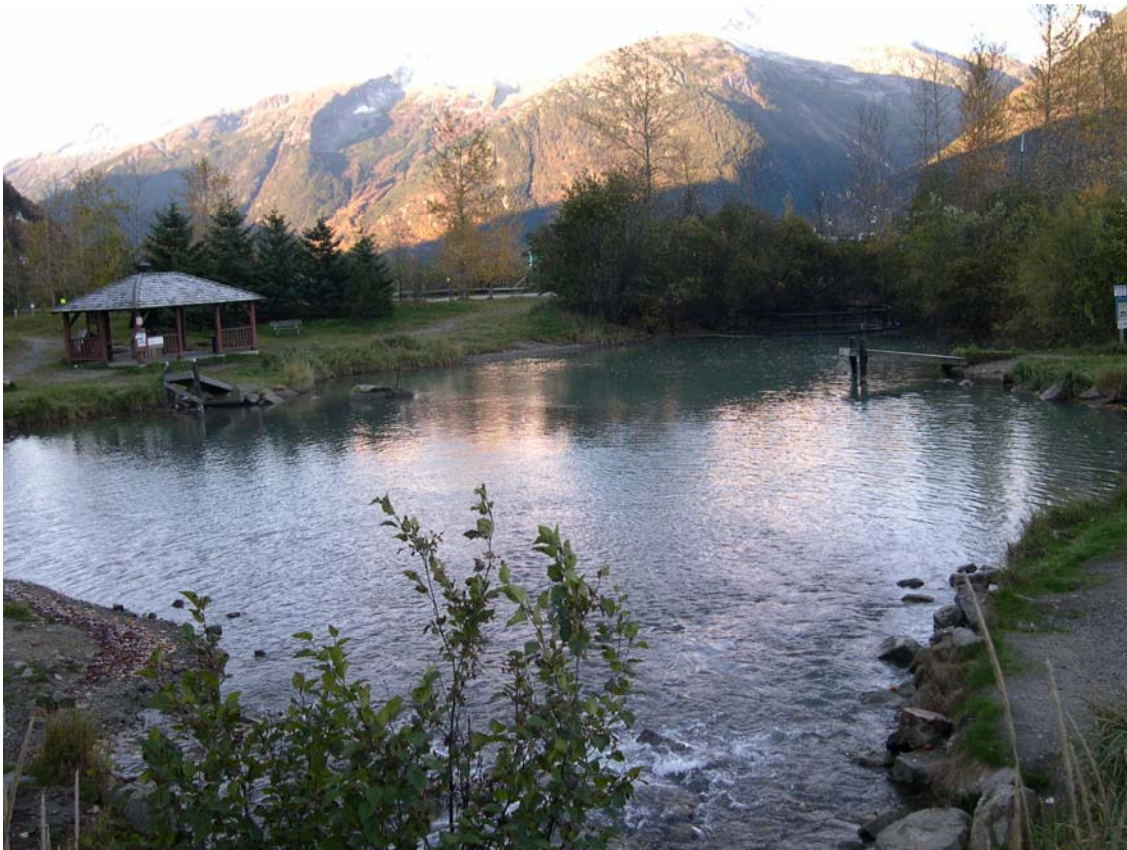




# SKAGWAY TRADITIONAL COUNCIL

A FEDERALLY RECOGNIZED TRIBE

## Pullen Creek Assessment



July 31, 2005

Prepared for:

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## 1.0 Introduction

### 1.1 *Purpose of Document*

Pullen Creek, located in Skagway, Alaska, is listed on Alaska's Section of the Environmental Protection Agency's (EPA) 1996 303(d) impaired waterbody list and on the Alaska Clean Water Action (ACWA) list for heavy metal contamination. When it was listed in 1996, there was no evaluation for Pullen Creek completed by the State of Alaska, and it was therefore carried over to the EPA 1998 303(d) list. Under the ACWA Program administered through the Alaska Department of Environmental Conservation (ADEC), Pullen Creek was scheduled for a Total Maximum Daily Load (TMDL) to recover the waterbody from heavy metal contamination. However, there was a lack of baseline data for an appropriate evaluation to begin this process.

In July of 2003, the Skagway Traditional Council (STC) applied for and received funding through the ACWA program to begin gathering baseline contaminant data on Pullen Creek. The purpose of this Pullen Creek Assessment document is to report the findings of this project and to document a more complete environmental assessment of Pullen Creek, to be used in future ACWA programs. In addition to reporting contaminant data, this document also includes: historical and background information available on the creek, information on fish and fish habitat, an overview of other Pullen Creek projects, and recommendations for future work.

### 1.2 *Location and General Description*

Skagway (59.45° N, 135.31° W) is located at the northernmost end of Lynn Canal, at the head of Taiya Inlet. It is 90 miles northeast of Juneau and 108 road miles south of Whitehorse, Yukon, Canada. Skagway is located in the Skagway Recording District (Sec. 11, T028S, R059E, Copper River Meridian). The greater Skagway area encompasses 455 square miles of land and 12 square miles of water.

The City of Skagway valley lies on unconsolidated floodplain deposits from the Skagway River, which overlay igneous and metamorphic bedrock. The bedrock consists mostly of Jurassic and Cretaceous quartz diorite and granodiorite, but also includes some basalt and aplite dikes. The alluvial delta is within a steep and narrow valley and the fill extends approximately 600 feet deep. In addition, the Skagway waterfront consists of like fill material that was placed there for development purposes.

Skagway has a maritime climate with cool summers and mild winters. Average summer temperatures range from 45-67 °F and winter temperatures range from 18-37 °F. Skagway receives less rain than is typical for Southeast Alaska. Precipitation in Skagway averages 26 inches of rain per year and 39 inches of snow per year.

Vegetation within and surrounding Skagway varies with elevation and soil type, ranging from coastal rainforest to boreal and sub-alpine forests. Common tree species are western and mountain hemlock, Sitka spruce, paper birch, black cottonwood, alder, willow and sub-alpine fir. Understory and herbaceous vegetation includes high bush cranberry, goat's beard, devil's club, blueberry, currant, ferns and mosses. The Skagway valley provides wildlife habitat for moose, mountain goat, brown and black bears, wolf, wolverine, porcupine, hoary marmot, and snowshoe hare. Whales, seals, salmon and trout can also be found in the surrounding area.

Pullen Creek (known as Mill Creek during the Klondike Gold Rush) is located on the northeast side of downtown Skagway at approximately 59° 27' N and 135° 18' W. The creek is within the Hydrologic Unit Code of 1901303. The mainstem of Pullen Creek is approximately 1.5 miles long (recently measured by the National Park Service) and has a spring-fed headwater located at the base of the steep mountainside on the eastern side of town (see Figure 1).

There are two main tributaries to Pullen Creek (see Figure 1). The first splits from the mainstem approximately 0.51 miles upstream from the mouth. Tributary One is fed by a small spring located near the Jerry Meyers Fish Hatchery, approximately 0.34 miles from the confluence of the mainstem. Tributary Two splits from the mainstem at 18<sup>th</sup> Street, approximately 1.3 miles from the mouth. This tributary is 0.34 miles long and has a headwater directly under the White Pass and Yukon Route rail yard at the northern end of town. Just below the confluence of Tributary One, Pullen Creek receives additional water from the Alaska Power and Telephone (APT) Dewey Lakes Hydroelectric plant. There has not been a hydrological study for Pullen Creek, however a brief description on hydrology may be found in section 4.0 of this document.

Pullen Creek is almost entirely urbanized, as its entire boundary lies within the City of Skagway. The impacts of urbanization are numerous: the creek has been moved and channelized several times, a majority of the mainstem receives runoff from impervious surfaces, there are 31 culverts, and many of the banks are impacted by trampling. In addition, the fish hatchery releases king and pink salmon fry into the creek. However, Pullen Creek does provide over-wintering rearing habitat for coho and Dolly Varden, and it provides spawning habitat for coho, pink and chum salmon.

There are two parks located on Pullen Creek which hold value for the community. Pullen Pond and Molly Walsh Park provide recreational value, fishing opportunities, tourism value for fish watching, and educational opportunities for kids.

### *1.3 Population/demographics*

Skagway is home to 860 year round residents. Approximately 5.1% of the population is Alaska Native or part Native. During the summer, Skagway gets over 750,000 visitors from cruise ships, the Alaska Marine Highway and the Klondike highway. To accommodate this influx, Skagway hosts a summer seasonal population of approximately 2,000 (includes year round residents).

Compared to state averages, the percent of Skagway residents under the age of 5 and between ages 20-24 is significantly less and the percent of residents that are 55 and older is significantly higher. Approximately 53% of the population is male, and 47% female. During the 2000 U.S. Census, there were 502 total housing units, 101 of which were vacant. Forty-seven of these vacant housing units are used only seasonally. An Economic Impact Study conducted by the City of Skagway in 1999 found that 51% of the owners of visitor-related businesses are not year-round residents.

The unemployment rate at that time was 14.1%, although 32.2% of all adults were not in the work force. The median household income was \$49,375, per capita income was \$27,700, and 3.7% of residents were living below the poverty level.

### *1.4 Land Use*

Approximately 452 square miles of land and 12 square miles of water are contained within the City of Skagway. Sixty eight percent of that land is managed by the U.S. Forest Service under the Tongass

Land Management Plan, with a small portion managed by the National Park Service as part of the Klondike Gold Rush National Historical Park. Twenty-seven percent is under State of Alaska management through the Alaska Mental Health Trust. The City of Skagway manages approximately 3%, and the remaining 2% is managed by private landowners, which includes some Native Allotments.

Land use designations for Skagway can be found in the City of Skagway's Comprehensive Plan (1999). In general, designations encourage land use and activities that are industrial and commercial in nature. Skagway is limited on housing opportunities, and land use designations encourage both low density and affordable residential living. With respect to the waterfront commercial industrial designation, the City gives priority to development that directly depends on waterfront location. The Comprehensive Plan also calls for reserving land that has potential for drinking water source and/or a hydroelectric generation source. Three recreational designations, Recreation/Open Space, Resource Reserve, and Recreation Reserve, are included in the Plan for undeveloped and high recreation value land. While there is not a Historic Value land use designation, the plan recognizes that there are historic resources in Skagway and that these resources should be encouraged and preserved.

The Comprehensive Plan also outlines how Pullen Creek has been manipulated via culverts to make way for homes and roads. In addition, an RV Park is located on the eastern part of the Port of Skagway. The city has expressed an interest in relocating the RV Park since the early 1990s, since it is utilizing limited and valuable waterfront space that the city believes could be put to better uses. Plans for the land on which the RV Park is located include marine related storage and staging space that will compliment small boat harbor use.

## **2.0 Historical Information**

Skagway is located within the traditional territory of the Chilkoot Band of the Tlingit Tribe. Skagway and its surrounding area were important historically as trade routes and subsistence grounds for the Lukaxh.ádi (Raven-Sockeye), Dakhl'aweidí (Eagle-Killer Whale), Yanyeidí (Eagle-Wolf), and Kaagwaantaan (Eagle-Wolf) clans. Trade routes ranged from interior Alaska/Canada to the tip of California, and may have also included the pacific islands of Hawaii and the east coast of Asia. While what is known as the city of Skagway now was not occupied year-round, the neighboring community of Dyea was a permanent Tlingit village.

In 1896, the discovery of gold brought prospectors to settle in Skagway. Although the Klondike Gold Rush lasted only three years (1896-1899), it drew some 20,000 prospectors traveling through Skagway on their way to either the Chilkoot Pass or White Pass trail. In 1900, Skagway became Alaska's first incorporated city. By then the gold rush years had ended and, as a result, Skagway's economy stabilized around the railroad industry. The town experienced an economic boom during World War II, and Skagway became an important part in Alaska's defense system. A fuel pipeline was built paralleling the railroad from Skagway to Whitehorse, Yukon Territory of Canada (YT) during the war. The pipeline and the railroad were used to haul materials for the war effort and for the construction of the Alaska-Canada Highway.

Another economic boom occurred during the late 1960's through mid 1970's with the opening of the Cyprus Anvil lead-zinc mine in Faro, Canada. Skagway's freight shipments increased from 132,000 tons annually to 800,000 tons by the mid-seventies. The White Pass and Yukon Route (WP & YR) built an ore terminal and ship basin on city-leased tidelands in order to handle the increased capacity. As labor costs continued to increase and the market price for ore decreased after 1975, the mine was

forced to close in 1982. The railroad, which was dependent on the mine shipments, was also shut down. The railroad reopened in 1988 and is now currently used for tourism.

The Klondike Highway, which links Skagway and Whitehorse, YT, was completed in 1978 and became open year-round by 1986. At this time tourism began to play a more important role in the city's economy. Presently, Skagway is a thriving tourist center and serves as an important trade route for Southeast Alaska. The Alaska Marine Highway connects the Panhandle to the Yukon Territory and British Columbia, as well as the Interior of Alaska. Skagway is one of the busiest small town ports in the world, hosting freight barges, ferries, cruise ships, water taxis, and fishing boats. Since the gold rush, the growth of the city has continuously altered the landscape.

### **3.0 Water Quality**

Although Pullen Creek is listed on the EPA's 303(d) impaired waterbody list, there is no information regarding water quality available for the creek. Currently, STC is working with local resource agencies and the Taiya Inlet Watershed Council (TIWC) to begin collecting water quality data for Pullen Creek. Potential impacts to water quality that have been identified by the Skagway community, include: heavy metals, hydrocarbons, poly-chlorinated biphenyls (PCB's), and pesticides.

#### *3.1 Heavy Metals*

It is suspected that the Nahku Ore Terminal and White Pass and Yukon Route railway activities may have potentially contaminated Pullen Creek because the rail line used to transport lead and zinc ore from the Yukon to the Nahku Ore Terminal runs along a large portion of Pullen Creek. During transport, the ore was uncovered and dust could have been dispersed by air movement to settle in the local waterways and the surrounding area. White Pass and Yukon Route loaded mining ore concentrate from the Yukon Territory at the terminal from 1967-1993, with a brief break from 1982-1986 due to the closure of the lead-zinc mine located in Faro, Canada. During its operation, approximately 50,000 tons of ore concentrate passed through the terminal each month. The Faro mine, which supplied the industry, was a galena mining and concentrating (by flotation) facility that produced low grade zinc (60%) and lead (40%). Ore was transported by railway until 1982, and then by trucks through town from 1986-1993.

Other potential sources of heavy metal contamination in Skagway include nine FUDS established during World War II. These sites are still being assessed by the Department of Defense for potential contamination. Urbanization may have also contributed heavy metals to water resources throughout the Skagway area. The STC is sampling Pullen Creek for heavy metals in their ACWA project, the details of which are included in section 6.4.

#### *3.2 Hydrocarbons*

There are 12 officially reported ADEC hydrocarbon contaminated sites within the City of Skagway (CCTHITA, 2004). These sites include underground storage tanks on private property, operations associated with White Pass and Yukon Route, old military sites from World War II, and the Nahku Ore Terminal. The Central Council of Tlingit and Haida Indian Tribes of Alaska (CCTHITA) worked in cooperation with the STC to document all hydrocarbon contaminated sites in the Skagway valley. However, an assessment of how far these sites relate and/or impact local waterways has not been conducted. The community of Skagway is concerned about whether these sites may be leaching into

groundwater, potentially impacting drinking water sources and fish resources in Pullen Creek and the Skagway River.

Run-off from impervious surfaces near and around Pullen Creek may also contribute hydrocarbons to the creek. The STC is screening for hydrocarbons in their ADEC ACWA project and details are included in section 6.4.

### *3.3 Other water quality parameters*

Water temperature, pH, conductivity, and dissolved oxygen are general water quality indicators. They can affect Pullen Creek if levels are outside of tolerable ranges for aquatic organisms the types and rates of chemical reactions occurring in a waterbody, and influence biological functions. For these reasons, background data on these basic water quality parameters are being collected in current projects being conducted on Pullen Creek.

Other contaminants such as poly-chlorinated biphenyls (PCBs) and herbicides also have a potential for impacting Pullen Creek. PCBs may be associated with electrical equipment, hydroelectric activities, and are sometimes used as solvents to facilitate pesticide application. Herbicide spraying was a common activity of the military and herbicides may have been used during World War II as a defoliant in association with railroad activities, to keep vegetation from interfering with railway transportation. Contaminant screening is being conducted in STC's ACWA project to determine presence or absence.

## **4.0 Hydrology**

Pullen Creek is a low-gradient stream system, which is spring-fed from three separate headwater locations. The source of these springs is unknown but could be from an independent aquifer or source water from the Skagway River or a combination of both. Pullen Creek may be fed through other groundwater locations, but this has not been documented. Additional water enters the creek through urban run-off and Skagway's storm-water system.

Pullen Creek has undergone significant changes in its hydrology and it's location has been altered on several occasions. Because it passes directly through the town, Pullen Creek is a highly urbanized creek. Pullen Creek presently passes through 31 culverts (see Figure 1) in its cumulative length of 2.16 miles.

Discharge in Pullen Creek varies depending upon location. Generally, the creek can be split into two discharge regimes, upstream from the APT tailrace and downstream from the same location. Above the tailrace, average discharge is between 0.5 cfs to 2.0 cubic feet per second (cfs). Below the tailrace discharge ranges from <2.0 cfs to 40.0 cfs, depending on whether APT is discharging into the creek. Water discharged at the APT tailrace comes from Dewey Lakes, which is located above APT at an elevation of approximately 500 feet.

Riparian vegetation along Pullen Creek varies and does not follow a consistent pattern. In some locations, Pullen Creek has riparian vegetation comprised of alder, willow, and herbaceous vegetation. Areas such as these generally have stable banks and provide cover for the stream. There are sections of the creek that lack riparian vegetation, and in residential areas are mowed to the creek bank. This leaves the banks prone to erosion and can potentially alter stream hydrology by contributing excess sediment to the stream.



Stream substrate in Pullen Creek varies depending upon location. Generally, the channel consists of silt/sand, detritus, and aquatic vegetation (mainly marsh marigold) upstream of the APT tailrace. The substrate downstream of the APT tailrace is primarily composed of gravel, cobble and boulders. High flows issued from the tailrace have been effective in transporting finer material downstream. The STC ACWA project collected substrate data, which is included in section 6.4.

## **5.0 Fish and Fish Habitat**

Pullen Creek is listed as an anadromous fish stream with the Alaska Department of Fish and Game (ADFG). This listing was last updated in 1998 and included coho, pink, and chum salmon, as well as Dolly Varden Char. The coho and Dolly Varden populations are considered native, and the creek offers both spawning and rearing habitat for these species. The extent of chum salmon history is not known, however they are listed as a present species. Pink salmon populations and a king salmon fishery were introduced to Pullen Creek through enhancement programs described in further detail in section 5.1.

