APPENDIX 23

Preliminary Fish Habitat Compensation Plan

Victoria GOLD CORP

Stantec

EAGLE GOLD PROJECT

Preliminary Fish Habitat Compensation Plan

Prepared for:

Victoria Gold Corp
680 – 1066 West Hastings Street
Vancouver, BC
V6E 3X2

Prepared by:

Stantec
4370 Dominion Street, Suite 500
Burnaby, BC
V5G 4L7
Tel: (604) 436-3014 Fax: (604) 436-3752

Project No.:

1490-10002

December 2010

Victoria GOLD CORP

Stantec


Victoria
GOLD CORP


Stantec

AUTHORSHIP

Kirby Ottenbreit, BA .....Author

Todd Goodsell, BS, B.Sc. .....Author

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1 INTRODUCTION

This document presents the Eagle Gold Preliminary Fish Habitat Compensation Plan (FHCP) to address predicted harmful alteration, disruption or destruction to fish habitat (HADD) losses resulting from the development of Victoria Gold Corp.'s (VIT) proposed Eagle Gold Project (the Project). The Project is a proposed gold mine using conventional heap leach facility and open pit operations with an eight year mine life. Key components of the project include:

- Mineral Reserves of 66 Million tons, at a grade of 0.82 grams gold per ton ore, containing 1.8 Million ounces
- A production of 9.1 Million tons per annum with an eight-year mine life
- Open pit mining of a primary gold deposit with a final open pit footprint of approximately 70 ha
- Two waste rock storage areas
- Gold extraction using a three stage crushing process, heap leaching, and a carbon adsorption, desorption, and recovery system
- Heap leaching process using sodium cyanide solution applied year round
- Access by highway and existing unpaved roads
- Power supplied by the Yukon Energy Corporation transmission grid for operations.

The Project is located in central Yukon Territory approximately 45 km north-northeast of the village of Mayo and 350 km north of Whitehorse by line of sight. The Project site is located between 700 m and 1,300 m above sea level. The Project is accessible via the Silver Trail (Highway 11) and the existing South McQuesten and Haggart Creek Roads. These two existing roads are a total 45 km in length and are divided by the South McQuesten River. The total driving distance from Mayo is approximately 85 km.

VIT plans to submit a comprehensive environmental assessment as part of the Project Proposal on December 17, 2010 as required by the *Yukon Environmental and Socio-Economic Assessment Act* (YESAA). An authorization under the *Fisheries Act* for the harmful alteration disruption or destruction of fish habitat as a result of the Project will be required. It is anticipated that Fisheries and Oceans Canada (DFO) will be identified by the Yukon Environmental and Socio-Economic Assessment Board (YESAB) as a Decision Body under YESAA. A Decision Body is a federal government, territorial government, or First Nation that has the authority to determine whether a project may proceed under the YESAA. Decision Bodies do not assess projects, rather they respond to recommendations made by the Executive Committee of YESAB. A Decision Body may accept, vary, or reject a recommendation, and must state its decisions in Decision Documents. The objective of the FHCP is to support DFO review of the Project Proposal that will be submitted under YESAA. As stated above, VIT is aware that authorization under the *Fisheries Act* Section 35(2) will be required prior to construction of the Project. A request for authorization will be submitted to DFO that includes detailed designs for fish habitat compensation in early 2011.

1.1 Overview of Project Area Fish and Fish Habitat and Limitations to Habitat Productive Capacity

Haggart Creek is approximately 38 km. in length and drains an area of approximately 330 km^2. Primary components of the Project infrastructure are located in the lower sections of the Dublin Gulch watershed, a tributary to upper Haggart Creek (Figure 1-2).

Historically, all flows from the Dublin Gulch watershed entered Haggart Creek near the existing Dublin Gulch/Haggart Creek confluence. However, recent placer mining activities have disturbed the watershed and rerouted flows from Stuttle Gulch and Eagle Pup into a new channel referred to as Eagle Creek. Eagle Creek parallels Dublin Gulch, to the south, and Haggart Creek, to the east, before directly entering Haggart Creek approximately 2.0 km downstream from the existing Dublin Gulch/Haggart Creek confluence.

Baseline information on fish and fish habitat in the local study area is summarized in Section 4.2 of the environmental assessment and described more fully in the Fish and Fish Habitat Environmental Baseline Report (Stantec 2010a). Field studies within the local Project area were completed over four sampling periods (August 2007, October 2007, April 2008, and July 2009) and included 59 sample sites, located on 28 watercourses in the region.

Arctic grayling and slimy sculpin were the only two fish species captured during field sampling programs conducted from 2007 – 2009. Grayling and slimy sculpin were captured or observed during these field programs in Lynx Creek, Haggart Creek, Ironrust Creek, Eagle Creek, and Dublin Gulch. There has been one recorded observation (1995) of Chinook salmon in Haggart Creek downstream from the Project location; however none were observed or captured during field sampling programs. Chinook spawners were observed at the Haggart Creek Road Bridge crossing of the South McQuesten River in August 2009. Other fish known to inhabit lower Haggart Creek include burbot and round whitefish. Arctic grayling and slimy sculpin are the only known fish species located in the fish-bearing watercourses directly impacted by mine development.

Arctic grayling are known to rear in upper Haggart Creek and its sub-basins. Past studies have determined grayling migrate to the South McQuesten River to overwinter (Pendray 1983); however, 2008 field studies found overwintering grayling in a large pool located in the upper Haggart Creek mainstem. The pool was likely created after 1983 during placer mining operations. Pendray (1983) observed that spawning by grayling in the Project area occurred predominantly in the South McQuesten River during the last two weeks of May. He also identified a small area at the mouth of Haggart Creek as a probable spawning site. The lack of overwintering habitat and the distance to the South McQuesten River is likely limiting the degree to which the uppers sections of the Haggart Creek watershed are utilized by grayling for other life-history stages (i.e., spawning and rearing).

Both First Nation and recreational fisheries for Arctic grayling exist on Haggart Creek downstream of its confluence with Lynx Creek, and in the South McQuesten River near the mouth of Haggart Creek.

2 SUMMARY OF HABITAT IMPACTS

The primary impacts to fish habitat will occur as a result of the diversion of Dublin Gulch around the Heap Leach Facility, and the in-filling of existing watercourses to accommodate the development of other mine components (i.e., open pit, waste rock storage areas). It is estimated the Project will result in the permanent loss of 17,929 m^2 of instream habitat and the associated riparian areas (191,550 m^2).

The construction of the Dublin Gulch diversion channel (DGDC) will divert flows from and eliminate fish habitat in lower Dublin Gulch. Construction of the DGDC, the Heap Leach Facility, and the Eagle Pup waste rock storage area will in-fill Ann Gulch, sections of Stuttle Gulch, and the majority of Eagle Pup. The Open Pit and Platinum Gulch waste rock storage area will eliminate upper portions of Platinum Gulch. The diversion of Dublin Gulch flows to Eagle Creek will result in a loss of wetted usable area for fish in Haggart Creek via reduced total water flow between its existing confluence with Dublin Gulch and its confluence with Eagle Creek approximately 1.8 km downstream.

Table 2-1 and Figure 2-1 provide an overview of habitat loss due to the construction of mine components and the DGDC. Ann Gulch and Platinum Gulch have been excluded from habitat loss calculations as well as the upper intermittent, ephemeral sections of Eagle Pup and Stuttle Gulch because they are not considered to be fish habitat. Ann Gulch is an ephemeral, non-fish-bearing watercourse that accounts for less than 2% of the total volume of flow in Dublin Gulch (Stantec 2010b). Platinum Gulch is similarly intermittent and ephemeral and accounts for less than 0.5% of Haggart Creek flows (Stantec 2010b). The Project will affect the upper areas of Platinum Gulch in which the channel is intermittent, poorly defined and has surface flows during high precipitation events only. Downstream effects to fish habitat, due to the loss of food, water, and nutrient inputs from these ephemeral and/or intermittent watercourses are negligible.

Table 2-1: Estimated Loss of Instream Fish Habitat

Watercourse	Affected Watercourse Length (m)			Avg. Channel Width (m)	Affected Habitat Area (m^2)		
	Fish-bearing	Non-fish-bearing	Total Length		Fish-bearing	Non-fish-bearing	Total Area
Dublin Gulch	1,540	550	2,090	6.04	9,302	3,322	12,624
Eagle Pup	–	776	776	1.27	–	986	986
Eagle Creek	–	1,425	1,425	2.41	–	3,434	3,434
Stuttle Gulch	–	554	554	0.70	–	388	388
Haggart Creek	1,800	–	1,800	n/a	497	–	497
Total	**3,340**	**3,305**	**6,645**		**9,799**	**8,130**	**17,929**

Riparian habitat losses have been calculated for all watercourses where permanent loss of instream habitat will occur (Table 2-2). Instream habitat losses within Haggart Creek will result solely from loss of wetted usable area and therefore have no associated losses of riparian habitat. Widths used to

calculate estimated losses of riparian habitat were 30 m for fish-bearing and 15 m for non-fish-bearing watercourses (BC MoE and DFO 2007).

Table 2-2: Estimated Loss of Riparian Habitat

Watercourse	Affected Habitat Area (m^2)		
	Fish-bearing	Non-fish-bearing	Total Area
Dublin Gulch	92,400	16,500	108,900
Eagle Pup	–	23,280	23,280
Eagle Creek	–	42,750	42,750
Stuttle Gulch	–	16,620	16,620
Haggart Creek	–	–	–
Total	**92,400**	**99,150**	**191,550**

Loss of wetted usable area for fish in Haggart Creek was estimated using survey and hydrology data to model the change of wetted perimeter at 82 transects. Transects were grouped into five homogenous reaches and estimates of change in wetted area were calculated for baseline, operational, and post-reclamation flow conditions. Three scenarios were used in the model: average, wet, and dry years (Table 2-3). For the purpose of calculating the potential HADD represented by reduced flows in Haggart Creek, the scenario in which the largest estimated loss of wetted usable area was used to provide the most conservative approach to HADD calculation.

Table 2-3: Modeled Change in Haggart Creek Wetted Area due to Dublin Gulch Flow Diversion

Reach	Change in Wetted Area for Three Model Scenarios		
	Average Year m^2 (%)	Wet Year m^2 (%)	Dry Year m^2 (%)
1	-63 (-2%)	-171 (-5.5%)	-28 (-0.9%)
2	-44 (-1.7%)	-50 (-1.9%)	-35 (-1.4%)
3	-50 (-3.2%)	-44 (-2.7%)	-19 (-1.2%)
4	-66 (-3.8%)	-53 (-3%)	-19 (-1.1%)
5	-156 (-2.3%)	-180 (-2.7%)	-67 (-1%)
Total	**-380 (-2.4%)**	**-497 (-3.2%)**	**-169 (-1.1%)**

3 OBJECTIVES

3.1 DFO Habitat Compensation Policy

Section 35 (2) of the Federal *Fisheries Act* provides for the protection of fish habitat. Under this section of the Act, no one may carry out any work or undertaking that results in the HADD, unless authorized by the Minister of Fisheries and Oceans Canada (DFO).

Preferably, a HADD can be avoided through project relocation, redesign and impact mitigation, whenever possible. Where a HADD cannot be avoided, compensation measures are necessary to achieve the Guiding Principle of No Net Loss, as specified in the 1986 *Policy for the Management of Fish Habitat* (DFO 1986). Proponents are required to compensate for the HADD as a condition of Subsection 35(2) Fisheries Act Authorizations. Compensation is defined in the Policy as:

> *"The replacement of natural habitat, increase in the productive capacity of existing habitat, or maintenance of fish production by artificial means in circumstances dictated by social and economic conditions, where mitigation techniques and other measures are not adequate to maintain habitats for Canada's fisheries resources".*

DFO's Habitat Policy sets to achieve a ~~"n~~o net loss" (NNL) in the productive capacity of fish habitat through the avoidance of negative impacts, the implementation of effective mitigation, or as a last resort, offsetting unavoidable negative impacts with habitat compensation in accordance with their hierarchy of preferred compensation options:

- Like for like habitat in the same ecological unit
- Unlike habitat in the same ecological unit
- Habitat in a different ecological unit
- Artificial maintenance of a stock of fish or deferred compensation.

The amount of compensation required is based on the residual loss of habitat after application of redesign and mitigation measures. Ratios of compensation to habitat loss are influenced by several factors:

- Certainty of success of the proposed compensation
- Variance in the quality of the replacement habitat in relation to the impacted habitat
- Delays in the functionality of compensation habitat
- Position of implemented compensation in the hierarchy of compensation options.

Other factors to be considered in compensation planning include:

- Fish species or stocks targeted in compensation objectives, and any fisheries management objectives, fishery use, or potential use of fish in the project area
- Opportunities to improve existing impacts or constraints to fish and fish habitat in the watershed

- First Nations traditional access to fish in the area, and traditional uses and ecological knowledge
- Compliance of compensation plans with recovery planning for species listed under the *Species at Risk Act*
- Amount and temporal nature of impact (permanent or temporary)
- Risk of failure and the time lag until compensatory habitats become fully functional
- Potential for the proposed Project to adversely affect the compensation works in the future
- Intrinsic value of habitat to be enhanced compared with the productive capacity gained through habitat enhancement
- Perpetuity of compensation works.

An initial meeting with DFO's Environmental Assessment and Major Projects Unit (EAMP) took place in November 2009, with a subsequent meeting in May 2010 to introduce the project and help identify objectives and priorities with respect to the federal *Fisheries Act*. An on-site visit was conducted with members from the EAMP in late August, 2010, in which potential HADDs were identified and to allow EAMP representatives to evaluate the suitability of conceptual compensation options.

3.2 Eagle Gold Habitat Compensation Objectives

The development of the FHCP considered: legislative requirements and policy detailed in the previous section, timeframes of the various project stages, and specific characteristics of existing habitat within the project area. The primary objectives of the plan are to increase the net productivity of fish habitat in the Haggart Creek watershed, and to design a compensation strategy that reflects the intent of DFO's *Policy for the Management of Fish Habitat* (DFO 2001) and incorporates the considerations and factors outlined within the policy.

The following sections describe how the factors outlined above are considered within the framework of the FHCP.

"No Net Loss" and Hierarchy of Preferred Compensation Options

The FHCP maintains that full compensation for fish habitat losses associated with the Project is feasible. All elements of the FHCP propose compensation works that meet the criteria of DFO's first option in the hierarchy of preferences for compensation under its habitat policy—providing like for like habitat within the Project area. Individual components of the compensation design are either incorporated into the project design, or are proposed in watercourses located within the project area within the watershed directly affected by the Project.

Targeted Fish Species/Stocks, Fishery Use, Management Objectives

The FHCP focuses on habitat impacts to Arctic grayling, as they are the only sport fish species present within the watercourses directly affected by the mine development, and a First Nations and recreational fishery for grayling exists downstream in the Haggart Creek watershed.

Environment Yukon recognizes that there is a general lack of data on which to base stock management decisions for Arctic grayling (Environment Yukon 2010). Information gathered from angler harvest surveys indicate a decline over the last several decades in some runs that have been heavily harvested. Management strategies for these runs primarily include angler education and regulation of the sport fisheries in these systems. Although these initiatives do not apply to the South McQuesten River system, slow recovery for the runs targeted by current management strategies suggest that proactive management for all Arctic grayling runs in the territory is needed (Environment Yukon 2010). The overall gain in habitat productive capacity proposed by the FHCP is consistent with this general proactive strategy of maintaining, or increasing, the strength of Arctic grayling runs in the Yukon.

Improve Existing Impacts or Address Existing Constraints to Fish Habitat

Past studies have indicated that overwintering habitat in the Haggart Creek watershed is scarce (Pendray 1983) and is the primary limiting factor to fish habitat productivity in the watershed. Therefore a key component of the proposed compensation is comprised of large deep pools with sufficient depth to remain unfrozen and oxygenated throughout the winter. Overwintering habitat within the Haggart Creek watershed makes it possible for Arctic grayling to be present immediately after ice breakup in the spring. Therefore, the FHCP includes development of quality grayling spawning habitat to further augment the productivity of the system. The primary objective of the FHCP is to increase the net productivity and complexity of fish habitat in the Haggart Creek watershed.

First Nations and Stakeholder consultation and use of the Area for Fishing

VIT has conducted a consultation program to engage with the FNNND, the VoM, local residents and other stakeholders with regard to the proposed Project. Since November 2009, VIT held 14 formal information and consultation events. In addition, meetings were held with several small groups and individuals and with regulators, and four newsletters were produced and sent to the general public. The primary parties consulted for the Project were the FNNND—within whose traditional territory the Project is located—and the VoM and its residents, due to the close proximity of the community to the site of the proposed Project. Details of the Eagle Gold Project Consultation Program are contained in Section 2 and Appendix 2 of the Project Proposal. In addition to consultation efforts, a Traditional Knowledge and Use Study was completed in conjunction with the FNNND. This study provided details on traditional use of local fish and fish habitat resources. Information received from these sources informed the design of the FHCP.

