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BURNCO AGGREGATE PROJECT

FISH AND FISH HABITAT BASELINE REPORT

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REPORT

Golder Associates

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1.0 INTRODUCTION

BURNCO Rock Products Ltd. (BURNCO) and 0819042 BC Ltd. are proposing to construct and operate a sand and gravel operation, the BURNCO Aggregate Project ("the Proposed Project"), on private property ("the Site") in the lower portion of the McNab Creek watershed (BC Watershed Code 900-106300) on the western shore of Howe Sound's Thornbrough Channel. The proposed pit will be situated on a flat area of the glacial fan-delta adjacent to the mouth of the creek.

Numerous watercourses (i.e., streams, ditches, groundwater-fed channels) are present on the Property in the vicinity of the proposed pit. At BURNCO's request, Golder Associates Ltd. (Golder) undertook fish and fish habitat assessments of these watercourses within or adjacent to the footprint of the Proposed Project components that are located within areas near the proposed pit and ancillary components such as buildings and roads.

The objectives of the habitat assessments were to collect information regarding the location and extent of available fish habitats and to assess the characteristics of these habitats. The objective of the fish sampling program was to collect information regarding the fish community present, and the distribution and habitat use of fish species potentially affected by the Proposed Project. This report provides a baseline description of the watercourses (both constructed and natural), habitat characteristics, habitat quality, fish distribution and fish use within the watercourses present near the Proposed Project.

2.0 METHODS

2.1 Habitat Mapping

Habitat mapping surveys focused on the watercourses located within the Proposed Project Area based on the predicted footprint of project activities. The surveys began in June 2011 and were completed in July 2012, with a follow-up survey in January 2014. A review of existing air photographs, orthophotographs, LiDAR, and available stream mapping was conducted to identify and locate mapped and unmapped watercourses. Groundtruthing was conducted during low flow and high flow seasons to field verify watercourse and map location, flow characteristics, habitat features, gradient and obstructions. Watercourses were mapped by traversing along the centre-line and collecting georeferenced positional data using a high-precision Trimble Global Positioning System (GPS) and receiver, where adequate satellite coverage was available, and supplemented with handheld Garmin GPS data, as needed. Stream mapping GPS files were downloaded and saved to the project server. Stream mapping results were overlaid on an orthographic photographic map base and each watercourse was assigned a unique watercourse number identifier. All watercourses in the Proposed Project Area are presented in Figure 1.

2.2 Fish Habitat Assessment

Fish habitat assessments were conducted for each watercourse to collect information regarding habitat characteristics and quality. Watercourses were traversed typically from their downstream point along their length within the Proposed Project Area. Assessments were conducted along a representative length of all intermittently flowing and ephemeral watercourses consistent with Reconnaissance (1:20,000) Fish and Fish Habitat Inventory: Standards and Procedures (RISC 2001). Detailed habitat mapping and measurements were completed for all perennial watercourses consistent with Level 1 Fish Habitat Assessment Procedures (FHAP) (Johnston and Slaney 1996), and included collection of information for each habitat unit along the entire length of watercourse within the Proposed Project Area The majority of the habitat assessments were conducted during the summer months and during moderate flows. Note that the level of flow present at the time of the survey can be evaluated by comparing the channel width with the wetted width at the time of the survey.

Data collected during the fish habitat assessment included the following:

- Channel measurements (channel width, wetted width, bankfull depth, water depth, residual pool depth, gradient);
- Cover (instream vegetation, overstream vegetation, deep pools, boulders, large and small woody debris (LWD and SWD), undercut banks);
- Morphology (riffle-pool, cascade-pool, step-pool, large channel);
- Substrate composition (fines, gravels, cobbles, boulders, bedrock);
- Habitat type and quality (spawning, rearing, holding, overwintering, migration);
- Fish Passage Obstructions (fall, cascades, chutes, beaver dams, culverts, log jams, etc.); and
- Photo documentation.

2.3 Fish Sampling

2.3.1 Electrofishing

Fish sampling was conducted to collect information regarding fish community and distribution, relative abundance, and fish density for representative habitats in the various waterbodies present in the vicinity of the Proposed Project. Representative sites were selected in watercourses, constructed and natural groundwater-fed watercourses, and the McNabb Creek mainstem and off-channel habitats throughout the Site. Backpack electrofishing was conducted using standard multiple-pass removal techniques consistent with Salmonid Field Protocols Handbook (Johnson et al. 2007) and RISC standards (RISC 1997). Methods are consistent with those applied throughout BC as part of fish inventory, stock assessment and productivity estimates (Ptolemy 1993; and Ptolemy et al. 2006). Sampling at each site involved multiple-pass electrofishing. Electrofisher settings, level of effort, and sampling times were recorded, as were the species, length, and weight of all fish captured. Sampling was conducted in the summer of 2009, 2010, 2011 and winter 2012. Sampling locations are provided in Figure 2.

In 2010, closed site electrofishing followed standardized methods for juvenile salmonid assessment used in other coastal watersheds in British Columbia (Ptolemy 1993, Ptolemy *et al.* 2006, Decker *et al.* 1999). Electrofishing sites were enclosed using two block nets (8 m long × 2 m high) to prevent in and out migration of fish during sampling. The two-person crew used a Smith Root 12B backpack electrofisher with a 25 cm diameter aluminum anode ring and a 3.2 m long “rat-tail” cathode. For each pass, sites were electrofished in a zigzag pattern proceeding upstream from the downstream end of the site. Fish captured during each pass were immediately processed and removed from the site before the next sampling pass was begun. Two passes were conducted at each site, with the exception of the Harlequin Creek) and a McNab Creek isolated pool, where a single pass was conducted.

Electrofisher settings (i.e., pulse width and voltage) were maintained as consistent as possible among sites, although minor adjustments were made based on site specific conditions and fishing efficiency (i.e., water conductivity, audible electrofisher tone, fish burn marks, etc.).

Fish captured by electrofishing were identified to species and measured to the nearest millimetre fork length. Once processed, the fish were allowed to recover and were released downstream of the site boundaries for the first pass or released at the sampling site after the last pass.

Fish removal data from each electrofishing pass is used to estimate population size, or the total number of fish that would have been captured if sampling continued until no fish remained at the site. Where a population estimate could not be calculated, the total number of fish captured for all passes was provided as a greater than or equal to estimate of the population. Standard error and confidence intervals (95%) were calculated for each population estimate. The number of each fish species captured was tabulated for each pass and totalled as a population estimate for each site. Density estimates were calculated based on the wetted area of each site and were reported as fish/m^2 for captured salmonid species.

The numbers of Coho Salmon marked during sampling in October of 2011 and recaptured in February of 2012 were used to estimate the total population of Coho Salmon in the upper segment of WC 2. Population estimates and 95% confidence intervals were calculated using the Chapman’s adjusted Petersen’s mark-recapture method. The population was considered closed based on overwintering behavior and stream residence of juvenile salmonids during the study period. The population estimate is considered conservative since an assumed mortality rate of 0 for juvenile salmonids between fall 2011 and winter 2012 sample events was used.

2.3.2 Minnow Trapping

Standard Gee-type minnow traps (RIC 1997), were used to collect fish from the groundwater-fed watercourses. Traps were baited with sardines and set sequentially along the length of each the watercourses as single or paired traps starting from its downstream end and spaced approximately 20 meters apart. Trapping locations are provided in Figure 2. Traps were set in the afternoon and fished overnight prior to being retrieved the following day.

Fish captured were identified to species and a subsample of between 15 and 30 of each species per sample event were measured for fork length and weighed using an electronic scale. All salmonids captured during minnow trapping were marked using an adipose fin clip to mark the fish captured during this study, and differentiate between other fish marking used in separate studies on the Property. Handling time was minimized to prevent mortality of marked fish. The total number of marked and recaptured Coho Salmon and Cutthroat Trout was recorded for each sample event. Once processed, the fish were allowed to recover and were released into the same area from which they were captured.

Coho Salmon population size and 95% confidence intervals were estimated using the single mark-release Chapman's adjusted Petersen formula (Ricker 1975). The density of juvenile Coho (fish/m^2) was determined using the measured watercourse area from habitat assessment data and the population estimate.

2.3.3 Smolt Sampling

A modified fyke net with v-type fence was used to sample out-migrating salmonids (smolts) from streams and groundwater-fed watercourses in the Proposed Project Area. Watercourses sampled included Harlequin Creek, Watercourse #2 (WC 2), and Watercourse #3 (WC 3). Fyke net locations were all positioned upstream of the limits of salt water intrusion and are provided in Figure 3.

The modified fyke net and v-type fence design was similar to that described in similar smolt outmigration study techniques documented in Conlin and Tutty (1979), Hyatt et al. (1984) and Rankin et al (1994). The fence was constructed of 6 mm wire mesh and supported by rebar and wooden stakes driven into the substrate and banks. The fyke net consisted of a rectangular metal frame (approximately 1.5 m by 0.7 m) with a short segment (<5m long) of small mesh (<6mm) netting. The caudal end was fitted with a pipe which delivered flows and captured fish to a live box constructed of 6 mm wire mesh and located downstream.

A modified fyke net was also set in the McNab mainstem using a lead net instead of a v-type fence, due to flow, depth and velocity constraints. A rope harness system was set up across the watercourse to fish fyke net mid-channel. A lead net was installed from the west bank extending from shore to the fyke net and sampling approximately a third of the channel width. The proportion of McNab Creek mainstem sampled was dependant on wetted width during the dates sampled.

The sampling program was initiated in McNab Creek and Harlequin Creek on April 3, 2012, and in the groundwater-fed watercourses on April 10, 2012 and completed on May 31, 2012. The set times for the modified fyke -nets averaged 24 hours for each location, with set times ranging from 20 hours to 30 hours, depending on the watercourse conditions and the length of time taken to process fish captured in the modified fyke -nets.

Fyke nets in Harlequin Creek and groundwater-fed watercourses were blocked with fencing between sample dates to prevent fish migration downstream. Fences were routinely inspected for damage, tampering, or washout, and cleaned of debris during each sample date. Any damage or openings in the fences was recorded and immediately repaired. Fyke netting in McNab Creek was dismantled following each sample date and no blocking of fish passage was conducted between sampling dates.

2.3.4 Adult Salmon Surveys

Golder conducted foot surveys of McNab Creek and WC 2 five times in 2009, eight times in 2010, nine times in 2011, seven times in 2012. The surveys were initiated in late summer and conducted through to winter in order to span the spawning season for 2009, 2010, 2011 and 2012. A single survey was conducted in 2013 and no attempt was made to span the duration of the spawning season during 2013. During the foot surveys, teams of two observers walked upstream through designated segments, along watercourse margins and banks where possible and counted and recorded live adult salmon and observed carcass numbers. In areas of deep undercut banks or pools, one member of the crew used a stick or rocks to flush out holding fish (although this was generally kept to a minimum so as not to stress holding salmon), while the other crew member counted the number and species of salmon.

Seventeen 100 m segments were delineated within McNab Creek based upon the distance upstream from the estuary. The full extent of the anadromous segments in McNab Creek were not surveyed, focusing instead on the segments within the lower 3.9 km; therefore the escapement estimates generated do not represent the entire system and should be considered indices of escapement (DFO 2005). The entire length of the upper and lower segments of WC 2 was also surveyed during each visit using the BC Hydro RoW to separate the two segments.

Estimates for adult Coho, Chum, Chinook and Pink Salmon index were derived using the Peak Count (PC) method which is based on the largest total live and dead salmon counts observed over the survey period. The PC technique is frequently used to index salmon escapement (Parken et al. 2003; Shaul et al. 2003).

2.3.5 Beach Seining

Beach seining was employed for collection of fish in the McNab Creek estuary. Eight sites were established in the nearshore areas along the shoreline of the Property from the McNab mainstem west to the outlet of Harlequin Creek. The sites were distributed across the entire length of shoreline and located based on the availability of suitable water depth for sampling at various tide stages. Areas of extensive, shallow, intertidal flats were not selected, as they were only available for sampling at the highest tide stage. Locations included deeper intertidal watercourses and outlets of groundwater-fed watercourses. Beach seining sites are presented on Figure 4.

The beach seine used was 26 meters long and 2 meters high and was set by hand from shore. Typically crew members would feed the net out to maximum wading depth and stretch the net out parallel to shore then pulling both ends directly back to shore, pursing the net once on-shore and pulling in the net On occasion, depending on the tide stage and shoreline conditions at the site, seining would include one crew member wading out perpendicular from shore with one end of the seine to maximum wading depth (~1.5m) or the full length of the seine while the other crew members held the other end on shore. The net would then be brought back to shore

in an arc, the net pursed, and pulled up to shore. The area seined at each site and on each date was approximated by measuring the length and width of the seine using a meter tape following sampling and the distance seined. Measurements were recorded in field notes to the nearest meter.

All fish captured were identified in the field; salmonids were identified to species; other fish were identified to family and species where possible. A sub-sample of 30 of each fish taxa captured per sample date were measured for length and weighed using an electronic scale. The subsample was generally selected from the first seines of each sample event until the target subsample amount was achieved.

Sampling was conducted once or twice a month at various sites between May and October 2011. Sampling was conducted at various times of day and tidal stages. The time of sampling was recorded for each beach seine conducted. Salinity was measured using a handheld multi-parameter water quality meter (YSI model 556) with readings taken at the surface and just above the seabed at each site sampled.

2.4 Benthic Invertebrate Sampling

Benthic invertebrate sampling was conducted August 19, 2013 at nine stations on McNab Creek, WC 2 and Harlequin Creek (Figure 5). A travelling kicknet (400-µm mesh) was used to collect a single time-integrated benthic invertebrate community sample from mainstem riffle habitat at each sampling station (Environment Canada 2012a). The stream was traversed in a zigzag pattern from bank to bank in an upstream direction for a collection time of three minutes. The collected material was washed into pre-labelled containers. The sample was preserved with 10% phosphate-buffered formalin in a 1:3 ratio (formalin to sample). The typical water depth of the kicked area was noted on the field sheets. Habitat variables measured at each station included canopy coverage, riparian vegetation, substrate characteristics, channel width, velocity, and depth. In situ water quality parameters, including pH, dissolved oxygen, conductivity, temperature, total dissolved solids (TDS) and redox potential, were measured at each site using a water quality multi-meter calibrated according to the manufacturer's instructions. Benthic descriptors were calculated to provide a qualitative comparison of the invertebrate community between stations. The following benthic community descriptors were calculated:

- Total abundance (number of individual organisms);
- Richness (number of taxa);
- Evenness; and
- Relative abundance.

Richness and evenness were calculated based on family-level identification. Relative invertebrate abundance was calculated for each major taxonomic group as a percentage of total abundance.

A summary of fisheries methods conducted by field staff during the survey period (2009-2013) is provided in Table 1 below.

Table 1: Summary of Fisheries Methods Utilized during the Survey Period (2009 to 2013)

Subject	General Methods	Method Citation	Timing
Fish Habitat	- Review of available orthophotos, air photos, LiDAR and stream mapping for existing and unmapped watercourses - GPS mapping of watercourses - Fish Habitat Assessment	RISC 2001; Johnston and Slaney 1996	2011-2013
Salmon Adults	- Salmon counting of spawners (holding) and carcasses - Peak Count determination	Johnston *et al* 1987; Irvine *et al*. 1992	2009-2013
Smolt Migration	- Fyke-netting with v-type fence - Fish processing - Habitat characterization including water quality (using an YSI 556 Multimeter) and site conditions (i.e., wetted width, water depth, and velocity).	Conlin and Tutty 1979; Hyatt *et al*. 1984; Rankin *et al* 1994	2012
Tidally Influenced Watercourse Habitat Fish Population	- Gee-type minnow trapping - Fish processing (i.e., species identification, fork length measurements and weights)	RIC 1997	2011
Estuary Fish Population	- Beach seining - Fish processing - Water characterization using a YSI 556 Multimeter	Ric 1997	2011
Freshwater Fish Population	- Electrofishing with block nets - Fish processing - Habitat Assessment of electrofished watercourses - Population estimates using 2 and 3-pass methodology (i.e., Zippen and the Generalized Removal Method, respectively)	Johnson etal. 2007, Ptolemy 1993; RISC 2001; Ptolemy *et al* 2006 Zippen 1958; Otis *et al* 1978	2009-2012
Fish in WC 2	- Block fences - Gee-type minnow traps - Coho population size using the Single-Mark-Release Chapman's Adjusted Peterson formula	RIC 1997 Ricker 1975	2009-2012
Benthic Invertebrate Community	- Kicknet invertebrate sampling - habitat and water quality parameters at each site	Environment Canada 2012	2013

3.0 RESULTS

Habitat surveys focused on the watercourses located near or within the Proposed Project Area and did not consider the entire McNab Creek watershed. The habitat surveys conducted evaluated the habitat capacity in each watercourse surveyed for spawning, rearing and overwintering of salmonids. This information as well as watercourse descriptions and general habitat and channel information is provided for each watercourse in the following sections.

3.1 Habitat Characterization

All watercourses surveyed in the Proposed Project Area are presented in Figure 1. The drainage areas and watercourses described are listed below in Table 2. All perennial, ephemeral and intermittent watercourses near and within the Proposed Project Area are described and evaluated in this section. The detailed habitat characterization data collected for each watercourse is provided in Attachment A. Representative photographs of the watercourses surveyed are provided in Attachment B.

Table 2: Watercourses near the Proposed Project Area by Watercourse Type and Key Drainage Area

Drainage Area	Watercourse	Watercourse Type
McNab Creek	Lower McNab Creek	Perennial
Harlequin Creek	Harlequin Creek	Perennial
	Harlequin Wetland	Perennial
Constructed Groundwater-fed Watercourses	WC 2	Perennial
	WC 21	Dry Watercourse
Natural Groundwater-fed Watercourses	WC 3	Perennial
	WC 3-E	Perennial
	WC 4-W	Perennial
	WC 4-E	Perennial
Northwest Watercourses	WC 10	Intermittent
	WC 10a-e	Ephemeral
	WC 11	Ephemeral
	WC 12	Ephemeral
	WC 13	Ephemeral
	WC 14	Ephemeral
	WC 14a	Ephemeral
Western Watercourses	WC 6	Ephemeral
	WC 7	Ephemeral
	WC 8	Ephemeral
	WC 9	Ephemeral
	WC 15	Ephemeral
	WC 16	Ephemeral
	WC 17	Ephemeral
	WC 18	Ephemeral
	WC 19	Ephemeral
	WC 20	Ephemeral

Drainage Area	Watercourse	Watercourse Type
Southwest Watercourse	WC 5	Perennial
Southwest Watercourses near Harlequin Creek	WC 22	Perennial
	WC 23	Intermittent
	WC 24	Intermittent
	WC 25	Intermittent
	WC 25-N	Intermittent
	WC 26a	Ephemeral
	WC 26b	Ephemeral
	Harlequin Creek Seepage	Ephemeral
	Harlequin Creek Seepage Wetland	Ephemeral

3.1.1 Lower McNab Creek

The mainstem watercourse of McNab Creek flows north and west of the Property and drains into Howe Sound's Thornborough Channel. The stream is typical of regional coastal systems, being relatively small and steep, with a segment of lower gradient habitat near its marine outlet. The segment of creek adjacent to the Property runs for approximately 1.7 kilometers. The watercourse in this area contains numerous cobble-bars, pools and off-channel habitats.

McNab Creek is a steep, coastal system that has cascade-pool morphologies within its upper mountain slope that transitions to cobble-riffle-pool, cobble-glide, and boulder morphologies within the lower reaches of the stream (Whelan 1999). Bedrock canyons present in its upper reaches restrict the watercourse, which is otherwise generally sinuous; substrates within the stream include gravels, cobble, and bedrock, with little presence of fines; the dominant substrates overall being boulder and cobble (Whelan 1999). The McNab Creek mainstem upstream of the Proposed Project has channel widths ranging from 10 to 20 meters and gradients of 4 to 9% (Whelan 1999).

The lower segment of McNab Creek adjacent to the Proposed Project is composed of riffle-glide morphologies, with a braided segment of channel approximately 0.9 to 1.1 km upstream of its outlet A side-channel, which is only wetted during high flow events, runs from 0.5 to 0.9 km along the east side of the main creek. Substrates in the lower reach include gravels, cobble, boulder and bedrock, the dominant of these being cobble. The wetted width ranges from of 15 to 28 m with an average of 23 m and average depth of 0.7 m. Gradients in the lower reach range between 1 to 2 percent. McNab Creek was observed to have higher flashy flows in the fall and spring, and low flows in the late summer. Summer low flows have been observed to be low enough to cease surface flow within this portion of the watercourse. Fish passage barriers were not identified within the lower two kilometer segment of McNab Creek.

The riparian vegetation along the lower McNab Creek is typical of the Coastal Western Hemlock very wet maritime subzone, composed of western hemlock (*Tsuga heterophylla*), western red cedar (*Thuja plicata*), big leaf maple (*Acer macrophyllum*) and vine maple (*Acer circinatum*), with shrubs such as salmon berry (*Rubus spectabilis*) and thimble berry (*Rubus parviflorus*) (BEC 2003). Segments of the riparian habitat along the 0.2 to 0.5 km and 0.9 to 1.4 km portions have red alder (*Alnus rubra*) present. This is likely due to the active watercourse moving and permitting the establishment of alder stands.

The lower reach of McNab Creek provides cover for fish in three large and relatively deep glide-pool segments located at 0.3, 0.9 and 1.0 km upstream from the outlet. These deeper pool areas provide overwintering habitat for salmonids and other fish species. Cover within the lower reach is overall considered moderate (20%) and provided by boulders, riffle-turbulence, woody debris, overhanging vegetation and within the pools mentioned above. Substrates for spawning are present along particular segments of the lower creek, with identified spawning habitat at 0.2, 0.3, 0.6, 0.9, 1.0 and 1.4 km upstream of the outlet The braided segment at the 0.9 km mark provides both spawning and holding habitat for Chum (*Oncorhynchus keta*) and Coho Salmon (*O. kisutch*) and Pink Salmon (*O. gorbuscha*) in its large pool and riffle-habitats. Rearing habitat for juvenile salmonids within the lower reach of the mainstem is considered marginal due to the higher velocity and depths during most of the year and limited cover along the watercourse margins.

3.1.2 Harlequin Creek

Harlequin Creek is situated in the south-west corner of the Property. It flows east off Mount Varley, and turns south on the west side of the main access road on the Property, flowing parallel to the road. The creek continues south through a wetland area and flows through a road culvert to the McNab intertidal area near the existing dock.

The watercourse changes from steep cascade-pool and step-pool habitats along the western mountain slopes, to riffle-pool and wetland habitats adjacent to the access road. The substrate within Harlequin is predominately cobbles with some gravel. The channel width of Harlequin ranges from 1.6 to 5.7 m, with an average of 3.4 m. Harlequin is wetted year-round, with flashy flows observed in the fall and spring. Wetted width ranges from of 0.6 to 5.1 m with an average of 2.8 m and average depth of 0.10 m. The average gradient of Harlequin's lower segment adjacent to the road is 2% while, segments surveyed upstream of the road have an average gradient of 9%.

The wetland area of Harlequin Creek is associated with beaver dam construction and subsequent backwatering and flooding. It is located within the lower reach of Harlequin Creek adjacent to the access road and is roughly 75 m long and 30 m wide. The location of the wetland area is identified in Figure 1. Substrates in this segment are composed primarily of fines and organics.

Harlequin Creek's riparian vegetation is a mix of western hemlock, western red cedar, big leaf maple and vine maple with shrubs such as salmon berry and thimble berry. Shrub species present include skunk cabbage (*Symplocarpus foetidus*) and various equisetum species in the wetland area of Harlequin Creek.

Harlequin Creek provides abundant cover for fish in the form of instream and overhanging vegetation and woody debris. Excellent substrates for spawning are present throughout Harlequin Creek, particularly in lower gradient segments, and in pool outlets in higher gradient segments. Slow flowing, deep pool areas in the wetland of Harlequin Creek provide suitable overwintering habitats for salmonids including Coho Salmon, Cutthroat Trout (*Oncorhynchus mykiss*) and sculpin species (Cottus sp.). No physical fish passage barriers to salmonids were noted along the length of Harlequin Creek within the BURNCO Property and study area.

3.1.3 WC 2

WC 2 is located in the center of the Proposed Project Area and was originally designed to provide spawning habitat for Chum Salmon, with the additional function of providing rearing habitat for Coho Salmon (DFO 1991). The watercourse is divided into two distinct segments separated by the hydro power line Right-of-Way (RoW) and culvert for the access road. WC 2 was constructed in three phases over the 18 years from 1985 to 2003; two phases of construction for the lower segment, followed by an additional phase of construction for the upper segment upstream of the hydro RoW.

3.1.3.1 WC 2 - Upper Segment

The upper segment of WC 2 consists of a straight, excavated channel flowing from north to south for approximately 520 m through the property. The watercourse in this segment is primarily low gradient (<1%) with pool or run habitat forming the majority of its length with the exception of approximately 100 m of riffle-pool habitat at its upper extent. The banks of this watercourse are large and steep with slopes as high as 45º and a height of 10 m or more above the streambed. The slopes have limited amounts of riparian vegetation and consist mainly of sand and gravel. The width of the channel at the top of the excavated banks exceeds 30 m. However the average watercourse width is 5.3 m with a range between 1.7 m to 16.0 m. The wetted width averaged 4.6 m and ranged between zero and 16.0 meters at the time of the survey. The average water depth in the watercourse was 57 cm with depth measurements ranging from 167 cm to zero at the time of the survey. At the time of the survey some segments of the watercourse did not have surface flow and it is assumed that subsurface flow was occurring. The watercourse receives year-round groundwater flows, and seasonal surface flows during heavy rainfall from WC 14, which cascades down the steep slope at the watercourse's northern end.

Riparian vegetation on the banks of the watercourse is sparse, consisting mainly of red alder saplings and some grasses. A dense red alder sapling stand is present along the top of the banks but this vegetation does not provide canopy for the watercourse. The majority of the watercourse's substrate is composed of fines over gravel and cobble with some exposed gravels and cobbles present in the upper 100 m of riffle pool habitats near the top of the watercourse. Instream cover consists primarily of logs and stumps scattered throughout the watercourse and boulders placed along the watercourse banks. Little overhanging riparian vegetation exists along the watercourse and thus, there are limited amounts of leaf litter available as allochthonous nutrient and energy input into the watercourse to support aquatic food webs and juvenile salmonid food sources.

The upper segment of WC 2 mainly contains rearing and overwintering habitat for juvenile salmonids, with the exception of a short segment of riffle-pool habitat near the top of the watercourse that contains exposed gravels and cobbles suitable for spawning. It is possible that spawning Chum Salmon could displace the fines in other areas however without suitable flushing flows spawning success is expected to be limited. Potential spawning and rearing habitats represented 16% and 84% of total habitat respectively in this segment of WC 2 (Figure 6).

Directly upstream of the access road culvert, there is currently a 1.0 m high beaver dam that spans the watercourse. The dam may be a temporary obstruction to upstream juvenile fish passage and may also limit access for adult salmon attempting to spawn in the upper segment of the watercourse. It is likely that the blockage is temporary however, without maintenance the dam material if displaced may clog the culvert that is approximately 30 m downstream.

3.1.3.2 WC 2 – Lower Segment

The watercourse flows through a 1 m culvert at the RoW access road and outlets into the lower segment of the watercourse south of the road. Below the culvert the watercourse turns east and flows for approximately 400 m before turning south again toward the foreshore approximately 150 m west of the mouth of McNab Creek. The lower segment of WC 2 consists primarily of slow flowing water with constructed run and pool areas. The lower segment of the watercourse flowing south to the foreshore is part of the pre-existing natural groundwater-fed watercourse. The lower portions of WC 2 are tidally influenced with tidal backwater effects extending up to the culvert under the RoW and saltwater intrusion reaching approximately 100 m inland.

The height of the excavated banks in the lower segment is much less (<5m) than in the upper segment of WC 2. Moderate to dense growth of native shrubs and trees is found on the banks providing slope stability throughout the lower segment of the watercourse. Substrate is primarily gravels and fines in run and pool habitats, respectively. The substrate transitions to primarily fine silts and organics mixed with cobble where the watercourse reaches the foreshore. The average top of bank width is 9.9 m with the average wetted width of approximately 5.6 m and an average depth of approximately 0.4 m at the time of the survey.

Riparian vegetation in the lower segment is composed of a mature mixed coniferous forest. Dominant tree species include Western hemlock, Douglas fir, red alder and bigleaf maple. The forest vegetation provides a dense canopy (>70%) and shades most of the watercourse and provides leaf litter and nutrient inputs.

The lower segment of WC 2 provides high value rearing and overwintering habitat to juvenile salmonids. Abundant cover is provided by logs and stable woody debris and deep pools that occur regularly throughout the lower segment. Overhanging vegetation along watercourse margins provides additional cover.

The faster flowing riffle habitats present in the watercourse, especially where it turns south towards the foreshore, provide exposed gravels and adequate flow for spawning salmonids.

3.1.4 Natural Groundwater-fed Watercourses (WC 3, 3-E, 4-E, 4-W)

There are four natural groundwater-fed watercourses located south of the lower segment of WC 2 where it flows east, parallel to the hydro RoW road. These groundwater-fed watercourses are identified, east to west, as 3-E, 3, 4-E, and 4-W.

Watercourse 3 is the only one of these watercourses that is connected to the lower segment of WC 2. This watercourse is slow-flowing with run and pool habitats. The upper portion is aligned north to south and connects to WC 2. The upper portion near the connection is freshwater, while the lower portion flowing southeast is tidally influenced and brackish. Watercourse 3 has an average watercourse width of approximately 7.5 m, an average wetted width of approximately 4.6 m, and water depths of approximately 0.5 m. The watercourse substrate is mainly composed of gravels, cobbles and fines.

The remaining groundwater-fed watercourses are dead-end channels that are primarily tidally influenced. Watercourse 3-E is a dead-end marshy watercourse that connects with Watercourse 3 near its outlet to the foreshore. The other two watercourses are dead-end slow-moving marshy watercourses draining groundwater into the intertidal flats along the shoreline of the property. These watercourses are characterized by fine substrates and moderate growths of marsh vegetation (e.g., skunk cabbage, emergent and rush species) with clusters of woody debris. Closer to the foreshore intertidal algae (e.g., Fucus sp.) is present on rocks in the watercourse.

Average watercourse width and wetted width are approximately 7.7 m and 3.0 m, respectively. Water depths are tidally influenced and average approximately 0.2 m. Substrates are predominantly fines, with some gravel and cobbles present at watercourse gradient changes and tidal outwash areas.

The upper portions of these groundwater-fed watercourses are located within a mature forest area adjacent to the foreshore consisting primarily of western hemlock, western red cedar, big leaf maple and vine maple trees.

Watercourse 3 has moderate to high value habitat for rearing and over-wintering juvenile Coho Salmon and Cutthroat Trout, providing abundant cover, food sources, and connectivity to upstream flows and freshwater inputs. Some salmon and trout spawning gravels are present in freshwater segments of the watercourse. A beaver dam is currently located near the mid-point of the Watercourse 3 watercourse length approximately at the high tide line, where the watercourse turns to the southeast. The beaver dam spans the watercourse and is approximately 1.0 m high, and may temporarily restrict fish passage upstream.

Watercourse 4-W appears to capture a higher amount of freshwater in its headwaters than Watercourses 3-E and 4-E. The 4-W watercourse has abundant cover including overhanging vegetation that provide suitable habitat for rearing and overwintering Coho juveniles and resident Cutthroat Trout.

Watercourses 3-E and 4-E appear to offer more limited over-wintering and rearing habitat opportunities for juvenile Coho and resident Cutthroat Trout as they appear to have lower fresh-groundwater inputs, and are more influenced by tidal flows. These latter two watercourses likely have transient fish use during high-tides. These watercourses appear to offer limited spawning habitat due to lower gradients and a lack of appropriate spawning gravels.

3.1.5 North West Watercourses (WC 10, 10a-e, 11, 12, 13, 14 and 14a)

3.1.5.1 Watercourse 10

Watercourse 10 is an intermittently flowing watercourse located in North West zone of the property area draining east from the west facing slope of Mount Varley through two 600 mm corrugated steel culverts under the main road into the Proposed Project Area. Flow from WC 10 fans out thorough watercourses continuing south east and south west near the upper segment of WC 2. Water currently flows to ground at the downstream end of Watercourse 10 and does not connect with the fish bearing waters of WC 2 upper segment. South of the wetted extent of the two branches of Watercourse 10, remnant dry watercourses (mapped as WC10a and WC10d) extend south approximately 500 m and 50 m, respectively. Descriptions of the ephemeral ditches and watercourses extending from Watercourse 10 (Watercourses 10a-10e) are provided below.

West and upstream of the main access road, Watercourse 10 is a medium to high gradient (30 %) watercourse that is wetted for most of the year, with an average bankfull width of 2.6 m, average wetted width of 2.6 m, and an average water depth of 0.1 m. At its highest gradients Watercourse 10 flows through a bedrock watercourse aligned within a recent clear cut.

Riparian areas are dominated by young cedar and hemlock sapling re-growth. Further downslope, Watercourse 10 transitions from step-pool to cascade-pool morphology with dominant substrate comprising boulders and cobble. Large woody debris log jams occur sporadically throughout Watercourse 10. Cover is provided primarily by woody debris and overhanging vegetation, which consists of salmonberry (Rubus spectabilis), thimbleberry (*Rubus parviflorus*), red alder saplings and various fern species.

Watercourse 10 does not have a surface connection to downstream fish-bearing watercourses, and no fish have been captured in the wetted habitats. This watercourse is considered non-fish bearing.

3.1.5.2 Watercourses 10a-10e

Watercourses 10a through to 10e are ephemeral ditches and watercourses scoured by overland flows fanning out across the lowlands within the proposed pit area and originating from Watercourse 10. These watercourses originate from water pooling in a low gradient wooded area in the northwest corner of the proposed pit and flow south and west eventually infiltrating to ground. Watercourse 10a is the longest of the branches and extends approximately 150 m south across the access road to the upper segment of WC 2. The lower half of Watercourse 10a is a remnant watercourse that only conveys flow seasonal.

The substrate of the wetted segments of Watercourses 10a to 10e is dominated by gravel and fines while the substrate of the lower dry segments are composed entirely of fines. The average wetted width of Watercourses 10a to 10e was 0.7 m, the average wetted depth was 0.1 m, and the average watercourse width was 1.4 m at the time of the survey.

The trees within the area of the proposed pit were recently harvested by clear-cut. The riparian vegetation in the lower segments of the Watercourses 10a through 10e is characterized by red alder pole saplings and salmonberry, thimbleberry, trailing blackberry (*Rubus ursinus*), and various fern species.

Watercourses 10a to 10e appear to have limited flows and no visible surface connectivity to downstream fish-bearing watercourses, and no fish were captured in the wetted habitat. These watercourses are considered non-fish bearing.

3.1.5.3 Watercourse 11

Watercourse 11 is an ephemeral drainage flowing southeast from the slope of Mount Varley to the main access road. At the road, flows infiltrate to ground or flow overland into Watercourse 10. Watercourse 11 has step-pool morphology with predominantly cobble substrate and an average watercourse width of 4.0 m. The average wetted width and water depth surveyed during a high rainfall event (January 27, 2012) was 0.8 m and 0.1 m, respectively.

