Alpine Development Water Supply
1999 Monitoring and Assessment

for

ARCO Alaska, Inc.

by

Baker

Michael Baker Jr., Inc.
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1.0 **Executive Summary**

Water surface elevation and water quality data were collected in Lake 93-12, Lake 93-13 and the Sakoonang Channel during the spring and summer of 1999 (Location Map, Appendix A). The purpose of collecting the data in Lakes 93-12 and 93-13 was primarily to satisfy permit stipulations associated with the Alpine Development (Alpine). The purpose of collecting the data in the Sakoonang Channel was to assess the potential for recharging Lakes 93-12 and 93-13 using water from the Sakoonang Channel.

As a result of the monitoring conducted in 1999 and the computations conducted for this report, the following can be concluded.

- The river inundated neither Lake 93-12 nor Lake 93-13 during 1999.
- Between 28 April and 25 September 1999 the net recharge of Lake 93-12 was approximately 9.4 million gallons (MG), and resulted from snowmelt and rainfall. Between 27 April and 25 September 1999, Lake 93-13 experienced a net loss of 4 MG. During this period, all of the water required for Alpine was withdrawn from Lake 93-13. No water was withdrawn from Lake 93-12.
- Depth averaged values of total suspended solids, salinity, conductivity, temperature, dissolved oxygen, and turbidity, as measured in the lakes between April and September, are presented in Tables 2.1 and 2.2.
- A statistical assessment of the long-term water balance associated with Lakes 93-12 and 93-13 suggests that even with periodic inundation of the lakes by the river, there is little chance (about 0.02 percent) that natural recharge will meet expected water demands during all of the first 7 years of operation. There is only about a 33 percent chance that natural recharge will provide sufficient water in 3 or more of the first 7 years. If it is assumed that the annual water demand will be constant at 10 MG in years 8 through 30 of operation, there is approximately a 0.5 percent chance that natural recharge will provide sufficient water to meet the expected demand in all 23 years. There is only about a 50 percent chance that natural recharge will provide sufficient water in 16 or more years of the 23-year period.
- Lakes 93-12 and 93-13 can probably be recharged annually using water from the Sakoonang Channel. However, to be sure of obtaining sufficient quantities of water from the Sakoonang Channel, the water will probably have to be taken during breakup. The water taken from the Sakoonang Channel during breakup is likely to be significantly higher in turbidity and
suspended solids than the water in Lakes 93-12 and 93-13. A comparison of the water quality in the lakes and the Sakoonang Channel is presented in Tables 4.1 and 4.2.

- Two other possibilities exist for recharging Lakes 93-12 and 93-13: snow fences and pumping from nearby lakes. Both of these options are discussed briefly in Section 5.0, but both require additional site specific information to determine if either option could practically provide sufficient water to make up the shortfall that is likely to occur in Lakes 93-12 and 93-13 over the life of the project.
2.0 Water Monitoring In Lakes 93-12 And 93-13

2.1 1999 Spring And Summer Water Level Monitoring

Water surface elevations were monitored in Lakes 93-12 and 93-13 during the period 27 April to 25 September 1999. A staff gage was installed in each lake, and the staff gages were read periodically throughout the monitoring period. The readings were converted to feet above British Petroleum Mean Sea Level and are reported as such in this report.

On Lake 93-12 the initial water surface elevation was obtained on 28 April. The lake was ice covered and the water surface elevation was 7.45 feet. The maximum water surface elevation occurred between 14 and 22 June. The lake was still 80 to 85 percent ice covered, and the water surface elevation was 7.93 feet. The first ice-free measurement was taken on 7 July, and indicated a water surface elevation of 7.87 feet. The final reading was taken on 25 September and indicated a water surface elevation of 7.74 feet. Thus, the final water surface elevation was 0.29 feet higher than the pre-breakup reading in April and 0.19 feet lower than the peak water surface elevation.

On Lake 93-13 the initial water surface elevation was measured on 27 April. The lake was ice covered and the water surface elevation was 5.91 feet. The maximum water surface elevation was measured on 9 June. The lake was still 95 percent ice covered, and the water surface elevation was 6.14 feet. The lake was ice-free on 28 June, and a water surface elevation of 5.99 feet was measured on 6 July. The final reading was taken on 25 September and indicated a water surface elevation of 5.73 feet. Thus, the final water surface elevation was 0.18 feet lower than the pre-breakup reading in April and 0.26 feet lower than the peak water surface elevation.

It should be noted that a relatively small change in water surface elevation results in a water volume change on the order of millions of gallons. A 1-inch change in water surface elevation on Lake 93-12 represents a water volume change on the order of 2.7 MG. A 1-inch change in water surface elevation on Lake 93-13 represents a water volume change on the order of 1.9 MG. Thus, there was a net gain of about 9.4 MG in Lake 93-12 and a net loss of about 4 MG in Lake 93-13 between late April and late September 1999.

All of the water supplied for the Alpine Development, during the 1999 water-monitoring program was withdrawn from Lake 93-13. No water was withdrawn from Lake 93-12. Additional information concerning the methods used and the data obtained is presented in Appendix B.
2.2 1999 Spring And Summer Water Quality Monitoring

A water quality monitoring program was conducted in both Lake 93-12 and Lake 93-13. Total suspended solids, salinity, conductivity, temperature, dissolved oxygen, and turbidity were measured at multiple depths within each lake. All of the parameters except total suspended solids and turbidity were measured directly with probes in the field. Turbidity and total suspended solids were measured by obtaining water samples and analyzing the samples in a laboratory. The average of the values obtained at each site, on each day of sampling, is summarized in Tables 2.1 and 2.2. Additional information concerning the methods and the data obtained is provided in Appendix B.

<table>
<thead>
<tr>
<th>Reading Date</th>
<th>Turbidity (NTU)</th>
<th>Total Suspended Solids (mg/L)</th>
<th>Temperature (°F)</th>
<th>Salinity (ppt)</th>
<th>Conductivity (μS)</th>
<th>Dissolved Oxygen (mg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4/28/99</td>
<td>2.3</td>
<td>n/a</td>
<td>36.2</td>
<td>0.1</td>
<td>n/a</td>
<td>12.7</td>
</tr>
<tr>
<td>7/14/99</td>
<td>1.4</td>
<td>12.0</td>
<td>57.4</td>
<td>0.0</td>
<td>63.9</td>
<td>10.7</td>
</tr>
<tr>
<td>8/25/99</td>
<td>1.9</td>
<td>1.5</td>
<td>42.4</td>
<td>0.0</td>
<td>51.7</td>
<td>12.3</td>
</tr>
<tr>
<td>9/21/99</td>
<td>1.1</td>
<td>&lt;MRL</td>
<td>38.3</td>
<td>0.0</td>
<td>48.9</td>
<td>13.3</td>
</tr>
</tbody>
</table>

Notes:
1. Abbreviations: NTU is Nephelometric Turbidity Unit, mg/L is milligrams per liter, °F is degrees Fahrenheit, μS = micro siemens, ppt = parts per thousand, and <MRL is below method detection limit.
2. All of the values reported are average values based on the values obtained at multiple depths. See Table B-3 and Figure B-3 (Appendix B) to obtain the values measured at each depth.
**Table 2.2** Lake 93-13 1999 Water Quality

<table>
<thead>
<tr>
<th>Reading Date</th>
<th>Turbidity (NTU)</th>
<th>Total Suspended Solids (mg/L)</th>
<th>Temperature (F)</th>
<th>Salinity (ppt)</th>
<th>Conductivity (μS)</th>
<th>Dissolved Oxygen (mg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4/27/99</td>
<td>2</td>
<td>n/a</td>
<td>34.7</td>
<td>0.2</td>
<td>N/a</td>
<td>8.6</td>
</tr>
<tr>
<td>6/25/99</td>
<td>1.6</td>
<td>n/a</td>
<td>41.1</td>
<td>0.1</td>
<td>108.9</td>
<td>13.6</td>
</tr>
<tr>
<td>7/14/99</td>
<td>1.3</td>
<td>14.0</td>
<td>57.6</td>
<td>0.1</td>
<td>137.8</td>
<td>10.5</td>
</tr>
<tr>
<td>8/25/99</td>
<td>5.2</td>
<td>9.2</td>
<td>41.9</td>
<td>0.1</td>
<td>114.5</td>
<td>12.5</td>
</tr>
<tr>
<td>9/20/99</td>
<td>2.1</td>
<td>2.9</td>
<td>38.3</td>
<td>0.1</td>
<td>111.3</td>
<td>13.4</td>
</tr>
</tbody>
</table>

**Notes:**

1. Abbreviations: NTU is Nephelometric Turbidity Unit, mg/L is milligrams per liter, °F is degrees Fahrenheit, μS = micro siemens, ppt = parts per thousand, and <MRL is below method detection limit.

2. All of the values reported are average values based on the values obtained at multiple depths. See Table B-3 and Figure B-3 (Appendix B) to obtain the values measured at each depth.
3.0 Probable Long-Term Water Balance In Lakes 93-12 And 93-13

This section presents an estimate of the annual fluctuations likely to occur in the water volumes of Lakes 93-12 and 93-13. This information is then used to predict the likelihood that these lakes will be able to supply a sufficient volume of water to meet the needs of Alpine.

3.1 Data

Since there are no long-term meteorological data for Alpine, accumulated snowfall, summer precipitation, and evaporation rates measured at Kuparuk between 1986 and 1998 were used to conduct this analysis (Appendix D). Kuparuk is located approximately 45 miles east of Alpine and is approximately the same distance from the coast.

In addition to rainfall and snowmelt, inundation by the river also adds water to the lakes. Breakup observations in 1995, 1996, 1998, and 1999 indicate that the lakes are likely to be inundated approximately once every four years.

The water requirements of Alpine have been estimated (Powell, 1999) for the first 7 years of operation and are presented in Table 3.1. The maximum allowable water withdrawal from Lakes 93-12 and 93-13 is controlled by permit stipulation and totals 36.2 MG for the two lakes (Fowler, 1999).

<table>
<thead>
<tr>
<th>Year</th>
<th>Annual Water Requirement (million gallons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>34.16</td>
</tr>
<tr>
<td>2001</td>
<td>30.48</td>
</tr>
<tr>
<td>2002</td>
<td>21.89</td>
</tr>
<tr>
<td>2003</td>
<td>21.89</td>
</tr>
<tr>
<td>2004</td>
<td>21.89</td>
</tr>
<tr>
<td>2005</td>
<td>9.97</td>
</tr>
<tr>
<td>2006</td>
<td>10.07</td>
</tr>
</tbody>
</table>

3.2 Analysis

Based on statistical distributions developed from the historical data and the estimated water requirements of the facility, a Monte Carlo (Haan, 1979) technique was utilized to predict the probability that an adequate volume of water will be available to meet the needs of Alpine (Appendix D). The model assumes that the lakes are full at the beginning of the simulation (i.e., the spring of 2000) and after the years in which the river inundates the lakes. The computations for each year of the simulation involve randomly selecting the magnitude of snowmelt runoff, summer rainfall, and summer evaporation from statistical distributions based on the actual data collected at Kuparuk. The expected useable volume of water (36.2 MG when the lakes are full)
for the current year is calculated by summing the useable volume remaining from the previous year, and the snowmelt runoff, summer rainfall and evaporation for the current year. To determine if there will be sufficient water available to meet the expected demand in the current year, the expected water demand for the current year is subtracted from the expected useable volume for the current year. If the expected useable volume equals or exceeds the expected demand, there will be a sufficient volume of water to meet Alpine's requirements.

Two analyses were conducted: one for the first 7 years of operation, and another for the next 23 years (years 8-30) of operation. For the second analysis it was assumed that the water demand would remain constant at 10 MG per year.

The first analysis indicates that there is only a 0.02 percent chance that natural recharge of Lakes 93-12 and 93-13 will provide sufficient water to meet the expected water demands during each of the first 7 years of operation. There is a 33 percent chance that natural recharge will provide sufficient water in 3 or more of the first 7 years. Additional information on the probability of meeting the expected water demand during the first seven years is presented in Table 3.2.

<table>
<thead>
<tr>
<th>Number of Years with Adequate Supply</th>
<th>Probability (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All 7</td>
<td>Less than 1</td>
</tr>
<tr>
<td>6 or more</td>
<td>Less than 1</td>
</tr>
<tr>
<td>5 or more</td>
<td>3</td>
</tr>
<tr>
<td>4 or more</td>
<td>12</td>
</tr>
<tr>
<td>3 or more</td>
<td>33</td>
</tr>
<tr>
<td>2 or more</td>
<td>63</td>
</tr>
<tr>
<td>1 or more</td>
<td>88</td>
</tr>
</tbody>
</table>

The second analysis indicates that there is a 0.47 percent chance that natural recharge of Lakes 93-12 and 93-13 will provide sufficient water to meet the expected water demands during each year of the remaining 23-year economic life of Alpine. There is a 50 percent chance that natural recharge will provide sufficient water in 16 or more years of the remaining 23 years. Additional information on the probability of meeting the expected water demand during years 8 through 30 of Alpine operations is presented in Table 3.3.
Thus, it is not likely that natural recharge of Lakes 93-12 and 93-13 will provide the water necessary to meet the water demands of the Alpine Development. Artificial means of recharging the existing water supply lakes, or development of an alternative water source, should be considered. Additional information concerning the data and computations used in the analyses are presented in Appendix D.

### Table 3.3 Probability Of An Adequate Water Supply During Years 8 through 30 of Alpine Operations

<table>
<thead>
<tr>
<th>Number of Years with Adequate Supply</th>
<th>Probability (%)</th>
<th>Number of Years with Adequate Supply</th>
<th>Probability (%)</th>
<th>Number of Years with Adequate Supply</th>
<th>Probability (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All 23</td>
<td>Less than 1</td>
<td>15 or more</td>
<td>61</td>
<td>7 or more</td>
<td>99</td>
</tr>
<tr>
<td>22 or more</td>
<td>2</td>
<td>14 or more</td>
<td>72</td>
<td>6 or more</td>
<td>100</td>
</tr>
<tr>
<td>21 or more</td>
<td>5</td>
<td>13 or more</td>
<td>80</td>
<td>5 or more</td>
<td>100</td>
</tr>
<tr>
<td>20 or more</td>
<td>10</td>
<td>12 or more</td>
<td>87</td>
<td>4 or more</td>
<td>100</td>
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<tr>
<td>19 or more</td>
<td>17</td>
<td>11 or more</td>
<td>92</td>
<td>3 or more</td>
<td>100</td>
</tr>
<tr>
<td>18 or more</td>
<td>27</td>
<td>10 or more</td>
<td>95</td>
<td>2 or more</td>
<td>100</td>
</tr>
<tr>
<td>17 or more</td>
<td>38</td>
<td>9 or more</td>
<td>98</td>
<td>1 or more</td>
<td>100</td>
</tr>
<tr>
<td>16 or more</td>
<td>50</td>
<td>8 or more</td>
<td>99</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
4.0 Artificial Lake Recharge Using Water From The Sakoonang Channel

4.1 Water Availability

4.1.1 1999 Discharge Monitoring

Discharge was monitored in the Sakoonang Channel between 27 May and 25 September 1999. The discharge hydrograph presented in Figure 4.1 illustrates the flow patterns during the 1999 spring and summer season. High flows occurred during breakup and tapered off through the month of June. By the end of June, water was no longer flowing in the Sakoonang Channel, except for the occasional storm that caused short periods of flow.

![Figure 4.1 1999 Average Daily Discharge in Sakoonang Channel](image)

Based on historical flow data developed for the Sakoonang Channel (see Section 4.1.2), the quantity of water flowing through the Sakoonang Channel in 1999 was somewhat lower than the historical average.

A brief description of the methods used to collect the data and monthly summaries of the data (including hydrographs) are presented in Appendix C.
4.1.2 Estimates Of Historic Spring And Summer Discharge

There are no annual discharge data for the Sakoonang Channel beyond that collected in 1999. However, there are six years of water surface elevation data on the East Channel that can be used to estimate discharge in the Sakoonang Channel. The East Channel controls the amount of flow that enters the Sakoonang Channel. Using the data recorded in 1999 for the East and Sakoonang Channels, a relationship was developed to estimate historic discharges in the Sakoonang Channel. Using the relationship and the data collected in the East Channel, the average daily discharge in the Sakoonang Channel was computed (Appendix E) and is presented in Figure 4.2.

Figure 4.2 Long Term Mean Discharge in Sakoonang Channel

Although the discharge in the Sakoonang Channel varies from year to year (Figure E-1, Appendix E), Figure 4.2 provides a reasonable approximation of the long-term average flow conditions. For the purposes of this report, it is particularly important to note the dramatic drop in discharge that occurs during the later half of June, and the relatively low discharge throughout the summer. The prominence of the double peaks depicted in Figure 4.2 during late May and early June is related to a gap in the available data. Although a double peak is not uncommon, it is likely that as more data becomes available, the prominence of the double peak will decrease. Additional information concerning the data available and the methods used to estimate the historic discharges in the Sakoonang Channel are presented in Appendix E.
4.1.3 Quantity And Timing Of Discharge With Respect To Lake Recharge

In an average year, the Sakoonang Channel has more than enough water to fully recharge the water supply lakes. However, the length of time during which water can be transferred is limited. Flow in the Sakoonang Channel typically begins during the end of May and peaks during the first week of June. After the peak, the discharge typically drops throughout the rest of June and by the end of the month can be expected to be near zero. During the summer months the discharge in the channel will vary between zero and a relatively low flow, as storms pass through the drainage basin. Once fresh water stops flowing in the channel, the water quality will diminish in response to saltwater migrating up the channel from the ocean.

It is likely that fresh water could be pumped annually from the Sakoonang Channel over a 20-day period during breakup to artificially recharge Lakes 93-12 and 93-13. This presumes that pumping would start as soon as the channel ice is free from the banks and that the pumping would be completed before the spring flow decreased to zero.

4.2 Water Quality With Respect To Lake Recharge

In 1999 the water quality measurements made in the Sakoonang Channel (Location Map, Appendix A) consisted of temperature, salinity, conductivity, dissolved oxygen, turbidity, total suspended solids, primary inorganic chemicals, secondary contaminants, volatile organic chemicals, total Trihalomethanes, radioactive contaminants, total Coliform Bacteria, and other general water quality parameters. The procedures used to conduct the monitoring and the data collected are presented in Appendices C and F.

A comparison of the 1999 primary water quality data collected in Lakes 93-12 and 93-13, and the Sakoonang Channel is presented in Table 4.1. The data consists of temperature, salinity, conductivity, dissolved oxygen, turbidity, and total suspended solids. The data for the Sakoonang Channel represents the water quality during the period when water would likely be transferred from the Sakoonang Channel to recharge the lakes (i.e., May and June). The data presented for the lakes represents the lake water quality during the summer months.

As shown in Table 4.1, the turbidity and total suspended solids are noticeably higher in the Sakoonang Channel than in the lakes. Additionally, the turbidity and total suspended solids in the Sakoonang Channel are highest during spring breakup when it is most likely that water would be
transferred to the lakes. Additional information concerning the water quality in the lakes and Sakoonang Channel is presented in Appendices B and C, respectively.
Table 4.1  Comparison Of Primary Water Quality Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Units</th>
<th>Lake 93-13 (1)</th>
<th>Lake 93-12 (2)</th>
<th>Sakoonang Channel (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Average (4)</td>
<td>Median</td>
<td>Range</td>
</tr>
<tr>
<td>Temperature</td>
<td>°C</td>
<td>7.7</td>
<td>5.5</td>
<td>3.5 - 14.2</td>
</tr>
<tr>
<td>Salinity</td>
<td>ppt</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
</tr>
<tr>
<td>Conductivity</td>
<td>μS</td>
<td>121.2</td>
<td>114.5</td>
<td>111.3 - 137.8</td>
</tr>
<tr>
<td>Turbidity (5)</td>
<td>NTU</td>
<td>2.9</td>
<td>2.1</td>
<td>1.3 - 5.2</td>
</tr>
<tr>
<td>Total Suspended Solids (6)</td>
<td>mg/L</td>
<td>8.7</td>
<td>9.2</td>
<td>2.9 - 14</td>
</tr>
</tbody>
</table>

Notes:
1. The Average, Median and Range for Lake 93-13 were based on data obtained on 14 July, 25 August and 20 September 1999.
2. The Average, Median and Range for Lake 93-12 were based on data obtained on 14 July, 25 August and 21 September 1999.
3. Because it is expected that water would be drawn from the top 6 feet of the flow in the Sakoonang Channel, the Average, Median and Range for the Sakoonang Channel were based on data obtained in the top 6 feet or less of the flow on 3 June, 6 June, 8 June and 10 June 1999, except for turbidity which is based on sample dates 1 June, 6 June, 8 June and 10 June 1999, and total suspended solids which is based on sample dates 31 May and 6 June 1999.
4. The averages presented in the table were computed by first computing the average of the data collected on each sample date and then computing the average of the averages associated with sampling dates listed above. For parameters with values below the method detection limit, the average was calculated by replacing the less than detection limit value with a value equal to one-half the method detection limit.
5. Turbidity in the lakes was calculated one of two ways, either: the value from a 0 to depth-integrated sample was used, or a weighted average from discrete samples was used.
6. In the lakes, total suspended solids values are based on a depth-integrated sample from 0 to depth.
A comparison of the Lake 93-13 and the Sakoonang Channel data associated with the secondary water quality parameters is presented in Table 4.2. The data consists of primary inorganic chemicals, secondary contaminants, hardness, volatile organic chemicals, Trihalomethanes, radioactive contaminants, and total Coliform Bacteria. The data for Lake 93-13 was collected in 1998 (Northern Testing Laboratories, 1999) and represents the water quality during the summer months. The data for the Sakoonang Channel was collected in 1999 and represents the water quality during the period when water would likely be transferred from the Sakoonang Channel to recharge the lakes (i.e., May and June). Summer data are not available for Lake 93-12.

Although there is limited data from which to draw conclusions, it appears that color, and aluminum, iron, magnesium, and sulfate concentrations may be higher in the Sakoonang water than in Lake 93-13. The chloride and sodium concentrations in the Sakoonang water may be lower than in Lake 93-13. Additional information concerning the magnitude of the secondary water quality parameters in the lakes and Sakoonang Channel is presented in Appendices B, C and F.

<table>
<thead>
<tr>
<th>Table 4.2 Comparison Of Secondary Water Quality Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Parameter</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Primary Inorganic Chemicals</strong></td>
</tr>
<tr>
<td>Antimony</td>
</tr>
<tr>
<td>Arsenic</td>
</tr>
<tr>
<td>Barium</td>
</tr>
<tr>
<td>Beryllium</td>
</tr>
<tr>
<td>Cadmium</td>
</tr>
<tr>
<td>Chromium</td>
</tr>
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<td>Fluoride</td>
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<tr>
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<tr>
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</tr>
<tr>
<td>Selenium</td>
</tr>
<tr>
<td>Thallium</td>
</tr>
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</table>
### Table 4.2 (continued) Comparison Of Secondary Water Quality Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Units</th>
<th>Lake 93-13 (1)</th>
<th>Sakoonang Channel (2) 06/01/99</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Average (3)</td>
<td>Median</td>
</tr>
<tr>
<td><strong>Secondary Contaminants</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aluminum</td>
<td>mg/L</td>
<td>&lt;0.02</td>
<td>&lt;0.015 - &lt;0.02</td>
</tr>
<tr>
<td>Chloride</td>
<td>mg/L</td>
<td>28.9</td>
<td>27.5</td>
</tr>
<tr>
<td>Color</td>
<td>Units</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Copper</td>
<td>mg/L</td>
<td>&lt;0.003</td>
<td>&lt;0.003</td>
</tr>
<tr>
<td>Langelier Index (Corrosivity)</td>
<td>(Unit)</td>
<td>-1.2</td>
<td>-1.3</td>
</tr>
<tr>
<td>Fluoride</td>
<td>mg/L</td>
<td>0.25</td>
<td>&lt;0.06</td>
</tr>
<tr>
<td>Foaming agents</td>
<td>mg/L</td>
<td>&lt;0.10</td>
<td>&lt;0.10</td>
</tr>
<tr>
<td>Iron</td>
<td>mg/L</td>
<td>0.086</td>
<td>0.086</td>
</tr>
<tr>
<td>Manganese</td>
<td>mg/L</td>
<td>0.013</td>
<td>0.010</td>
</tr>
<tr>
<td>Odor (4)</td>
<td>TON</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>PH</td>
<td></td>
<td>7.6</td>
<td>7.7</td>
</tr>
<tr>
<td>Silver</td>
<td>mg/L</td>
<td>0.00007</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Sodium</td>
<td>mg/L</td>
<td>14.1</td>
<td>14.3</td>
</tr>
<tr>
<td>Sulfate</td>
<td>mg/L</td>
<td>2.8</td>
<td>2.9</td>
</tr>
<tr>
<td>Total Dissolved Solids</td>
<td>mg/L</td>
<td>93</td>
<td>90</td>
</tr>
<tr>
<td>Zinc</td>
<td>mg/L</td>
<td>0.068</td>
<td>0.045</td>
</tr>
<tr>
<td><strong>General Water Quality Parameters</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calcium</td>
<td>mg/L</td>
<td>8.93</td>
<td>9.25</td>
</tr>
<tr>
<td>Alkalinity as CaCO3</td>
<td>mg/L</td>
<td>31</td>
<td>30</td>
</tr>
<tr>
<td>Hardness as CaCO3</td>
<td>mg/L</td>
<td>40.1</td>
<td>41.5</td>
</tr>
<tr>
<td>Magnesium</td>
<td>mg/L</td>
<td>3.05</td>
<td>4.4</td>
</tr>
<tr>
<td><strong>Volatile Organic Chemical Analysis (5)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ethylbenzene</td>
<td>mg/L</td>
<td>&lt;0.00020</td>
<td>&lt;0.00020</td>
</tr>
<tr>
<td>Toluene</td>
<td>mg/L</td>
<td>0.00021</td>
<td>&lt;0.00020</td>
</tr>
<tr>
<td>Total Xylene</td>
<td>mg/L</td>
<td>&lt;0.00020</td>
<td>&lt;0.00020</td>
</tr>
<tr>
<td>1,2,4-Trimethylbenzene</td>
<td>mg/L</td>
<td>&lt;0.00020</td>
<td>&lt;0.00020</td>
</tr>
<tr>
<td>1,3,5-Trimethylbenzene</td>
<td>mg/L</td>
<td>&lt;0.00020</td>
<td>&lt;0.00020</td>
</tr>
</tbody>
</table>
Table 4.2 (continued) Comparison Of Secondary Water Quality Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Units</th>
<th>Lake 93-13 (1)</th>
<th>Sakoonang Channel (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Average (3)</td>
<td>Median</td>
</tr>
<tr>
<td><strong>Total Trihalomethanes</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Trihalomethanes</td>
<td>mg/L</td>
<td>&lt;0.00050</td>
<td>&lt;0.00050</td>
</tr>
<tr>
<td><strong>Radioactive Contaminants</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gross Alpha Radioactivity (6)</td>
<td>pCi/L</td>
<td>ND@1+/-.42</td>
<td>ND@1+/-.42</td>
</tr>
<tr>
<td><strong>Total Coliform Bacteria</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Coliform By Colilert</td>
<td>(7)</td>
<td>Not Detected/</td>
<td>Detected</td>
</tr>
<tr>
<td>Fecal Coliform By Colilert</td>
<td></td>
<td>Not Detected</td>
<td>Not Detected</td>
</tr>
</tbody>
</table>

Notes:
1. The Average, Median and Range for Lake 93-13 were based on data obtained on 17 July, 18 August and 16 September 1998, except for gross alpha radiation, which is based only on 9 June 1998 data, and total Coliform Bacteria, which is based on 18 August and 16 September 1998 data.
2. Date for the Sakoonang Channel were collected on 1 June 1999.
3. For parameters with values below the method detection limit, the average was calculated by replacing the less than detection limit value with a value equal to one-half the method detection limit.
4. TON - Threshold Odor Number.
5. For Volatile Organic Chemical Analysis, only the parameters with values above the method detection limit during July, August or September are presented in the table above. Other Volatile Organics examined include: benzene, bromobenzene, bromochloromethane, bromodichloromethane, bromoform, bromomethane, n-butylnbenzene, sec-butylnbenzene, tert-butylnbenzene, carbon tetrachloride, chlorobenzene (monochlorobenzene), chloroethane, chloroform, chloromethane, 2-chlorotoluene, 4-chlorotoluene, dibromochloromethane, dibromomethane, 1,2-dichlorobenzene (o-dichlorobenzene), 1,3-dichlorobenzene, 1,4-dichlorobenzene (para-dichlorobenzene), dichlorodifluoromethane, 1,1-dichloroethane, 1,2-dichloroethane, 1,1-dichloroethene, cis-1,2-dichloroethene, trans-1,2-dichloroethene, 1,2-dichloropropane, 1,3-dichloropropane, 1,1-dichloropropene, cis-1,3-dichloro-propene, trans-1,3-dichloropropene, hexachlorobutadiene, isopropylbenzene, isopropylylouene, methylene chloride (dichloromethane), naphthalene, n-propylbenzene, styrene, 1,1,1,2-tetrachloroethane, 1,1,2,2-tetrachloroethane, tetracloroethane, 1,2,3-trichlorobenzene, 1,2,4-trichlorobenzene, 1,1,1-trichloroethane, 1,1,2-trichloroethane, trichloroethene, trichloroform, 1,2,3-trichloropropane, vinyl chloride, 4-bromofluorobenzene (BFB (Sur)), and 1,2-dichlorobenzene-d4 (1,2-DCB-d4 (Sur)). Laboratory results can be found in Appendix F.
6. The Gross Alpha Radioactivity is a statistical analysis and is reported as the mean value of the sample and the standard deviation.
7. Total coliform by colilert was not detected on 16 September 1998 but was detected on 18 August 1998.
5.0 Other Methods Of Lake Recharge

5.1 Snow Fences

Snow fences provide a potential solution to enhance the water recharge of Lakes 93-12 and 93-13. They have been used in Alaska for both water augmentation and drift control. Water accumulation data are available for two snow fences constructed on the North Slope of Alaska: one at Barrow and one at Wainwright. The water yield per lineal foot of fence and the height of the fence associated with the two sites is presented in Table 5.1.

<table>
<thead>
<tr>
<th>Location</th>
<th>Yield (gallons per lineal foot)</th>
<th>Height of Fence (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barrow, Alaska</td>
<td>8,300</td>
<td>4</td>
</tr>
<tr>
<td>Wainwright, Alaska</td>
<td>11,800</td>
<td>8</td>
</tr>
</tbody>
</table>

(Smith, D.W., 1996)

The data suggests that snow fences could provide a significant portion, if not all the water required by the Alpine facility. For example: a 1200-foot snow fence with operational properties similar to the fence in Barrow might yield an additional 10-MG of water; and a snow fence with similar properties to the Wainwright fence might yield an additional 14-MG. Both of these fences would provide Alpine’s entire estimated annual water requirement of 10 MG for the years 2005 and 2006.

The amount of water produced by a snow fence will vary from one location to another and from one year to the next as wind and precipitation conditions vary. Factors such as wind direction, wind velocity, topography, fence height, and fence design will affect the efficiency with which the fence catches blowing snow. It should be noted that additional snow accumulation as a result of the snow fence might lengthen the time the lake is ice-covered and thus effect water quality and fish populations. Snow fences are a viable option to increase water supply, but will require a site-specific assessment to estimate the magnitude of increase in attainable water and to assess potential environmental impacts.
5.2 Additional Fresh Water Sources

The recharge of Lakes 93-12 and 93-13 might be accomplished by transferring water from other nearby fresh water lakes. Potential lakes include 93-10 and 93-11, two lakes located east of 93-12.

Transferring water from additional fresh water lakes might offer Alpine greater flexibility than pumping from the Sakoonang Channel. Lake pumping can occur anytime over the summer months. Pumps and piping may be sized smaller and the water transfer can take place after the lake surfaces are ice-free. By comparison, water transfers from the Sakoonang Channel will be constrained to approximately a 20-day window during breakup when Lakes 93-12 and 93-13 are likely to be ice-covered. Additionally, the water quality in the nearby fresh water lakes is likely to more closely match the water quality in Lakes 93-12 and 93-13 than the water from the Sakoonang Channel.

The challenge associated with pumping from other nearby lakes may be finding a lake or lakes with a sufficient quantity of water to meet shortfalls in Lakes 93-12 and 93-13 if there are a number of consecutive years without natural recharge. The two lakes mentioned above have depths similar to Lakes 93-12 and 93-13, but are considerably smaller in surface area. Lake 93-10 has a reported depth of 14.5 feet and a water surface area of 61 acres (Moulton, 1997). Lake 93-11 has a reported depth of 12.5 feet and a water surface area of 22 acres (Moulton, 1997). Lakes 93-12 and 93-13 have surface areas of 100 and 69 acres, respectively. To assess the potential of nearby lakes to practically meet the shortfall likely to occur in Lakes 93-12 and 93-13, the water balance described in Section 3 should be enlarged to consider the water likely to be available from specific nearby lakes. The assessment would consider the estimated annual shortfall in Lakes 93-12 and 93-13, the amount of the allowable withdrawal from selected nearby lakes, and the available water in nearby lakes as a result of year to year variations in precipitation, evaporation, and flooding by the river.
6.0 References


APPENDIX A

LOCATION MAP

LIST OF FIGURES

Figure A-1: Location Map
APPENDIX B

LAKE 93-12 AND LAKE 93-13 1999 MONITORING DATA
AND 1998 WATER QUALITY DATA

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  Figure B-2c: Lake 93-12 1999 Conductivity Versus Depth
  Figure B-2d: Lake 93-12 1999 Dissolved Oxygen Versus Depth
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  Figure B-5b: Lake 93-13 1999 Salinity Versus Depth
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  Figure B-5d: Lake 93-13 1999 Dissolved Oxygen Versus Depth
  Figure B-5e: Lake 93-13 1999 Turbidity Versus Depth
Table B-6: Lake 93-13 1998 Secondary Water Quality Parameters
Methods

Water Level Monitoring

A staff gage was established in each lake and read periodically throughout the spring and summer. The height of the water on the staff gage was correlated to British Petroleum Mean Sea Level (BPMSL) and thus, all of the water surface elevations reported herein are based on BPMSL.

Water Quality Measurements

Salinity, Conductivity, Temperature, Dissolved Oxygen

Salinity, conductivity, and temperature were measured with a YSI Model 30 SCT meter. Dissolved oxygen and temperature were measured with a YSI Model 95 Dissolved Oxygen Meter.

Prior to making the measurements, the depth of water was measured and used to determine the measurement interval. Measurements were made at one-foot intervals from the bottom of the lake to the surface, with no measurements being made within one foot of the surface. For instance, if the lake was 9.6 feet deep, measurements were made at 8.6, 7.6, 6.6, 5.6, 4.6, 3.6, 2.6, and 1.6 feet from the water surface. To make the measurements, the probe to be used in making the measurement was attached to a weighted tape measure and lowered to the appropriate depth. Measurements were only recorded after the readings stabilized.

Turbidity

Turbidity was measured using a Hoch model 2100P Turbidimeter. Samples for turbidity measurement were obtained using one of two methods. The first method consisted of using a US D-74 depth-integrating sampler to collect a single sample representing the entire water column (i.e., from surface to 6 inches above the lakebed). The second method consisted of collecting discrete samples using a bailer. The lowest sample was collected 3 feet above the lakebed and additional samples were collected at three-foot intervals above the lowest sample. When discrete samples were taken, the turbidity was measured in each of the discrete samples.
Total Suspended Solids

A depth-integrated water sample was collected using a US D-74 depth-integrating sampler and the sample shipped to Northern Testing Laboratories for analysis.
Results

A summary of the 1999 water surface elevations and observations recorded on Lake 93-12 is presented in Table B-1. A summary of the water temperature, salinity, conductivity, dissolved oxygen, turbidity, and total suspended solids data collected in 1999 is presented in Table B-2. Plots of the various parameters versus water depth are presented in Figures B-2a, B-2b, B-2c, B-2d, and B-2e. A summary of the primary inorganic chemicals, secondary contaminants, hardness, volatile organic chemicals, trihalomethanes, radioactive contaminants, and total coliform bacteria collected in 1998 by others, is presented in Table B-3.

