/12/11	da	01/12/11	da	N	
--------------------------	----------	----	-----	----------	----	----------	----	---	--

### CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.



### ANALYTICAL RESULTS

Trace Project ID: T11A085  
Client Project ID: LEI Snow Study 10-600 USDA

Trace ID: T11A085-03 Date Collected: 01/11/11 10:50 Matrix: Aqueous  
Sample ID: A0 Date Received: 01/11/11 14:52

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
------------	---------------	-----	----------	----------	----	----------	----	-------	-----

#### METALS, TOTAL

Analysis Method: EPA 200.7 Rev. 4.4

Batch: T020928

Phosphorus	1.3 mg/L	0.050	1	01/12/11	ns	01/13/11	jlm		
Sodium	53 mg/L	1.0	1	01/12/11	ns	01/13/11	jlm		

#### WET CHEMISTRY

Analysis Method: EPA 120.1

Batch: T020930

Specific Conductance (EC)	460 umhos/cm	1.0	1	01/12/11	sm	01/12/11	sm		
---------------------------	--------------	-----	---	----------	----	----------	----	--	--

Analysis Method: EPA 300.0 Rev. 2.1

Batch: T020916

Nitrate as N	1.4 mg/L	0.10	5	01/12/11	bd	01/12/11	bd		
Nitrite as N	0.56 mg/L	0.10	5	01/12/11	bd	01/12/11	bd		

Analysis Method: EPA 350.1 Rev. 2.0

Batch: T020987

Ammonia as N	0.39 mg/L	0.010	1	01/17/11	da	01/17/11	da		
--------------	-----------	-------	---	----------	----	----------	----	--	--

Analysis Method: EPA 410.4 Rev. 2.0

Batch: T020939

Chemical Oxygen Demand	820 mg/L	97	25	01/12/11	sm	01/13/11	sm		
------------------------	----------	----	----	----------	----	----------	----	--	--

Analysis Method: EPA 9040C

Batch: T020933

Corrosivity-pH	9.89 pH Units		1	01/12/11	as	01/12/11	as	N	
----------------	---------------	--	---	----------	----	----------	----	---	--

Analysis Method: SM 4500-Cl- E, 20th

Batch: T020965

Chloride	23 mg/L	10	1	01/14/11	bd	01/14/11	bd	N	
----------	---------	----	---	----------	----	----------	----	---	--

Analysis Method: SM 5210 B-01

Batch: T020917

Biochemical Oxygen Demand 5-day	410 mg/L	2.0	1	01/12/11	sm	01/17/11	sm		
---------------------------------	----------	-----	---	----------	----	----------	----	--	--

Analysis Method: SM 5310 D-00

Batch: T020919

Dissolved Organic Carbon	290 mg/L	34	100	01/12/11	da	01/12/11	da	N	
--------------------------	----------	----	-----	----------	----	----------	----	---	--

### CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.



### ANALYTICAL RESULTS

Trace Project ID: T11A085  
Client Project ID: LEI Snow Study 10-600 USDA

Trace ID: T11A085-04 Date Collected: 01/11/11 10:55 Matrix: Aqueous  
Sample ID: B1.0 Date Received: 01/11/11 14:52

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
------------	---------------	-----	----------	----------	----	----------	----	-------	-----

#### METALS, TOTAL

Analysis Method: EPA 200.7 Rev. 4.4

Batch: T020928

Phosphorus	<0.050 mg/L	0.050	1	01/12/11	ns	01/13/11	jlm		
Sodium	<1.0 mg/L	1.0	1	01/12/11	ns	01/13/11	jlm		

#### WET CHEMISTRY

Analysis Method: EPA 120.1

Batch: T020930

Specific Conductance (EC)	9.0 umhos/cm	1.0	1	01/12/11	sm	01/12/11	sm		
---------------------------	--------------	-----	---	----------	----	----------	----	--	--

Analysis Method: EPA 300.0 Rev. 2.1

Batch: T020916

Nitrate as N	0.26 mg/L	0.10	5	01/12/11	bd	01/12/11	bd		
Nitrite as N	<0.10 mg/L	0.10	5	01/12/11	bd	01/12/11	bd		

Analysis Method: EPA 350.1 Rev. 2.0

Batch: T020987

Ammonia as N	0.11 mg/L	0.010	1	01/17/11	da	01/17/11	da		
--------------	-----------	-------	---	----------	----	----------	----	--	--

Analysis Method: EPA 410.4 Rev. 2.0

Batch: T020939

Chemical Oxygen Demand	<5.0 mg/L	5.0	1	01/12/11	sm	01/13/11	sm		
------------------------	-----------	-----	---	----------	----	----------	----	--	--

Analysis Method: EPA 9040C

Batch: T020933

Corrosivity-pH	6.32 pH Units		1	01/12/11	as	01/12/11	as		N
----------------	---------------	--	---	----------	----	----------	----	--	---

Analysis Method: SM 4500-Cl- E, 20th

Batch: T020965

Chloride	<10 mg/L	10	1	01/14/11	bd	01/14/11	bd		N
----------	----------	----	---	----------	----	----------	----	--	---

Analysis Method: SM 5210 B-01

Batch: T020917

Biochemical Oxygen Demand 5-day	<4.0 mg/L	4.0	4	01/12/11	sm	01/17/11	sm		
---------------------------------	-----------	-----	---	----------	----	----------	----	--	--

Analysis Method: SM 5310 D-00

Batch: T020919

Dissolved Organic Carbon	1.2 mg/L	0.50	1	01/12/11	da	01/13/11	da		N
--------------------------	----------	------	---	----------	----	----------	----	--	---

### CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.



### ANALYTICAL RESULTS

Trace Project ID: T11A085  
Client Project ID: LEI Snow Study 10-600 USDA

Trace ID: T11A085-05 Date Collected: 01/11/11 11:00 Matrix: Aqueous  
Sample ID: B.6 Date Received: 01/11/11 14:52

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
------------	---------------	-----	----------	----------	----	----------	----	-------	-----

#### METALS, TOTAL

Analysis Method: EPA 200.7 Rev. 4.4

Batch: T020928

Phosphorus	0.55 mg/L	0.050	1	01/12/11	ns	01/13/11	jlm		
Sodium	15 mg/L	1.0	1	01/12/11	ns	01/13/11	jlm		