Riparian vegetation on the lower slope is mainly red alder with western red cedar and western hemlock seedlings, salmonberry, red huckleberry (*Vaccinium parvifolium*) and various fern species. Cover would be provided by small woody debris and large boulders.

No fish were captured in Watercourse 11 and it does not have a downstream connection to fish-bearing waters. Watercourse 11 was therefore determined to be non-fish bearing.

3.1.5.4 Watercourse 12

Watercourse 12 is an ephemeral drainage that conveys flows north from Watercourse 11 and groundwater seepage parallel to the main road during high flow events. This watercourse is approximately 40 m in length and has an average watercourse width of 2.0 m; the watercourse was dry during the habitat surveys. The dominant substrate is gravel. Riparian vegetation is primarily red alder, Himalayan blackberry (*Rubus armeniacus*) and salmonberry.

No fish were captured in Watercourse 12 and it has no downstream connection to fish-bearing waters. Watercourse 12 was therefore determined to be non-fish bearing.

3.1.5.5 Watercourse 13

Watercourse 13 is characterized as an ephemeral watercourse receiving overland flow from the western slope. It conveys flows north for approximately 30 m parallel to the main road where it connects to Watercourse 14 and flows east through a road culvert where Watercourse 14 continues on the east side of the access road.

The watercourse has an average watercourse width of 1.2 m. At the time of survey (January 26-27, 2012) wetted width and water depth were 0.5 m, and 0.3 m, respectively. Gravel is the dominant substrate with cobble and fines present throughout its length. Riparian vegetation is primarily red alder and salmonberry.

Watercourse 13 is considered non-fish bearing due to non-flow periods and a lack of downstream connection to fish-bearing waters.

3.1.5.6 Watercourses 14 and 14a

Watercourse 14 collects surface flow from the western slope along the western side of the main road to the north of the proposed pit area. The flow is conveyed east under the main access road through two 600 mm culverts, where it flows south-east in a small watercourse for approximately 100 m before reaching an old access/logging road, and then continues southeast approximately 100 m where it drains down the steep slope at the north end of WC 2. Flow from Watercourse 14 into WC 2is ephemeral during periods of high rainfall. Water flow in

watercourse 14 is supplemented by ephemeral seasonal flows from Watercourse 14a, a swale situated on the west side of the main road, which flows east over the road and into Watercourse 14.

Watercourse 14 is a low gradient watercourse. Average watercourse width, wetted width and water depth during the assessment were approximately 3.6 m, 2.1 m and 0.1 m, respectively. Substrate consists of equal amounts of fines, gravel and cobble in its upper reach, and cobble and boulders dominating in the zone nearest to WC 2. Riparian vegetation along the watercourse is dominated by red alder saplings.

No fish were captured in Watercourse 14 during sampling in its lower segment during winter high-flows. It is considered non-fish bearing due to limited seasonal flows and lack of fish access at its downstream connection to WC 2.

3.1.5.7 West Watercourses (WC 6 to 9, and WC 15 to 20)

The west watercourses consist of natural watercourses and constructed drainage watercourses on the slope west of the main access road. These watercourses and ditches are ephemeral and are typically only wetted during periods of regular rainfall over the fall, winter, and spring months. Flows are conveyed down the slopes to the west side of the access road, where flows collect in roadside ditches and watercourses and then infiltrate or are conveyed through road culverts to the east side of the access road. West watercourses are located within a recent cutblock resulting in the riparian vegetation consisting primarily of young red alder with conifer saplings with an understory of shrub species.

The largest of these west watercourses include natural ephemeral Watercourses 6 to 9. Watercourses flowing along the slope on the west side of the road are characterised as step-pool morphology with dominant substrates composed of gravel and cobble. Drainage ditches and watercourses east of the road are typically smaller and dominated by gravel and fines. These watercourses become indistinct and end within the lowland flats of the proposed pit area, with flows infiltrating to ground with no connectivity to downstream watercourses. During periods of heavy prolonged rainfall, overflow south in Watercourse 6 appears to occasionally connect south to Watercourse 5 in overland flow or over the road.

The west watercourses have limited connectivity to fish bearing watercourses; only Watercourse 6 may have a limited connection to Watercourse 5 during times of heavy and persistent rainfall. No fish were captured in these watercourses and due to their limited connectively, the steep gradients, and the ephemeral nature of the watercourses they are considered non-fish bearing.

3.1.5.8 South-West Watercourse (WC 5)

WC 5 is located in the south-west corner of the Proposed Project Area. The watercourse flows east from the slope next to the main access road and continues south-east to the foreshore. The lower segment of the watercourse has an average watercourse width of approximately 7.7 m, an average wetted width of approximately 3.6 m, and an average water depth of 0.1 m. West of the main access road, the average watercourse width is approximately 2.5 m, the average wetted width is approximately 1.5 m and the average water depth is approximately 0.1 m. Overall, the average watercourse width is approximately 5.8 m, with an average wetted width of approximately 2.9 m, and an average water depth of approximately 0.2 m.

Watercourse 5 has cascade-pool/ riffle-pool morphology in its upstream reaches above the main road with moderate gradients (approximately 8%) and substrates dominated by gravel and cobble. The riparian vegetation is composed of re-growth deciduous forest. There is moderate cover primarily in the form of woody debris and overhanging vegetation. The lower reach of WC 5 is characterized as low gradient (approximately 1%) with an irregularly meandering watercourse and riffle-pool morphology with a substrate composition of primarily fines and gravel. Cover in this segment is abundant and composed primarily of woody debris, overhanging vegetation and boulders with some undercut banks. Side-channels and pools provide additional cover. The riparian vegetation present is a young deciduous forest re-growth from recent and historic clear-cut logging operations. Dominant species include red alder pole saplings in the upper canopy and salmonberry, oval-leaved blueberry (*Vaccinium ovalifolium*), willow (Salix sp.), salal (*Gaultheria shallon*) and ladyfern (*Athyrium filix-femina*) in the understory. The lowest reaches of WC 5 have riparian vegetation composed of a mature coniferous forest that extends to the foreshore.

The lower reach south of the RoW road and the wetland area on the west side of the main access road both provide high value habitat for rearing and overwintering salmonids. Gravels found in the watercourse provide suitable spawning substrates for trout and salmon including Coho and Chum. The upper reach also provides moderate value habitats for rearing and overwintering salmonids with pockets of suitable spawning gravels.

No physical fish passage barriers to salmonids were noted along the length of WC 5 within the Proposed Project Area.

3.1.5.9 South-West Watercourses near Harlequin Creek (WC 22 to 25, 25-N)

Several watercourses are present in the south-west corner of the Proposed Project Area that are tributaries or overflow watercourses of Harlequin Creek.

Several watercourses flow into Harlequin Creek from the high gradient slopes along the west side of the property. These watercourses are largely ephemeral with year-round base flows present in lower reaches near Harlequin Creek. Watercourses 25 and 25-N flow into the Harlequin Creek wetland; Watercourses 22-24 converge into a single watercourse (WC 22) that drains into the lower segment of Harlequin Creek near the road bridge crossing, and outlet to the foreshore (Photograph 70). A ditch along the RoW road (WC 26a) collects rainwater and conveys flows overland across the RoW road south, where it combines with collecting seepage and overflow from Harlequin Creek and drains (WC 26b) southeast. Seepage and overland flow collects and continues southeast toward the foreshore flowing through a lowland area and multiple watercourses. The multiple watercourses are often indistinct and flows infiltrate to ground with no surface connection to the foreshore. The volume of seepage, overland flows, and subsequent watercourse flow in this area appears to be resulting from seepage from Harlequin Creek to the adjacent main access road and has resulted in substantial flow and pooling of water throughout the forest in this area.

The south-west watercourses flowing to Harlequin are predominantly step-pool and cascade-pool watercourses with gravel and cobble substrates. Watercourses flowing from Harlequin are typically riffle-pool watercourses with gravel and fines substrates. Overall average watercourse width, wetted width, and water depths for these watercourses are approximately 1.5 m, 1.0 m, 0.1m, respectively.

The riparian vegetation on the south-west slope and the south-west lowland forested area is dominated by large conifers such as hemlock, douglas fir and cedar. Skunk cabbage is found throughout the lowland area east of Harlequin. Red alder and fireweed (*Epilobium angustifolium*) are predominant within the lowland area south of the RoW road.

Southwest watercourses tributary to Harlequin Creek have suitable seasonal habitats for rearing and overwintering salmonids. Pockets of suitable spawning gravels are found in many areas. Distribution of salmonids is limited to lower reaches where gradients and water velocities are passable to fish and adequate depth and flows are present. Coho Salmon were captured in Watercourse 22 downstream of a 1.0 m high log-step that may limit anadromous fish access, located approximately 30 m upstream of the confluence with Harlequin Creek. Cutthroat Trout were the only salmonid species collected upstream of the log step on the same watercourse. Upstream reaches are intermittent with numerous gradient and drop barriers to fish passage. The seepage watercourses and the seepage wetland east of Harlequin do not outlet to the intertidal habitats and are considered unlikely to provide transient fish use except when high flow events and flooding in Harlequin result in overland flows.

3.2 Fish Distribution and Abundance

3.2.1 Freshwater Fish Populations

3.2.1.1 Electrofishing

An electrofisher and block nets were used to sample McNab Creek, WC 2 (upper and lower segments), WC 3, WC 4-W, Harlequin Creek, WC 5, WC 10 and WC 14 in order to determine the extent of fish present in the Proposed Project Area. Fish distribution and identified barriers to fish movement are presented in Figure 7.

Locations and sampling sites are provided in Figure 2. Electrofishing effort completed at each site was highly variable and depended on the sampling area and number of passes conducted during sampling. Electrofishing settings and sampling effort are provided for all sample dates and sites in Table A-4 in Attachment A.

The number of fish captured and length measurements for all sample dates and sites are provided in Table 3. Capture numbers for each fish species are summarized for each watercourse and sample year in Table 4. A summary of the Coho Salmon and Cutthroat Trout population estimates and density calculations for each site is provided in Table 5. Many of the sampling events shown in Table 5 have capture rates that are not supportive of accurate population estimation and the total number of fish captured is provided rather than an estimation of the population. It should be recognized that total fish captured is a measure of abundance and may significantly underestimate the population. Calculated Coho and Cutthroat densities at all sites and watercourses sampled since 2010 are presented in Figures 8 and 9, respectively.

Table 3: Fish Captures and Fish Length Data, 2010 to 2012

Watercourse	Site #	Date	Species	# Captured	Min Length (mm)	Max Length (mm)	Avg Length (mm)	SD of Length (mm)
SUMMER								
McNab Creek	MC1	2010	CT	1	99	99	99	n/a
			SC	2	n/a	n/a	n/a	n/a
	MC2	2010	CO	7	55	62	58	2
			CT	8	55	65	59	3
			SC	12	79	107	92	8
	MC3	2010	CO	10	55	82	71	9
			CT	13	56	132	84	22
			SC	5	86	146	108	33
	MC4	2010	CO	18	65	86	76	6
			CT	3	87	182	132	48
			SC	9	32	91	69	20
	MC5	2010	CO	64	n/a	n/a	n/a	n/a
			CT	1	n/a	n/a	n/a	n/a
WC 2 - upper	1A	2010	CO	14	56	75	64	6
			SC	5	71	135	95	24
	9	2010	CO	15	56	66	60	4
			CT	20	45	105	69	19
			SC	5	52	78	65	18
		2011	CO	22	53	82	63.6	7.6
			CT	4	88	105	94.3	7.4
			SC	3	56	94	69.7	21.1
WC 2 - upper	8	2011	CO	124	50	73	61.6	6.0
			CT	22	37	115	73.2	29.0
			SC	11	n/a	n/a	n/a	n/a
WC 2 - lower	7	2010	CO	11	68	82	76	5
			SC	3	115	115	115	n/a
		2011	CO	59	54	88	67.0	8.3
			CT	1	90	90	90.0	n/a
			SC	39	58	165	98.9	23.5
			TSB	1	60	60	60.0	n/a
	1	2011	CO	4	52	70	59.5	7.5
			SC	11	46	113	78.5	21.8

Watercourse	Site #	Date	Species	# Captured	Min Length (mm)	Max Length (mm)	Avg Length (mm)	SD of Length (mm)
Harlequin Creek	6	2010	CT	31	n/a	n/a	n/a	n/a
			SC	1	n/a	n/a	n/a	n/a
		2011	CH	1	73	73	73.0	n/a
			CO	10	45	70	57.5	9.6
			CT	174	31	155	68.9	22.9
			SC	9	80	119	102.0	13.1
	10	2011	CT	28	50	170	100.2	28.8
Southwest watercourse (WC 5)	4	2011	CO	18	39	82	64.2	8.8
			CT	53	39	144	73.9	22.9
			SC	17	53	100	68.2	13.6
	2	2011	CO	27	48	84	63.9	7.5
			CT	39	31	145	91.4	22.1
			SC	10	60	107	83.0	14.9
	11	2011	CT	7	64	76	69.7	4.8
	12	2011	CO	8	72	109	83.5	11.0
			CT	49	68	165	109.9	20.6
Natural groundwater-fed watercourse (WC 3)	3	2011	CO	84	51	98	68.3	12.7
			SC	24	n/a	n/a	n/a	n/a
Natural groundwater-fed watercourse (WC 4-W)	5	2011	CO	25	48	82	68.3	7.7
			SC	12	33	102	67.9	23.5
WINTER								
WC 2 - upper	8	2012	CO	59	45	94	70	10
			CT	8	56	180	105	37
			SC	4	85	92	89	3
WC 2 - lower	7	2012	CO	41	51	105	69	11
			SC	9	72	110	91	12
Harlequin Creek	6	2012	CT	69	42	170	75	27
			SC	1	76	76	76	n/a
Southwest watercourse (WC 5)	4	2012	CO	29	58	100	79	12
			CT	36	52	132	87	23
			SC	9	60	90	72	9
Natural groundwater-fed watercourse (WC 3)	3	2012	CO	29	59	90	70	8
			SC	10	35	123	94	31
Northwest watercourse (WC 14)	13	2012	NFC	2	n/a	n/a	n/a	n/a
Northwest watercourse (WC 10)	14	2012	NFC	0	n/a	n/a	n/a	n/a

Notes: Species: CO – Coho Salmon, CT – Cutthroat Trout, GNFS – gunnelfish, RB – Rainbow Trout, SC – Sculpin species, STSC – Staghorn Sculpin, TSB – Threespine Stickleback, NFC – No Fish Caught. n/a – not taken.

Table 4: Number of Fish Captured by Watercourse, 2010 to 2012

Watercourse #	Species	2010	2011	2012
McNab Creek	Coho	105	0	0
	Cutthroat	34	0	0
	Sculpin	58	0	0
	Total	**197**	0	0
#2 - Upper	Coho	33	146	59
	Cutthroat	21	26	8
	Sculpin	10	14	4
	Total	**43**	**186**	**71**
#2 - Lower	Coho	18	63	41
	Cutthroat	0	1	0
	Sculpin	9	50	9
	Total	**27**	**114**	**50**
Harlequin Creek	Chinook	0	1	0
	Coho	0	10	0
	Cutthroat	45	202	83
	Sculpin	0	9	1
	Sculpin	4	0	0
	Total	**49**	**222**	**84**
#5	Coho	0	53	29
	Cutthroat	0	148	36
	Sculpin	0	27	9
	Total	**0**	**228**	**74**
#3	Coho	0	84	29
	Sculpin	0	24	10
	Total	**0**	**108**	**39**
#4-W	Coho	0	25	0
	Sculpin	0	12	0
	Total	**0**	**37**	**0**
#14	NFC	0	0	0
	Total	**0**	**0**	**0**
#13	NFC	0	0	0
	Total	**0**	**0**	**0**

Notes: NFC – No Fish Caught

Table 5: Fish Population Estimates and Densities for Electrofishing Sites

Watercourse	Site # (2011)	Date	Species	# fish	# passes	Pop Est*	SE*	ChiSq*	P*	Low – CI*	Upper – CI*	Area (m^2)	Density (fish/m^2)
McNab Creek	MC1	2010	Cutthroat	1	2	1	n/a	n/a	n/a	n/a	n/a	85	0.012
	MC2	2010	Coho	7	2	7	0.4	n/a	0.87	7	7	151	0.046
	MC2	2010	Cutthroat	8	2	8	0.0	n/a	1.00	8	8	151	0.053
	MC3	2010	Coho	16	2	24	14.6	n/a	0.40	17	101	116	0.207
	MC3	2010	Cutthroat	13	2	13	1.0	n/a	0.81	13	13	116	0.112
	MC4	2010	Coho	18	2	18	1.2	n/a	0.81	18	26	252	0.071
	MC4	2010	Cutthroat	3	2	3	0.7	n/a	0.75	3	3	252	0.012
	MC5	2010	Coho	64	1	64	n/a	n/a	n/a	n/a	n/a	245	0.261
	MC5	2010	Cutthroat	1	1	1	n/a	n/a	n/a	n/a	n/a	245	0.004
WC 2 - Upper	8	2011	Coho	124	2	160	19.3	n/a	0.52	138	220	275	0.582
	8	2011	Cutthroat	22	2	32	14.4	n/a	0.43	24	101	275	0.116
	9	2011	Coho	22	3	22	1.0	8.9	0.00	22	22	150	0.147
	9	2011	Cutthroat	4	3	4	0.5	2.8	0.10	4	4	150	0.027
	1A	2010	Coho	14	2	14	0.3	n/a	0.93	14	14	294	0.048
	1A	2010	Cutthroat	0	2	0	n/a	n/a	n/a	n/a	n/a	294	0.000
	8/9	2010	Coho	19	2	20	2.1	n/a	0.74	20	31	368	0.054
	8/9	2010	Cutthroat	20	2	20	0.2	n/a	0.95	20	20	368	0.054
WC 2 - Lower	1	2011	Coho	4	3	4	0.0	0.0	1.00	4	4	330	0.012
	1	2011	Cutthroat	4	3	0	n/a	n/a	n/a	n/a	n/a	330	0.000
	7	2010	Cutthroat	0	2	0	n/a	n/a	n/a	n/a	n/a	320	0.000
	7	2010	Coho	18	2	30	20.0	n/a	0.37	20	124	320	0.094
	7	2011	Coho	59	3	59	n/a	n/a	n/a	n/a	n/a	136	0.434
	7	2011	Cutthroat	1	3	1	n/a	n/a	n/a	n/a	n/a	137	0.007

Watercourse	Site # (2011)	Date	Species	# fish	# passes	Pop Est*	SE*	ChiSq*	P*	Low – CI*	Upper – CI*	Area (m^2)	Density (fish/m^2)
Harlequin Creek	6	2010	Coho	0	1	0	n/a	n/a	n/a	n/a	n/a	85	0.000
	6	2010	Cutthroat	3	1	3	n/a	n/a	n/a	n/a	n/a	85	0.035
	6	2011	Coho	10	3	14	8.1	1.8	0.18	11	59	315	0.044
	6	2011	Cutthroat	174	3	200	11.1	11.1	0.00	186	232	315	0.636
	10	2011	Cutthroat	28	3	39	12.2	1.8	0.18	30	91	104	0.374
WC 5	2	2011	Coho	27	3	30	3.3	0.3	0.61	28	44	100	0.295
	2	2011	Cutthroat	39	3	39	1.0	1.2	0.28	39	45	100	0.391
	4	2011	Coho	18	3	19	1.8	4.3	0.04	19	29	44	0.426
	4	2011	Cutthroat	53	3	65	9.3	0.4	0.54	57	99	44	1.479
	11	2011	Cutthroat	7	3	8	2.9	1.0	0.32	8	25	46	0.172
	12	2011	Coho	8	3	8	0.1	0.2	0.69	8	8	90	0.089
	12	2011	Cutthroat	49	3	58	7.4	1.2	0.27	52	85	90	0.647
WC 3	3	2011	Coho	84	2	116	21.6	n/a	0.47	94	190	120	0.967
WC 4-W	5	2011	Coho	25	1	25	n/a	n/a	n/a	n/a	n/a	117	0.214
Winter sampling													
WC 2 - Upper	8	2012	Coho	59	3	134	84.4	1	0.32	72	500	357	0.376
	8	2012	Cutthroat	8	3	10	4.3	2.62	0.11	9	34	357	0.027
WC 2 - Lower	7	2012	Coho	41	3	41	n/a	n/a	n/a	n/a	n/a	255	0.161
	7	2012	Cutthroat	0	3	0	n/a	n/a	n/a	n/a	n/a	255	0.000
WC 5	4	2012	Coho	29	2	29	1.2	n/a	0.84	29	36	101	0.287
	4	2012	Cutthroat	36	2	44	8.3	n/a	0.56	38	78	101	0.436

Watercourse	Site # (2011)	Date	Species	# fish	# passes	Pop Est*	SE*	ChiSq*	P*	Low – CI*	Upper – CI*	Area (m^2)	Density (fish/m^2)
Harlequin Creek	6	2012	Cutthroat	69	3	177	126	1.2	0.28	87	730	170	1.042
	6	2012	Coho	0	3	0	n/a	n/a	n/a	n/a	n/a	170	0.000
	10	2012	Cutthroat	14	3	20	9.82	4.32	0.0378	15	70	94	0.211
WC 14	13	2012	no fish	0	2	0	n/a	n/a	n/a	n/a	n/a	162	0
WC 10	14	2012	no fish	0	2	0	n/a	n/a	n/a	n/a	n/a	160	0
WC 3	3	2012	Coho	29	2	32	3.6	n/a	0.68	30	48	120	0.267

* Population estimate statistics from CAPTURE 2 program, version v.90210.1141. Population estimate did not isolate specific habitat types. P = probability of capture and ChiSq tests that P remained constant between passes.
Note: n/a = not available due to lack of fish capture data or could not be calculated due to poor distribution of capture data between passes (e.g., higher capture numbers in passes 2 or 3). Where a population estimate could not be calculated, the total number of fish captured was presented as a greater than or equal to estimate.
CI – Confidence Interval, SE – Standard Error

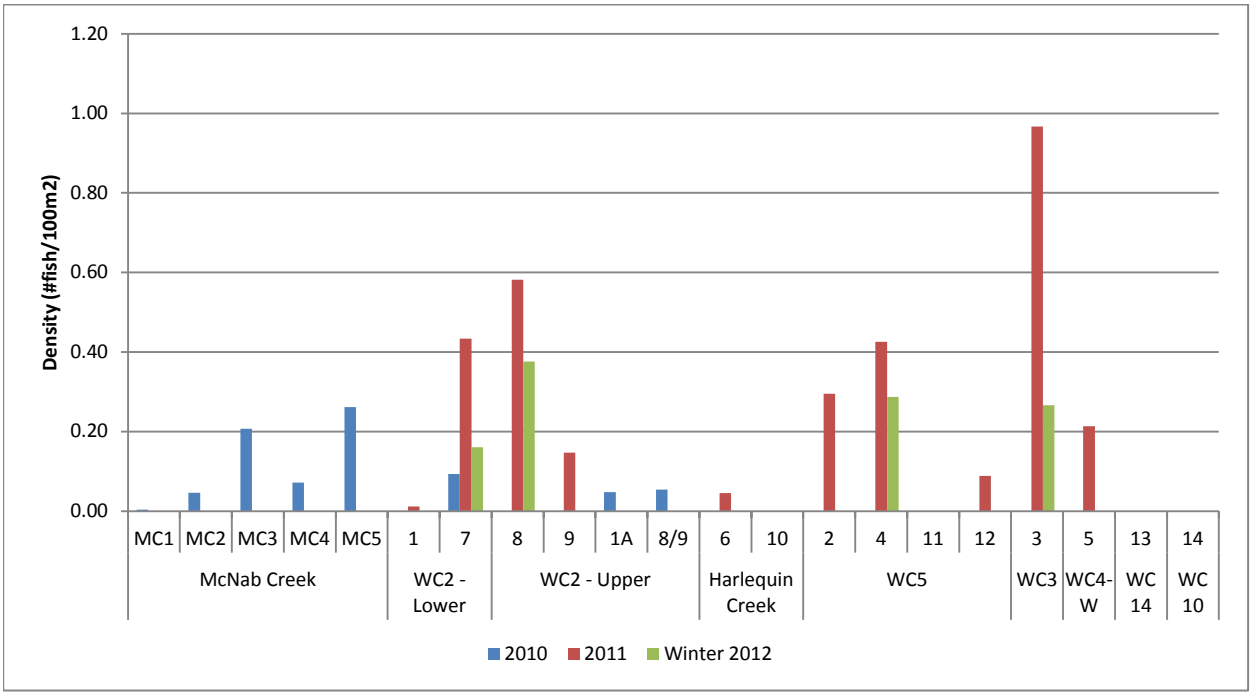


Figure 8: Juvenile Coho Salmon Densities at Sites Sampled 2009 to 2012

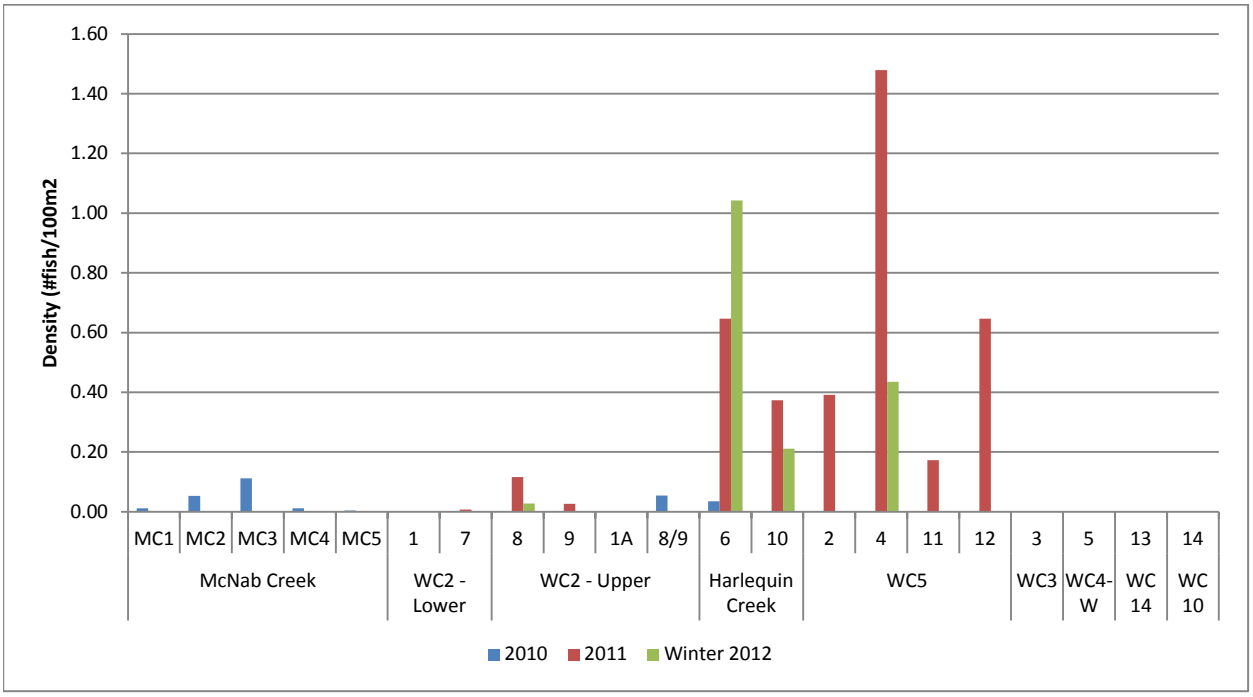


Figure 9: Cutthroat Trout Densities at Sites Sampled 2009 to 2012

Coho were the most frequently captured species in McNab Creek and WC 2. Cutthroat Trout were the most abundant species in Harlequin Creek and WC 5, and were also captured in high numbers in McNab Creek and the uppermost segment of WC 2. Cutthroats were not captured from the natural groundwater-fed watercourses WC 3 and 4-W and in the lower segment of WC 2. Sculpin were captured in all of the same sites where trout and salmon were captured. A single juvenile Chinook was captured in Harlequin Creek during 2011.

The highest Coho density was found in WC 3 during the summer of 2011 at 0.967 fish/m^2. Generally higher densities were found in the groundwater-fed watercourses (WC 2, WC 3, and 4-W) and WC 5. In the upper segment of WC 2, Coho densities ranged from 0.012 to 0.582 fish/m^2 with higher densities observed in a riffle-pool segment near the top of the watercourse. A total of 183 Coho Salmon were marked in the upper and lower segments of WC 2 and Watercourse #3 during sampling in 2011. A total of 129 Coho were captured during sampling in February 2012 including 9 recaptures. The Chapman's adjusted Petersen population estimate for Coho Salmon was 2,392 (range: 1,322 to 4,784).

Cutthroat Trout densities were highest in WC 5 and Harlequin Creek and ranged between 0.172 and 1.479 fish/m^2. Cutthroat Trout were captured in lower densities in the groundwater-fed watercourses with a maximum density of 0.116 fish/m^2 in the upper segment of WC 2.

Coho Salmon, Cutthroat Trout and sculpin species were captured in WC 5. Coho were captured in the lower segment below the hydro RoW and the wetland adjacent to the main road, while Cutthroat Trout were captured in the lower segments, within the wetland, and upstream of the wetland. Coho were only captured in lower segments of Harlequin Creek adjacent to the access road, while Cutthroat Trout were captured in higher gradient segments further upstream along the western slope.

3.2.1.2 Minnow Trapping

Minnow trapping was also used to estimate population abundance and relative fish number in the upper and lower segments of WC 2. Fish species captured included Coho Salmon and Cutthroat Trout. Catch was notably higher in the lower segment of WC 2. Coho Salmon catch per unit effort (CPUE) was 3 to 18 times higher in the lower segment when compared to the upper segment over all sample dates. Cutthroat Trout CPUE was similar between the upper and lower watercourses and ranged from 0.17 to 0.71 fish/24hr trap set

The number of Coho marked and recaptured was greater in the lower watercourse than the upper watercourse, while number of Cutthroat Trout captured were similar between the upper and lower watercourses.

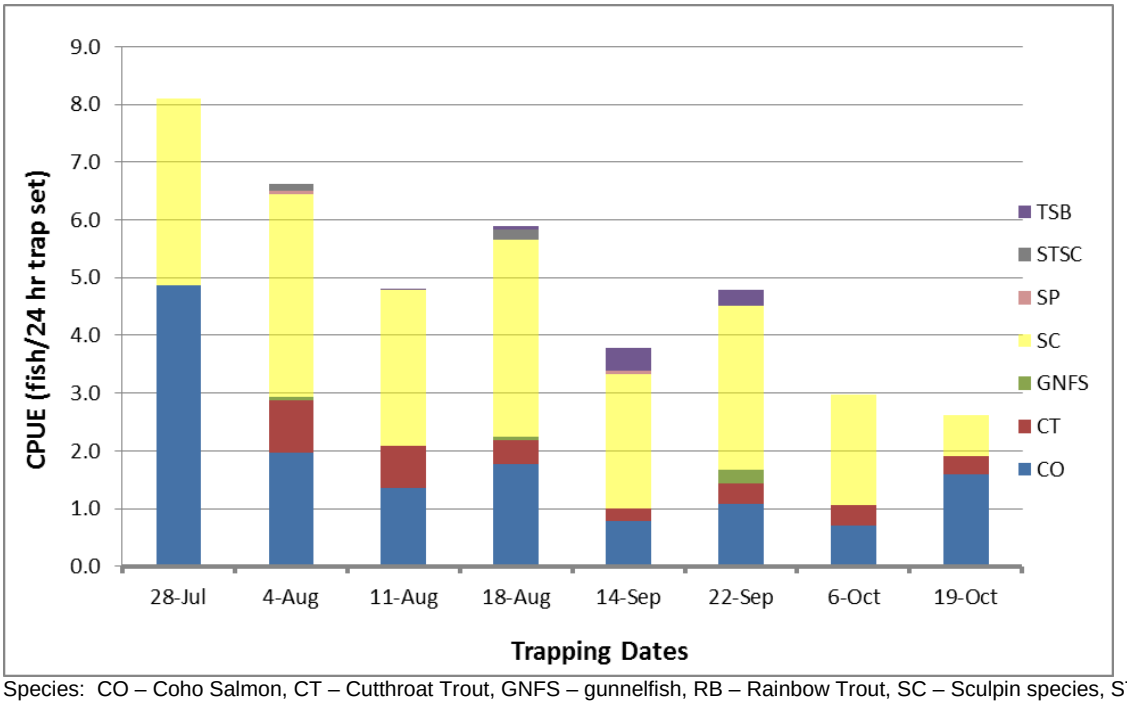
The numbers of captured, marked and recaptured Cutthroat Trout were too low to estimate population size in either the upper or lower segments of WC 2. The number of Coho captured, marked and recaptured was low in the upper segment of WC 2. Only one recapture was recorded in the second sample event, and two during the third sample event. Consequently, the number of recaptures was too low, and both the Petersen and Schnabel population estimates are considered poor estimates of the actual population of Coho in the upper segment of watercourse (Ricker 1975). The Petersen and Schnabel population estimates for Coho in the upper watercourse are 148 (range: 45 to 269) and 700 (239-3,502), respectively. The number of Coho marked and recaptured in the lower segment of WC 2 was higher at 167 and 13, respectively. The adjusted population estimate for Coho in the lower WC 2 segment is 1,656 (range: 995 to 2,935).

Calculated Coho densities include 0.045 fish/m^2 (range: 0.0003 to 0.082) and 0.212 fish/m^2 (range: 0.072 to 1.06 fish/m^2) in the upper segment and 0.289 fish/m^2 (range: 0.174 to 0.513) in the lower segment of WC 2, based on the approximate watercourse area from habitat assessment measurements (3,300 m^2 for upper watercourse, 4,125 m^2 for lower watercourse, and 1,600 m^2 for WC 3) and population estimates. Coho densities from electrofishing conducted in summer 2011 and winter 2012 in the upper watercourse ranged from 0.048 fish/m^2 to 0.582 fish/m^2 with an average of 0.241 fish/m^2 (SD=0.232). Coho densities in the lower watercourse and including WC 3 ranged from 0.012 to 0.967 fish/m^2 with and average density of 0.323 fish/m^2 (SD 0.29). Although population estimates were considered poor for the upper watercourse, Coho densities are similar to those observed during electrofishing sampling. Densities are also comparable for the lower watercourse.

Minnow traps were also used to collect fish in brackish waters of the tidally influenced reaches of the streams and groundwater-fed watercourses entering the foreshore. Sampling was conducted between end of July and end of October, 2011.

Fish capture data are provided in Attachment A. Catch results are standardized as catch per unit effort (CPUE) calculated as the number of fish per 24 hour trap set CPUE are summarized by watercourse and date and provided in Attachment A. Over the course of the study, fish captures from all groundwater-fed watercourses were found to be variable and no clear trends are evident (Figure 10). Coho Salmon were the most abundant species captured with total CPUE by sample date of between 4.9 and 0.7 fish/24 hour trap set in July and October, respectively. Capture results were generally similar between sample dates for all species, with the exception of the high captures of Coho in July 2011.

