Appendix H. Water Resource Report

Documents Included:

- **Water Source and Quality Investigations for Potential Relocation Sites**

WATER SOURCE AND QUALITY INVESTIGATIONS FOR POTENTIAL RELOCATION SITES KIVALINA, ALASKA

CONTRACT NO. DACW85-03-D-006
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WATER SOURCE AND QUALITY INVESTIGATIONS
FOR
POTENTIAL RELOCATION SITES

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WATER SOURCE AND QUALITY INVESTIGATIONS
FOR
POTENTIAL RELOCATION SITES
KIVALINA, ALASKA

1.0 INTRODUCTION

1.1 BACKGROUND

The U.S. Army Corps of Engineers – Alaska District (USACE-AD) is currently conducting a Relocation Master Plan Project for the community of Kivalina. The purpose of the Master Plan is to provide the community of Kivalina and relocation stakeholders preliminary facility designs, costs, schedules, and a decision matrix so that a village site can be selected, and the relocation effort can continue. Six relocation sites are being considered, along with a seventh alternative to improve the existing site. The sites include Simiq, Imnakuk Bluffs, Tatchim Isua, Kiniktuuraq, Igrugiavik, and Kuugruaq.

The required water resources for each of the sites will be determined by the chosen water and sewer system. Based on a design population of 950 people, the difference of fully piped water and sewer system and a self haul system is dramatic. A piped system will require approximately 60 gpcd, and a self haul system will require only 10 gpcd. For surface water stream sources, it is not feasible to take all the water in the creek. A creek should have a flow rate 3 to 4 times the proposed withdraw rate. To meet these demands, the stream flow rates will need to be approximately 160 GPM and 27 GPM respectively. The storage requirements of water will also be determined by the seasonal fluctuation of water flow rates.

Tryck Nyman Hayes, Inc. (TNH) has been tasked by the Corps to conduct a literature review of local geology and hydrology and develop a scope of work for field water quality sampling and geophysical investigations of potential community water sources for each village relocation site.

1.2 CONTRACT AUTHORIZATION

This study has been conducted under the terms of Contract No. DACW85-03-D-0006, Delivery Order No. 07, Mod 5 between the U.S. Army Engineer District, Alaska, and Tryck Nyman Hayes, Inc. This work is supplemental to the Master Relocation Study currently being prepared.

1.3 PURPOSE AND SCOPE

The purpose of the report is to complete a literature review of local geology and hydrology, with respect to determining the most likely location depth and yield for a public surface, or groundwater water supply source for each of the seven potential relocations sites. In addition, data gaps are to be identified and future scopes of work for field surface water quality/quantity sampling (all sites) and geophysical investigations (if deemed necessary) will be prepared. Village relocation sites include:

- Improving the existing townsite of Kivalina
- Simiq
- Imnakuk Bluff
- Tatchim Isua

- Kiniktuuraq
- Igrugaivik
- Kuugruaq

Potential water sources include the Wulik River, the Kivalina River, the Asikpak River, Imnakuk Creek, the small stream that flows through the Imnakuk Bluff site, lakes and small watercourses near the sites. The Area Location Map in Appendix A shows the locations of the village relocation sites and potential surface water sources.

1.4 EXISTING DATA AND LITERATURE REVIEW

In accordance with the scope of work, the following documents were sought and reviewed for information pertaining to water resources for each relocation site:

- USGS topographic maps;
- USGS geological maps;
- Discharge data from USGS gauging stations on Wulik and Kivalina Rivers and Ikalulrok Creek;
- Discharge data from other pertinent comparable USGS gauging stations with discharge data along the Chukchi coast;
- Geophysical Groundwater Source Investigations, Kivalina, Alaska by Golder Associates (1997), and other surface and ground water investigation data within the study area;
- Boring logs and water test well results from Phase II Engineering Services Geotechnical Investigations by R&M (2002);
- Most recent color stereo aerial photographs;
- Most recent color infrared (CIR) photographs;
- Local precipitation and snow pack data; and
- Data on lake areas and depths.

2.0 DATA ANALYZED PER VILLAGE SITE

For this report, surface water and ground water sources were considered. Surface water sources such as local streams, the Wulik and Kivalina Rivers were analyzed. Each source could either have a surface water intake for collection, or potentially use an infiltration gallery for water collection.

Potential ground water well sources in the region were also analyzed. However, after a review of available ground water information, it was concluded that water wells are not feasible for the potential relocation sites. See Section 5.0 for further explanation.

Water resource materials and other information were reviewed with respect to each potential village relocation site. A small number of technical reports have been performed for the potential relocation sites. Detailed information from these prior investigations has not been repeated in this report. Please refer to previous reports for specific data.

Four previous reports summarize prior investigations, and provide a new analysis of various subsurface and aquifer conditions.

Collected information was analyzed to determine the content and applicability for each relocation site's water resources. Information that pertains to each site is listed below, along with a brief explanation of what was determined. The reports include:

- Geophysical Groundwater Source Investigations, Kivalina, Alaska, by Golder Associates, (1997);
- Reconnaissance Geotechnical Investigation, Kivalina Alaska, by R&M Consultants, (2000);
- Phase II Engineering Services Geotechnical Investigations by R&M Consultants, (2002), and
- Geotechnical Investigations of Simiq, Tatchim Isua, and Imnakuk Bluff, by Shannon and Wilson, (2006).

2.1 KIVALINA

Existing reports identify the Wulik River as the only community water resource for the townsite of Kivalina. Currently, the village obtains water from a point approximately two miles upstream from the mouth of the Wulik River. Water is pumped to the village storage tanks during the months when the river is not frozen. Year round water supply from either an infiltration gallery on the Wulik River or from a well are being considered for Kivalina. Potential water well sources for Kivalina were previously investigated, and found not feasible due to saline ground water. See Figure 1 (Appendix A) for a location map of potential village relocation sites.

2.1.1 Existing Geotechnical and Groundwater Information

Most existing geotechnical information contains shallow test holes that were dug to show shallow subsurface conditions. Very little information exists with respect to potential ground water sources. The following report included historical information on groundwater information for Kivalina.

Geophysical Groundwater Source Investigation, Kivalina. Alaska, by Golder Associates (1997)

The report scope of work included a study of ground water resources for Imnakuk Bluff, Kuugruaq, and Igrugaivik. The report reviews existing information, analyzing existing well logs and performing geophysical investigations at the three relocation sites. The report then summarizes the recommendations for test well drilling, and provides a cost estimate for exploratory drilling.

The report cites that water wells drilled near the school by the Bureau of Indian Affairs produced only salt water. These wells were abandoned. One well was drilled to a depth of 215 feet and encountered unconsolidated sediments ranging from clay to gravel. The location of the wells is unknown. At present, there are no water wells near Kivalina.

2.1.2 USGS Topographic and Geophysical Maps

USGS, Noatak, Alaska 67162-A1-TF-250 shows contour information, streams, wetlands, and lakes within the region of Kivalina. From the mapping, it is apparent that the closest surface

water source for Kivalina is the Wulik River. No other surface water sources appear to be feasible.

Reconnaissance geological mapping has been published at a scale of 1:63,360 by the USGS for the Noatak C5, D5, D6 and D7 Quadrangles.

2.1.3 Other Surface and Ground Water Investigations within Study Area

No other surface or ground water studies have been completed near the townsite of Kivalina. However, a sanitary survey conducted in May 2004 by ASCG, Incorporated includes water samples of the Wulik River.

In addition, Travis Peterson Environmental Consulting Group is currently working directly for NANA to complete water quality studies of the Wulik River. The Peterson report focuses on runoff quality from Red Dog Mine, and compares data to the baseline water quality data that was generated during environmental studies of the mine site. At the time of this writing, the Peterson Group has not reduced the field data into a format that would allow inclusion into this report. Telephone conversations with staff report that the Wulik River does have winter flow conditions. The report completion is scheduled for 2007. It is recommended that a copy of the report be acquired at a later date.

2.1.4 Aerial Photography

Review of aerial photographs in previous reports does not identify potential ground water resources for Kivalina.

Color infrared (CIR) photographs were obtained to help determine potential water sources. These photographs were taken in 1978.

In addition to the CIR photographs, the following color photographs were obtained of Kivalina: Three photos of Kivalina are at a scale of 1 inch=1000 feet (taken in 2000), and one photo is scaled at 1 inch=800 feet (taken in 1997).

2.1.5 Discharge Data of Local Streams

USGS stream gauging station ID 15747000 is located on the Wulik River, measured below Tutak Creek, approximately 25 miles northeast of Kivalina. This stream gauging station is one of two gauging station near Kivalina or any of the potential relocation sites. A second steam gauging station is located at Ogoturuk Creek, 33 miles northwest. Ogoturuk site has data that is 44 years old and the village elders report the area to have different weather patterns than Kivalina. Because of the age of the data and the reported different weather patterns, the Ogoturuk Creek gauging station was not used for this report.

The drainage basin for the station ID 15747000 is 705 square miles, with a mean annual flow of 1,006 cubic feet per second (cfs). The average flows in April are 17.5 cfs and 3,215.8 cfs in June. The drainage basin is composed of both wetlands and mountainous regions.

2.1.6 Other Information: Lake Volumes, Snow Pack Depth, Precipitation

There is no existing information on lake volumes and snow pack data in the immediate region of Kivalina. Red Dog and Cape Krusenstern have snow pack information as part of the environmental work conducted there. However, the snow pack data of the mountainous regions of Red Dog Mine and Cape Krusenstern can not be directly applied to the runoff basins for the

Wulik or Kivalina Rivers. Wind blown snow and different weather patterns along the coast make correlation of snow pack data to runoff rates very difficult. For this reason, snow pack data outside the immediate runoff areas has been discounted.

Climate data taken from R&M's 1998 Reconnaissance Geotechnical Investigation shows the following:

2.1.6.1.1 Record	2.1.6.1.2 Kivalina
Period of Record (yrs.)	1973-1976
Elevation (m) (datum is NGVD 29)	3
Mean Annual Temperature (ºC)	-7.3
Mean Max. Daily Temperature (ºC)	-2.9
Mean Min. Daily Temperature (ºC)	-11.8
Record High Temperature (ºC)	24.4
Record Low Temperature (ºC)	-43.9
Mean Annual Precipitation (cm)	21.0
Maximum Daily Precipitation (cm)	2.2 (Aug. 1974)
Mean Annual Snowfall (cm)	148.3
Maximum Recorded Snow Depth (cm)	109.2 (Jan. 1974)

2.2 SIMIQ

Existing reports identify the Wulik River and Kivalina River as potential water sources for Simiq. Infiltration galleries, or surface water intakes within either river, may be considered for water sources. Possible ground water supplies are unknown for Simiq.

Data that pertains to Simiq water resources is included below.

2.2.1 Existing Geotechnical and Groundwater Information

Geotechnical Investigations of Simiq, Tatchim Isua, and Imnakuk Bluff, by Shannon and Wilson, (2006) (final report on drilling results)

Test holes drilled in 2005 at the Simiq site showed the area to be underlain by ice. The site was drilled to a depth of 25 feet, with two test holes. Both test holes showed ice from one foot below grade to the bottom of the test holes (25 feet). There was no discussion or indication of groundwater for this site.

Phase II Engineering Services, Geotechnical Investigations by R&M (2002).

The investigations included two 25-feet borings at the Kiniktuuraq site, and borrow site borings at Igrugaivik and Kuugruaq. A test well was also drilled along the Wulik River at the Igrugaivik site. While the testing was not at the Simiq site, the analysis of ground water potential in the region may be appropriate to Simiq.

A water well test hole located at Igrugaivik was advanced to 41 feet, where the well was abandoned due to the high salinity content of the water and soil. The well location is shown on Figure 1 in Appendix A.

The report concluded that it might be difficult to find a location for a water well, since it appears that most or all of the unfrozen (unbounded) soils containing significant amounts of groundwater may be saline near Kuugruaq, Igrugaivik, and Kiniktuuraq. Similar ground water conditions are likely to be encountered at Simiq.

2.2.2 USGS Topographic and Geophysical Maps

USGS, Noatak, Alaska 67162-A1-TF-250 shows Simiq is an elevated site, surrounded by streams, lakes, wetlands, and lakes within the region of Kivalina.

Reconnaissance geologic mapping has been published at a scale of 1:63,360 by the USGS for the Noatak C5, D5, D6 and D7 Quadrangles.

2.2.3 Other Surface and Ground Water Investigations within Study Area

The information presented in 2.1.3 applies to Simiq. No other surface or ground water studies have been completed near the Simiq site.

2.2.4 Aerial Photography

The only available photography of this site are two (2) 1978 USGS color infrared (CIR) photographs. There has been no previous analysis of the photographs.

2.2.5 Discharge Data of Local Streams

If the Simiq site is selected as a relocation site, both the Wulik and Kivalina Rivers are potential water sources. The drainage basins and discharge data have been estimated for potential intake locations for both rivers. The information presented in 2.1.5 includes discharge data for the Wulik River.

No discharge stations are located on the Kivalina River. However, analysis of the runoff data from the Wulik basin can be applied to the Kivalina River. Based on using the Kivalina as a water source for Simiq, the estimated size of the drainage basin is 187 square miles. Mean annual flow is estimated to be 267 cfs. Average flows for April and June are 4.6 cfs and 852 cfs, respectively. An estimate of monthly flow is included in Appendix A.

Selection of an intake site for the Kivalina River will require careful consideration of future erosion and influence from salt water pushing up the Kivalina River from tidal and storm influences. Elders report that tidal salt water pushes up the Kivalina River to near the Imnakuk Bluff Site.

2.2.6 Other Information: Lake Volumes, Snow Pack Depth, Precipitation

The information presented in 2.1.6 applies to Simiq. No other surface or ground water studies have been completed near the Simiq site.

2.3 IMNAKUK BLUFF

Existing reports identifying potential water resources for the Imnakuk Bluff site include the Kivalina River, Imnakuk Creek, and small drainage basins that flow through the site. Water well drilled into the thaw bulb of the Kivalina River may also be an alternative. Infiltration galleries

or surface water intakes within either river may be considered for water sources. Data that pertains to Imnakuk Bluffs water resources is included below.

2.3.1 Existing Geotechnical and Groundwater Information

Two investigations have occurred at the Imnakuk Bluff site. The investigations included geophysical tests by Golder in 1977 and drilling test holes by Shannon and Wilson in 2005.

Geotechnical Investigations of Simiq, Tatchim Isua, and Imnakuk Bluff, by Shannon and Wilson, (2006) (final report on drilling results):

Four holes were drilled in late summer 2005 at the Imnakuk Bluff Site. The drilling program did not yield any indications of ground water at the site. Shallow borings up to 25 feet were drilled. The borings revealed frozen soil, with ice lenses ranging from 9 feet to 15 feet thick.

Geophysical Groundwater Source Investigation, Kivalina Alaska, by Golder Associates (1997):

Geophysical tests at Imnakuk Bluff included an electromagnetic method, known as VLF, which can locate steeply dipping structures that have different geoelectric properties from their surroundings. VLF survey lines can determine if bedrock fractures are associated with the subtle drainage lines identified on the aerial photographs. The two VLF survey lines, VLF-1 and VLF-2, had a lack of corresponding anomalies that could indicate that the possible deep conductive body is not completely continuous between the two lines.

Electrical Resistivity Imaging (RI) was also used; a survey technique for developing continuous resistivity profiles of the subsurface. A line named KR-1 was used to determine if the north-south drainage feature at the site is associated with a hydraulically conductive zone that may be connected to a relic thaw bulb associated with the Kivalina River. The KR-2 line was conducted in active floodplain deposits to determine the depth of thaw in the active floodplain; however, the bottom of the thaw bulb was not detected along the line. The KR-3 and KR-4 lines were used to map the boundary of the thaw bulb between the floodplain and higher lands.

The report recommended the best location for a test well to be at the northern edge of the abandoned floodplain deposits. The well location targets a potential coarse-grained deposit and a potential relic thaw bulb.

2.3.2 USGS Topographic and Geophysical Maps

USGS, Noatak, Alaska 67162-A1-TF-250 shows Imnakuk Bluff as an elevated site, sloping towards the Kivalina River.

Reconnaissance geologic mapping has been published at a scale of 1:63,360 by the USGS for the Noatak C5, D5, D6 and D7 Quadrangles.

2.3.3 Other Surface and Ground Water Investigations within Study Area

No other surface or ground water studies have been completed near the Imnakuk Bluff site.

2.3.4 Aerial Photography

Aerial photographs of the project area were obtained and interpreted by Golder for the 1997 report. Color infrared (CIR) photographs were obtained to help determine potential water sources. These photographs were taken in 1978, and three of them pertain to Imnakuk Bluff.

In addition to the CIR photographs, the following color photographs were obtained of Imnakuk site: Five photos at a scale of 1 inch=800 feet were taken in 1995. The photography has established vertical and horizontal control that can be used to generate topography of the site.

2.3.5 Discharge Data of Local Streams

There is no current discharge data for the Kivalina River, Imnakuk Creek, or other streams in the near vicinity of the Imnakuk Bluff site. If the Imnakuk Bluff site is selected as a relocation site, there are various streams and rivers that are located within the vicinity of the site. Imnakuk Creek, IBUNC #1, IBUNC #2, and Kivalina River are potential water sources. The drainage basin and discharge data have been estimated for potential intake locations. The method used to gauge the flow of the streams on September 19, 2005 was a float timed across a measured distance of creek or stream. The cross-section of the stream was also measured.

IBUNC #1: Analysis of the IBUNC #1 indicates the estimated size of the drainage basin is 301 acres. Mean annual flow is estimated to be 303 gallons per minute (gpm). Average flows for April and June are 5 gpm and 967 gpm, respectively. Sheet 4, located in Appendix A, shows the drainage basin and monthly flow estimates.

Visual estimates and simple flow test measurements were conducted near the mouth. The estimate for flow in September 19th was 60 gpm. Village elders report that the creek appears to go dry in the winter months. However, with snow cover, there are commonly small flows present under the snow pack or in the gravel bed of streams. Verification of winter flows should be conducted.

IBUNC #2: Analysis of the IBUNC #2 indicates the estimated size of the drainage basin is 881 acres. Mean annual flow is estimated to be 884 gpm. Average flows for April and June are 15 gpm and 2,825 gpm, respectively. Sheet 5 located in Appendix A, shows the drainage basin and monthly flow estimates.

Visual estimates and simple flow test measurements were conducted near the mouth. An estimate for flow on September 19th was 400 gpm. Village elders report that the creek appears to go dry in the winter months. However, with snow cover, there are commonly small flows present under the snow pack or in the gravel bed of streams. Verification of winter flows should be conducted.

Imnakuk Creek: Analysis of the Imnakuk Creek indicates the estimated size of the drainage basin is 4012 acres. Mean annual flow is estimated to be 4,027 gpm. Average flows for April and June are 70 gpm and 12,870 gpm, respectively. Sheet 6, located in Appendix A, shows the drainage basin and monthly flow estimates.

Two visual estimates and simple flow test measurements were conducted at the mouth and approximately ¼ mile upstream of the mouth. On September 19th, 2005, Engineers performed a flow test and estimated the river to flow between 1,800 and 2,700 gpm. The

Imnakuk Creek

drainage channel appeared to be low, with evidence of flooding higher on the bank.

Kivalina River: Refer to section 2.2.5 for information on the Kivalina River Basin

2.3.6 Other Information: Lake Volumes, Snow Pack Depth, Precipitation

The information presented in 2.1.6 applies towards Imnakuk Bluff. No other surface or ground water studies have been completed near the Imnakuk Bluffs site.

2.4 TATCHIM ISUA

Existing reports identify potential water resources for Tatchim Isua including the Kivalina River, Asikpak River, and three unnamed creeks near the project site. Infiltration galleries or surface water intakes within either river may be considered for water sources. Data that pertains to Tatchim Isua water resources is included below.

2.4.1 Existing Geotechnical and Groundwater Information

Geotechnical Investigations of Simiq, Tatchim Isua, and Imnakuk Bluff, by Shannon and Wilson, (2006) (final report on drilling results):

Eight test holes were drilled in late summer 2005 at the Tatchim Isua Site, ranging from 8 to 21 feet in depth. The drilling program did not yield any indications of ground water at the site. Ice rich soil, with silts, sands, clay and some gravel was encountered. The test holes generally encounter frozen gravels underlain by bedrock. However, on the lower bench of the site, ice rich soils were encountered.

2.4.2 USGS Topographic and Geophysical Maps

USGS, Noatak, Alaska 67162-A1-TF-250 shows Tatchim Isua as an elevated site, sloping towards the Chukchi Sea.

Reconnaissance geologic mapping has been published at a scale of 1:63,360 by the USGS for the Noatak C5, D5, D6 and D7 Quadrangles.

2.4.3 Other Surface and Ground Water Investigations within Study Area

The information presented in 2.1.6 applies towards this site. No other surface or ground water studies have been completed near the Tatchim Isua site.

2.4.4 Aerial Photography

The only available photography of this site is a 1978 USGS color infrared (CIR) photographs (five photographs pertain to Tatchim Isua). There has been no previous analysis of the photographs.

2.4.5 Discharge Data of Local Streams

There is no current discharge data on the Asikpak River or other local streams pertaining to the Tatchim Isua site. However, a sanitary survey conducted in May 2004 by ASCG Incorporated includes water samples of the Wulik River. In addition, Travis Peterson Environmental Consulting (Peterson) is currently working directly for NANA to complete water quality studies of the Wulik River. The Peterson report focus on runoff quality from the Red Dog Mine, and compares the data to the baseline water quality data that was generated during environmental studies of the mine site. At this time, the Peterson report is not complete.

If the Tatchim Isua site is selected as a relocation site, there are a series of creeks located within and surrounding the village site that could be considered as water sources. The creeks include: the Asikpak River, TIUNC #1, TIUNC #2, and TIUNC #3. The drainage basin and discharge data have been estimated for potential intake locations.

Asikpak River: Based on a water intake located close to the basin, the estimated size of the drainage basin is 55,872 acres. Mean annual flow is estimated to be 125.0 cfs. Average flows for April and June are 2.2 cfs and 399.4 cfs, respectively. Sheet 10, located in Appendix A, shows the drainage basin and monthly flow estimates.

TIUNC #1: Analysis of the TIUNC #1 indicates the estimated size of the drainage basin is 454 acres. Mean annual flow is estimated to be 456 gpm. Average flows for April and June are 8 gpm and 1,458 gpm, respectively. Sheet 7, located in Appendix A, shows the drainage basin and monthly flow estimates.

On September 19th, 2005, visual estimates and simple flow test measurements were conducted near the mouth. An estimate for flow is 60 gpm. Village elders report that the creek appears to go dry in the winter months. However, with snow cover, there are commonly small flows present under the snow pack or in the gravel bed of streams. Verification of winter flows should be conducted.

TIUNC #2: Analysis of the TIUNC #2 indicates the estimated size of the drainage basin is 830 acres. Mean annual flow is estimated to be 834 gpm. Average flows for April and June are 15 gpm and 2,664 gpm, respectively. Sheet 8, located in Appendix A shows the drainage basin and monthly flow estimates.


TIUNC #2, Tatchim Isua

Visual estimates and a simple flow test measurement were conducted near the creek mouth. An estimate for flow on September 19th was 400 gpm. Village elders report that the creek appears to go dry in the winter months. However, with snow cover, there are commonly small flows present under the snow pack or in the gravel bed of streams. Verification of winter flows should be conducted.