#### WET CHEMISTRY

Analysis Method: EPA 120.1

Batch: T020930

Specific Conductance (EC)	160 umhos/cm	1.0	1	01/12/11	sm	01/12/11	sm		
---------------------------	--------------	-----	---	----------	----	----------	----	--	--

Analysis Method: EPA 300.0 Rev. 2.1

Batch: T020916

Nitrate as N	0.33 mg/L	0.10	5	01/12/11	bd	01/12/11	bd		
Nitrite as N	0.26 mg/L	0.10	5	01/12/11	bd	01/12/11	bd		

Analysis Method: EPA 350.1 Rev. 2.0

Batch: T020987

Ammonia as N	0.053 mg/L	0.010	1	01/17/11	da	01/17/11	da		
--------------	------------	-------	---	----------	----	----------	----	--	--

Analysis Method: EPA 410.4 Rev. 2.0

Batch: T020939

Chemical Oxygen Demand	260 mg/L	39	10	01/12/11	sm	01/13/11	sm		
------------------------	----------	----	----	----------	----	----------	----	--	--

Analysis Method: EPA 9040C

Batch: T020933

Corrosivity-pH	9.34 pH Units		1	01/12/11	as	01/12/11	as	N	
----------------	---------------	--	---	----------	----	----------	----	---	--

Analysis Method: SM 4500-Cl- E, 20th

Batch: T020965

Chloride	<10 mg/L	10	1	01/14/11	bd	01/14/11	bd	N	
----------	----------	----	---	----------	----	----------	----	---	--

Analysis Method: SM 5210 B-01

Batch: T020917

Biochemical Oxygen Demand 5-day	96 mg/L	2.0	1	01/12/11	sm	01/17/11	sm		
---------------------------------	---------	-----	---	----------	----	----------	----	--	--

Analysis Method: SM 5310 D-00

Batch: T020919

Dissolved Organic Carbon	79 mg/L	3.4	10	01/12/11	da	01/13/11	da	N	
--------------------------	---------	-----	----	----------	----	----------	----	---	--

### CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.



### ANALYTICAL RESULTS

Trace Project ID: T11A085  
Client Project ID: LEI Snow Study 10-600 USDA

Trace ID: T11A085-06 Date Collected: 01/11/11 11:05 Matrix: Aqueous  
Sample ID: B0 Date Received: 01/11/11 14:52

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
------------	---------------	-----	----------	----------	----	----------	----	-------	-----

#### METALS, TOTAL

Analysis Method: EPA 200.7 Rev. 4.4

Batch: T020928

Phosphorus	1.3 mg/L	0.050	1	01/12/11	ns	01/13/11	jlm		
Sodium	24 mg/L	1.0	1	01/12/11	ns	01/13/11	jlm		

#### WET CHEMISTRY

Analysis Method: EPA 120.1

Batch: T020930

Specific Conductance (EC)	240 umhos/cm	1.0	1	01/12/11	sm	01/12/11	sm		
---------------------------	--------------	-----	---	----------	----	----------	----	--	--

Analysis Method: EPA 300.0 Rev. 2.1

Batch: T020916

Nitrate as N	0.18 mg/L	0.10	5	01/12/11	bd	01/12/11	bd		
Nitrite as N	<0.10 mg/L	0.10	5	01/12/11	bd	01/12/11	bd		

Analysis Method: EPA 350.1 Rev. 2.0

Batch: T020987

Ammonia as N	0.066 mg/L	0.010	1	01/17/11	da	01/17/11	da		
--------------	------------	-------	---	----------	----	----------	----	--	--

Analysis Method: EPA 410.4 Rev. 2.0

Batch: T020939

Chemical Oxygen Demand	320 mg/L	39	10	01/12/11	sm	01/13/11	sm		
------------------------	----------	----	----	----------	----	----------	----	--	--

Analysis Method: EPA 9040C

Batch: T020933

Corrosivity-pH	9.00 pH Units		1	01/12/11	as	01/12/11	as	N	
----------------	---------------	--	---	----------	----	----------	----	---	--

Analysis Method: SM 4500-Cl- E, 20th

Batch: T020965

Chloride	11 mg/L	10	1	01/14/11	bd	01/14/11	bd	N	
----------	---------	----	---	----------	----	----------	----	---	--

Analysis Method: SM 5210 B-01

Batch: T020917

Biochemical Oxygen Demand 5-day	130 mg/L	2.0	1	01/12/11	sm	01/17/11	sm		
---------------------------------	----------	-----	---	----------	----	----------	----	--	--

Analysis Method: SM 5310 D-00

Batch: T020919

Dissolved Organic Carbon	130 mg/L	34	100	01/12/11	da	01/12/11	da	N	
--------------------------	----------	----	-----	----------	----	----------	----	---	--

### CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.



### ANALYTICAL RESULTS

Trace Project ID: T11A085  
Client Project ID: LEI Snow Study 10-600 USDA

Trace ID: T11A085-07 Date Collected: 01/11/11 12:50 Matrix: Aqueous  
Sample ID: Influent Date Received: 01/11/11 14:52

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED BY	ANALYZED BY	NOTES	MCL
------------	---------------	-----	----------	-------------	-------------	-------	-----

#### METALS, TOTAL

Analysis Method: EPA 200.7 Rev. 4.4

Batch: T020928

Phosphorus	2.4 mg/L	0.050	1	01/12/11	ns	01/13/11	jlm
Sodium	53 mg/L	1.0	1	01/12/11	ns	01/13/11	jlm

#### WET CHEMISTRY

Analysis Method: EPA 120.1

Batch: T020930

Specific Conductance (EC)	630 umhos/cm	1.0	1	01/12/11	sm	01/12/11	sm
---------------------------	--------------	-----	---	----------	----	----------	----

Analysis Method: EPA 300.0 Rev. 2.1

Batch: T020916

Nitrate as N	<0.10 mg/L	0.10	5	01/12/11	bd	01/12/11	bd
Nitrite as N	<0.10 mg/L	0.10	5	01/12/11	bd	01/12/11	bd

Analysis Method: EPA 350.1 Rev. 2.0

Batch: T020987

Ammonia as N	0.092 mg/L	0.010	1	01/17/11	da	01/17/11	da
--------------	------------	-------	---	----------	----	----------	----

Analysis Method: EPA 410.4 Rev. 2.0

Batch: T020939

Chemical Oxygen Demand	1300 mg/L	190	50	01/12/11	sm	01/13/11	sm
------------------------	-----------	-----	----	----------	----	----------	----

