TROUT CREEK/MORICETOWN WATERSHED ASSESSMENT PROJECT

INTEGRATED WATERSHED RESTORATION PLAN ROADS, HILLSLOPES & GULLIES

February, 1997

Prepared for:

Pacific Inland Resources Ltd.
Bulkley Ministry of Forests

Funding by:

Forest Renewal BC

Prepared By:

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Victoria, BC, Canada

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Direction for this watershed assessment project was provided by the Bulkley Forest District Office and Pacific Inland Resources Ltd., a Division of West Fraser Mills Ltd. (PIR). Other input was received from:

- Bell Pole Co. Ltd.
- Local road users

The MoF's, PIR's and Bell Pole's input has been especially helpful in the preparation of this report. Particularly, thanks are given to Steve Williams of the Bulkley Forest District, Alan Baxter of PIR and Ian Smith of Bell Pole.

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Dave Barker,
Project manager on behalf of Sterling Wood Group Inc.

DISTRIBUTION LIST

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1.0 INTRODUCTION

There are 14 watersheds in the Trout Creek/Moricetown Integrated Watershed Restoration Plan (Level 1 Project) found on either side of the Bulkley River. The project is just north of the town of Smithers and is within the Babine Mountain Range to the east and the Bulkley Mountain Range to the west. The total project watershed area is about 78,000 ha. There are three subprojects:

Level I watershed strategy, sediment source assessment (SSA)
Interior Watershed Assessment Program (IWAP)
Consolidated Access Management Plan (AMP)

Sterling Wood Group Inc. (SWG) conducted the sediment source assessment and the access management plan for Pacific Inland Resources (PIR), the proponent of the project. Madrone Consultants conducted the IWAP. PIR holds a watershed restoration contract #VA-18-96-0316W administered by the Ministry of Forests (MoF) Bulkley Forest District.

The SSA and AMP field and office assessments were performed by David Barker, MSc., RPF for Sterling Wood and the IWAP was performed by Kelly Eakins, MSc. for Madrone. Kate Lindsay, MSc., RPF (DERU Consultants) assisted in the SSA and AMP.

This document contains information on the Level I Sediment Source Assessment . The AMP and the IWAP reports are listed as Appendices II and VII under separate covers.

The project area has been divided into the following watersheds as shown in Table 1.

Table 1: Watersheds in the project area, by location

West side of Bulkley River (Kitseguecla Subunit)	East side of Bulkley River (Blunt Subunit)
Beavery/Cow Creeks	Bulkley*
Bulkley*	Causqua Creek
Schippers Creek	Gramophone Creek
Toboggan Creek	Kwun Creek
Trout Creek	Luno Creek
	Meed Creek
	No Name 1 Creeks
	Reiseter Creek
	Sharpe Creek
	Twin Creek

*"Bulkley" includes a group of small watersheds that are adjacent to and drain directly into the Bulkley River.

In addition to the above watersheds (the "core" project area), the 1:50 000 maps and associated databases include a listing of blocks in two additional watersheds, upper Kitseguecla and upper Blunt. These were included for the access management plan but were not reviewed for risk. Roads in these two watersheds which are eligible for FRBC watershed restoration funding are planned for deactivation in 1998.

Past industrial activities in the area included forest harvesting, road construction, mining and a BC Hydro transmission line. Current forest licensees in the project area include PIR, Bell Pole Ltd. and two woodlot licensees. The MoF Small Business Forest Enterprise Program (SBFEP) has also awarded licences to harvest timber in the project area. Other users of the watershed include recreationists, guide/outfitters, grazing licensees, trappers, first nations groups and private landholders.

The goals of watershed restoration for the Trout Creek/Moricetown watershed project area are:

- to reduce stream turbidity and maintain water quality
- to hasten the ecological succession of vegetation on slides
- to maintain the integrity of transportation structures
- to provide balanced employment opportunities
- to protect the integrity of fish-bearing streams

- to monitor the effectiveness of work done
- to encourage watershed related research activities which will assist in restoration work

These goals relate to forestry affected terrain and streams on Crown lands. That is, the current and future watershed work will focus on areas affected by past road building and harvesting activities.

Non-logging associated natural failures (outside of the blocks) were incidentally noted during the field work and although not a formal part of the program, are shown as failures on the 1:50 000 maps. These are principally gully sidewall failures originating outside of blocks, mainly in the Reiseter Creek area.

The basic inspection unit for the sediment source survey is the "block". Blocks are harvest units which often contain roads. These roads are of two types or categories: main and spur. A main road provides access not only to the block under consideration, but also to blocks beyond it. Spurs are roads usually within the block which provide local access. The block naming convention used in this report consists of five elements: Mapsheet number, MoF opening number, forest licensee number, polygon number and tag ID #. The only unique number system which is applicable to all blocks is the tag ID#, which is an internal number so that the GIS system can track the blocks. Report users will see the two main numbering systems on the 1:50 000 map: either the MoF opening number (e.g. 094-30) or the licensee number (e.g. 356-1). The MoF number refers to the mapsheet (094 = map 93L094) and opening (opening #30 in the Ministry's forest inventory system). The licensee number refers to the cutting permit and the block.

At least 70% of all blocks or forest roads in the study area have been field inspected as part of this project. All have been reviewed using aerial photographs. If a harvest unit had at least one terrain failure, it was scheduled for a Level II review. Blocks and roads were not scheduled for a level II review if:

- the block or road was on low risk terrain and exhibited no failures
- roads were to be reopened in 1997
- roads were older, revegetated and on low or moderate risk terrain
- roads were the responsibility of a licensee, MoF or the Ministry of Transportation and Highways (MoTH)

The products of this Level I report are to be used as input or a starting point for further inspections leading to prescriptions for work on problem areas. The intent of this Level I assessment was to summarize existing information; group the block or road segment pool into high, moderate or low risk and describe the impacts and recommend further work. It is intended as an overview, to be reviewed and interpreted by qualified technical and professional foresters. Due to the large volume of information processed, material is presented mostly in tabular rather than written format. This was done in order to be cost effective and to meet the MoF Region's intent for the Level I inspections.

The key map shows the project area.

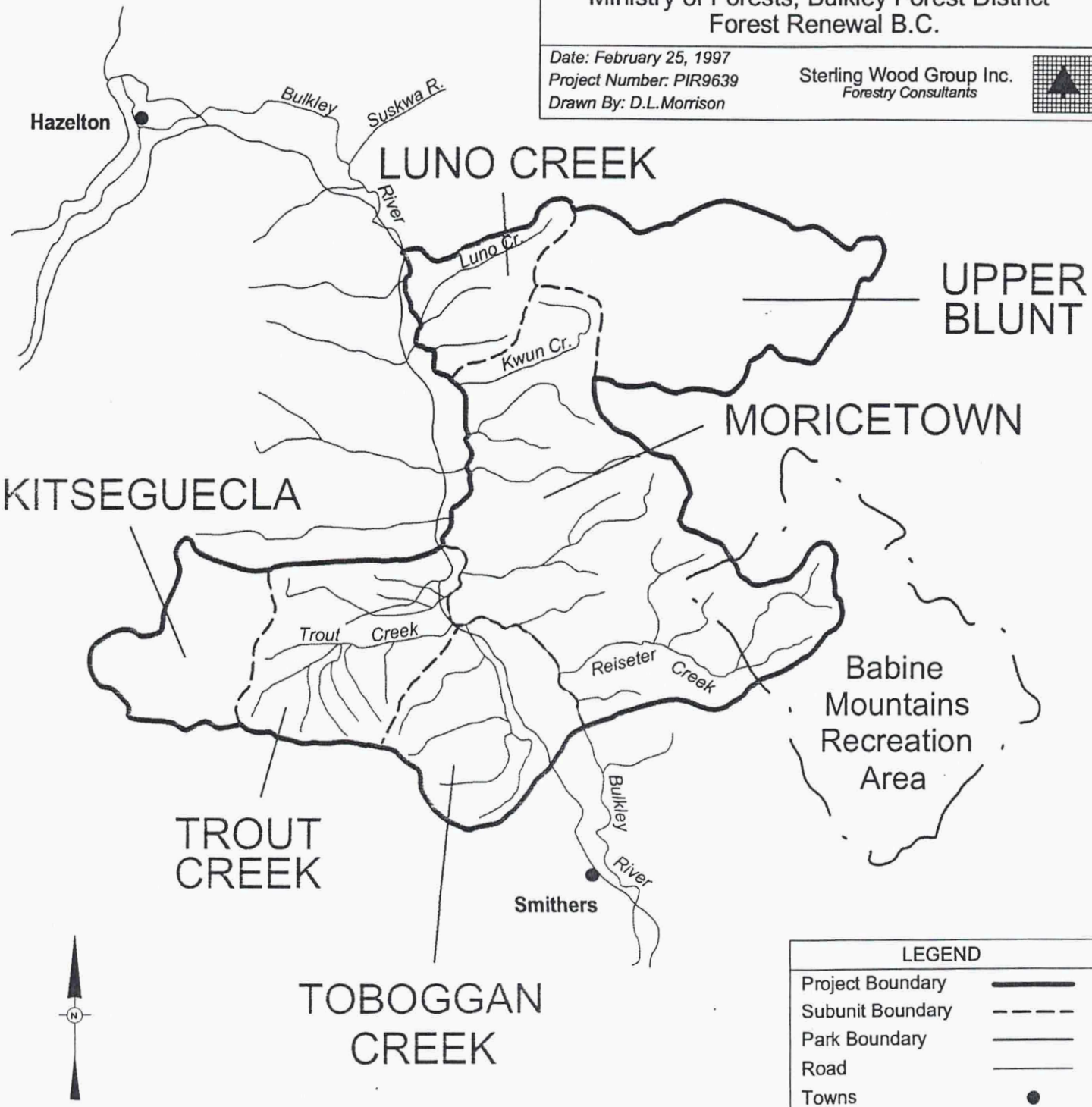
Kitseguecla/Moricetown
Watershed Restoration Program
Access Management Plan