The FHCP has been developed to meet DFO Habitat Policy, and the interests of the FNNND and other land users within and around the Project area. A First Nations and recreational fishery for Arctic grayling exists downstream in the Haggart Creek watershed. The goal of net gain in productive capacity of the grayling habitat in Haggart Creek will enhance this fishery.

The FHCP will be submitted to the FNNND for review and comments as Appendix 23 to the Project Proposal (Stantec 2010c).

Species at Risk Act (SARA) Listed Species

A search of the SARA public registry database determined that no freshwater fish species on Schedules 1 or 2 of SARA are present in the South McQuesten River watershed or in the entire Yukon Territory (GoC 2008). Therefore no SARA listed species or their habitat will be affected by the Project.

Type, Amount, and Supply of Fish Habitat at Impact and Compensation Sites

The FHCP aims to achieve a net gain in the productive capacity of Arctic grayling habitat through the creation of replacement habitat at a ratio exceeding 2:1. Total proposed habitat gains are 37,278 m^2 as compared with 17,929 m^2 of impacted habitat. Detailed discussions of impacted habitats and compensation habitats are provided in Sections 2 and 4 respectively.

Temporal Nature of Impacts

All Project-related HADDs are permanent in nature. The reintroduction of a portion of Dublin Gulch watershed flows back into Haggart Creek at closure will offset some of the loss in wetted usable area associated with the Project. However, for purposes of habitat loss calculation within the FHCP, the HADD identified in Haggart Creek due to the reduction of flows is considered permanent. More detailed discussion of habitat impacts is provided in Section 2.

Risk of Failure and Time Lag Associated with Compensation Habitat

The risk that compensation habitat will not function as planned will be low by provision of high ratios of proposed compensation habitat to lost habitat (2.1:1: detailed in Section 4.7) and will be mitigated through monitoring of habitat function and adaptive management (Sections 4.9.4 and 4.9.5).

All of the compensation elements are on-site and integrated into the overall mine development. Implementation timing of the elements is tied to the design, construction, operations and closure phases of the Project. As such, compensation development occurs concurrently with, or shortly after, habitat losses associated with the project and minimizes time lag between loss of habitat productivity and the time when compensation habitat becomes functional. An overview of the timing and schedule of compensation works, including the lag time between impacts to fish habitat and the creation of functioning compensation habitat, is provided in Section 4.9.2.

Potential for the Project to Adversely Affect Compensation Habitats

The Project has the potential to adversely affect compensation works in several ways:

- Changes in sediment concentrations
- Changes in contaminant concentrations
- Changes in base flows
- Changes in fish mortality.

The potential for these Project effects to occur on existing fish habitat is assessed in Section 6.7 of the Project Proposal (Stantec 2010c). Table 3-1 provides the standard mitigations that will be implemented to avoid and reduce the magnitude of effects the Project might have on the

compensation fish habitat. Provided mitigation measures are implemented as planned, residual effects of the Project on compensation works is predicted to be not significant.

Table 3-1: Mitigation for Potential Project Effects on Compensation Habitat

Potential Project Effects on Compensation Habitat	Mitigation
Change in sediment concentrations	▪ Design of channel diversions to include streamside vegetation and functioning riparian areas ▪ Minimize extent of clearing, grubbing and grading adjacent to compensation channels to that required for safe vehicle access and construction activities ▪ Stage construction within 30 m of all compensation habitat and retain buffer zones until construction activities begin to limit the time stream banks and soils are exposed ▪ Maintain 30 m riparian buffer between mine components and compensation works ▪ Implement a rigorous erosion and sediment control program including sediment and erosion control ponds sized to a 1:100 year 24-hour event ▪ Monitor TSS and turbidity levels prior to release from sediment control ponds ▪ Time riparian construction activities to avoid high risk weather and flow conditions ▪ Re-vegetate riparian areas of all compensation habitat where needed.
Change in contaminant concentrations	▪ During operations all water flowing through compensation habitat will be non-contact (will not flow through Project components or facilities). At closure water flowing through compensation habitat will include non-contact and contact water (seepage from Eagle Pup WRSA). This water will be treated to achieve water quality criteria prior to discharge. ▪ Detailed mitigations for water quality issues are provided in the Surface Water Quality and Aquatics section (Section 6.5) of the environmental assessment (Stantec 2010c) ▪ Mitigations for water quality issues arising from potential accidents and malfunctions are provided in Accidents and Malfunctions sections (Section 8) of the environmental assessment (Stantec 2010c).
Changes in base flows	▪ No water will be withdrawn directly from compensation habitats for project processes ▪ Details of Project water balance and hydrology are provided in the Water Management Plan contained within the environmental assessment (Stantec 2010c).
Change in fish/egg mortality	▪ No instream works will occur within compensation habitat ▪ Compensation habitat will be designed to ensure fish migration is not impeded ▪ Ensure industrial equipment operating near compensation habitat is in good working order and free of leaks ▪ No water will be withdrawn directly from compensation habitats for project use. ▪ Incorporate recommendations from DFO's Guidelines for the Use of Explosives in or near Canadian Fisheries Waters (Wright and Hopky 1998) to the greatest extent possible where blasting in or near compensation habitat ▪ Conduct blasting near compensation works within established least risk periods (LRPs) to minimize or prevent fish mortalities.

Intrinsic Value of Proposed Enhanced Habitat

One component of the FHCP involves the enlargement and enhancement of habitat within the existing Eagle Creek channel. The intrinsic value of this existing habitat has been evaluated using a modified version of established habitat evaluation procedures (HEP) (USFWS 1980; Hubert 1985; Minns 1995). Details of the habitat evaluation are provided in Section 4.2.1).

Perpetuity of Proposed Compensation Habitat

VIT holds mineral claims to most of the lands on which the proposed FHCP would be situated and anticipates all of those lands, and access to those lands, will be included in the Quartz Mining License and Lease issued in relation to the Project. Measures VIT is exploring to protect the habitat compensation works from activities by others is discussed in section 4.8 Land Tenure.

4 HABITAT COMPENSATION ELEMENTS

4.1 Overview

During baseline studies the following compensation options were identified to compensate for HADDs due to the development of the Project:

- Barrier removal on tributaries to Haggart Creek (Secret and Cadillac Creeks)
- Eagle Creek Compensation Channel (ECCC)
- Haggart Creek Off-Channel Habitat
- Modification of the Dublin Gulch diversion channel (DGDC).

The removal of barriers and improved access between Haggart Creek and both Secret and Cadillac Creeks have the potential to increase the overall usable area of fish habitat in the Haggart Creek watershed. Existing placer mining claims and activity in both Secret Creek and Cadillac Creek represent a high risk for future impacts to compensation works in these sub-basins, and this option was not considered further.

Implementation of the remaining three compensation opportunities, in combination, comprise the FHCP, and will be able to satisfy stated compensation objectives and meet the quantity of habitat required for fish habitat losses associated with the Project. The plan meets the criteria of the first option in the hierarchy of preferences for compensation under DFO‘s habitat policy, providing like for like habitat within the Project area. It also focuses on creating overwintering habitat for Arctic grayling which has been identified as one of the limiting factors to habitat productivity in the Haggart Creek system, and opens up new areas to fish above existing barriers to fish passage in Dublin Gulch. Each of the three components of the FHCP are discussed in further detail in the following sections.

4.2 Eagle Creek Fish Habitat Compensation Channel

Fish habitat productive capacity will be increased through the development of additional fish habitat and enhancement of existing fish habitat in lower Eagle Creek. An assessment of habitat productivity of the existing Eagle Creek channel was completed to quantify the gains in productive capacity attributable to compensation works. Productive capacity of the existing Eagle Creek channel was evaluated using a modified version of established habitat evaluation procedures (HEP) (USFWS 1980; Hubert 1985; Minns1995). Baseline habitat values were established against which habitat gains resulting from the ECCC can be compared. Results of the habitat evaluation and the design of the compensation channel are discussed in the following sections.

4.2.1 Existing Habitat Evaluation

The strategy for habitat compensation in Eagle Creek proposes to increase the productivity capacity of fish habitat via the creation of new habitat and enhancement of existing fish habitat (increasing the area and unit-area productivity of the available habitat). In order to quantify the productive capacity of existing and proposed compensation habitat within Eagle Creek, habitat units (HU) derived from habitat suitability index (HSI) curves for Arctic grayling (Hubert 1985) were used as a surrogate variable for productive capacity.

We understand that DFO does not directly endorse or approve the use of HSI values as a surrogate for habitat quality; however, the use of surrogate variables, and in particular HSI values, have been used as at common approach for analyzing habitat gains and losses for large projects throughout Canada (Packman, et. al., 2006; Minns and Moore 2003). HSI values are ratings based on quantitative and subjective ratings of habitat characteristics for key life-history stages of a given species.

Three key life-history stages for Arctic grayling were identified:

1. Spawning and embryo development
2. Fry rearing
3. Juvenile and Adult migratory and wintering habitat.

HSI curves were not available for Arctic grayling fry life-history stage; therefore, Instream Flow Incremental Methodology (IFIM) suitability index curves were used in place of HSI curves (Hubert 1985: Appendix B). Six habitat variables were used to generate HSI values for spawning and embryo development, four for rearing fry, and four for juvenile and adult grayling (Table 4-1). As per the HSI model (Hubert 1985), the variable with the lowest HSI value determines the overall HSI value assigned to the habitat unit. Similarly, the lowest variable score was used to determine the overall IFIM habitat unit value for grayling fry.

Eagle Creek was divided into 12 reaches and data was collected at a number of transects within each reach to generate HSI values for the three Arctic grayling life-history stages. HSI values were multiplied by reach area to generate the total HUs for each reach and life-history stage (Figure 4-1; Table 4-2). A breakdown of HSI and IFIM ratings for habitat variables within each reach is provided

in Appendix A. The primary factors limiting habitat value within the existing Eagle Creek channel are the high percentage of fine substrates and limited amount of gravel and cobble for spawning habitat; higher water velocities, shallow depths, and high percentage of fines for fry rearing habitat; and the absence of overwintering habitat for juveniles and adults.

Table 4-1: Habitat Variables Used in HSI and IFIM Modeling of Arctic Grayling Habitat in Eagle Creek

Life-History Stage	Variable	Description
Spawning and Embryo Development (HSI)	Water Temperature	Average maximum water temperature during warmest period of the year
	Dissolved Oxygen	Average minimum dissolved oxygen during the late summer period
	Gravel and Rubble Substrate	Percentage of substrate composed predominantly of gravel and rubble (1.0 – 20.0 cm diameter)
	Fines	Percentage of substrate comprised of fines (<3 mm diameter)
	Velocity	Average water velocity
	Pools	Percentage of pool, backwater, and side channel areas with water velocity <0.15 m/s
Fry rearing (IFIM)	Velocity	Average water velocity
	Depth	Average water depth
	Substrate	Dominant substrate particle size
	Water Temperature	Average maximum water temperature during the warmest period of the year
Juveniles and Adults (HSI)	Water Temperature	Average maximum water temperature during the warmest period of the year
	Dissolved Oxygen	Average minimum dissolved oxygen during the late summer period
	Spawning Access	Annual frequency of early spring access to tributary spawning streams within 150 km of wintering areas
	Wintering Habitat	Occurrence of winter habitat (deep pools with water velocities <0.15 m/s that do not freeze solid in winter

Table 4-2: Calculated Habitat Units for Spawning, Fry, and Adults and Juveniles in the Existing Eagle Creek Channel

Reach	Area (m^2)	Habitat Units			
		Spawning (HSI)	Fry (IFIM)	Juveniles and Adults (HSI)	Total
1	184.3	57.4	0.0	0.0	57.4
2	374.9	0.0	0.0	0.0	0.0
3	510.4	0.0	0.0	0.0	0.0
4	311.7	0.0	0.0	0.0	0.0
5	387.5	0.0	10.8	0.0	10.8
6	379.4	143.0	37.9	0.0	180.9
7	329.7	0.0	155.8	0.0	155.8
8	5,778.0	0.0	540.0	0.0	540.0
9	632.3	317.3	0.0	0.0	317.3
10	4,234.0	0.0	395.0	0.0	395.0
11	731.7	142.3	271.0	0.0	413.3
12	704.6	211.2	0.0	0.0	211.2
Total	**14,558.5**	**871.2**	**1,410.5**	**0.0**	**2,281.7**

The ECCC will be designed to provide habitat that is currently absent or scarce and address those factors which are currently limiting the productive capacity of watercourses in the project area.

4.2.2 Design Overview

To facilitate the creation of pond and stream channel habitat in Eagle Creek, all flows from the DGDC will be diverted into an enlarged and enhanced channel created within the existing flood plain. Runoff from the mine site (i.e., open pit and waste rock storage areas) that previously flowed from Eagle Pup and Stuttle Gulch into Eagle Creek will be captured for use in mine site processes and then recycled during the operations phase of the Project.

At the end of the operations phase (mine site closure); all mine site runoff will be returned to Haggart Creek near its existing confluence with Dublin Gulch. The increase in flow resulting from the return of mine site runoff to Haggart Creek will not exceed baseline flow contributions of Dublin Gulch, and no adverse downstream impacts or HADDs are predicted. Ultimately, some of the loss (497 m^2) in wetted usable area of fish habitat within Haggart Creek, between the existing Dublin Gulch confluence and the Eagle Creek confluence, will be re-established by these additional flow contributions. Although this will decrease the long-term habitat impacts of the Project, the re-establishment of this habitat at closure has not been used to reduce overall HADD calculations.

The ECCC will be a combination of new habitat creation as well as enhancement of the existing Eagle Creek channel and pools which currently have low habitat values (i.e., low HSI and IFIM ratings). The total area of new habitat provided by the ECCC is expected to be 25,800 m^2. This represents an increase in habitat value, over and above that provided by the existing Eagle Creek channel, of 23,518 HUs. Habitat units are an expression of the available area multiplied by the habitat quality rating represented by an HSI value (0 to 1), and therefore one habitat unit represents one square metre of fish habitat. Improvements to habitat value will be attained primarily through the reduction of sediment loads from upstream sources, placement of appropriate substrates for the various life-history stages of Arctic grayling, spawning habitat development, overwintering habitat development, and increased water depth from higher base flows.

Riparian habitat associated with the compensation channel totals 98,100 m^2 in area. This includes a 30 m riparian strip on either side of the channel and pools except where the existing road is located less than 30 m from the existing watercourse. Existing riparian vegetation is relatively intact downstream of the largest pond and is not included in riparian habitat gains. The remainder of the existing Eagle Creek channel is largely void of riparian vegetation due to past placer mining activities. Total riparian habitat gain included in habitat balance calculations is 75,300 m^2.

Detailed design of the compensation channel will follow known criteria and include features required to achieve the habitat quality and predicted increase in habitat unit values. Key elements of the design include:

- Increase in channel widths and capacity of the channel to convey diverted Dublin Gulch flows up to the 1:200 year flood event
- Creation of a stable channel with 2H:1V or gentler banks
- Excavation and enlargement of existing placer settling pond to provide overwintering habitat; a primary limiting factor to the productive capacity of the system
- Inclusion of spawning and rearing habitat characteristics throughout the channel
- Pool-riffle-run sequences spaced approximately at 6 times the channel width
- Cover features (e.g. root wads, boulder clusters) spaced every 15 to 30 metres depending on reach morphology.

Specifics of channel dimensions, morphology (riffle-pool-run), and habitat features will be included in detailed design drawings in the final fish habitat compensation plan during the regulatory phase of the project. The plan view and profile of the compensation channel is shown in figures 4-2a and 4-2b, with typical cross-sections and habitat features provided in Figures 4-3 and 4-4.

4.3 Haggart Creek Off-Channel Habitat

As noted previously, overwintering habitat is one of the key limiting factors to the productive capacity of the upper Haggart Creek watershed. Development of groundwater-fed off-channel habitat connected to Haggart Creek in the northern section of the Dublin Gulch alluvial fan can provide critical overwintering habitat for Arctic grayling that is otherwise scarce in the Haggart Creek

watershed. Groundwater test wells within the Dublin Gulch alluvial fan have demonstrated that groundwater levels are near the surface and can provide clean water in sufficient quantities for the development of off channel overwintering habitat that would connect with Haggart Creek via a newly created rearing channel. Artificially designed off-channel habitat in areas of upwelling groundwater has been shown to provide high quality rearing habitat for salmonids (Cooperman, et. al., 2006).