A summary of the 1999 water surface elevations and observations recorded on Lake 93-13 is presented in Table B-4. A summary of the water temperature, salinity, conductivity, dissolved oxygen, turbidity, and total suspended solids data collected in 1999 is presented in Table B-5. Plots of the various parameters versus depth are presented in Figures B-5a, B-5b, B-5c, B-5d, and B-5e. A summary of the primary inorganic chemicals, secondary contaminants, hardness, volatile organic chemicals, trihalomethanes, radioactive contaminants, and total coliform bacteria collected in 1998 by others, is presented in Table B-6.
### Table B-1: Lake 93-12 1999 Water Surface Elevations And Observations

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Water Surface Elevation (feet)</th>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>4/28/99</td>
<td></td>
<td>7.45</td>
<td></td>
</tr>
<tr>
<td>6/10/99</td>
<td>12:43</td>
<td>7.77</td>
<td></td>
</tr>
<tr>
<td>6/14/99</td>
<td>9:40</td>
<td>7.93</td>
<td>Approximately 90% ice coverage, ice along shoreline has melted</td>
</tr>
<tr>
<td>6/18/99</td>
<td>12:00</td>
<td>7.93</td>
<td>Approximately 85% ice coverage. Wide leads have opened along the east shore. Area surrounding the staff gauge has opened up considerably, approximately 30 - 40 feet open along the shoreline. Elsewhere along the perimeter, ice cover remains closer to shore, approximately 5 - 10 feet.</td>
</tr>
<tr>
<td>6/22/99</td>
<td>15:00</td>
<td>7.93</td>
<td>Ice coverage is approximately 80%.</td>
</tr>
<tr>
<td>6/24/99</td>
<td></td>
<td>7.92</td>
<td>Ice coverage is approximately 70%.</td>
</tr>
<tr>
<td>7/7/99</td>
<td>10:00</td>
<td>7.87</td>
<td>Lake is ice free.</td>
</tr>
<tr>
<td>7/11/99</td>
<td>11:30</td>
<td>7.84</td>
<td>+/- 0.02 ft.</td>
</tr>
<tr>
<td>7/14/99</td>
<td>16:50</td>
<td>7.83</td>
<td>+/- 0.01 ft.</td>
</tr>
<tr>
<td></td>
<td>19:30</td>
<td>7.82</td>
<td>+/- 0.02 ft.</td>
</tr>
<tr>
<td>7/19/99</td>
<td></td>
<td>7.84</td>
<td>Rain has fallen during the previous days.</td>
</tr>
<tr>
<td>7/22/99</td>
<td></td>
<td>7.83</td>
<td>Rain continues to fall.</td>
</tr>
<tr>
<td>7/27/99</td>
<td></td>
<td>7.61</td>
<td>Calm</td>
</tr>
<tr>
<td>7/29/99</td>
<td></td>
<td>7.78</td>
<td></td>
</tr>
<tr>
<td>8/2/99</td>
<td>17:00</td>
<td>7.75</td>
<td>Moderate wave action.</td>
</tr>
<tr>
<td>8/15/99</td>
<td></td>
<td>7.80</td>
<td>Rainy.</td>
</tr>
<tr>
<td>8/25/99</td>
<td>9:28</td>
<td>7.74</td>
<td>+/- 0.03 ft.</td>
</tr>
<tr>
<td>9/8/99</td>
<td>15:56</td>
<td>7.24</td>
<td>+/- 0.35 ft. Heavy wave action. Wind from the northeast.</td>
</tr>
<tr>
<td>9/21/99</td>
<td>16:01</td>
<td>7.74</td>
<td>+/- 0.10 ft.</td>
</tr>
<tr>
<td></td>
<td>16:41</td>
<td>7.72</td>
<td>+/- 0.10 ft.</td>
</tr>
<tr>
<td>9/25/99</td>
<td>18:15</td>
<td>7.74</td>
<td>No wave action. Ice was built up on staff gage, although there was no apparent ice in the lake. Pulled staff gage after taking reading. Left angle iron.</td>
</tr>
</tbody>
</table>

**Notes:**

1. Water surface elevations are based on Alpine Monument 4 and TBM 993259.
2. TBM 993259 has the following coordinates, N 70° 20' 00.7" W 150° 56' 48.9" (NAD27), and an elevation of 14.62 (established in 1999).
3. Alpine Monument 4 has the following coordinates, N 70° 20' 22.7" W 150° 55' 49.8" (NAD27), and an elevation of 12.36 (established in 1998).
<table>
<thead>
<tr>
<th>Date</th>
<th>Location</th>
<th>Water Surface Elevation (feet)</th>
<th>Sample Depth (ft)</th>
<th>Water Temp (°C)</th>
<th>Salinity (ppt)</th>
<th>Conductivity (μS)</th>
<th>Dissolved Oxygen (mg/L)</th>
<th>Turbidity (NTU)</th>
<th>Total Suspended Solids (mg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4/28/99 (1)</td>
<td>Site A</td>
<td>7.45</td>
<td>6.1</td>
<td>1.5</td>
<td>0.1</td>
<td></td>
<td>13.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>N 70° 20' 00.7&quot; W 150° 56' 48.9&quot; (NAD27)</td>
<td></td>
<td>7.1</td>
<td>2.1</td>
<td>0.1</td>
<td></td>
<td>13.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>8.1</td>
<td>2.4</td>
<td>0.1</td>
<td></td>
<td>14.0</td>
<td>2.3</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>9.1</td>
<td>2.7</td>
<td>0.1</td>
<td></td>
<td>12.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>10.1</td>
<td>2.9</td>
<td>0.1</td>
<td></td>
<td>10.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>11.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7/14/99 (2)</td>
<td>Site B</td>
<td>7.82</td>
<td>1.4</td>
<td>14.1</td>
<td>0.0</td>
<td>63.8</td>
<td>10.66</td>
<td>1.6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>N 70° 20' 01.2&quot; W 150° 56' 45.8&quot; (NAD27)</td>
<td></td>
<td>2.4</td>
<td>14.1</td>
<td>0.0</td>
<td>63.9</td>
<td>10.65</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3.4</td>
<td>14.1</td>
<td>0.0</td>
<td>63.9</td>
<td>10.66</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4.4</td>
<td>14.1</td>
<td>0.0</td>
<td>63.8</td>
<td>10.63</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5.4</td>
<td>14.1</td>
<td>0.0</td>
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<td>10.65</td>
<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>6.4</td>
<td>14.1</td>
<td>0.0</td>
<td>64.0</td>
<td>10.65</td>
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</tr>
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<td></td>
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<td>7.4</td>
<td>14.1</td>
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<td>8.4</td>
<td>14.1</td>
<td>0.0</td>
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<td>10.66</td>
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<td></td>
<td>9.4</td>
<td>14.1</td>
<td>0.0</td>
<td>63.9</td>
<td>10.71</td>
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</tr>
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<td>7.74</td>
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<td>51.7</td>
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<td>N 70° 20' 01.2&quot; W 150° 56' 45.8&quot; (NAD27)</td>
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<td>5.8</td>
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<td>12.27</td>
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<td>12.23</td>
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<td>0.0</td>
<td>51.7</td>
<td>12.26</td>
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<td>11.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>9/21/99 (2)</td>
<td>Site B</td>
<td>7.74</td>
<td>1.0</td>
<td>3.5</td>
<td>0.0</td>
<td>49.0</td>
<td>13.30</td>
<td></td>
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</tr>
<tr>
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<td>N 70° 20' 01.2&quot; W 150° 56' 45.8&quot; (NAD27)</td>
<td></td>
<td>2.0</td>
<td>3.5</td>
<td>0.0</td>
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<td>13.30</td>
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<td>3.5</td>
<td>0.0</td>
<td>48.9</td>
<td>13.27</td>
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<td></td>
<td>4.0</td>
<td>3.5</td>
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<td>13.29</td>
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<td>5.0</td>
<td>3.5</td>
<td>0.0</td>
<td>49.0</td>
<td>13.29</td>
<td>1.7</td>
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<td></td>
<td>6.0</td>
<td>3.5</td>
<td>0.0</td>
<td>48.8</td>
<td>13.30</td>
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</tr>
<tr>
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<td>7.0</td>
<td>3.5</td>
<td>0.0</td>
<td>48.8</td>
<td>13.29</td>
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<td>13.28</td>
<td>0.6</td>
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<td>3.5</td>
<td>0.0</td>
<td>48.5</td>
<td>13.27</td>
<td></td>
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</tr>
<tr>
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<td></td>
<td></td>
<td>10.0</td>
<td>3.5</td>
<td>0.0</td>
<td>48.9</td>
<td>13.32</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table B-2 (Continued): Lake 93-12 1999 Primary Water Quality Parameters

<table>
<thead>
<tr>
<th>Date</th>
<th>Location</th>
<th>Water Surface Elevation (feet)</th>
<th>Sample Depth (ft)</th>
<th>Water Temp (3) (°C)</th>
<th>Salinity (ppt)</th>
<th>Conductivity (µS)</th>
<th>Dissolved Oxygen (mg/L)</th>
<th>Turbidity (NTU)</th>
<th>Total Suspended Solids (mg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>9/21/99</td>
<td>continued</td>
<td>11.0 River Bed</td>
<td>Depth Integrated 0 - 11.0 feet</td>
<td>1.3</td>
<td>&lt;MRL</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes:
1. On this date the lake was covered with ice. The ice thickness was 4.5 feet and the distance from the top of the ice to the water surface was 0.1 feet.
3. The temperature is the average temperature from the DO meter and the SCT meter. The difference between the temperatures was generally within the accuracy of the instruments.
4. MRL = Method Reporting Limit (1.1 mg/L)
Figure B-2a: Lake 93-12 1999 Water Temperature Versus Depth

Note: See Table B-2 for site locations.
Figure B-2b: Lake 93-12 1999 Salinity Versus Depth

Salinity On 4/28/99 At Site A
Salinity (ppt)

<table>
<thead>
<tr>
<th>Water Depth (ft)</th>
<th>0</th>
<th>0.1</th>
<th>0.2</th>
<th>0.3</th>
<th>0.4</th>
<th>0.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lake Bed at 11.1 feet.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Salinity On 7/14/99 At Site B
Salinity (ppt)

<table>
<thead>
<tr>
<th>Water Depth (ft)</th>
<th>0</th>
<th>0.1</th>
<th>0.2</th>
<th>0.3</th>
<th>0.4</th>
<th>0.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lake Bed at 11.4 feet.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Salinity On 8/26/99 At Site B
Salinity (ppt)

<table>
<thead>
<tr>
<th>Water Depth (ft)</th>
<th>0</th>
<th>0.1</th>
<th>0.2</th>
<th>0.3</th>
<th>0.4</th>
<th>0.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lake Bed at 11.4 feet.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: See Table B-2 for site locations.
Figure B-2c: Lake 93-12 1999 Conductivity Versus Depth

Conductivity On 4/28/99 At Site A

Conductivity On 7/14/99 At Site B

Conductivity On 6/25/99 At Site B

There was no conductivity data collected on this date.

Note: See Table B-2 for site locations.
Note: See Table B-2 for site locations.
Figure B-2e: Lake L93-12 1999 Turbidity Versus Depth

Turbidity On 4/28/99 At Site A
Turbidity (NTU)

Bottom of ice at 4.5 feet.
A Total Suspended Solid sample was not collected at this site.
Lake Bed at 11.1 feet.

Turbidity On 7/14/99 At Site B
Turbidity (NTU)
The concentration of Total Suspended Solids, based on a depth integrated sample collected over the entire depth, was 12 mg/L.
Lake Bed at 11.4 feet.

Turbidity On 8/25/99 At Site B
Turbidity (NTU)
The concentration of Total Suspended Solids, based on a depth integrated sample collected over the entire depth, was 1.5 mg/L.
Lake Bed at 11.4 feet.

Turbidity On 9/21/99 At Site B
Turbidity (NTU)
The concentration of Total Suspended Solids, based on a depth integrated sample collected over the entire depth, was below the method reporting limit of 1.1 mg/L.
Lake Bed at 11.0 feet.

Note: See Table B-2 for site location.
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Units</th>
<th>ADEC Drinking Water Maximum Contaminant Level (1)</th>
<th>Sampling Date Results (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Primary Inorganic Chemicals</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Antimony</td>
<td>mg/L</td>
<td>0.006 &lt;0.003 &lt;0.003 &lt;0.003 &lt;0.003 &lt;0.003</td>
<td></td>
</tr>
<tr>
<td>Arsenic</td>
<td>mg/L</td>
<td>0.05 &lt;0.003 &lt;0.003 &lt;0.003 &lt;0.003 &lt;0.003</td>
<td></td>
</tr>
<tr>
<td>Barium</td>
<td>mg/L</td>
<td>2 0.092 0.12 0.106 0.129 0.134 0.126</td>
<td></td>
</tr>
<tr>
<td>Beryllium</td>
<td>mg/L</td>
<td>0.004 &lt;0.0005 &lt;0.0005 &lt;0.0005 &lt;0.0005 &lt;0.0005</td>
<td></td>
</tr>
<tr>
<td>Cadmium</td>
<td>mg/L</td>
<td>0.005 &lt;0.0001 &lt;0.0001 &lt;0.0001 &lt;0.0001 &lt;0.0001</td>
<td></td>
</tr>
<tr>
<td>Chromium</td>
<td>mg/L</td>
<td>0.1 &lt;0.002 &lt;0.002 &lt;0.002 &lt;0.002 &lt;0.002</td>
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</tr>
<tr>
<td>Cyanide</td>
<td>mg/L</td>
<td>0.2 &lt;0.02 &lt;0.02 &lt;0.02 &lt;0.02 &lt;0.02</td>
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</tr>
<tr>
<td>Fluoride</td>
<td>mg/L</td>
<td>4.0 &lt;0.04 0.04 &lt;0.04 &lt;0.04 0.12 0.05</td>
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<tr>
<td>Mercury</td>
<td>mg/L</td>
<td>0.002 &lt;0.0002 &lt;0.0002 &lt;0.0002 &lt;0.0002 &lt;0.0002</td>
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<tr>
<td>Nickel</td>
<td>mg/L</td>
<td>0.1 &lt;0.028 &lt;0.028 &lt;0.028 &lt;0.028 &lt;0.028</td>
<td></td>
</tr>
<tr>
<td>Nitrate</td>
<td>mg/L</td>
<td>10 0.08 0.06 0.05 &lt;0.03 &lt;0.03</td>
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<tr>
<td>Selenium</td>
<td>mg/L</td>
<td>0.05 &lt;0.003 &lt;0.003 &lt;0.003 &lt;0.003 &lt;0.003</td>
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</tr>
<tr>
<td>Thallium</td>
<td>mg/L</td>
<td>0.002 &lt;0.001 &lt;0.001 &lt;0.001 &lt;0.001 &lt;0.001</td>
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</tr>
<tr>
<td><strong>Secondary Contaminants</strong></td>
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</tr>
<tr>
<td>Aluminum</td>
<td>mg/L</td>
<td>0.2 &lt;0.055 &lt;0.055 &lt;0.055 &lt;0.055 &lt;0.055</td>
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</tr>
<tr>
<td>Chloride</td>
<td>mg/L</td>
<td>250 14.3 17 21.9 21.1 18.1 17</td>
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</tr>
<tr>
<td>Color</td>
<td>Units</td>
<td>15 &lt;5 10 10 10 10 10</td>
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<tr>
<td>Copper</td>
<td>mg/L</td>
<td>1.0 &lt;0.005 &lt;0.005 &lt;0.005 &lt;0.005 &lt;0.005</td>
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</tr>
<tr>
<td>Langelier Index (Corrosivity)</td>
<td>(Unit)</td>
<td>Noncorrosive -2.6 -1.6 -1.6 0.7 -1.6 -0.8</td>
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</tr>
<tr>
<td>Fluoride</td>
<td>mg/L</td>
<td>2.0 &lt;0.04 0.04 &lt;0.04 0.12 0.05 0.06</td>
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</tr>
<tr>
<td>Foaming agents</td>
<td>mg/L</td>
<td>0.5 &lt;0.10 &lt;0.10 &lt;0.10 &lt;0.10 &lt;0.10 &lt;0.10</td>
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<tr>
<td>Iron</td>
<td>mg/L</td>
<td>0.3 0.012 0.054 0.078 0.099 0.247 0.64</td>
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</tr>
<tr>
<td>Manganese</td>
<td>mg/L</td>
<td>0.05 &lt;0.056 &lt;0.005 &lt;0.009 &lt;0.007 &lt;0.047</td>
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<tr>
<td>Odor (3)</td>
<td>TON</td>
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</tr>
<tr>
<td>pH</td>
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<td>6.5 - 8.5 7.2 7.0 7.1 7.9 7.0 7.8</td>
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</tr>
<tr>
<td>Silver</td>
<td>mg/L</td>
<td>0.1 &lt;0.0001 &lt;0.0001 &lt;0.0001 &lt;0.0001 &lt;0.0001</td>
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</tr>
<tr>
<td>Sodium</td>
<td>mg/L</td>
<td>250 7.45 9.42 8.95 9.87 9.88 9.78</td>
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<tr>
<td>Sulfate</td>
<td>mg/L</td>
<td>250 &lt;0.20 &lt;0.20 &lt;0.20 &lt;0.20 &lt;0.20 &lt;0.20</td>
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</tr>
<tr>
<td>Total Dissolved Solids</td>
<td>mg/L</td>
<td>500 54 115 87 85 108 85</td>
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<td>Zinc</td>
<td>mg/L</td>
<td>5 &lt;0.008 &lt;0.008 &lt;0.008 &lt;0.011 &lt;0.008 &lt;0.008</td>
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</tr>
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</table>
Table B-3 (Continued): Lake 93-12 1998 Secondary Water Quality Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Units</th>
<th>ADEC Drinking Water Maximum Contaminant Level (1)</th>
<th>Sampling Date Results (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calcium</td>
<td>mg/L</td>
<td>(4)</td>
<td>11.2</td>
</tr>
<tr>
<td>Alkalinity as CaCO₃</td>
<td>mg/L</td>
<td>(4)</td>
<td>44</td>
</tr>
<tr>
<td>Bicarbonate Alkalinity</td>
<td>mg/L</td>
<td>(4)</td>
<td>44</td>
</tr>
<tr>
<td>Hardness as CaCO₃</td>
<td>mg/L</td>
<td>(4)</td>
<td>45.1</td>
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<tr>
<td>Magnesium</td>
<td>mg/L</td>
<td>(4)</td>
<td>4.16</td>
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<tr>
<td>Other Analyses</td>
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<tr>
<td>Ethylbenzene</td>
<td>mg/L</td>
<td>0.7</td>
<td>&lt;0.00020</td>
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<tr>
<td>Toluene</td>
<td>mg/L</td>
<td>1</td>
<td>0.00048</td>
</tr>
<tr>
<td>Total Xylene</td>
<td>mg/L</td>
<td>10</td>
<td>&lt;0.00020</td>
</tr>
<tr>
<td>Bromoform</td>
<td>mg/L</td>
<td>(4)</td>
<td>0.00066</td>
</tr>
<tr>
<td>Isopropylbenzene</td>
<td>mg/L</td>
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<td>&lt;0.00020</td>
</tr>
<tr>
<td>n-Propylbenzene</td>
<td>mg/L</td>
<td>(4)</td>
<td>&lt;0.00020</td>
</tr>
<tr>
<td>1,2,4-Trimethylbenzene</td>
<td>mg/L</td>
<td>(4)</td>
<td>&lt;0.00020</td>
</tr>
<tr>
<td>1,3,5-Trimethylbenzene</td>
<td>mg/L</td>
<td>(4)</td>
<td>&lt;0.00020</td>
</tr>
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<td>Volatile Organic Chemical Analysis (5)</td>
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<tr>
<td>Total Trihalomethanes</td>
<td>mg/L</td>
<td>0.10</td>
<td>0.00066</td>
</tr>
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<td>Radioactive Contaminants</td>
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<tr>
<td>Gross Alpha Radioactivity (6)</td>
<td>pCi/L</td>
<td>15</td>
<td>ND@1+/−0.28</td>
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<tr>
<td>Total Coliform Bacteria</td>
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<td></td>
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</tr>
<tr>
<td>Total Coliform By Colilert</td>
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<td>Not Detected</td>
</tr>
<tr>
<td>Fecal Coliform By Colilert</td>
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<td>Not Detected</td>
</tr>
<tr>
<td>Turbidity</td>
<td></td>
<td></td>
<td>5</td>
</tr>
</tbody>
</table>

Notes:
1. Alaska Department of Environmental Conservation (ADEC) Drinking Water Maximum Contaminant Levels are listed in the Alaska Drinking Water Regulations (18 AAC 80) as amended through 1 October 1999, except for Aluminum, Foaming Agents and Silver which are from the regulations as amended through 10 November 1994.
2. Shaded areas indicate levels that do not meet the Alaska Drinking Water Regulations.
Table B-3 (Continued): Lake 93-12 1998 Secondary Water Quality Parameters

3. TON - Threshold Odor Number
4. Parameter is regulated by ADEC but a Maximum Contaminant Level is not specified.
5. Only the parameters within the Volatile Organic Group that had values above the method detection limit during February, March, April, or May are presented in the table above. Other Volatile Organics examined include: benzene, bromobenzene, bromochloromethane, bromodichloromethane, bromomethane, n-butylbenzene, sec-butylbenzene, tert-butylbenzene, carbon tetrachloride, chlorobenzene (monochlorobenzene), chloroethane, chloroform, chloromethane, 2-chlorotoluene, 4-chlorotoluene, dibromochloromethane, dibromomethane, 1,2-dichlorobenzene (o-dichlorobenzene), 1,3-dichlorobenzene, 1,4-dichlorobenzene (para-dichlorobenzene), dichlorodifluoromethane, 1,1-dichloroethane, 1,2-dichloroethane, 1,1-dichloroethene, cis-1,2-dichloroethene, trans-1,2-dichloroethene, 1,2-dichloropropane, 1,3-dichloropropane, 2,2-dichloropropane, 1,1-dichloropropene, cis-1,3-dichloropropene, trans-1,3-dichloropropene, hexachlorobutadiene, p-isopropyltoluene, methylene chloride (dichloromethane), naphthalene, styrene, 1,1,1,2-tetrachloroethane, 1,1,2,2-tetrachloroethane, tetrachloroethene, 1,2,3-trichlorobenzene, 1,2,4-trichlorobenzene, 1,1,1-trichloroethane, 1,1,2-trichloroethane, trichloroethene, trichlorofluoromethane, 1,2,3-trichloropropene, vinyl chloride, 4-bromofluorobenzene (BFB (Surr)), and 1,2-dichlorobenzene-d4 (1,2-DCB-d4 (Surr)). Laboratory results can be found in Appendix F.
6. The Gross Alpha Radioactivity is a statistical analysis and is reported as the mean value of the sample and the standard deviation. Additional samples were collected on 26 May and 9 June 1998. The result of the 26 May test was ND@1+/-0.38 pCi/L and the result of the 9 June test was ND@1+/-0.32 pCi/L.
7. The laboratory analyses were performed by Northern Testing Laboratories, Inc.
Table B-4: Lake 93-13 1999 Water Surface Elevations And Observations

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Water Surface Elevation (feet)</th>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>4/27/99</td>
<td>10:17</td>
<td>5.91</td>
<td>Ice thickness is 4.3 feet and the distance from the top of the ice to the water surface is 0.3 feet.</td>
</tr>
<tr>
<td>6/9/99</td>
<td>12:00</td>
<td>6.14</td>
<td>There is still a 95% ice cover on the lake.</td>
</tr>
<tr>
<td>HWM</td>
<td></td>
<td>6.44</td>
<td>HWM from line on concrete blocks. +/- 0.10 ft. This could be a false line from local melt or wind. Lake was not inundated by the Sakoonang Channel this year.</td>
</tr>
<tr>
<td>6/14/99</td>
<td>11:00</td>
<td>6.06</td>
<td>A considerable amount of the ice has melted away from the lake shore. There is approximately 100 feet or more of open water around the perimeter of the lake, near the gage.</td>
</tr>
<tr>
<td>6/25/99</td>
<td>18:53</td>
<td>6.01</td>
<td>Ice coverage is approximately 20 - 30%.</td>
</tr>
<tr>
<td>6/28/99</td>
<td></td>
<td></td>
<td>The south end of the lake has approximately 10 - 15% ice coverage.</td>
</tr>
<tr>
<td>7/6/99</td>
<td>13:30</td>
<td>5.99</td>
<td>+/- 0.10 ft. Heavy wave action on the lake.</td>
</tr>
<tr>
<td>7/13/99</td>
<td>16:52</td>
<td>5.85</td>
<td>+/- 0.02 ft. Light wind.</td>
</tr>
<tr>
<td></td>
<td>19:11</td>
<td>5.84</td>
<td>+/- 0.02 ft. Light wind.</td>
</tr>
<tr>
<td>7/14/99</td>
<td>10:28</td>
<td>5.83</td>
<td>+/- 0.01 ft. Light wind.</td>
</tr>
<tr>
<td>7/19/99</td>
<td></td>
<td>5.84</td>
<td>Rain has fallen during the previous days.</td>
</tr>
<tr>
<td>7/22/99</td>
<td></td>
<td>5.91</td>
<td>Rain continues to fall.</td>
</tr>
<tr>
<td>7/26/99</td>
<td></td>
<td>5.81</td>
<td>Light wind.</td>
</tr>
<tr>
<td>7/29/99</td>
<td></td>
<td>5.77</td>
<td>West wind, mild wave action.</td>
</tr>
<tr>
<td>8/2/99</td>
<td>13:30</td>
<td>5.76</td>
<td>Light wind.</td>
</tr>
<tr>
<td>8/14/99</td>
<td></td>
<td>5.74</td>
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</tr>
<tr>
<td>8/18/99</td>
<td>16:30</td>
<td>5.73</td>
<td>Light wind. Moderate wave action.</td>
</tr>
<tr>
<td>8/25/99</td>
<td>16:00</td>
<td>5.71</td>
<td>+/- 0.02 ft. Light wind.</td>
</tr>
<tr>
<td>8/26/99</td>
<td>13:58</td>
<td>5.71</td>
<td>+/- 0.10 ft. Light wind.</td>
</tr>
<tr>
<td>9/8/99</td>
<td>8:30</td>
<td>5.67</td>
<td>+/- 0.02 ft. Light wind.</td>
</tr>
<tr>
<td>9/12/99</td>
<td>14:00</td>
<td>5.71</td>
<td></td>
</tr>
<tr>
<td>9/20/99</td>
<td>16:56</td>
<td>5.71</td>
<td>+/- 0.04 ft. Light wind.</td>
</tr>
<tr>
<td></td>
<td>18:20</td>
<td>5.71</td>
<td>+/- 0.02 ft. Light wind.</td>
</tr>
</tbody>
</table>
Table B-4 (Continued): Lake 93-13 1999 Water Surface Elevations And Observations

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Water Surface Elevation (feet)</th>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>9/25/99</td>
<td></td>
<td>5.73</td>
<td>+/– 0.03 ft. Ice was beginning to form around the edges of the lake and on the staff gage. Staff gage was pulled after reading, but angle iron was left.</td>
</tr>
</tbody>
</table>

Notes:
1. Water surface elevations are based on Alpine Monument 4 and TBM 993260.
2. TBM 993260 has the following coordinates, \( N 70^\circ 20' 45.1'' \ W 150^\circ 55' 28.6'' \) (NAD27), and an elevation of 16.00 (established in 1999).
3. Alpine Monument 4 has the following coordinates, \( N 70^\circ 20' 22.7'' \ W 150^\circ 55' 49.8'' \) (NAD27), and an elevation of 12.36 (established in 1998).
Table B-5: Lake 93-13 1999 Primary Water Quality Parameters

<table>
<thead>
<tr>
<th>Date</th>
<th>Location</th>
<th>Water Surface Elevation (feet)</th>
<th>Sample Depth (ft)</th>
<th>Water Temp (4) (C)</th>
<th>Salinity (ppt)</th>
<th>Conductivity (μS)</th>
<th>Dissolved Oxygen (mg/L)</th>
<th>Turbidity (NTU)</th>
<th>Total Suspended Solids (mg/L)</th>
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</thead>
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<tr>
<td>4/27/99 (1)</td>
<td>Site 1</td>
<td>N 70° 20' 35.2&quot; W 150° 55' 56.0&quot; (NAD27)</td>
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<td>Site 3</td>
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<td>Sample Depth (ft)</td>
<td>Water Temp (C)</td>
<td>Salinity (ppt)</td>
<td>Conductivity (μS)</td>
<td>Dissolved Oxygen (mg/L)</td>
<td>Turbidity (NTU)</td>
<td>Total Suspended Solids (mg/L)</td>
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<td>3.5</td>
<td>0.1</td>
<td>111.2</td>
<td>13.35</td>
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<td>3.5</td>
<td>0.1</td>
<td>111.2</td>
<td>13.34</td>
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<td>8.6</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>Lake Bed Depth Integrated 0 - 8.6 feet</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2.1</td>
<td>2.9</td>
</tr>
</tbody>
</table>

Notes:
1. On this date the lake was covered with ice. The ice thickness was 4.3 feet and the distance from the top of the ice to the water surface was 0.3 feet.
4. The temperature is the average temperature from the DO meter and the SCT meter. The difference between the temperatures was generally within the accuracy of the instruments.
Figure B-5a: Lake 93-13 1999 Water Temperature Versus Depth

- Temperature On 4/27/99 At Site 1: Bottom of ice at 4.3 feet. Lake Bed at 6.2 feet.
- Temperature On 7/13/99 At Site 3: Lake Bed at 9.0 feet.
- Temperature On 8/25/99 At Site 2: Lake Bed at 7.0 feet.
- Temperature On 8/25/99 At Site 3: Lake Bed at 8.9 feet.
- Temperature On 9/20/99 At Site 3: Lake Bed at 8.6 feet.

Note: See Table B-5 for locations.
Figure B-5b: Lake 93-13 1999 Salinity Versus Depth

Note: See Table 8-5 for site locations.
Figure B-5c: Lake 93-13 1999 Conductivity Versus Depth

Conductivity On 4/27/99 At Site 1
Conductivity (µS)

Conductivity On 5/25/99 At Site 2
Conductivity (µS)

Conductivity On 7/13/99 At Site 3
Conductivity (µS)

Conductivity On 7/14/99 At Site 3
Conductivity (µS)

Conductivity On 8/25/99 At Site 3
Conductivity (µS)

Note: See Table B-5 for site locations.
Figure B-5d: Lake 93-13 1999 Dissolved Oxygen Versus Depth

Note: See Table B-5 for site locations.
The concentration of Total Suspended Solids, based on a depth integrated sample collected over the entire depth, was 2.9 mg/L.

Lake Bed at 9.0 feet.

Lake Bed at 8.9 feet.

Lake Bed at 7.4 feet.

Lake Bed at 7.0 feet.

Lake Bed at 9.2 feet.

Lake Bed at 8.7 feet.

Lake Bed at 6.7 feet.

Bottom of Ice at 4.3 feet.

Note: See Table B-5 for site location.
## Table B-6: Lake 93-13 1998 Secondary Water Quality Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Units</th>
<th>ADEC Dr. Water Max Contaminant Level (1)</th>
<th>Sampling Date Results (2)</th>
</tr>
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<tbody>
<tr>
<td><strong>Primary Inorganic Chemicals</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Antimony</td>
<td>mg/L</td>
<td>0.006</td>
<td>&lt;0.003</td>
</tr>
<tr>
<td>Arsenic</td>
<td>mg/L</td>
<td>0.05</td>
<td>&lt;0.003</td>
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<tr>
<td>Barium</td>
<td>mg/L</td>
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<tr>
<td>Beryllium</td>
<td>mg/L</td>
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<tr>
<td>Cadmium</td>
<td>mg/L</td>
<td>0.005</td>
<td>&lt;0.0001</td>
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<tr>
<td>Chromium</td>
<td>mg/L</td>
<td>0.1</td>
<td>&lt;0.002</td>
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<tr>
<td>Cyanide</td>
<td>mg/L</td>
<td>0.2</td>
<td>&lt;0.02</td>
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<tr>
<td>Fluoride</td>
<td>mg/L</td>
<td>4.0</td>
<td>0.05</td>
</tr>
<tr>
<td>Mercury</td>
<td>mg/L</td>
<td>0.002</td>
<td>&lt;0.002</td>
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<tr>
<td>Nickel</td>
<td>mg/L</td>
<td>0.1</td>
<td>&lt;0.028</td>
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<td>Selenium</td>
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<td>&lt;0.003</td>
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<tr>
<td>Thallium</td>
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<td>&lt;0.001</td>
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<td>20</td>
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<td>mg/L</td>
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<td>0.05</td>
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<td>Foaming agents</td>
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<td>4</td>
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<td>7.0</td>
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<tr>
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<td>mg/L</td>
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<td>&lt;0.0001</td>
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<tr>
<td>Zinc</td>
<td>mg/L</td>
<td>5</td>
<td>&lt;0.008</td>
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<td>----------------------------</td>
<td>-------</td>
<td>-------------------------------------------------</td>
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<td>mg/L</td>
<td>(4)</td>
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<td>mg/L</td>
<td>(4)</td>
<td>56</td>
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<tr>
<td>Bicarbonate Alkalinity</td>
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<tr>
<td>Magnesium</td>
<td>mg/L</td>
<td>(4)</td>
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**Volatile Organic Chemical Analysis (5)**

| Benzene                    | mg/L  | 0.005                                           | 0.00027 | 0.00118 | 0.00088 | 0.00632 | 0.00141 | 0.00213 |
| Ethylbenzene               | mg/L  | 0.7                                             | <0.00020 | 0.00105 | 0.00127 | 0.0107  | 0.00777 | 0.00370 |
| Toluene                    | mg/L  | 1                                               | 0.00142 | 0.00600 | 0.00679 | 0.0635  | 0.00653 | 0.0186  |
| Total Xylene               | mg/L  | 10                                              | 0.00063 | 0.00067 | 0.00796 | 0.0529  | 0.00448 | 0.02123 |
| n-Butylbenzene             | mg/L  | (4)                                             | <0.00020 | <0.00020 | <0.00020 | 0.00060 | <0.00020 | 0.00025 |
| sec-Butylbenzene           | mg/L  | (4)                                             | <0.00020 | <0.00020 | <0.00020 | 0.00067 | <0.00020 | 0.00024 |
| Isopropylbenzene           | mg/L  | (4)                                             | <0.00020 | 0.00022 | 0.00027 | 0.00188 | <0.00020 | 0.00072 |
| p-Isopropyltoluene         | mg/L  | (4)                                             | <0.00020 | <0.00020 | <0.00020 | 0.00066 | <0.00020 | 0.00031 |
| n-Propylbenzene            | mg/L  | (4)                                             | <0.00020 | 0.00034 | 0.00042 | 0.00317 | <0.00020 | 0.00123 |
| 1,2,4-Trimethylbenzene     | mg/L  | (4)                                             | 0.00021 | 0.00105 | 0.00135 | 0.00709 | 0.00048 | 0.00302 |
| 1,3,5-Trimethylbenzene     | mg/L  | (4)                                             | 0.00021 | 0.00058 | 0.00143 | 0.0109  | 0.00024 | 0.00181 |

**Total Trihalomethanes**

| Total Trihalomethanes      | mg/L  | 0.10                                           | <0.00050 | <0.00050 | <0.00050 | <0.00050 | <0.00050 | <0.00050 |

**Radioactive Contaminants**

| Gross Alpha Radioactivity (6) | pCi/L | 15 | ND@1+/-0.31 | ND@1+/-0.34 | ND@1+/-0.31 | ND@1+/-0.31 | ND@1+/-0.34 | ND@1+/-0.36 |

**Total Coliform Bacteria**

| Total Coliform By Colilert | Not Detected | Not Detected | Not Detected | Not Detected | N/A | Not Detected | Not Detected |
| Fecal Coliform By Colilert | Not Detected | Not Detected | Not Detected | Not Detected | N/A | Not Detected | Not Detected |

**Turbidity**

| Turbidity | NTU  | 5    | 0.85  | 1.7   | 1.4   | 1.4   | 1.45   | 1.0   |
### Table B-6 (Continued): Lake 93-13 1998 Secondary Water Quality Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Units</th>
<th>ADEC Drinking Water Maximum Contaminant Level (1)</th>
<th>Sampling Date Results (2)</th>
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<td><strong>Primary Inorganic Chemicals</strong></td>
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<tr>
<td>Antimony</td>
<td>mg/L</td>
<td>0.006</td>
<td>&lt;0.003</td>
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<td>Arsenic</td>
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<td>&lt;0.02</td>
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<td>Fluoride</td>
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<td>&lt;0.0002</td>
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<td>Nickel</td>
<td>mg/L</td>
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<td>&lt;0.005</td>
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<tr>
<td>Nitrate</td>
<td>mg/L</td>
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<td>&lt;0.03</td>
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<tr>
<td>Selenium</td>
<td>mg/L</td>
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<td>&lt;0.004</td>
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<tr>
<td>Thallium</td>
<td>mg/L</td>
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<td>&lt;0.001</td>
</tr>
<tr>
<td><strong>Secondary Contaminants</strong></td>
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<td></td>
<td></td>
</tr>
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<td>mg/L</td>
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<td>Units</td>
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<td>10</td>
</tr>
<tr>
<td>Copper</td>
<td>mg/L</td>
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<td>&lt;0.003</td>
</tr>
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<td>-1.3</td>
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<td>Fluoride</td>
<td>mg/L</td>
<td>2.0</td>
<td>&lt;0.06</td>
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<tr>
<td>Foaming agents</td>
<td>mg/L</td>
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<td>&lt;0.10</td>
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<td>Iron</td>
<td>mg/L</td>
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<td>0.083</td>
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<tr>
<td>Manganese</td>
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</tr>
<tr>
<td>Odor (3)</td>
<td>TON</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>pH</td>
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<td>6.5 - 8.5</td>
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</tr>
<tr>
<td>Silver</td>
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<td>mg/L</td>
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<td>mg/L</td>
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### Table B-6 (Continued): Lake 93-13 1998 Secondary Water Quality Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Units</th>
<th>ADEC Drinking Water Maximum Contaminant Level (1)</th>
<th>Sampling Date Results (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calcium</td>
<td>mg/L</td>
<td>(4)</td>
<td>7/17/98 8/18/98 9/16/98 9/30/98</td>
</tr>
<tr>
<td>Alkalinity as CaCO₃</td>
<td>mg/L</td>
<td>(4)</td>
<td>8.19 9.25 9.35 9.47</td>
</tr>
<tr>
<td>Bicarbonate Alkalinity</td>
<td>mg/L</td>
<td>(4)</td>
<td>30 34 30 32</td>
</tr>
<tr>
<td>Hardness as CaCO₃</td>
<td>mg/L</td>
<td>(4)</td>
<td>30 34 30 32</td>
</tr>
<tr>
<td>Magnesium</td>
<td>mg/L</td>
<td>(4)</td>
<td>&lt;0.045 4.74 4.4 4.43</td>
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<tr>
<td><strong>Volatile Organic Chemical Analysis (5)</strong></td>
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<tr>
<td>Benzene</td>
<td>mg/L</td>
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<tr>
<td>Ethylbenzene</td>
<td>mg/L</td>
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<td>&lt;0.00020  &lt;0.00020  &lt;0.00020  &lt;0.00020</td>
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<tr>
<td>n-Butylbenzene</td>
<td>mg/L</td>
<td>(4)</td>
<td>&lt;0.00020  &lt;0.00020  &lt;0.00020  &lt;0.00020</td>
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<tr>
<td>sec-Butylbenzene</td>
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<td>(4)</td>
<td>&lt;0.00020  &lt;0.00020  &lt;0.00020  &lt;0.00020</td>
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<tr>
<td>Isopropylbenzene</td>
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<tr>
<td>n-Propylbenzene</td>
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<td>1,2,4-Trimethylbenzene</td>
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<td>1,3,5-Trimethylbenzene</td>
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<td>(4)</td>
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<tr>
<td><strong>Total Trihalomethanes</strong></td>
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<td>Total Trihalomethanes</td>
<td>mg/L</td>
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<td>Total Coliform By Colilert</td>
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<td>0.55 0.70 0.85  N/A</td>
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Table B-6 (Continued): Lake 93-13 1998 Secondary Water Quality Parameters

Notes:
1. Alaska Department of Environmental Conservation (ADEC) Drinking Water Maximum Contaminant Levels are listed in the Alaska Drinking Water Regulations (18 AAC 80) as amended through 10 October 1999, except for Aluminum, Foaming Agents and Silver which are from the regulations as amended through 10 November 1994.
2. Shaded areas indicate levels that do not meet the Alaska Drinking Water Regulations.
3. TON - Threshold Odor Number
4. Parameter is regulated by ADEC but a Maximum Contaminant Level is not specified.
5. Only the parameters within the Volatile Organic Group that had values above the method detection limit during February, March, April, May, July, August, or September are presented in the table above. Other Volatile Organics examined include: bromobenzene, bromochloromethane, bromodichloromethane, bromoform, bromomethane, tert-butylbenzene, carbon tetrachloride, chlorobenzene (monochlorobenzene), chloroethane, chloroform, chloromethane, 2-chlorotoluene, 4-chlorotoluene, dibromochloromethane, dibromomethane, 1,2-dichlorobenzene (o-dichlorobenzene), 1,3-dichlorobenzene, 1,4-dichlorobenzene (para-dichlorobenzene), dichlorodifluoromethane, 1,1-dichloroethane, 1,2-dichloroethane, 1,1-dichloroethene, cis-1,2-dichloroethene, trans-1,2-dichloroethene, 1,2-dichloropropane, 1,3-dichloropropane, 2,2-dichloropropane, 1,1-dichloropropene, cis-1,3-dichloropropene, trans-1,3-dichloropropene, hexachlorobutadiene, methylene chloride (dichloromethane), naphthalene, styrene, 1,1,1,2-tetrachloroethane, 1,1,2,2-tetrachloroethane, 1,2,3-trichlorobenzene, 1,2,4-trichlorobenzene, 1,1,1-trichloroethane, 1,1,2-trichloroethane, trichloroethene, trichloroethylene, 1,2,3-trichloropropane, vinyl chloride, 4-bromofluorobenzene (BFB (Surr)), and 1,2-dichlorobenzene-d4 (1,2-DCB-d4 (Surr)). Laboratory results can be found in Appendix F.
6. The Gross Alpha Radioactivity is a statistical analysis and is reported as the mean value of the sample and the standard deviation. Additional samples were collected on 26 May and 9 June 1998. The result of the 26 May test was ND@1+/0.38 pCi/L and the result of the 9 June test was ND@1+/0.42 pCi/L.
7. The laboratory analyses were performed by Northern Testing Laboratories, Inc.
APPENDIX C

SAKOONANG CHANNEL AND EAST CHANNEL 1999
MONITORING DATA

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Figure C-12b: Sakoonang Channel 1999 Salinity Versus Depth
Figure C-12c: Sakoonang Channel 1999 Conductivity Versus Depth
Figure C-12d: Sakoonang Channel 1999 Dissolved Oxygen Versus Depth
Figure C-12e: Sakoonang Channel 1999 Turbidity And Total Suspended Solids Versus Time

Table C-13: Sakoonang Channel 1999 Secondary Water Quality Parameters

Table C-14: East Channel 1999 Discharge at River Mile E27.09

Figure C-14: East Channel 1999 Hydrograph At River Mile E27.09
Methods

Water Level Monitoring

Water surface elevations were monitored at two locations along the Sakoonang Channel: river mile S6.47 near the Alpine Development, and river mile S15.79 near the upstream end of the channel. Three methods were used to monitor the elevation. All of the methods resulted in water surface elevations based on British Petroleum Mean Sea Level (BPMSL).

