APPENDIX O

PROPOSED SHIP HARBOUR LONG LAKE WILDERNESS AREA REPORT

Proposed Ship Harbour Long Lake Wilderness Area

Assessment of Protected Area Values

prepared for Eastern Shore Forest Watch

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Executive Summary

This study is a preliminary assessment of protection-oriented values of the proposed 18,000-hectare Ship Harbour Long Lake Wilderness Area on the Eastern Shore of Nova Scotia. It was commissioned by the Eastern Shore Forest Watch, a local not-for-profit conservation group that has been advocating protection of the area since 1999.

The methodology and criteria used are modelled after those established by the provincial Environment Department's 2001 wilderness assessments of Gully Lake and Eigg Mountain-James River. The Province designated those two sites as Wilderness Areas in March 2005.

Results from this research include:

- A GIS analysis of road density and fragmentation shows that the Proposed Ship Harbour Long Lake Wilderness Area is the largest remaining unprotected wilderness in the Halifax Regional Municipality (HRM). It contains the largest unprotected roadless patch in HRM, and overall road density is low (0.60 km/km^2). Roadless patches within the proposed Wilderness Area create a broad physical linkage between two existing Wilderness Areas, White Lake and Tangier Grand Lake, which neighbour the Ship Harbour Long Lake area to the west and southeast respectively. Combined, Ship Harbour Long Lake and these two Wilderness Areas span over 38,000 hectares of nearly contiguous forests and waterways. There is currently no protected areas assembly of this scale in central Nova Scotia. Large natural patches and expansive areas of low road density are critical for species with large area or interior habitat requirements. This may be particularly relevant for the endangered mainland moose in Nova Scotia (*Alces alces americana* Clinton), which occurs in small numbers on the Eastern Shore.

- The proposed Wilderness Area extends over parts of four "natural landscapes". Natural landscapes are geographically distinct regions (there are 80 covering Nova Scotia) that share similar biophysical characteristics. They are the basic planning unit used by the Department of Environment and Labour (DEL) to assess the provincial government's progress toward meeting its commitment of establishing a network of protected areas that captures Nova Scotia's landscape diversity. Nearly three-quarters of the proposed

Wilderness Area occurs within Landscape #30, the Central Quartzite Hills and Plains, which the Province considers under-represented in the provincial protected areas network. Protection of the proposed Wilderness Area would increase the representation level of Landscape #30 in the protected areas network dramatically. Within this landscape, Ship Harbour Long Lake contains both enduring physical features (bedrock geology formations, surficial geology types, and soil types) and six ecosystem types, including three forest types, which are either absent from or poorly represented in existing protected areas.

- Outstanding natural features such as old forests and significant ecosites occur within the study area at a higher frequency than in the surrounding landscape. Several stands of white pine and red spruce dominated old forest, which is now very uncommon in Nova Scotia, occur on the shores of Ship Harbour Long Lake and through the Fish River corridor. Scattered stands of conifer and mixed coniferous-deciduous old forest grow elsewhere in the study area. The margins of Scraggy Lake, portions of the Fish River corridor, and the plateau around the Flat Lakes support several outstanding fen and bog complexes.

- The proposed Wilderness Area offers outstanding wilderness recreation opportunities, particularly for backcountry canoeing and hiking. Canoeing opportunities occur primarily at two nodes: the Fish River corridor in the eastern half of the area (which includes two large lakes at either end: Scraggy Lake and Ship Harbour Long Lake), and the Admiral Lake - Moose Cove Lakes "corridor to the sea" in the southwestern end. Protection of the southwestern portion of the proposed Wilderness Area would secure Nova Scotia's first and only protected canoeing corridor that links interior lakes with the ocean. Backcountry hiking opportunities are supported by the area's wilderness character, and existing trails infrastructure. Formal hiking trails already go through a portion of the proposed Wilderness Area, linking it to the adjacent White Lake Wilderness Area and Trans Canada Trail. In conjunction with White Lake Wilderness Area and Tangier-Grand Lake Wilderness Area, protection of the study area would create a canoeing and hiking destination capable of providing extended (one to two week) tripping opportunities.

In 2001 the provincial Department of Environment and Labour conducted a brief "overview" of the protection-oriented values for the Ship Harbour Long Lake area (see Appendix 1). That work concluded that the site exhibited multiple outstanding protection values. In March of 2005 Premier John Hamm and Environment Minister Kerry Morash indicated the need for a comprehensive protected areas planning exercise to expand the provincial protected areas network. The Minister of Natural Resources and Minister of Environment and Labour have since confirmed that commitment in letters sent to the Eastern Shore Forest Watch. Based on the initial findings of the Department's overview, which are confirmed and expanded upon by this study, the Ship Harbour Long Lake area should be considered a priority for formal protection in the upcoming comprehensive planning exercise.

Because land use activities associated with forest management could have a substantial negative impact on the values that appear to make the study area a good candidate for protection (for example, low road density), it is important that the site be placed under a cutting and road building moratorium until the Province has completed the comprehensive planning exercise and resolved the final status of the proposed Wilderness Area. This conclusion echoes the recommendation for a development moratorium in a report on Ship Harbour Long Lake submitted to HRM Regional Council in 2000 by the municipality's Parks and Recreation Department (see Appendix 2). Their report points out, "To continue with present forestry practices in this area could well mean that sustainable recreation, tourism, and economic opportunities will be lost prior to the examination of other options."

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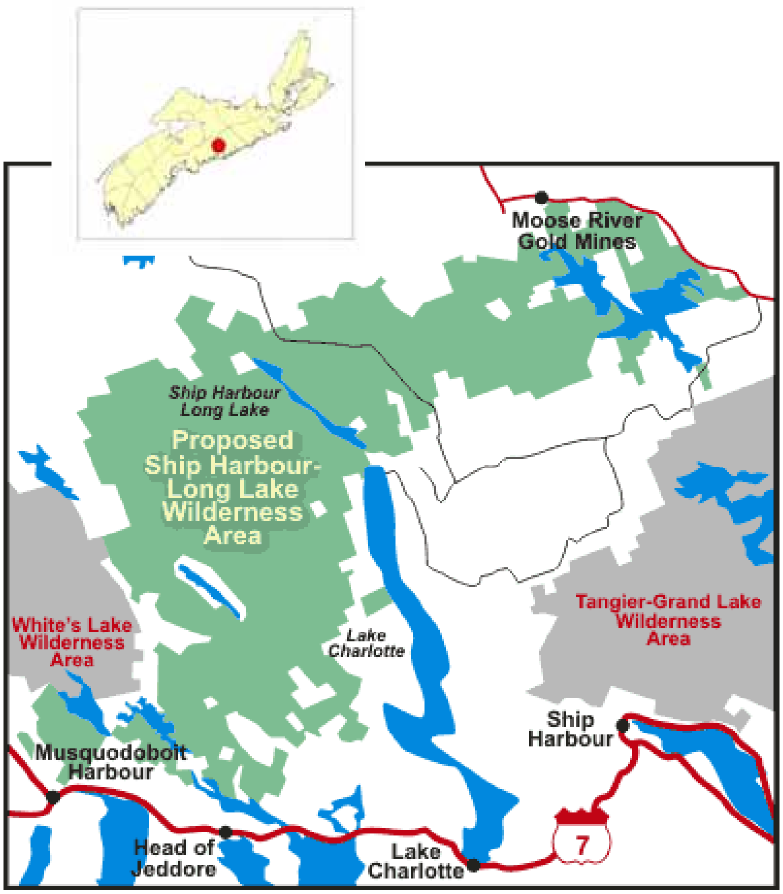
Background

The Proposed Ship Harbour Long Lake Wilderness Area lies on Nova Scotia's Eastern Shore, about 50 kilometres northeast of Halifax. It is a remnant of Nova Scotia's shrinking wilderness, covering roughly 17,522 hectares (175km^2) of publicly-owned Crown land, and an additional 745 hectares of open water. It's a largely untrammelled place. Thick coniferous and mixed forests blanket a rugged and diverse terrain. The woods are dotted by over 80 undeveloped lakes and ponds, and woven together by a network of streams and traditional canoe routes that range from gentle stillwaters to fast-flowing white water. Existing Wilderness Areas anchor it on either end.



Proposals for formal protection of the Ship Harbour Long Lake area date back to the early 1970s when the federal government proposed a National Park on the Eastern Shore. The National Park proposal, which included plans for land expropriation, was viewed locally as heavy-handed and the proposal was dropped in 1973.

In 1999 the Ecology Action Centre and Eastern Shore Forest Watch launched a campaign to build the area's public profile and persuade the provincial government to take steps towards designating roughly the Crown lands at Ship Harbour Long Lake under the provincial *Wilderness Areas Protection Act*. Stated reasons for seeking a protected area included to save one of the last large wildlands in the Halifax Regional Municipality (HRM), to preserve outstanding features like old forests and fragile wetlands, to realize ecological and recreational benefits of creating a wilderness corridor between two existing Wilderness Areas (White Lake and Tangier-Grand Lake), and to plug a representation gap in the provincial protected areas network. The last point refers to a commitment made by the provincial government in 1992 to establish "representative" protected areas in each of the province's natural regions by 2000 (Hummel 1995). This commitment has not yet been honoured for the region in which most of the proposed Ship Harbour Long Lake Wilderness Area is situated.

The Eastern Shore Forest Watch has advocated a Wilderness Area designation because it would provide the Ship Harbour Long Lake wilderness with legislative protection against industrial activities like logging, mining, and road building, while allowing most forms of outdoor recreation to continue, including traditional patterns of hunting and angling. The Wilderness Area proposal applies only to provincial Crown (i.e., publicly-owned) lands and would not affect activities on private lands.

About 63% of the proposed Wilderness Area (±11,019 hectares) overlaps with lands leased to Neenah Paper under the *Scott Maritimes Act.* A map of these leased lands is provided in Appendix 3. Neenah Paper, formerly Kimberly Clark, operates a bleached kraft pulp mill in Abercrombie, Pictou County. The remaining lands are not under any long-term forestry lease. However, the Department of Natural Resources can grant access for timber harvesting on these lands to other mills that have a volume agreement with the Crown (Dan Eidt, DNR, personal communication).

Officially, the Ship Harbour Long Lake area is currently managed under the Department of Natural Resources' Integrated Resource Management Plan, or IRM. Under the plan, announced in September 2000, the entire proposed Wilderness Area is zoned as Category 1 (General Resource Use) or Category 2 (Multiple and Adaptive Use). Both land use classes permit industrial resource extraction, although Category 2 is intended to better address the conservation of non-timber values. The IRM plan and process that created it have been widely criticized for not attempting to address provincial protected area objectives (e.g., Jobb 2001). Wariness of the IRM plan extended to the provincial Environment Department, which is responsible for protected areas planning. The *Daily News* reported in June 2001 that the then Deputy Minister of Environment advised his counterpart at Natural Resources that the "[IRM] materials recently reviewed by staff do not demonstrate a balanced approach in our view, and for DOE to suggest otherwise, particularly in light of recent public representations around this issue, would not be credible" (Flinn 2001). In short, IRM has failed to resolve the land use conflict over Ship Harbour Long Lake.

Since 1999 there has been considerable public interest in the future of Ship Harbour Long Lake:

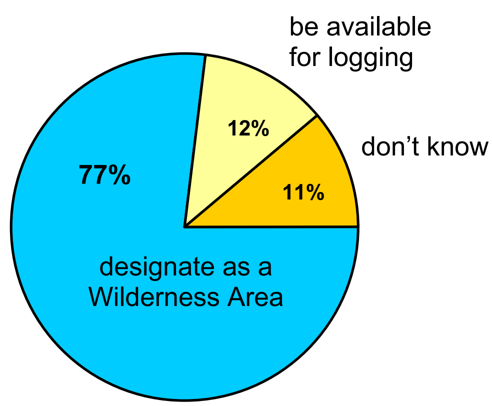
- In November 2000 HRM Mayor Peter Kelly wrote Premier John Hamm to request that the Environment Department conduct a Wilderness Area assessment of the area. Mr. Kelly's request stemmed from a unanimous HRM Council resolution in support of the assessment.

- The Eastern Shore Forest Watch collected over 3,000 signatures on a petition favouring formal protection of the area. Most signatures were from Eastern Shore residents.

- Over 150 businesses on the Eastern Shore signed a "business petition" in favour of establishing a Wilderness Area.

- By late 2001 the Premier's office had received about 700 letters calling on the government to designate Ship Harbour Long Lake as a Wilderness Area (Pat Lunn, Office of the Premier, personal communication).

- In November 2001, Corporate Research Associates of Halifax included a question about Ship Harbour Long Lake in a poll of 500 HRM residents. It asked respondents to indicate whether they thought the area should "be available for logging" or "be designated as a Wilderness Area". Seventy-seven percent preferred a Wilderness Area designation, 12% chose logging. There was no significant difference in the response between urban and rural residents.



"For this particular area, Ship Harbour Long Lake, people have indicated a clear preference for a Wilderness Area over logging" – Don Mills, President and CEO of Corporate Research Associates (in press release, December 11, 2001)

The proposal to protect lands at Ship Harbour Long Lake has also garnered interest from Eastern Shore MLA Bill Dooks. In early 2001, Mr. Dooks formally requested that the Department of Environment (now called the Department of Environment and Labour) conduct a Wilderness Area assessment of the lands proposed for protection.

Against this backdrop the former Minister of Environment and Labour (DEL), David Morse, directed his staff in May 2001 to prepare an "overview of protection-oriented values" for the proposed Wilderness Area as a basis for making an informed decision on whether to proceed with a more in-depth Wilderness Area assessment. That overview was completed later in 2001. Although preliminary, it appears to support the case for protection. A summary of that overview is attached in Appendix 1.

The conflict over Ship Harbour Long Lake probably reached a peak in July 2001 when it was discovered that the Department of Natural Resources (DNR) had approved harvesting plans in the core of the proposed Wilderness Area without informing the Environment Department, which was in the middle of preparing their overview. The harvesting plans, submitted by Kimberly Clark (now Neenah Paper), called for the construction of 6.3km of new hauling roads and several new clearcuts on the east side of Ship Harbour Long Lake. Protection advocates reacted to the incident by again raising the profile of the area and calling for its protection. So far, Neenah Paper has not begun construction of the proposed road. The company has voluntarily refrained from conducting forestry activities in the immediate vicinity of Ship Harbour Long Lake proper (the actual lake).

In the summer of 2003, the provincial government unveiled its environmental strategy, called the "Green Plan". The Green Plan affirmed the Nova Scotia government's commitment to continue expanding the protected areas network. During a press conference in March 2005 where he announced Wilderness Area designations for two blocks of Crown land in northern Nova Scotia – Gully Lake and Eigg Mountain-James River – the Premier acknowledged that a comprehensive protected areas planning exercise to identify and designate additional areas across the province was overdue. Since then the Environment Minister has confirmed that "areas like Ship Harbour Long Lake" would be evaluated through that systematic and comprehensive process.

Nonetheless, the Eastern Shore Forest Watch still views an assessment of protected area values as worthwhile for identifying and documenting the area's protection values, and for informing decisions that may be made during a comprehensive planning exercise. The purpose of this report is to describe the protected area values of the proposed Ship Harbour Long Lake Wilderness Area, such that government and other stakeholders can use the findings to help resolve the future status of the area.

The study area for this report is defined by the boundaries of the original Ship Harbour Long Lake Wilderness Area proposal, as mapped by the Forest Watch in 1999. The terms "Proposed Ship Harbour Long Lake Wilderness Area" and "study area" are used interchangeably. That said, the Eastern Shore Forest Watch recognizes that the boundaries of a future Wilderness Area could differ from those previously proposed, and in principle does not oppose modifications to those boundaries to reduce land use conflicts and optimize protection gains.

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Evolution of site selection criteria

The set of factors that are weighed when deciding where to create protected areas has evolved as public attitudes towards wilderness evolve and our understanding of conservation science improves. Many of the early protected areas in North America were protected under the banner of monumentalism – preserving scenic or interesting landforms (Soule and Noss 1998). Later, concepts of representation (protecting representative samples of different landscapes), special elements (protecting outstanding natural features, such as old forests), and connectivity (keeping ecological process intact across the landscape) gained traction.

In Nova Scotia, the criteria used to assess potential Wilderness Areas have also broadened. In selecting the original slate of 31 Wilderness Area that were designated with the passage of the *Wilderness Areas Protection Act* in 1998, the Province applied three main criteria (DNR 1994):

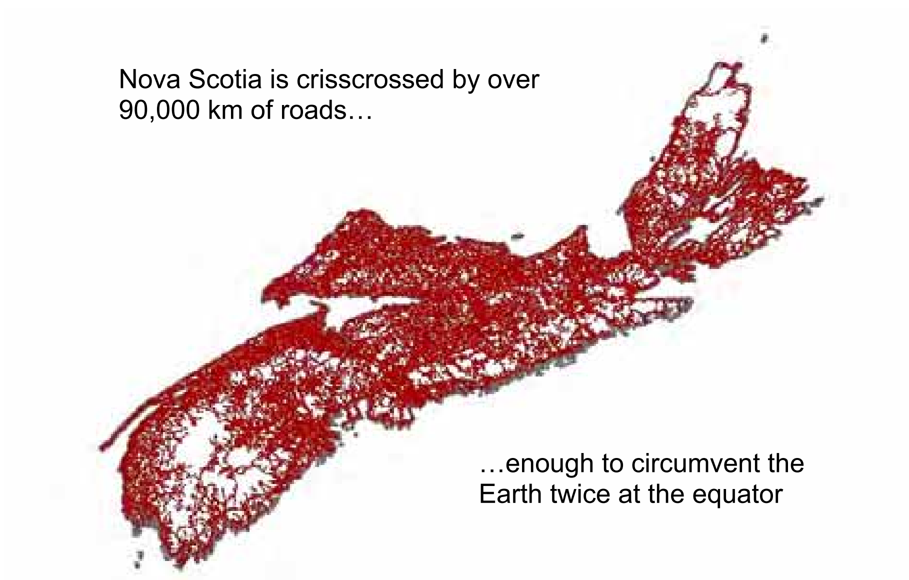
- landscape representation
- outstanding natural features
- wilderness recreation opportunities

In 2001, the Department of Environment and Labour (DEL) completed Wilderness Area assessments for two tracts of Crown land in northern Nova Scotia: Gully Lake and Eigg Mountain-James River. In those studies (DEL 2001a, DEL 2001b) the department assessed the three original criteria, but also explicitly recognized and investigated the "ecological value within a landscape context" for each area. This approach acknowledges the importance of retaining large intact natural patches in landscapes that are otherwise highly fragmented (Noss and Cooperrider 1994, Soule and Terborgh 1999, Groves 2003). In fact, the most persuasive arguments for creating protected areas in those studies hinged on landscape context – both Gully Lake and Eigg Mountain-James River are relatively large and intact forest patches in the midst of a severely fragmented and altered landscape. In 2003 the Province accepted both tracts as candidates for protection, and in March 2005 designated them under the *Wilderness Areas Protection Act*.

The formal recognition of natural patch size as a selection criterion for new protected areas is particularly appropriate for Nova Scotia, which has among the most fragmented landscapes in Canada. In its national "Nature Audit", the World Wildlife Fund (2003) found that just 10% of

Nova Scotia is still in a relatively natural condition. While our situation can be partly attributed to the province's long history of human settlement, fragmentation has grown more acute in the past few decades due to widespread clearcutting and continued proliferation of roads into wildlands. According to the National Forestry Database Program (Canadian Council of Forest Ministers 2004) an average of 52,060 hectares (520 km^2) of forest have been clearcut annually in Nova Scotia for the 10-year period ending in 2002. The provincial GIS roads layer, available from the Nova Scotia Geomatics Centre, catalogues over 90,000 km of roads in the province.

The remainder of this report assesses the protection values of the Ship Harbour Long Lake area, with emphasis on natural patch size, landscape representation, outstanding natural features, and wilderness recreation opportunities.



Value of large natural patches at Ship Harbour Long Lake

DEL (2001a) draws from Noss and Csuti (1997) to document several ways that landscape fragmentation diminishes biodiversity. They note that direct habitat loss reduces and potentially eliminates native populations of flora and fauna, that isolated habitat patches inhibit species movement and dispersal, that isolated populations face a higher probability of extinction, that functional core habitat is further reduced by edge effects, and that fragmentation can alter the influence of natural disturbance regimes, leading to further long-term changes in biotic communities. Related impacts on wildlife noted elsewhere include home range shifts, altered hunting and escape patterns, lowered reproductive success (Noss 1999, Trombulak and Frissell 2000), edge predation on birds (Gates and Gysel 1978, Small and Hunter 1988), brood parasitism (Noss 1999), and loss of interior habitat required by some bird and mammal species (Ortega and Capen 2002, Forman et al. 2003). Habitat specialists, or so-called “K-selected” species, are particularly vulnerable to fragmentation as they fare better in relatively undisturbed environments (Noss 1999).