Analysis Method: EPA 9040C

Batch: T020933

Corrosivity-pH	6.20 pH Units		1	01/12/11	as	01/12/11	as	N
----------------	---------------	--	---	----------	----	----------	----	---

Analysis Method: SM 4500-Cl- E, 20th

Batch: T020965

Chloride	29 mg/L	10	1	01/14/11	bd	01/14/11	bd	N
----------	---------	----	---	----------	----	----------	----	---

Analysis Method: SM 5210 B-01

Batch: T020917

Biochemical Oxygen Demand 5-day	760 mg/L	2.0	1	01/12/11	sm	01/17/11	sm
---------------------------------	----------	-----	---	----------	----	----------	----

Analysis Method: SM 5310 D-00

Batch: T020919

Dissolved Organic Carbon	370 mg/L	34	100	01/12/11	da	01/12/11	da	N
--------------------------	----------	----	-----	----------	----	----------	----	---

### CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.



### ANALYTICAL RESULTS

Trace Project ID: T11A085  
Client Project ID: LEI Snow Study 10-600 USDA

Trace ID: T11A085-08 Date Collected: 01/11/11 13:30 Matrix: Aqueous  
Sample ID: Fresh Date Received: 01/11/11 14:52

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
------------	---------------	-----	----------	----------	----	----------	----	-------	-----

#### METALS, TOTAL

Analysis Method: EPA 200.7 Rev. 4.4

Batch: T020928

Phosphorus	2.3 mg/L	0.050	1	01/12/11	ns	01/13/11	jlm		
Sodium	52 mg/L	1.0	1	01/12/11	ns	01/13/11	jlm		

#### WET CHEMISTRY

Analysis Method: EPA 120.1

Batch: T020930

Specific Conductance (EC)	600 umhos/cm	1.0	1	01/12/11	sm	01/12/11	sm		
---------------------------	--------------	-----	---	----------	----	----------	----	--	--

Analysis Method: EPA 300.0 Rev. 2.1

Batch: T020916

Nitrate as N	<0.10 mg/L	0.10	5	01/12/11	bd	01/12/11	bd		
Nitrite as N	<0.10 mg/L	0.10	5	01/12/11	bd	01/12/11	bd		

Analysis Method: EPA 350.1 Rev. 2.0

Batch: T020987

Ammonia as N	0.076 mg/L	0.010	1	01/17/11	da	01/17/11	da		
--------------	------------	-------	---	----------	----	----------	----	--	--

Analysis Method: EPA 410.4 Rev. 2.0

Batch: T020939

Chemical Oxygen Demand	1200 mg/L	190	50	01/12/11	sm	01/13/11	sm		
------------------------	-----------	-----	----	----------	----	----------	----	--	--

Analysis Method: EPA 9040C

Batch: T020933

Corrosivity-pH	6.52 pH Units		1	01/12/11	as	01/12/11	as		N
----------------	---------------	--	---	----------	----	----------	----	--	---

Analysis Method: SM 4500-Cl- E, 20th

Batch: T020965

Chloride	27 mg/L	10	1	01/14/11	bd	01/14/11	bd		N
----------	---------	----	---	----------	----	----------	----	--	---

Analysis Method: SM 5210 B-01

Batch: T020917

Biochemical Oxygen Demand 5-day	760 mg/L	2.0	1	01/12/11	sm	01/17/11	sm		
---------------------------------	----------	-----	---	----------	----	----------	----	--	--

Analysis Method: SM 5310 D-00

Batch: T020919

Dissolved Organic Carbon	360 mg/L	34	100	01/12/11	da	01/12/11	da		N
--------------------------	----------	----	-----	----------	----	----------	----	--	---

### CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.



### ANALYTICAL RESULTS

Trace Project ID: T11A085  
Client Project ID: LEI Snow Study 10-600 USDA

Trace ID: T11A085-09 Date Collected: 01/11/11 11:55 Matrix: Aqueous  
Sample ID: Combined A Date Received: 01/11/11 14:52

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
------------	---------------	-----	----------	----------	----	----------	----	-------	-----

#### METALS, TOTAL

Analysis Method: EPA 200.7 Rev. 4.4

Batch: T020928

Phosphorus	0.59 mg/L	0.050	1	01/12/11	ns	01/13/11	jlm		
Sodium	27 mg/L	1.0	1	01/12/11	ns	01/13/11	jlm		

#### WET CHEMISTRY

Analysis Method: EPA 120.1

Batch: T020930

Specific Conductance (EC)	270 umhos/cm	1.0	1	01/12/11	sm	01/12/11	sm		
---------------------------	--------------	-----	---	----------	----	----------	----	--	--

Analysis Method: EPA 300.0 Rev. 2.1

Batch: T020916

Nitrate as N	0.87 mg/L	0.10	5	01/12/11	bd	01/12/11	bd		
Nitrite as N	0.30 mg/L	0.10	5	01/12/11	bd	01/12/11	bd		

Analysis Method: EPA 350.1 Rev. 2.0

Batch: T020987

Ammonia as N	0.21 mg/L	0.010	1	01/17/11	da	01/17/11	da		
--------------	-----------	-------	---	----------	----	----------	----	--	--

Analysis Method: EPA 410.4 Rev. 2.0

Batch: T020939

Chemical Oxygen Demand	390 mg/L	97	25	01/12/11	sm	01/13/11	sm		
------------------------	----------	----	----	----------	----	----------	----	--	--

Analysis Method: EPA 9040C

Batch: T020933

Corrosivity-pH	9.76 pH Units		1	01/12/11	as	01/12/11	as	N	
----------------	---------------	--	---	----------	----	----------	----	---	--

Analysis Method: SM 4500-Cl- E, 20th

Batch: T020965

Chloride	13 mg/L	10	1	01/14/11	bd	01/14/11	bd	N	
----------	---------	----	---	----------	----	----------	----	---	--

Analysis Method: SM 5210 B-01

Batch: T020917

Biochemical Oxygen Demand 5-day	670 mg/L	2.0	1	01/12/11	sm	01/17/11	sm		
---------------------------------	----------	-----	---	----------	----	----------	----	--	--

Analysis Method: SM 5310 D-00

Batch: T020919

Dissolved Organic Carbon	150 mg/L	34	100	01/12/11	da	01/12/11	da	N	
--------------------------	----------	----	-----	----------	----	----------	----	---	--

### CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.



### ANALYTICAL RESULTS

Trace Project ID: T11A085  
Client Project ID: LEI Snow Study 10-600 USDA

Trace ID: T11A085-10 Date Collected: 01/11/11 12:00 Matrix: Aqueous  
Sample ID: Combined B Date Received: 01/11/11 14:52

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
------------	---------------	-----	----------	----------	----	----------	----	-------	-----

#### METALS, TOTAL

Analysis Method: EPA 200.7 Rev. 4.4

Batch: T020928

Phosphorus	0.63 mg/L	0.050	1	01/12/11	ns	01/13/11	jlm		
Sodium	14 mg/L	1.0	1	01/12/11	ns	01/13/11	jlm		

#### WET CHEMISTRY

Analysis Method: EPA 120.1

Batch: T020930

Specific Conductance (EC)	160 umhos/cm	1.0	1	01/12/11	sm	01/12/11	sm		
---------------------------	--------------	-----	---	----------	----	----------	----	--	--

Analysis Method: EPA 300.0 Rev. 2.1

Batch: T020916

Nitrate as N	0.25 mg/L	0.10	5	01/12/11	bd	01/12/11	bd		
Nitrite as N	0.23 mg/L	0.10	5	01/12/11	bd	01/12/11	bd		

Analysis Method: EPA 350.1 Rev. 2.0

Batch: T020987

Ammonia as N	0.052 mg/L	0.010	1	01/17/11	da	01/17/11	da		
--------------	------------	-------	---	----------	----	----------	----	--	--

Analysis Method: EPA 410.4 Rev. 2.0

Batch: T020939

Chemical Oxygen Demand	220 mg/L	97	25	01/12/11	sm	01/13/11	sm		
------------------------	----------	----	----	----------	----	----------	----	--	--

Analysis Method: EPA 9040C

Batch: T020933

Corrosivity-pH	8.99 pH Units		1	01/12/11	as	01/12/11	as	N	
----------------	---------------	--	---	----------	----	----------	----	---	--

Analysis Method: SM 4500-Cl- E, 20th

Batch: T020965

Chloride	<10 mg/L	10	1	01/14/11	bd	01/14/11	bd	N	
----------	----------	----	---	----------	----	----------	----	---	--

Analysis Method: SM 5210 B-01

Batch: T020917

Biochemical Oxygen Demand 5-day	210 mg/L	2.0	1	01/12/11	sm	01/17/11	sm		
---------------------------------	----------	-----	---	----------	----	----------	----	--	--

Analysis Method: SM 5310 D-00

Batch: T020919

Dissolved Organic Carbon	38 mg/L	3.4	10	01/12/11	da	01/14/11	da	N	
--------------------------	---------	-----	----	----------	----	----------	----	---	--

### CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.





the science of compliance

phone 231.773.5998
toll-free 800.733.5998
fax 231.773.6537

Trace Analytical Laboratories, Inc.
2241 Black Creek Road
Muskegon, MI 49444-2673
info@trace-labs.com
www.trace-labs.com



phone 231.773.5998
toll-free 800.733.5998
fax 231.773.6537

Trace Analytical Laboratories, Inc.
2241 Black Creek Road
Muskegon, MI 49444-2673
www.trace-labs.com

CHAIN-OF-CUSTODY RECORD

Page 1 of 1

TRACE ID NO. T11A085

Client Name: LEI
Contact Person: JOEL KENYON
Mailing Address:
City, State, Zip Code:
Phone:
Fax:
Email Address:
Cell #:

Project Name & #: SPONS STUDY 10-6881
Billing Address (if different):
City, State, Zip Code:
Phone:
PO #:

Report Results To:
City, State, Zip Code:
Phone:
Fax:
Email Address:
Cell #:
Sampled by: GULB

TRACE USE ONLY
Logged By: [Signature]
Received on/for: [Signature]
Soil Volatiles Preserved: MeOH Low Level Lab Sampling Time:
Checked By: [Signature]

Regulatory Requirements:
MERA TMDL's
Drinking Water
NPDES
USACE
Special
Turnaround Requirements:
Standard
3-4 Day (RUSH)\*
24-48 Hour (RUSH)\*
Requires prior approval
Matrix Key:
S = Soil
W = Water
SE = Sediment
OI = Oil
SO = Solid Waste
WI = Wipes
LW = Liquid Waste
A = Air
D = Drinking Water
SL = Sludge
ANALYSIS REQUESTED

Table with columns: Item #, DATE TAKEN, TIME TAKEN, METALS FIELD FILTERED, CLIENT SAMPLE ID, MATRIX, NUMBER OF CONTAINERS, RELEASED BY, RECEIVED BY, DATE, TIME. Includes handwritten entries for items 01-10 and remarks like 'BAD LABS', 'TUB', 'SPECIFIC COMP', 'PH', 'DDC', 'Na', 'Cl'.

In executing this Chain of Custody the client acknowledges acceptance of the terms and conditions of the agreement as set forth at http://www.trace-labs.com/contract

CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.

### SAMPLE LOG IN CHECKLIST

Date: 1-11-11 Client Name: LEI # of Coolers: 1  
 Trace ID #: T11A085 Project Name: \_\_\_\_\_ Cooler #: \_\_\_\_\_  
 Logged in by: [Signature] Cooler #s: \_\_\_\_\_

#### Cooler Receipt

Cooler/samples delivered by: Trace courier  Hand delivered  Commercial courier  Name of delivery person: \_\_\_\_\_  
 UPS  DHL  FED EX  US Mail   
 Did cooler come with a bill of lading? No  Yes   Not Applicable  
 Way Bill or Tracking #: \_\_\_\_\_  
 COC Seals present and intact on cooler? No  Yes   Not Applicable  
 Custody seals signed by Client? No  Yes  Client custody seal # (if applicable): \_\_\_\_\_

#### Coolant and Temperature

Type of Coolant Used	Yes	No	Cooler Temperature	Correction Factor <u>-0.1</u> °C
Slurry w/ crushed, cubed, or chip ice?	<input type="checkbox"/>	<input type="checkbox"/>	Date: <u>1-11-11</u>	Time: <u>14:52</u>
Multiple bags of ice around samples?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Temperature Blank: _____ °C	Range of 3 samples: <u>6</u> °C
Ice Packs/ Blue Ice :	<input type="checkbox"/>	<input type="checkbox"/>	Melt Water: _____ °C	Ice still present upon receipt: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
No Coolant Present:	<input type="checkbox"/>	<input type="checkbox"/>		