The first method used to monitor water surface elevations involved the use of level loop surveying between a monument with a known elevation and the water surface. This method was used periodically at all locations where water surface elevations were monitored.

The second method involved the use of staff gages. Staff gages were established at river miles S6.47 and S15.79 in the Sakoonang Channel and at river mile E27.09 in the East Channel. The staff gages were read periodically throughout the spring and summer. The height of the water on the staff gage was correlated to BPMSL by a level loop survey.

The third method involved the use of a MicroTides continuous water level recorder at river mile S15.79 in the Sakoonang Channel and at river mile E27.09 in the East Channel. The recorders were placed on the bed of the river and recorded the pressure above them at 10 minute intervals. A similar instrument was placed on the floodplain between the two recorders. By subtracting the air pressure recorded by the instrument on the floodplain from the total pressure recorded by the instruments on the riverbed, and applying a conversion factor, the depth of water above the instruments was computed. The depth of water above the water level recorder was correlated to BPMSL by a level loop survey.

Discharge Measurements In The Sakoonang Channel

Discharge measurements were made with a Mini or Price AA current meter, by wading or by suspension of the meter from a boat. The methods used to make the measurements and compute the discharge are as described in Discharge Measurements at Gaging Stations (Buchanan and Somers, 1984).
Discharge Estimates Based On Water Surface Elevation Measurements

Sakoonang Channel At River Mile S15.79

Estimates of the open water season discharge in the Sakoonang Channel were prepared based on one of two techniques. During the time when ice and snow were affecting the magnitude of the discharge associated with a particular water surface elevation, the discharge was estimated based on a combination of discharge, water surface elevation and water surface slope measurements, and normal depth computations. Once the ice and snow were no longer affecting the magnitude of the discharge at a particular water surface elevation, the data collected during the discharge measurements were used to develop a curvilinear relationship between water surface elevation and discharge. Based on a plot of the data, it was determined that for water surface elevations between 0.73 and 8.26 feet (BPMSL), three points could be used to describe the relationship between water surface elevation and discharge. At water surface elevations of 0, 3.33 and 8.26 feet (BPMSL), the discharge is 0, 552 and 1415 cfs, respectively. Using this relationship and the measured water surface elevations, discharge estimates were prepared for the period when ice and snow were not affecting the magnitude of the discharge at a particular water surface elevation.

East Channel At River Mile E27.09

As with the Sakoonang Channel, estimates of the open water season discharge in the East Channel were prepared based on one of two techniques. During the time when ice and snow were affecting the magnitude of the discharge associated with a particular water surface elevation, the discharge was estimated based on a combination of water surface elevation and water surface slope measurements, and normal depth computations. Once the ice and snow were no longer affecting the magnitude of the discharge at a particular water surface elevation, a stage-discharge curve developed in 1996 (Aldrich and Ray, 1996) was used with the water surface elevation measurements to estimate the discharge in the East Channel.

Water Quality Measurements In The Sakoonang Channel

Water quality samples were obtained from the Sakoonang Channel at a location near the flare pads at the Alpine Development.

Salinity, Conductivity, Temperature, Dissolved Oxygen

Salinity, conductivity and temperature were measured with a YSI Model 30 SCT meter. Dissolved oxygen and temperature were measured with a YSI Model 95 Dissolved Oxygen Meter.
Prior to making the measurements, the depth of water was measured and used to determine the measurement interval. Measurements were made at one-foot intervals from the riverbed to the surface, with no measurements being made within one foot of the surface. For instance, if the river was 9.6 feet deep, measurements were made at 8.6, 7.6, 6.6, 5.6, 4.6, 3.6, 2.6, and 1.6 feet from the water surface. To make the measurements, the probe to be used in making the measurement was attached to a weighted tape measure and lowered to the appropriate depth. Measurements were only recorded after the readings stabilized.

**Turbidity**

Turbidity was measured using a Hoch model 2100P Turbidimeter. Samples for turbidity measurement were obtained using one of two methods. The first method consisted of using a US D-74 depth-integrating sampler to collect two samples. The first sample contained water from the upper 6 feet of the water column and the second sample contained water from the entire water column (i.e. surface to 6 inches above the riverbed). The second method consisted of collecting discrete samples using a bailer. The lowest sample was collected 3 feet above the riverbed and additional samples were collected at three-foot intervals above the lowest sample. When discrete samples were taken, the turbidity was measured in each of the discrete samples.

**Total Suspended Solids**

A depth-integrated water sample was collected using a US D-74 depth-integrating sampler and shipped to Northern Testing Laboratories for analysis.

**Secondary Water Quality Parameters**

Primary inorganic chemicals, secondary contaminants, hardness, volatile organic chemicals, total Coliform Bacteria, and gross alpha radiation samples were collected by grab sample. Containers provided by the laboratory were filled as directed by the laboratory and shipped to Northern Testing Laboratories for analysis.
Results
A summary of the discontinuous water surface elevation measurements and observations made in
the Sakoonang Channel are presented in Table C-1. Summaries of the discharge measurements
made in the Sakoonang Channel are presented in Tables C-2 through C-10. A summary of both
the continuous and discontinuous water surface elevation measurements made in the Sakoonang
Channel, and the associated discharge estimates, is presented in Table C-11. A hydrograph of the
1999 Sakoonang Channel discharge is presented in Figure C-11. The primary water quality data
collected during 1999 in the Sakoonang Channel is presented in Table C-12. Plots of the various
parameters versus water depth are presented in Figures B-12a, B-12b, B-12c, B-12d and B-12e.
The secondary water quality data collected during 1999 in the Sakoonang Channel is presented in
Table C-13. A summary of both the continuous and discontinuous water surface elevation
measurements made in the East Channel, and the associated discharge estimates, is presented in
Table C-14. A hydrograph of the 1999 East Channel discharge is presented in Figure C-14.
### Table C-1: Sakoonang Channel 1999 Water Surface Elevations And Observations At River Mile S6.47 (TBM 27U)

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Water Surface Elevation (feet)</th>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>5/28/99</td>
<td>18:13</td>
<td>3.80</td>
<td></td>
</tr>
<tr>
<td>5/29/99</td>
<td>9:08</td>
<td>4.03</td>
<td>Open water with some ice floes.</td>
</tr>
<tr>
<td></td>
<td>17:36</td>
<td>4.03</td>
<td></td>
</tr>
<tr>
<td>5/30/99</td>
<td>12:43</td>
<td>4.61</td>
<td>Low water channel ice is discontinuous immediately below staff gage. Some low water channel ice is visible where the sea ice road crossed the Sakoonang Channel.</td>
</tr>
<tr>
<td></td>
<td>20:41</td>
<td>5.23</td>
<td>+/- 0.02 ft.</td>
</tr>
<tr>
<td>5/31/99</td>
<td>10:45</td>
<td>5.50</td>
<td>High water mark left sometime during the night of 5/30 - 5/31.</td>
</tr>
<tr>
<td></td>
<td>17:30</td>
<td>5.47</td>
<td>No floating ice.</td>
</tr>
<tr>
<td>6/1/99</td>
<td>10:31</td>
<td>5.28</td>
<td>+/- 0.03 ft.</td>
</tr>
<tr>
<td>6/2/99</td>
<td>10:10</td>
<td>4.74</td>
<td>+/- 0.04 ft.</td>
</tr>
<tr>
<td>6/3/99</td>
<td>10:45</td>
<td>4.22</td>
<td>+/- 0.01 ft.</td>
</tr>
<tr>
<td>6/4/99</td>
<td>15:12</td>
<td>3.84</td>
<td>+/- 0.01 ft.</td>
</tr>
<tr>
<td>6/5/99</td>
<td>8:30</td>
<td>3.65</td>
<td>+/- 0.01 ft.</td>
</tr>
<tr>
<td></td>
<td>12:52</td>
<td>3.59</td>
<td>+/- 0.02 ft.</td>
</tr>
<tr>
<td>6/6/99</td>
<td>11:30</td>
<td>3.24</td>
<td></td>
</tr>
<tr>
<td>6/7/99</td>
<td>9:42</td>
<td>1.59</td>
<td>+/- 0.03 ft.</td>
</tr>
<tr>
<td>6/9/99</td>
<td>16:45</td>
<td>0.67</td>
<td>+/- 0.03 ft.</td>
</tr>
<tr>
<td>6/25/99</td>
<td>14:53</td>
<td>0.30</td>
<td></td>
</tr>
<tr>
<td>6/26/99</td>
<td>12:52</td>
<td>0.20</td>
<td></td>
</tr>
<tr>
<td>7/12/99</td>
<td>18:33</td>
<td>-0.08</td>
<td>+/- 0.01 ft. Upstream of boom. Boom is approximately 5 feet downstream of TBM.</td>
</tr>
<tr>
<td></td>
<td>18:37</td>
<td>-0.03</td>
<td>+/- 0.03 ft. Downstream of boom.</td>
</tr>
<tr>
<td></td>
<td>23:36</td>
<td>-0.37</td>
<td>+/- 0.01 ft. Upstream of boom.</td>
</tr>
<tr>
<td></td>
<td>23:39</td>
<td>-0.36</td>
<td>+/- 0.01 ft. Downstream of boom.</td>
</tr>
<tr>
<td>7/13/99</td>
<td>10:22</td>
<td>-0.72</td>
<td>+/- 0.01 ft. Upstream of boom.</td>
</tr>
<tr>
<td></td>
<td>16:11</td>
<td>-0.26</td>
<td>+/- 0.02 ft. Upstream of boom.</td>
</tr>
<tr>
<td>7/14/99</td>
<td>11:27</td>
<td>-0.94</td>
<td>+/- 0.01 ft. Upstream of boom.</td>
</tr>
<tr>
<td></td>
<td>21:01</td>
<td>-0.54</td>
<td>+/- 0.01 ft. Upstream of boom.</td>
</tr>
</tbody>
</table>
Table C-1 (Continued): Sakoonang Channel 1999 Water Surface Elevations And Observations At River Mile S6.47 (TBM 27U)

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Water Surface Elevation (feet)</th>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>7/15/99</td>
<td>7:21</td>
<td>-0.84</td>
<td>+/- 0.01 ft. Upstream of boom.</td>
</tr>
<tr>
<td></td>
<td>9:54</td>
<td>-1.02</td>
<td>+/- 0.01 ft. Upstream of boom.</td>
</tr>
<tr>
<td>8/18/99</td>
<td>12:18</td>
<td>0.32</td>
<td>+/- 0.01 ft. Upstream of boom.</td>
</tr>
<tr>
<td></td>
<td>12:19</td>
<td>0.32</td>
<td>+/- 0.02 ft. Downstream of boom.</td>
</tr>
<tr>
<td>8/19/99</td>
<td>17:35</td>
<td>-1.04</td>
<td>+/- 0.10 ft.</td>
</tr>
<tr>
<td>8/24/99</td>
<td>14:34</td>
<td>-0.46</td>
<td>+/- 0.02 ft.</td>
</tr>
<tr>
<td>9/21/99</td>
<td>11:54</td>
<td>0.33</td>
<td>+/- 0.01</td>
</tr>
<tr>
<td>9/25/99</td>
<td>15:22</td>
<td>0.72</td>
<td>+/- 0.01</td>
</tr>
</tbody>
</table>

Notes:
1. Staff gage elevations are based on an elevation of 11.12 feet (BPMSL) for Colville Monument 27, which was established in 1998.
2. GPS coordinates for TBM 27U are N 70° 21' 18.0" W 150° 54' 38.6" (NAD27), elevation = 7.05 feet (BPMSL).
3. The top of the Monument 27 cap is about 0.88 feet above the ground.
4. The top of the Cap 6P is about 0.50 feet above the ground.
### Table C-2: Discharge Measurement At River Mile S16.20 On 29 May 1999

#### DISCHARGE MEASUREMENT NOTES

<table>
<thead>
<tr>
<th>LOCATION:</th>
<th>Sakoonang Channel TBM 8U</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date:</td>
<td>5/29, 1999</td>
</tr>
<tr>
<td>Party:</td>
<td>J. Meckel, J. Abrams</td>
</tr>
<tr>
<td>Width:</td>
<td>182'</td>
</tr>
<tr>
<td>Area:</td>
<td>1200 ft²</td>
</tr>
<tr>
<td>Vel:</td>
<td>1.22 fps</td>
</tr>
<tr>
<td>G.H.:</td>
<td>8.76 (TBM 8U)</td>
</tr>
<tr>
<td>Disch.:</td>
<td>1450 cfs</td>
</tr>
<tr>
<td>No Secs.</td>
<td>23</td>
</tr>
<tr>
<td>G.H. change:</td>
<td>0.02 ft in.: 2.01 hrs.:</td>
</tr>
<tr>
<td>Susp.:</td>
<td>15 lbs</td>
</tr>
<tr>
<td>Method coef.:</td>
<td>1</td>
</tr>
<tr>
<td>Hor. Angle coef.:</td>
<td>1</td>
</tr>
<tr>
<td>Sus. Coef.:</td>
<td>Meter No.</td>
</tr>
<tr>
<td>Type of meter:</td>
<td>Price AA</td>
</tr>
<tr>
<td>Date rated:</td>
<td>Factory</td>
</tr>
<tr>
<td>Meter:</td>
<td>0.5 ft. above bottom of weight.</td>
</tr>
<tr>
<td>Spin before meas. after</td>
<td>Method: Used hand line from boat to obtain measurements</td>
</tr>
<tr>
<td>Start measurement</td>
<td>Yes</td>
</tr>
<tr>
<td>Measurement rated:</td>
<td>Fair based on following conditions: Bottom hard, steady</td>
</tr>
<tr>
<td>Cross section:</td>
<td>Fairly uniform, snow/ice cover approx. 15% of the right bank based on later observations</td>
</tr>
<tr>
<td>Flow:</td>
<td>Smooth, uniform</td>
</tr>
<tr>
<td>Weather:</td>
<td>Overcast</td>
</tr>
<tr>
<td>Air @F:</td>
<td>Mid 30's</td>
</tr>
<tr>
<td>Gage:</td>
<td>Outside staff gage</td>
</tr>
<tr>
<td>Other:</td>
<td>Intake flushed</td>
</tr>
<tr>
<td>Record Removed:</td>
<td>Surface ice jam downstream ~ 1000', probable backwater affect. Snow drifts on both banks. Moderate ice floe. Firm bottom</td>
</tr>
<tr>
<td>Observer</td>
<td></td>
</tr>
<tr>
<td>Control:</td>
<td></td>
</tr>
<tr>
<td>Remarks</td>
<td>Ice jam at downstream section cleared at 13:25</td>
</tr>
<tr>
<td>G.H. of zero flow:</td>
<td>ft.</td>
</tr>
</tbody>
</table>

#### Gage Readings

<table>
<thead>
<tr>
<th>Time</th>
<th>Recorder</th>
<th>Inside</th>
<th>Outside</th>
<th>Type of meter</th>
<th>Date rated</th>
<th>Meter</th>
<th>Spin before meas. after</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>11:34</td>
<td>SG 9A</td>
<td>WSE = 8.75 BPMSL</td>
<td>-2.09</td>
<td>Price AA</td>
<td>Factory</td>
<td>0.5 ft. above bottom of weight.</td>
<td>Used hand line from boat to obtain measurements</td>
<td></td>
</tr>
<tr>
<td>11:15</td>
<td>TBM 8D</td>
<td>WSE = 8.72 BPMSL</td>
<td>-2.07</td>
<td></td>
<td></td>
<td>after</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11:50</td>
<td>Start measurement</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13:35</td>
<td>SG 9A</td>
<td>WSE = 8.77 BPMSL</td>
<td>-2.07</td>
<td></td>
<td></td>
<td>after</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15:24</td>
<td>SG 14</td>
<td>WSE = 8.81 BPMSL</td>
<td>3.82</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Weighted M.G.H.

| WSE = 8.76 BPMSL | Yes |

#### G.H. corrections

<table>
<thead>
<tr>
<th>Correct M.G.H.</th>
<th></th>
</tr>
</thead>
</table>

#### Measurement rated:

Fair based on following conditions: Bottom hard, steady

---

Page 1 of 3
<table>
<thead>
<tr>
<th>Angle coef.</th>
<th>Dist. From Initial point (ft)</th>
<th>Width (ft)</th>
<th>Depth (ft)</th>
<th>Observ. depth</th>
<th>Revolutions</th>
<th>Time In seconds</th>
<th>VELOCITY</th>
<th>Area (s.f.)</th>
<th>Discharge (cfs)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>At Point (fps)</td>
<td>Mean Invertical (fps)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>8</td>
<td>3.0</td>
<td>1.6</td>
<td>0</td>
<td>0</td>
<td>43</td>
<td>0.07</td>
<td>0.08</td>
<td>18.0</td>
<td>1.4</td>
</tr>
<tr>
<td>1</td>
<td>20</td>
<td>6.0</td>
<td>5.9</td>
<td>0.2</td>
<td>5</td>
<td>56</td>
<td>0.22</td>
<td>0.19</td>
<td>13.4</td>
<td>1.7</td>
</tr>
<tr>
<td>1</td>
<td>26</td>
<td>6.0</td>
<td>6.0</td>
<td>0.8</td>
<td>10</td>
<td>48</td>
<td>0.47</td>
<td>0.46</td>
<td>36.0</td>
<td>16.6</td>
</tr>
<tr>
<td>1</td>
<td>32</td>
<td>7.0</td>
<td>6.9</td>
<td>0.2</td>
<td>15</td>
<td>49</td>
<td>0.69</td>
<td>0.68</td>
<td>48.3</td>
<td>32.8</td>
</tr>
<tr>
<td>1</td>
<td>40</td>
<td>8.0</td>
<td>7.4</td>
<td>0.2</td>
<td>20</td>
<td>49</td>
<td>0.91</td>
<td>0.83</td>
<td>59.2</td>
<td>49.1</td>
</tr>
<tr>
<td>1</td>
<td>48</td>
<td>8.0</td>
<td>7.2</td>
<td>0.2</td>
<td>25</td>
<td>43</td>
<td>1.29</td>
<td>1.32</td>
<td>57.6</td>
<td>64.5</td>
</tr>
<tr>
<td>1</td>
<td>56</td>
<td>8.0</td>
<td>7.7</td>
<td>0.2</td>
<td>30</td>
<td>47</td>
<td>1.41</td>
<td>1.14</td>
<td>61.6</td>
<td>70.2</td>
</tr>
<tr>
<td>1</td>
<td>64</td>
<td>8.0</td>
<td>7.8</td>
<td>0.2</td>
<td>30</td>
<td>47</td>
<td>1.41</td>
<td>1.17</td>
<td>62.4</td>
<td>73.0</td>
</tr>
<tr>
<td>1</td>
<td>72</td>
<td>8.0</td>
<td>7.8</td>
<td>0.2</td>
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Table C-2 (Continued): Discharge Measurement At River Mile S16.20 On 29 May 1999
### Table C-2 (Continued): Discharge Measurement At River Mile S16.20 On 29 May 1999

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<th>Revolutions</th>
<th>Time In seconds</th>
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<th>Mean vertical (fps)</th>
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Table C-3: Discharge Measurement At River Mile S16.20 On 31 May 1999

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Page 1 of 3
Table C-3 (Continued): Discharge Measurement At River Mile S16.20 On 31 May 1999

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Table C-3 (Continued): Discharge Measurement At River Mile S16.20 On 31 May 1999

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<th>Area (s.f.)</th>
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REW = River Elevation.
**Table C-4: Discharge Measurement At River Mile 16.20 On 4 June 1999**

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Table C-4 (Continued): Discharge Measurement At River Mile S16.20 On 4 June 1999

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</table>

At River Mile S16.20 on 4 June 1999:

**VELOCITY**

- **At Point:** 1.73 (fps), 1.36 (fps)
- **Mean Vertical:** 1.76 (fps), 1.44 (fps)
- **Area (s.f.):** 32.0
- **Discharge (cfs):** 43.5

**Description:** REW measurement @ 14:22
### Table C-5: Discharge Measurement At River Mile S16.20 On 7 June 1999

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<thead>
<tr>
<th>LOCATION: Sakoonang Channel TBM 8U</th>
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<tr>
<td>Date: 6/7/1999 Party: J. Meckel, J. Abrams</td>
</tr>
<tr>
<td>Width: 179' Area: 488 ft² Vel: 1.2 fps G.H.: 3.78 (TBM 8U) Disch.: 585 cfs</td>
</tr>
<tr>
<td>No Ssecs. 24 G.H. change: 0.05 ft in.: 1.5 hrs.: Susp.: Top set. Rod</td>
</tr>
<tr>
<td>Method coef.: 1 Hor. Angle coef. 1 Sus. Coef.: 1 Meter No. Standard</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Time</th>
<th>Recorder</th>
<th>Inside</th>
<th>Outside</th>
<th>Date rated:</th>
</tr>
</thead>
<tbody>
<tr>
<td>14:16</td>
<td>TBM0084</td>
<td>WSE = 3.64 BPMSL +/- 0.02</td>
<td>Meter: ft. above bottom of weight.</td>
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<tr>
<td>15:00</td>
<td>TBM 8U</td>
<td>WSE = 3.80 BPMSL +/- 0.03</td>
<td>Spin before meas. 3:30 min after 2:30 min</td>
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<tr>
<td>15:12</td>
<td>Start measurement</td>
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<td>Method: Wading using top setting rod</td>
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<tr>
<td>16:11</td>
<td>End measurement</td>
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<tr>
<td>16:30</td>
<td>TBM 8U</td>
<td>WSE = 3.75 BPMSL +/- 0.04</td>
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<tr>
<td>17:00</td>
<td>TBM0084</td>
<td>WSE = 3.58 BPMSL +/- 0.04</td>
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</tr>
</tbody>
</table>

| Weighted M.G.H. | WSE = 3.78 BPMSL |
| Correct M.G.H. | |

| Measurement rated: Good based on following conditions: Flow uniform, steady |
| Cross section: Excellent |
| Flow: Uniform |
| Weather: Sunny Air of@: |
| Gage: Windy Water of@: |
| Other: |
| Record Removed: N/A Intake flushed: |
| Observer | |
| Control: Banks clean, no snow or ice |

| Remarks | At station 166, velocity near bottom disturbed due to clumps of shrubs |
| G.H. of zero flow: ft. | |
### Table C-5 (Continued): Discharge Measurement At River Mile S16.20 On 7 June 1999

<table>
<thead>
<tr>
<th>Angle coef.</th>
<th>Dist. From Initial point (ft)</th>
<th>Width (ft)</th>
<th>Depth (ft)</th>
<th>Observ. depth</th>
<th>Revolutions</th>
<th>Time In seconds</th>
<th>VELOCITY</th>
<th>Area (s.f.)</th>
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**Page 2 of 3**
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<th>Time In seconds</th>
<th>VELOCITY At Point (fps)</th>
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**Table C-5 (Continued): Discharge Measurement At River Mile S16.20 On 7 June 1999**

Table 1 (Page 3 of 3)
Table C-6: Discharge Measurement At River Mile S16.20 On 9 June 1999

<table>
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<td>LOCATION: Sakoon Channel TBM 8U</td>
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<tr>
<td>Width: 177 ft Area: 442 ft² Vel: 1.25 fps G.H.: 3.50 (TBM8U) Disch.: 552 cfs</td>
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<tr>
<td>No Secs.: 26 G.H. change: 0.04 ft in.: 1.6 hrs.: Susp.: Top set. rod</td>
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<td>Method coef.: 1 Hor. Angle coef. 1 Sus. Coef.: 1 Meter No. Standard</td>
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Gage Readings

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<th>Time</th>
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<th>Inside</th>
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<tr>
<td>17:11</td>
<td>TBM 8U</td>
<td>WSE = 3.48 BPMSL +/- 0.02</td>
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<td>17:35</td>
<td>Start measurement</td>
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<td>TBM 8U</td>
<td>WSE = 3.52 BPMSL +/- 0.02</td>
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<td>19:06</td>
<td>TBM0084</td>
<td>WSE = 3.33 BPMSL +/- 0.03</td>
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Weighted M.G.H. Levels obtained This date
G.H. corrections
Correct M.G.H. 3.50 (TBM 8U)

Measurement rated: Good - 5% based on following conditions: Uniform
Cross section: Fairly firm, uniform
Flow: Uniform distribution Weather: Rain, wind Air O°F:
Gage: Water O°F:
Other:
Record Removed: Intake flushed:
Observer

Remarks

G.H. of zero flow: ft.
Table C-6 (Continued): Discharge Measurement At Rivr Mile S16.20 On 9 June 1999

<table>
<thead>
<tr>
<th>Angle coef.</th>
<th>Dist. From Initial point (ft)</th>
<th>Width (ft)</th>
<th>Depth (ft)</th>
<th>Observ. depth (ft)</th>
<th>Revolutions</th>
<th>Time In seconds</th>
<th>VELOCITY</th>
<th>Area (s.f.)</th>
<th>Discharge (cfs)</th>
<th>Description</th>
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Table C-6 (Continued): Discharge Measurement At Rivr Mile S16.20 On 9 June 1999

<table>
<thead>
<tr>
<th>Angle coeff.</th>
<th>Dist. From Initial point (ft)</th>
<th>Width (ft)</th>
<th>Depth (ft)</th>
<th>Observ. depth</th>
<th>Revolutions</th>
<th>Time In seconds</th>
<th>VELOCITY</th>
<th>Mean Invertical</th>
<th>Area (s.f.)</th>
<th>Discharge (cfs)</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>1</td>
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<td>50</td>
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<td>17.6</td>
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<td>0.2</td>
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<td>44</td>
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<td>20.0</td>
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<td>1.41</td>
<td>20.0</td>
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<td>8.0</td>
<td>2.4</td>
<td>0.6</td>
<td>25</td>
<td>42</td>
<td>1.32</td>
<td>19.2</td>
<td>25.3</td>
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<td>30</td>
<td>48</td>
<td>1.38</td>
<td>18.4</td>
<td>25.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>46</td>
<td>8.0</td>
<td>2.3</td>
<td>0.6</td>
<td>25</td>
<td>44</td>
<td>1.26</td>
<td>18.4</td>
<td>23.2</td>
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<td></td>
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<td>50</td>
<td>1.11</td>
<td>18.4</td>
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<td>1.6</td>
<td>0.6</td>
<td>7</td>
<td>59</td>
<td>0.279</td>
<td>8.0</td>
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<td>1</td>
<td>28</td>
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<td>1</td>
<td>43</td>
<td>0.071</td>
<td>2.0</td>
<td>0.1</td>
<td></td>
<td>REW @ 1830</td>
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<tr>
<td>1</td>
<td>27</td>
<td>0.5</td>
<td>0.0</td>
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<td></td>
<td></td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
</tr>
<tr>
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<td>17</td>
<td>17</td>
<td></td>
<td></td>
<td></td>
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<td>442</td>
<td>553</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Page 3 of 3
<table>
<thead>
<tr>
<th>Location: Inlet to Sakoonang Channel (near TBM 81: N 70 deg 15 min 38.9 sec W 150 deg 51 min 20.7 sec)</th>
<th>Discharge Measurement Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date: August 17, 1999</td>
<td>Party: J. Aldrich, J. Abrams</td>
</tr>
<tr>
<td>Width: 13.7</td>
<td>Area: 5.24</td>
</tr>
<tr>
<td>Vel: 0.56</td>
<td>G.H.: WSE = 1.01 feet at TBM 81</td>
</tr>
<tr>
<td>Disch.: 2.96 cfs</td>
<td>Susp.:</td>
</tr>
</tbody>
</table>

| No. Secs. | 18 |
| G.H. change: 0.12 in. |

| G.H. change: | 0.12 in. |
| Susp.: | 0.97 hrs. |

<table>
<thead>
<tr>
<th>Method coef.: Hor. Angle coef.</th>
<th>Sus. Coef.:</th>
</tr>
</thead>
</table>

| Meter No. | Type of meter: Pygmy |

<table>
<thead>
<tr>
<th>Gage Readings</th>
<th>Date rated: Factory</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Time</th>
<th>Recorder Inside</th>
<th>Outside</th>
<th>Date rated:</th>
</tr>
</thead>
<tbody>
<tr>
<td>14:35</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14:45</td>
<td>Began discharge measurement</td>
<td>WSE = 1.00 est.</td>
<td></td>
</tr>
<tr>
<td>15:16</td>
<td>Finished discharge measurement</td>
<td>WSE = 1.01 est.</td>
<td></td>
</tr>
<tr>
<td>15:30</td>
<td></td>
<td>WSE = 1.02 BPMSL</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Weighted M.G.H.</th>
<th>G.H. corrections</th>
<th>Correct M.G.H.</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>WSE = 1.01 BPMSL</td>
<td></td>
</tr>
<tr>
<td>Levels obtained</td>
<td>0.00</td>
<td>At TBM 81</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Measurement rated: based on following conditions:</th>
<th></th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Flow:</th>
<th>Weather: Air °F @:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gage:</td>
<td>Water °F @:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Other:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Record Removed: Intake flushed:</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Observer</th>
<th></th>
</tr>
</thead>
</table>

| Control | |

| Remarks | WSE's based on an elevation of 26.69 (BPMSL) for Monument 8 and an elevation of 3.46 (BPMSL) for TBM 81. |

| G.H. of zero flow ft. | | |

Page 1 of 2
Table C-7 (Continued): Discharge Measurement At River Mile S17.0 On 17 August 1999

<table>
<thead>
<tr>
<th>Angle coef.</th>
<th>Dist. From Initial point (ft)</th>
<th>Width (ft)</th>
<th>Depth (ft)</th>
<th>Observ. depth</th>
<th>Revolutions</th>
<th>Time In seconds</th>
<th>VELOCITY At Point (fps)</th>
<th>Mean in- vertical (fps)</th>
<th>Area (s.f.)</th>
<th>Discharge (cfs)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>14.7</td>
<td></td>
<td>0.5</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Left edge of water</td>
</tr>
<tr>
<td>13.7</td>
<td>1.0</td>
<td>0.09 **</td>
<td></td>
<td></td>
<td>20</td>
<td>45</td>
<td>0.462</td>
<td>0.405</td>
<td>0.26</td>
<td>0.10</td>
<td>Vel measured 0.2 ft above bed</td>
</tr>
<tr>
<td>12.7</td>
<td>1.0</td>
<td>0.26 ***</td>
<td></td>
<td></td>
<td>25</td>
<td>40</td>
<td>0.639</td>
<td>0.581</td>
<td>0.32</td>
<td>0.19</td>
<td>Vel measured 0.2 ft above bed</td>
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<tr>
<td>11.7</td>
<td>1.0</td>
<td>0.32 **</td>
<td>0.6</td>
<td>30</td>
<td>42</td>
<td></td>
<td>0.726</td>
<td>0.726</td>
<td>0.42</td>
<td>0.30</td>
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<td>1.0</td>
<td>0.42</td>
<td>0.6</td>
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<td>54</td>
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<td>0.752</td>
<td>0.38</td>
<td>0.28</td>
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<td>0.6</td>
<td>40</td>
<td>51</td>
<td></td>
<td>0.794</td>
<td>0.794</td>
<td>0.26</td>
<td>0.21</td>
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</tr>
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<td>0.52</td>
<td>0.6</td>
<td>40</td>
<td>51</td>
<td></td>
<td>0.794</td>
<td>0.794</td>
<td>0.26</td>
<td>0.21</td>
<td></td>
</tr>
<tr>
<td>8.7</td>
<td>0.5</td>
<td>0.55</td>
<td>0.6</td>
<td>40</td>
<td>50</td>
<td></td>
<td>0.810</td>
<td>0.810</td>
<td>0.28</td>
<td>0.22</td>
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<td>0.6</td>
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<td>47</td>
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<td>0.859</td>
<td>0.859</td>
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<td>0.52</td>
<td>0.6</td>
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<td>43</td>
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<td>0.937</td>
<td>0.26</td>
<td>0.24</td>
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<tr>
<td>7.2</td>
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<td>0.50</td>
<td>0.6</td>
<td>40</td>
<td>51</td>
<td></td>
<td>0.794</td>
<td>0.794</td>
<td>0.25</td>
<td>0.20</td>
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<td>0.6</td>
<td>30</td>
<td>48</td>
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<td>0.659</td>
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<td>0.18</td>
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<td>0.57</td>
<td>0.6</td>
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<td>44</td>
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<td>0.583</td>
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<td>0.29</td>
<td>0.17</td>
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<td>5.7</td>
<td>0.5</td>
<td>0.58</td>
<td>0.6</td>
<td>25</td>
<td>48</td>
<td></td>
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<td>0.6</td>
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<td>43</td>
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<td>0.596</td>
<td>0.596</td>
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<td>0.6</td>
<td>20</td>
<td>43</td>
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<tr>
<td>3.7</td>
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<td>0.42 **</td>
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<td>0.176</td>
<td>0.168</td>
<td>0.22</td>
<td>0.05</td>
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<td>1.4</td>
<td>0.38 **</td>
<td></td>
<td>0</td>
<td>61</td>
<td></td>
<td>0.000</td>
<td>0.000</td>
<td>0.51</td>
<td>0.00</td>
<td>Vel measured 0.2 ft above bed</td>
</tr>
<tr>
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<td>0.85</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Right edge of water</td>
</tr>
<tr>
<td><strong>Total</strong></td>
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<td>5.24</td>
<td>2.96</td>
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<td></td>
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Table C-8: Discharge Measurement At River Mile S16.20 On 18 August 1999

<table>
<thead>
<tr>
<th>LOCATION: Sakoonang Channel at TBM 8U</th>
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<tbody>
<tr>
<td>Date: August 18, 1999 Party: J. Aldrich, J. Abrams</td>
</tr>
<tr>
<td>Width: 60.5 Area: 41.2 Vel: 1.00 G.H.: WSE = 0.89 feet at TBM 8U Disch.: 41.1 cfs</td>
</tr>
<tr>
<td>No Secs. 28 G.H. change: 0.36 in. 0.90 hrs.</td>
</tr>
</tbody>
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<table>
<thead>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Factory</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Time</th>
<th>Recorder</th>
<th>Inside</th>
<th>Outside</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:18</td>
<td>Level Survey</td>
<td>WSE = 0.93 BPM SL</td>
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<td>10:00</td>
<td>Began discharge measurement.</td>
<td>WSE = 0.91 est.</td>
<td></td>
</tr>
<tr>
<td>10:54</td>
<td>Finished discharge measurement.</td>
<td>WSE = 0.88 est.</td>
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<td>11:08</td>
<td>Level Survey</td>
<td>WSE = 0.87 BPM SL</td>
<td></td>
</tr>
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<table>
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<tr>
<th>Weighted M.G.H.</th>
<th>G.H. corrections</th>
<th>Correct M.G.H.</th>
</tr>
</thead>
<tbody>
<tr>
<td>WSE = 0.89 BPM SL</td>
<td>0</td>
<td>WSE = 0.89 BPM SL</td>
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<table>
<thead>
<tr>
<th>Measurement rated:</th>
<th>Cross section:</th>
<th>Flow:</th>
</tr>
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<tr>
<td>Excellent</td>
<td>Uniform</td>
<td>Uniform</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Weather:</th>
<th>Overcast Air °F@:</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Gage:</th>
<th>Other:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Record Removed: | Intake flushed: | |
|-----------------|-----------------|
| Intake flushed: | |

<table>
<thead>
<tr>
<th>Control:</th>
<th>G.H. of zero flow:</th>
</tr>
</thead>
<tbody>
<tr>
<td>East Channel</td>
<td>ft.</td>
</tr>
</tbody>
</table>

Note: Calculation of G.H. based on following conditions:

Measurement rated: Excellent based on following conditions:

Cross section: Uniform

Flow: Uniform

Weather: Overcast Air °F@: 50
<table>
<thead>
<tr>
<th>Angle coef.</th>
<th>Dist. From Initial point (ft)</th>
<th>Width (ft)</th>
<th>Depth (ft)</th>
<th>Observ. depth</th>
<th>Revolutions</th>
<th>Time in seconds</th>
<th>VELOCITY At Point (fps)</th>
<th>Mean Inverted (fps)</th>
<th>Area (s.f.)</th>
<th>Discharge (cfs)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
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<td>1</td>
<td>0.35</td>
<td>0.6</td>
<td>25</td>
<td>44</td>
<td>0.583</td>
<td>0.583</td>
<td>0.7</td>
<td>0.41</td>
<td>LEW</td>
</tr>
<tr>
<td>11</td>
<td></td>
<td>2</td>
<td>0.65</td>
<td>0.6</td>
<td>40</td>
<td>42</td>
<td>0.958</td>
<td>0.958</td>
<td>1.3</td>
<td>1.25</td>
<td></td>
</tr>
<tr>
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Table C-9: Discharge Measurement At River Mile S16.20 On 25 september 1999

| LOCATION: Sakoonane Channel 109 feet Downstream of TBM 8U |
| Date: September 25, 1999 | Party: J. Abrams, P. Straiger |
| Width: 70.5 | Area: 60.5 | Vel: 0.78 | G.H.: WSE = 1.41 feet at TBM 8U |
| No Secs: 22 | G.H. change: | In.: | 0.90 |

Method: Wading near TBM 8U

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Weighted M.G.H. | WSE = 1.41 BPMKL | Levels obtained | Yes |
G.H. corrections | |
Correct M.G.H. | WSE = 1.41 BPMKL | |
Measurement rated: Good based on following conditions: Cross section: Uniform Flow: Uniform |
Gage: |
Weather: Partly Over Air °F@: 34 Water °F@: |
Other: |
Record Removed: Intake flushed: |
Observer: |
Control East Channel |
Remarks |
G.H. of zero flow: ft.
Table C-9 (Continued): Discharge Measurement At River Mile S16.20 On 25 August 1999

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Table C-10: Summary Of Discharge Measurements

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Notes:
1. There was an ice jam downstream during much of the measurement.
2. The bed of the river had ice on it and there was a downstream ice jam.
3. The weighted water surface elevation at TBM 0084 was linearly interpolated based on a measured water surface elevation at TBM 81 and water level recorder data at TBM 0084.
Table C-11: Sakoonang Channel 1999 Discharge At River Mile S15.79

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Total 8453
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Table C-11 (Continued): Sakoonang Channel 1999 Discharge At River Mile S15.79

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Notes:
1. Two types of measurements were used. Discrete water surface elevation measurements are designated by a "d". The number of measurements per day varied from one to five. Continuous water surface elevation measurements are designated by a "c". The instrument used to obtain the continuous measurements records 1 minute averages of water depth above the instrument every 10 minutes, throughout the day.
Figure C-11: Sakoonang Channel 1999 Hydrograph At River Mile S15.79
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<th>Water Temp (°C)</th>
<th>Salinity (ppt)</th>
<th>Conductivity (μS)</th>
<th>Dissolved Oxygen (mg/L)</th>
<th>Turbidity (NTU)</th>
<th>TSS (mg/L)</th>
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<th>Water Temp (°C)</th>
<th>Salinity (ppt)</th>
<th>Conductivity (μS)</th>
<th>Dissolved Oxygen (mg/L)</th>
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6/8/99 (2) | F2 170 | N 70° 20' 25.5" | W 150° 55' 29.1" (NAD27) | 1.19 | 1.4 | 3.7 | 0.1 | 97.1 | 12.71 | | | |
| | | | 2.4 | 3.7 | 0.1 | 97.1 | 12.70 | | |
| | | | 3.4 | 3.8 | 0.1 | 97.1 | 12.71 | | |
| | | | 4.4 | 3.8 | 0.1 | 97.0 | 12.71 | | |
| | | | 5.4 | 3.8 | 0.1 | 97.2 | 12.71 | | |
| | | | 6.4 | 3.8 | 0.1 | 97.2 | 12.69 | | |
| | | | 7.4 | 3.8 | 0.1 | 97.2 | 12.70 | | |
| | | | 8.4 | 3.8 | 0.1 | 97.3 | 12.69 | | |
| | | | 9.4 | 3.8 | 0.1 | 97.4 | 12.70 | | |
| | | | 10.4 | 3.8 | 0.1 | 97.4 | 12.70 | | |
| | | | 11.4 | 3.8 | 0.1 | 97.3 | 12.69 | | |
| | | | 12.4 | 3.8 | 0.1 | 97.3 | 12.69 | | |
| | | | 13.4 | 3.8 | 0.1 | 97.4 | 12.69 | | |
| | | | 14.4 | 3.8 | 0.1 | 97.4 | 12.70 | | |
| | | | 15.4 River Bed | | | | | | |
| | | | | | | | | | |
| Depth Integrated 0 - 6 feet | 65 | | |
| Depth Integrated 0 - 15.4 feet | 50 | | |

6/10/99 (2) | F2 170 | N 70° 20' 25.5" | W 150° 55' 29.1" (NAD27) | 0.64 | 1.3 | 5.6 | 0 | 62.3 | 12.20 | | | |
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| | | | 4.3 | 5.6 | 0 | 62.4 | 12.22 | | |
| | | | 5.3 | 5.6 | 0 | 62.2 | 12.21 | | |
| | | | 6.3 | 5.7 | 0 | 62.3 | 12.22 | | |
| | | | 7.3 | 5.7 | 0 | 62.7 | 12.22 | | |
| | | | 8.3 | 5.7 | 0 | 63.0 | 12.22 | | |
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<td>3.4</td>
<td>3623</td>
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<td>3.0</td>
<td>3.4</td>
<td>3633</td>
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<td>3.4</td>
<td>3645</td>
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<td>3.4</td>
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<td>3666</td>
<td>12.64</td>
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<tr>
<td></td>
<td>River Bed</td>
<td></td>
<td>17.6</td>
<td>3.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes:
1. On this date the Channel was covered with ice. The ice thickness was 4.0 feet and the distance from the top of the ice to the water surface was 0.4 feet.
2. F2 170 denotes that the sample was collected near the southern flare pit approximately 46 feet from the left bank (See Figure 1).
3. F2a 122 denotes that the sample was collected near the southern flare pit approximately 60 feet from the left bank and is approximately 150 feet upstream from site F2 170 (See Figure 1).
4. The temperature is the average temperature from the DO meter and the SCT meter. The difference between the temperatures was generally within the accuracy of the instruments.
Figure C-12a: Sakoonang Channel 1999 Water Temperature Versus Depth

See Appendix A for site locations.
Figure C-12b: Sakoonang Channel 1999 Salinity Versus Depth

- Salinity On 4/28/99 At FZa 122
  - Salinity (ppt)
  - Bottom of ice at 4 feet.
  - River Bed at 16.1 feet.