The Dublin Gulch alluvial fan provides an excellent site for compensation development due to the low gradients, easy access from adjacent roads, and high-groundwater levels. A heavily armoured inlet will connect the overwintering pond with Haggart Creek to promote flushing and aeration. A protective berm will be created to reduce the risk of damage to the habitat due to overland flows during flood events. Fish cover features (e.g. large woody debris/root wad complexes, boulder clusters) will occupy 20% of the shallow areas of the overwintering pool margins. Riffle-pool sequences will be designed in the back channel at an approximate spacing of six times the channel width. Fish cover features will be situated every 10 to 15 m within the back channel portion of the habitat.

Specifics of channel dimensions, morphology (riffle-pool-run), and habitat features will be included in detailed design drawings in the final fish habitat compensation plan during the regulatory phase of the project.

The off-channel habitat plan view and profile are shown in Figure 4-5, with a typical cross-section provided in Figure 4-3. The habitat is expected to provide a total of 3,260 m^2 of instream habitat (3,140 m^2 of pond habitat and 121 m^2 of channel habitat) and 9,360 m^2 of riparian habitat.

4.4 Dublin Gulch Diversion Channel Fish Habitat

The DGDC is designed to convey Dublin Gulch flows safely around the mine Heap Leach Facility and past other Project infrastructure into the Eagle Creek drainage downstream of Project facilities. Original plans for the DGDC did not incorporate considerations and criteria for fish habitat and was designed simply to re-route Dublin Gulch flows for engineering requirements and protection of Project infrastructure. The current design includes riffle-pool sequences, habitat complexing, riparian planting, and fish-passable gradients, while maintaining a stable geometry and planform. The channel is 2.6 km long and will be capable of conveying the Probable Maximum Flood (PMF) of 105 m^3/s.

The upstream reach of the DGDC will intercept flow from the existing Dublin Gulch channel midway between the existing confluences of Eagle Pup and Stewart Gulch, then cross the Eagle Pup and Stuttle Gulch basins to bypass mine facilities. At its lower end, the DGDC will direct flows into the newly created ECCC downstream of the water management facilities near the location where the channel turns south within the Haggart Creek valley. The increased flow rates will provide the water volumes that will allow the compensation channel to achieve habitat enhancement targets.

The DGDC is divided into three distinct reaches:

- **Upper Reach**—a low gradient (1%), 900 m long, 5 m wide and 3 m deep channel along the valley contour

- **Middle Reach**—a wide (60 m), energy dissipater with 12 – 15% gradient, with in-channel energy dissipation structures. The energy dissipater will be designed as a fish passable boulder, step pool channel and will discharge to a velocity reduction pond and permit fish passage from the lower reach to the upper reach.
- **Lower Reach**—a 5 m wide, 3 m deep channel with average gradients of 5% over a length of approximately 1,200 m along the southern boundary of the lower Dublin Gulch valley.

Currently fish bearing habitat in Dublin Gulch is extensively degraded by placer mining operations that have occurred over the last several decades. Two large cascades located approximately 1.5 km and 2.0 km upstream of the confluence with Haggart Creek currently prohibit upstream passage of fish. The DGDC will route flows around these two barriers and open upstream habitat in Dublin Gulch for fish use. The new, upstream habitat available to fish due to the removal of these barriers is not included in compensation area calculations. The DGDC will be designed to enhance fish habitat and increase the productive capacity of the sub-basin. Enhancement prescriptions will include in stream complexing (addition of large woody debris [LWD], boulders and pools) and riparian planting to increase stability of the banks, decrease erosion and sedimentation, reduce temperature fluctuations, and provide allochthonous food sources—plants and insects from riparian vegetation. Riffle-pool sequences will be designed in the back channel at an approximate spacing of six times the channel width. Fish cover features will be situated every 15 to 30 m within the back channel portion of the habitat.

Specifics of channel dimensions, morphology (riffle-pool-run), and habitat features will be included in detailed design drawings in the final fish habitat compensation plan during the regulatory phase of the project. A plan view and profile of the DGDC is provided in Figure 4-6 and a typical cross-section shown in Figure 4-3. Creation of the channel is expected to provide 10,500 m^2 of both rearing and spawning habitat for Arctic grayling and 150,000 m^2 of associated riparian habitat.

4.5 Riparian Planting

At a minimum, vegetation will need to be planted in all areas where existing riparian vegetation is lost to Project works or is currently inadequate due to past placer mining activities. Local riparian species will be used for all planting efforts.

Riparian planting will be completed in the early spring (May) prior to bud break, or in the fall (approximately early-September), after bud set but before the ground is frozen. After the initial riparian planting, at least one year of replanting will be completed to fill in areas with unacceptable survivorship. Specifics of the riparian planting plan will be included in the final version of the fish habitat compensation plan during the regulatory phase of the project. The detailed plan will include:

- Type and number of trees, shrubs, and grasses to be planted
- Size of the plants to be planted
- Location of planting
- Monitoring plan for determining survival rates.

Post-planting monitoring will be conducted ensure a survival rate of 80% for shrubs and 100% for trees and identify areas for replanting in areas where targeted survival rates are not achieved,

4.6 Assessment of Potential Effects of Compensation Works on Fish and Fish Habitat

Compensation habitat development activities have the potential to adversely affect fish and the quality of fish habitat in watercourses directly affected by compensation works, in areas downstream of the compensation works, and in watercourses near proposed compensation development. Reduction in the quality of fish habitat can impair the ability of the system to maintain current levels of fish production. Fish can also experience direct mortality due to compensation construction activities.

The ways in which compensation habitat development activities can affect fish and fish habitat include:

- Change in habitat structure
- Change in sediment concentrations
- Change in water temperature
- Change in food and nutrient concentrations
- Change in access to habitats.

These potential effects are similar to many of those associated with the Project and they are assessed and mitigation measures described within the environmental assessment (Stantec 2010c). Table 4-3 below provides standard mitigation measures that will be implemented during compensation works to avoid the potentially adverse effects listed above.

Table 4-3: Standard Mitigations for Compensation Works

Effects on Fish Habitat Availability	Mitigation	Effectiveness of Mitigation
Change in water temperature	▪ Design of channel diversions to include streamside vegetation and functioning riparian areas ▪ Minimize extent of clearing, grubbing and grading adjacent to watercourses to that required for safe vehicle access and construction activities ▪ Re-vegetate where soil stabilization and erosion control is required	▪ High ▪ Modest reductions in riparian cover could occur in areas with intact streamside vegetation

Effects on Fish Habitat Availability	Mitigation	Effectiveness of Mitigation
Change in habitat structure	▪ Minimize extent of clearing, grubbing and grading adjacent to watercourses to that required for safe vehicle access and construction activities ▪ Existing road use where possible and appropriate temporary crossing methods where needed (e.g. temporary bridges) ▪ Flag environmentally sensitive areas before clearing and construction begins near watercourses ▪ Re-vegetate where soil stabilization and erosion control is required ▪ Locate temporary work spaces and stockpiles at least 30 m from top-of-bank of fish-bearing watercourses ▪ Protect stockpiles from erosion with tarps, sumps, or berms	▪ High ▪ A temporal reduction of riparian cover and food and nutrients will occur ▪ Small residual sediment loads are expected ▪ A temporal reduction in fish habitat productivity is expected while compensation habitat is being constructed
Change in sediment concentrations	▪ Design of channel diversions to include streamside vegetation and functioning riparian areas ▪ Minimize extent of clearing, grubbing and grading adjacent to watercourses to that required for safe vehicle access and construction activities ▪ Isolate all instream works within fish-bearing watercourses or non-fish-bearing watercourses where instream works have the potential to affect fish-bearing waters downstream ▪ Stage construction within 16 m of all watercourses and retain buffer zones until construction activities begin to limit time of bank and soil exposure ▪ Implement a rigorous erosion and sediment control program including sediment and erosion control ponds sized to a 1:100 year 24-hour event ▪ Monitor TSS and turbidity levels prior to release from sediment control ponds ▪ Time instream and riparian construction activities to avoid high risk weather and flow conditions ▪ Re-vegetate where soil stabilization and erosion control is required	▪ High ▪ Introduction of minor levels of sediment are expected to occur
Change in food and nutrient concentrations	▪ Design of channel diversions to include streamside vegetation and functioning riparian areas ▪ Minimize extent of clearing, grubbing and grading adjacent to watercourses to that required for safe vehicle access and construction activities ▪ Re-vegetate where soil stabilization and erosion control is required	▪ High ▪ Modest reductions in riparian cover could occur in areas with intact streamside vegetation

Effects on Fish Habitat Availability	Mitigation	Effectiveness of Mitigation
Change in contaminant concentrations	▪ Water used in mine processes will not flow through compensation habitat and will not be released without adequate treatment ▪ Mitigations for water quality issues are provided in the Surface Water Quality and Aquatics (Section 6.5)	▪ High ▪ Water quality objectives will be met
Change in access to habitats	▪ Time construction activities to avoid key migration periods ▪ Design new habitat to facilitate fish passage ▪ Manage flow diversions and water extraction to ensure adequate flows are maintained for fish passage ▪ Place material and instream structures in a manner that does not inhibit fish passage ▪ Prevent the formation of fish barriers when conducting instream works ▪ Minimize the time that instream works occur	▪ High ▪ Stream flows will be maintained so that no restriction of fish movement occurs ▪ Obstructions will not be formed
Change in fish/egg mortality	▪ Conduct instream work on fish-bearing watercourses during established LRPs where practicable to avoid conflicts with critical life-history stages ▪ Ensure fish migration is not impeded ▪ Ensure instream work does not occur in spawning areas if conducted outside of established LRPs ▪ Ensure industrial equipment operating near fish-bearing watercourses is in good working order and free of leaks ▪ Conduct instream work in fish-bearing watercourses in isolation of flows ▪ Conduct fish salvages before isolating channels for instream work or diversion ▪ Follow DFO's *Freshwater Intake End-of-Pipe Fish Screen Guideline* (DFO 1995) when placing intakes for pumps in fish-bearing watercourses ▪ Re-introduce flows to isolated watercourses immediately downstream of isolated areas to avoid fish stranding ▪ Dissipate discharge water energy where flows are re-introduced to fish-bearing watercourses ▪ Incorporate recommendations from DFO's Guidelines for the Use of Explosives in or near Canadian Fisheries Waters (Wright and Hopky 1998) to the greatest extent possible where blasting in or near fish-bearing watercourses ▪ Conduct blasting in dewatered works areas and within established LRPs to minimize fish mortalities ▪ Conduct fish salvages prior to infilling watercourses for mine development	▪ High ▪ Direct mortality of eggs or fish can be avoided ▪ Introduction of sediment and hazardous substances such as hydrocarbons, can be reduced to very low levels

4.7 Habitat Balance

A habitat balance has been prepared to summarize the habitat losses due to the Project development and gains from the proposed compensation options. Table 4-4 provides a summary of the habitat balance between impacted instream habitats and newly created or enhanced habitat. The total area of impacted instream habitat for the Project is estimated at 17,929 m^2. Approximately 30% of the impacted habitat is comprised of non-fish-bearing watercourses that contribute food, water, and nutrients to fish-bearing waters downstream. The total area of in-stream habitat proposed in the FHCP is 37,278 m^2, all of which is fish-bearing, for a net gain of 19,349 m^2 of fish habitat at a habitat creation ratio of 2.1:1.

Typically, existing habitat within the impacted watercourses consists of rearing habitat for Arctic grayling and non-fish-bearing upstream habitat which provides flow and allochthonous inputs to fish-bearing waters downstream. The FHCP is designed to provide fish-bearing habitat types which are currently scarce in the Haggart Creek watershed and may be limiting productivity—primarily overwintering and spawning habitat for Arctic grayling.

Planting will take place along all newly created watercourses. Shrubs planted in riparian areas will be native to the area, and are expected to form functioning riparian habitat within five years. Total riparian habitat gains are estimated to be 234,660 m^2.

The ratio of compensation riparian habitat to lost riparian habitat is 1.2:1, and meets the FHCP objective and DFO's policy objective of a net gain in habitat productivity.

Table 4-4: Habitat Balance

Project Component	Watercourse	Habitat Impacts (m^2)		Compensation Works	Habitat Gain (m^2)	
		Instream	Riparian		Instream	Riparian
Dublin Gulch Diversion	Dublin Gulch	12,624	108,900	Eagle Creek Compensation Channel (ECCC)	23,518[1]	75,300
	Eagle Creek	3,434	42,750	Haggart Creek Off-Channel Habitat	3,260	9,360
	Haggart Creek	497	0	Dublin Gulch diversion channel (DGDC)	10,500	150,000
Mine Infrastructure	Eagle Pup	986	23,280			
	Stuttle Gulch	388	16,620			
Total Habitat Loss		**17,929**	**191,550**	**Total Habitat Gain**	**37,278**	**234,660**
Net Gain (m^2):		**19,349**	**43,110**	**Compensation Ratio:**	**2.1:1**	**1.2:1**

NOTE:
[1] Habitat gains in the ECCC were calculated by subtracting habitat units in the existing Eagle Creek channel (2,281) from the habitat units predicted after implementation of compensation works (25,800)

4.8 Land Tenure

Surface and sub-surface mining claims on the Project property are currently recorded in the name of StrataGold Corporation (StrataGold), a wholly owned subsidiary of VIT. VIT holds mineral claims to most of the lands on which the proposed FHCP would be situated and anticipates all of those lands, and access to those lands, will be included in the Quartz Mining Licence and Lease issued in relation to the Project.

VIT will include the FHCP within the Closure and Reclamation Plan of the Quartz Mining Licence application and seek to ensure protection of the fish compensation works of the FHCP from placer mining through the inclusion of the FHCP as a condition in its mining licence or lease. Discussions related to long term protection of the FHCP works are ongoing with DFO and the Yukon Government – Energy, Mines and Resources (EMR).

4.9 Implementation Strategy

The following sections provide an overview of the preliminary planning required to implement the FHCP. This includes discussion of timing of compensation construction, soil handling, revegetation, and adaptive management. Site specific works plans and mitigation methods to minimize impacts to fish and fish habitat during construction will be included as an appendix to the detailed fish habitat compensation plan.

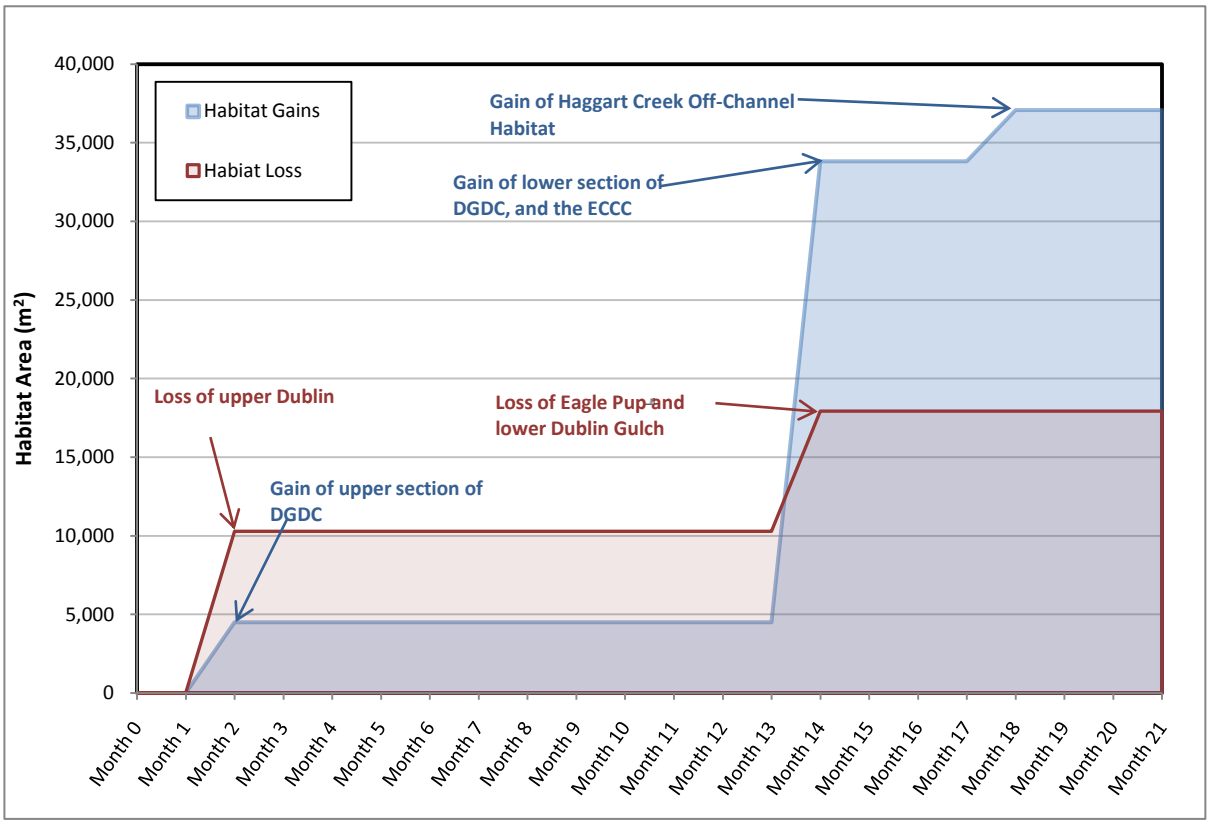
4.9.1 Execution and Administration

VIT will be responsible for the construction of the all compensation works including the implementation of mitigation measures and on-site monitoring during construction. Construction monitoring will be carried out by a qualified environmental monitor.

