nhc
northwest hydraulic consultants

Project No. 300063

January 3, 2013

Regional District of Nanaimo – Recreation and Parks
Oceanside Place
830 West Island Highway
Nanaimo BC, V9P 2X4

Attention: **David Palidwor**
Manager of Parks Services

Dear Mr. Palidwor:

Subject: **Miller Road Community Park**
Construction Completion Report

1. INTRODUCTION

In August 2012, the Regional District of Nanaimo (RDN) – Recreation and Parks constructed river bank erosion countermeasures on French Creek at Miller Park, near Parksville, BC. The project site is located on the right bank (looking downstream) of French Creek, approximately 1.9 km upstream of the Highway 19A crossing (Figure 1). Land adjacent to the eroding bend is an approximately 10 m wide strip of Miller Park (owned by the RDN), which backs onto private residential lots accessed via Miller Road. The goals for the project were to reduce the rate of lateral erosion of the right creek bank into Miller Park, while preserving fish habitat and other environmental values.

Northwest Hydraulic Consultants Ltd. (NHC) prepared the design for the project in 2010, which was described in the letter report "*Miller Road Community Park – French Creek Bank Erosion Protection Measures*". The purpose of this letter report is to document the implementation phase of the project. This report is a joint effort between BC Conservation Foundation (BCCF) and NHC.

1.1 WORK COMPLETED

The following work was completed for the implementation phase of this project:

1. Completed the project permits and approvals, which required a series of communications with the RDN, regulatory agency staff, and neighbouring land owners;
2. Coordinated materials, contractors and supplies. Material such as the large woody debris (LWD) and riprap armour were inspected to ensure they met the specifications;

3. Refined and updated the construction cost estimate for project budgeting purposes;
4. Conducted a pre-construction site meeting with the equipment contractor, RDN staff, neighbouring land owners, downstream utility staff and others to review the work and the schedule;
5. Salvaged the fish and diverted the creek away from the work area;
6. Constructed the project using heavy equipment and specified construction materials;
7. Completed planting and landscape restoration;
8. Provided engineering quality assurance / quality control (QA/QC) during the construction phase;
9. Tracked the project budget; and,
10. Surveyed the as-constructed project and prepared a completion report and record drawings (this document).

Remaining work includes monitoring the biological and physical performance and geomorphological response of the project for two years (2013 and 2014).