KEY MAP

Pacific Inland Resources
Ministry of Forests, Bulkley Forest District
Forest Renewal B.C.

Date: February 25, 1997
Project Number: PIR9639
Drawn By: D.L.Morrison

Sterling Wood Group Inc.
Forestry Consultants



Scale 1:400,000

LEGEND	
Project Boundary	
Subunit Boundary	
Park Boundary	
Road	
Towns	
Rivers, Streams	

2.0 METHODS

2.1 OFFICE REVIEW

SWG received paper copies of maps from both MoF's geographical information system (GIS) showing roads, harvest unit numbers ("opening numbers") and boundaries and PIR's mapping system. Forest inventory system history record and data files were received from the MoF and entered into a GIS system. The mapsheet files within the project area are shown in table 2. While this was being done, 1:20 000 paper copies of the MoF or PIR maps were spliced and prepared as 23 field maps in order to provide a means for recording notes during the field inspection.

Table 2: Mapsheet Files within the Project Area

093L083	093L092	093M004
093L084	093L093	093M005
093L085	093L094	093M014
093L086	093L095	093M015
	093L096	

The GIS mapping that was finally produced was an amalgamation of two sources: the 1994 MoF updated files and the PIR GIS mapping files which were based on earlier MoF files. Thus, the two systems were slightly different, especially for roads. Both systems had errors in them. It was decided to use both systems uncorrected and after this project is completed, both the MoF and PIR can update their databases from notes taken during this project.

Each block/road crossing was reviewed in the MoF office using the available aerial photography at scales of 1:15,000 to 1:20,000. Mostly black and white coverage from 1990 to 1994 was available, however there was some colour coverage as well. Nearly all of the existing crossings, failures and gullies showed up well on the photos. Notes were made on the 1:20,000 work maps in red pen. A second review of all the gullies was made using 1992 aerial photographs and notes were made in tabular form.

Other background information included geological maps (1:250,000 scale) and reconnaissance level terrain stability maps (1:50,000 scale, Trout Creek area).

Information on specific roads and blocks was available from PIR and Bell Pole and this was incorporated after the initial database was created from MoF data.

Table 3: Hazard, Consequence and Risk Matrix

HAZARD	CONSEQUENCE	RISK	LEVEL II REQUIRED Y/N
High	High	Very High	Yes
High	Moderate	High	Yes
Moderate	High	High	Yes
High	Low	Moderate	Yes
Moderate	Moderate	Moderate	Yes
Low	High	Moderate	Yes
Moderate	Low	Low	No
Low	Moderate	Low	No
Low	Low	Low	No

A preliminary Access Management Strategy report and maps 2 and 3 were completed in January 1997 and submitted to PIR, Bell Pole and the MoF for their review. A public meeting was held in February, 1997. Subsequently, feed-back was received. This was then incorporated into the report and a final was submitted to the licensees and the MoF District.

2.2 FIELD WORK

The majority of the field inspection was done by helicopter reconnaissance. The Blunt Forest Service Road was inspected on the ground. It is shown in the database as one long linear item, in contrast to the area based block system.

As the observer flew over the block and road system, notes were made in pencil, relating to the red x's previously put on the map in the office (see Appendix VI).

The objective of the field work was to confirm or improve the assessment of hazard and consequence made in the office or to determine if there was additional hazard that was previously undetected from the earlier work based on the aerial photographs. Because we focussed on expected areas of instability, an exhaustive check of each block was not done. Sites that were expected to have problems as identified by aerial photography were a focus of the review and where no problems appeared, a more general assessment of the entire block was done. Notes were

confined to statements such as "road is stable", or "OK", indicating there were no problems with a particular site. If there was a problem, it was noted and quantified.

In total, 7.8 hours of helicopter time were used during the assessment. This works out to an average of slightly over three minutes per block which was sufficient time to note that there were some hazards and consequences, but certainly not enough time to evaluate **all** hazards or consequences. Once a portion of the block had a problem which relegated it to a moderate or high risk, then we moved on to the next unit. This system enabled a cost effective risk assessment and allowed some (not all) quantification of problems.

Existing slides were assessed for approximate size, location and potential impact upon a stream. Gully problems were noted and shown as failures on the 1:20,000 map.

The principal mainlines are shown on the map and given a name. Spurs are not named; they are included in the block name.

At the end of the field inspection, a risk sheet was finalized for each block and each gully that was inspected. A gully table was completed for all gullies reviewed either by aerial photographs or by helicopter. All blocks had risk sheets completed, but not all gullies or slides in the project area were reviewed since many either had a low risk or were outside the influence of a harvest block or road.

2.3 OFFICE REPORT

The office report phase had the following tasks:

- quality control of the block risk and gully reports
- data entry into, and quality control of, a Paradox spreadsheet
- analysis of the results and preparation of tables
- merging of the MoF and PIR base maps (these had data anomalies)
- transfer of information to plastic mylar copies of the 1:50,000 maps
- digitizing of the 1:50,000 map (Maps 1,2,3 & 4)
- preparation of the written reports and review of the reports, addition of cost estimates and final publication

Office work control sheets were designed and used to allow maintenance of quality control during cleanup of the maps and transfer of data to the computer.

The project deliverables include:

- report and appendices (appendices III, IV & V are also in Quattro Pro format)
- 1:50,000 GIS maps
- field notes, risk sheets and hand written maps showing inspection points

3.0 RESULTS

3.1 GENERAL PROJECT AREA CHARACTERISTICS

The Trout Creek/Moricetown project area occurs on the east side of the Bulkley River in the Babine Range north of Smithers and on the west side of the river in the Trout Creek/Toboggan Creek area. It is within the ICH and SBS Biogeoclimatic Zone which is characterized by moderate fall, winter and spring precipitation including snow (~40-70 cm annually). Winters are moderately cold and snow pack, while it can be significant, is much lower than on the Coast Range. Summers are relatively warm and moist. Typical flood periods are after breakup and occur in late spring. Late summer stream flows are typically low. One major flood event was noted in Glacier Creek, however, few other large flood events have occurred.

The Bulkley River is an important transportation route for migrating salmon and many of the tributaries to the Bulkley within the study area contain resident trout and Dolly varden. Thus, any forest management activities on the uplands such as roads which cross streams have the potential to introduce sediment into these waterways and affect fish habitat. Detailed fish studies have not been done for many of the tributaries in the study area. It was assumed these tributaries have fish if they had gradients <12%.

Geologically, the project area is within sedimentary rock formations, with some volcanics on the south side of the Trout Creek watershed. Intrusive rock can be found scattered throughout the project area. Table 4 shows major rock formation categories and their locations.

The volcanic and shale rock formations and unconsolidated materials are generally easily erodible and and roads constructed within these areas may be subject to failure on steeper slopes. Roads constructed through the plutonic or igneous groups are quite stable, when built and maintained to standard.