4.9.2 Construction Timing

The timing of compensation works construction is a key consideration in ensuring the temporal loss of productive capacity within the project watersheds is minimized (i.e., the lag time between impacts to fish habitat and the creation of functioning compensation habitat). A preliminary schedule of habitat gains attributed to compensation works in relation to timing of habitat losses is provided below.

Schedule of Predicted Compensation Habitat Gains and Losses



Mine development is tentatively scheduled to begin at the end of Q1 2012 pending approval of permit and authorization applications. During the second month of construction (Month 2), work will begin on the ECCC, and flows from Dublin Gulch will be diverted into the upper DGDC, energy dissipater and back into the existing Dublin Gulch channel to allow for construction of the lower DGDC and ECCC. Construction of the lower DGDC and ECCC will be complete by Month 13. After Month 13, the upper and lower sections of the DGDC will be connected and water will begin flowing through the ECCC. Assuming the 2012 start date, construction of the Haggart Creek Off-Channel habitat will take place throughout the summer of 2013 and will be completed by the end of Q3 2013.

Currently the riparian area of lower Eagle Creek is comprised of a mix of mature trees, pole sapling and early seral shrubs, as well as areas where riparian vegetation has been completely removed by past placer mining activity. Existing mature vegetation, where it exists, will be disturbed to the minimum extent possible during channel enhancement construction. This will allow for mature vegetation to remain in place to shorten the lag of compensation habitat productivity in the ECCC, We expect minimal to no lag from construction level productivity to full habitat productivity due to these practices, and an overall increase in riparian function from currently fragmented conditions.

4.9.3 Soil Handling

Soil excavated for compensation works will be used in the creation of channels, protective berms to prevent damage of compensation habitat from Haggart Creek flood flows, and in mine infrastructure development. Soil will be stored in areas designated within the mine plan and will be situated at least 30 m from the nearest watercourse. Quantities of material to be moved and locations of disposed soils will be provided as part of the final habitat compensation design drawings submitted with the request for authorization under the *Fisheries Act*.

4.9.4 Adaptive Management

Adaptive management as part of the development of the compensation elements will provide a management tool to adjust the elements as required, ensuring goals are met and habitats are functioning within specified timelines. Ongoing monitoring of compensation planning activities, including collection of habitat data, will provide information which will be measured against established targets and timeframes for individual compensation works. Should deficiencies or data gaps be identified, the adaptive management framework will trigger a feedback mechanism to ensure deficiencies are addressed and compensation efforts continue moving toward the overall goal of achieving No Net Loss. The adaptive management process for compensation works will incorporate contingency planning, management objectives, ongoing monitoring and the proponent's commitment for achieving benchmark goals along specified timelines with regard to the FHCP.

Potential issues that may reduce the effectiveness of compensation habitat are outlined in Table 4-5 along with strategies that may address these issues. Ongoing monitoring and adaptive management will ensure that these issues are effectively addressed as they may arise.

Table 4-5 Potential Issues for Compensation Effectiveness

Issue	Mitigation Strategies
Future development, long-term mining	▪ Development other than placer mining will require DFO authorization for projects that may impact compensation works ▪ Potential for removal of compensation areas from further placer staking or reclassification of compensation watercourses under placer mining guidelines.
Failure of habitat to function as designed (e.g. formation of obstructions, beaver activity, winter kill)	▪ Ongoing monitoring and adaptive management will identify habitat function issues or deficiencies as they arise ▪ Contingency planning and a commitment toward redesigning compensation as necessary to achieve habitat productivity objectives.

4.9.5 Monitoring

With respect to mitigation and compensation measures, a compliance monitoring program verifies the conditions of the FHCP have been met, whereas follow-up monitoring is used to determine the efficacy of the required mitigation measures and compensation works. Importantly, fish habitat

compensation monitoring will be managed through conditions of required *Fisheries Act* authorizations. To ensure the compensation works are constructed to design specifications, monitoring will be scheduled at regular intervals throughout construction of the various channel components. The construction monitoring schedule will generally follow recommendations described in the *British Columbia Standards and Best Practices for Instream Works* (MWLAP 2004) as Yukon Standards and Best Practices are still currently under development.

To determine the effectiveness of the proposed compensation works, a monitoring program will be developed and implemented. The program will adhere to methods established in the *Monitoring and Assessment of Fish Habitat Compensation and Stewardship Projects: Study Design, Methodology and Example Case Studies* (Pearson, et al. 2005) and focus on the biological effectiveness (e.g. seasonal use for Arctic grayling and physical integrity of constructed channel components). The monitoring program will include assessments of water quantity and quality (e.g. temperature, pH); habitat structure, attribute integrity and functionality (e.g. riparian revegetation survival; and fish use by Arctic grayling at each life-history stage.

The proposed monitoring schedule will include:

- Seasonal assessments of water quality, biological, and physical attributes of the constructed compensation works during the first year of operations (four assessments)
- Overwintering fish use assessments of the ECCC and Haggart Creek Off-Channel habitat during the first year of operations, and every second winter after that during Project operations
- Summer fish use assessments of the ECCC, DGDC, and Haggart Creek Off-Channel habitat during the first year of operations, and every second summer after that during Project operations.

Remedial or adaptive measures will be applied immediately following any evaluation that determines a reduction in functionality or integrity of the compensation work based on a quantified trigger value.

4.10 Cost Estimate

Estimated costs of implementing the FHCP are provided in Table 4-6. Cost estimates are provided for each element of the plan. As proposed compensation components are either implicit within the design of the Project or located adjacent to the mine site, substantial cost savings can be realized through:

- Habitat compensation via enhancements to the DGDC will not result in the incursion of additional costs as these costs are included in the capital cost of the project
- Heavy machinery will be on site for construction of mine components and will not require transport to and from compensation areas
- All materials for compensation habitat are located on site and will generally originate from the existing floodplain from within mine site (gravels, boulders, LWD etc.).

Based on past experience with fish habitat compensation channel construction and enhancement, we approximate the average cost per 100 linear metres of new habitat development to be $150,000.

The FHCP includes a total of 1.76 km of liner meters of new habitat. Therefore the estimated total cost of implementation of the FHCP is $2,640,000.

Table 4-6 Estimated Habitat Compensation Costs

Compensation Element	Estimated % of Total Cost	Estimated Cost ($CDN)
Project Supervision	3%	79,200
Labour	35%	924,000
Equipment	50%	1,320,000
Reporting	2%	52,800
Construction and Effectiveness Monitoring	10%	264,000
Total	**100%**	**2,640,000**

4.11 Uncertainties

Habitat compensation projects often carry a certain degree of uncertainty which can vary according to a number of factors:

- The technical feasibility of the proposed compensation works
- The quality and quantity of habitat compensation proposed in relation to the impacted habitat
- The timescale over which the benefits of the proposed compensation will be realized.

Uncertainties inherent in the FHCP will be addressed through:

- Detailed design of the compensation channel, DGDC, and off-channel habitat
- Inclusion of limiting habitat types that have been demonstrated to work within the Project watershed
- Effectiveness monitoring of the compensation works
- Implementation of adaptive management to respond to results from effectiveness monitoring.

The creation of overwintering habitat for Arctic grayling is a key component of the FHCP. Baseline studies have shown that large placer ponds recently excavated in Haggart Creek are being utilized by grayling for overwintering where no wintering habitat previously existed. Structure of the habitat within the DGDC and ECCC will be based on that which is currently present in Dublin Gulch and utilized by Arctic grayling.

Habitat ratios proposed within the FHCP exceed 2:1, and in all cases, fish-bearing habitat is being proposed as compensation for lost non-fish-bearing habitat (approximately 30% of the total impacted habitat). These high replacement ratios will help achieve the goal of net gain in habitat productive capacity in the face of the compensation effectiveness uncertainty.

The effectiveness monitoring program will follow a standard five-year program for fish habitat compensation programs. VIT will commit to developing a comprehensive monitoring plan in conjunction with DFO.

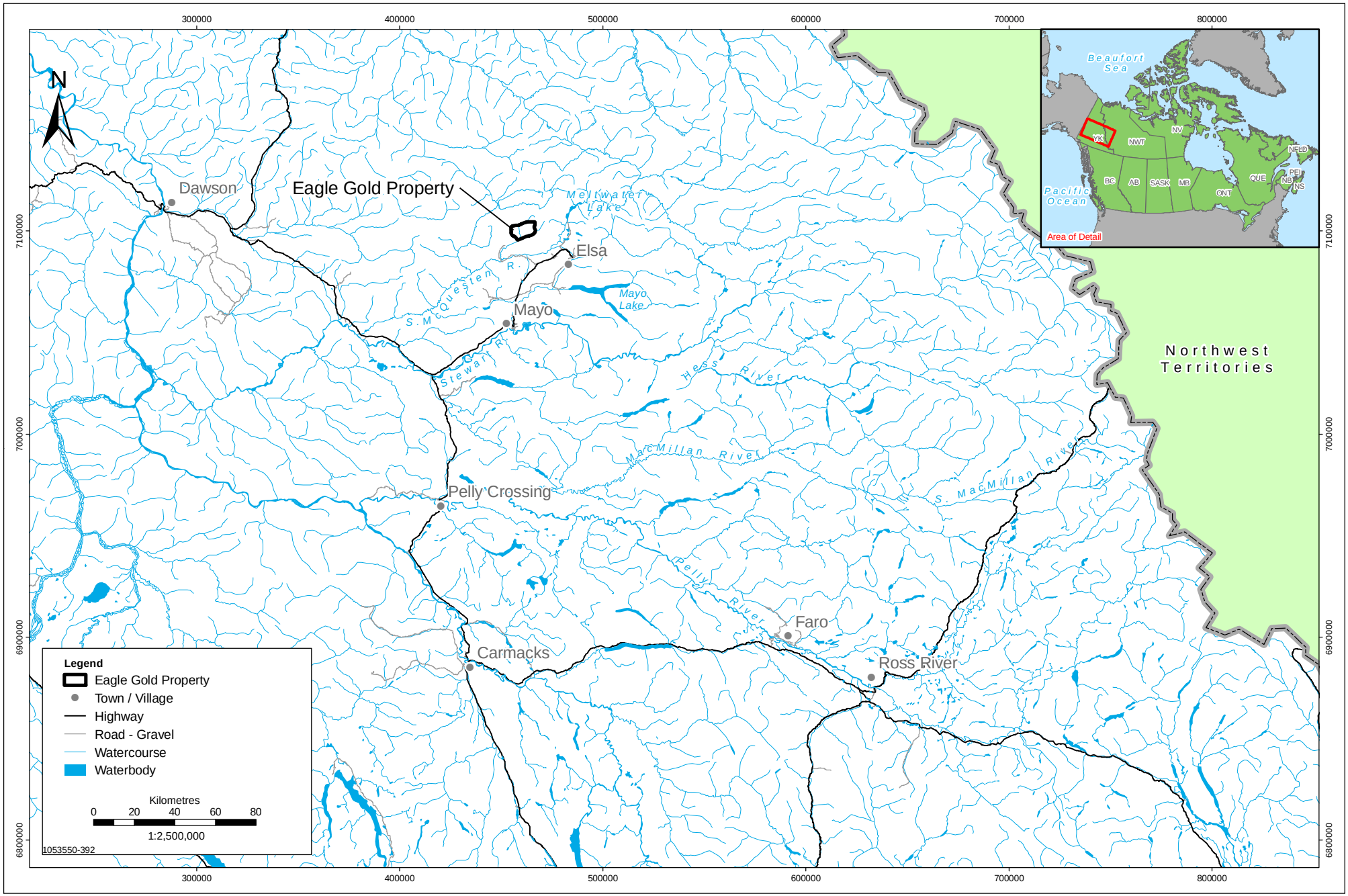
4.12 Closure

VIT believes the FHCP adequately addresses the impacts of the proposed Project on fish and aquatic habitat through the creation of new habitat and enhancement of existing habitats. The information presented in this plan is based on the best available knowledge at this time. The fish habitat compensation plan presented here is considered preliminary and subject to detailed design of the components and availability of suitable location for engineered structures.

Stantec is presenting the conceptual plan to DFO on behalf of VIT to solicit feedback and help determine its adequacy for approval of a Fisheries Act Authorization. Please do not hesitate to contact the undersigned with any questions, comments, or suggestions. We appreciate your active participation in this process and look forward to your comments and additional discussion as necessary.

5 FIGURES

Please see the following pages.



Data Sources; Government of Canada, Victoria Gold Corp.

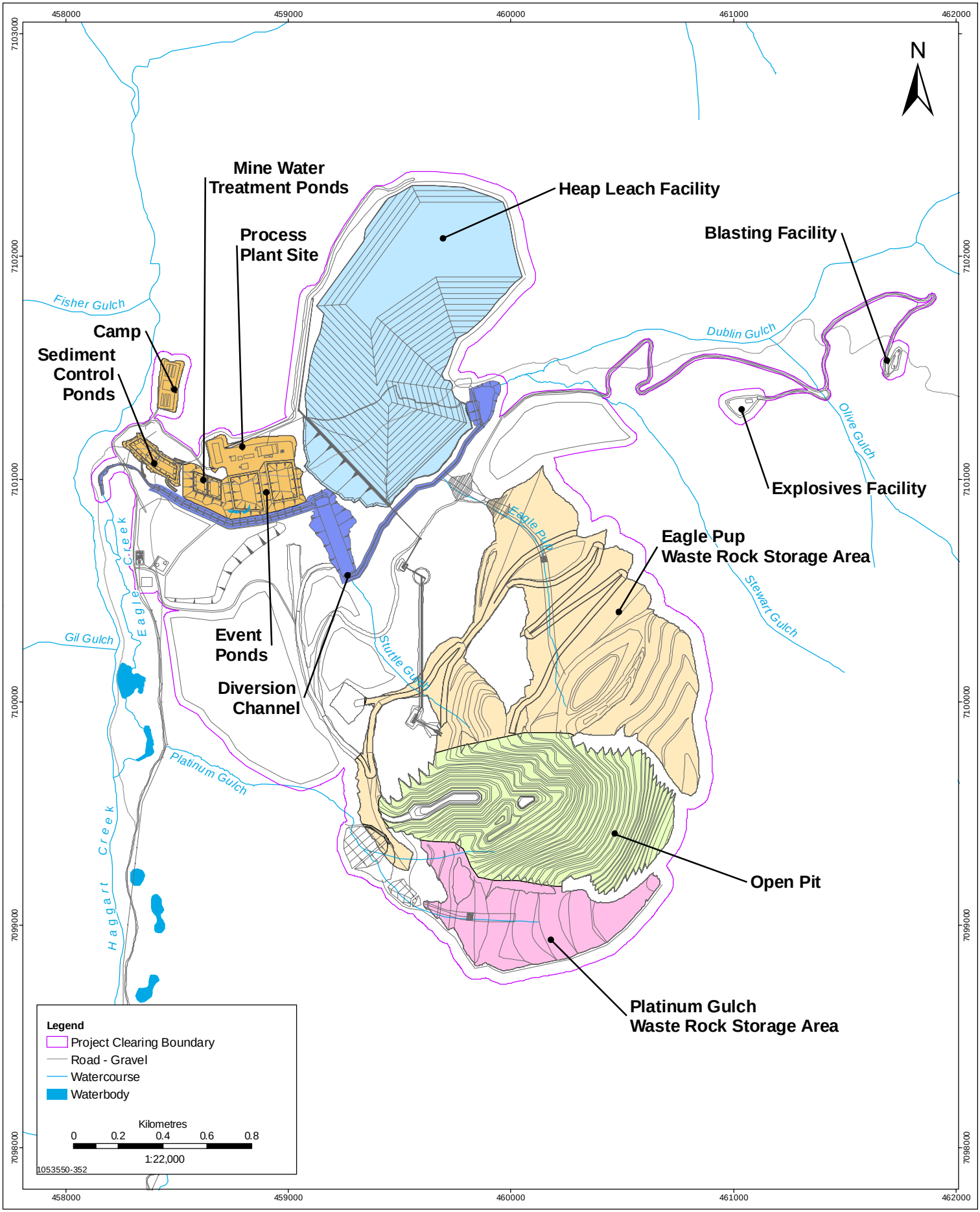
Stantec
4370 Dominion Street
Burnaby, British Columbia
V5G 4L7
Tel. (604) 436 3014
Fax. (604) 436 3752

Victoria GOLD CORP

PROJECT LOCATION

EAGLE GOLD PROPERTY
YUKON TERRITORY

PROJECTION	DRAWN BY
UTM - ZONE 8	LS
DATUM	CHECKED BY
NAD 83	RS
DATE	FIGURE NO.
3-November-2010	1-1



Data Sources; Government of Canada, Victoria Gold Corp.