TIUNC #3, Tatchim Isua

TIUNC #3: Analysis of the TIUNC #3 indicates the estimated size of the drainage basin is 1,080 acres. Mean annual flow is estimated to be 1,085 gpm. Average flows for April and June are 19 gpm and 3,466 gpm, respectively. Sheet 9, located in Appendix A, shows the drainage basin and monthly flow estimates.

Visual estimates and simple flow test measurements were conducted near the mouth. An estimate for flow on September 19th was 670 gpm. Village elders report that the creek appears to go dry in the winter months. However, with

snow cover, there are commonly small flows present under the snow pack or in the gravel bed of streams. Verification of winter flows should be conducted.

2.4.6 Other Information: Lake Volumes, Snow Pack Depth, Precipitation

No other surface or ground water studies have been completed near the Tatchim Isua site.

2.5 KINIKTUURAQ

Existing reports identified the Wulik River as the only potential community water resource for this site. There are no other surface water sources that have been considered for Kiniktuuraq. Ground water has been investigated for the site, with one test well yielding saline ground water. Data that pertains to Kiniktuuraq water resources is included below.

2.5.1 Existing Geotechnical and Groundwater Information

Reconnaissance Geotechnical Investigation, Kivalina Relocation by R&M (2000): The investigation included 29 test borings and samples in the areas of Kuugrauq, Igrugaivik, and Kiniktuuraq locations. Test borings were shallow, ranging in depth from 11 to 26 feet.

Groundwater was encountered while drilling in six test borings. Generally, borings that encountered groundwater were located along the sand and beach within proximity of the Wulik River. Ground water depths ranged from 0.5 to 9 feet. The report concluded that there was underlying permafrost, and the water level represents a perched condition that is highly influence by seasonal variations and the ground thermal state. The report did not identify any surface or groundwater resources for Kiniktuuraq.

Phase II Engineering Services, Geotechnical Investigations by R&M (2002):

The investigations included two 25-feet borings at the Kiniktuuraq site, and borrow site borings at Igrugaivik and Kuugruaq. A test well was also drilled along the Wulik River, at the Igrugaivik site.

Soil test borings at Kiniktuuraq did not yield groundwater. A separate water well test hole located at Igrugaivik was advanced to 41 feet. This well was abandoned due to the high salinity content of the water and soil.

The report concluded that it might be difficult to find a location for a water well as it appears that most or all of the unfrozen (unbounded) soils containing significant amounts of groundwater may have high salinity content near the proposed village sites.

2.5.2 USGS Topographic and Geophysical Maps

USGS, Noatak, Alaska 67162-A1-TF-250 shows contour information, streams, lakes, wetlands, and lakes within the region of Kivalina. From the mapping, the most feasible water resource for the Kiniktuuraq site is the Wulik River.

Reconnaissance geologic mapping has been published at a scale of 1:63,360 by the USGS for the Noatak C5, D5, D6 and D7 Quadrangles.

2.5.3 Other Surface and Ground Water Investigation within Study Area

The information presented in 2.1.3 applies to Kiniktuuraq. No other surface or ground water studies have been completed near the Kiniktuuraq site.

2.5.4 Aerial Photography

Color infrared (CIR) photographs were obtained to help determine potential water sources. These photographs were taken in 1978. Two photographs pertain to the Kiniktuuraq site and potential surrounding water sources.

In addition to the CIR photographs, the following color photographs were obtained of Kiniktuuraq: one Kiniktuuraq photo is at a scale of 1 inch=1,000 feet (taken in 2000), and two photos are at a scale of 1 inch=800 feet (taken in 1997).

2.5.5 Discharge Data of Local Streams

The information presented in 2.1.5 includes discharge data for the Wulik River. There are no other streams considered for Kiniktuuraq.

2.5.6 Other Information: Lake Volumes, Snow Pack Depth, Precipitation

The information presented in 2.1.6 applies towards this site. No other surface or ground water studies have been completed near the Kiniktuuraq site.

2.6 IGRUGAIVIK

Existing reports identified the Wulik River as the only potential community water resource for this site. There are no other surface water sources that have been considered for Igrugaivik. Ground water has been investigated at this site with one test well yielding saline ground water. Data that pertains to Igrugaivik water resources is included below.

2.6.1 Existing Geotechnical and Groundwater Information

Geophysical Groundwater Source Investigation, Kivalina Alaska, by Golder Associates (1997)

Several geophysical survey methods were used to investigate the electrical properties of the subsurface at Igrugaivik and other sites. The electrical properties of the subsurface are related to its water bearing potential.

Geophysical surveys included RI lines and TDEM soundings. Four RI lines helped to determine if a possible thaw bulb at the site exists. There was no indication of a shallow thaw bulb beneath line WR-3, and the data could not determine whether this possible thawed layer is at the bottom of permafrost or within the permafrost zone. The WR-4, WR-5, and WR-6 lines showed that the boundary of the thaw bulb corresponds with the contact between the abandoned floodplain, the old terrace, and upland frozen silts.

TDEM sounding was used to determine the depth of the permafrost on the drained lake deposits. Low resistivity values of the bottom layer indicate silty and/or clayey material or possible saline groundwater (not suitable for a water supply well).

The report recommended drilling a test well near the abandoned floodplain deposits, with an alternative test well location close to the Wulik River. However, test results in future programs yielded saline ground water at Igrugaivik.

The report also cites that water wells drilled near the school by the Bureau of Indian Affairs produced only salt water. These wells were abandoned. One well was drilled to a depth of 215 feet and encountered unconsolidated sediments ranging in size from clay to gravel.

Reconnaissance Geotechnical Investigation, Kivalina Relocation by R&M (2000). The investigation included 29 test borings and samples in the areas of the Kuugruaq, Igrugaivik, and Kiniktuuraq locations. Test borings were shallow, ranging in depth from 11 to 26 feet. Groundwater was encountered while drilling in six test borings. Generally, borings that encountered groundwater were located along the sand and beach within proximity of the Wulik River. Ground water depths ranged from 0.5 to 9 feet.

The report concluded that there was underlying permafrost, and the water level represents a perched condition that is highly influenced by seasonal variations and the ground thermal state. The report did not identify any surface or groundwater resources for Igrugaivik.

Phase II Engineering Services, Geotechnical Investigations by R&M (2002). The investigation included several borrow site and test borings at the Igrugaivik site. A test well was also drilled along the Wulik River at the Igrugaivik site.

The water well test hole located was advanced to 41 feet where the well was abandoned due to the high salinity content of the water and soil.

The report concluded that it may be difficult to find a location for a water well as it appears that most or all of the unfrozen (unbounded) soils containing significant amounts of groundwater may contain saline near the proposed village sites.

Most existing geotechnical information pertains to shallow drilling that does not indicate potential water sources for an annual supply to a new village.

2.6.2 USGS Topographic and Geophysical Maps

USGS, Noatak, Alaska 67162-A1-TF-250 shows contour information, streams, lakes, wetlands, and lakes throughout the Kivalina area. From the mapping, the most feasible surface water resource for the Igrugiavik site is the Wulik River.

Reconnaissance geologic mapping has been published at a scale of 1:63,360 by the USGS for the Noatak C5, D5, D6 and D7 Quadrangles.

2.6.3 Other Surface and Ground Water Investigations within Study Area

The information presented in 2.1.3 applies to Igrugiavik. No other surface or ground water studies have been completed near the site.

2.6.4 Aerial Photography

Aerial photographs of the project area were obtained and interpreted by Golder for the 1997 report. Color infrared (CIR) photographs were obtained to help determine potential water sources. Two photographs pertain to the site.

In addition to the CIR photographs, the following color photographs were obtained of this site: Three photos of Igrugaivik are at a scale of 1 inch=800 feet (taken in 1997).

2.6.5 Discharge Data of Local Streams

The information presented in 2.1.5 includes flow estimates for the Wulik River. There are no other streams considered for Igrugiavik.

2.6.6 Other Information: Lake Volumes, Snow Pack Depth, Precipitation

The information presented in 2.1.6 applies towards this site. No other surface or ground water studies have been completed near the Igrugaivik site.

2.7 KUUGRUAQ

Existing reports identified the Wulik River as the only potential community water resource for this site. There are no other surface water sources that have been considered for Kuugruaq. Ground water has been investigated at Igrugaivik, which is in close proximity to Kuugruaq, with one test well yielding saline ground water. Data that pertains to Kuugruaq water resources is included below.

2.7.1 Existing Geotechnical and Groundwater Information

Geophysical Groundwater Source Investigation, Kivalina Alaska, by Golder Associates (1997) Golder Associates preformed geophysical surveying at the Kuugruaq site consisting of RI, EM34, and TDEM surveying, and recommended test well drilling for sites.

The RI surveying was used to determine a thaw bulb associated with the abandoned floodplain, and its relative configuration. Results suggest that a deep thaw bulb exists at the intersection of the WR-1 and WR-2, extending towards the Wulik River to the north and west. The elevated terrace deposits along the south half of WR-2 and the abandoned floodplain deposits at the eastern end of WR-1 are interpreted to be permafrost zones.

EM34 results support the RI data that indicates the boundary of the thaw bulb occurs at the contact between the old terrace and floodplain deposits.

In order to determine the depth to the base of the permafrost, TDEM soundings were made on the elevated terrace deposits. The low resistivity values of the bottom layer are commonly associated with silty and/or clayey material or possible saline groundwater, none of which would be suitable targets for a water supply well. There may be thin frozen zones within this layer (less than 60 feet thick) which is too thin to be detected by the TDEM method.

The report cites that water wells drilled near the school by the Bureau of Indian Affairs produced only salt water. These wells were abandoned. One well was drilled to a depth of 215 ft and encountered unconsolidated sediments ranging in size from clay to gravel.

Reconnaissance Geotechnical Investigation, Kivalina Relocation by R&M (2000). The investigation included 29 test borings and samples in the areas of the Kuugruaq, Igrugaivik, and Kiniktuuraq locations. Test borings were shallow, ranging in depth from 11 to 26 feet. Ground water was encountered while drilling in six test borings. Generally, borings that encountered groundwater were located along the sand and beach within proximity of the Wulik River. Ground water depths ranged from 0.5 to 9 feet.

The report concluded that there was underlying permafrost, and the water level represents a perched condition that is highly influenced by seasonal variations and the ground thermal state. The report did not identify any surface or groundwater resources for Kuugruaq.

Phase II Engineering Services, Geotechnical Investigations by R&M (2002).

The investigation included several borrow sites and test borings at the Igrugaivik site. A test well was also drilled along the Wulik River at the Igrugaivik site. Kuugruaq site is in close proximity to Igurgaivik and soils conditions in the lower wetlands areas may be similar.

The water well test hole located was advanced to 41 feet at Igrugaivik, where the well was abandoned due to the high salinity content of the water and soil.

The report concluded that it may be difficult to find a location for a water well as it appears that most or all of the unfrozen (unbounded) soils containing significant amounts of groundwater may contain saline near the proposed village sites.

Most existing geotechnical information pertains to shallow drilling that does not indicate potential water sources for an annual supply to a new village.

2.7.2 USGS Topographic and Geophysical Maps

USGS, Noatak, Alaska 67162-A1-TF-250 shows contour information, streams, lakes, wetlands, and lakes throughout the Kivalina area. From the mapping, the most feasible surface water resource for the Kuugruaq site is the Wulik River.

Reconnaissance geologic mapping has been published at a scale of 1:63,360 by the USGS for the Noatak C5, D5, D6 and D7 Quadrangles.

2.7.3 Other Surface and Ground Water Investigations within Study Area

The information presented in 2.1.3 applies to Kuugruaq. No other surface or ground water studies have been completed near the site.

2.7.4 Aerial Photography

Aerial photographs of the project area were obtained and interpreted by Golder for the 1997 report. Color infrared (CIR) photographs were obtained to help determine potential water sources. Three photographs pertain to the site.

In addition to the CIR photographs, the following color photographs were obtained of this site: Three photos of Kuugruaq are at a scale of 1 inch=800 feet (taken in 1997).

2.7.5 Discharge Data of Local Streams

The information presented in 2.1.5 includes flow estimates for the Wulik River. There are no other streams considered for Kuugruaq.

2.7.6 Other Information: Lake Volumes, Snow Pack Depth, Precipitation

The information presented in 2.1.6 applies towards this site. No other surface or ground water studies have been completed near the Kuugruaq site.

3.0 WATER SAMPLING/MONITORING PLAN

3.1 KIVALINA RIVER

Water sampling on the Kivalina River should be performed quarterly and should test for the parameters shown in Section 5.1. Spring water sampling should be timed to coincide with spring run-off. Supplementary sampling should also take place in the summer, fall, and during the

winter. Furthermore, the limits of salt water intrusion due to storm or tidal action should be tested and documented.

3.2 WULIK RIVER

Adequate information on water quality from the Wulik River already exists and no testing is necessary if the existing intake location is retained. However, if new inland sites are developed, water quality sampling at the new sties should be conducted. The sampling should follow the parameters discussed for the Kivalina River.

3.3 SMALL CREEKS AND STREAMS

Small creeks and streams should also be tested on a quarterly basis. Salt water intrusion monitoring is not necessary on these waterways. Of the small creeks and streams measured in September 2005, only Imnakuk Creek and the Asikpak River showed potential for year around flow for the water needs of a new town site. It's speculated by the village elders that the small streams around Imnakuk Bluff go dry in the winter. However, Imnakuk Creek should still be measured for potential use in filling a reservoir. Monthly stream gauging will also allow calculations for storage to be developed if the small creeks go dry in the winter time. Surface storage is commonly used to bridge periods of low flow.

In addition to water quality sampling, stream gauging should be conducted for one year via monthly gauging and average daily readings. The gauging will be performed with a pressure sensor that rests on the bottom of the stream bed. The sensor will read the water pressure which can then be used to calculate water depth, and records this depth every twelve hours. Streams will also need to be gauged and measured accurately during the installation of the sensors. With that information, the flow of the stream can be determined throughout the year. This will also indicate if the stream freezes solid during the winter.

The sensor should be placed in the deepest section of the stream and, whenever possible, a small weir should be built. A weir is not required for the sensor to work or data to be collected, but the layout of the stream and streambed will dictate that need.

The data receiver is located in a weather proof box placed approximately 75 feet from the stream and elevated on a stake. Although the receiver is capable of holding data for more than one year, it is recommended that the data be downloaded at a minimum of every 4 to 6 months in the event of equipment failure.

4.0 DATA GAPS BY VILLAGE SITE

4.1 GROUND WATER

Data gaps for water resource information exist at all sites except the existing Kivalina village site. For all sites except Kivalina there are no deep water well test holes. Previous reports indicate that groundwater could supply a year-round water source if found in sufficient quantity and quality. Exploratory geophysics and drilling conducted in the site vicinity suggest that thaw bulbs along the Wulik or Kivalina Rivers may be the most likely source of groundwater in the area (Golder 1997; R&M 2002). However, only two test wells have been drilled to date, which yielded saline groundwater from a 41 feet deep hole drilled at a location approximately 1 mile inland from Kivalina Lagoon (R&M 2002), and salt water in the 215 feet deep well drilled at

Kivalina. The source of the saline groundwater may be a subsurface intrusion effect or surface infiltration during high tides and storm surges.

Review of infrared aerial photos did not indicate any fault lines or ground water resources near potential village sites. In addition, all sites are located near the coast. Based on the lack of success in drilling water wells in the region, and the risk of salt water intrusion of any deep water well, further drilling is not advised for the area. See Section 5.0 for further information.

4.2 SURFACE WATER:

For surface water sources, the following data gaps exist by site.

4.2.1 Kivalina, Kiniktuuraq, Igrugaivik, and Kuugrauq

All of these villages propose to use the Wulik River as a water source. The extent of salt water intrusion due to high tide, or storm surge is unknown at this time. However, based on preliminary data, a 16.1 foot high surge could be expected during a 100 year flood event. There is not adequate topography information to estimate the extent of storm surge in this report. The extent will have to be verified during field work. The Kivalina River is expected to have the same elevation storm surge; once again there is not adequate topography information to estimate the extent of storm surge in this report.

4.2.2 Simiq

The Simiq site could use either the Wulik or Kivalina Rivers. While the Wulik River does not have data gaps, the Kivalina River has significant data gaps for measured flow, limits of salinity influence, and water quality data. Section 3 includes recommended testing for the Kivalina River.

4.2.3 Tatchim Isua

Village elders report that the unnamed creeks near Tatchim Isua go dry during winter months. Calculations show that TIUNC #1 has flow rates that could average as low as 8 gpm in April. TIUNC #2 and #3 were computed to have higher April flows of 14.5 gpm for TIUNC #2, and 19 gpm for TIUNC #3. To confirm winter flow rates, daily flow tests should be measured for TIUNC #2 and TIUNC #3. Quarterly water quality tests should be performed from TIUNC #2 and TIUNC #3. Quarterly tests should also be performed for Asikpak River. TIUNC #1 is not recommended for further study due to the small drainage basin of 454 acres.

Section 3 includes recommended testing for Tatchim Isua streams.

4.2.4 Imnakuk Bluff

Potential water sources for Imnakuk Bluff include IBUNC #1 and #2, Imnakuk Creek, and the Kivalina River. Village elders report that the unnamed creeks located near Imnakuk Bluff go dry during winter months. Calculations show that IBUNC #1 has flow rates that could average as low as 5 gpm in April. IBUNC #2 was computed to have higher April flows of 15.3 gpm. Further analysis of IBUNC #1 is not recommended due to its small drainage basin of 301 acres, and its low flow rates. Further analysis is recommended for the remaining creeks.

For IBUNC #2 and Imnakuk Creek, daily water flow monitoring is recommended for a period of 1 year. In addition, quarterly water quality sampling is recommended.

For the Kivalina River, quarterly water quality sampling is needed to confirm seasonal variations in water quality. In addition, an infiltration area should be identified for further investigates as a possible water intake site. In order to test for a potential infiltration site, the extent of salt water intrusion due to tidal influences should be documented.

5.0 RECOMMENDATIONS FOR STAGE II FIELD INVESTIGATIONS

The recommendation of this report is to utilize surface water sources for all alternatives, for a number of reasons.

First, no community in the greater area has a proven subsurface water resource, and as such, the immediate area around Kivalina, including all of the alternative sites, is unlikely to yield a usable subsurface water source. The Red Dog Mine and the communities of Kotzebue, Shishmaref, and Point Hope all utilize surface water sources based on their inability to identify usable subsurface water for drilling.

Second, test holes drilled in the immediate area around Kivalina yielded only brackish water at depth, and as such, there is no indication that drilled wells will result in any usable subsurface water source. A test well drilled at Igrugaivik into a river thaw bulb encountered saline water.

Third, the geology of the Kivalina area also points to an absence of subsurface water sources. The area in which all of the alternative sites are located is either a river delta on a coastal plain, inundated with brackish water, or located on bedrock. Any subsurface water sources in this area located on a spit or within the river delta are also subject to salt water contamination during sea storms in which the tides are pushed inland by storm surges. This salt water contamination can reach ground water through recharge. Two sites, Tachim Issua and Imnakuk Bluffs, are likely located where shallow gravels or frozen soils overlie bedrock. The likelihood of finding a subsurface water supply with enough year around capacity to serve a community is low.

In summary, the drilling of wells to establish a surface water source is not feasible for Kivalina, and is not likely to yield positive results based on an analysis of regional data. A proven subsurface water source has not yet been identified in the Kivalina area.

Recommendations for further field investigations of surface water are described below.

The following list shows the recommended water sources for further testing.

Water quality sampling and flow testing for Asikpak River and Imnakuk Creek.

Water quality sampling and flow testing for Kivalina and Wulik Rivers. Water quality sampling and limit of tidal salt water intrusion for the Kivalina and Wulik Rivers are also recommended.

5.1 WATER QUALITY TESTING:

As described in Section 3 and Section 4, the selected village site may require quarterly sampling of the surface water streams. The sampling will be conducted quarterly to coincide with the seasonal water quality changes. Sampling includes onsite testing for temperature, pH, turbidity, dissolved oxygen, conductivity, carbon dioxide, ammonia, and hydrogen sulfide. Sampling also includes laboratory testing for primary inorganic chemicals, volatile organic compounds, secondary chemicals, and specialty treatment parameters. In addition to the detailed shown

below, onsite sodium and conductivity testing are required on the Kivalina River to document the limits of salt water intrusion due to storm surge. A detailed summary is included below:

On Site Testing Requirements

Ammonia (as Nitrogen) Hydrogen Sulfide

Carbon Dioxide pH

Conductivity Temperature

Dissolved Oxygen Turbidity

Laboratory Testing Requirements

Alkalinity as CaCo3

Aluminum (s)

Arsenic (p)

Bromide

Calcium

Chloride (s)

Chlorine Demand

Color, True and Apparent (s) (48 hr. HT)

Dissolved Organic Carbon

Fluoride (p & s)

Hardness as CaCO3

HAA5 Formation Potential

Iron (s)

Langlier Index (includes pH, TDS, Alkalinity) (s)

Lead

Magnesium

Manganese (s)

Nitrate (p)

Nitrite (p) (48 hr. HT)

Organic Constituents (UV 254) (48 hr. HT)

Sodium (s)

Sulfate (s)

Total Dissolved Solids

Total Organic Carbon

TTHM Formation Potential

Turbidity (48 hr. HT)

Zinc (s)

Volatile Organic Compounds 524.2

Primary Inorganics

- Antimony 200.8
- Barium 200.8
- Cadmium 200.8
- Selenium 200.8
- Mercury 200.8
- Beryllium 200.8
- Chromium 200.8
- Thallium 200.8
- Nickel 200.8
- Cyanide SM4500

Secondary Chemical Contaminants

- Silver 200.8
- Copper 200.8
- Foaming Agents SM5540 (48 hr. HT)
- Odor SM2150 (48 hr. HT)

Total Coliform P/A SM 9223 (30 hr. HT)

(p) Part of 18 AAC Primary Inorganics List

(s) Part of 18 AAC Secondary Chemical Contaminants List

5.2 STREAM GAUGING:

As described in Section 3, stream gauging should be conducted for one year via monthly gauging and average daily readings. Stream gauging is only required on the local drainage basins listed above.

5.3 SITE SKETCHES:

For those sites that have stream gauging, a general sketch of a potential water intake area should be developed which shows a general site plan, and possible intake configuration. This sketch should be generated based on visual observations of the site.