Table 4: Rock formations in the project area

Rock Formation	General Erodibility	Watersheds
a) layered (sedimentary, metamorphic, volcanics, unconsolidated)		
Endako Group (basalt)	moderate	Bulkley south
Telkwa Formation (volcanic)	moderate-high	Trout Creek, north Toboggan
Red Rose Formation (sandstone)	moderate-high	Togoggan, Bulkley, upper Reiseter
Kitsuns Creek Formation (volcanic, feldspar, coal)	moderate-high	Trout Creek Southwest, upper Schippers, Twin, Reiseter, Gramophone (most common formation)
Trout Creek Formation (conglomerate, sandstone, coal)	moderate-high	Trout Creek Centre, Beavery/Cow, Bulkley Centre
Smithers Formation (sandstone, volcanic, limestone)	moderate-high	Trout Creek South
Unconsolidated deep deposits (till, gravel, sand, silt, alluvium)	high	all lower slopes, Gramophone north, No Name 1, Kwun, lower Sharpe, Luno and Bulkley
Skeena Group (conglomerate, shale, coal, volcanic	high	Causqua
Bowser L. Group (conglomerate, shale)	high	upper Kwun
b) Plutonic (igneous)		
Nanika intrusions (porphyritic granite, granodiorite)	low	north Trout, Schippers, Bulkley centre
Bulkley instrusions	low	Upper Twin, south Reiseter, Upper Sharpe, Luno
Source: MinFile for maps 093L and 093M, Ministry of Energy, Mines & Petroleum Resources		

The project area was glaciated and the soils are generally derived from glacial deposits. These include "blankets" on the lowlands and "veneers" in the uplands areas, with some rock intrusions and glacio-fluvial deposits in the mouths of the major rivers and streams. Glacio-fluvial deposits are deep in the Moricetown area and are easily erodable.

The Glacier Gulch area has been the subject of much exploration and mining activity. Principal minerals and metals found there are silver, lead, zinc, gold, copper, molybdenum, bismuth and platinum. Coal is found in the Trout Creek watershed.

3.2 OVERVIEW ASSESSMENTS CONDUCTED

During the overview assessments it was noted that currently three general states of forest cover exist:

- Old growth forest in the upper portions of the project area and between the logged areas
- Patches of second growth forest in the upland portions. This regenerated after logging during the 1950's to the 1970's. Roads from this period tend to be brushed in or revegetated
- Younger regenerating stands from recent logging in the 1980's and 1990's

During the overview flights, very few slides and torrented gullies were noted. Primarily, most slides are sidewall failures in Reiseter Creek. Avalanche tracks, a rock slide and a torrented gully were noted in the Glacier Gulch and the Toboggan Creek area. The remaining areas showed little impacts of logging or road building activities, other than minor flooding or erosion.

Generally, recent crossings are in good condition. Older ones have either been maintained or are blown out. There is an existing bridge in poor condition over Owens Creek south of block 002-1.

A total of 163 crossings and risk locations on upland areas as shown in table 5 were reviewed.

Table 5: Total Stream Crossings and Risk Location Points Field Checked

Watershed	*Locations Field Checked (#)*	*Total Stream Crossings* (#)*
Beavery/Cow	3	5
Bulkley	1	1
Causqua	10	9
Gramophone	10	13
Kwun	20	19
Luno	4	4
Meed	5	8
NoName	22	17
Reiseter	6	5
Schippers	1	4
Sharpe	20	17
Toboggan	17	18
Trout	31	31
Twin	13	13
Total	**163**	**164**

*Includes crossings on private lands which were not field checked.
Field inspections were 95% by helicopter and 5% on the ground.

3.3 SUMMARY OF EXISTING PROJECT AREA CONDITIONS

Large scale timber harvesting on Crown land began in the Trout Creek/Moricetown project area in the late 1950's. Table 6 shows approximate areas harvested in each decade to October, 1996, the date to which this Level I assessment applies.

Table 6: Areas Harvested in the Trout Creek/Moricetown Watershed.

Period	Number of Blocks*	Area (ha)	Average Block Size (ha)
1959-1969	29	1590	55
1970-1979	29	1540	53
1980-1989	80	3630	45
1990-1996	36	1280	35
Total	**174**	**8040**	

* A block includes the cutblock, roads, uplands and gullies within the cutblock. It is labelled using the MoF's Forest Cover Mapping opening number
protocol. Areas do not include the areas covered by roads outside of the block area, nor does it include the areas cleared on private land. This table excludes blocks in the Upper Kitseguecla and Upper Blunt watersheds and excludes roads associated with a harvest area.

Thus, about 11 % of the total project area has been harvested or had mature timber removed. (Crown land portion)

Average block size has been slowly falling since 1959, from an average of 55 ha to an average of 35 ha (1990-1996). It is interesting that the Forest Practices Code may have had little effect in reducing block size, if one looks at the period from 1990-1999. In the database attached to the maps which included new blocks planned to be harvested, average block size from 1990 to 1995 was 35 ha and was 36 ha from 1996 to 1999. Probably because of adjacency and other rules, harvesting rate has decreased from the high rate during the 1980's to a rate approaching that found in the 1960's and 1970's.

There are about 520 km roads in the project area, nearly all of which were originally constructed for harvesting. This number does not include smaller private roads or public roads outside of the main highways. The total includes 310 km of main and 210 km of spur roads. About half of the roads in the project area are currently abandoned or used principally for silviculture or recreation, rather than for harvesting. A considerable proportion of the unused or abandoned roads have revegetated.

The scope of the project included a field and office review of information on some 174 harvested blocks and 8 road systems unassociated with harvest blocks within the project area. In addition to the Level I assessment, the terms of reference require the preparation of an access management plan (called a WRP Access Management Strategy Map in the contract for services). This has been submitted as a separate report. This Access Management Plan included the Upper Kitseguecla and Upper Blunt as well as the project area noted previously.

Watersheds within the area are shown in table 7.

Table 7: Watershed areas

Watershed	Location compared with Bulkley River	Area in ha
Beaver/Cow	west side	2,256
Bulkley	both sides	7,352
Casqua	east side	5,895
Gramophone	east side	6,317
Kwun	east side	2,616
Luno	east side	3,471
Meed	east side	2,744
NN-1*	east side	3,452
Reiseter	east side	16,268
Schippers	west side	2,523
Sharpe	east side	3,032
Toboggan	west side	10,861
Trout	west side	9,082
Twin	east side	2,203
Total		**78,072**

*NN-1 stands for "no name", a series of small unnamed tributaries of the Bulkley River

The 1:50,000 topographic map (Map 1) shows these subunits.

A low proportion of the blocks had high to very high risk. The risks associated with these blocks would include road erosion or crossing washout, gully torrenting and/or potential slide activity. Although the hazard sheets on the majority of these indicated that further level II inspections were warranted (from the table matrix), only 58 blocks and/or road systems were scheduled for a further Level II. This involves inspection of about 120 km of road. The blocks/roads which exhibit moderate to high risk and were not scheduled for a level II inspection are usually the current responsibility of the licensee in the study area or have old roads which are revegetated and exhibit no problems.

Table 8 gives risk assessment results by subunit.

Table 8: Risk Assessment

Watershed	Total Number of Blocks *1	Blocks Heli or Road Checked	Estimate of Risk (#)				Level II Required (#)	Very High & High Risk % of Total	Level II required (%)
			Very High	High	Moderate	Low			
Beavery/Cow	2	1	0	0	1	1	1	0	50
Bulkley	22	13	3	4	4	11	7	32	32
Causqua Cr.	1	1	0	1	0	0	1	100	100
Gramophone Cr.	36	24	0	0	11	25	9	0	25
Kwun Cr.	11	11	0	1	5	5	4	9	36
Luno Cr.	5	4	0	1	2	2	2	20	40
Meed Cr.	11	9	0	0	3	8	2	0	18
NN-1 Cr.	14	14	0	2	6	6	8	14	57
Reiseter Cr.	1	1	0	0	0	1	0	0	0
Schipper's Cr.	3	1	0	0	2	1	2	0	67
Sharpe Cr.	11	8	0	1	6	4	4	9	36
Toboggan	18	14	0	3	4	11	5	17	28
Trout Cr.	43	25	0	2	12	29	10	5	23
Twin Cr.	4	4	0	0	2	2	3	0	75
Total	**182**	**130**	**3**	**15**	**58**	**106**	**58**	**10**	**32**

*1 blocks/roads in more than one watershed unit are counted only in the watershed where most of the block occurs.
N.B. The above table is ***combined*** risk for roads, gullies and slides. The table includes roads that were not associated with a block.

In general, the terrain within the project area is relatively benign and blocks and roads in general exhibit low impact on the fisheries resources. About 10% of the blocks and roads in the project area exhibit high or very high risk. Usually these risks are associated with road crossings.

In addition to the 58 blocks recommended for further level II inspection, there are 44 blocks which have low or moderate risk and are low priority for inspection. These blocks are shown in the database in Appendix V with a Y* in the Level II column. These blocks and roads are eligible for FRBC funding, but are not a priority because of the low risk they exhibit. About 40 km of road is involved.