Pullen Creek has the potential to support wild and hatchery salmon runs. However, water quality, fish passage obstructions, changes in hydrology, debris accumulation, and urban runoff affect fish habitat, which may in turn limit fish populations. According to a River Habitat Study completed by Theodore Merrell, Jr. (1993), the entire population of spawning salmon in Pullen Creek was probably less than 100 pinks, cohos, and chums. In a stream walking survey, the escapement of adult fish from Pullen Creek was significantly higher than in Merrell's report (Bethers, 2003). There were 962 pink salmon carcasses and 43 coho salmon carcasses found in that survey. Trapping efforts performed by STC also trapped juvenile fish in Pullen Creek to gather information about the species present. Trapping events were conducted in the fall and winter of 2003 and the spring and summer of 2004. Results for each calendar year are found in Appendix A and B. In general, coho and Dolly Varden were present in Pullen Creek during all trapping events, and they were found distributed throughout the creek except in the pond at the railyard.

### *5.1 Jerry Meyers Fish Hatchery*

In 1979 Pullen Creek was designated an area meriting special attention as part of the Alaska Coastal Management Plan. As part of the long-range plan, the Skagway School system was given a Scientific Education Permit to operate a hatchery. The Jerry Meyers Fish Hatchery, built in 1981 with a \$30,000 appropriation by the Alaska State Legislature, is owned by the city and is run by the School District. The hatchery was built on the upper portion of Tributary One, which is spring fed approximately 100 yards from the structure. The hatchery was recognized as the Alaska Vocational Education Program of the Year in 1989 for its accomplishments as an outdoor classroom.

The hatchery transplants king and pink eggs and fish from other Southeast Alaska locations, such as Burrow Creek and Douglas Island Pink and Chum (DIPAC), into Pullen Creek. King salmon were introduced in recent years as a part of a four-party agreement worked out with DIPAC, Burrow Creek Hatchery, Jerry Meyers Fish Hatchery, and the City of Skagway. According to the agreement, the Skagway hatchery provides eggs for DIPAC, which raises the eggs and returns the fry for "imprinting" at the weir located below the railroad culvert and Congress Way culvert on Pullen Creek.

With assistance from the Southeast Conference, the City of Skagway investigated the potential to expand the Jerry Meyers Fish Hatchery. The expansion project had support from the local commercial and sport fishing industry and DIPAC; however a River Habitat Study conducted by Merrell in 1993

determined that the expansion was not feasible at its present location. Merrell's reasoning is that the summer water temperatures are too cold for optimal growth and rearing of fish and that the current location does not present ample space for building a larger facility. Merrell suggests relocating the hatchery to a site downstream from the powerhouse, as Pullen Park is a suitable site and is currently being used as a collection point to capture mature salmon for eggs and for rearing juvenile salmonids before release.

## 5.2 *Fish Passage and Habitat*

Fish passage has been a concern on Pullen Creek in the past. For example, the creek outfall had been relocated several times over the last 30 years. In the 1960s, the outfall was relocated from the east boat harbor to make room for the ore terminal construction. It was moved back to its original location in the 1970s due to the boat harbor expansion and the need to reduce freshwater flow in the harbor and subsequent winter icing. Finally, in the late 1990s the ADF&G moved the creek mouth to its present location approximately 60 yards east. The outlet was subsequently elevated many feet above its original elevation, forcing fish to migrate into the stream through a culvert that is only accessible during high tide. As part of a mitigation project for the Skagway Airport, the Alaska Department of Transportation Public Facilities (ADOTPF) placed a flume structure at the opening of the culvert, improving access to Pullen Creek for juvenile and adult fish.

In 2000, the ADF&G identified a fish barrier above the Dewey Lakes Hydroelectric Project tailrace. A small culvert was preventing the large runs of pink salmon from accessing upper Pullen Creek. APT removed this culvert in 2001 with ADF&G's guidance. A new creek bed was subsequently created with gravel and the creek banks were revegetated.

To improve fish habitat in the lower reach of Pullen Creek, ADOTPF accepted a mitigation project to replace two culverts between the creek mouth and Broadway Street. In addition, the section between the culverts was "daylighted" utilizing rock dams to create pools to aid fish migrating upstream. In addition, ADOTPF created a rock weir structure and installed baffling on the Second Street culvert to help decrease flow and create "steps" for the fish to pass upstream (see section 6.1 for more details).

Above Pullen Pond, there are two culverts which lead to a section of the creek termed the "Congress Way Reach". This stretch of stream is wide and shallow and appears to be backwatered from the downstream culvert. The east bank has no riparian vegetation. The reach is a known location for spawning, even though the habitat is not ideal spawning conditions. The TIWC is currently pursuing in grant funding to improve fish passage and habitat in the Congress Way reach of Pullen Creek.

Some of the storm drains connecting to Pullen Creek are accessible to fish at higher flows and lead to the gutter system. The problem is most noticeable at the storm drains that enter the creek on 9<sup>th</sup> and 10<sup>th</sup> Streets. The fish can enter the gutter system through the drain pipes and could become trapped in when water levels decrease. This would result in unnecessary fish kills that could be prevented with screens that block entry into the storm drain system.

## 5.3 *Sport and Commercial Fishing*

Salmon returning to Pullen Creek must migrate into the stream through a culvert. Hatchery fish must therefore mill in saltwater off the mouth of the stream until a sufficient high tide and stream flows allow them to pass through the culvert. This situation increases the vulnerability of the fish to predation and to sport fishing. To ensure that enough salmon enter Pullen Creek for brood stock

needs, the ADFG has closed the area of Taiya Inlet north of a line extending from a department marker on the Broadway Dock to a department marker on the ore terminal dock during June and August.

## **6.0 Current Projects**

Current efforts at monitoring water quality and fish habitat on Pullen Creek have been implemented by separate projects through various organizations. These organizations include the ADOTPF for Skagway Airport mitigation, APT for Dewey Lakes Hydroelectric relicensing, TIWC for various projects, and the STC for ACWA programs. Below there is a brief description of the first three projects, and a detailed description of STC's ACWA project, which is the primary focus of this assessment.

### *6.1 Alaska Department of Transportation Airport Mitigation Project*

The ADOTPF received a permit in 1998 to improve the airport, which included a modification of the Skagway River to divert flow away from the airport. With the airport expansion, mitigation efforts for the impacts on Skagway River may help to improve Pullen Creek. As part of the mitigation, ADOTPF replaced culverts and rebuilt the lower portion of Pullen Creek, largely to improve fish habitat (see section 5.2). Mitigation projects included replacing the Broadway Street culvert with two larger culverts, creating a "daylighted" segment of Pullen Creek on a stretch located near the ferry terminal, and building a rock weir structure and four baffle plates to back water into the culvert on Second Avenue.

Work for the Pullen Creek mitigation was completed in 1999. According to the Skagway Airport Improvements Final Environmental Assessment, monitoring of Pullen Creek mitigation measures will evaluate impacts over a period of five years. Monitoring on Pullen Creek included fish identification and enumeration, fish passage, water flow measurements, and assessment of macroinvertebrate recruitment in the "daylighted" section.

Silver King Environmental completed the first monitoring for fish identification, enumeration, and passage for the ADOTPF in October 2002. At this time, the Pullen Creek structures were found to have two deficiencies: first, the four rock dams located near the ferry terminal have been washed out; second, the rock weir in Pullen Pond has also washed out and, therefore, is insufficient in backing water into the culvert.

The "daylighted" channel, according to the October 2002 evaluation, is likely used more as a migratory passage than a rearing area. The increased flow due to the loss of the rock dams may pose a problem to fish attempting to migrate upstream. However, it was noted that there is the possibility of smaller fish being able to seek refuge from the increased flows along the rocky shoreline of the channel.

Both the dams and the rock weir in Pullen Creek were designed with undersized rocks that could not withstand the higher flows. The ADOTPF rebuilt the weir structure in the Spring of 2004, but with larger grade rocks. The ADOTPF also installed additional baffles at the culvert outlet at Pullen Pond near Second Avenue. However, the rock dams will be replaced with boulder clusters.

## 6.2 *Alaska Power and Telephone Dewey Lakes Hydroelectric Project*

APT is undergoing the relicensing of the Dewey Lake Hydropower Project. Through its application with the Federal Energy Regulatory Commission, APT will monitor to determine if the power plant may be adversely impacting Pullen Creek. Addressing agency concerns, APT is collecting baseline data on the following parameters as part of its monitoring efforts: temperature, conductivity, pH, total dissolved solids, total suspended solids, turbidity, nitrogen, phosphorus, biological oxygen demand, alkalinity, chlorophyll A, fecal coliforms, nitrates, nitrites, total coliforms and hardness. Water temperature is being monitored within the tailrace, as well as just above the railroad culvert. Water temperature stratification in the reservoir will be collected on a quarterly basis, and a habitat survey will be conducted using the U.S. Forest Service “Fish and Aquatic Stream Habitat Survey” protocols. The data of this project are still being collected at the time of this assessment and a project report is expected to be released in 2005.

## 6.3 *Taiya Inlet Watershed Council Projects*

The community of Skagway formed the TIWC in February of 2003. The council acts as a community stewardship organization for watersheds within the entire Taiya Inlet, but has focused much of its work thus far on Pullen Creek. A variety of projects have been completed or are ongoing, including annual litter pickup events, an annual public workshop focusing on stream ecology, and publication and distribution of a streamside stewardship brochure that provides landowners with suggestions for reducing potential sources of nonpoint source pollution and improving backyard fish and wildlife habitat.

The TIWC has also assisted with water quality monitoring, in cooperation with STC. Using the protocols outlined by STC in their Pullen Creek Quality Assurance Project Plan, TIWC conducted a water quality sampling event in November 2003. The purpose was to provide additional baseline data for STC’s ACWA Project. Data obtained during the project are presented in Appendix C.

TIWC hosted a macroinvertebrate sampling training in the spring of 2004, using the volunteer level protocols established by the University of Alaska Anchorage’s Environment and Natural Resources Institute. The training was held in conjunction the POWTEC, LLC. Skagway community members had requested macroinvertebrate information be included in the creek assessment. Results of the macroinvertebrate sampling event are presented in Table 29.

TIWC is currently developing the Pullen Creek Action Plan which will identify opportunities for habitat and water quality improvements. The council has facilitated interactions between resource agencies and landowners regarding fish passage improvements on the Congress Way reach, and is currently pursuing funding to complete the restoration work. The organization will continue to facilitate the exchange of information on Pullen Creek throughout the community of Skagway.

Finally, the TIWC received an FY06 ACWA grant to map and collect baseline data on the stormwater system in Skagway. In conjunction with the City of Skagway, the information will be used for educational outreach and the development of a stormwater management plan.

## 6.4 Skagway Traditional Council Alaska Clean Water Action Project for FY04

### Introduction and Methods

In July 2003, STC received an ACWA grant to begin collecting baseline water quality data for Pullen Creek. The primary purpose of the STC project was to assess water, sediment, bank soil and biological quality in Pullen Creek, focusing on heavy metals. Lead, zinc, cadmium and mercury have been found in the Skagway Harbor and within the community of Skagway through various other testing programs. These contaminants are assumed to have originated from an ore transfer facility and the associated railroad. There are, however, other potential sources including seven formerly used defense sites (FUDS) used by the military during World War II, the effects of urbanization, and other undetermined sources.

While sampling was primarily for screening Pullen Creek for heavy metals, other data on hydrocarbons, basic water quality (temperature, dissolved oxygen, conductivity and pH), total suspended solids, discharge, and substrate composition were collected. In addition, a screening tested called a Tentatively Identified Compounds (TIC) was conducted to screen for a variety of common contaminants.

STC developed a Quality Assurance Project Plan (QAPP) for all data collected under their program between July 2003 and June 2005. There were five sampling locations on Pullen Creek, which were chosen to integrate tributaries and to give geographic spread along the creek (Figure 1). There were five sampling events to collect a full years worth of data: February 2004, May 2004, August 2004, November 2004, and March 2005. Water, sediments and bank soils were collected and analyzed for heavy metals and hydrocarbons for each sampling event. In addition, macroinvertebrates were collected in May 2005 and analyzed for heavy metals. Basic water quality, total suspended solids, discharge, substrate composition and TIC were also measured in situ during each sampling event.

All samples were collected in accordance to STC's QAPP. Heavy metal and hydrocarbon analysis on water, sediments and bank soils were conducted at Shoalwater Bay Laboratory and heavy metal analysis on macroinvertebrates was conducted by Columbia Analytical Services, Inc. Data from soil samples were compared back to the State of Alaska's method 2 soil clean-up levels. Data on water samples were compared back to the State of Alaska water quality standards. For sediments, the data were compared to National Oceanic Atmospheric Administration's (NOAA) Effects Range Median (ERM) for Sediment Quality Guidelines. There were no guidelines set for barium or selenium in NOAA's guidelines, so these parameters were compared to the State of Alaska's method 2 soil clean-up levels. There are no standards set for comparison of biological data on macroinvertebrates. Biological samples from Pullen Creek will be compared back to Nelson Creek, which was selected as a reference stream due to it's similarity to Pullen Creek and it's geographic location outside of the Skagway valley basin.

### Results and Discussion

The scope of this study was limited to contaminant screening purposes and does not address the extent and source of contamination. The data only determine if contaminants are present and at what levels. Tables 1-15 summarize data collected for heavy metal testing and tables 16-25 summarize data for hydrocarbon testing on soil, sediment and water for all sampling events. Table 26 summarizes the data collected for heavy metals on macroinvertebrates.

Arsenic in soils was detected at levels that exceeded the State of Alaska's clean-up standard (1.8 mg/kg) in February, May, August and November of 2004 (tables 1, 4, 7, 10). Arsenic levels were exceeded at every site for each sampling event, with the exception of Pullen Pond in August (1.5 mg/kg) and the Confluence to Tributary One in November (1.4 mg/kg). In the March 2005 sampling event, arsenic was not detected in soil at any of the sites (table 13). Arsenic did not exceed sediment (70 mg/kg) or water (50 µg/L) standards for any sampling event. Due to the prevalence of arsenic in soils associated with Pullen Creek samples, a discussion for arsenic is warranted. The State's method 2 soil clean-up level for arsenic is listed at 1.8 mg/kg. Background levels of arsenic occur naturally in Southeast Alaska soils, and it could be argued that the State of Alaska's regulatory levels are too low for non-drinking water sources.

There have been two previous investigations into background levels of arsenic in soils and sediments in Alaska. For arsenic, background levels in Alaska were found to be a mean of 6.7 mg/Kg and an arithmetic mean of 9.6 mg/Kg (USGS professional paper 1458) and 17.3 mg/Kg (Geochemical Atlas of Alaska). While these papers are not regulatory, they lend evidence that it would be difficult to regulate levels of arsenic that are above the State method 2 soil clean-up level, because background levels of arsenic will always remain. The levels of arsenic found in this study do not exceed what may be considered background, and are therefore not noted as a high concern.

Barium exceeded the State of Alaska's method 2 clean-up standard (982.0 mg/kg) at Tributary Two and the Rail Yard Headwater in soil in February 2004 (table 1). Barium also exceeded the State of Alaska's method 2 soil clean-up standard (982.0 mg/kg) at every site in sediment during the same sampling event (table 2). Barium exceeded the State of Alaska water quality standard (2000.0 µg/L) in water sampling once in August 2004 at the Pullen Pond site (table 9). While there are background levels of barium in Southeast Alaska soils, the State of Alaska's clean-up standards appear to be higher than the previously mentioned USGS study indicated as background (595 mg/kg and 698 mg/kg in USGS professional paper 1458). According to the Agency for Toxic Substances and Disease Registry (ATSDR), barium has adverse health impacts as occurs in compound form with other elements such as sulfur, carbon and oxygen. Common barium compounds have been found in drilling muds (lubricants for rock drills), paint, brinks, tiles, glass and rubber.

Cadmium exceeded the State of Alaska's method 2 soil clean-up level (4.5 mg/kg) at the Fish Hatchery site in August 2004 and at the Fish Hatchery and Confluence to Tributary One sites in March 2005. Cadmium was below standards for both sediments (6.6 mg/kg) and water (5.0 µg/L) for all sampling events. The State of Alaska's soil clean-up standards for cadmium are higher than the background levels found in the USGS study indicated as background (1.3 mg/kg and 2.0 mg/kg, USGS professional paper 1458). According to the ATSDR, cadmium can have adverse health impacts if exposure is to high levels over a long term. In addition, cadmium is considered a likely carcinogen. Cadmium can be found associated with production of metals such as zinc, lead and copper. It may also be found in batteries, pigments, metal coatings and plastics.

Chromium exceeded the State of Alaska's method 2 soil clean-up level (23.0 mg/K) at the Fish Hatchery in March 2005 (table 13). Chromium was below standards for both sediments (370.0 mg/kg) and water (100.0 µg/L) for all sampling events. The State of Alaska's clean-up standards higher than what the USGS studies have determined as potential mean level background (50 mg/kg and 64 mg/kg in USGS professional paper 1458). According to the ATSDR, there are various forms of chromium (forms 0, III and VI) that have adverse impacts on human health. Chromium VI is a known carcinogen. While chromium III occurs naturally in the environment as an essential nutrient,

chromium 0 and VI are generally produced by industrial processes. Chromium is used for making steel, chrome plating, dyes and pigments, leather tanning and wood preserving.

Lead exceeded the State of Alaska's method 2 soil clean-up standard (400 mg/kg) in soil at the Fish Hatchery for all sampling events (tables 1, 4, 7, 10, 13). Lead also exceeded the standard in soil at the Confluence to Tributary One in August 2004 and March 2005 (tables 7 and 13). In February 2004 and May 2004, lead exceeded the standard in soil at the Railyard headwater (tables 1, 4). For sediments, lead exceeded the NOAA ERM (218.0 mg/Kg) at Pullen Pond, the Confluence to Tributary One, the Confluence to Tributary Two and the Rail Yard Headwater in February 2004 (Table 2). Lead also exceeded the NOAA ERM at the Confluence of Tributary Two during the August 2004 sampling event (table 8). Lead did not exceed the State of Alaska's water quality standard (15.0 µg/L). The State of Alaska's method 2 soil clean-up level and NOAA's ERM are both higher than what the USGS studies have determined as potential mean level background (12 mg/kg and 14 mg/kg in USGS professional paper 1458). Lead is a highly regulated contaminant due to its potential adverse effects on human health. While Pullen Creek is not a drinking water source for the community of Skagway, lead is easily transported through soil, air and water and has the potential for entering into the biotic communities and bioaccumulating through the food chain. According to the ATSDR, lead comes from mining, the burning of fossil fuels and the manufacturing of it. It is currently unknown whether or not lead can be considered a carcinogen. Lead can be used in batteries, ammunition, and metal products. In addition, lead can be used to shield against X-rays.

Mercury exceeded the State of Alaska's method 2 soil clean-up standard (1.24 mg/kg) in soil in March 2005 at the Fish Hatchery (table 13). Mercury did not exceed NOAA's ERM in sediments (0.71 mg/kg) or the State of Alaska water quality standards (1.24 µg/L). There is not a level indicated by the USGS to be considered background for mercury (USGS professional paper 1458). According to the ATSDR, mercury is known to have extreme adverse health effects on human in low short-term and long-term doses. There is insufficient data to determine if mercury is a carcinogen. Mercury can be produced by microscopic organisms into the form of methylmercury. It can also be found naturally in its metallic form. Mercury is used to produce chlorine gas and caustic soda, as well as in thermometers, batteries and dental fillings.