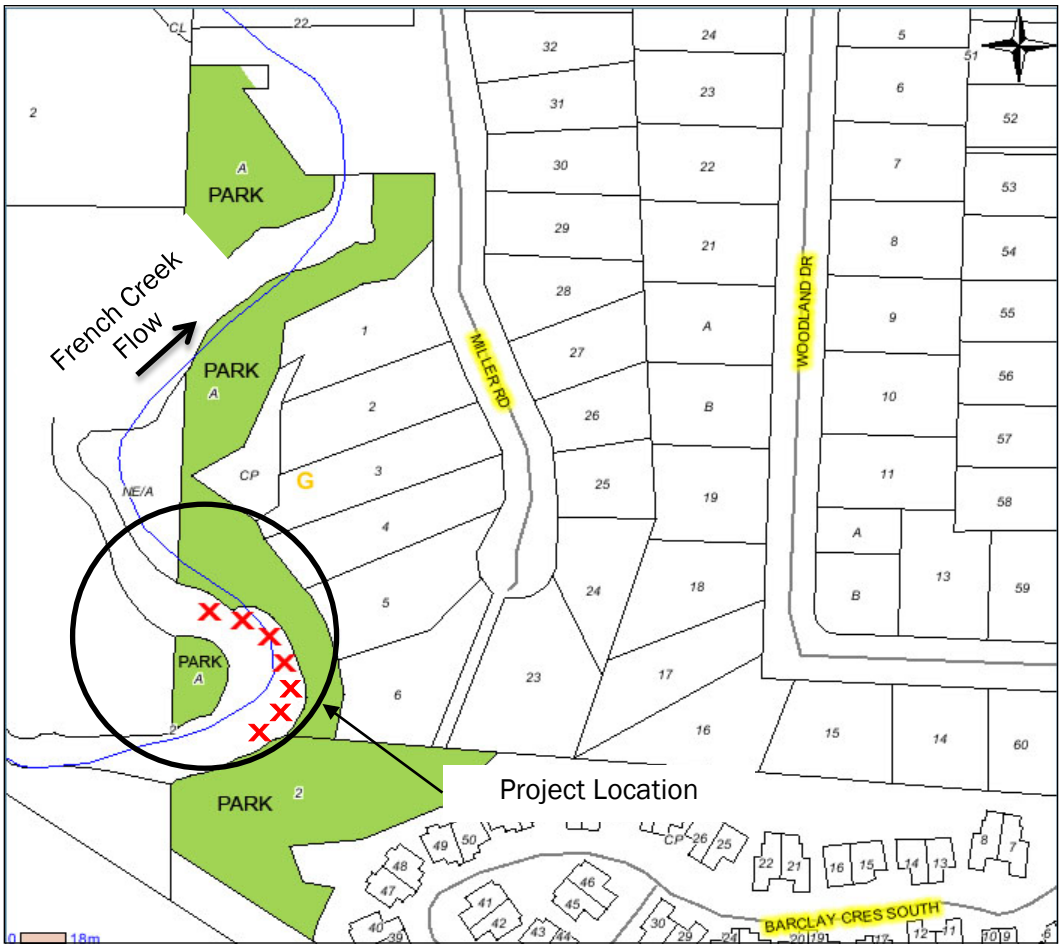

Figure 1. Project location.

2. CONSTRUCTION

For the construction phase of the project, BCCF was the Construction Manager and Environmental Monitor; Bowerman Excavating Ltd. provided the heavy equipment and supplied the woody debris and riprap materials; and NHC was the Project Engineer.

Construction took place from August 20 to August 30, 2012, with site revegetation in October 2012. Figure 2 shows the construction schedule.

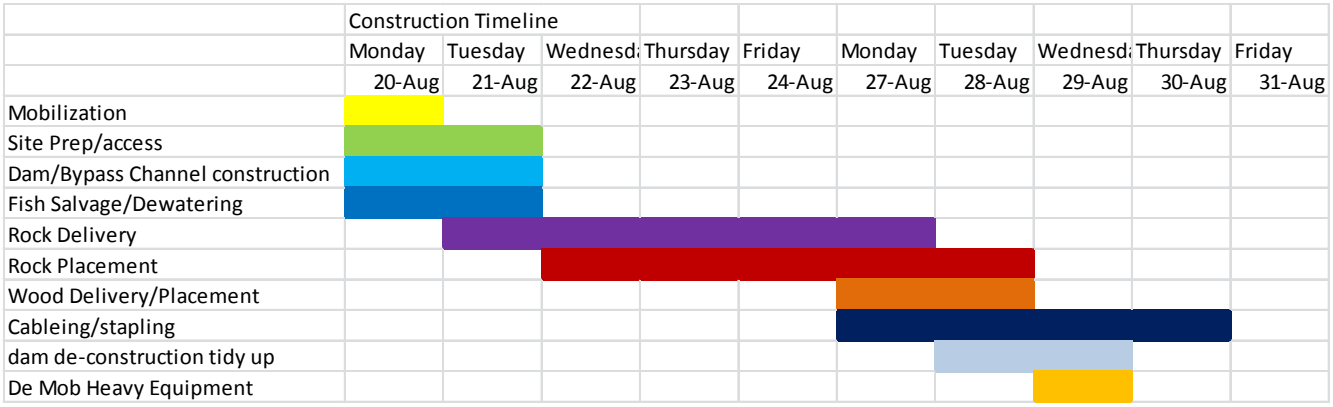

Figure 2. Construction schedule.

The site was accessed through private residential property off of Miller Road. The first step was to isolate the creek reach at the project site with stop nets, and then remove all fish in the work zone (Section 2.1). After the fish were removed, a John Deere 200DLC hydraulic excavator was used to construct a ramp from the top of the bank into the creek channel. The excavator was used to construct a diversion channel along the left bank, and the creek flow was diverted away from the toe of the right bank (Photo 1).

An arbourist contractor removed several trees that were overhanging the work site. The roots were left intact to preserve the creek bank integrity (Photo 2).

The eroding bank slope was prepared by grading the gravel subgrade at a 1.5:1 slope; then riprap was keyed 1.2m into the channel bed at the toe of the slope. The riprap was installed from downstream to upstream, and the embankment was armoured up to the design elevation (Photo 3). After the riprap placement was complete, approximately 250 m^3 of gravel was removed from the channel bar and stockpiled off-site. The volume of removed gravel was approximately the same as the volume of riprap brought to the site (Photo 4).

Large woody debris (LWD) was hauled to the site and positioned by the excavator. The LWD was anchored using wire rope, clamps, and epoxy (Section 2.2).

The excavator was used at the end of the project to contour the gravel bar. Clean gravel and cobble (the paving layer) from the surface of the gravel bar was set aside at the start of the project, this material was redistributed on top of the disturbed creek bed and left bank bar.