Some “generalist” species benefit from the younger and more open habitats created by fragmentation, but these species, like white-tailed deer (*Odocoileus virginanus*) and eastern coyote (*Canis latrans*), tend to be plentiful already. In many cases, their high numbers put less abundant and sensitive species at risk through further habitat alteration and/or competition for resources (Alverson et al. 1994).

As with DEL’s reviews of Gully Lake and Eigg Mountain-James River, this study considers the spatial distribution of roads to identify natural habitat patches in the study area and the broader landscape. Likewise, the degree of fragmentation in the study area and its surroundings is derived from roads data. This approach, supported by a growing body of scientific research (see reviews by Saunders et al. (1991), Noss (1999), Trombulak and Frissell (2000), Havlick (2002) and Forman et al. (2003)), assumes that roads are a good surrogate for anthropogenic landscape modification, and consequently that road patterns approximate coarse-scale fragmentation. While fragmentation is perhaps the most obvious road impact, the above reviews also make a compelling case that roads severely degrade wild and semi-wild landscapes in a myriad of additional ways. Those impacts, which are discussed below, give further credence to the value of retaining large natural patches.

Various researchers have proposed ways to classify road impacts on wildland ecosystems, but they are all similar. The most straightforward is probably by Havlick (2002), who defines two broad categories, use effects and presence effects.

Use effects. Use effects are caused by human activities on roads and the places they access. They are particularly damaging when roads open up previously insulated and unexploited wildlands because even small use increases can cause disproportionately large impacts (Foreman et al. 2003). Impacts propagating directly from the road corridor include road kill, intentional or inadvertent wildlife harassment, dispersal of exotic species and forest pathogens, atmospheric pollution, and illegal garbage dumping (Noss 1999). Indirect effects accrue from the access that roads provide. It is not uncommon for hunting, fishing, poaching, and trapping pressure to be higher in places that are easy to access. In Nova Scotia, the access problem has been made worse by the popularity of all-terrain vehicles (Bancroft 2005). Because the vast majority of forest fires in Nova Scotia are caused by people (Wein and Moore 1979), it is also likely that fire risk increases as roads open up the backcountry to machines, fuels, careless smokers, camps, etc.

Presence effects. Presence effects are perpetuated simply by a road's physical existence on the landscape. Some of these impacts relate to how a road network interferes with physical and biotic processes that regulate an ecosystem's composition, structure, and function, and drive its evolution. Impacts are often subtle, sometimes invisible, and occur regardless of human activities. Because many presence effects operate at the landscape scale, impacts can permeate into wildlands from adjacent resource lands. Examples of physical presence effects include rerouting of stream networks (Jones et al. 1999), disruption in the natural frequency and intensity of geomorphic events (e.g., accelerated erosion), alteration of microclimates (e.g., exacerbated windthrow (Franklin and Forman 1987)), and truncation of natural disturbance events (Baker 1992). Undesirable in their own right, these impacts can also trigger feedback loops capable of nudging the composition, functions, or structure of a wildland ecosystem out of sync with the range of conditions that would be expected naturally (Swanson et al. 1988).

"Although road density has many ecological effects, the first road into a natural landscape area has the largest relative effect. It represents a threshold after which effects rapidly cascade and multiply"

- p. 374, Forman et al. (2003)

1997 airphoto of new hauling roads at the north end of Ship Harbour Long Lake. By 2001 the roads were extended, followed by clearcutting.

Mainland moose. On the Eastern Shore, the mainland moose (*Alces alces americana* Clinton) may be particularly sensitive to both use and presence effects of road incursion into wildlands. In 2003 DNR listed the mainland moose as "endangered" under Nova Scotia's *Endangered Species Act*. According to a recent status report (Parker 2003), the mainland moose population is estimated at 1,000 to 1,200 individuals, and declining. The status report claims that between 100 and 200 individuals are scattered through Guysborough and Halifax counties, including a concentration of approximately twenty to thirty animals near Ship Harbour. The status report identifies roads as a likely contributor to the species' decline. One reason it cites is the associated landscape fragmentation that makes moose habitat more hospitable to white-tailed deer. In Nova Scotia, moose rarely occupy areas where deer have arrived, a phenomenon that is usually attributed to a parasitic brainworm *Parelaphostrongylus tenuis* that some deer carry and pass on to moose. *P. tenuis* is usually benign to its deer host, but can be lethal to moose.

The status report also warns of use effects on moose, stating, "Increased incursion into wilderness moose habitat by forestry roads raises the threat of disturbance from humans and illegal kill." (p.2). In April 2005 a Nova Scotia resident pleaded guilty to killing three endangered moose – a mature female and two calves – near Parrsboro (Chronicle Herald 2005). The offender had shot the animals from a spur road penetrating into moose habitat.

The negative association between roads and Nova Scotia's mainland moose is also a key finding of recent research conducted at Dalhousie University. Beazley et al. (2004) found a statistically significant negative correlation between road density and moose pellet distribution. They recommend maintaining areas of low road density by minimizing new road construction and possibly decommissioning old logging roads.

Road density and patch analysis for Ship Harbour Long Lake

Forman et al. (2003) cite two useful metrics of landscape fragmentation: road density and patch or “mesh” size. Road density is simply the length of road per unit area, often expressed as km/km^2. Mesh size refers to the area of patches surrounded by roads or other developments. A third metric – area to perimeter ratio – helps assess the interior habitat value of remnant patches by recognizing that patches with higher ratios have less edge habitat and are therefore preferred (Diamond 1975).

In this study, the provincial roads layer was analyzed in ArcGIS to compare the road density of the study area with the road densities of each of the natural landscapes in eastern HRM, and of HRM as a whole (excluding the urban core). It was also used to identify remnant interior habitat patches in HRM, from which the size and area-to-perimeter ratio of patches in the study area were quantitatively compared with those in the remainder of HRM. For these analyses, the HRM portion of the provincial roads layer was tiled together from frames downloaded from the GeoNova website, maintained by Service Nova Scotia and Municipal Relations. For HRM, that layer is current to 1997. Both the road density and patch analyses included all roads, regardless of road class or type.

Road density

Road densities by natural landscape are summarized in Table 1 (Map 3 shows the location of natural landscapes in HRM). In this analysis, road length refers to the summed length of all roads in each landscape, and does not include other linear features like pipelines or powerline corridors. The road density of the study area was calculated to be 0.60 km/km^2. This compares to 2.26 km/km^2 for non-urban HRM as a whole. About 72% of the study area falls within Landscape #30 – the Central Quartzite Hills and Plains. Road density for this landscape as a whole was calculated to be 1.94km/km^2.

Table 1. road density by natural landscape

Landscape		road density (km/km²)
28	Shubenacadie River Rolling Hills[1]	2.54
29b	Interior Ridges (Wittenburg Ridge)	2.56
30	Central Quartzite Hills and Plains	1.94[2]
30a	Shubenacadie Lake	2.15[2]
30b	Fish River	1.03
31	Sackville Drumlins	4.10
33	Eastern Shore Beaches	2.77
34	Eastern Shore Granite Ridge	0.60
35	Eastern Shore Quartzite Plain[1]	3.12
36	Eastern Shore Drumlins	2.12
36a	Tangier River	2.38
36b	Moser River	1.86
37	Eastern Shore Islands	2.64
	all HRM	2.26[2]
	all Nova Scotia	1.71
	Proposed Ship Harbour Long Lake Wilderness Area	0.60

[1] portion of landscape within HRM
[2] excludes Halifax-Dartmouth-Bedford-Sackville urban core

Patch analysis

Roads and fragmentation impact wild ecosystems at multiple spatial scales. Some microclimatic changes, for example, can be contained within the first 20m from a road edge, while broader landscape-scale effects (e.g., invasive species encroachment, disruption of wildlife movement), can extend for more than a kilometre into a natural ecosystem (Forman et al. (2003)). Therefore, when using roads data, it is appropriate to conduct patch analyses using more than one buffer threshold. In their wilderness assessment of Gully Lake, DEL (2001a) cites research in Meffe and Carroll (1997) showing that edge effects on interior birds (e.g., nest predation, parasitism) can penetrate 600m from road edges. The analysis in this report uses two penetration thresholds, 600m and 200m, to be consistent with the criteria used by DEL in their Wilderness Area assessments of Gully Lake and Eigg Mountain-James River. Lakes and rivers were not subtracted from the analyses.

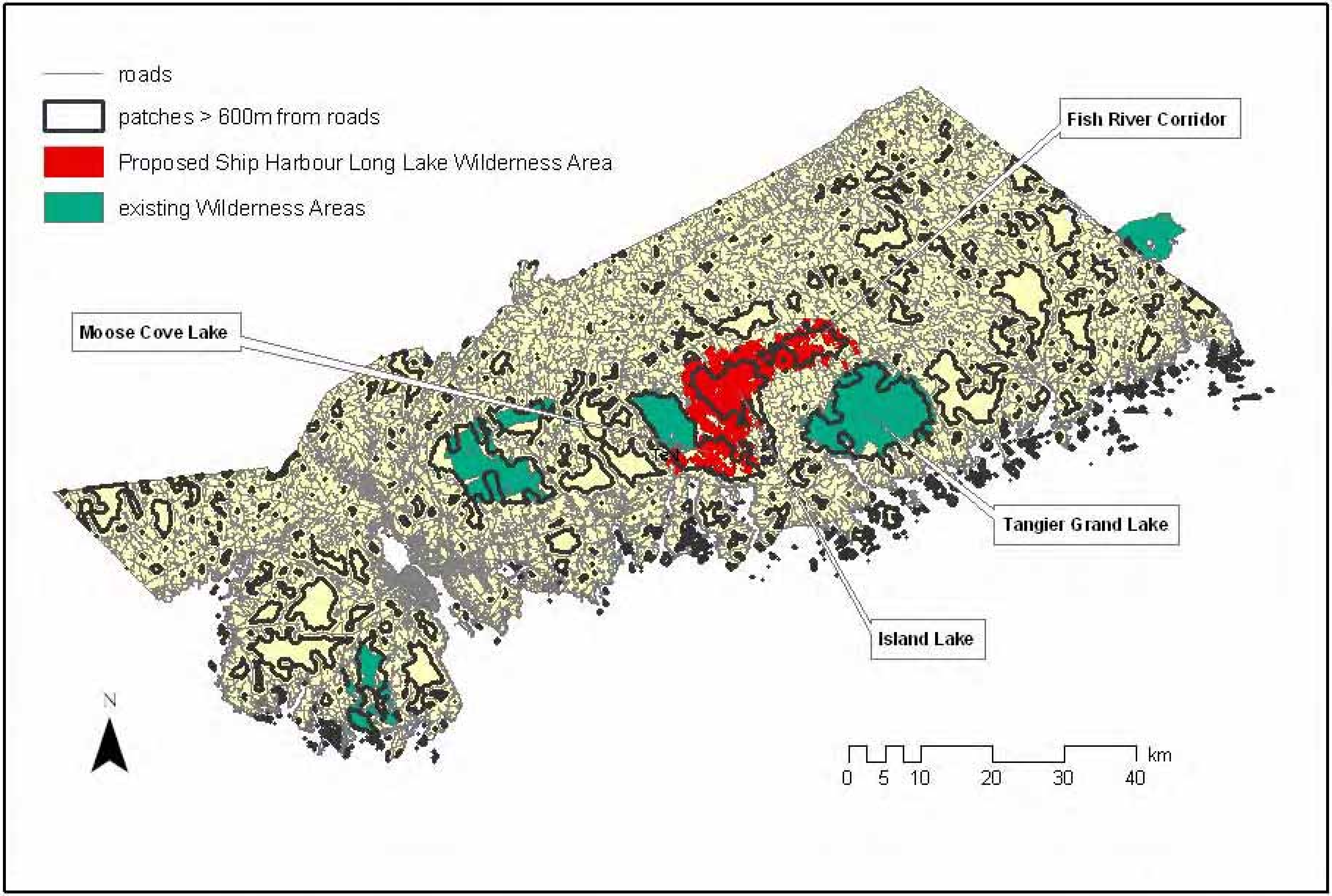
In the first analysis, a 600m buffer was applied along either side of all roads. Map 1 shows the resultant interior patches – i.e., lands not falling in the buffer areas. Patches smaller than 1 ha are not shown. Map 2 shows the same results using a 200m buffer, omitting patches under 10 ha.

Using the 600m threshold, 585 interior patches greater than one hectare were identified within HRM. The area of these patches totals 114,000 ha. Not surprisingly, the frequency of interior patches diminishes as patch size increases (see Figure 1). Fewer than 100 patches are over 100 ha, twenty exceed 1,000 ha, and only five exceed 5,000ha. The third and fourth largest interior patches in HRM are found in the proposed Wilderness Area: Moose Cove Lake (8,496 ha, of which 4,124 ha are within the White Lake Wilderness Area) and Island Lake (5,318 ha). Importantly, these two patches are situated in close proximity to one another. The Moose Cove Lake and Island Lake patches have the highest area-to-perimeter ratios of any patches in HRM except for Tangier Grand Lake (Figure 2). With the 600m buffer, the Tangier Grand Lake patch is the largest in HRM and most of it is protected as a Wilderness Area.

A similar relationship occurs when looking at patches 200m from roads (see Figure 3). Using this threshold, the GIS analysis identified 1,023 interior patches in HRM over 10 ha. There are 277 patches over 100 ha, 49 over 1,000 ha, and nine over 5,000 ha. The lower buffering threshold (200m rather than 600m) allows the Moose Cove Lake and Island Lake patches, as well as the Tangier Grand Lake patch, to all connect to one another as a single patch. The aggregation of these three areas creates a large contiguous patch of 42,048 ha. The Tangier Grand Lake portion is connected to the Moose Cove Lake/Island Lake portion only by a narrow strip where Lake Charlotte flows into Second Lake, so it is useful to also conceptualize this large patch as two smaller patches side-by-side. The Moose Cove Lake/Island Lake patch would then measure 21,375 ha, making it the largest interior patch in HRM. Apart from the aforementioned areas, only one other interior patch in HRM exceeds 10,000 ha when the 200m threshold is applied (overlapping with the Waverley-Salmon River Long Lake Wilderness Area).

The Fish River corridor patch measures 3,034 ha using the 600m buffer, and 6,285 ha using the 200m buffer. While it is a significant interior patch (among the ten largest in HRM) it also has substantial connectivity value. Due to its location, the Fish River corridor geographically links the Moose Cove Lake and Island Lake patches to the Tangier Grand Lake patch. By extension, this also creates a broad connection between White Lake and Tangier Grand Lake Wilderness Areas. These linkages are significant at a provincial scale. The study area and both neighbouring Wilderness Areas together cover 38,863 ha, of which 33,808 ha can be considered interior habitat patches with the 200m buffer. This far exceeds the size of any protected areas assembly in central Nova Scotia.

Map 1. Fragmentation Analysis: Patches greater than 600m from roads



Georeferencing: NAD 83, UTM Zone 20
Produced with data obtained from the Nova Scotia Department of Natural Resources and Service Nova Scotia and Municipal Relations

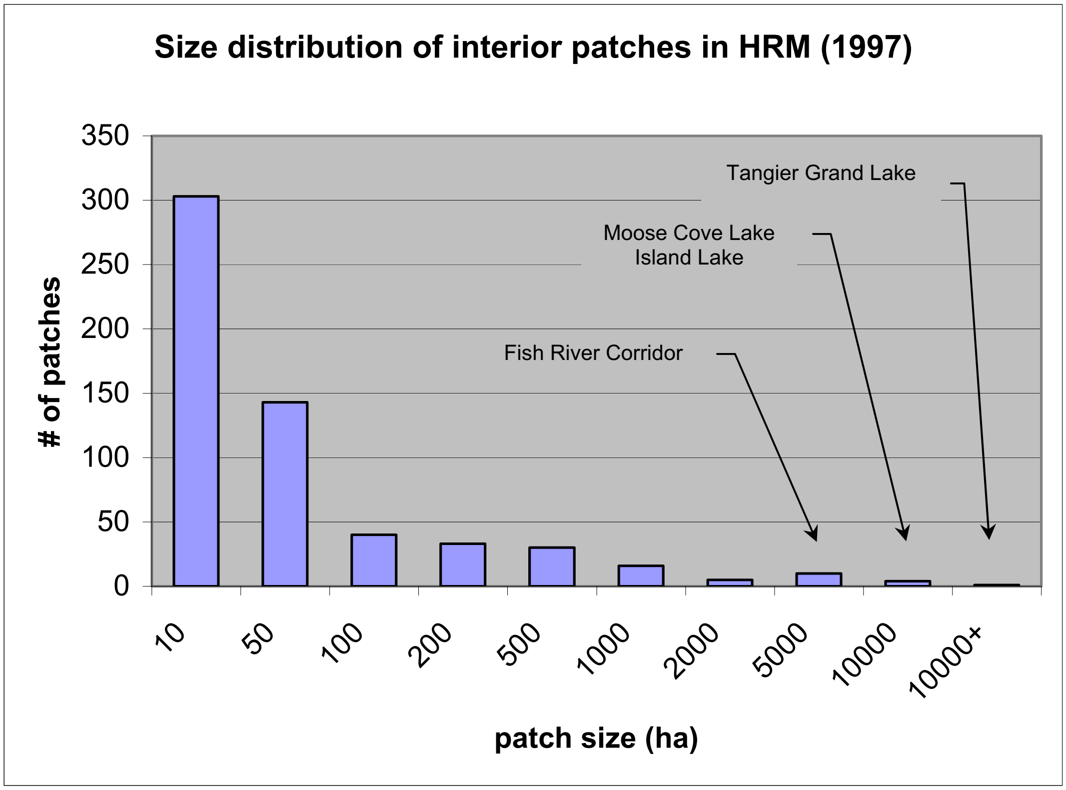


Figure 1. Size distribution of patches > 600m from roads in HRM (does not include patches smaller than 1 ha)