The brackish segments of groundwater-fed watercourses WC 2 and WC 3 were generally similar in their capture results of Coho and Cutthroat (Figure 11). Overall, Cutthroat Trout capture numbers were low; the highest numbers captured in Harlequin Creek and WC 5 with a total of 32 and 15, respectively. Seasonal sampling in the other natural groundwater-fed watercourses found juvenile Coho Salmon in three of the four watercourses. The one exception is Watercourse 3-E where no fish sampling was conducted. Cutthroat Trout juveniles were captured within Watercourses 3 and 4-W where flows of freshwater are present. Juvenile Chum Salmon were also captured within the lower intertidal habitat of Watercourse 4-W following the spring outmigration. Sculpin were captured throughout most freshwater segments of these watercourses. Other fish species, such as gunnelfish (Family Pholidae), Threespine Stickleback (*Gasterosteus aculeatus*), and White Spotted Greenling (*Hexagrammos stelleri*) were also captured within the lower intertidal habitats of these groundwater-fed watercourses.



Species: CO – Coho Salmon, CT – Cutthroat Trout, GNFS – gunnelfish, RB – Rainbow Trout, SC – Sculpin species, STSC – Staghorn Sculpin, TSB – Threespine Stickleback.

Figure 10: Fish Capture per Unit Effort (CPUE) and Species Composition in Tidal Reaches of all Groundwater-fed Watercourses and Tributaries, October 2011

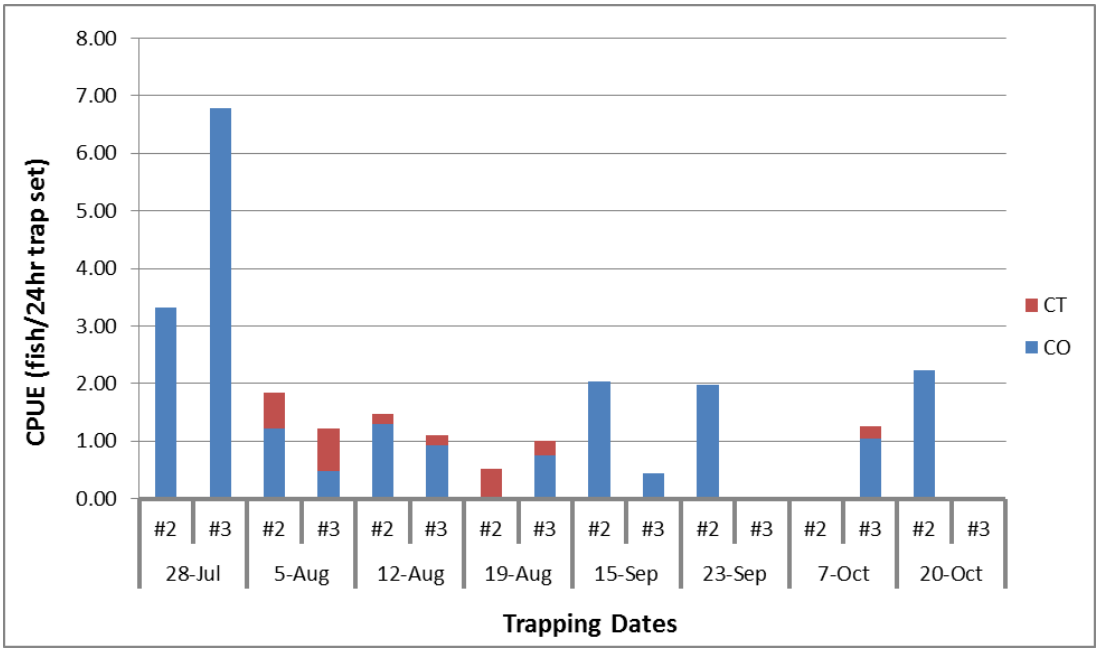


Figure 11: Coho Salmon and Cutthroat Trout Capture per Unit Effort (CPUE) in Brackish Reaches of Groundwater-fed Watercourses WC 2 and WC 3

3.2.1.3 Fyke Netting

Out-migrating salmonid juveniles were captured using fyke nets in McNab Creek and Harlequin Creek during 2013 and in the groundwater-fed watercourses during 2012. Sampling locations are presented in Figure 3. Fish species captured during this period included Coho Salmon, Chum Salmon, Pink Salmon, Chinook Salmon, Steelhead/Rainbow Trout (*Oncorhynchus mykiss*), and Cutthroat Trout. The salmon captured included parr and smolt life stages while the trout species were all parr.

Fish fences located in Harlequin Creek and WC 3 were found to be breached during inspections on multiple dates. A segment of the fence along the watercourse bank in WC 3 was repeatedly found to be pulled or pushed off the bank or substrate, likely the result of beaver activity. No further breaches of the fence on WC 3 were noted following the last repair efforts completed on May 16. The maximum number of days when the WC 3 block fence may have been breached is estimated to be 19, which assumes the fence was altered within 24 hours of being repaired on each sample date. This extended period of being breached may have led to a significant under representation of fish numbers for the lower watercourse as WC 3 is directly connected to the lower segment of the groundwater-fed watercourse. The block fence on Harlequin Creek was also found to have a segment disrupted by the pressure of high water flow on April 26, partially opening the fence and permitting downstream movement of fish. The maximum number of days when the fence may have been breached was 7. The anchor for the fyke net harness in McNab Creek became dislodged during fyke net assembly on April 26 as a result of high flows in the creek. As such, the numbers of fish captures in the lower segment of WC 2 fyke net are not a representation of the total fish in the lower watercourse. As previously noted, only one breach of the fence in Harlequin Creek was observed which remained breached over a brief time period. No breaches were noted in the upper segment of WC 2; therefore, the count of fish moving downstream would have a greater reliability as a representation of total fish in the upper watercourse. Downstream fish migration in McNab Creek was not blocked between sample dates and sampling was not completed continuously. Therefore, the McNab Creek fish captures provide an indication of species diversity, relative abundance, and general migration timing. Sampling dates and set durations along with water quality measurements and site conditions including water depth, wetted width and water velocity are provided in Attachment A.

Fish capture results and size data are provided in Table 6 and Table 7 respectively. Fish species captured during the study included Coho Salmon, Chum Salmon, Pink Salmon, Chinook Salmon, Rainbow Trout / Steelhead (*O. mykiss*), Cutthroat Trout, sculpin, and Threespine Stickleback (*Gasterosteus aculeatus*)

Table 6: Number of Fish Captured during Modified Fyke Net Sampling, April 3 to May 31, 2012

Watercourse	Species	# Fish Captured										
		3-Apr	4-Apr	11-Apr	19-Apr	27-Apr	3-May	11-May	17-May	24-May	31-May	Total
WC 2 - Lower	CO	0	0	0	0	129	101	33	56	80	9	**408**
	CT	0	0	0	0	11	0	1	0	2	0	**14**
	NFC	0	0	1	1	0	0	0	0	0	0	**2**
	SC	0	0	0	0	6	5	1	0	2	0	**14**
	TSB	0	0	0	0	1	0	0	0	0	0	**1**
WC 2 - Upper	CH	0	0	1	0	0	0	0	0	0	0	**1**
	CO	0	0	32	90	287	50	35	123	106	95	**818**
	CT	0	0	6	1	19	1	0	5	2	5	**39**
	RB/ST	0	0	1	0	0	0	0	1	1	0	**3**
	SC	0	0	1	0	0	0	0	1	1	2	**5**
Harlequin Creek	CO	0	2	1	1	25	15	8	11	0	1	**64**
	CT	0	1	4	1	2	9	0	7	5	3	**32**
	NFC	1	0	0	0	0	0	0	0	0	0	**1**
	SC	0	0	1	2	3	1	0	1	4	6	**18**
McNab Creek	CH	0	1	0	0	0	0	0	0	0	0	**1**
	CM	0	3	4	21	0	41	21	10	14	4	**118**
	CO	0	4	2	26	0	16	5	14	30	14	**111**
	PK	0	359	306	370	0	31	28	5	2	0	**1101**
	RB/ST	0	1	0	0	0	0	0	0	0	0	**1**
	SC	0	0	0	1	0	0	0	2	2	0	**5**

CH - Chinook Salmon, CM-Chum Salmon, CO - Coho Salmon, CT-Cutthroat Trout, FL - Flounder, STFL-Starry Flounder, SC- Sculpin, STSC-Staghorn Sculpin (, TPSC-Tidepool Sculpin , TSB-Three-spined Stickleback, GNFS-Gunnelfish, GR- Greenling, WSGR-White Spotted Greenling, SL-Sand Lance, SP-Shiner Perch

Table 7: Summary of Fish Length and Weight Measurements, April 3 to May 31, 2012

Watercourse	Species	n	Length (mm)				Weight (mm)			
			Min	Max	Avg	SD	Min	Max	Avg	SD
WC 2 - Lower	CO	157	64	115	80.8	9.0	2.4	14.7	5.4	1.8
	CT	13	112	232	177.5	43.2	12.5	218.1	70.8	63.4
	SC	13	64	150	101.7	24.7	2.8	52.1	17.2	15.4
	TSB	1	42	42	42.0	n/a	0.8	0.8	0.8	n/a
	Total	**184**	**42**	**232**	**88.9**	**29.5**	**0.8**	**218.1**	**10.8**	**23.8**
WC 2 - Upper	CH	1	95	95	95.0	n/a	8.3	8.3	8.3	n/a
	CO	185	57	135	81.9	11.8	0.5	16.8	5.6	2.4
	CT	38	75	214	143.6	30.2	3.2	78.5	27.8	17.7
	RB/ST	3	152	172	162.0	10.0	23.7	46.5	33.7	11.6
	SC	5	85	129	102.0	17.1	7.6	20.2	12.0	5.1
	Total	**232**	**57**	**214**	**93.5**	**29.1**	**0.5**	**78.5**	**9.7**	**11.3**
Harlequin Creek	CO	64	65	101	83.7	6.9	3	11.4	6.6	1.5
	CT	32	56	315	89.7	45.1	1.2	19.6	6.1	4.7
	SC	18	42	127	66.3	23.3	0.9	27.9	5.0	6.6
	Total	**114**	**42**	**315**	**82.7**	**26.9**	**0.9**	**27.9**	**6.2**	**3.8**
McNab Creek	CH	1	87	87	87.0	n/a	7.2	7.2	7.2	n/a
	CM	107	28	46	35.0	2.0	0.1	0.6	0.3	0.1
	CO	111	29	80	35.2	7.7	0.1	6.4	0.6	1.0
	PK	156	28	39	34.0	1.8	0.1	0.5	0.3	0.1
	RB/ST	1	149	149	149.0	n/a	31	31	31.0	n/a
	SC	5	37	91	73.4	21.2	5.1	14.9	8.7	4.0
	Total	**381**	**28**	**149**	**35.6**	**9.2**	**0.1**	**31**	**0.6**	**2.0**

Notes: Min – Minimum, Max – Maximum, Avg – Average, SD – Standard Deviation, n – number of individuals

Coho Salmon were the most abundant species captured. The total number of Coho Salmon captured was 1,401 including 64 in Harlequin Creek, 111 in McNab Creek, 408 in the lower segment of WC 2 and 818 in the upper segment of WC 2. The daily capture rate of Coho Salmon peaked at 25 in Harlequin Creek and 287 in the upper and 129 in the lower segment of WC 2 sites. The capture rate of Coho in McNab Creek had a peak of 30 fish captured per sample day.

Coho captured in McNab Creek were smaller than those captured from WC 2 and Harlequin Creek. Coho captured in McNab Creek had an average length of 35 mm ranging from 29 to 80 mm. Coho had an average length of 81 mm (range: 64 to 115 mm) in the lower segment of WC 2 , an average of 82 mm (range: 57 to 135 mm) in the upper segment of WC 2. In Harlequin Creek the average size was 84 mm (range: 65 to 101 mm).

Out-migrating Pink and Chum Salmon fry were only captured in McNab Creek with a total count of 1,101 and 118, respectively. Chum captured in McNab Creek had a mean length of 35 mm (SD ± 2 mm). The mean length of Pink Salmon fry captured in McNab Creek was at 34 mm (SD ± 2 mm). The early April onset of the sampling may not have captured the beginning of the Pink Salmon outmigration.

Only two Chinook Salmon parr/smolts were captured in the upper segment of WC 2. Fork lengths were 87 and 95 mm and weights were 7.2 and 8.3 g, respectively.

The total numbers of Cutthroat Trout counted during the fyke net programs were 32 Cutthroat on Harlequin Creek, 14 Cutthroat on the lower segment of WC 2 and 39 Cutthroat on the upper segment of WC 2. There were no Cutthroat Trout captured in McNab Creek.

Downstream migration of Cutthroat Trout peaked on April 27, 2012 in both WC 2 sites when a total of 11 and 19 Cutthroat were captured in the lower and upper segments. Peak capture in Harlequin Creek was on May 3, 2012 with a total of 9 Cutthroat Trout captured.

A wide range of lengths were recorded for Cutthroat Trout captured from all sampled sites; Cutthroat Trout captured in Harlequin Creek were smaller overall than those captured from WC 2.

Four fish identified as Rainbow Trout /Steelhead were captured in four separate samples: one at the McNab Creek fyke net on April 4 and three at the upper segment of WC 2 fyke net on April 11 and May 17 and 24, 2012 (Photograph C). The length and weight of the McNab Creek Rainbow Trout / Steelhead was 149 mm and 31 g; Rainbow Trout / Steelhead in the upper segment of WC 2 had length and weights of 152, 162, and 172 mm and 31.0, 23.7, 46.5 g, respectively.

3.2.2 Adult Salmon

McNab Creek and WC 2 were visually surveyed for returning adult salmon during the late summer and fall from 2009 to 2013 and counts of adult salmon were collected (Table 8).

In McNab Creek, Pink Salmon and Chum Salmon were the most abundant species observed, with average daily counts of 691 (range: 0 to 2335) and 118 (range: 0 to 261) respectively. Adult Chinook and Coho Salmon were also observed in much lower numbers.

WC 2 had fewer returning adults. Pink and Chum Salmon remained the dominant species with peak count averages of 8 (range: 0 to 38) and 5 (range: 0 to 16) respectively. A single Coho Salmon was observed during each of the 2009 and 2012 survey years; no Chinook were observed in WC 2 during the survey period.

The segments of McNab Creek that consistently had the highest recorded observations of Coho, Chum and Pink Salmon throughout the survey period were primarily those lower reaches that contain pools, which returning salmon were observed to be using as holding locations prior to selecting redds and spawning (Figure 13). The watercourses at 900-1000 m upstream from the mouth also have suitable habitat for spawning. Pink and Coho observations were also relatively high in the 200-300 m segment and Chum observations were relatively high at the 1300-1400 m segment. Pink Salmon were observed exhibiting spawning behaviour in the segments of McNab Creek near the estuary and throughout most of the segments surveyed within the lower 1.7 km reach.

Table 8: Run timing, Peak Day, Peak Count and Total Number of Days Adult Coho, Chinook, Chum, and Pink Salmon Observed in the McNab Creek Watersheds in 2009, 2010, 2011, 2012, and 2013

Watercourse	Survey Year	Salmon Species	First Day of Survey	First Day Observed	Peak Count		Last Day Fish Observed
					Date	Count	
McNab Creek	2009	Coho	9-Sept-09	19-Oct-09	19-Oct-09	3	19-Oct-09
		Chinook	9-Sept-09	30-Sept-09	30-Sept-09	38	30-Sept-09
		Chum	9-Sept-09	24-Nov-09	24-Nov-09	261	24-Nov-09
		Pink	9-Sept-09	9-Sept-09	9-Sept-09	1105	19-Oct-09
	2010	Coho	23-Aug-10	2-Nov-10	2-Nov-10	2	2-Nov-10
		Chinook	23-Aug-10	n/a	n/a	0	n/a
		Chum	23-Aug-10	2-Nov-09	2-Nov-09	2	2-Nov-09
		Pink	23-Aug-10	9-Sept-09	23-Sept-09	13	23-Sept-09
	2011	Coho	31-Aug-11	27-Oct-11	27-Oct-11	2	2-Dec-11
		Chinook	31-Aug-11	n/a	n/a	0	n/a
		Chum	31-Aug-11	2-Dec-11	2-Dec-11	3	2-Dec-11
		Pink	31-Aug-11	31-Aug-11	14-Sept-11	2335	19-Oct-11
	2012	Coho	6-Aug-12	25-Oct-12	8-Nov-12	6	8-Nov-12
		Chinook	6-Aug-12	n/a	n/a	0	n/a
		Chum	6-Aug-12	25-Oct-12	8-Nov-12	324	22-Nov-12
		Pink	6-Aug-12	n/a	n/a	0	n/a

Watercourse	Survey Year	Salmon Species	First Day of Survey	First Day Observed	Peak Count		Last Day Fish Observed
					Date	Count	
WC 2	2009	Coho	9-Sept-09	19-Oct-09	19-Oct-09	1	19-Oct-09
		Chinook	9-Sept-09	n/a	n/a	0	n/a
		Chum	9-Sept-09	24-Nov-09	24-Nov-09	16	24-Nov-09
		Pink	9-Sept-09	n/a	n/a	0	n/a
	2010	Coho	23-Aug-10	n/a	n/a	0	n/a
		Chinook	23-Aug-10	n/a	n/a	0	n/a
		Chum	23-Aug-10	n/a	n/a	0	n/a
		Pink	23-Aug-10	n/a	n/a	0	n/a
	2011	Coho	22-Sept-11	n/a	n/a	0	n/a
		Chinook	22-Sept-11	n/a	n/a	0	n/a
		Chum	22-Sept-11	n/a	n/a	0	n/a
		Pink	22-Sept-11	22-Sept-11	23-Sept-11	38	7-Oct-11
	2012	Coho	11-Oct-12	8-Nov-12	8-Nov-12	1	8-Nov-12
		Chinook	11-Oct-12	n/a	n/a	0	n/a
		Chum	11-Oct-12	8-Nov-12	8-Nov-12	9	8-Nov-12
		Pink	11-Oct-12	n/a	n/a	0	n/a

Note: The areas being sampled were not equal among the sites. n/a – not applicable

3.2.3 Beach Seining for Nearshore Fish Populations

The number of each fish species captured over the duration of the study is summarized by sample date in Table 9. Fish population summary statistics, including abundance, density, the proportion of all juvenile salmon, and proportion of Coho Salmon captured are provided in Table 10. The number of each fish species captured was highly variable between sites and sample dates. Diversity of fish species in the nearshore areas was high with numerous fish species captured on each sample date. The most abundant species captured were sculpin including general sculpin (Cottus spp.), Staghorn Sculpin (*Leptocottus armatus)*, and Tidepool Sculpin (*Oligocottus maculosus*). Other species present in high numbers included flounder {(including general flounder spp.(*Achiropsettidae* spp.), and Starry Flounder (*Platichthys stellatus*)}, and Shiner Perch (*Cymatogaster aggregata*). Fish sampling capture data, locations, sampling dates, tides and water quality parameters are provided in Attachment A.

Table 9: Fish Species Abundance for Each Sample Date during Beach Seining, 2011

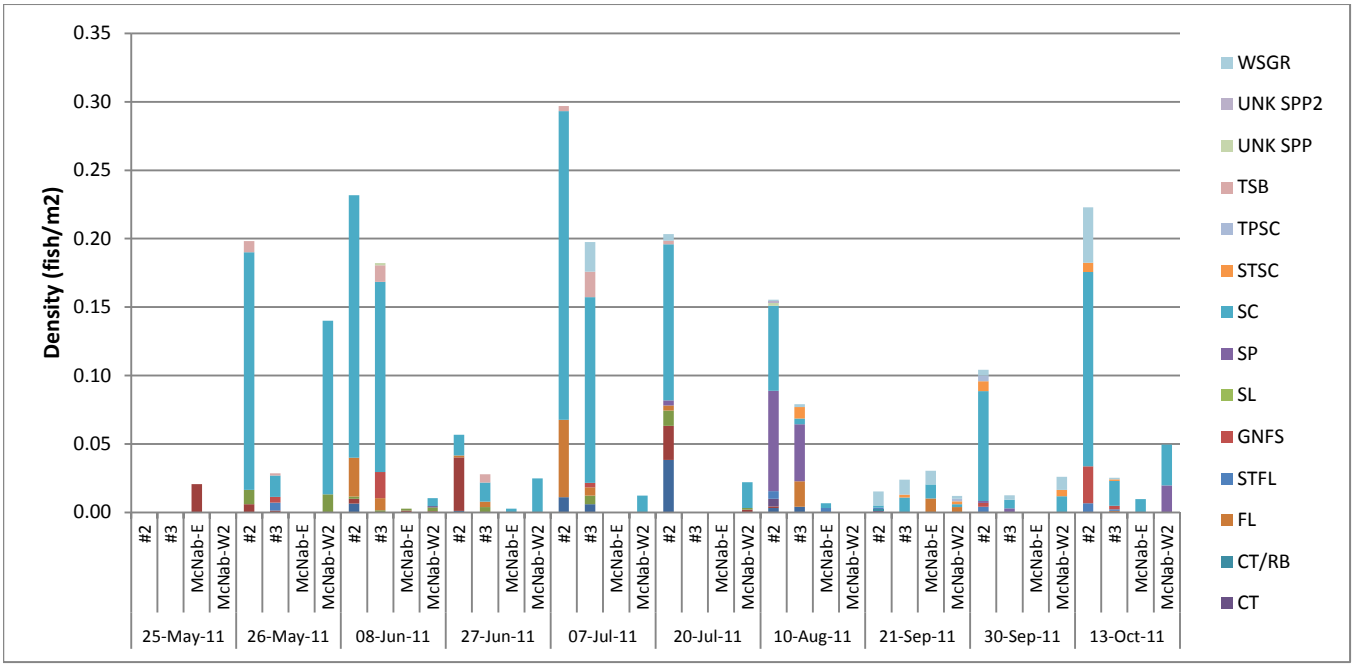
Species	25-May	26-May	8-Jun	27-Jun	7-Jul	20-Jul	10-Aug	21-Sep	30-Sep	13-Oct
Chinook Salmon	5	2	5	2	5	31	6	-	-	-
Chum Salmon	6	9	4	35	-	23	2	-	-	-
Coho Salmon	3	7	9	2	2	10	1	-	-	-
Cutthroat Trout	3	-	1	2	-	-	5	3	-	3
Cutthroat / Rainbow Trout	-	-	-	-	-	-	-	1	-	-
Flounder	-	-	78	4	32	3	9	5	-	2
Gunnelfish	2	4	17	-	4	1	1	-	2	8
Sandlance	-	10	-	-	-	-	-	-	-	-
Sculpin (general)	32	203	298	27	121	113	70	22	73	72
Shiner Perch	-	-	3	168	71	28	91	-	5	5
Starry Flounder	4	4	-	-	-	-	6	1	4	8
Staghorn Sculpin	-	-	-	-	-	-	4	3	7	3
Tidepool Sculpin	-	-	-	-	-	-	-	1	3	-
Threespine Stickleback	-	9	19	5	7	2	-	-	-	2
Unknown sp.	-	-	1	-	-	-	2	-	-	-
Unknown sp.2	-	-	-	-	-	-	1	-	-	-
Whitesided Greenling	-	-	-	-	7	4	2	21	9	7
Total	**55**	**248**	**435**	**245**	**250**	**216**	**200**	**57**	**104**	**110**

Table 10: Summary Fish Capture Information from Beach Seining in McNab Nearshore, 2011

Parameter	May 25	May 26	June 8	June 27	July 7	July 20	Aug 10	Sept 21	Sept 30	Oct 13
Abundance (fish/site)	14 ± 15	62 ± 48	73 ± 77	41 ± 60	50 ± 45	72 ± 80	40 ± 58	8 ± 5	26 ± 32	16 ± 11
Density (fish/m^2)	0.024 ± 0.015	0.161 ± 0.105	0.124 ± 0.133	0.073 ± 0.076	0.115 ± 0.126	0.116 ± 0.091	0.055 ± 0.064	0.013 ± 0.010	0.043 ± 0.042	0.055 ± 0.075
Proportion of Juvenile Salmon	0.64	0.07	0.24	0.16	0.02	0.18	0.13	0.00	0.00	0.00
Proportion of Coho Salmon	0.28	0.04	0.13	0.02	0.01	0.03	0.05	0.00	0.00	0.00

* Values are presented as Mean ± Standard Deviation of all sites per sample date

Average fish densities and the proportion of juvenile salmon in the beach catch for each sample date are presented in Figure 12. Overall fish density was variable with the highest density occurring between May 26th and July 20th. The relative abundance of juvenile salmon generally declined from May 25th to August 10th with no captures after August 10th.



Species: CH-Chinook Salmon, CM-Chum Salmon, CO-Coho Salmon, CT-Cutthroat Trout, FL-Flounder (*Pleuronectidae* spp.), STFL-Starry Flounder (*Platichthys stellatus*), SC-Sculpin (Cottidae spp.), STSC-Staghorn Sculpin (*Leptocottus armatus*), TPSC-Tidepool Sculpin (*Oligocottus maculosus*), TSB-Three-spined Stickleback (*Gasterosteus aculeatus*), GNFS-Gunnelfish (*Pholidae* spp.) GR- Greenling (Hexagrammidae spp.), WSGR-White Spotted Greenling (*Hexagrammos stelleri*), SL-Sand Lance (Ammodytidae spp.), SP-Shiner Perch (*Cymatogaster aggregate*)

Figure 12: Fish Density McNab Creek Estuary Nearshore Beach Seining, 2011

3.3 Benthic Invertebrate Communities

Measures of benthic community composition (or relative abundance) provide information based on the relative contributions of different taxa (Barbour et al. 1999). Key taxa can provide important information about the condition of the benthic community. Percent EPT (Order Ephemeroptera [mayflies], Order Plecoptera [stoneflies], and Order Trichoptera [cadissflies]), percent Chironomids (non-biting midges) and percent Tombidiformes (mites) were calculated at each station. EPT taxa are characteristic of fast flowing, lotic habitats in BC and are generally considered to be sensitive to environmental disturbances including changes in water chemistry, sedimentation and scouring of the stream bed due to high flow events (Resh and Jackson 1993; Barbour et al. 1999). Both chironomids and EPT taxa represent important aquatic food sources and are the major prey item for several species of fish (Voshell 2002). Trombidiforms (primarily present as Family Hygrobatidae) routinely parasitize other aquatic larvae and can cause significant reduction in the abundance of other invertebrate organisms in a particular habitat (Voshell 2002). A summary of benthic community metrics for each station is provided in Table 11. The sampling locations are provided in Figure 5.

Table 11: Summary of Benthic Community Metrics

Metric	McNab Creek						WC 2		Harlequin Creek
	T-01	T-02*	T-03	T-04	T-05	T-06	T-07	T-08	T-09
Abundance	779	352 ± 100	288	327	2192	181	238	800	1303
Richness	15	13 ± 1	16	15	15	10	18	13	20
Evenness	0.19	0.21 ± 0.03	0.21	0.20	0.10	0.35	0.18	0.24	0.16
% EPT Taxa	36	14 ± 3	50	26	8	35	11	54	57
% Chironomidae	52	53 ± 3	31	54	82	13	47	39	28
% Trombidiformes	7	32 ± 5	16	19	8	52	39	1	2

Notes:
Stations are ordered from downstream to upstream, within each watercourse
* T-02 displayed as mean ± standard error (n = 3)

Taxa richness was low to moderate at the stations sampled, with 10 to 20 families observed. In general, the values calculated for evenness were closer to 0 than to 1, indicating that organisms were unevenly distributed among the taxonomic groups observed with the community dominated by relatively few species at each station. Relative abundance and percent composition analysis indicated that at the majority of stations the invertebrate community was dominated by the Family Chironomidae, with the exception of the community at station T-03 (McNab Creek), T-08 (upstream station on WC 2) and T-09 (Harlequin Creek), where EPT taxa were dominant, and at station T-06 (upstream station on McNab Creek) where the Order Trombidiformes were the most dominant taxa. In this study, the site with lowest total abundance of invertebrates (T-06) also had the highest proportion of Trombidiforms.

Habitat variables measured indicated that habitat throughout McNab Creek was fairly similar, and characteristic of a wide, fast flowing creek with larger coarse substrates (cobbles and boulders). Watercourse 2 upstream station (T-08) had features of a small alpine creek (e.g., narrow, fast flowing, large, coarse substrate), and the downstream station (T-09) had features indicative of recent disturbance. Harlequin Creek exhibited conditions indicative of a fast-flowing creek with smaller substrate (silt/clay, gravel) and moderate canopy cover. Overall, stations were similar within all three watercourses and were typical of lotic habitats throughout BC.

4.0 STATEMENT OF LIMITATIONS

This report was prepared for the exclusive use of BURNCO Rock Products Ltd. (BURNCO), its assignees and representatives. The inferences concerning the site conditions contained in this report are based on information provided by BURNCO, a limited review of available literature, the regulatory requirements at the time of writing, which changed during that time (i.e., legislative amendment to the *Fisheries Act* in 2012), and site reconnaissance visits conducted by Golder Associates Ltd. (Golder) personnel. Golder makes no warranty, expressed or implied, and assumes no liability with respect to the use of the information contained in this report at the subject site, or any other site, for other than its intended purpose.

The findings and conclusions documented in this report have been prepared for the specific application to this Proposed Project, and have been developed in a manner consistent with the level of care normally exercised by environmental professionals currently practising under similar conditions in the jurisdiction. Any use which a third party makes of this report, or any reliance on or decisions made based on it, are the responsibility of such third parties. Golder accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions taken based on this report.

BURNCO understands and acknowledges that this document is not intended or represented by Golder to be suitable for reuse by any party, including, but not limited to, BURNCO, its employees, agents, subcontractors or subsequent owners on any extension of a specific project not covered by this Agreement or on any other project, whether BURNCO's or otherwise, without Golder's prior written permission. Any reuse unauthorized by Golder will be at BURNCO's sole risk.

If new information is discovered during future work, Golder should be requested to re-evaluate the conclusions of this report and provide amendments, as required, prior to any reliance upon the information presented herein.

5.0 CLOSURE

We trust this information is sufficient for your needs at this time. Should you have any questions, please do not hesitate to contact the undersigned. We look forward to receipt of your comments and any questions or requests for clarification you identify.

GOLDER ASSOCIATES LTD.

Dave Carter, M.Sc.
Senior Environmental Scientist

Reviewed by:

Shawn Redden, R.P.Bio.
Associate, Senior Fisheries Biologist

DC/AC/SR/asd

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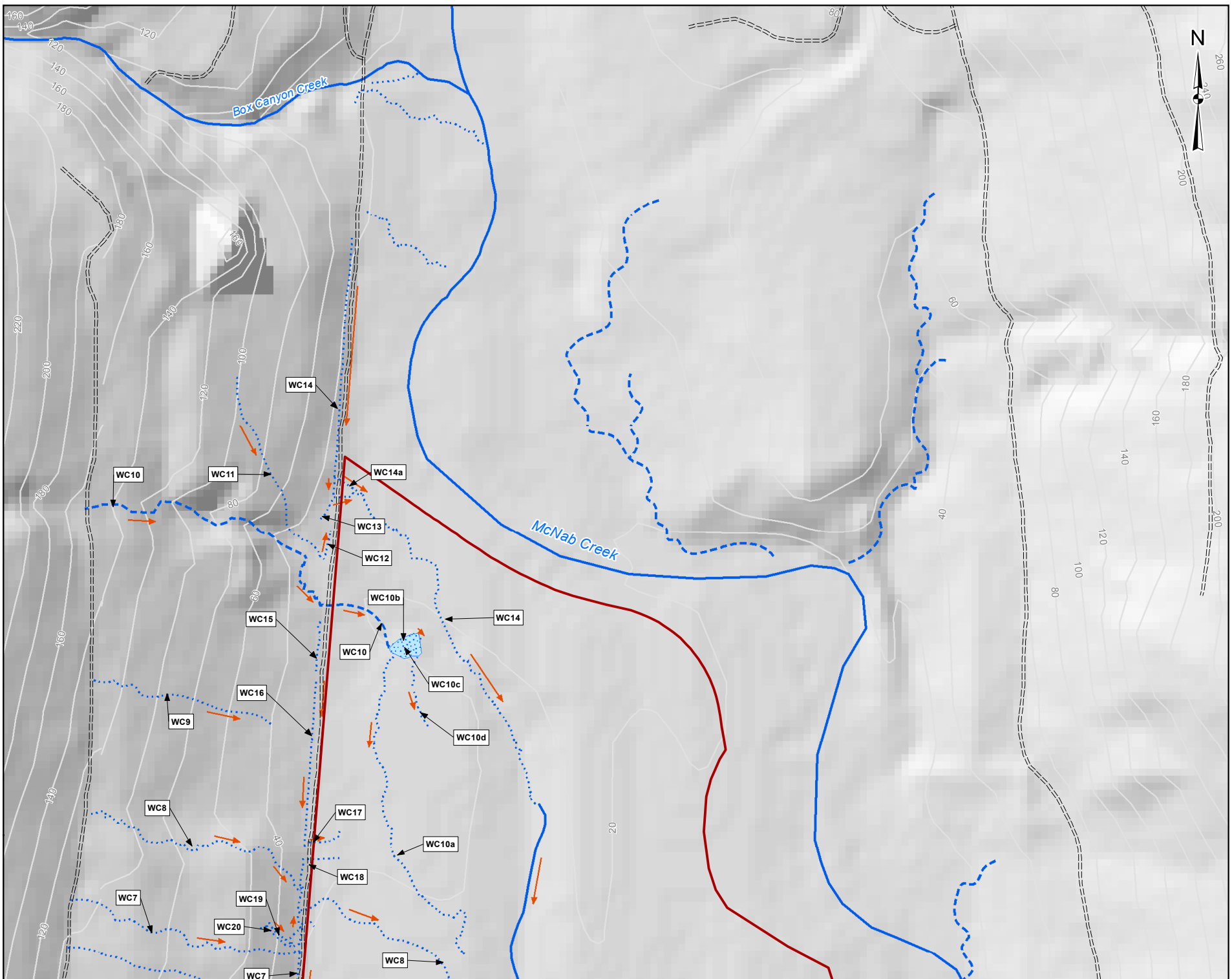

LEGEND

- Project Area
- Low Lying Wetted Area
- Beaver Impounded Wetted Area
- Waterbody
- Intertidal Zone
- Road (Existing)
- Contour (20m)
- Permanent / Perennial Watercourse
- Intermittent Watercourse
- Ephemeral Watercourse
- Direction of Flow

200 0 200

SCALE 1:7,000 METRES

REFERENCE

Watercourses from the Province of British Columbia and field data. DEM from Geobase. Base data from the Province of British Columbia. Contours from TRIM positional data. Projection: UTM Zone 10 Datum: NAD 83

PROJECT

BURNCO ROCK PRODUCTS LTD.
BURNCO AGGREGATE PROJECT, HOWE SOUND, B.C.

