

**Seward Highway, Milepost 99-105 (Bird to Indian)  
ADOT&PF State Project #53577  
Stream Habitat Inventory and Shoreline Assessment**



**Prepared for:**  
DOWL Engineers  
4040 B Street  
Anchorage, AK 99503

**By:**  
Inter-Fluve  
1020 Wasco Street, Suite 1  
Hood River, OR 97031  
541-386-9003  
[www.interfluve.com](http://www.interfluve.com)

**July 30, 2007**

## Table of Contents

Introduction.....	1
Shoreline Assessment and Mapping.....	1
Methods.....	1
Discussion.....	2
Stream Habitat Inventory.....	3
Methods.....	3
Stream Descriptions.....	5
“Bear” Creek, MP 100.6.....	5
Bird Creek, MP 101.5.....	6
“Ball Field” Creek, MP 102.7.....	7
Indian Creek, MP 102.9.....	8
“Subdivision” Creek, MP 103.5.....	10
“Roadside” Creek, MP 103.9.....	10
Literature Cited.....	11

## **Introduction**

This report is intended to provide an inventory, mapping and documented record of the shoreline and stream habitat for the Seward Highway, Milepost 99-105 (Bird to Indian) Project. The highway improvement project is located along the Turnagain Arm approximately 20-miles from Anchorage, Alaska. Project location is shown in Sheet 1.

The shoreline assessment of the entire project length was conducted to map the substrate types and intertidal vegetative communities found along the project corridor. The goal of this aspect of the project was the determination of a classification system that would efficiently delineate the existing substrate and vegetation types, and the application of this system to produce a set of maps based on aerial photographic images to document conditions. This mapping effort will supplement a comprehensive study of the nearshore ecology of Turnagain Arm being conducted by HDR. In combination, the studies will provide insight into the habitat of the nearshore biological communities along the shoreline adjacent to the proposed project.

The focus of the stream field work conducted on August 1-3, 2006 was the assessment of the physical habitat of the six streams known to cross the highway within the project boundaries. The scope of this assessment did not include the trapping of juvenile fish to determine species composition, specific areas of use, or outmigrant timing. Similarly, adult spawning surveys were not conducted as part of this assessment. A survey of the existing limited recent literature available was combined with interviews with resource agency biologists in order to compile existing agency knowledge and published information about the fish use of the subject streams. Specifically, information was sought to determine:

- Timing and location of adult fish use of the streams, both salmon and eulachon
- Timing of juvenile salmon outmigration
- Timing and location of use of the streams by rearing salmonids

The available information from literature and agency communication regarding use of stream systems by juvenile and adult salmonids is incorporated into each stream description section.

## **Shoreline Assessment and Mapping**

### ***Methods***

The goal of the shoreline assessment and mapping for the Seward Highway MP 99 to 105 (Bird to Indian) Project was the determination of a classification system that would efficiently delineate the existing substrate and vegetation types along the project shoreline, and the application of this system to produce a set of maps based on aerial photographic images to document conditions. The resulting maps are attached to this report as Sheets 2 through 13. These maps of the substrate types and intertidal vegetative communities will complement the wetland delineation and mapping that is being conducted concurrently by DOWL for this project. This inventory will also supplement a

comprehensive study of the nearshore ecology of Turnagain Arm being conducted by HDR. In combination, the efforts will provide insight into the habitat composition of the nearshore biological communities and the possible impacts of the proposed project.

The field work for this project was conducted on August 3-4, 2006. The entire project shoreline was walked and printed copies of high resolution aerial photographs were used to demarcate the location and kind of substrate present. Surface vegetation location and type were also noted on the photographs. The surveys were conducted during periods of low tidal conditions in order to maximize the area available for the survey. The focus of the mapping was nearshore habitat, and no below-water investigations were conducted. The initial plan was to utilize a hand held GPS unit to map the primary features of the shoreline, but this was determined to be unnecessary due to the high resolution of the aerial photographs available.