Appendix A – Maps and Runoff Calculations

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M:\

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ASIKPAK RIVER

TIUNC #1

TIUNC #2

TATCHIM ISUA

TIUNC #3

IMNAKUK CREEK

IMNAKUK BLUFF

IBUNC #1

IBUNC #2

KIVALINA RIVER

SIMIQ

WULIK RIVER

CHUKCHI SEA

RAW WATER INTAKE POINT

KUUGRUAQ

INTAKE POINT

R&M 2002 TEST WELL 14

KIVALINA

IGRUGAIVIK

KINIKTUURAQ

LEGEND

RELOCATION SITE

SCALE: 1 INCH = 1 MILE

ENGINEERING/SURVEYING & LANDSCAPE ARCHITECTURE
Tryck Nyman Hayes, Inc.
911 W. 8TH AVENUE, SUITE 300
ANCHORAGE, AK 99501-3407
TEL: (907) 279-0563 · FAX: (907) 278-7979

FIGURE 1
KIVALINA RELOCATION SITE MAP

SHEET 1 OF 1

FILE NO. 03003.007

XREF's/IMAGES USED FOR THIS DWG:

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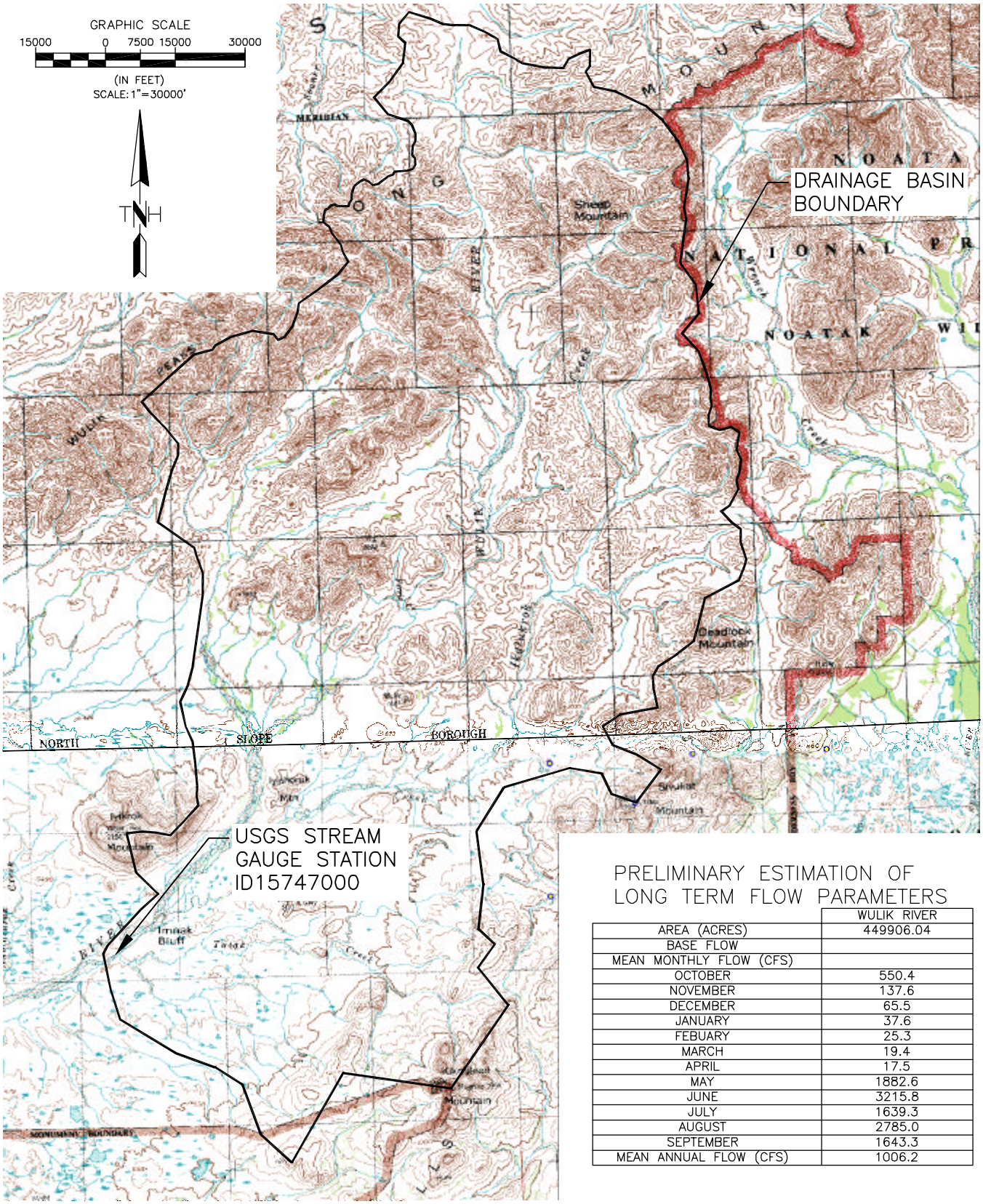

PRELIMINARY ESTIMATION OF LONG TERM FLOW PARAMETERS

	WULIK RIVER
AREA (ACRES)	449906.04
BASE FLOW	
MEAN MONTHLY FLOW (CFS)	
OCTOBER	550.4
NOVEMBER	137.6
DECEMBER	65.5
JANUARY	37.6
FEBUARY	25.3
MARCH	19.4
APRIL	17.5
MAY	1882.6
JUNE	3215.8
JULY	1639.3
AUGUST	2785.0
SEPTEMBER	1643.3
MEAN ANNUAL FLOW (CFS)	1006.2

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WULIK RIVER STREAM GAUGE BASIN

USGS GAGING STATION
STATION ID: 15747000

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DRAWN BY: RH	PROJECT No: 03003.007
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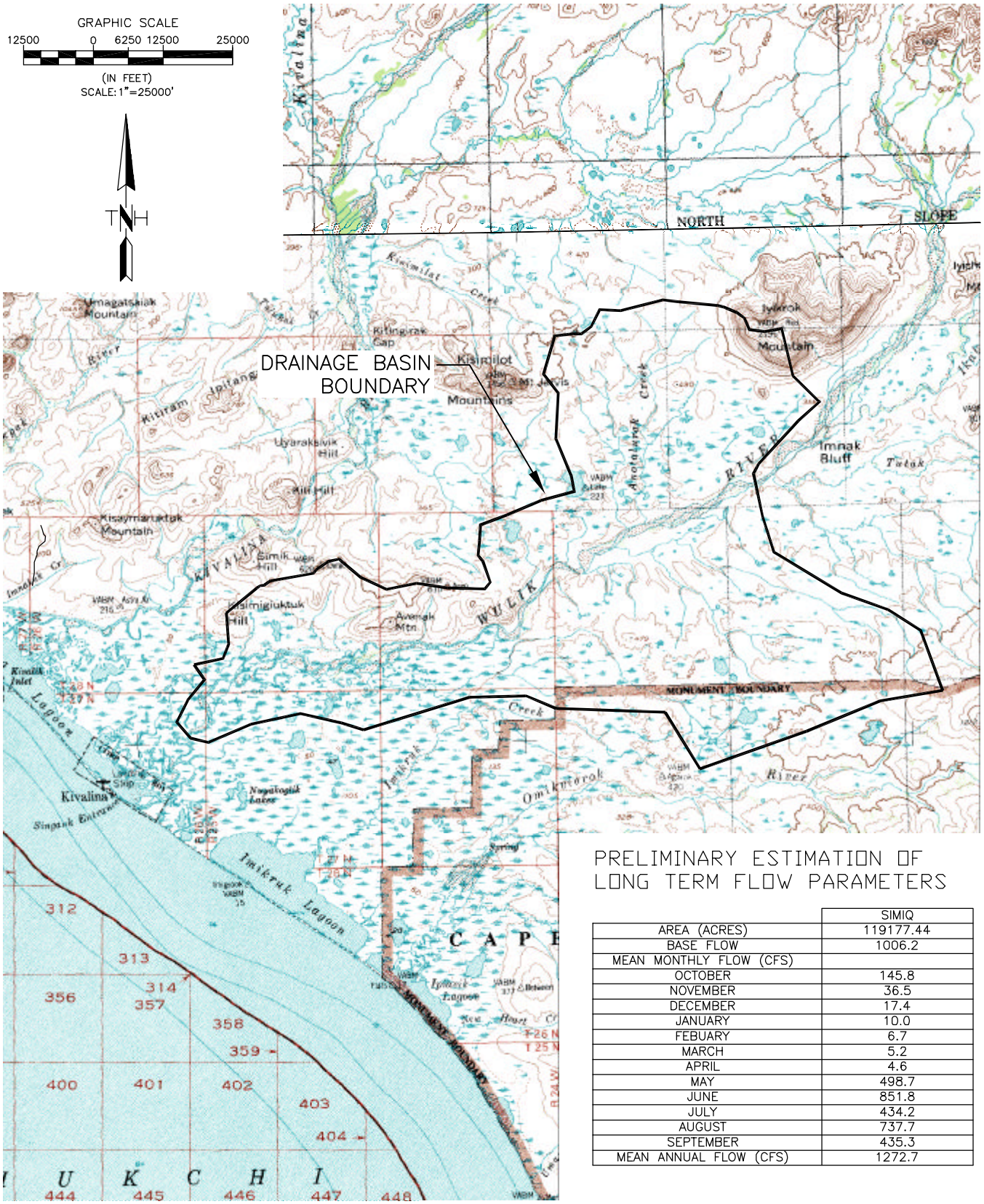

PRELIMINARY ESTIMATION OF LONG TERM FLOW PARAMETERS

	SIMIQ
AREA (ACRES)	119177.44
BASE FLOW	1006.2
MEAN MONTHLY FLOW (CFS)	
OCTOBER	145.8
NOVEMBER	36.5
DECEMBER	17.4
JANUARY	10.0
FEBUARY	6.7
MARCH	5.2
APRIL	4.6
MAY	498.7
JUNE	851.8
JULY	434.2
AUGUST	737.7
SEPTEMBER	435.3
MEAN ANNUAL FLOW (CFS)	1272.7

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WULIK RIVER BASIN

KIVALINA, SIMIQ, KINIKTUURAQ
IGRUGAIVIK, KUURGRUAQ SITES

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DRAWN BY: RH	PROJECT No: 03003.007
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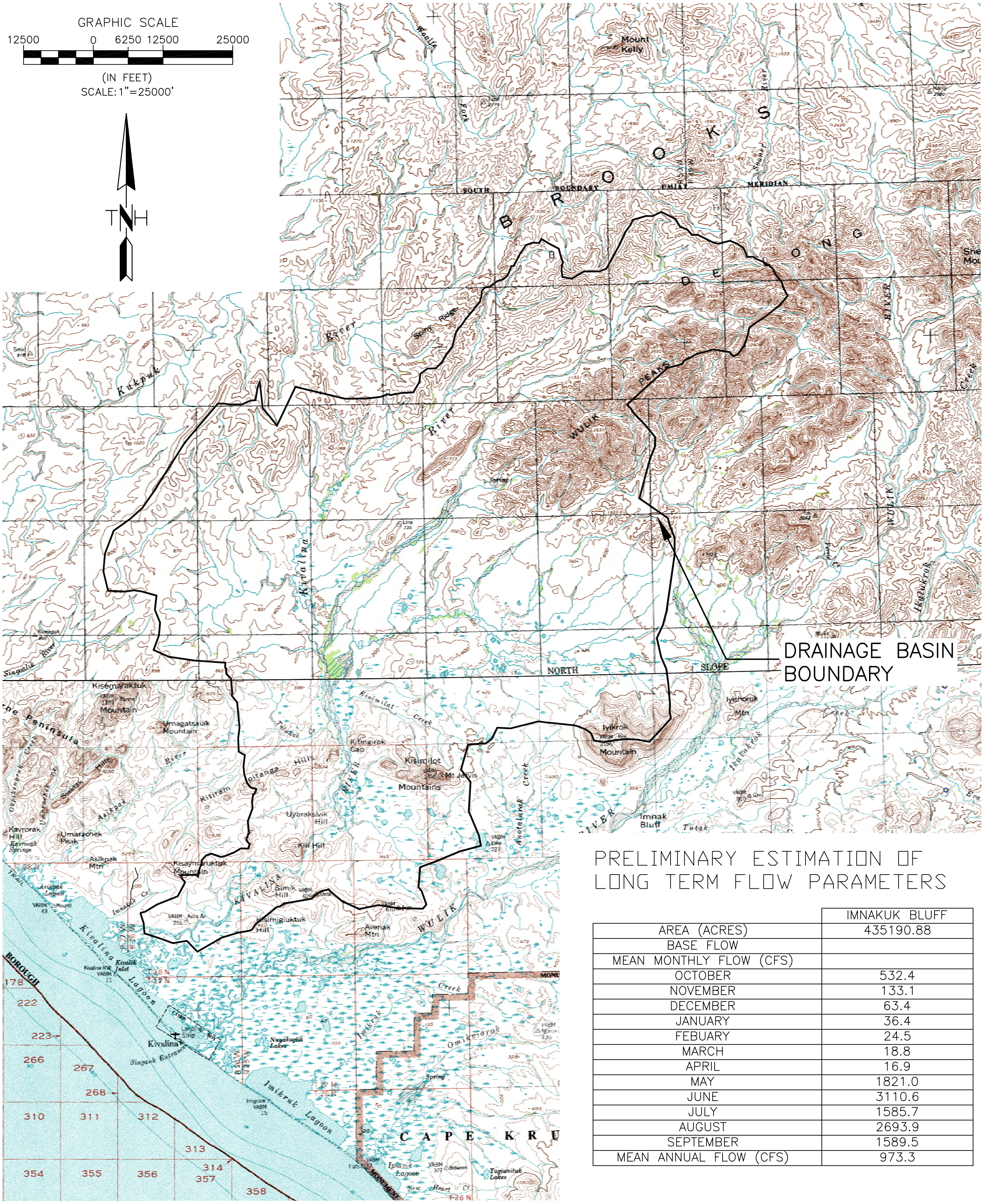

PRELIMINARY ESTIMATION OF LONG TERM FLOW PARAMETERS

	IMNAKUK BLUFF
AREA (ACRES)	435190.88
BASE FLOW	
MEAN MONTHLY FLOW (CFS)	
OCTOBER	532.4
NOVEMBER	133.1
DECEMBER	63.4
JANUARY	36.4
FEBUARY	24.5
MARCH	18.8
APRIL	16.9
MAY	1821.0
JUNE	3110.6
JULY	1585.7
AUGUST	2693.9
SEPTEMBER	1589.5
MEAN ANNUAL FLOW (CFS)	973.3

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KIVALINA RIVER BASIN

SIMIQ AND IMNAKUK SITES

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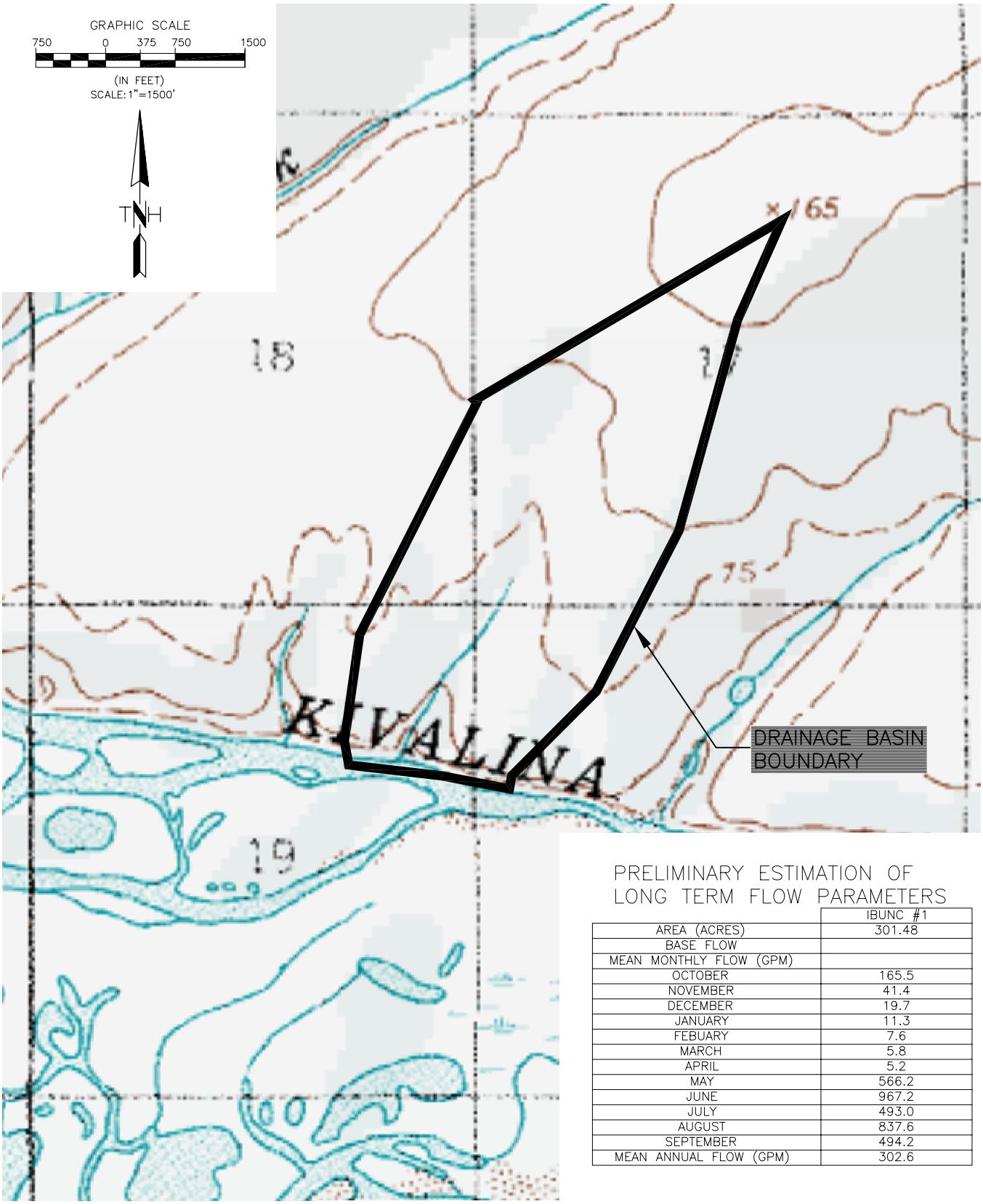

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PRELIMINARY ESTIMATION OF LONG TERM FLOW PARAMETERS

	IBUNC #1
AREA (ACRES)	301.48
BASE FLOW	
MEAN MONTHLY FLOW (GPM)	
OCTOBER	165.5
NOVEMBER	41.4
DECEMBER	19.7
JANUARY	11.3
FEBUARY	7.6
MARCH	5.8
APRIL	5.2
MAY	566.2
JUNE	967.2
JULY	493.0
AUGUST	837.6
SEPTEMBER	494.2
MEAN ANNUAL FLOW (GPM)	302.6

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ANCHORAGE, AK 99501-3497
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IBUNC #1 BASIN

IMNAKUK BLUFF SITE

DESIGN BY: RH	DATE: 03/23/06
DRAWN BY: RH	PROJECT No: 03003.007
SCALE: 1" = 1500'	REV. –
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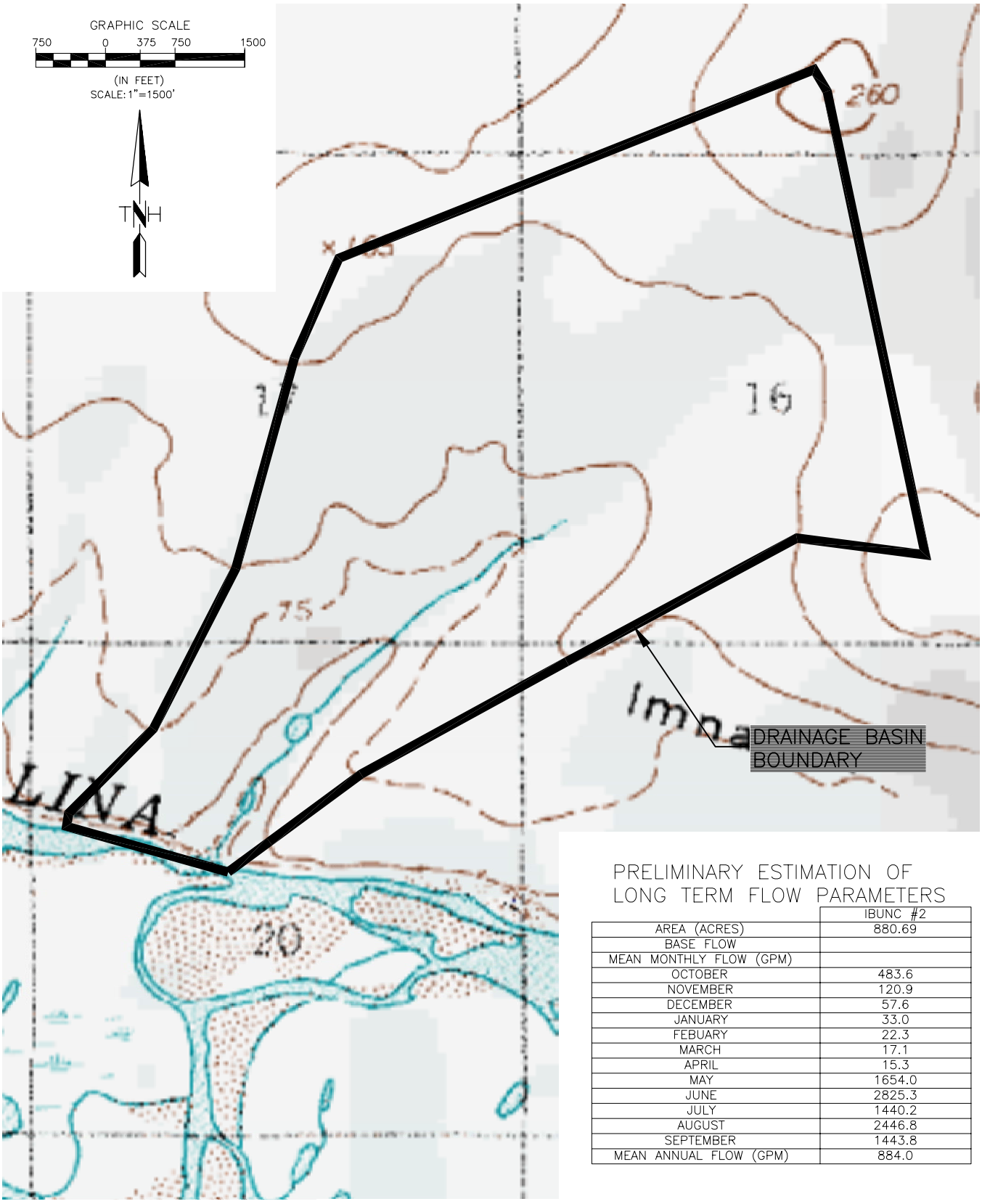
FIELD BOOK: –	SHEET 4 OF 10
GRID: –	



XREF's/IMAGES USED FOR THIS DWG:

PLOTTED: 08/17/06 TIME: 10:10 am

LAYER MGR: *.lay CTB FILE: *.ctb

DRAWING NAME: Small Drainage basin.dwg

PRELIMINARY ESTIMATION OF LONG TERM FLOW PARAMETERS

	IBUNC #2
AREA (ACRES)	880.69
BASE FLOW	
MEAN MONTHLY FLOW (GPM)	
OCTOBER	483.6
NOVEMBER	120.9
DECEMBER	57.6
JANUARY	33.0
FEBUARY	22.3
MARCH	17.1
APRIL	15.3
MAY	1654.0
JUNE	2825.3
JULY	1440.2
AUGUST	2446.8
SEPTEMBER	1443.8
MEAN ANNUAL FLOW (GPM)	884.0