TITLE

WATERCOURSES

Golder Associates

PROJECT NO. 11-1422-0046			PHASE No.	
DESIGN	DC	01 May 2015	SCALE AS SHOWN	REV. 0
GIS	DL	10 Mar. 2016	FIGURE 1	
CHECK	DC	10 Mar. 2016		
REVIEW	SR	10 Mar. 2016		

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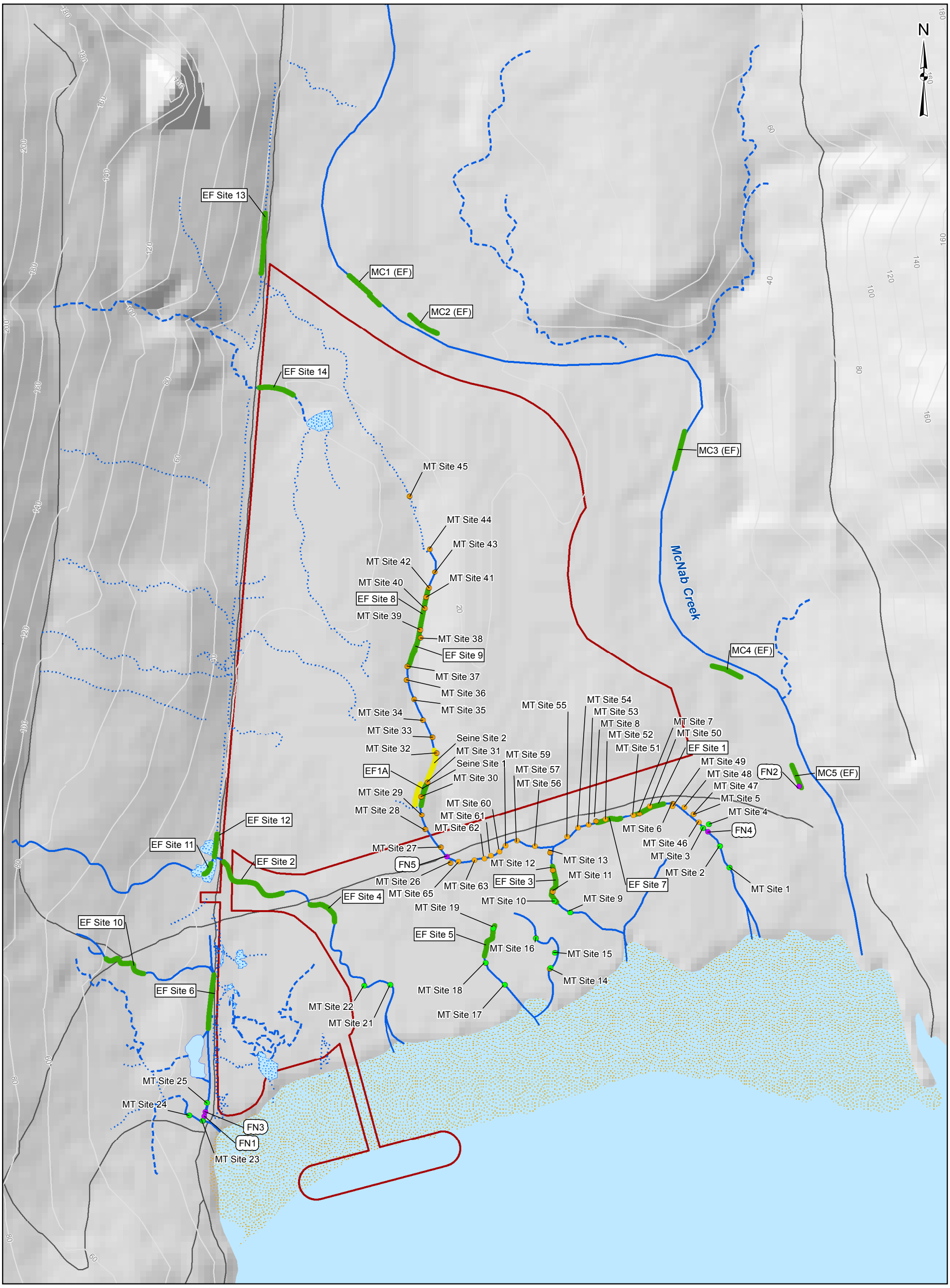

LEGEND

- Project Area
- Low Lying Wetted Area
- Beaver Impounded Wetted Area
- Waterbody
- Intertidal Zone
- Road (Existing)
- Contour (20m)
- Permanent / Perennial Watercourse
- Intermittent Watercourse
- Ephemeral Watercourse
- Electrofishing Site (EF)
- Seine Site
- Fyke Net Site (FN)
- Freshwater Minnow Trap Site (MT)
- Intertidal Minnow Trap Site (MT)

REFERENCE

DEM from Geobase. Base data from the Province of British Columbia. Contours from TRIM positional data. Watercourses from the Province of British Columbia and field data. Projection: UTM Zone 10 Datum: NAD 83

200 0 200

SCALE 1:6,500 METRES

PROJECT

BURNCO ROCK PRODUCTS LTD.
BURNCO AGGREGATE PROJECT, HOWE SOUND, B.C.

TITLE

FISH SAMPLING

Golder Associates

PROJECT NO. 11-1422-0046			PHASE No.	
DESIGN	RH	6 Nov. 2012	SCALE AS SHOWN	REV. 0
GIS	DL	10 Mar. 2016		
CHECK	DC	10 Mar. 2016		
REVIEW	SR	10 Mar. 2016		

FIGURE 2

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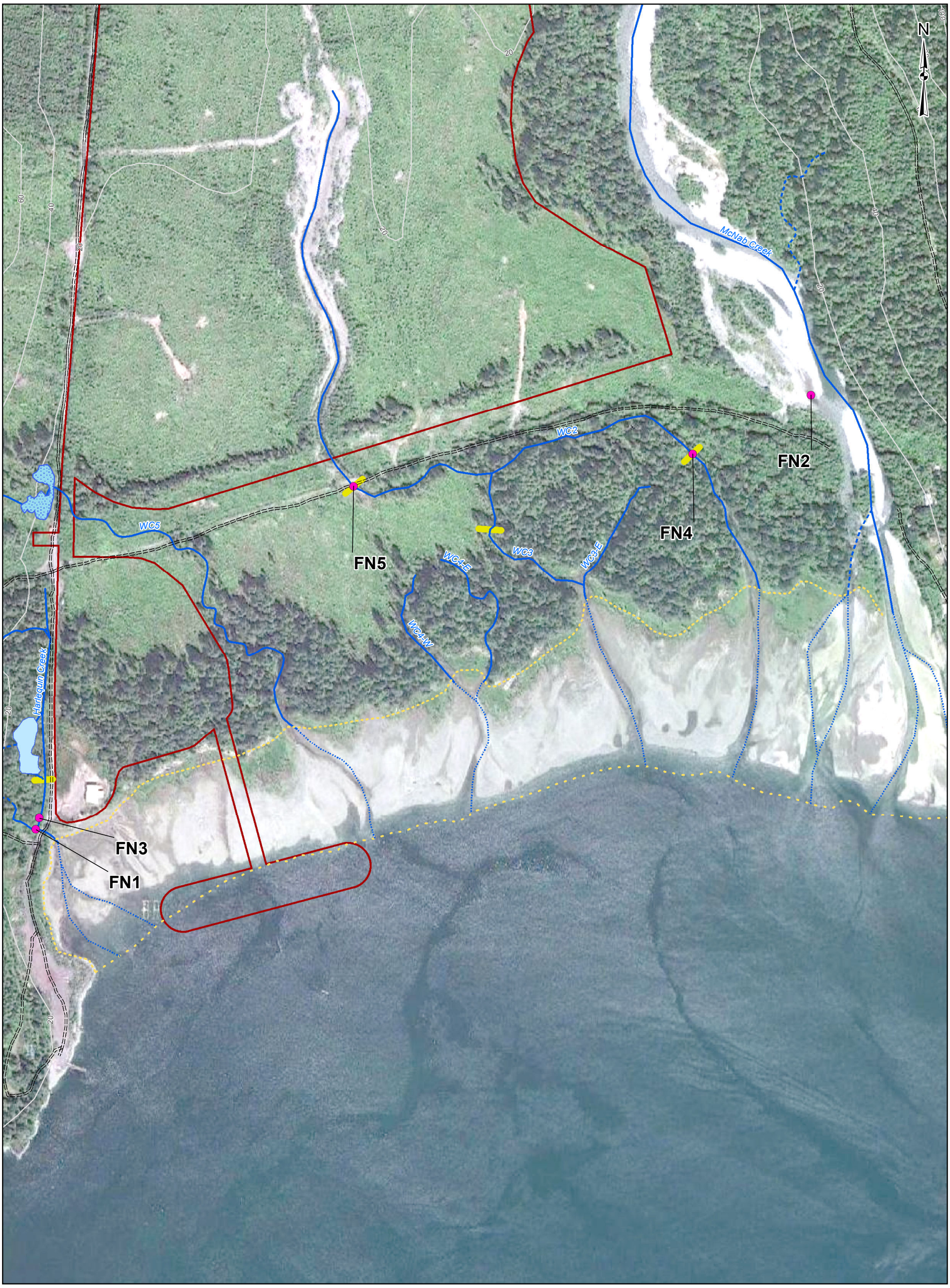

LEGEND

- Fyke Net Site
- Block Fence Location
- Project Area
- Low Lying Wetted Area
- Beaver Impounded Wetted Area
- Permanent / Perennial Watercourse
- Intermittent Watercourse
- Intertidal Watercourse
- High Tide Line
- Low Tide Line
- Road (Existing)
- Contour (20m)

REFERENCE

Watercourses from the Province of British Columbia and field data. Base data from the Province of British Columbia. Contours from TRIM positional data. Base image from Google Maps 20100807. Projection: UTM Zone 10 Datum: NAD 83

100 0 100

SCALE 1:5,000 METRES

PROJECT

BURNCO ROCK PRODUCTS LTD.
BURNCO AGGREGATE PROJECT, HOWE SOUND, B.C.

TITLE

SMOLT OUTMIGRATION SAMPLING

Golder Associates

PROJECT NO. 11-1422-0046			PHASE No.	
DESIGN	RH	26 Feb. 2013	SCALE AS SHOWN	REV. 0
GIS	DL	10 Mar. 2016		
CHECK	DC	10 Mar. 2016		
REVIEW	SR	10 Mar. 2016		

FIGURE 3

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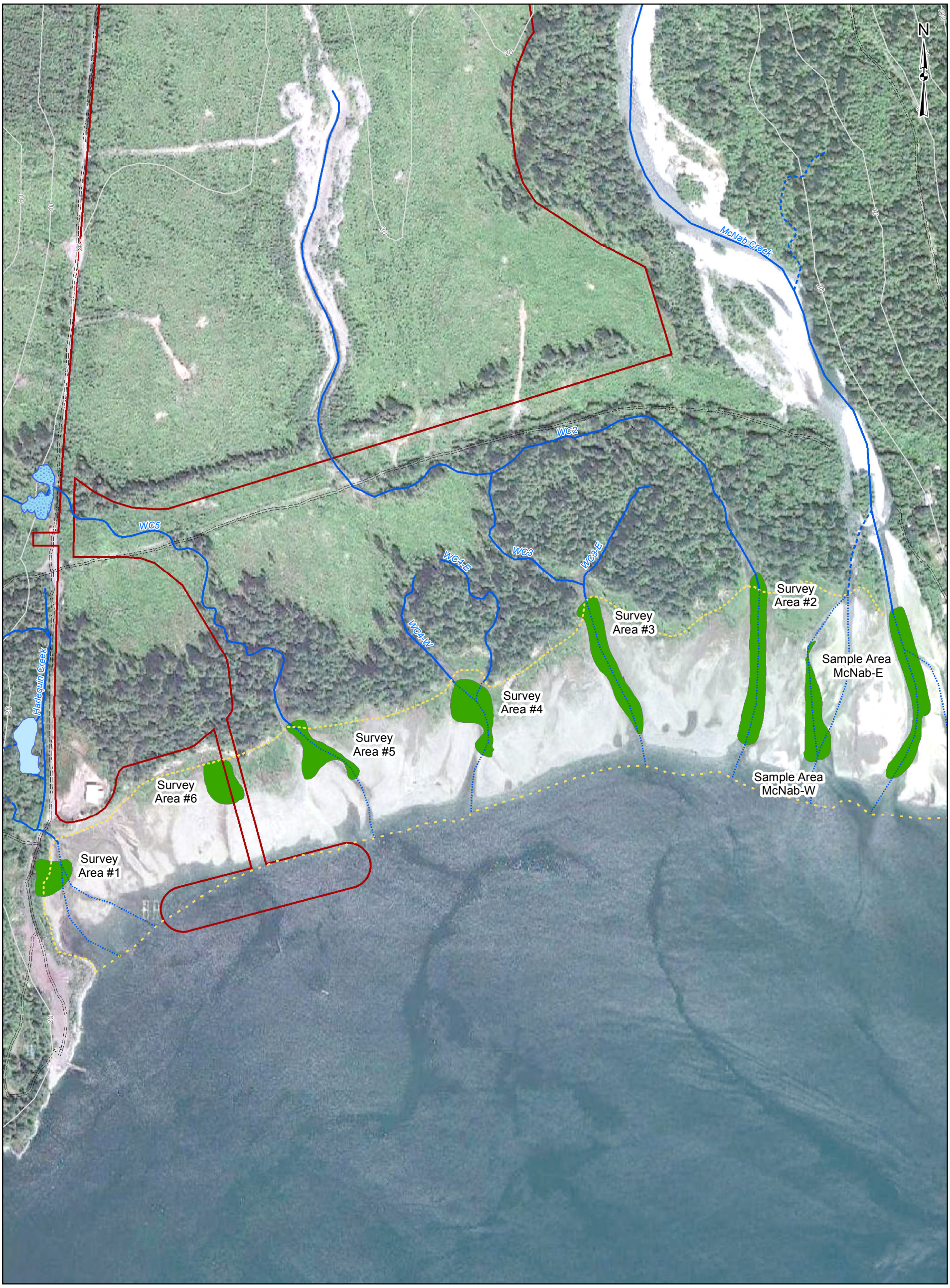

LEGEND

- Beach Seine Site
- Project Area
- Low Lying Wetted Area
- Beaver Impounded Wetted Area
- Permanent / Perennial Watercourse
- Intermittent Watercourse
- Intertidal Watercourse
- High Tide Line
- Low Tide Line
- Road (Existing)
- Contour (20m)

100 0 100

SCALE 1:5,000 METRES

REFERENCE

Watercourses from the Province of British Columbia and field data. Base data from the Province of British Columbia. Contours from TRIM positional data. Base image from Google Maps 20100807. Projection: UTM Zone 10 Datum: NAD 83

PROJECT

BURNCO ROCK PRODUCTS LTD.
BURNCO AGGREGATE PROJECT, HOWE SOUND, B.C.

TITLE

NEARSHORE FISH SAMPLING LOCATIONS, 2011

Golder Associates

PROJECT NO. 11-1422-0046			PHASE No.	
DESIGN	RH	19 Mar. 2013	SCALE AS SHOWN	REV. 0
GIS	DL	10 Mar. 2016	FIGURE 4	
CHECK	DC	10 Mar. 2016		
REVIEW	SR	10 Mar. 2016		

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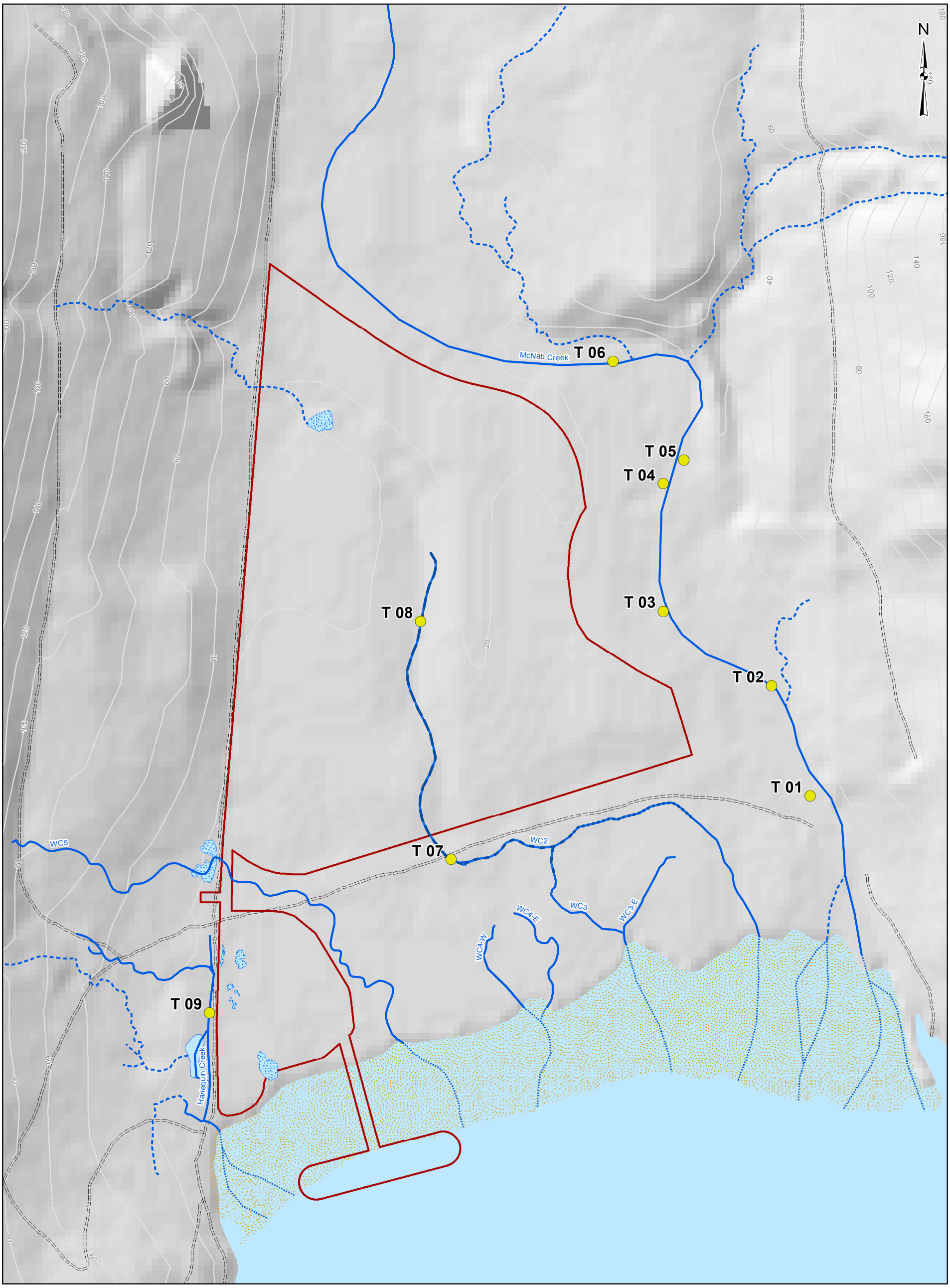

LEGEND

- Benthic Invertebrate Community Sample Location
- Project Area
- Waterbody
- Low Lying Wetted Area
- Beaver Impounded Wetted Area
- Intertidal Zone
- Road (Existing)
- Contour (20m)
- Permanent / Perennial Watercourse
- Intermittent Watercourse
- Intertidal Watercourse

Constructed Watercourse

- Phase 1 (1985)
- Phase 2 (1998)
- Phase 3 (2001 - 2003)

REFERENCE

DEM from Geobase. Watercourses from the Province of British Columbia and field data. Base data from the Province of British Columbia. Contours from TRIM positional data. Projection: UTM Zone 10 Datum: NAD 83

200 0 200

SCALE 1:6,500 METRES

PROJECT

BURNCO ROCK PRODUCTS LTD.
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TITLE

BENTHIC INVERTEBRATE COMMUNITY SAMPLING

PROJECT NO. 11-1422-0046			PHASE No.	
DESIGN	RH	14 Mar. 2014	SCALE AS SHOWN	REV. 0
GIS	DL	10 Mar. 2016	**FIGURE 5**	
CHECK	DC	10 Mar. 2016		
REVIEW	SR	10 Mar. 2016		

Golder Associates

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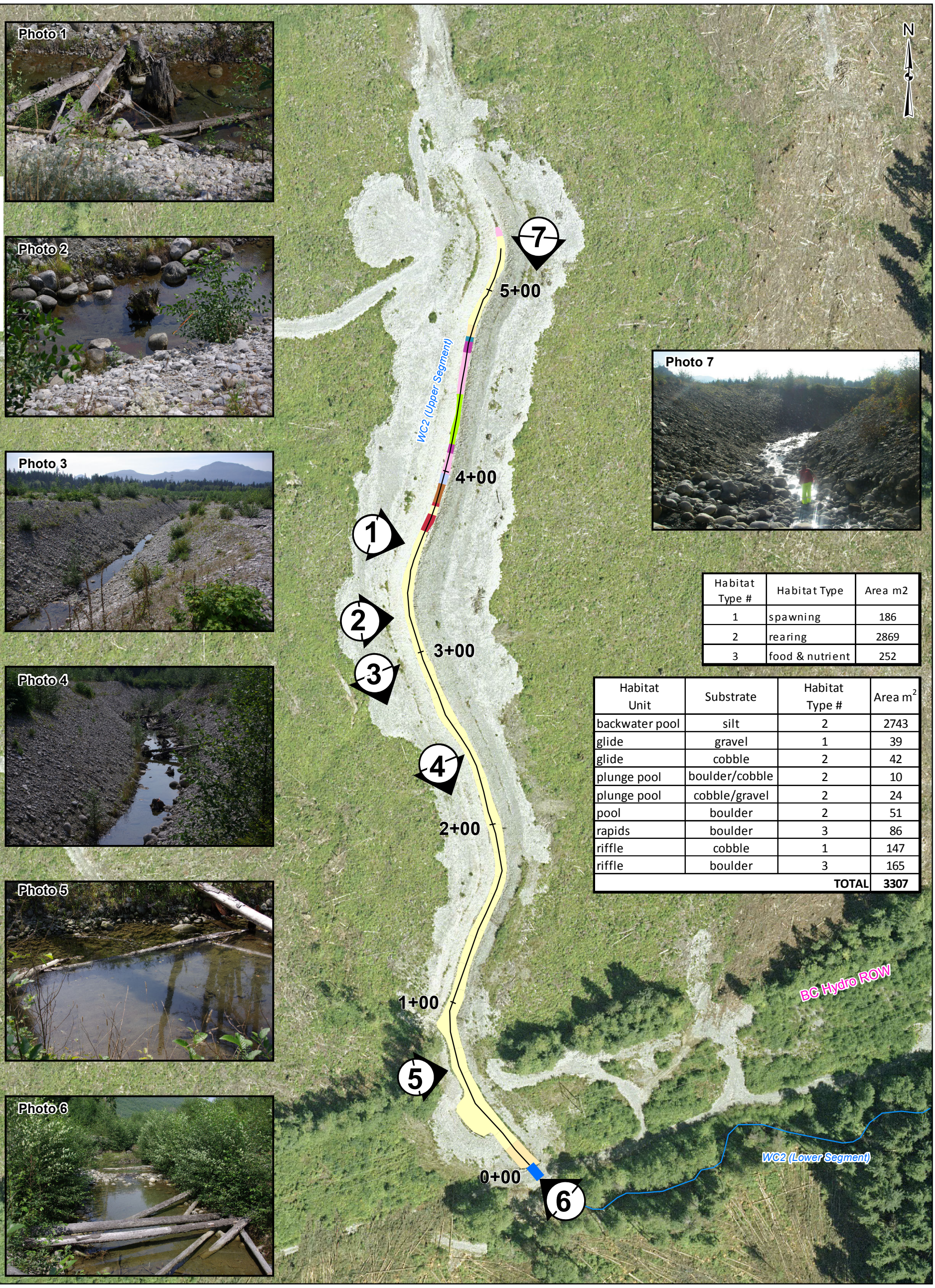

Habitat Type #	Habitat Type	Area m2
1	spawning	186
2	rearing	2869
3	food & nutrient	252

Habitat Unit	Substrate	Habitat Type #	Area m^2
backwater pool	silt	2	2743
glide	gravel	1	39
glide	cobble	2	42
plunge pool	boulder/cobble	2	10
plunge pool	cobble/gravel	2	24
pool	boulder	2	51
rapids	boulder	3	86
riffle	cobble	1	147
riffle	boulder	3	165
		TOTAL	**3307**

LEGEND

- backwater pool; silt
- glide; cobble
- glide; gravel
- plunge pool; boulder/cobble
- plunge pool; cobble/gravel
- pool; boulder
- rapids; boulder
- riffle; boulder
- riffle; cobble
- Lower Segment of WC2
- 100m Increments Along Watercourse
- Culvert
- # Photopoint

50 0 50

SCALE 1:2,000 METRES

REFERENCE

Watercourse from the Province of British Columbia and field data. Base Image from Google Maps 20150807.
Projection: UTM Zone 10 Datum: NAD 83

PROJECT

BURNCO ROCK PRODUCTS LTD.
BURNCO AGGREGATE PROJECT, HOWE SOUND, B.C.

TITLE

UPPER SEGMENT OF WC2 HABITAT UNITS

Golder Associates

PROJECT NO. 11-1422-0046			PHASE No.	
DESIGN	RH	08 Oct 2009	SCALE AS SHOWN	REV. 0
GIS	DL	10 Mar. 2016		
CHECK	DC	10 Mar. 2016		
REVIEW	SR	10 Mar. 2016		

FIGURE 6

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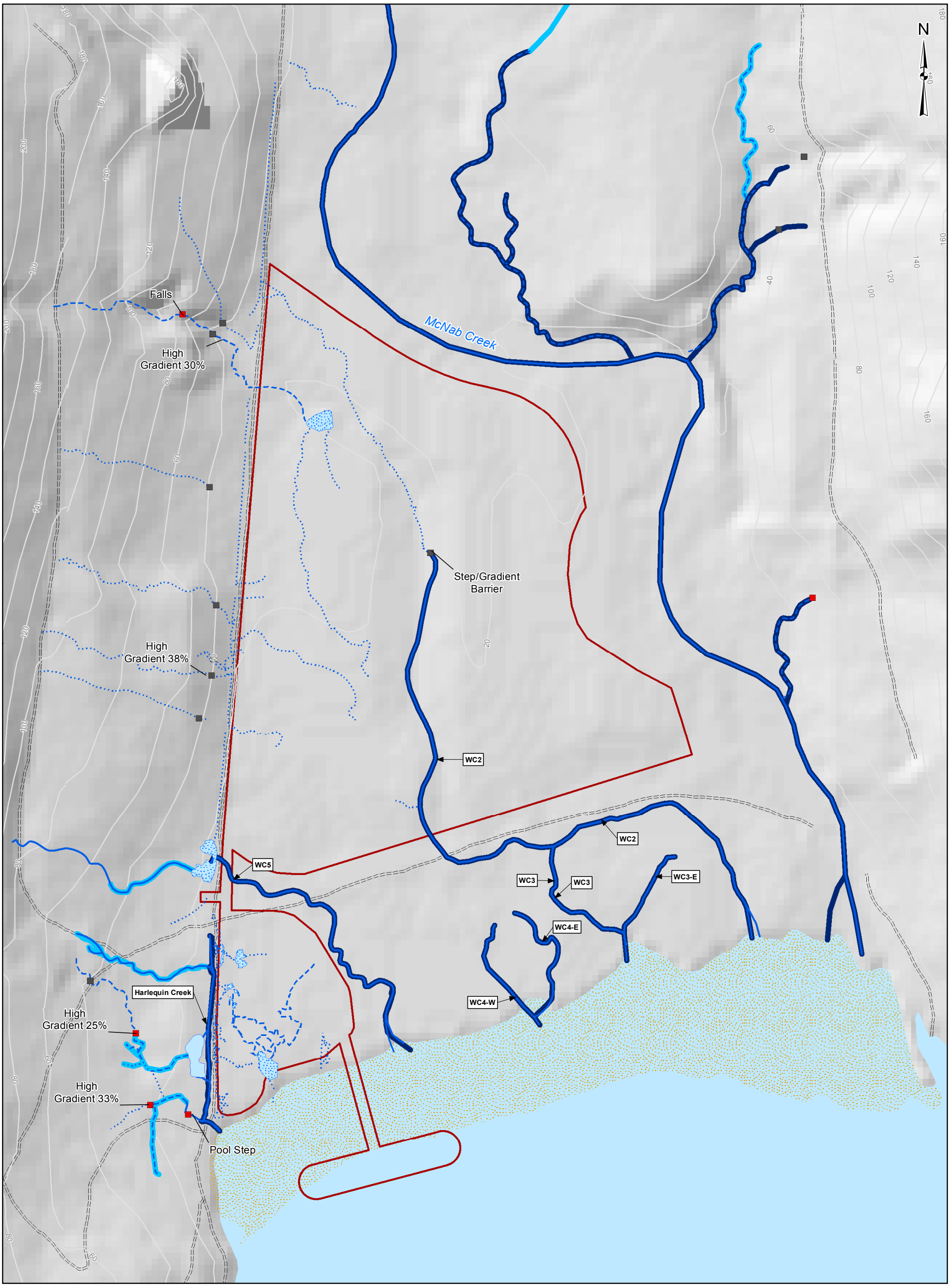

LEGEND

- Field Observed
- Gradient greater than 25% *
- Project Area
- Low Lying Wetted Area
- Beaver Impounded Wetted Area
- Waterbody
- Intertidal Zone
- Road (Existing)
- Contour (20m)
- Permanent / Perennial Watercourse
- Intermittent Watercourse
- Ephemeral Watercourse
- Anadromous/Resident Fish Presence
- Resident Fish Presence

REFERENCE

* Gradient greater than 25% determined based on TRIM Positional data and Geobase DEM. DEM from Geobase. Watercourses from the Province of British Columbia and field data. Base data from the Province of British Columbia. Contours from TRIM positional data.
Projection: UTM Zone 10 Datum: NAD 83

200 0 200

SCALE 1:6,500 METRES

PROJECT

BURNCO ROCK PRODUCTS LTD.
BURNCO AGGREGATE PROJECT, HOWE SOUND, B.C.

TITLE

FISH DISTRIBUTION AND BARRIERS

Golder Associates

PROJECT NO. 11-1422-0046			PHASE No.	
DESIGN	DC	01 May 2015	SCALE AS SHOWN	REV. 0
GIS	DL	10 Mar. 2016	FIGURE 7	
CHECK	DC	10 Mar. 2016		
REVIEW	SR	10 Mar. 2016		

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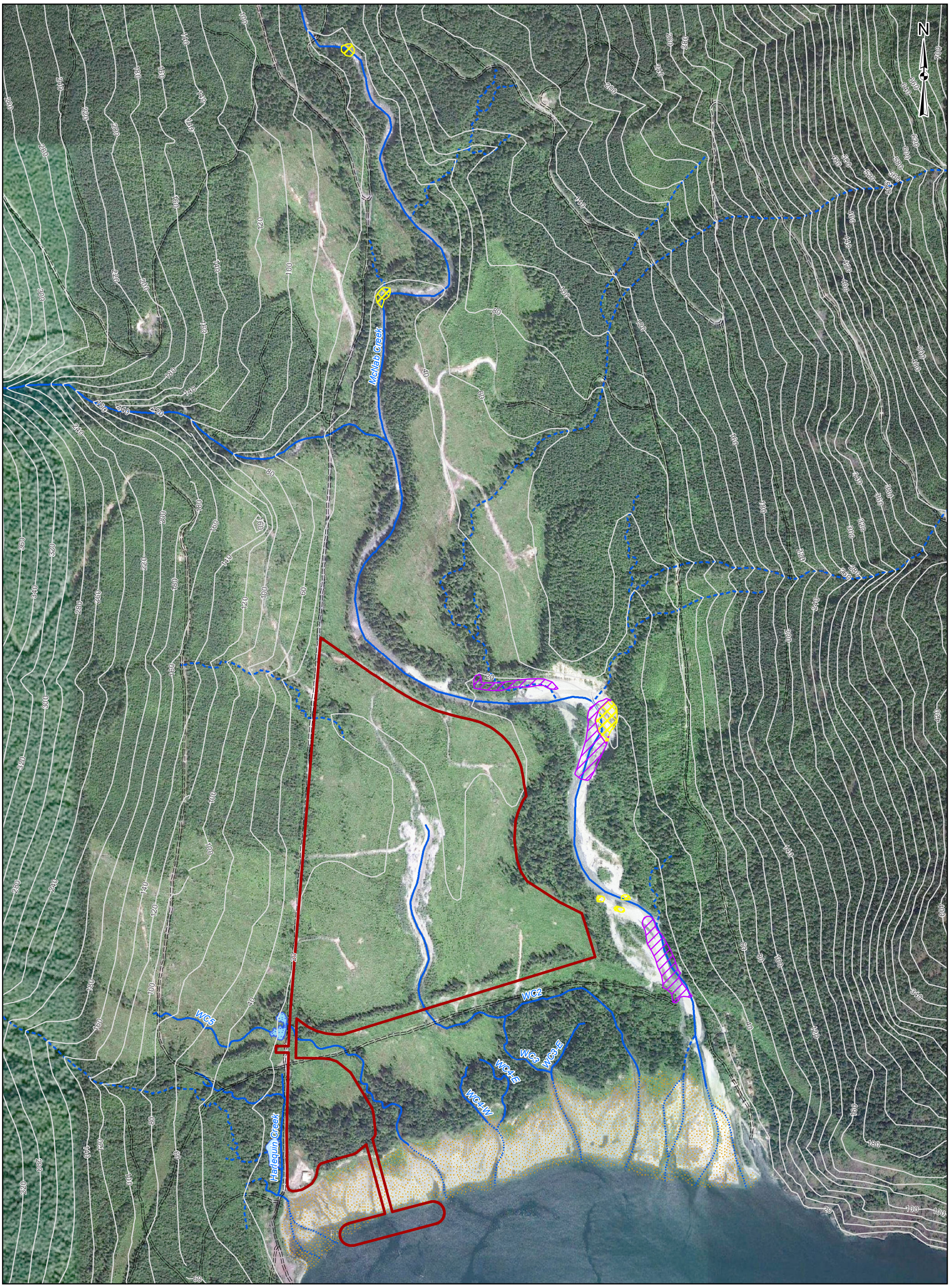

LEGEND

- Major Salmon Spawning Area
- Major Adult Salmon Holding Area
- Project Area
- Low Lying Wetted Area
- Beaver Impounded Wetted Area
- Intertidal Zone
- Permanent / Perennial Watercourse
- Intermittent Watercourse
- Intertidal Watercourse
- Road (Existing)
- Contour (20m)

REFERENCE

Watercourses from the Province of British Columbia and field data. Base data from the Province of British Columbia. Contours from TRIM positional data. Base image from Google Maps 20100807. Projection: UTM Zone 10 Datum: NAD 83

200 0 200

SCALE 1:10,000 METRES

PROJECT

BURNCO ROCK PRODUCTS LTD.
BURNCO AGGREGATE PROJECT, HOWE SOUND, B.C.