Inter-Fluve determined that a total of nine separate classifications or categories of substrate types were necessary to adequately classify the nearshore habitat along this project. The dynamic tidal action of Turnagain Arm combined with the high silt load has limited the establishment of vegetation in the intertidal zone of this stretch of Turnagain Arm. In fact, only rockweed (*Fucus gardneri*), was seen in substantial quantity. A very few limited and widely scattered small patches of green algae were observed, likely *Enteromorpha* spp. The classifications that are indicated on the maps are as follows:

- *Riprap*. Large rock placed along the shoreline to protect the highway or railroad fill slopes from erosion.
- *Mixed riprap*. A combination of large rock and existing fill or naturally occurring soils. This material is often colonized with grasses and shrubs.
- *Rock outcroppings*. Naturally occurring bedrock.
- *Boulders*. Naturally occurring large rounded rock.
- *Gravel*. Unconsolidated mixture of small pebbles.
- *Sand*. Small loose, free draining grains of rock.
- *Silt*. Fine washed particles.
- *Mud*. Very fine, saturated material.
- *Rockweed*. Presence of rockweed (*Fucus gardneri*).

Sketches were drawn to scale while in the field at low tide on the AeroMap aerial photographs (flight date 05-24-06) that encompass the entire project for each substrate classification. These field drawings were then converted to CAD drawings using AutoCAD LT, and subsequently incorporated into final CAD drawings.

Representative existing conditions were documented on site with photographs (see Sheets 2-19).

## **Discussion**

The dominant pattern of substrate distribution along the shoreline of the Seward Highway between MP 99 and MP 105 is a steep riprap slope leading to a narrow band of gravel

which then blends into the prevalent mud and silts of Turnagain Arm. Periodically, rocky outcroppings protrude from the shoreline and induce eddies as the strong tidal currents flow up and down the shoreline. The variations in water velocities result in concomitant variations in distribution of sediments, by particle size, and in the relative elevation of the bars, pools or channels formed. The rock outcroppings also provide the primary habitat for the relatively small amount of resilient vegetation that lives in this harsh environment. On a macro scale, the undulations of the shoreline affect the larger scale distributions of gravel, sand, silt and mud, and the formation of the major channel within Turnagain Arm.

The major stream systems in this area, Bird and Indian Creek, also influence the sediment distribution near their termini at salt water, and create channels that extend well into the intertidal zone. The numerous small mountain drainages that enter Turnagain Arm along the project shoreline also produce drainage patterns clearly visible in the easily erodable mud of the lower intertidal zone. These tidal streams constitute areas of diurnally changing hydraulic influences and are in a state of continuous modification. This situation makes it difficult to document habitat constituents as they are in a state of constant flux. The stream channel habitats of the tidal areas however make up a small overall portion of the habitat surveyed.

## **Stream Habitat Inventory**

### ***Methods***

The goal of the stream habitat inventory for the Seward Highway MP 99 to 105 (Bird to Indian) Project was to map the aquatic habitat and stream geomorphic conditions currently present in the six primary streams that cross the project boundaries and document the findings (see Sheet 1). The mapping encompassed sections of the streams predicted to extend both upstream and downstream of anticipated limits of the hydraulic or construction impacts that may result from the implementation of the highway realignment options currently under consideration for this project. In all cases, the stream surveys extended to the stream terminus at tidewater.

The initial inventory was conducted by physically walking the subject reaches of the streams and taking detailed notes and measurement of the channel conditions present at the time of the survey. The field work for this inventory was conducted over a three day period, August 1-3, 2006.

The lengths of the habitat features were measured with a hip chain. The measurements started from a structure that was easily identifiable on aerial photographs, thus allowing for the accurate mapping of the field data onto aerial base maps for each stream. The width of the features was measured and tabulated in a field book. The primary habitat features mapped were pools, riffles, glides/runs, areas of sub-surface flow and tidal zones. These individual habitat units are defined as:

- *Pools.* Pools are areas with very low velocities with residual depths greater than 0.5 foot. Water surfaces are flat.

- *Backwater Pool*. A pool formed from an eddy along a channel margin as a result of an upstream obstruction like a large tree, rootwad, or boulder.
- *Plunge Pool*. A pool at the base of a waterfall formed by hydraulic erosion.
- *Step Pool*. One of a series of pools separated by short, steep sections of stream.
- *Riffles*. Riffles have obvious surface turbulence and are typically shallow water less than a foot deep with low to moderate slopes (<4%). Water velocities are greater than 1f/s
- *Glide/run*. Habitat units commonly referred to as glides and runs are lumped into one unit designation. This is done to improve the repeatability of designation of this habitat unit. Glide/runs have some surface turbulence due to water velocities greater than that for pools and are typically deeper than riffles. Water velocity is less than 1f/s to distinguish from riffles. Water surfaces are very gently sloping.
- *Sub-surface*. If the entire flow goes sub-surface (across the entire wetted width), the unit is classified as sub-surface.
- *Tidal*. The area of the stream subject to frequent submergence of stream features by salt water.