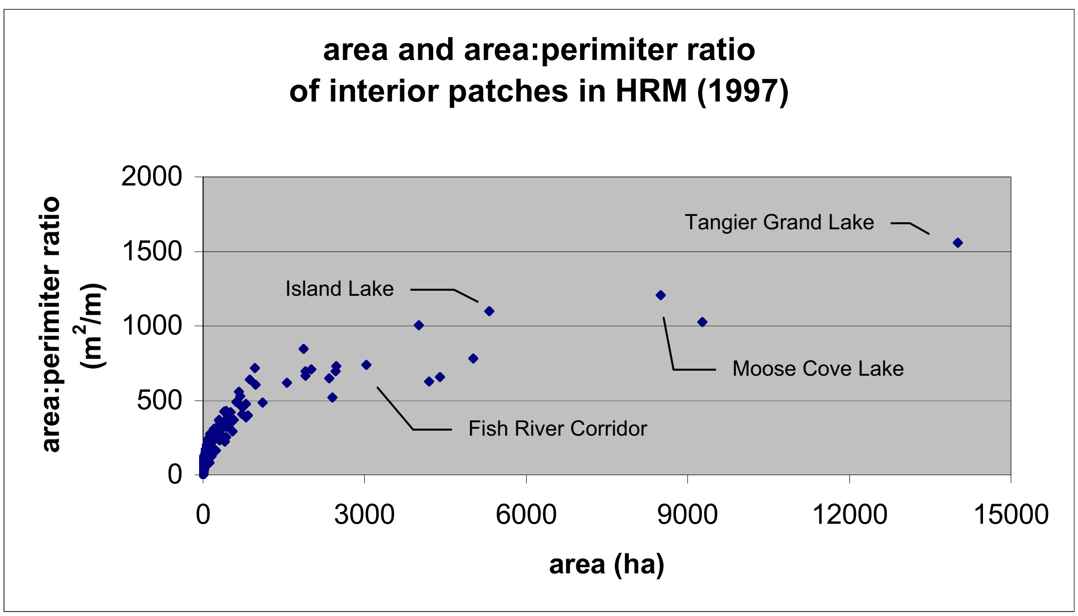
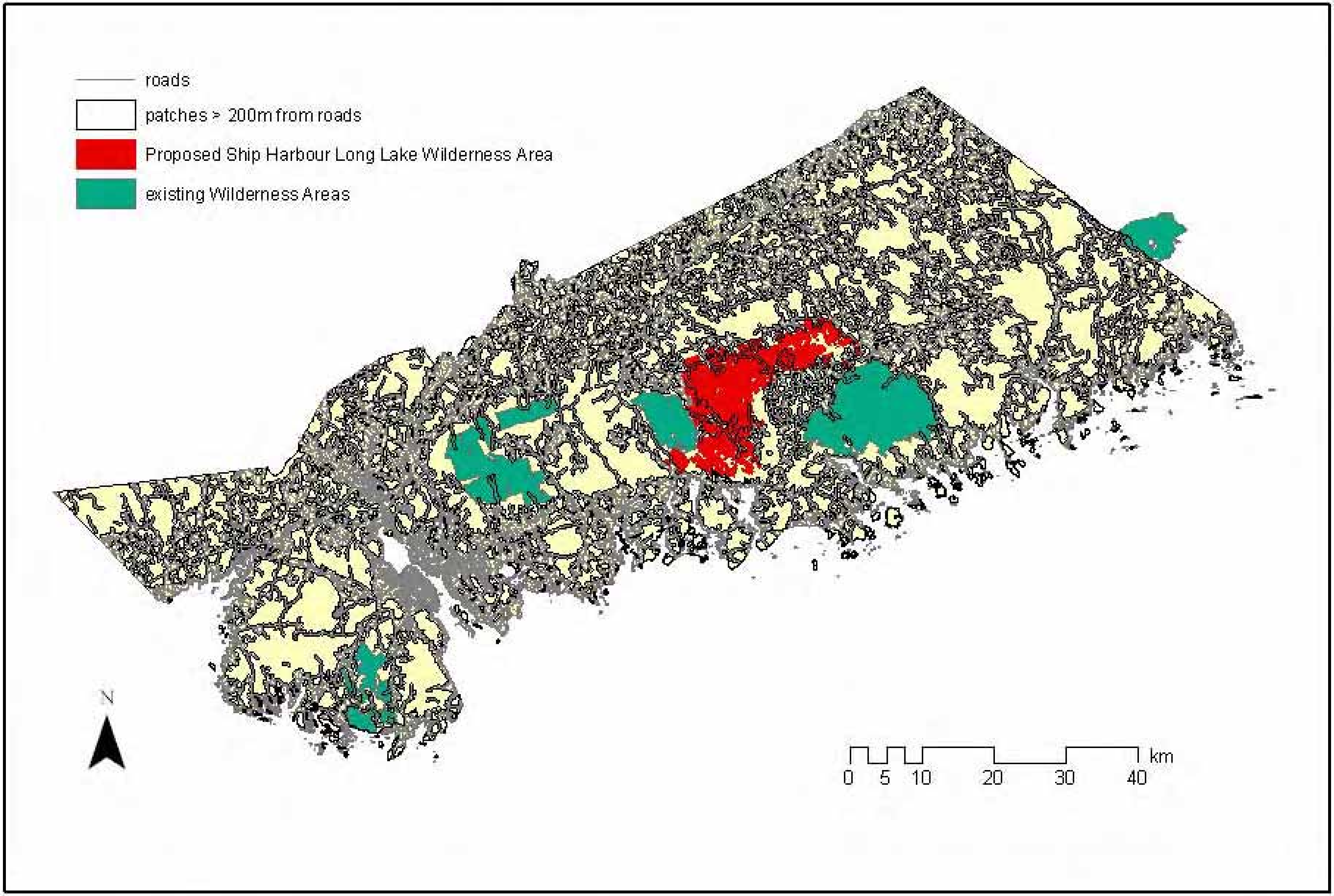


Figure 2. Scatterplot of area and area:perimeter ratio of interior patches > 600m from roads in HRM

Map 2. Fragmentation Analysis: Patches greater than 200m from roads



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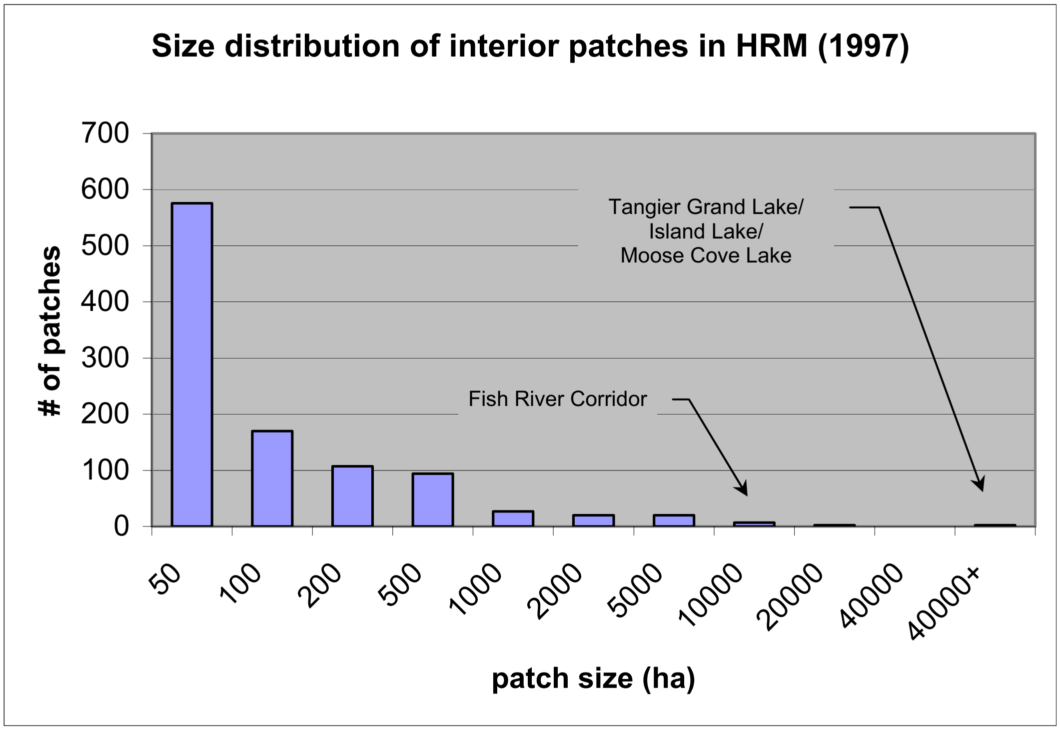


Figure 3. Size distribution of patches > 200m from roads in HRM (does not include patches smaller than 10 ha)

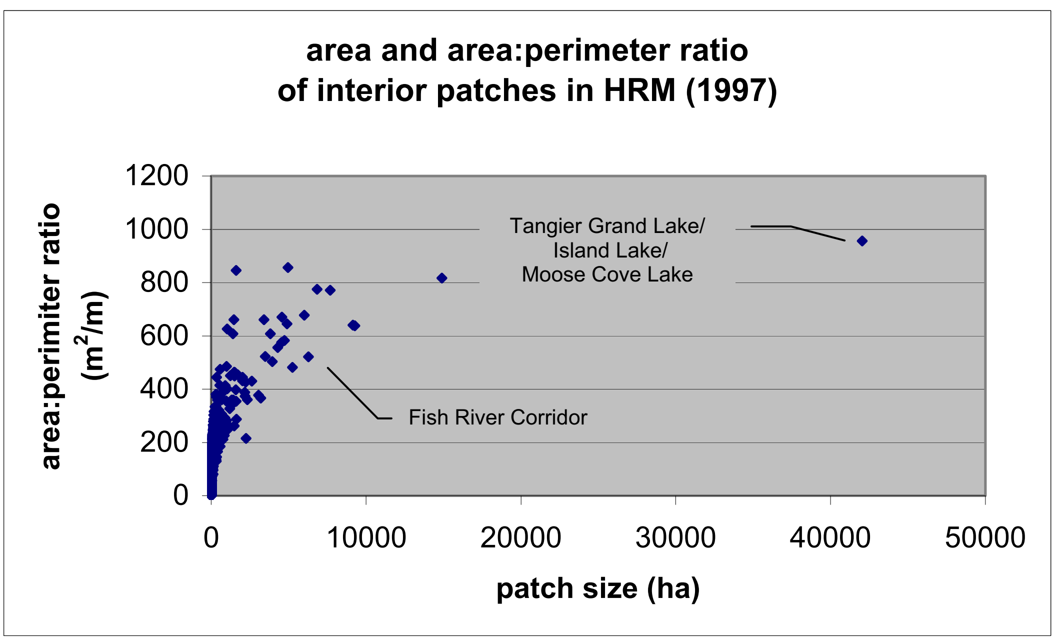


Figure 4. Scatterplot of area and area:perimeter ratio of interior patches > 200m from roads in HRM

Landscape representation

The concept of representation is widely recognized as an underpinning of science-based protected areas planning (Noss and Cooperrider 1994, Kavanagh and Iacobelli 1995, Noss et al. 1999). The idea behind representation is to permanently protect areas that capture a representative sample of all the different habitats and landforms present in a region. By ensuring that a portion of each ecosystem type is included in a protected areas network, the theory holds that the various habitat needs for the full spectrum of species present in a region are addressed. This is a coarse-filter approach, which recognizes that representative areas alone cannot fully capture the habitat requirements of all species. Fine-filter approaches, like preserving small "hot spots" or "ecosites" that are especially rich in biodiversity, are needed to supplement representative areas (Noss et al. 1999).

In Nova Scotia, representation is the centrepiece of the provincial government's commitments to complete a comprehensive provincial protected areas network. Most commonly cited is the "Tri-Council Statement of Commitment" from 1992, in which all provinces pledged to "make every effort to complete Canada's networks of protected areas representative of Canada's land based regions by the year 2000" (Hummel 1995). Provincial governments made this high-level commitment in response to the World Wildlife Fund's national Endangered Spaces Campaign.

Provincial protected area ministers endorse the Tri-Council Statement of Commitment in Aylmer, Quebec (1992).

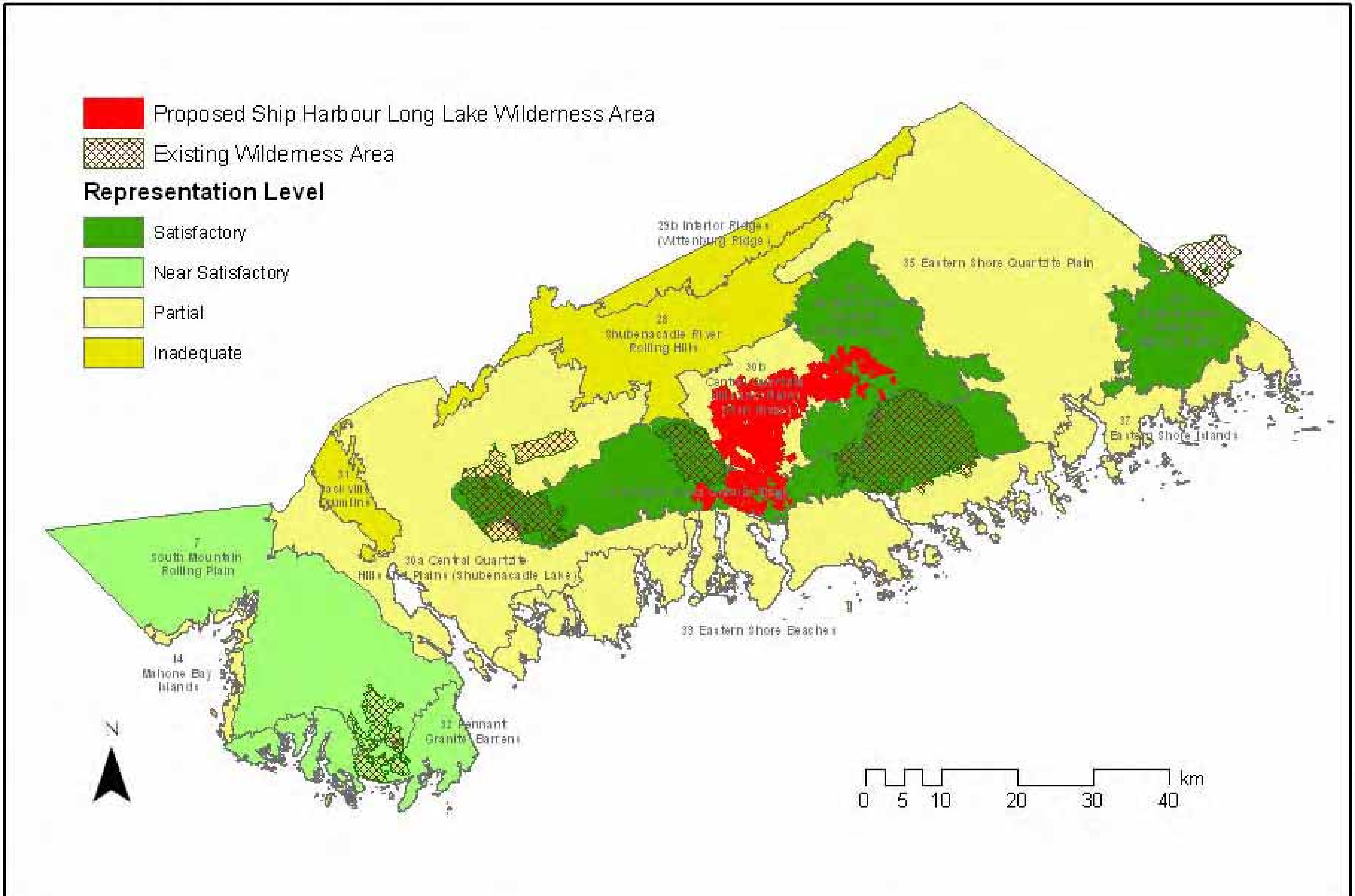
Variations of this commitment are repeated in the National Forest Strategy of 1998, Nova Scotia's Protected Areas Strategy of 1997, the Canadian Biodiversity Strategy of 1995, the Whitehorse Mining Initiative of 1994, and the Sustainable Development Strategy for Nova Scotia of 1992.

For the purpose of protected areas planning in Nova Scotia, the provincial government has delineated and recognizes 80 regions or "natural landscapes" in Nova Scotia (see Appendix 4). DEL describes a natural landscape as "a mosaic of different but interacting ecosystems that are repeated in a similar pattern to form a distinct and definable land unit or area. A landscape is characterized by distinctive local environmental and biotic factors or elements (i.e., the local variety and distribution of landforms and vegetation communities, local climate, and local natural disturbance regime)" (p.2, DEL 2002). The Annapolis Valley is an example of a natural landscape in Nova Scotia.

Currently, DEL considers 23 of the province's natural landscapes to have a "satisfactory" level of protection. Five more are considered to be at a "near satisfactory" level. The remaining natural landscapes have few or no protected areas within them and are considered poorly represented. They are priority regions for new protected areas.

Of the thirteen natural landscapes occurring within HRM, four are considered to be at or near a satisfactory level of protection (see Map 3). The rest require a significant amount of new protected land to reach a satisfactory level. At first glance, the Eastern Shore appears to be flush with protected areas. Three existing Wilderness Areas (Waverley-Salmon River Long Lake, White Lake, and Tangier-Grand Lake) are accessible from Route 7 between Dartmouth and Sheet Harbour. However, all three of them lie predominantly in the same landscape, #34 - the Eastern Shore Granite Ridge. This landscape appropriately has a "satisfactory" level of protection. But the coastal landscapes (#33 - Eastern Shore Beaches, and #34 - Eastern Shore Islands) and the interior quartzite landscapes (#30 Central Quartzite Hills and Plains, and #35 - Eastern Shore Quartzite Plain) do not.

Map 3. Landscape Representation within HRM



Georeferencing: NAD 83, UTM Zone 20
Produced with data obtained from the Nova Scotia Department of Natural Resources, Department of Environment and Labour, and Service Nova Scotia and Municipal Relations

Along with Landscape #35, the Eastern Shore Quartzite Plain, the most obvious representation gap in HRM is Landscape #30, the Central Quartzite Hills and Plains. Landscape #30 is the most expansive natural landscape in HRM, covering over 20% of the municipality. This region consists of two disjunct units, one stretching from Pockwock Lake to the Musquodoboit Valley (30a), and a smaller unit (30b) situated south of the Musquodoboit Valley. The provincial government considers the Central Quartzite Hills and Plains to have only "partial" representation, meaning that "major ecosystems and elements" of this region are not captured by protected areas (DNR 1994). Protected areas in this landscape - Clattenburgh Brook Wilderness Area and a portion of the Waverley-Salmon River Long Lake Wilderness Area – are small and only partially capture a handful of the landscape's features.

The Proposed Ship Harbour Long Lake Wilderness Area appears to provide a good opportunity to fill the representation gap for Landscape #30. Nearly three-quarters of the study area falls within the Central Quartzite Hills and Plains, making it the largest tract of Crown land in the landscape. It also contains more roadless terrain than any other Crown or private tracts in the landscape.

This section provides a cursory biophysical description of the proposed Wilderness Area, from west to east, with emphasis on the Central Quartzite Hills and Plains. The potential contribution of the study area's landscape elements to strengthening representation within the provincial protected areas network is then discussed.

The proposed Wilderness Area is divided among four different landscapes as follows:

Landscape #30:	Central Quartzite Hills and Plains	12,537 ha	72%
Landscape #33:	Eastern Shore Beaches	65 ha	<1%
Landscape #34:	Eastern Shore Granite Ridge	2,979 ha	17%
Landscape #36:	Eastern Shore Drumlins	1,941 ha	11%

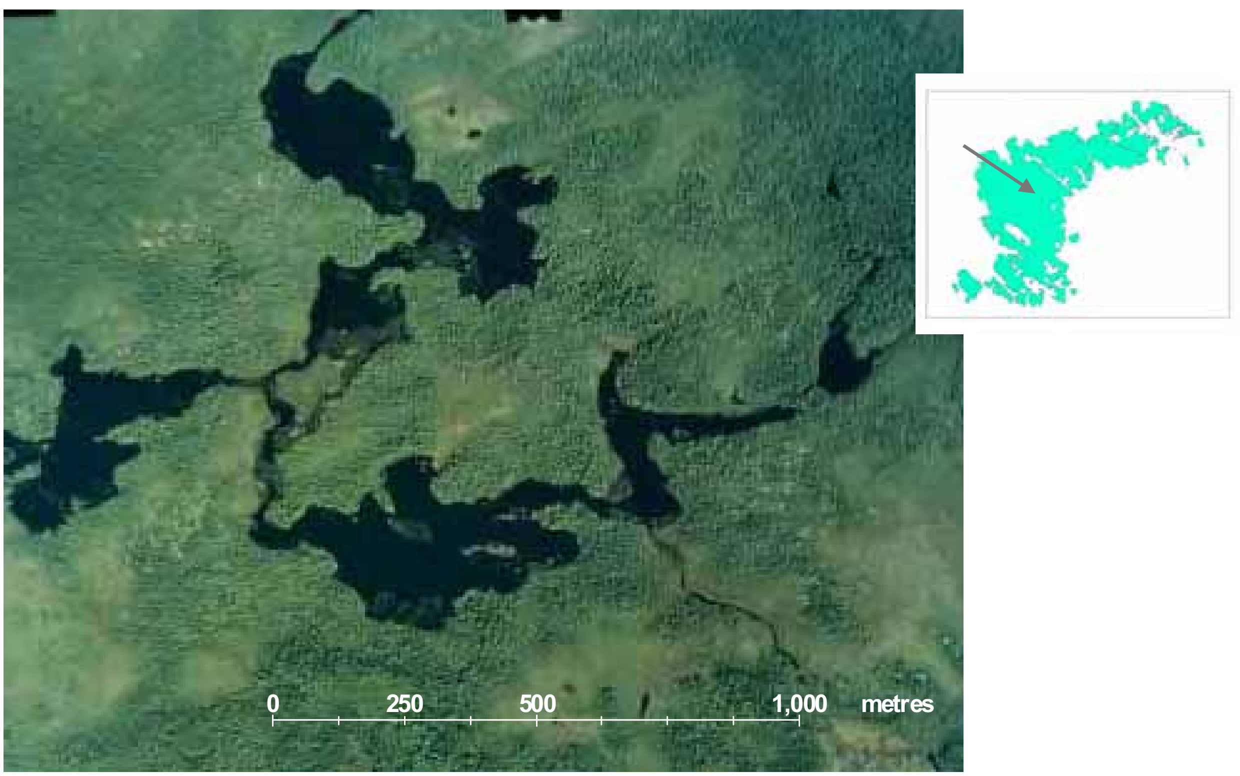
<u>Biophysical description of the Proposed Ship Harbour Long Lake Wilderness Area</u>

The southwestern portion of the proposed Wilderness Area between White Lake Wilderness Area and Head of Jeddore is contained within Landscape #34, the Eastern Shore Granite Ridge. This rugged landscape extends from Waverley to Sheet Harbour along the southern interior of the Eastern Shore. Landscape features in the southwestern part of the study area are typical of the rest of the landscape. The area is underlain by a 375 million-year-old intrusion of Devonian granite bedrock which is visible in places as exposed granite ridges and knolls, rock barrens, and cliffs. Where bedrock is not exposed it tends to be covered only by a thin layer of stony till deposited by glaciers about 12,000 years ago, and “excessively stony”, well-drained, and acidic soils (MacDougall et al. 1963). Glacial scouring is responsible for creating the elongated lakes in this part of the study area – Admiral Lake, Salmon River Long Lake, Richardson Lake, Moose Cove Lake, Oak Lake, and so on. Their parallel drainage pattern follows the southeast orientation of the advancing ice. Elevation in the Landscape #34 portion of the study area ranges from 100’ to 300’.