#### General

	Yes	No	NA
COC taped to inside of cooler lid?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
All bottles arrived unbroken with labels in good condition?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Each sample point is in a sealed plastic bag?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Labels filled out completely?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
All bottle labels agree with Chain of Custody (COC)?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sufficient sample to run tests requested?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
pH checked and samples at correct pH?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Correct preservative added to samples?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DRO/GRO samples received and appropriate check in form completed?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Air bubbles absent from VOAs?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
COC filled out properly and signed by client?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
COC signed in by TRACE sample custodian?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Was project manager called and samples discussed?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Contact: \_\_\_\_\_ Date: \_\_\_\_\_

**Notes:**

---



---



---



---

### CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.

January 12, 2011

Mr. Joel Kenyon  
Lakeshore Environmental, Inc.  
803 Verhoeks Street  
Grand Haven, MI 49417

Phone: (616) 844-5050  
Fax: (616) 844-5053

RE: Trace Project T11A027  
Client Project LEI Snow Study 10-600 USDA

Dear Mr. Kenyon:

Enclosed are your analytical results. The results of this report relate only to the samples listed in the body of this report.

All reports were examined through Trace's validation process to ensure that requirements for quality and completeness were satisfied. All reported analytical results were obtained in accordance with the methods referenced on the reports. Every practical effort was made to meet the reporting limit specifications for this work, however, some results may have raised reporting limits to correct for percent solids.

For clients that require NELAC Accreditation, Trace certifies that these test results meet all requirements of the NELAC Standard, except for those analytes with a "N" notation. These analytes have not been evaluated by NELAC at Trace's discretion and will not be reported unless requested by client.

If you have questions concerning this report, please contact me at 231.773.5998 or by email at [jmink@trace-labs.com](mailto:jmink@trace-labs.com).

Sincerely,



Jon Mink  
Project Manager

Enclosures



ILEPA Accreditation No. 100318 NJDEP Accreditation No. MI008 PADEP Accreditation No. 68-04471

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.



phone 231.773.5998  
toll-free 800.733.5998  
fax 231.773.6537

Trace Analytical Laboratories, Inc.  
2241 Black Creek Road  
Muskegon, MI 49444-2673  
info@trace-labs.com  
www.trace-labs.com

### SAMPLE SUMMARY

Trace Project ID: T11A027  
Client Project ID: LEI Snow Study 10-600 USDA

Trace ID	Sample ID	Matrix	Collected By	Date Collected	Date Received
T11A027-01	Fresh	Aqueous	awg	01/05/11 14:05	01/05/11 15:07
T11A027-02	Influent	Aqueous	awg	01/05/11 14:00	01/05/11 15:07

### CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.

**AN EXPLANATION OF TERMS AND SYMBOLS WHICH MAY OCCUR IN THIS REPORT**

**DEFINITIONS**

LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
MS	Matrix Spike
MSD	Matrix Spike Duplicate
RPD	Relative Percent Difference
DUP	Matrix Duplicate
RDL	Reporting Detection Limit
MCL	Maximum Contamination Limit
TIC	Tentatively Identified Compound
<, ND or U	Indicates the compound was analyzed for but not detected
*	Indicates a result that exceeds its associated MCL or Surrogate control limits
N	Indicates that the compound has not been evaluated by NELAC
NA	Indicates that the compound is not available.

**DATA QUALIFIERS**

---

Trace ID: T11A027-01

**Analysis: SM 4500-H+ B-00**

---

pH Note O-04 : This sample was analyzed outside the EPA recommended holding time.

---

pH Note pH : The pH was analyzed at 0939

---

Trace ID: T11A027-02

**Analysis: SM 4500-H+ B-00**

---

pH Note O-04 : This sample was analyzed outside the EPA recommended holding time.

---

pH Note pHa : The pH was analyzed at 0945

**CERTIFICATE OF ANALYSIS**

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.

### ANALYTICAL RESULTS

Trace Project ID: T11A027  
Client Project ID: LEI Snow Study 10-600 USDA

Trace ID: T11A027-01 Date Collected: 01/05/11 14:05 Matrix: Aqueous  
Sample ID: Fresh Date Received: 01/05/11 15:07

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
------------	---------------	-----	----------	----------	----	----------	----	-------	-----

#### METALS, TOTAL

Analysis Method: EPA 200.7 Rev. 4.4

Batch: T020845

Phosphorus	1.3 mg/L	0.050	1	01/06/11	ns	01/07/11	jlm		
Sodium	73 mg/L	1.0	1	01/06/11	ns	01/07/11	jlm		

#### WET CHEMISTRY

Analysis Method: EPA 120.1

Batch: T020840

Specific Conductance (EC)	680 umhos/cm	1.0	1	01/06/11	as	01/06/11	as		
---------------------------	--------------	-----	---	----------	----	----------	----	--	--

Analysis Method: EPA 300.0 Rev. 2.1

Batch: T020842

Nitrate as N	1.9 mg/L	0.10	5	01/06/11	bd	01/06/11	bd		
Nitrite as N	0.37 mg/L	0.10	5	01/06/11	bd	01/06/11	bd		

Analysis Method: EPA 350.1 Rev. 2.0

Batch: T020853

Ammonia as N	<0.010 mg/L	0.010	1	01/06/11	bd	01/10/11	sm		
--------------	-------------	-------	---	----------	----	----------	----	--	--

Analysis Method: EPA 410.4 Rev. 2.0

Batch: T020894

Chemical Oxygen Demand	2100 mg/L	970	250	01/10/11	sm	01/11/11	sm		
------------------------	-----------	-----	-----	----------	----	----------	----	--	--

Analysis Method: SM 4500-Cl- E, 20th

Batch: T020864

Chloride	33 mg/L	10	1	01/07/11	sm	01/07/11	sm	N	
----------	---------	----	---	----------	----	----------	----	---	--

Analysis Method: SM 4500-H+ B-00

Batch: T020873

pH	6.71 pH Units		1	01/07/11	rb	01/07/11	rb	O-04, pH	
----	---------------	--	---	----------	----	----------	----	----------	--

Analysis Method: SM 5210 B-01

Batch: T020859

Biochemical Oxygen Demand 5-day	1000 mg/L	2.0	1	01/07/11	as	01/12/11	sm		
---------------------------------	-----------	-----	---	----------	----	----------	----	--	--