As can be seen from the table, Trout and Gramophone watersheds have by far the most blocks and roads. However, the riskiest as a percentage of the total are Causqua, Bulkley, Luno and Toboggan watersheds. These watersheds have a relatively large number of road crossings which are at risk and if sedimentation were to occur, will affect a fisheries stream.

Of the 30 gullies reviewed in the harvested portion of the study area, only one, Glacier Creek, has torrented. This torrent deposited considerable gravel below block 094-9 and may have affected the downstream fisheries. The initiation point on this torrent may have been the result of either of two events- the slide on Glacier Creek road or a natural snow dam which broke during the spring thaw. However, there is no substantive evidence that the author discovered for either phenomenon. The slide appeared to stop at the road, however, may have actually continued to the stream and blocked it, causing a subsequent torrent. Other than the Glacier Creek torrent, the gullies are relatively clean of debris and are stable.

The gully assessments did not include gullies on private land. Larger gullies are Luno, Causqua, Kwun, Gramophone and Toboggan Creeks.

There were a total of 31 road crossings of the gullies that were checked. Crossing integrity varies from place to place and details can be found in the notes on the work maps. In general, old wooden culverts or small bridges on inactive roads are failing or flooded. However, the water handled by the smaller gullies (1 to 3 m across, high water mark) is generally low. Many of these smaller gullies probably formed after the last ice age, as a consequence of meltwater channels under the ice. Subsequently, the volume of water running through these gullies is significantly reduced. Thus, the gullies in general present little risk of torrenting.

Approximately 6000 m of gullies in the project area have been harvested. From the aerial photos and the field inspection, little damage has been done as a result, although a few exceptions can be noted on the field maps and notes. In general, no further inspections on the gullies withing the cut blocks are warranted. The only further inspection recommended is on Glacier Cr. A more detailed tabular summary is given in Table 3 in Appendix IV.

There are only two slides which can be attributed to logging or road activities. These are shown in Appendix III.

Natural upland failures (slides) not associated with logging have not been included in Appendix III because assessment of these was not part of the work contract and proposed rehabilitation does not fall under the current FRBC mandate.

There are very few areas within the road/logged environment of the total project area which show high terrain instability. Most failures that were noted are naturally occurring, such as those in the Reiseter Creek area. The two failures which are described in Appendix III (Table 2) require further inspection. One is shown in Table 9 and requires review by a professional geoscientist. The other is a sidewall failure in a gully north west of block 084-6 and should be checked by a forest

engineer on the ground. It is the author's opinion that little remedial work can be done on this sidewall failure, however a level II inspection should be made to confirm or dispute this opinion.

More recommendations for additional professional review may arise as the detailed level II work progresses. Nevertheless, any additional professional work from that recommended in this report is expected to be minor.

Table 9: Unstable Locations Requiring Professional Review

Watershed	Location	Problem
Toboggan Creek	Glacier Creek Road	Road related slide
Toboggan Creek	Block 084-9/Glacier Creek gully	Debris torrent
Toboggan Creek	Toboggan Creek Road	Unstable road bed

4.0 RECOMMENDATIONS

4.1 TECHNICAL

1. Conduct Level II inspections on the roads, gullies and slides shown in Appendices III, IV and V (tables 2, 3 and 4) that are prescribed as a ***yes*** under the "Level II" or "inspect" column.
2. Conduct Level II inspections if budget permits on roads and blocks shown as Y* in Appendix V.
3. Conduct Level III geoscientist inspections as noted in Table 9. The final scope of work should be defined during the level II phase.

4.2 ESTIMATE OF COSTS

Table 10 shows the estimate of costs to perform the Level II and Level III work. General costs are given for professional referral, more detailed costing where necessary should be done during the Level II work.

Table 10: Anticipated Costs for Level II and Level III (Professional Geoscientist) Work

Level II							
Item	Number of Units to review	Person Days			Cost		
		Forest Engineer	Forest Technician	Secretarial/ Drafting	Fees	Expenses	Total
Recommended roads & slides	58(120 km)	20	100	25	$50,000	$10,000	$60,000
Additional road	44(40 km)	6	30	10	$15,000	$3,000	$18,000

Level III						
Item	Number of Units to review	Person Days		Cost		
		Professional/Technical	Secretarial/Drafting	Fees	Expenses	Total
Geoscientist	3	3	1	$2,700	$1,000	$3,700
Helicopter	1.5 hrs				$1,000	$1,000
Total				$67,700	$15,000	$82,700

Costs do not include administration or GST.

APPENDIX I

Map 1: Overview Basemap Showing Areas Assessed; Recommendations for Level II Assessments for Roads, Slides & Gullies

APPENDIX II

Access Management Plan (separate cover)

APPENDIX III

Table of Slides Showing Requirement for a Level II Assessment (Table 2)

Slide codes for Appendix III

Appendix III ("Table 2") gives tabular information about the slides found in the study area. The maps show the slide numbers within a square. The table gives information on the two slides found in the study area within or close to harvest units ("blocks") or associated with roads. Slides outside of harvest units or roads are shown as a "failure", but are not described in this table nor on the final map. Notes may be shown on the work maps.

An example of the information given in the table is for **slide #** (slide number) 1 on **slide location** (Glacier Cr. Road). The **approximate date** is 1990. This slide was inspected and notes can be found in the work map. **Area (m^2)** is about 100 m^2. Other headings are described as follows:

Type of failure: Types of failures are as follows:

OSD-open slope deep
OSS-open slope shallow
CHF-channelized failure
BRF-bedrock failure

Initiation point is either **RD (ROAD)** or associated with the harvest unit (**IB**-inside block or **EB**, edge of block).

Surficial mat is the surficial material showing after the slide has occurred. **U** is unconsolidated such as gravel, till or soil; **R** is rock and **B** is boulders

Sedi. deliv. is the location where the slide ended up. **STR** is stream, **NON** means no impact on a stream (within the block and the debris is unlikely to end up in a stream).

Current revegetation % is the proportion of the slide area that has vegetation (usually alder).

Assess needed? is the recommendation for further assessment or review. Slide 4 requires review: **Y** (yes).

Rehab method is rehabilitation method. This was not filled in since all estimates were made from the air and/or photos and ground review is needed to determine what method should be used.

Rehab priority is rehabilitation priority: **H** high and **M** moderate.

Table 2 Landslide Inventory and Rehabilitation Approaches

slide #	slide location	area (m2)	type of failure	initiation point	surficial material	sedi-ment delivery	current revege-tation (%)	detailed assess. needed	rehabil-itation method	rehabilitation priority & rationale
1	Glacier Cr. road	200	BRF	RD	R	STR	0	Y-geomorph	U	H: above fisheries works downstream
2	064-5 (NW,) outside of block & road)	100	OSS	NF	M	STR	0	Y	U	L: unlikely much can be done,slide is out-side of road or block.

APPENDIX IV

Table of Gullies Showing Requirements for a Level II Assessment (Table 3)

Gully codes for Appendix IV

Appendix IV ("Table 3") gives tabular information about the gullies found in the Trout Creek/Moricetown project area. The map (work map and final 1:50 000 scale map) show numbers for each gully associated with or near roads and/or harvest areas (blocks). Table 3 gives information on gullies which have the potential to impact roads and blocks.

An example of the information given in the table is for **gully #** (gully number) 1 in the Luno Creek **watershed**. Where it crossed the road it was inspected and notes can be found in the work map for the area. The **closest block or road** that it relates to is #014-62 The remaining headings in this table are explained as follows:

# of road crossings is self evident. Gully #1 crossed one road.

Length in block (m) is the number of metres that the gully traversed the block. Since this gully is outside blocks, there were 0 m of gully #1 within the block.

Width of mid/lower slope (m) is the width of the high water mark in the gully, on average for the middle and lower slope positions of the gully. This number is based on an estimate from aerial photos and where notes were taken during the aerial reconnaissance at lower water levels, thus this statistic is very approximate. It is useful for describing the order of magnitude of the width of the gully. Gully 1 width is about 5 m wide on average between the mid and lower slope positions.

Water flow & debris transport is an indicator of of the power for transporting woody debris or gravel down the gully. Gully 1 has H (high) debris transport. M (moderate), L (low) and NC (not clear) are the other categories.

Sedi. source & debris loads is an indicator of the volume of available sediment or debris that is capable of being transported downstream. Gully 1 has M (moderate) sediment source since it flows through a forested area and although soils are erodable, it is assumed that the banks are stable from tree roots and potential volume of material to be washed downstream is minimal.

Sedim. delivery is an indicator of the likelihood of the debris reaching a sensitive area, such as a fisheries stream. Gully 1 has a H (high) probability that if more debris came down, it would reach the Bulkley River.

Assess needed? is the recommendation for further assessment or review. Gully 1 does not require further review: N (no). For gully 1, the only area requiring a check, in the author's opinion is near the highway bridge. This is the responsibility of the highways department and recommendations for this are not covered in the mandate for this report.

