

**COQUITLAM RIVER WATERSHED:
KWIKWETLEM SIDE-CHANNEL
HABITAT RESTORATION,
PUBLIC AWARENESS,
AND REPORT HISTORY**

**BRIDGE COASTAL REHABILITATION PROGRAM
FINAL REPORT - OCTOBER 2003**

01.LM.19

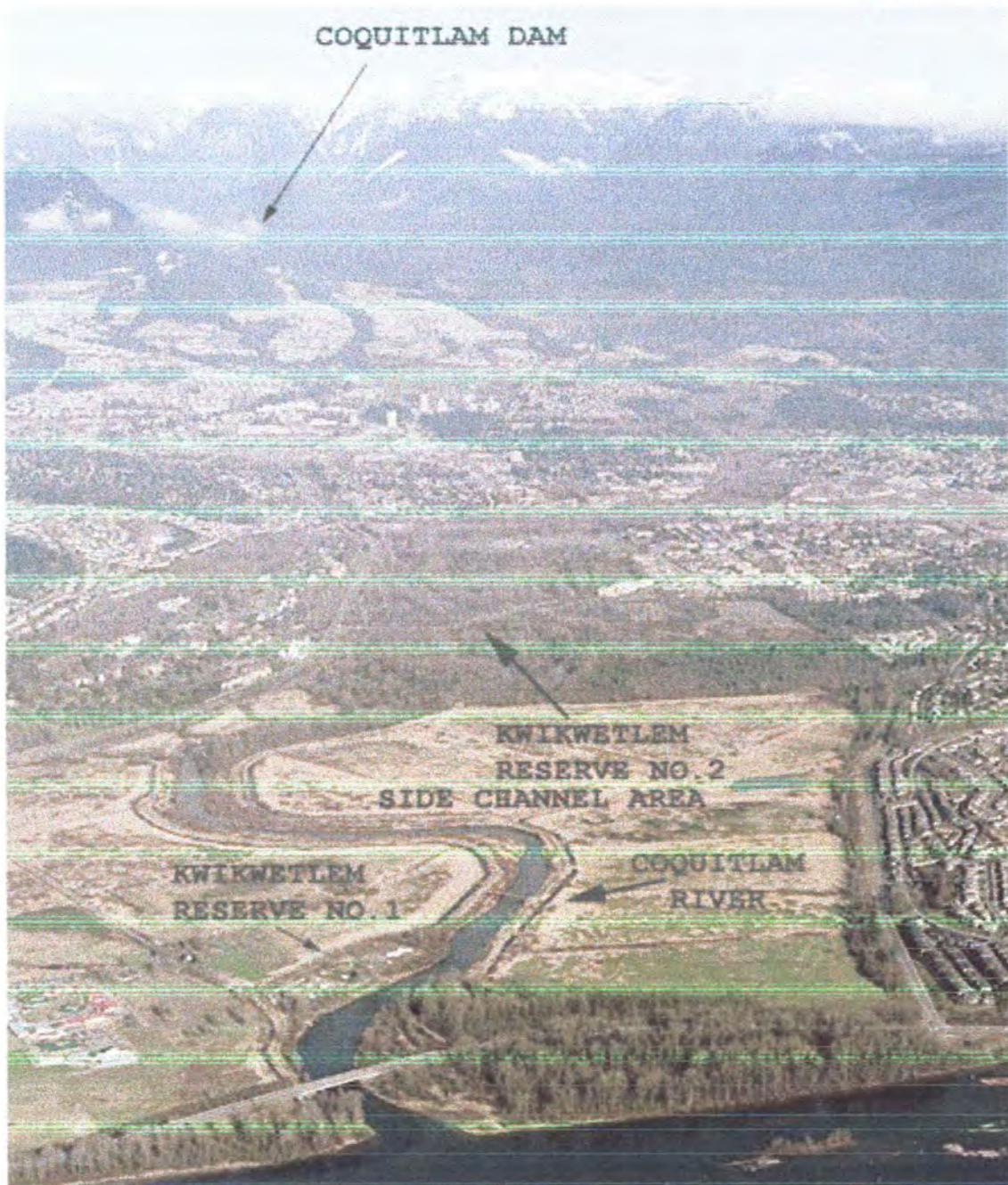


TABLE OF CONENTS

Executive Summary

Acknowledgements

1. Overview

1.1. Report History of Coquitlam River

1.2. The Side Channel Restoration Project Feasibility Study

2. Report Discussion - Red Fish Up The River

3. Proposed Side Channel Rehabilitation Study Area

4. Proposed Methods for Side Channel Rehabilitation

4.1. Water level dynamics monitoring program

4.2. Lowering the side channel and bathymetric survey

4.3. Excavation and connection to stormwater pump station

4.4. Woody debris

4.5. Estimated costs

5. Kwikwetlem Cemetery and Groundwater Mitigation Options

5.1. Estimated Costs

References

Figures

Location Map

1.1. National Archives Reference Center

1.2. "Residualized Kokanee"