Analysis Method: SM 5310 D-00

Batch: T020844

Dissolved Organic Carbon	390 mg/L	34	100	01/06/11	da	01/06/11	da	N	
--------------------------	----------	----	-----	----------	----	----------	----	---	--

### CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.



### ANALYTICAL RESULTS

Trace Project ID: T11A027  
Client Project ID: LEI Snow Study 10-600 USDA

Trace ID: T11A027-02 Date Collected: 01/05/11 14:00 Matrix: Aqueous  
Sample ID: Influent Date Received: 01/05/11 15:07

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
------------	---------------	-----	----------	----------	----	----------	----	-------	-----

#### METALS, TOTAL

Analysis Method: EPA 200.7 Rev. 4.4

Batch: T020845

Phosphorus	1.3 mg/L	0.050	1	01/06/11	ns	01/07/11	jlm		
Sodium	67 mg/L	1.0	1	01/06/11	ns	01/07/11	jlm		

#### WET CHEMISTRY

Analysis Method: EPA 120.1

Batch: T020840

Specific Conductance (EC)	650 umhos/cm	1.0	1	01/06/11	as	01/06/11	as		
---------------------------	--------------	-----	---	----------	----	----------	----	--	--

Analysis Method: EPA 300.0 Rev. 2.1

Batch: T020842

Nitrate as N	<0.10 mg/L	0.10	5	01/06/11	bd	01/06/11	bd		
Nitrite as N	<0.10 mg/L	0.10	5	01/06/11	bd	01/06/11	bd		

Analysis Method: EPA 350.1 Rev. 2.0

Batch: T020853

Ammonia as N	<0.010 mg/L	0.010	1	01/06/11	bd	01/10/11	sm		
--------------	-------------	-------	---	----------	----	----------	----	--	--

Analysis Method: EPA 410.4 Rev. 2.0

Batch: T020894

Chemical Oxygen Demand	1700 mg/L	970	250	01/10/11	sm	01/11/11	sm		
------------------------	-----------	-----	-----	----------	----	----------	----	--	--

Analysis Method: SM 4500-Cl- E, 20th

Batch: T020864

Chloride	30 mg/L	10	1	01/07/11	sm	01/07/11	sm	N	
----------	---------	----	---	----------	----	----------	----	---	--

Analysis Method: SM 4500-H+ B-00

Batch: T020873

pH	6.28 pH Units		1	01/07/11	rb	01/07/11	rb	O-04, pHa	
----	---------------	--	---	----------	----	----------	----	-----------	--

Analysis Method: SM 5210 B-01

Batch: T020859

Biochemical Oxygen Demand 5-day	720 mg/L	2.0	1	01/07/11	as	01/12/11	sm		
---------------------------------	----------	-----	---	----------	----	----------	----	--	--

Analysis Method: SM 5310 D-00

Batch: T020844

Dissolved Organic Carbon	360 mg/L	34	100	01/06/11	da	01/06/11	da	N	
--------------------------	----------	----	-----	----------	----	----------	----	---	--

### CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.





December 22, 2010

Mr. Joel Kenyon  
Lakeshore Environmental, Inc.  
803 Verhoeks Street  
Grand Haven, MI 49417

Phone: (616) 844-5050  
Fax: (616) 844-5053

RE: Trace Project T10L154  
Client Project LEI Snow Study 10-600 USDA

Dear Mr. Kenyon:

Enclosed are your analytical results. The results of this report relate only to the samples listed in the body of this report.

All reports were examined through Trace's validation process to ensure that requirements for quality and completeness were satisfied. All reported analytical results were obtained in accordance with the methods referenced on the reports. Every practical effort was made to meet the reporting limit specifications for this work, however, some results may have raised reporting limits to correct for percent solids.

For clients that require NELAC Accreditation, Trace certifies that these test results meet all requirements of the NELAC Standard, except for those analytes with a "N" notation. These analytes have not been evaluated by NELAC at Trace's discretion and will not be reported unless requested by client.

If you have questions concerning this report, please contact me at 231.773.5998 or by email at [jmink@trace-labs.com](mailto:jmink@trace-labs.com).

Sincerely,



Jon Mink  
Project Manager

Enclosures



ILEPA Accreditation No. 100318 NJDEP Accreditation No. MI008 PADEP Accreditation No. 68-04471

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.



phone 231.773.5998  
toll-free 800.733.5998  
fax 231.773.6537

Trace Analytical Laboratories, Inc.  
2241 Black Creek Road  
Muskegon, MI 49444-2673  
info@trace-labs.com  
www.trace-labs.com

### SAMPLE SUMMARY

Trace Project ID: T10L154  
Client Project ID: LEI Snow Study 10-600 USDA

Trace ID	Sample ID	Matrix	Collected By	Date Collected	Date Received
T10L154-01	A.8	Waste Water	ag	12/14/10 14:00	12/14/10 15:08
T10L154-02	Influent	Waste Water	ag	12/14/10 14:00	12/14/10 15:08

### CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.

**AN EXPLANATION OF TERMS AND SYMBOLS WHICH MAY OCCUR IN THIS REPORT**

**DEFINITIONS**

LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
MS	Matrix Spike
MSD	Matrix Spike Duplicate
RPD	Relative Percent Difference
DUP	Matrix Duplicate
RDL	Reporting Detection Limit
MCL	Maximum Contamination Limit
TIC	Tentatively Identified Compound
<, ND or U	Indicates the compound was analyzed for but not detected
*	Indicates a result that exceeds its associated MCL or Surrogate control limits
N	Indicates that the compound has not been evaluated by NELAC
NA	Indicates that the compound is not available.

**DATA QUALIFIERS**

---

---

Trace ID: T10L154-01

***Analysis: SM 4500-H+ B-00***

---

pH                                      Note pH :    The pH was analyzed at 08:51.

---

---

Trace ID: T10L154-02

***Analysis: SM 4500-H+ B-00***

---

pH                                      Note pHa :    The pH was analyzed at 12:00.

**CERTIFICATE OF ANALYSIS**

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.