Remedial measures is an estimate of whether practical measures could be taken to either repair the damage (if any) caused by debris movement or reduce future environmental impacts. It is unlikely that anything could be done in the adjacent logged areas or in-stream to minimize the impacts of future torrents within gully 1. "N" indicates no measures can be taken and a "U" indicates that it is unknown if remedial measures could be taken.

Table 3 Gully Inventory and Assessment Recommendations

Water-shed	Gully #	Closest block or road	# of road cross-ings	Length in cut block (m)	width, mid-slope, lower slope, (m)	waterflow & debris transport potential	sediment sources & debris loads	sediment delivery	detailed assessment needed	remedial measures
Luno Cr	1	014-62	1	0*	5	H	M	H	N	N
* Area along Luno Cr. is unlogged and has a stream management zone (SMZ). The public highway crosses the creek with a substantial bridge.										
No further gully inspection is required, over and above that needed for the public highway crossing										
Sharpe	2	014-56	5	800*	2	L-M	L-M	L	N	N
* Sharpe Creek estimates are made upstream in block 014-79 where the gully is clearcut. Remaining area has an SMZ										
Sharpe	3	014-79	1	0*	2	L	M	L	N	N
* Gully is adjacent to S boundary of block, inside an SMZ.										
Sharpe	4	014-73	1	0*	1	L	L	L	N	N
* Gully is adjacent to S boundary of block, inside an SMZ.										
Sharpe	4A	014-78	2	300	1	L	L	L	N	N
Kwun	5	501-1*	1	0**	3	M	M	M	N***	N
* There are four small gullies in the N end of 505-1 which exhibit low flows, are small, will likely have no environmental impact and are not included in this formal										
** Gully is not inside block, only crosses the road.										
*** Crossing is clear and bridge appears to be in good condition. Gully is not logged. No assessment above the crossings needed.										
NN-1 Cr	6	004-30	2	600*	2	L	M	L	N	N
* Most of gully in the block bordered by an SMZ.										
NN-1 Cr	7	069-4	1	150	1	L	L	L	N	N
NN-1 Cr	8	069-4	1	0*	2	L	L	M	N	N
* Gully is not inside block, only crosses the road.										
Causqua	9	Causqua Mine Rd.	1	0*	8	H	H	H	N**	N
* Causqua Creek does not flow through a logged block.										
** Causqua Creek. Gully originates above the crossing in natural forest and continues downstream to junction with Bulkley.										
Crossing is clean and no further investigation is warranted.										
Gramophone	10	036-2	1	0*	1	L	L	L	N	N
* Gully is not inside block, only crosses the road.										
Gramophone	11	046-5	1	0*	4	M**	M	H	N	N
* Gramophone Creek is beside the block and is mostly protected by an SMZ.										
** Area of significant debris transport is upstream of crossing in unlogged area.										
Toboggan	12	084-9	1	0*	5	H	H	H	Y	U
* Glacier Creek is outside block, but below Glacier Cr. road. This gully has torrented. Geomorphologist should review this stream.										
Toboggan	13	084-9	1	100	1	L	L	L	N	N

Table 3 Gully Inventory and Assessment Recommendations

Water-shed	Gully #	Closest block or road	# of road cross-ings	Length in cut block (m)	width, mid-slope, lower slope, (m)	waterflow & debris transport potential	sediment sources & debris loads	sediment delivery	detailed assessment needed	remedial measures
Toboggan	14	084-8	1	0	5	H	H	H	N*	U
* Toboggan Creek is not affected by road crossings or harvesting activities and there is no need for a further in-stream review.										
Toboggan	15	084-8	1	0	2	L	M	M	N*	N
* Area of significant debris transport is upstream of crossing in unlogged area.										
Toboggan	16	084-1	0	300*	1	L	L	L	N	N
* Gully originates above block and disappears inside the block										
Toboggan	17	002-1	1	300*	3	M	M	M	N**	N
* Beside the block, mostly protected by an SMZ.										
** Area of significant debris transport is upstream of crossing in unlogged area.										
Trout Cr.	18	350-1	0	200*	1	L	L	L	N	N
* Beside the block, mostly protected by an SMZ.										
Trout Cr.	19	350-1	1	500	1	L	L	L	N	N
Trout Cr.	19A	350-1	0	100*	1	L	L	L	N	N
* Gully originates above the block and disappears inside the block.										
Trout Cr.	20	351-1	1	100	1	L	L	L	N	N
Trout Cr.	21	351-1	3	700	1	L	L	L	N	N
Trout Cr.	22	351-1	1	500*	2	M	L	L	N	N
* Gully originates above the block and disappears inside the block.										
Trout Cr.	23	351-1	1	0*	1	L	M	L	N	N
* Is beside block, within one tree length of logged area.										
Trout Cr.	24	352-1	1	100*	1	L	L	L	N	N
* Gully originates above the block and disappears beside the block.										
Trout Cr.	25	352-1	0	200*	1	L	L	L	N	N
* Gully originates above the block and disappears inside the block.										
Trout Cr.	26	352-1	0	500*	1	L	L	L	N	N
* Gully originates above the block and disappears inside the block.										
Trout Cr.	27	355-2	1	300	1	L	L	L	N	N
Trout Cr.	28	355-2	1	0	1	L	L	M	N	N

APPENDIX V

Table of Blocks & Roads Showing Requirements for a Level II Assessment (Table 4)

Appendix V Table 4 Blocks

Map sheet	Tag #	Poly #	Open #	Licensee #	Watershed	Problems	Haz.	Cons	Risk	Level II?	Work Priority	Comments	Length (km)	Area (ha)	Subunit
093L096				NONE											
093L093	145	126	30		BEAVERY/COW	STEEP BELOW	M	L	L	Y*	LOW		1.5	74	KI
093L094	141	484	50		BEAVERY/COW	STEEP	H	L	M	Y	MED		2.6	34.8	KI
093L094	147	267	3		BULKLEY	N	M	H	H	Y*	LOW	STABLE,NO WORK NEEDED	0.1	3.4	BL
093L094	142	320	3		BULKLEY	N	M	H	H	Y*	LOW	STABLE,NO WORK NEEDED	0.2	3.6	BL
093L094	131	360	3		BULKLEY	N	M	H	H	Y*	LOW	STABLE,NO WORK NEEDED	1.3	3.4	BL
093L094	129	361	4		BULKLEY	N	L	L	L	Y*	LOW		1.3	3.7	BL
093L094	130	490	25		BULKLEY	N	L	L	L	Y*	LOW		0.1	36.2	BL
093L094	111	169	27		BULKLEY	N	L	L	L	N				24.4	BL
093L094	139	453	28		BULKLEY	N	L	L	L	Y*	LOW		0.6	65.7	BL
093L094	176	454	30		BULKLEY	N	L	L	L	Y*	LOW		1.2	40.3	BL
093L094	97	247	31		BULKLEY	STP,CULV,FLD	M	M	M	Y	MED		3.5	24	KI
093L094	98	455	45		BULKLEY	N	L	L	L	N				8	BL
093L094	126	456	46		BULKLEY	N	L	L	L	Y*	LOW		1	26	BL
093L094	183	478	49		BULKLEY	N	L	L	L	Y*	LOW		1.9	27	BL
093L095	88	128	25		BULKLEY	N	L	L	L	N				54.5	BL
093M004	201	404	14		BULKLEY	N	M	L	L	Y	LOW	DO RD INSP	1.9	39	BL
093M004	203	177	32		BULKLEY	BRIDGE,STEEP	H	H	VH	Y	HIGH		0.2	4.3	BL
093M004	205	567	38		BULKLEY	BRIDGE,STEEP	H	H	VH	Y	HIGH		0.7	4.4	BL
093M004	206	568	38		BULKLEY	BRIDGE,STEEP	H	H	VH	Y	HIGH		0	5.8	BL
093M004	183	558	49		BULKLEY									0	BL
093M004	198	402	13	A-07448,2	BULKLEY	N	M	M	M	Y*	LOW	NO CROSSINGS	1.4	51.5	BL
093M004				BLUNTFSR	BULKLEY	CULVERTS	M	H	H	N		LICENSEE RSP		0	BL
093M004				CASQUA NRD	BULKLEY	N	M	M	M	Y	LOW	CHECK XING	0.8	0	BL
093M014	303	192	64		BULKLEY	N	L	L	L	N				41.5	BL
093M014	299	432	66		BULKLEY	N	M	M	M	Y	MED	CHK SECONDARY RD ONLY	1.1	72	BL
093M014				BULKLEYHRD	BULKLEY										
093M004	201	404	14		CASQUA CR.										
093M004	203	177	32		CASQUA CR.										
093M004	208	504	17	069-1	CASQUA CR.										
093M004	204	406	16	069-2	CASQUA CR.										
093M004	402	405	15	069-3	CASQUA CR.										
093M004	207	581	45	069-3	CASQUA CR.										
093M004	198	402	13	A-07448,2	CASQUA CR.										
093M004				BLUNTFSR	CASQUA CR.										
093M004				CASMINERD	CASQUA CR.	CULVERT	M	H	H	Y	MED		0.3	0	BL
093M004				CASQUA NRD	CASQUA CR.										