In some cases, the pool habitat unit was more specifically defined into step pools, plunge pools (found at culvert outlets) and backwater pools.

Additionally, a number of other stream features were noted in the field and incorporated into either the mapping or the narrative description of the streams. These features included:

- Substrate types. This delineation was not finely detailed, and was often limited by accessibility. The noted types include silt, sand, gravels, cobble, and large rock.
- Bank type.
- Riparian vegetation. This was documented with photography.
- Gravel bar location. The type and extent of vegetation on the bar was also noted
- Large woody debris locations.
- Tributary locations.

The mapped reaches were documented with photographs.

The primary habitat features were converted from the field book notes and sketches to CAD drawings using AutoCAD LT, and were then incorporated into the final CAD drawings. The sketches were drawn to scale on the AeroMap aerial photographs (flight date 05-24-06) that encompass the entire project. Stream widths of less than 3' were drawn with a single line.

## **Stream Descriptions**

### **“Bear” Creek, MP 100.6**

#### Physical Description

This stream survey was conducted between tidewater and a point 120' upstream of the culvert crossing the bike path immediately to the north of the highway (see Sheet 14). At the upstream end of the surveyed section, the stream flows through a birch and alder forest and the stream banks are well vegetated with grasses. This part of the stream is composed of a 5' wide glide reach with a length of 90', leading into a backwater pool upstream of the culvert inlet. There is a substantial quantity of organic debris within the stream, the substrate is gravel, and the habitat appears well suited for rearing coho and Dolly Varden.

Between the access road culvert and the highway culvert is a 4' wide riffle section with a length of 35'. The highway culvert itself is 132' in length and, according to data from Alaska Department of Fish and Game (ADF&G) surveys, this culvert does not provide fish passage (Ed Weiss, Alaska Department of Natural Resource (DNR) 4/18/06 scoping comments). At the outlet of the highway culvert the stream drops 1.5' into a 6' wide plunge pool in a rocky substrate. The stream then flows through a short 30' riffle section and into an extended reach of step pool habitat. The step pool reach is 252' in length and averages 6' in width. In this reach, the step pools are formed by periodic debris dams, the stream substrate is primarily gravel and rock, the riparian area is thickly vegetated, and there is a mature forested canopy of cottonwood, birch and spruce over much of the stream. The stream then flows into a 5' wide riffle section, first through 65' of continued forest conditions, and then for another 160' through a grassy meadow. Within the forest, the stream substrate is gravel and rock, and the stream bed is stable, with 2' well-vegetated banks. In contrast, the stream in the meadow section is incised to a depth of up to 6', and although there is a thick vegetative mat of grasses covering the meadow, the silty soil in this area is easily eroded and the stream banks are unstable. The stream flow is adequate to transport much of the finer material, so the stream substrate remains primarily gravel. Just up stream of the railroad crossing culvert there is a 1.5' deep pool and then an 8' long riffle section. The railroad culvert is perched about 3' and discharges onto riprap. Below a short riprap zone, the stream flows through a well defined channel through the mud of the intertidal zone.

#### Fish Utilization

This stream is not currently listed in the ADF&G Anadromous Waters Catalog although Dolly Varden char (*Salvelinus malma*), have recently been trapped near the bike path crossing (Ed Weiss, DNR, agency meeting of 8/1/06). The stream was trapped on June 27<sup>th</sup> and 28<sup>th</sup> 2006, by Ed Weiss and Stewart Seaberg of DNR. One trap was set approximately 200 feet upstream of the bike path bridge and captured 2 Dolly Varden. A second trap was located approximately 100 feet downstream of the bike path bridge and captured 13 Dolly Varden. Both traps were set overnight (Stewart Seaberg, email to Ed Weiss dated June 28, 2006). It is not known if the railroad culvert provides for fish passage.

## **Bird Creek, MP 101.5**

### Physical Description

The section of Bird Creek surveyed for this project is influenced by the level of the tide in Turnagain Arm (see Sheet 15). The habitat units described and mapped exist at low tide, with nearly the entire reach shifting to a deep water glide during some high tides. The reach surveyed extended from a point 1165' upstream of the foot bridge crossing downstream to the rocky outcropping within Turnagain Arm, approximately 500' downstream of the railroad bridge.