Moose Cove Lake (Irwin Barrett photo)

For the most part, forest productivity is low due to the thin and nutrient-deprived soil. On exposed ridges, forest cover tends to be dominated by scrubby white and red pine, red spruce, balsam fir, and early-successional hardwoods. These ridges are susceptible to burning, as evidenced by a 100ha fire scar on the west side of Admiral Lake. Where soil has been able to accumulate, forests are more productive, and include small pockets of old white pine, red spruce, and hemlock, as well some mixed conifer-deciduous stands.

Moving northeast, the study area transitions into Landscape #30, the Central Quartzite Hills and Plains around Rocky and Skull Lakes. This landscape is almost entirely underlain by 500 million-year-old Meguma Group rock from the Cambro-Ordivician period – older metamorphic bedrock that the granite from the Eastern Shore Granite Ridge intruded through to the south. Meguma Group bedrock is subdivided into two formations: the primarily iron-rich slates of the Halifax Formation, and the quartzite and greywacke rocks of the Goldenville Formation (Miller and Milligan n.d.). All of the proposed Wilderness Area in Landscape #30 is all underlain by the latter. Because the bedrock in Landscape #30 is less resistant than the granite to the south, the relief to the northeast is smoother – one of the “plains” of the Central Quartzite Hills and Plains. Between Fishing Lake and the western slope of Ship Harbour Long Lake the terrain is practically flat, as the granite ridges give way to a 300’ plateau roughly six kilometres wide. This upland straddles the watershed divide between the Salmon River system to the southwest and the Lake Charlotte/Ship Harbour watershed to the east. Unrestrained by topography, several shallow lakes of various sizes, like the aptly named Flat Lakes, assume broad sprawling shapes across the plateau. These lakes are connected by gentle stillwaters in a deranged to dendritic drainage pattern. Dozens of open and treed bogs ranging in size from less than a hectare to the 90 ha Bruce Plain bog complex are scattered across the otherwise forested terrain.



Aerial photo of the Flat Lakes

Forests atop the plateau are primarily coniferous, with white pine, red spruce, and balsam fir all being common. There is a small mixedwood component, mostly limited to about half a dozen stands from 10 to 50 ha between Island Lake and Cranberry Lake. Black spruce and tamarack occur in depressions and along wetland margins.

Continuing eastward toward Ship Harbour Long Lake, the terrain changes dramatically. Elevation drops from about 250’ a kilometre away from the western shore of the lake to less than 50’ at the shore. On the opposite shore elevation accrues at an equal pace. In the gully of this depression lies the spear-shaped Ship Harbour Long Lake, which is less than 200m wide in most places but extends 5km in a near-exact northwest to southeast orientation. The lake marks the reappearance of a rugged landscape, although it is all still part of the Central Quartzite Hills and Plains. Crumpling of the bedrock east of the lake has created a highly fractured and folded landscape extending to Scraggy Lake, as evidenced by the abrupt corners and rectangular alignment of the Fish River and its tributaries.

Forests along Ship Harbour Long Lake and eastward to Scraggy Lake continue to be dominated by softwoods, but there are more big trees, including impressive stands dominated by red spruce, white pine, and in a few cases, eastern hemlock. The older stands tend to be concentrated along the Fish River, Big Lake/Faulkner Lake tributary and Ship Harbour Long Lake. Some mixed conifer-deciduous stands that include yellow birch, white birch, white ash, beech, and red maple occur on the slopes and ridges between these watercourses.

The boundary between Landscape #30 and Landscape #36 (the Eastern Shore Drumlins) occurs along the western margin of Scraggy Lake. Only 11% of the study area – the eastern-most portion - falls within the Eastern Shore Drumlins. A defining characteristic of this landscape is its egg-shaped hills, called drumlins, that formed from material released by melting glaciers. The drumlins are composed of silty till (Stea et al. 1992) and tend to support impressive forest growth. Digital mapping by Fisher (1997) indicates that two small drumlins are almost completely contained within the study area, and up to six more drumlins partially extend into it. There are also a number of bogs and meadows along the margins of Scraggy Lake.

<u>Representation value</u>

Estimates in this section on the extent to which the study area and existing protected areas contribute to landscape representation are confined to Landscape #30. The portion of the study area in Landscape #33 is too small to influence representation, and Landscapes #34 and #36 are already considered to have a “satisfactory” level of landscape representation in the provincial protected areas network.

Two classes of landscape elements are considered here: physical topics (sometimes referred to as “enduring features”, because they change very little over time) and ecosystem types. Physical topics and respective map sources include bedrock geology (Province of Nova Scotia and Atlantic Geoscience Society 1994), surficial geology (Stea et al. 1992), and soils (MacDougall et al. 1963). Ecosystem types are both aquatic and terrestrial. Forested ecosystem types are defined by combinations of topography, drainage, and climax forest type. Determining the precise extent to which the study area represents all ecosystem types is beyond the scope of this study, as doing so would require detailed ecosystem mapping not currently available. However, the Protected Areas Division of DEL is currently preparing fine-scale ecosystem mapping for that purpose (Rob Cameron, DEL, personal communication). It is recommended that DEL use this information to determine more precisely the extent to which the proposed Wilderness Area captures representative ecosystem types.

Table 2 and Table 3 on the following page show that several major landscape elements occurring within the proposed Wilderness Area are absent from or poorly represented in existing protected areas. While the tables list all major physical topics (i.e., geology and soil types) for Landscape #30, ecosystem types are confined to those found within the study area, rather than the entire landscape. Representation levels (e.g., poor, good) are estimated based on the relative occurrence of landscape elements in the study area compared to their incidence in the entire landscape.

Table 2. Representation level of physical topics

PHYSICAL TOPIC	description	representation within study area	representation within existing protected areas
bedrock geology formations	Goldenville Formation	good	poor
	Halifax Formation	none	none
surficial geology types	silty till	good	poor
	stony till	none	none
soil types	well-to-rapidly drained sandy loam	good	poor
	imperfectly drained sandy loam	good	none
	well drained loam to sandy clay loam	none	none

Table 3. Representation level of ecosystem types

ECOSYSTEM TYPE	representation within study area	representation within existing protected areas
lakes and ponds	good	poor
rivers and streams	good	poor
wetlands	good	poor
imperfectly drained, coniferous-dominated, undulating to rolling terrain	good	none
imperfectly drained, coniferous-dominated, flat to gently undulating terrain	good	poor
well drained, mixed-coniferous-dominated mixed forest, rolling terrain	good	none

Outstanding natural features

Old forests

Forest stands considered to be "old forests" typically exhibit some or all the following attributes that tend to be scarce in younger forests: a high percentage of old trees, an uneven age-class distribution, multi-layered vertical structure, single and multiple tree-fall gaps, standing snags (large dead trees), woody debris on the forest floor, dominance of late-successional species, macro-porous soils, a well developed herb layer, and an abundance of lichens, mosses, fungi, and liverworts (Leverett 2001). The paucity of these important structural and biological elements in today's Canadian forests has led to interest from government and others across the country in protecting old forest remnants. The need to retain remnant old forest stands in Nova Scotia is particularly acute. Forests in this province have undergone a dramatic shift to younger age classes since the 1950s, due mainly to forest harvesting. Most of the older forests are gone. In 1958, forests in age classes older than 80 years accounted for a quarter of the province's forests. Today they cover less than 1%. Forests older than 100 years have been reduced from 8% of the province's forest area to 0.15% during the same period (Wilson and Colman 2001). The transition to younger forests has been accompanied by a shift in the tree species composition of Nova Scotia's forests. Over much of their historical range, long-lived shade tolerant species such as eastern hemlock, red spruce, yellow birch, and sugar maple have been supplanted by pioneer species such as white birch and aspen (Loo and Ives 2003).

Old forest dependent bird species (e.g., cavity nesters) found within or proximate to the study area include great horned owl (*Bubo virginianus*), barred owl (*Strix varia*), saw-whet owl (*Aegolius acadicus*), yellow-bellied sapsucker (*Sphyrapicus varius*), and pileated woodpecker (*Dryocopius pileatus*) (Erskine 1992). According to Parker (2003), older conifer forests are important for moose, and the loss of mature conifer forests to timber harvesting could pose a threat to local populations of Nova Scotia's mainland moose.

The Environment Department's Significant Old and Unique Forests (SOUF) GIS layer suggests that several concentrations of old and unique forest stands occur along the Fish River corridor and the shores of Ship Harbour Long Lake (see Map 4). These are stands that the provincial forest inventory identifies as being dominated by climax species and reaching a canopy height threshold of 17 metres for most species (DEL 2003). Personal observations confirm the presence of old forest in both areas, closely corresponding to the locations depicted in Map 4.

The SOUF layer codes most of these stands as white pine or red spruce dominated, which is also consistent with personal observations. The SOUF layer does not identify any hardwood dominated old forest stands within the study area, which is limited to Crown lands. The only old forest stand dominated by hardwoods in the vicinity of the study area occurs on a peninsular drumlin near the centre of Scraggy Lake. Although part of a private inholding, this stand is mentioned here because of its important location (surrounding completely by the lake and the proposed Wilderness Area) and its uniqueness. According to the SOUF layer, there may be smaller and more scattered old forest stands through the western portion of the study area as well.

Because stand typing for the provincial forest inventory does not always correspond to conditions on the ground, there may be additional old stands not captured in the GIS inventories. Much of the proposed Wilderness Area has not been heavily harvested for several decades, so many stands that would not currently be considered "old" may nonetheless be starting to exhibit old-growth characteristics (e.g., breaking up of the canopy) and can evolve into old forest if left undisturbed.

Old red spruce forest near Ship Harbour Long Lake

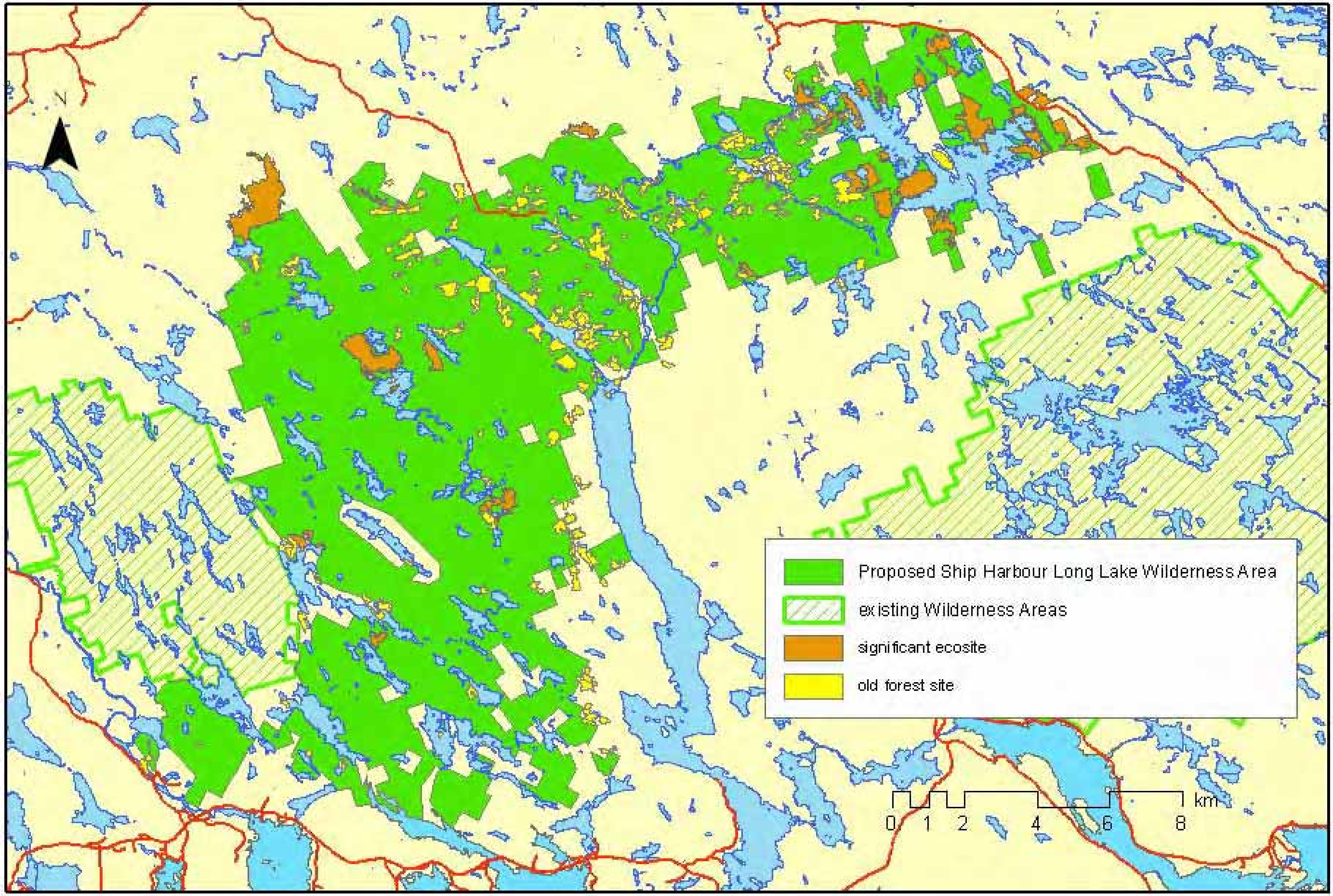
During a site visit in September 2004, it was noted that Hurricane Juan had uprooted most of the large red spruce in two of the stands depicted as SOUF along Ship Harbour Long Lake. White pine in these stands were, for the most part, not affected. These altered stands can also be considered "unique" forests, as few stands in the province are the product of a large and infrequent natural disturbance on an old forest, and fewer still would have been left alone (e.g., not salvaged). According to Lindenmayer et al. (2004) the "biological legacies" created by a major disturbance like a hurricane – for example, tipped up root mounds and large logs on the forest floor – help maintain key ecosystem processes that facilitate species recovery and restore nutrient levels. They point out that removing these legacies can have negative impacts on many taxa and recommend that large areas be off-limits to salvage logging.

<u>Significant ecosites</u>

The proposed Wilderness Area harbours several "significant ecosites" that have been mapped by the provincial Environment Department (see Map 4). These are relatively small landform-vegetation complexes that are dissimilar to the ecosystem matrix that surrounds them (DEL 2003). Significant ecosites are often biologically rich and/or can provide habitat for rare or vulnerable species (DEL 2003). Most of the significant ecosites within the proposed Wilderness Area are bogs or fen-bog complexes along the low-lying margins of Scraggy Lake. There are also two large bogs in the western half of the study area: a 90 ha shrub bog just north of Island Lake, and a 160 ha open bog that straddles the study area's boundary near Bruce Lake.

Large open bog near the outlet of Scraggy Lake

Map 4. Old forests and significant ecosites



Georeferencing: NAD 83, UTM Zone 20
Produced with data obtained from the Nova Scotia Department of Natural Resources, Department of Environment and Labour, and Service Nova Scotia and Municipal Relations

Wilderness recreation opportunities

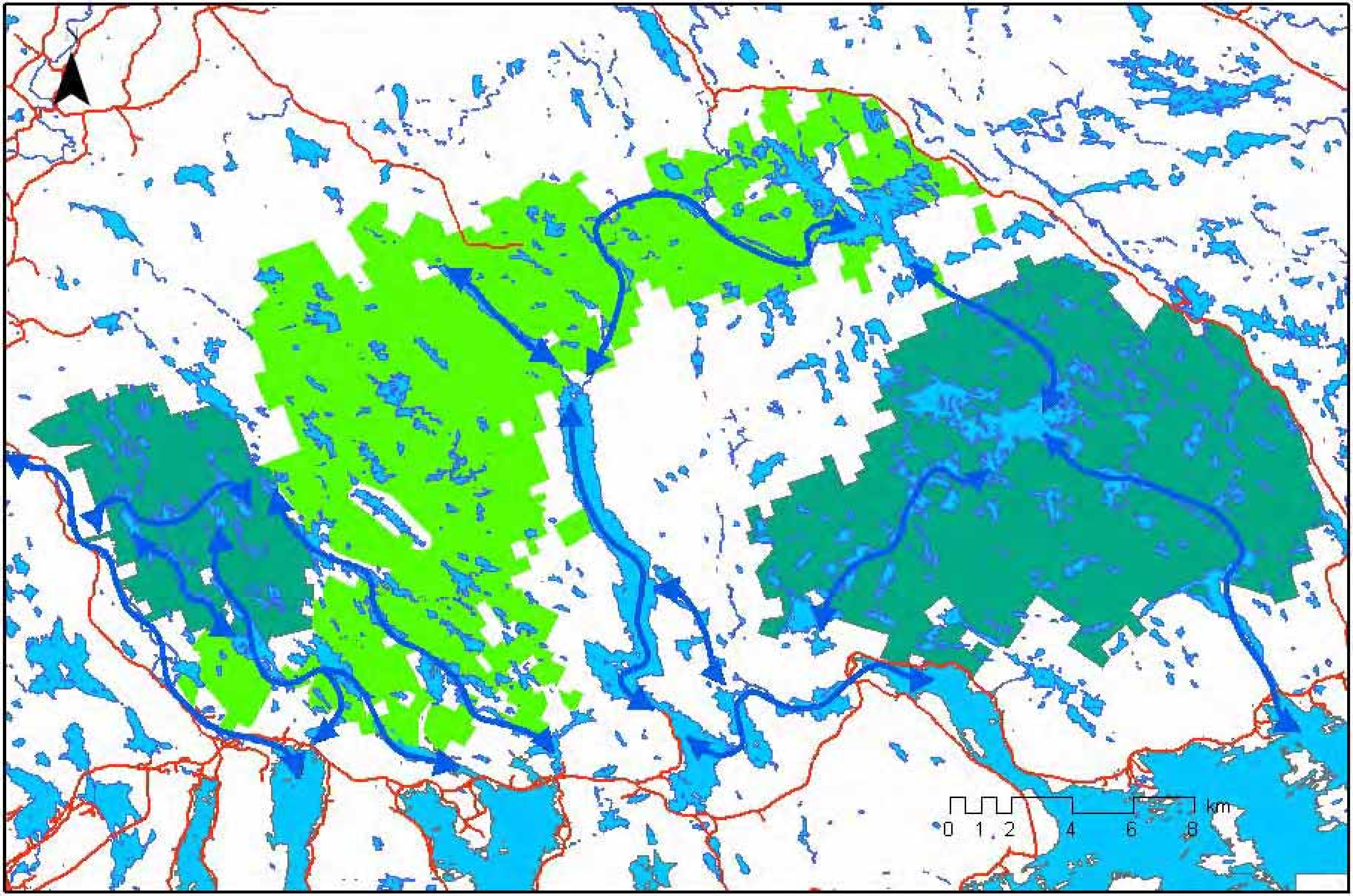
The protection and provision of wilderness recreation opportunities is listed as an objective of the *Wilderness Areas Protection Act*. This reflects the aspirations of Nova Scotians to preserve backcountry recreation opportunities, and recognizes the role that natural areas can play in supporting the growing demand for nature tourism in the province. The Ship Harbour Long Lake area is well positioned to offer visitors and HRM's growing population outstanding outdoor recreation experiences, given its impressive wild landscape, size, location between two existing Wilderness Areas, and its proximity to Halifax. Canoeing and hiking are obvious recreational draws for the proposed Wilderness Area, as well as traditional hunting and fishing.