### ANALYTICAL RESULTS

Trace Project ID: T10L154  
Client Project ID: LEI Snow Study 10-600 USDA

Trace ID: T10L154-01 Date Collected: 12/14/10 14:00 Matrix: Waste Water  
Sample ID: A.8 Date Received: 12/14/10 15:08

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
------------	---------------	-----	----------	----------	----	----------	----	-------	-----

#### METALS, TOTAL

Analysis Method: EPA 200.7 Rev. 4.4

Batch: T020531

Phosphorus	1.8 mg/L	0.050	1	12/15/10	ns	12/16/10	jlm		
Sodium	55 mg/L	1.0	1	12/15/10	ns	12/16/10	jlm		

#### WET CHEMISTRY

Analysis Method: EPA 120.1

Batch: T020548

Specific Conductance (EC)	630 umhos/cm	1.0	1	12/16/10	as	12/16/10	as		
---------------------------	--------------	-----	---	----------	----	----------	----	--	--

Analysis Method: EPA 300.0 Rev. 2.1

Batch: T020513

Nitrate as N	<0.10 mg/L	0.10	5	12/14/10	bd	12/14/10	bd		
Nitrite as N	<0.10 mg/L	0.10	5	12/14/10	bd	12/14/10	bd		

Analysis Method: EPA 350.1 Rev. 2.0

Batch: T020609

Ammonia as N	0.053 mg/L	0.010	1	12/21/10	bd	12/21/10	da		
--------------	------------	-------	---	----------	----	----------	----	--	--

Analysis Method: EPA 410.4 Rev. 2.0

Batch: T020556

Chemical Oxygen Demand	2600 mg/L	390	100	12/16/10	da	12/21/10	da		
------------------------	-----------	-----	-----	----------	----	----------	----	--	--

Analysis Method: SM 4500-Cl- E, 20th

Batch: T020550

Chloride	39 mg/L	10	1	12/16/10	da	12/16/10	da	N	
----------	---------	----	---	----------	----	----------	----	---	--

Analysis Method: SM 4500-H+ B-00

Batch: T020627

pH	6.46 pH Units		1	12/14/10	js	12/15/10	js	pH	
----	---------------	--	---	----------	----	----------	----	----	--

Analysis Method: SM 5210 B-01

Batch: T020534

Biochemical Oxygen Demand 5-day	1000 mg/L	2.0	1	12/15/10	sm	12/20/10	sm/as		
---------------------------------	-----------	-----	---	----------	----	----------	-------	--	--

Analysis Method: SM 5310 D-00

Batch: T020572

Dissolved Organic Carbon	1200 mg/L	340	1000	12/17/10	bd	12/17/10	zzz	N	
--------------------------	-----------	-----	------	----------	----	----------	-----	---	--

### CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.



### ANALYTICAL RESULTS

Trace Project ID: T10L154  
Client Project ID: LEI Snow Study 10-600 USDA

Trace ID: T10L154-02 Date Collected: 12/14/10 14:00 Matrix: Waste Water  
Sample ID: Influent Date Received: 12/14/10 15:08

PARAMETERS	RESULTS UNITS	RDL	DILUTION	PREPARED	BY	ANALYZED	BY	NOTES	MCL
------------	---------------	-----	----------	----------	----	----------	----	-------	-----

#### METALS, TOTAL

Analysis Method: EPA 200.7 Rev. 4.4

Batch: T020531

Phosphorus	1.7 mg/L	0.050	1	12/15/10	ns	12/16/10	jlm		
Sodium	50 mg/L	1.0	1	12/15/10	ns	12/16/10	jlm		

#### WET CHEMISTRY

Analysis Method: EPA 120.1

Batch: T020548

Specific Conductance (EC)	630 umhos/cm	1.0	1	12/16/10	as	12/16/10	as		
---------------------------	--------------	-----	---	----------	----	----------	----	--	--

Analysis Method: EPA 300.0 Rev. 2.1

Batch: T020513

Nitrate as N	<0.10 mg/L	0.10	5	12/14/10	bd	12/14/10	bd		
Nitrite as N	<0.10 mg/L	0.10	5	12/14/10	bd	12/14/10	bd		

Analysis Method: EPA 350.1 Rev. 2.0

Batch: T020609

Ammonia as N	0.042 mg/L	0.010	1	12/21/10	bd	12/21/10	da		
--------------	------------	-------	---	----------	----	----------	----	--	--

Analysis Method: EPA 410.4 Rev. 2.0

Batch: T020556

Chemical Oxygen Demand	2800 mg/L	390	100	12/16/10	da	12/21/10	da		
------------------------	-----------	-----	-----	----------	----	----------	----	--	--

Analysis Method: SM 4500-Cl- E, 20th

Batch: T020550

Chloride	35 mg/L	10	1	12/16/10	da	12/16/10	da	N	
----------	---------	----	---	----------	----	----------	----	---	--

Analysis Method: SM 4500-H+ B-00

Batch: T020627

pH	8.00 pH Units		1	12/14/10	js	12/15/10	js	pHa	
----	---------------	--	---	----------	----	----------	----	-----	--

Analysis Method: SM 5210 B-01

Batch: T020534

Biochemical Oxygen Demand 5-day	1600 mg/L	2.0	1	12/15/10	sm	12/20/10	sm/as		
---------------------------------	-----------	-----	---	----------	----	----------	-------	--	--

Analysis Method: SM 5310 D-00

Batch: T020572

Dissolved Organic Carbon	1100 mg/L	340	1000	12/17/10	bd	12/17/10	zzz	N	
--------------------------	-----------	-----	------	----------	----	----------	-----	---	--

### CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.





the science of compliance

phone 231.773.5998  
 toll-free 800.733.5998  
 fax 231.773.6537

Trace Analytical Laboratories, Inc.  
 2241 Black Creek Road  
 Muskegon, MI 49444-2673  
 info@trace-labs.com  
 www.trace-labs.com



the science of compliance

phone 231.773.5998  
 toll-free 800.733.5998  
 fax 231.773.6537

Trace Analytical Laboratories, Inc.  
 2241 Black Creek Road  
 Muskegon, MI 49444-2673  
 www.trace-labs.com

CHAIN-OF-CUSTODY RECORD

Page 1 of 1

TRACE ID NO.  
 T10L154

**Report Results To:**

Client Name: LEI  
 Contact Person: SOEL KENYU  
 Mailing Address: \_\_\_\_\_  
 City, State, Zip Code: \_\_\_\_\_  
 Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
 Email Address: \_\_\_\_\_  
 Cell #: \_\_\_\_\_  
 Project Name & #: LEI SHAW STUDY  
 Billing Address (if different): \_\_\_\_\_  
 City, State, Zip Code: \_\_\_\_\_  
 Attn: \_\_\_\_\_ Phone: \_\_\_\_\_ PO #: \_\_\_\_\_