- Salinity On 5/23/99 At FZa 122
  - Salinity (ppt)

- Salinity On 7/13/99 At F2a 122
  - Salinity (ppt)
  - River Bed at 13.7 feet.

- Salinity On 8/6/99 At FZa 122
  - Salinity (ppt)

- Salinity On 8/10/99 At F2a 122
  - Salinity (ppt)
  - River Bed at 16.9 feet.

- Salinity On 6/25/99 At FZa 122
  - Salinity (ppt)
  - River Bed at 16.6 feet.

- Salinity On 7/13/99 At F2a 122
  - Salinity (ppt)
  - River Bed at 16.4 feet.

- Salinity On 8/10/99 At F2a 122
  - Salinity (ppt)

- Salinity On 6/29/99 At F2 170
  - Salinity (ppt)
  - River Bed at 16.8 feet.

- Salinity On 7/13/99 At F2 170
  - Salinity (ppt)
  - River Bed at 15.3 feet.

- Salinity On 8/10/99 At F2 170
  - Salinity (ppt)
  - River Bed at 14.7 feet.

- Salinity On 6/29/99 At F2 170
  - Salinity (ppt)

The salinity was outside the range of this graph. The salinity ranged from 22.6 ppt to 22.8 ppt. See Table 4: Sakoonang Channel Basic Water Quality parameters for values and locations.

See Appendix A for site locations.
Figure C-12c: Sakoonang Channel 1999 Conductivity Versus Depth

There was no conductivity data collected on this date.

Conductivity On 6/28/99 At F2 122
Conductivity (μS)

Conductivity On 6/30/99 At F2 1070
Conductivity (μS)

Conductivity On 6/22/99 At F2 170
Conductivity (μS)

Conductivity On 6/1/99 At F2 170
Conductivity (μS)

Conductivity On 6/15/99 At F2 170
Conductivity (μS)

Conductivity On 6/25/99 At F2 170
Conductivity (μS)

Conductivity On 7/13/99 At F2 170
Conductivity (μS)

Conductivity On 7/15/99 At F2a 122
Conductivity (μS)

Conductivity On 8/1/99 At F2a 122
Conductivity (μS)

The first value at a depth 1.9 feet is 702 μS. The last value at 15.9 feet is 724 μS.

River Bed at 14.6 feet.

River Bed at 15.4 feet.

River Bed at 15.3 feet.

River Bed at 14.7 feet.

River Bed at 16.8 feet.

River Bed at 17.8 feet.

River Bed at 16.8 feet.

River Bed at 17.5 feet.

River Bed at 17.5 feet.

See Appendix A for site locations.
Figure C-12d: Sakoonang Channel 1999 Dissolved Oxygen Versus Depth

Dissolved Oxygen On 4/28/99 At F2a 122
Dissolved Oxygen (mg/L)

Bottom of Ice at 4 feet.

Dissolved Oxygen went both above and below the river bed.

Dissolved Oxygen On 6/8/99 At F2 170
Dissolved Oxygen (mg/L)

River Bed at 16.8 feet.

Dissolved Oxygen On 7/13/99 At F2 170
Dissolved Oxygen (mg/L)

River Bed at 16.9 feet.

River Bed at 16.1 feet.

Dissolved Oxygen On 6/3/99 At F2 170
Dissolved Oxygen (mg/L)

River Bed at 17.0 feet.

Dissolved Oxygen On 9/21/99 At F2a 122
Dissolved Oxygen (mg/L)

River Bed at 17.6 feet.

Dissolved Oxygen On 8/31/99 At F2a 122
Dissolved Oxygen (mg/L)

River Bed at 15.3 feet.

River Bed at 15.4 feet.

River Bed at 14.7 feet.

River Bed at 13.7 feet.

See Appendix A for site locations.
Figure C-12e: Sakoonang Channel 1999 Turbidity And Total Suspended Solids Versus Time

Turbidity
(Based On Depth Integrated Sample Collected Between 0 And 6 Feet)

<table>
<thead>
<tr>
<th>Date</th>
<th>Turbidity (NTU)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4/28/99</td>
<td>5</td>
</tr>
<tr>
<td>5/31/99</td>
<td>60</td>
</tr>
<tr>
<td>6/6/99</td>
<td>70</td>
</tr>
<tr>
<td>6/8/99</td>
<td>80</td>
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<tr>
<td>6/10/99</td>
<td>90</td>
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<tr>
<td>6/25/99</td>
<td>100</td>
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<tr>
<td>7/13/99</td>
<td>110</td>
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<tr>
<td>8/19/99</td>
<td>120</td>
</tr>
<tr>
<td>9/21/99</td>
<td>130</td>
</tr>
</tbody>
</table>

Total Suspended Solids
(Based On Depth Integrated Sample Collected Between 0 And 6 Feet)

<table>
<thead>
<tr>
<th>Date</th>
<th>TSS (mg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4/28/99</td>
<td>20</td>
</tr>
<tr>
<td>5/31/99</td>
<td>140</td>
</tr>
<tr>
<td>6/6/99</td>
<td>160</td>
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<tr>
<td>6/8/99</td>
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<tr>
<td>6/10/99</td>
<td>200</td>
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<tr>
<td>6/25/99</td>
<td>220</td>
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<tr>
<td>7/13/99</td>
<td>240</td>
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<tr>
<td>8/19/99</td>
<td>260</td>
</tr>
<tr>
<td>9/21/99</td>
<td>280</td>
</tr>
</tbody>
</table>
Figure C-12e (Continued): Sakoonang Channel 1999 Turbidity And Total Suspended Solids Versus Time

**Turbidity**
(Based On Depth Integrated Sample Collected Over The Entire Depth)

- F2a 122
- F2 170

**Total Suspended Solids**
(Based on Depth Integrated Sample Collected Over The Entire Depth)

- F2a 122
- F2 170
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Units</th>
<th>ADEC Drinking Water Maximum Contaminant Level (1)</th>
<th>6/1/99</th>
<th>7/1/99</th>
<th>8/1/99</th>
<th>9/1/99</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Primary Inorganic Chemicals</strong></td>
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<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Antimony</td>
<td>mg/L</td>
<td>0.006</td>
<td>&lt;0.002</td>
<td>&lt;0.003</td>
<td>&lt;0.003</td>
<td>&lt;0.003</td>
</tr>
<tr>
<td>Arsenic</td>
<td>mg/L</td>
<td>0.05</td>
<td>0.003</td>
<td>&lt;0.004</td>
<td>&lt;0.004</td>
<td>&lt;0.004</td>
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<tr>
<td>Barium</td>
<td>mg/L</td>
<td>2</td>
<td>0.0988</td>
<td>0.122</td>
<td>0.139</td>
<td>0.171</td>
</tr>
<tr>
<td>Beryllium</td>
<td>mg/L</td>
<td>0.004</td>
<td>&lt;0.0010</td>
<td>&lt;0.0007</td>
<td>&lt;0.0007</td>
<td>&lt;0.0007</td>
</tr>
<tr>
<td>Cadmium</td>
<td>mg/L</td>
<td>0.005</td>
<td>0.0001</td>
<td>&lt;0.0001</td>
<td>0.0001</td>
<td>0.0001</td>
</tr>
<tr>
<td>Chromium</td>
<td>mg/L</td>
<td>0.1</td>
<td>0.003</td>
<td>&lt;0.002</td>
<td>0.005</td>
<td>0.003</td>
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<tr>
<td>Cyanide</td>
<td>mg/L</td>
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<td>&lt;0.02</td>
<td>&lt;0.02</td>
<td>&lt;0.02</td>
<td>&lt;0.02</td>
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<tr>
<td>Fluoride</td>
<td>mg/L</td>
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<td>&lt;0.06</td>
<td>0.07</td>
<td>&lt;0.06</td>
<td>0.15</td>
</tr>
<tr>
<td>Mercury</td>
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<td>&lt;0.0002</td>
<td>0.0003</td>
<td>&lt;0.0002</td>
<td>&lt;0.0002</td>
</tr>
<tr>
<td>Nickel</td>
<td>mg/L</td>
<td>0.1</td>
<td>&lt;0.02</td>
<td>&lt;0.01</td>
<td>&lt;0.01</td>
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<tr>
<td>Nitrate</td>
<td>mg/L</td>
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<td>0.06</td>
<td>0.06</td>
<td>&lt;0.03</td>
<td>&lt;0.03</td>
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<tr>
<td>Selenium</td>
<td>mg/L</td>
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<td>&lt;0.002</td>
<td>&lt;0.004</td>
<td>&lt;0.004</td>
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<tr>
<td>Thallium</td>
<td>mg/L</td>
<td>0.002</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
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<tr>
<td>Aluminum</td>
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<td>3.11</td>
<td>0.36</td>
<td>3.36</td>
<td>0.35</td>
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<tr>
<td>Chloride</td>
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<td>45</td>
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<td>Copper</td>
<td>mg/L</td>
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<td>0.008</td>
<td>0.025</td>
<td>0.009</td>
<td>&lt;0.006</td>
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<td>Langelier Index (Corrosivity) (Unit)</td>
<td>Noncorrosive</td>
<td>Noncorrosive</td>
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<td>-0.17</td>
<td>-0.09</td>
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<tr>
<td>Fluoride</td>
<td>mg/L</td>
<td>2.0</td>
<td>&lt;0.06</td>
<td>0.07</td>
<td>&lt;0.06</td>
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<td>Foaming agents</td>
<td>mg/L</td>
<td>0.5</td>
<td>&lt;0.10</td>
<td>&lt;0.10</td>
<td>&lt;0.10</td>
<td>&lt;0.10</td>
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<tr>
<td>Iron</td>
<td>mg/L</td>
<td>0.3</td>
<td>5.08</td>
<td>1.26</td>
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<td>Manganese</td>
<td>mg/L</td>
<td>0.05</td>
<td>0.121</td>
<td>0.114</td>
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<td>2</td>
<td>2</td>
<td>1</td>
<td>4</td>
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</tr>
<tr>
<td>Silver</td>
<td>mg/L</td>
<td>0.1</td>
<td>0.0001</td>
<td>&lt;0.0002</td>
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<td>&lt;0.0002</td>
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<td>Sodium</td>
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<td>5.5</td>
<td>31.6</td>
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<td>Total Dissolved Solids</td>
<td>mg/L</td>
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<td>54</td>
<td>558</td>
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<td>3020</td>
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<td>Zinc</td>
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<tr>
<td>Calcium</td>
<td>mg/L</td>
<td>(4)</td>
<td>7.92</td>
<td>26.5</td>
<td>32.8</td>
<td>80.2</td>
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<tr>
<td>Alkalinity as CaCO3</td>
<td>mg/L</td>
<td>(4)</td>
<td>21</td>
<td>73</td>
<td>76</td>
<td>82</td>
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<tr>
<td>Hardness as CaCO3</td>
<td>mg/L</td>
<td>(4)</td>
<td>N/A</td>
<td>N/A</td>
<td>134</td>
<td>610</td>
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<tr>
<td>Magnesium</td>
<td>mg/L</td>
<td>(4)</td>
<td>N/A</td>
<td>N/A</td>
<td>12.7</td>
<td>109.9</td>
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<tr>
<td>Ethylbenzene</td>
<td>mg/L</td>
<td>0.7</td>
<td>&lt;0.0002</td>
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<td>0.00026</td>
<td>&lt;0.0002</td>
</tr>
<tr>
<td>Toluene</td>
<td>mg/L</td>
<td>1</td>
<td>&lt;0.0002</td>
<td>0.00046</td>
<td>0.00150</td>
<td>&lt;0.0002</td>
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<tr>
<td>Total Xylene</td>
<td>mg/L</td>
<td>10</td>
<td>&lt;0.0002</td>
<td>0.00041</td>
<td>0.00252</td>
<td>&lt;0.0002</td>
</tr>
<tr>
<td>1,2,4-Trimethylbenzene</td>
<td>mg/L</td>
<td>(4)</td>
<td>&lt;0.00020</td>
<td>&lt;0.00020</td>
<td>0.00033</td>
<td>&lt;0.0002</td>
</tr>
<tr>
<td>1,3,5-Trimethylbenzene</td>
<td>mg/L</td>
<td>(4)</td>
<td>&lt;0.00020</td>
<td>0.00074</td>
<td>&lt;0.00020</td>
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</tr>
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Table C-13: (Continued) Sakoonang Channel 1999 Secondary Water Quality Parameters

<table>
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<tr>
<th>Parameter</th>
<th>Units</th>
<th>ADEC Drinking Water Maximum Contaminant Level (1)</th>
<th>Sampling Date Results (2)</th>
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<tbody>
<tr>
<td></td>
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<td>6/1/99</td>
</tr>
<tr>
<td>Total Trihalomethanes</td>
<td>mg/L</td>
<td>0.10</td>
<td>&lt;0.00050</td>
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<td>Radioactive Contaminants</td>
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</tr>
<tr>
<td>Gross Alpha Radioactivity</td>
<td>pCi/L</td>
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<td>1.89+/-0.71</td>
</tr>
<tr>
<td>Total Coliform Bacteria</td>
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</tr>
<tr>
<td>Total Coliform By Colilert</td>
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<td>Not Detected</td>
<td>Detected</td>
</tr>
<tr>
<td>Fecal Coliform By Colilert</td>
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<td>Not Detected</td>
</tr>
<tr>
<td>Turbidity</td>
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</tr>
<tr>
<td>Turbidity (Field Tested)</td>
<td>NTU</td>
<td>5</td>
<td>80</td>
</tr>
</tbody>
</table>

Notes:
1. Alaska Department of Environmental Conservation (ADEC) Drinking Water Maximum Contaminant Levels are listed in the Alaska Drinking Water Regulations (18 AAC 80) as amended through 1 October 1999, except for Aluminum, Foaming Agents and Silver which are from the regulations as amended through 10 November 1994.
2. Shaded areas indicate levels that do not meet the Alaska Drinking Water Regulations.
3. TON - Threshold Odor Number.
4. Parameter is regulated by ADEC but a Maximum Contaminant Level is not specified.
5. Only the parameters within the Volatile Organic Group that had values above the method detection limit during June, July, August or September are presented in the table above. Other Volatile Organics examined include: benzene, bromobenzene, bromochloromethane, bromodichloromethane, bromoform, bromomethane, n-butylbenzene, sec-butylbenzene, tert-butylbenzene, carbon tetrachloride, chlorobenzene (monochlorobenzene), chloroethane, chloroform, chloromethane, 2-chlorotoluene, 4-chlorotoluene, dibromochloromethane, dibromomethane, 1,2-dichlorobenzene (o-dichlorobenzene), 1,3-dichlorobenzene, 1,4-dichlorobenzene (para-dichlorobenzene), dichlorodifluoromethane, 1,1-dichloroethane, 1,2-dichloroethane, 1,1-dichloroethene, cis-1,2-dichloroethene, trans-1,2-dichloroethene, 1,2-dichloropropane, 1,3-dichloropropane, 2,2-dichloropropane, 1,1-dichloropropene, cis-1,3-dichloropropene, trans-1,3-dichloropropene, hexachlorobutadiene, isopropylbenzene, p-isopropyltoluene, methylene chloride (dichloromethane), naphthalene, n-propylbenzene, styrene, 1,1,1,2-tetrachloroethane, 1,1,2,2-tetrachloroethane, tetrachloroethene, 1,2,3-trichlorobenzene, 1,2,4-trichlorobenzene, 1,1,1-trichloroethane, 1,1,2-trichloroethane, trichloroethene, trichlorofluoromethane, 1,2,3-trichloropropene, vinyl chloride, 4-bromofluorobenzene, and 1,2-dichlorobenzene-d4.
6. The Gross Alpha Radioactivity is a statistical analysis and is reported as the mean value of the sample and the standard deviation.
7. Three sets of Total Coliform Bacteria were gathered on 8 June 1999 for retesting. Two of the samples (Sak 001 and 002) were split from a single sample collected in the Sakoonang Channel. The third sample (Sak 003) was a blank sample prepared from deionized water. The results were: Sakoonang Channel Sample 001, Total Coliform By Colilert - Detected, Fecal Coliform By Colilert - Not Detected; Sakoonang Channel Sample 002, Total Coliform By Colilert - Detected, Fecal Coliform By Colilert - Detected; and the Blank sample, Total Coliform By Colilert - Not Detected, Fecal Coliform By Colilert - Not Detected.
8. Turbidity is based on a depth integrated sample from 0 to 6 feet.
Table C-13: (Continued) Sakoonang Channel 1999 Secondary Water Quality Parameters

9. Other General Water Quality Parameters examined were depth, temperature, salinity, conductivity, dissolved oxygen, and total suspended solids.

10. The laboratory analyses were performed by Northern Testing Laboratories, Inc.
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| Total  | 470,600  |
### Table C-14: (Continued) East Channel 1999 Discharge At River Mile E27.09

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<th>Type of Measurement</th>
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<td>Min (ft)</td>
<td>Average (ft)</td>
<td>Max (cfs)</td>
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**Total** 385,500

**Notes:**

1. Two types of measurements were used. Discrete water surface elevation measurements are designated by a "d". The number of measurements per day varied from one to five. Continuous water surface elevation measurements are designated by a "c". The instrument used to obtain the continuous measurements records 1 minute averages of water depth above the instrument every 10 minutes, throughout the day.

Figure C-14: East Channel 1999 Hydrograph At River Mile E27.09
APPENDIX D

LAKE 93-12 AND LAKE 93-13 WATER SUPPLY RISK ASSESSMENT

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Table D-4: Lake 93-12 Estimated Annual Water Volume Fluctuations (excluding river flooding)
Table D-5: Lake 93-13 Estimated Annual Water Volume Fluctuations (excluding river flooding)
Table D-6: Snowmelt, Summer Precipitation, And Evaporation Distributions Used In The Risk Assessment Model

Figure D-1: Risk Assessment Spreadsheet and Assumptions

LIST OF ATTACHEMENTS

Attachment D-1: Years 2000 – 2006 Water Supply Risk Assessment Model Results
Attachment D-2: Years 2007 – 2029 Water Supply Risk Assessment Model Results
Methods

Data
Meteorological data collected at Kuparuk between 1986 to 1998 were used to conduct a water supply risk assessment of Lakes 93-12 and 93-13. The Kuparuk data consisted of maximum snow on ground in May, summer precipitation and summer evaporation rates, and is presented in Table D-1.

Evaporation Rate Verification
To confirm the expected similarity in evaporation rates between Kuparuk and the Alpine Development (Alpine), data collected near Alpine was used to estimate the evaporation rates on Lakes 93-12 and 93-13 during the 1999 open water season. The evaporation rates estimated for the 1999 season at Alpine were compared to the lake evaporation rates developed for Kuparuk based on measured pan evaporation rates at Kuparuk (Table D-1).

The 1999 evaporation rates from Lakes 93-12 and 93-13 were calculated using data from the period 7 July to 25 September 1999. They were calculated as the difference between the net water volume change (calculated from changes in water surface elevation) and the sum of precipitation (Nuiqsut weather data, US National Weather Service, 1999) and artificial water withdrawal (Donnelly, 1999). A summary of the computations and results are presented in Tables D-2 and D-3.

Evaporation rates of 1.5 and 1.4 mm/day were calculated for Lakes 93-12 and 93-13, respectively. These rates compare favorably to the Kuparuk open water annual average evaporation rate of 1.9 mm/day, and the observed range of 0.9 to 2.7 mm/day (Rate of Lake Evaporation @ Kuparuk, Table D-1).

Water Supply Risk Assessment
A spreadsheet model, utilizing a Monte Carlo statistical technique (Haan, 1979) was developed to simulate annual fluctuations in Lakes 93-12 and 93-13, and to estimate the percentage of years during the life of Alpine when the expected water demands would be met. The model uses statistical distributions of the annual water volume associated with flooding by the river, snowmelt, summer precipitation and evaporation, and computes the volume of water available for use by Alpine on an annual basis. Because the magnitude of the meteorological parameters and
The occurrence of river flooding vary randomly, the model is run through the entire economic life of the project (30 years) 100,000 times. The result is an estimate of the probability of meeting the expected water demand during the first 7 years of operations, when the water demand is expected to be particularly high, and during the next 23 years, when the water demand is expected to be significantly less (Figure D-1).

The frequency of flooding used by the model was determined from breakup observations in years 1995, 1996, 1998, and 1999. The data indicates that the lakes are likely to be flooded approximately once every four years. Thus, the model randomly selects whether or not a flood occurs based on a 25 percent probability that a flood will occur in any given year.

The snowmelt, summer precipitation, and evaporation parameters were created by applying the Kuparuk data to Lakes 93-12 and 93-13. The specific procedures used to create the parameters are as follows. First, annual water volumes associated with each parameter were estimated by multiplying the magnitude of each parameter by the surface area of each lake as described in Tables D-4 and D-5. Secondly, the water volume associated with each parameter, for each year in which data are available, were combined to provide a single value for each parameter in each year. The mean and standard deviation associated with each of these parameters was used in a lognormal distribution to provide the values used by the model, as described in Table D-6.
Results

A report of the model results for years 2000-2006 is presented in Attachment D-1. A report of the model results for years 2007-2029 is presented in Attachment D-2.
Table D-1: Snow/Water Equivalent, Summer Precipitation, and Evaporation at Kuparuk

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<th>Year</th>
<th>Max. Snow on Ground in May @ Kuparuk (1)</th>
<th>Water Equivalent (2)</th>
<th>May 15 - Sept 15 Precipitation @ Kuparuk (3)</th>
<th>May 15 - Sept 15 Rate of Pan Evap. @ Kuparuk (4)</th>
<th>Rate of Lake Evap. @ Kuparuk (4)</th>
<th>Total Lake Evaporation (5)</th>
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<tbody>
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<td>(Inches)</td>
<td>(mm)</td>
<td>(mm)</td>
<td>(Inches)</td>
<td>(mm)</td>
<td>(mm/day)</td>
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<td>71</td>
<td>2.49</td>
<td>63.2</td>
<td>1.5</td>
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Notes:
1. Data obtained from the National Weather Service.
2. A Water equivalent coefficient of 0.28 (Stern, 1999) was used to convert snow depth to water equivalent.
3. Data obtained from the National Weather Service. May 15 to September 15 represents the time when precipitation is most likely to fall as rain and not snow, and is therefore considered independent from the snowpack.
4. Lake Evaporation was computed based on the measured pan evaporation and an average pan evaporation coefficient of 0.61. The average pan evaporation coefficient (0.61) was developed from data collected on the North Slope by Kane and Carlson (1973) in 1973 and by ABR (Cater, 1999) in 1996.
5. Total lake evaporation is based on an 80-day summer, July 1st to September 15th. Lakes are assumed to be ice-free during this period and evaporation is assumed to only occur when lakes are ice-free.
**Table D-2: Lake 93-12 1999 Evaporation Rates**

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Lake Evaporation (6)  -12,542,398 gallons

Over the period of July 7 to Sept. 25 the evaporation rate equals (inches/day) 0.06 (mm/day) 1.5

Notes:
1. Nuiqsut precipitation data obtained from the National Weather Service. Value is the total precipitation over the analysis period July 7th to September 25th. This time frame represents the ice-free period of lake data.
3. The net difference in water surface elevation from July 7th to September 25th.
4. The lake surface area equals 100 acres (4,356,000 SQFT) (Moulton, 1997). The volume equals total precipitation x lake surface area.
5. The drainage area (minus the lake surface area) equals 73.4 acres (3,197,000 SQFT) estimated by Michael Baker Jr., Inc. The volume equals total precipitation x drainage area x 0.37 (Kane, et al., 1999).
6. The total evaporation over the study period equals the difference between the lake water balance and the change in water volume based on staff gage measurements.
Table D-3: Lake 93-13 1999 Evaporation Rates

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Lake Evaporation (6) -8,494,874 gallons

Over the period of July 7 to Sept. 25 the evaporation rate equals (inches/day) 0.06
(mm/day) 1.4

Notes:
1. Nuiqsut precipitation data obtained from the National Weather Service. Value is the total precipitation over
   the analysis period July 7th to September 25th. This time frame represents the ice-free period of lake data.
3. The net difference in water surface elevation from July 7th to September 25th.
4. The lake surface area equals 69 acres (3,006,000 SQFT) (Moulton, 1997). The volume equals total precipitation x lake surface area.
5. The drainage area (minus the lake surface area) equals 82.9 acres (3,610,000 SQFT) estimated by Michael Baker Jr., Inc. The volume
   equals total precipitation x drainage area x 0.37 (Kane, et al., 1999).
6. The total evaporation over the study period equals the difference between the lake water balance and the
   change in water volume based on staff gage measurements.
Table D-4: Lake 93-12 Estimated Annual Water Volume Fluctuations (excluding river flooding)

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<th>Snowmelt Directly on Lake (5)</th>
<th>Snowmelt Runoff Into Lake (6)</th>
<th>Total Snowmelt</th>
<th>May 15 - Sept 15 Precipitation @ Kuparuk (4)</th>
<th>Precipitation Directly Into Lake</th>
<th>Precipitation Runoff Into Lake (7)</th>
<th>Total Precipitation</th>
<th>Estimated Lake Evaporation (8)</th>
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<td>(Gallons)</td>
<td>(Gallons)</td>
<td>(Gallons)</td>
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<td>(Gallons)</td>
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<tr>
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<td>57</td>
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<td>2,988,627</td>
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<td>4,535,543</td>
<td>57</td>
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<td>2,988,627</td>
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</tr>
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</table>

Notes:
1. Total drainage area including lake surface estimated at 173.4 acres (7,553,000 SQFT) by Michael Baker Jr., Inc.
2. Lake surface area equals 100 acres (4,356,000 SQFT), (Moulton, 1997)
3. The lake runoff area equals 73.4 acres (3,197,000 SQFT) and is the difference between the total drainage area and the lake surface area.
4. Values from Table D-1.
5. "Snowmelt directly on lake" represents the snowpack water volume that accumulates directly on the lake surface and does not include the snowmelt runoff on the ground draining to the lake.
6. The coefficient of 0.67 was used to calculate the water volume resulting from snowmelt runoff on the drainage basin (Kane, et al., 1999).
7. A runoff coefficient of 0.37 was used to calculate the runoff volume resulting from precipitation on the ground draining to the lake (Kane, et al., 1999).
8. The estimated lake evaporation in millimeters was taken from Table D-1 and the volumes were calculated based on the lake surface area.
Table D-5: Lake 93-13 Estimated Annual Water Volume Fluctuations (excluding river flooding)

<table>
<thead>
<tr>
<th>Year</th>
<th>Water Equivalent of Snow (4) (mm)</th>
<th>Snowmelt Directly on Lake (5) (Gallons)</th>
<th>Snowmelt Runoff Into Lake (6) (Gallons)</th>
<th>Total Snowmelt (Gallons)</th>
<th>May 15 - Sept 15 Precipitation at Kuparuk (4) (mm)</th>
<th>Precipitation Directly Into Lake (Gallons)</th>
<th>Precipitation Runoff Into Lake (7) (Gallons)</th>
<th>Total Precipitation (Gallons)</th>
<th>Estimated Lake Evaporation (8) (mm)</th>
<th>Estimated Lake Evaporation (8) (Gallons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1986</td>
<td>85</td>
<td>6,295,345</td>
<td>5,065,368</td>
<td>11,360,712</td>
<td>44</td>
<td>3,241,353</td>
<td>1,440,273</td>
<td>4,681,626</td>
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<td>10,031,952</td>
</tr>
<tr>
<td>1987</td>
<td>43</td>
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<td>45</td>
<td>3,553,770</td>
<td>1,490,224</td>
<td>4,843,994</td>
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</tr>
<tr>
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<td>14</td>
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<td>4,290,577</td>
<td>1,906,488</td>
<td>6,197,065</td>
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</tr>
<tr>
<td>1990</td>
<td>21</td>
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<td>1,266,342</td>
<td>2,840,178</td>
<td>50</td>
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<td>10,622,067</td>
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<td>57</td>
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<td>1,856,536</td>
<td>6,034,697</td>
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<td>11,212,181</td>
</tr>
<tr>
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</tbody>
</table>

Notes:
1. Total drainage area including lake surface estimated at 151.9 acres (6,616,000 SQFT) by Michael Baker Jr., Inc.
2. Lake surface area equals 69 acres (3,006,000 SQFT), (Moulton, 1997)
3. The lake runoff area equals 82.9 acres (3,610,000 SQFT) and is the difference between the total drainage area and the lake surface area.
4. Values from Table D-1.
5. "Snowmelt directly on lake" represents the snowpack water volume that accumulates directly on the lake surface and does not include the snowmelt runoff on the ground draining to the lake.
6. The coefficient of 0.67 was used to calculate the water volume resulting from snowmelt runoff on the drainage basin (Kane, et al., 1999).
7. A runoff coefficient of 0.37 was used to calculate the runoff volume resulting from precipitation on the ground draining to the lake (Kane, et al., 1999).
8. The estimated lake evaporation in millimeters was taken from Table D-1 and the volumes were calculated based on the lake surface area.
Table D-6: Snowmelt, Summer Precipitation, And Evaporation Data Used In The Risk Assessment Model

<table>
<thead>
<tr>
<th>Year</th>
<th>Lake 93-12 Snowmelt (1)</th>
<th>Lake 93-13 Snowmelt (2)</th>
<th>Combined Snowmelt</th>
<th>Lake 93-12 Summer Precipitation (1)</th>
<th>Lake 93-13 Summer Precipitation (2)</th>
<th>Combined Summer Precipitation</th>
<th>Lake 93-12 Evaporation (1)</th>
<th>Lake 93-13 Evaporation (2)</th>
<th>Combined Evaporation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(Gallons)</td>
<td>(Gallons)</td>
<td>(Gallons)</td>
<td>(Gallons)</td>
<td>(Gallons)</td>
<td>(Gallons)</td>
<td>(Gallons)</td>
<td>(Gallons)</td>
<td>(Gallons)</td>
</tr>
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</tr>
<tr>
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<td>26,016,364</td>
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<td>16,644,894</td>
<td>7,491,241</td>
<td>5,872,328</td>
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</tr>
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<th>Mean (3)</th>
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<th>Mean (3)</th>
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<td>Standard Deviation (3)</td>
<td>5.08</td>
<td>Standard Deviation (3)</td>
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</table>

Notes:
1. Values from Table D-4.
2. Values from table D-5
3. The mean and standard deviation are presented in units of million gallons.
Figure D-1: Risk Assessment Spreadsheet and Assumptions

<table>
<thead>
<tr>
<th>Year (1)</th>
<th>Annual Water Requirement (2) (MG)</th>
<th>Flood Test (3)</th>
<th>Flood Year (4)</th>
<th>Snow Melt (5) (MG)</th>
<th>Summer Precipitation (6) (MG)</th>
<th>Evaporation (7) (MG)</th>
<th>Supply Balance (8) (MG)</th>
<th>Counter (9)</th>
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<td></td>
</tr>
</tbody>
</table>

Total Years with Sufficient Supply (10) 4

Notes:
1. Model runs all 30 years (2000-2029) concurrently.
2. Annual water demands in the years 2000-2006 provided by Powell (Powell, 1999). Annual water demands in the years 2007-2029 assumed at 10 MG annually.

<table>
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<th>Year</th>
<th>Water Estimate</th>
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</thead>
<tbody>
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<tr>
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</tr>
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</tr>
<tr>
<td>2005</td>
<td>9.97 MG</td>
</tr>
<tr>
<td>2006</td>
<td>10.07 MG</td>
</tr>
<tr>
<td>2007-2029</td>
<td>10.00 MG</td>
</tr>
</tbody>
</table>

3. Model variable that generates a random number between 0 and 4.

4. Based on available data it is assumed that there is a 25% probability that the lakes will be flooded in any given year. Flood year is "true" (indicating flood did occur) if the flood test random number is less than or equal to 1. Flood year is "false" (indicating flood did not occur) if flood test is greater than 1 or less than or equal to 4.

5. Model variable defining snowmelt for a given year. The distribution of the variable is assumed to be lognormal, with a mean of 15.04 MG and a standard deviation of 7.98 based on Kuparuk data. The data is the combined total of both Lakes 93-12 and 93-13. Snowmelt does not effect the available water supply on years of flooding based on the assumption that flooding causes the lakes to reach maximum levels.

6. Model variable defining summer precipitation for a given year. The distribution of the variable is assumed to be lognormal, with a mean of 16.13 MG and a standard deviation of 5.08 based on Kuparuk data. The data is the combined total of both Lakes 93-12 and 93-13.

7. Model variable defining evaporation for a given year. The distribution of the variable is assumed to be lognormal, with a mean of 27.02 MG and a standard deviation of 6.09 based on Kuparuk data. The data is the combined total of both Lakes 93-12 and 93-13.

8. The supply balance is the remaining supply after yearly withdrawal for facility use. The model uses the following logic:

   a. The lakes are assumed full in the spring of 2000. When the lakes are full the available supply is 36.2 MG. This is the combined usable volume of Lakes 93-12 and 93-13 as set by the regulatory
b. The model tests for flood year. If flood year is true, the lakes are assumed full and the supply balance is calculated accordingly. The supply balance then equals $36.2 - \text{annual water requirement} + \text{summer precipitation} - \text{evaporation}$.

c. If flood year is false, the model checks the supply balance from the previous year. If the previous years supply balance is positive, the new supply balance equals the previous years supply balance + snowmelt + summer precipitation - evaporation - the annual water requirement. If the previous years supply balance is negative the previous years supply balance is then set to zero and the new supply balance equals zero + snowmelt + summer precipitation - evaporation - the annual water requirement. This assumes that no more than the regulatory limit is ever allowed to be withdrawn from the lakes.

9. The counter equals "1" if years supply balance is positive, indicating there was a sufficient water volume to meet the demands of Alpine. The counter equals "0" if years supply is negative, indicating the water supply fell below the allowable volume.