Selenium and silver did not exceed any standard level set in this document for comparison, therefore there is no results to report for these elements.

Zinc did not exceed the State of Alaska's method 2 soil clean-up level (8100.0 mg/kg) for any sampling event. However, zinc did exceed the NOAA ERM (410.0 mg/kg) in sediments at the Fish Hatchery, the Confluence of Tributary One, the Confluence of Tributary Two, and the Rail Yard Headwaters during the February 2004 sampling event (table 2). For sediments, zinc also exceeded the NOAA ERM (410.0 mg/kg) at the Fish Hatchery in May 2004, at the Confluence of Tributary Two in August 2004, and at the Confluence of Tributary One in March of 2005 (tables 5, 8, 14). Zinc did not exceed the State of Alaska's water quality standard (8100.0 mg/kg) for any sampling event. The State of Alaska's method 2 soil clean-up level and NOAA's ERMs are both higher than what the USGS study considers background in Alaska (70 mg/kg and 79 mg/kg, in USGS professional paper 1458). According to the ATSDR, zinc is a necessary element in the human diet. However, if exposure to zinc is 10 times what is needed for good health, the effects can be adverse. Zinc is not a known or suspected carcinogen. Zinc is used in coating to prevent rust, in dry cell batteries, and mixed with other metals to create alloys such as those found in U.S. pennies. Zinc compounds are commonly used to make paint, rubber, dyes, wood preservative and ointments.

There were not enough samples in the biological testing to conduct a statistical comparison on heavy metals in macroinvertebrates between the three sites. However, lead and zinc both appear to be found at higher levels in macroinvertebrates sampled at the Confluence of Tributary One (table 26). When comparing functional feeding groups, there was a significant difference in the level of barium between shredders and predators (t-test;  $p = 0.025$ ), where shredders had a higher level. There is also a general trend of zinc levels being higher in shredders than in predators, but this was not significant ( $p = 0.50$ ). Because there are no comparative data to compare levels back to, it is unknown if the levels of barium and zinc are of concern.

The hydrocarbon test used in this study was an analysis of Benzene, Toluene, Ethylbenzene and Xylene (BTEX). Ethylbenzene exceeded the State of Alaska's method 2 soil clean-up level (5.0 mg/kg) in sediments during the November 2004 sampling event at the Pullen Pond site (77.4 mg/kg) and the Rail Yard Headwater site (17.4 mg/kg). There were no other exceedences in standards for sediment or water for any sampling event. According to the ATSDR there is very little information available on the effects of ethylbenzene on human health. It is also not a known carcinogen. Ethylbenzene can be found in manufactured products such as ink, insecticides, paint and fuels. It is used to make other chemicals like styrene.

Supplemental information collected under this project includes basic water quality data (temperature, dissolved oxygen, conductivity and pH), discharge and pebble count information for each site (table 27). This information was gathered to begin developing a general baseline of information for future data comparison. In addition, Total Suspended Solids were collected, however all samples came back with no detection of suspended solids above the method detection limit (4.0 mg/L).

In general, water temperatures were coolest at the Pullen Pond site (average 4.3 °C). A higher temperature measurement in August at this site is extreme, and may have been a result of a fish weir that was left in place without maintenance that had debris and dead salmon carcasses built up. Difficulty with the field calibration of the dissolved oxygen probe may account for abnormal readings (see table 27). All other temperature, pH and conductivity readings are within expected ranges.

Discharge at each site was also measured. At the Pullen Pond site, discharge measurements were dependant upon the Dewey Lakes Hydroelectric Plant. Measurements ranged from low of 2.33 cfs in February 05 to a high of 34.37 cfs in May 04. The Confluence of Tributary One had a mean discharge of 1.75 cfs ( $\pm 0.43$  cfs), the Fish Hatchery had a mean discharge of 0.40 cfs ( $\pm 0.23$  cfs), and the Confluence of Tributary Two had a mean discharge of 1.57 cfs ( $\pm 0.87$  cfs). Discharge was only measured at the Rail Yard Headwater in February 04 at 0.15 cfs and in May 04 at 0.50 cfs. Other measurements at this site were not obtained because of weather and low flowing conditions.

A summary of the pebble count data to qualify substrate at each site can be found in table 27. In general, the Pullen Pond site consisted of boulder (>256 mm) and small cobble (64-127.9 mm) in the stream bed, with sand and silt along the edges at the stream bank. The Confluence of Tributary One bed substrate was comprised of very course gravel (32-63.9 mm) and sand (<2 mm). The Fish Hatchery site was dominated by silt (< 2mm) and detritus, with some wood. The Confluence of Tributary Two was a mix of sand/silt (<2 mm), detritus and vegetation. The Rail Yard Headwater site had very course gravel (32-63.9 mm) and small cobble (64-127.9 mm) embedded in sand/silt (<2 mm).

The STC performed a TIC (Tentatively Identified Compounds) test below Pullen Pond during the February 2004, May 2004, August 2004, November 2004, and March 2005 sampling events, to screen



for other potential contaminants in the water column. The purpose of the TIC test was to determine if sampling should be covering other contaminants such as PCBs, pesticides, herbicides, etc. Two contaminants were detected during the TIC test (Table 28). In both February 2004 and March 2005, bis(2-Ethylhexyl) Phthalate was detected at 10 µg/L and in May pentachlorophenol was detected at 77 µg/L. The State of Alaska's groundwater clean-up level for each contaminant is 6.0 µg/L and 1.0 µg/L respectively.

Bis(2-Ethylhexyl) Phthalate (DEHP) is a common additive to plastics to make them more flexible. According to the Agency for Toxic Substances and Disease Registry (ATSDR) exposure is low and at low levels DEHP is not toxic. Pentachlorophenol is a manufactured chemical which is a restricted use pesticide and is used industrially as a wood preservative for utility poles, railroad ties, and wharf pilings. At high levels, pentachlorophenol can be very toxic.

## **7.0 Recommendations**

The data collected under STC's ACWA program should be considered for screening purposes. The purpose of data collection under this program was to screen for contaminants and start developing a baseline of water quality information. Before the data are used for regulatory purposes, it is recommended that an independent data quality review take place. This will assure all quality assurance and control measures by the field sampling crew and the laboratory analysis were within the guidelines of the Quality Assurance Project Plan. Non-regulatory uses of the data are still feasible.

The STC ACWA study showed that heavy metals are present in bank soils and sediments associated with Pullen Creek. Of particular concern is the presence of lead and zinc, however barium was also found at high levels which exceeded the standards set forth as comparison values. In a meeting with the stakeholders of Pullen Creek, it was discussed and recommended that STC move forward with the development of a Waterbody Recover Plan under their ACWA program for FY06.

The Waterbody Recovery Plan for Pullen Creek should address the cumulative effects of current and future construction projects along or near Pullen Creek. STC's concern is that if construction is not mindful of the contaminated bank soils of Pullen Creek, the project may introduce these contaminants into the creek. In addition, all projects that occurs near Pullen Creek should have a pre-construction and post-construction monitoring program. This will help to safeguard the potential of re-introducing contaminants into pathways that may make it into Pullen Creek.

Contaminants appear to be more closely associated with the Fish Hatchery site, where arsenic, barium, cadmium, chromium, lead, mercury and zinc were all found in exceedence of standards in soils and sediments in the STC ACWA study. It is recommended that a comprehensive site specific study be conducted on the stretch of creek just below the Fish Hatchery. The study should be designed to determine the extent of contamination.

With respect to the biological testing conducted under STC's ACWA program, The data from STC's biological testing is considered for background purposes. It is recommended that a more detailed study be conducted, which can incorporate broader sampling in order to collect the biomass needed for analyzing multiple samples. Nelson Creek still be used as a reference site for comparison.

STC's Tentatively Identified Compound (TIC) test revealed that Pullen Creek contained elevated levels of bis(2-Ethylhexyl) Phthalate and Pentachlorophenol. These results were not consistent between sampling events (bis(2-Ethylhexyl) Phthalate was detected in February and Pentachlorophenol

was detected in May). If these contaminants are a concern to the Skagway community, it is recommended that a sampling program be developed.

Open storm drains, which empty into Pullen Creek, have the potential to allow fish passage into the drain system. When run-off levels subside, the fish become trapped in the drain. It is recommended that the community of Skagway work with the ADF&G to develop a feasible way to address the issue.

Pullen Creek is a spring-fed stream, however very little is understood about the source of the water. There is a possibility that the Skagway River may be a source of one or more of the springs which feed into Pullen Creek. It is recommended that a hydrological study be conducted to address this issue. Source water information can be useful in delineating contamination pathways.

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*We are from Skagway. Our grandfathers and grandmothers are our Ancestors who have gone on we call them Haa Shagoon. It is from ages past that they have called this land Chilkoot Lkóot Aani. That is how we know it today. We who now walk this land seek to learn the ways of our Ancestors, to live in harmony and balance on this land. It will be this way, because of your help. Your kindness is amazing. We have always had respect for each other through our culture. Thank you so much, our friends and relatives.*

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### **Land Owners along Pullen Creek**

For allowing sampling and other work done along the property. A community-wide sense of responsibility and cooperation is necessary for the long term health of Pullen Creek

## Tables

**Table 1.** Results of February, 2004 soil sampling for heavy metals on Pullen Creek, Skagway, Alaska. Samples were analyzed using EPA methods 200.9, 7081, 7471A, and 7951. Clean up levels are indicated next to contaminant and are based on the State of Alaska's method 2 soil clean-up levels.

LOCATION OF SAMPLE:	Pullen Creek	Pullen Creek	Pullen Creek	Pullen Creek	Pullen Creek
DESCRIPTION OF LOCATION:	Pullen Pond	Fish Hatchery	Confluence of Tributary One	Confluence of Tributary Two	Rail Yard Headwater (State St.)
DATE OF SAMPLE:	2/23/2004	2/24/2004	2/23/2004	2/23/2004	2/24/2004
TYPE OF SAMPLE:	Soil	Soil	Soil	Soil	Soil
FIELD SAMPLE ID:	PPSOM2	FHSOM2	T1SOM2	T2SOM2	HWSOM2
TESTING LABORATORY	Shoalwater	Shoalwater	Shoalwater	Shoalwater	Shoalwater
LABORATORY SAMPLE ID:	40226-02	40226-15	40226-18	40226-07	40226-10
DATE RECEIVED:	2/26/2004	2/26/2004	2/26/2004	2/26/2004	2/26/2004
DATE ANALYZED	4/29/2004	4/29/2004	4/29/2004	4/29/2004	4/29/2004
CONCENTRATION UNITS:	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg
Arsenic (As) - 1.8 mg/Kg	3.7	8.2	20	8.1	12.9
Barium (Ba) - 982.0 mg/Kg	367	653	452	1060	1360
Cadmium (Cd) - 4.5 mg/Kg	ND	1.3	0.9	0.800	2.8
Chromium (Cr) - 23.0 mg/Kg	7.7	19.9	13	6.2	19.8
Lead (Pb) - 400.0 mg/Kg	123.0	1240	346	116	520
Mercury (Hg) - 1.24 mg/Kg	ND	ND	ND	ND	ND
Selenium (Se) - 3.0 mg/Kg	ND	ND	ND	ND	ND
Silver (Ag) - 19.0 mg/Kg	ND	2.1	ND	ND	2.60
Zinc (Zn) - 8100.0 mg/Kg	85	673	317	263	391

**Table 2.** Results of February, 2004 sediment sampling for heavy metals on Pullen Creek, Skagway, Alaska. Samples were analyzed using EPA methods 200.9, 7081, 7471A, and 7951. Clean up levels are indicated next to contaminant and are based on the NOAA's Effects Range Median for Sediment Quality Guidelines (for arsenic, cadmium, chromium, lead, mercury, silver and zinc) and the State of Alaska's method 2 soil clean-up levels (for barium and selenium).

LOCATION OF SAMPLE:	Pullen Creek	Pullen Creek	Pullen Creek	Pullen Creek	Pullen Creek
DESCRIPTION OF LOCATION:	Pullen Pond	Fish Hatchery	Confluence of Tributary One	Confluence of Tributary Two	Rail Yard Headwater (State St.)
DATE OF SAMPLE:	2/24/2004	2/23/2004	2/24/2004	2/24/2004	2/23/2004
TYPE OF SAMPLE:	Sediment	Sediment	Sediment	Sediment	Sediment
FIELD SAMPLE ID:	PPSDM2	FHSDM2	T1SDM2	T2SDM2	HWSDM2
TESTING LABORATORY	Shoalwater	Shoalwater	Shoalwater	Shoalwater	Shoalwater
LABORATORY SAMPLE ID:	40226-03	40226-16	40226-19	40226-08	40226-11
DATE RECEIVED:	2/26/2004	2/26/2004	2/26/2004	2/26/2004	2/26/2004
DATE ANALYZED	4/29/2004	4/29/2004	4/29/2004	4/29/2004	4/29/2004
CONCENTRATION UNITS:	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg
Arsenic (As) – 70.0 mg/Kg	13.0	19.2	7.1	15	17.5
Barium (Ba) - 982.0 mg/Kg	1290	1340	1080	1070	1840
Cadmium (Cd) – 6.6 mg/Kg	ND	1.7	0.7	2.000	1.6
Chromium (Cr) - 370.0 mg/Kg	20	43.5	12	32	30.6
Lead (Pb) - 218.0 mg/Kg	422	207	263	373	633
Mercury (Hg) – 0.71 mg/Kg	ND	ND	ND	ND	ND
Selenium (Se) - 3.0 mg/Kg	ND	ND	ND	ND	ND
Silver (Ag) – 3.73 mg/Kg	1.2	0.7	ND	0.9	2.40
Zinc (Zn) - 410.0 mg/Kg	293	835	551	913	557



**Table 3.** Results of February, 2004 water sampling for heavy metals on Pullen Creek, Skagway, Alaska. Samples were analyzed using EPA methods 200.9, 208.2, 245.1, and 289.2. Clean up levels are indicated next to contaminant and are based on the State of Alaska groundwater clean-up levels.

LOCATION OF SAMPLE:	Blank	Pullen Creek	Pullen Creek Rail Yard Headwater (State St.)
DESCRIPTION OF LOCATION:		Pullen Pond	
DATE OF SAMPLE:		2/23/2004	2/24/2004
TYPE OF SAMPLE:	Blank	Water	Water
FIELD SAMPLE ID:	BLWM	PPWM2	HWWM2
TESTING LABORATORY	Shoalwater	Shoalwater	Shoalwater
LABORATORY SAMPLE ID:	40226-22	40226-05	40226-13
DATE RECEIVED:	2/26/2004	2/26/2004	2/26/2004
DATE ANALYZED	4/29/2004	4/29/2004	4/29/2004
CONCENTRATION UNITS:	ug/L	ug/L	ug/L
Arsenic (As) – 50 ug/L	ND	ND	ND
Barium (Ba) - 2000.0 ug/L	ND	77	84
Cadmium (Cd) - 5.0 ug/L	ND	ND	ND
Chromium (Cr) - 100.0 ug/L	1.4	1.6	0.63
Lead (Pb) - 15.0 ug/L	ND	ND	ND
Mercury (Hg) – 1.24 mg/Kg	ND	ND	ND
Selenium (Se) - 50.0 ug/L	ND	ND	ND
Silver (Ag) – 180.0 ug/L	ND	1.01	ND
Zinc (Zn) – 11000.0 ug/L	ND	ND	ND

**Table 4.** Results of May, 2004 soil sampling for heavy metals on Pullen Creek, Skagway, Alaska. Samples were analyzed using EPA methods 200.9, 7081, 7471A, and 7951. Clean up levels are indicated next to contaminant and are based on the State of Alaska's method 2 soil clean-up levels.

LOCATION OF SAMPLE:	Pullen Creek	Pullen Creek	Pullen Creek	Pullen Creek	Pullen Creek	Pullen Creek
DESCRIPTION OF LOCATION:	Pullen Pond	Fish Hatchery	Confluence of Tributary One	Confluence of Tributary Two	Rail Yard Headwater (State St.)	Rail Yard Headwater (State St.)
DATE OF SAMPLE:	5/17/2004	5/17/2004	5/17/2004	5/17/2004	5/17/2004	5/17/2004
TYPE OF SAMPLE:	Soil	Soil	Soil	Soil	Soil	Soil
FIELD SAMPLE ID:	PPSOM3	FHSOM3	T1SOM3	T2SOM3	HWSOM3	HWSOM3
TESTING LABORATORY	Shoalwater	Shoalwater	Shoalwater	Shoalwater	Shoalwater	Shoalwater
LABORATORY SAMPLE ID:	40519-06	40519-23	40519-19	40519-27	40519-14	40519-14 Dup
DATE RECEIVED:	5/19/2004	5/19/2004	5/19/2004	5/19/2004	5/19/2004	5/19/2004
DATE ANALYZED	5/26/2004	5/26/2004	5/26/2004	5/26/2004	5/26/2004	5/26/2004
CONCENTRATION UNITS:	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg
Arsenic (As) - 1.8 mg/Kg	4.4	3.0	1.9	2.7	4.7	4.5
Barium (Ba) - 982.0 mg/Kg	280.0	180.0	210.0	290.0	120.0	110.0
Cadmium (Cd) - 4.5 mg/Kg	ND	ND	ND	ND	ND	ND
Chromium (Cr) - 23.0 mg/Kg	2.4	6.4	5.1	3.6	11.0	3.7
Lead (Pb) - 400.0 mg/Kg	90.0	620.0	340.0	54.0	740.0	640.0
Mercury (Hg) - 1.24 mg/Kg	ND	ND	ND	ND	ND	ND
Selenium (Se) - 3.0 mg/Kg	ND	ND	ND	ND	ND	ND
Silver (Ag) - 19.0 mg/Kg	ND	ND	ND	ND	2.2	2.3
Zinc (Zn) - 8100.0 mg/Kg	130.0	650.0	1800.0	94.0	290.0	300.0

**Table 5.** Results of May, 2004 sediment sampling for heavy metals on Pullen Creek, Skagway, Alaska. Samples were analyzed using EPA methods 200.9, 7081, 7471A, and 7951. Clean up levels are indicated next to contaminant and are based on the NOAA's Effects Range Median for Sediment Quality Guidelines (for arsenic, cadmium, chromium, lead, mercury, silver and zinc) and the State of Alaska's method 2 soil clean-up levels (for barium and selenium).