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IBUNC #2 BASIN

IMNAKUK BLUFF SITE

DESIGN BY: RH	DATE: 03/23/06
DRAWN BY: RH	PROJECT No: 03003.007
SCALE: 1" = 1500'	REV. –
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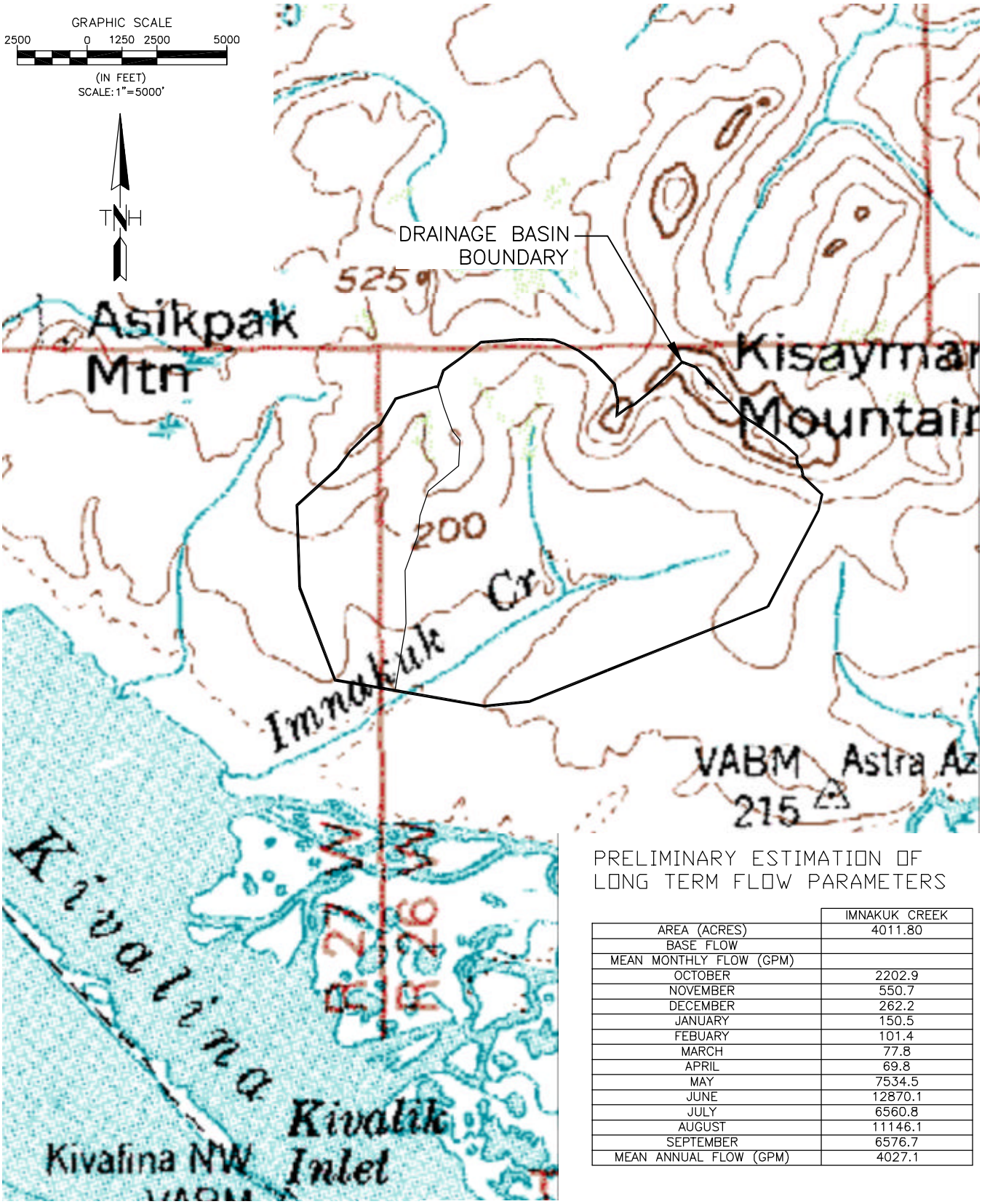
GRID: –	



PRELIMINARY ESTIMATION OF LONG TERM FLOW PARAMETERS

	IMNAKUK CREEK
AREA (ACRES)	4011.80
BASE FLOW	
MEAN MONTHLY FLOW (GPM)	
OCTOBER	2202.9
NOVEMBER	550.7
DECEMBER	262.2
JANUARY	150.5
FEBUARY	101.4
MARCH	77.8
APRIL	69.8
MAY	7534.5
JUNE	12870.1
JULY	6560.8
AUGUST	11146.1
SEPTEMBER	6576.7
MEAN ANNUAL FLOW (GPM)	4027.1

XREFs/IMAGES USED FOR THIS DWG:

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LAYER MGR: *.lay CTB FILE: *.ctb

DRAWING NAME: Big Drainage Basin.dwg

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IMNAKUK CREEK BASIN

IMNAKUK SITE

DESIGN BY: RH	DATE: 03/23/06
DRAWN BY: RH	PROJECT No: 03003.007
SCALE: 1" = 5000'	REV. –
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GRID: –	

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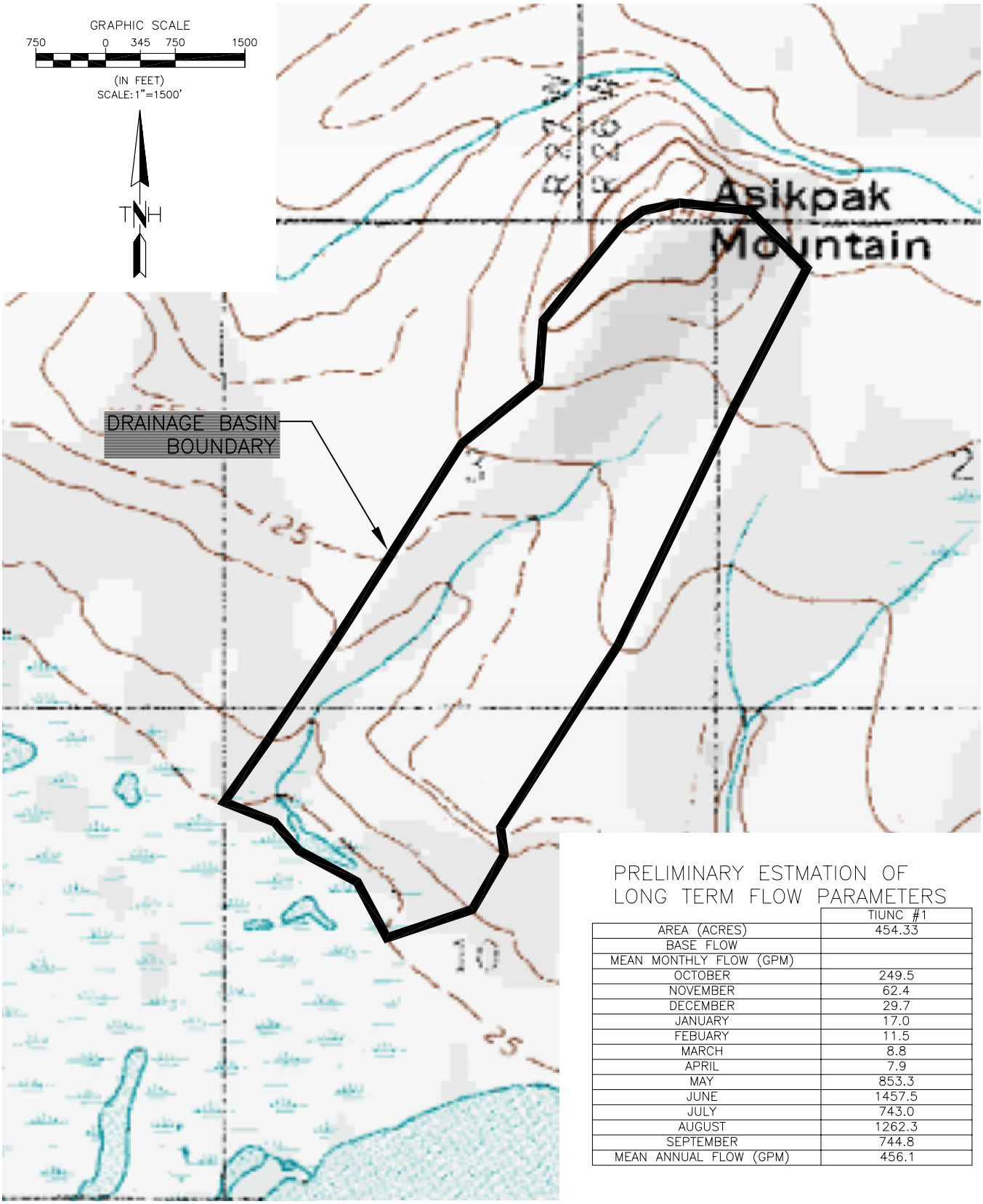
(IN FEET)
SCALE: 1"=1500'



PRELIMINARY ESTMATION OF LONG TERM FLOW PARAMETERS

	TIUNC #1
AREA (ACRES)	454.33
BASE FLOW	
MEAN MONTHLY FLOW (GPM)	
OCTOBER	249.5
NOVEMBER	62.4
DECEMBER	29.7
JANUARY	17.0
FEBUARY	11.5
MARCH	8.8
APRIL	7.9
MAY	853.3
JUNE	1457.5
JULY	743.0
AUGUST	1262.3
SEPTEMBER	744.8
MEAN ANNUAL FLOW (GPM)	456.1

XREF's/IMAGES USED FOR THIS DWG:

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LAYER MGR: *.lay CTB FILE: *.ctb

DRAWING NAME: Small Drainage basin.dwg

TNH
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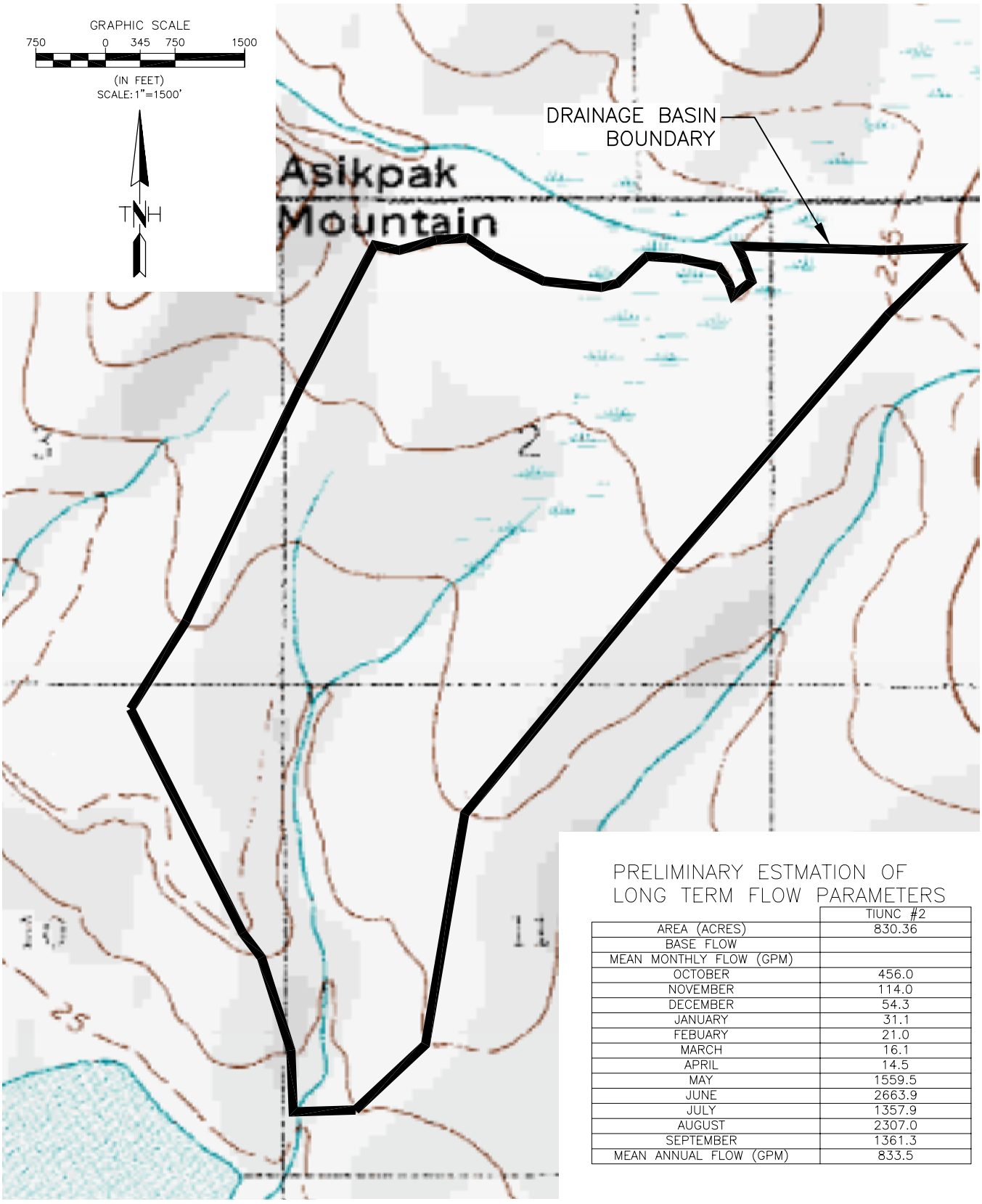
TIUNC #1 BASIN

TATCHIM ISUA SITE

DESIGN BY: RH	DATE: 03/23/06
DRAWN BY: RH	PROJECT No: 03003.007
SCALE: 1" = 1500'	REV. –
CAD DWG FILE: M:\03003.007Kivalina\WRP\Mapping\DrainageBasin	
FIELD BOOK: –	SHEET 7 OF 10
GRID: –	



PRELIMINARY ESTMATION OF LONG TERM FLOW PARAMETERS

	TIUNC #2
AREA (ACRES)	830.36
BASE FLOW	
MEAN MONTHLY FLOW (GPM)	
OCTOBER	456.0
NOVEMBER	114.0
DECEMBER	54.3
JANUARY	31.1
FEBUARY	21.0
MARCH	16.1
APRIL	14.5
MAY	1559.5
JUNE	2663.9
JULY	1357.9
AUGUST	2307.0
SEPTEMBER	1361.3
MEAN ANNUAL FLOW (GPM)	833.5

XREF's/IMAGES USED FOR THIS DWG:

PLOTTED: 08/17/06 TIME: 10:13 am

LAYER MGR: *.lay CTB FILE: *.ctb

DRAWING NAME: Small Drainage basin.dwg

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TIUNC #2 BASIN

TATCHIM ISUA SITE

DESIGN BY: RH	DATE: 03/23/06
DRAWN BY: RH	PROJECT No: 03003.007
SCALE: 1" = 1500'	REV. –
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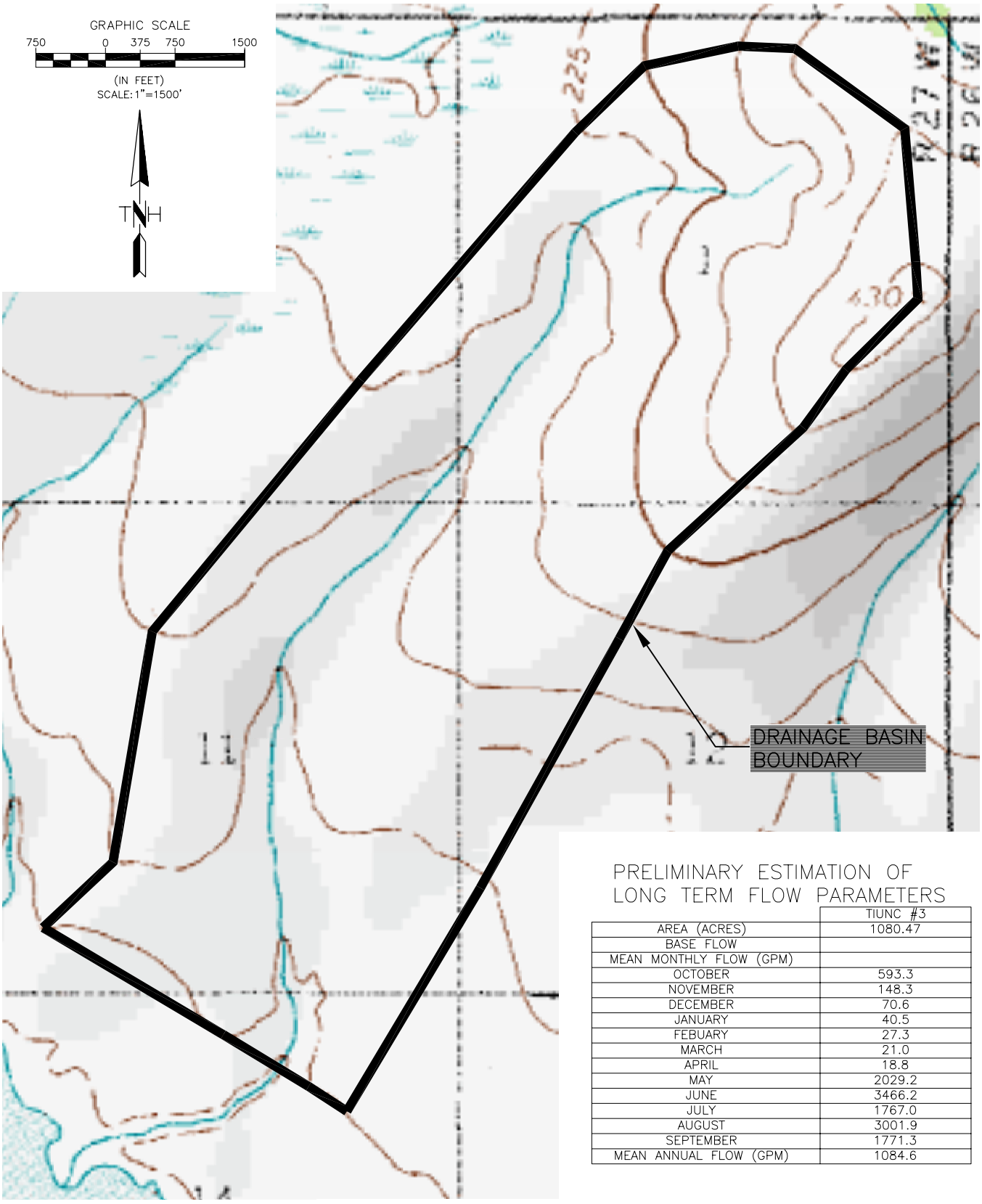
FIELD BOOK: –	SHEET 8 OF 10
GRID: –	



PRELIMINARY ESTIMATION OF LONG TERM FLOW PARAMETERS

	TIUNC #3
AREA (ACRES)	1080.47
BASE FLOW	
MEAN MONTHLY FLOW (GPM)	
OCTOBER	593.3
NOVEMBER	148.3
DECEMBER	70.6
JANUARY	40.5
FEBUARY	27.3
MARCH	21.0
APRIL	18.8
MAY	2029.2
JUNE	3466.2
JULY	1767.0
AUGUST	3001.9
SEPTEMBER	1771.3
MEAN ANNUAL FLOW (GPM)	1084.6

XREF's/IMAGES USED FOR THIS DWG:

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TIUNC #3 BASIN

TATCHIM ISUA SITE

DESIGN BY: RH	DATE: 03/23/06
DRAWN BY: RH	PROJECT No: 03003.007
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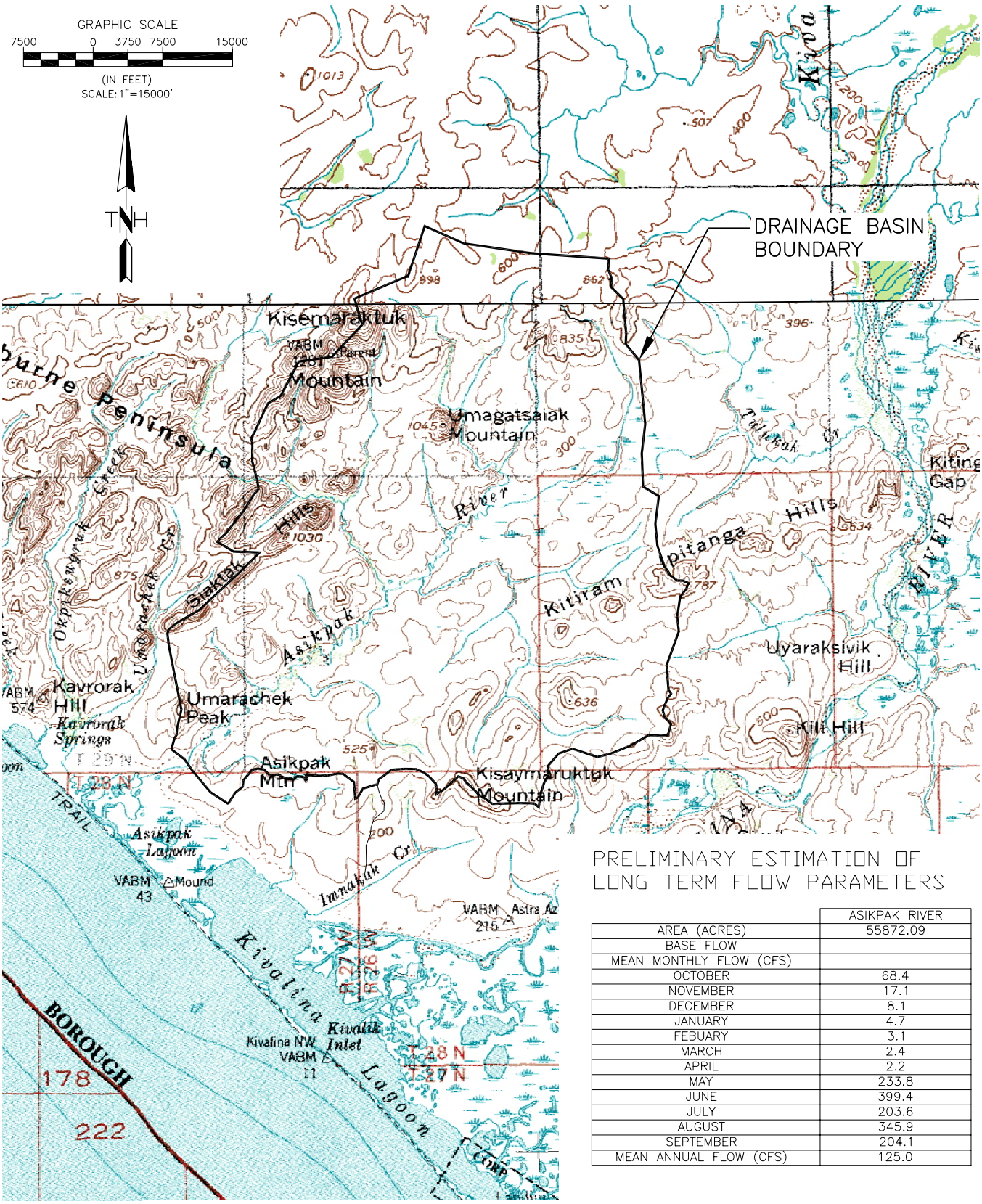
GRID: –	



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LAYER MGR: *.lay CTB FILE: *.ctb

DRAWING NAME: Big Drainage Basin.dwg

PRELIMINARY ESTIMATION OF LONG TERM FLOW PARAMETERS

	ASIKPAK RIVER
AREA (ACRES)	55872.09
BASE FLOW	
MEAN MONTHLY FLOW (CFS)	
OCTOBER	68.4
NOVEMBER	17.1
DECEMBER	8.1
JANUARY	4.7
FEBUARY	3.1
MARCH	2.4
APRIL	2.2
MAY	233.8
JUNE	399.4
JULY	203.6
AUGUST	345.9
SEPTEMBER	204.1
MEAN ANNUAL FLOW (CFS)	125.0

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ASIKPAK RIVER BASIN

TATCHIM ISUA SITE

DESIGN BY: RH	DATE: 03/23/06
DRAWN BY: RH	PROJECT No: 03003.007
SCALE: 1" = 15000'	REV. –
CAD DWG FILE: M:\03003.007Kivalina\WRP\Mapping\kivtopo	
FIELD BOOK: –	SHEET 10 OF 10
GRID: –	

Appendix B – Scope of Work for Further Field Sampling

Appendix B

SCOPE OF WORK

CONTRACT NO. DACW85-03-D-006

DELIVERY ORDER NO. 07 MOD 05

WATER SOURCE AND QUALITY INVESTIGATION FOR POTENTIAL RELOCATION SITES

KIVALINA, ALASKA

May 8, 2005

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1. GENERAL

The U.S. Army Corps of Engineers – Alaska District (USACE-AD) is conducting source and quality investigations of surface and ground water in support of evaluation of potential relocation sites for the community of Kivalina, Alaska. This work is supplemental to the Stage I Master plan currently being prepared.