Regulatory Requirements:  MERA TMDL's  Standard  3-4 Day (RUSH)\*  24-48 Hour (RUSH)\*  
 Drinking Water  NPDES  USACE  Special  
 \* Requires prior approval

Turnaround Requirements:  Standard  3-4 Day (RUSH)\*  24-48 Hour (RUSH)\*  
 \* Requires prior approval

Matrix Key: S = Soil, W = Water, SE = Sediment, OI = Oil, SO = Solid Waste, WI = Wipes, LW = Liquid Waste, A = Air, D = Drinking Water, SL = Sludge

**ANALYSIS REQUESTED**

TRACE USE ONLY

Logged By: [Signature] Checked By: [Signature]  
 Received on ice: Yes  No  Preservative Checked: Yes  No  N/A  
 Soil Volatiles Preserved: MeOH Low Level Lab Sampling Time: \_\_\_\_\_

Request for Analytical Services				Bill To:		Report Results To:	
TRACE NO.	DATE TAKEN	TIME TAKEN	METALS FIELD FILTERED	CLIENT SAMPLE ID	MATRIX	NUMBER OF CONTAINERS	REMARKS
01	12/11/10	14:00		A.G.	W3	3	
02	✓	✓		WELSER T	W2	2	
03	✓	✓					
04	✓	✓					
05	✓	✓					
06	✓	✓					
07	✓	✓					
08	✓	✓					
09	✓	✓					
10	✓	✓					
11	✓	✓					
12	✓	✓					
13	✓	✓					
14	✓	✓					
15	✓	✓					
16	✓	✓					
17	✓	✓					
18	✓	✓					
19	✓	✓					
20	✓	✓					
21	✓	✓					
22	✓	✓					
23	✓	✓					
24	✓	✓					
25	✓	✓					
26	✓	✓					
27	✓	✓					
28	✓	✓					
29	✓	✓					
30	✓	✓					
31	✓	✓					
32	✓	✓					
33	✓	✓					
34	✓	✓					
35	✓	✓					
36	✓	✓					
37	✓	✓					
38	✓	✓					
39	✓	✓					
40	✓	✓					
41	✓	✓					
42	✓	✓					
43	✓	✓					
44	✓	✓					
45	✓	✓					
46	✓	✓					
47	✓	✓					
48	✓	✓					
49	✓	✓					
50	✓	✓					
51	✓	✓					
52	✓	✓					
53	✓	✓					
54	✓	✓					
55	✓	✓					
56	✓	✓					
57	✓	✓					
58	✓	✓					
59	✓	✓					
60	✓	✓					
61	✓	✓					
62	✓	✓					
63	✓	✓					
64	✓	✓					
65	✓	✓					
66	✓	✓					
67	✓	✓					
68	✓	✓					
69	✓	✓					
70	✓	✓					
71	✓	✓					
72	✓	✓					
73	✓	✓					
74	✓	✓					
75	✓	✓					
76	✓	✓					
77	✓	✓					
78	✓	✓					
79	✓	✓					
80	✓	✓					
81	✓	✓					
82	✓	✓					
83	✓	✓					
84	✓	✓					
85	✓	✓					
86	✓	✓					
87	✓	✓					
88	✓	✓					
89	✓	✓					
90	✓	✓					
91	✓	✓					
92	✓	✓					
93	✓	✓					
94	✓	✓					
95	✓	✓					
96	✓	✓					
97	✓	✓					
98	✓	✓					
99	✓	✓					
100	✓	✓					

In executing this Chain of Custody, the client acknowledges acceptance of the terms and conditions of the agreement as set forth at <http://www.trace-labs.com/terms.htm>

CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.

### SAMPLE LOG IN CHECKLIST

Date: <u>12-14-10</u>		Client Name: <u>LET</u>		# of Coolers: <u>1</u>	
Trace ID #: <u>T10L154</u>		Project Name: <u>[Signature]</u>		Cooler #s: _____	
		Logged in by: <u>[Signature]</u>		Cooler #s: _____	
Cooler Receipt					
Cooler/samples delivered by:		Trace courier <input type="checkbox"/>	Hand delivered <input checked="" type="checkbox"/>	Name of delivery person: _____	
		Commercial courier <input type="checkbox"/>	UPS <input type="checkbox"/>	DHL <input type="checkbox"/>	FED EX <input type="checkbox"/>
		US Mail <input type="checkbox"/>			
Did cooler come with a bill of lading?		No <input type="checkbox"/>	<input checked="" type="checkbox"/> Not Applicable		
		Yes <input type="checkbox"/>	Way Bill or Tracking #: _____		
COC Seals present and intact on cooler?		No <input type="checkbox"/>	<input checked="" type="checkbox"/> Not Applicable		
		Yes <input type="checkbox"/>			
Custody seals signed by Client?		No <input type="checkbox"/>	Client custody seal # (if applicable): _____		
		Yes <input type="checkbox"/>			
Coolant and Temperature					
Type of Coolant Used			Cooler Temperature Correction Factor <u>+0.2°C</u>		
	Yes	No	Date: <u>12-14-10</u> Time: <u>15:08</u>		
Slurry w/ crushed, cubed, or chip ice?	<input type="checkbox"/>	<input type="checkbox"/>	Temperature Blank: _____ °C		
Multiple bags of ice around samples?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Range of 3 samples: <u>4</u> °C		
Ice Packs/ Blue Ice :	<input type="checkbox"/>	<input type="checkbox"/>	Melt Water: _____ °C		
No Coolant Present:	<input type="checkbox"/>	<input type="checkbox"/>	Ice still present upon receipt: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		
General					
	Yes	No	NA		
COC taped to inside of cooler lid?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
All bottles arrived unbroken with labels in good condition?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Each sample point is in a sealed plastic bag?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
Labels filled out completely?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
All bottle labels agree with Chain of Custody (COC)?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Sufficient sample to run tests requested?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
pH checked and samples at correct pH?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
Correct preservative added to samples?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
DRO/GRO samples received and appropriate check in form completed?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
Air bubbles absent from VOAs?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
COC filled out properly and signed by client?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
COC signed in by TRACE sample custodian?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Was project manager called and samples discussed?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Contact: _____			Date: _____		
<b>Notes:</b>					

### CERTIFICATE OF ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Trace Analytical Laboratories, Inc.