3.1. 1996 aerial photo of study area

3.2. Orthophoto of side channel area

4.1. Side channel mouth area

5.1. Location of cemetery, options for connectivity, and Pump House Station

Appendixes

Appendix A: Kerr, Wood, Leidel's Summary of Cost Estimates

Appendix B: Financial Statement

Appendix C: Newspaper articles

EXECUTIVE SUMMARY

The Kwikwetlem Nation, located near the mouth of the Coquitlam River, was provided a grant by B.C. Hydro's Bridge Coastal Rehabilitation Program for two interrelated projects: a feasibility study to reactivate a Coquitlam River side channel, located within the boundaries of Kwikwetlem Reserve No. 2, for critical salmon habitat; and for an early report history (1898-1914) on the former Coquitlam River salmon populations, the impacts of the two Coquitlam dams on the salmon, and the relationship between the salmon and the Kwikwetlem Nation.

Engineering consultants with Kerr, Wood, Leidel completed a feasibility study report in early December 2001. The study examined options for reactivating approximately 1.2 kilometres of a former Coquitlam River channel that municipal authorities closed off decades ago. The study also included options for mitigating groundwater seepage into a Kwikwetlem cemetery site beside the northern end of the side channel. The study recommended that the side channel would provide critical rearing habitat for coho salmon. Proposed side channel reactivation costs were estimated at \$150,000, and an additional \$75,000 for groundwater controls at the cemetery site.

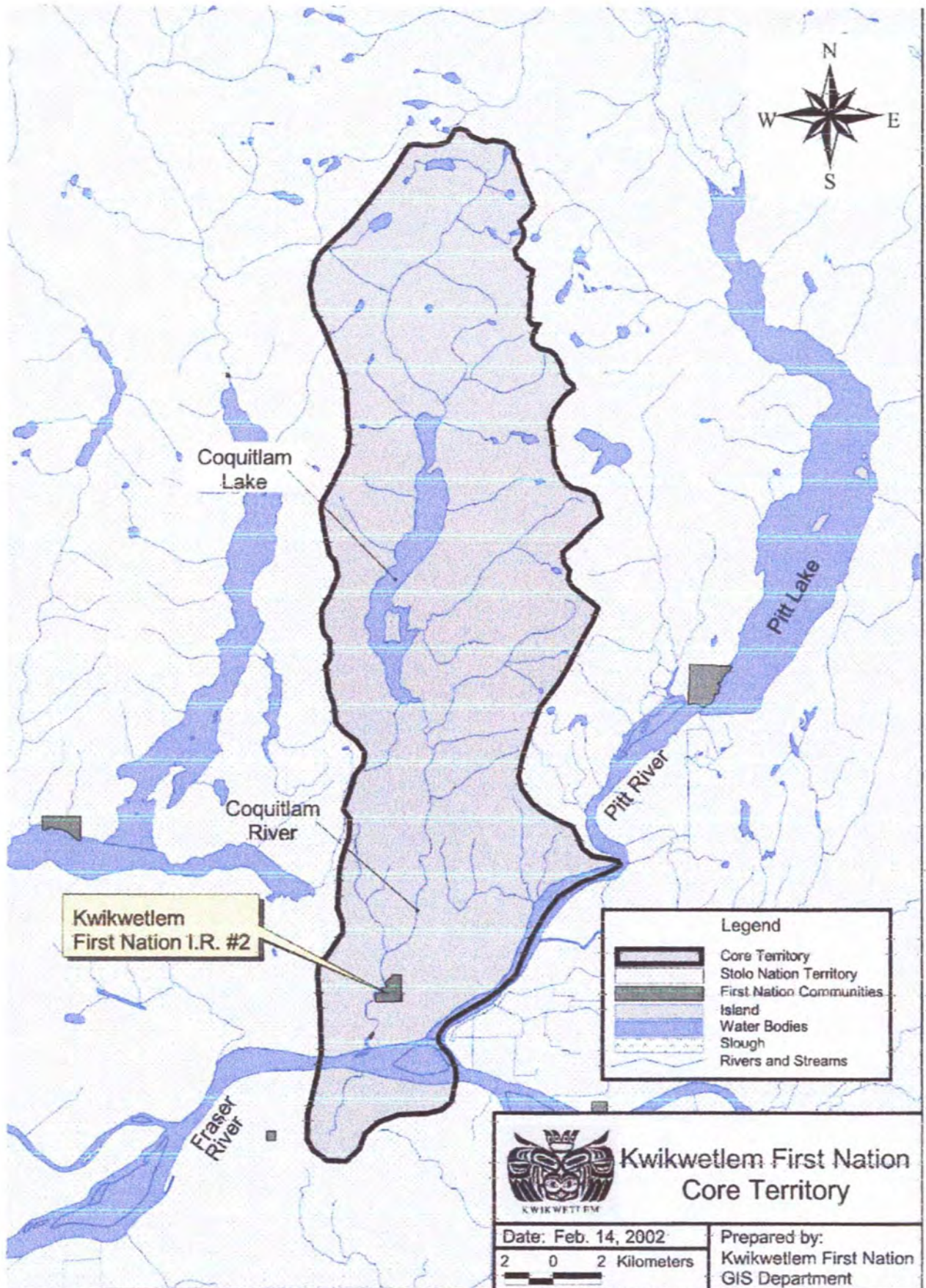
A detailed report on the early history of the Coquitlam River, *Red Fish Up The River - A Report on the Former Coquitlam Salmon Migrations and the Hydro-Electric Developments at Coquitlam Lake, British Columbia, Pre-1914*, was completed on October 1, 2001. The report established that large populations of salmon and steelhead trout migrated into and out of the former Coquitlam Lake area that was obstructed by the placement of a second dam structure in 1913. The first small 1905 dam incorporated a fish ladder, designed by the federal Department of Fisheries, which allowed fish passage. A former early run of a distinct sockeye species, which the Kwikwetlem Nation were named after, became extinct as a result of the later dam. Evidence of fishing camps collected from archeologists along the eastern shorelines of Coquitlam Lake indicates the historic significance of the area for the Kwikwetlem Nation and their dependence on the former runs of salmon. Kwikwetlem Chief Johnny confirmed this in an 1889 letter, where he described that his people and their culture utterly depended on the salmon. Scientists, conducting fish surveys in the Coquitlam Reservoir, recently discovered a direct genetic link to this lost race of salmon described as "residualized sockeye", provided in their March 2003 report to the Bridge Coastal Rehabilitation Program, *Feasibility of Reintroducing Sockeye and Other Species of Salmon in the Coquitlam Reservoir, B.C.*