2. SURFACE INVESTIGATIONS

This work consists of water quality investigations and flow testing of selected streams and rivers. Half of the potential village sites include a potential surface water sources that require further investigations. The list of streams is dependent on the selected village site. Depending on the village site selected, the following streams are required to be sampled.

Water quality sampling and flow testing for Asikpak River and Imnakuk Creek.

Water quality sampling and flow testing for Kivalina and Wulik Rivers. Water quality sampling and limit of tidal salt water intrusion for the Kivalina and Wulik Rivers are also recommended.

3. DETAILED SURFACE AND GROUNDWATER INVESTIGATIONS SCOPE

Task 1 – Flow Testing

The consultant shall conduct daily flow testing to determine the most likely location, depth, and yield for a public surface or groundwater supply source. Small creeks and streams should also be tested on a quarterly basis.

Stream gauging should be conducted for one year via monthly gauging and average daily readings. The gauging will be performed with a pressure sensor that rests on the bottom of the stream bed. The sensor will read the water pressure which can then be used to calculate water depth, and records this depth every twelve hours. Streams will also need to be gauged and measured accurately during the installation of the sensors. With that information, the flow of the stream can be determined throughout the year. This will also indicate if the stream freezes solid during the winter.

The sensor should be placed in the deepest section of the stream and, whenever possible, a small weir should be built. A weir is not required for the sensor to work or data to be collected, but the layout of the stream and streambed will dictate that need.

The data receiver is located in a weather proof box placed approximately 75 feet from the stream and elevated on a stake. Although the receiver is capable of holding data for more than one year, it is recommended that the data be downloaded at a minimum of every 4 to 6 months in the event of equipment failure.

At least four site visits are anticipated to set up the equipment and download the information. Additional monthly checks should be made by a trained local person.

Task 2 – Water Quality Testing:

For the selected village site, water quality testing is required for the streams and rivers. Water quality testing will be conducted with both field measurements and with samples that are returned to a certified laboratory.

At a minimum, the following sampling is required for a potential surface water source:

On Site Testing Requirements

Ammonia (as Nitrogen) Hydrogen Sulfide
Carbon Dioxide pH
Conductivity Temperature
Dissolved Oxygen Turbidity

Laboratory Testing Requirements

Alkalinity as CaCo3
Aluminum (s)
Arsenic (p)
Bromide
Calcium
Chloride (s)
Chlorine Demand
Color, True and Apparent (s) (48 hr. HT)
Dissolved Organic Carbon
Fluoride (p & s)
Hardness as CaCO3
HAA5 Formation Potential
Iron (s)
Langlier Index (includes pH, TDS, Alkalinity) (s)
Lead
Magnesium
Manganese (s)
Nitrate (p)
Nitrite (p) (48 hr. HT)
Organic Constituents (UV 254) (48 hr. HT)
Sodium (s)
Sulfate (s)
Total Dissolved Solids
Total Organic Carbon
TTHM Formation Potential
Turbidity (48 hr. HT)
Zinc (s)

Volatile Organic Compounds 524.2

Primary Inorganics

- Antimony 200.8
- Barium 200.8
- Cadmium 200.8
- Selenium 200.8
- Mercury 200.8
- Beryllium 200.8
- Chromium 200.8
- Thallium 200.8
- Nickel 200.8
- Cyanide SM4500

Secondary Chemical Contaminants

- Silver 200.8
- Copper 200.8
- Foaming Agents SM5540 (48 hr. HT)
- Odor SM2150 (48 hr. HT)

Total Coliform P/A SM 9223 (30 hr. HT)

(p) Part of 18 AAC Primary Inorganics List
(s) Part of 18 AAC Secondary Chemical Contaminants List

Task 3 – Conceptual Water Intake Sketches:

For each water source investigated, a conceptual level sketch of a site plan and water intake or infiltration gallery shall be developed. The site sketches shall be based on visual inspection of the sites.

4. WATER QUALITY AND QUANTITY SUMMARY REPORT

Based on results for field and laboratory analysis, a summary report will be prepared by the consultant outline the results of the sampling. The following information is anticipated to be the minimum required, but may change based on the findings of stage I:

- Watercourse flow rates, water yield, and water quality;
- Watercourse descriptive characteristics and cross sections;
- Upstream limit of salt water intrusion or influence (if applicable);
- Potential for year-round water intake location
- Suggested treatment techniques for the water source to comply with local and federal drinking water standards.

5. SAFETY

The consultant is responsible for the safety of his personnel, equipment, materials, and the public at all times when in the field and/or the public environment.

6. QUALITY CONTROL

The consultant shall prepare a Quality Control Plan (QCP) and Project Management Plan (PMP) to manage, control, and document the performance of these tasks. The QCP and PMP shall be submitted to USACE-AD for approval. The QC activities shall be documented and included in the final report. The consultant shall ensure that the corporate quality policy is understood, implemented, and maintained at all levels in the organization. The consultant shall perform continuous tracking, checks, representations, adjustments and visualization of his field data for quality control and to establish efficient field procedures. The consultant is responsible for ensuring that project work proceeds smoothly in accordance with the SOW and maintaining a continual vigilance for ways to increase efficiency and quality, as well as providing weekly summaries of Quality Control activities. Copies of the weekly summaries shall be submitted to USACE-AD monthly.

7. SCHEDULE

Two (2) copies of the QCP and PMP shall be submitted to USACE-AD within one (1) week of notice to proceed. Water quality and flow testing efforts shall be initiated for summer installation of testing equipment. Flow testing and water quality test results shall be submitted as intermediate quarterly submittals. A summary report shall be submitted within 4 weeks after all data has been received back from the field and lab.

Four (4) hard copies and one (1) electronic copy of the draft report shall be submitted not later than twelve (12) weeks after work commences. USACE-AD will take two (2) weeks for review and comment. Final report shall be submitted two (2) weeks after USACE-AD review and comments are complete.

8. DELIVERABLES

Submittals shall be delivered to

U.S. ARMY CORPS OF ENGINEERS, ALASKA DISTRICT
CENPA-EN-CW-PF
ATTN: J. LARRY SCUDDER
P.O. BOX 6898
ELMENDORF AFB, ALASKA 99506-6898

Deliverables shall be accompanied by a letter or shipping form listing the materials being transmitted. The consultant shall provide six (6) hard copies (one unbound) and three (3) electronic copies of the final report in both MS Office and PDF formats on compact discs. All field notes, sketches, recordings and computations made by the consultant in completing this work shall be available at all times during the progress of the work for examination by the Contracting Officer, or his authorized representative. All such material shall become the property of the Government upon completion of the task order.

Appendix C – ASCG Water Quality Data

The following was taken from Kivalina Sanitary Survey Report, prepared by ASCG Incorporated, May 2004.

Appendix B

Water Sample Analytical Results

Analyte	EPA Regulatory Limit	[redacted]								
Inorganic Chemical Contaminants										
Antimony	=6	ND	ND	ND	-	**ND**	-	-	µg/L	ok
Arsenic	=10	ND	ND	ND	-	**ND**	-	-	µg/L	ok
Barium	=2000	138	88	47.8	-	**182**	-	-	µg/L	ok - below regulatory limits
Beryllium	=4	ND	ND	ND	-	**ND**	-	-	µg/L	ok
Cadmium	=5	ND	ND	ND	-	**0.120**	-	-	µg/L	ok - below regulatory limits
Chromium	=100	ND	ND	ND	-	**ND**	-	-	µg/L	ok
Cyanide	=0.2	ND	ND	ND	-	**ND**	-	-	mg/L	ok
Mercury by Cold Vapor	=0.002	ND	ND	ND	-	**ND**	-	-	mg/L	ok
Nickel	=100	ND	ND	ND	-	**2.29**	-	-	µg/L	ok - below regulatory limits
Nitrate	=10	ND	0.242	0.256	ND	-	-	-	mg/L as N	ok
Nitrite	=1	ND	ND	ND	ND	-	-	-	mg/L as N	ok
Total Nitrate and Nitrate	=10	ND	ND	ND	ND	-	-	-	mg/L as N	ok
Selenium	=50	ND	ND	ND	-	**ND**	-	-	µg/L	ok
Thallium	=2	ND	ND	ND	-	**ND**	-	-	µg/L	ok

[redacted]										
Volitile Organic Chemicals (VOCs)										
1,1-Dichloroethane	<0.007	ND	ND	ND	ND	-	-	-	mg/L	ok
1,1,1-Trichloroethane	<0.2	ND	ND	ND	ND	-	-	-	mg/L	ok
1,1,2-Trichloroethane	<0.005	ND	ND	ND	ND	-	-	-	mg/L	ok
1,2-Dichloroethane	<0.005	ND	ND	ND	ND	-	-	-	mg/L	ok
1,2-Dichloropropane	<0.005	ND	ND	ND	ND	-	-	-	mg/L	ok
1,2,4-Trichlorobenzene	<0.07	ND	ND	ND	ND	-	-	-	mg/L	ok
Benzene	<0.005	ND	ND	ND	ND	-	-	-	mg/L	ok
Carbon tetrachloride	<0.005	ND	ND	ND	ND	-	-	-	mg/L	ok
cis-1,2-Dichloroethane	<0.07	ND	ND	ND	ND	-	-	-	mg/L	ok
Ethybenzene	<0.7	ND	ND	ND	ND	-	-	-	mg/L	ok
Chlorobenzene	<0.1	ND	ND	ND	ND	-	-	-	mg/L	ok
o-Dichlorobenzene	<0.005	ND	ND	ND	ND	-	-	-	mg/L	ok
para-Dichlorobenzene	<0.075	ND	ND	ND	ND	-	-	-	mg/L	ok
Styrene	<0.1	ND	ND	ND	ND	-	-	-	mg/L	ok
Tetrachloroethene	<0.005	ND	ND	ND	ND	-	-	-	mg/L	ok
Toluene	<1	ND	ND	ND	ND	-	-	-	mg/L	ok
trans-1,2-Dichloroethene	<0.1	ND	ND	ND	ND	-	-	-	mg/L	ok
Trichloroethene	<0.005	ND	ND	ND	ND	-	-	-	mg/L	ok
Vinyl chloride	<0.002	ND	ND	ND	ND	-	-	-	mg/L	ok
Xylene (total)	<10	ND	ND	ND	ND	-	-	-	mg/L	ok

[redacted]									
Secondary MCL's									
Chloride	=250	23.4	38.9	63.1	21.2	-	-	-	mg/L	ok - below regulatory limits
Color	=15	ND	ND	5.00	-	5.00	-	-	PCU	ok - below regulatory limits
Corrosivity										
Langlier Index @ 40°F	>0	-0.06	0.125	0.125	-	0.05	-	-	n/a	Appears noncorrosive at low temperatures
Langlier Index @ 140°F	>0	1.02	1.205	1.205	-	1.13	-	-	n/a	Appears noncorrosive at high temperatures
Fluoride	=2	1.09	ND	ND	0.469	-	-	-	mg/L	ok - below regulatory limits
Foaming Agents (MBAS)	=2	ND	ND	ND	ND	-	-	-	mg/L	ok
Iron										
Iron - Total	=30	ND	ND	ND	-	0.86	-	-	mg/L	ok - below regulatory limits
Iron - Dissolved	=30	ND	ND	ND	-	ND	-	-	mg/L	ok
Manganese	=50	ND	ND	172	-	32.6	-	-	µg/L	ok - below regulatory limits
Odor (TON)	=3	ND	ND	ND	ND	-	-	-	T.O.N.	ok
pH	6.5 - 8.5	7.9	8.0	8.0	-	8.1	-	-	pH Units	ok - below regulatory limits
Sodium	=250	15.7	18.1	32.4	-	4.91	-	-	mg/L	ok - below regulatory limits
Sulfate	=250	56.3	52.0	14.6	55.1	-	-	-	mg/L	ok - below regulatory limits
Total Dissolved Solids	=500	229	241	259	-	160	-	-	mg/L	ok - below regulatory limits
Zinc	=5000	29.1	279	2.65	-	17.3	-	-	µg/L	ok - below regulatory limits

[redacted]										
Lead & Copper										
Lead	=15	0.895	0.634	0.40	**1.34**	-	-	-	µg/L	ok - below regulatory limits
Copper	=1300	111	108	29.3	-	**4.75**	-	-	µg/L	ok - below regulatory limits
Disinfection Byproducts										
Total Trihalomethanes (TTHMs)	<0.080	0.014	ND	ND	**0.020**	-	-	-	mg/L	ok - below regulatory limits
Turbidity										
Turbidity	n/a	0.47	0.69	1.20	-	**7.94**	-	-	NTU	ok - Sample taken at raw water intake (Wulik note: excedes drinking water regulations
Thiocyanate										
Thiocyanate	1.0	ND	ND	ND	-	**ND**	-	-	mg/L	ok - not detected
Giardia & Cryptosporidium										
Giardia	Negative	Negative	Negative	Negative	**Negative**	**Negative**	-	-	n/a	ok - negaitve (not detected)
Cryptosporidium	Negative	Negative	Negative	Negative	**Negative**	**Negative**	-	-	n/a	ok - negaitve (not detected)
Metals by ICP/MS										
Aluminum	n/a	ND	ND	ND	-	**365**	-	-	µg/L	Indicates an increase since 1997
Cobalt	n/a	ND	ND	ND	-	**ND**	-	-	µg/L	ok
Molybdenum	n/a	ND	ND	ND	-	**ND**	-	-	µg/L	ok
Potassium	n/a	0.71	0.97	1.11	-	**642**	-	-	µg/L	Indicates a decrease since 1997
Silicon	n/a	-	-	-	-	**1570**	-	-	µg/L	ok (not tested in 1997)
Silver	n/a	ND	ND	ND	-	**ND**	-	-	µg/L	ok
Vanadium	n/a	ND	ND	ND	-	**ND**	-	-	µg/L	ok
					-		-	-		
Required Removal of TOC										
Total Organic Carbon	n/a	0.697	0.621	0.865	-	**0.761**	-	-	mg/L	TOC >2.0-4.0
Alkalinity	n/a	118	139	141	-	**106**	-	-	mg/L	Alkalinity >60-120 Required Removal of TOC = 25%

Notes:
ND - Analyzed - not detected

[redacted]	[redacted]								
Total Coliform Bacteria									
Washeteria									
Total Coliform	=1	**0**	-	-				col/100mL	ok
School									
Total Coliform	=1	-	**0**	-				col/100mL	ok
Health Clinic									
Total Coliform	=1	-	-	**0, 2 OB**				col/100mL	ok - 2 other non-harmful bacteria detected
Water Intake									
Total Coliform	=1	-	-	-	**0, 119 OB**			col/100mL	ok - 119 other non-harmful bacteria detected
Lagoon near set net									
Total Coliform	=1	-	-	-	-	**0, 28 OB**		col/100mL	ok - 28 other non-harmful bacteria detected
Lagoon near landfill									
Total Coliform	=1	-	-	-	-		**0, 185 OB**	col/100mL	ok - 185 other non-harmful bacteria detected

Appendix C

Laboratory Analysis Report

Laboratory Analysis Report

200 W. Potter Drive
Anchorage, AK 99518-1605
Tel: (907) 562-2343
Fax: (907) 561-5301
Web: http://www.sgsenvironmental.com

Steve Pannone
ASCG Incorporated

3900 C Street Suite 501
Anchorage, AK 99518

Work Order:	1034586
	Kivalina Drinking Water
Client:	ASCG Incorporated
Report Date:	August 20, 2003

Enclosed are the analytical results associated with the above workorder.

As required by the state of Alaska and the USEPA, a formal Quality Assurance/Quality Control Program is maintained by SGS. A copy of our Quality Control Manual that outlines this program is available at your request. The laboratory ADEC certification numbers are AK08-03 (DW) and UST-005 (CS).

Except as specifically noted, all statements and data in this report are in conformance to the provisions set forth in our Quality Assurance Program Plan.

If you have any questions regarding this report or if we can be of any other assistance, please call your SGS Project Manager at (907) 562-2343.

The following descriptors may be found on your report which will serve to further qualify the data.

PQL	Practical Quantitation Limit (reporting limit).
U	Indicates the analyte was analyzed for but not detected.
F	Indicates an estimated value that falls below PQL, but is greater than the MDL.
J	The quantitation is an estimation.
B	Indicates the analyte is found in a blank associated with the sample.
*	The analyte has exceeded allowable regulatory or control limits.
GT	Greater Than
D	The analyte concentration is the result of a dilution.
LT	Less Than
!	Surrogate out of control limits.
Q	QC parameter out of acceptance range.
M	A matrix effect was present.
JL	The analyte was positively identified, but the quantitation is a low estimation.

Note: Soil samples are reported on a dry weight basis unless otherwise specified.

SGS

SGS Ref.#	1034586001
Client Name	ASCG Incorporated
Project Name/#	Kivalina Drinking Water
Client Sample ID	River Samples
Matrix	Drinking Water
WSID	340117

All Dates/Times are Alaska Standard Time

Printed Date/Time	08/20/2003 10:45
Collected Date/Time	07/24/2003 9:15
Received Date/Time	07/25/2003 9:00
Technical Director	Stephen C. Ede
Released By	Heather Steele

Sample Remarks:

Thiocyanate was analyzed by SGS/CTE of Charleston, WV.
Crypto and giardia were analyzed by CH Diagnostics of Loveland, CO.
SM 2120B - Sample analyzed past hold time for Color due to lab error.
Mercury by EPA 1613 was analyzed by Columbia Analytical Services of Kelso, WA.

Parameter	Qualifiers	Results	PQL	Units	Method	Container ID	Allowable Limits	Prep Date	Analysis Date	Init
									08/04/03	JYC
Alkalinity		106	20.0	mg/L	SM20 2320B					
Magnesium		9.03	0.100	mg/L	EP200.7	B		07/31/03	08/07/03	WAW
Calcium		49.9	0.100	mg/L	EP200.7	B		07/31/03	08/07/03	WAW
Phosphorus		35.2	30.0	ug/L	EP200.8	B		07/31/03	08/09/03	WAW
Metals by ICP/MS										
Aluminum		385	20.0	ug/L	EP200.8	B		07/31/03	08/09/03	WAW
Cobalt		4.00 U	4.00	ug/L	EP200.8	B		07/31/03	08/09/03	WAW
Lead		1.34	0.200	ug/L	EP200.8	B		07/31/03	08/09/03	WAW
Molybdenum		10.0 U	10.0	ug/L	EP200.8	B		07/31/03	08/09/03	WAW
Potassium		642	500	ug/L	EP200.8	B		07/31/03	08/09/03	WAW
Silicon		1570	200	ug/L	EP200.8	B		07/31/03	08/09/03	WAW
Silver		1.00 U	1.00	ug/L	EP200.8	B		07/31/03	08/09/03	WAW
Vanadium		20.0 U	20.0	ug/L	EP200.8	B		07/31/03	08/09/03	WAW
Waters Department										
Ammonia-N		0.100 U	0.100	mg/L	4500-NH3 F	C		07/31/03	08/01/03	JYC
Sulfide		0.100 U	0.100	mg/L	EPA 376.2	F			07/30/03	KC
Total Organic Carbon		0.761	0.500	mg/L	EPA 415.1	G			07/30/03	JJB
Turbidity		7.94	0.100	NTU	SM20 2130B	E			07/25/03	JYC
Inorganic Contaminants										
Antimony		1.00 U	1.00	ug/L	EP200.8	B	(<=6)	07/31/03	08/09/03	WAW
Arsenic		5.00 U	5.00	ug/L	EP200.8	B	(<=50)	07/31/03	08/09/03	WAW
Barium		182	3.00	ug/L	EP200.8	B	(<=2000)	07/31/03	08/09/03	WAW
Beryllium		0.400 U	0.400	ug/L	EP200.8	B	(<=4)	07/31/03	08/09/03	WAW
Cadmium		0.120	0.100	ug/L	EP200.8	B	(<=5)	07/31/03	08/09/03	WAW
Chromium		1.00 U	1.00	ug/L	EP200.8	B	(<=100)	07/31/03	08/09/03	WAW

SGS

SGS Ref.#	1034586001
Client Name	ASCG Incorporated
Project Name/#	Kivalina Drinking Water
Client Sample ID	River Samples
Matrix	Drinking Water
WSID	340117

All Dates/Times are Alaska Standard Time

Printed Date/Time	08/20/2003 10:45
Collected Date/Time	07/24/2003 9:15
Received Date/Time	07/25/2003 9:00
Technical Director	Stephen C. Ede

Parameter	Qualifiers	Results	PQL	Units	Method	Container ID	Allowable Limits	Prep Date	Analysis Date	Init
Inorganic Contaminants										
Cyanide		0.0050 U	0.0050	mg/L	SM20 4500CN-C,E	A	(<=0.2)	07/31/03	08/01/03	PLW
Mercury by Cold Vapor		0.000200 U	0.000200	mg/L	EP245.1	B	(<=0.002)	07/31/03	07/31/03	JAL
Nickel		2.29	2.00	ug/L	EP200.8	B	(<=100)	07/31/03	08/09/03	WAW
Selenium		5.00 U	5.00	ug/L	EP200.8	B	(<=50)	07/31/03	08/09/03	WAW
Thallium		1.00 U	1.00	ug/L	EP200.8	B	(<=2)	07/31/03	08/09/03	WAW
Secondary Contaminants										
Color		5.00	5.00	PCU	SM20 2120B	E	(<=15)		07/29/03	KC
Copper		4.75	1.00	ug/L	EP200.8	B	(<=1300)	07/31/03	08/09/03	WAW
Iron		0.860	0.0200	mg/L	EP200.7	B		07/31/03	08/07/03	WAW
Langlier Index @ 40 degree F		0.05			SM14 203				08/15/03	KAW
Manganese		32.6	1.00	ug/L	EP200.8	B	(<=50)	07/31/03	08/09/03	WAW
Langlier Index @ 140 degree F		1.13			SM14 203				08/15/03	KAW
pH		8.10	0.100	pH units	EPA 150.1	E	(6.5-8.5)		07/25/03	JYC
Sodium		4.91	1.00	mg/L	EP200.7	B		07/31/03	08/07/03	WAW
Zinc		17.3	2.00	ug/L	EP200.8	B	(<=5000)	07/31/03	08/09/03	WAW
Total Dissolved Solids		160	50.0	mg/L	SM20 2540C	E	(<=500)		07/25/03	JYC

SGS

SGS Ref.#	1034586002
Client Name	ASCG Incorporated
Project Name/#	Kivalina Drinking Water
Client Sample ID	River Samples
Matrix	Drinking Water
WSID	340117

All Dates/Times are Alaska Standard Time

Printed Date/Time	08/20/2003 10:45
Collected Date/Time	07/24/2003 9:15
Received Date/Time	07/25/2003 9:00
Technical Director	Stephen C. Ede
Released By	Heather Steele

Sample Remarks:

Parameter	Qualifiers	Results	PQL	Units	Method	Container ID	Allowable Limits	Prep Date	Analysis Date	Init
Metals Department										
Iron		0.0400 U	0.0400	mg/L	EP200.7 Dissolved	A		07/24/03	08/18/03	BAG

SGS

S Ref.#	1034586003
Client Name	ASCG Incorporated
Project Name/#	Kivalina Drinking Water
ent Sample ID	Treatment Plant
atrix	Drinking Water
VSID	340117

All Dates/Times are Alaska Standard Time

Printed Date/Time	08/20/2003 10:45
Collected Date/Time	07/24/2003 11:30
Received Date/Time	07/25/2003 9:00
Technical Director	Stephen C. Ede

Released By Heather Steele

Sample Remarks:

VOCs by EPA 524.2 were analyzed by SGS/CTE of Ludington, MI.
MBAS (Surfactants) by SM5440C was analyzed by Northern Testing Laboratories of Anchorage, AK.