10. Model forecast variable predicting the total number of years with sufficient supply in a given trial. It is the sum of the counter column. The model has two counters, the first is for years 2000-2006 and the second is for years 2007-2029.
Years 2000-2006 Water Supply Risk Assessment Model Results

Crystal Ball Report
Simulation started on 4/27/00 at 17:47:35
Simulation stopped on 4/27/00 at 20:02:03

Forecast: # Years with Supply 2000 - 2006

Summary:
Display Range is from 0.00 to 7.00
Entire Range is from 0.00 to 7.00
After 100,000 Trials, the Std. Error of the Mean is 0.00

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Forecast: # Years with Supply 2000 - 2006

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Page 1 of 3
### Years 2000-2006 Water Supply Risk Assessment Model Results

**Forecast:** # Years with Supply 2000 - 2006 (cont'd)

**Cell:** J13

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End of Forecast
Years 2000-2006 Water Supply Risk Assessment Model Results

Assumptions

Assumption: Flood Test
Uniform distribution with parameters:
Minimum 0.00
Maximum 4.00
Mean value in simulation was 2.00

Assumption: Snowmelt Runoff
Lognormal distribution with parameters:
Mean 15.04
Standard Dev. 7.98
Selected range is from 0.00 to +Infinity
Mean value in simulation was 15.03

Assumption: Precipitation
Lognormal distribution with parameters:
Mean 16.13
Standard Dev. 5.08
Selected range is from 0.00 to +Infinity
Mean value in simulation was 16.12

Assumption: Evaporation
Lognormal distribution with parameters:
Mean 27.02
Standard Dev. 6.09
Selected range is from 0.00 to +Infinity
Mean value in simulation was 27.01

End of Assumptions
Attachment D-2

Years 2007-2029 Water Supply Risk Assessment Model Results

Crystal Ball Report
Simulation started on 4/27/00 at 17:47:35
Simulation stopped on 4/27/00 at 20:02:03

Forecast: # Years with Supply 2007 - 2029

Summary:
Display Range is from 0.00 to 25.00
Entire Range is from 2.00 to 23.00
After 100,000 Trials, the Std. Error of the Mean is 0.01

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Page 1 of 4
### Years 2007-2029 Water Supply Risk Assessment Model Results

**Forecast: # Years with Supply 2007 - 2029 (cont'd)**

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**Total:** 100.00% 100000
## Attachment D-2

### Years 2007-2029 Water Supply Risk Assessment Model Results

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**Assumptions**

**Assumption: Flood Test**

Uniform distribution with parameters:
- Minimum: 0.00
- Maximum: 4.00

Mean value in simulation was 2.00

**Assumption: Snowmelt Runoff**

Lognormal distribution with parameters:
- Mean: 15.04
- Standard Dev.: 7.98

Selected range is from 0.00 to +Infinity
Mean value in simulation was 15.03

**Assumption: Precipitation**

Lognormal distribution with parameters:
- Mean: 16.13
- Standard Dev.: 5.08

Selected range is from 0.00 to +Infinity
Mean value in simulation was 16.12

**Assumption: Evaporation**

Lognormal distribution with parameters:
- Mean: 27.02
- Standard Dev.: 6.09

Selected range is from 0.00 to +Infinity
Mean value in simulation was 27.01

End of Assumptions
APPENDIX E

SAKOONANG CHANNEL DISCHARGE ESTIMATES BASED ON MEASUREMENTS IN THE EAST CHANNEL

TABLE OF CONTENTS

Methods
Results

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Table E-1: East And Sakoonang Channel Discharge


Figure E-2: Mean Sakoonang Channel Hydrograph
Methods

Mean Sakoonang Channel Hydrograph

A number of years of water surface elevation and discharge data are available for the East Channel at the head of the delta (E27.09). This data was used in combination with two equations describing the relationship between the magnitude of the discharge in the East Channel and the magnitude of the discharge in the Sakoonang Channel to prepare a mean spring and summer hydrograph for the Sakoonang Channel.

East Channel Data

Estimates of the discharge in the East Channel at the head of the delta, during most of the open water season, are available for 1962 (Arnborg et al., 1966), 1977 (U.S. Geological Survey, 1978) and 1999 (Appendix C). Additionally, both discontinuous and continuous water surface elevation measurements were made over most of the open water season in 1997 (Aldrich and Noll, 1997). This information was used in conjunction with a stage-discharge curve (Aldrich and Ray, 1996) to estimate the discharge at the head of the delta during 1997.

In addition to the above referenced data, there are a number of years for which estimates of the discharge during breakup are available. This data was collected in 1993 (Aldrich and Hammond, 1993), 1996 (Aldrich and Ray, 1996) and 1998 (Michael Baker Jr., Inc., 1998).

Relationship Between East Channel And Sakoonang Channel Discharges

Using the data collected in the Sakoonang and East Channels during 1999 (Appendix C), two linear regression equations were developed to describe the relationship between the magnitude of the discharge in the East Channel and the magnitude of the discharge in the Sakoonang Channel. The relationships are as follows.

From the beginning of breakup through the 3rd day after the peak discharge at the head of the delta, the time when ice is most likely to be affecting the relationship between the water surface elevation and discharge, the following relationship was developed.

\[ Q_{ADDs} = 0.0156 \times Q_{ADDE} - 307.51 \]

Where:
- \( Q_{ADDs} \) = Average daily discharge in the Sakoonang Channel in cfs, and
- \( Q_{ADDE} \) = Average daily discharge in the East Channel in cfs.
The correlation coefficient associated with this equation ($R^2$) is 0.84 and the standard error of the estimate (SEE) is 230 cfs.

For the period starting with the 5th day after the peak discharge and continuing through the summer, the following relationship was developed.

$$Q_{ADDS} = 0.0145 \times Q_{ADDE} - 448.57$$

Where:
- $Q_{ADDS}$ = Average daily discharge in the Sakoonang Channel in cfs, and
- $Q_{ADDE}$ = Average daily discharge in the East Channel in cfs.

The correlation coefficient associated with this equation ($R^2$) is 0.97 and the standard error of the estimate (SEE) is 54 cfs.

On the 4th day after the peak discharge at the head of the delta, the discharge in the Sakoonang Channel is assumed to be the average of the estimates produced with the two equations described above.

Using these equations and the historic discharge data available for the East Channel at the head of the delta, the discharge likely to have occurred in the Sakoonanag Channel during 1962, 1977, 1993, 1996, 1997, and 1998 was estimated.
Results

A summary of the average daily discharge estimated to have occurred in the East and Sakoonang Channels during 1962, 1977, 1993, 1996, 1997, 1998, and 1999 is presented in Table E-1. A plot of discharge estimated to have occurred in the Sakoonang Channel during each of the above referenced years is presented in Figure E-1. A plot of the likely mean discharge in the Sakoonang Channel is presented in Figure E-2.
Table E-1: East And Sakoonang Channel Discharge

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Table E-1 (Continued): East And Sakoonang Channel Discharge

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Notes:

1. The 1962 East Channel discharge was taken from Arnborg (1966).
   The 1977 East Channel discharge was taken from U.S. Geological Survey (1977).
   The 1993 East Channel discharge was taken from Aldrich and Hammond (1993).
   The 1996 East Channel discharge was taken from Aldrich and Ray (1996).
   The 1997 East Channel discharge was computed from water surface elevations provided in Aldrich and Noll (1997) and the open water stage-discharge curve presented in Aldrich and Ray (1996).
   The 1998 East Channel discharge was taken from Michael Baker Jr., Inc. (1998).
   The 1999 East Channel discharge was computed based on water surface elevations measured in 1999. During the open water season, the discharge was computed using the stage-discharge curve presented in Aldrich and Ray (1996). During the period when ice impacted the water surface elevation, the discharge was computed based on normal depth computations using water surface slopes measured at the same time as the water surface elevation.

2. The discharge in the Sakoonang Channel was estimated based on the discharge in the East Channel except for 1999 when it was estimated based on water surface elevation and discharge measurements made in the Sakoonang Channel (Appendices C and E).
Figure E-2: Mean Sakoonang Channel Hydrograph

Discharge (cfs)

15-May  31-May  16-Jun  2-Jul  18-Jul  3-Aug  19-Aug  4-Sep  20-Sep
APPENDIX F
NORTHERN TESTING LABORATORIES
WATER QUALITY DATA REPORTS

TABLE OF CONTENTS

1999 Sakoonang Channel Data
1999 Lake 93-12 And Lake 93-13 Data
1998 Lake 93-12 Data
1998 Lake 93-13 Data
1999 Sakoonang Channel Data
**Report Date:** 06/22/99  
**Date Arrived:** 06/02/99  
**Date Sampled:** 06/01/99  
**Time Sampled:** 1130  
**Collected By:** JA  
**MRL = Method Reporting Limit**  

**Our Lab #:** F184671  
**Location/Project:** Alpine 1999 Water Program  
**Your Sample ID:** Sakoonang TBM 8U  
**Sample Matrix:** Water  
**Comments:** Sakoonang Channel

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Reported By: Cindy L. Christian  
Laboratory Director
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Reported By: Cindy L. Christian
Laboratory Director
**Legend**

- **MRL** = Method Report Level
- **MCL** = Max. Contaminant Level
- **B** = Present In Method Blank
- **E** = Estimated Value
- **M** = Matrix Interference
- **H** = Above MCL
- **D** = Lost To Dilution

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**Legend**

- MRL = Method Report Level
- MCL = Max. Contaminant Level
- B = Present In Method Blank
- E = Estimated Value
- M = Matrix Interference
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- D = Lost To Dilution

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<tr>
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<th>MRL</th>
<th>Date Prepared</th>
<th>Date Analyzed</th>
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Reported By: Stephanie K. Cowling
Chemistry Supervisor
**Report Date:** 6/9/99  
**Date Arrived:** 6/3/99  
**Sample Date:** 6/1/99  
**Sample Time:** 11:19  
**Collected By:** Julene Abrams

**Legend**

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<th>Date Prepared</th>
<th>Date Analyzed</th>
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</thead>
<tbody>
<tr>
<td>1,1,1-Trichloroethane</td>
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</table>

**Reported By:** Stephanie K. Cowling  
**Chemistry Supervisor**
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**Method**: EPA 524.2

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<tr>
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<th>Units</th>
<th>Result</th>
<th>MRL</th>
<th>Date Prepared</th>
<th>Date Analyzed</th>
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Reported By: Stephanie K. Cowling
Chemistry Supervisor
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<td>Styrene</td>
<td>µg/L</td>
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Reported By: Stephanie K. Cowling
Chemistry Supervisor
Report Date: 6/9/99  
Date Arrived: 6/3/99  
Sample Date: 5/17/99  
Sample Time:  
Collected By:  

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<th>Parameter</th>
<th>Units</th>
<th>Result</th>
<th>MRL</th>
<th>Date Prepared</th>
<th>Date Analyzed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,1,1-Trichloroethane</td>
<td></td>
<td>ug/L</td>
<td>&lt;MRL</td>
<td>0.20</td>
<td></td>
<td>6/4/99</td>
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<tr>
<td>1,1,2-Trichloroethane</td>
<td></td>
<td>ug/L</td>
<td>&lt;MRL</td>
<td>0.20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trichloroethene</td>
<td></td>
<td>ug/L</td>
<td>&lt;MRL</td>
<td>0.20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trichlorofluoromethane</td>
<td></td>
<td>ug/L</td>
<td>&lt;MRL</td>
<td>0.50</td>
<td></td>
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</tr>
<tr>
<td>1,2,3-Trichloropropene</td>
<td></td>
<td>ug/L</td>
<td>&lt;MRL</td>
<td>0.20</td>
<td></td>
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</tr>
<tr>
<td>1,2,4-Trimethylbenzene</td>
<td></td>
<td>ug/L</td>
<td>&lt;MRL</td>
<td>0.20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1,3,5-Trimethylbenzene</td>
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<td>ug/L</td>
<td>&lt;MRL</td>
<td>0.20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vinyl Chloride</td>
<td></td>
<td>ug/L</td>
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<td>0.50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>m,p-Xylene</td>
<td></td>
<td>ug/L</td>
<td>&lt;MRL</td>
<td>0.20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>o-Xylene</td>
<td></td>
<td>ug/L</td>
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<td>4-Bromofluorobenzene</td>
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<td>1,2-Dichlorobenzene-d4</td>
<td></td>
<td>% Recovery</td>
<td>90</td>
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<td></td>
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</tr>
</tbody>
</table>

Stephanie K. Cowling  
Chemistry Supervisor
### Drinking Water Analysis Report for Total Coliform Bacteria

**Date Received:** 6/2/99  
**Time Received:** 10:15

**Date Analyzed:** 6/2/99  
**Time Analyzed:** 13:40

**Date Reported:** 6/3/99  
**Time Reported:** 15:00

**Next Sample Due:**

***Comments***
- **S** = Satisfactory  
- **U** = Unsatisfactory  
- **POS** = Positive Test Result  
- **ND** = None Detected  
- **TNTC** = Too Numerous To Count (>200 Colonies)  
- **CG** = Confluent Growth  
- **SA** = Sample Age >30 Hours But <48 Hours. Results May Not Be Reliable  
- **Old** = Sample Age >48 Hours. Too Old For Analysis  
- **R** = Resample Required  
- **NT** = No Test

<table>
<thead>
<tr>
<th>Sample Date</th>
<th>Sample Time</th>
<th>Total*</th>
<th>E. Coli</th>
<th>Other*</th>
<th>HPC**</th>
<th>Result</th>
<th>Lab#</th>
<th>Location</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>6/1/99</td>
<td>11:29</td>
<td>POS</td>
<td>POS</td>
<td>NT</td>
<td>NT</td>
<td>AK5108</td>
<td>Sakooanang Channel TBM</td>
<td>U, Resample</td>
<td></td>
</tr>
</tbody>
</table>

---

**Method of Analysis:** MMO-MUG (SM 9223 B)

**Phone Number:**

**Fax Number:**

**Collected by:** JDA

**Sample Type:** Routine
Michael Baker, Jr. Inc.  
100 Cushman Street, Ste. 201  
Fairbanks AK 99701

Attn: J. Aldrich/J. Abrams

Our Lab #: F184673  
Location/Project: Alpine 1999 Water Program  
Your Sample ID: Sakoonang TBM 8U  
Sample Matrix: Water  
Comments: Sakoonang Channel

<table>
<thead>
<tr>
<th>Lab#</th>
<th>Method</th>
<th>Parameter</th>
<th>Units</th>
<th>Results*</th>
<th>MRL</th>
<th>Prepared</th>
<th>Analyzed</th>
</tr>
</thead>
<tbody>
<tr>
<td>F184673</td>
<td>EPA 900.0 Gross Alpha</td>
<td>pCi/L</td>
<td>1.89+/-0.71</td>
<td></td>
<td>11/05/99</td>
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Report Date: 11/24/99  
Date Arrived: 06/02/99  
Date Sampled: 06/01/99  
Time Sampled: 1113  
Collected By: JA  

MRL = Method Reporting Limit  
*B Flag Definitions  
B = Below Regulatory Min.  
H = Above Regulatory Max.

Digest Date: 11/05/99

Reported By: Cindy L. Christian  
Laboratory Director
Michael Baker, Jr. Inc.
100 Cushman Street, Ste. 201
Fairbanks AK 99701

Attn: J. Aldrich/J. Abrams

Our Lab #: F184672
Location/Project: Alpine 1999 Water Program
Your Sample ID: Sakoonang TBM 8U
Sample Matrix: Water
Comments: Sakoonang Channel; Meas. liq. vol. = 128mL analyzed, 948mL submitted

<table>
<thead>
<tr>
<th>Lab#</th>
<th>Method</th>
<th>Parameter</th>
<th>Units</th>
<th>Results</th>
<th>MRL</th>
<th>Prepared</th>
<th>Analyzed</th>
</tr>
</thead>
<tbody>
<tr>
<td>F184672</td>
<td>SM2540-D</td>
<td>Total Suspended Solids</td>
<td>mg/L</td>
<td>160</td>
<td>7.8</td>
<td>06/04/99</td>
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</tr>
</tbody>
</table>

Report Date: 06/09/99
Date Arrived: 06/02/99
Date Sampled: 05/31/99
Time Sampled: -
Collected By: JM

MRL = Method Reporting Limit
* Flag Definitions
B = Below Regulatory Min.
H = Above Regulatory Max.

Reported By: Cindy L. Christian
Laboratory Director
NORTHERN TESTING LABORATORIES, INC.

Michael Baker Jr. Inc.
100 Cushman Street Suite 201
Fairbanks AK 99701

Attn: Jim Aldrich

Our Lab #: F184842
Location/Project: Sakoonang Channel
Your Sample ID: 0-6' Mix
Sample Matrix: Water
Comments:

<table>
<thead>
<tr>
<th>Lab#</th>
<th>Method</th>
<th>Parameter</th>
<th>Units</th>
<th>Results</th>
<th>MRL</th>
<th>Prepared</th>
<th>Analyzed</th>
</tr>
</thead>
<tbody>
<tr>
<td>F184842</td>
<td>SM2540-D</td>
<td>Total Suspended Solids</td>
<td>mg/L</td>
<td>92</td>
<td>5.4</td>
<td>06/11/99</td>
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</tbody>
</table>
Michael Baker Jr. Inc.

100 Cushman Street Suite 201
Fairbanks AK 99701

Attn: Jim Aldrich

Our Lab #: F184843
Location/Project: Sakoonang Channel
Your Sample ID: 0-16.8' Mix
Sample Matrix: Water
Comments:

<table>
<thead>
<tr>
<th>Lab#</th>
<th>Method</th>
<th>Parameter</th>
<th>Units</th>
<th>Results</th>
<th>MRL Prepared Analyzed</th>
<th>Digest Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>F184843</td>
<td>SM2540-D</td>
<td>Total Suspended Solids</td>
<td>mg/L</td>
<td>87</td>
<td>4.7</td>
<td>06/11/99</td>
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</table>

Report Date: 06/15/99
Date Arrived: 06/10/99
Date Sampled: 06/06/99
Time Sampled: 1840
Collected By: JM

MRL = Method Reporting Limit

* Flag Definitions
   B = Below Regulatory Min.
   H = Above Regulatory Max.

Reported by: Cindy L. Christian
Laboratory Director
Report Date: 10 June 99
Report No.: 99060009

Report of Analysis

Jim Aldrich
Michael Baker Jr., Inc.
100 Cushman St. STE 201
Fairbanks, AK 99701
Phone #: 455-8073

Field ID Number: SAK 001
Sample Description: Sakoonang Channel
Date/Time Sampled: 06/08/99 @ 09:30 by JM
Date/Time Received: 06/09/99 @ 09:30 by ZR
NTL Lab Number: NT05082

<table>
<thead>
<tr>
<th>Analyte</th>
<th>Result</th>
<th>Units</th>
<th>MDL</th>
<th>Method</th>
<th>Preparation Date</th>
<th>Analysis Date</th>
<th>Analyst</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Coliform by Colilert</td>
<td>Detected</td>
<td>CFU/100ml</td>
<td>SM 9223B</td>
<td>06/09/99</td>
<td>06/10/99</td>
<td>JEP</td>
<td></td>
</tr>
<tr>
<td>Fecal Coliform by Colilert</td>
<td>Not Detected</td>
<td>Det/Non Det</td>
<td>SM 9223B</td>
<td>06/09/99</td>
<td>06/10/99</td>
<td>JEP</td>
<td></td>
</tr>
</tbody>
</table>

Approved by: Zachary Richter / Jerry Pollen
Chemist / Lab Tech
Report Date: 10 June 99  
Report No.: 99060009

# Report of Analysis

Jim Aldrich  
Michael Baker Jr., Inc.  
100 Cushman St. STE 201  
Fairbanks, AK 99701  
Phone # 455-8073

<table>
<thead>
<tr>
<th>Field ID Number</th>
<th>SAK 002</th>
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</thead>
<tbody>
<tr>
<td>Sample Description</td>
<td>Sakoonang Channel</td>
</tr>
<tr>
<td>Date/Time Sampled</td>
<td>06/08/99 @09:33</td>
</tr>
<tr>
<td>Date/Time Received</td>
<td>06/09/99 @09:30</td>
</tr>
<tr>
<td>NTL Lab Number</td>
<td>NT05083</td>
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<table>
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<th>MDL</th>
<th>Method</th>
<th>Date</th>
<th>Date</th>
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<tr>
<td>Total Coliform by Colilert</td>
<td>Detected</td>
<td>CFU/100ml</td>
<td>SM 9223B</td>
<td>06/09/99</td>
<td>06/10/99</td>
<td>JEP</td>
<td></td>
</tr>
<tr>
<td>Fecal Coliform by Colilert</td>
<td>Detected</td>
<td>Det/Non Det</td>
<td>SM 9223B</td>
<td>06/09/99</td>
<td>06/10/99</td>
<td>JEP</td>
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</tr>
</tbody>
</table>

Approved by: John Pollen  
Chemist / Lab Tech
Report Date: 10 June 99

Report of Analysis

Jim Aldrich
Michael Baker Jr., Inc.
100 Cushman St. STE 201
Fairbanks, AK 99701
Phone # 455-8073

<table>
<thead>
<tr>
<th>Field ID Number</th>
<th>Sample Description</th>
<th>Date/Time Sampled</th>
<th>Date/Time Received</th>
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<tbody>
<tr>
<td>SAK 003</td>
<td>Sakoonang Channel</td>
<td>06/08/99 @09:36</td>
<td>06/09/99 @09:30</td>
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</table>

<table>
<thead>
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<th>Result</th>
<th>Units</th>
<th>MDL</th>
<th>Method</th>
<th>Preparation Date</th>
<th>Analysis Date</th>
<th>Analyst</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Coliform by Colilert</td>
<td>Not Detected</td>
<td>CFU/100ml</td>
<td></td>
<td>SM 9223B</td>
<td>06/09/99</td>
<td>06/10/99</td>
<td>JEP</td>
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<tr>
<td>Fecal Coliform by Colilert</td>
<td>Not Detected</td>
<td>Det/Non Det</td>
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<td>SM 9223B</td>
<td>06/09/99</td>
<td>06/10/99</td>
<td>JEP</td>
</tr>
</tbody>
</table>

Approved by: Zachary Richter / Jerry Pollen
Chemist / Lab Tech
Michael Baker, Jr., Inc.
4601 Business Park Blvd., Suite 42
Anchorage AK 99503

Attn: -

Our Lab #: F185437
Location/Project: Sakoonang F2 170'
Your Sample ID: 0-6'
Sample Matrix: Water
Comments:

<table>
<thead>
<tr>
<th>Lab#</th>
<th>Method</th>
<th>Parameter</th>
<th>Units</th>
<th>Results</th>
<th>MRL</th>
<th>Prepared</th>
<th>Analyzed</th>
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</thead>
<tbody>
<tr>
<td>F185437</td>
<td>SM2540-D</td>
<td>Total Suspended Solids</td>
<td>mg/L</td>
<td>32</td>
<td>2.9</td>
<td>07/02/99</td>
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</tr>
</tbody>
</table>

Report Date: 07/08/99
Date Arrived: 06/30/99
Date Sampled: 06/25/99
Time Sampled: -
Collected By: TR

MRL = Method Reporting Limit
* Flag Definitions
B = Below Regulatory Min.
H = Above Regulatory Max.

RECEIVED
JUL 12 1999
MICHAEL BAKER, JR., INC.

Reported By: Patricia R. Woody
Senior Chemist
Michael Baker, Jr., Inc.
4601 Business Park Blvd., Suite 42
Anchorage AK 99503

Attn: -

Our Lab #: F185438
Location/Project: Sakoonang F2 170'
Your Sample ID: 0-14'
Sample Matrix: Water
Comments:

<table>
<thead>
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<th>Lab#</th>
<th>Method</th>
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<th>Units</th>
<th>Results</th>
<th>Digest Date</th>
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<tbody>
<tr>
<td>F185438</td>
<td>SM2540-D</td>
<td>Total Suspended Solids</td>
<td>mg/L</td>
<td>32</td>
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</tbody>
</table>

Report Date: 07/08/99
Date Arrived: 06/30/99
Date Sampled: 06/25/99
Time Sampled: -
Collected By: TR

MRL = Method Reporting Limit
* Flag Definitions
B = Below Regulatory Min.
H = Above Regulatory Max.

Reported By: Patricia A. Wood
Senior Chemist
Report Date: 08/18/99
Date Arrived: 07/15/99
Date Sampled: 07/14/99
Time Sampled: 1145
Collected By: VR

MRL = Method Reporting Limit
* Flag Definitions
B = Below Regulatory Min.
H = Above Regulatory Max.

<table>
<thead>
<tr>
<th>Lab#</th>
<th>Method</th>
<th>Parameter</th>
<th>Units</th>
<th>Results *</th>
<th>MRL Prepared Analyzed</th>
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</thead>
<tbody>
<tr>
<td>F185811</td>
<td>EPA 200.7</td>
<td>Aluminum, Total</td>
<td>mg/L</td>
<td>0.36 H</td>
<td>0.06 07/28/99 08/10/99</td>
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<tr>
<td></td>
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<td>Barium, Total</td>
<td>mg/L</td>
<td>0.122</td>
<td>0.007 07/28/99 08/10/99</td>
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<tr>
<td></td>
<td></td>
<td>Beryllium, Total</td>
<td>mg/L</td>
<td>&lt;MRL</td>
<td>0.0007 07/28/99 08/10/99</td>
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<tr>
<td></td>
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<td>Calcium, Total</td>
<td>mg/L</td>
<td>26.5</td>
<td>0.04 07/28/99 08/10/99</td>
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<tr>
<td></td>
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<td>Copper, Total</td>
<td>mg/L</td>
<td>0.025</td>
<td>0.006 07/28/99 08/10/99</td>
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<td></td>
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<td>Iron, Total</td>
<td>mg/L</td>
<td>1.26 H</td>
<td>0.056 07/28/99 08/17/99</td>
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<tr>
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<td>Manganese, Total</td>
<td>mg/L</td>
<td>0.114 H</td>
<td>0.006 07/28/99 08/10/99</td>
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<tr>
<td></td>
<td></td>
<td>Sodium, Total</td>
<td>mg/L</td>
<td>101</td>
<td>0.1 07/28/99 08/10/99</td>
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<tr>
<td></td>
<td></td>
<td>Nickel, Total</td>
<td>mg/L</td>
<td>&lt;MRL</td>
<td>0.01 07/28/99 08/10/99</td>
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<tr>
<td></td>
<td></td>
<td>Zinc, Total</td>
<td>mg/L</td>
<td>&lt;MRL</td>
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<tr>
<td></td>
<td>EPA 200.9</td>
<td>Silver, Total</td>
<td>mg/L</td>
<td>&lt;MRL</td>
<td>0.0002 07/28/99 07/29/99</td>
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<tr>
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<td>Arsenic, Total</td>
<td>mg/L</td>
<td>&lt;MRL</td>
<td>0.004 07/28/99 07/28/99</td>
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<td></td>
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<td>Cadmium, Total</td>
<td>mg/L</td>
<td>&lt;MRL</td>
<td>0.0001 07/28/99 07/28/99</td>
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<td></td>
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<td>Chromium, Total</td>
<td>mg/L</td>
<td>&lt;MRL</td>
<td>0.002 07/28/99 08/02/99</td>
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<td>Antimony, Total</td>
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<td></td>
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<td>Thallium, Total</td>
<td>mg/L</td>
<td>&lt;MRL</td>
<td>0.001 07/28/99 07/29/99</td>
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<td></td>
<td>EPA 245.1</td>
<td>Mercury</td>
<td>mg/L</td>
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<td>0.0002 07/29/99</td>
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<td></td>
<td>EPA 300.0</td>
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<td>4.00 08/10/99</td>
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<td>Fluoride</td>
<td>mg/L</td>
<td>0.07</td>
<td>0.06 07/29/99</td>
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<tr>
<td></td>
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<td>Sulfate</td>
<td>mg/L</td>
<td>31.6</td>
<td>4.0 07/29/99</td>
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<tr>
<td></td>
<td>SM2120-B</td>
<td>Color, Apparent</td>
<td>Unit</td>
<td>45 H</td>
<td>5 07/15/99</td>
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<td></td>
<td>SM2150-B</td>
<td>Odor</td>
<td>Unit</td>
<td>2</td>
<td>1 07/15/99</td>
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</table>

Reported By: Cindy L. Christian
Laboratory Director
<table>
<thead>
<tr>
<th>Lab#</th>
<th>Method</th>
<th>Parameter</th>
<th>Units</th>
<th>Results *</th>
<th>Digest Date</th>
<th>MRL</th>
<th>Prepared</th>
<th>Analyzed</th>
</tr>
</thead>
<tbody>
<tr>
<td>F185811 SM2320-B</td>
<td>Alkalinity as CaCO₃</td>
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<td>15</td>
<td>07/16/99</td>
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<td>SM2330-B</td>
<td>Langelier Index</td>
<td>Unit</td>
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<td>08/17/99</td>
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<tr>
<td>SM2540-C</td>
<td>Total Dissolved Solids</td>
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<td>SM4500-CN</td>
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<td>0.02</td>
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</table>
**NORTHERN TESTING LABORATORIES, INC.**

3330 INDUSTRIAL AVENUE
8005 SCHOON STREET
POUCH 340043

FAIRBANKS, ALASKA 99701
ANCHORAGE, ALASKA 99518
PRUDHOE BAY, ALASKA 99734

(907) 456-3116 • FAX 456-3125
(907) 349-1000 • FAX 349-1016
(907) 659-2145 • FAX 659-2146

---

**Michael Baker Jr., Inc.**
4601 Business Park Blvd., Ste. 42
Anchorage, AK 99503

**Attn:** Aldrich/Abrams

**Client ID:** F2a 122

**Client Project #:** Sakoonang

**Source:** Sakoonang

**NTI Lab#:** A162279

**Sample Matrix:** Water

**Comments:**

---

**Report Date:** 8/4/99

**Date Arrived:** 7/11/99

**Sample Date:** 7/14/99

**Sample Time:** 11:45

**Collected By:** V. Robinson

---

**Method** | **Parameter** | **Units** | **Result** | **MRL** | **Date Prepared** | **Date Analyzed**
--- | --- | --- | --- | --- | --- | ---

**EPA 524.2**

- Benzene: ug/L <MRL 0.20 7/25/99
- Bromobenzene: ug/L <MRL 0.20
- Bromochloromethane: ug/L <MRL 0.20
- Bromodichloromethane: ug/L <MRL 0.20
- Bromoform: ug/L <MRL 0.50
- Bromomethane: ug/L <MRL 1.00
- n-Butylbenzene: ug/L <MRL 0.20
- sec-Butylbenzene: ug/L <MRL 0.20
- tert-Butylbenzene: ug/L <MRL 0.20
- Carbon Tetrachloride: ug/L <MRL 0.20
- Chlorobenzene: ug/L <MRL 0.20
- Chloroethane: ug/L <MRL 1.00
- Chloroform: ug/L <MRL 0.30
- Chloromethane: ug/L <MRL 0.50
- 2-Chlorotoluene: ug/L <MRL 0.20
- 4-Chlorotoluene: ug/L <MRL 0.20
- Dibromochloromethane: ug/L <MRL 0.20
- Dibromomethane: ug/L <MRL 0.20
- 1,2-Dichlorobenzene: ug/L <MRL 0.20
- 1,3-Dichlorobenzene: ug/L <MRL 0.20
- 1,4-Dichlorobenzene: ug/L <MRL 0.20
- Dichlorodifluoromethane: ug/L <MRL 0.50
- 1,1-Dichloroethane: ug/L <MRL 0.20

---

**Reported By:** Stephanie K. Cowling
**Chemistry Supervisor**
### Method Parameter

<table>
<thead>
<tr>
<th>Method</th>
<th>Parameter</th>
<th>Units</th>
<th>Result</th>
<th>MRL</th>
<th>Date Prepared</th>
<th>Date Analyzed</th>
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<tr>
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<td>ug/L</td>
<td>&lt;MRL</td>
<td>0.20</td>
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</table>
Michael Baker Jr., Inc.
4601 Business Park Blvd., Ste. 42
Anchorage, AK 99503

Attn: Aldrich/Abrams

Client ID: F2a 122
Client Project #: 
Source: Sakoonag
NTL Lab#: A162279
Sample Matrix: Water
Comments:

<table>
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<tr>
<th>Method</th>
<th>Parameter</th>
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<th>Result</th>
<th>MRL</th>
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<th>Date Analyzed</th>
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SM 5540 C
Foaming Agents (MBAS) mg/L <MRL 0.10 7/16/99

Reported By: Stephanie K. Cowling
Chemistry Supervisor
Michael Baker Jr., Inc.  
4601 Business Park Blvd., Ste. 42  
Anchorage, AK 99503

Attn: Aldrich/Ablams  
Client ID: Travel Blank  
Client Project #: Sakoonang  
Source: NTL Lab# A162280  
Sample Matrix: Water  
Comments:

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</tbody>
</table>

Reported By: Stephanie K. Cowling  
Chemistry Supervisor
## Report Details
- **Client ID:** Travel Blank
- **Client Project #:** Sakoonang
- **NTL Lab #:** A182280
- **Sample Matrix:** Water
- **Report Date:** 7/31/99
- **Date Arrived:** 7/16/99
- **Sample Date:** 5/17/99
- **Sample Time:**
- **Collected By:**

## Legend
- MRL = Method Report Level
- MCL = Max. Contaminant Level
- B = Present In Method Blank
- E = Estimated Value
- M = Matrix Interference
- H = Above MCL
- D = Lost To Dilution

## Methodology

<table>
<thead>
<tr>
<th>Method</th>
<th>Parameter</th>
<th>Units</th>
<th>Result</th>
<th>MRL</th>
<th>Date Prepared</th>
<th>Date Analyzed</th>
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<tbody>
<tr>
<td>1,2-Dichloroethane</td>
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<td>&lt;MRL</td>
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<td>7/25/99</td>
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<td>Toluene</td>
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<td>0.20</td>
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</tbody>
</table>

---

**Reported By:** Stephanie K. Cowling  
Chemistry Supervisor
### Northern Testing Laboratories, Inc.

**Address:**
- Fairbanks, Alaska 99701
- Anchorage, Alaska 99518
- Prudhoe Bay, Alaska 99734

**Contact:**
- Phone: (907) 456-3116, FAX 456-3125
- Phone: (907) 349-1000, FAX 349-1016
- Phone: (907) 699-2145, FAX 699-2146

---

**Information:**
- **Attn:** Aldrich/Abrams
- **Client ID:** Travel Blank
- **Client Project #:**
- **Source:** Sakoonang
- **NTL Lab #:** A162280
- **Sample Matrix:** Water
- **Collected By:**

**Report Details:**
- **Report Date:** 7/31/99
- **Date Arrived:** 7/16/99
- **Sample Date:** 5/17/99
- **Sample Time:**

---

**Table:**

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<tr>
<th>Method</th>
<th>Parameter</th>
<th>Units</th>
<th>Result</th>
<th>MRL</th>
<th>Date</th>
<th>Date</th>
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<tbody>
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<td>1,1,1-Trichloroethane</td>
<td>ug/L</td>
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<td>1,2-Dichlorobenzene-d4</td>
<td>% Recovery</td>
<td></td>
<td>69</td>
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</table>

---

**Reported By:** Stephanie K. Cowling

Chemistry Supervisor
NORTHERN TESTING LABORATORIES, INC.

3330 INDUSTRIAL AVENUE
FAIRBANKS, ALASKA 99701
(907) 456-3116 • FAX 456-3125
8005 SCHOOK STREET
ANCHORAGE, ALASKA 99518
(907) 249-1000 • FAX 349-1016
POUCH 340043
PRUDHOE BAY, ALASKA 99734
(907) 659-2145 • FAX 659-2146

DRINKING WATER ANALYSIS REPORT FOR TOTAL COLIFORM BACTERIA

Michael Baker Jr. Inc.
100 Cushman Street, Ste. 201
Fairbanks AK 99701

Date Received: 7/15/99  Time Received: 10:10
Date Analyzed: 7/15/99  Time Analyzed: 14:10
Date Reported: 7/16/99  Time Reported: 15:00

Phone Number:
Fax Number:
Collected by: VLR
Sample Type Untreated Routine
Method of Analysis: MMO-MUG (SM 9223 B)

Comments:

<table>
<thead>
<tr>
<th>Sample Date</th>
<th>Sample Time</th>
<th>Coliform</th>
<th>E. Coli</th>
<th>Other Bacteria</th>
<th>HPC</th>
<th>Lab#</th>
<th>Location</th>
<th>Comments</th>
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</thead>
<tbody>
<tr>
<td>7/14/99</td>
<td>11:53</td>
<td>POS</td>
<td>ND</td>
<td>NT</td>
<td>NT</td>
<td>AK5109</td>
<td>F2A 122</td>
<td>U, Disinfect, R</td>
</tr>
</tbody>
</table>

Comments:

S = Satisfactory
U = Unsatisfactory
POS = Positive Test Result
ND = None Detected
TNTC = Too Numerous To Count (>200 Colonies)
CG = Confluent Growth
HSM = Heavy Sediment Masking, Results May Not Be Reliable
SA = Sample Age >30 Hours But <48 Hours, Results May Not Be Reliable
Old = Sample Age >48 Hours, Too Old For Analysis
R = Resample Required
NT = No Test
* # Colonies/100 ml
** # Colonies/ml
Michael Baker, Jr., Inc.
100 Cushman Street, Ste. 201
Fairbanks AK 99701

Attn: J Aldrich/J Abrams

Our Lab #: F185810
Location/Project: Sakoonang
Your Sample ID: F2a 122
Sample Matrix: Water

Report Date: 11/24/99
Date Arrived: 07/15/99
Date Sampled: 07/14/99
Time Sampled: 1145
Collected By: VR

MRL = Method Reporting Limit

<table>
<thead>
<tr>
<th>Lab#</th>
<th>Method</th>
<th>Parameter</th>
<th>Units</th>
<th>Results *</th>
<th>Digest Date</th>
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<tbody>
<tr>
<td>F185810</td>
<td>EPA 900.0</td>
<td>Gross Alpha</td>
<td>pCi/L</td>
<td>ND@1+/-0.46</td>
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</tr>
</tbody>
</table>

Reported By: Cindy L. Christian
Laboratory Director
Attn: J Aldrich/J Abrams

Our Lab #: F185812
Location/Project: Sakoonang
Your Sample ID: F2a 0-6'
Sample Matrix: Water

<table>
<thead>
<tr>
<th>Lab#</th>
<th>Method</th>
<th>Parameter</th>
<th>Units</th>
<th>Results</th>
<th>Digest Date</th>
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<tr>
<td>F185812</td>
<td>SM2540-D</td>
<td>Total Suspended Solids</td>
<td>mg/L</td>
<td>10</td>
<td>07/16/99</td>
</tr>
</tbody>
</table>

Report Date: 07/21/99
Date Arrived: 07/15/99
Date Sampled: 07/13/99
Time Sampled: 1440
Collected By: VR

MRL = Method Reporting Limit

* Flag Definitions
B = Below Regulatory Min.
H = Above Regulatory Max.

Reported by: Cindy L. Christian
Laboratory Director
Michael Baker, Jr., Inc.
3010 Davis Road
Fairbanks AK 99701

Attn: J Aldrich/J Abrams

Our Lab #: F185813
Location/Project: Sakoonang
Your Sample ID: F2a 0-16.9'
Sample Matrix: Water

Report Date: 07/21/99
Date Arrived: 07/15/99
Date Sampled: 07/13/99
Time Sampled: 1445
Collected By: VR

MRL = Method Reporting Limit

<table>
<thead>
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</table>

* Flag Definitions
B = Below Regulatory Min.
H = Above Regulatory Max.

<table>
<thead>
<tr>
<th>Lab#</th>
<th>Method</th>
<th>Parameter</th>
<th>Units</th>
<th>Results</th>
<th>MRL</th>
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<th>Analyzed</th>
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<td>F185813</td>
<td>SM2540-D</td>
<td>Total Suspended Solids</td>
<td>mg/L</td>
<td>11</td>
<td>2.0</td>
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</tbody>
</table>

Reported By: Cindy L. Christian
Laboratory Director
Michael Baker, Jr., Inc.
100 Cushman Street, Suite 201
Fairbanks AK 99701
Attn: J Abrams/J Aldrich

Our Lab #: F186739
Location/Project: Sakoonang Channel
Your Sample ID: F2a 122
Sample Matrix: Water
Comments: Magnesium: 12.7mg/L, Hardness as CaCO3: 134mg/L, analyzed 09/14/99

<table>
<thead>
<tr>
<th>Lab#</th>
<th>Method</th>
<th>Parameter</th>
<th>Units</th>
<th>Results *</th>
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<td>F186739</td>
<td>EPA 200.7</td>
<td>Aluminum, Total</td>
<td>mg/L</td>
<td>3.36 H</td>
<td>0.06 08/27/99 09/13/99</td>
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<tr>
<td></td>
<td></td>
<td>Barium, Total</td>
<td>mg/L</td>
<td>0.139</td>
<td>0.007 08/27/99 09/15/99</td>
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<tr>
<td></td>
<td></td>
<td>Beryllium, Total</td>
<td>mg/L</td>
<td>&lt;MRL</td>
<td>0.0007 08/27/99 09/13/99</td>
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<td>Calcium, Total</td>
<td>mg/L</td>
<td>32.8</td>
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<td>Copper, Total</td>
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<td>0.006 08/27/99 09/09/99</td>
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<td>Iron, Total</td>
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<td>Manganese, Total</td>
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<td>1.1 08/27/99 09/14/99</td>
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<td>Zinc, Total</td>
<td>mg/L</td>
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<td>Arsenic, Total</td>
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<td>8.0 09/01/99</td>
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Reported By: Cindy L. Christian
Laboratory Director
Attn: Julene Abrams

Date: 10/15/99

Report Date: 10/15/99

Date Arrived: 08/27/99

Date Sampled: 08/25/99

Time Sampled: 1329

Collected By: D. Yi

MRL = Method Reporting Limit

Flag Definitions
B = Below Regulatory Min.
H = Above Regulatory Max.