<u>Backcountry canoeing</u>

The study area boasts outstanding opportunities for backcountry canoeing, both within its boundaries – where there are over 80 lakes and ponds – and by enhancing existing opportunities in the neighbouring White Lake and Tangier-Grand Lake Wilderness Areas. Combined, the two existing Wilderness Areas and the study area are as large as Kejimkujik National Park ("Canada's canoeing park") but contain 150 lakes, more than three times as many as Keji. The study area also contains key linkages between traditional canoe routes in and out of the existing Wilderness Areas that are currently at high risk of being degraded. For example, if protected, the southwestern portion of the study area would connect the interior lakes of White Lake Wilderness Area with the Atlantic Ocean at Jeddore Harbour, creating Nova Scotia's first and only protected lakes-to-the-ocean wilderness corridor. Other canoeing linkages exist between the study area and Tangier-Grand Lake Wilderness Area, the study area and White Lake Wilderness Area, and Tangier-Grand Lake Wilderness Area and White Lake Wilderness Area via the study area. Map 5 depicts some known canoe routes in the study area.

DEL's 2001 overview of Ship Harbour Long Lake claims that these linkages "could position the Eastern Shore as a world-class wilderness destination". The HRM staff report to Regional Council on Ship Harbour Long Lake (see Appendix 2) makes explicit reference to the opportunity to build on the lake and river resources of the two existing Wilderness Areas, and comes to similar conclusion: "The area also provides the opportunity to physically link between the two formally designated wilderness areas of White Lake and Tangier Grand, which in full presents itself as a marketable world class open space system". The area's appeal for canoeing has also been recognized by the Tourism Industry Association of Nova Scotia

Map 5. Backcountry canoe routes

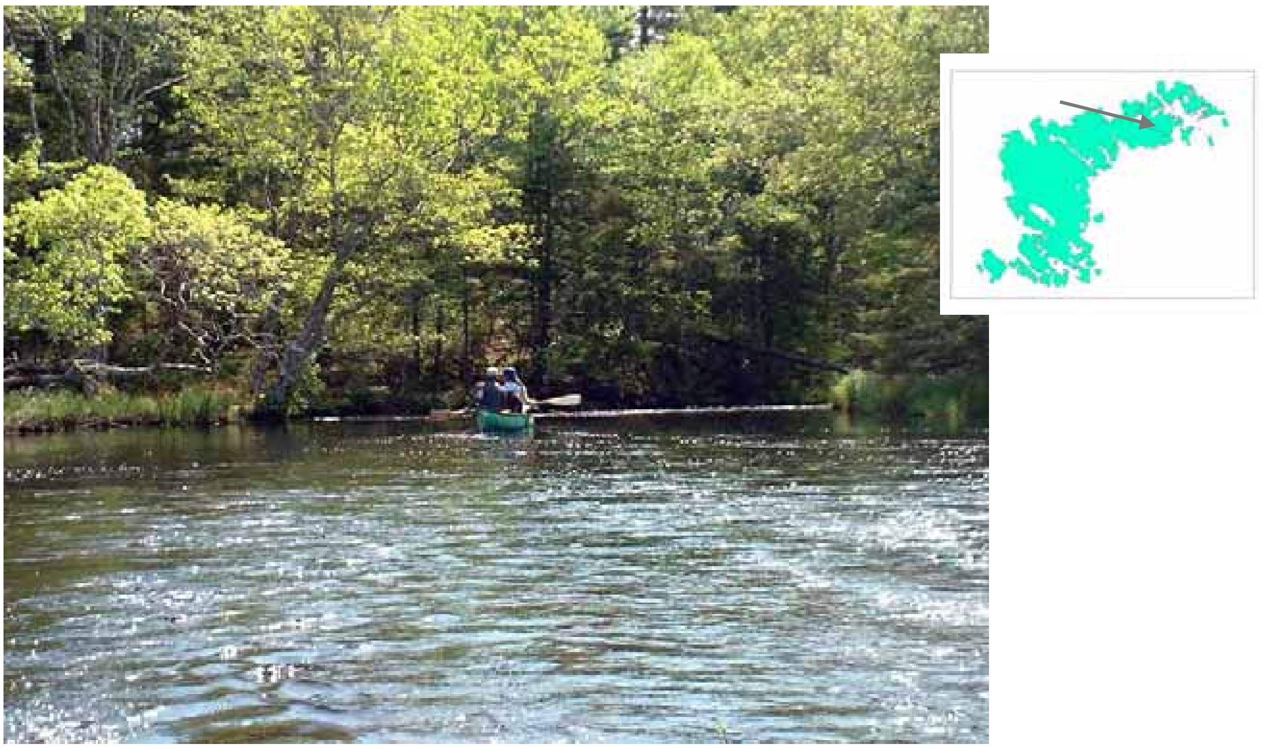


Georeferencing: NAD 83, UTM Zone 20
Produced with data obtained from the Nova Scotia Department of Natural Resources and Service Nova Scotia and Municipal Relations

Eastern Shore Forest Watch Association

Nova Scotia Public Lands Coalition

(TIANS). In 2001, TIANS issued a press release calling for the Ship Harbour Long Lake area to be protected. This was triggered by concern that the Province would attempt to preserve the wilderness character of primitive canoe routes primarily by applying viewsheds. Their press release noted: “A world class wilderness like Ship Harbour Long Lake needs real protection. We can’t market buffer strips as wilderness. Visitors come here to see the real thing” (TIANS 2001).



Fish River near Dreadnaught Stillwater

The best canoeing opportunities in the central and eastern portions of the study area occur at Scraggy Lake, Ship Harbour Long Lake proper, and the Fish River, which links the two lakes via the head of Lake Charlotte. Scraggy Lake, true to its name, offers dozens of small coves and islands to explore. Most of the islands, located primarily in the eastern and northwestern arms of the lake are owned by the Crown, and are part of the Wilderness Area proposal. To date, the lake is largely undeveloped, even on the privately owned portions. Scraggy Lake is also a good entry point for paddlers going down the Fish River or traversing across the Tangier-Grand Lake Wilderness Area to Ship Harbour. People who have canoed Fish River describe it as challenging and remote, and enjoy the abruptly alternating settings of rapids, pools, and stillwaters. From Scraggy Lake to the Murchyville Road bridge or the landing at the Upper Lake

Charlotte Provincial Park Reserve is a two-day trip for most paddlers. The river is best run in the spring and fall when water is high. In low water this trip would require frequent tedious lifts, and be considerably less enjoyable.

The Scraggy Lake to Ship Harbour route via Tangier-Grand Lake is a remote 34 km trip that takes travellers across eighteen lakes and ponds, and nineteen portages. This route is included in “Canoe Routes of Nova Scotia” (Dill 1983), which describes the time required as “several days”. Both the Fish River and Scraggy Lake to Tangier routes are profiled in the 1988 “Eastern Shore Lake Systems” canoe map, distributed by Canoe Nova Scotia and the Nova Scotia Sport and Recreation Commission. Ship Harbour Long Lake itself is excellent for canoeing because it is deep, largely free of obstructions, and relatively safe given the shape of the lake and shelter from the wind. Even though getting up and down the lake is a 10 km trip, there are only a few spots on the lake where a canoe get more than 200m from shore.

Canoeing on Ship Harbour Long Lake

Canoeists who explore Fish River, Ship Harbour Long Lake, or watercourses in the western part of Tangier-Grand Lake Wilderness Area can easily extend their trips via Lake Charlotte. Routes accessible through Lake Charlotte include the Level Spot Lake loop and the Ship Harbour River, which passes through Second and Weeks Lakes en route to the Atlantic Ocean at Ship Harbour.

The proposed Wilderness Area's other premiere canoeing destination is in the southwest, near White Lake Wilderness Area. There are over a dozen canoeable and highly scenic lakes in this portion of the study area that are connected primarily by old carries, but also by a few passable streams. Two traditional routes that originate in White Lake Wilderness Area and connect to the ocean stand out (Bruce Graves, retired guide, personal communication). One is via Admiral Lake and either Eel Pond or Salmon River Lake. The other is longer and further east, from Logging Lake to Oyster Pond, via Rocky Lake, Richardson Lake, Moose Cove Lake, and Oak Lake. A variation of this route is to bypass Richardson Lake with East Lake and Skull Lake. With the cooperation of private landowners west of lower Lake Charlotte it may be possible to link the canoe routes in the eastern and western parts of the study area. Under this scenario, backcountry canoe trips offered by a protected Ship Harbour Long Lake Wilderness Area could easily exceed a week or two.

The plateau lakes in the central part of the proposed Wilderness Area – Island and Flat Lakes, for example – look appealing for canoe exploring but are difficult to access. They are unlikely to become canoeing destinations.

Backcountry hiking

Currently, three trails in the proposed Ship Harbour Long Lake Wilderness Area are managed and promoted for backcountry hiking by the Musquodoboit Trailways Association. They are all in the southwestern portion of the study area: Bayer Lake loop (1 km), Admiral Lake loop (5.5 km), and South Granite Ridge Trail (8.5 km) (Musquodoboit Trailways Association 2005, Nova Scotia Health Promotion 2005). These trails are part of a 26 km trails network between Gibraltar Rock and Musquodoboit Harbour. The Trans Canada Trail, which runs atop an abandoned railbed wedged between the Musquodoboit River and the western border of White Lake Wilderness Area, serves as the primary feeder route. It provides non-motorized access to all three backcountry trails. The Bayer Lake and Admiral Lake loops are completely contained within the proposed Wilderness Area, as is the southern portion (about 2.5 km) of South Granite Ridge Trail. The South Granite Ridge Trail extends into White Lake Wilderness Area to the north, connecting with the North Granite Ridge Trail to Gibraltar Rock. The combined length of the ridge trails is 17.9 km. A one-kilometre segment of the Trans Canada Trail shares a border with the proposed Wilderness Area at Bayer Lake.

A drawing card for the Musquodoboit Trailways network is the remote wilderness setting that provides a high-quality backcountry recreation experience. Attractions include a mix of coniferous and deciduous forests (including some old forest), steep climbs up granite ridges, rock caves, a variety of wildlife, and panoramic lookoffs over lakes, forest, and the ocean (Musquodoboit Trailways Association 2005). The White Lake Wilderness Area secures a wilderness setting for the portion of the trails network that occurs within it. This cannot be said of the trails in the study area, where backcountry hiking experiences could be degraded by forestry, road construction, motorized access, or other developments.

Apart from the aforementioned trails, Ship Harbour Long Lake currently contains few hiking destinations. However, according to Paul Euloth (HRM Regional Trails Coordinator, personnel communication), the area's wilderness character, proximity to Halifax, and location between two existing Wilderness Areas gives it "outstanding potential" to become a premiere backcountry hiking destination for HRM. Euloth notes that carefully designed and placed hiking trails could conceivably follow a route through the study area that links the Musquodoboit Trailways network with the Tangier Grand Lake Wilderness Area. It is doubtful that existing protected areas in the region could offer backcountry hiking opportunities on this scale because they span considerably less distance than that between the White Lake and Tangier Grand Lake Wilderness Areas. Euloth cites the Musquodoboit Trailways network and the new Crowbar Lake trail in the Salmon River Long Lake Wilderness Area as successful examples of community driven of trail projects, and suggests a similar approach could be appropriate for Ship Harbour Long Lake.

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Appendix 1

Summary of Protection-oriented Values: Ship Harbour Long Lake Area

Prepared: August 2, 2001

The following is a summary of protection-oriented values that are associated with a preliminary area of interest which DEL staff have identified within the publically proposed Ship Harbour Long Lake wilderness. This area of interest corresponds more or less to the undeveloped portion (as of May, 2001), with the following exceptions: (1) a portion of the Murchyville Road and two sections of road and adjacent harvest areas in the southwest are included; (2) all but 2 key areas within Kimberly-Clark's 2001 Crown operating plan are excluded. Other portions of this area of interest may be subject to approved Crown operating plans (e.g. Mactara), unknown to DEL at this time.

The following values will also be illustrated on a series of maps which are being prepared by staff:

Connectivity

- the area of interest forms a wilderness corridor between White Lake and Tangier Grand Lake wilderness areas, providing an ecological and wilderness recreation link between these two wilderness areas

Large Roadless Areas

- the area of interest includes a relatively large roadless area in the Flat Iron Lakes area, as well as a series of smaller ones. Roadless areas are ecologically important, significant for wilderness recreation, and are increasingly rare in Nova Scotia.

Landscape Representation

- 70% of the area of interest is within one of Nova Scotia's natural landscapes which is inadequately represented in a protected area (Central Quartzite Hills and Plains - Fish River).

Old Forest Stands

- Preliminary GIS-based inventory shows that old forest stands are scattered throughout the area of interest, with a concentration of sites along Fish River and near Ship Harbour Long Lake. Many of these are red spruce dominated, but white pine and mixed hardwood/softwood stands also occur.

Major Wetlands

- Major wetlands (large bogs) are concentrated in the Flat Iron Lakes area and at Scraggy Lake.

Major Lakes and Waterways

- The area encloses, or includes frontage on, more than 70 lakes and numerous waterways, with the following highlights:

- concentration of lakes between Salmon River and Moose Lakes (near Jeddore);
- interconnected lakes in the Flat Iron Lakes area;
- Scraggy Lake - a large, well-known backcountry lake;
- Fish River system - connecting Scraggy Lake and Lake Charlotte/ Ship Harbour Long Lake;
- Ship Harbour Long Lake.

Wilderness Recreation & Tourism
The area of interest offers an outstanding array of wilderness recreation and tourism opportunities, based largely on use of the interconnected lakes and waterways. In addition, the area links to other significant opportunities in the adjacent White Lake and Tangier Grand Lake wilderness areas. This link is significant and could position the Eastern Shore as a world-class wilderness destination. A summary of these values follows:

- **Areas of High Scenic Value**
  The following highly scenic areas are derived from DEL's Crown land inventory information. These are highlights. Other areas are also scenic.
  - Scraggy Lake to Ship Harbour Long Lake, inclusive, via Fish River;
  - rugged, hilly area centred around Salmon River Lake, near White Lake Wilderness Area.

- **Major Canoe Routes**
  The area includes provincially significant wilderness canoe routes, which are important to the province's growing nature tourism industry. These routes provide connections between White Lake and Tangier Grand Lake wilderness areas. The following routes are highlights:
  - interconnected lakes from White Lake Wilderness Area to Jeddore Harbour;
  - interconnected lakes and ocean from Jeddore Harbour to Tangier Grand Lake Wilderness Area (this connection is outside the area of interest);
  - river route from Scraggy Lake to Lake Charlotte / Ship Harbour Long Lake via the scenic, white-water Fish River;
  - part of traditional interconnected lakes connection between the large Scraggy and Tangier Grand lakes;
  - remote interconnected lakes in the Flat Iron lakes area.

- **Wilderness Sport Fishing & Hunting**
  - The area has a long tradition of wilderness sport fishing and, to a lesser extent, hunting.

D:\Oliver\NewAreas\ShipHrbr\values.wpd

Appendix 2

11.5.9

Halifax Regional Council
July 11, 2000

TO: Mayor Fitzgerald and Members of Halifax Regional Council

SUBMITTED BY:
K.R. Meech, Chief Administrative Officer

Dan English, Deputy Chief Administrative Officer

DATE: July 4, 2000

SUBJECT: **Proposed Ship Harbour Long Lake Wilderness Area**

ORIGIN

Presentation to Regional Council February 2, 2000 by the Eastern Shore Forest Walk Association and Ecology Action Centre. Seeking HRM support for their proposal to include a major parcel of Crown land on the Eastern Shore, under the Wilderness Areas Protection Act.

RECOMMENDATION

It is recommended that:

1.) Council pass a resolution requesting the Nova Scotia Department of Environment to undertake a study into the feasibility of designating the proposed Ship Harbour Long Lake Wilderness Area, under the Wilderness Areas Protection Act.

2.) It is also recommended that Regional Council request that the Province declare a development, road building, and tree harvesting moratorium while this study is underway, so that this opportunity is not lost in the meantime.

BACKGROUND

The geographic area in question has been named the Ship Harbour Long Lake Wilderness Area. Encompassing approximately 17,000 hectares of Crown land, between the White Lake Wilderness Area and Tangier Grand Wilderness Area. Generally, this area includes over 50 lakes, numerous old growth forest stands, significant wetlands, and representation of the "Central Quartzite Hills and Plains" natural landscape. Attached to this report is a copy of the Eastern Shore Forest Watch Association's proposal, which includes a map of the area, highlights the landscape description and outstanding features of the area (See Appendix).

The urgency of this proposal is primarily due to the increased logging activity along the Eastern Shore Region, in which clear cutting practices are destroying vast areas of wilderness. Most of the Ship Harbour Long Lake Wilderness Area is leased to the forestry company of Kimberley Clark, which is now beginning to harvest in this area. As described to Council during their presentation, the Eastern Shore Forest Watch Association, in partnership with the Ecology Action Centre, have been strongly lobbying the Provincial Government to designate this area under the Wilderness Areas Protection Act.

Their lobby has involved extensive correspondence with Premier John Hamm, the Minister of Natural Resources, the Honourable Ernie Fage, and the Minister of the Environment, the Honourable John Chataway. The Provincial response generally outlines that the responsibility for Crown land planning and management, outside the 31 designated Wilderness Areas, is with the Department of Natural Resources. The Department of Natural Resources is currently conducting an integrated resource management planning process (IRM), for all Crown lands. Therefore, these groups are encouraged to bring their concerns forward in this process. In the meantime however, the Province is indicating it's legal responsibility to honour the existing forestry licencing agreement with Kimberley Clark in this area.

The Province has also responded by stating that the Ship Harbour Long Lake Wilderness Area did not meet the ecological criteria used to identify the 31 wilderness areas in Nova Scotia. However, the Department of Environment did state that they are aware of significant natural and outdoor recreation values within this area. The Department also acknowledged that certain ecosystems and natural elements existed in this area that are not well represented in the existing protected wilderness areas. Based on this, the Department of Environment agreed to meet with the proponents of this lobby. This meeting has recently taken place, and the Ecology Action Centre has reported to staff that DOE is now considering undertaking a study to examine the ecological importance of this area

DISCUSSION

In follow up to the presentation, staff has had the opportunity to further research and discuss this proposal with members of the Ecology Action Centre, and Eastern Shore Forest Watch Association. Based on this research and discussion, the Parks & Recreation Department supports the efforts of these two organizations. Historically, this area has been utilized for a wide range of outdoor recreation activities including, fishing, hunting, canoeing, camping, picnicking, and nature appreciation.

These lands and their recreational uses play an important part in the economic, social, and environmental fabric of many communities along the Eastern Shore. Further, this area contains numerous fresh water lake ecosystems that are important to these recreational pursuits and therefore should be protected. This area also provides the opportunity to physically link between the two formally designated wilderness areas of White Lake and Tangier Grand, which in full presents itself as a marketable world class open space system.

Based on the significant environmental qualities, combined with the recreational uses of this area, staff is recommending that Regional Council support the efforts of the Eastern Shore Forest Watch Association and the Ecology Action Centre. Stressing the importance of a moratorium on forestry and development until a study and management plan can be devised by the Province through the IRM process. To continue with present forestry practices in this area could well mean that future sustainable recreation, tourism, and economic opportunities will be lost prior to the examination of other options.