Parameter	Qualifiers	Results	PQL	Units	Method	Container ID	Allowable Limits	Prep Date	Analysis Date	Init
Inorganic Contaminants										
Fluoride		0.469	0.100	mg/L	EPA 300.0	A	(<=2)		07/25/03	JJB
Nitrate-N		0.100 U	0.100	mg/L	EPA 300.0	A	(<=10)		07/25/03	JJB
Nitrite-N		0.100 U	0.100	mg/L	EPA 300.0	A	(<=1)		07/25/03	JJB
Secondary Contaminants										
Chloride		21.2	0.100	mg/L	EPA 300.0	A	(<=250)		07/25/03	JJB
Fluoride		0.469	0.100	mg/L	EPA 300.0	A	(<=2)		07/25/03	JJB
Odor (TON)		1.00 U	1.00	T.O.N.	SM 2150B	A	(<=3)		07/25/03	JYC
Sulfate		55.1	0.200	mg/L	EPA 300.0		(<=250)		07/29/03	JS

SGS

GS Ref.#	1034586004
Client Name	ASCG Incorporated
Project Name/#	Kivalina Drinking Water
ient Sample ID	Washeteria Sink
...atrix	Drinking Water
WSID	340117

All Dates/Times are Alaska Standard Time

Printed Date/Time	08/20/2003 10:45
Collected Date/Time	07/24/2003 11:30
Received Date/Time	07/25/2003 9:00
Technical Director	Stephen [illegible]
Released By	

Sample Remarks:

Parameter	Qualifiers	Results	PQL	Units	Method	Container ID	Allowable Limits	Prep Date	Analysis Date	Init
Microbiology Laboratory										
Total Coliform		0		col/100mL	SM18 9222B	A	(<=1)		07/25/03	BAG

SGS

S Ref.#	1034586005
Client Name	ASCG Incorporated
Project Name/#	Kivalina Drinking Water
ient Sample ID	School
atrix	Drinking Water
VSID	340117

All Dates/Times are Alaska Standard Time

Printed Date/Time	08/20/2003 10:45
Collected Date/Time	07/24/2003 11:45
Received Date/Time	07/25/2003 9:00
Technical Director	Stephen [illegible]
Released By	Heather Steele

Sample Remarks:

Parameter	Qualifiers	Results	PQL	Units	Method	Container ID	Allowable Limits	Prep Date	Analysis Date	Init
Microbiology Laboratory										
Total Coliform		0		col/100mL	SM18 9222B	A	(<=1)		07/25/03	BAG

SGS

GS Ref.#	1034586006
Client Name	ASCG Incorporated
Project Name/#	Kivalina Drinking Water
ient Sample ID	Clinic
atrix	Drinking Water
WSID	340117

All Dates/Times are Alaska Standard Time

Printed Date/Time	08/20/2003 10:45
Collected Date/Time	07/24/2003 12:00
Received Date/Time	07/25/2003 9:00
Technical Director	Stephen C. Ede
Released By	Heather Hale

ample Remarks:

arameter	Qualifiers	Results	PQL	Units	Method	Container ID	Allowable Limits	Prep Date	Analysis Date	Init
icrobiology Laboratory										
Total Coliform		2 OB, No Coli		col/100mL	SM18 9222B	A	(<=1)		07/25/03	BAG

CT&E Environmental Services Inc.
Laboratory Division

200 W. Potter Drive
Anchorage, AK 99518-1605
Tel: (907) 562-2343
Fax: (907) 561-5301

inking Water Analysis Report for Total Coliform Bacteria

READ INSTRUCTIONS ON REVERSE SIDE BEFORE COLLECTING SAMPLE

MUST BE COMPLETED BY WATER SUPPLIER

- [X] **PUBLIC WATER SYSTEM I.D. #** 340117
- [ ] **PRIVATE WATER SYSTEM**

[X] *Send Results* [X] *Send Invoice*
Company Name: ASCG, INC
Contact Name: STEVE PANNONE
Phone Number: 907-339-6552
Fax Number: 907-339-5329
Mailing Address: 3900 C STREET SUITE 501
City: ANCH. State: AK Zip Code: 99503

[ ] *Send Results* [ ] *Send Invoice*
Company Name:
Contact Name:
Mailing Address:
City: State: Zip Code:

SAMPLE DATE: 07 (Month) 24 (Day) 03 (Year)

SAMPLE TYPE:
- [ ] Routine
- [ ] Repeat Sample (for routine sample with lab ref. no. _____)
- [X] Special Purpose SANITARY SURVEY
- [X] Treated Water
- [ ] Untreated Water

SAMPLE LOCATION: WASHATERIA SINK

Time Collected: 11:30Am

Collected By: NICOLE KNOX (Please Print)

TO BE COMPLETED BY LABORATORY

Analysis shows this Water SAMPLE to be:
- [X] Satisfactory
- [ ] Unsatisfactory
- [ ] Sample over 30 hours old, results may be unreliable
- [ ] Sample too long in transit; sample should not be over 30 hours old at examination to indicate reliable results. Please send new sample via special delivery mail.

Date Received: 7-25-03
Time Received: 0900
Analysis Began: 1720

Analytical Method: [X] Membrane Filter [ ] MMO-MUG

* Number of colonies/100 ml.

Lab Ref. No.	Result*	Analyst
1034586 4A	0	SMTS

Sent to A.D.E.C. Anch Fbks Jun [X] Faxed

Date: 7/27/03 Time: 2323

Client notified of unsatisfactory results:
[ ] Phoned _____ Spoke with [ ] Faxed
Date: _____ Time: _____

BACTERIOLOGICAL WATER ANALYSIS RECORD

MMO-MUG Result: Total Coliform _____ *E. Coli* _____

Membrane Filter: Direct Count 0 Colonies/100 ml

TNTC – Too Numerous To Count

Verification: LTB _____ BGB _____ COLIFIRM _____

OB – Other Bacteria

Fecal Coliform Confirmation _____

Final Membrane Filter Results 0 Coliform/100 ml

Reported By [signature] Date 7/28/03 Time 2315 hrs
SMTS 7/27/03

Comments:

CT&E Environmental Services Inc.
Laboratory Division

200 W. Potter Drive
Anchorage, AK 99518-1605
Tel: (907) 562-2343
Fax: (907) 561-5301

king Water Analysis Report for Total Coliform Bacteria

READ INSTRUCTIONS ON REVERSE SIDE BEFORE COLLECTING SAMPLE

MUST BE COMPLETED BY WATER SUPPLIER

- ☐ PUBLIC WATER SYSTEM I.D. #
- ☐ PRIVATE WATER SYSTEM

☐ Send Results ☐ Send Invoice

ASCG Inc — Steve Parsons

3900 C Street Suite 501

Anch AK

☐ Send Results ☐ Send Invoice

SAMPLE DATE: 07 (Month) 24 (Day) 03 (Year)

SAMPLE TYPE:

- ☐ Routine
- ☐ Repeat Sample (for routine sample with lab ref. no. _____)
- ☐ Special Purpose
- ☐ Treated Water
- ☐ Untreated Water

SAMPLE LOCATION: School

Time Collected: 1145

Collected By: _____ (Please Print)

TO BE COMPLETED BY LABORATORY

Analysis shows this Water SAMPLE to be:

- ☒ Satisfactory
- ☐ Unsatisfactory
- ☐ Sample over 30 hours old, results may be unreliable
- ☐ Sample too long in transit; sample should not be over 30 hours old at examination to indicate reliable results. Please send new sample via special delivery mail.

Date Received: 7-25-03

Time Received: 0900

Analysis Began: 1720

Analytical Methods: ☒ Membrane Filter ☐ MMO-MUG

• Number of colonies/100 ml.

Lab Ref. No.	Result*	Analyst
1034586-5A	0	JMTS

Sent to A.D.E.C. Anch Fbks Jun ☐ Faxed

Date: _____ Time: _____

Client notified of unsatisfactory results:

☐ Phoned _____ Spoke with ☐ Faxed

Date: _____ Time: _____

BACTERIOLOGICAL WATER ANALYSIS RECORD

MMO-MUG Result: Total Coliform _____ *E. Coli* _____

Membrane Filter: Direct Count 0 Colonies/100 ml

TNTC – Too Numerous To Count

Verification: LTB _____ BGB _____ COLIFIRM _____

OB – Other Bacteria

Fecal Coliform Confirmation _____

Final Membrane Filter Results 0 Coliform/100 ml

Reported By John Westbury Date 7/27/03 Time 2365 hrs

Comments: Filed Out at lab SLT

CT&E Environmental Services Inc.
Laboratory Division

200 W. Potter Drive
Anchorage, AK 99518-1605
Tel: (907) 562-2343
Fax: (907) 561-5301

...inking Water Analysis Report for Total Coliform Bacteria

READ INSTRUCTIONS ON REVERSE SIDE BEFORE COLLECTING SAMPLE

MUST BE COMPLETED BY WATER SUPPLIER

☐ PUBLIC WATER SYSTEM I.D. # ☐☐☐☐☐☐

☐ PRIVATE WATER SYSTEM

☐ *Send Results* ☐ *Send Invoice*

Steve Parmore — Contact name
ASCG — Water System Name/Company Name
Fax Number
Phone Number
3800 C St Suite 501 — Mailing Address
Anch — City; AK — State; 99503 — Zip Code

☐ *Send Results* ☐ *Send Invoice*

Contact name
Company Name
Mailing Address
City; State; Zip Code

SAMPLE DATE: 07 Month 24 Day 03 Year

SAMPLE TYPE:

☐ Routine
☐ Repeat Sample (for routine sample with lab ref. no. ______)
☐ Special Purpose
☐ Treated Water
☐ Untreated Water

SAMPLE LOCATION: Clinic

Time Collected: 1200

Collected By: ______ (Please Print)

TO BE COMPLETED BY LABORATORY

Analysis shows this Water SAMPLE to be:

☒ Satisfactory
☐ Unsatisfactory
☐ Sample over 30 hours old, results may be unreliable
☐ Sample too long in transit; sample should not be over 30 hours old at examination to indicate reliable results. Please send new sample via special delivery mail.

Date Received: 7-25-03
Time Received: 0900
Analysis Began: 1720

Analytical Method: ☒ Membrane Filter ☐ MMO-MUG

* Number of colonies/100 ml.

Lab Ref. No.	Result*	Analyst
1034586-6A	2 OB No Coli	JMS

Sent to A.D.E.C. Anch Fbks Jun ☐ Faxed

Date: ______ Time: ______

Client notified of unsatisfactory results:

☐ Phoned ______ Spoke with ☐ Faxed

Date: ______ Time: ______

BACTERIOLOGICAL WATER ANALYSIS RECORD

E. Coli ______

MMO-MUG Result: Total Coliform ______

Membrane Filter: Direct Count 2 OB, No Coli Colonies/100 ml

Verification: LTB ______ BGB ______ COLIFIRM ______

Fecal Coliform Confirmation ______ Coliform/100 ml

Final Membrane Filter Results Satisfactory

Reported By [signature] Date 7/27/03 Time ~~2315~~ hrs JMS 7/27/03

TNTC – Too Numerous To Count

OB – Other Bacteria

Comments: filled Out at lab JMS

SGS Member of the SGS Group (Société Générale de Surveillance)

SGS

200 W. Potter Drive
Anchorage, AK 99518-1605
Tel: (907) 562-2343
Fax: (907) 561-5301
Web: http://www.sgsenvironmental.com

Steve Pannone
ASCG, Inc.

Work Order:	3033128 PWSID # 340117 (1034586)
Client:	ASCG, Inc.
Report Date:	August 05, 2003

Enclosed are the analytical results associated with the above workorder.

As required by the state of Alaska and the USEPA, a formal Quality Assurance/Quality Control Program is maintaned by SGS. A copy of our Quality Control Manual that outlines this program is available at your request.

Except as specifically noted, all statements and data in this report are in conformance to the provisions set forth in our Quality Assurance Program Plan.

If you have any questions regarding this report or if we can be of any other assistance, please call your SGS Project Manager at (907) 562-2343.

The following descriptors may be found on your report which will serve to further qualify the data.

PQL	Practical Quantitation Limit (reporting limit).
U	Indicates the analyte was analyzed for but not detected.
F	Indicates an estimated value that falls below PQL, but is greater than the MDL.
J	Indicates an estimated value that falls below PQL, but is greater than the MDL.
B	Indicates the analyte is found in the blank associated with the sample.
*	The analyte has exceeded allowable limits.
GT	Greater Than
D	Secondary Dilution
LT	Less Than
!	Surrogate out of range

SGS

tef.#	3033128001
k... Name	ASCG, Inc.
roject Name/#	PWSID # 340117 (1034586)
l t Sample ID	Treatment Plant
s ix	Drinking Water

Printed Date/Time	08/05/2003 13:39
Collected Date/Time	07/24/2003 11:30
Received Date/Time	07/29/2003 8:30
Technical Director	Stephen C. Ede
Released By	Denise Hecker

s ple Remarks:
Sample analyzed at the Ludington, Michigan laboratory of SGS Environmental Services Inc.
Volatile sample pH > 2.

Parameter	Results	PQL	Units	Method	Allowable Limits	Prep Date	Analysis Date	Init
GC/MS VOLATILE ORGANIC ANALYSIS							08/02/03	JEH
1,1,1,2-Tetrachloroethane	0.00050 U	0.00050	mg/L	EPA 524.2			08/02/03	JEH
1,1,1-Trichloroethane	0.00050 U	0.00050	mg/L	EPA 524.2	(<.2)		08/02/03	JEH
1,1,2,2-Tetrachloroethane	0.00050 U	0.00050	mg/L	EPA 524.2			08/02/03	JEH
1,1,2-Trichloroethane	0.00050 U	0.00050	mg/L	EPA 524.2	(<.005)		08/02/03	JEH
1,1-Dichloroethane	0.00050 U	0.00050	mg/L	EPA 524.2			08/02/03	JEH
1,1-Dichloroethene	0.00050 U	0.00050	mg/L	EPA 524.2	(<.007)		08/02/03	JEH
1,1-Dichloropropene	0.00050 U	0.00050	mg/L	EPA 524.2			08/02/03	JEH
1,2,3-Trichlorobenzene	0.00050 U	0.00050	mg/L	EPA 524.2			08/02/03	JEH
1,2,3-Trichloropropane	0.00050 U	0.00050	mg/L	EPA 524.2	(<.07)		08/02/03	JEH
1,2,4-Trichlorobenzene	0.00050 U	0.00050	mg/L	EPA 524.2			08/02/03	JEH
1,2,4-Trimethylbenzene	0.00050 U	0.00050	mg/L	EPA 524.2			08/02/03	JEH
1,2-Dibromo-3-chloropropane	0.00050 U	0.00050	mg/L	EPA 524.2			08/02/03	JEH
1,2-Dibromoethane	0.00050 U	0.00050	mg/L	EPA 524.2	(<.6)		08/02/03	JEH
1,2-Dichlorobenzene	0.00050 U	0.00050	mg/L	EPA 524.2	(<.005)		08/02/03	JEH
1,2-Dichloroethane	0.00050 U	0.00050	mg/L	EPA 524.2	(<.005)		08/02/03	JEH
1,2-Dichloropropane	0.00050 U	0.00050	mg/L	EPA 524.2			08/02/03	JEH
1,3,5-Trimethylbenzene	0.00050 U	0.00050	mg/L	EPA 524.2			08/02/03	JEH
1,3-Dichlorobenzene	0.00050 U	0.00050	mg/L	EPA 524.2			08/02/03	JEH
1,3-Dichloropropane	0.00050 U	0.00050	mg/L	EPA 524.2	(<.075)		08/02/03	JEH
1,4-Dichlorobenzene	0.00050 U	0.00050	mg/L	EPA 524.2			08/02/03	JEH
2,2-Dichloropropane	0.00050 U	0.00050	mg/L	EPA 524.2			08/02/03	JEH
2-Chlorotoluene	0.00050 U	0.00050	mg/L	EPA 524.2			08/02/03	JEH
4-Chlorotoluene	0.00050 U	0.00050	mg/L	EPA 524.2			08/02/03	JEH
4-Isopropyltoluene	0.00050 U	0.00050	mg/L	EPA 524.2	(<.005)		08/02/03	JEH
Benzene	0.00050 U	0.00050	mg/L	EPA 524.2			08/02/03	JEH
Bromobenzene	0.00050 U	0.00050	mg/L	EPA 524.2			08/02/03	JEH
Bromochloromethane								

SGS

Ref.#	3033128001	Printed Date/Time	08/05/2003 13:39
Client Name	ASCG, Inc.	Collected Date/Time	07/24/2003 11:30
Project Name/#	PWSID # 340117 (1034586)	Received Date/Time	07/29/2003 8:30
Client Sample ID	Treatment Plant	Technical Director	Stephen C. Ede
Matrix	Drinking Water		

Parameter	Results	PQL	Units	Method	Allowable Limits	Prep Date	Analysis Date	Init
GC/MS VOLATILE ORGANIC ANALYSIS							08/02/03	JEH
Bromodichloromethane	0.0052	0.00050	mg/L	EPA 524.2			08/02/03	JEH
Bromoform	0.0036	0.00050	mg/L	EPA 524.2			08/02/03	JEH
Bromomethane	0.00050 U	0.00050	mg/L	EPA 524.2			08/02/03	JEH
Carbon tetrachloride	0.00050 U	0.00050	mg/L	EPA 524.2	(<.005)		08/02/03	JEH
Chlorobenzene	0.00050 U	0.00050	mg/L	EPA 524.2	(<.1)		08/02/03	JEH
Chloroethane	0.00050 U	0.00050	mg/L	EPA 524.2			08/02/03	JEH
Chloroform	0.0028	0.00050	mg/L	EPA 524.2			08/02/03	JEH
Chloromethane	0.00050 U	0.00050	mg/L	EPA 524.2			08/02/03	JEH
cis-1,2-Dichloroethene	0.00050 U	0.00050	mg/L	EPA 524.2	(<.07)		08/02/03	JEH
cis-1,3-Dichloropropene	0.00050 U	0.00050	mg/L	EPA 524.2			08/02/03	JEH
Dibromochloromethane	0.0088	0.00050	mg/L	EPA 524.2			08/02/03	JEH
Dibromomethane	0.00050 U	0.00050	mg/L	EPA 524.2			08/02/03	JEH
Dichlorodifluoromethane	0.00050 U	0.00050	mg/L	EPA 524.2			08/02/03	JEH
Ethylbenzene	0.00050 U	0.00050	mg/L	EPA 524.2	(<.7)		08/02/03	JEH
Hexachlorobutadiene	0.00050 U	0.00050	mg/L	EPA 524.2			08/02/03	JEH
Isopropylbenzene	0.00050 U	0.00050	mg/L	EPA 524.2			08/02/03	JEH
Methyl-t-butyl ether	0.00050 U	0.00050	mg/L	EPA 524.2			08/02/03	JEH
Methylene chloride	0.00050 U	0.00050	mg/L	EPA 524.2	(<.005)		08/02/03	JEH
n-Butylbenzene	0.00050 U	0.00050	mg/L	EPA 524.2			08/02/03	JEH
n-Propylbenzene	0.00050 U	0.00050	mg/L	EPA 524.2			08/02/03	JEH
Naphthalene	0.00050 U	0.00050	mg/L	EPA 524.2			08/02/03	JEH
o-Xylene	0.0010 U	0.0010	mg/L	EPA 524.2	(<10)		08/02/03	JEH
P & M -Xylene	0.00050 U	0.00050	mg/L	EPA 524.2	(<10)		08/02/03	JEH
sec-Butylbenzene	0.00050 U	0.00050	mg/L	EPA 524.2			08/02/03	JEH
Styrene	0.00050 U	0.00050	mg/L	EPA 524.2	(<.1)		08/02/03	JEH
tert-Butylbenzene	0.00050 U	0.00050	mg/L	EPA 524.2			08/02/03	JEH
Tetrachloroethene	0.00050 U	0.00050	mg/L	EPA 524.2	(<.005)		08/02/03	JEH
Toluene	0.020	0.00050	mg/L	EPA 524.2	(<1)		08/02/03	JEH
Total Trihalomethanes	0.00050 U	0.00050	mg/L	EPA 524.2	(<.1)		08/02/03	JEH
trans-1,2-Dichloroethene					(<.1)			

SGS

Ref.#	3033128001	Printed Date/Time	08/05/2003 13:39
nt Name	ASCG, Inc.	Collected Date/Time	07/24/2003 11:30
Project Name/#	PWSID # 340117 (1034586)	Received Date/Time	07/29/2003 8:30
Client Sample ID	Treatment Plant	Technical Director	Stephen C. Ede
Matrix	Drinking Water		

Parameter	Results	PQL	Units	Method	Allowable Limits	Prep Date	Analysis Date	Init
/MS VOLATILE ORGANIC ANALYSIS								
	0.00050 U	0.00050	mg/L	EPA 524.2			08/02/03	JEH
trans-1,3-Dichloropropene	0.00050 U	0.00050	mg/L	EPA 524.2	(<.005)		08/02/03	JEH
chloroethene	0.00050 U	0.00050	mg/L	EPA 524.2			08/02/03	JEH
chlorofluoromethane	0.00040 U	0.00040	mg/L	EPA 524.2	(<.002)		08/02/03	JEH
Vinyl chloride	0.0010 U	0.0010	mg/L	EPA 524.2	(<10)		08/02/03	JEH
ylene (total)								
Surrogates								
nofluorobenzene Surr	90.6		%	EPA 524.2	74-116		08/02/03	JEH
anofluoromethane Surr	92.4		%	EPA 524.2	78-126		08/02/03	JEH
Toluene-d8 Surr	96.4		%	EPA 524.2	86-112		08/02/03	JEH

SGS

Ref.#	3033128002
Client Name	ASCG, Inc.
Project Name/#	PWSID # 340117 (1034586)
Client Sample ID	Trip Blank
Matrix	Drinking Water

Printed Date/Time	08/05/2003 13:39
Collected Date/Time	07/24/2003 0:00
Received Date/Time	07/29/2003 8:30
Technical Director	Stephen C. Ede
Released By	Denise Heckler

Sample Remarks:
Sample analyzed at the Ludington, Michigan laboratory of SGS Environmental Services Inc.