TITLE

ADULT SALMON SPAWNING AND HOLDING AREAS

Golder Associates

PROJECT NO. 11-1422-0046			PHASE No.	
DESIGN	RH	19 Mar. 2013	SCALE AS SHOWN	REV. 0
GIS	DL	10 Mar. 2016		
CHECK	DC	10 Mar. 2016		
REVIEW	SR	10 Mar. 2016		

FIGURE 13

Path: X:\Project Data\BC\McNab\Figures\MXD\Fish\Baseline\BURNCO_FISH_Figure_13_Adult_Salmon_Spawning_and_Holding_Areas.mxd

ATTACHMENT A

Data Tables

Table A-1: Habitat characteristics of Ephemeral and Intermittent Watercourses

Key Watercourse or Drainage Area	Watercourse	Average Channel Width (m)	Average Wetted Width (m)	Average Bankfull Depth (m)	Average Wetted Depth (m)	General Channel Morphology	Dominant Substrate	Gradient (%)	Cover Type*	Dominant Riparian Vegetation**	Fish Habitat***	Fish Presence
Constructed Groundwater-fed Watercourse	WC 21	5.0	-	1.0	-	Cascade	Boulders	-	-	MF	None	No
Northwest Watercourses	WC 10	2.4	1.6	0.55	0.18	Step Pool	Cobble	23.0	OV, LWD	MF	SP, R	No
	WC 10a-e	1.4	0.7	0.1	0.1	Riffle Pool	Fines	-	-	MF-Shr	OW	No
	WC 11	4.0	0.8	0.2	0.05	Riffle Pool	Cobble	-	-	Shr	R	No
	WC 12	2.0	-	0.28	-	Riffle Pool	Fines	2.3	OV	MF	None	No
	WC 13	1.2	0.5	1.0	0.35	Riffle Pool	Gravel	-	OV, SWD	MF	None	No
	WC 14	3.6	2.1	0.3	0.11	Riffle Pool	Fines	-	OV, SWD	DF	R	No
	WC 14a	2.8	2.7	0.1	0.06	Large Channel	Fines	-	-	n/a	None	No
Western Watercourses	WC 6	2.0	0.6	0.51	0.05	Riffle Pool	Fines	12.5	OV	Shr	OW, R	No
	WC 7	1.4	1.2	0.2	0.08	Riffle Pool	Gravel	-	-	YF	R	No
	WC 8	1.6	1.2	0.3	0.18	Riffle Pool	Gravel. Cobble	-	-	YF	R	No
	WC 9	1.2	0.3	0.5	-	Riffle Pool	Gravel, Cobble	-	LWD	YF	R	No
	WC 15	1.6	-	0.6	0.37	Riffle	Fines	-	-	YF-Shr	R	No
	WC 16	1.6	-	0.27	-	Riffle	Fines	2.5	-	YF-Shr	R	No
	WC 17	2.2	-	0.73	-	Riffle	Fines, Gravel	-	-	YF-Shr	None	No
	WC 18	1.8	-	0.68	-	Riffle	Gravel, Cobble	-	-	YF-Shr	None	No
	WC 19	3.4	2.2	0.1	0.09	Riffle Pool	Gravel	-	-	YF-Shr	None	No
	WC 20	0.9	0.8	0.2	0.15	Riffle Pool	Gravel	-	-	YF-Shr	None	No
Southwest Watercourses near Harlequin Creek	WC 22	2.1	1.6	0.5	0.16	Riffle Pool	Gravel	9.8	U, SWD, OV	MF	OW, R, SP	Anadromous
	WC 23	2.0	1.7	0.36	0.03	Riffle	Clay / Fines	18.0	OV, SWD	MF	R	Resident potential
	WC 24	1.8	1.1	0.53	0.1	Large Channel	Fines	3.0	LWD, SWD	MF	R	Resident potential
	WC 25	1.6	1.0	0.21	0.07	Riffle Pool	Fines	18.0	B, SWD	MF	OW, R	Resident potential
	WC 25-N	1.8	1.4	0.3	0.09	Riffle Pool	Gravel	13.1	OV, U	MF	OW, R, SP	Resident potential
	WC 26a	1.6	0.3	0.07	-	Riffle	Fines	-	-	YF	None	No
	WC 26b	0.3	0.3	0.03	-	Riffle	Gravel	-	-	n/a	None	No
	Harlequin Creek Seepage	0.5	0.5	0.1	0.1	Riffle Pool	Fines	-	-	MF	None	No
	Harlequin Creek Seepage Wetland	6.4	5.7	0.3	0.2	Large Channel	Fines	-	-	MF	OW, R	No

Notes:
* Cover: LWD – Large Woody Debris, SWD – Small Woody Debris, B – Boulders, OV – Overhanging Vegetation, U - Undercut
** Dominant Riparian Vegetation: MF – Mature Forest, YF – Young Forest, Shr - Shrub, DF – Deciduous Forest
*** Fish Habitat: SP – Step Pool, R - Riffle, OW - Overwintering

Table A-2: Habitat characteristics of perennial watercourses

Watercourse #	Reach #	Distance (m)	Habitat Type****	Length (m)	Gradient (%)	Depth (m)				Avg. Width (m)			Pools (m)	Substrate Comp. (%)*				Spawning Gravel?	Total LWD Tally	Cover**				Off-channel Habitat	Riparian Veg.***			Barriers	Comments
						Bankfull	LU Wetted	CU Wetted	RU Wetted	Avg Water Depth	Bankfull	Wetted		F	G	C	B			Type 1	%	Type 2	%		Type	Stage	Canopy (%)		
5	1	0+0	G	39	2	1.7	0.1	0.2	0.1	0.13	14.5	4.9	n/a	70	20	10	0	No	30+	IV	35	LWD	10	n/a	C	MF	1	None	#5 = RoW watercourse = wetland watercourse
5	1	0+20	G	-	-	1.8	0.1	0.2	0.1	0.13	16.7	4.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	1	0+39	R	9	n/a	1.8	0.11	0.08	0.12	0.10	17.2	6.2	n/a	30	30	40	0	No	8	IV	20	LWD	10	n/a	C	MF	10	None	-
5	1	0+44	R	-	-	1.8	0.08	0.11	0.13	0.11	16	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	1	0+49	G	17	n/a	1.65	0.12	0.07	0.08	0.09	18.9	5.5	n/a	35	35	30	0	No	6	IV	15	LWD	5	Ephemeral ~35m	C	MF	10	None	-
5	1	0+57	G	-	-	1.2	0.09	0.12	0.09	0.10	13.9	4.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	1	0+68	G	17	0	1.4	0.07	0.09	0.07	0.08	14	4.9	n/a	25	50	25	0	No	5	U	10	LWD	10	Ephemeral ~40m	C	MF	20	None	-
5	1	0+77	G	-	-	1.4	0.36	0.26	0.1	0.24	13	3.3	0.36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	1	0+85	R	13	2	0.9	0.05	0.1	0.04	0.06	11	4	n/a	10	10	80	0	No	4	LWD	15	B	15	n/a	C	MF	2	None	"B" for cover primarily refers to "Cobble"
5	1	0+92	R	-	-	0.9	0.04	0.11	0.04	0.06	11.5	3.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	1	0+98	P	10	0.5	0.7	0.16	0.13	0.11	0.13	5.2	3.5	0.27	50	10	40	0	No	3	LWD	15	B	10	Braid ~40m	C	MF	40	None	"B" for cover primarily refers to "Cobble"
5	1	1+03	P	-	-	0.7	0.14	0.27	0.11	0.17	6.2	3.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	2	1+08	R	18	3	0.4	0.04	0.03	0.07	0.05	4.2	3.7	n/a	10	15	75	0	No	0	B	10	OV	5	n/a	C	MF	35	None	"B" for cover primarily refers to "Cobble"
5	2	1+17	R	-	-	1.2	0.12	0.08	0.04	0.08	5.3	3	-	-	-	-	-	-	1	LWD	10	B	10	n/a					"B" for cover primarily refers to "Cobble"
5	2	1+26	G	9	1	0.4	0.06	0.08	0.14	0.09	3.5	3.4	n/a	15	60	25	0	Yes	7	LWD	30	n/a	-	-	C	MF	30	None	-
5	2	1+31	G	-	-	0.5	0.13	0.06	0.19	0.13	4	3.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	2	1+35	G	13	-	1.5	0.03	0.05	0.04	0.04	5	2	n/a	10	60	30	0	No	20+	LWD	20	B	5	n/a	C	MF	2	None	"B" for cover primarily refers to "Cobble"
5	2	1+42	G	-	-	0.4	0.05	0.12	0.04	0.07	4.5	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	3	1+48	R	7	-	0.5	0.03	0.09	0.09	0.07	4.7	2.3	0.28	15	75	10	0	Yes	1	LWD	10	n/a	-	n/a	C	MF	0	None	-
5	3	1+52	R	-	-	0.5	0.04	0.07	0.23	0.11	5	3.1	-	-	-	-	-	-	-	LWD	10	n/a	-	-	C	MF	0	None	pools interconnected
5	3	1+55	G	18	1.5	0.4	0.17	0.16	0.27	0.20	7	6.1	n/a	10	80	10	0	Yes	30+	LWD	60	IV	5	n/a	C	MF	0	None	-
5	3	1+64	G	-	-	0.4	0.21	0.16	0.12	0.16	6.8	5.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	3	1+73	P	23	-	1	0.14	0.35	0.17	0.22	4.4	3.3	0.35	80	20	0	0	No	70+	LWD	10	n/a	-	n/a	C	MF	20	None	braided
5	3	1+85	G	-	-	0.35	0.14	0.17	0.11	0.14	3.8	2.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Watercourse #	Reach #	Distance (m)	Habitat Type****	Length (m)	Gradient (%)	Depth (m)				Avg. Width (m)			Pools (m)	Substrate Comp. (%)*				Spawning Gravel?	Total LWD Tally	Cover**				Off-channel Habitat	Riparian Veg.***			Barriers	Comments
						Bankfull	LU Wetted	CU Wetted	RU Wetted	Avg Water Depth	Bankfull	Wetted		F	G	C	B			Type 1	%	Type 2	%		Type	Stage	Canopy (%)		
5	3	1+96	G	16	-	0.3	0.08	0.1	0.16	0.11	5.3	4.3	n/a	60	40	0	0	No	20+	LWD	50	n/a		n/a	C	MF	5	-	-
5	3	2+04	G	-	-	1	0.12	0.09	0.12	0.11	5.5	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	4	2+12	G	24	-	1	0.12	0.12	0.12	0.12	10.3	2.8	n/a	n/a	n/a	n/a	n/a	No	20+	LWD	30	n/a		n/a	C	MF	1	LWD	-
5	4	2+24	G	-	-	0.5	0.06	0.14	0.06	0.09	3.8	1.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	4	2+36	G	30	-	0.5	0.15	0.23	0.16	0.18	4.5	3.4	n/a	60	40	0	0	No	30+	LWD	40	OV	50	Channel braids	M	MF	40	-	-
5	4	2+51	G	-	-	0.3	0.18	0.13	0.14	0.15	4	3.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Branch	-
5	4	2+66	G	17	-	0.3	0.14	0.16	0.1	0.13	2.4	1.2	0.26	50	50	0	0	Yes	30+	LWD	20	IV	15	n/a	M	YF	5	None	-
5	4	2+82	G	66	-	0.5	0.13	0.2	0.15	0.16	4	1.9	n/a	30	60	10	0	Yes	20+	IV	20	LWD/ U	10	n/a	M	YF	35	None	-
5	4	3+15	G	-	-	0.5	0.17	0.21	0.18	0.19	2	1.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-
5	4	3+48	G	7.5		0.8	0.13	0.19	0.11	0.14	2.7	2.1	n/a	5	80	15	0	No	0	Bridge	100	n/a	0	n/a	N	-	-	None	-
5	4	3+56	G	9	-	0.5	0.28	0.21	0.18	0.22	1.5	1.2	n/a	100	0	0	0	No	0	OV	20	DP	10	Ephemeral	M	YF	15	None	-
5	4	3+62	P	-	-	1	0.44	0.44	0.33	0.40	1.2	1.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-
5	4	3+65	R	64	-	0.7	0.21	0.24	0.18	0.21	0.6	1.6	n/a	40	40	20	0	No	0	OV	25	U	5	n/a	S	SH R	10	None	-
5	4	3+97	R	-	-	0.4	0.25	0.35	0.3	0.30	1.4	1.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	4	4+29	O	59	-	0.5	0.25	0.3	0.1	0.22	3.3	2.2	n/a	100	0	0	0	No	0	OV	15	IV	30	Wetland	S	SH R	30	None	Wetland
5	4	4+65	O	-	-	0.3	0.13	0.14	0.08	0.12	5	1.5	-	-	-	-	-	-	-	-	-	-	-	-	M	MF	n/a		Wetland - skunk cabage
5	5	4+88	G	21	0.5	0.4	0.09	0.2	0.26	0.18	5	1.6	n/a	10	70	20	0	Yes	4	OV	20	LWD/ U	15/20	n/a	M	MF	60	None	-
5	5	4+99	G	-	-	0.3	0.08	0.08	0.05	0.07	2.5	1.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	5	5+09	G	16	1	0.6	0.28	0.28	0.17	0.24	2.6	1.6	n/a	30	50	20	0	No	12	OV	20	LWD/ U	30/10	n/a	M	MF	20	None	-
5	5	5+17	G	-	-	0.5	0.28	0.28	0.3	0.29	2.6	1.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	5	5+25	R	4	-	0.4	0.12	0.12	0.22	0.15	1.7	1.7	n/a	0	10	15	75	No	1	OV	5	B	20	n/a	M	MF	30	None	-
5	5	5+29	P	8	-	0.5	0.32	0.32	0.17	0.27	4.8	2.7	0.38	20	30	40	10	No	8	LWD	20	DP	30	n/a	M	MF	15	None	-
5	5	5+33	P	-	-	0.6	0.38	0.38	0.37	0.38	10.1	7.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	5	5+37	G	8	-	0.3	0.06	0.08	0.11	0.08	1.9	1.1	n/a	0	0	85	15	No	0	Bridge	100	n/a	-	n/a	N	-	-	None	-
5	5	5+45	O	8	-	1	0.6	0.81	0.71	0.71	5.5	4	n/a	100	0	0	0	No	0	IV	20	n/a	-	n/a	W	n/a	2	None	Wetland
5	5	5+53	O	36	-	0.3	0.09	0.13	0.1	0.11	2.4	1	n/a	50	50	0	0	No	0	IV	20	OV	20	n/a	W / D	PS	1	None	Wetland with flow centralised in riffle-type watercourse
5	5	5+89	R	35	-	0.5	0.15	0.18	0.13	0.15	1.2	1.2	n/a	50	50	0	0	No	40+	LWD	40	OV	40	n/a	D	PS	0	None	-

Watercourse #	Reach #	Distance (m)	Habitat Type****	Length (m)	Gradient (%)	Depth (m)				Avg. Width (m)			Pools (m)	Substrate Comp. (%)*				Spawning Gravel?	Total LWD Tally	Cover**				Off-channel Habitat	Riparian Veg.***			Barriers	Comments
						Bankfull	LU Wetted	CU Wetted	RU Wetted	Avg Water Depth	Bankfull	Wetted		F	G	C	B			Type 1	%	Type 2	%		Type	Stage	Canopy (%)		
5	5	6+09	R	-	-	0.3	0.03	0.04	0.07	0.05	5.5	3.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	5	6+24	P	34	5	0.3	0.11	0.13	0.12	0.12	1.5	1.3	n/a	10	30	40	20	No	30	LWD	30	B	10	n/a	C	MF	80	None	Pool contains some turbulence due to protruding substrate (cobble) - "B" for cover primarily refers to "Cobble"
5	5	6+44	P	-	-	1.6	0.1	0.12	0.06	0.09	1.6	1.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Pool contains some turbulence due to protruding substrate (cobble)
5	5	6+58	R	79		1.8	0.05	0.06	0.03	0.05	2.4	1.2	n/a	20	40	30	10	No	40+	LWD	70	OV	30	n/a	D	PS	0	None	-
5	5	7+06	R	-	-	1.5	0.17	0.14	0.05	0.12	2.6	0.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	5	7+37	C	unknown	8	1.5	0.1	0.2	0.15	0.15	2.7	1.5	n/a	0	10	40	50	No	20+	LWD	15	OV	20	n/a	D	PS	40	None	-
Harlequin Creek	1	0+00	O	15	-	-	-	-	-	-	-	3.4	n/a	0	40	60	0	No	1	LWD	5	SWD	10	n/a	N	-	0	None	Intertidal fan - distance to low tide mark is 134 metres
Harlequin Creek	1	0+15	G	15	-	-	-	-	-	-	-	2.15	n/a	40	20	40	0	No	0	Bridge	100	n/a	-	n/a	N	-	0	-	-
Harlequin Creek	1	0+24	R	10	-	1.2	0.03	0.1	0.1	0.08	3.4	2.4	n/a	10	20	70	0	No	0	OV	7	SWD	8	n/a	S	SHR	1	None	confluence of Harlequin fr N and channel fr W
Harlequin Creek	1	0+35	P	3.5	-	3	0.39	0.14	0.05	0.19	1.7	1.65	Yes	60	40	0	0	No	1	OV	35	DP	15	n/a	M	YF	-	None	-
Harlequin Creek	1	0+38.5	R	5	-	2.4	0.08	0.09	0.06	0.08	2.5	2.5	n/a	20	50	30	0	No	-	OV	30	U	10	n/a	-	-	-	None	-
Harlequin Creek	1	0+43.5	G	7	-	2.4	0.12	0.18	0.03	0.11	2.5	2.2	n/a	40	40	20	0	No	0	OV	40	U	10	n/a	D	YF	40	None	-
Harlequin Creek	1	0+47	G	-	-	2.5	0.22	0.2	0.1	0.17	2.5	2.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Harlequin Creek	1	0+50.5	C	18.5	2.5	2	0.22	0.2	0.1	0.17	2.9	2.3	n/a	20	20	30	30	No	0	OV	25	U	10	n/a	M	YF	60	None	-
Harlequin Creek	1	0+59.75	C	-	-	1.7	0.17	0.2	0.22	0.20	2	0.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Harlequin Creek	1	0+69	G	42	-	1.2	0.1	0.15	0.15	0.13	3.2	2.4	n/a	15	50	30	5	No	0	OV	20	U	5	trib to wetland	S	SHR	50	None	-
Harlequin Creek	1	0+90	G	-	-	0.5	0.09	0.13	0.13	0.12	2.1	1.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Mark 090 trib draining wetland to Harlequin
Harlequin Creek	2	1+11	G	66	0.2	0.4	0.12	0.16	0.09	0.12	1.9	0.6	0.4	50	30	20	0	Yes	0	OV	20	U	5	n/a	D	PS	50	None	pool fed by wetland roughly 30m west
Harlequin Creek	2	1+44	G	-	-	0.15	0.05	0.05	0.04	0.05	4.2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	wetland roughly 63 metres long (south to north)
Harlequin Creek	3	1+77	R	56	0.5	0.7	0.1	0.08	0.11	0.10	2.2	4.8	n/a	15	40	35	10	Yes	5	OV		SWD	-	n/a	D	YF	25	None	-

Watercourse #	Reach #	Distance (m)	Habitat Type****	Length (m)	Gradient (%)	Depth (m)				Avg. Width (m)			Pools (m)	Substrate Comp. (%)*				Spawning Gravel?	Total LWD Tally	Cover**				Off-channel Habitat	Riparian Veg.***			Barriers	Comments
						Bankfull	LU Wetted	CU Wetted	RU Wetted	Avg Water Depth	Bankfull	Wetted		F	G	C	B			Type 1	%	Type 2	%		Type	Stage	Canopy (%)		
Harlequin Creek	3	2+05	R	-	-	0.4	0.07	0.02	0.13	0.07	3.7	3.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Harlequin Creek	3	2+33	G	5	-	0.8	0.11	0.12	0.09	0.11	3	2.7	n/a	40	35	25	0	Yes	0	SWD	40	U	20	n/a	D	YF		None	-
Harlequin Creek	3	2+35.5	P	-	-	1	0.24	0.2	0.09	0.18	2.2	1.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Harlequin Creek	3	2+38	R	25	-	0.5	0.08	0.09	0.12	0.10	2.3	2.1	n/a	20	30	50	0	Yes	0	OV	10	U	5	n/a	D	YF	60	None	-
Harlequin Creek	3	2+50.5	R	-	-	1	0.2	0.1	0.15	0.15	2.8	2.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Harlequin Creek	3	2+63	R	4.5	4	1	0.1	0.12	0.05	0.09	3.5	1.6	n/a	0	10	90	0	No	0	B	8	OV	2	n/a	D	YF	40	None	"B" for cover primarily refers to "Cobble"
Harlequin Creek	3	2+67.5	G	12.5	-	0.6	0.17	0.2	0.13	0.17	1.6	1.4	see Row 81	90	10	0	0	No	0	IV	10	n/a	-	n/a	D	YF	-	None	runs North; confluence w chan fr West
Harlequin Creek	3	2+73.75	P	-	-	0.7	0.22	0.37	0.5	0.36	3.8	3.4	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	fry observed in pool (coho & cutthroat)
Harlequin Creek	4	2+67.5w	C	25	10	0.3	0.1	0.08	0.05	0.08	3	1.5	0.32	15	60	0	25	No	10+	OV	-	SWD	-	n/a	M	MF	15	None	runs West; confluence w Glide-Pool running North
Harlequin Creek	4	2+80w	C	-	-	0.5	0.15	0.08	0.08	0.10	1.8	1.7	n/a	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Harlequin Creek	4	2+80	C	21	9	0.4	0.28	0.32	0.22	0.27	4	3.5	0.32	10	40	50	0	Yes	4	LWD		OV	-	Backwater pool	C	MF	90	Step	Riffle runs fr West
Harlequin Creek	4	2+91	C	-	-	-	-	-	-	-	-	-	0.48	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Harlequin Creek	3	2+80n	P	51	0	1	0.12	0.17	0.23	0.17	5	4.3	0.23	100	0	0	0	No	0	IV	10	OV	5	n/a	M	YF	80	None	pool backwaters to North
Harlequin Creek	3	2+80+25.5n	P	-	-	1.5	0.35	0.35	0.25	0.32	4.6	3	0.35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Harlequin Creek	4	3+01	C	9	-	0.4	0.05	0.05	0.1	0.07	4.3	3.3	0.1	30	50	20	0	No	3	LWD	30	OV	30	Backwater pool	C	MF	20	None	channel connects with Riffle Step fr 2+67.5
Harlequin Creek	4	3+10	P	4	-	0.5	0.05	0.1	0.2	0.12	15	14	0.2	40	50	10	0	No	-	SWD	20	OV	10	-	C	MF	20	None	connected to Riffle Step at 3+01
Harlequin Creek	4	3+14	R	8.5	-	0.3	0.05	0.12	0.15	0.11	4.5	3	n/a	20	60	20	0	No	2	SWD	20	OV	20	n/a	C	MF	45	None	-
Harlequin Creek	4	3+22.5	R	5	-	0.4	0.17	0.05	0.15	0.12	3.5	3.4	n/a	30	50	20	0	No	4	SWD		n/a		n/a	C	MF		None	braided
Harlequin Creek	4	3+27.5	C	18	13	0.5	0.1	0.2	0.03	0.11	3	3	n/a	5	15	80	0	No	7	LWD	15	SWD	10	n/a	M	MF	25	None	Mark 105 backwater fr meandering Riffle
Harlequin Creek	4	3+36.5	C	-	-	0.5	0.1	0.17	0.08	0.12	3	2.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Harlequin Creek	4	3+45.5	C	66	5	1.7	0.03	0.08	0.23	0.11	3.5	2.5	0.23	10	20	40	30	No	4	LWD	15	U	10	n/a	M	MF	60	Step	step - pool

Watercourse #	Reach #	Distance (m)	Habitat Type****	Length (m)	Gradient (%)	Depth (m)				Avg. Width (m)			Pools (m)	Substrate Comp. (%)*				Spawning Gravel?	Total LWD Tally	Cover**				Off-channel Habitat	Riparian Veg.***			Barriers	Comments
						Bankfull	LU Wetted	CU Wetted	RU Wetted	Avg Water Depth	Bankfull	Wetted		F	G	C	B			Type 1	%	Type 2	%		Type	Stage	Canopy (%)		
Harlequin Creek	4	3+78.5	C	-	-	2	0.25	0.05	0.15	0.15	3.8	2.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4-W	1	0+00	G	43	1	1.5	0.66	0.77	0.17	0.53	18	16	-	50	0	50	0	No	30+	LWD	20	U / B	5	-	C	MF	35	None	tidal influence on habitat type
4-W	1	0+22	G	-	-	1.5	0.55	0.6	0.45	0.53	12	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4-W	1	0+43	G	15	-	1.0	0.4	0.4	0.23	0.34	12	5.3	-	50	0	50	0	No	10+	LWD	15	U / B	2	-	C	MF	5	None	-
4-W	1	0+50	G	-	-	1.0	0.1	0.17	0.16	0.14	8.8	5.1	-	-	-	-	-	-	-	-	-	-	-	-	-	NA	-	-	-
4-W	2	0+58	R	14	2	0.7	0.08	0.1	0.05	0.08	8.0	3.0	-	10	10	80	0	No	35+	LWD	20	SWD	10	-	C	MF	5	None	-
4-W	2	0+65	R	-	-	0.5	0.08	0.05	0.07	0.07	4.5	3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	NA	-	-	-
4-W	2	0+72	G	16	-	0.6	0.15	0.16	0.12	0.14	5.5	3.5	-	40	0	60	0	No	20+	SWD	10	LWD	10	Backwater Pool-RUB -12m	C	MF	10	None	-
4-W	2	0+80	G	-	-	0.5	0.35	0.35	0.15	0.28	6.0	4.5	-	-	-	-	-	-	-	-	-	-	-	-	-	NA	1	-	-
4-W	2	0+88	R	2	-	1	0.08	0.12	0.05	0.08	7.0	3.5	-	50	0	40	10	No	3	-	-	-	-	-	C	MF	20	None	-
4-W	2	0+90	G	17	-	0.4	0.12	0.15	0.11	0.13	8.0	7.5	-	90	0	10	0	No	12	SWD	15	U	10	BR@1+100	C	INIT	2	None	-
4-W	2	0+99	G	-	-	1.0	0.28	0.4	0.35	0.34	5.5	4.7	-	-	-	-	-	-	-	-	-	-	-	BR@1+100	-	-	-	-	-
4-W	2	1+07	R	3	-	0.5	0.01	0.01	0.03	0.02	5.0	2.3	-	0	0	90	10	No	3	SWD	20	LWD	10	-	C	INIT	0	None	-
4-W	2	1+10	G	8	-	0.7	0.18	0.17	0.12	0.16	4.0	3.0	-	80	0	20	0	No	10+	LWD	40	OV	30	Backwater Pool@1+100 - 22m	C	INIT	0	None	-
4-W	2	1+14	G	-	-	0.5	0.15	0.18	0.18	0.17	6.0	2.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4-W	2	1+18	G	9	-	0.3	0.1	0.08	0.05	0.08	3	1.0	-	65	0	35	0	No	10+	SWD	50	IV	50	-	C	INIT	0	None	-
4-W	2	1+00	G	11	-	0.5	0.01	0.03	0.05	0.03	2.8	0.8	-	80	20	0	0	No	10+	LWD	15	SWD	15	BR@1+100		NA	0	None	-
4-E	1	0+00	R	4	2.5	1.8	0.06	0.08	0.06	0.07	11.0	4.0	-	10	0	50	40	No	0	U	5	-	-	-	C	MF	30	none	-
4-E	1	0+04	G	16	2	1.8	0.03	0.1	0.05	0.06	10	4	-	100	0	0	0	No	8	LWD	15	-	-	-	C	MF	80	none	-
4-E	1	0+12	G	-	-	1.6	0.08	0.1	0.13	0.10	11	3	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-
4-E	1	0+20	R	9	-	1.5	0.03	0.02	0.03	0.03	10.0	2.5	-	75	0	20	5	No	10+	LWD	40	OV	10	-	C	MF	20	none	-
4-E	1	0+25	R	-	-	1.3	0.08	0.1	0.1	0.09	11.0	2.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4-E	1	0+29	G	53	1.5	1.3	0.01	0.05	0.03	0.03	8.0	1.2	-	100	0	0	0	No	20	SWD	10	-	-	HFT@0+65	C	MF	50	none	acronym see Rob Harrison
4-E	1	0+56	G	-	-	1	0.05	0.02	0.08	0.05	10.0	2.5	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-
4-E	1	0+82	R	19	-	1.3	0.03	0.03	0.08	0.05	8.0	2.3	-	60	0	40	0	No	40+	LWD	50	SWD	30	-	C	MF	2	none	-
4-E	1	0+92	R	-	-	1.3	0.08	0.05	0.1	0.08	11.0	4.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4-E	1	1+01	O	19	-	1	0.1	0.05	0.05	0.07	7.0	2.8	-	85	0	10	5	No	15+	LWD	25	SWD	30	-	C	MF	30	none	Wetland with channelized glide-type flow

Watercourse #	Reach #	Distance (m)	Habitat Type****	Length (m)	Gradient (%)	Depth (m)				Avg. Width (m)			Pools (m)	Substrate Comp. (%)*				Spawning Gravel?	Total LWD Tally	Cover**				Off-channel Habitat	Riparian Veg.***			Barriers	Comments
						Bankfull	LU Wetted	CU Wetted	RU Wetted	Avg Water Depth	Bankfull	Wetted		F	G	C	B			Type 1	%	Type 2	%		Type	Stage	Canopy (%)		
4-E	1	1+10	O	-	-	0.03	0.03	0.03	0.03	0.03	14.0	9.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Wetland with channelized glide-type flow
4-E	1	1+20	O	2	2	0.7	0.05	0.01	0.01	0.02	4.5	2.5	-	0	50	50	0	No	0	-	-	-	-	sidechannel@1+20	C	MF	60	none	Wetland with flow channelized into riffle
4-E	1	1+20	G	18	-	0.5	0.05	0.9	0.01	0.32	4.6	1.6	-	-	-	-	-	No	20	LWD	40	SWD	10	-	C	MF	40	none	-
4-E	1	1+29	G	-	-	0.5	0.01	0.02	0.03	0.02	3.0	1.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4-E	1	1+38	O	13	-	1.6	0.08	0.08	0.01	0.06	4.0	2.2	-	100	0	0	0	No	10	LWD	30	-	-	-	C	MF	10	none	Wetland with glide-type flow
4-E	1	1+45	O	-	-	0.7	0.03	0.03	0.03	0.03	5.0	2.3	-	-	-	-	-	-	-	-		-	-	-	-	NA	-	-	Wetland with glide-type flow
4-E	1	1+51	O	28	-	0.7	<.01	<.01	<.01		3.5	2.0	-	100	0	0	0	No	30+	LWD	90	OV	50	-	-	-	-	none	Flow seeps from ground
4-E	1	1+20	R	15	-	0.8	0.01	0.03	0.04	0.03	2.5	1.3	-	100	0	0	0	No	15+	LWD	20	OV	30	-	-	-	-	none	seepage
4-E	1	1+35	O	-	-	1.7	-	-	-	-	4.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Dry channel
3-E	1	0+00	G	6.2	1	2	0.05	0.17	0.06	0.09	16.0	3.0	-	100	0	0	0	No	12	LWD	5	OV	10	-	M	MF	5	-	-
3-E	1	0+30	G	-	-	2	0.1	0.15	0.17	0.14	11.0	1.5	-	-	-	-	-	-	-	-	-	-	-	intertidal@east-8m	-	-	-	-	-
3-E	1	0+60	R	5	1		-	-	-	-	-	-	-	20	80	0	0	No	0	-	-	OV	10	-	M	MF	10	-	-
3-E	1	0+65	R	-	-	1.2	0.05	0.09	0.09	0.08	10.5	2.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3-E	1	0+69	G	16	1	1	0.05	0.08	0.05	0.06	8	1.5	-	80	0	20	0	No	3	OV	5	LWD	5	-	M	MF	5		-
3-E	1	0+70	G	-	-	1.2	0.12	0.1	0.08	0.10	8.0	3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3-E	1	0+80	R	15	3	1.1	0.05	0.1	0.1	0.08	6	3.3	-	0	20	80	0	No	11	IV	50	LWD	20	intertidal@east-15m	M	MF	5		-
3-E	1	0+85	R	-	-	1.2	0.05	0.08	0.09	0.07	6.0	0.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3-E	1	0+95	G	15	1	1.3	0.06	0.06	0.05	0.06	10	1.2	-	0	40	60	0	No	6	LWD	60	OV	10	-	M	MF	20		-
3-E	1	1+05	G	-	-	1	0.05	0.08	0.06	0.06	8.0	1.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3-E	1	1+10	R	15	1	1.5	0.08	0.1	0.06	0.08	10.0	1.8	-	0	20	80	0	No	12	LWD	60	OV	10	-	M	MF	5	-	-
3-E	1	1+20	R	-	-	1.5	0.05	0.08	0.05	0.06	10.0	0.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3-E	1	1+25	R	10	1.6	2.2	0.1	0.12	0.08	0.10	1.6	1.5	-	100	-	-	-	No	5	LWD	60	OV	10	-	C	MF	15	-	habitat type illegible
3-E	1	1+30	R	-		2	0.05	0.08	0.06	0.06	7.0	1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3-E	1	1+35	R	18	2	2	-	-	-	-	7	-	-	0	0	-	20	No	-	OV	60	-	-	-	C	MF	15	-	habitat type illegible, dry bed
3-E	1	1+53	O	End	-	-	-	-	-	-	-	-	-	Mossy bed				-	-	OV	60	LWD	10		C	MF	-		No flow; moss lines bottom of watercourse
3	-	0+00	G	20	2	2	0.25	0.35	0.2	0.27	8	2.5	-	40	0	60	0	No	3	LWD	5	-	-	-	C	MF	0	-	-
3	-	0+10	G	-	-	2	0.2	0.5	0.3	0.33	9	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Watercourse #	Reach #	Distance (m)	Habitat Type****	Length (m)	Gradient (%)	Depth (m)				Avg. Width (m)			Pools (m)	Substrate Comp. (%)*				Spawning Gravel?	Total LWD Tally	Cover**				Off-channel Habitat	Riparian Veg.***			Barriers	Comments
						Bankfull	LU Wetted	CU Wetted	RU Wetted	Avg Water Depth	Bankfull	Wetted		F	G	C	B			Type 1	%	Type 2	%		Type	Stage	Canopy (%)		
3	-	0+20	R	24	1	1.8	0.15	0.2	0.1	0.15	8	4	-	0	20	80	0	No	3	LWD	10	IV	10		C	MF	5	-	-
3	-	0+34	R	-	1	2	0.15	0.2	0.15	0.17	15	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	-	0+44	G	12	2	2	0.1	0.15	0.08	0.11	5	3	-	0	20	80	0	No	2	U / B	5	OV	10	west@0+55	C	MF	5	-	-
3	-	0+50	G	-	-	1.2	0.25	0.35	0.25	0.28	6	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	-	0+56	R	24	1	1.8	0.1	0.12	0.08	0.10	5	4	-	0	20	80	0	No	3	LWD	10	-	-	-	M	MF	20	-	-
3	-	0+68	R	-	-	2	0.08	0.2	0.05	0.11	4	3.5	-	0	20	80	0	No	-	-	-	-	-	-	-	-	-	-	-
3	-	0+80	R	20	2	1.5	0.05	0.12	0.08	0.08	5	3	-	0	80	20	0	No	10	LWD	20	-	-	-	M	MF	20	-	-
3	-	0+90	R	-	-	1.5	0.4	0.15	0.03	0.19	7	4	0.4	-	-	-	-	-	-	-	-	-	-	Intertidal @East-15m	-	-	-	-	scour pool
3	-	1+00	G	97	-	1.2	0.2	0.2	0.15	0.18	6	2.5	0.5	0	20	80	0	No	35	LWD	20	U / B	10	pool crest at 1+05	C	MF	30	-	
3	-	1+36	G	-	-	2	0.6	0.7	0.4	0.57	6	3.5	0.8	0	40	0	60	No	-	-	-	-	-	-	-	-	-	-	
3	-	1+97	P	23	-	3.5	0.9	1.1	0.7	0.90	11.2	8	1.2	90	0	0	10	No	20	LWD	30	OV	10	-	C	MF	30	-	Beaver Dam
3	-	2+10	P	-	-	3	0.8	1.2	0.9	0.97	11	9	-	90	0	0	10	No	-	-	-	-	-	-	-	-	-	-	Upstream connection to WC 2
2	1	0+00	R	4	1	1.6	0.15	0.25	0.1	0.17	16	3.5	-	0	20	80	0	No	2	IV	5	LWD	5	-	C	MF	5	-	-
2	1	0+02	R	-	-	1.6	0.1	0.2	0.12	0.14	16	3.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	1	0+04	G	19	1	1.2	0.1	0.15	0.1	0.12	14	3.5	-	90	10	0	0	No	4	IV	10	LWD	5	-	C	MF	15	-	-
2	1	0+13	G	-	-	2	0.2	0.4	0.15	0.25	12	4.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	1	0+23	R	37	2	2	0.15	0.2	0.12	0.16	15	4.5	0.4	0	60	40	0	Yes	7	LWD	20	-	-	tidal pool-east-20m	C	MF	30	-	trimble dropped out, scour pool@0+42
2	1	0+50	R	-	-	2	0.1	0.15	0.08	0.11	17	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	1	0+60	G	5	1	1.5	0.2	0.2	0.35	0.25	8	6	-	50	50	0	0	Yes	5	LWD	20	-	-	-	C	MF	80	-	step pool
2	1	0+63	G	-	-	0.8	0.15	0.2	0.1	0.15	7	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	1	0+65	G	7	1	0.7	0.1	0.2	0.25	0.18	5	3.5	-	30	70	0	0	Yes	8	LWD	20	-	-	-	C	MF	75	-	log step pool
2	1	0+72	G	21	1	2	0.7	0.5	0.7	0.63	5	4	-	40	60	0	0	Yes	5	LWD	20	U / B	10	-	M	MF	50	-	Beaver Dam
2	1	0+93	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	1	0+93	G	28	0	3	0.5	0.4	0.3	0.40	7	6	-	0	50	50	0	Yes	5	OV	20	-	-	-	M	MF	30	-	-
2	1	1+21	G	33	0	3	0.6	0.74	0.35	0.56	6	5.5	-	0	60	40	0	No	4	-	-	-	-	-	-	-	-	-	-
2	1	1+54	P	5	0	4.5	0.9	1.3	0.8	1.00	12.5	11	-	0	40	60	0	No	7	LWD	20	U	10	-	M	MF	30	-	-
2	1	1+59	G	50	0	4	0.6	0.7	0.6	0.63	6	5.2	-	0	40	60	0	No	20	OV	20	-	-	-	-	-	-	-	-
2	1	2+09	G	48	0	2	0.3	0.3	0.7	0.43	6.5	6.2	-	0	40	60	0	Yes	0	OV	20	-	-	-	M	YF	20	-	-
2	1	2+57	G	5	0	3	0.65	0.7	0.6	0.65	5.5	5.3	-	50	0	50	0	No	10	OV	20	LWD	20	-	M	YF	40	-	-