<table>
<thead>
<tr>
<th>Lab#</th>
<th>Method</th>
<th>Parameter</th>
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<th>Results *</th>
<th>Digest Date</th>
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<th>Date Analyzed</th>
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</tbody>
</table>

Submitted by: Cindy L. Christian
Laboratory Director
**Legend**

- **MRL** = Method Report Level
- **MCL** = Max. Contaminant Level
- **B** = Present In Method Blank
- **E** = Estimated Value
- **M** = Matrix Interference
- **H** = Above MCL
- **D** = Lost To Dilution

<table>
<thead>
<tr>
<th>Method</th>
<th>Parameter</th>
<th>Units</th>
<th>Result</th>
<th>MRL</th>
<th>Date Prepared</th>
<th>Date Analyzed</th>
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<tr>
<td></td>
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<td>ug/L</td>
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<td>0.20</td>
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<td>Bromochloromethane</td>
<td>ug/L</td>
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<td>0.20</td>
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<tr>
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<td></td>
<td>Bromoform</td>
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<td>ug/L</td>
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<td></td>
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<td>1.00</td>
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Reported By: Stephanie K. Cowling
Chemistry Supervisor
Michael Baker Jr., Inc.  
100 Cushman Street, Suite 201  
Fairbanks, AK 99701  

Attn: Abrams/Aldrich  
Client ID: F2a 122  
Client Project #:  
Source:  
NTL Lab#: A163073  
Sample Matrix: Water  
Comments:  

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<th>Result</th>
<th>MRL</th>
<th>Date Prepared</th>
<th>Date Analyzed</th>
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Reported By: Stephanie K. Cowling  
Chemistry Supervisor
### Method Parameter Table

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<tr>
<th>Method Parameter</th>
<th>Units</th>
<th>Result</th>
<th>MRL</th>
<th>Date Prepared</th>
<th>Date Analyzed</th>
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<tr>
<td>1,1,2-Trichloroethane</td>
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<tr>
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**Legend**
- MRL = Method Report Level
- MCL = Max. Contaminant Level
- B = Present In Method Blank
- E = Estimated Value
- M = Matrix Interference
- H = Above MCL
- D = Lost To Dilution

Report Date: 9/2/99
Date Arrived: 8/24/99
Sample Date: 8/19/99
Sample Time: 21:45
Collected By: Abrams/Aldrich

Reported By: Stephanie K. Cowling
Chemistry Supervisor
Michael Baker Jr., Inc.
100 Cushman Street, Suite 201
Fairbanks, AK 99701
Attn: J. Abrams
Client ID: F2a 122
Client Project #: Sakoonang Channel F2a
Source: Sakoonang Channel F2a
NTL Lab#: A163182
Sample Matrix: Water
Comments:

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<th>Result</th>
<th>MRL</th>
<th>Date Prepared</th>
<th>Date Analyzed</th>
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Report Date: 9/1/99
Date Arrived: 8/27/99
Sample Date: 8/25/99
Sample Time: 13:27
Collected By: D. Yi

** Legend **

MRL = Method Report Level
MCL = Max. Contaminant Level
B = Present In Method Blank
E = Estimated Value
M = Matrix Interference
H = Above MCL
D = Lost To Dilution

Stephanie K. Cowling
Chemistry Supervisor
### Method and Parameter Results

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<tr>
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<th>Result</th>
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<th>Date Analyzed</th>
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**Legend:**

- **MRL** = Method Report Level
- **MCL** = Max. Contaminant Level
- **B** = Present In Method Blank
- **E** = Estimated Value
- **M** = Matrix Interference
- **H** = Above MCL
- **D** = Lost To Dilution

Reported By: Stephanie K. Cowling
Chemistry Supervisor
Report Date: 9/2/99  
Date Arrived: 8/24/99  
Sample Date: 7/9/99  
Sample Time: 9:40  
Collected By:  

** Legend **  
MRL = Method Report Level  
MCL = Max. Contaminant Level  
B = Present In Method Blank  
E = Estimated Value  
M = Matrix Interference  
H = Above MCL  
D = Lost To Dilution  

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<th>Result</th>
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<th>Date Prepared</th>
<th>Date Analyzed</th>
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<td>0.20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Styrene</td>
<td></td>
<td>ug/L</td>
<td>&lt;MRL</td>
<td>0.20</td>
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</tr>
<tr>
<td>1,1,2-Tetrachloroethane</td>
<td></td>
<td>ug/L</td>
<td>&lt;MRL</td>
<td>0.20</td>
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<td></td>
</tr>
<tr>
<td>1,1,2,2-Tetrachloroethane</td>
<td></td>
<td>ug/L</td>
<td>&lt;MRL</td>
<td>0.20</td>
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<tr>
<td>Tetrachloroethene</td>
<td></td>
<td>ug/L</td>
<td>&lt;MRL</td>
<td>0.20</td>
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<tr>
<td>Toluene</td>
<td></td>
<td>ug/L</td>
<td>&lt;MRL</td>
<td>0.20</td>
<td></td>
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<tr>
<td>1,2,3-Trichlorobenzene</td>
<td></td>
<td>ug/L</td>
<td>&lt;MRL</td>
<td>0.20</td>
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<tr>
<td>1,2,4-Trichlorobenzene</td>
<td></td>
<td>ug/L</td>
<td>&lt;MRL</td>
<td>0.20</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Reported By: Stephanie K. Cowling  
Chemistry Supervisor
**Method** | **Parameter** | **Units** | **Result** | **MRL** | **Date Prepared** | **Date Analyzed**
--- | --- | --- | --- | --- | --- | ---
1,1,1-Trichloroethane | ug/L | <MRL | 0.20 | 8/30/99
1,1,2-Trichloroethane | ug/L | <MRL | 0.20 | 
Trichloroethene | ug/L | <MRL | 0.20 | 
Trichlorofluoromethane | ug/L | <MRL | 0.50 | 
1,2,3-Trichloropropane | ug/L | <MRL | 0.20 | 
1,2,4-Trimethylbenzene | ug/L | <MRL | 0.20 | 
1,3,5-Trimethylbenzene | ug/L | <MRL | 0.20 | 
Vinyl Chloride | ug/L | <MRL | 0.50 | 
m,p-Xylene | ug/L | <MRL | 0.20 | 
o-Xylene | ug/L | <MRL | 0.20 | 
Total Trihalomethanes | ug/L | <MRL | 0.50 | 
4-Bromofluorobenzene | % Recovery | 92 | 
1,2-Dichlorobenzene-d4 | % Recovery | 75 |
Report Date: 21 August 99

Report No.: 99080037

Report of Analysis

Jim Aldrich
Michael Baker Jr., Inc.
100 Cushman St. STE 201
Fairbanks, AK 99701
Phone # 455-8073

<table>
<thead>
<tr>
<th>Field ID Number</th>
<th>SAK F2A</th>
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</thead>
<tbody>
<tr>
<td>Sample Description</td>
<td>Water</td>
</tr>
<tr>
<td>Date/Time Sampled</td>
<td>08/19/99 @12:31 by J.A.</td>
</tr>
<tr>
<td>Date/Time Received</td>
<td>08/19/99 @16:00 by ZR</td>
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<td>NTL Lab Number</td>
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<table>
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<th>Analyte</th>
<th>Result</th>
<th>Units</th>
<th>MDL</th>
<th>Method</th>
<th>Preparation Date</th>
<th>Analysis Date</th>
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<tbody>
<tr>
<td>Total Coliform by Colilert</td>
<td>Detected</td>
<td>CFU/100ml</td>
<td>SM 9223B</td>
<td>08/19/99</td>
<td>08/20/99</td>
<td>ZR</td>
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</tr>
</tbody>
</table>

Approved by:
Zachary Richter / Jerry Pollien
Chemist / Lab Tech
Michael Baker, Jr., Inc.
100 Cushman Street, Suite 201
Fairbanks AK 99701

Attn: J Abrams/J Aldrich

Our Lab #: F186740
Location/Project: Sakoonang Channel
Your Sample ID: F2a 122
Sample Matrix: Water
Comments:

<table>
<thead>
<tr>
<th>Lab#</th>
<th>Method</th>
<th>Parameter</th>
<th>Units</th>
<th>Results</th>
<th>MRL</th>
<th>Prepared</th>
<th>Analyzed</th>
<th>Digest Date</th>
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<tbody>
<tr>
<td>F186740</td>
<td>EPA 900.0</td>
<td>Gross Alpha</td>
<td>pCi/L</td>
<td>1.33+/-0.56</td>
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</tbody>
</table>

Report Date: 11/24/99
Date Arrived: 08/23/99
Date Sampled: 08/19/99
Time Sampled: 1930
Collected By: JA/JA

MRL = Method Reporting Limit
* Flag Definitions
  B = Below Regulatory Min.
  H = Above Regulatory Max.
Michael Baker, Jr., Inc.
100 Cushman Street, Suite 201
Fairbanks AK 99701

Attn: Julene Abrams

Our Lab #: F186853
Location/Project: Sakoonang Channel F2a
Your Sample ID: F2a 122 0-6'
Sample Matrix: Water
Comments:

<table>
<thead>
<tr>
<th>Lab#</th>
<th>Method</th>
<th>Parameter</th>
<th>Units</th>
<th>Results *</th>
<th>Digest Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>F186853</td>
<td>SM2540-D</td>
<td>Total Suspended Solids</td>
<td>mg/L</td>
<td>96</td>
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</tbody>
</table>

Report Date: 08/31/99
Date Arrived: 08/27/99
Date Sampled: 08/19/99
Time Sampled: 
Collected By: D. Yi

MRL = Method Reporting Limit
*B = Below Regulatory Min.
H = Above Regulatory Max.

Reported by: Cindy L. Christian
Laboratory Director
Michael Baker, Jr., Inc.
100 Cushman Street, Suite 201
Fairbanks AK 99701

Attn: Julene Abrams

Our Lab #: F186854
Location/Project: Sakoonang Channel F2a
Your Sample ID: F2a 122 0-15.6’
Sample Matrix: Water
Comments:

Report Date: 08/31/99
Date Arrived: 08/27/99
Date Sampled: 08/19/99
Time Sampled: -
Collected By: D. Yi

MRL = Method Reporting Limit

* Flag Definitions
B = Below Regulatory Min.
H = Above Regulatory Max.

<table>
<thead>
<tr>
<th>Lab#</th>
<th>Method</th>
<th>Parameter</th>
<th>Units</th>
<th>Results</th>
<th>Digest Date</th>
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<tbody>
<tr>
<td>F186854</td>
<td>SM2540-D</td>
<td>Total Suspended Solids</td>
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<td>88</td>
<td>08/27/99</td>
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Reported by: Cindy L. Christian
Laboratory Director
Report Date: 10/18/99
Date Arrived: 09/23/99
Date Sampled: 09/21/99
Time Sampled: 0642
Collected By: S Tolan
MRL = Method Reporting Limit

Our Lab #: F187563
Location/Project: 1999 Water Monitoring
Your Sample ID: F2a 122
Sample Matrix: Water
Comments: Hardness as CaCO3 = 610 mg/L; Analyzed 12/13/99. Revised Transmittal

<table>
<thead>
<tr>
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<th>Method</th>
<th>Parameter</th>
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<tbody>
<tr>
<td>F187563</td>
<td>EPA 200.7</td>
<td>Aluminum, Total</td>
<td>mg/L</td>
<td>0.35</td>
<td>H 0.06 09/23/99 10/15/99</td>
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<tr>
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<td>Barium, Total</td>
<td>mg/L</td>
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<td>0.007 09/23/99 10/14/99</td>
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<tr>
<td></td>
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<td>Beryllium, Total</td>
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<td>0.0007 09/23/99 10/13/99</td>
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<tr>
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<td>Calcium, Total</td>
<td>mg/L</td>
<td>80.2</td>
<td>0.04 09/23/99 10/13/99</td>
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<td>Copper, Total</td>
<td>mg/L</td>
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<td>0.006 09/23/99 09/29/99</td>
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<td>Iron, Total</td>
<td>mg/L</td>
<td>1.24 H</td>
<td>0.006 09/23/99 10/14/99</td>
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<td>Manganese, Total</td>
<td>mg/L</td>
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<tr>
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<td>Sodium, Total</td>
<td>mg/L</td>
<td>845 H</td>
<td>1.1 09/23/99 10/13/99</td>
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<tr>
<td></td>
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<td>Nickel, Total</td>
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<td>Zinc, Total</td>
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<td>EPA 200.9</td>
<td>Silver, Total</td>
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<td>Arsenic, Total</td>
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<td>Cadmium, Total</td>
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<td>Chromium, Total</td>
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<td>0.002 09/23/99 10/14/99</td>
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<td>Thallium, Total</td>
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<td>0.12 10/14/99</td>
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<td>Sulfate</td>
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<td>Color, Apparent</td>
<td>Unit</td>
<td>35 H</td>
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Reported By: Marci L. Irwin
Chemistry Supervisor
<table>
<thead>
<tr>
<th>Lab#</th>
<th>Method</th>
<th>Parameter</th>
<th>Units</th>
<th>Results *</th>
<th>MRL</th>
<th>Prepared</th>
<th>Analyzed</th>
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<tbody>
<tr>
<td>F187563</td>
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<td>SM2320-B Alkalinity as CaCO3</td>
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<td>SM2330-B Langelier Index</td>
<td>Unit</td>
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<td>10/15/99</td>
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<td>SM2540-C Total Dissolved Solids</td>
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<td>SM4500-H- pH</td>
<td>Unit</td>
<td>7.9</td>
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</tbody>
</table>

Reported By: Marci L. Irwin
Chemistry Supervisor
**Legend**

- **MRL** = Method Report Level
- **MCL** = Max. Contaminant Level
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<table>
<thead>
<tr>
<th>Method Parameter</th>
<th>Units</th>
<th>Result</th>
<th>MRL</th>
<th>Date Prepared</th>
<th>Date Analyzed</th>
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<tbody>
<tr>
<td>Benzene</td>
<td>ug/L</td>
<td>&lt;MRL</td>
<td>0.20</td>
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<tr>
<td>Bromobenzene</td>
<td>ug/L</td>
<td>&lt;MRL</td>
<td>0.20</td>
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<tr>
<td>Bromochloromethane</td>
<td>ug/L</td>
<td>&lt;MRL</td>
<td>0.20</td>
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<tr>
<td>Bromodichloromethane</td>
<td>ug/L</td>
<td>&lt;MRL</td>
<td>0.20</td>
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<tr>
<td>Bromoform</td>
<td>ug/L</td>
<td>&lt;MRL</td>
<td>0.50</td>
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<tr>
<td>Bromomethane</td>
<td>ug/L</td>
<td>&lt;MRL</td>
<td>1.00</td>
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<tr>
<td>n-Butylbenzene</td>
<td>ug/L</td>
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<td>0.20</td>
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<td>sec-Butylbenzene</td>
<td>ug/L</td>
<td>&lt;MRL</td>
<td>0.20</td>
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<td>tert-Butylbenzene</td>
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<td>2-Chlorotoluene</td>
<td>ug/L</td>
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<td>4-Chlorotoluene</td>
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<tr>
<td>Dibromomethane</td>
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<tr>
<td>1,2-Dichlorobenzene</td>
<td>ug/L</td>
<td>&lt;MRL</td>
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<tr>
<td>1,3-Dichlorobenzene</td>
<td>ug/L</td>
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<tr>
<td>1,4-Dichlorobenzene</td>
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<td>1,1-Dichloroethane</td>
<td>ug/L</td>
<td>&lt;MRL</td>
<td>0.20</td>
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</tbody>
</table>

Reported By: Stephanie K. Cowling
Chemistry Supervisor
**Legend**

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<thead>
<tr>
<th>Method</th>
<th>Parameter</th>
<th>Units</th>
<th>Result</th>
<th>MRL</th>
<th>Prepared</th>
<th>Analyzed</th>
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<tbody>
<tr>
<td>1,2-Dichloroethane</td>
<td>ug/L</td>
<td>&lt;MRL</td>
<td>0.20</td>
<td>9/24/99</td>
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<tr>
<td>1,1-Dichloroethene</td>
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<td>&lt;MRL</td>
<td>0.20</td>
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<tr>
<td>cis-1,2-Dichloroethene</td>
<td>ug/L</td>
<td>&lt;MRL</td>
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<tr>
<td>trans-1,2-Dichloroethene</td>
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<td>cis-1,3-Dichloropropene</td>
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<tr>
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<td>&lt;MRL</td>
<td>0.20</td>
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</tr>
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Reported By: Stephanie K. Cowling
Chemistry Supervisor
Michael Baker Jr., Inc.
100 Cushman Street, Suite 201
Fairbanks, AK 99701

Attn: Julene Abrams
Client ID: F2a 122
Client Project #: 1999 Water Monitoring
Source: 1999 Water Monitoring
NTL Lab#: A163921
Sample Matrix: Water
Comments: Foaming Agent expired prior to arrival at laboratory.

<table>
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<th>Method</th>
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<th>Result</th>
<th>MRL</th>
<th>Date Prepared</th>
<th>Date Analyzed</th>
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<tbody>
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<td>9/24/99</td>
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<tr>
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Reported By: Stephanie K. Cowling
Chemistry Supervisor
### Method Parameter Summary

<table>
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<tr>
<th>Method Parameter</th>
<th>Units</th>
<th>Result</th>
<th>MRL</th>
<th>Date Prepared</th>
<th>Date Analyzed</th>
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<td>Bromoform</td>
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<td>n-Butylbenzene</td>
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<td>ug/L</td>
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</tbody>
</table>

**Legend**

- MRL = Method Report Level
- MCL = Max. Contaminant Level
- B = Present in Method Blank
- E = Estimated Value
- M = Matrix Interference
- H = Above MCL
- D = Lost To Dilution

Report Date: 9/27/99
Date Arrived: 9/24/99
Sample Date:
Sample Time:
Collected By:

Reported By: Stephanie K. Cowling
Chemistry Supervisor
Michael Baker Jr., Inc.
100 Cushman Street, Suite 201
Fairbanks, AK 99701
Attn: Julene Abrams
Client ID: Travel Blank
Client Project #: 1999 Water Monitoring
Source: NTL Lab#: A163923
Sample Matrix: Water
Comments:

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<th>Result</th>
<th>MRL</th>
<th>Date Prepared</th>
<th>Date Analyzed</th>
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</thead>
<tbody>
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<td>0.20</td>
<td></td>
<td>9/24/99</td>
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<tr>
<td>1,1-Dichloroethene</td>
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Report Date: 9/27/99
Date Arrived: 9/24/99
Sample Date: 
Sample Time: 
Collected By: 

**Legend**
MRL = Method Report Level
MCL = Max Contaminant Level
B = Present In Method Blank
E = Estimated Value
M = Matrix Interference
H = Above MCL
D = Lost To Dilution

Reported By: Stephanie K. Cowling
Chemistry Supervisor
**Method** | **Parameter** | **Units** | **Result** | **MRL** | **Date Prepared** | **Date Analyzed**
--- | --- | --- | --- | --- | --- | ---
1,1,1-Trichloroethane | ug/L | <MRL | 0.20 | 9/24/99
1,1,2-Trichloroethane | ug/L | <MRL | 0.20
Trichloroethene | ug/L | <MRL | 0.20
Trichlorofluoromethane | ug/L | <MRL | 0.50
1,2,3-Trichloropropane | ug/L | <MRL | 0.20
1,2,4-Trimethylbenzene | ug/L | <MRL | 0.20
1,3,5-Trimethylbenzene | ug/L | <MRL | 0.20
Vinyl Chloride | ug/L | <MRL | 0.50
m,p-Xylene | ug/L | <MRL | 0.20
o-Xylene | ug/L | <MRL | 0.20
Total Trihalomethanes | ug/L | <MRL | 0.50
4-Bromofluorobenzene | % Recovery | 109
1,2-Dichlorobenzene-d4 | % Recovery | 99
Report Date: 02 October 99

Report No.: 99090041

Jim Aldrich
Michael Baker Jr., Inc.
100 Cushman St. STE 201
Fairbanks, AK 99701
Phone # 455-8073

Field ID Number: S2A122
Sample Description: Water from Sak River
Date/Time Sampled: 09/28/99 @15:20
Date/Time Received: 09/29/99 @14:00 by ZR
NTL Lab Number: NT05612

<table>
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<th>MDL</th>
<th>Method</th>
<th>Date</th>
<th>Date</th>
<th>Analyst</th>
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<td>CFU/100ml</td>
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<td>09/30/99</td>
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Approved by: Zachary Richter / Jerry Pollen
Chemist / Lab Tech
Michael Baker Jr., Inc.
100 Cushman Street, Suite 201
Fairbanks AK 99701

Attn: Julene Abrams

Our Lab #: F187655
Location/Project: Alpine
Your Sample ID: F2a 122 0-6' MBJ
Sample Matrix: Water

<table>
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<th>Lab#</th>
<th>Method</th>
<th>Parameter</th>
<th>Units</th>
<th>Results</th>
<th>MRL</th>
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<th>Analyzed</th>
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<td>SM2540-D</td>
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<td>mg/L</td>
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<td>09/27/99</td>
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Michael Baker Jr., Inc.
100 Cushman Street, Suite 201
Fairbanks AK 99701

Attn: Julene Abrams

Report Date: 09/30/99
Date Arrived: 09/27/99
Date Sampled: 09/21/99
Time Sampled: -
Collected By: JDA

MRL = Method Reporting Limit

* Flag Definitions
B = Below Regulatory Min.
H = Above Regulatory Max.

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<th>Location/Project:</th>
<th>Your Sample ID:</th>
<th>Sample Matrix:</th>
<th>Comments:</th>
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<td>F2a 122 0-17.6' MBJ</td>
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<th>Method Parameter</th>
<th>Parameter</th>
<th>Units</th>
<th>Results *</th>
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<th>Prepared</th>
<th>Analyzed</th>
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<td>mg/L</td>
<td>8.0</td>
<td>2.5</td>
<td>09/27/99</td>
<td></td>
</tr>
</tbody>
</table>

Reported By: Cindy L. Christian
Laboratory Director
1999 Lake 93-12 And Lake 93-13 Data
Michael Baker, Jr.
100 Cushman Street, Suite 201
Fairbanks AK 99701

Attn: Jim Aldrich

Our Lab #: F185902
Location/Project: -
Your Sample ID: L93-12 4/28
Sample Matrix: Water
Comments:

<p>|</p>
<table>
<thead>
<tr>
<th>Lab#</th>
<th>Method</th>
<th>Parameter</th>
<th>Units</th>
<th>Results *</th>
<th>MRL</th>
<th>Prepared</th>
<th>Analyzed</th>
</tr>
</thead>
<tbody>
<tr>
<td>F185902</td>
<td>SM2540-D</td>
<td>Total Suspended Solids</td>
<td>mg/L</td>
<td>12</td>
<td>1.9</td>
<td>07/16/99</td>
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Report Date: 07/21/99
Date Arrived: 07/16/99
Date Sampled: 07/14/99
Time Sampled: -
Collected By: -

MRL = Method Reporting Limit

* Flag Definitions
B = Below Regulatory Min.
H = Above Regulatory Max.

Reported By: Cindy L. Christian
Laboratory Director
Michael Baker, Jr., Inc.
100 Cushman Street, Suite 201
Fairbanks AK 99701

Attn: Julene Abrams

Our Lab #: F186855
Location/Project: Sakoonang Channel F2a
Your Sample ID: L93-13
Sample Matrix: Water
Comments:

<table>
<thead>
<tr>
<th>Lab#</th>
<th>Method Parameter</th>
<th>Units</th>
<th>Results *</th>
<th>Digest Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>F186855 SM2540-D</td>
<td>Total Suspended Solids</td>
<td>mg/L</td>
<td>&lt;MRL</td>
<td>1.7</td>
</tr>
</tbody>
</table>

Report Date: 08/31/99
Date Arrived: 08/27/99
Date Sampled: 08/25/99
Time Sampled: -
Collected By: D. Yi

MRL = Method Reporting Limit

* Flag Definitions
B = Below Regulatory Min.
H = Above Regulatory Max.

Reported By: Cindy L. Christian
Laboratory Director
Attn: Julene Abrams

Our Lab #: F187654
Location/Project: Alpine
Your Sample ID: L93-12 MBJ
Sample Matrix: Water
Comments:

<table>
<thead>
<tr>
<th>Lab#</th>
<th>Method</th>
<th>Parameter</th>
<th>Units</th>
<th>Results *</th>
<th>Digest Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>F187654 SM2540-D</td>
<td>Total Suspended Solids</td>
<td>mg/L</td>
<td>&lt;MRL</td>
<td>1.1</td>
<td>09/27/99</td>
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</table>

Report Date: 09/30/99
Date Arrived: 09/27/99
Date Sampled: 09/21/99
Time Sampled: -
Collected By: JDA

MRL = Method Reporting Limit

* Flag Definitions
B = Below Regulatory Min.
H = Above Regulatory Max.

Reported by: Cindy L. Christian
Laboratory Director
Michael Baker, Jr.
100 Cushman Street, Suite 201
Fairbanks AK 99701

Attn: Jim Aldrich

Our Lab #: F185900
Location/Project: -
Your Sample ID: L93-13 6/25
Sample Matrix: Water
Comments:

<table>
<thead>
<tr>
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<th>Method</th>
<th>Parameter</th>
<th>Units</th>
<th>Results</th>
<th>Digest Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>F185900</td>
<td>SM2540-D</td>
<td>Total Suspended Solids</td>
<td>mg/L</td>
<td>14</td>
<td>07/16/99</td>
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</table>

Report Date: 07/21/99
Date Arrived: 07/16/99
Date Sampled: 07/14/99
Time Sampled: -
Collected By: -

MRL = Method Reporting Limit

* Flag Definitions
B = Below Regulatory Min.
H = Above Regulatory Max.

Reported by: Cindy L. Christian
Laboratory Director
Michael Baker, Jr.
100 Cushman Street, Suite 201
Fairbanks AK 99701

Attn: Jim Aldrich

Our Lab #: F185901
Location/Project: -
Your Sample ID: L93-13 7/13
Sample Matrix: Water
Comments:

Report Date: 07/21/99
Date Arrived: 07/16/99
Date Sampled: 07/14/99
Time Sampled: -
Collected By: -

MRL = Method Reporting Limit

* Flag Definitions
B = Below Regulatory Min.
H = Above Regulatory Max.

<table>
<thead>
<tr>
<th>Lab#</th>
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<th>Units</th>
<th>Results *</th>
<th>Digest Date</th>
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</thead>
<tbody>
<tr>
<td>F185901</td>
<td>SM2540-D</td>
<td>Total Suspended Solids</td>
<td>mg/L</td>
<td>230</td>
<td>07/16/99</td>
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<tr>
<td></td>
<td></td>
<td></td>
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<td>4.0</td>
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Reported By: Cindy L. Christian
Laboratory Director
Michael Baker Jr. Inc.
100 Cushman Street, Suite 201
Fairbanks AK 99701

Attn: Julene Abrams

Our Lab #: F186949
Location/Project: 1999 Alpine Monitoring
Your Sample ID: L93-13
Sample Matrix: Water
Comments:

Lab#  Method  Parameter                             Units  Results  MRL Prepared Analyzed
F186949 SM2540-D Total Suspended Solids           mg/L   9.2      1.2       09/01/99

Report Date: 09/03/99
Date Arrived: 09/01/99
Date Sampled: 08/25/99
Time Sampled: -
Collected By: JA

MRL = Method Reporting Limit

* Flag Definitions
B = Below Regulatory Min.
H = Above Regulatory Max.

Reported by: Cindy L. Christian
Laboratory Director
Michael Baker Jr., Inc.
100 Cushman Street, Suite 201
Fairbanks AK 99701

Attn: Julene Abrams

Our Lab #: F187653
Location/Project: Alpine
Your Sample ID: L93-13
Sample Matrix: Water
Comments:

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<th>Method</th>
<th>Parameter</th>
<th>Units</th>
<th>Results</th>
<th>Digest Date</th>
<th>MRL Prepared</th>
<th>Analyzed</th>
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<tbody>
<tr>
<td>F187653 SM2540-D</td>
<td>Total Suspended Solids</td>
<td>mg/L</td>
<td>2.9</td>
<td>09/27/99</td>
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</table>
1998 Lake 93-12 Data
Attn: Jim McGinnis, PE

Our Lab #: F176285
Location/Project: Alpine Camp Water System
Your Sample ID: 93-12
Sample Matrix: Water
Comments:

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<thead>
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<th>Lab#</th>
<th>Method</th>
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<th>Units</th>
<th>Results *</th>
<th>Date Prepared</th>
<th>Date Analyzed</th>
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</thead>
<tbody>
<tr>
<td>F176285</td>
<td>EPA 150.1 pH</td>
<td>Unit</td>
<td>7.2</td>
<td></td>
<td>02/04/98</td>
<td></td>
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<tr>
<td></td>
<td>EPA 180.1 Turbidity</td>
<td>NTU</td>
<td>0.35</td>
<td>0.05</td>
<td>02/04/98</td>
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<tr>
<td></td>
<td>EPA 200.7 Aluminum</td>
<td>mg/L</td>
<td>&lt;MDL</td>
<td>0.055</td>
<td>02/13/98</td>
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<tr>
<td></td>
<td>Barium</td>
<td>mg/L</td>
<td>0.092</td>
<td>0.002</td>
<td>02/13/98</td>
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<tr>
<td></td>
<td>Beryllium</td>
<td>mg/L</td>
<td>&lt;MDL</td>
<td>0.0005</td>
<td>02/13/98</td>
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<tr>
<td></td>
<td>Calcium</td>
<td>mg/L</td>
<td>11.2</td>
<td>0.016</td>
<td>03/02/98</td>
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<tr>
<td></td>
<td>Iron</td>
<td>mg/L</td>
<td>0.012</td>
<td>0.010</td>
<td>02/12/98</td>
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<tr>
<td></td>
<td>Hardness as CaCO3</td>
<td>mg/L</td>
<td>45.1</td>
<td>0.1</td>
<td>03/06/98</td>
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<tr>
<td></td>
<td>Magnesium</td>
<td>mg/L</td>
<td>4.16</td>
<td>0.073</td>
<td>03/06/98</td>
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<tr>
<td></td>
<td>Manganese</td>
<td>mg/L</td>
<td>0.056</td>
<td>H</td>
<td>02/13/98</td>
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<tr>
<td></td>
<td>Sodium</td>
<td>mg/L</td>
<td>7.45</td>
<td>0.120</td>
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<td>Nickel</td>
<td>mg/L</td>
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<td>Zinc</td>
<td>mg/L</td>
<td>&lt;MDL</td>
<td>0.008</td>
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<td>EPA 200.9 Silver</td>
<td>mg/L</td>
<td>&lt;MDL</td>
<td>0.0001</td>
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<td>Arsenic</td>
<td>mg/L</td>
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<td>0.003</td>
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<td>Cadmium</td>
<td>mg/L</td>
<td>&lt;MDL</td>
<td>0.0001</td>
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<td>Chromium</td>
<td>mg/L</td>
<td>&lt;MDL</td>
<td>0.002</td>
<td>02/11/98</td>
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<tr>
<td></td>
<td>Copper</td>
<td>mg/L</td>
<td>&lt;MDL</td>
<td>0.005</td>
<td>02/10/98</td>
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<tr>
<td></td>
<td>Antimony</td>
<td>mg/L</td>
<td>&lt;MDL</td>
<td>0.003</td>
<td>02/12/98</td>
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<tr>
<td></td>
<td>Selenium</td>
<td>mg/L</td>
<td>&lt;MDL</td>
<td>0.003</td>
<td>02/18/98</td>
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<td></td>
<td>Thallium</td>
<td>mg/L</td>
<td>&lt;MDL</td>
<td>0.001</td>
<td>02/13/98</td>
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<tr>
<td></td>
<td>EPA 245.1 Mercury</td>
<td>mg/L</td>
<td>0.0002</td>
<td>0.0002</td>
<td>02/16/98</td>
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<tr>
<td></td>
<td>EPA 300.0 Chloride</td>
<td>mg/L</td>
<td>14.3</td>
<td>1.00</td>
<td>02/09/98</td>
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Report Date: 03/09/98
Date Arrived: 02/04/98
Date Sampled: 02/01/98
Time Sampled: -
Collected By: -

MDL = Method Detection Limit

* Flag Definitions
B = Below Regulatory Min.
H = Above Regulatory Max.

Reported By: Cindy L. Christian
Laboratory Director
<table>
<thead>
<tr>
<th>Lab#</th>
<th>Method</th>
<th>Parameter</th>
<th>Units</th>
<th>Results</th>
<th>Date Prepared</th>
<th>Date Analyzed</th>
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<tbody>
<tr>
<td>F176285</td>
<td>EPA 300.0</td>
<td>Fluoride</td>
<td>mg/L</td>
<td>&lt;MDL</td>
<td>02/04/98</td>
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<td>Nitrate-N</td>
<td>mg/L</td>
<td>0.00</td>
<td>02/04/98</td>
<td>02/04/98</td>
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<td>Sulfate</td>
<td>mg/L</td>
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<td>SM2120-B</td>
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<td>Color, Apparent</td>
<td>Unit</td>
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<tr>
<td>SM2150-B</td>
<td>Odor</td>
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<td>TON</td>
<td>8 H</td>
<td>02/04/98</td>
<td>02/04/98</td>
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<tr>
<td>SM2320-B</td>
<td>Alkalinity</td>
<td>Alkalinity as CaCO3</td>
<td>mg/L</td>
<td>44</td>
<td>02/11/98</td>
<td>02/11/98</td>
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<tr>
<td></td>
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<td>Bicarbonate Alkalinity</td>
<td>mg/L</td>
<td>44</td>
<td>02/11/98</td>
<td>02/11/98</td>
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<td>(as CaCO3)</td>
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<td>SM2330-B</td>
<td>Langelier</td>
<td>Index</td>
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<td>-1.6</td>
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<tr>
<td>SM2540-C</td>
<td>Total Dissolved Solids</td>
<td>mg/L</td>
<td>54</td>
<td>20</td>
<td>02/17/98</td>
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<tr>
<td>SM4500-CN</td>
<td>Total Cyanide</td>
<td>mg/L</td>
<td>&lt;MDL</td>
<td>0.02</td>
<td>02/11/98</td>
<td>02/11/98</td>
</tr>
</tbody>
</table>

Reported By: Cindy L. Christian
Laboratory Director
**Legend**

- **MRL** = Method Report Level
- **MCL** = Max. Contaminant Level
- **B** = Present In Method Blank
- **E** = Estimated Value
- **M** = Matrix Interference
- **H** = Above MCL
- **D** = Lost To Dilution

### Report Details

- **Report Date:** 2/20/98
- **Date Arrived:** 2/5/98
- **Sample Date:** 2/1/98
- **Sample Time:**
- **Collected By:**

### Client Information

- **Client ID:** 93-12
- **Client Project #:**
- **Source:** Alpine Camp Water System
- **NTL Lab #:** A154122
- **Sample Matrix:** Water
- **Comments:**

<table>
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<th>Method</th>
<th>Parameter</th>
<th>Units</th>
<th>Result</th>
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<th>Date Analyzed</th>
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<td>EPA 524.2</td>
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<td>Benzene</td>
<td>ug/L</td>
<td>&lt;MRL</td>
<td>0.20</td>
<td>2/12/98</td>
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<tr>
<td></td>
<td>Bromobenzene</td>
<td>ug/L</td>
<td>&lt;MRL</td>
<td>0.20</td>
<td></td>
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<tr>
<td></td>
<td>Bromochloromethane</td>
<td>ug/L</td>
<td>&lt;MRL</td>
<td>0.20</td>
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<td>&lt;MRL</td>
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<tr>
<td></td>
<td>Bromoform</td>
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<td>&lt;MRL</td>
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<td>n-Butylbenzene</td>
<td>ug/L</td>
<td>&lt;MRL</td>
<td>0.20</td>
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<td>sec-Butylbenzene</td>
<td>ug/L</td>
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<td>tert-Butylbenzene</td>
<td>ug/L</td>
<td>&lt;MRL</td>
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<td>Carbon Tetrachloride</td>
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<td>&lt;MRL</td>
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<td>Chlorobenzene</td>
<td>ug/L</td>
<td>&lt;MRL</td>
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<td>Chloroethane</td>
<td>ug/L</td>
<td>&lt;MRL</td>
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<td>2-Chlorotoluene</td>
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<td>4-Chlorotoluene</td>
<td>ug/L</td>
<td>&lt;MRL</td>
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<tr>
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<td>Dibromochloromethane</td>
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<td>Dibromomethane</td>
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<tr>
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<td>1,2-Dichlorobenzene</td>
<td>ug/L</td>
<td>&lt;MRL</td>
<td>0.20</td>
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<tr>
<td></td>
<td>1,3-Dichlorobenzene</td>
<td>ug/L</td>
<td>&lt;MRL</td>
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<td>1,4-Dichlorobenzene</td>
<td>ug/L</td>
<td>&lt;MRL</td>
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<td>Dichlorodifluoromethane</td>
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<tr>
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<td>1,1-Dichloroethane</td>
<td>ug/L</td>
<td>&lt;MRL</td>
<td>0.20</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Reported By: Jorma K. Kuusisto
Chemistry Supervisor
Michael Baker, Jr., Inc.  
4601 Business Park Blvd., Ste. 42  
Anchorage, AK 99503

Attn: Jim McGinnis, P.E.  
Client ID: 93-12

Source: Alpine Camp Water System  
NTL Lab#: A154122

Sample Matrix: Water  
Sample Date: 2/1/98  
Sample Time:  
Report Date: 2/20/98  
Date Arrived: 2/5/98

<table>
<thead>
<tr>
<th>Method Parameter</th>
<th>Units</th>
<th>Result</th>
<th>MRL</th>
<th>Date Prepared</th>
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<tbody>
<tr>
<td>1,2-Dichloroethane</td>
<td>ug/L</td>
<td>&lt;MRL</td>
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<td>2/12/98</td>
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<tr>
<td>1,1-Dichloroethene</td>
<td>ug/L</td>
<td>&lt;MRL</td>
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<tr>
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Reported By: Jorma K. Kuusisto  
Chemistry Supervisor
Michael Baker, Jr., Inc.
4601 Business Park Blvd., Ste. 42
Anchorage, AK 99503

Attn: Jim McGinnis, P.E.
Client ID: 93-12
Client Project #: 
Source: Alpine Camp Water System
NTL Lab#: A154122
Sample Matrix: Water

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<th>Parameter</th>
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<th>Date Analyzed</th>
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Reported By: Jorma K. Kuusisto
Chemistry Supervisor
**DRINKING WATER ANALYSIS REPORT FOR TOTAL COLIFORM BACTERIA**

Michael Baker Jr., Inc.  
4601 Business Park Blvd.; Ste. 42  
Anchorage AK 99503  

<table>
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<tr>
<th>Phone Number:</th>
<th>Fax Number:</th>
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<tbody>
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</table>

Collected by:  
Sample Type: Private water Systems  
Method of Analysis: MMO-MUG (SM 9223 B)  

**Comments**  
S = Satisfactory  
U = Unsatisfactory  
POS = Positive Test Result  
ND = None Detected  
TNTC = Too Numerous To Count (>200 Colonies)  
CG = Confluent Growth  
HSM = Heavy Sediment Masking, Results May Not Be Reliable  
SA = Sample Age >30 Hours But <48 Hours, Results May Not Be Reliable  
OA = Sample Age >48 Hours, Too Old For Analysis  
R = Resample Required  
NT = No Test  

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<thead>
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<th><strong>Sample Date</strong></th>
<th><strong>Sample Time</strong></th>
<th><strong>Total</strong></th>
<th><strong>E. Coli</strong></th>
<th><strong>Other</strong></th>
<th><strong>HPC</strong></th>
<th><strong>Lab#</strong></th>
<th><strong>Location</strong></th>
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Marian Ruth  
Environmental Analyst  
2/4/98  
Northern Testing Laboratories, Inc  
Fairbanks, AK
Michael Baker, Jr. Inc.
4601 Business Park Blvd.; Ste 42
Anchorage AK 99503

Attn: Jim McGinnis, PE

Our Lab #: F176289
Location/Project: Alpine Camp Water System
Your Sample ID: 93-12
Sample Matrix: Water
Comments:

<table>
<thead>
<tr>
<th>Lab#</th>
<th>Method</th>
<th>Parameter</th>
<th>Units</th>
<th>Results</th>
<th>MRL</th>
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<th>Analyzed</th>
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Report Date: 04/28/98
Date Arrived: 02/04/98
Date Sampled: 02/01/98
Time Sampled: -
Collected By: -

MRL = Method Reporting Limit

* Flag Definitions
B = Below Regulatory Min.
H = Above Regulatory Max.