BUDGET IMPLICATIONS

None

MULTI-YEAR FINANCIAL IMPLICATIONS

None

ALTERNATIVES

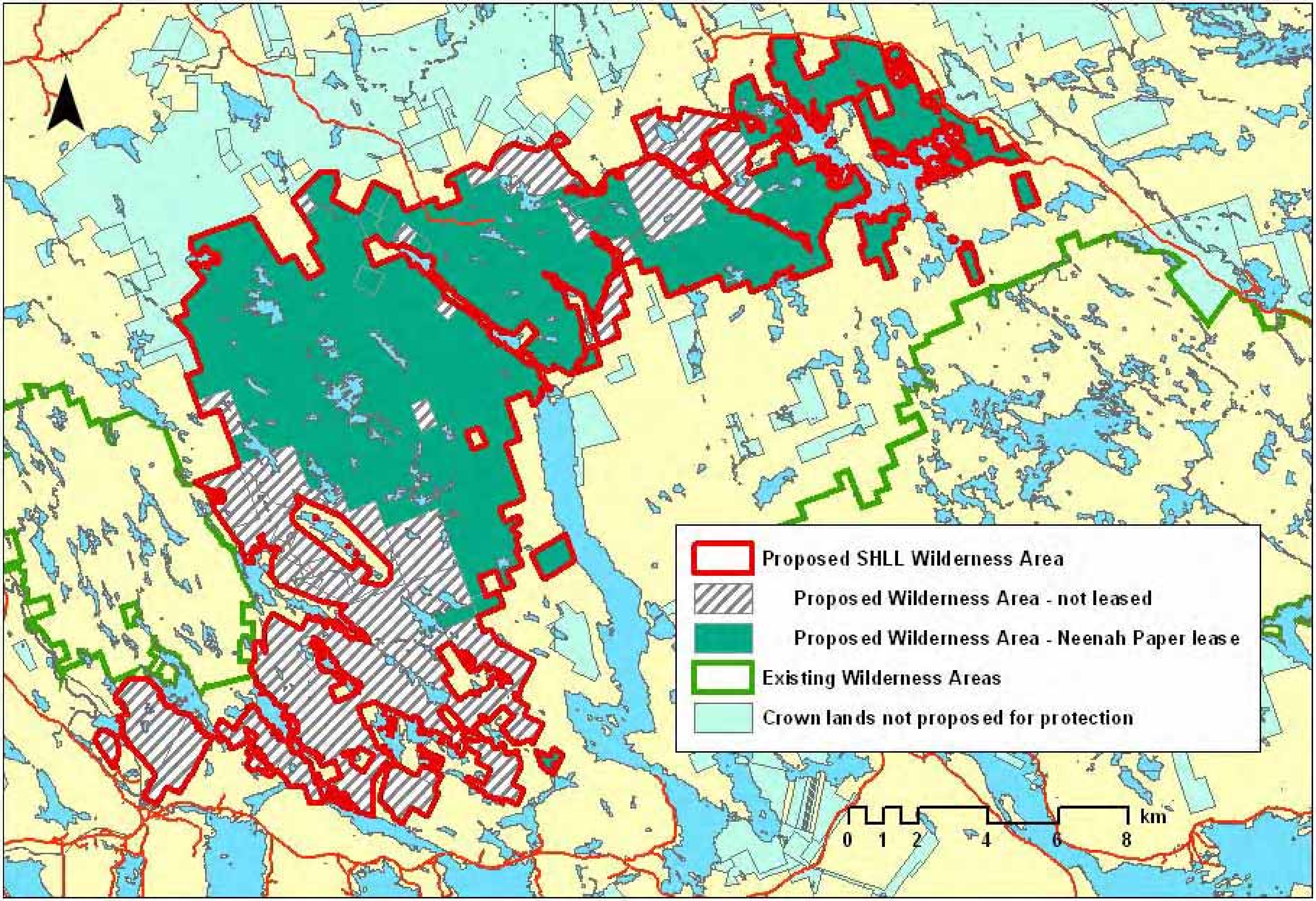
No Recommended Alternatives

ATTACHMENTS

Eastern Shore Forest Watch Association Proposal

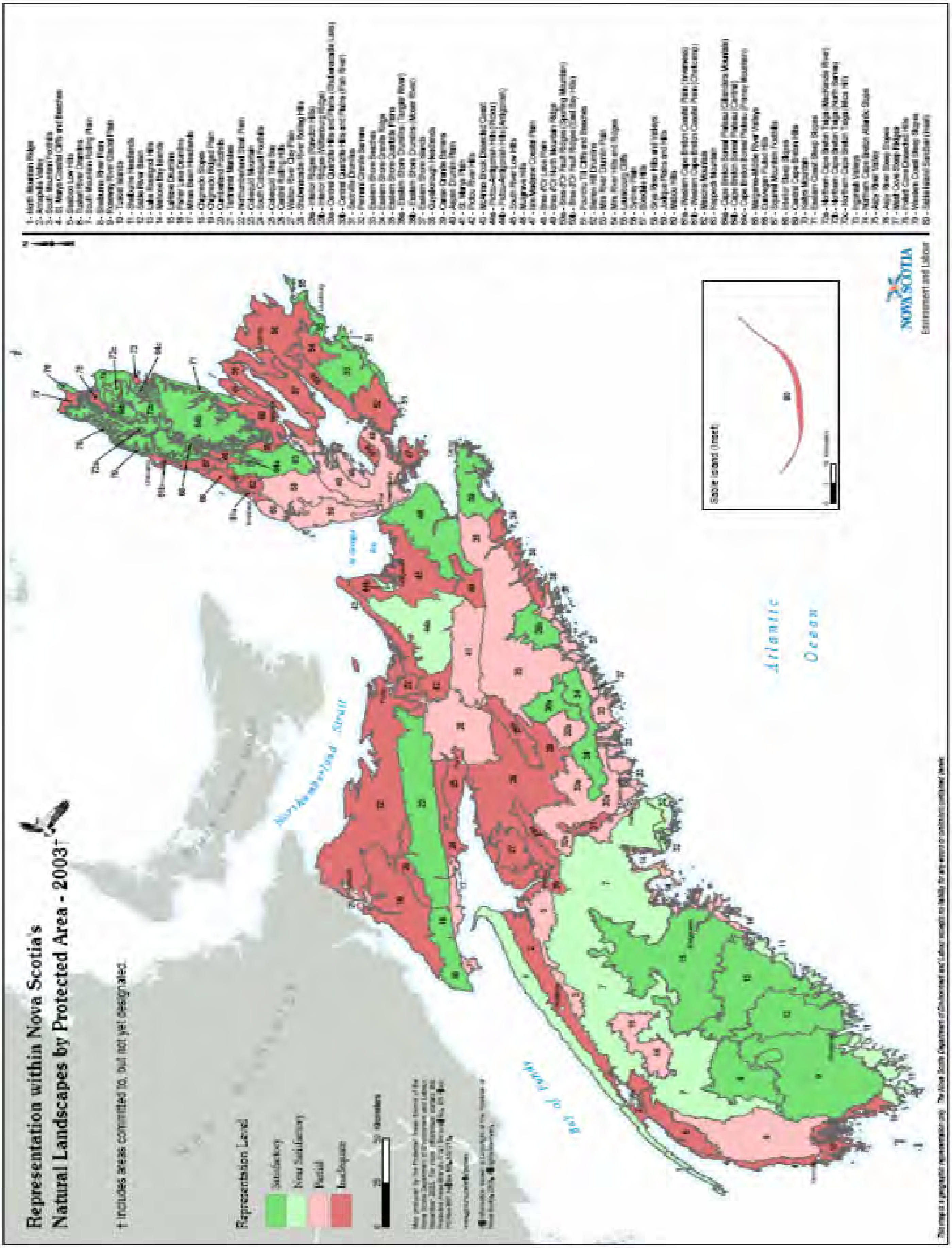
Additional copies of this report, and information on its status, can be obtained by contacting the office of the Municipal Clerk at 490-4210, or Fax 490-4208.	
Report Prepared by:	Blair Blakeney, Regional Coordinator Park Planning & Development 490-6789 Peter Bigelow, General Manager, Recreation Facilities 490-6047
Report Approved by:	for Karen MacTavish, Director, Parks & Recreation

Appendix 3. Proposed Ship Harbour Long Lake Wilderness Area - Neenah Paper lease



Georeferencing: NAD 83, UTM Zone 20
Produced with data obtained from the Nova Scotia Department of Natural Resources,
Department of Environment and Labour, and Service Nova Scotia and Municipal Relations

Appendix 4


Representation within Nova Scotia's
Natural Landscapes by Protected Area - 2003†
† includes areas committed to, but not yet designated
Representation Level
Satisfactory
Near Satisfactory
Partial
Inadequate
Northumberland Strait
Bay of Fundy
Atlantic Ocean
Sable Island (Inset)
NOVA SCOTIA
Environment and Labour

APPENDIX P

HISTORIC TAILINGS MANAGEMENT PLAN

MOOSE RIVER GOLD MINE

Historical Tailings Management Plan
DDV gold
Moose River, Nova Scotia

Date :	**November 1, 2007**	Réf. / Ref. :	**M022088-E1**

INSPEC-SOL ENGINEERING SOLUTIONS

INSPEC-SOL INC. 31 Gloster Court, Dartmouth, Nova Scotia B3B 1X9 • Tel.: (902) 468-6413 • Fax: (902) 468-2207

Reference No. M022088-E1

November 1, 2007

Mr. Peter Carter
Atlantic Gold
DDV Gold Ltd.
P.O. Box 71 Stn A
Fredricton, NB
E3B 4Y2

Re: Historic Tailings Management Plan
Moose River Gold Mine Project
Moose River, Nova Scotia

Dear Mr. Carter:

In accordance with your recent instructions, we have completed a management plan of the existing historic tailings for the above-mentioned site.

We trust that this report meets with your present requirements. Please do not hesitate to contact us should any questions arise.

Yours very truly,

INSPEC-SOL INC.

Gerardo Cardenas Gutierrez, P. Eng., MASc.
Project Manager

DT/GCG/JO/PO/njb

Enclosures:

2 originals (Copy via e-mail: petercarter2@hotmail.com)

TABLE OF CONTENTS

1.0 INTRODUCTION

Inspec-Sol Inc. (**Inspec-Sol**) has completed a Historic Tailings Management Plan for the Touquoy Gold Project Site in Moose River, Halifax County, Nova Scotia.

1.1 Project Overview

The proposed Moose River Gold Mine open pit is located in the area of six historic mining stamp mills that operated between 1882 and 1925. The assessment of the historic mine tailings carried out by D.D.V. Gold Ltd shows that the tailings (approximately 5000 tonnes) from the Moose River Gold Mine Stamp Mill and G&K Gold Co. Stamp Mill are laying within the Touquoy Project property limit near the proposed open pit (Figure 1. DDV Gold Historic Stamp Mill Locations. Appendix I). The Moose River Gold Mines stamp mill was located within the boundary of the proposed pit and the tailings extend to the south, while the G&K Gold Co. stamp mill was located near the southwest limit of the pit and the tailings from this stamp mill extend to the Moose River. The DDV Gold Ltd. historic mine tailings assessment report is presented at Appendix I.

During the process of evaluating the potential impacts of the Touquoy Gold Project, this study was implemented to review the information on the historic mine tailings and to propose a management plan for the tailings within and out side of the open pit area.

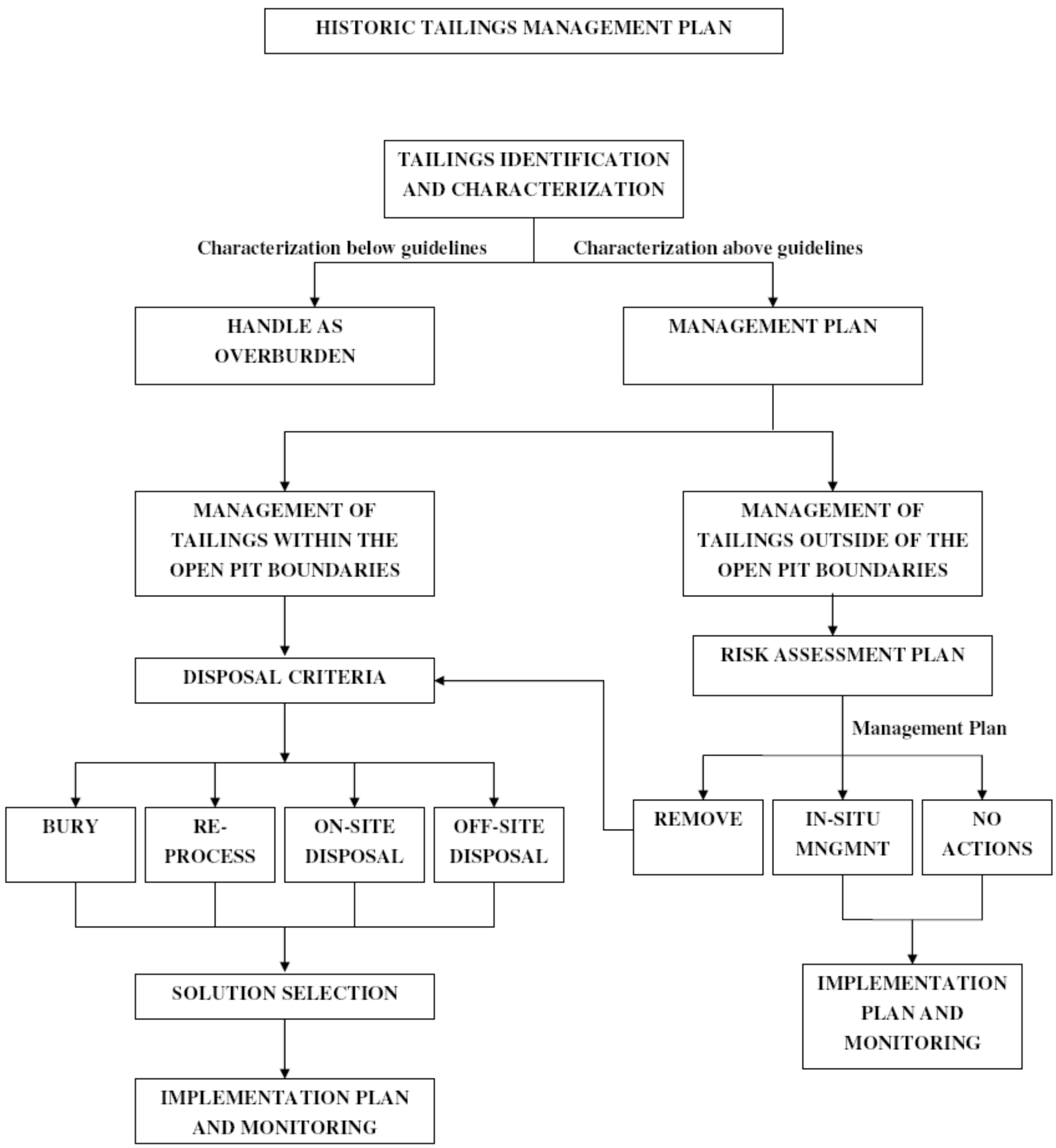
1.2 Management Plan Objectives

Figure 1 illustrates the methodology to be followed for the Historic Tailings Management Plan. This plan contains two main elements, the disposal management plan for the historic tailings located within the boundaries of the proposed open pit or in areas that new infrastructure will occur; and the historic tailings on site that will not be disturbed during mining operations.

The assessment will be based in local regulations for tailings and contaminated soil disposal and/or treatment.

Figure 1.

HISTORIC TAILINGS MANAGEMENT
TOUQUOY GOLD PROJECT



2.0 HISTORIC TAILINGS IDENTIFICATION AND CHARACTERIZATION

DDV Gold performed a tailings identification and characterization program. This section will provide an overview of the results obtained by DDV Gold as well as the program for a detailed characterization of the historic tailings and surrounding areas.

2.1 Historic Tailings Identification and Characterization (DDV Gold)

DDV personnel defined the distribution, thickness and known characteristics of the tailings by digging a number of holes with a trenching spade within the area. Some tailings samples were obtained for mercury analysis as indicated in Table 1 of Appendix I.

2.1.1 Moose River Gold Mines Stamp Mill Tailings

The Moose River Gold Mines stamp mill tailings extend from the stamp mill location, within the southeast boundary of the proposed open-pit, to the south, as shown in Figure 1 in Appendix II), covering an area approximately 3,000 m^2 with an average thickness of 0.2 to 0.3 m. This represents a volume of 600 to 900 m^3, which is equivalent to approximately 800 to 1,200 metric tonnes.

2.1.2 G&K Stamp Mill Tailings

The G&K stamp mill was located on the southwest side of the proposed open pit and the tailings area extends to the south west in a low lying swampy area on the west side of the Moose River Gold Mines provincial Park access road that goes from the stamp mill to Moose river. The drainage ditch dug on the west side of the road is likely to have directed part of the tailings to Moose River.

The historic tailings cover an estimated area of 6300 m^2 with thicknesses ranging from 0.3 to 0.4 m. This represents a volume between 1900 to 2500 m^3, equivalent to 2450 to 3350 metric tonnes.

2.1.3 Chemical Characterization

At this time, DDV Gold performed chemical analysis on some tailings samples obtained in both stamp mill tailings areas as well as the Touquoy stamp mill located directly on the bank of the Moose River to the southwest.

Samples form three stamp mills have been sent for testing providing mercury concentrations ranging from 4.36 ppm (G&K Co. sample no. MRT-07-06) to 60.2 ppm (G&K Co. sample no. MRT-07-05). Table no. 2 (section 3.2.1) provides the Canadian Council of Ministers of the Environment (CCME) guidelines for industrial land use.

Table 1 provides the chemical characteristics and its comparison with CCME guidelines of the historic tailings samples obtained by DDV gold.

Table No. 1
The Solution Selection Table

		CEQG-Soil[1]		MRT- 07 Samples concentration							
		Industrial	Commercial								
Elements	**Units**	**Soil**	**Soil**	**01**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Available Aluminum (Al)	mg/kg	-	-	1.49	2.11	1.37	1.6	1.07	2.13	2.05	1.16
Available Antimony (Sb)	mg/kg	40	40								
Available Arsenic (As)	mg/kg	12	12	866	895	637	9650	>10000	3260	5740	>10000
Available Barium (Ba)	mg/kg	2000	2000	30	50	40	20	10	40	30	90
Available Beryllium (Be)	mg/kg	8	8								
Available Boron (B)	mg/kg	-	-	<10	<10	<10	<10	<10	<10	<10	<10
Available Cadmium (Cd)	mg/kg	22	22	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Available Chromium (Cr)	mg/kg	87	87	15	22	14	17	12	23	28	10
Available Cobalt (Co)	mg/kg	300	300	15	15	14	9	6	10	10	154
Available Copper (Cu)	mg/kg	91	91	80	60	46	18	14	58	267	113
Available Lead (Pb)	mg/kg	600	260	17	29	37	297	44	29	34	43
Available Molybdenum (Mo)	mg/kg	40	40	<1	<1	<1	<1	<1	<1	<1	<1
Available Nickel (Ni)	mg/kg	50	50	33	28	24	24	22	25	19	108
Available Silver (Ag)	mg/kg	40	40	<0.2	<0.2	0.3	0.9	0.5	0.2	<0.2	0.5
Available Thallium (Tl)	mg/kg	1	1	<10	<10	<10	<10	<10	<10	<10	<10
Available Vanadium (V)	mg/kg	130	130	11	16	10	13	12	16	14	12
Available Zinc (Zn)	mg/kg	360	360	66	87	60	81	57	98	80	149
Mercury	mg/kg	50	24	5.1	7.03	6.4	60.2	9.38	4.36	16.9	3.85

2.2 Historic Tailings Identification and Characterization Program

In addition to the current tailings identification and characterization study, a series of monitoring wells should be drilled through the historic tailings to obtain soil and water samples which should be tested for metals in order to define metals concentrations in groundwater and soil underlying historic tailings.

2.3 Contaminated Material Guidelines for Characterization

To define the potential level of contaminations in tailings and soil, all samples should be analysed for metals content including mercury. All results should be compared to the CCME soil quality guidelines for commercial and industrial waste. Material above guidelines should be treated as contaminated material.

3.0 MANAGEMENT PLAN

As previously described in 1.2, a portion of the historic tailings will be disturbed or removed during the excavation of the open pit. Various management options are available for the disposal of those tailings and selection criteria must be set in order to evaluate these options. In the same way, historic tailings that are not removed or disturbed should be evaluated to define if action is required.

3.1 Management of Tailings Within the Open Pit Boundaries

3.1.1 Disposal Criteria

Disposal criteria were selected to address the various constraints that may affect the choice of a disposal option. The following criteria were retained:

- Risks :

  The risk criteria were assessed for potential occurrences based on the basic properties of the contaminant (mercury), natural phenomena involved (erosion, leaching, etc.), recognized toxicity and regulatory content limitation of the contaminant. No formal risk assessment study was carried out in this case however, it is understood that the disposal solution should minimize these risks:

- Contaminants remobilization;
- Short or long term environmental impact ;
- Short or long term impact on human health;

- Technical feasibility :

  The technical feasibility criteria evaluates if the disposal option are practical and based on a technology or methodology that is locally available and applicable in the prevailing conditions at the mine site.

- Cost :

  If acceptable with respect to the other criteria, the lowest cost solution will be the most attractive. Cost effectiveness is directly linked to the mine's profit-earning capacity and must be respected.

- Future liability and permanent solution :

  The selected excavated tailings management solution should be a final solution to avoid future liability and leave no ongoing management legacy to future property owners.

3.1.2 Disposal Options

Four options are considered available and should therefore be analysed with respect to the proposed remediation criteria. These options are listed below and described in the following sections.

- Remove and bury;
- Re-process;
- On-site containment;
- Off-site disposal.

3.1.2.1 Bury

The remove and bury option is a simple solution. The excavated tailings would be transported and dumped in the waste rock pile where 5000 additional tonnes would pose no management constraint. In this case, no particular impoundment, protection or future follow-up is proposed. Some disadvantages to burying the excavated tailings are as follows:

- Contaminates remobilization
- Possible exposure to humans and environment would create the requirement of future management.