Watercourse #	Reach #	Distance (m)	Habitat Type****	Length (m)	Gradient (%)	Depth (m)				Avg. Width (m)			Pools (m)	Substrate Comp. (%)*				Spawning Gravel?	Total LWD Tally	Cover**				Off-channel Habitat	Riparian Veg.***			Barriers	Comments
						Bankfull	LU Wetted	CU Wetted	RU Wetted	Avg Water Depth	Bankfull	Wetted		F	G	C	B			Type 1	%	Type 2	%		Type	Stage	Canopy (%)		
2	1	2+62	P	10	0	3	0.5	0.6	0.5	0.53	17	15	-	0	50	50	0	No	-	-	-	-	-	-	-	-	-	-	-
2	1	2+72	G	48	0	3	0.5	0.6	0.5	0.53	6.5	6.3	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-	-	-
2	1	3+20	G	88		3	0.7	0.8	0.6	0.70	5.3	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	1	4+08	G	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	culvert	convergence to #3 groundwater-fed watercourse west
2	-	4+08	P	16	-	3	0.7	0.8	0.75	0.75	8	7.5	-	0	0	80	20	No	10	LWD	20	OV	10	-	M	YF	20		-
2	-	4+24	G	10	-	4	1.3	1.1	1.25	1.22	4	4	-	-	-	-	-	-	-	-	-	-	-	Spur-North-5@2+33	-	-	-	-	-
2	-	4+34	P	31	-	3	1.1	1.4	1	1.17	11	10	-	0	0	40	60	No	6	LWD	5	-	-	Spur-South-5@2+48	-	-	-	-	-
2	-	4+65	G	155	-	3	0.8	0.9	1	0.90	4.5	4	-	0	40	60	0	No	7	-	-	-	-	Spur-South-3@2+88	M	YF	60		-
2	-	5+31	G	-	-	4	0.7	0.95	0.9	0.85	6	3.5	-	0	40	60	0	No	16	LWD	-	-	-	Spur-South-3@3+40	-	-	-	-	-
2	-	5+61	G	-	-	4	0.5	0.65	0.65	0.60	10	4	-	-	-	-	-	-	8	-	-	-	-	-	-	-	-	-	-
2	-	5+77	G	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-	Spur-North-3@3+379	M	PS	10	-	-
2	-	6+05	G	-	-	4	0.5	0.35	0.3	0.38	7	5	-	50	50	0	0	Yes		-	-	-	-	-	-	-	-	-	-
2	-	6+20	O	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	Culvert
2	Upper	0+00	G	21	-	0.85	0.65	0.82	0.85	0.77	10	10	-	90	0	0	10	No	12	LWD	10	B	10	-	D	PS	1	Beaver dam	-
2	Upper	0+11	G	21	-	0.91	0.82	0.91	0.81	0.85	9	9	-	90	0	0	10	No	-	-	-	-	-	-	-	-	-	-	-
2	Upper	0+21	P	28	2	1.08	1.08	1.06	1.06	1.07	11	11	-	90	5	0	5	No	2	IV	5	LWD	<5	-	D	PS	< 1	-	-
2	Upper	0+35	P	28		1.7	1.64	1.67	1.7	1.67	16	16	-	90	5	0	5	No	-	-	-	-	-	-	D	PS	0	-	sparse riparian veg
2	Upper	0+49	G	106	1	1.5	1.26	1.49	1.5	1.42	8	8	-	75	0	20	5	No	25	LWD	10	IV	1	-	-	-	-	-	-
2	Upper	1+55	G	83	1	1.2	0.9	1.2	1.07	1.06	6	6	-	75	0	20	5	No	40	LWD	15	-	-	-	D	PS	0	-	LWD log jam 8x12m
2	Upper	2+38	G	60	-	-	-	-	-	-	-	-	-	75	0	20	5	No	-	-	-	-	-	-	-	-	-	-	-
2	Upper	2+98	G	68	1	1.36	1	1.36	0.93	1.10	6	6	-	70	5	10	15	No	2	IV	5	B & LWD	5 & 6	-	D	PS	0	-	sparse riparian veg
2	Upper	3+32	G	68	1	1	0.8	1	0.86	0.89	5	5	-	70	5	10	15	No	2	-	-	-	-	-	D	PS	0	-	sparse riparian veg
2	Upper	3+66	G	54	1	0.46	0.46	0.44	0.38	0.43	4	4	-	5	50	30	15	Yes	-	-	-	-	-	-	-	-	-	-	-
2	Upper	3+93	G	54	1	0.47	0.47	0.43	0.45	0.45	4.1	4.1	-	5	50	30	15	Yes	-	-	-	-	-	-	-	-	-	-	-
2	Upper	4+20	G	14	-	0.46	0.45	0.46	0.37	0.43	3.65	3.65	-	5	40	45	10	No	-	C	10	B	5	-	N	NA	0	v	-

Watercourse #	Reach #	Distance (m)	Habitat Type****	Length (m)	Gradient (%)	Depth (m)				Avg. Width (m)			Pools (m)	Substrate Comp. (%)*				Spawning Gravel?	Total LWD Tally	Cover**				Off-channel Habitat	Riparian Veg.***			Barriers	Comments
						Bankfull	LU Wetted	CU Wetted	RU Wetted	Avg Water Depth	Bankfull	Wetted		F	G	C	B			Type 1	%	Type 2	%		Type	Stage	Canopy (%)		
2	Upper	4+27	G	14	-	0.39	0.39	0.34	0.3	0.34	2.7	2.7	-	5	40	45	10	No	-	C	10	B	5	-	N	NA	0		-
2	Upper	4+34	R	15	3	0.17	0.17	0.11	0.09	0.12	1.7	1.7	-	0	10	80	10	No	-	C	10	B	5	-	N	NA	0	-	-
2	Upper	4+42	R	15	3	0.19	0.19	0.17	0.08	0.15	1.7	1.7	-	0	10	80	10	No	-	C	12	B	3	-	N	NA	0	-	-
2	Upper	4+49	G	33	2	0.22	0.22	0.2	0.08	0.17	2.3	2.3	-	5	60	30	5	Yes	3	LWD	2	C	3	-	N	NA	0	-	Marginal spawning gravel
2	Upper	4+65	G	33	2	0.26	0.26	0.25	0.26	0.26	2.35	2.35	-	5	60	30	5	No	3	LWD	2	C	3	-	N	NA	0	-	-
2	Upper	4+82	R	5	10	0.13	0.13	0.09	0.12	0.11	3	3	-	0	15	45	40	No	-	B	7	C	3	-	N	NA	0	-	-
2	Upper	4+87	G	37	2	0.28	0.28	0.24	0.25	0.26	4.2	4.2	-	55	30	10	5	No	-	LWD	3	B	1	-	N	NA	0	-	marginal grasses & red alder PS
2	Upper	5+06	G	37	2	0.42	0.4	0.42	0.41	0.41	3.6	3.6	-	55	30	10	5	No	15	LWD	3	B	1	-	N	NA	0	-	-
2	Upper	5+24	R	40	3	0.07	0.07	0.04	0.06	0.06	4.3	2.8	-	0	10	60	30	No	1	-	-	-	-	-	N	NA	0	-	-
2	Upper	5+44	R	40	3	0.04	-	0.04	-	0.04	5.1	0	-	0	10	60	30	No	-	-	-	-	-	-	N	NA	0	-	watercourse dry
2	Upper	5+64	C	36	11	-	-	-	-	-	3.9	0	-	-	-	-	-	No	-	-	-	-	-	-	N	NA	0	-	watercourse dry

Notes:
*Substrate Composition: F – Fines, G – Gravel, C – Cobble, B - Boulder
**Cover: LWD – Large Woody Debris, SWD – Small Woody Debris, B – Boulders, C – Cobble, OV – Overhanging Vegetation, U – Undercut
*** Riparian Vegetation Stage: MF – Mature Forest, YF – Young Forest, PS - Pole-sapling Stage, NA – Not Applicable, INIT – Initial - Non-vegetated or Initial Stage (following disturbance)
***Riparian Vegetation Type: N - None, M -Mixed Forest, D – Deciduous Forest, C - Coniferous Forest, S - Shrub
****Habitat Type: R - Riffle, G – Glide, P – Pool, O - Off

Table A-3: Electrofishing (EF) site description, location and habitat characteristics

Watercourse	Site #	Description	Northing (m) ****	Easting (m) ****	Habitat Type*	Avg. Width (m)	Avg. Depth (m)	Substrate (%) **	Cover (Dom/Sub-dom) ***
McNab Creek	MC1	Mainstem section of McNab Creek near northwest corner of Project area.	5491147.1	471608.5	R	-	0.25 / 0.35	60% C, 30% G, 10% B	low – B
	MC2	Small side-channel/off-channel located on downstream end of bend in mainstem near northwest corner of Project area.	5491102.9	471690.9	R/G/P	-	0.15 / 0.30	80% G, 10% F, 5% C, 5% B	low to mod – P / OV & Bs
	MC3	Small side-channel/off-channel located on downstream end of bend in mainstem near northeast corner of Project area.	5490888.0	472135.0	R/G/P	-	0.25 / 0.6	40% G, 40% C, 10% B, 10% F	mod – P / B & WD & U
	MC4	Alcove pool along margin of mainstem.	5490507.4	472217.1	G/P	-	0.4 / 1.1	60% C, 10% B, 30% G	mod – WD / B & U
	MC5	Seasonally isolated off-channel pool on cobble bar ~100 m north of hydro RoW.	5490324.7	472336.6	P	-	0.25 / 0.35	60% C, 30% G, 10% B	low - B
Lower Segment of WC 2 (Constructed Groundwater-fed Watercourse)	1	Lower section of WC 2 downstream of old shed and near bend to south.	5490270.0	472081.5	G/P	5.5 / 6.5	0.43 / 2.0	60% C, 40% G	low - OV
	7	Lower section of WC 2 near old shed.	5490251.0	472012.0	G/P	5.0 / 6.5	0.6 / 1.0	80% G, 10% C, 10% F	mod to high - WD / OV.
Upper Segment of WC 2 (Constructed Groundwater-fed Watercourse)	8	Headwaters of WC 2. Riffle-pool section of watercourse.	5490609.9	471692.9	G/R	2.8 / 2.8	0.29 / 0.33	46% C, 40% G, 10% B, 4% F	low - B / LWD
	9	Near headwaters of WC 2. Riffle-pool section of watercourse.	5490609.9	471692.9	R/G/P	4.0 / 4.0	0.15 / 0.35	40% C, 40% G, 20% B	low - B / WD
	1A	Watercourse 2 ~100 m upstream of access road culvert. Backwater pool section of watercourse.	5490295.1	471692.4	G/P	-	0.9 / 1.2	80% F, 10% G, 5% C	low to mod - WD / B & OV.
Natural Watercourse (WC3)	3	Lower portion of watercourse, upstream of tidal influence.	5490138.5	471921.2	G	3.5 / 6.0	0.57 / 2.0	60% B, 40% G	high - LWD / U & B
Natural Watercourse (WC4-W)	5	Headwaters of watercourse.	5490042.3	471806.2	G	3.5 / 5.5	0.14 / 0.6	60% C, 40% F	mod - SWD / LWD
Harlequin Creek	6	Creek along west side of road RoW.	5489936.5	471325.4	R/G/P	2.4 / 3.1	0.1 / 0.3	80% G, 10% C, 10% F	mod - OV. / WD & Ps
	10	Upper section of creek near road and hydro RoW.	5490002.0	471177.8	C	2.5 / 3.8	0.15 / 2.0	40% C, 30% B, 20% G, 10% F	mod - LWD / U
Southwest Watercourse (WC5)	2	Watercourse section within hydro RoW between access roads.	5490141.4	471397.6	O	2.2 / 3.3	0.22 / 0.5	100% F	high - IV / OV

Watercourse	Site #	Description	Northing (m) ****	Easting (m) ****	Habitat Type*	Avg. Width (m)	Avg. Depth (m)	Substrate (%) **	Cover (Dom/Sub-dom) ***
	4	Section of watercourse downstream of hydro RoW and access road.	5490099.2	471525.6	G	1.9 / 4.0	0.16 / 0.5	60% G, 30% F, 10% C	mod - IV / LWD & U
	11	Section of watercourse upstream of access road and wetland area.	5490164.3	471322.8	O	1.3 / 2.4	0.11 / 0.3	50% F, 50% G	mod - IV / OV
	12	Section of ditch along west side of access road.	5490205.5	471334.8	O	4.0 / 5.5	0.71 / 1.0	100% F	mod - IV
Northwest Watercourse (WC10)	14	Ephemeral watercourse west of access road receiving flows from west slope.	5490994.9	471439.8	R	0.96 / 1.21	0.08 / 0.21	100% F	low - OV / SWD
Northwest Watercourse (WC14)	13	Ephemeral ditch along west side of access road.	5491244.8	471417.3	O	0.97 / 1.87	0.13 / 0.13	100% F	mod - IV / SWD

* Habitat Type: R - Riffle, G – Glide, P – pool, O - Overhang
** Substrate: F – Fines, G – Gavel, C – Cobble, B – Boulder
*** Cover: SWD – Small Woody Debris, P – Pools, B – Boulders, OV – Overhanging Vegetation, IV - Instream Vegetation, mod – moderate
**** Easting and Northing taken from center of electrofishing site area

Table A-4: Electrofishing (EF) Sampling Settings and Effort 2010-2012

Date	Watercourse	EF Site	Length (m)	Avg. Width (m)	Approx. Area (mP^2P)	Pass	Effort (sec)	Voltage (V)	Current (Hz)	Pulse (milliseconds)
9-Sept-10	Upper Segment of WC 2 (Constructed Groundwater-fed Watercourse)	1A	49	6	294	1	936	600	50	6
						2	442	600	50	6
	Upper Segment of WC 2 (Constructed Groundwater-fed Watercourse)	9	92	4	368	1	882	600	50	6
						2	720	600	50	6
16-Sept-10	McNab Creek	MC1	15.5	5.5	86	1	543	700	50	6
						2	438	700	50	6
		MC2	43	3.5	151	1	890	800	50	6
						2	628	800	50	6
		MC3	29	4	116	1	882	600	50	6
						2	720	600	50	6
	Harelquin Creek	6	37	2.3	85	1	1393	700	50	6
23-Sept-10	McNab Creek	MC4	24	10.5	252	1	724	900	60	6
						2	499	900	60	6
		MC5	35	7	245	1	990	900	60	6
	Lower Segment of WC2 (Constructed Groundwater-fed Watercourse)	7	32	10	320	1	720	700	60	6
						2	633	700	60	6
18-Aug-11	Lower Segment of WC2 (Constructed Groundwater-fed Watercourse)	1	60	5.5	330	1	1005	500	40	7
						2	898	500	40	7
						3	798	500	40	7
31-Aug-11	Southwest Watercourse (WC5)	2	100.0	1.0	100	1	943	500	70	7
						2	545	500	70	7
						3	328	500	70	7
8-Sep-11	Natural Watercourse (WC3)	3	50	2	100	1	947	500	50	5
			60	2	120	2	611	500	50	5
9-Sep-11	Southwest Watercourse (WC5)	4	43.8	1	43.8	1	547	500	50	5
						2	451	500	50	5
						3	391	500	50	5
	Natural Watercourse (WC4-W)	5	36.7	3.2	117	1	496	500	50	5
16-Sep-11	Lower Segment of WC 2 (Constructed Groundwater-fed Watercourse)	7	55	5	275	1	1106	800	50	5
						2	859	800	50	5
						3	953	800	50	5
	Upper Segment of WC 2 (Constructed Groundwater-fed Watercourse)	8	72	4.3	310	1	1192	800	50	5
						2	967	800	50	5

Date	Watercourse	EF Site	Length (m)	Avg. Width (m)	Approx. Area (mP^2P)	Pass	Effort (sec)	Voltage (V)	Current (Hz)	Pulse (milliseconds)
23-Sep-11	Harlequin Creek	6	85.0	1.6	136	1	796	n/a	n/a	n/a
						2	759	n/a	n/a	n/a
						3	743	n/a	n/a	n/a
05-Oct-11	Upper Segment of WC 2 (Constructed Groundwater-fed Watercourse)	9	30.0	5.0	150	1	553	600	40	5
						2	239	600	40	5
						3	335	600	40	5
06-Oct-11	Harlequin Creek	6	85.0	2.1	178.5	1	2551	n/a	n/a	n/a
						2	1190	n/a	n/a	n/a
27-Oct-11	Harlequin Creek	10	52.0	2.0	104	1	326	500	70	5
						2	272	500	70	5
						3	259	500	70	5
	Southwest Watercourse (WC5)	11	35.0	1.3	46	1	203	600	70	5
						2	224	600	70	5
						3	168	600	70	5
		12	30.0	3.0	90	1	314	500	70	5
						2	318	500	70	5
						3	264	500	70	5
15-Feb-12	Lower Segment of WC 2 (Constructed Groundwater-fed Watercourse)	7	51.0	5.0	255	1	928	600	50	6
						2	774	600	50	6
						3	897	600	50	6
	Upper Segment of WC 2 (Constructed Groundwater-fed Watercourse)	8	83.0	4.3	357	1	644	600	50	6
						2	568	600	50	6
						3	491	600	50	6
21-Feb-12	Northwest Watercourse (WC 14)	13	98.0	1.7	162	1	545	600	50	6
						2	638	600	50	6
	Northwest Watercourse (WC 10)	14	71.0	2.3	160	1	479	600	50	6
						2	450	600	50	6
22-Feb-12	Southwest Watercourse (WC5)	4	44.0	2.3	101	1	737	700	50	6
						2	729	700	50	6
	Natural Watercourse (WC3)	3	60.0	2.0	120	1	1013	700	50	6
						2	767	700	50	6
29-Feb-12	Harlequin Creek	6	85.0	2.0	170	1	565	600	50	6
						2	494	600	50	6
						3	417	600	50	6
		10	52.0	1.8	94	1	295	600	50	6
						2	233	600	50	6
						3	204	600	50	6

Notes: Hz – Hertz, sec – seconds, EF – Electrofishing, Approx. – approximate, Avg. - Average

Table A-5: Summary of Electrofishing (EF) Sampling Effort, 2010 to 2012

Year	Site #	# Passes	EF seconds	Sample Area (m^2)
Summer 2010	1	2	1378	294
	6	1	1393	85
	7	2	1353	320
	8	2	1602	368
	MC1	2	981	86.
	MC2	2	1518	151
	MC3	2	1602	116
	MC4	2	1223	252
	MC5	1	990	245
Summer 2010 Total		**16**	**12040**	**1917**
Avg±SD		**1.8±0.4**	**1338±234**	**213±106**
Summer 2011	1	3	2701	330
	2	3	1816	100
	3	2	1558	120
	4	3	1389	44
	5	1	496	117
	6	5*	6039*	315*
	7	3	2918	275
	8	2	2159	310
	9	3	1127	150
	10	3	857	104
	11	3	595	45.5
	12	3	896	90
Summer 2011 Total		**34**	**22551**	**1864**
Avg±SD		**2.8±0.9**	**1879±1526**	**155±98**
Winter 2012	3	2	1780	120
	4	2	1466	101
	6	3	1476	170
	7	3	2599	255
	8	3	1703	357
	10	3	732	93.6
	13	2	1183	162
	14	2	929	160
Winter 2012 Total		**20**	**11868**	**1418**
Avg±SD		**2.5±0.5**	**1484±579**	**177±89**

* Summary of sampling effort from two different dates

Table A-6: Electrofishing fish capture numbers and length data, 2010 to 2012

Watercourse	Site #	Date	Species*	# Captured	Min Length (mm)	Max Length (mm)	Avg Length (mm)	SD of Length (mm)
SUMMER								
McNab Creek	MC1	2010	CT	1	99	99	99	n/a
			SC	2	n/a	n/a	n/a	n/a
	MC2	2010	CO	7	55	62	58	2
			CT	8	55	65	59	3
			SC	12	79	107	92	8
	MC3	2010	CO	10	55	82	71	9
			CT	13	56	132	84	22
			SC	5	86	146	108	33
	MC4	2010	CO	18	65	86	76	6
			CT	3	87	182	132	48
			SC	9	32	91	69	20
	MC5	2010	CO	64	n/a	n/a	n/a	n/a
			CT	1	n/a	n/a	n/a	n/a
Upper Segment of WC 2 (Constructed Groundwater-fed Watercourse)	1A	2010	CO	14	56	75	64	6
			SC	5	71	135	95	24
	9	2010	CO	15	56	66	60	4
			CT	20	45	105	69	19
			SC	5	52	78	65	18
		2011	CO	22	53	82	63.6	7.6
			CT	4	88	105	94.3	7.4
			SC	3	56	94	69.7	21.1
Upper Segment of WC 2 (Constructed Groundwater-fed Watercourse)	8	2011	CO	124	50	73	61.6	6.0
			CT	22	37	115	73.2	29.0
			SC	11	n/a	n/a	n/a	n/a
Lower Segment of WC 2 (Constructed Groundwater-fed Watercourse)	7	2010	CO	11	68	82	76	5
			SC	3	115	115	115	n/a
		2011	CO	59	54	88	67.0	8.3
			CT	1	90	90	90.0	n/a
			SC	39	58	165	98.9	23.5
			TSB	1	60	60	60.0	n/a
	1	2011	CO	4	52	70	59.5	7.5
			SC	11	46	113	78.5	21.8

Watercourse	Site #	Date	Species*	# Captured	Min Length (mm)	Max Length (mm)	Avg Length (mm)	SD of Length (mm)
Harlequin Creek	6	2010	CT	31	n/a	n/a	n/a	n/a
			SC	1	n/a	n/a	n/a	n/a
		2011	CH	1	73	73	73.0	n/a
			CO	10	45	70	57.5	9.6
			CT	174	31	155	68.9	22.9
			SC	9	80	119	102.0	13.1
	10	2011	CT	28	50	170	100.2	28.8
Southwest watercourse (WC5)	4	2011	CO	18	39	82	64.2	8.8
			CT	53	39	144	73.9	22.9
			SC	17	53	100	68.2	13.6
	2	2011	CO	27	48	84	63.9	7.5
			CT	39	31	145	91.4	22.1
			SC	10	60	107	83.0	14.9
	11	2011	CT	7	64	76	69.7	4.8
	12	2011	CO	8	72	109	83.5	11.0
			CT	49	68	165	109.9	20.6
Natural groundwater-fed watercourse (WC3)	3	2011	CO	84	51	98	68.3	12.7
			SC	24	n/a	n/a	n/a	n/a
Natural groundwater-fed watercourse (WC4-W)	5	2011	CO	25	48	82	68.3	7.7
			SC	12	33	102	67.9	23.5
WINTER								
WC 2 (Constructed Groundwater-fed Watercourse)	8	2012	CO	59	45	94	70	10
			CT	8	56	180	105	37
			SC	4	85	92	89	3
WC 2 (Constructed Groundwater-fed Watercourse)	7	2012	CO	41	51	105	69	11
			SC	9	72	110	91	12
Harlequin Creek	6	2012	CT	69	42	170	75	27
			SC	1	76	76	76	n/a
Southwest watercourse (WC5)	4	2012	CO	29	58	100	79	12
			CT	36	52	132	87	23
			SC	9	60	90	72	9
Natural groundwater-fed watercourse (WC3)	3	2012	CO	29	59	90	70	8
			SC	10	35	123	94	31
Northwest watercourse (WC14)	13	2012	NFC	2	n/a	n/a	n/a	n/a
Northwest watercourse (WC10)	14	2012	NFC	2	n/a	n/a	n/a	n/a

Notes: CH-Chinook Salmon, CM-Chum Salmon, CO - Coho Salmon, CT-Cutthroat Trout, SC-Sculpin, TSB-Three-spined Stickleback

Table A-7: Electrofishing number of fish species captured by watercourse, 2010-2012

Watercourse #	Species*	2010	2011	2012
McNab Creek	CO	105	0	0
	CT	34	0	0
	SC	58	0	0
	Total	**197**	**0**	**0**
WC 2 - Upper	CO	33	146	59
	CT	21	26	8
	SC	10	14	4
	Total	**43**	**186**	**71**
WC 2 - Lower	CO	18	63	41
	CT	0	1	0
	SC	9	50	9
	Total	**27**	**114**	**50**
Harlequin Creek	CH	0	1	0
	CO	0	10	0
	CT	45	202	83
	SC	0	9	1
	SC	4	0	0
	Total	**49**	**222**	**84**
#5	CO	0	53	29
	CT	0	148	36
	SC	0	27	9
	Total	**0**	**228**	**74**
#3	CO	0	84	29
	SC	0	24	10
	Total	**0**	**108**	**39**
#4-W	CO	0	25	0
	SC	0	12	0
	Total	**0**	**37**	**0**
#14	NFC	0	0	0
#13	NFC	0	0	0

Notes: NFC – No Fish Caught

Table A-8: Fish population Estimates and Densities for Electrofishing Sites

Watercourse	Site # (2011)	Date	Species	# fish	# passes	Pop Est*	SE*	ChiSq*	P*	Low – CI*	Upper – CI*	Area (m^2)	Density (fish/m^2)
McNab Creek	MC1	2010	Cutthroat	1	2	1	n/a	n/a	n/a	n/a	n/a	85	0.012
	MC2	2010	Coho	7	2	7	0.4	n/a	0.87	7	7	151	0.046
	MC2	2010	Cutthroat	8	2	8	0.0	n/a	1.00	8	8	151	0.053
	MC3	2010	Coho	16	2	24	14.6	n/a	0.40	17	101	116	0.207
	MC3	2010	Cutthroat	13	2	13	1.0	n/a	0.81	13	13	116	0.112
	MC4	2010	Coho	18	2	18	1.2	n/a	0.81	18	26	252	0.071
	MC4	2010	Cutthroat	3	2	3	0.7	n/a	0.75	3	3	252	0.012
	MC5	2010	Coho	64	1	64	n/a	n/a	n/a	n/a	n/a	245	0.261
	MC5	2010	Cutthroat	1	1	1	n/a	n/a	n/a	n/a	n/a	245	0.004
WC 2 - Upper	8	2011	Coho	124	2	160	19.3	n/a	0.52	138	220	275	0.582
	8	2011	Cutthroat	22	2	32	14.4	n/a	0.43	24	101	275	0.116
	9	2011	Coho	22	3	22	1.0	8.9	0.00	22	22	150	0.147
	9	2011	Cutthroat	4	3	4	0.5	2.8	0.10	4	4	150	0.027
	1A	2010	Coho	14	2	14	0.3	n/a	0.93	14	14	294	0.048
	1A	2010	Cutthroat	0	2	0	n/a	n/a	n/a	n/a	n/a	294	0.000
	8/9	2010	Coho	19	2	20	2.1	n/a	0.74	20	31	368	0.054
	8/9	2010	Cutthroat	20	2	20	0.2	n/a	0.95	20	20	368	0.054
WC 2 - Lower	1	2011	Coho	4	3	4	0.0	0.0	1.00	4	4	330	0.012
	1	2011	Cutthroat	4	3	0	n/a	n/a	n/a	n/a	n/a	330	0.000
	7	2010	Cutthroat	0	2	0	n/a	n/a	n/a	n/a	n/a	320	0.000
	7	2010	Coho	18	2	30	20.0	n/a	0.37	20	124	320	0.094
	7	2011	Coho	59	3	59	n/a	n/a	n/a	n/a	n/a	136	0.434
	7	2011	Cutthroat	1	3	1	n/a	n/a	n/a	n/a	n/a	137	0.007
Harlequin Creek	6	2010	Coho	0	1	0	n/a	n/a	n/a	n/a	n/a	85	0.000
	6	2010	Cutthroat	3	1	3	n/a	n/a	n/a	n/a	n/a	85	0.035
	6	2011	Coho	10	3	14	8.1	1.8	0.18	11	59	315	0.044
	6	2011	Cutthroat	174	3	200	11.1	11.1	0.00	186	232	315	0.636
	10	2011	Cutthroat	28	3	39	12.2	1.8	0.18	30	91	104	0.374
WC 5	2	2011	Coho	27	3	30	3.3	0.3	0.61	28	44	100	0.295
	2	2011	Cutthroat	39	3	39	1.0	1.2	0.28	39	45	100	0.391
	4	2011	Coho	18	3	19	1.8	4.3	0.04	19	29	44	0.426
	4	2011	Cutthroat	53	3	65	9.3	0.4	0.54	57	99	44	1.479
	11	2011	Cutthroat	7	3	8	2.9	1.0	0.32	8	25	46	0.172
	12	2011	Coho	8	3	8	0.1	0.2	0.69	8	8	90	0.089
	12	2011	Cutthroat	49	3	58	7.4	1.2	0.27	52	85	90	0.647

Watercourse	Site # (2011)	Date	Species	# fish	# passes	Pop Est*	SE*	ChiSq*	P*	Low – CI*	Upper – CI*	Area (m^2)	Density (fish/m^2)
WC 3	3	2011	Coho	84	2	116	21.6	n/a	0.47	94	190	120	0.967
WC 4-W	5	2011	Coho	25	1	25	n/a	n/a	n/a	n/a	n/a	117	0.214
Winter Sampling													
WC 2 - Upper	8	2012	Coho	59	3	134	84.4	1	0.32	72	500	357	0.376
	8	2012	Cutthroat	8	3	10	4.3	2.62	0.11	9	34	357	0.027
WC 2 - Lower	7	2012	Coho	41	3	41	n/a	n/a	n/a	n/a	n/a	255	0.161
	7	2012	Cutthroat	0	3	0	n/a	n/a	n/a	n/a	n/a	255	0.000
WC 5	4	2012	Coho	29	2	29	1.2	n/a	0.84	29	36	101	0.287
	4	2012	Cutthroat	36	2	44	8.3	n/a	0.56	38	78	101	0.436
Harlequin Creek	6	2012	Cutthroat	69	3	177	126	1.2	0.28	87	730	170	1.042
	6	2012	Coho	0	3	0	n/a	n/a	n/a	n/a	n/a	170	0.000
	10	2012	Cutthroat	14	3	20	9.82	4.32	0.0378	15	70	94	0.211
WC 14	13	2012	no fish	0	2	0	n/a	n/a	n/a	n/a	n/a	162	0
WC 10	14	2012	no fish	0	2	0	n/a	n/a	n/a	n/a	n/a	160	0
WC3	3	2012	Coho	29	2	32	3.6	n/a	0.68	30	48	120	0.267

* Population estimate statistics from CAPTURE 2 program, version v.90210.1141. Population estimate did not isolate specific habitat types.
Note: n/a = not available due to lack of fish capture data or could not be calculated due to poor distribution of capture data between passes (e.g., higher capture numbers in passes 2 or 3).
Where a population estimate could not be calculated, the total number of fish captured was presented as a conservatively low population estimate.
CI – Confidence Interval

Table A-9: Modified fyke net sample dates and set duration

Set Date	Set Duration (hrs)			
	WC 2 - Upper	WC 2 – Lower	Harlequin Ck.	McNab Ck.
3-Apr-12	-	-	24.4	-
4-Apr-12	-	-	30.8	19.9
11-Apr-12	19.8	21.3	24.0	21.6
19-Apr-12	26.8	27.2	25.5	25.7
27-Apr-12	23.1	26.4	22.6	-
3-May-12	29.5	25.0	24.3	23.8
11-May-12	24.3	23.2	22.6	22.4
17-May-12	23.4	23.8	24.0	23.6
24-May-12	21.0	21.6	22.2	19.8
31-May-12	22.0	22.6	23.1	21.0
TOTAL	**189.9**	**191.1**	**243.5**	**177.6**

Table A-10: Number of fish captured during modified fyke net sampling, April 3 to May 31, 2012

Watercourse	Species	# Fish Captured										
		3-Apr	4-Apr	11-Apr	19-Apr	27-Apr	3-May	11-May	17-May	24-May	31-May	Total
WC 2 - Lower	CO	0	0	0	0	129	101	33	56	80	9	**408**
	CT	0	0	0	0	11	0	1	0	2	0	**14**
	NFC	0	0	1	1	0	0	0	0	0	0	**2**
	SC	0	0	0	0	6	5	1	0	2	0	**14**
	TSB	0	0	0	0	1	0	0	0	0	0	**1**
WC 2 - Upper	CH	0	0	1	0	0	0	0	0	0	0	**1**
	CO	0	0	32	90	287	50	35	123	106	95	**818**
	CT	0	0	6	1	19	1	0	5	2	5	**39**
	RB/ST	0	0	1	0	0	0	0	1	1	0	**3**
	SC	0	0	1	0	0	0	0	1	1	2	**5**
Harlequin Creek	CO	0	2	1	1	25	15	8	11	0	1	**64**
	CT	0	1	4	1	2	9	0	7	5	3	**32**
	NFC	1	0	0	0	0	0	0	0	0	0	**1**
	SC			1	2	3	1		1	4	6	**18**
McNab Creek	CH	0	1	0	0	0	0	0	0	0	0	**1**
	CM	0	3	4	21	0	41	21	10	14	4	**118**
	CO	0	4	2	26	0	16	5	14	30	14	**111**
	PK	0	359	306	370	0	31	28	5	2	0	**1101**
	RB/ST	0	1	0	0	0	0	0	0	0	0	**1**
	SC	0	0	0	1	0	0	0	2	2	0	**5**