Digest Date
04/01/98

Reported by: Cindy L. Christian
Laboratory Director
Michael Baker, Jr. Inc.
4601 Business Park Blvd.; Ste 42
Anchorage AK 99503

Attn: Jim McGinnis, PE

Report Date: 03/26/98
Date Arrived: 03/16/98
Date Sampled: 03/13/98
Time Sampled: 1030
Collected By: DD

MRL = Method Reporting Limit

* Flag Definitions
B = Below Regulatory Min.
H = Above Regulatory Max.

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Reported by: Cindy L. Christian
Laboratory Director
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<th>Lab#</th>
<th>Method</th>
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Reported by: Cindy L. Christian
Laboratory Director
Michael Baker, Inc.  
4601 Business Park Blvd., Ste. 42  
Anchorage, AK 99503  
Attn: Jim McGinnis

Client ID: 93-12 (F176934)  
Client Project #:  
Source:  
NTL Lab#: A154552  
Sample Matrix: Water  
Comments:  

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Reported By: Jorma K. Kuusisto  
Chemistry Supervisor
**Legend**

- **MRL** = Method Report Level
- **MCL** = Max. Contaminant Level
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<thead>
<tr>
<th>Method</th>
<th>Parameter</th>
<th>Units</th>
<th>Result</th>
<th>MRL</th>
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Reported By: Jorma K. Kuusisto
Chemistry Supervisor
**Legend**

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<th>Units</th>
<th>Result</th>
<th>MRL</th>
<th>Date Prepared</th>
<th>Date Analyzed</th>
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Reported By: Jorma K. Kuusisto
Chemistry Supervisor
Report Date: 15 March 98

Report No.: 98030021

Report of Analysis

Bonnie Buteyn
Northern Testing Laboratories
3330 Industrial Avenue
Fairbanks, AK 99701
(907)456-3116

<table>
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<th>Field ID Number</th>
<th>Sample Description</th>
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<th>Date/Time Received</th>
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Approved by: [Signature]

Don Ochook / Jerry Pollen
Chemist / Lab Tech
Michael Baker, Jr. Inc.
4601 Business Park Blvd.; Ste 42
Anchorage AK 99503

Attn: Jim McGinnis, PE

Report Date: 04/28/98
Date Arrived: 03/16/98
Date Sampled: 03/13/98
Time Sampled: 1030
Collected By: DD

MRL = Method Reporting Limit

* Flag Definitions
B = Below Regulatory Min.
H = Above Regulatory Max.

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<th>Method</th>
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Reported By: Cindy L. Christian
Laboratory Director
Michael Baker, Jr. Inc.
4601 Business Park Blvd.; Ste 42
Anchorage AK 99503

Attn: Jim McGinnis, PE

Our Lab #: F177161
Location/Project: Alpine Camp Water System
Your Sample ID: 93-12
Sample Matrix: Water
Comments:

<table>
<thead>
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<th>Method</th>
<th>Parameter</th>
<th>Units</th>
<th>Results *</th>
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Report Date: 04/13/98
Date Arrived: 03/30/98
Date Sampled: 03/27/98
Time Sampled: 1030
Collected By: LL

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Reported By: Cindy L. Christian
Laboratory Director
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Reported by: Cindy L. Christian
Laboratory Director
**Report Date:** 4/8/98  
**Date Arrived:** 3/31/98  
**Sample Date:** 3/27/98  
**Sample Time:** 10:30  
**Collected By:** L.L.

**Client ID:** 93-12 (F177161)  
**Client Project #:**  
**Source:**  
**NTL Lab#:** A154707  
**Sample Matrix:** Water  
**Comments:** MBAS received/analyzed beyond recommended holding time

<table>
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<tr>
<th>Method</th>
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<th>Result</th>
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<th>Date Analyzed</th>
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</table>

**Legend**

- **MRL** = Method Report Level  
- **MCL** = Max. Contaminant Level  
- **B** = Present in Method Blank  
- **E** = Estimated Value  
- **M** = Matrix Interference  
- **H** = Above MCL  
- **D** = Lost To Dilution

**Supervisor:**  
**Chemistry Supervisor:**
Michael Baker, Inc.
4601 Business Park Blvd., Ste. 42
Anchorage, AK 99503

Attn: Jim McGinnis
Client ID: 93-12 (F177161)
Client Project #: 
Source: 
NTL Lab#: A154707
Sample Matrix: Water
Comments: MBAS received/analyzed beyond recommended holding time

<table>
<thead>
<tr>
<th>Method</th>
<th>Parameter</th>
<th>Units</th>
<th>Result</th>
<th>MRL</th>
<th>Date Prepared</th>
<th>Date Analyzed</th>
</tr>
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<tbody>
<tr>
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<td>0.20</td>
<td>4/1/98</td>
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<tr>
<td>1,1-Dichloroethene</td>
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Reported By: Jorma K. Kuusisto
Chemistry Supervisor
Client ID: 93-12 (F177161)
Client Project #: 
Source: 
NTL Lab#: A154707
Sample Matrix: Water
Comments: MBAS received/analyzed beyond recommended holding time

<table>
<thead>
<tr>
<th>Method Parameter</th>
<th>Units</th>
<th>Result</th>
<th>MRL</th>
<th>Date Prepared</th>
<th>Date Analyzed</th>
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<td>4/1/98</td>
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Report Date: 4/8/98
Date Arrived: 3/31/98
Sample Date: 3/27/98
Sample Time: 10:30
Collected By: L.L.

**Legend**
MRL = Method Report Level
MCL = Max. Contaminant Level
B = Present in Method Blank
E = Estimated Value
M = Matrix Interference
H = Above MCL
D = Lost To Dilution

Reported By: Jorma K. Kuusisto
Chemistry Supervisor
**Drinking Water Analysis Report for Total Coliform Bacteria**

**Sample Data**

<table>
<thead>
<tr>
<th>Sample Date</th>
<th>Sample Time</th>
<th>Total Coliform</th>
<th>E. Coli</th>
<th>Other Bacteria</th>
<th>HPC Result</th>
<th>Lab#</th>
<th>Location</th>
<th>Comments</th>
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<td>92-82</td>
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**Comments**

- S = Satisfactory
- U = Unsatisfactory
- POS = Positive Test Result
- ND = None Detected
- TNTC = Too Numerous To Count (>200 Colonies)
- CG = Confluent Growth
- HSM = Heavy Sediment Masking, Results May Not Be Reliable
- SA = Sample Age >30 Hours But <48 Hours, Results May Not Be Reliable
- OL = Sample Age >48 Hours, Too Old For Analysis
- R = Resample Required
- NT = No Test

---

Cindy L. Christen, Laboratory Director

Northern Testing Laboratories, Inc. Fairbanks, AK
Michael Baker, Jr. Inc.  
4601 Business Park Blvd.; Ste 42  
Anchorage AK 99503  

Attn: Jim McGinnis, PE

Our Lab #: F177154  
Location/Project: Alpine Camp Water System  
Your Sample ID: 93-12  
Sample Matrix: Water  
Comments:

<table>
<thead>
<tr>
<th>Lab#</th>
<th>Method Parameter</th>
<th>Units</th>
<th>Results *</th>
<th>Digest Date</th>
</tr>
</thead>
<tbody>
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<td>F177154</td>
<td>EPA 900.0 Gross Alpha</td>
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Report Date: 06/10/98  
Date Arrived: 03/30/98  
Date Sampled: 03/27/98  
Time Sampled: 1030  
Collected By: LL  

MRL = Method Reporting Limit  
* Flag Definitions  
B = Below Regulatory Min.  
H = Above Regulatory Max.  

Reported by: Cindy L. Christian  
Laboratory Director
Michael Baker, Jr. Inc.
4601 Business Park Blvd.; Ste 42
Anchorage AK 99503

Attn: Jim McGinnis, PE

Our Lab #: F177423
Location/Project: Alpine Camp Water System
Your Sample ID: 93-12
Sample Matrix: Water
Comments:

<table>
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<tr>
<th>Lab#</th>
<th>Method</th>
<th>Parameter</th>
<th>Units</th>
<th>Results *</th>
<th>Digest Date</th>
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<td></td>
<td>EPA 300.0</td>
<td>Chloride</td>
<td>mg/L</td>
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Reported By: Cindy L. Christian
Laboratory Director
<table>
<thead>
<tr>
<th>Lab#</th>
<th>Method</th>
<th>Parameter</th>
<th>Units</th>
<th>Results *</th>
<th>MRL</th>
<th>Prepared</th>
<th>Analyzed</th>
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<td>SM4500-CN</td>
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<td>&lt;MRL</td>
<td>0.02</td>
<td>04/16/98</td>
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</tr>
</tbody>
</table>

Reported by: Cindy L. Christian  
Laboratory Director
Michael Baker, Inc.
4601 Business Park Blvd., Ste. 42
Anchorage, AK 99503

Attn: Jim McGinnis
Client ID: 93-12 (F177423)
Client Project #: AK 2065
Source: AK 2065
NTL Lab#: A154906
Sample Matrix: Water
Comments: MBAS exceeded 48 hour holding time, VOC vials contained head space.

Report Date: 4/28/98
Date Arrived: 4/16/98
Sample Date: 4/12/98
Sample Time: 14:00
Collected By: ** Legend **
MRL = Method Report Level
MCL = Max. Contaminant Level
B = Present In Method Blank
E = Estimated Value
M = Matrix Interference
H = Above MCL
D = Lost To Dilution

<table>
<thead>
<tr>
<th>Method</th>
<th>Parameter</th>
<th>Units</th>
<th>Result</th>
<th>MRL</th>
<th>Date Prepared</th>
<th>Date Analyzed</th>
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</thead>
<tbody>
<tr>
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<td>&lt;MRL</td>
<td>0.20</td>
<td>4/17/98</td>
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<tr>
<td></td>
<td>Bromobenzene</td>
<td>ug/L</td>
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<tr>
<td></td>
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<tr>
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<td>Bromoform</td>
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<td>0.50</td>
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<td>Bromomethane</td>
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<td>1.00</td>
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<td>n-Butylbenzene</td>
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<td>Chloromethane</td>
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<tr>
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<td>ug/L</td>
<td>&lt;MRL</td>
<td>0.20</td>
<td></td>
<td></td>
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</table>

Reported By: Jorma K. Kuusisto
Chemistry Supervisor
Report Date: 4/28/98  
Date Arrived: 4/16/98  
Sample Date: 4/12/98  
Sample Time: 14:00  
Collected By: **legend**  
MRL = Method Report Level  
MCL = Max. Contaminant Level  
B = Present In Method Blank  
E = Estimated Value  
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<table>
<thead>
<tr>
<th>Method</th>
<th>Parameter</th>
<th>Units</th>
<th>Result</th>
<th>MRL</th>
<th>Date Prepared</th>
<th>Date Analyzed</th>
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<td>&lt;MRL</td>
<td>0.20</td>
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<td>4/17/98</td>
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<tr>
<td>1,1-Dichloroethene</td>
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<td></td>
<td>&lt;MRL</td>
<td>0.20</td>
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<td>&lt;MRL</td>
<td>0.20</td>
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<td>1,1-Dichloropropene</td>
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<td>1,1,2,2-Tetrachloroethane</td>
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<tr>
<td>Tetrachloroethene</td>
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<tr>
<td>1,2,4-Trichlorobenzene</td>
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</table>

Reported By: Jorma K. Kuusisto  
Chemistry Supervisor
Dear Jim McGinnis,

I am writing to report the results of the sample taken from Anchorage, AK 99503 on April 12, 1998. The sample was collected and analyzed by NORTHERN TESTING LABORATORIES, INC. The sample was a water sample and the MBAS exceeded the 48 hour holding time, and the VOC vials contained head space.

The sample was collected on April 16, 1998, and the sample time was 14:00. The sample was analyzed by Michael Baker, Inc., on April 28, 1998.

The sample was analyzed for various compounds, including volatile organic compounds (VOCs). The results are summarized in the table below:

<table>
<thead>
<tr>
<th>Method</th>
<th>Parameter</th>
<th>Units</th>
<th>Result</th>
<th>MRL</th>
<th>Date Prepared</th>
<th>Date Analyzed</th>
</tr>
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<tbody>
<tr>
<td>1,1,1-Trichloroethane</td>
<td>ugm/L</td>
<td>&lt;MRL</td>
<td>0.20</td>
<td>4/17/98</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1,1,2-Trichloroethane</td>
<td>ugm/L</td>
<td>&lt;MRL</td>
<td>0.20</td>
<td>4/17/98</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trichloroethene</td>
<td>ugm/L</td>
<td>&lt;MRL</td>
<td>0.20</td>
<td>4/17/98</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trichlorofluoromethane</td>
<td>ugm/L</td>
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<td>4/17/98</td>
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<tr>
<td>1,2,3-Trichloropropene</td>
<td>ugm/L</td>
<td>&lt;MRL</td>
<td>0.20</td>
<td>4/17/98</td>
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<tr>
<td>1,2,4-Trimethylbenzene</td>
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<td>0.95</td>
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<td>4/17/98</td>
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</tbody>
</table>

I hope this information is helpful. If you have any questions, please do not hesitate to contact me.

Sincerely,

[Signature]

Chemistry Supervisor
Michael Baker, Jr. Inc.
4601 Business Park Blvd.; Ste 42
Anchorage AK 99503

Attn: Jim McGinnis, PE

Our Lab #: F177430
Location/Project: Alpine Camp Water System
Your Sample ID: 93-12
Sample Matrix: Water
Comments:

<table>
<thead>
<tr>
<th>Lab#</th>
<th>Method</th>
<th>Parameter</th>
<th>Units</th>
<th>Results*</th>
<th>MRL</th>
<th>Prepared</th>
<th>Analyzed</th>
<th>Digest Date</th>
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<tbody>
<tr>
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<td>EPA 900.0</td>
<td>Gross Alpha</td>
<td>pCi/L</td>
<td>ND@l+/-0.32</td>
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<td>05/22/98</td>
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</tbody>
</table>
**Michael Baker, Jr. Inc.**  
4601 Business Park Blvd.; Ste 42  
Anchorage AK 99503

Attn: Jim McGinnis, PE

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<thead>
<tr>
<th>Lab#</th>
<th>Method</th>
<th>Parameter</th>
<th>Units</th>
<th>Results *</th>
<th>Digest Date</th>
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<th>Analyzed</th>
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Report Date: 05/15/98  
Date Arrived: 04/29/98  
Date Sampled: 04/26/98  
Time Sampled: 1410  
Collected By: WP

MRL = Method Reporting Limit

* Flag Definitions  
B = Below Regulatory Min.  
H = Above Regulatory Max.

Reported by: Cindy L. Christian  
Laboratory Director
<table>
<thead>
<tr>
<th>Lab#</th>
<th>Method</th>
<th>Parameter</th>
<th>Units</th>
<th>Results</th>
<th>MRL</th>
<th>Prepared</th>
<th>Date</th>
<th>Analyzed</th>
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</table>

Reported by: Cindy L. Christian
Laboratory Director
Michael Baker, Inc.
4601 Business Park Blvd., Ste. 42
Anchorage, AK 99503

Attn: Jim McGinnis

Client ID: 93-12
Client Project #: 
Source: NTL Lab#
Sample Matrix: Water
Comments: F177659 Sample received/analyzed beyond MBAS holding time

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<thead>
<tr>
<th>Method Parameter</th>
<th>Units</th>
<th>Result</th>
<th>MRL</th>
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<th>Date Analyzed</th>
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<td>ug/L</td>
<td>&lt;MRL</td>
<td>0.20</td>
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Reported By: Jorma K. Kuusisto
Chemistry Supervisor
Michael Baker, Inc.  
4601 Business Park Blvd., Ste. 42  
Anchorage, AK 99503  

Attn: Jim McGinnis  
Client ID: 93-12  
Client Project #:  
Source:  
NTL Lab#: A155017  
Sample Matrix: Water  
Comments: F177659 Sample received/analyzed beyond MBAS holding time  

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<th>Result</th>
<th>MRL</th>
<th>Date Prepared</th>
<th>Date Analyzed</th>
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<td>5/1/98</td>
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<tr>
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<td>0.20</td>
<td>5/1/98</td>
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<td>5/1/98</td>
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<tr>
<td>1,1,2,2-Tetrachloroethane</td>
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<td>5/1/98</td>
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<td>5/1/98</td>
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<tr>
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<tr>
<td>1,2,3-Trichlorobenzene</td>
<td>ug/L</td>
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<td>0.20</td>
<td>5/1/98</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1,2,4-Trichlorobenzene</td>
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<td>0.20</td>
<td>5/1/98</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Reported By: Jorma K. Kuusisto  
Chemistry Supervisor
Michael Baker, Inc.
4601 Business Park Blvd., Ste. 42
Anchorage, AK 99503

Attn: Jim McGinnis
Client ID: 93-12
Client Project #: 
Source: 
NTL Lab#: A155017
Sample Matrix: Water
Comments: F177659 Sample received/analyzed beyond MBAS holding time

<table>
<thead>
<tr>
<th>Method</th>
<th>Parameter</th>
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<th>MRL</th>
<th>Date Prepared</th>
<th>Date Analyzed</th>
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<tbody>
<tr>
<td>1,1,1-Trichloroethane</td>
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<td>0.20</td>
<td>5/1/98</td>
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<tr>
<td>1,1,2-Trichloroethane</td>
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<tr>
<td>1,2,4-Trimethylbenzene</td>
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<td>% Recovery</td>
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Report Date: 5/6/98
Date Arrived: 4/30/98
Sample Date: 4/26/98
Sample Time: 14:10
Collected By: WP

** Legend **
MRL = Method Report Level
MCL = Max. Contaminant Level
B = Present in Method Blank
E = Estimated Value
M = Matrix Interference
H = Above MCL
D = Lost To Dilution

Reported By: Jorma K. Kuusisto
Chemistry Supervisor
DRINKING WATER ANALYSIS REPORT FOR TOTAL COLIFORM BACTERIA

Michael Baker Jr., Inc.  
4601 Business Park Blvd.; Ste. 42  
Anchorage AK 99503

Date Received: 4/27/98  Time Received: 17:30
Date Analyzed: 4/28/98  Time Analyzed: 18:00
Date Reported: 5/1/98  Time Reported: 11:14
Next Sample Due: 

Comments
S = Satisfactory
U = Unsatisfactory
POS = Positive Test Result
ND = None Detected
TNTC = Too Numerous To Count (>200 Colonies)
CG = Confluent Growth
HSM = Heavy Sediment Masking, Results May Not Be Reliable
SA = Sample Age >30 Hours But <48 Hours, Results May Not Be Reliable
Old = Sample Age >48 Hours, Too Old For Analysis
R = Resample Required
NT = No Test

Phone Number: 
Fax Number: 
Collected by: WP
Sample Type Special Purpose
Method of Analysis: MMO-MUG (SM 9223 B)

<table>
<thead>
<tr>
<th>Sample Date</th>
<th>Sample Time</th>
<th>Total*</th>
<th>E. Coli</th>
<th>Other* Bacteria</th>
<th>HPC** Result</th>
<th>Lab#</th>
<th>Location</th>
<th>Comments</th>
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<td>13:40</td>
<td>ND</td>
<td>ND</td>
<td>NT</td>
<td>NT</td>
<td>AK2189</td>
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Comments: 

Marlen Ruth  Environmental Analyst  5/1/98

Northern Testing Laboratories, Inc  Fairbanks, AK
Michael Baker, Jr. Inc.  
4601 Business Park Blvd.; Ste 42  
Anchorage AK 99503

Attn: Jim McGinnis, PE

Our Lab #: F177666  
Location/Project: Alpine Camp Water System  
Your Sample ID: 93-12  
Sample Matrix: Water  
Comments:

<table>
<thead>
<tr>
<th>Lab#</th>
<th>Method</th>
<th>Parameter</th>
<th>Units</th>
<th>Results *</th>
<th>MRL Prepared Analyzed</th>
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<tr>
<td>F177666</td>
<td>EPA 900.0</td>
<td>Gross Alpha</td>
<td>pCi/L</td>
<td>ND@1+/-0.33</td>
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Report Date: 06/10/98  
Date Arrived: 04/29/98  
Date Sampled: 04/26/98  
Time Sampled: 1410  
Collected By: WP  
MRL = Method Reporting Limit  
* Flag Definitions  
B = Below Regulatory Min.  
H = Above Regulatory Max.

Reported By: Cindy L. Christian  
Laboratory Director
Report Date: 05/29/98
Date Arrived: 05/14/98
Date Sampled: 05/11/98
Time Sampled: 1520
Collected By: -

MRL = Method Reporting Limit
* Flag Definitions
B = Below Regulatory Min.
H = Above Regulatory Max.

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<thead>
<tr>
<th>Lab#</th>
<th>Method</th>
<th>Parameter</th>
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<th>Results *</th>
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<td>Beryllium</td>
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<td>Calcium</td>
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Reported By: Cindy L. Christian
Laboratory Director
<table>
<thead>
<tr>
<th>Lab#</th>
<th>Method</th>
<th>Parameter</th>
<th>Units</th>
<th>Results *</th>
<th>MRL</th>
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Reported By: Cindy L. Christian
Laboratory Director
Report Date: 5/29/98
Date Arrived: 5/15/98
Sample Date: 5/11/98
Sample Time: 15:20
Collected By:

** Legend **
MRL = Method Report Level
MCL = Max. Contaminant Level
B = Present In Method Blank
E = Estimated Value
M = Matrix Interference
H = Above MCL
D = Lost To Dilution

<table>
<thead>
<tr>
<th>Method</th>
<th>Parameter</th>
<th>Units</th>
<th>Result</th>
<th>MRL</th>
<th>Date Prepared</th>
<th>Date Analyzed</th>
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<td>2-Chlorotoluene</td>
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Reported By: Jorma K. Kuusisto
Chemistry Supervisor
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<th>Result</th>
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Reported By: Jorma K. Kuusisto
Chemistry Supervisor
Michael Baker, Inc.  
4601 Business Park Blvd., Ste. 42  
Anchorage, AK 99503  

Attn: Jim McGinnis  
Client ID: 93-12 (F178039)  
Client Project #: 2271  
Source:  
NTL Lab#: A155281  
Sample Matrix: Water  
Comments:  

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<tr>
<th>Method</th>
<th>Parameter</th>
<th>Units</th>
<th>Result</th>
<th>MRL</th>
<th>Date Prepared</th>
<th>Date Analyzed</th>
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<tbody>
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Report Date: 14 May 98  
Report No.: 98050015

Report of Analysis

Northern Testing Laboratories  
3330 Industrial Avenue  
Fairbanks, AK 99701  
(907) 456-3116

<table>
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<tr>
<th>Field ID Number</th>
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<td>Sample Description</td>
<td>Lake Sampling</td>
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<tr>
<td>Date/Time Sampled</td>
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<tr>
<td>Date/Time Received</td>
<td>05/12/98 @14:56 by JEP</td>
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<table>
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<th>Method</th>
<th>Preparation Date</th>
<th>Analysis Date</th>
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<td>SM 9223B</td>
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</table>

Approved by:  
Don Cook / Jerry Pollen  
Chemist / Lab Tech
Michael Baker, Jr. Inc.  
4601 Business Park Blvd.; Ste 42  
Anchorage AK 99503

Attn: Jim McGinnis, PE

Our Lab #: F178046  
Location/Project: Alpine Camp Water System  
Your Sample ID: 93-12  
Sample Matrix: Water  
Comments: 

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<th>MRL</th>
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Report Date: 07/22/98  
Date Arrived: 05/14/98  
Date Sampled: 05/11/98  
Time Sampled: 1520  
Collected By: -  

MRL = Method Reporting Limit  

* Flag Definitions  
B = Below Regulatory Min.  
H = Above Regulatory Max.

Cindy L. Christian  
Laboratory Director
Michael Baker, Jr. Inc.  
4601 Business Park Blvd.; Ste 42  
Anchorage AK 99503  

Attn: Jim McGinnis, PE  

Our Lab #: F178234  
Location/Project: Alpine Camp Water System  
Your Sample ID: L93-12  
Sample Matrix: Water  
Comments:

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Report Date: 07/22/98  
Date Arrived: 05/28/98  
Date Sampled: 05/26/98  
Time Sampled: 1540  
Collected By: -  

MRL = Method Reporting Limit  
* Flag Definitions  
B = Below Regulatory Min.  
H = Above Regulatory Max.  

Reported By: Cindy L. Christian  
Laboratory Director
Michael Baker, Jr. Inc.
4601 Business Park Blvd.; Ste 42
Anchorage AK 99503

Attn: Jim McGinnis, PE

Our Lab #: F178542
Location/Project: Alpine Camp Water System
Your Sample ID: 93-12
Sample Matrix: Water
Comments: 

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Report Date: 07/22/98
Date arrived: 06/11/98
Date Sampled: 06/09/98
Time Sampled: 0910
Collected By: DAD/KHE

MRL = Method Reporting Limit

* Flag Definitions
B = Below Regulatory Min.
H = Above Regulatory Max.

Reported by: Cindy L. Christian
Laboratory Director
1998 Lake 93-13 Data
Michael Baker, Jr. Inc.
4601 Business Park Blvd.; Ste 42
Anchorage AK 99503

Attn: Jim McGinnis, PE

Our Lab #: F176284
Location/Project: Alpine Camp Water System
Your Sample ID: 93-13
Sample Matrix: Water
Comments:

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Reported by: Cindy L. Christian
Laboratory Director
<table>
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<tr>
<th>Lab#</th>
<th>Method</th>
<th>Parameter</th>
<th>Units</th>
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Reported by: Cindy L. Christian
Laboratory Director
Michael Baker, Jr., Inc.  
4601 Business Park Blvd., Ste. 42  
Anchorage, AK 99503  

Attn: Jim McGinnis, P.E.  
Client ID: 93-13  
Client Proj ect #:  
Source: Alpine Camp Water System  
NTL Lab#: A154121  
Sample Matrix: Water  
Comments:  

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Reported By: Jorma K. Kuusisto  
Chemistry Supervisor
**Legend**

- **MRL** = Method Report Level
- **MCL** = Max. Contaminant Level
- **B** = Present In Method Blank
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Reported By: Jorma K. Kunsisto
Chemistry Supervisor
**Legend**

- MRL = Method Report Level
- MCL = Max. Contaminant Level
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<table>
<thead>
<tr>
<th>Method</th>
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<th>Result</th>
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Reported By: Jorma K. Knusisto
Chemistry Supervisor
Michael Baker, Jr., Inc.
4601 Business Park Blvd., Ste. 42
Anchorage, AK 99503

Attn: Jim McGinnis, P.E.

Client ID: Travel Blank
Client Project #: 
Source: Alpine Camp Water System
NTL Lab#: A154125
Sample Matrix: Water

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</table>

Reported By: Jorma K. Kuusisto
Chemistry Supervisor
Michael Baker, Jr., Inc.
4601 Business Park Blvd., Ste. 42
Anchorage, AK 99503

Attn: Jim McGinnis, P.E.
Client ID: Travel Blank
Client Project #: 
Source: Alpine Camp Water System
NTL Lab#: A154125
Sample Matrix: Water
Comments:

<table>
<thead>
<tr>
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<th>Parameter</th>
<th>Units</th>
<th>Result</th>
<th>MRL</th>
<th>Date Prepared</th>
<th>Date Analyzed</th>
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Reported By: Jorma K. Kunsisto
Chemistry Supervisor
Michael Baker, Jr., Inc.  
4601 Business Park Blvd., Ste. 42  
Anchorage, AK 99503  

Attn: Jim McGinnis, P.E.  
Client ID: Travel Blank  
Client Project #:  
Source: Alpine Camp Water System  
NTL Lab#: A154125  
Sample Matrix: Water  
Comments:  

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<th>Result</th>
<th>MRL</th>
<th>Date Prepared</th>
<th>Date Analyzed</th>
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Report Date: 2/20/98  
Date Arrived: 2/5/98  
Sample Date: 2/1/98  
Sample Time:  

**Legend**  
MRL = Method Report Level  
MCL = Max. Contaminant Level  
B = Present In Method Blank  
E = Estimated Value  
M = Matrix Interference  
H = Above MCL  
D = Lost To Dilution  

Reported By: Jorma K. Kuusisto  
Chemistry Supervisor
DRINKING WATER ANALYSIS REPORT FOR TOTAL COLIFORM BACTERIA

Michael Baker Jr., Inc.  
4601 Business Park Blvd.; Ste. 42  
Anchorage AK 99503

Date Received: 2/2/98  Time Received: 15:10
Date Analyzed: 2/2/98  Time Analyzed:
Date Reported: 2/4/98  Time Reported: 10:11

Next Sample Due: 

Comments
S = Satisfactory
U = Unsatisfactory
POS = Positive Test Result
ND = None Detected
TNTC = Too Numerous To Count (>200 Colonies)
CG = Confluent Growth
HSM = Heavy Sediment Masking, Results May Not Be Reliable
SA = Sample Age >30 Hours But <48 Hours, Results May Not Be Reliable
Old = Sample Age >48 Hours, Too Old For Analysis
R = Resample Required
NT = No Test
*# Colonies/100 ml  **# Colonies/ml

<table>
<thead>
<tr>
<th>Sample Date</th>
<th>Sample Time</th>
<th>Total* Coliform</th>
<th>E. Coli</th>
<th>Other* Bacteria</th>
<th>HPC** Result</th>
<th>Lab#</th>
<th>Location</th>
<th>Comments</th>
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<td>ND</td>
<td>ND</td>
<td>NT</td>
<td>NT</td>
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Marlan Ruth  
Environmental Analyst  2/4/98
Northern Testing Laboratories, Inc  Fairbanks, AK
Michael Baker, Jr. Inc.  
4601 Business Park Blvd.; Ste 42  
Anchorage AK 99503  

Attn: Jim McGinnis, PE  

Our Lab #: F176288  
Location/Project: Alpine Camp Water System  
Your Sample ID: 93-13  
Sample Matrix: Water  
Comments:  

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<th>Lab#</th>
<th>Method</th>
<th>Parameter</th>
<th>Units</th>
<th>Results *</th>
<th>MRL</th>
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<th>Analyzed</th>
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Report Date: 04/28/98  
Date Arrived: 02/04/98  
Date Sampled: 02/01/98  
Time Sampled:  
Collected By:  

MRL = Method Reporting Limit  
* Flag Definitions  
B = Below Regulatory Min.  
H = Above Regulatory Max.

Reported By: Cindy L. Christian  
Laboratory Director
Michael Baker, Jr. Inc.
4601 Business Park Blvd.; Ste 42
Anchorage AK 99503

Attn: Jim McGinnis, PE

Our Lab #: F176936
Location/Project: Alpine Camp Water System
Your Sample ID: 93-13
Sample Matrix: Water
Comments:

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Reported by: Cindy L. Christian
Laboratory Director
<table>
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<th>Lab#</th>
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<th>Parameter</th>
<th>Units</th>
<th>Results</th>
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Reported by: Cindy L. Christian
Laboratory Director
Michael Baker, Inc.
4601 Business Park Blvd., Ste. 42
Anchorage, AK 99503
Attn: Jim McGinnis
Client ID: 93-13 (F176936)
Client Project #: 
Source:
NTL Lab#: A154554
Sample Matrix: Water
Comments:

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<tr>
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<th>Units</th>
<th>Result</th>
<th>MRL</th>
<th>Date Prepared</th>
<th>Date Analyzed</th>
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<td>ug/L</td>
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Reported By: Jorma K. Kuusisto
Chemistry Supervisor
**Method** | **Parameter** | **Units** | **Result** | **MRL** | **Date Prepared** | **Date Analyzed**
--- | --- | --- | --- | --- | --- | ---
1,2-Dichloroethane | ug/L | <MRL | 0.20 | 3/18/98
1,1-Dichloroethene | ug/L | <MRL | 0.20
Cis-1,2-Dichloroethene | ug/L | <MRL | 0.20
Trans-1,2-Dichloroethene | ug/L | <MRL | 0.20
1,2-Dichloropropane | ug/L | <MRL | 0.20
1,3-Dichloropropane | ug/L | <MRL | 0.20
2,2-Dichloropropane | ug/L | <MRL | 0.20
1,1-Dichloropropene | ug/L | <MRL | 0.20
Cis-1,3-Dichloropropene | ug/L | <MRL | 0.20
Trans-1,3-Dichloropropene | ug/L | <MRL | 0.20
Ethylbenzene | ug/L | 1.05 | 0.20
Hexachlorobutadiene | ug/L | <MRL | 0.20
Isopropylbenzene | ug/L | 0.22 | 0.20
p-Isopropyltoluene | ug/L | <MRL | 0.20
Methylene Chloride | ug/L | <MRL | 0.50
Naphthalene | ug/L | <MRL | 0.20
n-Propylbenzene | ug/L | 0.34 | 0.20
Styrene | ug/L | <MRL | 0.20
1,1,1,2-Tetrachloroethane | ug/L | <MRL | 0.20
1,1,2,2-Tetrachloroethane | ug/L | <MRL | 0.20
Tetrachloroethene | ug/L | <MRL | 0.20
Toluene | ug/L | 6.00 | 0.20
1,2,3-Trichlorobenzene | ug/L | <MRL | 0.20
1,2,4-Trichlorobenzene | ug/L | <MRL | 0.20
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<tr>
<th>Method</th>
<th>Parameter</th>
<th>Units</th>
<th>Result</th>
<th>MRL</th>
<th>Date Prepared</th>
<th>Date Analyzed</th>
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</table>

Reported By: Jorma K. Kuusisto
Chemistry Supervisor
**NORTHERN TESTING LABORATORIES, INC.**

3330 INDUSTRIAL AVENUE
FAIRBANKS, ALASKA 99701
(907) 456-3116 • FAX 456-3125

8005 SCHOON STREET
ANCHORAGE, ALASKA 99518
(907) 349-1000 • FAX 349-1016

---

Michael Baker, Inc.
4601 Business Park Blvd., Ste. 42
Anchorage, AK 99503

Attn: Jim McGinnis
Client ID: Travel Blank
Client Project #: 
Source: 
NTL Lab#: A154555
Sample Matrix: Water
Comments:

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</tbody>
</table>

Reported By: Jorma K. Kuusisto
Chemistry Supervisor

---

**Legend**
- MRL = Method Report Level
- MCL = Max. Contaminant Level
- B = Present in Method Blank
- E = Estimated Value
- M = Matrix Interference
- H = Above MCL
- D = Lost To Dilution
<table>
<thead>
<tr>
<th>Method</th>
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<th>MRL</th>
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Reported By: Jorma K. Kuusisto
Chemistry Supervisor
Michael Baker, Inc.  
4601 Business Park Blvd., Ste. 42  
Anchorage, AK 99503  
Attn: Jim McGinnis  
Client ID: Travel Blank  
Client Project #:  
Source:  
NTL Lab#: A154555  
Sample Matrix: Water  
Comments:  

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<tr>
<th>Method Parameter</th>
<th>Units</th>
<th>Result</th>
<th>MRL</th>
<th>Date Prepared</th>
<th>Date Analyzed</th>
</tr>
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<tbody>
<tr>
<td>1,1,1-Trichloroethane</td>
<td>ug/L</td>
<td>&lt;MRL</td>
<td>0.20</td>
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<tr>
<td>1,1,2-Trichloroethane</td>
<td>ug/L</td>
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<tr>
<td>Trichloroethene</td>
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<td>o-Xylene</td>
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<td>BFV (Surr)</td>
<td>% Recovery</td>
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<td>1,2-DCB-d4 (Surr)</td>
<td>% Recovery</td>
<td>82</td>
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Reported By: Jorma K. Kuusisto  
Chemistry Supervisor
Report Date: 15 March 98

Report No.: 98030021

Bonnie Buteyn
Northern Testing Laboratories
3330 Industrial Avenue
Fairbanks, AK 99701
(907)456-3116

Field ID Number: 93-13
Sample Description: AK1976
Date/Time Sampled: 03/13/98 @11:30 by DD
Date/Time Received: 03/14/98 @08:29 by JEP
NTL Lab Number: NTO3021

<table>
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<tr>
<th>Analyte</th>
<th>Result</th>
<th>Units</th>
<th>MDL</th>
<th>Method</th>
<th>Preparation Date</th>
<th>Analysis Date</th>
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<tr>
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<td>SM 9221D</td>
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</table>

Approved by: Jon Cook / Jerry Pollen
Chemist / Lab Tech
Michael Baker, Jr. Inc.
4601 Business Park Blvd.; Ste 42
Anchorage AK 99503

Attn: Jim McGinnis, PE

Our Lab #: F176943
Location/Project: Alpine Camp Water System
Your Sample ID: 93-13
Sample Matrix: Water
Comments:

<table>
<thead>
<tr>
<th>Lab#</th>
<th>Method</th>
<th>Parameter</th>
<th>Units</th>
<th>Results *</th>
<th>MRL</th>
<th>Prepared</th>
<th>Analyzed</th>
<th>Digest Date</th>
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<tbody>
<tr>
<td>F176943</td>
<td>EPA 900.0 Gross Alpha</td>
<td>pCi/L ND@l+/-0.34</td>
<td>04/08/98</td>
<td></td>
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</tr>
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</table>