As indicated in the graphical presentation, the furthest upstream reach surveyed was composed of a riffle split by a gravel bar. The total length of the riffle is 270', with one branch of the creek averaging 40' in width, and the other 25'. At the downstream end of the riffle the creek is within a single channel with a width of 50'. The substrate is a matrix of cobbles and gravels, and the creek flows within a floodplain of alluvial material. The immediate stream banks are largely unvegetated, but grasses are present on the floodplain areas less subject to scouring flows. At the downstream end of the riffle, a slight change in gradient combined with the presence of mid-channel boulders and a rock outcropping has resulted in the formation of a pool of 150' in length and an average width of about 50'. The pool is actively fished by sport fishermen and was about 2-3' in depth.

Another riffle-pool-riffle reach follows downstream. This reach varies in width from 50 to 75' with the south bank composed primarily of mud, and the north shoreline varying from a gravel bar, to a rock face, to a shallow slope of mud. At the time of the survey, the area was heavily utilized by sport fishermen and there was little in the way of established vegetation immediately adjacent to the water.

The next reach is a glide section of about 120' in length, followed by a 90' riffle section. This reach is very consistent, with an average width of 75' and banks composed of gravels overlaid with a deposition of fine silt and mud. The shoreline was very trampled, and no vegetation was present. Downstream of the riffle the creek morphology shifts to a series of step pools as it flows under the bridges and to the edge of the Turnagain Arm shoreline. The step pools are formed by a large number of boulders positioned throughout the channel. The stream width narrows to an average of 50' and the stream banks steepen to support the bridge structures. The next reach extends from just below the bridge to the rocky outcropping in Turnagain Arm, a distance of 450'. This reach functions as a riffle during low tide and has an average width of 75'.

### Fish Utilization

Bird Creek is listed in the ADF&G Anadromous Waters Catalog AWC# 247-60-10280, and supports Chinook salmon (*Oncorhynchus tshawytscha*), coho salmon (*Oncorhynchus kisutch*), chum salmon (*Oncorhynchus keta*), and pink salmon (*Oncorhynchus gorbuscha*). Penguin Creek, a tributary to Bird Creek just north of the project boundary, is also listed (AWC# 247-6010280-2008), and supports Chinook salmon spawning. Although Penguin Creek will not be directly impacted by this project, Bird Creek does serve as a corridor for all fish entering or leaving this system.

ADF&G has conducted foot survey counts of Chinook salmon returning to Bird Creek and its tributary Penguin Creek that indicate an annual run of 190 Chinook salmon from 1994-2003 with a range from 50 to 500 Chinook salmon (Miller and Bosch, 2004). About one-half of the Chinook salmon counted in the Bird Creek drainage were found to spawn in Penguin Creek. The timing of the adult return is from late May through early July. A series of waterfalls in Bird Creek approximately one-half mile above the Penguin Creek confluence prevent fish access to the upper reaches of Bird Creek. The Bird Creek drainage provides rearing habitat for juvenile Chinook salmon. Although there has not been a study to determine the specific timing of the outmigration of Chinook smolt, it is likely that this occurs in May and June each year (Dan Bosch, ADF&G, personal communication, 1-16-07).

Bird Creek historically had a small natural return of coho salmon, and has been stocked since 1992 to provide sport fishing opportunity (Miller and Bosch, 2004). Because Bird Creek is not considered to have a significant natural spawning population of coho salmon, no biological escapement goal for coho salmon has been established for this system (Bosch and Evans, 2006). Coho are harvested from late July through mid-September. Coho harvested in the intertidal area may also be bound for other systems on Turnagain Arm. The stocking of this system with approximately 100,000 coho smolt occurs annually, usually between May 20 and June 10. These fish usually leave the river system immediately, entering Turnagain Arm within a few hours of release (Dan Bosch, ADF&G, agency meeting 8-1-06). Bird Creek is considered to have little coho rearing habitat.

Bird Creek supports the largest pink salmon sport fishery in the Anchorage area. Pink salmon return to Bird Creek in July and early August each year, with the even years being the years of stronger returns. The Bird Creek pink salmon fishery is managed to allow angler opportunity on a harvestable surplus of salmon while assuring sustained yield. ADF&G has not established a pink salmon escapement goal for this system (Miller and Bosch, 2004).

Bird Creek provides the majority of the chum salmon sport fish harvest in the Anchorage area streams and also contributes to the Dolly Varden harvest.

Although the exact timing of juvenile outmigration is not known, pink and chum salmon typically emerge in early to late spring and immediately move out to sea.