LOCATION OF SAMPLE:	Pullen Creek	Pullen Creek	Pullen Creek	Pullen Creek	Pullen Creek
DESCRIPTION OF LOCATION:	Pullen Pond	Fish Hatchery	Confluence of Tributary One	Confluence of Tributary Two	Rail Yard Headwater (State St.)
DATE OF SAMPLE:	5/17/2004	5/17/2004	5/17/2004	5/17/2004	5/17/2004
TYPE OF SAMPLE:	Sediment	Sediment	Sediment	Sediment	Sediment
FIELD SAMPLE ID:	PPSDM3	FHSDM3	T1SDM3	T2SDM3	HWSDM3
TESTING LABORATORY	Shoalwater	Shoalwater	Shoalwater	Shoalwater	Shoalwater
LABORATORY SAMPLE ID:	40519-07	40519-24	40519-20	40519-28	40519-15
DATE RECEIVED:	5/19/2004	5/19/2004	5/19/2004	5/19/2004	5/19/2004
DATE ANALYZED	5/26/2004	5/26/2004	5/26/2004	5/26/2004	5/26/2004
CONCENTRATION UNITS:	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg
Arsenic (As) – 70.0 mg/Kg	0.8	3.4	1.2	1.6	1.2
Barium (Ba) - 982.0 mg/Kg	250.0	180.0	190.0	200.0	170.0
Cadmium (Cd) – 6.6 mg/Kg	ND	ND	ND	ND	ND
Chromium (Cr) - 370.0 mg/Kg	5.5	14.0	5.5	5.6	6.9
Lead (Pb) - 218.0 mg/Kg	80.0	98.0	75.0	66.0	130.0
Mercury (Hg) – 0.71 mg/Kg	ND	ND	ND	ND	ND
Selenium (Se) - 3.0 mg/Kg	ND	ND	ND	ND	ND
Silver (Ag) – 3.73 mg/Kg	ND	0.6	ND	ND	ND
Zinc (Zn) - 410.0 mg/Kg	110.0	770.0	240.0	200.0	160.0

**Table 6.** Results of May, 2004 water sampling for heavy metals on Pullen Creek, Skagway, Alaska. Samples were analyzed using EPA methods 200.9, 208.2, 245.1, and 289.2. Clean up levels are indicated next to contaminant and are based on the State of Alaska groundwater clean-up levels.

LOCATION OF SAMPLE:	Blank	Pullen Creek	Pullen Creek	Pullen Creek
DESCRIPTION OF LOCATION:		<b>Pullen Pond</b>	<b>Rail Yard Headwater (State St.)</b>	<b>Rail Yard Headwater (State St.)</b>
DATE OF SAMPLE:		5/17/2004	5/17/2004	5/17/2004
TYPE OF SAMPLE:	Blank	Water	Water	Water
SAMPLE ID:	BLWM3	PPWM3	HWWM3	HWWM3 DUP
TESTING LABORATORY	Shoalwater	Shoalwater	Shoalwater	Shoalwater
LABORATORY SAMPLE ID:	Blank	40519-09	40519-17	40519-17 DUP
DATE RECEIVED:	5/19/2004	5/19/2004	5/19/2004	5/19/2004
DATE ANALYZED	5/26/2004	5/26/2004	5/26/2004	5/26/2004
CONCENTRATION UNITS:	ug/L	ug/L	ug/L	ug/L
Arsenic (As) – 50 ug/L	ND	ND	ND	ND
Barium (Ba) - 2000.0 ug/L	ND	ND	ND	ND
Cadmium (Cd) - 5.0 ug/L	ND	ND	ND	ND
Chromium (Cr) - 100.0 ug/L	ND	ND	ND	ND
Lead (Pb) - 15.0 ug/L	ND	ND	ND	ND
Mercury (Hg) – 1.24 mg/Kg	ND	ND	ND	ND
Selenium (Se) - 50.0 ug/L	ND	ND	ND	ND
Silver (Ag) – 180.0 ug/L	0.6	0.6	0.5	0.6
Zinc (Zn) – 11000.0 ug/L	ND	ND	ND	ND

**Table 7.** Results of August, 2004 soil sampling for heavy metals on Pullen Creek, Skagway, Alaska. Samples were analyzed using EPA methods 200.9, 7081, 7471A, and 7951. Clean up levels are indicated next to contaminant and are based on the State of Alaska's method 2 soil clean-up levels

LOCATION OF SAMPLE:	Pullen Creek	Pullen Creek	Pullen Creek	Pullen Creek	Pullen Creek	Pullen Creek
DESCRIPTION OF LOCATION:	Pullen Pond	Fish Hatchery	Confluence of Tributary One	Confluence of Tributary Two	Rail Yard Headwater (State St.)	Rail Yard Headwater (State St.)
DATE OF SAMPLE:	8/31/2004	8/31/2004	8/31/2004	8/31/2004	8/31/2004	8/31/2004
TYPE OF SAMPLE:	Soil	Soil	Soil	Soil	Soil	Soil
SAMPLE ID:	PPSOM4	FHSOM4	T1SOM4	T2SOM4	HWSOM4	HWSOM4
TESTING LABORATORY	Shoalwater	Shoalwater	Shoalwater	Shoalwater	Shoalwater	Shoalwater
LABORATORY SAMPLE ID:	40902-01	40902-12	40902-08	40902-16	40902-20	40902-20 Dup
DATE RECEIVED:	9/2/2004	9/2/2004	9/2/2004	9/2/2004	9/2/2004	9/2/2004
DATE ANALYZED	9/21/2004	9/21/2004	6/21/2004	9/21/2004	9/21/2004	9/21/2004
CONCENTRATION UNITS:	Mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg
Arsenic (As) - 1.8 mg/Kg	1.5	12.0	7.0	6.1	7.6	6.8
Barium (Ba) - 982.0 mg/Kg	105.0	302.0	408.0	250.0	344.0	NA
Cadmium (Cd) - 4.5 mg/Kg	ND	5.4	0.7	ND	2.3	2.3
Chromium (Cr) - 23.0 mg/Kg	2.2	12.0	6.1	7.2	15.0	15.0
Lead (Pb) - 400.0 mg/Kg	54.6	1627.0	438.0	129.0	358.0	NA
Mercury (Hg) - 1.24 mg/Kg	ND	ND	ND	ND	ND	ND
Selenium (Se) - 3.0 mg/Kg	ND	ND	ND	ND	ND	ND
Silver (Ag) - 19.0 mg/Kg	ND	5.4	ND	ND	1.9	2.1
Zinc (Zn) - 8100.0 mg/Kg	49.3	2554.0	960.0	179.0	320.0	NA

**Table 8.** Results of August, 2004 sediment sampling for heavy metals on Pullen Creek, Skagway, Alaska. Samples were analyzed using EPA methods 200.9, 7081, 7471A, and 7951. Clean up levels are indicated next to contaminant and are based on the NOAA's Effects Range Median for Sediment Quality Guidelines (for arsenic, cadmium, chromium, lead, mercury, silver and zinc) and the State of Alaska's method 2 soil clean-up levels (for barium and selenium).

LOCATION OF SAMPLE:	<b>Pullen Creek</b>	<b>Pullen Creek</b>	<b>Pullen Creek</b>	<b>Pullen Creek</b>	<b>Pullen Creek</b>
DESCRIPTION OF LOCATION:	<b>Pullen Pond</b>	<b>Fish Hatchery</b>	<b>Confluence of Tributary One</b>	<b>Confluence of Tributary Two</b>	<b>Rail Yard Headwater (State St.)</b>
DATE OF SAMPLE:	8/31/2004	8/31/2004	8/31/2004	8/31/2004	8/31/2004
TYPE OF SAMPLE:	Sediment	Sediment	Sediment	Sediment	Sediment
SAMPLE ID:	PPSDM4	FHSDM4	T1SDM4	T2SDM4	HWSDM4
TESTING LABORATORY	Shoalwater	Shoalwater	Shoalwater	Shoalwater	Shoalwater
LABORATORY SAMPLE ID:	40902-02	40902-13	40902-09	40902-17	40902-21
DATE RECEIVED:	9/2/2004	9/2/2004	9/2/2004	9/2/2004	9/2/2004
DATE ANALYZED	9/21/2004	9/21/2004	9/21/2004	9/21/2004	9/21/2004
CONCENTRATION UNITS:	Mg/Kg	mg/Kg	Mg/Kg	mg/Kg	mg/Kg
Arsenic (As) – 70.0 mg/Kg	2.9	4.8	2.3	8.6	7.8
Barium (Ba) - 982.0 mg/Kg	394.0	180.0	99.7	248.0	397.0
Cadmium (Cd) – 6.6 mg/Kg	ND	ND	ND	1.0	0.6
Chromium (Cr) - 370.0 mg/Kg	3.6	7.1	2.7	14.0	14.0
Lead (Pb) - 218.0 mg/Kg	52.8	64.4	60.7	232.0	159.0
Mercury (Hg) – 0.71 mg/Kg	ND	ND	ND	ND	ND
Selenium (Se) - 3.0 mg/Kg	ND	ND	ND	ND	ND
Silver (Ag) – 3.73 mg/Kg	ND	ND	ND	0.8	0.8
Zinc (Zn) - 410.0 mg/Kg	137.0	218.0	179.0	<b>565.0</b>	145.0

**Table 9.** Results of August, 2004 water sampling for heavy metals on Pullen Creek, Skagway, Alaska. Samples were analyzed using EPA methods 200.9, 208.2, 245.1, and 289.2. Clean up levels are indicated next to contaminant and are based on the State of Alaska groundwater clean-up levels.

LOCATION OF SAMPLE:	Blank	Pullen Creek	Pullen Creek Rail Yard Headwater	Pullen Creek Rail Yard Headwater
DESCRIPTION OF LOCATION:		Pullen Pond	(State St.)	(State St.)
DATE OF SAMPLE:		8/31/2004	8/31/2004	8/31/2004
TYPE OF SAMPLE:	Blank	Water	Water	Water
SAMPLE ID:	BLWM4	PPWM4	HWWM4	DUP
TESTING LABORATORY	Shoalwater	Shoalwater	Shoalwater	Shoalwater
LABORATORY SAMPLE ID:	Method Blank	40902-04	40902-23	40902-23 DUP
DATE RECEIVED:	9/2/2004	9/2/2004	9/2/2004	9/2/2004
DATE ANALYZED	9/21/2004	9/21/2004	9/21/2004	9/21/2004
CONCENTRATION UNITS:	ug/L	ug/L	ug/L	ug/L
Arsenic (As) – 50 ug/L	ND	ND	ND	ND
Barium (Ba) - 2000.0 ug/L	ND	1200.0	130	140
Cadmium (Cd) - 5.0 ug/L	ND	ND	ND	ND
Chromium (Cr) - 100.0 ug/L	4.7	1.6	0.7	0.5
Lead (Pb) - 15.0 ug/L	ND	ND	ND	ND
Mercury (Hg) – 1.24 mg/Kg	ND	ND	ND	ND
Selenium (Se) - 50.0 ug/L	ND	ND	ND	ND
Silver (Ag) – 180.0 ug/L	ND	ND	ND	ND
Zinc (Zn) – 11000.0 ug/L	ND	ND	ND	ND

**Table 10.** Results of November, 2004 soil sampling for heavy metals on Pullen Creek, Skagway, Alaska. Samples were analyzed using EPA methods 200.9, 7081, 7471A, and 7951. Clean up levels are indicated next to contaminant and are based on the State of Alaska's method 2 soil clean-up levels.

LOCATION OF SAMPLE:	Pullen Creek	Pullen Creek	Pullen Creek	Pullen Creek	Pullen Creek
DESCRIPTION OF LOCATION:	Pullen Pond	Fish Hatchery	Confluence of Tributary One	Confluence of Tributary Two	Rail Yard Headwater (State St.)
DATE OF SAMPLE:	11/15/2004	11/15/2004	11/15/2004	11/15/2004	11/15/2004
TYPE OF SAMPLE:	Soil	Soil	Soil	Soil	Soil
SAMPLE ID:	PPSOM5	FHSOM5	T1SOM5	T2SOM5	HWSOM5
TESTING LABORATORY	Edge	Edge	Edge	Edge	Edge
LABORATORY SAMPLE ID:	Analytical	Analytical	Analytical	Analytical	Analytical
LABORATORY SAMPLE ID:	40902-01	41117-24	41117-20	41117-16	41117-08
DATE RECEIVED:	11/19/2004	11/19/2004	11/19/2004	11/19/2004	11/19/2004
DATE ANALYZED	12/10/2004	12/13/2004	12/10/2004	12/10/2004	12/10/2004
CONCENTRATION UNITS:	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg
Arsenic (As) - 1.8 mg/Kg	14.0	5.8	1.4	2.6	5.7
Barium (Ba) - 982.0 mg/Kg	99.0	250.0	156.0	133.0	318.0
Cadmium (Cd) - 4.5 mg/Kg	1.5	3.4	1.5	2.0	3.5
Chromium (Cr) - 23.0 mg/Kg	7.9	6.7	5.4	7.9	12.0
Lead (Pb) - 400.0 mg/Kg	60.0	592.0	18.0	33.0	168.0
Mercury (Hg) - 1.24 mg/Kg	0.1	0.2	0.0	0.1	0.2
Selenium (Se) - 3.0 mg/Kg	ND	ND	ND	ND	ND
Silver (Ag) - 19.0 mg/Kg	ND	ND	ND	ND	ND
Zinc (Zn) - 8100.0 mg/Kg	63.0	373.0	48.0	109.0	127.0



**Table 11.** Results of November, 2004 sediment sampling for heavy metals on Pullen Creek, Skagway, Alaska. Samples were analyzed using EPA methods 200.9, 7081, 7471A, and 7951. Clean up levels are indicated next to contaminant and are based on the NOAA's Effects Range Median for Sediment Quality Guidelines (for arsenic, cadmium, chromium, lead, mercury, silver and zinc) and the State of Alaska's method 2 soil clean-up levels (for barium and selenium).

LOCATION OF SAMPLE:	<b>Pullen Creek</b>	<b>Pullen Creek</b>	<b>Pullen Creek</b>	<b>Pullen Creek</b>	<b>Pullen Creek</b>
DESCRIPTION OF LOCATION:	<b>Pullen Pond</b>	<b>Fish Hatchery</b>	<b>Confluence of Tributary One</b>	<b>Confluence of Tributary Two</b>	<b>Rail Yard Headwater (State St.)</b>
DATE OF SAMPLE:	11/15/2004	11/15/2004	11/15/2004	11/15/2004	11/15/2004
TYPE OF SAMPLE:	Sediment	Sediment	Sediment	Sediment	Sediment
SAMPLE ID:	PPSDM5 Edge	FHSDM5 Edge	T1SDM5 Edge	T2SDM5 Edge	HWSDM5 Edge
TESTING LABORATORY LABORATORY SAMPLE ID:	Analytical 41117-02	Analytical 41117-25	Analytical 41117-21	Analytical 41117-17	Analytical 41117-09
DATE RECEIVED:	11/19/2004	11/19/2004	11/19/2004	11/19/2004	11/19/2004
DATE ANALYZED	12/10/2004	12/13/2004	12/13/2004	12/10/2004	12/10/2004
CONCENTRATION UNITS:	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg
Arsenic (As) – 70.0 mg/Kg	2.4	4.5	5.5	4.0	4.2
Barium (Ba) - 982.0 mg/Kg	168.0	172.0	172.0	136.0	159.0
Cadmium (Cd) – 66.0 mg/Kg	2.1	2.5	3.1	3.1	2.3
Chromium (Cr) – 370.0 mg/Kg	7.3	11.2	12.0	4.3	12.0
Lead (Pb) - 218.0 mg/Kg	113.0	70.0	108.0	53.0	123.0
Mercury (Hg) – 0.71 mg/Kg	0.1	0.1	0.1	0.0	0.1
Selenium (Se) - 3.0 mg/Kg	ND	ND	ND	ND	ND
Silver (Ag) – 3.73 mg/Kg	ND	ND	ND	ND	ND
Zinc (Zn) - 410.0 mg/Kg	174.0	170.0	353.0	91.0	139.0

**Table 12.** Results of November, 2004 water sampling for heavy metals on Pullen Creek, Skagway, Alaska. Samples were analyzed using EPA methods 200.9, 208.2, 245.1, and 289.2. Clean up levels are indicated next to contaminant and are based on the State of Alaska groundwater clean-up levels.

LOCATION OF SAMPLE:	Pullen Creek	Pullen Creek Rail Yard
DESCRIPTION OF LOCATION:	Pullen Pond	Headwater (State St.)
DATE OF SAMPLE:	11/15/2004	11/15/2004
TYPE OF SAMPLE:	Water	Water
SAMPLE ID:	PPWM5	HWWM5
TESTING LABORATORY	Shoalwater	Shoalwater
LABORATORY SAMPLE ID:	41117-04	41117-11
DATE RECEIVED:	11/19/2004	11/19/2004
DATE ANALYZED	12/8/2004	12/8/2004
CONCENTRATION UNITS:	ug/L	ug/L
Arsenic (As) – 50 ug/L	ND	0.0002
Barium (Ba) - 2000.0 ug/L	0.0460	0.0520
Cadmium (Cd) - 5.0 ug/L	ND	ND
Chromium (Cr) - 100.0 ug/L	ND	ND
Lead (Pb) - 15.0 ug/L	ND	0.0010
Mercury (Hg) – 1.24 mg/Kg	ND	0.0010
Selenium (Se) - 50.0 ug/L	ND	ND
Silver (Ag) – 180.0 ug/L	ND	ND
Zinc (Zn) – 11000.0 ug/L	ND	ND
Zinc (Zn) - 8100.0 mg/Kg	0.0030	ND

**Table 13.** Results of March, 2005 soil sampling for heavy metals on Pullen Creek, Skagway, Alaska. Samples were analyzed using EPA methods 200.9, 7081, 7471A, and 7951. Clean up levels are indicated next to contaminant and are based on the State of Alaska's method 2 soil clean-up levels.

LOCATION OF SAMPLE:	Pullen Creek	Pullen Creek	Pullen Creek	Pullen Creek	Pullen Creek
DESCRIPTION OF LOCATION:	Pullen Pond	Fish Hatchery	Confluence of Tributary One	Confluence of Tributary Two	Rail Yard Headwater (State St.)
DATE OF SAMPLE:	3/7/2005	3/7/2005	3/7/2005	3/7/2005	3/7/2005
TYPE OF SAMPLE:	Soil	Soil	Soil	Soil	Soil
SAMPLE ID:	PPSOM6	FHSOM6	T1SOM6	T2SOM6	HWSOM6
TESTING LABORATORY	Shoalwater	Shoalwater	Shoalwater	Shoalwater	Shoalwater
LABORATORY SAMPLE ID:	50309-01	50309-12	50309-08	50309-16	50309-20
DATE RECEIVED:	4/1/2005	4/1/2005	4/1/2005	4/1/2005	4/1/2005
DATE ANALYZED	4/5/2005	4/5/2005	4/5/2005	4/13/2005	4/13/2005
CONCENTRATION UNITS:	Mg/Kg	mg/Kg	Mg/Kg	mg/Kg	mg/Kg
Arsenic (As) - 1.8 mg/Kg	ND	ND	ND	ND	ND
Barium (Ba) - 982.0 mg/Kg	53.3	320.0	240.0	244.0	356.0
Cadmium (Cd) - 4.5 mg/Kg	ND	7.1	8.0	ND	3.0
Chromium (Cr) - 23.0 mg/Kg	6.9	22.8	14.2	7.5	18.7
Lead (Pb) - 400.0 mg/Kg	19.6	2090.0	485.0	186.0	350.0
Mercury (Hg) - 1.24 mg/Kg	ND	2.1	0.3	0.2	0.2
Selenium (Se) - 3.0 mg/Kg	ND	ND	ND	ND	ND
Silver (Ag) - 19.0 mg/Kg	ND	ND	ND	ND	2.6
Zinc (Zn) - 8100.0 mg/Kg	39.3	1790.0	1200.0	166.0	345.0

**Table 14.** Results of March, 2005 sediment sampling for heavy metals on Pullen Creek, Skagway, Alaska. Samples were analyzed using EPA methods 200.9, 7081, 7471A, and 7951. Clean up levels are indicated next to contaminant and are based on the NOAA's Effects Range Median for Sediment Quality Guidelines (for arsenic, cadmium, chromium, lead, mercury, silver and zinc) and the State of Alaska's method 2 soil clean-up levels (for barium and selenium).