3.1.2.2 Re-process

Re-processing of modern and historic tailings is general considered to be problematic and not recommended for several reasons. The primary economic reason is that organics are contained in the tailings from tree roots, leaves, vegetation that all contain carbon that interferes with the CIL Process. So in cases where the tailings do have economic grades of gold the costs associated with "tuning" the mill for the relatively small volume of tailings generally makes this an un-economic venture. On the environmental side, the re-processing of tailings where the metals have acclimated to being in the environment often results in new forms of the metals being created. These new forms (oxides, sulphides, etc.) can be problematic in the TMF and in effluent quality. Mills are designed for the ore specific to the deposit and are therefore not easily adjusted for changing inputs.

3.1.2.3 On-site Containment

On-site containment of the excavated tailings would be carried out by disposing of the tailings in the containment cells used to store the arsenic-rich sludge from effluent treatment of the new mill. The proposed cells will be designed, earthquake resistant structures, constructed of waste rock for geomechanical strength, lined with clay to prevent exfiltration.

3.1.2.4 Off-Site Disposal

Off-site disposal of the excavated tailings would require transportation to an authorized disposal facility. No facilities in Nova Scotia or New Brunswick will currently accept mercury contaminated soils. The nearest authorised sites are located in the province of Québec, some examples would be Horizon Environnement in Grandes-Piles, Parc environnemental AES in Larouche or Cintec in LaSalle. The distance to these sites from Moose River is over 1 100 km. The maximum concentration of mercury in soils accepted at these facilities is limited to 50 ppm, which is below some results obtained from the historic tailings assessment assays.

3.1.3 Solution Selection

Each of the remediation options were analysed for the remediation criteria presented in section 3.1.2. The "Solution Selection Table" in Table 1 summarises the evaluation carried out and shows the options that clearly do not meet one or more criteria, or have a potential constraint.

The option of On-Site containment of the excavated historic tailings shows the least constraints with respect to the defined criteria and is thus recommended for the management of the excavated/disturbed tailings.

Table No. 1
Historic Tailings Disposal Options

Disposal Options	Risk			Technical feasibility	Cost	Future liability	Solution permanence
	Contaminant remobilisation	Short term or long term environmental impact	Short term or long term impact on human health				
1. Leave in place	Potential from erosion to the river	Potential from long term contaminant leaching in river	Potential from water use downstream (drinking, swimming)	Impossible in pit area Suitable along river to minimise contaminant release in the river.	Minimal at start-up. Could increase in case of future liability.	Potential if change in legislation or lawsuit for mismanagement, etc.	Ongoing legacy of known contamination case.
2. Remove and bury	Potential from exposure to air and water.						
3. Re-process	Unlikely except from excavation at river's edge.	Possible methyl-mercury byproduct toxic to living organism.	Possible methyl-mercury byproduct toxic to living organism.				
4. On-site containment	Unlikely except from excavation at river's edge.						
5. Off-site disposal	Unlikely except from excavation at river's edge.	Medium risk from dumping in case of accident. Important atmospheric release from transportation			High cost for disposal (over 200 $/T.M.) and transportation (approx. 200 $/T.M.)		

3.1.4 Implementation Plan and Monitoring

The following sections present the various steps required to carry out and manage the implementation of the proposed solution. The excavation of the tailings and the disposal in the plant's sludge containment cells will follow a detailed procedure to minimize environmental impacts in an efficient manner.

3.1.4.1 Detailed Mapping and Characterization

A detailed mapping and characterization of both tailings areas will be needed to complete the data from the historic tailings assessment. Sampling will be concentrated to define the limits of the tailings areas but will also be located to refine the information throughout the areas, with special attention to the river's edge tailings configuration. Sampling will also enable us to assess the quality of the underlying soils.

In addition to the tailings identification and characterization, we suggest drilling a series of monitoring wells to an approximate depth of 6 m or 1.5m into bedrock. Soil and water samples should be tested for metals in order to define metals concentrations in groundwater and soil underlying historic tailings.

The various layers encountered in the samplings will be described and sampled for further analysis. Soil and water conditions will also be noted to assess traffic options for heavy machinery. Selected samples will be submitted to various analyses for the determination of mercury and arsenic content, pH, grain size and water content.

Results from the characterization will be used to prepare the excavation plan, including depth and extent of excavation, type of machinery, etc.

3.1.4.2 Logging

The tailings areas abandoned after the stamp mills closure are now covered with shrubs and trees (spruce, aspen, birch, tamarack, etc). Logging of the trees and slashing of the shrubs in these areas will be required before excavating and shall be contracted locally.

Logging should be limited, it is important not to remove tree stumps and/or strip the organic surface layer. The organic layer is very thin so the stripping would carry tailings that would be hauled with the plant roots. All material in the organic layer should be removed and transported to the containment cells with the tailings.

3.1.4.3 Excavation and Disposal

Excavation, transportation and disposal will be carried out using mine equipment. The exact procedure will be determined depending on available machinery and site conditions.

Tailings can be excavated to the required depth with a dozer and stockpiled for further loading in the dump trucks or loaded directly in the trucks as it is excavated with a hydraulic shovel in which case the excavator's bucket will be fitted with a smooth blade to avoid scarifying contaminated tailings into the underlying clean soil. If tailings are stockpiled on site for further loading a mitigation procedure will be necessary to prevent mobilization of tailings in stockpiles. Temporary drainage will be implemented to redirect runoff water away from the excavation zone to minimize contaminant remobilization during excavation.

Dumping in the containment cells will be carried out following the mine's engineering personnel instructions to avoid damaging cell membranes and ensure ease of future operations.

After excavation and transportation are completed, the haul road will be graded to recuperate tailings spread by the dump truck tire treads and avoid leaching of the contaminants from the road surface to the drainage network.

3.1.4.4 Transition Areas Management, Sloping and Re-vegetation

Tailings located adjacent to the open pit should also be removed and disposed of accordingly. After excavation the excavated area should be sloped and re-vegetated to avoid mobilization of tailings into or away from the open pit.

3.1.4.5 Technical Supervision, Monitoring and Reporting

Excavation, transportation and disposal of the tailings will require full time supervision by a qualified technician. Excavation depth will be monitored and control sampling will be carried out to guarantee that restoration goals are achieved according to the proposed restoration plan.

Regular sampling of runoff water, Moose River water and south-east creek water downstream of the tailings during the excavation work will be carried out to monitor water quality with respect to the applicable criteria.

A technical report will be prepared upon completion of the work and will present the chronology of the work carried out, analysis results on the quality of the soils left in place, water quality monitoring results and the final quantities of tailings excavated.

3.2 Management of Tailings Outside of the Open Pit Boundaries

3.2.1 Risk Assessment

The management of Historic Tailings and impacted soil outside of the open pit boundaries that won't be disturbed or excavated will be based on the risks associated with its characteristics, site use and users. In order for there to be risk there needs to be a contaminant, a pathway and a receptor. For example if you have a contaminant (lead in soil) that is immobile (contained in a concrete slab) and no receptor (no site users) there is no risk to leaving that contaminant in place. The tailings management plan will use risk assessment as a tool to determine the management options for the Touquoy Project where identified tailings are outside of the pit boundaries. Additional characterization beyond what is required to determine if the soil is above or below guidelines is needed for input data for the risk assessment. The extent of horizontal and vertical impact on the soil due to the tailings is not known at this point. An investigation program will be completed to drill a series of boreholes and install groundwater monitoring wells. Bedrock is anticipated at shallow depths in the vicinity of the historic tailings, boreholes should be advanced approximately 2-4 m through overburden and bedrock should be cored for approximately 1 m. It is also recommended to sample surface water in the nearby Moose River. The required site specific data that is as follows:

Groundwater metals analysis (including mercury)
Surface water metals analysis (including mercury)

Sediment metals analysis (including mercury)
Soil metals analysis (including mercury)
Soil leachate testing for lead and mercury.
Soil PAH testing

From the input data models are used to determine the risk associated with the contaminants of concern at a site and Site Specific Target Levels (SSTL's) will be calculated. Where the SSTL's are above the values found on the site, the material would typically be left in place with restrictions on site use and uses for the adjacent lands such as restricting surface water flow, erosion, mass removal of materials that could alter surface water and groundwater movements, etc. Where the SSTL's are below the values found on the site, the materials would be managed as if they were above CCME guidelines as outlined on Table No. 2.

As noted above a risk assessment must make a number of assumptions and restrictions on a site for the SSTL have to be valid. Many of these restrictions would create more risk than removal to the TMF. Of these typical restrictions there are several to note that could be problematic for the Touquoy site such as groundwater and surface water flow directions, vegetative cover and proximity to watercourses. If the historic tailings were left in place some of the planned drainage and sedimentation and erosion control measures would be affected to prevent surface water and groundwater movements towards, from or near historic tailings. This would be to the detriment of protecting Moose River, tributaries and localized wetland systems. Changes to vegetative cover in close proximity to the historic tailings and surface water and groundwater movement changes could also occur as a result of third party activities (forestry, road building) that DDVG could not control creating harm if the historic tailings are left in place. Several of the areas where historic tailings are located are also in areas where re-mobilization and movement of the materials could occur, particularly those close to the Moose River. In summary, we feel the risk associated with leaving the materials in place is greater than having the historic tailings in the TMF.

Table No. 2
Applicable CCME Guidelines

		CEQG-Soil[1]			CEQG-Sediment[2]
		Industrial	Commercial	Residential/Parkland	Freshwater
Elements	**Units**	**Soil**	**Soil**	**Soil**	**Sediment**
Available Aluminum (Al)	mg/kg	-	-	-	-
Available Antimony (Sb)	mg/kg	40	40	20	-
Available Arsenic (As)	mg/kg	12	12	12	5.9
Available Barium (Ba)	mg/kg	2000	2000	500	-
Available Beryllium (Be)	mg/kg	8	8	4	-
					-
Available Boron (B)	mg/kg	-	-	-	-
Available Cadmium (Cd)	mg/kg	22	22	10	0.6
Available Chromium (Cr)	mg/kg	87	87	64	37.3
Available Cobalt (Co)	mg/kg	300	300	50	-
Available Copper (Cu)	mg/kg	91	91	63	35.7
Available Iron (Fe)	mg/kg	-	-	-	-
Available Lead (Pb)	mg/kg	600	260	140	35
Available Manganese (Mn)	mg/kg	-	-	-	-
Available Molybdenum (Mo)	mg/kg	40	40	10	-
Available Nickel (Ni)	mg/kg	50	50	50	-
Available Selenium (Se)	mg/kg	3.9	3.9	1	-
Available Silver (Ag)	mg/kg	40	40	20	-
Available Strontium (Sr)	mg/kg	-	-	-	-
Available Thallium (Tl)	mg/kg	1	1	1	-
Available Uranium (U)	mg/kg	-	-	-	-
Available Vanadium (V)	mg/kg	130	130	130	-
Available Zinc (Zn)	mg/kg	360	360	200	123
Mercury	mg/kg	50	24	6.6	0.17

Elements	Units	CEQG-Water[3] Freshwater Surface Water	Drinking Water[4] MAC	AO
Dissolved Aluminum (Al)	µg/L	5-100[5]	-	100/200
Dissolved Antimony (Sb)	µg/L	-	6	-
Dissolved Arsenic (As)	µg/L	5	10	-
Dissolved Barium (Ba)	µg/L	-	1000	-
Dissolved Beryllium (Be)	µg/L	-	-	-
Dissolved Bismuth (Bi)	µg/L	-	-	-
Dissolved Boron (B)	µg/L	-	5000	-
Dissolved Cadmium (Cd)	µg/L	0.0017	5	-
Dissolved Chromium (Cr)	µg/L	8.9	50	-
Dissolved Cobalt (Co)	µg/L	-	-	-
Dissolved Copper (Cu)	µg/L	2-4[6]	-	≤ 1000
Dissolved Iron (Fe)	µg/L	300	-	≤ 300
Dissolved Lead (Pb)	µg/L	1-7[7]	10	-
Dissolved Manganese (Mn)	µg/L	-	-	≤50
Dissolved Molybdenum (Mo)	µg/L	73	-	-
Dissolved Nickel (Ni)	µg/L	25-150[8]	-	-
Dissolved Selenium (Se)	µg/L	1	10	-
Dissolved Silver (Ag)	µg/L	0.1	-	-
Dissolved Strontium (Sr)	µg/L	-	-	-
Dissolved Thallium (Tl)	µg/L	0.8	-	-
Dissolved Uranium (U)	µg/L	-	20	-
Dissolved Vanadium (V)	µg/L	-	-	-
Dissolved Zinc (Zn)	µg/L	30	-	≤ 5000
Mercury	µg/L	26	1	

Notes:

- \- No applicable guideline
- MAC Maximum Acceptable Concentrations
- AO Aesthetic Objectives
- 1 Canadian Environmental Quality Guidelines: Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health (Update 6.0.2, November 2006)
- 2 Canadian Environmental Quality Guidelines: Canadian Sediment Quality Guidelines for the Protection of Aquatic Life (Update 2002)
- 3 Canadian Environmental Quality Guidelines: Canadian Water Quality Guidelines for the Protection of Aquatic Life (Update 6.0.1, December 2006
- 4 Guidelines for Canadian Drinking Water Quality (March 2007)
- 5 5µg/L at pH<6.5; 100µg/L at pH≥ 6.5
- 6 2 µg/L at [$CaCO_3$] = 0-120 mg/L ; 3 µg/L at [CaCO3] = 120-180 mg/L ; 2 µg/L at [CaCO3] = ≥ 180 mg/L;
- 7 No fact sheet created
- 8 25 µg/L at [$CaCO_3$] = 0-60 mg/L ; 65 µg/L at [CaCO3] = 60-120 mg/L ; 110 µg/L at [CaCO3] = 120-180 mg/L ; 150 µg/L at [CaCO3] = ≥ 180 mg/L;

3.2.2 Management Techniques

After completing the sampling and monitoring program, the assessment will analyze the following options:

- No Actions

  The tailings that will not be disturbed with mining operations do not possess a risk to humans or the environment.

- In-Situ Management

  It is not required to remove the tailings and contaminated material. However, an in-situ treatment is required and will be defined and supervised by Inspec-Sol personnel.

- Removal

  The tailings should be removed and disposed. Disposal criteria and options should be decided according to the specific tailings characterization.

3.2.3 Implementation and Monitoring

With risk assessments, the regulators typically take the approach that the results are a suggestion that the risk is acceptable. The vast majority of sites being managed using risk assessment have a monitoring component to assess changes in values used in the risk assessment, for example the groundwater chemistry, water level values, etc. The site management process is regulated by the Province of Nova Scotia via the Nova Scotia Department of Environment and Labour. A copy of the Guidelines for Management of Contaminated Sites is provided in Appendix II for reference.

A program adapted to the risk assessment study conclusions will be recommended after the study is completed.

We trust that this report meets with your present requirements. Please do not hesitate to contact us should any questions arise.

REGISTERED PROFESSIONAL ENGINEER
DATE Nov 1, 07
G. CARDENAS GUTIERREZ
8150
PROVINCE OF NOVA SCOTIA

Denis Theriault	Gerardo Cardenas Gutierrez, P. Eng., M.A.Sc.
Environmental Division	Project Manager

A P P E N D I X I

Moose River Historic Mine Tails. DDV Gold
Historic Tailings Metals Scan Results

Touquoy Gold Project
Assessment of Historic Mine Tailings

Introduction

Six historic mining stamp mills have been identified within the Moose River area dating from 1882 up till the last recorded production in 1925. Records are sparse for the period but it is known that three of those stamp mills were sited along the banks of Moose River itself and two stamp mills were established close to mining activities, within the limits of the current settlement. The location of the sixth stamp mill, the Reynolds Mill, has not been determined.

The location and distribution of tails from each of the sites is discussed and details of mercury sampling provided.

Stamp Mill Locations

The positions of five stamp mills are shown in Figure 1. Three stamp mills can be identified, and two others tentatively identified, in a photograph (Figure 2) that is dated at some time around 1904 when five of the six mills were standing at the same time.

Moose River Gold Mines Stamp Mill (1882 – 1907?)

This mill did not discharge tails directly into the Moose River. The foundations remain for the 20-stamp battery and a linear drain defines the northeastern margin to the tailing storage. It appears that the tails have been piped or drained along this margin past a rock waste dump before discharging in a fan like manner (Figure 3). The southern end of the tails storage coincides with the headwaters of a small stream draining to the south that has been tested via stream sediment sample site SED 3 (Figure 1). This sample site returned a mercury concentration of 0.44ppm, which is in excess of the Interim Sediment Quality Guideline (ISQG) and can attributed to derivation from the Moose River Gold Mines Stamp Mill tailings.

The tailings are sandy and of quite consistent grain size, typically mottled brown and grey and in places preserve distinct stratification. They overlie grey clays or soils developed on the underlying bouldery- tills. In places a silt layer up to 10cm thick has been deposited on top of the sandy tailings.

The distribution of the tailings was defined by digging a number of holes with a trenching spade. Tailing thicknesses are shown in Figure 3.

Three of the holes were sampled for mercury analyses. Several photos showing the relief at this location and profiles for the sample sites are appended to this report.

The area of tails shown in figure 3 is approximately 3000m^2. If an average thickness of tailings of between 0.2m and 0.3m is used, then approximately

600m^3 to 900m^3 of tailings, equivalent to 800 to 1200 tonnes, remain at this site.

G & K Stamp Mill (1904-1915?)

Concrete foundations remain for this 40-stamp battery, which is sited next to the Roothog workings. The area has been disturbed in recent years with infilling of old shafts and construction of access into the Moose River Gold Mines Provincial Park. Tailings have accumulated in what is now a low lying swampy area on the east side of the raised park access road and are represented in hummocky, much disturbed ground on the west side of the access road. It seems likely that drains dug on the west side of the park road would originally have been connected to the swamp area and would have directed a proportion of the tailings into Moose River.

The stamp mill is particularly prominent in figure 2. Several wet areas can be seen in the photograph, beneath and beside a large diameter pipe running between the mill and the Moose River. These are confined within the area of tailings shown in figure 4.

Four samples were taken for mercury analyses. Profiles for the sample sites are shown in photographs appended to this report and the thickness of tailings at each of the sample sites is shown in figure 4.

The tailing impoundment area that is shown in Figure 4 covers 6300m^2. It is possibly exaggerated but with an average thickness of 0.3m to 0.4m, the area would represent between 1900m^3 and 2500m^3, or between 2450 tonnes and 3350 tonnes of tailings.

Touquoy Stamp Mill (1888-1925)

The Touquoy Stamp Mill started production in 1888 and was the longest running stamp mill at Moose River Gold Mines. It consisted of 15 stamps and was located on the bank of the Moose River in the position shown in Figure 1. Several former and current Moose River residents remember playing in the disused mill during their childhoods in the 1940s and 1950s.

The Touquoy Stamp Mill is difficult to confidently identify in Figure 2 despite being the longest standing stamp mill and being centrally located on the bank of Moose River. A building that may represent the mill is labelled in the figure.

There was an attempt to restart mining operations at Moose River in 1936 but this was abandoned following the collapse of the Reynolds Shaft. And there were plans at that time to rebuild and restart the Touquoy Stamp Mill. However, no actual gold production was recorded and the last mention of gold production was for 1924-1925.

The mill was water driven and wooden remnants of the flume from a dam on Moose River can still be found. However, the actual mill site has been buried beneath a large pile of waste rock pushed up to the riverbank during road building activities and during levelling of the Moose River Gold Mines Provincial Park. A local resident (Mr Darrell Hilchey) who remembers the last stamp mill as a child has identified yellow brown stained water in a drain leading into Moose River as linking directly to the old mill site and a sample representing a tailing thickness of 0.3m was taken from the bank of the drain for mercury analysis (Sample MRT-07-008; 3.85ppm Hg). Another former resident (Mr Gilbert Fahie) recalls large piles of yellow tailings forming a sandbar at the local swimming spot, which is still a popular swimming spot and is adjacent to the former mill site. Residents, including Mr Hilchie, suggest that sandbars formed from the old tails still exist in Moose River, well downstream of the settlement.

A stream sediment sample (SED 2) was taken from Moose River, approximately 70m downstream from the Touquoy Stamp Mill site and very close to a drain linking G&K Gold Co. tailings to the river (Figure 1). This sample returned 0.52ppm Hg, exceeding both the Interim Sediment Quality Guideline (ISQG) and Probable Effect Level (PEL) guideline for sediment quality.