ACKNOWLEDGMENTS

The Kwikwetlem Nation is indebted to B.C. Hydro's Bridge Coastal Fish and Wildlife Restoration Program and Management Board for critical project funding for the feasibility and historical reports. In association, many thanks to B.C. Hydro's Coquitlam Water Use Plan Consultative Committee for addressing many related issues.

This report is dedicated to all of the Kwikwetlem Nation elders that have passed on. Thanks also to the assistance from Mel Bailey from Katzie First Nation.





Location Map of Coquitlam watershed and Kwikwetlem traditional territory.

COQUITLAM RIVER WATERSHED: KWIKWETLEM SIDE-CHANNEL HABITAT RESTORATION, PUBLIC AWARENESS, AND REPORT HISTORY

1. OVERVIEW

B.C. Hydro's Bridge Coastal Fish-Wildlife Restoration Program approved of two interrelated projects for the Kwikwetlem First Nation in 2001: a report history of the Coquitlam River salmon and the Kwikwetlem people, and; reactivation feasibility of a former lower Coquitlam River channel located within the boundaries of Kwikwetlem Reserve #2, to provide critical salmon habitat with a corresponding public viewing and informational centre.

1.1. Report History of Coquitlam River

The purpose of the report was twofold:

- to compile and describe early records on salmon populations prior to and following B.C. Hydro's twin-phase dam construction periods (1903-1905; 1911-1913) situated at the mouth of Coquitlam Lake, and;
- to establish the historic dependence of the Kwikwetlem people on salmon for their livelihood and culture.



Photo 1.1. National Archives reference centre.

The final October 1, 2001 report, *Red Fish Up The River*, was researched, compiled, and written over a two and a half month period by Will Koop, a Vancouver researcher. Koop was familiar with relevant historic records, summarized in his April 1994 report, *A Presentation on the History of the Coquitlam Watershed and River from 1898-1914*. Apart from conducting research at local and provincial archival repositories, the National Archives in Ottawa were visited over a four-day period to review critical documents. The Kwikwetlem Nation released the report on April 18, 2002 through a press statement and conference. The information generated

much public interest, featured in local newspapers, and was the subject of a ten-minute documentary on CBC radio.