CH-Chinook Salmon, CM-Chum Salmon, CO - Coho Salmon, CT-Cutthroat Trout, FL - Flounder (Pleuronectidae spp.), STFL-Starry Flounder (Platichthys stellatus), SC- Sculpin (Cottidae spp.), STSC-Staghorn Sculpin (Leptocottus armatus), TPSC-Tidepool Sculpin (Oligocottus maculosus), TSB-Three-spined Stickleback (Gasterosteus aculeatus), GNFS-Gunnelfish (Pholidae spp.) GR- Greenling (Hexagrammidae spp.), WSGR-White Spotted Greenling (Hexagrammos stelleri), SL-Sand Lance (Ammodytidae spp.), SP-Shiner Perch (Cymatogaster aggregate)

Table A-11: Water quality measurements at fyke net locations during spring 2012

Watercourse	Date	Temp. (°C)	Cond.(*u*S/cm)	DO (mg/L)	pH
WC 2 – Upper section	10-Apr-12	7.5	17.0	10.14	6.85
	19-Apr-12	7.0	17.6	10.84	8.14
	26-Apr-12	7.0	20.7	10.94	8.05
	02-May-12	7.5	15.8	11.11	7.03
	10-May-12	-	-	-	-
	16-May-12	8.1	15.8	9.75	6.90
	23-May-12	-	-	-	-
	30-May-12	6.6	17.0	10.7	6.25
Average / Standard Deviation		**7.3 / 0.5**	**17.3 / 1.8**	**10.58 / 0.53**	**7.20 / 0.74**
WC 2 – Lower section	10-Apr-12	4.6	12.9	11.84	6.88
	19-Apr-12	4.5	17.3	11.59	8.20
	26-Apr-12	6.2	17.1	10.13	7.36
	02-May-12	5.7	18.8	11.74	7.92
	10-May-12	-	-	-	-
	16-May-12	6.3	11.5	12.30	7.24
	23-May-12	5.6	6.0	10.82	4.74
	30-May-12	4.8	9.0	11.85	6.81
Average / Standard Deviation		**5.4 / 0.7**	**13.2 / 4.8**	**11.47 / 0.74**	**7.02 / 1.13**
McNab Creek	03-Apr-12	-	-	-	-
	04-Apr-12	-	-	-	-
	10-Apr-12	4.9	8.7	11.87	7.54
	19-Apr-12	4.8	8.7	12.72	7.23
	02-May-12	6.2	7.0	13.52	7.5
	10-May-12	-	-	-	-
	16-May-12	6.7	5.7	12.31	7.32
	23-May-12	-	-	-	-
	30-May-12	5.1	6.0	13.14	6.48
	30-May-12	5.6	6.0	13.54	6.65
Average / Standard Deviation		**5.5 / 0.8**	**7.0 / 1.4**	**12.85 / 0.67**	**7.12 / 0.45**
Harlequin Creek	03-Apr-12	7.2	26.8	11.50	-
	04-Apr-12	-	-	-	-
	10-Apr-12	7.9	26.4	10.82	7.03
	19-Apr-12	7.5	28.8	12.21	7.70
	26-Apr-12	7.6	22.1	12.30	7.38
	02-May-12	7.4	25.2	12.71	7.27
	10-May-12	-	-	-	-
	16-May-12	8.7	26.8	12.43	6.97
	23-May-12	7.9	24.0	11.99	5.25
	30-May-12	7.2	30.0	12.74	7.31
Average / Standard Deviation		**7.7 / 0.5**	**26.3 / 2.7**	**12.09 / 0.65**	**6.99 / 0.80**

Table A-12: Watercourse characteristics during fyke net sampling

Watercourse	Date	Wetted width (m)	Water depth (m)	Water Velocity (m/s)
WC 2 - Upper	10-Apr-12	6.8	0.60	-
	19-Apr-12	6.8	0.60	0.03
	26-Apr-12	7.2	0.61	0.08
	02-May-12	7.0	0.67	0.03
	10-May-12	7.2	0.64	0.04
	16-May-12	7.6	0.75	0.03
	23-May-12	7.1	0.67	0.36
	30-May-12	7.1	0.69	0.03
Average / Standard Deviation		**7.1 / 0.3**	**0.65 / 0.05**	**0.09 / 0.12**
WC 2 - Lower	10-Apr-12	2.6	0.17	-
	19-Apr-12	4.9	0.20	0.13
	26-Apr-12	4.7	0.25	0.25
	02-May-12	4.8	0.31	0.37
	10-May-12	4.6	0.17	0.25
	16-May-12	4.7	0.21	0.13
	23-May-12	4.7	0.27	0.08
	30-May-12	4.7	0.20	0.08
Average / Standard Deviation		**4.5 / 0.8**	**0.22 / 0.05**	**0.18 / 0.11**
McNab Creek	03-Apr-12	-	-	-
	04-Apr-12	-	-	-
	10-Apr-12	18.8	0.60	-
	19-Apr-12	28.2	0.69	0.33
	02-May-12	26.0	0.55	0.22
	10-May-12	26.0	0.60	0.33
	16-May-12	30.0	0.60	0.33
	23-May-12	27.9	0.60	0.50
	30-May-12	28.4	0.20	0.50
	31-May-12	31.5	0.82	0.50
Average / Standard Deviation		**27.1 / 3.8**	**0.58 / 0.18**	**0.39 / 0.11**
Harlequin Creek	03-Apr-12	-	-	-
	04-Apr-12	-	-	-
	10-Apr-12	1.9	0.26	-
	19-Apr-12	2.1	0.30	0.40
	26-Apr-12	1.9	0.22	0.33
	02-May-12	2.1	0.25	0.40
	10-May-12	2.2	0.18	0.50
	16-May-12	1.9	0.90	0.33
	23-May-12	2.1	0.19	0.33
	30-May-12	2.1	0.21	0.33
Average / Standard Deviation		**2.0 / 0.1**	**0.31 / 0.23**	**0.37 / 0.06**

Table A-13: McNab Creek wetted width and fyke net sample width for sample dates

Set Date	Wetted Width (m)	Sample width (m)	% of wetted width
4-Apr-12	n/a	n/a	n/a
10-Apr-12	18.8	6.12	33
18-Apr-12	28.2	7.1	25
2-May-12	26	5.4	21
10-May-12	26	7.3	28
16-May-12	30	6.5	22
23-May-12	27.9	5.8	21
30-May-12	28.4	4.7	17
31-May-12	31.5	3.7	12

Table A-15: Adult salmonid enumeration survey timing

Date	McNab	Segments	Distance (km)	WC 2	Segments	Distance (km)
9-Sep-09	Surveyed	0 to 1200	1.2	Surveyed	Upper / Lower	1.2
15-Sep-09	Surveyed	0 to 1200	1.2	Surveyed	Upper / Lower	1.2
30-Sep-09	Surveyed	0 to 1200	1.2	Surveyed	Upper / Lower	1.2
19-Oct-09	Surveyed	0 to 1200	1.2	Surveyed	Upper / Lower	1.2
24-Nov-09	Surveyed	0 to 3900	3.9	Surveyed	Upper / Lower	1.2
23-Aug-10	Surveyed	0 to 1200	1.2	Surveyed	Upper / Lower	1.2
9-Sep-10	Surveyed	0 to 1200	1.2	Surveyed	Upper / Lower	1.2
16-Sep-10	Not surveyed	n/a	n/a	Surveyed	Upper / Lower	1.2
23-Sep-10	Surveyed	0 to 1200	1.2	Surveyed	Upper / Lower	1.2
30-Sep-10	Not surveyed	n/a	n/a	Surveyed	Upper / Lower	1.2
6-Oct-10	Surveyed	0 to 1200	1.2	Surveyed	Upper / Lower	1.2
02-Nov-10	Surveyed	0 to 1200	1.2	Surveyed	Upper / Lower	1.2
09-Nov-10	Not surveyed	n/a	n/a	Surveyed	Upper / Lower	1.2
31-Aug-11	Surveyed	0 to 1900	1.9	Not surveyed	n/a	n/a
8-Sep-11	Surveyed	0 to 1500	1.5	Not surveyed	n/a	n/a
14-Sep-11	Surveyed	0 to 1900	1.9	Not surveyed	n/a	n/a
23-Sep-11	Surveyed	0 to 1100	1.1	Surveyed	Lower intertidal	0.12
30-Sep-11	Surveyed	0 to 700	0.7	Not surveyed	n/a	n/a
6-Oct-11	Surveyed	0 to 1100	1.1	Surveyed	Lower intertidal	0.12
19-Oct-11	Surveyed	0 to 1800	1.8	Not surveyed	n/a	n/a
27-Oct-11	Surveyed	0 to 1800	1.8	Not surveyed	n/a	n/a
2-Dec-11	Surveyed	0 to 3900	3.9	Surveyed	Upper	0.56
6-Mar-12	Surveyed	0 to 1200	1.2	Not surveyed	n/a	n/a
16-Mar-12	Surveyed	0 to 1800	1.8	Not surveyed	n/a	n/a
27-Sep-12	Surveyed	0 to 1000	1	Not surveyed	n/a	n/a
11-Oct-12	Surveyed	0 to 1000 & 3900	1.1	Surveyed	Upper / Lower	1.2
25-Oct-12	Surveyed	0 to 1700 & 3900	1.8	Surveyed	Upper / Lower	1.2
8-Nov-12	Surveyed	0 to 1700	1.7	Surveyed	Upper / Lower	1.2
22-Nov-12	Surveyed	0 to 2000 & 3900	2.1	Surveyed	Upper / Lower	1.2
19-Aug-13	Surveyed	0 to 1200	1.2	Not surveyed	n/a	n/a

Table A-16: Adult salmonid enumeration frequency and survey locations.

Watercourse	Segment	2009	2010	2011	2012
McNab Creek	0 - 100	5	5	9	7
	100 - 200	5	5	9	7
	200 - 300	5	5	9	7
	300 - 400	5	5	9	7
	400 - 500	5	5	9	7
	500 - 600	5	5	9	7
	600 - 700	5	5	9	7
	700 - 800	5	5	8	7
	800 - 900	5	5	8	7
	900 - 1000	5	5	8	7
	1000 - 1100	5	5	8	5
	1100 - 1200	5	5	6	5
	1200 - 1300	1	0	6	4
	1300 - 1400	1	0	6	4
	1400 - 1500	1	0	6	4
	1500 - 1600	1	0	5	4
	1600 - 1700	1	0	5	4
	1700 - 1800	1	0	5	2
	1800 - 1900	1	0	3	1
	1900 - 2000	1	0	1	1
	2000 - 2100	1	0	1	0
	2100 - 2200	1	0	1	0
	2200 - 2300	1	0	1	0
	2300 - 2400	1	0	1	0
	2400 - 2500	1	0	1	0
	2500 - 2600	1	0	1	0
	2600 - 2700	1	0	1	0
	2700 - 2800	1	0	1	0
	2800 - 2900	1	0	1	0
	2900 - 3000	1	0	1	0
	3000 - 3100	1	0	1	0
	3100 - 3200	1	0	1	0
	3200 - 3300	1	0	1	0
	3300 - 3400	1	0	1	0
	3400 - 3500	1	0	1	0
	3500 - 3600	1	0	1	0
	3600 - 3700	1	0	1	0
	3700 - 3800	1	0	1	0
	3800 - 3900	1	0	1	3
WC 2	Upper	5	8	1	4
	Lower	5	8	2	4

Table A-17: Adult salmon run observations in the McNab Creek watersheds in 2009, 2010, 2011, 2012, and 2013

Watercourse	Survey Year	Salmon Species	First Day Survey	First Day Observed	Peak Count		Last Day Fish Observed	# Days Salmon Observed in Survey Areas
					Date	Count		
McNab Creek	2009	Coho	9-Sept-09	19-Oct-09	19-Oct-09	3	19-Oct-09	1
		Chinook	9-Sept-09	30-Sept-09	30-Sept-09	38	30-Sept-09	1
		Chum	9-Sept-09	24-Nov-09	24-Nov-09	261	24-Nov-09	1
		Pink	9-Sept-09	9-Sept-09	9-Sept-09	1105	19-Oct-09	40
	2010	Coho	23-Aug-10	2-Nov-10	2-Nov-10	2	2-Nov-10	1
		Chinook	23-Aug-10	n/a	n/a	0	n/a	0
		Chum	23-Aug-10	2-Nov-09	2-Nov-09	2	2-Nov-09	1
		Pink	23-Aug-10	9-Sept-09	23-Sept-09	13	23-Sept-09	27
	2011	Coho	31-Aug-11	27-Oct-11	27-Oct-11	2	2-Dec-11	36
		Chinook	31-Aug-11	n/a	n/a	0	n/a	0
		Chum	31-Aug-11	2-Dec-11	2-Dec-11	3	2-Dec-11	1
		Pink	31-Aug-11	31-Aug-11	14-Sept-11	2335	19-Oct-11	49
	2012	Coho	6-Mar-12	25-Oct-12	8-Nov-12	6	8-Nov-12	14
		Chinook	6-Mar-12	n/a	n/a	0	n/a	0
		Chum	6-Mar-12	25-Oct-12	8-Nov-12	324	22-Nov-12	28
		Pink	6-Mar-12	n/a	n/a	0	n/a	0
WC 2	2009	Coho	9-Sept-09	19-Oct-09	19-Oct-09	1	19-Oct-09	1
		Chinook	9-Sept-09	n/a	n/a	0	n/a	0
		Chum	9-Sept-09	24-Nov-09	24-Nov-09	16	24-Nov-09	1
		Pink	9-Sept-09	n/a	n/a	0	n/a	0
	2010	Coho	23-Aug-10	n/a	n/a	0	n/a	0
		Chinook	23-Aug-10	n/a	n/a	0	n/a	0
		Chum	23-Aug-10	n/a	n/a	0	n/a	0
		Pink	23-Aug-10	n/a	n/a	0	n/a	0
	2011	Coho	22-Sept-11	n/a	n/a	0	n/a	0
		Chinook	22-Sept-11	n/a	n/a	0	n/a	0
		Chum	22-Sept-11	n/a	n/a	0	n/a	0
		Pink	22-Sept-11	22-Sept-11	23-Sept-11	38	7-Oct-11	15
	2012	Coho	11-Oct-12	8-Nov-12	8-Nov-12	1	8-Nov-12	1
		Chinook	11-Oct-12	n/a	n/a	0	n/a	0
		Chum	11-Oct-12	8-Nov-12	8-Nov-12	9	8-Nov-12	1
		Pink	11-Oct-12	n/a	n/a	0	n/a	0

Table A-18: Percent distribution of live and dead Coho Salmon observed in segments surveyed in the McNab Creek watershed in 2009, 2010, 2011, 2012, and 2013

Watercourse	Segment	Distribution of Live Coho (%)					Distribution of Dead Coho (%)				
		2009	2010	2011	2012	2013	2009	2010	2011	2012	2013
McNab Creek	0-100	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	100-200	0.0		0.0	0.0	0.0	0.0		0.0	0.0	0.0
	200-300	0.0		33.3	0.0	0.0	0.0		0.0	0.0	0.0
	300-400	0.0		0.0	20.0	0.0	0.0		0.0	0.0	0.0
	400-500	0.0		0.0	0.0	0.0	0.0		0.0	0.0	0.0
	500-600	0.0		0.0	0.0	0.0	0.0		0.0	0.0	0.0
	600-700	0.0		0.0	0.0	0.0	0.0		0.0	0.0	0.0
	700-800	0.0		0.0	0.0	0.0	0.0		0.0	0.0	0.0
	800-900	0.0		0.0	0.0	0.0	0.0		0.0	0.0	0.0
	900-1000	0.0		33.3	40.0	0.0	0.0		0.0	0.0	0.0
	1000-1100	0.0		33.3	0.0	0.0	0.0		0.0	0.0	0.0
	1100-1200	0.0		0.0	0.0	0.0	0.0		0.0	0.0	0.0
	1200-1300	100.0		0.0	0.0	n/a	0.0		0.0	0.0	n/a
	1300-1400	0.0		0.0	0.0	n/a	0.0		0.0	0.0	n/a
	1400-1500	0.0		0.0	0.0	n/a	0.0		0.0	0.0	n/a
	1500-1600	0.0		0.0	0.0	n/a	0.0		0.0	0.0	n/a
	1600-1700	0.0		0.0	0.0	n/a	0.0		0.0	0.0	n/a
	1700-1800	0.0		0.0	0.0	n/a	0.0		0.0	0.0	n/a
	1800-1900	0.0		0.0	0.0	n/a	0.0		0.0	0.0	n/a
	1900-2000	0.0		0.0	0.0	n/a	0.0		0.0	0.0	n/a
	2000-2100	0.0	n/a	0.0	n/a	n/a	0.0	n/a	0.0	n/a	n/a
	2100-2200	0.0	n/a	0.0	n/a	n/a	0.0	n/a	0.0	n/a	n/a
	2200-2300	0.0	n/a	0.0	n/a	n/a	0.0	n/a	0.0	n/a	n/a
	2300-2400	0.0	n/a	0.0	n/a	n/a	0.0	n/a	0.0	n/a	n/a
	2400-2500	0.0	n/a	0.0	n/a	n/a	0.0	n/a	0.0	n/a	n/a
	2500-2600	0.0	n/a	0.0	n/a	n/a	0.0	n/a	0.0	n/a	n/a
	2600-2700	0.0	n/a	0.0	n/a	n/a	0.0	n/a	0.0	n/a	n/a
	2700-2800	0.0	n/a	0.0	n/a	n/a	0.0	n/a	0.0	n/a	n/a
	2900-3900	0.0	n/a	0.0	40.0	n/a	0.0	n/a	0.0	0.0	n/a
WC 2	Upper	100.0	0.0	0.0	0.0	n/a	0.0	100.0	0.0	0.0	n/a
	Lower	0.0	0.0	0.0	0.0	n/a	0.0	0.0	0.0	0.0	n/a

Table A-19: Percent distribution of live and dead Chinook Salmon observed in segments surveyed in the McNab Creek watershed in 2009, 2010, 2011, 2012, and 2013

Watercourse	Segment	Distribution of Live Chinook (%)					Distribution of Dead Chinook (%)				
		2009	2010	2011	2012	2013	2009	2010	2011	2012	2013
McNab	0-100	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	100-200	5.3		0.0	0.0	0.0	0.0		0.0	0.0	0.0
	200-300	10.5		0.0	0.0	0.0	0.0		0.0	0.0	0.0
	300-400	0.0		0.0	0.0	0.0	0.0		0.0	0.0	0.0
	400-500	0.0		0.0	0.0	0.0	0.0		0.0	0.0	0.0
	500-600	0.0		0.0	0.0	0.0	0.0		0.0	0.0	0.0
	600-700	0.0		0.0	0.0	0.0	0.0		0.0	0.0	0.0
	700-800	10.5		0.0	0.0	0.0	0.0		0.0	0.0	0.0
	800-900	0.0		0.0	0.0	0.0	0.0		0.0	0.0	0.0
	900-1000	0.0		0.0	0.0	0.0	0.0		0.0	0.0	0.0
	1000-1100	0.0		0.0	0.0	0.0	0.0		0.0	0.0	0.0
	1100-1200	57.9		0.0	0.0	0.0	0.0		0.0	0.0	0.0
	1200-1300	15.8		0.0	0.0	n/a	0.0		0.0	0.0	n/a
	1300-1400	0.0		0.0	0.0	n/a	0.0		0.0	0.0	n/a
	1400-1500	0.0		0.0	0.0	n/a	0.0		0.0	0.0	n/a
	1500-1600	0.0		0.0	0.0	n/a	0.0		0.0	0.0	n/a
	1600-1700	0.0		0.0	0.0	n/a	0.0		0.0	0.0	n/a
	1700-1800	0.0		0.0	0.0	n/a	0.0		0.0	0.0	n/a
	1800-1900	0.0		0.0	0.0	n/a	0.0		0.0	0.0	n/a
	1900-2000	0.0		0.0	0.0	n/a	0.0		0.0	0.0	n/a
	2000-2100	0.0	n/a	0.0	n/a	n/a	0.0	n/a	0.0	n/a	n/a
	2100-2200	0.0	n/a	0.0	n/a	n/a	0.0	n/a	0.0	n/a	n/a
	2200-2300	0.0	n/a	0.0	n/a	n/a	0.0	n/a	0.0	n/a	n/a
	2300-2400	0.0	n/a	0.0	n/a	n/a	0.0	n/a	0.0	n/a	n/a
	2400-2500	0.0	n/a	0.0	n/a	n/a	0.0	n/a	0.0	n/a	n/a
	2500-2600	0.0	n/a	0.0	n/a	n/a	0.0	n/a	0.0	n/a	n/a
	2600-2700	0.0	n/a	0.0	n/a	n/a	0.0	n/a	0.0	n/a	n/a
	2700-2800	0.0	n/a	0.0	n/a	n/a	0.0	n/a	0.0	n/a	n/a
	2900-3900	0.0	n/a	0.0	0.0	n/a	0.0	n/a	0.0	0.0	n/a
WC 2	Upper	0.0	0.0	0.0	0.0	n/a	0.0	0.0	0.0	0.0	n/a
	Lower	0.0	0.0	0.0	0.0	n/a	0.0	0.0	0.0	0.0	n/a

Table A-20: Percent distribution of live and dead Chum Salmon observed in the segments surveyed in the McNab Creek watershed in 2009, 2010, 2011, 2012, and 2013.

Watercourse	Segment	Distribution of Live Chum (%)					Distribution of Dead Chum (%)				
		2009	2010	2011	2012	2013	2009	2010	2011	2012	2013
McNab Creek	0-100	0.8	100.0	0.0	6.7	0.0	0.8	0.0	0.0	1.1	0.0
	100-200	1.5		0.0	2.1	0.0	3.1		0.0	1.1	0.0
	200-300	3.0		0.0	0.0	0.0	9.3		0.0	1.1	0.0
	300-400	0.0		100.0	11.7	0.0	11.6		0.0	2.2	0.0
	400-500	0.0		0.0	11.7	0.0	0.0		0.0	0.0	0.0
	500-600	0.0		0.0	0.5	0.0	0.8		0.0	0.0	0.0
	600-700	0.0		0.0	3.8	0.0	0.0		0.0	0.0	0.0
	700-800	0.0		0.0	2.1	0.0	0.8		0.0	0.0	0.0
	800-900	6.1		0.0	3.6	0.0	5.4		0.0	2.2	0.0
	900-1000	31.1		0.0	53.3	0.0	46.5		0.0	11.2	0.0
	1000-1100	18.2		0.0	1.9	0.0	15.5		0.0	0.0	0.0
	1100-1200	3.0		0.0	0.2	0.0	2.3		0.0	1.1	0.0
	1200-1300	9.1		0.0	0.0	n/a	3.9		0.0	0.0	n/a
	1300-1400	27.3		0.0	0.0	n/a	0.0		0.0	0.0	n/a
	1400-1500	27.3		0.0	0.7	n/a	0.0		0.0	0.0	n/a
	1500-1600			0.0	0.0	n/a			0.0	0.0	n/a
	1600-1700			0.0	0.7	n/a			0.0	0.0	n/a
	1700-1800			0.0	0.5	n/a			0.0	0.0	n/a
	1800-1900			0.0	0.0	n/a			0.0	0.0	n/a
	1900-2000			0.0	0.0	n/a			0.0	0.0	n/a
	2000-2100		n/a	0.0	n/a	n/a		n/a	0.0	n/a	n/a
	2100-2200		n/a	0.0	n/a	n/a		n/a	0.0	n/a	n/a
	2200-2300		n/a	0.0	n/a	n/a		n/a	0.0	n/a	n/a
	2300-2400		n/a	0.0	n/a	n/a		n/a	0.0	n/a	n/a
	2400-2500		n/a	0.0	n/a	n/a		n/a	0.0	n/a	n/a
	2500-2600		n/a	0.0	n/a	n/a		n/a	0.0	n/a	n/a
	2600-2700		n/a	0.0	n/a	n/a		n/a	0.0	n/a	n/a
	2700-2800		n/a	0.0	n/a	n/a		n/a	0.0	n/a	n/a
	2900-3900		n/a	0.0	0.5	n/a		n/a	0.0	0.0	n/a
WC 2	Upper	50.0	0.0	0.0	0.0	n/a	33.6	0.0	0.0	0.0	n/a
	Lower	50.0	0.0	0.0	100.0	n/a	66.6	0.0	0.0	100.0	n/a

Table A-21: Percent distribution of live and dead Pink Salmon observed in the segments surveyed in the McNab Creek watershed in 2009, 2010, 2011, 2012, and 2013

Watercourse	Segment	Distribution of Live Pink (%)					Distribution of Dead Pink (%)				
		2009*	2010	2011	2012	2013	2009*	2010	2011	2012	2013
McNab Creek	0-100	3.8	100.0	10.0	0.0	0.0	0.0	100.0	28.4	0.0	0.0
	100-200	0.9		6.3	0.0	0.0	3.3		9.2	0.0	0.0
	200-300	5.3		26.4	0.0	0.0	2.0		13.8	0.0	0.0
	300-400	3.0		13.8	0.0	0.0	2.2		4.6	0.0	0.0
	400-500	0.4		0.7	0.0	0.0	1.1		0.9	0.0	0.0
	500-600	9.8		0.8	0.0	0.0	4.0		5.5	0.0	0.0
	600-700	0.8		0.1	0.0	0.0	2.2		2.8	0.0	0.0
	700-800	6.4		1.5	0.0	0.0	1.4		1.8	0.0	0.0
	800-900	0.4		6.9	0.0	0.0	7.6		10.1	0.0	0.0
	900-1000	28.1		5.8	0.0	0.0	47.0		15.6	0.0	0.0
	1000-1100	37.5		10.7	0.0	0.0	28.9		5.5	0.0	0.0
	1100-1200	3.8		5.7	0.0	0.0	0.4		0.0	0.0	0.0
	1200-1300	0.0		0.0	0.0	n/a	0.0		0.0	0.0	n/a
	1300-1400	0.0		0.0	0.0	n/a	0.0		0.0	0.0	n/a
	1400-1500	0.0		3.1	0.0	n/a	0.0		0.0	0.0	n/a
	1500-1600	0.0		0.3	0.0	n/a	0.0		0.9	0.0	n/a
	1600-1700	0.0		1.2	0.0	n/a	0.0		0.9	0.0	n/a
	1700-1800	0.0		1.7	0.0	n/a	0.0		0.0	0.0	n/a
	1800-1900	0.0		0.0	0.0	n/a	0.0		0.0	0.0	n/a
	1900-2000	0.0	n/a	0.0	0.0	n/a	0.0	n/a	0.0	0.0	n/a
	2000-2100	0.0	n/a	0.0	n/a	n/a	0.0	n/a	0.0	n/a	n/a
	2100-2200	0.0	n/a	0.0	n/a	n/a	0.0	n/a	0.0	n/a	n/a
	2200-2300	0.0	n/a	0.0	n/a	n/a	0.0	n/a	0.0	n/a	n/a
	2300-2400	0.0	n/a	0.0	n/a	n/a	0.0	n/a	0.0	n/a	n/a
	2400-2500	0.0	n/a	0.0	n/a	n/a	0.0	n/a	0.0	n/a	n/a
	2500-2600	0.0	n/a	0.0	n/a	n/a	0.0	n/a	0.0	n/a	n/a
	2600-2700	0.0	n/a	0.0	n/a	n/a	0.0	n/a	0.0	n/a	n/a
	2700-2800	0.0	n/a	0.0	n/a	n/a	0.0	n/a	0.0	n/a	n/a
	2900-3900	0.0	n/a	0.0	0.0	n/a	0.0	n/a	0.0	0.0	n/a
WC 2	Upper	n/a	n/a	0.0	0.0	n/a	n/a	n/a	0.0	0.0	n/a
	Lower	n/a	n/a	1.2	0.0	n/a	n/a	n/a	0.0	0.0	n/a
#5	Lower	n/a	n/a	< 0.0	0.0	n/a	n/a	n/a	0.0	0.0	n/a

Notes:
*P Counts with no definition of segment were not included

Table A-22: Minnow trapping fish capture data by watercourse and sample date

Dates	28-Jul-2011							28-Jul-2011 *							05-Aug-2011											12-Aug-2011										
WCs / Species	#3	#2	Total	Length Avg	SD	Weight Avg	SD	#3	#2	Total	Length Avg	SD	Weight Avg	SD	#3	#4-E	#4-W	#5	#2	Total	Length Avg	SD	Weight Avg	SD	#3	#4-E	#4-W	#5	HC-W	HC	#2	Total	Length Avg	SD	Weight Avg	SD
CO	48	26	74	59	9	n/a	n/a	13	8	21	60	12	n/a	n/a	2	16	5	6	4	33	63	7	n/a	n/a	5	1	11	11	1	2	7	38	63	8	n/a	n/a
CT	4	4	8	118	20	n/a	n/a	-	-	-	-	-	-	-	3	-	1	9	2	15	100	15	n/a	n/a	1	-	-	1	2	15	1	20	90	19	n/a	n/a
GNFS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	130	n/a	n/a	n/a	-	-	-	-	-	-	-	-	-	-	-	-
RB	-	1	1	105	n/a	n/a	n/a	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SC	10	18	28	97	12	n/a	n/a	7	-	7	90	11	n/a	n/a	19	2	8	13	17	59	97	19	n/a	n/a	21	3	13	8	1	12	17	75	91	14	n/a	n/a
SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	100	n/a	n/a	n/a	-	-	-	-	-	-	-	-	-	-	-	-
STSC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	-	-	2	131	49	n/a	n/a	-	-	-	-	-	-	-	-	-	-	-	-
TSB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	1	48	n/a	n/a	n/a
NFC	-	7	7	n/a	n/a	n/a	n/a	-	5	5	n/a	n/a	n/a	n/a	-	-	-	-	1	1	n/a	n/a	n/a	n/a	-	-	1	-	-	-	-	1	n/a	n/a	n/a	n/a

Dates	19-Aug-2011											15-Aug-2011											23-Sep-2011										
WCs / Species	#3	#4-E	#4-W	#5	HC	#2	Total	Length Avg	SD	Weight Avg	SD	#3	#4-E	#4-W	#5	HC-W	HC	#2	Total	Length Avg	SD	Weight Avg	SD	#3	#4-E	#4-W	#5	HC-W	HC	#2	Total	Length Avg	SD	Weight Avg	SD
CO	3	7	11	5	4	-	30	69	6	4.0	1.2	2	-	5	5	-	1	4	17	71	7	3.4	1.3	-	2	3	2	4	3	10	24	75	8	3.7	1.8
CT	1	-	1	-	3	2	7	102	8	10.7	2.8	-	-	-	1	-	4	-	5	103	27	7.8	1.9	-	-	-	2	4	2	-	8	94	19	7.1	2.5
GNFS	1	-	-	-	-	-	1	135	n/a	7.5	n/a	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	1	-	-	-	5	122	14	4.0	2.3
RB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SC	13	2	2	6	6	29	58	97	14	11.2	4.9	10	1	3	4	-	14	19	51	92	15	8.8	3.8	25	2	13	3	-	11	9	63	93	13	7.4	4.3
SP	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	1	60	n/a	3.0	n/a	-	-	-	-	-	-	-	-	-	-	-	-
STSC	-	1	2	-	-	-	3	93	24	9.9	8.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TSB	-	-	-	1	-	-	1	50	n/a	1.8	n/a	-	5	1	3	-	-	-	9	46	12	1.3	0.5	-	-	5	1	-	-	-	6	50	10	n/a	n/a
NFC	1	-	-	-	-	-	1	n/a	n/a	n/a	n/a	1	1	1	-	1	-	1	5	n/a	n/a	n/a	n/a	3	-	2	1	-	-	-	6	n/a	n/a	n/a	n/a

Dates	07-Oct-2011											20-Oct-2011										
WCs / Species	#3	#4-E	#4-W	#5	HC-W	HC	#2	Total	Length Avg	SD	Weight Avg	SD	#3	#4-E	#4-W	#5	HC-W	HC	#2	Total	Length Avg	SD	Weight Avg	SD
CO	5	-	1	1	-	9	-	16	73	5	3.9	1.5	-	-	6	-	2	17	11	36	82	9	5.8	2.0
CT	1	-	-	2	1	4	-	8	110	14	10.4	3.1	-	-	-	1	1	5	-	7	101	17	8.9	3.4
GNFS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
RB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SC	12	5	3	4	2	11	6	43	99	17	9.8	3.6	5	1	1	4	-	2	3	16	88	19	7.7	4.1
SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
STSC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TSB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NFC	-	-	2	2	-	-	3	7	n/a	n/a	n/a	n/a	4	1	2	1	-	-	1	9	n/a	n/a	n/a	n/a

Notes:
Species: CO – Coho Salmon, CT – Cutthroat Trout, GNFS – gunnelfish, RB – Rainbow Trout, SC – Sculpin species, STSC – Staghorn Sculpin, TSB – Threespine Stickleback, NFC – no fish caught,.
HC – Harlequin Creek, HC-W – Tributary from the west to Harlequin
*Capture data from Sites, 5, 6, 7, 8 and 11, 12, 13 removed

Table A-23: Catch per unit effort (CPUE) for Coho Salmon and Cutthroat Trout by watercourse and sample date

Date	28-Jul-2011		28-Jul-2011*		05-Aug-2011					12-Aug-2011							19-Aug-2011						15-Sep-2011						
Species/WC	#3	#2	#3	#2	#3	#4-E	#4-W	#5	#2	#3	#4-E	#4-W	#5	HC-W	HC	#2	#3	#4-E	#4-W	#5	HC	#2	#3	#4-E	#4-W	#5	HC-W	HC	#2
CO	25.0	10.8	6.8	3.3	0.5	9.6	1.5	1.4	1.2	0.9	0.5	2.0	2.1	0.9	0.6	1.3	0.8	4.4	3.4	2.0	2.3	0.0	0.4	0.0	2.6	1.3	0.0	1.0	2.0
CT	2.1	1.7	0.0	0.0	0.7	0.0	0.3	2.1	0.6	0.2	0.0	0.0	0.2	1.9	4.8	0.2	0.3	0.0	0.3	0.0	1.7	0.5	0.0	0.0	0.0	0.3	0.0	4.0	0.0

Date	23-Sept-2011							07-Oct-2011							20-Oct-2011						
Species/WC	#3	#4-E	#4-W	#5	HC-W	HC	#2	#3	#4-E	#4-W	#5	HC-W	HC	#2	#3	#4-E	#4-W	#5	HC-W	HC	#2
CO	0.0	2.0	0.8	0.5	3.9	1.5	2.0	1.0	0.0	0.5	0.3	0.0	9.0	0.0	0.0	0.0	1.5	0.0	2.1	8.9	2.2
CT	0.0	0.0	0.0	0.5	3.9	1.0	0.0	0.2	0.0	0.0	0.5	0.3	4.0	0.0	0.0	0.0	0.0	0.3	1.1	2.6	0.0

Species: CO – Coho Salmon, CT – Cutthroat Trout, GNFS – Gunnelfish, RB – Rainbow Trout, SC – Sculpin, STSC – Staghorn Sculpin, TSB – Threespine Stickleback, NFC – no fish caught,.
HC – Harlequin Creek, HC-W – Tributary from the west to Harlequin
*Capture data from Sites 5,6,7,8 and 11, 12, 13 removed

Table A-24: Mark Re-capture data for Coho Salmon captured during intertidal minnow trapping

Date	28-Jul-2011			5-Aug-2011			12-Aug-2011			19-Aug-2011			15-Sep-2011			23-Sep-2011			7-Oct-2011			20-Oct-2011		
Watercourse	C	M	R	C	M	R	C	M	R	C	M	R	C	M	R	C	M	R	C	M	R	C	M	R
#2	8	-	-	4	4	-	7	7	-	-	-	-	4	4	-	10	10	-	-	-	-	11	11	-
#3	13	-	-	2	2	-	5	5	-	3	3	-	2	2	-	-	-	-	5	2	-	-	-	-
#4-E	-	-	-	16	16	-	1	1	-	7	7	-	-	-	-	2	2	-	-	-	-	-	-	-
#4-W	-	-	-	5	5	-	11	11	-	11	11	-	5	3	1	3	2	-	1	1	-	6	6	-
#5	-	-	-	6	5	-	11	10	-	5	5	-	5	5	-	2	1	1	1	-	-	-	-	-
Harlequin - W	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	4	4	-	-	-	-	2	2	-
Harlequin Creek	-	-	-	-	-	-	2	2	-	4	4	-	1	1	-	3	3	-	9	8	1	17	17	-

Notes: C – Captures, M – Marks, R - Recaptures

Table A-25: Mark Re-capture data for Cutthroat Trout captured during intertidal minnow trapping

Date	5-Aug-2011			12-Aug-2011			19-Aug-2011			15-Sep-2011			23-Sep-2011			7-Oct-2011			20-Oct-2011		
Watercourse	C	M	R	C	M	R	C	M	R	C	M	R	C	M	R	C	M	R	C	M	R
#2	2	-	-	1	1	-	2	1	1	-	-	-	-	-	-	-	-	-	-	-	-
#3	3	-	-	1	1	-	1	1	-	-	-	-	-	-	-	1	-	-	-	-	-
#4-W	1	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-
#5	9	-	-	1	1	-	-	-	-	1	-	-	2	2	-	2	1	1	1	1	-
Harlequin - W	-	-	-	2	2	-	-	-	-	-	-	-	4	4	-	1	1	-	1	1	-
Harlequin Creek	-	-	-	15	15	-	3	1	2	4	-	-	2	-	1	4	3	1	5	2	3

Notes: C – Captures, M – Marks, R - Recaptures

Table A-26: Water quality measurements during minnow trapping of McNab Creek intertidal habitat, 2011.