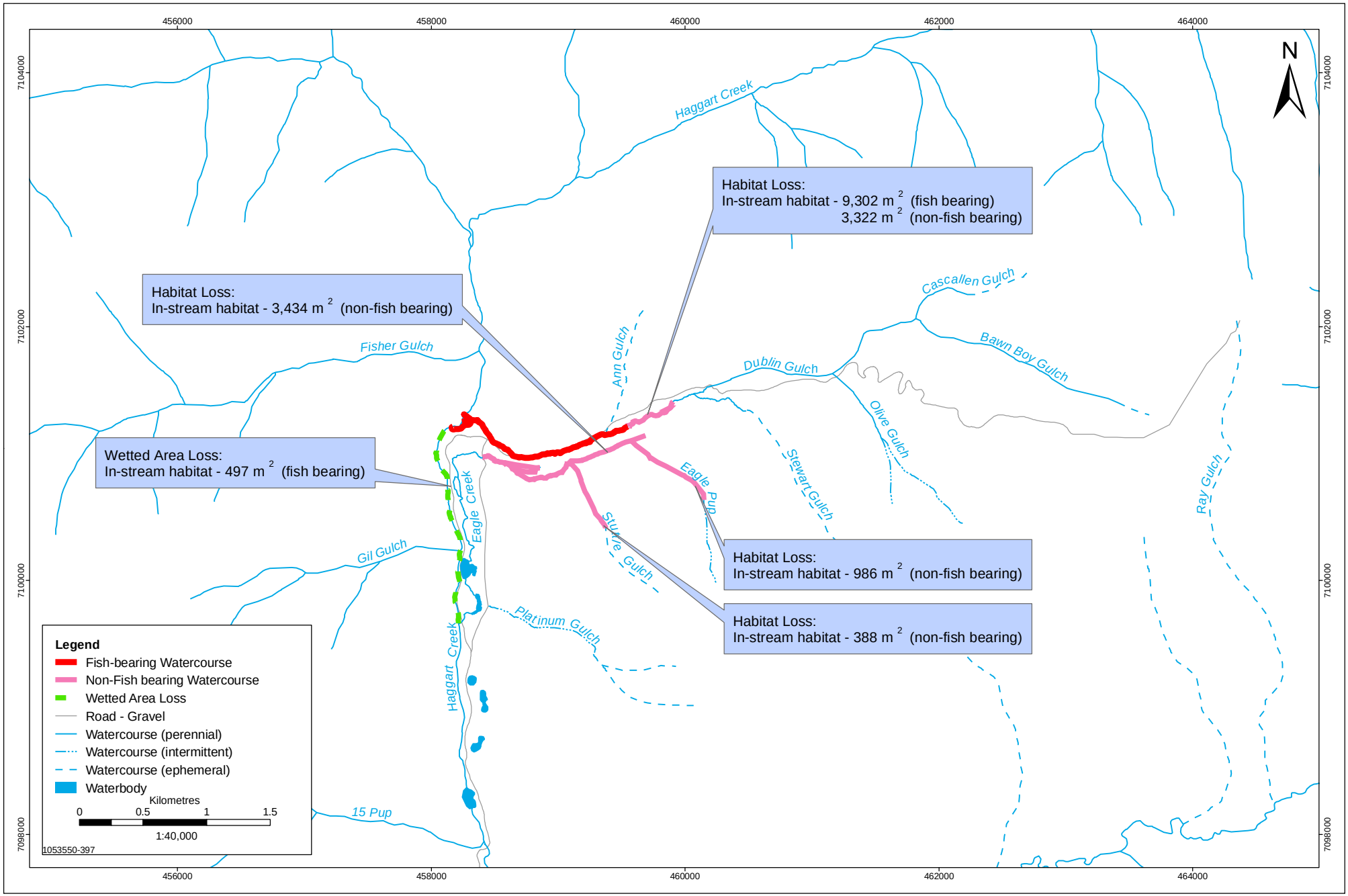
Stantec
4370 Dominion Street
Burnaby, British Columbia
V5G 4L7
Tel. (604) 436 3014
Fax. (604) 436 3752

Victoria GOLD CORP

MINE SITE OVERVIEW

EAGLE GOLD PROPERTY
YUKON TERRITORY

PROJECTION: UTM - ZONE 8	DRAWN BY: LS
DATUM: NAD 83	CHECKED BY: RS
DATE: 3-November-2010	FIGURE NO.: 1-2



Data Sources; Government of Canada, Victoria Gold Corp.

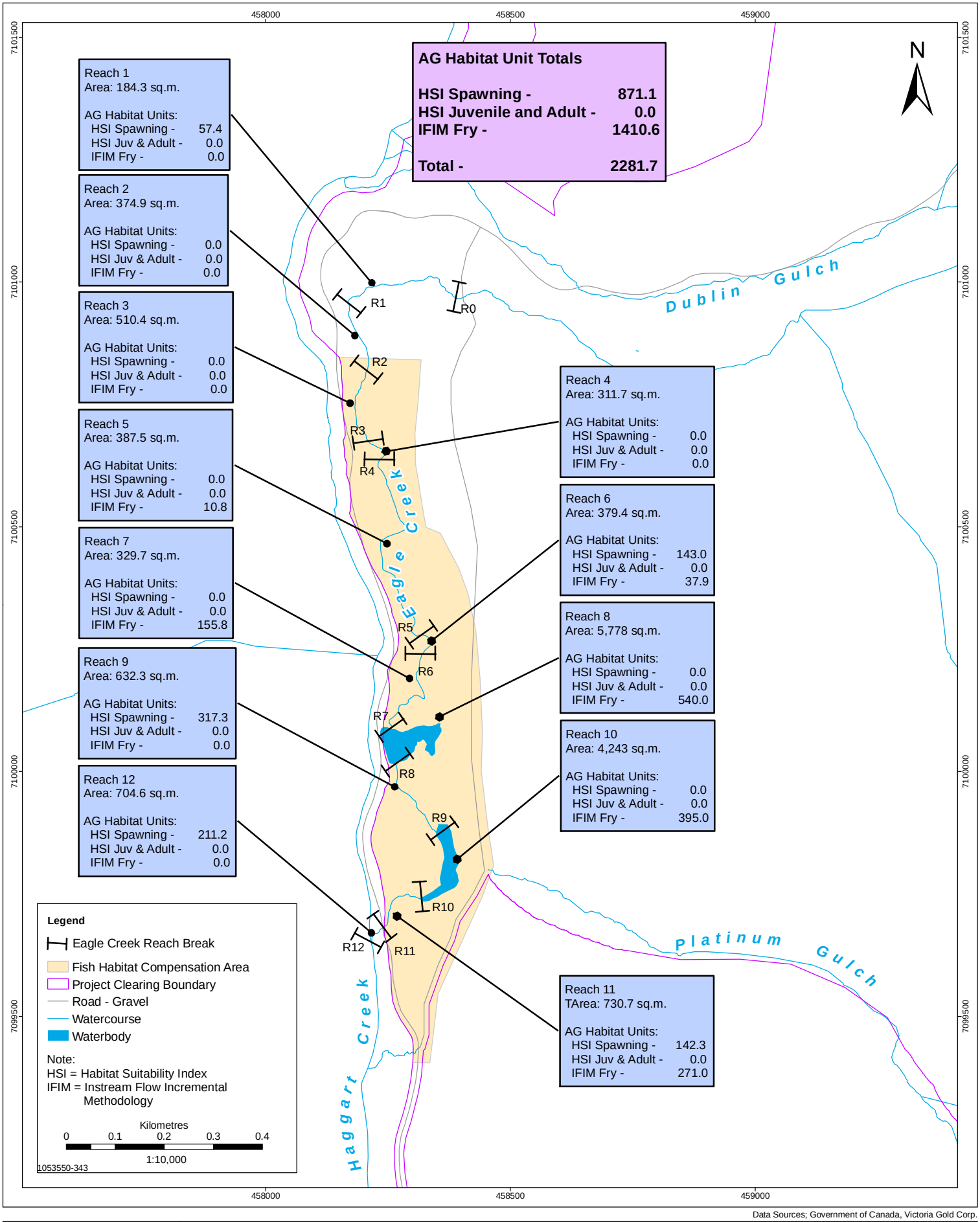
Stantec
4370 Dominion Street
Burnaby, British Columbia
V5G 4L7
Tel. (604) 436 3014
Fax. (604) 436 3752

Victoria GOLD CORP

LOCATION AND EXTENT OF PROJECT HADDS

EAGLE GOLD PROPERTY
YUKON TERRITORY

PROJECTION: UTM - ZONE 8	DRAWN BY: LS
DATUM: NAD 83	CHECKED BY: RS
DATE: 05-November-2010	FIGURE NO.: 2-1



Data Sources; Government of Canada, Victoria Gold Corp.

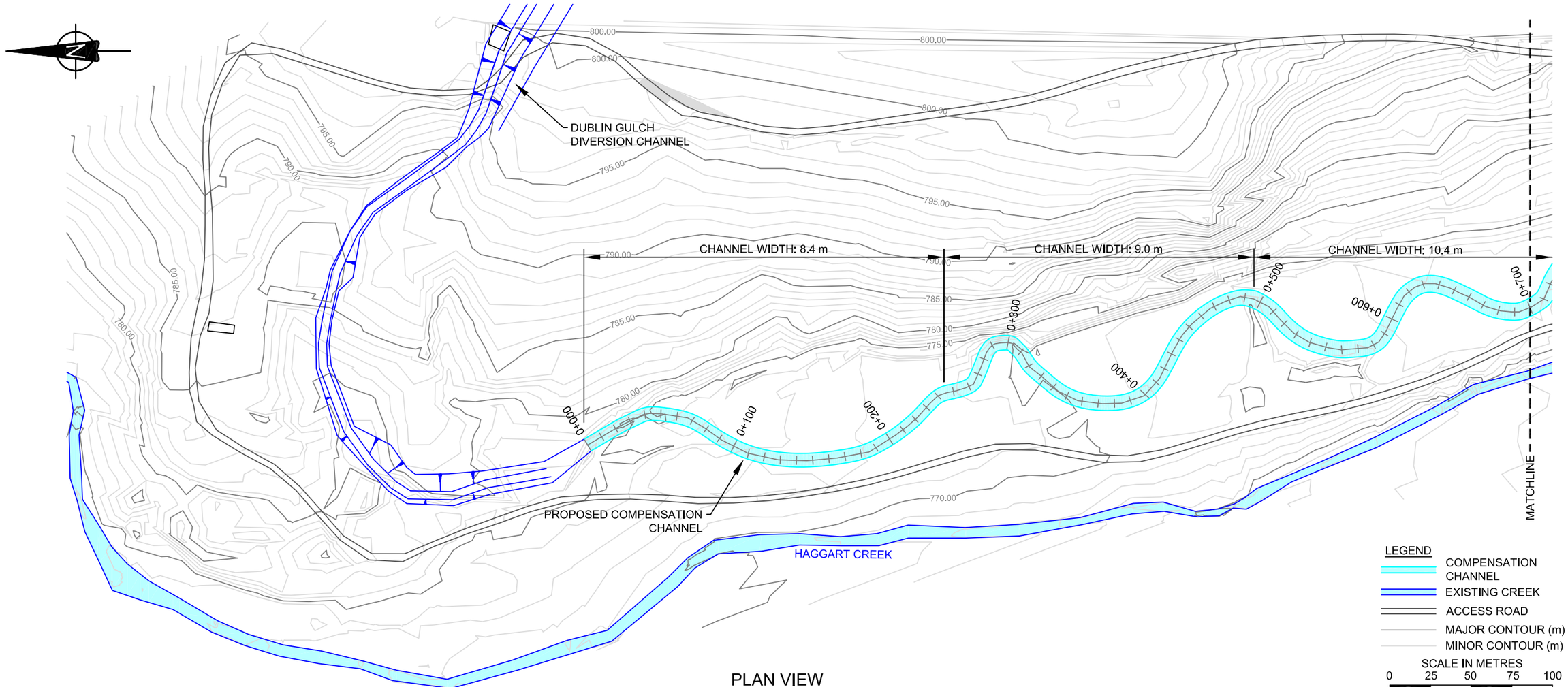
Stantec
4370 Dominion Street
Burnaby, British Columbia
V5G 4L7
Tel. (604) 436 3014
Fax. (604) 436 3752

Victoria GOLD CORP

EAGLE CREEK HABITAT EVALUATION

EAGLE GOLD PROPERTY
YUKON TERRITORY

PROJECTION: UTM - ZONE 8	DRAWN BY: LS
DATUM: NAD 83	CHECKED BY: RS
DATE: 3-November-2010	FIGURE NO.: 4-1



PLAN VIEW
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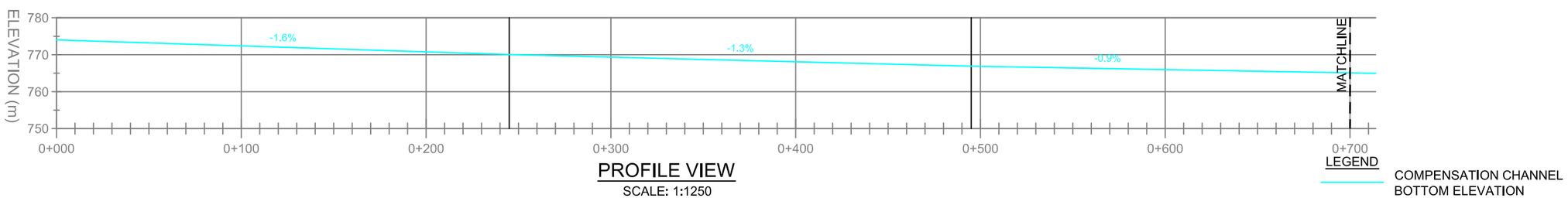

PROFILE VIEW
SCALE: 1:1250

Reference:	**Job No.:** 149010002 **Scale:** AS SHOWN **Date:** 26-Oct-10 **Dwn. By:** GH **App'd By:** KO	**Client:** VICTORIA GOLD **Site Address** YUKON TERRITORY, BC	FISH HABITAT COMPENSATION PLAN	EAGLE CREEK COMPENSATION CHANNEL PLAN AND PROFILE VIEW	**Dwg. No.:** 4-2a

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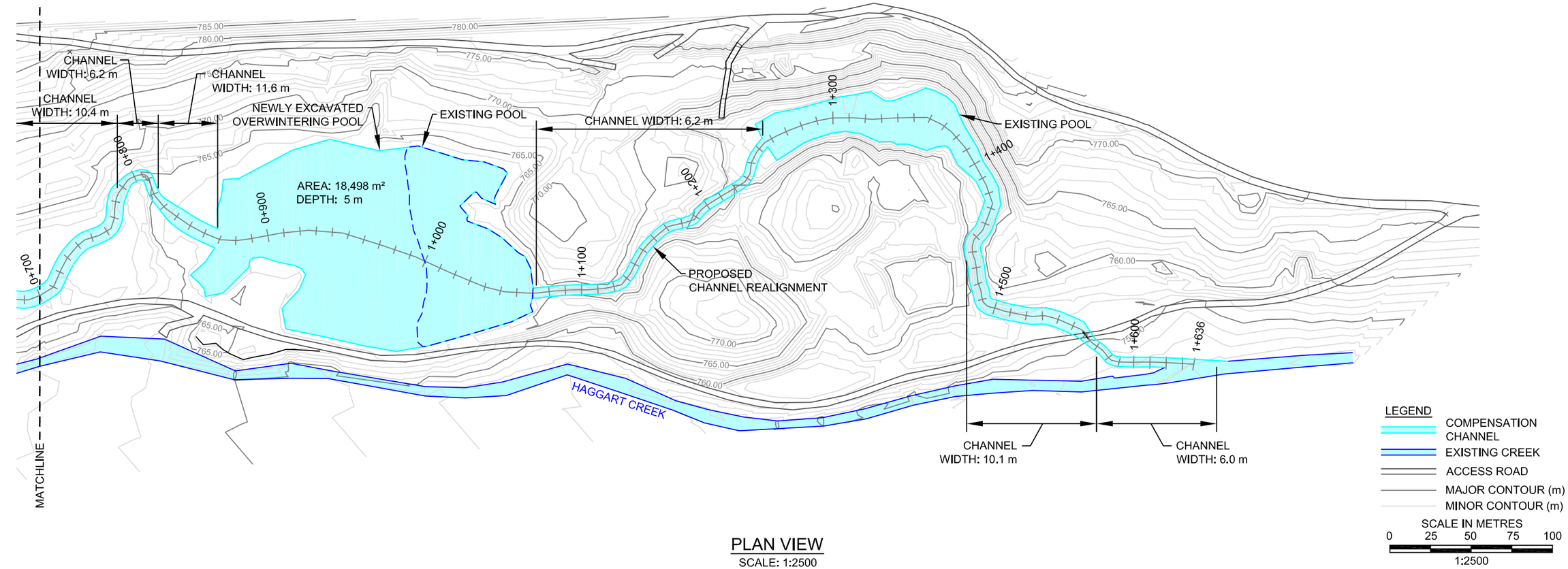