LOCATION OF SAMPLE:	<b>Pullen Creek</b>	<b>Pullen Creek</b>	<b>Pullen Creek</b>	<b>Pullen Creek</b>	<b>Pullen Creek</b>
DESCRIPTION OF LOCATION:	<b>Pullen Pond</b>	<b>Fish Hatchery</b>	<b>Confluence of Tributary One</b>	<b>Confluence of Tributary Two</b>	<b>Rail Yard Headwater (State St.)</b>
DATE OF SAMPLE:	3/7/2005	3/7/2005	3/7/2005	3/7/2005	3/7/2005
TYPE OF SAMPLE:	Sediment	Sediment	Sediment	Sediment	Sediment
SAMPLE ID:	PPSDM6	FHSDM6	T1SDM6	T2SDM6	HWSDM6
TESTING LABORATORY	Shoalwater	Shoalwater	Shoalwater	Shoalwater	Shoalwater
LABORATORY SAMPLE ID:	50309-02	50309-13	50309-09	50309-17	50309-21
DATE RECEIVED:	4/1/2005	4/1/2005	4/1/2005	4/1/2005	4/1/2005
DATE ANALYZED	4/5/2005	4/5/2005	4/5/2005	4/13/2005	4/13/2005
CONCENTRATION UNITS:	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg
Arsenic (As) – 70.0 mg/Kg	ND	ND	ND	ND	ND
Barium (Ba) - 982.0 mg/Kg	132.0	196.0	191.0	198.0	187.0
Cadmium (Cd) – 6.6 mg/Kg	1.3	ND	2.4	2.0	2.0
Chromium (Cr) - 370.0 mg/Kg	4.2	8.7	11.4	11.7	16.9
Lead (Pb) - 218.0 mg/Kg	9.7	17.3	36.8	20.7	47.3
Mercury (Hg) – 0.71 mg/Kg	33.4	50.3	116.0	107.0	215.0
Selenium (Se) - 3.0 mg/Kg	0.1	0.1	0.1	0.1	0.2
Silver (Ag) – 3.73 mg/Kg	ND	ND	ND	ND	ND
Zinc (Zn) - 410.0 mg/Kg	ND	ND	ND	ND	ND
Zinc (Zn) - 8100.0 mg/Kg	90.6	134.0	452.0	271.0	200.0

**Table 15.** Results of March, 2005 water sampling for heavy metals on Pullen Creek, Skagway, Alaska. Samples were analyzed using EPA methods 200.9, 208.2, 245.1, and 289.2. Clean up levels are indicated next to contaminant and are based on the State of Alaska groundwater clean-up levels.

LOCATION OF SAMPLE:	Pullen Creek	Pullen Creek Rail Yard
DESCRIPTION OF LOCATION:	Pullen Pond	Headwater (State St.)
DATE OF SAMPLE:	3/7/2005	3/7/2005
TYPE OF SAMPLE:	Water	Water
SAMPLE ID:	PPWM6	HWWM6
TESTING LABORATORY	Shoalwater Tribal	Shoalwater Tribal
LABORATORY SAMPLE ID:	50309-04	50309-23
DATE RECEIVED:	4/1/2005	4/1/2005
DATE ANALYZED	4/12/2005	4/12/2005
CONCENTRATION UNITS:	ug/L	ug/L
Arsenic (As) – 50 ug/L	ND	ND
Barium (Ba) - 2000.0 ug/L	0.0520	0.0520
Cadmium (Cd) - 5.0 ug/L	ND	ND
Chromium (Cr) - 100.0 ug/L	ND	ND
Lead (Pb) - 15.0 ug/L	ND	ND
Mercury (Hg) – 1.24 mg/Kg	ND	0.0010
Selenium (Se) - 50.0 ug/L	ND	ND
Silver (Ag) – 180.0 ug/L	ND	ND
Zinc (Zn) – 11000.0 ug/L	ND	ND
Zinc (Zn) - 8100.0 mg/Kg	0.0070	ND

**Table 16.** Results of February, 2004 sediment sampling for hydrocarbons on Pullen Creek, Skagway, Alaska. Samples were analyzed using EPA method 8260A. Clean up levels are indicated next to Contaminant and are based on the State of Alaska's method 2 soil clean-up levels.

LOCATION OF SAMPLE:	<b>Pullen Creek</b>	<b>Pullen Creek</b>
DESCRIPTION OF LOCATION:	<b>Pullen Pond</b>	<b>Rail Yard Headwater (State St.)</b>
DATE OF SAMPLE:	2/23/2004	2/24/2004
TYPE OF SAMPLE:	Sediment	Sediment
FIELD SAMPLE ID:	PPSDB2	HWSDB2
TESTING LABORATORY	Shoalwater	Shoalwater
LABORATORY SAMPLE ID:	40226-04	40226-12
DATE RECEIVED:	2/26/2004	2/26/2004
DATE ANALYZED	3/1/2004	3/1/2004
CONCENTRATION UNITS:	mg/Kg	mg/Kg
Benzene - 0.02 mg/Kg	ND	ND
Ethylbenzene - 5.0 mg/Kg	ND	ND
Toluene - 4.80 mg/Kg	0.03	0.030
Xylenes (Total) - 69.0 mg/Kg	ND	ND
o-Xylene	ND	0.020

**Table 17.** Results of February, 2004 water sampling for hydrocarbons on Pullen Creek, Skagway, Alaska. Samples were analyzed using EPA method 8260A. Clean up levels are indicated next to contaminant and are based on the State of Alaska's groundwater clean-up levels. The Tributary One site was not analyzed because the sample bottle was broken during shipping.

LOCATION OF SAMPLE:	Blank	Pullen Creek	Pullen Creek	Pullen Creek	Pullen Creek
DESCRIPTION OF LOCATION:		Pullen Pond	Fish Hatchery	Confluence of Tributary Two	Rail Yard Headwater (State St.)
DATE OF SAMPLE:		2/23/2004	2/24/2004	2/23/2004	2/24/2004
TYPE OF SAMPLE:	Blank	Water	Water	Water	Water
FIELD SAMPLE ID:	BLWBB	PPWB2B	FHWB2A	T2WB2A	HWWB2A
TESTING LABORATORY	Shoalwater	Shoalwater	Shoalwater	Shoalwater	Shoalwater
LABORATORY SAMPLE ID:	40226-23B	40226-06	40226-21A	40226-9A	40226-14A
DATE RECEIVED:	2/26/2004	2/26/2004	2/26/2004	2/26/2004	2/26/2004
DATE ANALYZED	2/26/2004	2/26/2004	2/26/2004	2/26/2004	2/26/2004
CONCENTRATION UNITS:	ug/L	ug/L	ug/L	ug/L	ug/L
Benzene - 5.0 ug/L	ND	ND	ND	ND	ND
Ethylbenzene - 700.0 ug/L	ND	ND	ND	ND	ND
Toluene - 1000 ug/L	ND	ND	ND	ND	ND
Xylenes (Total)- 10.0 ug/L	ND	ND	ND	ND	ND
o-Xylene	ND	ND	ND	ND	ND

**Table 18.** Results of May, 2004 sediment sampling for hydrocarbons on Pullen Creek, Skagway, Alaska. Samples were analyzed using EPA method 8260A. Clean up levels are indicated next to contaminant and are based on the State of Alaska's method 2 soil clean-up levels.

LOCATION OF SAMPLE:	Blank	Pullen Creek	Pullen Creek
DESCRIPTION OF LOCATION:		<b>Pullen Pond</b>	<b>Rail Yard Headwater (State St.)</b>
DATE OF SAMPLE:		5/17/2004	5/17/2004
TYPE OF SAMPLE:	Blank	Sediment	Sediment
FIELD SAMPLE ID:	BLSOBB	PPSDB3	HWSDB3
TESTING LABORATORY	Shoalwater	Shoalwater	Shoalwater
LABORATORY SAMPLE ID:	MB052504	40519-08	40519-16
DATE RECEIVED:	5/19/2004	5/19/2004	5/19/2004
DATE ANALYZED	5/25/2004	5/25/2004	5/25/2004
CONCENTRATION UNITS:	mg/Kg	mg/Kg	mg/Kg
Benzene - 0.02 mg/Kg	ND	ND	ND
Ethylbenzene - 5.0 mg/Kg	ND	ND	ND
Toluene - 4.80 mg/Kg	ND	ND	ND
Xylenes (Total) - 69.0 mg/Kg	ND	ND	22
o-Xylene	ND	ND	14



**Table 19.** Results of May, 2004 water sampling for hydrocarbons on Pullen Creek, Skagway, Alaska. Samples were analyzed using EPA method 8260A. Clean up levels are indicated next to contaminant and are based on the State of Alaska's groundwater clean-up levels.

LOCATION OF SAMPLE:	Blank	Pullen Creek	Pullen Creek	Pullen Creek	Pullen Creek	Pullen Creek
DESCRIPTION OF LOCATION:		Pullen Pond	Fish Hatchery	Confluence of Tributary One	Confluence of Tributary Two	Rail Yard Headwater (State St.)
DATE OF SAMPLE:		5/17/2004	5/17/2004	5/17/2004	5/17/2004	5/17/2004
TYPE OF SAMPLE:	Blank	Water	Water	Water	Water	Water
FIELD SAMPLE ID:	BLWBB	PPWB3A	FHWB3B	T1WB3A	T2WB3A	HHWB3B
TESTING LABORATORY	Shoalwater	Shoalwater	Shoalwater	Shoalwater	Shoalwater	Shoalwater
LABORATORY SAMPLE ID:	MB052004	50519-10	40519-26	40519-21	40519-12	40519-29
DATE RECEIVED:	5/19/2004	5/19/2004	5/19/2004	5/19/2004	5/19/2004	5/19/2004
DATE ANALYZED	5/20/2004	5/20/2004	5/20/2004	5/20/2004	5/20/2004	5/20/2004
CONCENTRATION UNITS:	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Benzene - 5.0 ug/L	ND	ND	ND	ND	ND	ND
Ethylbenzene - 700.0 ug/L	ND	ND	ND	ND	ND	ND
Toluene - 1000 ug/L	ND	ND	ND	ND	ND	ND
Xylenes (Total)- 10.0 ug/L	ND	ND	ND	ND	ND	ND
o-Xylene	ND	ND	ND	ND	ND	ND

**Table 20.** Results of August, 2004 sediment sampling for hydrocarbons on Pullen Creek, Skagway, Alaska. Samples were analyzed using EPA method 8260A. Clean up levels are indicated next to contaminant and are based on the State of Alaska's method 2 soil clean-up levels.

LOCATION OF SAMPLE:	<b>Pullen Creek</b>	<b>Pullen Creek</b>
DESCRIPTION OF LOCATION:	<b>Pullen Pond</b>	<b>Rail Yard Headwater (State St.)</b>
DATE OF SAMPLE:	8/31/2004	8/31/2004
TYPE OF SAMPLE:	Sediment	Sediment
SAMPLE ID:	PPSDB4	HWSDB4
TESTING LABORATORY	Shoalwater	Shoalwater
LABORATORY SAMPLE ID:	40902-03	40902-22
DATE RECEIVED:	9/2/2004	9/2/2004
DATE ANALYZED	9/15/2004	9/15/2004
CONCENTRATION UNITS:	mg/Kg	mg/Kg
Benzene - 0.02 mg/Kg	ND	ND
Ethylbenzene - 5.0 mg/Kg	ND	ND
Toluene - 4.80 mg/Kg	ND	ND
Xylenes (Total) - 69.0 mg/Kg	ND	25
o-Xylene	ND	16.6

**Table 21.** Results of August, 2004 water sampling for hydrocarbons on Pullen Creek, Skagway, Alaska. Samples were analyzed using EPA method 8260A. Clean up levels are indicated next to contaminant and are based on the State of Alaska's groundwater clean-up levels.

LOCATION OF SAMPLE:	Pullen Creek	Pullen Creek	Pullen Creek	Pullen Creek	Pullen Creek
DESCRIPTION OF LOCATION:	Pullen Pond	Fish Hatchery	Confluence of Tributary Two	Confluence of Tributary Two	Rail Yard Headwater (State St.)
DATE OF SAMPLE:	8/31/2004	8/31/2004	8/31/2004	8/31/2004	8/31/2004
TYPE OF SAMPLE:	Water	Water	Water	Water	Water
SAMPLE ID:	PPWB4A	FHWB4A	T1WB4A	T2WB4A	HHWB4A
TESTING LABORATORY	Shoalwater	Shoalwater	Shoalwater	Shoalwater	Shoalwater
LABORATORY SAMPLE ID:	40902-05	40902-14	40902-10	40902-18	40902-24
DATE RECEIVED:	9/2/2004	9/2/2004	9/2/2004	9/2/2004	9/2/2004
DATE ANALYZED	9/14/2004	9/14/2004	9/14/2004	9/14/2004	9/14/2004
CONCENTRATION UNITS:	ug/L	ug/L	ug/L	ug/L	ug/L
Benzene 5.0 ug/L	ND	ND	ND	ND	ND
Ethylbenzene 700.0 ug/L	ND	ND	ND	ND	ND
Toluene 1000.0 ug/L	ND	ND	ND	ND	ND
m,p-Xylene 10.0 ug/L	ND	ND	ND	ND	ND
o-Xylene	ND	ND	ND	ND	ND

**Table 22.** Results of November, 2004 sediment sampling for hydrocarbons on Pullen Creek, Skagway, Alaska. Samples were analyzed using EPA method 8260A. Clean up levels are indicated next to contaminant and are based on the State of Alaska's method 2 soil clean-up levels.

LOCATION OF SAMPLE:	Pullen Creek	Pullen Creek Rail Yard Headwater (State St.)
DESCRIPTION OF LOCATION:	Pullen Pond	
DATE OF SAMPLE:	11/15/2004	11/15/2004
TYPE OF SAMPLE:	Sediment	Sediment
SAMPLE ID:	PPSDB5	HWSDB5
TESTING LABORATORY	Shoalwater	Shoalwater
LABORATORY SAMPLE ID:	41117-03	41117-10
DATE RECEIVED:	11/17/2004	11/17/2004
DATE ANALYZED	11/19/2004	11/19/2004
CONCENTRATION UNITS:	mg/Kg	mg/Kg
Benzene - 0.02 mg/Kg	ND	ND
Ethylbenzene - 5.0 mg/Kg	77.4	17.4
Toluene - 4.8 mg/Kg	ND	ND
m,p-Xylene - 69.0 mg/Kg	20.1	24.65
o-Xylene	12.6	13.25

**Table 23.** Results of November, 2004 water sampling for hydrocarbons on Pullen Creek, Skagway, Alaska. Samples were analyzed using EPA method 8260A. Clean up levels are indicated next to contaminant and are based on the State of Alaska's groundwater clean-up levels.

LOCATION OF SAMPLE:	Pullen Creek	Pullen Creek	Pullen Creek	Pullen Creek	Pullen Creek
DESCRIPTION OF LOCATION:	Pullen Pond	Fish Hatchery	Confluence of Tributary One	Confluence of Tributary Two	Rail Yard Headwater (State St.)
DATE OF SAMPLE:	11/15/2004	11/15/2004	11/15/2004	11/15/2004	11/15/2004
TYPE OF SAMPLE:	Water	Water	Water	Water	Water
SAMPLE ID:	PPWB5A	FHWB5A	T1WB5A	T2WB5A	HHWB5A
TESTING LABORATORY	Shoalwater	Shoalwater	Shoalwater	Shoalwater	Shoalwater
LABORATORY SAMPLE ID:	41117-05	41117-14	4117-22	41117-18	41117-12
DATE RECEIVED:	11/17/2004	11/17/2004	11/17/2004	11/17/2004	11/17/2004
DATE ANALYZED	11/18/2004	11/18/2004	11/18/2004	11/18/2004	11/18/2004
CONCENTRATION UNITS:	ug/L	ug/L	ug/L	ug/L	ug/L
Benzene – 5.0 ug/L	ND	ND	ND	ND	ND
Ethylbenzene – 700.0 ug/L	ND	ND	ND	ND	ND
Toluene – 1000.0 ug/L	ND	ND	ND	ND	ND
m,p-Xylene – 10.0 ug/L	ND	ND	ND	ND	ND
o-Xylene	ND	ND	ND	ND	ND

**Table 24.** Results of March, 2005 sediment sampling for hydrocarbons on Pullen Creek, Skagway, Alaska. Samples were analyzed using EPA method 8260A. Clean up levels are indicated next to contaminant and are based on the State of Alaska's method 2 soil clean-up levels.

LOCATION OF SAMPLE:	<b>Pullen Creek</b>	<b>Pullen Creek</b>
DESCRIPTION OF LOCATION:	<b>Pullen Pond</b>	<b>Rail Yard Headwater (State St.)</b>
DATE OF SAMPLE:		
TYPE OF SAMPLE:	Sediment	Sediment
SAMPLE ID:	PPSDB6	HWSD6
TESTING LABORATORY	Shoalwater	Shoalwater
LABORATORY SAMPLE ID:	50309-03	50309-22
DATE RECEIVED:	3/9/2005	3/9/2005
DATE ANALYZED	3/16/2005	3/16/2005
CONCENTRATION UNITS:	mg/Kg	mg/Kg
Benzene – 0.02 mg/Kg	ND	ND
Ethylbenzene – 5.0 mg/Kg	ND	ND
Toluene – 4.8 mg/Kg	ND	ND
m,p-Xylene – 69.0	ND	ND
o-Xylene	ND	12

**Table 25.** Results of March, 2005 water sampling for hydrocarbons on Pullen Creek, Skagway, Alaska. Samples were analyzed using EPA method 8260A. Clean up levels are indicated next to contaminant and are based on the State of Alaska's groundwater clean-up levels.