The report confirmed the previous existence of large numbers of salmon migrations in the Coquitlam River and their spawning habitat in the former Coquitlam Lake area, with records documenting Kwikwetlem Nation's former long-held dependence on the salmon. Substantiated by early newspaper references, their name-title, "Red Fish Up the River", originated from a unique and extinct run of sockeye, referred to by early federal fishery inspectors as the "bastard" sockeye.



Photo 1.2. "Kokanee", or "residualized sockeye", discovered in Coquitlam Reservoir at Cedar Creek. Photo courtesy of Bob Bocking, LGL Limited.

The report also became a catalyst for proposals to conduct fish surveys and the reintroduction of salmon species in the Coquitlam Reservoir as discussed by members and concerned specialists at B.C. Hydro's Coquitlam Dam Water Use Planning meetings. Amazingly and coincidentally, scientists may have recently discovered this former race of salmon in the Coquitlam Reservoir. In the LGL Limited report, *Feasibility of Reintroducing Sockeye and Other Species of Pacific Salmon in the Coquitlam Reservoir*, the scientists suggest that the Kokanee may in fact be the "bastard" salmon, and have proposed measures to increase its remaining few numbers in the Reservoir impoundment area.

1.2. The Side-Channel Restoration Project Feasibility Study

Red Fish Up The River supported and renewed the Kwikwetlem Nation's initiatives for developing proposed critical lower river salmon spawning habitat and public informational viewing areas and kiosks on a former active river channel located within the boundaries of their Reserve lands, I.R. #2.

Following the approval process for the restoration project, the Kwikwetlem Nation acquired the engineering consulting services of Kerr Wood Leidel Associates Limited to prepare a feasibility study. A draft report, *Feasibility Study For A Side Channel Reactivation At*

Kwayhqutlum I.R. No. 2, was presented to the Kwikwetlem on November 30, 2001, "to construct an ecologically sensitive educational and cultural interpretive centre." The report identified that "Funding ... is dependent on the completion of an engineering and hydrogeological feasibility study that addresses flooding concerns at the nearby cemetery and reconnection of the side channel back to the river system". Due to the nature of the Kwikwetlem Reserve lands on a low elevation flood plain and concerns about groundwater affecting the Kwikwetlem's cemetery located within it, the proposed undertaking had associated complications.

The feasibility study included an historical review and assessment of the Coquitlam River and its channel. It related that the Coquitlam dam and river control projects were responsible for removing "channel complexities" associated with a former wild river. Flow control measures at the dam led to "considerable channel narrowing, fine sediment aggradation and loss of fish habitat," resulting from "a reduction of peak flows through upstream discharge controls, dyking, and intensive gravel mining." The study concluded that the "proposed side channel reactivation is a remnant of the river's former complexity" and was therefore critical for adding valuable fish habitat.

Side channels are considered to be critical spawning and rearing habitats for chum and coho salmon, and steelhead trout: "The value of side channel habitat is not only limited to the obvious benefit of protecting juvenile fish from extreme flood events. Their stable flow and temperature regime and generally higher nutrient level provide fertile growing conditions for aquatic plants, insects and fish."

Two options, including benefits and drawbacks, were provided for proposals to increase base flows into the proposed side channel site now filled with pools of water forming "a marshy lake habitat":

- by reconnecting the upstream end of the side channel to the Coquitlam River;
- by diversion of groundwater and upper slope water sources.

The consultants advised that an artificial direct link from the Coquitlam River to the upper side-channel near the cemetery was costly and problematic. Due to factors related to river sedimentation deposits and possible debris jams that would at times impede diversion flows, the second option for groundwater charge was considered "more appropriate". The effectiveness of the second option was dependent upon findings from surface and sub-surface water quality tests for storm-water runoff pollutants from the adjacent Mary Hill residential area. At present, the side-channel "receives a majority of its flow from groundwater sources", and is "overgrown with vegetation and apparently carries stagnant flows for significant portions of the year." "Juvenile coho salmon have been known to migrate" to the upper end of the off-channel "during high flows".

Logistics and options for connecting the mouth of the side-channel to the main stem of the Coquitlam River were described. Due to the incising of the Coquitlam River channel, there is now a one-meter difference in height between the two channels during low water, which prevents juvenile fish from ascending the side channel at low water:

"Design work for enhancement of the side channel should focus on determining how water levels in the two systems are connected throughout the year.... Determining how

often the two systems are connected is critical in assessing the functionality of the side channel in providing over wintering habitat.”

Due to the nature of the side channel itself, the consultants recommended against provisions to enhance the area for “spawning habitat”. Rather, the channel area was recommended to develop critical coho salmon “rearing habitat”. It was also recommended that all the factors involved in the assessment should be carefully detailed in a “pre-design” study.

According to estimates provided in the November 2001 report, combined costs for both groundwater controls at the cemetery and for side-channel reactivation would amount to approximately \$225,000, not including estimates for constructing and producing public education facilities.

2. REPORT DISCUSSION - RED FISH UP THE RIVER

According to early government records, the Kwikwetlem Nation was dependent upon the Coquitlam River salmon for its livelihood. This was explained in Kwikwetlem Chief Johnny’s March 1899 letter of concern to the federal government’s Inspector of Fisheries in New Westminster City about the impacts of a dam on his people. Extensive evidence obtained by archeologists of early fishing camps along portions of the eastern perimeter of the Coquitlam Reservoir indicates their subsistence history in the area. During a transition period, when the provincial government granted a water licence at the mouth of Coquitlam Lake in the late 1880s for New Westminster City’s domestic water needs, “Indians” were regularly hired by the City during salmon spawning periods to remove the dead fish accumulating near the water intake.

As a result of the federal Fisheries Department’s concerns and responsibilities about maintaining salmon migrations into the former Coquitlam Lake area, the first small dam completed in 1905 included a fish ladder structure on its eastern flank. Government and corporate records also show that following proposals for construction of a larger dam in 1909, little regard was provided for the salmon with its completion in 1913, thereby preventing future fish ascent. Prior to the release of *Red Fish Up The River*, little information was known about this history and the large populations of former salmon. Along with the pressures of local settlement and development on the Kwikwetlem Nation’s way of life, the loss of salmon in the Coquitlam River system was significant, along with the loss of ancestral fishing grounds at Coquitlam Lake.

After the release of the report to members of BCRP’s Management Board and B.C. Hydro’s Coquitlam Water Use Plan Consultative Committee, it inspired discussion on the feasibility of reintroducing fish passage into the Coquitlam Reservoir. This led the Committee to fund a critical review by LGL Limited of a recent fish passage report for B.C. Hydro, and on a feasibility study by LGL for reintroducing salmon via fish passage in the Coquitlam Reservoir, *Feasibility of Reintroducing Sockeye and Other Species of Salmon in the Coquitlam Reservoir, B.C.* During the course of sampling for fish species by LGL in the Reservoir, a type of kokanee were discovered at the mouth of Cedar Creek, where they had apparently been spawning since the closure of the River in 1912. Genetic testing was conducted on the fish, with the remarkable finding that the kokanee was in actuality “residualized sockeye”, the former parents of the “bastard” salmon lost after the dam prevented their ascent in 1913. LGL concluded that there were no inherent biological impediments to restoring fish passage into the Coquitlam Reservoir.

With the recent proposals for the construction of a new dam facility on the Coquitlam Reservoir, the Consultative Committee and B.C. Hydro representatives negotiated the implementation of a fish passage structure into the proposed dam, with an agreement for increased water flows into the Coquitlam River for fish downstream of the dam.

3. PROPOSED SIDE CHANNEL REHABILITATION STUDY AREA

Kerr, Wood, Leidel Associates Limited included four aerial photographs of the proposed side channel study site in its November 2001 feasibility report. Two of these images were kindly provided.

Figure 3.1, a 1996 color aerial, provides the general inter-urban landscape context surrounding the study area. As is evident, land development is predominant, and very little undeveloped lands remain in the lower reaches of the Coquitlam River. To the immediate right and east of the side channel site, and outside the boundaries of Kwikwetlem Reserve No.2, is the large up-slope Mary Hill urban residential complex within the municipal boundaries of Port Coquitlam City. This interface, as described by the consultants, creates an important concern in their recommended water quality infusion option for the proposed side channel rehabilitation site.

Figure 3.2, a black & white orthophoto, provides detailed visual information about the side channel site. The main stem of the side channel, from its mouth at the Coquitlam River to the Old Pitt River Road (immediately south of the Pitt River Road), showing the pools in the side channel, is approximately 1.1 kilometres in length. The side channel's width varies between ten to thirty meters. In addition, there is also a 140-meter long tributary side channel at the upper eastern end. This is a total of just over 1.2 kilometres of combined side channel habitat. The cemetery is located at the upper end of the side channel, immediately to the west. The Coquitlam River dyke runs along the eastern perimeter of the side channel.

4. PROPOSED METHODS FOR SIDE CHANNEL REHABILITATION

According to the engineering consultants, the proposed reactivation and redevelopment of the lower Coquitlam River side channel involves a series of recommended activities.

4.1. Water level dynamics monitoring program

There is the need for detailed measurements and monitoring programs to determine the present dynamics of water flow interactions between the side channel and the Coquitlam River throughout the year, particularly during critical seasonal coho salmon migration periods.

“Design work for enhancement of the side channel should focus on determining how water levels in the two systems fluctuate throughout the year.... Determining how often the two systems are connected is critical in assessing the functionality of the side channel in providing over wintering habitat.”

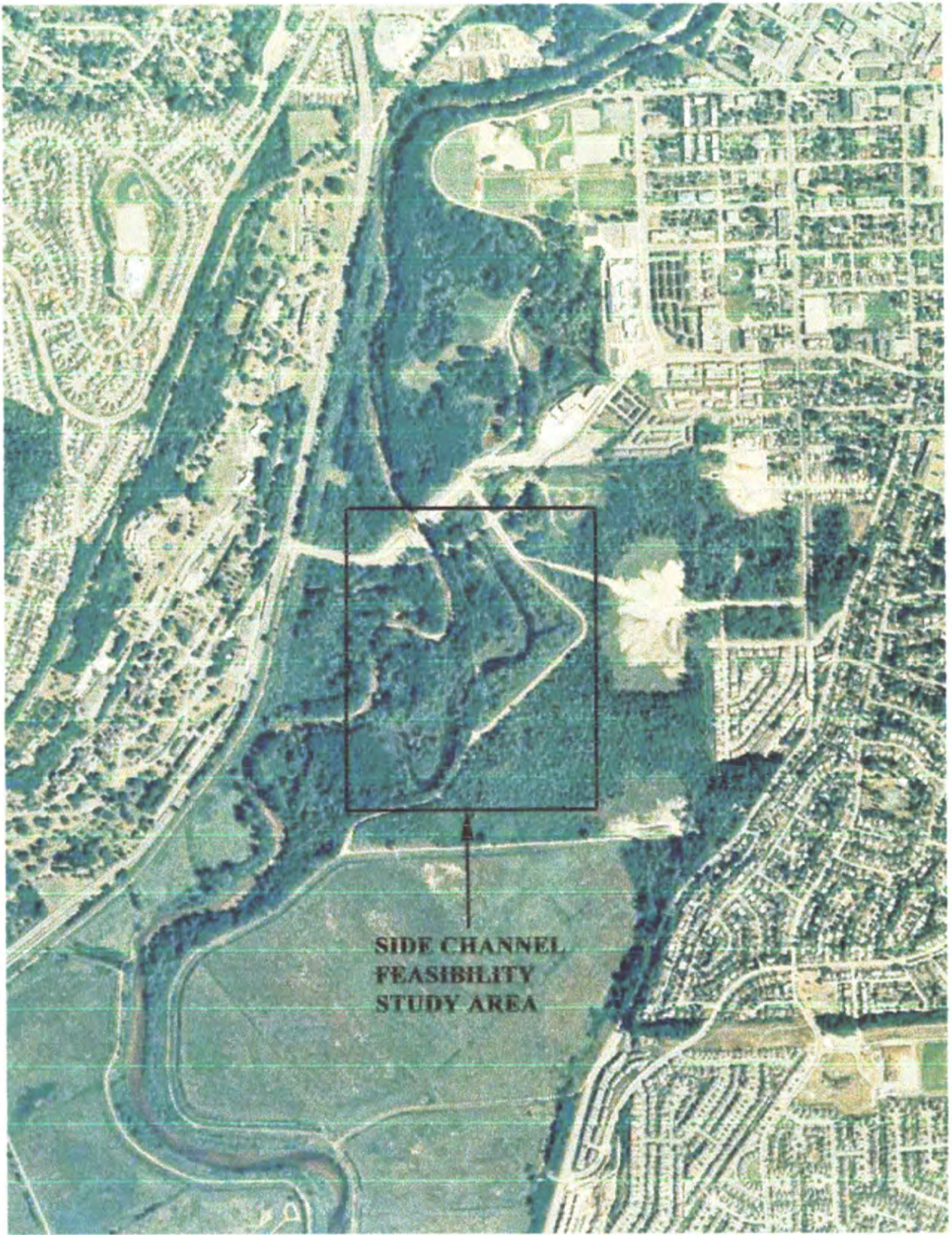


Figure 3.1. 1996 aerial photograph of lower Coquitlam River showing urban interface with side channel area. Coquitlam City boundary to left, Port Coquitlam boundary to right.

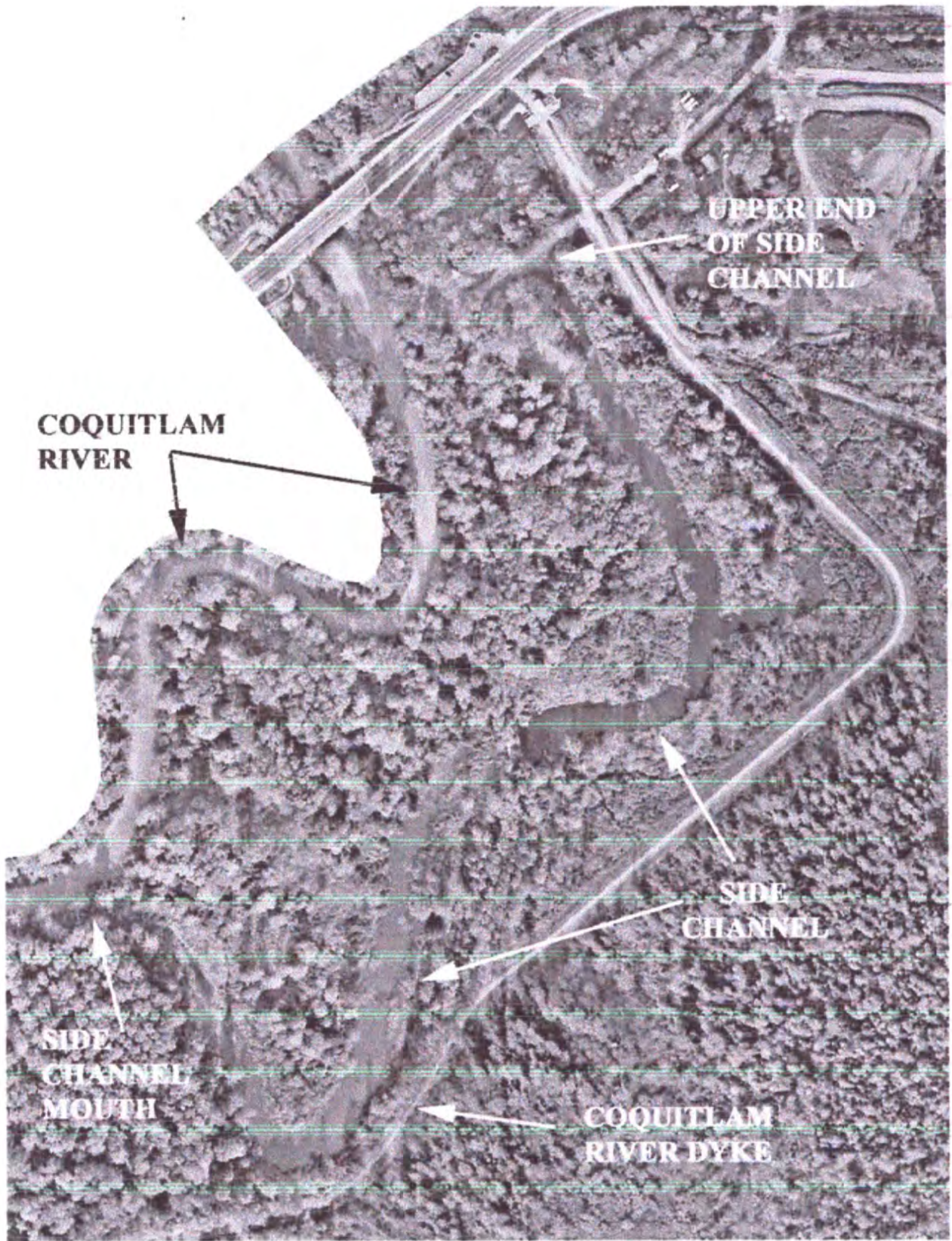


Figure 3.2. Orthophoto showing complete side channel area on Kwikwetlem I.R.#2.

“Determine mainstem channel water levels for various spring and fall discharges at the side channel outlet.... Measure the water level of the side channel near the outlet in the fall and spring.... make an appraisal of their connectivity.”

Connectivity between the two sources is also influenced and complicated by tidal surges originating from the Fraser River working upstream to the side channel.

4.2. Lowering the side channel and bathymetric survey

At low water, the Coquitlam River is now one meter lower than the side channel, therefore water flow connectivity may be absent at critical times of the year for coho salmon migration and movement. This may necessitate engineering to lower the bottom side channel. By doing so, this may significantly impact the side channel by reducing “pool depth due to dewatering,” necessitating the possibility for lowering much, or all, of the remaining side channel. The consultants recommend a “bathymetric survey of the channel should be completed to determine if pool depth would be significantly impacted by lower water levels.”



Photo 4.1. Location of Coquitlam River and side channel mouth.

4.3. Excavation and connection to stormwater pump station

Figure 4-1 of the Kerr, Wood, Leidel report indicates the two options for upper channel connections to the Coquitlam River and the stormwater pump station. As the consultants have recommended the second option, for connection to the pump station, this connection may be made by either the placement of a culvert, or by excavating a one hundred meter trench as an extension of the side channel. Refer to figure 3.2 for the two connectivity locations.

4.4. Woody debris

Should the above-mentioned programs be instituted, it is recommended that "high concentrations of woody debris complexing" be placed throughout the side channel to enhance coho salmon overwintering habitat.

4.5. Estimated Costs

According to "Class D cost estimates" for November 2001 dollars, the program for side channel reactivation is estimated at \$150,000 (Appendix).

5. KWIKWETLEM CEMETARY AND GROUNDWATER MITIGATION OPTIONS

Kerr, Wood, Leidel contracted Piteau Associates Engineering Ltd. "to complete a brief hydrogeologic study to address the feasibility of groundwater control options" for Kwikwetlem's cemetery site near the northwest end of the side channel.

"In discussions with the Band, it is understood that it is not necessary to provide a permanent lowering of the water table. However, the Band does require the ability to temporarily control the local water table, so caskets can be lowered into dry excavations. Groundwater exclusion systems such as cutoff walls are considered to be impractical for the site due to high cost and the potential for extensive site disruption."

A series of test pits were excavated around the cemetery, along with water-pumping tests, in order to understand the nature of groundwater infiltration. Two recommended options were provided to mitigate groundwater depth and inflows:

- (a). To construct french drains on three sides of the cemetery. Such a design, along with a pumping system, would allow the area to be drained "prior to an interment".
- (b). To "compact the loose water bearing silt to collapse the voids and reduce its hydraulic conductivity". This could be achieved by the use of commercial vibrating equipment or by replacing the area with suitable "fill".

5.1. Estimated Costs

Cost estimates for temporary groundwater reduction at the cemetery are \$75,000 (Appendix A).



Figure 5.1. Cemetery site location; Options 1 & 2; Pump House Station location.

6. RECOMMENDATIONS

DELIVERABLES: One electronic copy (.pdf files in CD-ROM format placed in an adhesive CD-ROM folder at the back of the report) and two hard copies.

REFERENCES

Bocking, R.C., and M.N. Gaboury. *Feasibility of Reintroducing Sockeye and Other Species of Salmon in the Coquitlam Reservoir, B.C.* LGL Limited. March 2003.

B.C. Hydro Report. *Evaluation of Restoring Historic Passage for Anadromous Fish at BC Hydro Facilities.* Global Consultants. June 2001.

Kerr, Wood, Leidel Associates Ltd. *Feasibility Study for a Side Channel Reactivation at Kwayhquiltum I.R. No. 2.* Draft for Discussion. December 2001.

Koop, Will. *A Presentation on the History of the Coquitlam Watershed and River from 1898 - 1914*, for the Port Moody Ecological Society, on the Evening of April 6, 1994, 18 pages. (Located at the Vancouver Public Library & website: www.alternatives.com/bctwa/CoqRivHist.)

Koop, Will. *Red Fish Up The River. A Report on the Former Coquitlam Salmon Migrations and the Hydro-Electric Developments at Coquitlam Lake, British Columbia, Pre-1914.* Presented for the Kwikwetlem Nation through B.C. Hydro's Bridge Coastal Fish and Wildlife Rehabilitation Fund. October 1, 2001.

APPENDIX A: KERR, WOOD, LEIDEL'S SUMMARY OF COST ESTIMATES

Side Channel Reactivation	
Diversion of urban runoff	\$20,000
Riprap protection on channel walls	\$20,000
Decommissioning dyke penetration at river channel	\$10,000
Reuse of culvert across access to cemetery	\$5,000
Outlet construction works including access to site	\$20,000
Habitat complexing (allowance)	\$25,000
Pre-design study	\$20,000
Engineering and contingency	\$30,000
Sub-total	\$150,000
Cemetery	
150 metres of perimeter interception ditches at 100/m	\$15,000
Ground water control at \$75/m	\$12,000
Pump station	\$15,000
Electrical connection	\$10,000
Sedimentation and polishing ponds	\$3,000
Engineering and contingencies (30%)	\$20,000
Sub-total	\$75,000
Grand Total	\$225,000

APPENDIX B: FINANCIAL STATEMENT

EXPENDITURE ITEM	DESCRIPTION	TOTAL COST
Report History: <i>Red Fish Up The River.</i>	Archival research (included a return flight and four days in Ottawa at the Canadian Archives), travel expenses, photo reproduction, photocopying. Per diem: \$275.	\$11,000

APPENDIX C: Confirmation of BCRP Recognition (newspaper clippings, press releases, newsletters, brochures, photographs of signs/plaques etc.)