PLAN VIEW
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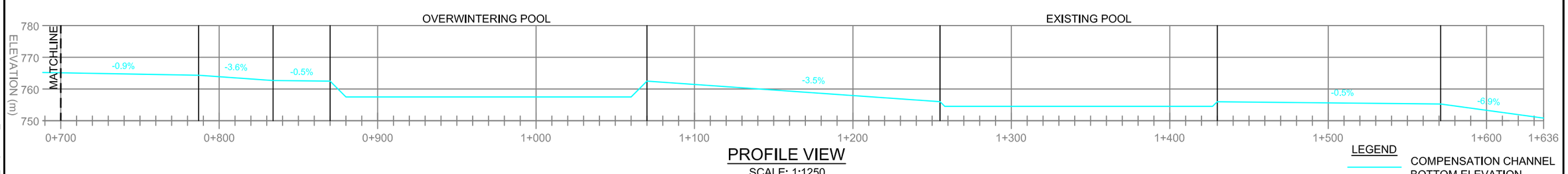

PROFILE VIEW
SCALE: 1:1250

Reference:	**Job No.:** 149010002 **Scale:** AS SHOWN **Date:** 26-Oct-10 **Dwn. By:** GH **App'd By:** KO	**Client:** VICTORIA GOLD **Site Address** YUKON TERRITORY, BC	FISH HABITAT COMPENSATION PLAN	EAGLE CREEK COMPENSATION CHANNEL PLAN AND PROFILE VIEW	**Dwg. No.:** 4-2b

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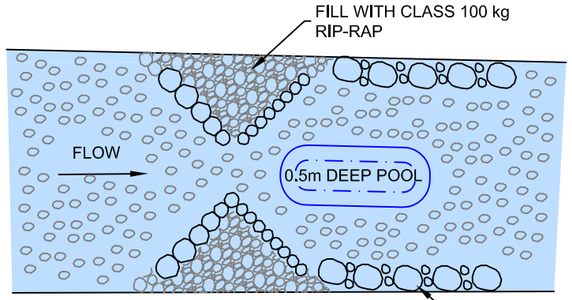
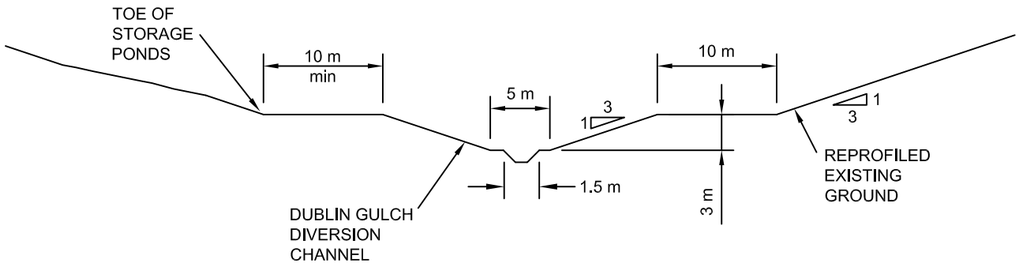


A TYPICAL DETAIL
OPPOSING WING DEFLECTOR
SCALE: NTS



D TYPICAL SECTION
LOWER DUBLIN GULCH DIVERSION CHANNEL
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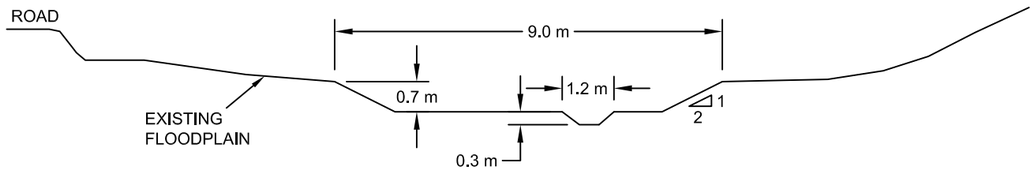

B TYPICAL SECTION
EAGLE CREEK COMPENSATION CHANNEL
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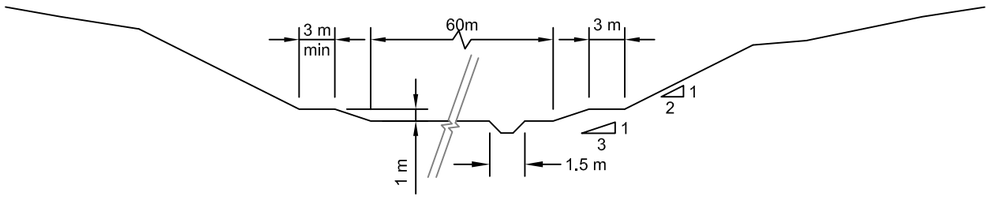

E TYPICAL SECTION
DUBLIN GULCH ENERGY DISSIPATOR
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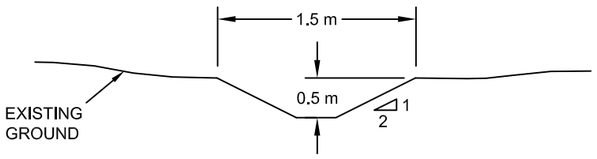
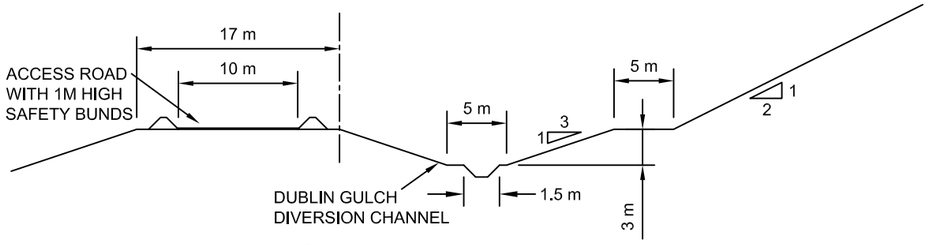


C TYPICAL SECTION
OFF-CHANNEL HABITAT BACK CHANNEL
SCALE: NTS



F TYPICAL SECTION
UPPER DUBLIN GULCH DIVERSION CHANNEL
SCALE: NTS

Reference:	**Job No.:** 149010002 **Scale:** NTS **Date:** 26-Oct-10 **Dwn. By:** GH **App'd By:** KO	**Client:** VICTORIA GOLD **Site Address** YUKON TERRITORY, BC	FISH HABITAT COMPENSATION PLAN	TYPICAL CROSS SECTIONS AND TYPICAL HABITAT FEATURES	**Dwg. No.:** 4-3

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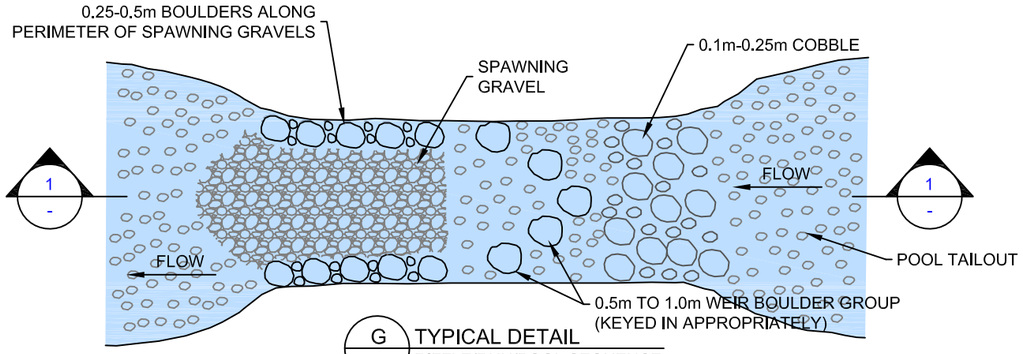
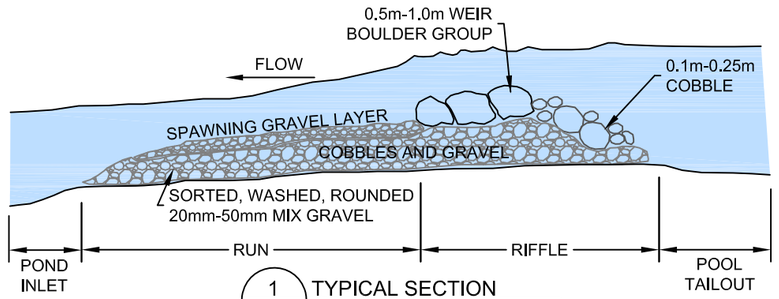
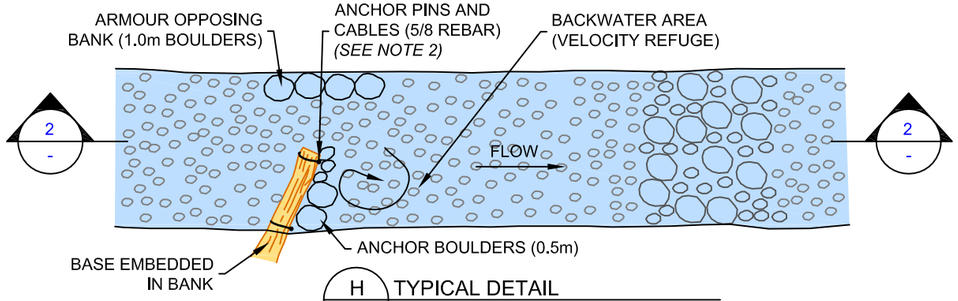


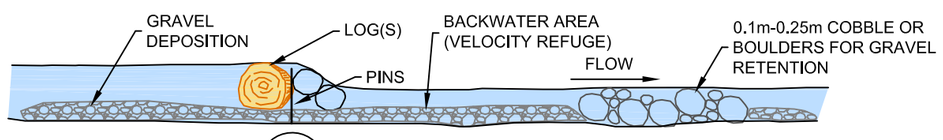
G TYPICAL DETAIL
RIFFLE/RUN/POOL SEQUENCE
SCALE: NTS



1 TYPICAL SECTION
RIFFLE/RUN/POOL SEQUENCE
SCALE: NTS



H TYPICAL DETAIL
DEFLECTION LOG CONSTRUCTION LOG
SCALE: NTS



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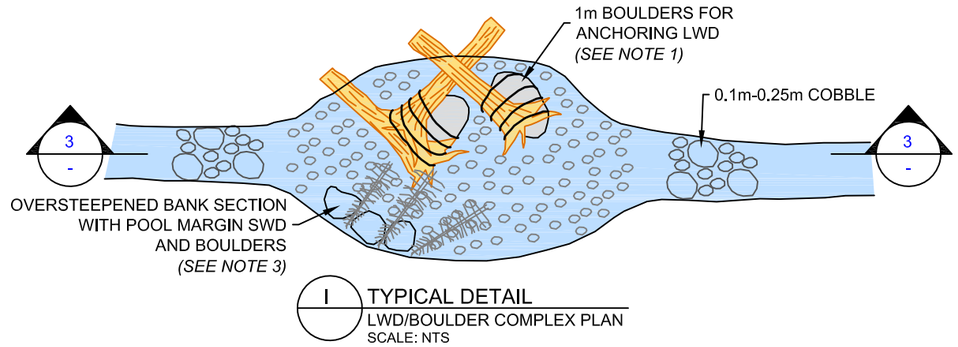
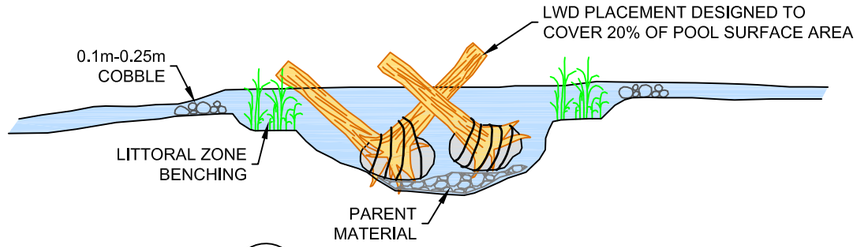
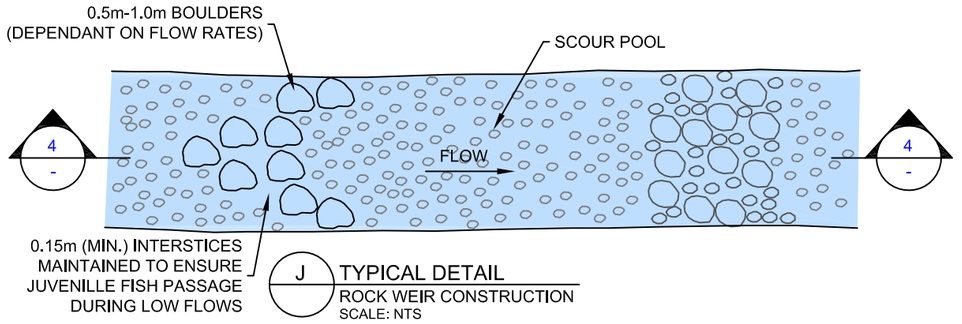
DEFLECTION LOG CONSTRUCTION LOG
SCALE: NTS



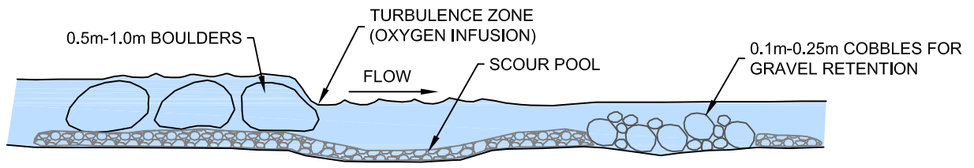
I TYPICAL DETAIL
LWD/BOULDER COMPLEX PLAN
SCALE: NTS



3 TYPICAL SECTION
LWD/BOULDER COMPLEX PLAN
SCALE: NTS



J TYPICAL DETAIL
ROCK WEIR CONSTRUCTION
SCALE: NTS



4 TYPICAL SECTION
ROCK WEIR CONSTRUCTION
SCALE: NTS

NOTES:
1. LWD SHOULD RETAIN ROOTWADS AND LIMBS IF POSSIBLE.
2. CABLING OF LWD MAY NOT BE REQUIRED IF THE STEMS CAN BE PINNED UNDER BOULDER COMPLEXES.
3. ALL ON-SITE SWD (SMALL WOODY DEBRIS IS TO BE INCORPORATED INTO THE POOL OR CHANNEL MARGINS WHERE APPLICABLE. OVERSIZED OR UNDERSIZED BOULDERS MAY ALSO BE INCORPORATED INTO THE CHANNEL DESIGN.