LOCATION OF SAMPLE:	Blank	Pullen Creek	Pullen Creek	Pullen Creek	Pullen Creek	Pullen Creek
DESCRIPTION OF LOCATION:		Pullen Pond	Fish Hatchery	Confluence of Tributary One	Confluence of Tributary Two	Rail Yard Headwater (State St.)
DATE OF SAMPLE:		3/7/2005	3/7/2005	3/7/2005	3/7/2005	3/7/2005
SAMPLE ID:	BLWBB	PPWBA6	FHWBA6	T1WBA6	T2WBA6	HHWBA6
TESTING LABORATORY	Shoalwater	Shoalwater	Shoalwater	Shoalwater	Shoalwater	Shoalwater
LABORATORY SAMPLE ID:	MB052004	50309-05	50309-14	50309-10	50309-18	50309-24
DATE RECEIVED:	3/9/2005	3/9/2005	3/9/2005	3/9/2005	3/9/2005	3/9/2005
DATE ANALYZED	3/16/2005	3/16/2005	3/16/2005	3/16/2005	3/16/2005	3/16/2005
CONCENTRATION UNITS:	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Benzene – 50.0 ug/L	ND	ND	ND	ND	ND	ND
Ethylbenzene – 700.0 ug/L	ND	ND	ND	ND	ND	ND
Toluene – 1000.0 ug/L	ND	ND	ND	ND	ND	ND
M,p-Xylene – 10.0 ug/L	ND	ND	ND	ND	ND	ND
o-Xylene	ND	ND	ND	ND	ND	ND

**Table 26.** Results of March, 2005 biological sampling for heavy metals on Pullen Creek and Nelson Creek, Skagway, Alaska. Samples were analyzed using EPA method 200.8, 6010B, and 7740.

LOCATION OF SAMPLE:	<b>Pullen Creek</b>	<b>Pullen Creek</b>	<b>Pullen Creek</b>	<b>Nelson Creek</b>	<b>Nelson Creek</b>
DESCRIPTION OF LOCATION:	<b>Pullen Pond</b>	<b>Pullen Pond</b>	<b>Confluence of Tributary One</b>	<b>Above Bridge</b>	<b>Above Bridge</b>
DATE OF SAMPLE:	5/23/2005	5/23/2005	5/24/2005	5/25/2005	5/25/2005
TYPE OF SAMPLE:	Tissue (shredders)	Tissue (predators)	Tissue (shredders)	Tissue (shredders)	Tissue (predators)
SAMPLE ID:	PCPPTM1-S Columbia	PCPPTMI-P Columbia	PCT1TM1-S Columbia	NSABTM1-S Columbia	NSABTM1-P Columbia
TESTING LABORATORY	Analytical	Analytical	Analytical	Analytical	Analytical
DATE RECEIVED:	6/4/2005	6/4/2005	6/4/2005	6/4/2005	6/4/2005
DATE EXTRACTED	6/17/2005	6/17/2005	6/17/2005	6/17/2005	6/17/2005
CONCENTRATION UNITS:	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg
Arsenic (As)	0.8	0.5	1.4	0.8	0.5
Barium (Ba)	181.0	23.0	393.0	315.0	39.4
Cadmium (Cd)	1.3	0.3	1.6	0.5	0.4
Chromium (Cr)	1.1	1.9	1.5	0.8	0.5
Copper	18.0	20.2	18.5	10.5	17.5
Lead (Pb)	9.1	2.0	32.9	0.9	0.3
Selenium (Se)	2.3	2.6	2.2	1.0	2.3
Zinc (Zn)	421.0	459.0	949.0	215.0	375.0



**Table 28.** Results of water sampling for Tentatively Identified Compounds (TIC) on Pullen Creek, Skagway, Alaska. Samples were analyzed using the modified EPA method 8270C. Clean-up levels are indicated for those contaminants which were detected. These results are for screening purposes only.

LOCATION OF SAMPLE:	Pullen Creek	Pullen Creek	Pullen Creek	Pullen Creek	Pullen Creek
DESCRIPTION OF LOCATION:	Pullen Pond	Pullen Pond	Pullen Pond	Pullen Pond	Pullen Pond
DATE OF SAMPLE:	2/23/2004	5/17/2004	8/31/2004	11/15/2004	3/7/2005
TYPE OF SAMPLE:	Water	Water	Water	Water	Water
FIELD SAMPLE ID:	PPWTC2	PPWTC3	PPWTC4	PPWTC5	PPWTC6
TESTING LABORATORY	Shoalwater	Shoalwater	Shoalwater	Shoalwater	Shoalwater
LABORATORY SAMPLE ID:	40226-17	40519-18	40902-07	41117-07	50309-07
DATE RECEIVED:	2/26/2004	5/19/2004	9/2/2004	11/7/2004	3/9/2005
DATE ANALYZED	3/4/2004	6/14/2004	12/3/2004	12/3/2004	4/12/2005
CONCENTRATION UNITS:	ug/L	ug/L	Ug/L	ug/L	ug/L
Phenol	ND	ND	ND	ND	ND
bis(2-chloroethyl)ether	ND	ND	ND	ND	ND
2-Chlorophenol	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	ND	ND	ND	ND	ND
2-Methylphenol	ND	ND	ND	ND	ND
bis(2-chloroisopropyl)ether	ND	ND	ND	ND	ND
N-nitroso-di-n-propylamine	ND	ND	ND	ND	ND
4-Methylphenol	ND	ND	ND	ND	ND
Hexachloroethane	ND	ND	ND	ND	ND
Nitrobenzene	ND	ND	ND	ND	ND
Isophorone	ND	ND	ND	ND	ND
2-Nitrophenol	ND	ND	ND	ND	ND
2,4-Dimethylphenol	ND	ND	ND	ND	ND
bis(2-chloroethoxy)methane	ND	ND	ND	ND	ND
2,4-Dichlorophenol	ND	ND	ND	ND	ND
1,2,4-Trichlorobenzene	ND	ND	ND	ND	ND
Naphthalene	ND	ND	ND	ND	ND
2,6-Dichlorophenol	ND	ND	ND	ND	ND
4-Chloroaniline	ND	ND	ND	ND	ND
Hexachlorobutadiene	ND	ND	ND	ND	ND
4-Chloro-3-methyl phenol	ND	ND	ND	ND	ND
2-Methylnaphthalene	ND	ND	ND	ND	ND
Hexachlorocyclopentadiene	ND	ND	ND	ND	ND
2,4,6-Trichlorophenol	ND	ND	ND	ND	ND
2,4,5-Trichlorophenol	ND	ND	ND	ND	ND
2-Chloronaphthalene	ND	ND	ND	ND	ND
2-Nitroaniline	ND	ND	ND	ND	ND
Dimethyl phthalate	ND	ND	ND	ND	ND
2,6-Dinitrotoluene	ND	ND	ND	ND	ND
Acenaphthene	ND	ND	ND	ND	ND
2,4-Dinitrophenol	ND	ND	ND	ND	ND

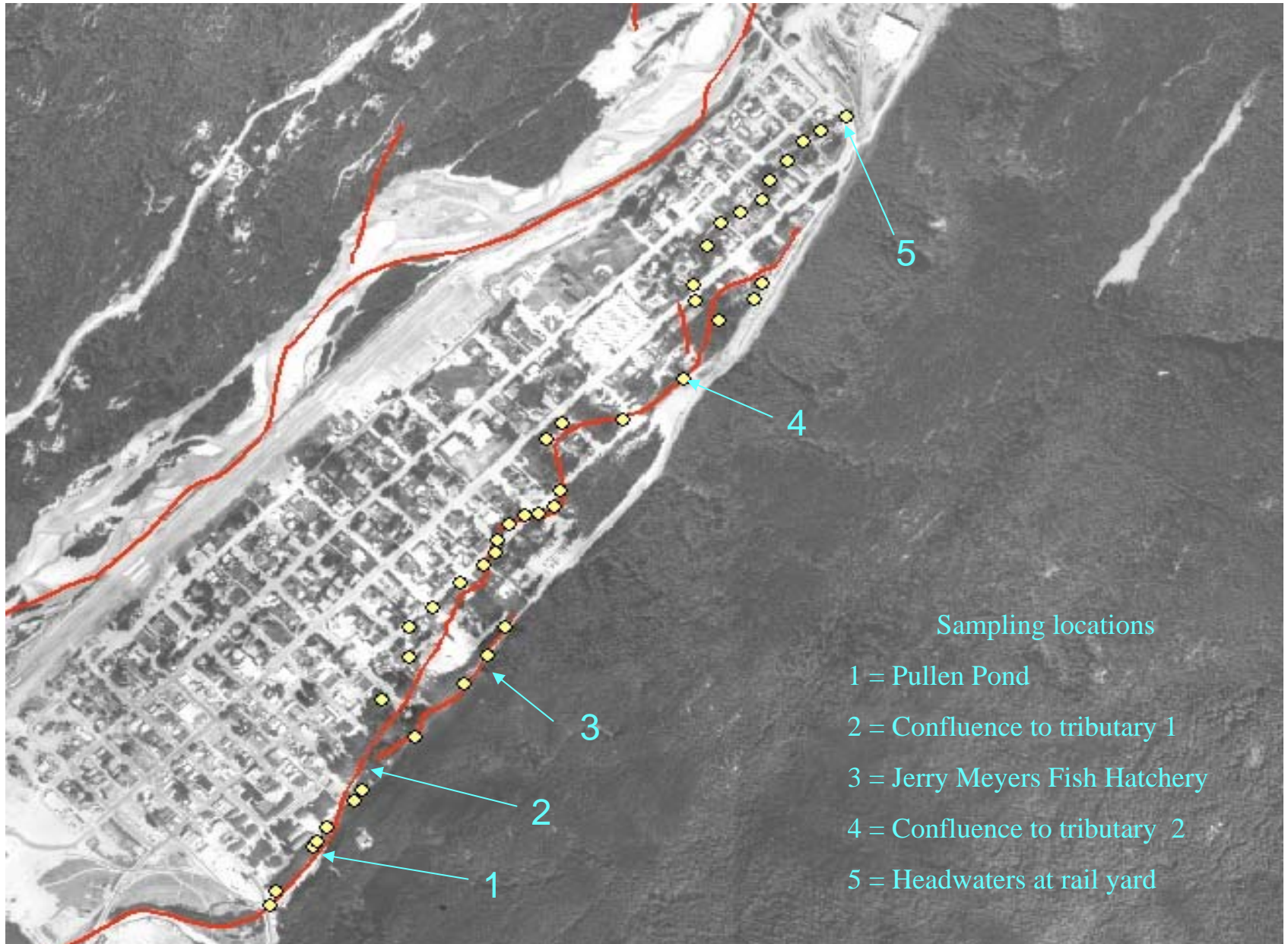
LOCATION OF SAMPLE:	Pullen Creek	Pullen Creek	Pullen Creek	Pullen Creek	Pullen Creek
DESCRIPTION OF LOCATION:	Pullen Pond	Pullen Pond	Pullen Pond	Pullen Pond	Pullen Pond
DATE OF SAMPLE:	2/23/2004	5/17/2004	8/31/2004	11/15/2004	3/7/2005
TYPE OF SAMPLE:	Water	Water	Water	Water	Water
FIELD SAMPLE ID:	PPWTC2	PPWTC3	PPWTC4	PPWTC5	PPWTC6
TESTING LABORATORY	Shoalwater	Shoalwater	Shoalwater	Shoalwater	Shoalwater
LABORATORY SAMPLE ID:	40226-17	40519-18	40902-07	41117-07	50309-07
DATE RECEIVED:	2/26/2004	5/19/2004	9/2/2004	11/7/2004	3/9/2005
DATE ANALYZED	3/4/2004	6/14/2004	12/3/2004	12/3/2004	4/12/2005
CONCENTRATION UNITS:	ug/L	ug/L	ug/L	ug/L	ug/L
4-Nitrophenol	ND	ND	ND	ND	ND
Dibenzofuran	ND	ND	ND	ND	ND
2,4-Dinitrotoluene	ND	ND	ND	ND	ND
2,3,4,6-Tetrachlorophenol	ND	ND	ND	ND	ND
Diethyl Phthalate	ND	ND	ND	ND	ND
Fluorene	ND	ND	ND	ND	ND
4-Chlorophenyl phenyl ether	ND	ND	ND	ND	ND
4-Nitroaniline	ND	ND	ND	ND	ND
4,6-Dinitro-2-methylphenol	ND	ND	ND	ND	ND
Azobenzene	ND	ND	ND	ND	ND
4-Bromophenyl phenyl ether	ND	ND	ND	ND	ND
Hexachlorobenzene	ND	ND	ND	ND	ND
Pentachlorophenol = 1.0 ug/L	ND	77	ND	ND	ND
Phenanthrene	ND	ND	ND	ND	ND
Anthracene	ND	ND	ND	ND	ND
di-n-Butyl Phthalate	ND	ND	ND	ND	ND
Fluoranthene	ND	ND	ND	ND	ND
Pyrene	ND	ND	ND	ND	ND
Butyl Benzyl Phthalate	ND	ND	ND	ND	ND
Benz[a]anthracene	ND	ND	ND	ND	ND
Chrysene	ND	ND	ND	ND	ND
bis(2-Ethylhexyl) Phthalate = 6.0 ug/L	10	ND	ND	ND	10
di-n-octyl phthalate	ND	ND	ND	ND	ND
Benzo[b]fluoranthene	ND	ND	ND	ND	ND
Benzo[k]fluoranthene	ND	ND	ND	ND	ND
Benzo[a]pyrene	ND	ND	ND	ND	ND
Indeno[1,2,3-cd]pyrene	ND	ND	ND	ND	ND
Dibenz[a,h]anthracene	ND	ND	ND	ND	ND
Benzo[ghi]perylene	ND	ND	ND	ND	ND

**Table 29.** Macroinvertebrates found in two locations on Pullen Creek, using the ENRI Volunteer level protocols.

	<b>Below Pullen Pond</b>		<b>Above APT Tailrace</b>	
	Estimated number	Number of different types	Estimated number	Number of different types
<b>Mayflies</b>	13	4	100	2
<b>Stoneflies</b>	15	3	128	2
<b>Caddisflies</b>	115	4	14	4
<b>Midges</b>	200	6	400	6
<b>Craneflies</b>	0	0	5	2
<b>Aquatic Mites</b>	4	1	8	1
<b>Worms</b>	60	1	12	1
<b>other</b>	2	1	8	1

## Figures

Figure 1. Map of Pullen Creek (right) and Skagway River (left). Red lines indicate anadromous fish presence data collected by the Alaska Department of Fish and Game. Yellow boxes indicate culverts on Pullen Creek (data collected by ADFG).





Appendix A  
2003 STC Fish Trapping Report

**2003 Pullen Creek Fish Trapping Report (Permit # SF-2003-139)**  
**Report to the Alaska Department of Fish and Game**

In October of 2003, the Skagway Traditional Council (STC) began an assessment project on Pullen Creek, in Skagway, Alaska. The project, funded through an Alaska Clean Water Action (ACWA) grant, has a primary objective of determining whether Pullen Creek needs to remain on Alaska's impaired waterbody list. In addition to contaminant testing, STC has been tasked with developing an assessment report for the creek, a document which can be used as a starting point for future decision making on Pullen Creek issues.

POWTEC, LLC (the firm hired to assist STC in the project) will be collecting baseline information for Pullen Creek, including fish use information, through the Spring of 2004. Results in this report are from the first of two minnow trapping events scheduled for Pullen Creek, where trapping occurred October 15-16, 2003.

Methods used for this study are outlined in the Fish Resource Permit Study Plan (Appendix A). For minnow trapping, there were no deviations from the outlined protocol. Trap locations were determined on-site and were limited to the mainstem up to tributary 1 and throughout tributary 1 (Table 1). The entire creek was not trapped, due to limited time and not having permission from the multiple private residential landowners in which Pullen Creek runs (see Appendix B for a map of Pullen Creek). It is expected that the entire drainage will be trapped during the Spring, 2004 (given land owner permission)

Table 1 outlines the total number of fish trapped in Pullen Creek, by trap number and trap location. Trapped fish were identified to species and measured to fork length. To minimize the stress on the fish and because no anesthesia was used, measurements were obtained in increments of 5 mm, before the fish were released back into the stream. Figures 1 and 2 represent the approximate size categories of fish trapped, for Coho smolt and Dolly Varden, respectively.

A foot survey to document adult fish counts was conducted during the trapping event. However, due to timing, very few adult fish were observed in the creek. On October 15<sup>th</sup>, 2003, five adult Coho salmon were seen on the mainstem, below tributary 1 near the footbridge. Eight Dolly Varden were observed in the pool of water directly above the Jerry Meyers Fish Hatchery. On October 16<sup>th</sup>, 2003, three Dolly Varden were observed at the headwaters of the mainstem (see Appendix B for a map of Pullen Creek).

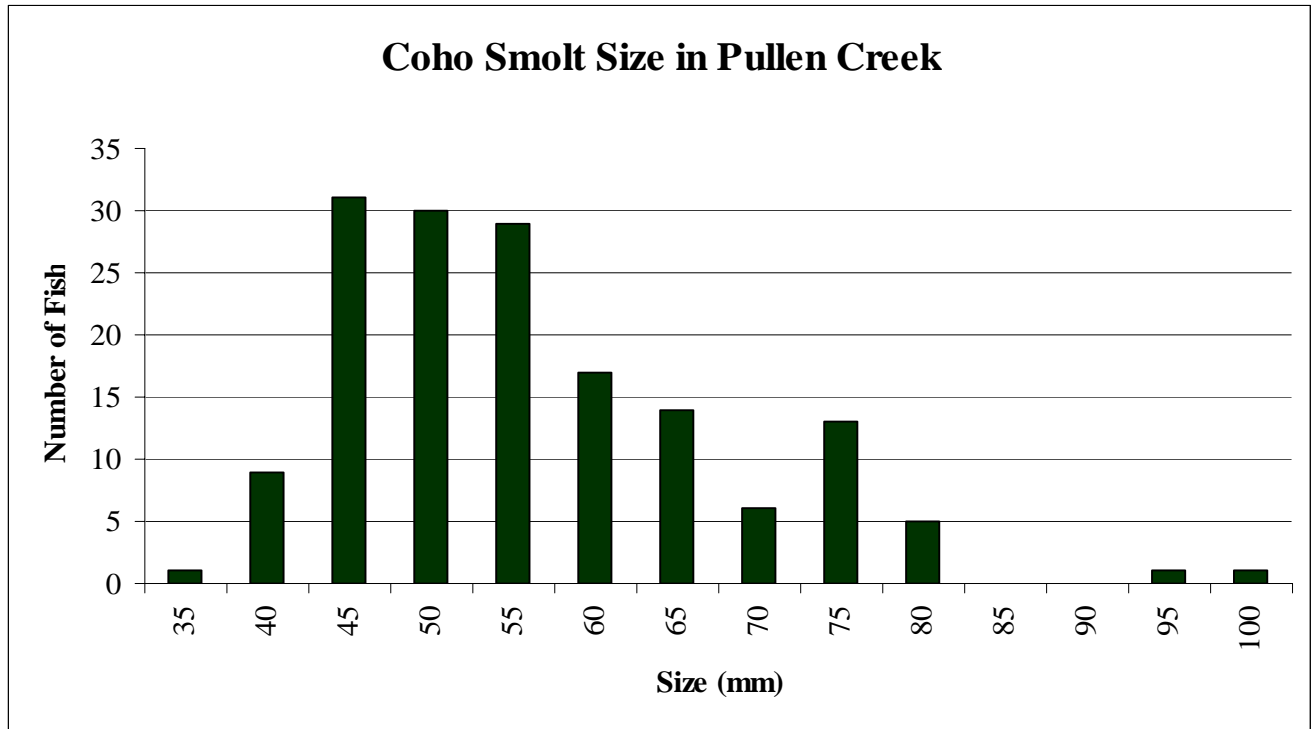
Additional data, including temperature, pH, dissolved oxygen, conductivity and discharge were not taken during this trapping event, as parameters will be measured during water quality and soil sampling events.