The access ramp was removed.

The disrupted landscaping was restored on the private residential property and the work site was revegetated with native stream-type vegetation (Section 2.3).

Photo 1. A channel was constructed on the left bank to divert the creek away from the work area. Fish passage past the work site was maintained. Silty groundwater seepage in the work zone was pumped to the left bank floodplain, and was allowed to percolate into the ground.

Photo 2. An arbourist removed several trees that were overhanging the creek. The tree roots were left intact on the bank.

Photo 3. The eroding bank was prepared by grading the filter layer (gravel), and then riprap was keyed into the stream bed and extended up to the design elevation.

Photo 4. Approximately 250 m^3 of gravel was removed from the gravel bar and hauled off-site.

2.1 FISH SALVAGE

Fish Salvage commenced on August 20, 2012. The construction area was isolated with stop nets (2 m x 15 m, 12 mm stretch mesh) above and below the project area (Photo 5).

Three methods of fish capture were used including: pole seining, trapping ('gee' type baited with roe), and electroshocking. The majority of the fish were removed using pole seining techniques. Gee-traps were set after pole seining; the gee-traps were checked periodically throughout the day, fish were released, and traps were re-baited as necessary. The gee-traps were left to soak overnight and all were removed the morning of August 21, 2012. Electrofishing was used as the final method of capture before the stream flow was diverted and the site was dewatered. All captured fish were identified and enumerated, then released above or below the project site (Photo 6). A summary of all fish removed from the area is provided in Table 1.

Photo 5. Stop nets were used upstream and downstream of the project site to isolate the area. Fish were removed between the stop nets.

Photo 6. The salvaged fish were identified and enumerated, then released above or below the project site.

Table 1. Fish salvage summary.

Method	Coho		Trout (RB)			Cutthroat		Stickleback	Sculpin	Crayfish	Lamprey
	Fry	Parr	Fry	Parr	Adult	Parr	Adult				
Seine	689	80	16	12	0	2	0	81	13	172	0
Gee trap	197	18	5	15	2	0	0	0	115	72	0
Shock	93	16	5	10	1	0	1	6	26	12	10
Total	**979**	**114**	**26**	**37**	**3**	**2**	**1**	**87**	**154**	**256**	**10**
					Total Salmonid		**1162**		**Total Other**		**507**

2.2 LARGE WOODY DEBRIS

Large Woody Debris (LWD) was incorporated into the project to provide high value fish habitat for juvenile and adult salmon and trout. LWD structures were constructed at both the upstream and downstream ends of the project incorporating 40-50% of the project area (90% of the project length).

Tri-log type structures were built at the upstream end of the site to help direct the thalweg away from the toe of the bank, and a small rock apron was installed behind the log structures to reduce bank erosion. Scour pools are expected to develop near the tri-log structures. The scour pools should provide deep, slow water areas for rearing and holding salmonids (Photo 7).

The linear riprap section downstream of the tri-log structures incorporated single stem logs with roots. The LWD is intended to add hydraulic variability, reduce near-bank water velocities, and create small scour pools and provide cover habitat (Photo 8). All LWD was anchored using boulder ballast secured with 12.5 mm diameter wire rope, clamps, and epoxy as per the design (Photo 9).

Photo 7. Tri-log structures were constructed at the upstream end of the site. Some riprap was installed behind the LWD to reduce bank erosion.

Photo 8. LWD was added to the linear riprap section to improve fish habitat values.

Photo 9. The BCCF crew anchored the LWD to boulders using wire rope, clamps, and epoxy.

2.3 RE-VEGETATION

A riparian prescription was developed in early October, 2012. Planting was conducted with assistance from local fish and game/streamkeepers volunteer groups on October 26, 2012. Plants were obtained from the Nanaimo Area Land Trust (NALT) native plant nursery in Cedar, BC, as well as some sword fern salvaged from other areas of the park. Planting effort was concentrated at the access ramp area and the over-steepened banks at the downstream end of the site (Photo 10). Wood debris, primarily decomposing alder, was also added to the open disturbed areas to assist with plant survival; the dispersed wood debris adds nutrients, help retains moisture, and assists building soil. A list of the plants and cuttings planted is provided in Table 2. All the disturbed soil, including the left bank gravel bar, was seeded with a coastal revegetation seed mix (Table 3).

Photo 10. The stream banks and disturbed areas were revegetated with native plants. Local volunteers assisted with the planting work.

Table 2. Plants and cuttings used to revegetate the site.