Reference:	**Job No.:** 149010002 **Scale:** NTS **Date:** 26-Oct-10 **Dwn. By:** GH **App'd By:** KO	**Client:** VICTORIA GOLD **Site Address** YUKON TERRITORY, BC	FISH HABITAT COMPENSATION PLAN	TYPICAL HABITAT FEATURES AND HABITAT COMPLEXING	**Dwg. No.:** 4-4

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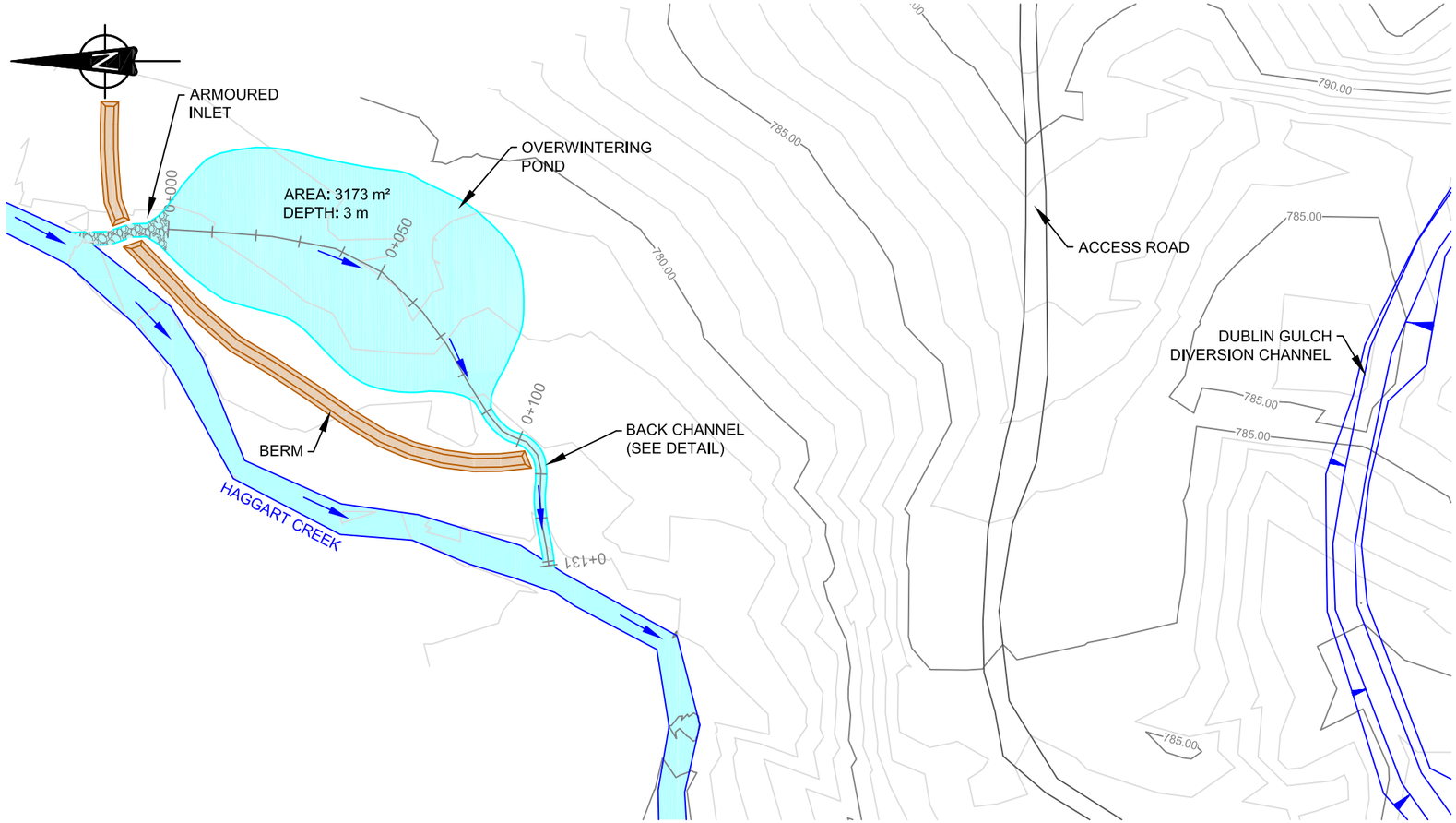
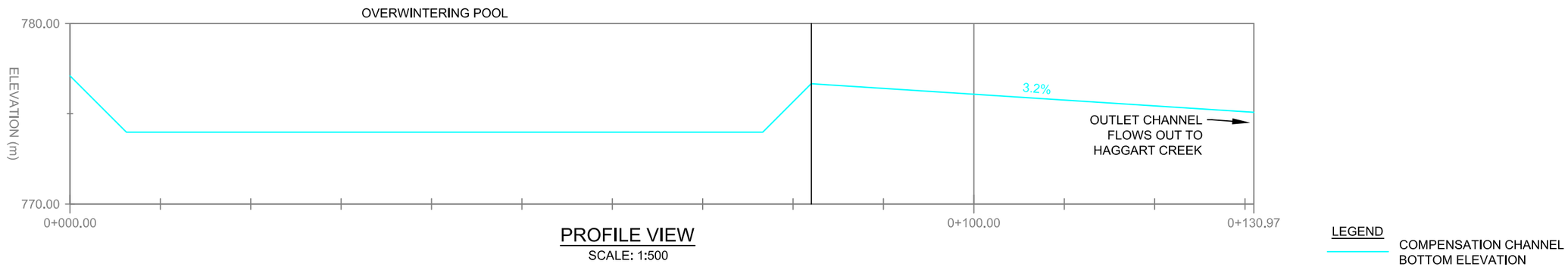


PLAN VIEW
SCALE: 1:1250



PROFILE VIEW
SCALE: 1:500

Reference:	**Job No.:** 149010002 **Scale:** AS SHOWN **Date:** 26-Oct-10 **Dwn. By:** GH **App'd By:** KO	**Client:** VICTORIA GOLD **Site Address** YUKON TERRITORY, BC	FISH HABITAT COMPENSATION PLAN	DUBLIN GULCH OFF-CHANNEL HABITAT PLAN AND PROFILE VIEW	**Dwg. No.:** 4-5

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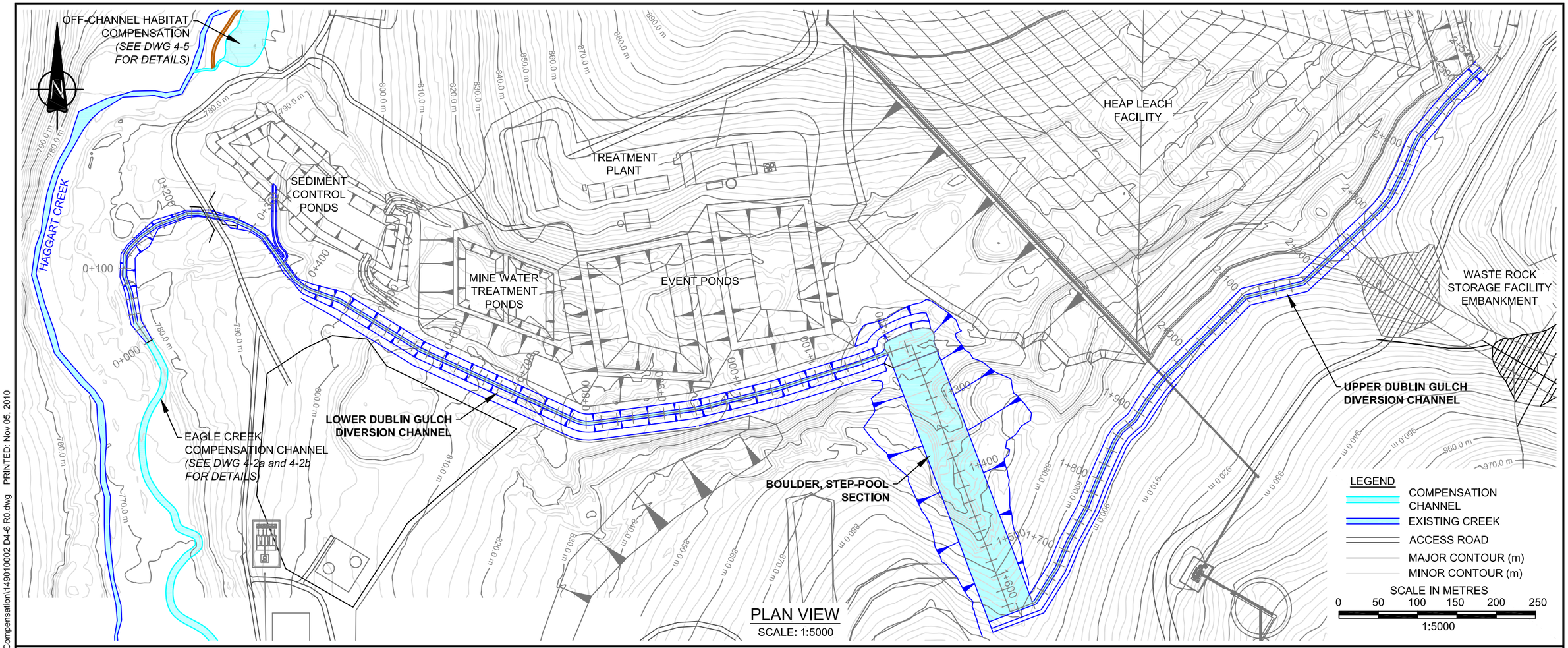
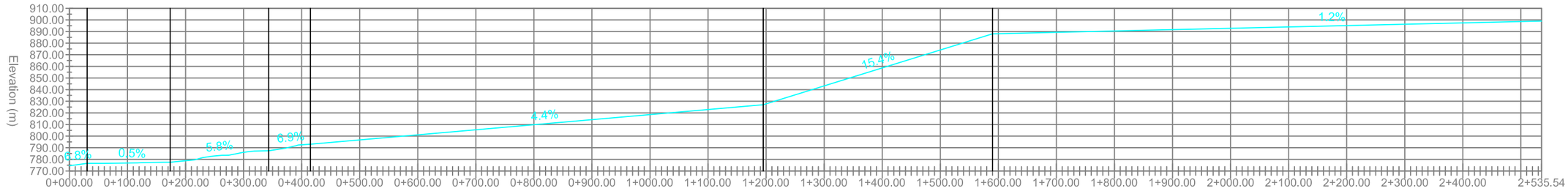


PLAN VIEW
SCALE: 1:5000



PROFILE VIEW
SCALE: 1:7500

Reference:	**Job No.:** 149010002 **Scale:** AS SHOWN **Date:** 26-Oct-10 **Dwn. By:** GH **App'd By:** KO	**Client:** VICTORIA GOLD **Site Address** YUKON TERRITORY, BC	FISH HABITAT COMPENSATION PLAN	DUBLIN GULCH DIVERSION CHANNEL PLAN AND PROFILE VIEW	**Dwg. No.:** 4-6

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APPENDIX A

Eagle Creek Habitat Evaluation – HSI and IFIM Values

Victoria GOLD CORP

Stantec

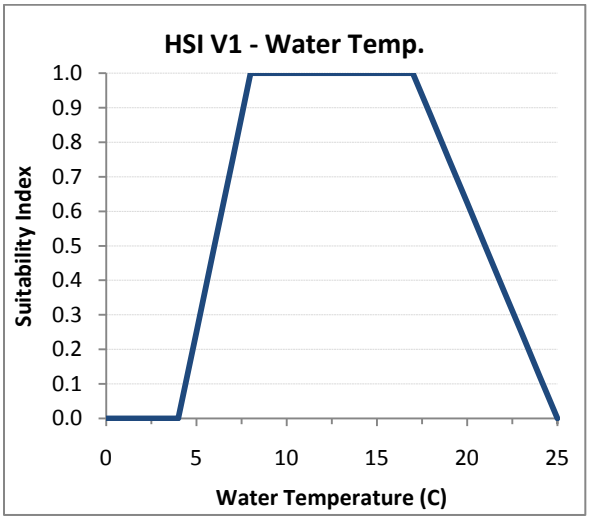
			Spawning Variable								Fry Variable						Juvenile and Adult Variable					
	Width @ Transect (m)	Area (m^2)	Temp.	DO	Rubble	Fines	Vel.	Pool	HSI Score	Habitat Units	Vel.	Depth	Subs.	Temp.	IFM Score	Habitat Units	Temp.	DO	Spawn Access	Winter	HSI Score	Habitat Units
Reach 1	0.35	9.49	1.00	1.00	1.00	0.25	1.00	1.00	0.25	2.4	0.00	1.00	0.50	1.00	0.00	0.0	1.00	1.00	1.00	0.00	0.00	0.0
	0.60	16.26	1.00	1.00	1.00	0.63	1.00	1.00	0.63	10.2	0.00	1.00	1.00	1.00	0.00	0.0	1.00	1.00	1.00	0.00	0.00	0.0
	0.90	24.39	1.00	1.00	1.00	0.75	1.00	1.00	0.75	18.3	0.00	1.00	0.50	1.00	0.00	0.0	1.00	1.00	1.00	0.00	0.00	0.0
	0.60	16.26	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.0	0.00	1.00	0.50	1.00	0.00	0.0	1.00	1.00	1.00	0.00	0.00	0.0
	0.75	20.33	1.00	1.00	1.00	0.75	1.00	1.00	0.75	15.2	0.00	1.00	1.00	1.00	0.00	0.0	1.00	1.00	1.00	0.00	0.00	0.0
	0.65	17.62	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.0	0.00	1.00	0.50	1.00	0.00	0.0	1.00	1.00	1.00	0.00	0.00	0.0
	0.50	13.55	1.00	1.00	1.00	0.63	1.00	1.00	0.63	8.5	0.00	1.00	1.00	1.00	0.00	0.0	1.00	1.00	1.00	0.00	0.00	0.0
	0.70	18.97	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.0	0.00	1.00	0.50	1.00	0.00	0.0	1.00	1.00	1.00	0.00	0.00	0.0
	0.90	24.39	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.0	0.00	1.00	0.50	1.00	0.00	0.0	1.00	1.00	1.00	0.00	0.00	0.0
	0.85	23.04	1.00	1.00	1.00	0.13	1.00	1.00	0.13	2.9	0.00	1.00	0.50	1.00	0.00	0.0	1.00	1.00	1.00	0.00	0.00	0.0
Reach Total		**184.28**								**57.4**						**0.0**						**0.0**
Reach 2	2.20	99.37	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.0	0.00	1.00	0.50	1.00	0.00	0.0	1.00	1.00	1.00	0.00	0.00	0.0
	1.80	81.30	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.0	0.00	1.00	0.50	1.00	0.00	0.0	1.00	1.00	1.00	0.00	0.00	0.0
	0.80	36.13	1.00	1.00	1.00	0.00	3.08	1.00	0.00	0.0	0.00	1.00	0.50	1.00	0.00	0.0	1.00	1.00	1.00	0.00	0.00	0.0
	1.20	54.20	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.0	0.00	1.00	0.50	1.00	0.00	0.0	1.00	1.00	1.00	0.00	0.00	0.0
	1.10	49.68	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.0	0.00	1.00	0.50	1.00	0.00	0.0	1.00	1.00	1.00	0.00	0.00	0.0
	1.20	54.20	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.0	0.00	1.00	0.50	1.00	0.00	0.0	1.00	1.00	1.00	0.00	0.00	0.0
Reach Total		**374.88**								**0.0**						**0.0**						**0.0**
Reach 3	0.90	40.65	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.0	0.00	1.00	0.50	1.00	0.00	0.0	1.00	1.00	1.00	0.00	0.00	0.0
	2.10	94.85	1.00	1.00	1.00	0.00	3.00	1.00	0.00	0.0	0.00	0.00	0.50	1.00	0.00	0.0	1.00	1.00	1.00	0.00	0.00	0.0
	2.70	121.95	1.00	1.00	1.00	0.00	0.97	1.00	0.00	0.0	0.00	0.00	0.50	1.00	0.00	0.0	1.00	1.00	1.00	0.00	0.00	0.0
	3.20	144.53	1.00	1.00	0.50	0.00	1.00	1.00	0.00	0.0	0.00	0.00	0.50	1.00	0.00	0.0	1.00	1.00	1.00	0.00	0.00	0.0
	1.60	72.27	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.0	0.00	0.00	0.50	1.00	0.00	0.0	1.00	1.00	1.00	0.00	0.00	0.0
	0.80	36.13	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.0	0.00	1.00	0.50	1.00	0.00	0.0	1.00	1.00	1.00	0.00	0.00	0.0
Reach Total		**510.38**								**0.0**						**0.0**						**0.0**
Reach 4	1.00	67.75	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.0	0.00	1.00	0.50	1.00	0.00	0.0	1.00	0.00	1.00	0.00	0.00	0.0
	1.10	74.53	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.0	0.00	1.00	0.50	1.00	0.00	0.0	1.00	0.00	1.00	0.00	0.00	0.0
	1.30	88.08	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.0	0.00	1.00	0.50	1.00	0.00	0.0	1.00	0.00	1.00	1.00	0.00	0.0
	1.20	81.30	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.0	0.00	1.00	0.50	1.00	0.00	0.0	1.00	0.00	1.00	0.00	0.00	0.0
Reach Total		**311.65**								**0.0**						**0.0**						**0.0**
Reach 5	2.20	59.62	1.00	1.00	0.25	0.00	1.00	1.00	0.00	0.0	0.00	0.00	0.50	1.00	0.00	0.0	1.00	1.00	1.00	0.00	0.00	0.0
	3.50	94.85	1.00	1.00	0.00	0.00	1.00	1.00	0.00	0.0	0.00	1.00	0.50	1.00	0.00	0.0	1.00	1.00	1.00	0.00	0.00	0.0
	1.70	46.07	1.00	1.00	0.50	0.00	1.00	1.00	0.00	0.0	0.00	0.00	0.50	1.00	0.00	0.0	1.00	1.00	1.00	0.00	0.00	0.0
	0.90	24.39	1.00	1.00	0.00	0.00	1.00	1.00	0.00	0.0	0.00	1.00	0.50	1.00	0.00	0.0	1.00	1.00	1.00	0.00	0.00	0.0
	0.80	21.68	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.0	0.00	1.00	0.50	1.00	0.00	0.0	1.00	1.00	1.00	0.00	0.00	0.0
	1.00	27.10	1.00	1.00	0.75	0.00	0.78	1.00	0.00	0.0	0.00	1.00	0.50	1.00	0.00	0.0	1.00	1.00	1.00	0.00	0.00	0.0
	0.80	21.68	1.00	1.00	0.25	0.00	1.00	1.00	0.00	0.0	0.00	1.00	0.50	1.00	0.00	0.0	1.00	1.00	1.00	0.00	0.00	0.0
	1.50	40.65	1.00	1.00	0.00	0.00	0.00	1.00	0.00	0.0	1.00	0.00	0.50	1.00	0.00	0.0	1.00	1.00	1.00	0.00	0.00	0.0
	0.80	21.68	1.00	1.00	0.75	0.00	0.13	1.00	0.00	0.0	1.00	1.00	0.50	1.00	0.50	10.8	1.00	1.00	1.00	0.00	0.00	0.0
	1.10	29.81	1.00	1.00	0.00	0.00	0.70	1.00	0.00	0.0	0.00	1.00	0.50	1.00	0.00	0.0	1.00	1.00	1.00	0.00	0.00	0.0
Reach Total		**387.53**								**0.0**						**10.8**						**0.0**