All information gather during this trapping event will be integrated into the Pullen Creek Assessment document, which will be produced by the Skagway Traditional Council in the Spring of 2004. Any questions regarding this present work may be directed to Lance Twitchell, President of Skagway Traditional Council ([ltwitchell@skagwaytraditional.org](mailto:ltwitchell@skagwaytraditional.org)) or Cathy Needham, Principal Investigator for POWTEC, LLC ([cneedham@powtec.net](mailto:cneedham@powtec.net)).

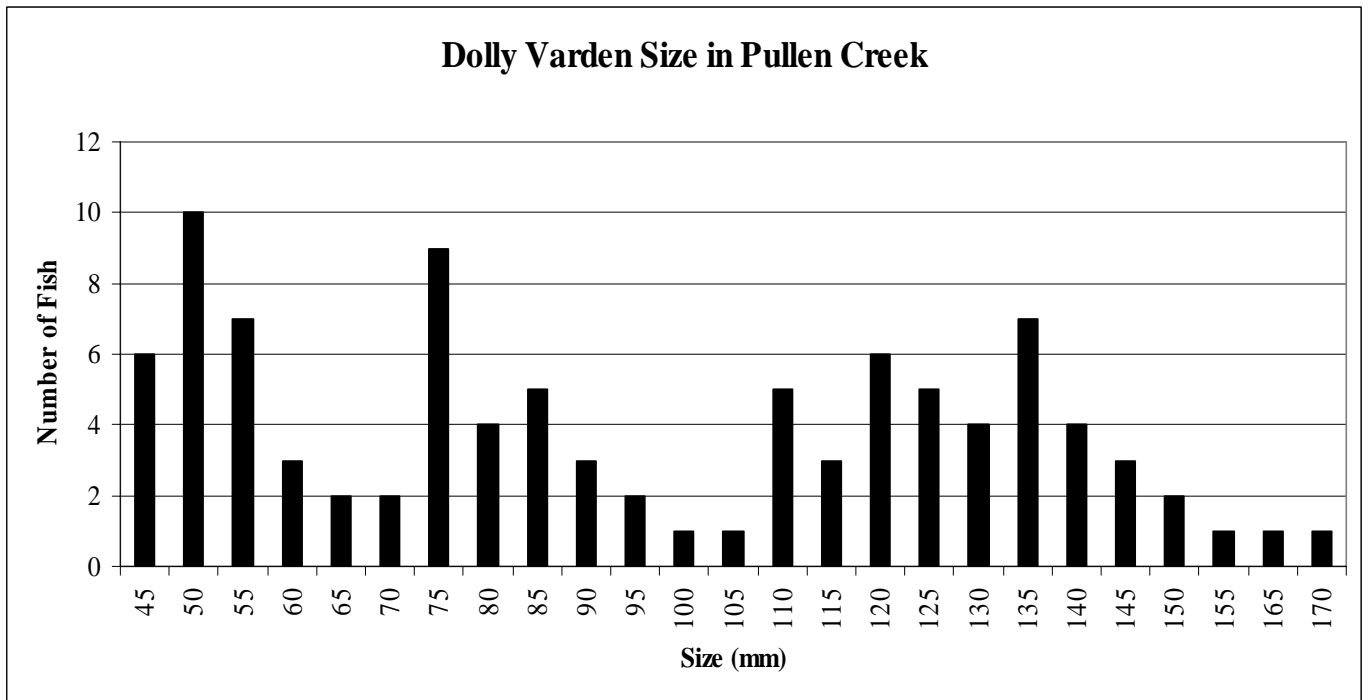


**Table 1: Results of the October, 2003 trapping event on Pullen Creek in Skagway, Alaska. Traps 1-17 were set and checked on October 15, 2003 and traps 18-19 were set and checked on October 16, 2003.**

<b>Trap</b>	<b>Latitude</b>	<b>Longitude</b>	<b>Coho Salmon</b>	<b>Dolly Varden</b>
1	59° 27.069' N	135° 19.172' W	0	0
2	59° 27.074' N	135° 19.125' W	0	0
3	59° 27.070' N	135° 18.037' W	0	0
4	59° 27.075' N	135° 19.011' W	0	0
5	59° 27.076' N	135° 19.025' W	1	0
6	59° 27.067' N	135° 19.007' W	0	0
7	59° 27.083' N	135° 18.566' W	1	0
8	59° 27.103' N	135° 18.558' W	36	12
9	59° 27.124' N	135° 18.521' W	45	4
10	59° 27.137' N	135° 18.501' W	3	0
11	59° 27.163' N	135° 18.459' W	30	9
12	59° 27.198' N	135° 18.397' W	27	15
13	59° 27.223' N	135° 18.331' W	14	29
14	59° 27.236' N	135° 18.341' W	0	0
15	59° 27.249' N	135° 18.326' W	0	0
16	59° 27.256' N	135° 18.306' W	0	0
17	59° 27.265' N	135° 18.307' W	0	0
18	59° 27.507' N	135° 17.578' W	0	28
19	59° 27.582' N	135° 17.592' W	0	0
<b>Total Fish</b>			<b>157</b>	<b>97</b>



**Figure 1. Size distribution of Coho smolt trapped in Pullen Creek, Skagway, Alaska. A total of 157 fish were trapped and measured to nearest 5 mm, in October, 2003.**



**Figure 2. Size distribution of Dolly Varden trapped in Pullen Creek, Skagway, Alaska. A total of 97 fish were trapped and measured to nearest 5 mm, in October, 2003.**

Appendix A  
Fish Resource Permit Study Plan

## **Pullen Creek Fish Trapping Study Plan**

Pullen Creek, located through the center of the City of Skagway, is listed on Alaska's Section 303(d) impaired waterbody list and on the Alaska Clean Water Action (AWCA) list for metal contamination. Trace metals have been found associated with the creek, and Skagway Harbor, and are believed to have originated from an ore transfer facility and its railroad. Pullen Creek is currently scheduled for a Total Maximum Daily Load (TMDL) in October, 2003, however there is a lack of baseline data needed to evaluate the need for a TMDL. In addition, Pullen Creek is listed as an anadromous waterbody, hosting King, Coho, Pink and Chum salmon, Dolly Varden Char and sea-run Cutthroat trout. The King and Pink Salmon are hatchery enhanced, through a Skagway School District run hatchery program. Pullen Creek has had extensive urban impacts to its fish habitat, including numerous oil and fuel spills, extensive bank erosion, building development and culverts. A comprehensive assessment for Pullen Creek is needed, to identify and prioritize habitat restoration efforts.

The Skagway Traditional Council was awarded a FY2004 Alaska Clean Water Action (ACWA) grant to address the above issues, including a comprehensive assessment for Pullen Creek. The environmental assessment will be performed by POWTEC, LLC. It will include a historical records and information search for Pullen Creek, and will be based on all potential impacts to the creek over time. POWTEC, LLC will perform a site visit and take baseline water quality, water quantity, and fish distribution and habitat use data, as well as map the creek system.

### **Methods**

Baseline fish distribution and habitat use data will be collected by means of fish trapping and a walking survey. Trapping and walking surveys will occur during the Fall of 2003 and trapping will occur again in the Spring of 2004. Trapping locations will be determined on-site (dependent on water flow and available pools) and marked with flagging. GPS way-points will be logged to help determine sites for future repeated trapping. Walking survey's will be performed to get an estimation of adult counts in Pullen Creek for the Fall of 2003.

Fish trapping will consist of using baited minnow traps, with standard mesh sizes of both 0.125 and 0.25-inch diameters. The traps will be tethered with 6-10 ft. of nylon cord. Minnow traps will be baited with approximately 1 ounce of salmon eggs, disinfected for 10 minutes in a 1:100 solution of betadyne in water. Baited traps will be placed in pools of water, preferably with cover (i.e. undercut banks). Traps will be soaked for approximately 2 hours, to capture fish. Trapped fish will be placed in white-bottomed plastic trays with water and identified to species, measured to fork length, counted and returned to the creek. No anesthetic will be used. Data will include a description of trap location, description of habitat, identification of fish trapped, size of fish trapped and number of fish trapped. Additional data taken on the same day (but not at each trap location) will include discharge, dissolved oxygen, pH, and temperature.

During the Fall of 2003, a walking survey will be performed on Pullen Creek to document the use of the creek by adult spawning Coho salmon. The survey crew will walk the entirety of Pullen Creek, from the mouth to the headwaters, and note the presence of adult fish. Data collected will include: approximate location of fish, species of fish, number of fish, sex of fish (if determinable) and whether the fish was alive or dead on the banks of the creek.

All data will be presented in the Pullen Creek Assessment report, which is a deliverable of the ACWA grant received by Skagway Traditional Council.

Appendix B  
2004 STC Fish Trapping Report

**2004 Pullen Creek Fish Trapping Report (Permit # SF-2004-017)**  
**Report to the Alaska Department of Fish and Game**

In October of 2003, the Skagway Traditional Council (STC) began an assessment project on Pullen Creek, in Skagway, Alaska. The project, funded through an Alaska Clean Water Action (ACWA) grant, has a primary objective of determining whether Pullen Creek needs to remain on Alaska's impaired waterbody list. In addition to contaminant testing, STC has been tasked with developing an assessment report for the creek, a document that can be used as a starting point for future decision-making on Pullen Creek issues.

POWTEC, LLC (the firm hired to assist STC in the project) will be collecting baseline information for Pullen Creek, including fish use information, through the spring of 2004. Results in this report are from the February and May 2004 trapping event that occurred on Pullen Creek.

Methods used for this study are outlined in the Fish Resource Permit Study Plan (Appendix A). For minnow trapping, there were no deviations from the outlined protocol except the traps were set overnight during the May event. Trap locations were determined on-site and were represented throughout the drainage except for a short length of creek we did not obtain permission to trap directly above the Dewey Lake hydropower plant (Tables 1 & 2 and see Appendix B for a map of Pullen Creek). However, less traps were set in the February event.

Tables 1 and 2 outline the total number of fish trapped in Pullen Creek, by trap number and trap location. Trapped fish were identified to species, measured to nearest 5mm fork length, and released into the stream. Figures 1 and 2 represent the approximate size categories of fish trapped, for Coho smolt and Dolly Varden in February, respectively. Figures 3 & 4 represent the May event.

Additional data, including temperature, pH, dissolved oxygen, conductivity and discharge were taken during this trapping event with water quality parameters.

All information gathered during this trapping event will be integrated into the Pullen Creek Assessment document, which will be produced by the Skagway Traditional Council in the Spring of 2004. Any questions regarding this present work may be directed to Lance Twitchell, President of Skagway Traditional Council ([ltwitchell@skagwaytraditional.org](mailto:ltwitchell@skagwaytraditional.org)) or Cathy Needham, Principal Investigator for POWTEC, LLC ([cneedham@powtec.net](mailto:cneedham@powtec.net)).

**Table 1: Results of the February 2004 trapping event on Pullen Creek in Skagway, Alaska.**

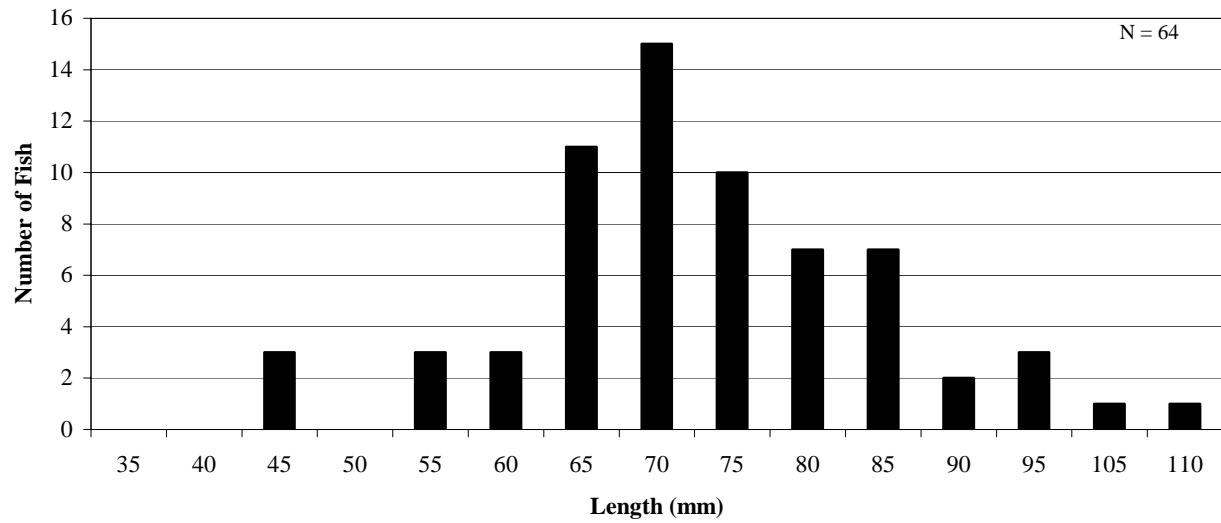
<b>Trap</b>	<b>Latitude</b>	<b>Longitude</b>	<b>Coho Salmon</b>	<b>Dolly Varden</b>
1	59° 45.255' N	135° 31.792' W	0	0
2	59° 45.234' N	135° 31.577' W	0	0
3	59° 45.234' N	135° 31.499' W	0	0
4	59° 45.253' N	135° 31.517' W	0	0
5	59° 45.271' N	135° 31.395' W	0	0
6	59° 45.300' N	135° 31.395' W	0	0
7	59° 45.038' N	135° 31.282' W	0	0
8	59° 45.451' N	135° 31.160' W	0	0
9	59° 45.491' N	135° 31.940' W	3	0
10	59° 45.595' N	135° 30.927' W	16	1
11	59° 45.663' N	135° 30.817' W	38	0
12	59° 45.695' N	135° 30.762' W	3	0
13	59° 45.744' N	135° 30.708' W	0	0
14	59° 45.800' N	135° 30.663' W	0	0
15	59° 45.695' N	135° 30.762' W	0	1
16	59° 45.904' N	135° 30.751' W	0	0
17	59° 46.300' N	135° 30.770' W	0	0
18	59° 46.347' N	135° 30.112' W	0	0
19	59° 46.632' N	135° 29.793' W	4	14
20	59° 46.461' N	135° 29.750' W	0	0
21	59° 46.674' N	135° 29.659' W	0	0
		<b>Total</b>	<b>64</b>	<b>16</b>

**Table 2: Results of the May 2004 trapping event on Pullen Creek in Skagway, Alaska.**

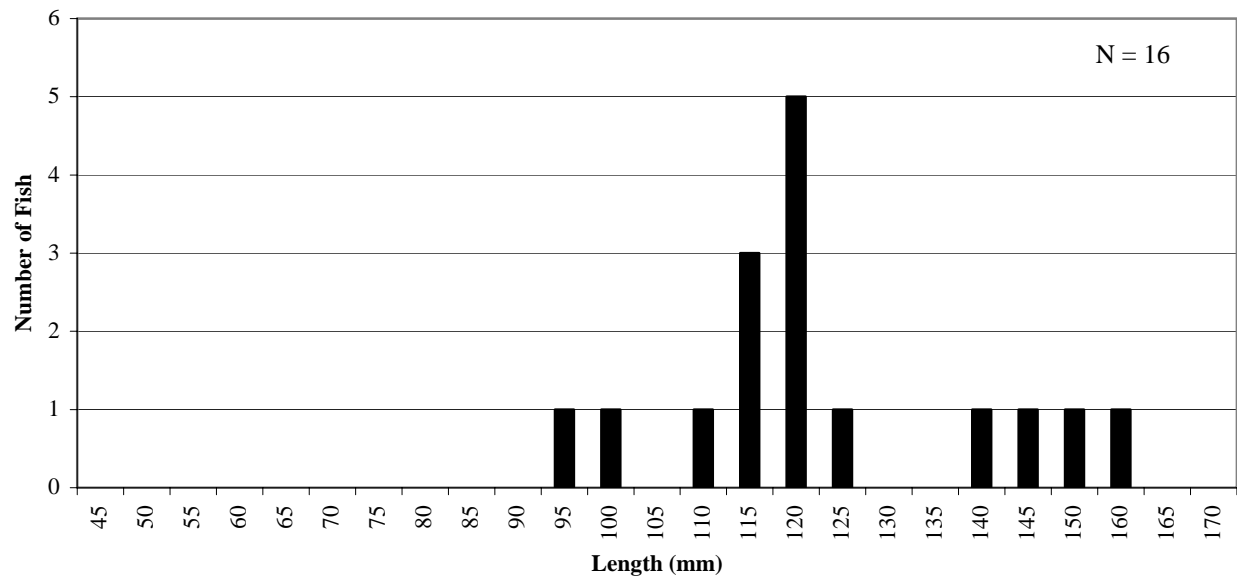
<b>Trap</b>	<b>Latitude</b>	<b>Longitude</b>	<b>Coho Salmon</b>	<b>Dolly Varden</b>
1	59° 45.257' N	135° 31.806' W	0	0
2	59° 45.241' N	135° 31.682' W	0	0
3	59° 45.228' N	135° 31.594' W	0	0
4	59° 45.225' N	135° 31.494' W	0	0
5	59° 45.260' N	135° 31.454' W	0	0
6	59° 45.257' N	135° 31.513' W	1	6
7	59° 45.269' N	135° 31.401' W	1	4
8	59° 45.304' N	135° 31.405' W	2	1
9	59° 45.374' N	135° 31.274' W	1	2
10	59° 45.454' N	135° 31.144' W	0	0
11	59° 45.459' N	135° 31.148' W	0	0
12	59° 45.479' N	135° 31.108' W	3	2
13	59° 45.599' N	135° 30.916' W	6	7
14	59° 45.654' N	135° 30.824' W	4	1
15	59° 45.459' N	135° 31.152' W	0	0
16	59° 45.459' N	135° 31.152' W	0	0
17	59° 45.695' N	135° 30.745' W	0	1
18	59° 45.731' N	135° 30.726' W	0	1
19	59° 45.599' N	135° 31.084' W	0	0
20	59° 45.638' N	135° 31.015' W	0	0
21	59° 45.791' N	135° 30.916' W	0	5
22	59° 45.880' N	135° 30.755' W	0	1
23	59° 46.138' N	135° 30.504' W	0	1
24	59° 46.132' N	135° 30.293' W	0	1
25	59° 46.299' N	135° 30.044' W	0	2
26	59° 46.343' N	135° 30.117' W	0	1
27	59° 46.500' N	135° 30.117' W	0	1
28	59° 46.671' N	135° 29.656' W	0	3
29	59° 46.399' N	135° 29.824' W	0	3
30	59° 46.454' N	135° 29.739' W	0	5
	<b>Total</b>		<b>18</b>	<b>48</b>