Reported by: Cindy L. Christian
Laboratory Director
**NORTHERN TESTING LABORATORIES, INC.**

3330 INDUSTRIAL AVENUE
8005 SCHOOL STREET
POUCH 340043
FAIRBANKS, ALASKA 99701
(907) 456-3116, FAX 456-3125
ANCHORAGE, ALASKA 99518
Prudhoe Bay, Alaska 99734
(907) 349-1000, FAX 349-1016

Michael Baker, Jr. Inc.
4601 Business Park Blvd.; Ste 42
Anchorage AK 99503

Attn: Jim McGinnis, PE

Report Date: 04/13/98
Date Arrived: 03/30/98
Date Sampled: 03/27/98
Time Sampled: 1315
Collected By: LL

**MRL = Method Reporting Limit**

Our Lab #: F177159
Location/Project: Alpine Camp Water System
Your Sample ID: 93-13
Sample Matrix: Water
Comments:

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<th>Method Parameter</th>
<th>Units</th>
<th>Results *</th>
<th>Digest Date</th>
<th>MRL Prepared Analyzed</th>
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<td>F177159</td>
<td>EPA 150.1 pH</td>
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<td>EPA 180.1 Turbidity</td>
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<td>1.4</td>
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<td></td>
<td>EPA 200.7 Aluminum</td>
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<td>Barium</td>
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<td>0.196</td>
<td>04/03/98</td>
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Reported By: Cindy L. Christian
Laboratory Director
<table>
<thead>
<tr>
<th>Lab#</th>
<th>Method</th>
<th>Parameter</th>
<th>Units</th>
<th>Results *</th>
<th>MRL</th>
<th>Prepared</th>
<th>Date Analyzed</th>
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<td></td>
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<td>Odor TON</td>
<td>TON</td>
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<td>Alkalinity as CaCO3 mg/L</td>
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</tbody>
</table>

Reported by: Cindy L. Christian
Laboratory Director
Michael Baker, Inc.
4601 Business Park Blvd., Ste. 42
Anchorage, AK 99503

Attn: Jim McGinnis

Client ID: 93-13 (F177159)
Client Project #: 
Source: 
NTL Lab#: A154705
Sample Matrix: Water
Comments: MBAS received/analyzed beyond recommended holding time

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<th>MRL</th>
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<tr>
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<tr>
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<tr>
<td></td>
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<td></td>
<td>1,1-Dichloroethane</td>
<td>ug/L</td>
<td>&lt;MRL</td>
<td>0.20</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Reported By: Jorma K. Kuusisto
Chemistry Supervisor
Michael Baker, Inc.
4601 Business Park Blvd., Ste. 42
Anchorage, AK 99503
Attn: Jim McGinnis
Client ID: 93-13 (F177159)
Client Project #: Source:
Sample Matrix: Water
Comments: MBAS received/analyzed beyond recommended holding time

<table>
<thead>
<tr>
<th>Method</th>
<th>Parameter</th>
<th>Units</th>
<th>Result</th>
<th>MRL</th>
<th>Date Prepared</th>
<th>Date Analyzed</th>
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<tbody>
<tr>
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<td>ug/L</td>
<td>&lt;MRL</td>
<td>0.20</td>
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<td>4/1/98</td>
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<tr>
<td>1,1-Dichloroethene</td>
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<td>&lt;MRL</td>
<td>0.20</td>
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<tr>
<td>cis-1,2-Dichloroethene</td>
<td>ug/L</td>
<td>&lt;MRL</td>
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<td>trans-1,2-Dichloroethene</td>
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<td>&lt;MRL</td>
<td>0.20</td>
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<tr>
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</tr>
<tr>
<td>p-Isopropyltoluene</td>
<td>ug/L</td>
<td>&lt;MRL</td>
<td>0.20</td>
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<tr>
<td>Methylene Chloride</td>
<td>ug/L</td>
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<td>0.50</td>
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<td>n-Propylbenzene</td>
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<tr>
<td>1,1,1,2-Tetrachloroethane</td>
<td>ug/L</td>
<td>&lt;MRL</td>
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<tr>
<td>1,1,2,2-Tetrachloroethane</td>
<td>ug/L</td>
<td>&lt;MRL</td>
<td>0.20</td>
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<tr>
<td>Tetrachloroethene</td>
<td>ug/L</td>
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<td>0.20</td>
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<tr>
<td>Toluene</td>
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<td>1,2,3-Trichlorobenzene</td>
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<td>&lt;MRL</td>
<td>0.20</td>
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<td></td>
</tr>
<tr>
<td>1,2,4-Trichlorobenzene</td>
<td>ug/L</td>
<td>&lt;MRL</td>
<td>0.20</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Reported By: Jorma K. Kuusisto
Chemistry Supervisor
### Laboratory Report

**NORTHERN TESTING LABORATORIES, INC.**

3330 INDUSTRIAL AVENUE
FAIRBANKS, ALASKA 99701
(907) 458-3116 • FAX 458-3125

8005 SCHOON STREET
ANCHORAGE, ALASKA 99518
(907) 349-1000 • FAX 349-1016

POUCH 340043
PRUDHOE BAY, ALASKA 99734
(907) 659-2145 • FAX 659-2146

---

**Michael Baker, Inc.**
4601 Business Park Blvd., Ste. 42
Anchorage, AK 99503

Attn: Jim McGinnis

Client ID: 93-13 (F177159)

Client Project #: 

Source: 

NTL Lab#: A154705

Sample Matrix: Water

Comments: MBAS received/analyzed beyond recommended holding time

---

<table>
<thead>
<tr>
<th>Method</th>
<th>Parameter</th>
<th>Units</th>
<th>Result</th>
<th>MRL</th>
<th>Date Prepared</th>
<th>Date Analyzed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,1,1-Trichloroethane</td>
<td>ug/L</td>
<td>&lt;MRL</td>
<td>0.20</td>
<td></td>
<td>4/1/98</td>
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</tr>
<tr>
<td>1,1,2-Trichloroethane</td>
<td>ug/L</td>
<td>&lt;MRL</td>
<td>0.20</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trichloroethene</td>
<td>ug/L</td>
<td>&lt;MRL</td>
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<td>Trichlorofluoromethane</td>
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<tr>
<td>1,2,3-Trichloropropane</td>
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<td>&lt;MRL</td>
<td>0.20</td>
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<td>1,2,4-Trimethylbenzene</td>
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<td>1,3,5-Trimethylbenzene</td>
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<td>Vinyl Chloride</td>
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<td>m,p-Xylene</td>
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<td>o-Xylene</td>
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<td>Total Trihalomethanes</td>
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<td>0.50</td>
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<tr>
<td>BFB (Surr)</td>
<td>% Recovery</td>
<td>100</td>
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<td>1,2-DCB-d4 (Surr)</td>
<td>% Recovery</td>
<td>102</td>
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<td>SM 5540 C</td>
<td>Foaming Agents (MBAS)</td>
<td>mg/L</td>
<td>&lt;MRL</td>
<td>0.10</td>
<td>4/6/98</td>
<td>4/7/98</td>
</tr>
</tbody>
</table>

---

Reported By: Jorma K. Kuusisto
Chemistry Supervisor
Drinking Water Analysis Report for Total Coliform Bacteria

Michael Baker Jr., Inc.
4601 Business Park Blvd.; Ste. 42
Anchorage, AK 99503

Date Received: 3/28/98 Time Received: 13:50
Date Analyzed: 3/29/98 Time Analyzed: 14:30
Date Reported: 4/2/98 Time Reported: 09:31

Next Sample Due:

Phone Number:
Fax Number:

Collected by: LL

Sample Type: Special Purpose
Method of Analysis: MMO-MUG (SM 9223 B)

Comments: Lounsby & Associates

<table>
<thead>
<tr>
<th>Sample Date</th>
<th>Sample Time</th>
<th>Total* Coliform</th>
<th>E. Coli Result</th>
<th>Other* Bacteria Result</th>
<th>HPC** Result</th>
<th>Lab#</th>
<th>Location</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/27/98</td>
<td>10:30</td>
<td>ND</td>
<td>ND</td>
<td>NT</td>
<td>NT</td>
<td>AK1985</td>
<td>93-12</td>
<td>Satisfactory</td>
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<td>15:55</td>
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<td>ND</td>
<td>NT</td>
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<td>AK1986</td>
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<td>3/27/98</td>
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<td>ND</td>
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<td>3/27/98</td>
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<td>ND</td>
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<td>AK1988</td>
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<td>3/27/98</td>
<td>15:25</td>
<td>ND</td>
<td>ND</td>
<td>NT</td>
<td>NT</td>
<td>AK1989</td>
<td>93-22</td>
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<td>3/27/98</td>
<td>12:40</td>
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<td>NT</td>
<td>NT</td>
<td>AK1990</td>
<td>92-22</td>
<td>Satisfactory</td>
</tr>
</tbody>
</table>

* = None Detected
** = Too Numerous To Count (>200 Colonies)
SA = Sample Age >30 Hours But <48 Hours, Results May Not Be Reliable
Old = Sample Age >48 Hours, Too Old For Analysis
R = Resample Required
NT = No Test

Comments:
S = Satisfactory
U = Unsatisfactory
POS = Positive Test Result
ND = None Detected
CG = Confluent Growth
HSM = Heavy Sediment Masking, Results May Not Be Reliable
SA = Sample Age >30 Hours But <48 Hours, Results May Not Be Reliable

Cindy L. Christian
Laboratory Director
4/2/98

Northern Testing Laboratories, Inc Fairbanks, AK
Michael Baker, Jr. Inc.
4601 Business Park Blvd.; Ste 42
Anchorage AK 99503

Attn: Jim McGinnis, PE

Our Lab #: F177152
Location/Project: Alpine Camp Water System
Your Sample ID: 93-13
Sample Matrix: Water
Comments:

<table>
<thead>
<tr>
<th>Lab#</th>
<th>Method</th>
<th>Parameter</th>
<th>Units</th>
<th>Results *</th>
<th>MRL</th>
<th>Prepared</th>
<th>Analyzed</th>
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</thead>
<tbody>
<tr>
<td>F177152</td>
<td>EPA 900.0</td>
<td>Gross Alpha</td>
<td>pCi/L</td>
<td>ND@1+/-0.31</td>
<td>05/24/98</td>
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Report Date: 06/10/98
Date Arrived: 03/30/98
Date Sampled: 03/27/98
Time Sampled: 1315
Collected By: LL

MRL = Method Reporting Limit

* Flag Definitions
B = Below Regulatory Min.
H = Above Regulatory Max.

Cindy L. Christian
Laboratory Director
Michael Baker, Jr. Inc.
4601 Business Park Blvd.; Ste 42
Anchorage AK 99503

Attn: Jim McGinnis, PE

Our Lab #: F177424
Location/Project: Alpine Camp Water System
Your Sample ID: 93-13
Sample Matrix: Water
Comments:

<table>
<thead>
<tr>
<th>Lab#</th>
<th>Method</th>
<th>Parameter</th>
<th>Units</th>
<th>Results *</th>
<th>Digest Date</th>
<th>Prepared Analyzed</th>
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<tbody>
<tr>
<td>F177424</td>
<td>EPA 150.1 pH</td>
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<td>Unit</td>
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<tr>
<td>F177424</td>
<td>EPA 180.1 Turbidity</td>
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<td>NTU</td>
<td>1.4</td>
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<tr>
<td>F177424</td>
<td>EPA 200.7 Aluminum</td>
<td>mg/L</td>
<td>&lt;MRL</td>
<td>0.055</td>
<td>04/29/98</td>
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<tr>
<td></td>
<td>Barium</td>
<td>mg/L</td>
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<td>0.002</td>
<td>04/29/98</td>
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<tr>
<td></td>
<td>Beryllium</td>
<td>mg/L</td>
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<tr>
<td></td>
<td>Calcium</td>
<td>mg/L</td>
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<td>Iron</td>
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<td>0.010</td>
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<td>Hardness as CaCO3</td>
<td>mg/L</td>
<td>88.4</td>
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<tr>
<td></td>
<td>Magnesium</td>
<td>mg/L</td>
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<td>0.073</td>
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<tr>
<td></td>
<td>Manganese</td>
<td>mg/L</td>
<td>0.060 H</td>
<td>0.003</td>
<td>04/29/98</td>
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<td>Sodium</td>
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<td>Nickel</td>
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<td>04/29/98</td>
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<td>Zinc</td>
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<td>EPA 200.9 Silver</td>
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<tr>
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<td>Arsenic</td>
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<td>04/16/98</td>
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<tr>
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<td>Cadmium</td>
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<td>0.0001</td>
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<tr>
<td></td>
<td>Chromium</td>
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<td>Copper</td>
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<td>0.005</td>
<td>04/27/98</td>
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<tr>
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<td>Antimony</td>
<td>mg/L</td>
<td>&lt;MRL</td>
<td>0.003</td>
<td>04/28/98</td>
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<tr>
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<td>Selenium</td>
<td>mg/L</td>
<td>&lt;MRL</td>
<td>0.003</td>
<td>04/27/98</td>
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<td>Thallium</td>
<td>mg/L</td>
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<td>0.001</td>
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<tr>
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<td>EPA 245.1 Mercury</td>
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<tr>
<td></td>
<td>EPA 300.0 Chloride</td>
<td>mg/L</td>
<td>43.6</td>
<td>3.50</td>
<td>05/02/98</td>
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Report Date: 05/04/98
Date Arrived: 04/15/98
Date Sampled: 04/12/98
Time Sampled: 1145
Collected By: -

MRL = Method Reporting Limit
*B = Below Regulatory Min.
H = Above Regulatory Max.

Reported by: Cindy L. Christian
Laboratory Director
<table>
<thead>
<tr>
<th>Lab#</th>
<th>Method</th>
<th>Parameter</th>
<th>Units</th>
<th>Results</th>
<th>MRL</th>
<th>Prepared</th>
<th>Date</th>
<th>Analyzed</th>
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<tbody>
<tr>
<td>F177424</td>
<td>EPA 300.0</td>
<td>Fluoride</td>
<td>mg/L</td>
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<td>04/15/98</td>
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<td>Nitrate-N</td>
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<td>Sulfate</td>
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<td>TON</td>
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<td>Alkalinity as CaCO3</td>
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<td>Bicarbonate Alkalinity (as CaCO3)</td>
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<td>SM2330-B</td>
<td>Langelier Index</td>
<td>Unit</td>
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<td>SM2540-C</td>
<td>Total Dissolved Solids</td>
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<tr>
<td>SM4500-CN</td>
<td>Total Cyanide -E</td>
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<td>0.02</td>
<td>04/16/98</td>
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</tbody>
</table>

Reported By: Cindy L. Christian
Laboratory Director
Report Date: 4/28/98  
Date Arrived: 4/16/98  
Sample Date: 4/12/98  
Sample Time: 14:00  

**Legend**  
MRL = Method Report Level  
MCL = Max. Contaminant Level  
B = Present In Method Blank  
E = Estimated Value  
M = Matrix Interference  
H = Above MCL  
D = Lost To Dilution

<table>
<thead>
<tr>
<th>Method Parameter</th>
<th>Units</th>
<th>Result</th>
<th>MRL</th>
<th>Date Prepared</th>
<th>Date Analyzed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benzene</td>
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<tr>
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<td>ug/L</td>
<td>&lt;MRL</td>
<td>0.20</td>
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<tr>
<td>Bromochloromethane</td>
<td>ug/L</td>
<td>&lt;MRL</td>
<td>0.20</td>
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<td></td>
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<tr>
<td>Bromodichloromethane</td>
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<td>0.20</td>
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<td></td>
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<td>Bromoform</td>
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<td>&lt;MRL</td>
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<td></td>
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<tr>
<td>Bromomethane</td>
<td>ug/L</td>
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<td>1.00</td>
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<tr>
<td>n-Butylbenzene</td>
<td>ug/L</td>
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<tr>
<td>sec-Butylbenzene</td>
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<tr>
<td>tert-Butylbenzene</td>
<td>ug/L</td>
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<td></td>
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<tr>
<td>Carbon Tetrachloride</td>
<td>ug/L</td>
<td>&lt;MRL</td>
<td>0.20</td>
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<td></td>
</tr>
<tr>
<td>Chlorobenzene</td>
<td>ug/L</td>
<td>&lt;MRL</td>
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Reported By: Jorma K. Kuusisto  
Chemistry Supervisor
Michael Baker, Inc.
4601 Business Park Blvd., Ste. 42
Anchorage, AK 99503
Attn: Jim McGinnis
Client ID: 93-13 (F177424)
Client Project #: 
Source: AK 2066
NTL Lab#: A154907
Sample Matrix: Water
Comments: MBAS exceeded 48 hour holding time, VOC vials contained head space.

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<th>MRL</th>
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<th>Date Analyzed</th>
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Reported By: Jorma K. Kuusisto
Chemistry Supervisor
Report Date: 4/28/98  
Date Arrived: 4/16/98  
Sample Date: 4/12/98  
Sample Time: 14:00  

Collecting By: **Legend** **

MRL = Method Report Level  
MCL = Max. Contaminant Level  
B = Present In Method Blank  
E = Estimated Value  
M = Matrix Interference  
H = Above MCL  
D = Lost To Dilution  

<table>
<thead>
<tr>
<th>Method</th>
<th>Parameter</th>
<th>Units</th>
<th>Result</th>
<th>MRL</th>
<th>Date Prepared</th>
<th>Date Analyzed</th>
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SM 5540 C  
Foaming Agents (MBAS)  

Reported By: Jorma K. Kauhasto  
Chemistry Supervisor
Michael Baker, Jr. Inc.
4601 Business Park Blvd.; Ste 42
Anchorage AK 99503

Attn: Jim McGinnis, PE

---

Report Date: 06/10/98
Date Arrived: 04/15/98
Date Sampled: 04/12/98
Time Sampled: 1145
Collected By: -

MRL = Method Reporting Limit

* Flag Definitions
B = Below Regulatory Min.
H = Above Regulatory Max.

---

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<th>Units</th>
<th>Results ±</th>
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Our Lab #: F177661
Location/Project: Alpine Camp Water System
Your Sample ID: 93-13
Sample Matrix: Water
Comments:

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Reported By: Cindy L. Christian
Laboratory Director
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<th>Results</th>
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Reported by: Cindy L. Christian
Laboratory Director
**Legend**

- **MRL** = Method Report Level
- **MCL** = Max. Contaminant Level
- **B** = Present In Method Blank
- **E** = Estimated Value
- **M** = Matrix Interference
- **H** = Above MCL
- **D** = Lost To Dilution

<table>
<thead>
<tr>
<th>Method</th>
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<th>Result</th>
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Reported By: Jorma K. Kuusisto
Chemistry Supervisor
Michael Baker, Inc.
4601 Business Park Blvd., Ste. 42
Anchorage, AK 99503

Attn: Jim McGinnis

Client ID: 93-13
Client Project #: 
Source: 
NTL Lab#: A155019
Sample Matrix: Water
Comments: F177661 Sample received/analyzed beyond MBAS holding time

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<th>Date Analyzed</th>
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</tbody>
</table>

Reported By: Jorma K. Kuusisto
Chemistry Supervisor
Michael Baker, Inc.
4601 Business Park Blvd., Ste. 42
Anchorage, AK 99503

Attn: Jim McGinnis
Client ID: 93-13
Client Project #: 
Source: 
NTL Lab#: A155019
Sample Matrix: Water
Comments: Sample received/analyzed beyond MBAS holding time

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<th>Method</th>
<th>Parameter</th>
<th>Units</th>
<th>Result</th>
<th>MRL</th>
<th>Date Prepared</th>
<th>Date Analyzed</th>
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<td>5/1/98</td>
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<td>1,1,2-Trichloroethane</td>
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<tr>
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<td>% Recovery</td>
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<td>mg/L</td>
<td>&lt;MRL</td>
<td>0.10</td>
<td>5/4/98</td>
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Reported By: Jorma K. Kuusisto
Chemistry Supervisor
**DRINKING WATER ANALYSIS REPORT FOR TOTAL COLIFORM BACTERIA**

**Michael Baker Jr., Inc.**
4601 Business Park Blvd.; Ste. 42
Anchorage AK 99503

**Phone Number:**

**Fax Number:**

**Collected by:** WP

**Sample Type** Special Purpose

**Method of Analysis:** MMO-MUG (SM 9223 B)

**Date Received:** 4/27/98  **Time Received:** 17:30
**Date Analyzed:** 4/28/98  **Time Analyzed:** 18:00
**Date Reported:** 5/1/98  **Time Reported:** 11:14

**Next Sample Due:**

**Comments**
- S = Satisfactory
- U = Unsatisfactory
- POS = Positive Test Result
- ND = None Detected
- TNTC = Too Numerous To Count (>200 Colonies)
- CG = Confluent Growth
- HSM = Heavy Sediment Masking, Results May Not Be Reliable
- SA = Sample Age >30 Hours But <48 Hours, Results May Not Be Reliable
- Old = Sample Age >48 Hours, Too Old For Analysis
- R = Resample Required
- NT = No Test
- * # Colonies/100 ml
- ** # Colonies/ml

<table>
<thead>
<tr>
<th>Sample Date</th>
<th>Sample Time</th>
<th>Total* E. Coli</th>
<th>Other* Bacteria</th>
<th>HPC** Result</th>
<th>Lab#</th>
<th>Location</th>
<th>Comments</th>
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<td>4/26/98</td>
<td>13:40</td>
<td>ND ND</td>
<td>NT</td>
<td>NT</td>
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**Signature:**

Marlan Ruth  Environmental Analyst  5/4/98

Northern Testing Laboratories, Inc  Fairbanks, AK
Michael Baker, Jr. Inc.
4601 Business Park Blvd.; Ste 42
Anchorage AK 99503

Attn: Jim McGinnis, PE

Our Lab #: F177668
Location/Project: Alpine Camp Water System
Your Sample ID: 93-13
Sample Matrix: Water
Comments:

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<th>Method</th>
<th>Parameter</th>
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<th>Results *</th>
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<td>pCi/L</td>
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Report Date: 06/10/98
Date Arrived: 04/29/98
Date Sampled: 04/26/98
Time Sampled: 1340
Collected By: WP

MRL = Method Reporting Limit

* Flag Definitions
  B = Below Regulatory Min.
  H = Above Regulatory Max.

Reported By: Cindy L. Christian
Laboratory Director
Michael Baker, Jr. Inc.
4601 Business Park Blvd.; Ste 42
Anchorage AK 99503

Attn: Jim McGinnis, PE

Our Lab #: F178037
Location/Project: Alpine Camp Water System
Your Sample ID: 93-13
Sample Matrix: Water
Comments:

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Reported By: Cindy L. Christian
Laboratory Director
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Reported by: Cindy L. Christian
Laboratory Director
Report Date: 5/29/98  
Date Arrived: 5/15/98  
Sample Date: 5/11/98  
Sample Time: 14:45  
Collected By:  

** Legend **

- **MRL** = Method Report Level  
- **MCL** = Max. Contaminant Level  
- **B** = Present In Method Blank  
- **E** = Estimated Value  
- **M** = Matrix Interference  
- **H** = Above MCL  
- **D** = Lost To Dilution

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Reported By: Jorma K. Kuusisto  
Chemistry Supervisor
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Reported By: Jorma K. Kuusisto
Chemistry Supervisor
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SM 5540 C

Foaming Agents (MBAS)        | mg/L                    | <MRL  | 0.10    |     | 5/28/98       |               |

Report Date: 5/29/98
Date Arrived: 5/15/98
Sample Date: 5/11/98
Sample Time: 14:45
Collected By: Michael Baker, Inc.

Client ID: 93-13 (F178037)
Client Project #: 2270
Source: NTL Lab#: A155279
Sample Matrix: Water

Legend

MRL = Method Report Level
MCL = Max. Contaminant Level
B = Present In Method Blank
E = Estimated Value
M = Matrix Interference
H = Above MCL
D = Lost To Dilution

Reported By: Jorma K. Kuusisto
Chemistry Supervisor
### Report of Analysis

**Northern Testing Laboratories**  
3330 Industrial Avenue  
Fairbanks, AK 99701  
(907)456-3116

---

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<th>Sample Description</th>
<th>Date/Time Sampled</th>
<th>Date/Time Received</th>
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Approved by:  
Don Cook / Jerry Pollen  
Chemist / Lab Tech
Michael Baker, Jr. Inc.  
4601 Business Park Blvd.; Ste 42  
Anchorage AK 99503  

Attn: Jim McGinnis, PE

Our Lab #: F178044  
Location/Project: Alpine Camp Water System  
Your Sample ID: 93-13  
Sample Matrix: Water  
Comments:

<table>
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<th>Lab#</th>
<th>Method</th>
<th>Parameter</th>
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Report Date: 07/22/98
Date Arrived: 05/14/98
Date Sampled: 05/11/98
Time Sampled: 1445
Collected By: -

MRL = Method Reporting Limit

* Flag Definitions:
B = Below Regulatory Min.
H = Above Regulatory Max.

Reported By: Cindy L. Christian
Laboratory Director
Michael Baker, Jr. Inc.
4601 Business Park Blvd.; Ste 42
Anchorage AK 99503

Attn: Jim McGinnis, PE

Our Lab #: F179227
Location/Project: Alpine Camp Water System
Your Sample ID: 93-13
Sample Matrix: Water
Comments:

<table>
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<tr>
<th>Lab#</th>
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<th>Parameter</th>
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<th>Analyzed Date</th>
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Laboratory Director
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Reported by: Cindy L. Christian
Laboratory Director
Michael Baker, Inc.
4601 Business Park Blvd., Ste. 42
Anchorage, AK 99503

Attn: Jim McGinnis

Client ID: 93-13
Client Project #: 
Source: 
NTL Lab#: A156499
Sample Matrix: Water
Comments:

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Reported By: Jorma K. Kuusisto
Chemistry Supervisor
Report Date: 7/27/98  
Date Arrived: 7/20/98  
Sample Date: 7/17/98  
Sample Time:  
Collected By:  
** Legend **  
MRL = Method Report Level  
MCL = Max. Contaminant Level  
B = Present In Method Blank  
E = Estimated Value  
M = Matrix Interference  
H = Above MCL  
D = Lost To Dilution  

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Reported By: Jorma K. Kuusisto  
Chemistry Supervisor
NORTHERN TESTING LABORATORIES, INC.

Michael Baker, Inc.
4601 Business Park Blvd., Ste. 42
Anchorage, AK 99503
Attn: Jim McGinnis
Client ID: 93-13
Client Project #: 
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Reported By: Jorma K. Kuusisto
Chemistry Supervisor
Report Date: 7/27/98  
Date Arrived: 7/20/98  
Sample Date: 7/17/98  
Sample Time:  
Collected By:  

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Reported By: Jorma K. Kuusisto  
Chemistry Supervisor
### Method Table

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<th>Units</th>
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</table>

Reported By: Jorma K. Kuusisto
Chemistry Supervisor
**Legend**

- **MRL** = Method Report Level
- **MCL** = Max. Contaminant Level
- **B** = Present In Method Blank
- **E** = Estimated Value
- **M** = Matrix Interference
- **H** = Above MCL
- **D** = Lost To Dilution

<table>
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<tr>
<th>Method</th>
<th>Parameter</th>
<th>Units</th>
<th>Result</th>
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<th>Date Prepared</th>
<th>Date Analyzed</th>
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Reported By: Jorma K. Kuusisto
Chemistry Supervisor
Michael Baker, Jr. Inc.
4601 Business Park Blvd.; Ste 42
Anchorage AK 99503

Attn: Jim McGinnis, PE

Our Lab #:  F179862
Location/Project: Alpine Camp Water System
Your Sample ID: 93-13
Sample Matrix: Water
Comments:

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Reported by Cindy L. Christian
Laboratory Director
<table>
<thead>
<tr>
<th>Lab#</th>
<th>Method</th>
<th>Parameter</th>
<th>Units</th>
<th>Results</th>
<th>MRL</th>
<th>Prepared</th>
<th>Date</th>
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<td>Color, Apparent</td>
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Reported By: Cindy L. Christian
Laboratory Director
**Legend**
- **MRL** = Method Report Level
- **MCL** = Max. Contaminant Level
- **B** = Present in Method Blank
- **E** = Estimated Value
- **M** = Matrix Interference
- **H** = Above MCL
- **D** = Lost To Dilution

<table>
<thead>
<tr>
<th>Method Parameter</th>
<th>Units</th>
<th>Result</th>
<th>MRL</th>
<th>Date Prepared</th>
<th>Date Analyzed</th>
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<td>Bromomethane</td>
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<td>1,3-Dichlorobenzene</td>
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<td>ug/L</td>
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Reported By: Jorma K. Kuusisto
Chemistry Supervisor
**Legend**

- **MRL** = Method Report Level
- **MC** = Max Contaminant Level
- **B** = Present In Method Blank
- **E** = Estimated Value
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<table>
<thead>
<tr>
<th>Method Parameter</th>
<th>Units</th>
<th>Result</th>
<th>MRL</th>
<th>Date Prepared</th>
<th>Date Analyzed</th>
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<td>8/24/98</td>
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Reported By: Jorma K. Kuusisto
Chemistry Supervisor
Michael Baker, Inc.
4601 Business Park Blvd., Ste. 42
Anchorage, AK 99503
Attn: Jim McGinnis
Client ID: 93-13
Client Project #: 
Source: 
NTL Lab#: A157249
Sample Matrix: Water
Comments: F179862

<table>
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<tr>
<th>Method</th>
<th>Parameter</th>
<th>Units</th>
<th>Result</th>
<th>MRL</th>
<th>Date Prepared</th>
<th>Date Analyzed</th>
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<td>8/24/98</td>
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<td>8/21/98</td>
<td>8/21/98</td>
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</table>

Reported By: Jorma K. Kuusisto
Chemistry Supervisor
**DRINKING WATER ANALYSIS REPORT FOR TOTAL COLIFORM BACTERIA**

Michael Baker Jr., Inc.  
4601 Business Park Blvd.; Ste. 42  
Anchorage AK 99503

Date Received: 8/19/98  
Time Received: 09:55

Date Analyzed: 8/19/98  
Time Analyzed: 13:50

Date Reported: 8/20/98  
Time Reported: 15:00

Next Sample Due:

Phone Number:
Fax Number:
Collected by:
Sample Type: Routine
Method of Analysis: MMO-MUG (SM 9223 B)

<table>
<thead>
<tr>
<th>Sample Date</th>
<th>Sample Time</th>
<th>Total*</th>
<th>E. Coli</th>
<th>Other*</th>
<th>HPC**</th>
<th>Lab#</th>
<th>Location</th>
<th>Comments</th>
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<td>POS</td>
<td>ND</td>
<td>NT</td>
<td>NT</td>
<td>AK2001</td>
<td>93-13</td>
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<tr>
<td>8/18/98</td>
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<td>NT</td>
<td>AK2016</td>
<td>92-82</td>
<td>U,</td>
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</tbody>
</table>

Comments:

- **S** = Satisfactory
- **U** = Unsatisfactory
- **POS** = Positive Test Result
- **ND** = None Detected
- **TNTC** = Too Numerous To Count (>200 Colonies)
- **CG** = Confluent Growth
- **SA** = Sample Age >30 Hours But <48 Hours, Results May Not Be Reliable
- **Old** = Sample Age >48 Hours, Too Old For Analysis
- **R** = Resample Required
- **NT** = No Test

- *# Colonies/100 ml**  
- **# Colonies/ml**

**RECEIVED**

AUG 24 1998

MICHAEL BAKER, JR., INC.

---

Marlen Ruth  
Environmental Analyst  
8/20/98

Northern Testing Laboratories, Inc  Fairbanks, AK
Michael Baker, Jr. Inc.
4601 Business Park Blvd.; Ste 42
Anchorage AK 99503
Attn: Jim McGinnis, PE

Our Lab #:  F180482
Location/Project: Alpine Camp Water System
Your Sample ID:  9313
Sample Matrix:  Water
Comments:

<table>
<thead>
<tr>
<th>Lab#</th>
<th>Method</th>
<th>Parameter</th>
<th>Units</th>
<th>Results *</th>
<th>MRL</th>
<th>Prepared</th>
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<td>09/17/98</td>
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<td>09/17/98</td>
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Reported By: Cindy L. Christian
Laboratory Director
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Reported by: Cindy L. Christian
Laboratory Director
Attn:  Jim McGinnis  
Client ID:  9313  
Client Project #:  
Source:  
NTL Lab#:  A158253  
Sample Matrix:  Water  
Comments:  

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Reported By:  Jorma K. Kuusisto  
Chemistry Supervisor
Sample Date: 9/17/98
Sample Time: 10:00

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<th>Date Prepared</th>
<th>Date Analyzed</th>
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Michael Baker, Inc.  
4601 Business Park Blvd., Ste. 42  
Anchorage, AK  99503

Attn: Jim McGinnis

Client ID: 9313  
Client Project #:  
Source: 
NTL Lab#: A158253  
Sample Matrix: Water  
Comments:

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<th>MRL</th>
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SM 5540 C  
Foaming Agents (MBAS) | mg/L | <MRL | 0.10 | 9/18/98 | 

Reported By: Jorma K. Kuusisto  
Chemistry Supervisor
**DRINKING WATER ANALYSIS REPORT FOR TOTAL COLIFORM BACTERIA**

| Sample Date | Sample Time | Total* Coliform | E. Coli | Other* Bacteria | HPC** Result | Lab#       | Location | Comments          |
|-------------|-------------|-----------------|---------|-----------------|--------------|-----------|----------|------------------|------------------|
| 9/16/98     | 10:00       | ND               | ND      | NT              | NT           | AK3094    | 9313     | Satisfactory      |
| 9/16/98     | 10:00       | ND               | ND      | NT              | NT           | AK3102    | 9282     | Satisfactory      |

Comments:
- **S** = Satisfactory
- **U** = Unsatisfactory
- **POS** = Positive Test Result
- **ND** = None Detected
- **TNTC** = Too Numerous To Count (>200 Colonies)
- **CG** = Confluent Growth
- **HSM** = Heavy Sediment Masking, Results May Not Be Reliable
- **SA** = Sample Age >30 Hours But <48 Hours, Results May Not Be Reliable
- **Old** = Sample Age >48 Hours, Too Old For Analysis
- **R** = Resample Required
- **NT** = No Test

* # Colonies/100 ml  ** # Colonies/ml
Report Date: 10/20/98
Date Arrived: 10/02/98
Date Sampled: 09/30/98
Time Sampled: -
Collected By: -

MRL = Method Reporting Limit

* Flag Definitions
B = Below Regulatory Min.
H = Above Regulatory Max.

<table>
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<th>Method</th>
<th>Parameter</th>
<th>Units</th>
<th>Results *</th>
<th>MRL</th>
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<th>Analyzed</th>
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Reported By: Cindy L. Christian
Laboratory Director
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Reported By: Cindy L. Christian
Laboratory Director
**Legend**

- **MRL** = Method Report Level
- **MCL** = Max. Contaminant Level
- **B** = Present in Method Blank
- **E** = Estimated Value
- **M** = Matrix Interference
- **H** = Above MCL
- **D** = Lost to Dilution

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Reported By: Jorma K. Kuusisto
Chemistry Supervisor
Report Date: 10/14/98
Date Arrived: 10/1/98
Sample Date: 9/30/98
Sample Time: 

Collected By: ** Legend **
MRL = Method Report Level
MCL = Max. Contaminant Level
B = Present In Method Blank
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Reported By: Jorma K. Kuusisto
Chemistry Supervisor
**Report Date:** 10/14/98  
**Date Arrived:** 10/11/98  
**Sample Date:** 9/30/98  
**Sample Time:**  
**Collected By:**

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<td></td>
</tr>
<tr>
<td>SM 5540 C</td>
<td>Foaming Agents (MBAS)</td>
<td>mg/L</td>
<td>&lt;MRL</td>
<td>0.10</td>
<td>10/2/98</td>
<td></td>
</tr>
</tbody>
</table>

Reported By: Jorma K. Kuusisto  
Chemistry Supervisor
Attn: Jim McGinnis  
Michael Baker, Incorporated  
4601 Business Park Blvd., Ste. #42  
Anchorage, AK 99503

Date Received: 10/1/98  
Time Received: 13:00

Date Analyzed: 10/1/98  
Time Analyzed: 17:30

Date Reported: 10/9/98  
Time Reported: 09:50

Next Sample Due:

Comments:

<table>
<thead>
<tr>
<th>Sample Date</th>
<th>Sample Time</th>
<th>Total* Coliform</th>
<th>Fecal Coliform</th>
<th>Other* Bacteria</th>
<th>HPC** Result</th>
<th>Lab#</th>
<th>Location</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>9/30/98</td>
<td>POS</td>
<td>ND</td>
<td>NT</td>
<td>NT</td>
<td>AK3092</td>
<td>93-13</td>
<td></td>
<td>U</td>
</tr>
</tbody>
</table>

Note: 
- POS = Positive Test Result
- ND = None Detected
- TNTC = Too Numerous To Count (>200 Colonies)
- CG = Confluent Growth
- HSM = Heavy Sediment Masking, Results May Not Be Reliable
- SA = Sample Age >30 Hours But <48 Hours, Results May Not Be Reliable
- Old = Sample Age >48 Hours, Too Old For Analysis
- R = Resample Required
- NT = No Test

* # Colonies/100 ml  ** # Colonies/ml
Michael Baker, Jr. Inc.
4601 Business Park Blvd.; Ste 42
Anchorage AK 99503

Attn: Jim McGinnis, PE

Our Lab #: F178231
Location/Project: Alpine Camp Water System
Your Sample ID: L93-13
Sample Matrix: Water
Comments:

<table>
<thead>
<tr>
<th>Lab#</th>
<th>Method</th>
<th>Parameter</th>
<th>Units</th>
<th>Results *</th>
<th>MRL</th>
<th>Prepared</th>
<th>Analyzed</th>
</tr>
</thead>
<tbody>
<tr>
<td>F178231</td>
<td>EPA 900.0 Gross Alpha</td>
<td>pCi/L</td>
<td>ND01+/-0.38</td>
<td>07/08/98</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Report Date: 07/22/98
Date Arrived: 05/28/98
Date Sampled: 05/26/98
Time Sampled: 1210
Collected By: -

MRL = Method Reporting Limit
* Flag Definitions
B = Below Regulatory Min.
H = Above Regulatory Max.

Reported By: Cindy L. Christian
Laboratory Director
Michael Baker, Jr. Inc.  
4601 Business Park Blvd.; Ste 42  
Anchorage AK 99503

Attn: Jim McGinnis, PE

Our Lab #: F178543  
Location/Project: Alpine Camp Water System  
Your Sample ID: 93-13  
Sample Matrix: Water  
Comments:

<table>
<thead>
<tr>
<th>Lab#</th>
<th>Method</th>
<th>Parameter</th>
<th>Units</th>
<th>Results *</th>
<th>MRL Prepared</th>
<th>Analyzed</th>
</tr>
</thead>
<tbody>
<tr>
<td>F178543</td>
<td>EPA 900.0</td>
<td>Gross Alpha</td>
<td>pCi/L</td>
<td>ND@1+-0.42</td>
<td>07/08/98</td>
<td></td>
</tr>
</tbody>
</table>

Report Date: 07/22/98  
Date Arrived: 06/11/98  
Date Sampled: 06/09/98  
Time Sampled: 0900  
Collected By: DAD/KHE

MRL = Method Reporting Limit

* Flag Definitions  
B = Below Regulatory Min.  
H = Above Regulatory Max.

Reported By: Cindy L. Christian  
Laboratory Director