Date	Watercourse	Site	Temp. (°C)	Conductivity (uS/cm)	Salinity (ppm)*	Dissolved Oxygen (mg/L)	pH
28-Jul-11		**Average**	**8.95**	**19**	**0.01**	**13.56**	**5.67**
	#2	1	7.91	10	0.01	15.63	7.57
	#2	4	8.06	9	0.00	12.78	5.05
	#2	6	7.82	10	0.01	13.62	5.07
	#3	9	10.19	58	0.04	13.26	5.80
	#3	11	9.66	15	0.01	10.55	5.20
	#3	13	10.03	14	0.01	15.54	4.98
4-Aug-11		**Average**	**10.73**	**155**	**0.10**	**9.99**	**6.29**
	#2	1	8.46	51	0.03	10.58	7.14
	#2	2	8.22	43	0.03	10.02	6.10
	#3	9	9.89	61	0.04	10.78	6.06
	#3	10	9.51	36	0.02	9.70	5.92
	#4-E	15	10.25	209	0.14	10.01	6.32
	#4-W	17	11.30	554	0.37	10.56	6.29
	#4-W	18	10.68	279	0.18	10.29	6.08
	#4-W	19	9.75	144	0.10	8.86	5.81
	#5	21	13.94	156	0.09	9.81	6.59
	#5	22	15.34	21	0.01	9.33	6.62
11-Aug-11		**Average**	**11.26**	**85**	**0.04**	**9.32**	**6.87**
	#2	4	9.00	56	0.03	9.24	8.01
	#3	9	9.08	25	0.02	11.13	6.93
	#4-E	15	10.51	148	0.01	11.70	6.81
	#4-W	19	9.39	77	0.05	8.91	6.33
	#5	21	14.06	253	0.15	10.40	6.80
	#5	22	14.31	19	0.01	11.08	7.25
	#22	24	12.45	18	0.01	2.75	5.96
18-Aug-11		**Average**	**10.38**	**150**	**0.07**	**9.40**	**6.28**
	#2	1	6.43	10	0.01	9.80	6.88
	#2	2	9.12	9	0.00	9.09	5.99
	#2	4	9.42	10	0.01	9.01	5.93
	#3	10	9.95	15	0.01	9.50	5.84
	#3	9	10.19	45	0.03	10.02	5.90
	#4-E	15	10.52	144	0.10	10.20	6.43
	#4-E	16	9.59	74	0.05	8.86	6.29

Date	Watercourse	Site	Temp. (°C)	Conductivity (uS/cm)	Salinity (ppm)*	Dissolved Oxygen (mg/L)	pH
	#4-W	17	11.05	802	0.27	9.99	6.31
	#4-W	19	9.60	51	0.03	8.07	5.98
	#5	21	13.00	534	0.34	8.98	6.29
	#5	22	14.12	23	0.01	9.40	6.85
	Harlequin	23	11.60	83	0.02	9.92	6.63
		Average	**10.71**	**352.3**	**0.24**	**8.05**	**6.42**
14-Sep-11	#2	1	9.9	9	0.01	8.32	6.12
	#2	3	10.0	9.4	0.01	7.94	6.11
	#2	4	10.3	10.4	0.01	7.24	5.98
	#3	10	9.1	16.3	0.01	8.15	5.94
	#3	9	9.3	50.8	0.04	9.41	6.19
	#4-E	15	10.2	381.7	0.26	9.97	6.57
	#4-E	16	9.5	122.6	0.08	8.48	6.51
	#4-W	17	10.3	1,042	0.73	9.62	6.42
	#5	19	10.7	489.3	0.33	7.03	6.42
	#5	21	12.6	2,351	1.62	7.90	6.70
	#5	22	13.6	31.6	0.02	8.70	7.16
	Harlequin	23	11.0	24.2	0.02	10.76	6.91
	#22	24	12.7	41.3	0.03	1.11	6.44
		Average	**11.27**	**2,724**	**1.61**	**10.80**	**5.69**
22-Sep-11	#2	1	10.27	12	0.00	20.17	6.70
	#2	3	9.91	12	0.00	9.55	6.80
	#2	4	10.91	12	0.00	14.02	5.67
	#3	9	9.33	125	0.06	13.21	5.44
	#3	10	9.04	25	0.01	9.32	4.95
	#4-E	15	10.33	613	0.30	10.97	4.41
	#4-E	16	9.94	411	0.20	8.86	6.02
	#4-W	17 – Surface	12.90	5,009	1.95	9.45	5.84
	#4-W	17 – Bottom	14.01	14,246	8.34	9.52	6.01
	#4-W	18 – Surface	9.47	220	0.10	9.24	5.55
	#4-W	18 – Bottom	9.45	219	0.10	9.12	5.81
	#5	19	8.90	117	0.06	8.82	5.20
	#5	21 – Surface	13.82	11,404	8.18	9.16	5.94
	#5	21 – Bottom	14.07	16,381	9.66	8.64	5.91
	#5	22	12.66	144	0.06	12.15	5.56

Date	Watercourse	Site	Temp. (°C)	Conductivity (uS/cm)	Salinity (ppm)*	Dissolved Oxygen (mg/L)	pH
	Harlequin	23	13.48	25	0.01	10.13	5.83
	#22	24	13.23	24	0.01	10.59	4.94
	Harlequin	25	11.11	28	0.01	11.48	5.75
6-Oct-11		**Average**	**10.36**	**6,431.7**	**5.24**	**9.76**	**11.95**
	#2	1	9.1	17.2	0.01	8.89	n/a
	#2	4	10.7	271	0.18	7.98	n/a
	#3	9	8.1	61.7	0.04	9.81	n/a
	#3	10	8.1	30.9	0.02	9.13	n/a
	#4-E	16	9.0	140	0.10	8.96	n/a
	#4-W	17 – Surface	10.7	12,000	9.70	10.66	n/a
	#4-W	17 – Bottom	11.6	19,740	16.25	10.16	n/a
	#4-W	19	8.9	120.3	0.08	8.43	n/a
	#5	21 – Surface	11.5	17,000	13.85	10.30	n/a
	#5	21 – Bottom	12.1	20,658	16.85	11.22	n/a
	#5	22	10.0	30.6	0.02	9.82	n/a
	Harlequin	23 – Surface	11.3	81.8	0.05	9.76	n/a
	Harlequin	23 – Bottom	12.1	19,879	16.16	12.13	n/a
	#22	24	11.8	13.8	0.01	9.43	n/a
19-Oct-11		**Average**	**9.32**	**18,636**	**11.74**	**11.95**	**6.53**
	#2	1	8.41	20	0.01	16.51	4.43
	#2	3	8.41	21	0.01	11.83	4.35
	#2	5	8.20	17	0.01	12.00	4.60
	#3	9 – Surface	7.62	650	0.30	11.98	6.45
	#3	9 – Bottom	10.46	40,406	26.58	10.09	7.01
	#3	10	7.57	28	0.01	12.84	5.12
	#3	11	7.46	27	0.01	10.01	4.97
	#4-E	16 – Surface	10.29	40,744	26.08	13.60	7.58
	#4-E	16 – Bottom	10.42	41,689	26.63	11.76	7.68
	#4-W	17	10.71	41,621	25.84	11.11	7.81
	#4-W	19 – Surface	9.49	28,009	17.77	14.69	7.20
	#4-W	19 – Bottom	10.00	38,255	24.21	10.99	7.21
	#5	21 – Surface	10.50	36,445	23.50	10.25	7.82
	#5	21 – Bottom	10.90	43,756	28.12	10.11	7.83
	#5	22 – Surface	8.94	20,763	10.14	13.31	7.57
	#5	22 – Bottom	9.71	39,648	25.29	10.99	7.43

Date	Watercourse	Site	Temp. (°C)	Conductivity (uS/cm)	Salinity (ppm)*	Dissolved Oxygen (mg/L)	pH
	#5	22	8.48	32	0.01	12.48	7.52
	Harlequin	23	9.97	528	0.26	10.77	6.18
	#22	24	10.08	20	0.01	10.50	5.67
	Harlequin	25	8.81	39	0.02	13.27	6.12

n/a = pH measurements were unavailable as a result from the YSI pH probe not functioning appropriately and unable to be calibrated.
* = Salinity values calculated using formula conversion at: http://www.chemiasoft.com/chemd/salinity_calculator

Table A-27: Beach seining dates, sites and areas sampled in near shore areas, 2011

Sample Date	Survey Area							
	#1	#2	#3	#4	#5	#6	McNab-E	McNab-W
25-May-11	700	-	-	-	-	-	144	-
26-May-11	-	484	700	400	-	-	-	150
8-Jun-11	-	600	576	362	576	-	720	1056
27-Jun-11	152	792	500	-	-	780	1392	160
7-Jul-11	-	266	324	-	572	-	286	322
20-Jul-11	-	806	-	-	-	-	820	900
10-Aug-11	-	900	480	-	539	-	293	-
21-Sep-11	120	1170	459	495	350	576	294	495
30-Sep-11	-	710	638	360	-	-	720	420
13-Oct-11	-	148	824	631	502	864	102	202
Total Area	**972**	**5875**	**4501**	**2249**	**2539**	**2220**	**4771**	**3705**
# Dates Sampled	**3**	**9**	**8**	**5**	**6**	**3**	**9**	**8**

Table A-28: Salinity and temperature measurements during beach seining of McNab nearshore habitat, 2011

Date	Site	Surface		Bottom	
		Temp. (°C)	Salinity (ppm)	Temp. (°C)	Salinity (ppm)
25-May-11	**Average**	**6.7**	**0.4**	**7.3**	**2.8**
	#1	10.5	1.3	11.6	6.6
	McNab-E	4.8	0.0	5.5	1.7
	McNab-W	4.9	0.0	4.9	0.0
26-May-11	**Average**	**8.8**	**1.8**	**9.9**	**4.9**
	#2	8.2	2.2	10.8	6.3
	#3	10.7	2.2	12.1	7.5
	#4	11.5	2.7	11.8	5.5
	McNab-W	4.8	0.1	4.9	0.2
8-Jun-11	**Average**	**11.5**	**3.1**	**13.0**	**6.0**
	#2	10.4	0.8	13.1	6.9
	#3	14.3	2.3	14.7	4.8
	#4	15.7	3.2	16.1	4.6
	#5	14.7	11.6	14.8	11.6
	McNab-E	5.9	0.0	5.9	0.0
	McNab-W	8.3	0.5	13.3	8.1
27-Jun-11	**Average**	**11.1**	**2.4**	**11.2**	**3.5**
	#1	14.7	2.6	15.1	3.2
	#2	13.8	3.4	13.9	9.9
	#3	14.2	2.5	14.7	3.1
	#6	14.7	8.6	15.0	8.7
	McNab-E	6.6	0.0	6.6	0.0
	McNab-W	6.8	0.0	6.8	0.0
7-Jul-11	**Average**	**10.0**	**1.0**	**12.6**	**3.3**
	#2	9.5	1.0	14.3	5.4
	#3	12.3	1.3	13.9	3.4
	#5	13.3	2.8	13.4	2.8
	McNab-E	7.3	0.0	7.3	0.0
	McNab-W	7.7	0.1	14.3	4.7
20-Jul-11	**Average**	**10.8**	**1.3**	**14.3**	**4.9**
	#2	9.0	0.4	14.2	5.0
	#5	16.8	4.8	16.0	5.9
	McNab-E	8.5	0.0	12.7	1.8
	McNab-W	9.0	0.1	14.6	7.1

Date	Site	Surface		Bottom	
		Temp. (°C)	Salinity (ppm)	Temp. (°C)	Salinity (ppm)
10-Aug-11	**Average**	**14.5**	**2.3**	**15.2**	**3.6**
	#2	13.4	1.0	15.4	4.3
	#3	15.8	3.3	16.8	4.8
	#5	17.3	5.0	17.1	5.1
	McNab-E	11.4	0.0	11.4	0.0
21-Sep-11	**Average**	**15.3**	**10.3**	**15.6**	**13.2**
	#1	15.7	12.9	15.8	13.0
	#2	14.6	6.4	15.5	13.1
	#3	15.4	9.7	15.5	14.1
	#4	15.8	12.0	15.9	13.1
	#5	15.7	12.3	15.7	12.6
	#6	15.6	12.4	15.6	12.5
	McNab-E	14.2	5.5	15.0	14.4
	McNab-W	15.2	11.2	15.6	13.1
30-Sep-11	**Average**	**12.2**	**n/a**	**13.1**	**n/a**
	#2	12.2	**n/a**	12.9	**n/a**
	#3	12.1	**n/a**	13.1	**n/a**
	#4	12.9	**n/a**	13.2	**n/a**
	McNab-E	12.7	**n/a**	13.2	**n/a**
	McNab-W	11.3	**n/a**	13.1	**n/a**
13-Oct-11	**Average**	**10.8**	**3.6**	**11.5**	**13.4**
	#2	10.2	2.2	11.2	15.0
	#3	9.5	2.1	10.9	9.9
	#4	12.3	6.7	11.3	14.8
	#5	12.0	3.0	12.0	11.3
	#6	13.8	8.1	12.2	11.1
	McNab-E	8.7	0.2	11.4	15.8
	McNab-W	9.3	3.1	11.5	15.7

Notes:
Ppm – Parts Per Million, n/a – not applicable or measurement not taken

Table A-29: Summary fish capture information from beach seining in McNab nearshore, 2011

Parameter	May 25	May 26	June 8	June 27	July 7	July 20	Aug 10	Sept 21	Sept 30	Oct 13
Abundance (fish/site)	14 ± 15	62 ± 48	73 ± 77	41 ± 60	50 ± 45	72 ± 80	40 ± 58	8 ± 5	26 ± 32	16 ± 11
Density (fish/m^2)	0.024 ± 0.015	0.161 ± 0.105	0.124 ± 0.133	0.073 ± 0.076	0.115 ± 0.126	0.116 ± 0.091	0.055 ± 0.064	0.013 ± 0.010	0.043 ± 0.042	0.055 ± 0.075
Proportion of Juvenile Salmon	0.64	0.07	0.24	0.16	0.02	0.18	0.13	0.00	0.00	0.00
Proportion of Coho Salmon	0.28	0.04	0.13	0.02	0.01	0.03	0.05	0.00	0.00	0.00

* Values are presented as Mean ± Standard Deviation of all sites per sample date

Table A-30: Tide height during McNab nearshore fish sampling, 2011

Date	Time	Site	Tide Height (m)	Depth (m)
25-May-11	11:15	#1	2.75	0.7
	13:50	McNab-E	2.95	0.8
	15:00	McNab-W	2.6	0.8
26-May-11	n/a	McNab-W	n/a	0.5
	n/a	#2	n/a	0.8
	n/a	#3	n/a	0.6
	n/a	#4	n/a	0.6
08-Jun-11	10:10	McNab-E	3.3	1.3
	11:04	McNab-W	3.3	1.0
	12:04	#2	3.1	1.0
	13:22	#3	2.65	1.2
	14:49	#4	2.2	0.9
	15:35	#5	1.75	0.3
27-Jun-11	10:30	McNab-E	1.1	1.2
	10:48	McNab-E	1.2	1.2
	11:02	McNab-W	1.25	0.5
	12:34	#2	1.8	1.1
	14:25	#3	2.9	1.3
	15:50	#6	3.4	0.9
	16:54	#1	3.75	1
07-Jul-11	10:26	McNab-E	3.4	n/a
	11:54	McNab-W	3.2	n/a
	12:36	#2	3.1	n/a
	14:46	#3	2.4	n/a
	16:40	#5	2	n/a
20-Jul-11	10:14	McNab-E	3.3	1
	11:13	McNab-W	3	0.6
	12:15	#2	3.65	1
	15:40	#5	1.9	0.6
10-Aug-11	10:20	McNab-E	0.85	0.6
	12:28	#2	1.8	1.0
	14:16	#3	3	1.2
	16:06	#5	4	1.1

Date	Time	Site	Tide Height (m)	Depth (m)
21-Sep-11	10:12	McNab-E	3.8	1.4
	10:54	McNab-W	3.1	0.8
	11:27	#2	3.25	1.6
	12:48	#3	3.75	1.4
	13:47	#4	3.9	1.3
	14:27	#5	3.95	0.9
	15:04	#6	3.95	0.6
	15:40	#1	3.9	0.7
30-Sep-11	13:00	McNab-E	3.1	0.8
	13:38	McNab-W	2.9	0.7
	14:19	#2	2.8	0.9
	15:26	#3	3.05	1.0
	16:38	#4	3.5	0.5
13-Oct-11	9:57	McNab-E	3.75	n/a
	10:28	McNab-W	3.5	n/a
	11:07	#2	3.3	n/a
	12:12	#3	3.05	n/a
	13:16	#4	3.05	n/a
	14:30	#5	3.25	n/a
	15:20	#6	3.5	n/a

McN – McNab Creek, SD – Standard Deviation, n –, Avg – Average, mm - Millimeters

Table A-31: Beach seining fish capture data, McNab nearshore, 2011

Date	25-May						26-May							8-Jun								27-Jun								7-Jul							20-Jul							
Species	Survey Area #			Sample Size	Length (mm)		Survey Area #				Sample Size	Length (mm)		Survey Area #						Sample Size	Length (mm)			Survey Area #						Sample Size	Length (mm)			Survey Area #				Sample Size	Length (mm)			Survey Area #				Sample Size	Length (mm)	
	1	McN-E	McN-W	n	Avg	SD	2	3	4	McN-W	n	Avg	SD	2	3	4	5	McN-E	McN-W	n	Avg	SD	1	2	3	6	McN-E	McN-W	n	Avg	SD	2	3	5	McN-E	McN-W	n	Avg	SD	2	5	McN-E	McN-W	n	Avg	SD
CH	5	-	-	5	40	5	-	-	2	-	2	40	6	4	-	-	1	-	-	5	50	26	1	1	-	-	-	-	2	50	2	3	2	-	-	-	5	61	10	31	-	-	-	31	72	5
CM	3	3	-	6	42	9	3	1	5	-	9	47	8	2	-	-	-	1	1	4	38	1	-	31	-	4	-	-	35	41	4	-	-	-	-	-	0	-	-	20	1	-	2	23	71	5
CO	2	-	1	3	39	5	5	-	-	2	7	40	5	1	1	-	3	1	3	9	58	24	-	-	2	-	-	-	2	61	1	-	2	-	-	-	2	87	1	9	-	-	1	10	58	9
CT	3	-	-	3	89	5	-	-	-	-	0	-	-	-	-	-	-	-	1	1	135	n/a	2	-	-	-	-	-	2	118	4	-	-	-	-	-	0	-	-	-	-	-	0	-	-
CT/RB	-	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	0	-	-	-	-	-	0	-	-
FL	-	-	-	0	-	-	-	-	-	-	0	-	-	17	5	1	55	-	-	78	69	62	1	1	2	-	-	-	4	53	42	15	2	15	-	-	32	70	49	3	-	-	-	3	46	9
GNFS	2	-	-	2	115	28	-	3	1	-	4	138	28	-	11	-	6	-	-	17	72	44	-	-	-	-	-	-	0	-	-	-	1	3	-	-	4	49	7	-	1	-	-	1	42	n/a
SL	-	-	-	0	-	-	-	-	10	-	10	36	6	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	0	-	-	-	-	-	0	-	-
SC	32	-	-	32	58	23	84	11	89	19	203	40	9	115	80	2	95	-	6	298	65	37	-	12	7	-	4	4	27	39	24	60	44	12		5	121	60	43	92	4	-	17	113	47	16
SP	-	-	-	0	-	-	-	-	-	-	0	-	-	-	-	1	2	-	-	3	96	1	12	-	-	15 6	-	-	168	106	9	-	-	71	-	-	71	97	6	3	25	-	-	28	65	28
STFL	4	-	-	4	79	74	-	4	-	-	4	170	67	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	0	-	-	-	-	-	0	-	-
STSC	-	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	0	-	-	-	-	-	0	-	-
TPSC	-	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	0	-	-	-	-	-	0	-	-
TSB	-	-	-	0	-	-	4	1	4	-	9	47	8	-	7	-	12	-	-	19	53	10	2	-	3	-	-	-	5	38	16	1	6	-	-	-	7	48	17	2	-	-	-	2	56	6
Unknown species #1	-	-	-	0	-	-	-	-	-	-	0	-	-	-	1	-	-	-	-	1	35	n/a	-	-	-	-	-	-	0	-	-	-	-	-	-	-	0	-	-	-	-	-	0	-	-
Unknown species #2	-	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	0	-	-	-	-	-	0	-	-
WSGR	-	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-	0	-	-	-	7	-	-	-	7	29	4	4	-	-	-	4	29	2
Total	**51**	**3**	**1**	**55**	**462**	**149**	**96**	**20**	**111**	**21**	**248**	**558**	**137**	**139**	**105**	**4**	**174**	**2**	**11**	**435**	**671**	**205**	**18**	**45**	**14**	**16 0**	**4**	**4**	**245**	**506**	**102**	**79**	**64**	**101**	**0**	**5**	**249**	**501**	**137**	**164**	**31**	**0**	**20**	**215**	**486**	**80**

Notes:

***Fish Species Codes:**

CODE	Common Name	*Latin Name*
CH	Chinook Salmon	*Oncorhychus tshawytscha*
CM	Chum Salmon	*Oncorhychus keta*
CO	Coho Salmon	*Oncorhychus kisutch*
CT	Coastal Cutthroat Trout	*Oncorhychus clarki clarki*
FL	Flounder	*Pleuronectidae spp.*
STFL	Starry Flounder	*Platichthys stellatus*
SC	Sculpin	*Cottidae*
STSC	Pacific Staghorn Sculpin	*Leptocottus armatus*
TPSC	Tidepool Sculpin	*Oligocottus maculosus*
TSB	Three-spined Stickleback	*Gasterosteus aculeatus*
GNFS	Gunnelfish	*Pholidae*
GR SPP.	Greenling	*Hexagrammidae*
WSGR	White Spotted Greenling	*Hexagrammos stelleri*
SL	Sand Lance	*Ammodytidae*
SP	Shiner Perch	*Cymatogaster aggregata*

Date	10-Aug								21-Sep											30-Sep										13-Oct									
Species	Survey Area #					Sample Size	Length (mm)		Survey Area #								Sample Size	Length (mm)		Survey Area #					Sample Size	Length (mm)		Survey Area #							Sample Size	Length (mm)	
	2	3	5	McN-E	McN-W	n	Avg.	SD	1	2	3	4	5	6	McN-E	McN-W	n	Avg	SD	2	3	4	McN-E	McN-W	n	Avg	SD	2	3	4	5	6	McN-E	McN-W	n	Avg	SD
CH	3	2	1	-	-	6	76	5	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-	0	-	-
CM	1	-	-	-	1	2	71	28	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-	0	-	-
CO	-	-	1	-	-	1	71	n/a	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-	0	-	-
CT	5	-	-	-	-	5	153	36	-	2	-	-	-	-	-	-	2	353	67	-	-	-	-	-	0	-	-	-	-	3	-	-	-	3	260	43
CT/RB	-	-	-	-	-	0	-	-	-	1	-	-	-	-	-	-	1	270	n/a	-	-	-	-	-	0	-	-	-	-	-	-	-	-	0	-	
FL	-	9	-	-	-	9	61	3	-	-	-	-	-	-	3	2	5	66	4	-	-	-	-	-	0	-	-	-	1	-	1	-	-	2	286	n/a
GNFS	-	-	-	-	1	1	51	n/a	-	-	-	-	-	-	-	-	0	-	-	2	-	-	-	-	2	123	n/a	4	2	2	-	-	-	-	8	83	33
SL	-	-	-	-	-	0	-	-	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-	0	-	-
SC	56	2	-	1	11	70	36	17	-	2	5	4	3	4	3	1	22	37	10	57	4	7	-	5	73	30	9	21	15	14	9	6	1	6	72	31	9
SP	66	20	2	-	3	91	75	24	-	-	-	-	-	-	-	-	0	-	-	1	2	2	-	-	5	70	3	-	-	-	1	-	-	4	5	43	24
STFL	5	-	-	1	-	6	165	18	-	1	-	-	-	-	-	-	1	170	n/a	3	-	1	-	-	4	168	21	1	1	1	5	-	-	-	8	136	52
STSC	-	4	-	-	-	4	72	8	-	-	1	1	-	-	-	1	3	79	55	5	-	-	-	2	7	59	24	1	1	-	1	-	-	-	3	171	103
TPSC	-	-	-	-	-	0	-	-	-	-	-	-	-	-	-	1	1	33	n/a	3	-	-	-	-	3	34	2	-	-	-	-	-	-	-	0	-	-
TSB	-	-	-	-	-	0	-	-	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	0	-	-	-	-	1	-	1	-	-	2	31	2
Unknown sp	2	-	-	-	-	2	47	12	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-	0	-	-
Unknown Sp #2	1	-	-	-	-	1	69	n/a	-	-	-	-	-	-	-	-	0	-	-	-		-	-	-	0	-	-	-	-	-	-	-	-	0	-	-
WSGR	1	1	-	-	-	2	34	5	-	12	5	-	-	-	3	1	21	31	5	3	2	-	-	4	8	26	9	6	1	-	-	-	-	-	7	38	4
Total	**140**	**38**	**4**	**2**	**16**	**200**	**981**	**156**	**0**	**18**	**11**	**5**	**3**	**4**	**9**	**6**	**56**	**1039**	**141**	**74**	**8**	**10**	**0**	**11**	**102**	**510**	**68**	**33**	**21**	**21**	**17**	**7**	**1**	**10**	**110**	**1079**	**270**

Notes:

***Fish Species Codes:**

CODE	Common Name	*Latin Name*
CH	Chinook Salmon	*Oncorhychus tshawytscha*
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CT	Coastal Cutthroat Trout	*Oncorhychus clarki clarki*
FL	Flounder	*Pleuronectidae spp.*
STFL	Starry Flounder	*Platichthys stellatus*
SC	Sculpin	*Cottidae*
STSC	Pacific Staghorn Sculpin	*Leptocottus armatus*
TPSC	Tidepool Sculpin	*Oligocottus maculosus*
TSB	Three-spined Stickleback	*Gasterosteus aculeatus*
GNFS	Gunnelfish	*Pholidae*
GR SPP.	Greenling	*Hexagrammidae*
WSGR	White Spotted Greenling	*Hexagrammos stelleri*
SL	Sand Lance	*Ammodytidae*
SP	Shiner Perch	*Cymatogaster aggregata*

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ATTACHMENT B

Photographs

Photograph 1: Lower McNab Creek, at 0+00 m and within the estuary, view looking north upstream, September 8th, 2011

Photograph 2: Lower McNab Creek, at approximately 1000 m upstream from the estuary, view looking south downstream, August 31th, 2011

Photograph 3: Lower McNab Creek view looking west upstream approximately 1200 m from the estuary, November 16th, 2010

Photograph 4: Lower segment of WC 2 (constructed groundwater-fed watercourse) glide habitat, approximately 405 m upstream from estuary, view facing west upstream. July 28th, 2011

Photograph 5: Upper segment of WC 2 (constructed groundwater-fed watercourse), within the Proposed Project Area and 400 m upstream from the RoW road, view looking south downstream. September 9th, 2010

Photograph 6: WC 3 view looking north upstream. July 13th, 2011

Photograph 7: WC 3-E view looking south-west downstream. July 13th, 2011

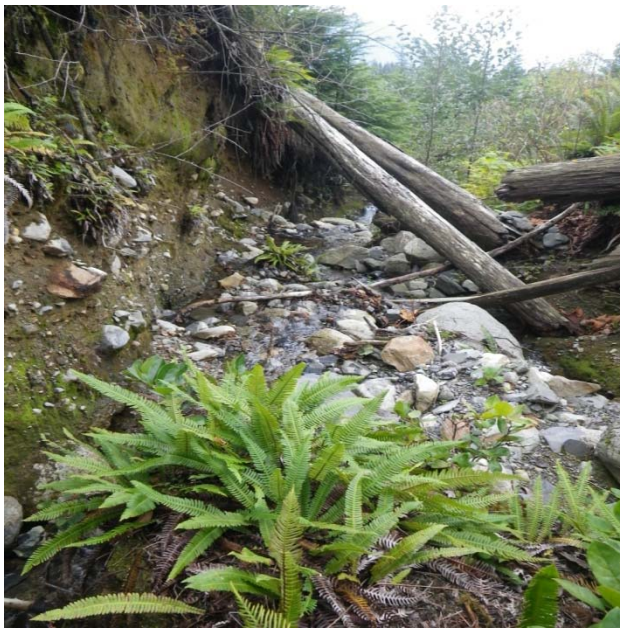
Photograph 8: WC 4-W view looking north-west upstream at riffle habitat 110 m from estuary. July 6th, 2011

Photograph 9: WC 4-E at approximately 100 m from estuary, view looking north-west upstream at seepage wetland. July 6th, 2011

Photograph 10: WC 5 view looking south downstream at glide habitat, approximately 260 m upstream from the estuary, and outside of the Proposed Project Area. May 3rd, 2011

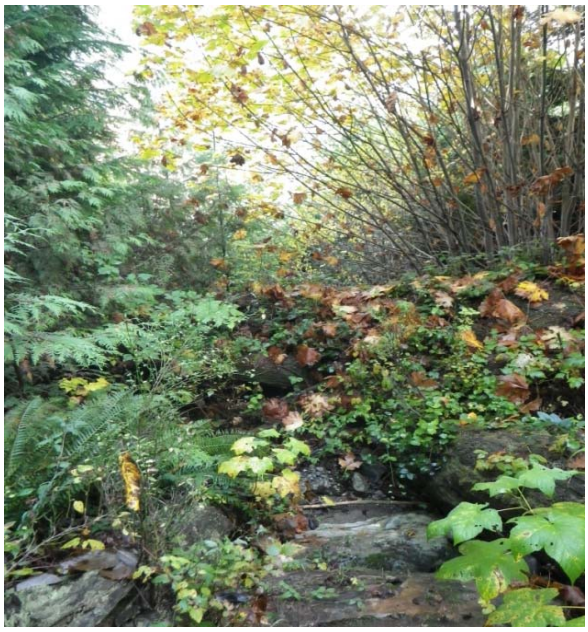
Photograph 11: Harlequin Creek riffle habitat, view looking north upstream, located immediately north of confluence with WC 22. June 28th, 2011

Photograph 12: WC 6, on west slope outside of the Proposed Project Area, view looking east downstream. August 22nd, 2011



Photograph 13: WC 7 view looking east downstream at riffle habitat by eroded bank on the west slope, several hundred metres upstream from the main road. July 10th, 2011

Photograph 14: Seasonally wetted WC 8 within a ravine, view looking east downstream, approximately 175 m from main road. February 9th, 2012



Photograph 15: Ephemerally wetted WC 9 cascade habitat, view looking east upstream, on the west slope outside of the Proposed Project Area. October 27th, 2011

Photograph 16: WC 10 view looking east downstream from main road. July 14th, 2011

Photograph 17: WC 13 ephemeral watercourse view north. January 26th, 2012

Photograph 18: Seasonally wetted WC 14, view looking north-west upstream within clear-cut and the Proposed Project Area. January 27th, 2012

Photograph 19: The non-wetted bed of WC 16 which runs north-south parallel to the main road. July 14th, 2011

Photograph 20: WC 17 looking north upstream at 600mm culvert crossing underneath the main road. July 14th, 2011

Photograph 21: Ephemerally wetted upper WC 19, west of the Project boundary, view looking east towards the main road. February 9th, 2012

Photograph 22: Ephemerally wetted lower WC 20, west of the Proposed Project Area, view looking north. February 9th, 2012

Photograph 23: Ephemerally wetted WC 21, view looking west from WC 2, approximately 100 m upstream from the RoW road. July 26th, 2011

Photograph 24: Log-plunge-pool on WC 22, upstream of confluence with Harlequin Creek, outside the southern boundary of the Proposed Project Area. July 26th, 2011

Photograph 25: Log-step pool on ephemerally wetted WC 23, approximately 140 m west of the Harlequin Creek confluence. July 26th, 2011

Photograph 26: Seepage flow from the ephemeral WC 24, at its confluence with WC 22, approximately 80 m upstream from Harlequin Creek. July 26th, 2011

Photograph 27: Large woody debris covering WC 25, where it begins to flow from the west slope to the Harlequin Creek wetland. July 26th, 2011

Photograph 28: South-west intermittent watercourse draining tor the Harlequin Creek Seepage Wetland, view looking north-east upstream. February 29th, 2012

Photograph 29: South-west ephemeral watercourse draining from Harlequin Creek Seepage, a beaver impounded wetland, view looking east downstream. February 29th, 2012

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