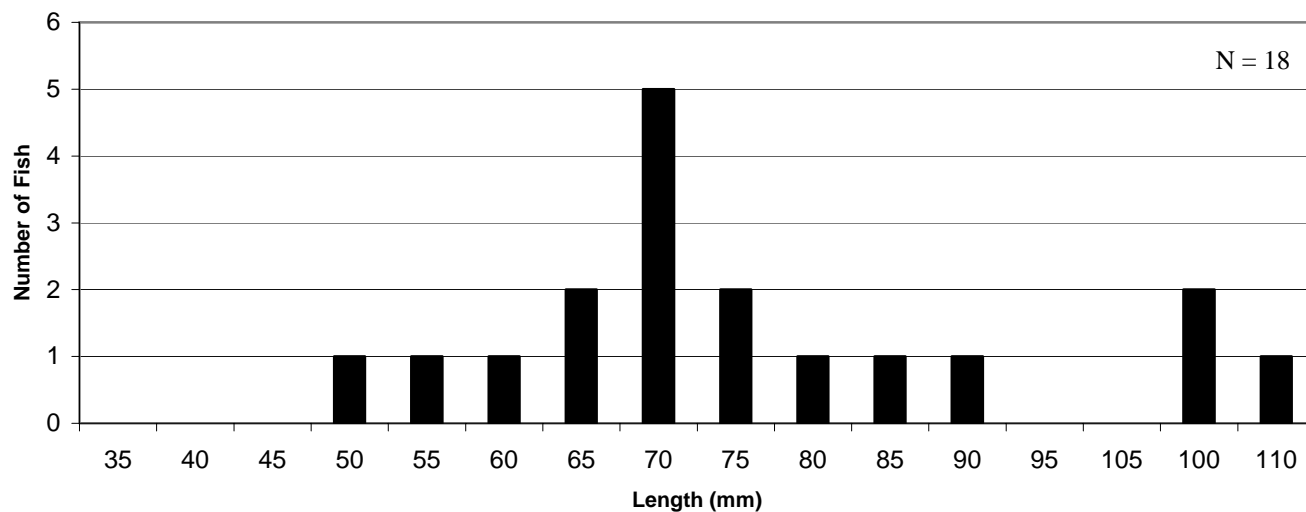
**Figure 1. Size distribution of Coho smolt trapped in Pullen Creek, Skagway, Alaska Feb-2004.**



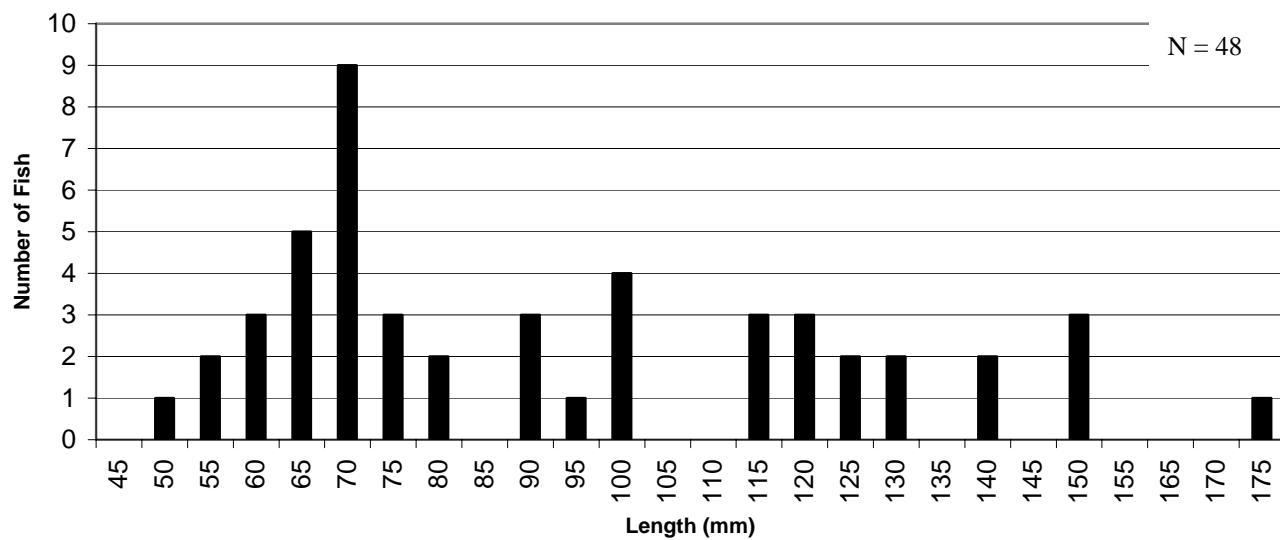
**Figure 2. Size distribution of Dolly Varden trapped in Pullen Creek, Skagway, Alaska Feb-2004.**



**Figure 3. Size distribution of Coho smolt trapped in Pullen Creek in Skagway, Alaska May 2004.**



**Figure 4. Size distribution of Dolly Varden trapped in Pullen Creek in Skagway, Alaska May 2004.**



Appendix A  
Fish Resource Permit Study Plan

## **Pullen Creek Fish Trapping Study Plan**

Pullen Creek, located through the center of the City of Skagway, is listed on Alaska's Section 303(d) impaired waterbody list and on the Alaska Clean Water Action (ACWA) list for metal contamination. Trace metals have been found associated with the creek, and Skagway Harbor, and are believed to have originated from an ore transfer facility and its railroad. Pullen Creek is currently scheduled for a Total Maximum Daily Load (TMDL) in October, 2003, however there is a lack of baseline data needed to evaluate the need for a TMDL. In addition, Pullen Creek is listed as an anadromous waterbody, hosting King, Coho, Pink and Chum salmon, Dolly Varden Char and sea-run Cutthroat trout. The King and Pink Salmon are hatchery enhanced, through a Skagway School District run hatchery program. Pullen Creek has had extensive urban impacts to its fish habitat, including numerous oil and fuel spills, extensive bank erosion, building development and culverts. A comprehensive assessment for Pullen Creek is needed, to identify and prioritize habitat restoration efforts.

The Skagway Traditional Council was awarded a FY2004 Alaska Clean Water Action (ACWA) grant to address the above issues, including a comprehensive assessment for Pullen Creek. The environmental assessment will be performed by POWTEC, LLC. It will include a historical records and information search for Pullen Creek, and will be based on all potential impacts to the creek over time. POWTEC, LLC will perform a site visit and take baseline water quality, water quantity, and fish distribution and habitat use data, as well as map the creek system.

### **Methods**

Baseline fish distribution and habitat use data will be collected by means of fish trapping and a walking survey. Trapping and walking surveys will occur during the Fall of 2003 and trapping will occur again in the Spring of 2004. Trapping locations will be determined on-site (dependent on water flow and available pools) and marked with flagging. GPS way-points will be logged to help determine sites for future repeated trapping. Walking survey's will be performed to get an estimation of adult counts in Pullen Creek for the Fall of 2003.

Fish trapping will consist of using baited minnow traps, with standard mesh sizes of both 0.125 and 0.25-inch diameters. The traps will be tethered with 6-10 ft. of nylon cord. Minnow traps will be baited with approximately 1 ounce of salmon eggs, disinfected for 10 minutes in a 1:100 solution of betadyne in water. Baited traps will be placed in pools of water, preferably with cover (i.e. undercut banks). Traps will be soaked for approximately 2 hours, to capture fish. Trapped fish will be placed in white-bottomed plastic trays with water and identified to species, measured to fork length, counted and returned to the creek. No anesthetic will be used. Data will include a description of trap location, description of habitat, identification of fish trapped, size of fish trapped and number of fish trapped. Additional data taken on the same day (but not at each trap location) will include discharge, dissolved oxygen, pH, and temperature.

During the Fall of 2003, a walking survey will be performed on Pullen Creek to document the use of the creek by adult spawning Coho salmon. The survey crew will walk the entirety of Pullen Creek, from the mouth to the headwaters, and note the presence of adult fish. Data collected will include: approximate location of fish, species of fish, number of fish, sex of fish (if determinable) and whether the fish was alive or dead on the banks of the creek.

All data will be presented in the Pullen Creek Assessment report, which is a deliverable of the ACWA grant received by Skagway Traditional Council.

Appendix C  
Data from Taiya Inlet Watershed Council testing  
November, 2003

Table 1. Results of November, 2003 sediment sampling for heavy metals on Pullen Creek, Skagway, Alaska. Samples were analyzed using EPA methods 200.9, 7081, 7471A, and 7951. Clean up levels are indicated next to contaminant and are based on the State of Alaska's method 2 soil clean-up levels.

LOCATION OF SAMPLE:	Pullen Creek	Pullen Creek	Pullen Creek	Pullen Creek	Pullen Creek
DESCRIPTION OF LOCATION:	Pullen Pond	Fish Hatchery	Fork at 18th & State	Rail Yard Headwater (State St.)	Hillside Spring Headwater
DATE OF SAMPLE:	11/20/2003	11/20/2003	11/20/2003	11/21/2003	11/21/2003
TYPE OF SAMPLE:	Sediment	Sediment	Sediment	Sediment	Sediment
FIELD SAMPLE ID:	PPS1_N20/03	FHS1_N20/03	T2S1_N20/03	HWS1_N21/03	HW2S1_N21/03
TESTING LABORATORY	Analytica, Inc.	Analytica, Inc.	Analytica, Inc.	Analytica, Inc.	Analytica, Inc.
LABORATORY SAMPLE ID:	J0311126-02C	J0311126-04C	J0311126-06C	J0311126-08C	J0311126-10C
DATE RECEIVED:	11/22/2003	11/22/2003	11/22/2003	11/22/2003	11/22/2003
DATE ANALYZED	12/8/2003	12/8/2003	12/8/2003	12/8/2003	12/8/2003
CONCENTRATION UNITS:	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg
Arsenic (As) - 1.8 mg/Kg	0.550	4.27	2.58	4.10	2.69
Barium (Ba) - 982.0 mg/Kg	140	214	192	301	168
Cadmium (Cd) - 4.5 mg/Kg	0.0586	0.627	0.700	0.534	0.353
Chromium (Cr) - 23.0 mg/Kg	3.57	10.4	8.03	16.7	6.27
Lead (Pb) - 400.0 mg/Kg	43.0	125	123	291	192
Mercury (Hg) - 1.24 mg/Kg	0.0692	0.129	ND	0.193	ND
Selenium (Se) - 3.0 mg/Kg	0.246	1.30	0.686	0.655	0.380
Silver (Ag) - 19.0 mg/Kg	1.09	1.42	0.722	1.10	1.06

Table 2. Results of November, 2003 water sampling for heavy metals on Pullen Creek, Skagway, Alaska. Samples were analyzed using EPA methods 200.9, 208.2, 245.1, and 289.2. Clean up levels are indicated next to contaminant and are based on the State of Alaska groundwater clean-up levels.

LOCATION OF SAMPLE:	Pullen Creek	Pullen Creek	Pullen Creek	Pullen Creek	Pullen Creek
DESCRIPTION OF LOCATION:	Pullen Pond	Fish Hatchery	Fork at 18th & State	Rail Yard Headwater (State St.)	Hillside Spring Headwater
DATE OF SAMPLE:	11/20/2003	11/20/2003	11/20/2003	11/21/2003	11/21/2003
TYPE OF SAMPLE:	Water	Water	Water	Water	Water
FIELD SAMPLE ID:	PPW1_N20/03	FHW1_N20/03	T2W1_N20/03	HWW1_N20/03	HW2W1_N21/03
TESTING LABORATORY	Analytica, Inc.	Analytica, Inc.	Analytica, Inc.	Analytica, Inc.	Analytica, Inc.
LABORATORY SAMPLE ID:	J0311126-01A	J0311126-03A	J0311126-05A	J0311126-07C	J0311126-09A
DATE RECEIVED:	11/22/2003	11/22/2003	11/22/2003	11/22/2003	11/22/2003
DATE ANALYZED	12/4/2003	12/4/2003	12/4/2003	12/4/2003	12/4/2003.
CONCENTRATION UNITS:	ug/L	ug/L	ug/L	ug/L	ug/L
Arsenic (As) - 50 ug/L	ND	ND	ND	ND	ND
Barium (Ba) - 2000.0 ug/L	45.9	40.5	50.1	49.2	51.5
Cadmium (Cd) - 5.0 ug/L	ND	ND	ND	ND	ND
Chromium (Cr) - 100.0 ug/L	ND	ND	0.148	0.189	0.193
Lead (Pb) - 15.0 ug/L	0.168	ND	ND	0.181	ND
Mercury (Hg) - 1.24 mg/Kg	ND	ND	ND	ND	0.00035
Selenium (Se) - 50.0 ug/L	ND	ND	ND	ND	ND
Silver (Ag) - 180.0 ug/L	1.01	0.601	0.530	0.489	0.486

Table 3. Results of November, 2003 sediment sampling for hydrocarbons on Pullen Creek, Skagway, Alaska. Samples were analyzed using EPA method 8260A. Clean up levels are indicated next to contaminant and are based on the State of Alaska's groundwater clean-up levels.

LOCATION OF SAMPLE:	Pullen Creek	Pullen Creek	Pullen Creek	Pullen Creek	Pullen Creek
DESCRIPTION OF LOCATION:	<b>Pullen Pond Fish Hatchery</b>		<b>Fork at 18th &amp; State</b>	<b>Rail Yard Headwater (State St.)</b>	<b>Hillside Spring Headwater</b>
DATE OF SAMPLE:	11/20/2003	11/20/2003	11/20/2003	11/21/2003	11/21/2003
TYPE OF SAMPLE:	Sediment	Sediment	Sediment	Sediment	Sediment
FIELD SAMPLE ID:	PPS1_N20/03	FHS1_N20/03	T2S1_N20/03	HWS1_N21/03	HW2S1_N21/03
TESTING LABORATORY	Analytica, Inc.	Analytica, Inc.	Analytica, Inc.	Analytica, Inc.	Analytica, Inc.
LABORATORY SAMPLE ID:	J0311126-02C	J0311126-04C	J0311126-06C	J0311126-08C	J0311126-10C
DATE RECEIVED:	11/22/2003	11/22/2003	11/22/2003	11/22/2003	11/22/2003
DATE ANALYZED	12/2/2003	12/8/2003	12/8/2003	12/8/2003	12/8/2003
CONCENTRATION UNITS:	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg
Benzene - 0.02 mg/Kg	ND	ND	ND	ND	ND
Ethylbenzene - 5.0 mg/Kg	0.012	ND	ND	ND	ND
Toluene - 4.80 mg/Kg	ND	ND	0.027	0.015	0.0092
Xylenes (Total) - 69.0 mg/Kg	0.05	ND	0.053	0.030	0.015

Table 4. Results of November, 2003 water sampling for hydrocarbons on Pullen Creek, Skagway, Alaska. Samples were analyzed using EPA method 8260A. Clean up levels are indicated next to contaminant and are based on the State of Alaska's groundwater clean-up levels.

LOCATION OF SAMPLE:	Pullen Creek	Pullen Creek	Pullen Creek	Pullen Creek	Pullen Creek
DESCRIPTION OF LOCATION:	<b>Pullen Pond</b>	<b>Fish Hatchery</b>	<b>Fork at 18th &amp; State</b>	<b>Rail Yard Headwater (State St.)</b>	<b>Hillside Spring Headwater</b>
DATE OF SAMPLE:	11/20/2003	11/20/2003	11/20/2003	11/20/2003	11/20/2003
TYPE OF SAMPLE:	Water	Water	Water	Water	Water
FIELD SAMPLE ID:	PPW1_N20/03	FHW1_N20/03	T2W1_N20/03	HWW1_N20/03	HW2W1_N21/03
TESTING LABORATORY	Analytica, Inc.	Analytica, Inc.	Analytica, Inc.	Analytica, Inc.	Analytica, Inc.
LABORATORY SAMPLE ID:	J0311126-01A	J0311126-03A	J0311126-05A	J0311126-07C	J0311126-09A
DATE RECEIVED:	11/22/2003	11/22/2003	11/22/2003	11/22/2003	11/22/2003
DATE ANALYZED	12/2/2003	12/4/2003	12/4/2003	12/4/2003	12/4/2003.
CONCENTRATION UNITS:	ug/L	ug/L	ug/L	ug/L	ug/L
Benzene - 5.0 ug/L	ND	ND	ND	ND	ND
Ethylbenzene - 700.0 ug/L	ND	ND	ND	ND	ND
Toluene - 1000 ug/L	ND	ND	ND	ND	ND
Xylenes (Total)- 10.0 ug/L	ND	ND	ND	ND	ND

Table 5. Summary of basic water quality parameter, discharge and substrate type for each sampling site and event on Pullen Creek, in Skagway Alaska. See Figure X for sampling site locations.

	<b>Pullen Pond</b>	<b>Tributary One</b>	<b>Fish Hatchery</b>	<b>Tributary Two</b>	<b>White Pass Pond</b>	<b>Headwaters</b>
<b>Air Temp (°C)</b>	-6	-	-4	-	-2	-3
<b>Water Temp (°C)</b>	0.25	-	3.12	3.72	4.13	4.39
<b>DO (mg/L)</b>	28.20	-	18.34	11.36	10.72	16.20
<b>pH</b>	6.17	-	7.11	6.61	6.14	6.26
<b>Conductivity (µS/cm)</b>	0.099	-	0.202	0.154	0.154	0.153
<b>Discharge (cfs)</b>	0.135	-	0.018	0.056	0.003	0.032
<b>Substrate Type</b>						
Silt (Si)	18%	-	0%	11%	18%	4%
Sand (S)	10%	-	50%	8%	15%	8%
Very Fine Gravel (VFG)	0%	-	0%	0%	2%	2%
Fine Gravel (FG)	0%	-	0%	4%	10%	10%
Medium Gravel (MGR)	7%	-	0%	4%	14%	25%
Coarse Gravel (CGR)	9%	-	0%	6%	5%	14%
Very Coarse Gravel (VCG)	20%	-	0%	13%	5%	8%
Small Cobble (SC)	16%	-	0%	7%	5%	4%
Large Cobble (LC)	6%	-	0%	2%	3%	0%
Boulder (B)	11%	-	0%	3%	1%	1%
Detritus (D)	0%	-	50%	25%	10%	4%
Wood (W)	1%	-	0%	8%	4%	0%
Garbage (G)/Plastic	2%	-	0%	1%	8%	0%
Vegetation (V)	0%	-	0%	8%	0%	0%

Si/S	<2 mm	MG	8 - 15.9 mm	SC	64 - 127.9 mm
VFG	2 - 3.9 mm	CG	16 - 31.9 mm	LC	128 - 255.9 mm
FG	4 - 7.9 mm	VCG	32 - 63.9 mm	B	>256 mm