Most of the tailings would have been discharged directly into the Moose River and only a very small volume of tailings will be contained beneath the waste rock.

A photograph, looking southeast from the bank of the Moose River at the now buried mill site is appended. It provides some idea of the relatively recent disturbance of the old mining areas due to sourcing of road base from old waste dumps and to levelling of the provincial park site.

Colonial Mining Company Stamp Mill (1898-1899)

The concrete foundations to the 10-stamp mill shown can be found within 10m of the current bridge crossing Moose River, near the provincial park. The mill started processing ore in 1898 but was apparently destroyed by fire in 1899. A large building can be seen in Figure 2 at the site of the mill. This is of a size typical of a stamp mill and perhaps the mill was rebuilt after the fire.

The foundations are very close to the riverbank. No tailings remain in that area and presumably mine tailings were discharged directly into the river.

McGregor Stamp Mill (1887-1908?)

The foundations for this stamp mill have not been located but the position of the mill is shown in an 1898 plan of the area produced by Faribault for the Geological Survey of Canada. A stamp mill clearly visible in the left hand portion of the figure 2 photograph will be either the McGregor Stamp Mill or the Reynolds Stamp Mill but local residents do not remember seeing any remnants of either mill site.

The McGregor Stamp Mill was water driven and was sited on the bank of the Moose River. Tailings will have been discharged into the river.

Reynolds Stamp Mill (1899-1904)

This stamp mill comprised eight stamps and only operated for a short period. No remnants have been located after extensive searching and local and past residents who have been questioned do not recall ever seeing evidence for this stamp mill. It may be the stamp mill shown in the left hand portion of Figure 2.

Mercury Sampling and Results

A total of eight samples were taken; three represent tailings from the Moose River Gold Mines Stamp Mill, four represent the G&K Stamp Mill tailings and one represents the very limited exposure (and volume) of tailings from the Touquoy Stamp Mill. Assay results are shown in the following table and the original assay report is appended.

Table 1
Mercury Analyses of Historic Tailings at Moose River GoldMines

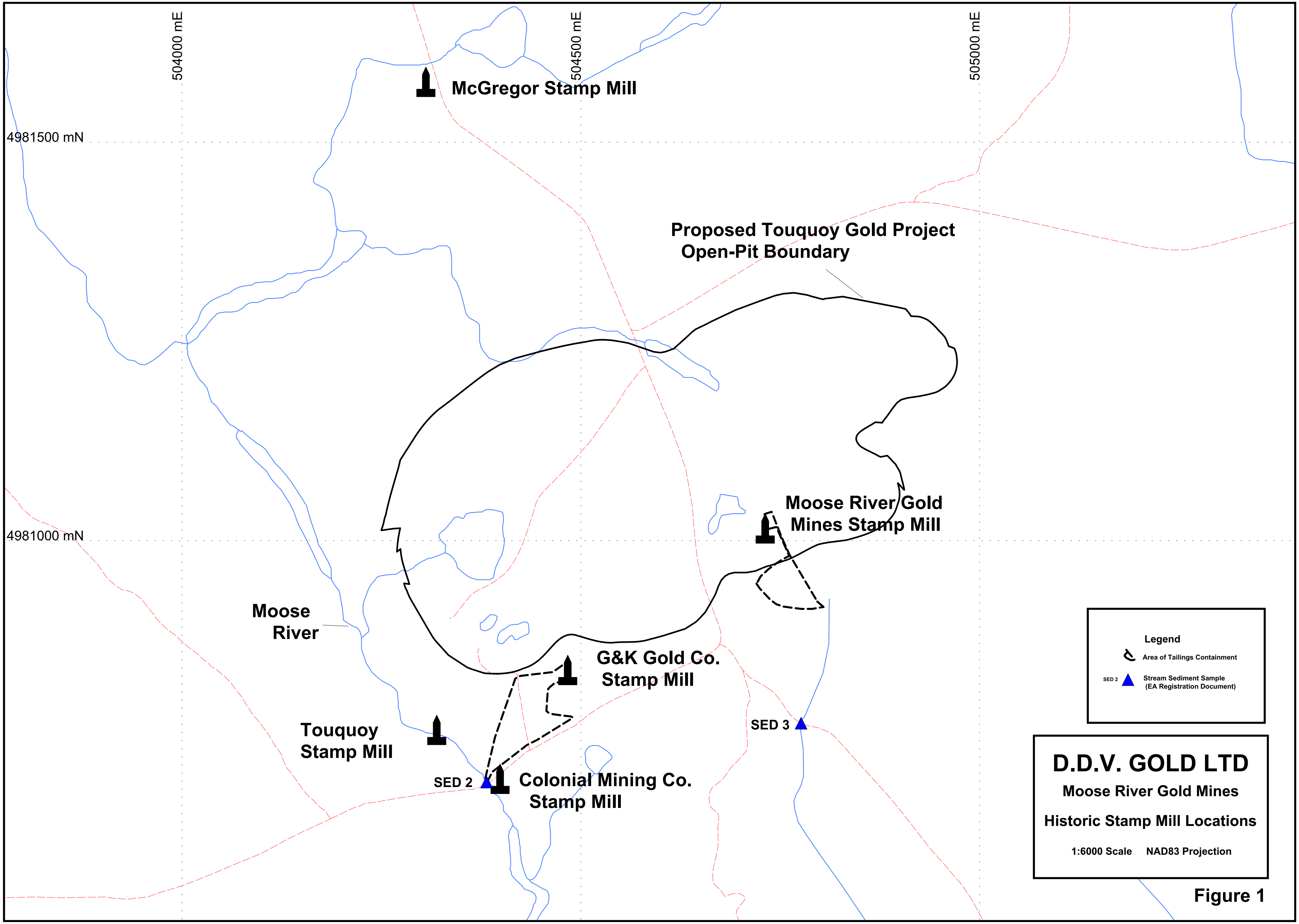
Stamp Mill	Easting (NAD83)	Northing (NAD83)	Sample No.	Hg (ppm)
Moose River Gold Mines	504735	4981025	MRT-07-01	5.1
	504773	4980960	MRT-07-02	7.03
	504759	4980952	MRT-07-03	6.4
G&K Gold Co.	504462	4980831	MRT-07-04	60.2
	504451	4980806	MRT-07-05	9.38
	504438	4980775	MRT-07-06	4.36
	504421	4980754	MRT-07-07	16.9
Touquoy	504349	4980763	MRT-07-08	3.85

Conclusions

The locations of five of the six stamp mills that operated at Moose River Gold Mines have been identified. Three of those mills discharged tailings directly into the Moose River and the remaining tailings have been located for two others.

The Reynolds Mill, which operated between 1899 and 1904, has not been located. After a rigorous search, it is unlikely that any tailings from the Reynolds Mill will occur within the proposed limits of the Touquoy open-pit.

A proportion of the Moose River Gold Mines tails fall within or close to the proposed open pit boundary, as do some of the G&K Gold Co. tailings. Samples from these remaining tails have returned high levels of mercury to a maximum of 60.2ppm. Mercury in the tails has been feeding into Moose River via existing drainage with stream sediment samples at several downstream locations returning high mercury levels.


504000 mE
504500 mE
505000 mE
4981500 mN
4981000 mN
McGregor Stamp Mill
Proposed Touquoy Gold Project
Open-Pit Boundary
Moose River Gold
Mines Stamp Mill
Moose
River
G&K Gold Co.
Stamp Mill
Touquoy
Stamp Mill
SED 2
Colonial Mining Co.
Stamp Mill
SED 3
Legend
Area of Tailings Containment
SED 2
Stream Sediment Sample
(EA Registration Document)
D.D.V. GOLD LTD
Moose River Gold Mines
Historic Stamp Mill Locations
1:6000 Scale
NAD83 Projection
Figure 1

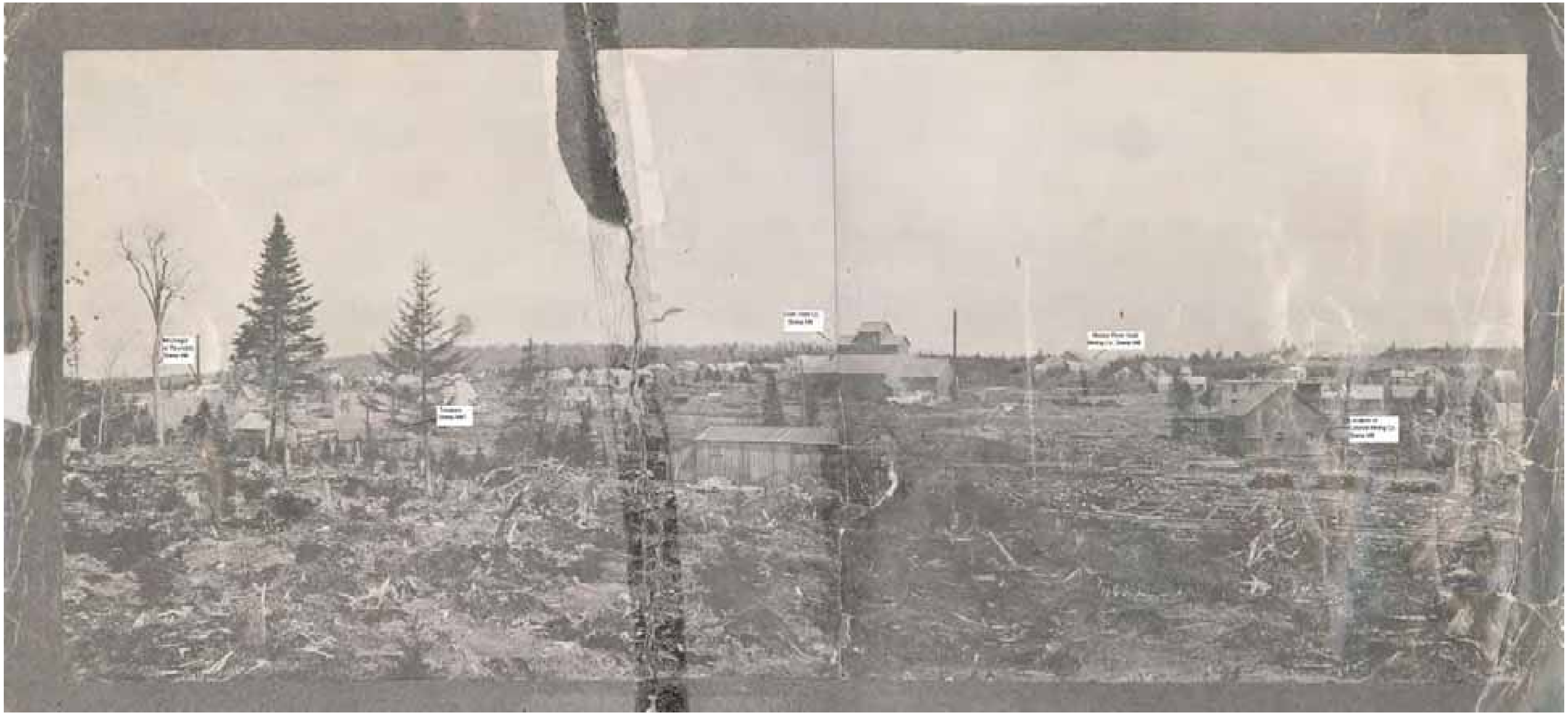


Figure 2 – Moose River Gold Mines
(looking east from the west bank of the Moose River)

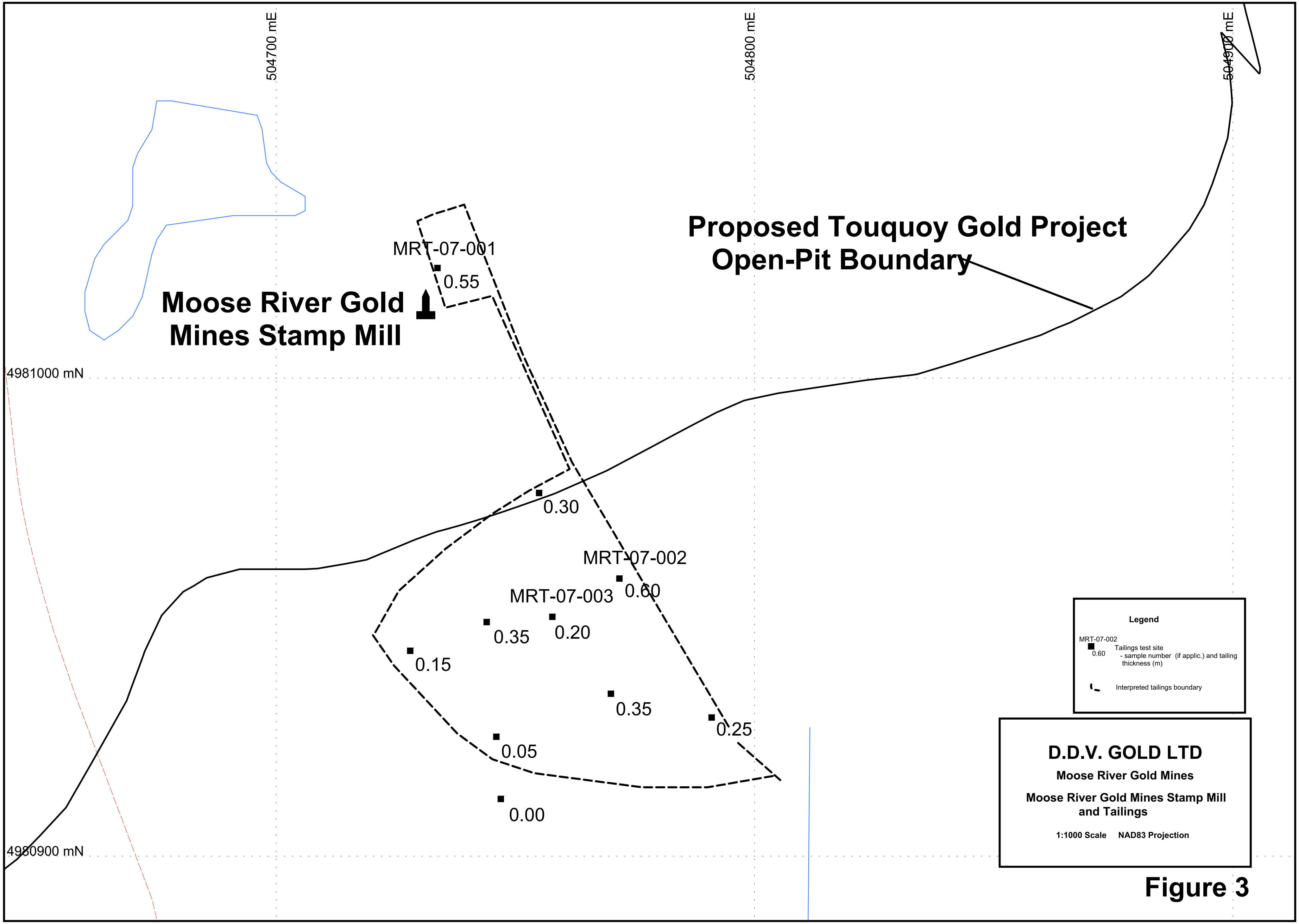

504700 mE
504800 mE
504900 mE
4981000 mN
4980900 mN
Proposed Touquoy Gold Project
Open-Pit Boundary
Moose River Gold
Mines Stamp Mill
MRT-07-001
0.55
0.30
MRT-07-002
0.60
MRT-07-003
0.20
0.35
0.15
0.35
0.25
0.05
0.00
Legend
MRT-07-002
0.60
Tailings test site
- sample number (if applic.) and tailing thickness (m)
Interpreted tailings boundary
D.D.V. GOLD LTD
Moose River Gold Mines
Moose River Gold Mines Stamp Mill
and Tailings
1:1000 Scale
NAD83 Projection

Figure 3

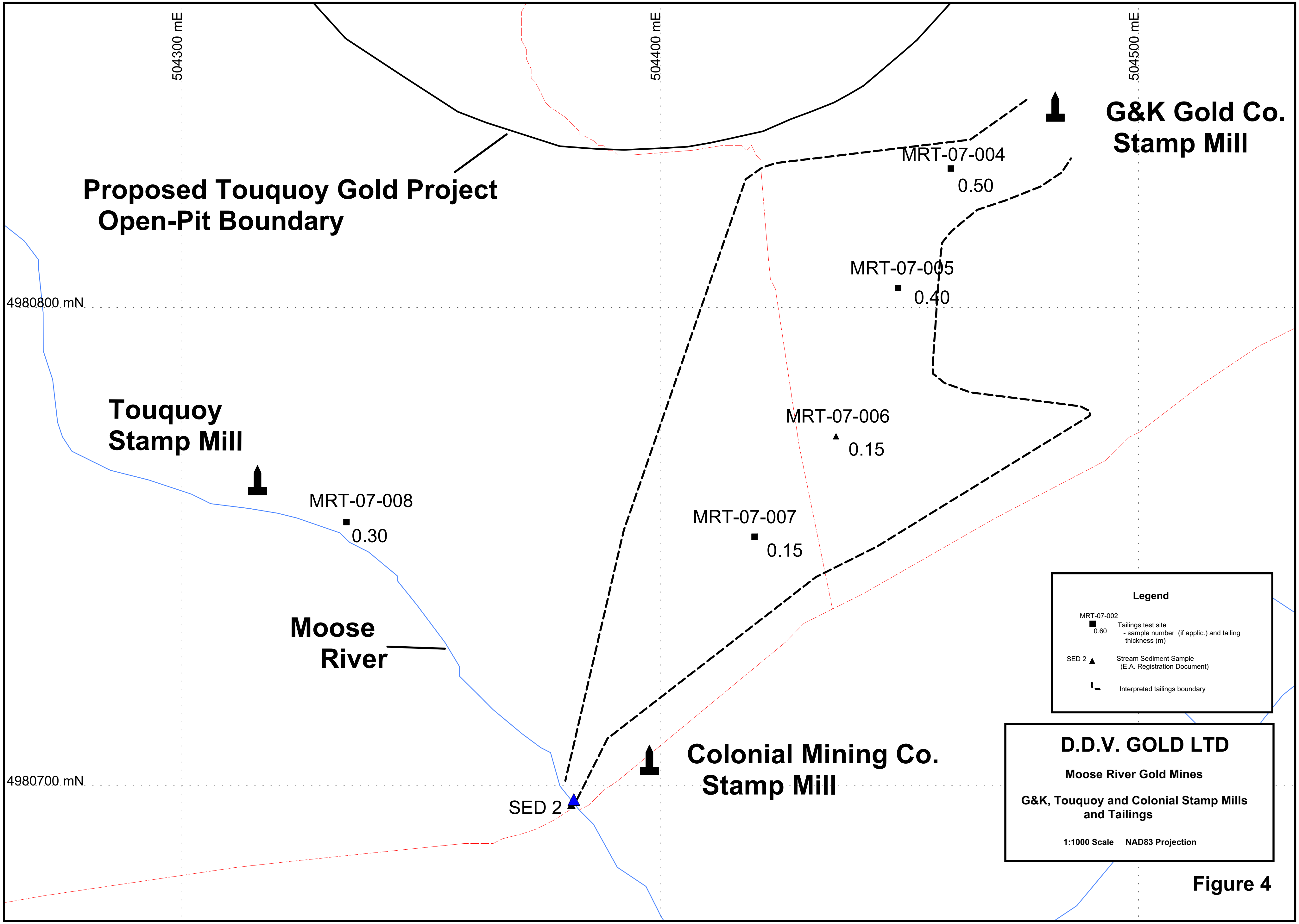

504300 mE
504400 mE
504500 mE
4980800 mN
4980700 mN
G&K Gold Co.
Stamp Mill
Proposed Touquoy Gold Project
Open-Pit Boundary
MRT-07-004
0.50
MRT-07-005
0.40
MRT-07-006
0.15
MRT-07-007
0.15
MRT-07-008
0.30
Touquoy
Stamp Mill
Moose
River
SED 2
Colonial Mining Co.
Stamp Mill
Legend
MRT-07-002
0.60
Tailings test site
- sample number (if applic.) and tailing thickness (m)
SED 2
Stream Sediment Sample
(E.A. Registration Document)
Interpreted tailings boundary
D.D.V. GOLD LTD
Moose River Gold Mines
G&K, Touquoy and Colonial Stamp Mills and Tailings
1:1000 Scale
NAD83 Projection

Figure 4

Photographs

G&K Gold Co. tailings looking south along park acces road.

The tails lie in the swampy ground to the left of the road and in hummocky terrain to the right of the road (out of picture).

Moose River Gold Mining Co. tailing storage area looking south.