	Common Name	Latin Name	# planted
Plants	Douglas Fir	*Pseudosuga menziesii*	8
	Western Red Cedar	*Thuja plicata*	11
	Red Alder	*Alnus rubra*	6
	Western Hemlock	*Tsuga heterophylla*	2
	Pacific Crab apple	*Malus fusca*	2
	Cascara	*Rhamnus purshiana*	2
	Broad Leaf Maple	*Acer macrophyllum*	4
	Sword Fern	*Polystichum munitum*	17
		Total Plants	**52**
Stakes	Red Osier Dogwood	*Cornus stolonifera*	11
	Willow	*Salix Spp.*	157
		Total Stakes	**168**

Table 3. Revegetation seed mix.

Common Name	Latin Name
Creeping Red Fescue	*Festuca rubra*
Hard Fescue	*Festuca ovina*
Slender Wheatgrass	*Agrophyron trachycaulum*
Perennial Ryegrass	*Lolium perenne*
Dahurian Wild Ryegrass	*Elymus dahuricus*
Orchardgrass	*Dactylis glomerata*
Timothy	*Phleum pratense*
Canada Bluegrass	*Poa compressa*
Red Top	*Agrostis gigantea*
White Clover	*Trifolium repens*
Single Cut Red Clover	*Trifolium pratense*
Alsike Clover	*Trifolium hybridum*

2.4 Mitigation Measures

A system of mitigation measures were used to reduce the environmental risk of the project. Best management practices were followed for the duration of the project. A qualified environmental monitor was onsite during all instream activities.

The heavy equipment contractor and operators used for this project were experienced with instream construction work. The hydraulic excavator was inspected prior to entering the riparian area; it was in good condition, was less than 5 years old, and was clean and free of leaks. The excavator was also equipped with Chevron 'Clarity' Environmentally Friendly Lubrication (EFL) and had an onboard spill kit. A ground response spill kit was accessible at all times. Equipment refuelling and/or maintenance were all completed outside the riparian corridor.

The initial fording was located at the area of existing riprap, this kept bank disturbance to a minimum. Crossing of the wetted channel occurred only twice. The first crossing was on the first day of construction. The stream was diverted to the bypass channel, and the site remained isolated for subsequent work until the final day when the flow was diverted back to the creek bed.

The work was planned and completed in late August, which is typically a low flow period on Eastern Vancouver Island, and is in the 'fish work window'. During the construction period stream flows were very low, estimated at 15 l/s, making full stream diversion effective. A diversion channel was excavated on the left bank gravel bar and all flows were diverted through the channel for the entire construction period. This method was used because it required minimal maintenance, kept the channel diverted overnight without the need to maintain pumps, and allowed for unimpeded fish migration past the construction site.

A gravel coffer dam was constructed at the downstream end of the project site. A sump was excavated just upstream of the coffer dam and a 75 mm trash pump was used to remove silty groundwater seepage from the work area. The silty water was pumped to the left bank flood plain, where it percolated into the ground.

Turbidity was monitored 50 m downstream of the site. Turbidity was within the predetermined work limits during the construction.

Clean surface gravel from the creek bed (i.e. armour layer) was stock piled at the beginning of construction and used as a top dressing during the final grading to help reduce sediment from being suspended during higher flows.

The creek flow was returned to the creek bed after all bank protection and LWD construction was complete. Water was diverted slowly by the partial damming of the diversion channel. A pump remained running at the lower end of the construction site to extract the first pulse of water back through the original channel. The pump remained in place until the water was running clear, at which point the diversion channel was dammed off and decommissioned.

3. RECOMMENDATIONS

The site should be monitored for physical and biological performance by a qualified professional engineer and fish biologist for two years after construction. A summary of the monitoring reports should be kept on file.

Annual overview site reviews should be conducted by RDN staff beyond 2014. Any changes or potential issues should be noted, particularly:

- LWD, anchor ballast, wire rope;
- Riprap revetment;
- Excessive toe erosion or erosion at the upstream and/or downstream extents of the project;
- Creek alignment or creek bed changes (i.e. aggradation or degradation); and,
- Land use changes, or any other variations.

Annual photo comparisons should be used to assist in identifying small year-over-year incremental changes.

Qualified professionals should be consulted as required.

Sincerely,

northwest hydraulic consultants ltd.

original signed by Graham Hill

Graham Hill P.Eng.
Project Engineer

BRITISH COLUMBIA CONSERVATION FOUNDATION

origninal signed by Jeramy Damborg

Jeramy Damborg B.Sc., Dip. Fisheries
Project Biologist

cc:

Leslie MacDougall, Fisheries and Oceans Canada

Enclosures:

French Creek, Miller Park Bank Erosion Protection Record Drawing

DISCLAIMER