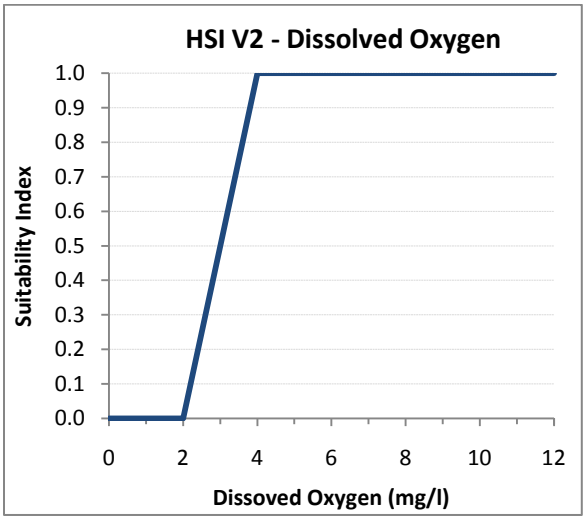
			Spawning Variable								Fry Variable						Juvenile and Adult Variable					
	Width @ Transect (m)	Area (m^2)	Temp.	DO	Rubble	Fines	Vel.	Pool	HSI Score	Habitat Units	Vel.	Depth	Subs.	Temp.	IFM Score	Habitat Units	Temp.	DO	Spawn Access	Winter	HSI Score	Habitat Units
Reach 6	0.70	37.94	1.00	1.00	1.00	0.38	0.63	1.00	0.38	14.2	1.00	1.00	1.00	1.00	1.00	37.9	1.00	1.00	1.00	0.00	0.00	0.0
	0.90	48.78	1.00	1.00	1.00	0.00	0.82	1.00	0.00	0.0	0.00	1.00	0.50	1.00	0.00	0.0	1.00	1.00	1.00	0.00	0.00	0.0
	1.80	97.56	1.00	1.00	1.00	0.63	1.00	1.00	0.63	61.0	0.00	1.00	1.00	1.00	0.00	0.0	1.00	1.00	1.00	0.00	0.00	0.0
	2.00	108.40	1.00	1.00	1.00	0.63	1.00	1.00	0.63	67.8	0.00	1.00	1.00	1.00	0.00	0.0	1.00	1.00	1.00	0.00	0.00	0.0
	1.60	86.72	1.00	1.00	1.00	0.00	0.73	1.00	0.00	0.0	0.00	1.00	0.50	1.00	0.00	0.0	1.00	1.00	1.00	0.00	0.00	0.0
Reach Total		**379.40**								**143.0**						**37.9**						**0.0**
Reach 7	1.90	85.82	1.00	1.00	0.00	0.00	0.60	1.00	0.00	0.0	1.00	1.00	0.50	1.00	0.50	42.9	1.00	1.00	1.00	0.00	0.00	0.0
	1.70	76.78	1.00	1.00	0.25	0.00	0.37	1.00	0.00	0.0	1.00	1.00	0.50	1.00	0.50	38.4	1.00	1.00	1.00	0.00	0.00	0.0
	1.50	67.75	1.00	1.00	0.00	0.00	0.61	1.00	0.00	0.0	1.00	1.00	0.50	1.00	0.50	33.9	1.00	1.00	1.00	0.00	0.00	0.0
	0.40	18.07	1.00	1.00	0.00	0.00	1.00	1.00	0.00	0.0	0.00	1.00	0.50	1.00	0.00	0.0	1.00	1.00	1.00	0.00	0.00	0.0
	0.80	36.13	1.00	1.00	0.00	0.00	0.64	1.00	0.00	0.0	1.00	1.00	0.50	1.00	0.50	18.1	1.00	1.00	1.00	0.00	0.00	0.0
	1.00	45.17	1.00	1.00	0.00	0.00	0.31	1.00	0.00	0.0	1.00	1.00	0.50	1.00	0.50	22.6	1.00	1.00	1.00	0.00	0.00	0.0
Reach Total		**329.72**								**0.0**						**155.8**						**0.0**
Reach 8	n/a	5778 (1080)	1.00	1.00	0.00	0.00	0.00	1.00	0.00	0.0	1.00	0.00 (1.00)	0.50	1.00	0.00	0.00 (540)	1.00	1.00	1.00	0.00	0.00	0.0
Reach Total		**5778.00**								**0.0**						**540.0**						**0.0**
Reach 9	2.00	90.33	1.00	1.00	1.00	0.38	1.00	1.00	0.38	33.9	0.00	1.00	1.00	1.00	0.00	0.0	1.00	1.00	1.00	0.00	0.00	0.0
	2.90	130.98	1.00	1.00	1.00	0.50	0.67	1.00	0.50	65.5	0.00	1.00	1.00	1.00	0.00	0.0	1.00	1.00	1.00	0.00	0.00	0.0
	2.10	94.85	1.00	1.00	1.00	0.63	1.00	1.00	0.63	59.3	0.00	1.00	1.00	1.00	0.00	0.0	1.00	1.00	1.00	0.00	0.00	0.0
	2.40	108.40	1.00	1.00	1.00	0.63	0.72	1.00	0.63	67.8	0.00	1.00	1.00	1.00	0.00	0.0	1.00	1.00	1.00	0.00	0.00	0.0
	2.30	103.88	1.00	1.00	1.00	0.38	1.00	1.00	0.38	39.0	0.00	1.00	1.00	1.00	0.00	0.0	1.00	1.00	1.00	0.00	0.00	0.0
	2.30	103.88	1.00	1.00	1.00	0.50	1.00	1.00	0.50	51.9	0.00	1.00	1.00	1.00	0.00	0.0	1.00	1.00	1.00	0.00	0.00	0.0
Reach Total		**632.33**								**317.3**						**0.0**						**0.0**
Reach 10	n/a	4234 (790)	1.00	1.00	0.00	0.00	0.00	1.00	0.00	0.0	1.00	0.00 (1.00)	0.50	1.00	0.00	0.00 (395)	1.00	1.00	1.00	0.00	0.00	0.0
Reach Total		**4234.00**								**0.0**						**395.0**						**0.0**
Reach 11	1.60	108.40	1.00	1.00	1.00	0.75	1.00	1.00	0.75	81.3	0.00	1.00	1.00	1.00	0.00	0.0	1.00	0.00	1.00	0.00	0.00	0.0
	1.20	81.30	1.00	1.00	1.00	0.75	1.00	1.00	0.75	61.0	0.00	1.00	1.00	1.00	0.00	0.0	1.00	0.00	1.00	0.00	0.00	0.0
	5.00	338.75	1.00	1.00	1.00	0.00	0.03	1.00	0.00	0.0	1.00	1.00	0.50	1.00	0.50	169.4	1.00	0.00	1.00	0.00	0.00	0.0
	3.00	203.25	1.00	1.00	1.00	0.00	0.54	1.00	0.00	0.0	1.00	1.00	0.50	1.00	0.50	101.6	1.00	0.00	1.00	0.00	0.00	0.0
Reach Total		**731.70**								**142.3**						**271.0**						**0.0**
Reach 12	1.30	117.43	1.00	1.00	1.00	0.50	0.81	1.00	0.50	58.7	0.00	1.00	1.00	1.00	0.00	0.0	1.00	1.00	1.00	0.00	0.00	0.0
	4.50	406.50	1.00	1.00	1.00	0.38	1.00	1.00	0.38	152.4	0.00	1.00	0.50	1.00	0.00	0.0	1.00	1.00	1.00	0.00	0.00	0.0
	2.00	180.67	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.0	0.00	0.00	0.50	1.00	0.00	0.0	1.00	1.00	1.00	0.00	0.00	0.0
Reach Total		**704.60**								**211.2**						**0.0**						**0.0**
Totals										**871.1**						**1410.6**						**0.0**

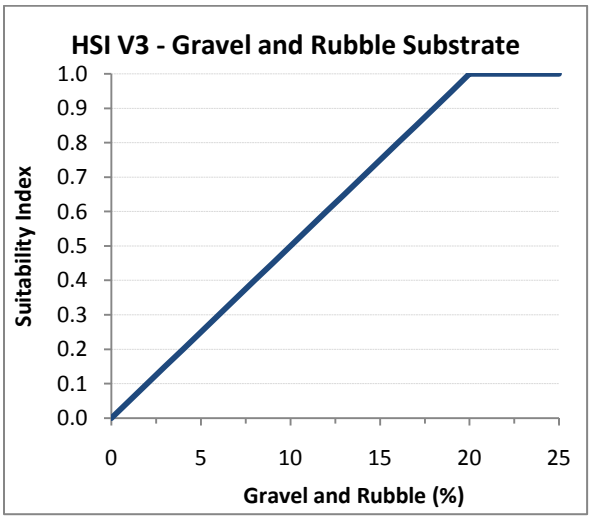
APPENDIX B

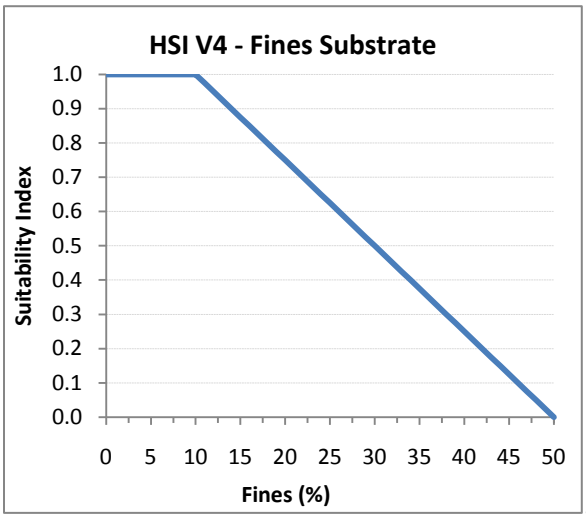
HSI and IFIM Curves – Arctic Grayling

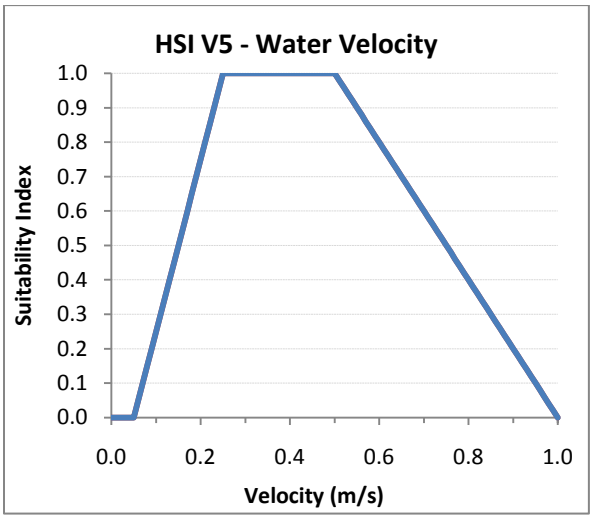
HSI Curves – Arctic Grayling Spawning and Incubation

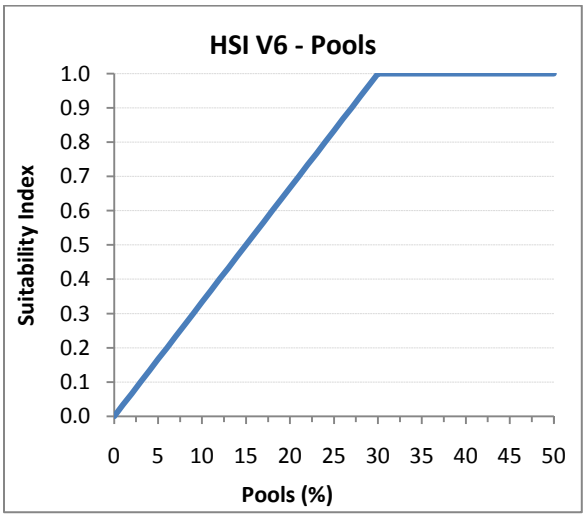




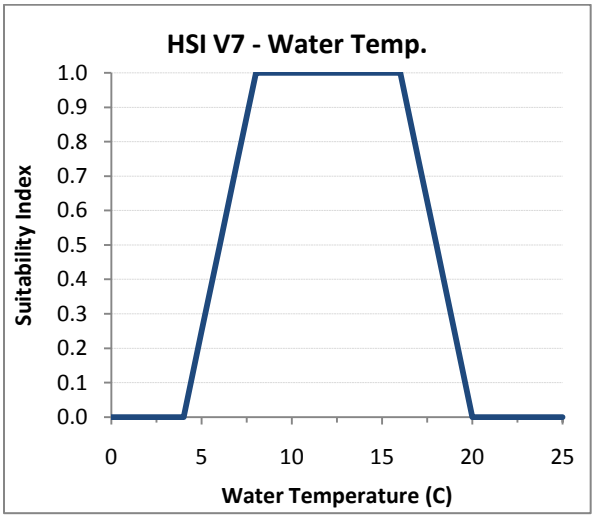


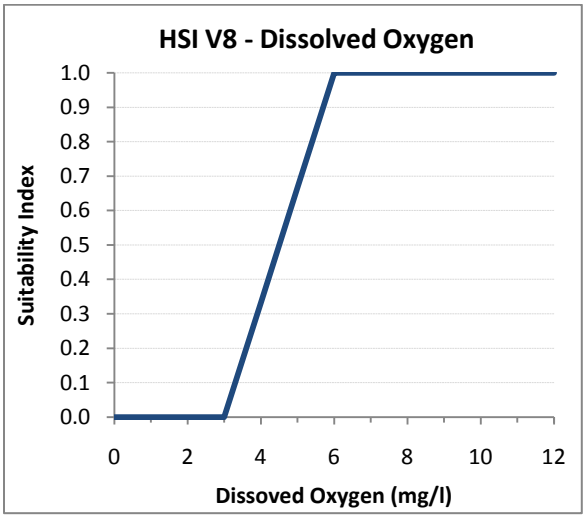


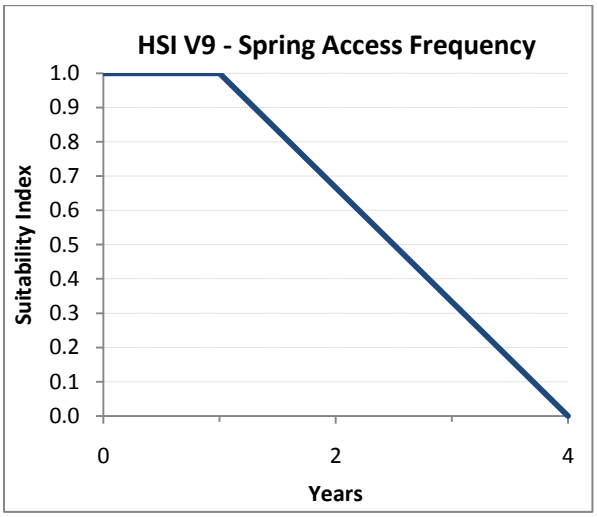


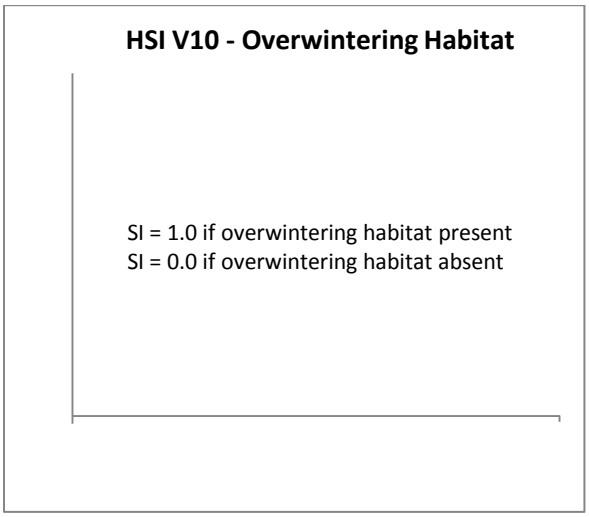


HSI Curves – Arctic Grayling Juveniles and Adults









IFM Curves – Arctic Grayling Fry