Parameter	Results	PQL	Units	Method	Allowable Limits	Prep Date	Analysis Date	Init
GC/MS VOLATILE ORGANIC ANALYSIS								
1,1,1,2-Tetrachloroethane	0.00050 U	0.00050	mg/L	EPA 524.2			08/02/03	JEH
1,1,1-Trichloroethane	0.00050 U	0.00050	mg/L	EPA 524.2	(<.2)		08/02/03	JEH
1,1,2,2-Tetrachloroethane	0.00050 U	0.00050	mg/L	EPA 524.2			08/02/03	JEH
1,1,2-Trichloroethane	0.00050 U	0.00050	mg/L	EPA 524.2	(<.005)		08/02/03	JEH
1,1-Dichloroethane	0.00050 U	0.00050	mg/L	EPA 524.2			08/02/03	JEH
1,1-Dichloroethene	0.00050 U	0.00050	mg/L	EPA 524.2	(<.007)		08/02/03	JEH
1,1-Dichloropropene	0.00050 U	0.00050	mg/L	EPA 524.2			08/02/03	JEH
1,2,3-Trichlorobenzene	0.00050 U	0.00050	mg/L	EPA 524.2			08/02/03	JEH
1,2,3-Trichloropropane	0.00050 U	0.00050	mg/L	EPA 524.2			08/02/03	JEH
1,2,4-Trichlorobenzene	0.00050 U	0.00050	mg/L	EPA 524.2	(<.07)		08/02/03	JEH
1,2,4-Trimethylbenzene	0.00050 U	0.00050	mg/L	EPA 524.2			08/02/03	JEH
1,2-Dibromo-3-chloropropane	0.00050 U	0.00050	mg/L	EPA 524.2			08/02/03	JEH
1,2-Dibromoethane	0.00050 U	0.00050	mg/L	EPA 524.2			08/02/03	JEH
1,2-Dichlorobenzene	0.00050 U	0.00050	mg/L	EPA 524.2	(<.6)		08/02/03	JEH
1,2-Dichloroethane	0.00050 U	0.00050	mg/L	EPA 524.2	(<.005)		08/02/03	JEH
1,2-Dichloropropane	0.00050 U	0.00050	mg/L	EPA 524.2	(<.005)		08/02/03	JEH
1,3,5-Trimethylbenzene	0.00050 U	0.00050	mg/L	EPA 524.2			08/02/03	JEH
1,3-Dichlorobenzene	0.00050 U	0.00050	mg/L	EPA 524.2			08/02/03	JEH
1,3-Dichloropropane	0.00050 U	0.00050	mg/L	EPA 524.2			08/02/03	JEH
1,4-Dichlorobenzene	0.00050 U	0.00050	mg/L	EPA 524.2	(<.075)		08/02/03	JEH
2,2-Dichloropropane	0.00050 U	0.00050	mg/L	EPA 524.2			08/02/03	JEH
2-Chlorotoluene	0.00050 U	0.00050	mg/L	EPA 524.2			08/02/03	JEH
4-Chlorotoluene	0.00050 U	0.00050	mg/L	EPA 524.2			08/02/03	JEH
4-Isopropyltoluene	0.00050 U	0.00050	mg/L	EPA 524.2			08/02/03	JEH
Benzene	0.00050 U	0.00050	mg/L	EPA 524.2	(<.005)		08/02/03	JEH
Bromobenzene	0.00050 U	0.00050	mg/L	EPA 524.2			08/02/03	JEH
Bromochloromethane	0.00050 U	0.00050	mg/L	EPA 524.2			08/02/03	JEH

SGS

Ref.#	3033128002	Printed Date/Time	08/05/2003 13:39
Client Name	ASCG, Inc.	Collected Date/Time	07/24/2003 0:00
Project Name/#	PWSID # 340117 (1034586)	Received Date/Time	07/29/2003 8:30
Client Sample ID	Trip Blank	Technical Director	Stephen C. Ede
Matrix	Drinking Water		

Parameter	Results	PQL	Units	Method	Allowable Limits	Prep Date	Analysis Date	Init
GC/MS VOLATILE ORGANIC ANALYSIS								
Bromodichloromethane	0.00050 U	0.00050	mg/L	EPA 524.2			08/02/03	JEH
Bromoform	0.00050 U	0.00050	mg/L	EPA 524.2			08/02/03	JEH
Bromomethane	0.00050 U	0.00050	mg/L	EPA 524.2			08/02/03	JEH
Carbon tetrachloride	0.00050 U	0.00050	mg/L	EPA 524.2	(<.005)		08/02/03	JEH
Chlorobenzene	0.00050 U	0.00050	mg/L	EPA 524.2	(<.1)		08/02/03	JEH
Chloroethane	0.00050 U	0.00050	mg/L	EPA 524.2			08/02/03	JEH
Chloroform	0.00050 U	0.00050	mg/L	EPA 524.2			08/02/03	JEH
Chloromethane	0.00050 U	0.00050	mg/L	EPA 524.2			08/02/03	JEH
cis-1,2-Dichloroethene	0.00050 U	0.00050	mg/L	EPA 524.2	(<.07)		08/02/03	JEH
cis-1,3-Dichloropropene	0.00050 U	0.00050	mg/L	EPA 524.2			08/02/03	JEH
Dibromochloromethane	0.00050 U	0.00050	mg/L	EPA 524.2			08/02/03	JEH
Dibromomethane	0.00050 U	0.00050	mg/L	EPA 524.2			08/02/03	JEH
Dichlorodifluoromethane	0.00050 U	0.00050	mg/L	EPA 524.2			08/02/03	JEH
Ethylbenzene	0.00050 U	0.00050	mg/L	EPA 524.2	(<.7)		08/02/03	JEH
Hexachlorobutadiene	0.00050 U	0.00050	mg/L	EPA 524.2			08/02/03	JEH
Isopropylbenzene	0.00050 U	0.00050	mg/L	EPA 524.2			08/02/03	JEH
Methyl-t-butyl ether	0.00050 U	0.00050	mg/L	EPA 524.2			08/02/03	JEH
Methylene chloride	0.00050 U	0.00050	mg/L	EPA 524.2	(<.005)		08/02/03	JEH
n-Butylbenzene	0.00050 U	0.00050	mg/L	EPA 524.2			08/02/03	JEH
n-Propylbenzene	0.00050 U	0.00050	mg/L	EPA 524.2			08/02/03	JEH
Naphthalene	0.00050 U	0.00050	mg/L	EPA 524.2			08/02/03	JEH
o-Xylene	0.00050 U	0.00050	mg/L	EPA 524.2	(<10)		08/02/03	JEH
P & M -Xylene	0.0010 U	0.0010	mg/L	EPA 524.2	(<10)		08/02/03	JEH
sec-Butylbenzene	0.00050 U	0.00050	mg/L	EPA 524.2			08/02/03	JEH
Styrene	0.00050 U	0.00050	mg/L	EPA 524.2	(<.1)		08/02/03	JEH
tert-Butylbenzene	0.00050 U	0.00050	mg/L	EPA 524.2			08/02/03	JEH
Tetrachloroethene	0.00050 U	0.00050	mg/L	EPA 524.2	(<.005)		08/02/03	JEH
Toluene	0.00050 U	0.00050	mg/L	EPA 524.2	(<1)		08/02/03	JEH
Total Trihalomethanes	0.00050 U	0.00050	mg/L	EPA 524.2	(<.1)		08/02/03	JEH
trans-1,2-Dichloroethene	0.00050 U	0.00050	mg/L	EPA 524.2	(<.1)		08/02/03	JEH

SGS

GS Ref.#	3033128002	Printed Date/Time	08/05/2003 13:39
Client Name	ASCG, Inc.	Collected Date/Time	07/24/2003 0:00
Project Name/#	PWSID # 340117 (1034586)	Received Date/Time	07/29/2003 8:30
Client Sample ID	Trip Blank	Technical Director	Stephen C. Ede
Matrix	Drinking Water		

Parameter	Results	PQL	Units	Method	Allowable Limits	Prep Date	Analysis Date	Init
GC/MS VOLATILE ORGANIC ANALYSIS							08/02/03	JEH
trans-1,3-Dichloropropene	0.00050 U	0.00050	mg/L	EPA 524.2			08/02/03	JEH
Trichloroethene	0.00050 U	0.00050	mg/L	EPA 524.2	(<.005)		08/02/03	JEH
Trichlorofluoromethane	0.00050 U	0.00050	mg/L	EPA 524.2			08/02/03	JEH
Vinyl chloride	0.00040 U	0.00040	mg/L	EPA 524.2	(<.002)		08/02/03	JEH
Xylene (total)	0.0010 U	0.0010	mg/L	EPA 524.2	(<10)		08/02/03	JEH
Surrogates							08/02/03	JEH
Bromofluorobenzene Surr	89.2		%	EPA 524.2	74-116		08/02/03	JEH
Dibromofluoromethane Surr	87.4		%	EPA 524.2	78-126		08/02/03	JEH
Toluene-d8 Surr	95		%	EPA 524.2	86-112		08/02/03	JEH

CHAIN OF CU[illegible]

CT&E Environmental Services Inc.
Laboratory Division

166072 COC Serial

CT&E Environmental Services Inc.

1034528

CT&E Reference: 303128

PAGE 2 OF 2

(1)
CLIENT: ASCG INC
CONTACT: STEVE PANNONE PHONE NO: (907) 339-6552
PROJECT: IGIVALINA DRINKING WATER PWSID#: 340117
REPORTS TO: STEVE PANNONE ASCG FAX NO: (907) 339-5329
INVOICE TO: QUOTE#
P.O. NUMBER:

(2)

LAB NO.	SAMPLE IDENTIFICATION	DATE	TIME	MATRIX	No. CONTAINERS	SAMPLE TYPE C=COMP G=GRAB	Preservation Used	Analysis Required (3)	REMARKS
1 (3) A-F	TREATMENT PLANT	7/24/03	11:30A	WATER	3			✓ Pb's inorg cons Anion RS 7/28/03	
(4) A	WASHETERIA							✓ Pb's metals RS 7/28/03	
(5) A	SCHOOL RS 7/28/03							✓ Pb's dioxin RS 7/28/03	
(6) A	CLINIC							✓ VOC by 524	
2 7	Trip Blank	7/24/03			3			X	

(5)

Collected/Relinquished By: (1)	Date	Time	Received By:
Nicole Kruse	7/25/03	0900	
Relinquished By: (2)	Date	Time	Received By:
Relinquished By: (3)	Date	Time	Received By:
Relinquished By: (4)	Date 7.25.03	Time 0900	Received For Laboratory By: Heather L Hansen

(4)
Shipping Carrier:
Shipping Ticket No:
Data Deliverables:
Level I Level II Level III EDD Type:
Temperature C: #1 #2 Cooler 3.3 5.5 TR 3.5 C 6.C
Chain of Custody Seal: (Circle) INTACT BROKEN ABSENT
Requested Turnaround Time and Special Instructions:
Relinquished by: Rhonda Struchu 7/28/03 1130
Rec. By: P. Applecha 7-29-03 8:30

200 W. Potter Drive Anchorage, AK 99518 Tel: (907) 562-2343 Fax: (907) 561-5301
3180 Peger Road Fairbanks, AK 99701 Tel: (907) 474-9656 Fax: (907) 474-9685

White - Retained by Lab (Project File) Yellow - Returned with Report Pink - Retained by Sampler
0-720

CT&E Environmental Services Inc.

SAMPLE R[illegible]IPT FORM

CT&E ....: 3033.28

Yes	No		
	✓	Are samples RUSH, priority, or *within 72 hrs.* of hold time?	
	✓	If yes have you done *e-mail notification*?	
	✓	Are samples *within 24 hrs.* of hold time or due date?	
	✓	If yes, have you *spoken with* Supervisor?	
	✓	Archiving bottles – if required, are they properly marked?	
	✓	Are there any problems (e.g., lids, analyses)?	
	✓	Were samples preserved correctly and pH verified?	
	✓	Has Project Manager been notified of problems?	
	✓	Is this a DOD project? (USACE, Navy, AFCEE):	
		If yes, complete page 2 of Sample Receipt Form	
	✓	Will a data package be required?	
	✓	If this is for PWS, provide PWSID.	
	✓	Is there a quote for this project?	
	✓	Will courier charges apply?	

Method of payment? _____

Due Date: Std

Received Date/Time: 7-29-03 8:30

Received Temperature*:

Thermometer ID: 21352801

Cooler ID	Temp Blank	Cooler Temp
	3.5°c	6°c

Matrix of each Sample:

1	H2O
1	Trip Blank H2O
	BMS/BMSD

Additional Sample Remarks

- Extra Sample Volume?
- Limited Sample Volume?
- Field pres'd for volatiles?
- Field-filtered for dissolved?
- Lab-filtered for dissolved?
- Ref Lab required?

Completed by (sign): R Appledorn **(print):** R Appledorn

Notes:

# of each Container Received:

	950 ml amber unpres'd
	950 ml amber w / HCl
	500 ml amber w / H_2SO_4
	1L cubies unpres'd
	1L Cubitainers w / HNO_3
	1L Cubitainers w / H_2SO_4
	1L Cubitainers w / NaOH + ZnAc
	250 mL Nalgene NaOH
	120 ml coli bottles
	60 ml Nalgene unpres'd
	60 mL Nalgene w/ H_2SO_4
	8 oz amber unpres'd
	4 oz amber unpres'd
	4 oz w / septa w / MeOH
6	40 ml vials w / HCl
	40 mL ascorbic acid + HCl
	Other (specify)
	Other (specify)
	Other (specify)
	Other (specify)

Log-in proofed by: DDH 7/29/03

TO BE COMPLETED IN ANCHORAGE UPON ARRIVAL FROM FAIRBANKS:

DATE / TIME: _____

COOLER AND TEMP BLANK READINGS*

Cooler ID	Temp Blank	Cooler	Cooler ID	Temp Blank	Cooler

CUSTODY SEALS INTACT: YES / NO #/ WHERE: _____

COMPLETED BY (INITIAL): _____

*Temperature readings include thermometer correction factors.

Form F004r04 (Revised 12/28/01)

NORTHERN TESTING LABORATORIES, INC.

3330 INDUSTRIAL AVENUE
5761 SILVERADO WAY; UNIT N
POUCH 340043

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

(907) 456-3116 • FAX 456-3125
(907) 349-1000 • FAX 349-1018
(907) 659-2148 • FAX 659-2148

SGS Environmental Services, Inc.
200 W. Potter Drive
Anchorage, AK 99518

Attn: Rhonda Strucher
Phone: (907) 562-2343
Fax: (907) 561-5301

NTL Lab#: A308548
Client Sample ID: 1034586003
Client Project: Kivalina DW
Location: Treatment Plant
Sample Matrix: Water
COC #:

Report Date: 07/29/03
Date Arrived: 07/25/03
Date Sampled: 07/24/03
Time Sampled: 9:15
Collected By:

Flag Definitions
MRL = Method Reporting Limit
MCL = Maximum Contaminant Level
B = Present in Blank
H = Exceeds Regulatory Limit
M = Matrix Interference
J = Estimated Value
D = Lost to Dilution
U = Less Than Reporting Limit

Comments:

Analysis Method / Parameter	Result	Units	Flag	MRL	MCL	Prep Method	Prep Date	Analysis Date
SM 5540 C								
Foaming Agents (MBAS)	< MRL	mg/L	U	0.10				07/25/03

wendy mitchell
Reported By: Wendy Mitchell
Anchorage Laboratory Manager

CHAIN OF CUSTODY RECORD

CT&E Environmental Services Inc.
Laboratory Division

- Alaska
- Michigan
- West Virginia
- Maryland
- New Jersey
- New Orleans

www.ctesi.com

(1)

CLIENT: SGS/CTE

CONTACT: Rhonda PHONE NO: ( ) 562-2343

PROJECT: Kivalina DW PWSID#:

REPORTS TO:

FAX NO: ( ) 561-5301

INVOICE TO: QUOTE#

P.O. NUMBER:

CT&E Reference: NT

PAGE 1 OF 1

(2)

LAB NO.	SAMPLE IDENTIFICATION	DATE	TIME	MATRIX	No. CONTAINERS	SAMPLE TYPE C = COMP G = GRAB	Preservatives Used	(3) Analysis Required: MBAS	REMARKS
A308548	1034586003	7/24/08	095	DW	1			X	Client ID Treatment Plant

(5)

Collected/Relinquished By: (1)	Date	Time	Received By:
Rhonda Strauch	7/25/08	1000	S Murray
Relinquished By: (2)	Date	Time	Received By:
Relinquished By: (3)	Date	Time	Received By:
Relinquished By: (4)	Date	Time	Received For Laboratory By:

(4)

Shipping Carrier: Temperature C:

Shipping Ticket No:

Data Deliverables: Chain of Custody Seal: (Circle)

Level I Level II Level III EDD Type: INTACT BROKEN ABSENT

Requested Turnaround Time and Special Instructions:

200 W. Potter Drive Anchorage, AK 99518 Tel: (907) 562-2343 Fax: (907) 561-5301
3180 Peger Road Fairbanks, AK 99701 Tel: (907) 474-9666 Fax: (907) 474-9685

White - Retained by Lab (Project File) Yellow - Returned with Report Pink - Retained by Sampler

0-720

ANALYSIS FOR WATERBORNE PARTICULATES

Invoice 20030609

CH Diagnostic and Consulting Service, Inc.
214 SE 19th Street, Loveland, CO 80537
Brec L. Clay, President/Treasurer; Gregory D. Sturbaum, President/Secretary
(970) 667-9789

Customer 20031478
SGS Environmental
200 W. Potter Dr.
Anchorage, AK 99518

Laboratory Information
Federal Express; 7/28/03; 0920 Hrs; 14°C; 10-1 L carboys
Results submitted by: Brec L Clay Pam Scott Treasurer

Sample Identification: ASCG-Kivalina DW, 1034586001, River samples, Finished water

Sample Information:

Sample Date & Time: 7/24/03 09:15 AM **Sampler:** Rhonda Strucher

Amount: 9 L **Filter Color:** N/A **Filter Type:** Envirochek™ HV capsule

Date/Time Eluted: 7/28/03 11:15 AM **Centrifugate:** 5.56 mL/100 L

RESULTS OF GIARDIA AND CRYPTOSPORIDIUM ANALYSIS

Amount of sample assayed: 9 L

		Total IFA Count	Empty	Amorphous Structure	1 Internal Structure	>=2 Internal Structure	Internal Structure	DAPI+ (nuclei stained)	DAPI+ (intense internal staining)	DAPI-
Giardia	detected	0	0	0	0	0		0	0	0
	# / L	<0.1	<0.1	<0.1	<0.1	<0.1		<0.1	<0.1	<0.1
Cryptosporidium	detected	0	0	0			0	0	0	0
	# / L	<0.1	<0.1	<0.1			<0.1	<0.1	<0.1	<0.1

This sample was analyzed for *Giardia* and *Cryptosporidium* by the method outlined in Method 1623: *Cryptosporidium* and *Giardia* in Water by Filtration/IMS/IFA April 2001 USEPA, Washington D.C., EPA-821-R-01-025. All limitations stated in the method apply. Detection limit calculated from volume assayed. If HV capsule or foam filter was received, method was modified by filtering sample through a Pall Envirochek™ HV capsule or IDEXX Filta-Max™ filter at the sample site. If Microscopic Particulate Analysis was also performed, particulate extraction was modified.

COMMENTS: Sample collection 7/24/03 11:15AM MST.

SGS

Laboratory Analysis Report

SGS ENVIRONMENTAL SERVICES-ALASKA
KIVALINA DW 340117
CT&E Laboratory Delivery Group Number: TA3-G0-P594 Page 1

COC: 022505

DATE: 08/06/03

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed in an attached case narrative. Release of the data contained in the hard copy data package has been authorized by the Laboratory Manager or designee, as verified by the following signature.

A case narrative is not required.

Reference	Sample Description	Sampled	Laboratory Number
1034586001	RIVER SAMPLE	07/24/2003	TA3-G0-P594-001

Submitted by,

Scott G. Mandirola

Production Manager

This report includes a total of 2 pages.

CT&E Environmental Services Inc.
Laboratory Division: Charleston Laboratory

Rhonda Strucher
SGS ENVIRONMENTAL SERVICES-ALASKA

Laboratory Number TA3-G0-P594-001

1034586001
RIVER SAMPLE

COC 022505
Date Sampled 07/24/03 09:15
Date Received 07/29/03 09:45

Type F Matrix WATER
Sampled by CLIENT

080603 1221 Ver. 4.0.198

ANALYSIS FOR REQUESTED PARAMETERS

Analyzed Parameter	CAS No.	Result	Flg	RLimit	Units	S Method	Date/Time/Anl		Dilf
Thiocyanate		ND	U	1.0	mg/L	SM4500-C	08/05/03 17:30	CBS	1.0

SGS

CHAIN OF CUSTODY RECORD
CT&E Enviromental Services Inc.
Laboratory Division

Locations Nationwide
- Alaska
- Louisiana
- Maryland
- Michigan
- New Jersey
- West Virginia
- Hawaii

www.sgsenvironmental.com

TA3-GOPS9Y-001

022505

(1)

CLIENT: SGS Enviro-AK

CONTACT: Rhonda Stricker PHONE NO: 907-562-2343

PROJECT: Kivalina DW SITE/PWSID#: 340117

REPORTS TO: SGS AK - Rhonda FAX NO: 907-562-5301

INVOICE TO: ↓ QUOTE #

P.O. NUMBER

CT&E Reference: SGS WV

PAGE 1 OF 1

(2)

LAB NO.	SAMPLE IDENTIFICATION	DATE	TIME	MATRIX	No CONTAINERS	SAMPLE TYPE	Preservatives Used	Analysis Required (3) Thiocyanate	REMARKS
1	1034581001	7/24/03	0915	DW	1			X	River Sample

(5)

Collected/Relinquished By:(1)	Date	Time	Received By:
Rhonda Stricker	7/28/03	1130	
Relinquished By: (2)	Date	Time	Received By:
Relinquished By: (3)	Date	Time	Received By:
Relinquished By: (4)	Date 7-29-03	Time 9:45	Received By: Robin Hambrick

(4)

Shipping Carrier: UPS

Shipping Ticket No:

Samples Received Cold? (Circle) YES NO

Temperature °C: 3.8

Special Deliverable Requirements:

Chain of Custody Seal: (Circle) INTACT BROKEN ABSENT

Requested Turnaround Time and Special Instructions:

200 W. Potter Drive Anchorage, AK 99518 Tel: (907) 562-2343 Fax: (907) 561-5301
1200 Conrad Industrial Drive Ludington, MI 49431 Tel: (231) 843-1677 Fax: (231) 845-6942
151 James Drive West St. Rose, LA 70087 Tel: (504) 468-8401 Fax: (504) 463-3304
1258 Greenbrier Street Charleston, WV 25311 Tel: (304) 346-0725 Fax: (304) 346-0761

White - Retained by Lab
Yellow - Returned with Report

SGS

CHAIN OF CUSTODY RECORD
CT&E Enviromental Services Inc.
Laboratory Division

TA3-GOPS9Y-001

Locations Nationwide
- Alaska
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- West Virginia

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022505

(1)
CLIENT: SGS Enviro-AK
CONTACT: Rhonda Stuckler PHONE NO: 907-562-2343
PROJECT: Kivalina DW SITE/PWSID#: 340117
REPORTS TO:
SGSAk-Rhonda FAX NO.: 907-5615301
INVOICE TO: QUOTE #
P.O. NUMBER

CT&E Reference: SGS WV

PAGE 1 OF 1

(2)

LAB NO.	SAMPLE IDENTIFICATION	DATE	TIME	MATRIX	No CONTAINERS	SAMPLE TYPE (C=COMP, G=GRAB)	Preservatives Used	Analysis Required (3) Thio Cyanate	REMARKS
1	1034586001	7/24/03	0915	DW	1			X	River Sample

(5)

Collected/Relinquished By:(1)	Date	Time	Received By:
Rhonda Stuckler	7/28/03	1130	
Relinquished By: (2)	Date	Time	Received By:
Relinquished By: (3)	Date	Time	Received By:
Relinquished By: (4)	Date 7-29-03	Time 9:45	Received By: Robin Hambrick

(4)

Shipping Carrier: UPS
Shipping Ticket No:
Samples Received Cold? (Circle) YES NO
Temperature °C: 3.8
Special Deliverable Requirements:
Chain of Custody Seal: (Circle) INTACT BROKEN ABSENT
Requested Turnaround Time and Special Instructions:

200 W. Potter Drive Anchorage, AK 99518 Tel: (907) 562-2343 Fax: (907) 561-5301
1200 Conrad Industrial Drive Ludington, MI 49431 Tel: (231) 843-1677 Fax: (231) 845-6942
151 James Drive West St. Rose, LA 70087 Tel: (504) 469-8401 Fax: (504) 463-3304
1258 Greenbrier Street Charleston, WV 25311 Tel: (304) 346-0725 Fax: (304) 346-0781

White - Retained by Lab
Yellow - Returned with Report
Pink - Retained by Sampler

SGS

SGS Environmental Services

A national network of environmental laboratories

www.sgsenvironmental.com tel: 304.346.0725 fax: 304.346.0761

SGS Report Definitions

<Hit>	Denotes parameter was detected
ND	Denotes parameter was not detected
RLimit	The reporting limit is the lowest reported concentration after corrections have been made for sample dilution, sample weight, and (for soils and sediments) amount of moisture in the sample. A * on the reporting limit denotes it was adjusted by the laboratory for dilution, percent solid and/or sample volume
S	A "Y" denotes the result was corrected for percent solid
DilF	The dilution factor
Flg	A flag designation applied to the result, please refer to the definitions below

SGS Flag (Flg) Definitions

U	Denotes parameter was not detected at or above the reporting limit
J	Estimated result -- the result was detected below the reporting limit
E	Estimated result -- the result was above the instrument calibration range
D	Spike or surrogate was diluted out in order to achieve a parameter result within instrument calibration range
I	A result could not be reported due to matrix interference
NON	Denotes a non-numeric result was reported
B	Parameter detected in the method blank
C	Result not reported due to parameter detected in the method blank, please see reanalysis
N	Estimated result due to co-elution of another parameter
NS	Parameter was not spiked
NC	Parameter was unable to be confirmed
Y	Parameter was confirmed
*	Denotes recovery failure of spike or surrogate

Units:

mg/kg and mg/L are otherwise commonly referred to as parts per million (ppm)
µg/kg and µg/L are otherwise commonly referred to as parts per billion (ppb)

1317 South 13th Avenue P.O. Box 479 Kelso, Washington 98626 (360) 577-7222 ph (360) 636-1068 fax

Columbia Analytical Services, Inc.
An Employee - Owned Company

August 1, 2003

Service Request No: K2305511

Rhonda Strucher
CT&E Environmental Services, Inc.
200 W. Potter Dr.
Anchorage, AK 99518-1605

Dear Rhonda:

Enclosed are the results of the sample(s) submitted to our laboratory on July 29, 2003. For your reference, these analyses have been assigned our service request number K2305511.