Eulachon have been reported harvested in Bird Creek. The return occurs from mid-May through June 15 (Miller and Bosch, 2004).

## **“Ball Field” Creek, MP 102.7**

### Physical Description

This stream is fed by a large wetland complex that lies along the north side of the highway between MP 102.3 and MP 102.7 (see Sheet 16). The wetlands are composed of

pools and low gradient streams heavily vegetated with sedges and grasses. The stream substrate through this area is primarily organic matter over a variety of sediment sizes, with the typical channel approximately three feet wide and 8-12" deep. Between the highway crossing culvert and the wetlands, the stream flows through a series of glides and riffles for about 140'. Most of this reach is forested, primarily with alder, and the substrate is rocky. Immediately upstream of the culvert is a shallow, short glide that widens to 10'. Between the highway culvert and the bike path culvert the stream is composed of a very uniform 3' wide glide reach with high banks vegetated with cottonwood and alder. There is some organic debris in the streambed of this 250' reach.

Downstream of the bike path culvert the stream grade steepens and falls through a series of 5' wide rocky step pools for about 90'. It then broadens into an 8' wide glide for another 90'. The riparian vegetation over this area is dense, and composed of overhanging alder and mature cottonwood. There is a large amount of woody debris in the stream and the habitat appears ideal for rearing coho or Dolly Varden. The stream then narrows to a steeper step pool section, with the pools formed by dams of organic debris, and then broadens once more into a 185' backwater pool with a width that varies from 5' to 20'. The substrate in this area appears to be primarily organic matter over top of fine sediments, and the stream banks are earthen. Downstream of the backwater pool is a 5' wide step pool section similarly formed by periodic, small organic debris dams. The stream then runs through a series of narrow riffle sections for about 140' before it enters the railroad crossing culvert. The outlet of this culvert spills the stream onto a rocky riprap section of the upper intertidal zone, and the stream then spreads broadly over the gravel area of the beach, once more becoming a more defined channel in the muddy substrate of the lower intertidal zone.

#### Fish Utilization

This stream is not listed in the ADF&G Anadromous Waters Catalog. The lack of a defined channel through the upper intertidal zone, combined with a perched pipe at the railroad crossing may prevent fish from accessing the stream at all, although this may not be the case during certain high tide events. This stream appears to have the potential to be a highly productive system for rearing fish, and has sufficient flow and gradient in some reaches to serve as spawning habitat. The culverts under the bike path and highway appear likely to provide adequate fish passage in their current condition, but could be improved. The extensive wetland habitat upstream of the highway crossing is ideal juvenile coho and Dolly Varden rearing habitat.

### **Indian Creek, MP 102.9**

#### Physical Description

This creek was surveyed starting from a point 280' upstream of the north edge of the Seward Highway Bridge and proceeding downstream (see Sheet 17). At the upstream end of the survey, the stream was a single riffle with an average width of 35'. The stream flows over a rocky substrate and through a mature forest of birch, cottonwood, willow and alder. At a point 260' upstream of the bridge the creek splits into two channels and flows around a forested island. The east channel is composed of a single riffle reach with

a fairly uniform width of 15'. The length of this reach of the stream is 250'. On the eastern bank of this reach there is a backwater pool located about 50' upstream of the bridge. This pool is about 40' long and tapers in width from 10' at the intersection with Indian Creek to less than 2' at its easternmost point. The western branch of the stream is composed of a series of riffles and pools. The first pool begins at the upstream end of the island and is created in part by a small log jam. The pool is 27' in length and 15' in width. The stream then flows through a 95' riffle reach before another log jam slows the flow and has created a pool. This pool is 23' long and averages 10' wide. There is a 2' high waterfall at the log jam.

The riffle that starts at the pool outlet joins with the east branch riffle and continues downstream under the highway bridge. On the western side, 35' downstream of the bike path bridge, there is a 45' long, 6' wide backwater pool. The bank along the pool is undercut, and the willow trees along the edge are overhanging the stream. The riffle reach continues downstream, sweeping around a broad corner, with a small branch splitting around a vegetated island just downstream of the backwater pool. Throughout the riffle reach the stream substrate is composed of small cobbles with larger rocks providing structure within the stream. The average width of the riffle section is 30' and the banks remain forested with alder, cottonwood and willow. The next downstream reach is composed of a 30' long glide, averaging 25' in width. The southern bank of the stream along the glide is eroded, with many of the trees lying nearly horizontal and reaching full width across the stream. The remaining reach to the three railroad crossing culverts is all riffle and averages 15' in width. In this reach, the average substrate size is larger than immediately upstream and includes rocks that are part of the fill for the adjacent railroad tracks. The stream bends 90° into the three 6' diameter culverts that cross under the railroad. These pipes are all in poor condition, with substantial rusted sections, especially at the outlet ends. Downstream of the culverts the stream flows through a rocky intertidal reach that is composed of a riffle during low tide.

### Fish Utilization

Indian Creek is listed in the ADF&G Anadromous Waters Catalog AWC# 247-60-10290, and supports natural runs of Chinook and pink salmon. Coho salmon are also present in this system, but it is thought these fish are likely strays from Bird Creek (Dan Bosch, ADF&G, agency meeting 8-1-06).

Although there has not been a study to determine the specific timing of the outmigration of Chinook smolt, it is likely that this occurs in May and June each year (Dan Bosch, ADF&G, personal communication, 1-16-07). Pink salmon fry typically emerge in early to late spring and reside in fresh water only a short time before outmigrating to the ocean. It is not thought that there is much coho rearing habitat in this system, although the pools observed during this survey are characteristic of productive coho habitat and could provide adequate rearing areas for at least a few fish.

Currently the railroad culverts are perched during low tide, and the combination of rock placement at the outlet and sharp, jagged, decomposed metal make fish access during low

tide hazardous, if not highly unlikely. At the time of the survey the tide was low and a substantial number of pink salmon were milling just below the pipes. There were no fish observed attempting to leap the outlet falls. At high tide the pipes should not serve as a barrier to fish passage.

### **“Subdivision” Creek, MP 103.5**

#### Physical Description

This is a mountain fed stream that passes through a series of driveway culverts before it reaches the highway (see Sheet 18). Immediately upstream of the highway culvert there is a 40’ riffle section running parallel to the highway. This riffle has an average width of 2’ and follows the toe of the embankment. It is well vegetated with grasses and has gravel substrate. Upstream of this riffle the stream passes through two culverts separated by another short riffle section. Above the upper culvert the stream flows through an E-Type channel overgrown with dense riparian vegetation.

Between the outlet of the highway culvert and the railroad culvert the stream consists of an open riffle section with minimal vegetative cover. Downstream of the railroad crossing culvert the stream is composed of a 120’ glide section of uniform grade. In this section, the stream is entrenched, the substrate is primarily gravel, and there is a substantial quantity of small woody debris present. The riparian vegetation is primarily grasses, with some scattered cottonwood forest. This glide reach terminates in a 5’ waterfall at the upper edge of the intertidal zone. Downstream of the waterfall the stream spreads out broadly over the 90’ wide section of gravel beach and consolidates into a more defined channel in the silt substrate of the lower intertidal zone.

#### Fish Utilization

Although the waterfall is a fish passage barrier, trapping conducted by DNR during the summer of 2006 found resident Dolly Varden present between the railroad culvert inlet and the highway (Ed Weiss, pers com). At this time the stream is not listed in the ADF&G Anadromous Waters Catalog.

### **“Roadside” Creek, MP 103.9**

#### Physical Description

At the time of the survey, this stream had water present only below the outlet of the railroad crossing culvert (see Sheet 19). Upstream of the highway culvert inlet, the roadside ditch was dry. The small flow emerging from the railroad crossing culvert immediately spread into a thickly vegetated, backwater pool with a depth of approximately one foot. The substrate of the pool was decayed organic matter overlaying gravel. The pool had a short outlet channel extending to the top of the gravel beach, where the flow went subsurface, emerging again as a defined channel within the silt substrate of the lower intertidal area. Although there was not a defined channel across the gravel portion of the beach, recent aerial photography indicates that such flow may exist during higher water events.

### Fish Utilization

This stream is not listed in the ADF&G Anadromous Waters Catalog, and it is not known if the pond habitat is utilized by rearing fish. No char or salmon spawning habitat was observed within this stream system, and there was no up stream habitat available for fish use.

## **Literature Cited**

Bosch, D. and D. Evans. 2006. Estimates of commercial and sport harvest and escapement in 1999-2001 of coho salmon stocked into Northern Cook Inlet streams in 1998-2000. Alaska Department of Fish and Game, Fishery Data Series No. 05-25, Anchorage.

Miller, M. G. and D. Bosch. 2004. Area management report for the recreational fisheries of Anchorage, 2003. Alaska Department of Fish and Game, Fishery Management Series No. 04-07, Anchorage.