Appendix V Table 4 Blocks

Map sheet	Tag #	Poly #	Open #	Licensee #	Watershed	Problems	Haz.	Cons	Risk	Level II?	Work Priority	Comments	Length (km)	Area (ha)	Subunit
093L094	156	60	2		GRAMOPHONE	N	L	L	L	Y*	LOW		0.5	35.2	BL
093L094	184	82	7		GRAMOPHONE									0	BL
093L094	154	477	26		GRAMOPHONE	N	M	M	M	Y	MED		0.7	21.2	BL
093L094	176	454	30		GRAMOPHONE										
093L094	172	457	47		GRAMOPHONE	N	M	M	M	Y	MED		1	15.5	BL
093L094	150	119	16	024-2	GRAMOPHONE	N, REVEG SPUR	M	L	L	N		MAINRD LIC. RESP.		78	BL
093L094	155	95	15	024-4	GRAMOPHONE	N	L	L	L	N		MAINRD LIC. RESP.		13.2	BL
093L094	185	377	12	036-1	GRAMOPHONE									0	BL
093L094	171	447	42	036-A	GRAMOPHONE	FLOODED@XING	M	M	M	Y	MED		0.1	4.2	BL
093L094	168	445	9	036-B	GRAMOPHONE	NO XING	M	M	M	Y	MED	LOW FLOW IN STR.	0.4	32	BL
093L094	164	378	44	036-C	GRAMOPHONE	N	L	L	L	N				5.2	BL
093L094	157	379	14	036-J	GRAMOPHONE	N, PIT GOOD	M	M	M	N		MAIN IS LIC. RESP.		9.3	BL
093L094	170	365	8	046-1	GRAMOPHONE	N	L	L	L	Y	LOW	LEVII REQ ON 2 SIDES	0.5	34.3	BL
093L094	166	101	10	046-2	GRAMOPHONE		M	L	L	Y*	LOW		1	88.3	BL
093L094	174	105	11	046-3	GRAMOPHONE		L	L	L	Y*	LOW		1.5	89	BL
093L094	182	362	5	046-4	GRAMOPHONE	N	L	L	L	N				47	BL
093L094	160	99	13	046-5	GRAMOPHONE	N	M	M	M	Y	MED		0.3	25.4	BL
093L094	308	428	0	094-47A	GRAMOPHONE	N	L	L	L	Y*	LOW		1.1	7.7	BL
093L094	153	489	5	530-2	GRAMOPHONE	STEEP SPUR	M	L	L	N				69.6	BL
093L094	167			D	GRAMOPHONE	N	L	L	L	N				6	BL
093L094	173			E	GRAMOPHONE	N	L	L	L	N				5	BL
093L094	181	374	43	F	GRAMOPHONE	N	L	L	L	N				5.4	BL
093L095	150	214	16	024-2	GRAMOPHONE									0	BL
093L095	151	244	15	024-3	GRAMOPHONE	N	M	L	L	Y*	LOW		2.5	17.9	BL
093L095	185	1	12	036-1	GRAMOPHONE									0	BL
093L095	159	37	13	079-1	GRAMOPHONE	N, REVEG SPUR	M	M	M	N		MAINRD LIC. RESP.		96.9	BL
093L095	162	296	14	079-2	GRAMOPHONE	N, REVEG SPUR	M	L	L	N		MAINRD LIC. RESP.		74.4	BL
093L095	169			375-A	GRAMOPHONE	N	L	L	L	N		LIC. RESP.		14	BL
093L095	161			375-B	GRAMOPHONE	N	L	L	L	N		LIC. RESP.		40	BL
093L095	163			375-C	GRAMOPHONE	N	L	M	L	N		LIC. RESP.		40	BL
093L095	178			375-D	GRAMOPHONE	N	L	L	L	N		LIC. RESP.		37	BL
093L095	175			375-E	GRAMOPHONE	N	L	L	L	N		LIC. RESP.		40	BL
093L095	171			375-F	GRAMOPHONE	N	L	L	L	N		LIC. RESP.		16	BL
093L095	165			375-G	GRAMOPHONE	N	L	L	L	N		LIC. RESP.		25	BL
093M004	185	400	12	036-1	GRAMOPHONE	N	M	M	M	Y	MED	S6 STREAM IN NORTH END	1.6	87	BL
093M004	192	521	8	036-2	GRAMOPHONE	N	M	M	M	Y	MED		3.2	96	BL
093M004	193	396	9	036-3	GRAMOPHONE									0	BL

Appendix V Table 4 Blocks

Map sheet	Tag #	Poly #	Open #	Licensee #	Watershed	Problems	Haz.	Cons	Risk	Level II?	Work Priority	Comments	Length (km)	Area (ha)	Subunit
093M004	174	399	11	046-3	GRAMOPHONE									0	BL
093M004	184	392	7	046-4	GRAMOPHONE	N	L	L	L	Y*	LOW		1	34	BL
093M004	198	402	13	A-07448,2	GRAMOPHONE										
093M004	191			G	GRAMOPHONE	N	M	M	M	N		NO ROADS		2	BL
093M004	186			H	GRAMOPHONE	N	M	L	L	N				4	BL
093M005	193	309	9	036-3	GRAMOPHONE	CULV,EROSION	M	M	M	Y	MED		3.2	112	BL
093M005	189	19	10	036-4	GRAMOPHONE	N	M	L	L	Y*	LOW		1	65	BL
093M004	256	595	26	505-1	KWUN CR.									0	BL
093M004	238	553	9	506-1	KWUN CR.	N	L	L	L	N		LIC. RESP.		102.7	BL
093M004	251	127	1	508-1	KWUN CR.									0	BL
093M014	273	466	2		KWUN CR.										
093M014	260	364	30		KWUN CR.	N	L	M	L	N		FSR RD TO SOUTH		29.7	BL
093M014	275	445	75		KWUN CR.	N	L	M	L	N		LIC. RESP.		26.6	BL
093M014	256	481	26	505-1	KWUN CR.	CULVERT	M	H	H	N		LIC RESP.		276	BL
093M014	251	485	1	508-1	KWUN CR.	N	M	M	M	Y	MED		1.2	120	BL
093M014	290	486	4	546-2	KWUN CR.									0	BL
093M014	277	425	3	546-3	KWUN CR.	N	M	M	M	N		DEACTIVATED		46	BL
093M014	274	464	77	CP2-1	KWUN CR.	N	L	M	L	N		LIC. RESP.		25.8	BL
093M014	280	447	76	CP2-2	KWUN CR.	CULVERT	M	M	M	Y	MED		1.3	42.7	BL
093M015	259	323	1	508-2	KWUN CR.	N	L	M	L	Y*	LOW		0.2	13	BL
093M015	285	321	3	546-1	KWUN CR.	N	L	H	M	Y	LOW		4.3	10.1	BL
093M015	290	322	4	546-2	KWUN CR.	FLOODED	M	M	M	Y	MED		0.8	34	BL
093M014	24	186	60		LUNO CR.	N	M	M	M	Y	LOW		0.5	30	BL
093M014	25	427	61		LUNO CR.	N	L	L	L	Y*	LOW		0.4	9.4	BL
093M014	306	429	62		LUNO CR.	N	M	H	H	N		PUB.RD,FORD		27.1	BL
093M014	21	185	63		LUNO CR.	N	L	L	L	Y*	LOW		0.5	27.7	BL
093M014	305	472	78		LUNO CR.	CULVERT	M	M	M	Y	MED	DEACTIVATED	1.4	50	BL
093L094	123	135	20		MEED CR.	N	L	M	L	N				54.6	BL
093L094	132	384	19	024-1	MEED CR.	CULVERT	M	M	M	Y	MED		4.7	59	BL
093L094	150	119	16	024-2	MEED CR.										
093L094	155	95	15	024-4	MEED CR.										
093L094	138	449	34	036-I	MEED CR.	N	M	L	L	Y	LOW	DO A LEV II WITH 024-1	0.1	37	BL
093L094	136	496	32	530-1	MEED CR.	N	L	L	L	N				4	BL
093L094	153	489	5	530-2	MEED CR.										BL
093L094	149	122	17	A-08418	MEED CR.	N, REVEG SPUR	M	M	M	N		MAINRD LIC. RESP.		59.4	BL
093L094	140	382	18	A-21682	MEED CR.	N	L	L	L	Y*	LOW	MAINRD LIC. RESP.	1.5	62	BL
093L095	105	260	20		MEED CR.	N	L	M	L	Y*	LOW		0.8	14.2	BL

Appendix V Table 4 Blocks

Map sheet	Tag #	Poly #	Open #	Licensee #	Watershed	Problems	Haz.	Cons	Risk	Level II?	Work Priority	Comments	Length (km)	Area (ha)	Subunit
093L095	88	128	25		MEED CR.										
093L095	104	304	30		MEED CR.	N	L	L	L	Y*	LOW		0.5	8.3	BL
093L095	132	259	19	024-1	MEED CR.									0	BL
093L095	150	214	16	024-2	MEED CR.										
093L095	138	294	34	036-1	MEED CR.									0	BL
093L095	117	117	18	068-1	MEED CR.	N	M	L	L	Y*	LOW	MAIN LIC. RESP.	0.2	45.3	BL
093L095	114	257	17	068-2	MEED CR.	N, REVEG SPUR	M	M	M	Y*	LOW	XING OK ON MAINRD	0.7	72.6	BL
093L095	136	310	32	530-1	MEED CR.									0	BL
093L095				MEED CREEK	MEED CR.	N, REVEG SPUR	L	L	L	N				0	BL
093M004	211	104	30		NN-1 CR.	N	M	H	H	N		HIGH RISK RD LICENSEE RESP.		648.3	BL
093M004	229	446	70		NN-1 CR.	N	L	L	L	N				11.8	BL
093M004	208	504	17	069-1	NN-1 CR.	CULVERT	M	M	M	Y	MED		1.4	64	BL
093M004	400	582	47	069-1	NN-1 CR.	N	M	L	L	Y	LOW	DO RD INSP	0.6	19	BL
093M004	204	406	16	069-2	NN-1 CR.	EROSION	M	M	M	Y	MED		3.1	101.7	BL
093M004	401	580	46	069-2	NN-1 CR.	N	M	L	L	Y	LOW		0.2	11.3	BL
093M004	402	405	15	069-3	NN-1 CR.	CULVERT	M	M	M	Y	MED		3.1	52	BL
093M004	207	581	45	069-3	NN-1 CR.	CULVERT	M	M	M	Y	MED		0.1	91.1	BL
093M004	215	569	18	069-4	NN-1 CR.	FORD	M	M	M	Y	MED		2.1	79.9	BL
093M004	240			374-1	NN-1 CR.	N	M	L	L	N		LICENSEE RSP		15	BL
093M004	237			374-2	NN-1 CR.	N	M	L	L	N		LICENSEE RSP		34	BL
093M004	223			374-3	NN-1 CR.	N	M	M	M	N		LICENSEE RSP		36	BL
093M004	224			374-4	NN-1 CR.	N	M	L	L	N		LICENSEE RSP		28	BL
093M004	238	553	9	506-1	NN-1 CR.										
093M014	251	485	1	508-1	NN-1 CR.										
093M014				BULKLEYHRD	NN-1 CR.	OLD	M	H	H	Y	MED		7	0	BL
093L095	106	301	21	068-3	REISETER CR.	N	M	L	L	Y*	LOW	MAIN LIC. RESP.	0.5	77	BL
093L095				MEED CREEK	REISETER CR.										
093L093	145	126	30		SCHIPPERS CR										KI
093L093	109	496	33		SCHIPPERS CR	STEEP RD	M	L	L	Y	LOW	CHK SHORT SPUR TO BLK	0.4	3.8	KI
093L093	108	509	47		SCHIPPERS CR	STEEP RD	H	L	M	Y	LOW		0.6	20.5	KI
093L093	144			524-1	SCHIPPERS CR										KI
093L093	148			524-2	SCHIPPERS CR	N	M	M	M	N		LIC. RESP.		38	KI
093L093	127			524-3	SCHIPPERS CR										KI
093M014	273	466	2		SHARPE CR.	N	L	M	L	N				9	BL
093M014	299	432	66		SHARPE CR.										
093M014	300	287	67		SHARPE CR.	N, REVEG SPUR	L	H	M	Y*	LOW		0.6	46.6	BL
093M014	298	438	68		SHARPE CR.	CULVERT	M	M	M	Y	MED		0.9	26.7	BL

Appendix V Table 4 Blocks

Map sheet	Tag #	Poly #	Open #	Licensee #	Watershed	Problems	Haz.	Cons	Risk	Level II?	Work Priority	Comments	Length (km)	Area (ha)	Subunit
093M014	297	439	69		SHARPE CR.	N	L	L	L	Y*	LOW		0.1	13.3	BL
093M014	294	278	70		SHARPE CR.	N	L	H	M	N		PUB.RD-MOTH RESP		23.2	BL
093M014	284	271	71		SHARPE CR.	N	L	M	L	Y	LOW		1	96.1	BL
093M014	293	291	72		SHARPE CR.	N, REVEG SPUR	M	M	M	N				44.8	BL
093M014	289	442	73		SHARPE CR.	N	M	M	M	Y	MED		3.2	100	BL
093M014	287	295	74		SHARPE CR.	N	M	L	L	N				28.1	BL
093M014	275	445	75		SHARPE CR.										
093M014	262			550-1	SHARPE CR.	N	M	M	M	N		LIC. RESP., DEACTIVATED		37	BL
093M014	301	479	79	CP100-1	SHARPE CR.	N	M	H	H	Y	MED		1.5	87	BL
093M014	305	472	78	CP100-2	SHARPE CR.										
093M014	274	464	77	CP2-1	SHARPE CR.										
093M014	280	447	76	CP2-2	SHARPE CR.										
093L084	19	14	1		TOBOGGAN CR.	N, REVEG SPUR	M	M	M	N		NO XING PROBLEM		76	KI
093L084	23	203	2		TOBOGGAN CR.	N, REVEG SPUR	M	L	L	N				67	KI
093L084	31	271	3		TOBOGGAN CR.	N, REVEG SPUR	M	L	L	N				44	KI
093L084	26	319	3		TOBOGGAN CR.	N	L	L	L	N				9	KI
093L084	12	109	4		TOBOGGAN CR.	N	L	M	L	Y*	LOW		2.3	43	KI
093L084	14	328	5		TOBOGGAN CR.	N	M	L	L	N				30	KI
093L084	7	275	6		TOBOGGAN CR.	NO XING,WALL	M	M	M	Y*	LOW	LIC. RESP., DEACTIVATED	0.2	27.4	KI
093L084	120	335	7		TOBOGGAN CR.	N	M	L	L	Y*	LOW		2	100	KI
093L084	2	159	8		TOBOGGAN CR.	GULLY	M	M	M	Y	MED		2.5	43.5	KI
093L084	1	280	9		TOBOGGAN CR.	TORR. GULLY	H	M	H	Y	GEO-H	CHK GLACIER GULCH	2.2	50	KI
093L084	18			357-1	TOBOGGAN CR.	CULVERT	L	M	L	N		LIC. RESPONS.		30	KI
093L084				GLACIER RD	TOBOGGAN CR.	SLIDE	H	M	H	Y	GEO-H	CHK RD&SLIDEsw	1.1	0	KI
093L084				TOBOGGANR	TOBOGGAN CR.	AVA,NO EROSI	H	M	H	Y	GEO-H		8.6	0	KI
093L094	31	339	3		TOBOGGAN CR.									0	KI
093L094	77	497	6		TOBOGGAN CR.	N	M	L	L	N				35.4	KI
093L094	78	452	22		TOBOGGAN CR.	N	L	L	L	N				3.6	KI
093L094	41	353	23		TOBOGGAN CR.										
093L094	52	474	23		TOBOGGAN CR.	N	L	L	L	N		NO ROADS		6	KI
093L094	40	391	24		TOBOGGAN CR.										
093L094	43	344	21	002-1	TOBOGGAN CR.	CULV,FLOOD	M	M	M	Y	MED		6.2	122.2	KI
093L094	71	390	22	002-2	TOBOGGAN CR.	N	L	M	L	Y*	LOW		0.2	14	KI
093L083	34	23	27		TROUT CR.									0	KI
093L083	32	24	28		TROUT CR.									0	KI
093L083	30	270	34	351-1	TROUT CR.									0	KI
093L083	29	265	36	352-1	TROUT CR.									0	KI

Appendix V Table 4 Blocks

Map sheet	Tag #	Poly #	Open #	Licensee #	Watershed	Problems	Haz.	Cons	Risk	Level II?	Work Priority	Comments	Length (km)	Area (ha)	Subunit
093L083	28	281	16	355-1	TROUT CR.	N	L	M	L	Y*	LOW		0.9	36	KI
093L083	17	282	17	355-2	TROUT CR.	N	M	M	M	Y	MED		1.1	57.8	KI
093L093	79	498	7		TROUT CR.	REVEG,NOXING	L	M	L	N				10.6	KI
093L093	74	380	9		TROUT CR.	N	L	M	L	N				4	KI
093L093	63	469	9		TROUT CR.	N	L	M	L	N				11	KI
093L093	72	340	13		TROUT CR.	N	L	L	L	Y*	LOW	FSR	0.5	28	KI
093L093	86	478	14		TROUT CR.	N	L	L	L	Y*	LOW		0.1	13	KI
093L093	87		15		TROUT CR.	N	L	L	L	Y*	LOW	FSR	0.5	38	KI
093L093	101	449	17		TROUT CR.	N	H	M	H	Y	MED	CHECK STREAM	0	7.5	KI
093L093	93	358	18		TROUT CR.	N, REVEG SPUR	H	M	H	Y	MED	CHECK STREAM	0.5	25	KI
093L093	49	366	19		TROUT CR.	N XING	L	M	L	Y*	LOW		1.6	134.7	KI
093L093	118	371	21		TROUT CR.	N, REVEG SPUR	L	M	L	N				14	KI
093L093	36	415	22		TROUT CR.	STEEP SPUR	M	M	M	Y	MED		0.5	21.3	KI
093L093	56	459	23		TROUT CR.	N	L	M	L	N				24	KI
093L093	62	388	25		TROUT CR.	N	L	M	L	Y*	LOW		0.5	55	KI
093L093	91	461	26		TROUT CR.	N	L	L	L	Y*	LOW	PUBLIC RD, OLD RD TO SE	1	11	KI
093L093	34	410	27		TROUT CR.	N, REVEG SPUR	M	M	M	N		OLD LOGGING		19.6	KI
093L093	32	406	28		TROUT CR.	N	M	L	L	N				19.4	KI
093L093	58	367	38		TROUT CR.	REV	L	L	L	N				3	KI
093L093	61	368	38		TROUT CR.	REVEG OLD RD	L	L	L	N				5	KI
093L093	65	369	38		TROUT CR.	REVEG	L	L	L	Y*	LOW		0.1	3	KI
093L093	57	471	38		TROUT CR.	REVEG	L	L	L	N				9	KI
093L093	68	499	38		TROUT CR.	REVEG	L	L	L	N				3	KI
093L093	48	477	46		TROUT CR.	N	L	M	L	N				10	KI
093L093	46	482	46		TROUT CR.	N	L	M	L	N				5	KI
093L093	108	509	47		TROUT CR.										
093L093	73		16	16A	TROUT CR.	N	L	L	L	N				29	KI
093L093	37	405	29	29B	TROUT CR.	N, REVEG SPUR	M	M	M	N		OLD LOGGING		25	KI
093L093	51	495	32	350-1	TROUT CR.	CULV,DEBRIS	M	M	M	Y	MED		7	329	KI
093L093	85	497	44	350-1	TROUT CR.	N	L	L	L	Y*	LOW		1	23.2	KI
093L093	30	420	34	351-1	TROUT CR.	CULVERTS	M	M	M	Y	MED	MANY S6 STREAMS	4	233	KI
093L093	29	494	36	352-1	TROUT CR.	EROCULVBRIDG	M	M	M	Y	MED		2	260	KI
093L093	28	533	16	355-1	TROUT CR.									0	KI
093L093	33			355-3	TROUT CR.	N	L	L	L	N				4	KI
093L093	47	520	45	356-3	TROUT CR.	N	L	M	L	N				9.3	KI
093L093	144			524-1	TROUT CR.	N	M	M	M	N		LIC. RESP.		37	KI
093L093	127			524-3	TROUT CR.	N	M	M	M	N		LIC. RESP.		37	KI

Appendix V Table 4 Blocks

Map sheet	Tag #	Poly #	Open #	Licensee #	Watershed	Problems	Haz.	Cons	Risk	Level II?	Work Priority	Comments	Length (km)	Area (ha)	Subunit
093L093	134	523	54	529-2	TROUT CR.	N	M	L	L	Y*	LOW		0.9	28	KI
093L093	44	483	24	A-29943	TROUT CR.	N	L	M	L	N				93.6	KI
093L093	59			KYAHCP40	TROUT CR.	N	L	L	L	Y*	LOW		0.8	20	KI
093L093	64	127	20	WL101	TROUT CR.	OLD BRIDGE	L	H	M	Y	MED		1.3	61.2	KI
093L094	41	353	23		TROUT CR.	CULV,REVEG	M	M	M	Y	MED		1.2	54	KI
093L094	40	391	24		TROUT CR.	CULV	M	M	M	Y	MED		3.2	288.3	KI
093L094	97	247	31		TROUT CR.										
093L094	89	395	41		TROUT CR.	N	L	L	L	N				7.2	KI
093L094	38	357	29	29A	TROUT CR.	N	M	L	L	N				27	KI
093L094	37	358	29	29B	TROUT CR.									0	KI
093L094	51	481	32	350-1	TROUT CR.	CULV								0	KI
093L085				Newitt Rd	TWIN CR.	N	L	M	L	N				0	BL
093L095	53	147	22		TWIN CR.	N	M	M	M	Y	MED		4.1	8.6	BL
093L095	45	230	22		TWIN CR.	N	L	M	L	Y	LOW		4.1	5.6	BL
093L095	69	151	31		TWIN CR.	N	M	M	M	Y	LOW		8.2	28	BL

				Appendix V Upper Blunt and Kitseguecla										
Map Sheet	Tag #	Poly #	Open #	Licensee #	Watershed	Problems	Haz.	Cons.	Risk	Lev II	Work priority	Notes	Road Length	Area
093L082				358-1	Upper Kits									
093L082				358-2	Upper Kits									
093L082				358-3	Upper Kits								1.3	
093L082				359-1	Upper Kits									
093L082				359-2	Upper Kits									
093L082				359-3	Upper Kits								1	
093L083				358-1	Upper Kits									
093L092				003-3	Upper Kits									
093L092				507-1	Upper Kits								2	
093L092				507-2	Upper Kits								1.3	
093L092				507-3	Upper Kits								0.9	
093L092				507-4	Upper Kits								2.6	
093L092			1		Upper Kits								0.7	
093L092			2		Upper Kits								0.7	
093L092			3		Upper Kits								0.6	
093L092			4		Upper Kits								1.3	
093L092			5		Upper Kits								1.6	
093L092			7		Upper Kits								0.9	
093L092			9		Upper Kits									
093L092			59		Upper Kits									
093L093				003-1	Upper Kits									
093L093				003-1A	Upper Kits									
093L093				003-2	Upper Kits									
093L093				003-3	Upper Kits									
093L093				356-1	Upper Kits								1.4	
093L093				356-2	Upper Kits								1.8	
093L093				529-1	Upper Kits								2.1	
093L093				529-3	Upper Kits								1.2	
093L093				KYAHCP41	Upper Kits									
093L093			1		Upper Kits								0.7	
093L093			2		Upper Kits									
093L093			3	092-3	Upper Kits									
093L093			5		Upper Kits									
093L093			6		Upper Kits								0.3	
093L093			9	092-9	Upper Kits									

				Appendix V Upper Blunt and Kitseguecla										
Map Sheet	Tag #	Poly #	Open #	Licensee #	Watershed	Problems	Haz.	Cons.	Risk	Lev II	Work priority	Notes	Road Length	Area
093L093			10		Upper Kits									
093L093			11		Upper Kits								1.1	
093L093			12		Upper Kits									
093M005				372-2	Upper Blunt									
093M005				373-1	Upper Blunt								0.5	
093M005				374-6	Upper Blunt								0.5	
093M005				561-1	Upper Blunt									
093M005				561-2	Upper Blunt									
093M005				561-3	Upper Blunt									
093M005				561-4	Upper Blunt									
093M015				508-3	Upper Blunt								0.5	
093M015				528-1	Upper Blunt									
093M015				528-2	Upper Blunt									
093M015				548-1	Upper Blunt								0.4	
093M015				548-2	Upper Blunt									
093M015				555-1	Upper Blunt								0.5	
093M015				555-2	Upper Blunt								1.6	
093M015				555-3	Upper Blunt								2	
093M015				568-2	Upper Blunt									
093M015				568-3	Upper Blunt									
													29.5	

APPENDIX VI

Block Risk Reports and Work Maps
(separate cover)

APPENDIX VII

Interior Watershed Assessment Procedure Report (separate cover)

APPENDIX VIII

Photographs