All analyses were performed according to our laboratory's quality assurance program. The test results meet requirements of the NELAC standards except as noted in the case narrative report. All results are intended to be considered in their entirety, and Columbia Analytical Services, Inc. (CAS) is not responsible for use of less than the complete report. Results apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report.

Please call if you have any questions. My extension is 3260.

Respectfully submitted,

Columbia Analytical Services, Inc.

Harvey Jacky
Project Chemist

HJ/jeb

Acronyms

ASTM	American Society for Testing and Materials
A2LA	American Association for Laboratory Accreditation
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
CFU	Colony-Forming Unit
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
ELAP	Environmental Laboratory Accreditation Program
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
LUFT	Leaking Underground Fuel Tank
M	Modified
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MPN	Most Probable Number
MRL	Method Reporting Limit
NA	Not Applicable
NC	Not Calculated
NCASI	National Council of the Paper Industry for Air and Stream Improvement
ND	Not Detected
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons
tr	Trace level is the concentration of an analyte that is less than the PQL but greater than or equal to the MDL.

Inorganic Data Qualifiers

*	The result is an outlier. See case narrative.
#	The control limit criteria is not applicable. See case narrative.
	The analyte was found in the associated method blank at a level that is significant relative to the sample result.
E	The result is an estimate amount because the value exceeded the instrument calibration range.
J	The result is an estimated concentration that is less than the MRL but greater than or equal to the MDL.
U	The compound was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL.
i	The MRL/MDL has been elevated due to a matrix interference.
X	See case narrative.

Metals Data Qualifiers

#	The control limit criteria is not applicable. See case narrative.
B	The result is an estimated concentration that is less than the MRL but greater than or equal to the MDL.
E	The percent difference for the serial dilution was greater than 10%, indicating a possible matrix interference in the sample.
M	The duplicate injection precision was not met.
N	The Matrix Spike sample recovery is not within control limits. See case narrative.
S	The reported value was determined by the Method of Standard Additions (MSA).
U	The compound was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL.
W	The post-digestion spike for furnace AA analysis is out of control limits, while sample absorbance is less than 50% of spike absorbance.
i	The MRL/MDL has been elevated due to a matrix interference.
X	See case narrative.
*	The duplicate analysis not within control limits. See case narrative.
+	The correlation coefficient for the MSA is less than 0.995.

Organic Data Qualifiers

*	The result is an outlier. See case narrative.
#	The control limit criteria is not applicable. See case narrative.
A	A tentatively identified compound, a suspected aldol-condensation product.
B	The analyte was found in the associated method blank at a level that is significant relative to the sample result.
C	The analyte was qualitatively confirmed using GC/MS techniques, pattern recognition, or by comparing to historical data.
D	The reported result is from a dilution.
E	The result is an estimate amount because the value exceeded the instrument calibration range.
J	The result is an estimated concentration that is less than the MRL but greater than or equal to the MDL.
N	The result is presumptive. The analyte was tentatively identified, but a confirmation analysis was not performed.
P	The GC or HPLC confirmation criteria was exceeded. The relative percent difference is greater than 40% between the two analytical results (25% for CLP Pesticides).
U	The compound was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL.
i	The MRL/MDL has been elevated due to a chromatographic interference.
X	See case narrative.

Additional Petroleum Hydrocarbon Specific Qualifiers

F	The chromatographic fingerprint of the sample matches the elution pattern of the calibration standard.
L	The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of lighter molecular weight constituents than the calibration standard.
H	The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of heavier molecular weight constituents than the calibration standard.
O	The chromatographic fingerprint of the sample resembles an oil, but does not match the calibration standard.
.	The chromatographic fingerprint of the sample resembles a petroleum product eluting in approximately the correct carbon range, but the elution pattern does not match the calibration standard.
Z	The chromatographic fingerprint does not resemble a petroleum product.

Case Narrative

COLUMBIA ANALYTICAL SERVICES, INC.

Client:	CT&E Environmental Services	**Service Request No.:**	K2305511
Project:	NA	**Date Received:**	7/29/03
Sample Matrix:	Water		

CASE NARRATIVE

All analyses were performed consistent with the quality assurance program of Columbia Analytical Services, Inc. (CAS). This report contains analytical results for samples designated for Tier II data deliverables. When appropriate to the method, method blank results have been reported with each analytical test. Additional quality control analyses reported herein include: Matrix/Duplicate Matrix Spike (MS/DMS).

Sample Receipt

One water sample was received for analysis at Columbia Analytical Services on 7/29/03. The sample was preserved with hydrochloric acid upon receipt by the laboratory. The sample was received in good condition and consistent with the accompanying chain of custody form. The sample was stored in a refrigerator at 4°C upon receipt at the laboratory.

Total Metals

No anomalies associated with the analysis of these samples were observed.

Approved by _____ Date 7/31/03

Chain of Custody Documentation

SGS

CHAIN OF CUSTODY RECORD
CT&E Enviromental Services Inc.
Laboratory Division

Locations Nationwide
- Alaska
- Louisiana
- Maryland
- Michigan
- New Jersey
- West Virginia
- Hawaii

www.sgsenvironmental.com

022504

1230551

(1)

CLIENT: SGS Enviro
CONTACT: Rhonda Stracher PHONE NO: 907-562-2343
PROJECT: Kivalina D.W SITE/PWSID#: 340117
REPORTS TO: 200 W. Potter Dr. Anch. AK 99518 FAX NO.: 907-561-5301
INVOICE TO: ↓ QUOTE # P.O. NUMBER

CT&E Reference: CAS-Kelso

PAGE 1 OF 1

(2)

LAB NO.	SAMPLE IDENTIFICATION	DATE	TIME	MATRIX	No CONTAINERS	SAMPLE TYPE (C=COMP, G=GRAB)	Preservatives Used	(3) Analysis Required: Hg by 1631	REMARKS
	1034586001	7/24/03	0915	DW	1			X	1 River Samples

(5)

Collected/Relinquished By:(1)	Date	Time	Received By:
Rhonda Stracher	7/28/03	1130	Fran Blust CAS 7/28/03 1130
Relinquished By: (2)	Date	Time	Received By:
Relinquished By: (3)	Date	Time	Received By:
Relinquished By: (4)	Date	Time	Received By:

(4)

Shipping Carrier:
Shipping Ticket No:
Special Deliverable Requirements:

Samples Received Cold? (Circle) YES NO
Temperature °C: _____
Chain of Custody Seal: (Circle) INTACT BROKEN ABSENT

Requested Turnaround Time and Special Instructions:

200 W. Potter Drive Anchorage, AK 99518 Tel: (907) 562-2343 Fax: (907) 561-5301
181 James Drive West St. Rose, LA 70087 Tel: (504) 468-8401 Fax: (504) 463-3304

White - Retained by Lab
Yellow - Returned with Report

8-29-03; 8:48AM; 907 561 5301 # 35/ 43

Project/Client CTE Work Order K23 05871

Cooler received on 4/29/03 and opened on 4/29/03 by T.Blank

SHORT HOLD TIME

1. Were custody seals on outside of cooler? (Y) N
   If yes, how many and where? front
2. Were seals intact and signature & date correct? (Y) N
3. Is the shipper's airbill available and filed? If no, record airbill number: 17A8619W0741273157 Y (N)

COC #				
Temperature of cooler(s) upon receipt:	5.9			
Temperature Blank:				

6. Were custody papers properly filled out (ink, signed, etc.)? (Y) N
7. Type of packing material present gel packs
8. Did all bottles arrive in good condition (unbroken)? (Y) N
9. Were all bottle labels complete (*i.e.* analysis, preservation, etc.)? (Y) N
10. Were all bottle labels and tags agree with custody papers? (Y) N
11. Were the correct types of bottles used for the tests indicated? (Y) N
12. Were all of the preserved bottles received at the lab with the appropriate pH? Y (N)
13. Were VOA vials checked for absence of air bubbles, and if present, noted below? Y N
14. Did the bottles originate from CAS/K or a branch laboratory? (Y) N
15. Are CWA Microbiology samples received with > ½ the 24 hr. hold time remaining from collection? Y N
    Was Cl2/Res negative? Y N

Explain any discrepancies: 1 < Samples to be preserved @ lab.

RESOLUTION:

Samples that required preservation or received out of temperature:

Sample ID	Reagent	Volume	Lot Number	Bottle Type	Rec'd out of Temperature	Initials

CRFREV.DOC3/5/2003

Metals

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	CT&E Environmental Services, Inc.	**Service Request:**	K2305511
Project:	NA	**Date Collected:**	7/15, 16/03
Sample Matrix:	Water	**Date Received:**	7/29/03

Mercury, Total

Prep Method:	METHOD	**Units:**	ng/L
Analysis Method:	1631E	**Basis:**	NA
Test Notes:			

Sample Name	Lab Code	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
1034586001	K2305511-001	1.0	1	7/29/03	7/30/03	2.5	
Method Blank	K2305511-MB	1.0	1	7/29/03	7/30/03	ND	

Approved By: _____ Date: 7/31/03

IA052505

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	CT&E Environmental Services, Inc.	**Service Request:**	K2305511
Project:	NA	**Date Collected:**	NA
Sample Matrix:	Water	**Date Received:**	NA
		Date Extracted:	7/29/03
		Date Analyzed:	7/30/03

Matrix Spike Summary
Total Metals

Sample Name:	Batch QC	**Units:**	ng/L
Lab Code:	K2305414-001S	**Basis:**	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Spike Level	Sample Result	Spiked Sample Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Mercury	METHOD	1631E	1.0	5.0	ND	5.5	110	71-125	

Date Extracted: 7/29/03
Date Analyzed: 7/30/03

Matrix Spike Summary
Total Metals

Sample Name: Batch QC
Lab Code: K2305414-001S
Test Notes:

Units: ng/L
Basis: NA

Analyte	Prep Method	Analysis Method	MRL	Spike Level	Sample Result	Spiked Sample Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Mercury	METHOD	1631E	1.0	5.0	ND	5.5	110	71-125	

Approved By: _____ Date: 7/31/03

MS/052595

05511ICP.BR1 - MS 7/31/03

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

ent:	CT&E Environmental Services, Inc.	Service Request:	K2305511
Project:	NA	Date Collected:	NA
Sample Matrix:	Water	Date Received:	NA
		Date Extracted:	7/29/03
		Date Analyzed:	7/30/03

Matrix Spike/Duplicate Matrix Spike Summary
Total Metals

Sample Name:	Batch QC	Units:	ng/L
Lab Code:	K2305414-001S, K2305414-001SD	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Spike Level MS	Spike Level DMS	Sample Result	Spike Result MS	Spike Result DMS	Percent Recovery MS	Percent Recovery DMS	CAS Acceptance Limits	Relative Percent Difference	Result Notes
Mercury	METHOD	1631E	1.0	5.0	5.0	ND	5.5	5.4	110	108	71-125	2	

Approved By: _____ Date: 7/31/03

DMS/052505

05511ICP.BR1 - DMS 7/31/03

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	CT&E Environmental Services, Inc.	**Service Request:**	K2305511
Project:	NA	**Date Collected:**	NA
LCS Matrix:	Water	**Date Received:**	NA
		Date Extracted:	7/29/03
		Date Analyzed:	7/30/03

Ongoing Precision and Recovery (OPR) Sample Summary
Total Metals

Sample Name:	Ongoing Precision and Recovery (Initial)	**Units:**	ng/L
		Basis:	NA

Test Notes:

Source: High Purity Stds. 908211

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Mercury	METHOD	1631E	5.00	4.83	97	77-123	

Approved By: _____ Date: 7/31/03

LCS/032295

05311ICP.BR1 - OPR (ksw) 7/31/03

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	CT&E Environmental Services, Inc.	**Service Request:**	K2305511
Project:	NA	**Date Collected:**	NA
LCS Matrix:	Water	**Date Received:**	NA
		Date Extracted:	7/29/03
		Date Analyzed:	7/30/03

Ongoing Precision and Recovery (OPR) Sample Summary
Total Metals

Sample Name: Ongoing Precision and Recovery (Final)

Units: ng/L
Basis: NA

Test Notes:

Source: High Purity Stds. 908211

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Mercury	METHOD	1631E	5.00	4.82	96	77-123	

Approved By: _____ Date: 7/31/03

LCS/032295

05511ICP BR1 - OPR (lcsw) (2) 7/31/03

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	CT&E Environmental Services, Inc.	**Service Request:**	K2305511
Project:	NA	**Date Collected:**	NA
LCS Matrix:	Water	**Date Received:**	NA
		Date Extracted:	7/29/03
		Date Analyzed:	7/30/03

Quality Control Sample (QCS) Summary
Total Metals

Sample Name:	Quality Control Sample	**Units:**	ng/L
Lab Code:	K2305511-QCS	**Basis:**	NA
Test Notes:			

Source: Inorganic Ventures N-HG02019

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Mercury	METHOD	1631E	5.00	4.83	97	77-123	

Approved By: _____ Date: 7/31/03

LCS032295

SGS

...ing Water Analysis Report for Total Coliform Bacteria

READ INSTRUCTIONS ON REVERSE SIDE BEFORE COLLECTING SAMPLE

200 W. Potter Drive
Anchorage, AK 99518-1605
Tel: (907) 562-2343
Fax: (907) 561-5301

MUST BE COMPLETED BY WATER SUPPLIER

- ☐ PUBLIC WATER SYSTEM I.D. # ☐☐☐☐☐☐
- ☐ PRIVATE WATER SYSTEM

☐ *Send Results* ☐ *Send Invoice*

W... System Name/Company Name ... Contact name

F...e Number ... Fax Number

M...g Address

C... State ... Zip Code

FAX TO 338-5329

☒ *Send Results* ☐ *Send Invoice*

ASCG INC — STEVE SAVOIE
Company Name — Contact name

3900 'C' STREET SUITE 501
Mailing Address

ANCH — AK — 99501
City — State — Zip Code

TO BE COMPLETED BY LABORATORY

Analysis shows this Water SAMPLE to be:

- ☒ Satisfactory
- ☐ Unsatisfactory
- ☐ Sample over 30 hours old, results may be unreliable
- ☐ Sample too long in transit; sample should not be over 30 hours old at examination to indicate reliable results. Please send new sample via special delivery mail.

Date Received 1-21-04

Time Received 0930

Analysis Began 1630

Analytical Method: ☒ Membrane Filter ☐ MMO-MUG

* Number of colonies/100 ml.

A...PLE DATE: 01 (Month) 20 (Day) 04 (Year)

1040397 1A

A...MPLE TYPE:		Result*	Analyst
Routine	☐ Treated Water	119	DC
Repeat Sample (for routine sample with lab ref. no. _____)	☐ Untreated Water	OB, no coli	
Special Purpose			

A...MPLE LOCATION	Time Collected	Collected By
Column 1 - H2O Intake	11:10am	R. Reich (Please Print)

Fbtls Jun ☐ Faxed

Date: _____ Time: _____

Client notified of unsatisfactory results:

☐ Phoned _____ Spoke with ☐ Faxed

Date: _____ Time: _____

BACTERIOLOGICAL WATER ANALYSIS RECORD

Held For Confirmation

MMO-MUG Result: Total Coliform _____ *E. Coli* _____

Membrane Filter: Direct Count 119 OB, no coliforms Colonies/100 ml

Verification: LTB negative BGB negative COLIFIRM _____

Fecal Coliform Confirmation negative

Final Membrane Filter Results satisfactory Coliform/100 ml

Reported By D. Leary Date 1/26/04 Time 1030 hrs

TNTC = Too Numerous To Count

OB = Other Bacteria

SGS

ı cing Water Analysis Report for Total Coliform Bacteria

READ INSTRUCTIONS ON REVERSE SIDE BEFORE COLLECTING SAMPLE

200 W. Potter Drive
Anchorage, AK 99518-1605
Tel: (907) 562-2343
Fax: (907) 561-5301

MUST BE COMPLETED BY WATER SUPPLIER

- ☐ PUBLIC WATER SYSTEM I.D. # ☐☐☐☐☐☐
- ☐ PRIVATE WATER SYSTEM

Send Results ☐ *Send Invoice*

Water System Name/Company Name — Contact name

Phone Number — Fax Number

Mailing Address

City — State — Zip Code

Fax to 539-5829

Send Results ☒ *Send Invoice*

NSCG, FNS — STEVEN PANNONE (Company Name — Contact name)

3900 'C' STREET, STE 501 (Mailing Address)

ANCH — AK — 99503 (City — State — Zip Code)

TO BE COMPLETED BY LABORATORY

Analysis shows this Water SAMPLE to be:

- ☒ Satisfactory
- ☐ Unsatisfactory
- ☐ Sample over 30 hours old, results may be unreliable
- ☐ Sample too long in transit; sample should not be over 30 hours old at examination to indicate reliable results. Please send new sample via special delivery mail.

Date Received 1-21-04

Time Received 0930

Analysis Began 1630

Analytical Method: ☒ Membrane Filter ☐ MMO-MUG

* Number of colonies/100 ml.

SAMPLE DATE: 01 Month 20 Day 04 Year

1040397-34

Result* 185 OB, no coli **Analyst** DC

SAMPLE TYPE:

- ☒ Routine
- ☐ Repeat Sample (for routine sample with lab ref. no. _____)
- ☐ Special Purpose
- ☐ Treated Water
- ☐ Untreated Water

Sent to A.D.E.C.: Anch ☐ Fbks ☐ Jun ☐ Faxed

Date: _____ Time: _____

Client notified of unsatisfactory results:

☐ Phoned _____ Spoke with ☐ Faxed

Date: _____ Time: _____

SAMPLE LOCATION	Time Collected	Collected By
Station 2 - Lagoon near landfill	11:25	R. Reich (Please Print)

BACTERIOLOGICAL WATER ANALYSIS RECORD

Held For Confirmation

MMO-MUG Result: Total Coliform _____ *E. Coli* _____

Membrane Filter: Direct Count 185 OB, no coliforms Colonies/100 ml

Verification: LTB negative BGB negative COLIFIRM _____

Fecal Coliform Confirmation negative

Final Membrane Filter Results satisfactory Coliform/100 ml

Reported By D. Long Date 1/26/04 Time 1030 hrs

TNTC = Too Numerous To Count

OB = Other Bacteria

Comments:

SGS

...king Water Analysis Report for Total Coliform Bacteria

READ INSTRUCTIONS ON REVERSE SIDE BEFORE COLLECTING SAMPLE

200 W. Potter Drive
Anchorage, AK 99518-1605
Tel: (907) 562-2343
Fax: (907) 561-5301

MUST BE COMPLETED BY WATER SUPPLIER

- ☐ PUBLIC WATER SYSTEM I.D. # ☐☐☐☐☐☐
- ☐ PRIVATE WATER SYSTEM

☐ *Send Results* ☐ *Send Invoice*

Water System Name/Company Name _____ Contact name _____

Phone Number _____ Fax Number _____

Mailing Address _____

City _____ State _____ Zip Code _____

FAX TO 339-5329

☒ *Send Results* ☒ *Send Invoice*

Company Name: ASCG INC Contact name: STEVEN PARSONS

Mailing Address: 3900 'C' STREET, SUITE 501

City: ANCH State: AK Zip Code: 99503

TO BE COMPLETED BY LABORATORY

Analysis shows this Water SAMPLE to be:

- ☒ Satisfactory
- ☐ Unsatisfactory
- ☐ Sample over 30 hours old, results may be unreliable
- ☐ Sample too long in transit; sample should not be over 30 hours old at examination to indicate reliable results. Please send new sample via special delivery mail.

Date Received 1-21-04

Time Received 0930

Analysis Began 1630

Analytical Method: ☒ Membrane Filter ☐ MMO-MUG

* Number of colonies/100 ml.

1040397-2A

	Result*	Analyst
	28 OB, no coli	DC

Fbks Jun ☐ Faxed

Date: _____ Time: _____

Client notified of unsatisfactory results:

☐ Phoned _____ Spoke with ☐ Faxed

Date: _____ Time: _____

SAMPLE DATE: 01 (Month) 20 (Day) 04 (Year)

SAMPLE TYPE:

- ☐ Routine
- ☐ Repeat Sample (for routine sample with lab ref. no. _____)
- ☐ Special Purpose
- ☐ Treated Water
- ☐ Untreated Water

SAMPLE LOCATION	Time Collected	Collected By
Valve 3 - lagoon near-est inlet	11:30	E. Reid (Please Print)

BACTERIOLOGICAL WATER ANALYSIS RECORD

Held For Confirmation

MMO-MUG Result: Total Coliform _____ *E. Coli* _____

Membrane Filter: Direct Count 28 OB, no coliforms Colonies/100 ml

Verification: LTB negative BGB negative COLIFIRM _____

Fecal Coliform Confirmation negative

Final Membrane Filter Results Satisfactory Coliform/100 ml

Reported By D. Long Date 1/26/04 Time 1030 hrs

TNTC = Too Numerous To Count

OB = Other Bacteria

...nts: