

IRM Planning Project

Area 2 — Witchcraft Lake: Integrated Resource Management Plan

Report Prepared for:

W.J. Besse, MF, RPF and Ken Dodd, RPF, Area Planner

Professors—VIU Forestry Department.

Prepared by Matthew M. Boeckmann

Additional information provided by:

Will Hallstrom, Cody Jackman, Ken Pitt, and Reid Wyatt.

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INTRODUCTION

Scope of the Project

This project is intended to foster creative thinking by integrating a host of resource values (as defined in FRPA) and stakeholder values to create an Integrated Resource Management Plan (IRMP) for the Area allotted to each group for the Inventory Report. This is the second and individual part of the project has students focus their attention on managing for specific goals and objectives while also considering all other values and stakeholders as is required in legislation in order to harvest. This particular IRMP focuses its attention on Visuals and Recreation while maintaining timber development of the area.

A management plan has three major requirements: landowner goals and objectives, inventories, and management strategies. These are to be covered in the remainder of the IRMP.

Description of the Defined Forest Area

The management area of interest in this Plan is the area whose centre is approximately E 424228, N 5445869 (NAD 83), whose land-base area is 76.6 ha, and falls within Woodlot Licence 020 (Crown B land as identified on the WLLP for Woodlot 020). This area will be referred to as "Area 2" throughout this report; VIU (who current have the tenure) will be "the licensee."

Area 2 accessible from Benson View Road in Nanaimo, B.C. or by the existing Island Timberlands (IT) logging road that ends just inside the south-east boundary (refer to **Appendices** maps). Area 2 is located along the steep terrain south of Witchcraft Lake, extending west to Mcarrigle Creek, east to IT owned private land, and south to a clearly defined unharvestable strip identified in recesses of the area. Area 2 has a long bench/plateau that extends from the eastern boundary to roughly the middle of Witchcraft Lake just beyond its southern shoreline. Another smaller bench extends from roughly the centre of the western border, past (unnamed) Stream 3 until it meets with a series of rock bluffs and cliffs. The landscape is otherwise very steep and difficult terrain even on foot made even more challenging to navigate from the series of scattered bluffs, rock outcrops, and cliffs.

Four streams have been identified as worthy of consideration, including two along the western border, and two along the eastern bench. There are several other unmapped streams in Area 2, but they have been deemed to be of little concern due to poor accessibility and other existing limitations, or due to their small size (S6 non-perennial streams).

Witchcraft Lake Park is directly adjacent to the north-west boundary; an official trail maintained by the RDN has been given a 50m recreation corridor buffer. This trail cuts through part of the western-most portion of Area 2.

Timber on the site ranges in species and size, but generally Fd dominates the area along with smaller numbers of Cw in the north, and a mix of Hw and Pl in the south. The higher the timber, the smaller the size. The best timber has been identified along the two natural benches.

For a more thorough description, refer to the **Inventory Summary**.

General Management Goals

Area 2 falls under the Vancouver Island Land Use Plan. The Saanich to Qualicum Special Management Zone (SMZ) has been recently recognized captures the entirety of Area 2 under a Retention level VQO. Our primary management goals for Area 2 include:

- Integrating and enhancing recreational opportunities in Area 2 while minimizing the impact to other resource values. The opportunities may include hiking, mountain biking, and geo-caching.
- Maintaining and enhancing the visual quality to residents of Nanaimo and viewers traveling along the Inland Island Highway. Areas of concern include: Harewood, Westwood Lake, Nanaimo's visitors' centre, the North Nanaimo bluffs, and residents near Area 2 in the vicinity of Witchcraft Lake.

Our primary goals include the resolution of potential conflicting interests between various recreational users and forest management activities while minimizing the impact on timber production. Woodlot 20 is heavily used for recreation values, and because Area 2 includes a recreation corridor maintained by the RDN to connect Witchcraft Lake to Mount Benson Regional Park, recreation is considered a high priority. Visual landscape objectives must be met through modified silviculture systems and alternation of harvesting as per the WLLP for Woodlot 020.

Secondary goals include management of riparian features, sensitive ecosystems, biodiversity and wildlife values, First Nations values, berry-picking opportunities, forest health agents, sensitive soils, and subcategories thereof. Attempts will be made, wherever possible, to overlap areas containing more than one identified value. Chosen silviculture system(s) will attempt to address concerns over these values in the planned harvest area(s) and enhance them whenever possible.

A final goal of this IRMP is to address the concerns of six identified stakeholders that have an interest in Area 2. These stakeholders are as follows:

- Snuneymuxw First Nation and Nanoose First Nation
- Nanaimo Mountain Bike Club
- Nanaimo Motocross Association
- Nanaimo Area Land Trust
- Nanaimo Naturalists

INVENTORY SUMMARY

It is recognized that some details relevant to this IRMP were not included in the original Inventory Report for Area 2. Where relevant, some data was added to this summary but other data such as timber volume tables cannot be included as these tables are not accessible.

TIMBER

Forest Cover & Stand Volumes

- Pockets of high value timber (predominately Fd and Cw) in the south-east corner and western bench (the latter is inaccessible).
- South edge has mixed lower value Fd, Plc, and Hw.
- Rock bluffs have either no timber or low value Plc.
- Total stand volume is 538m³/ha (Cw 53.8m³/ha; Plc 53.8m³/ha; Fd 432m³/ha).

Plot #	Total Trees	Merchantable Volume (m ³)	Mean Volume per Hectare (m ³)
1	5	177	
2	4	802	
3	3	268	
4	6	556	
5	2	465	
6	6	589	
7	4	223	
8	3	256	
9	4	450	
10	3	332	
11	5	803	
12	4	439	
13	2	180	
14	6	774	
15	3	206	
Mean Volume per Hectare (m ³)			538.65m ³ /ha

Table 1: Volume Summary Table.

Road and Harvest Planning

- Harvesting opportunity along the eastern bench adjacent to existing Island Timberlands cutblocks; feasible block layout and road construction with little to no end haul.
- IT roads requires minimal resurfacing (class 1), some clearing (class 2) and potentially widening for sections of 100-200m. Remaining 5km to Nanaimo Lakes Road are active.
- Benson View Road (City of Nanaimo) is not recommended due to high residential/recreational use; access point being in an identified site with poor soil stability.
- Western bench would provide minimal return for the effort required to access it.
- A mix of grapple (~ 25 ha) and hoe chuck (~15 ha) is recommended for THLB.
- Visual quality considerations may impact final layout.
- Variable retention (aggregated) is probably the best suited silviculture system.

SILVICULTURE

Site Series Description

- Area 2 is in the CWHxm1 with 5 site series identified.
- Ecosystem map boundary is not always consistent with forest cover map.
- Area 2 characterized by: steep slopes, coarse, well-drained soils, very dry to fresh SMR and poor to rich SNR. Rock bluffs/outcrops result in rapid responses to precipitation events due to drainage patterns.

Site Series	Slope Position	Moisture Status	Soil	Tree spp.
01 (Plot 1)	Mid-slope (slightly mounded; 18%)	Water shedding and receiving	Deep, loamy sand (podzol); high CFC, Moder humus	Fd (dom) Cw (inter) Hw (inter)
Plants (Even distribution)	Plants (Mod. distribution)	Plants (Low distribution)	Other	
Dull Oregon grape, salal	Swordfern, step moss, Oregon beaked moss, red huckleberry	Coastal leafy moss	Laminated root rot on Mature Fd.	

Table 2: Plot 1 findings.

Site Series	Slope Position	Moisture Status	Soil	Tree spp.
02 (Rock Bluffs) (Plot 2)	Varies.	Water shedding (exposed bedrock)	Sandy loam with 70% CFC; brunisol; mor humus form.	Fd (dom) Arbutus (dom)
Plants (Even distribution)	Plants (Mod. distribution)	Plants (Low distribution)	Other	
Rock mosses, salal, lichens	N/A	Dull Oregon grape	N/A	

Table 3: Plot 2 findings.

Site Series	Slope Position	Moisture Status	Soil	Tree spp.
03 (Plot 3)	Upper-Mid slope	Water shedding and receiving	Coarse sandy loam mineral soil; thin mor humus form.	Fd (dom) Cw (supp) Hw (supp)
Plants (Even distribution)	Plants (Mod. distribution)	Plants (Low distribution)	Other	
N/A	N/A	N/A	N/A	

Table 4: Plot 3 findings.

Site Series	Slope Position	Moisture Status	Soil	Tree spp.
05 (Plot 4)	Bench	Water shedding and receiving	Fine sandy loam podzol; thick moder humus form.	Fd (dom) Cw (dom) Hw (co-dom/inter) Dr (in canopy gaps)
Plants (Even distribution)	Plants (Mod. distribution)	Plants (Low distribution)	Other	
Swordfern, salal, dull Oregon grape	Step moss, Oregon beaked moss	Oceanspray	Mild laminated root rot.	

Table 5: Plot 4 findings.

Site Series	Slope Position	Moisture Status	Soil	Tree spp.
01/05 (Plot 5)	Upper-Mid slope	Water shedding and receiving	Deep, loamy sand (podzol); high CFC, Moder humus	Fd (dom) Cw (co-dom/inter) Hw (inter)
Plants (Even distribution)	Plants (Mod. distribution)	Plants (Low distribution)	Other	
Dull Oregon grape, salal, swordfern, step moss, Oregon beaked moss	N/A	Red huckleberry, lanky moss	Some old growth attributes despite young age; some laminated root rot present.	

Table 6: Plot 5 findings.

Sensitive Sites and Rare & Endangered Species

- Each rock outcrop bears ecologically sensitive plant communities.
- Dynamic topography paired with coarse soils and multiple fast-flowing streams has created numerous sections of fan terrain in higher elevations/benches.
- Possible Rare and Endangered Species:
 - Rough leaved aster
 - Deltoid balsamroot
 - Purple sanicle (technically in CDF, but could appear)
 - Streambank lupine

- Variety of lichens

Forest Health

- Patches of laminated root rot in mature Fd in 05 and 01 SS.
- Possibility of hemlock dwarf mistletoe.

NON-TIMBER RESOURCES

Stream, Lake, Wetland Classification

- Witchcraft lake drainage is part of the Westwood Watershed.
- McGarrigle Creek drains into the Millstone River and Nanaimo Harbour.
- Coho travel up lower McGarrigle Creek.
- The Millstone flows past farmland, Bowen Park, and suburbs.
- Stream 1 and 2 were included in area maps as they are worthy of consideration in harvesting block.
- Fan features were noted at the lower end of Stream 3 and the upper origin of streams 1 and 2.
- Planned harvest area exceeds 10m reserve around the lake.
- John Morgan from VIU's RMOT department confirmed presence of stickleback in Witchcraft Lake (Class L2).
- No wetlands were noted.

Feature	Stream, Lake, Wetland	Class	Average Width (cm)	Average Depth (cm)	Bank Gradient	Flow Gradient	Substrate	Comments
Stream 1	S	S6	134	12	10%	15%	B 20% ; C 20%; G 60%.	Seasonal. High CWD.
Stream 2	S	S6	104	8	10%	18%	B 5%; C 20%; G 60%; F 15%.	Seasonal. Ripple complex.
Stream 3	S	S6	210	15	10%	35%	O 20%; F 10%; G 10%; C 30%; B 10%; R 20%.	Perennial. Several waterfalls present. Fan present at low end of stream.
Mcgarrigle Creek	S	S5	368	13	80%	10%	O 15%; F 50%; G 10%; C 15%; B 10%.	Perennial. Severe erosion and stability issues along banks. Labelled S6 but has S5 widths.
Witchcraft Lake	L	L2	N/A	N/A	N/A	N/A	N/A	Located outside of Area 2. Contains stickleback. Heavy recreational use in area.

Table 6: Riparian feature findings. To see a map of the riparian features, refer to **Appendix V**.

Wildlife

- Ungulate activity noted throughout Area 2.
- Barred owl noted in eastern portion.
- Rock outcrops have plentiful arboreal and ground lichens and evidence of deer.
- Bear dens not noted and unlikely due to high recreational use.
- Stream features favour amphibious life; amphibian presence is potential.
- Scattered Fd vets in lower sections of Area 2 suitable as wildlife trees (2 in particular noted).
- 21 snags of varying size, species and decay were noted.

Recreation

- RDN maintains the official trail from Witchcraft Lake Park to Mount Benson Regional Park along with a 50m recreational corridor.
- Viewpoints along trails in Area 2 were given a high priority status.
- Lower trails used by mountain bikers and hikers; higher trails used exclusively by hikers.
- Geocaches are present in the area; geocachers are to be considered trail users.

- Heavily used trail to Westwood Lake present in harvestable area; possible mitigation strategy is to move the trail north through collaboration with the Nanaimo Mountain Bike Club.
- No fishing resources have been identified.

First Nations & Non-Timber Values

- Snuneymuxw First Nation (SFN) has claims encompassing Area 2.
- SFN will be given a chance to express interest in mature Cw resources present.
- Salal resources protected by recreational corridor.
- SFN to be given an opportunity to remove traditional non-timber products and traditional cedar products from harvestable areas prior to harvest.

Visual Quality Objectives and Strategies

- Area 2 is under a Retention Level VQO.
- Planned harvest area is of low concern for visual quality in north portion.
- Appropriate planning for aggregated retention or similar silviculture system needed.
- Existing sparsely-treed bluffs may be used in conjunction with VR to achieve the Retention level VQOs.

MANAGEMENT OBJECTIVES, STRATEGIES, AND PRACTICES

I - TIMBER DEVELOPMENT PLAN

A. Timber Resources

i. AAC Determination

Area 2 provided a challenge for inventory purposes: there was no inventory data available from the GIS database for Woodlot 020 in the newly added Crown Schedule B land. Although inventory data must exist for the purpose of the woodlot's current 4,800m³ AAC calculation, there was no way of accessing this information in time to complete this project. As such, the AAC calculation had to be modified. The technique used to calculate the new AAC is by no

means very accurate and would not stand up on a legal level, but for the purpose of this project it was necessary to work with what we had immediate access to.

Section B-9 of the Woodlot Management Plan states that "*the woodlot's Timber Harvesting Land Base is proposed to be approximately 1300 hectares out of a total area of approximately 1700 hectares, or about 76% of the land base;*" this leaves "*24% of the total woodlot area reserved from harvesting.*" The 24% figure includes both non-productive sites or areas that have been reserved from harvest. In determining the new AAC this value served as a comparison to Area 2.

Area 2 is 76.6ha in size. Due to access issues in the western portion of Area 2, sensitive ecosystem sites (rock bluffs/outcrops) with a 5m buffer and the bench/slopes along the western-most border have all been excluded from the "harvestable area," leaving 33.4ha. Further deductions include 0.7ha of retention along Streams 1 and 2, and 0.8ha for road access. This leaves 31.9ha as the THLB out of the 76.6ha. 44.7ha are non-harvestable.

Turning these values into proportions, 42% of Area 2 is harvestable, and 58% is non-harvestable. The difference between the proportion of the Woodlot's non-harvestable land-base (24%) and Area 2's is 34% less area. Applying this value to the existing AAC yields a 1,632m³ deduction. The final value for the new AAC for the entire Woodlot comes out to **3168m³**. Without a better means of calculating an AAC, the above AAC will be used for the purpose of this project.

Total Area (ha)	Road Length (m)	Stream Buffer (ha – 20m)	“Harvest Area” (ha)	Non-Harvest (ha)	Harvestable Area (%)
76.6	1521.1		3.6	33.4	42
	Road Area (ha – 5m width)	Stream Retention (ha – 20%)	THLB with deductions (ha)		Non-Harvest Area (%)
	0.8	0.7	31.92		58
WL 020 Harvest Area (%)					Deduction Factor (%)
	76				34

WL 020 Non-Harvest Area (%)	New AAC: Extrapolated (m ³)
24	3168

Table 7: Calculation summary table of the AAC deduction factor to determine the new AAC based on an extrapolation of the conditions of Area 2 spread over 1700ha.

ii. Identified Stakeholders

The objectives for Area 2 include a list of stakeholders to be considered:

- Snuneymuxw First Nation and Nanoose First Nation
- Nanaimo Mountain Bike Club
- Nanaimo Motocross Association
- Nanaimo Area Land Trust
- Nanaimo Naturalists

Snuneymuxw First Nation and Nanoose First Nation

First Nations values and interests are being addressed in **First Nations**.

Nanaimo Mountain Bike Club

Since the Nanaimo Mountain Bike Club is active in its involvement with a variety of property and tenure holders, the licensee will be contacting the Nanaimo Mountain Bike Club to collaborate on how best to address any of their potential concerns (Nanaimo Mountain Bike Club 2014). They have stated no direct concerns on their website to address directly in this Plan. The main focus of talks will be the conversion of the old logging road trail into a new logging road and the proposed compromise by constructing a new trail for users. Furthermore, the Nanaimo Mountain Bike Club will be one way of getting the word out that harvesting is occurring in the area and recreational users need briefly avoid the area while active harvesting is occurring. Refer to **Recreation**.

Nanaimo Motocross Association

The Nanaimo Motocross Association will be informed of harvesting in Area 2 but given that Wastelands Motocross Track is not near Area 2 there is likely little to discuss further (Nanaimo Motocross Association 2014).

Nanaimo & Area Land Trust

The Nanaimo & Area Land Trust has stated a list of six major concerns on their website that the IRMP will attempt to address. NALT will be contacted to be made aware of the harvesting plans. The concerns are:

1. *"Loss of recreational uses due to inaccessibility during logging and change in future values after logging.*
2. *Loss of aesthetic values, if the view of the mountain begins to change to a patchwork of bare and brown patches instead of a continuous backdrop of forest.*
3. *Destruction of eco-tourism potential (hiking and biking in summer, x-country skiing and snow-shoeing in winter, and a gateway to back-country trekking).*
4. *Loss of last pockets of old-growth timber, endangered plant and animal species, and other significant habitats.*
5. *Serious erosion and slow re-growth of the forest on steep north and north east slopes. Yet another threat to the shrinking Vancouver Island wildlife.*
6. *Further negative impacts on the Millstone River watershed, and the fish and water quality values in that river." - NALT (2009).*

The timber development plan for Area 2 considers and addresses the concerns of NALT to the best of its abilities without unduly reducing timber values on the site:

1. If stakeholders are concerned with the areas being harvested affecting regular recreational traffic, it is further incentive to assist the licensee with the offer of relocating the heavily used trail from Witchcraft Lake to Westwood Lake. Work on the trail rerouting can begin if stakeholders feel the need to have an available recreational trail along the area in

question, and so long as stakeholders are willing to assist the licensee in addressing their concerns. See **Recreation** for more details.

2. Aesthetic values will attempt to be maintained to the highest degree without unduly reducing timber available for harvest and/or impacting regeneration. Mitigation of negative visual impacts will be accomplished through modified group retention silviculture systems, 2-3m green-up before harvesting adjacent blocks, and harvesting the upper blocks before Cutblock D to act as a visual buffer using mature timber. Refer to the **Timber Development Plan** and **Silviculture**.
3. In the plan, the licensee is doing everything in its power to minimize the impact of harvesting on recreational users. The design of cutblocks and the use of group retention silvicultural systems is intended to ensure that post-harvest conditions will allow for as rapid a regeneration as possible given site constraints, and that the effects of harvesting are temporary (not impacting the unstable soils). Refer to **Recreation**.
4. A significant portion of timber with old-growth characteristics was identified in the western portion of Area 2, serving both recreational users and wildlife and plant communities. This area must be retained due to the difficulty of access. The licensee will retain up to 20% basal area within a 20m riparian management zone except where roads are needed for access. Sensitive ecosystems including rock bluffs/outcrops will not be harmed and will themselves have a 5m buffer. See **Biodiversity, Wildlife, and Riparian Features** for more details.
5. In conjunction with existing constraints, harvesting design will attempt to address any impacts to soil stability problems by the distribution of retention and by retaining 20% basal area of riparian management areas. Refer to **Soil Stability** for more details.
6. Minimal disturbance to streams due to keeping 20% basal area in the riparian management area and designing roads to follow existing trails where possible should not have negative impacts on the Millstone River. McGarrigle Creek and its associated streams are not being touched directly. Refer to **Riparian Features** for more details.

Nanaimo Naturalists

The Nanaimo Field Naturalists (who have been involved in projects including the Buttertubs Marsh Conservation Area) are a club that has been disbanded since 2010 according to the Nanaimo Archives. These records may be accessed from:

<http://www.nanaimoarchives.ca/index.php?p=1_163_Nanaimo-Field-Naturalist-Club-fonds>

B. Road access

Viable road access is provided by the Island Timberlands (IT) roads as mentioned in the Inventory Report for Area 2. Roads are planned to be extended from two existing roads: the lower road will extend a relatively recently harvested IT cutblock beside Area 2 providing access to the lower northern half of the Area; the upper road will make use of a partially deactivated road providing access to the upper southern half of the Area. Fortunately, the lower road only requires minimal resurfacing (class 1), some clearing (class 2) and potentially widening for sections of 100-200m. The upper road appears to be partially deactivated. 300m will require the same treatment as the lower road; roughly 250m will require re-construction to access Area 2. The development of these roads will keep road access costs to a minimum; the roads are to be made straight and only as long as necessary for harvesting. There should be little to no blasting necessary for the upper road.

Area maps suggest there is an opening between the rock bluffs that may provide access to the western portion of Area 2 through which the upper road could be extended. However, the reconnaissance of that location shows that there is very steep topography at this location and that extending the road is not possible without significant effort including significant cuts and possibly some blasting. As such, the upper road will be extended only to accommodate harvesting where it is feasible.

The lower road will make use of the large existing trail/old logging road so that less clearing will be needed for the road right-of-way. The road can be extended along this bench so that it reaches as far as the park boundary (although it will only be extended as far as needed for harvesting). To access the patch of timber just past Streams 1 and 2 between the rock bluffs, the road cannot be

built at a reasonable grade without unduly impacting the streams by starting the curve such that there is a second stream crossing. As such, a road will not be attempted up this relatively steep slope.

In order for road access to be established, the licensee will contact IT for permission to access roads on their land.

C. Initial Harvest Unit & Subsequent Harvesting

The initial harvest unit identified in this timber development plan (Cutblock A) has been chosen based on the need to reduce visual impact. By choosing to begin harvesting from the top of the THL, and allowing subsequent cutblocks to be harvested upon a 3m green-up, there will always be greenery present on the mountainside. Lower blocks (as of yet unharvested) will provide a visual buffer due to the trees screening the view from below. The retention patches and dispersed retention at the upper edge will further mask visual impact to the area. Since soil stability is a great concern and the slopes are range between roughly 40-70% for most of the area, the cutblock will be felled using hand-falling techniques. The timber will be yarded to roadside using grapple yarding to minimize movement over the soil and to access the steep terrain. Rock bluffs nearby will be used to blend in the cutblocks on the visual landscape, but may pose difficulties accessing timber. As such, the area will be made larger to accommodate a larger amount of retention than 30%. This area is presumed to have less volume per hectare due to what was noted in the original Inventory Report. As such, there is further justification for making this cutblock larger. Harvesting of cutblocks will occur in the order they are named (CB - A to CB - D)

Applying a 30% retention factor in addition to the AAC, 8.4ha is roughly the best size of cutblock to meet but neither fall under or over the AAC. However, this assumes the cubic metres of timber per hectare remain at a constant. This is most likely not the case. Cutblock A was increased well above 8.4ha in order to account for lower volumes that are likely to come from the higher elevation areas and the higher retention that may be needed due to inaccessible areas

along the rock bluffs. The lower cutblocks fall below the AAC because the timber is larger there and will likely yield above the average volume per hectare.

Cutblock	Total Area (ha)	Retention Target (%)	Estimated Volume (m3)	Estimated Cut (m3)
A	9.2	30%	4949.6	3464.7
B	8.2	30%	4411.6	3088.1
C	8.4	30%	4519.2	3163.4
D	7.9	30%	4250.2	2975.1

Table 8: Summary tables for CB - A to CB - D. To see a map of the cutblocks, refer to **Appendix II**.

D. Harvesting Systems

Hand-falling is the choice method of felling timber in the Area 2 cutblocks. This method was chosen for several reasons. First: the location is primarily second growth (with the exception of a few vets) and the cost of hand-falling decreases while in second-growth (Forest Practices Branch). Second: the location has steep slopes on the upper cutblocks making hand-falling an obvious choice for those areas. Third: the area is subject to soil stability problems; entering even more than necessary with machinery may make these problems worse. Last: hand-falling means that areas with dispersed retention will be less damaged by machinery and falling can be conducted with more precision.

Cutblocks A and C are to be yarded using Live Skyline (tower) yarding system. The steep slopes combined with soil stability issues makes cable yarding a better option than other yarding systems. Skyline systems are the best for partial cuts and retention cuts and can be used in thinning (in this case small areas of dispersed retention) (Clayoquot Sound Scientific Panel 1995). Since there is no need for multi-span operations in these cutblocks, there is no need for a Standing Skyline. Based on the layout of the block, there will probably be two separate set-ups required for yarding the entire area in Cutblock A. This will increase yarding costs. Although the upper blocks have greater cost for felling and yarding due to the topography, the lower blocks will help cover the costs with better quality wood and lower costs for road construction, felling and yarding alike. Cutblocks B and D will also be hand-felled. Since the terrain is far less difficult overall, costs should be minimized. These blocks will be hoe-forwarded as it is not as steep, there is relatively less soil stability issues, and hoe-forwarding is cheaper than cable

yarding. Hoe-forwarding is also able to accomplish the silviculture systems that are desired for Area 2.

II - SILVICULTURE

A. Silvicultural Systems

The inventory report recommends a variable retention silviculture system, specifically aggregated (group) retention. It is necessary to consider the conflicting values in Area 2 for determining the most appropriate silviculture system to meet management objectives. The primary objectives for Area 2 are to maintain recreational and visual features without unduly reducing the harvest.

Ideally, a patch cut system would be the best for the sake of VQO's and recreation: it would be easy to avoid having any major impacts on existing trails, and patch cuts could be planned in such a way that they mimic the appearance of existing rock bluffs on the landscape level. Unfortunately, this will not satisfy timber objectives and is unsustainable in the long-term because the forest cover is dominated by Fd, which is not very shade tolerant (especially on the coast). Furthermore, Area 2 has a north-east aspect and is in the shadow of Mount Benson. The conditions are not ideal for growing shade intolerant species as is. Having small openings will lead to regeneration problems. Both the WLLP 020 and the WLMP 020 suggest partial cuts as an option for meeting VQO's. As such, the plan for Area 2 is to use both modified group retention and standard group retention.

Due to the highly visible nature of Area 2, it is inevitable that harvesting the upper area of Area 2 will have an impact on visuals that will be noticeable. To meet the VQO while maintaining timber production goals, it is necessary to compromise. FORREX released a variable retention decision aid which suggests a 40%+ retention to help meet Retention level VQO's (Zielke 2008). However, it also recommends consideration of the tree species and how well it will grow under these conditions. As such, it seems more reasonable to opt for a somewhat lower retention of 30%.

At a Retention level VQO, it is necessary to make forest disturbances "blend in" with the surroundings. Rock bluffs will be assisting in this endeavor. On the Cutblocks A and C, the upper edges will be implementing a "feathered" edge using a small strip of dispersed retention. Although not ideal for growing conditions for regeneration, it will be useful for emulating the surrounding bluffs where trees thin out. The lower edge will not be necessary to treat the same as the remaining trees will screen harvesting activities adjacent to that edge. Retention patches will be distributed to best accommodate mitigation of large "brown" patches on the visual landscape.

Cutblocks B and D will be using standard group retention unless a reason is discovered why they must also use the modified technique. These cutblocks will be less visible due to them being mostly on the flat bench and as such it is more reasonable to avoid using any dispersed retention.

B. Reforestation

Site Series for this CWHxm1 site along with the WLLP 020 Stocking Standards helped to determine what species to restock the cutblocks with. SS 03 requires MMS (P+A) 400sph and MSS (P) 400sph. To ensure adequate stocking of preferred species, Fd and Pl will both be used. Although no Pl was noted on the plot for the 03 SS, it is suited for an 03 SS and is the only other option for preferred species to allow for a mixed species stand.

SS 01 requires MSS (P+A) 500sph and MSS (P) 400sph. To meet First Nations obligations and assist in reforesting laminated root rot disease centres, Cw will be used as an acceptable species.

The reforestation prescription for each cutblock will look as follows:

- Cutblock A: Fd (90%), Pl (10%) for 03; Fd (80%), Cw (20%) for 01.
- Cutblock C: Fd (90%), Pl (10%) for 03; Fd (80%), Cw (20%) for 01.
- Cutblock B: Fd (80%), Cw (20%) for 01.
- Cutblock D: Fd (80%), Cw (20%) for 01; Fd (90%), Pl (10%) for 03.

Green-up requirements will be as followed (based on dominant SS and Fd's FG height - refer to WLLP 020):

- Cutblock A: 2m height.
- Cutblock B: 3m height.

- Cutblock C: 2m height.
- Cutblock D: 3m height.

Success of reforestation and green-up will be monitored in silviculture surveys.

C. Stand tending

Although upper elevation sites of Area 2 could probably benefit from fertilizer due to lower productivity, unless funding is provided it would not be possible; heavy recreational use and potential controversy due to the steep slope and water quality concerns to McGarrigle Creek (out which Witchcraft Lake drains) are enough to warrant not trying to pursue fertilization.

The only other potential stand tending that may be needed on Area 2 is brushing. To determine whether or not the site will actually require any brushing, the information will be gathered in silviculture surveys of the cutblocks and further discussions of stand tending will be held upon receiving recommendations from the surveys.

D. Forest health

Laminated root rot (*Phellinus weirii*) is present in the area. One patch was identified within Cutblock B. This is to be managed by removal of all present timber followed by stumping site prep where possible. Although soil stability is an issue in the surrounding area, the location in question is not very steep and should therefore be at minimal risk for soil degradation or erosion. Root rot patches are to be planted with a greater concentration of Cw to minimize continued root rot problems.

The laminated root rot in the western section along McGarrigle Creek is not to be heavily managed. For the purpose of mitigating liabilities for recreational users, the area should be periodically checked for potential danger trees. Danger trees caused by the root rot must especially be removed along the RDN recreation corridor.

Although it was not observed, hemlock dwarf mistletoe (*Arceuthobium tsugense*) may be present in patches where hemlock exists. Most of the hemlock in Area 2 is limited to the western portion of the area, which is not being harvested. Furthermore, Hw is not to be among the planned species to restock the cutblocks. Hw is an acceptable species for SS 01 but with no evidence that

hemlock dwarf mistletoe being on-site, there is no need to plan to manage it at this time. If hemlock dwarf mistletoe is found then it will be dealt with accordingly.

No other major health concerns were noted in the harvest area. If other forest health concerns are identified, plans to deal with these concerns will be made as they are discovered.

III - OTHER RESOURCE VALUES

A. Biodiversity

The inventory for Area 2 found that the area along the rock bluffs/outcrops and near the recreational corridor had the most potential for wildlife values with an abundance of wildlife trees and snags, corridors and forage for ungulates, streams with potential for amphibian life, root rot to create diverse stand structure, and old-growth characteristics. Because this area was identified as being very challenging for road access with little return for the effort and cost required, the best use for this area is for it to be left intact. Because this area also has a network of trails and connects to the adjacent Witchcraft Lake Park, it is an ideal area to integrate retention of recreational features while leaving the rest of the area for wildlife. The site has lots of snags and CWD present. These serve a variety of organisms from cavity nesters to insects that live in or consume decaying wood.

The sensitive bluffs and rock outcrops throughout the area will be avoided because they are 1) non-productive and 2) most of these features have potentially hazardous terrain surrounding them which may make falling and yarding a challenge. Furthermore, these sites have a variety of different plant species and lichens unique to these drier and poorer sites and may harbour some of the rare and endangered species that may be present on-site. The plants and lichens present will be retained along with the sensitive ecosystems as habitat and wildlife corridors (primarily for ungulates). Likewise some of the older trees present on some of these sites provide habitat and/or nesting sites for bird species. A 5m buffer surrounding sensitive ecosystems will help to better protect the features found within.

Due to the constraints placed on VQO's in Area 2 (as well as visuals being one of three primary objectives for the area), cutblocks will have a significant amount of retention (30%+). These patches will vary in size but will help to keep older stand characteristics for organisms that prefer established mature forest. These patches will be free of disturbances from harvesting operations, thus helping promote a greater diversity of life, including species that may have been using the harvested area prior to harvest. Their spacing (which will largely be a function of VQO's) will help to keep a high percentage of forest influence in the cutblocks.

For the purposes of visual retention, potential public scrutiny by recreational users, soil stability concerns, and to address potential rare and endangered species, streams 1 and 2 will retain 20% of their 20m riparian management area. Although these streams are S6's, amphibian life is a possibility as they bear characteristics favourable for amphibians in the lower sections. By retaining 20% basal area, the RMA's will serve as corridors for wildlife that connect with the corridors along the rock bluffs.

If rare or endangered organisms or communities are discovered in Area 2, retention patches may be modified to best protect these organisms or communities as much as possible without unduly reducing the available timber. Since the identified sensitive ecosystems are not being disturbed, this applies only to newly discovered rare or endangered organisms or ecosystems as of yet unmapped.

i. Rare and Endangered Species

During the recce of Area 2 for the inventory, no specific rare or endangered species were noted. However, sensitive plant communities were noted to be present on rock bluffs/outcrops where they exist. The following is a list of potential rare or endangered species that may be present on-site:

- Rough leaved aster
- Deltoid balsamroot
- Purple sanicle (technically in the CDF, but could appear)

- Streambank lupine
- Variety of lichens

Sensitive ecosystems are being avoided with a 5m buffer, and 20% basal area is to be retained in the riparian management area; these are locations that are most likely to harbour rare or endangered species. If other rare or endangered species are found, layout design for retention may be modified to try and accommodate these species.

B. First Nations

The Appendices of the WLLP 020 make mention that the Snuneymuxw First Nation (SFN) were opposed to harvesting in Schedule B Crown land on the WL. The exchange went as follows:

March 28th, 2008

On behalf of the licensee, Nancy Pezel hand delivered to the Nanoose First Nation and the Snuneymuxw First Nation band offices a copy of the Woodlot Licence Plan and a corresponding letter informing them of the Woodlot Licence Plan review period, and requesting written comments on the plan be forwarded to Barry Ostrand.

June 6th, 2008

Nancy Pezel received a phone message from the Snuneymuxw First Nation stating they are opposed to logging on Crown Land, that they are dissatisfied with the current referral process, and that they will be going through Integrated Land Management Bureau. No written comments were received.

June 9th, 2008

Barry Ostrand sent an e-mail to the Nanoose First Nation asking if any comments will be sent regarding the WLP. No written comments were received.

Excerpt from WLLP 020.

There has been no apparent resolution to this situation. However, the licensee has done its part in trying to contact the SFN regarding this issue. At this point in time, the strategy to approach the SFN will be to contact them regarding our intension to harvest part of Area 2. The licensee will offer the SFN all potential cultural resources present on the THLB well prior to harvesting dates. The Nanoose First Nation will also be contacted about First Nations resources on-site. There is no evidence in the WLLP that the Nanoose First Nation share opposition of harvesting on Crown land.

i. Cedar Trees

Cedar will be a component of reforestation where ecologically suitable sites are present and in accordance to pre-defined stocking standards found in the WLLP 020. A minor component of pole-sized cedar will be retained where it exists and cedar will be retained in wildlife tree patches whenever possible.

The licensee will first notify the First Nations of areas to be harvested (for timber or road construction purposes) to give them an opportunity to strip cedar bark prior to harvest if desired.

If monumental cedars are found within Area 2 (which is highly unlikely), the First Nations will be contacted to ask if they wish to assess and/or use them for traditional purposes.

ii. Traditional Plants

Areas where rare or scarce plant species with traditional uses are found will be avoided or harvesting modified. These and other plants with traditional uses will be identified and the First Nations notified of their presence. The First Nations will be provided with an opportunity to collect plants with traditional or medicinal uses in areas to be harvested prior to the harvest.

iii. Spiritual Sites

The harvest area information will be sent to the First Nations for review. If the First Nations identify a spiritual site within Area 2, the location will either be excluded from harvest, or harvesting modified to minimize potential impacts so long as harvesting opportunities are not unduly reduced. If necessary, updated plans will also be sent to the First Nations for review.

iv. Cultural Heritage Features

In the unlikely event that any cultural heritage features be discovered in Area 2, all efforts will be made to protect these features and First Nations notified of their existence. Cultural heritage features may include but are not limited to archaeological finds relating to First Nations heritage or CMT's.

All efforts will be made to keep an open communication with the First Nations as they are major stakeholders in the area.

C. Recreation

As part of the data collection process for the Inventory of Area 2, the network of trails that was found within the GIS database for WL 020 were analyzed. The following is a full version of the Inventory Report's findings and recommendations:

"Area 2 contains a series of official and non-official hiking and biking trails. The GIS database for the Woodlot 20 contained trail data from 2009 and 2012 provided by the RDN and the Nanaimo Mountain Bike Club. These trails were walked in the field to confirm their location and their apparent use. Trails were categorized as high or low priority. Viewpoints along trails in Area 2 were also given high priority status. The majority of trails are too steep for mountain bike use. There is a series of trails in the mid-lower slopes of Area 2 that are suitable for mountain biking. Some trails have fallen into disrepair due to limited use. The official trails within Area 2 receive heavy foot traffic due to its connection from Witchcraft Lake Park and Mount Benson Regional Park. These were identified as highest priority for protection.

Three Geocaches have been identified to be in or adjacent to Area 2. None of these are within the planned harvest area and since Geocachers generally follow existing trails they are included as trail-users.

The location of our planned harvest area is only likely to affect two non-official trails. One was categorized as low priority, but the other is heavily used as is high priority (as it connects to Westwood Lake's trails). There is no viable alternative but to harvest around this trail. Our strategy to deal with this situation is to collaborate with stakeholders such as the Nanaimo Mountain Bike Club to provide an alternative route for users of the existing trail. By moving the trail slightly to the north, the trail would be surrounded by a forested buffer. Since there are unstable soils in the area, it is unsuitable for harvest but would suffice for recreational trail use as long as safety hazards are identified and dealt with appropriately should they exist.

With the confirmation that there are only stickleback in Witchcraft Lake, there is no concern over recreational fishing at the lake." - (Boeckmann 2014)

The following is a summary table of the findings of the trail verification:

Trail ID	Priority	Comments
1	High	This trail is the trail that is identified to require a Recreational Corridor. It's location has been plotted using data both from the RDN and the Nanaimo Mountain Bike Club. On the ground it is identified by orange reflective markers. Some locations along the trail are unstable and/or very steep. As an "official" trail, work should be done to minimize slipping hazards by either modifying the trail location or installing climbing ropes. Dangers trees were present along the length of the trail and should be accessed/removed for public safety.
2	High	This trail parallels and later meets with the RDN trail. Its use is evidently roughly the same as the main trail. DRL was present in small patches along the north end of the trail which is causing danger trees to become a hazard. The trail's closeness to McGarrigle Creek represents a problem for erosion of the trail from significant undercuts along the stream. Erosion has been leading to many unstable trees nearby as well.
3	High	This is a short section of trail that follows the southern banks of Witchcraft Lake. It is outside of the Woodlot but serves as access to trail 4.
4	High*	This trail is unofficial and appears to be an old logging road, but it now serves as the connection between Westwood Lake and Westwood Ridge trail networks to Witchcraft Lake and Mount Benson. Its use is heavy and it is well-established. *The trail and its scenery is not particularly spectacular other than larger trees than the rest of Area 2. This trail happens to be on one of the only harvestable sites in Area 2. As such, the trail could be moved with little effort further to the north as a continuation of trail 3. The trail would pass through unstable soils which are unsuitable for harvesting but would hold up to recreational uses.
5	Low*	This trail connects the upper mid-section of the RDN trail with trail 4. It bears resemblance to a heavily used game trail (which it may well once have been) rather than a proper trail. This access trail provides a somewhat more gradual climb up the mountain-side.*The only section which may be deemed of any priority is the span that leads to a viewpoint overlooking the west side of Nanaimo and its environs from a rock bluff.
6	Low	This trail connects trail 5 to trail 1. The use is apparently little different from trail 5.
7	Low	This trail connects trail 3 to trail 5. The use is apparently little different from trail 5.

Table 9: A summary of the findings for the trails. To see a map of the trails, refer to **Appendix IV**.

Recreation is one of three primary objectives for Area 2 and as such will be an important factor that plays into silvicultural systems used for Area 2. The WLLP 020 states that:

Modified harvesting where practice requirements in the WLPPR do not apply:

By using intermediate harvesting systems (commercial thinning) or single tree or group selection silviculture systems, the trail through the Recreational Corridor linking Witchcraft Lake to Mount Benson (in the eastern portion of the woodlot) will be maintained and the forest near the trail is expected to be maintained. The licensee will continue to work with the RDN to formalize a suitable location for establishment of this trail.

Excerpt from WLLP 020.

Although harvestable timber is present on-site surrounding the above mentioned Recreational Corridor, there is no obvious economically feasible way of extracting timber from the area. Since there are several active trails in this portion of Area 2, and because the area near these trails is extremely visually sensitive from important viewing areas across Nanaimo, the entire eastern section of Area 2 will be left intact to serve the public for recreational use from Witchcraft Lake to Mount Benson.

The geocaches present in and around Area 2 will not be impacted by harvesting; they are located on the rock bluffs/outcrops, lie just outside of Area 2 in Park-land or IT private land, or are along the recreation corridor. Due to the Terms of Use Agreement on Groundspeak's geocaching website/database (www.geocaching.com) the coordinates for the geocaches mentioned herein will not be disclosed. Visit the Groundspeak website above to access geocache locations, or refer to the generalized map provided in **Appendix VII**. Geocachers whose caches are in the vicinity will be informed to temporarily disable their caches if they are near harvesting activities.

Due to harvesting constraints, it is necessary to focus harvesting efforts around the existing trail that connects Witchcraft Lake and Westwood Lake. Although this is not an official trail, it is heavily used as confirmed by its size and lack of encroaching vegetation. Recreational stakeholders will no doubt be concerned about this trail's value, especially given that this Plan intends to run the lower road along a large portion of the trail. Given that harvesting will impact this trail drastically, stakeholders will be given a chance to voice their concerns. The licensee is willing to do one of two options unless another reasonable (or better) option accomplishes the same goals. The options are: do not deactivate the roads when harvesting is completed and the roads are no longer needed, instead allowing recreational users to use the road to access Westwood lake -- (the existing trail connects to a cutblock road anyway); or (if stakeholders dislike the idea of losing a mature forest along their recreation avenue) the licensee can work with stakeholders including the Nanaimo Mountain Bike Club to establish a trail extending from an existing trail that borders the lake. In the latter option, the trail will pass through a sensitive soil site which has been deemed inoperable due to concerns over sensitive soils. The licensee could also combine both options if that is deemed a preferable option; it would enhance recreational opportunities by allowing more than one way to travel the route. During the winter months when there is snow in the area, keeping the road may well enhance the area for snowshoeing or cross-country skiing opportunities as the area will be more open allowing for more snow. It is not known how well the existing conditions are for these activities, but harvesting will allow for a greater snow-depth through to IT's cutblocks along Mount Benson.

It would also be possible to keep the upper road open for recreational users. Although no trail currently connects the old logging road and the western trail network, a footpath could be made through the steep terrain easier than having the road extend through the bluffs. This opportunity could also be discussed with stakeholders such as the Nanaimo Mountain Bike Club. Having this road remain open may also open up greater opportunities for viewpoints along the nearby bluffs and an alternative way to access some of the geocaches in the vicinity.

The two other trails that are affected by harvesting are relatively minor trails. Given the efforts the licensee will be making to help enhance or mitigate recreational opportunities, the disturbance of a small section of these trails should not have significant impacts on recreational use. These trails will have to be closed during harvesting operations, but there is nothing stopping the continued use of these trails post-harvest. Furthermore, there are no significant viewpoints or features that will be impacted by harvesting the area.

D. Visual Quality Objectives

The following is a detailed version of the Inventory Report's findings for VQO's:

"Area 2 falls within a Retention level VQO as identified on the WLP for Woodlot 020. Retention level VQO "consist[s] of an altered forest landscape in which the alteration, when assessed from a significant public viewpoint, is (i) difficult to see, (ii) small in scale, and (iii) natural in appearance" as per the FPPR, (Section 1.1). The identified potential harvest area is located on the lower South-east portion of Area 2 adjacent to an existing cutblock, following a natural bench. This area contains low to moderate visual concerns. Aggregated VR was identified as the preferred silviculture system to use for the harvest area; if laid out appropriately it should deal with potential visual issues in the higher elevation areas of the harvest area.

The assessment conducted for visuals for Area 2 was done in two stages: in the office and in the field. Referring to the preliminary block boundary designed in ArcMap in February after the initial recce of the location, the block boundary was set into Google Earth as a semi-transparent polygon feature. By assessing the area for potential viewpoints, several locations were identified to conduct the field portion of the assessment. These areas were identified based on the significance of the potential impact on VQOs. Specific viewpoints were chosen as various representative views or broader areas. The primary viewpoints established were: Harewood/South Nanaimo, the Beacon, the Nanaimo Parkway Visitor Centre, the North Nanaimo bluffs, Westwood Lake Park, North Nanaimo Town Centre, Westwood Ridge, and Witchcraft Lake. From the ground view feature in Google Earth, Area

2 was assessed for features of low, moderate, and high concern. The locations were then visited in-person (with the exception of The Beacon and Westwood Ridge) to take picture evidence to back up the office assessment.

Our strategies to deal with the VQOs are to leave a sizable buffer between Witchcraft Lake, the surrounding residences, and the harvest area. Potential and existing viewpoints for recreational users (typically found on rock bluffs) are being fully retained. Aggregated VR should minimize the impact of harvest on visual quality. Existing sparsely-treed bluffs may be used in conjunction with VR to achieve the Retention level VQOs."
- (Boeckmann 2014)

VQO's are one of three primary objectives for Area 2. The WLLP 020 states that:

Modified harvesting where practice requirements in the WLPPR apply:

Harvesting will be modified within the visual polygons of the woodlot. Intermediate harvesting systems (commercial thinning), small clearcuts with reserves or partial cutting silviculture systems, or selection silviculture systems will be used to meet the Visual Quality Objectives identified for those portions of the woodlot that lie within the Scenic Area.

Excerpt from WLLP 020.

VQO's will therefore be achieved through a consideration of Visual Quality ratings as found in the Inventory Report for Area 2 and the use of group retention silviculture systems. Refer to **Appendix X-XI** for the images used for visual assessment and **Appendices VIII-IX** visual impact maps. Much of the details regarding VQO's have been covered in other areas.

Visual impacts will attempt to be best mitigated using a modified group retention silviculture system on Cutblocks A and C as described in **Silviculture Systems**. Green-up is required when harvesting adjacent cutblocks. In this case, SS 01 dominated cutblocks (B and D) will be using a 3m green-up and SS 03 cutblocks (A and C) will be using a 2m green-up. These values are based on the FG minimum height criteria for the dominant species planted on these sites (Fd) (WLLP 020 2008).

The order of the cutblock harvests is important to the VQO's plan: Cutblock A is to be harvested first so that there is still a visual barrier of mature timber below to help mask harvesting. This block is also closest to the rock bluffs so it will be easiest to blend in with its surroundings.

E. Wildlife

The series of rock outcrops and rock bluffs along Area 2 provide excellent corridors for wildlife including ungulates. The rock bluffs/outcrops have a variety of lichens that ungulates may consume. These natural features will be avoided during harvesting as they have little timber, are mostly inaccessible, and there is dangerous terrain around some of these sites (in part contributing to a 5m buffer surrounding these areas). With the retention of these features and some of the surrounding forest, it is expected that a variety of wildlife will make use of them.

Identified wildlife trees (meeting criteria that may include internal decay, forks, large rotten branches, loose and/or cracked bark, recent scars, existing wildlife use (including nests or cavities), veterans, or trees that are windfirm but do not make for good sawlogs) are to be retained unless they are a danger to workers, diseased, and/or infected with pests threatening adjacent trees; or there is a need to remove the tree for the purpose of accessing adjacent stands. Authorization to remove a wildlife tree will be given in the cutting permit or road permit. Should a wildlife tree be removed, a comparable tree with similar characteristics is to be retained in a nearby location if possible. If not possible, an equivalent amount of wildlife trees with similar characteristics must be retained elsewhere in the Area.

For wildlife tree patches, similar characteristics apply as for individual wildlife trees.

F. Soil Stability

The WLLP 020 has identified Area 2 as a sensitive soils site:

Contiguous areas of sensitive soils:

Sensitive soils (Soil Stability on the WLP map) are evident within the gully of Benson Creek and on the slopes below Mount Benson. These are generally characterised by thin soils over rock, colluvial material, or highly erodable soils on steeper slopes.

Excerpt from WLLP 020.

The maps for road access to the cutblocks within Area 2 are subject to change if when traversed it is found that colluvial material will pose a safety risk for road construction on the planned route. Since colluvial material is extremely poor material to build roads on, if it is present along

the planned road route there are two options: reroute to an area where there is no colluvium if such an option exists and is feasible, or find a route with minimal slope to pass the colluvium.

Due to the steepness of the terrain in Area 2, streams are a greater concern as many have gully-like features in higher elevations. From both a riparian and soils stability perspective it benefits to retain some of the trees within the riparian management area. Refer to *Riparian Features* for more information.

In conjunction with the VQO's, harvesting will be kept to only 70% of the cutblocks' size; group retention and dispersed retention (upper slopes only) will help to retain stability on these slopes. The small cutblock sizes will help to ensure the impacts on soil are minimal. When cutblocks are being traversed, field crews will be responsible for making note on unmapped problematic soil stability issues. If necessary, based on these findings cutblock designs may need further revision before the area can be harvested. Problematic areas may include unmapped bluffs or rock outcrops, talus slopes, unmapped fans, terrain that is inaccessible by equipment, or dangerous for equipment or ground crews (including potential overhead hazards around rock features).

If it is discovered that harvesting has negatively affected soils causing a potential for degradation and/or erosion, rehabilitation of the site may be necessary. This will be decided based on post-harvest observations.

A soil disturbance limit has been set in the WLLP 020:

- Alternative WLPPR s.24(1)(a):
 - 8% of Net Area to be Reforested where no stumping for root disease is to be carried out
 - 15% of the Net Area to be Reforested For Cutblocks where stumping for root disease is to be carried out and root disease infection is moderate to high

Rationale:

Where terrain and soil conditions allow, stumping is generally the licensee's preferred root disease treatment option. Stumping allows the most ecologically suitable species, Douglas-fir, to be regenerated. In the licensee's experience, soil disturbance levels have ranged up to 15% within cutblocks that were stumped for root disease control.

Excerpt from WLLP 020.

The licensee will use these limits to guide acceptable levels of soil disturbance.

G. Riparian Features

McGarrigle Creek and Stream 3 will be unaffected by harvesting due to harvesting access constraints; their riparian features and characteristics will be undisturbed.

Streams 1 & 2 lie within the harvestable land-base; they are S6 streams and may be cleared of their management areas. However, soil stability problems and their gully-like features in the steeper upstream sections demand that greater care of these riparian features be taken. As such, the riparian management retention (20% Basal Area within 20m RMA for S6 streams as established on the WLLP 020) will be retained except where designated road access has been established. This will help to retain riparian features, biodiversity, meet VQO's, and reduce potential disapproval of the public by not fully harvesting the RMA (due to the presence of geocaches in the area along the bluffs that pass by these streams in the higher elevations activities will be visible in the upper and lower portions by recreational users).

The planned harvest area for Area 2 is well outside of the Witchcraft Lake retention and management zones. As such, harvesting will not be modified to accommodate the lake.

H. Invasive Species & Competing Vegetation

As per the commitments of the licensee, roadside cuts/fills will be seeded with grasses and legumes using Canada Common #1 grade seed or better. This also applies to any landings, pits, or quarries that may be designed in Area 2.

The licensee will ensure that travel to the site is minimized and that vehicles or clothing articles do not have invasive vegetation seeds on them. Furthermore, the cutblocks will promptly be restocked with seedlings able to withstand the vegetation conditions on-site to out-compete invasive or competing vegetation.

Silviculture surveys will be used to assess competing vegetation and invasive species should they become problematic. The situation will be monitored, recommendations made and followed-up on.

I. Range, Forage, and Associated Plant Community Values

No range land is present on or nearby Woodlot 020, nor are any lands proposed to be designated as such.

Forage and associated plant communities for ungulates such as deer and elk are accounted for by areas of retention, WTP's, and riparian buffers (see *Biodiversity, Wildlife, and Riparian Features*).

J. Resource Features

No karst topography features are present in or surrounding Area 2. Wildlife trees are to be protected (see **Wildlife**) as are CMT's (see **First Nations**). The WLLP 020 makes it clear that no resource features other than wildlife habitat were are known to exist:

Resource features other than wildlife habitat features and other features where the location must not be disclosed

At the time of preparing this woodlot licence plan, no resource features had been established within the woodlot licence area under the Government Actions Regulation. There were also no resource features within the woodlot licence area that were made “known” by the district manager under the regulations of the *Forest Practices Code of BC Act*.

Excerpt from WLLP 020.

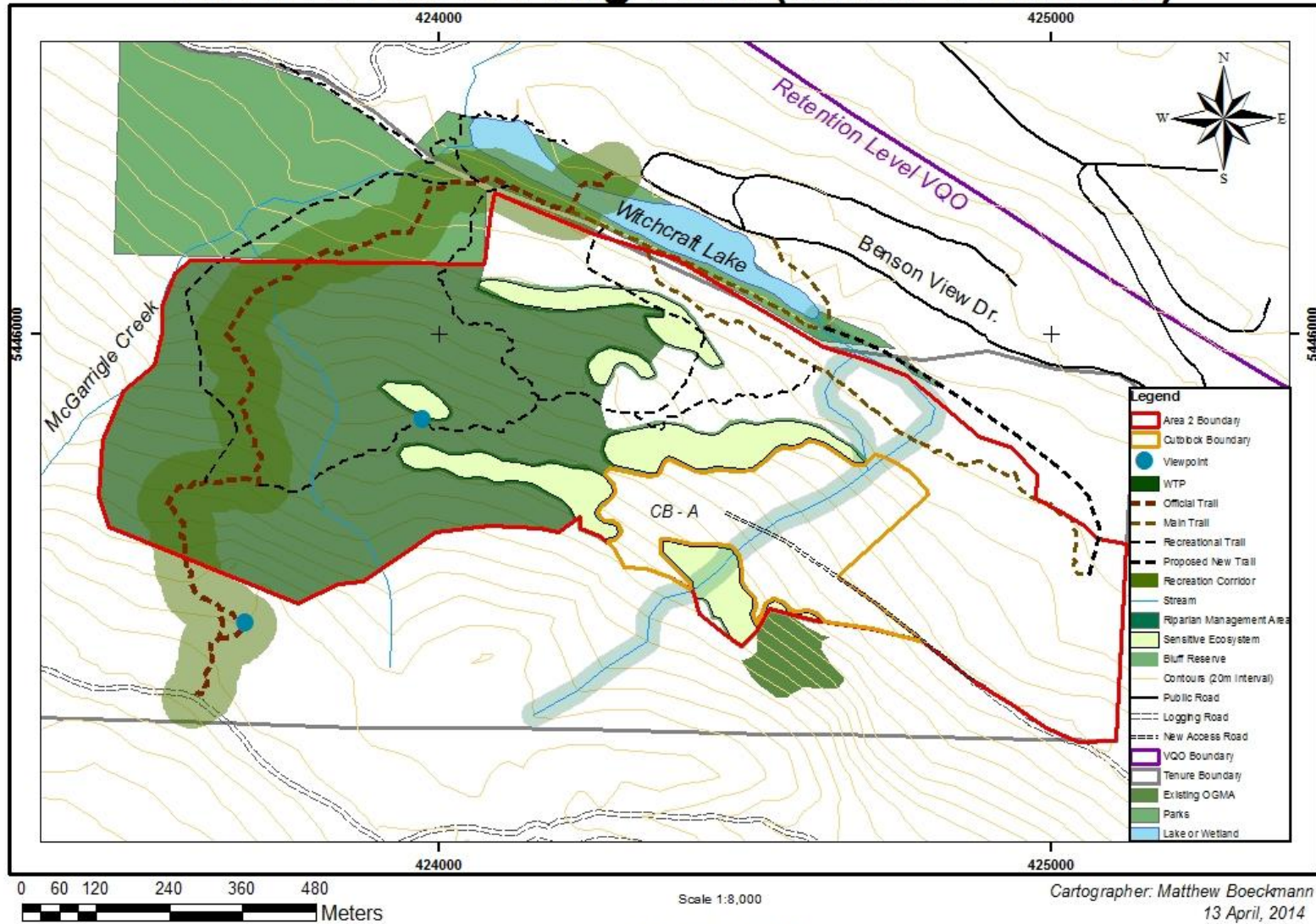
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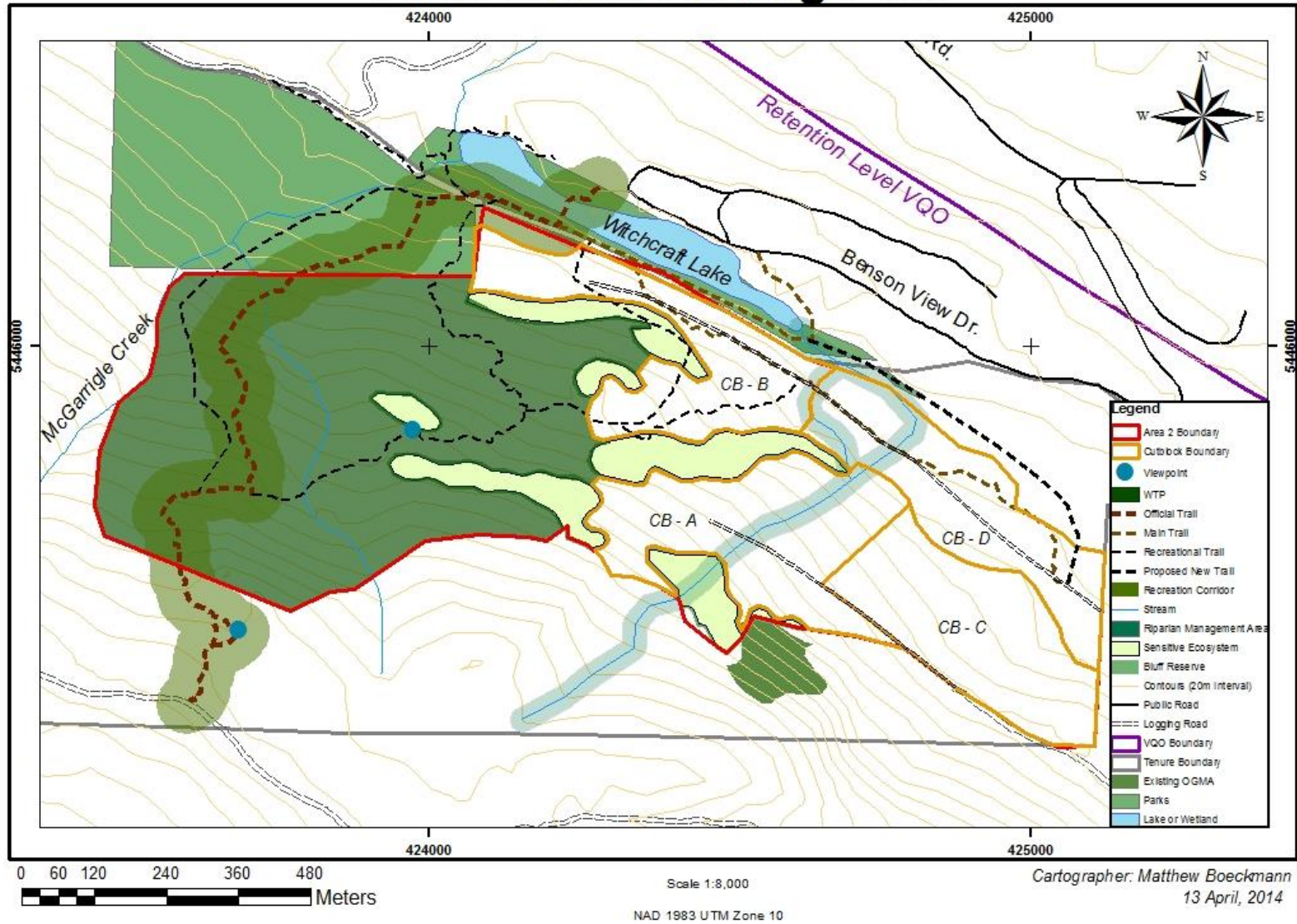
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Appendix I

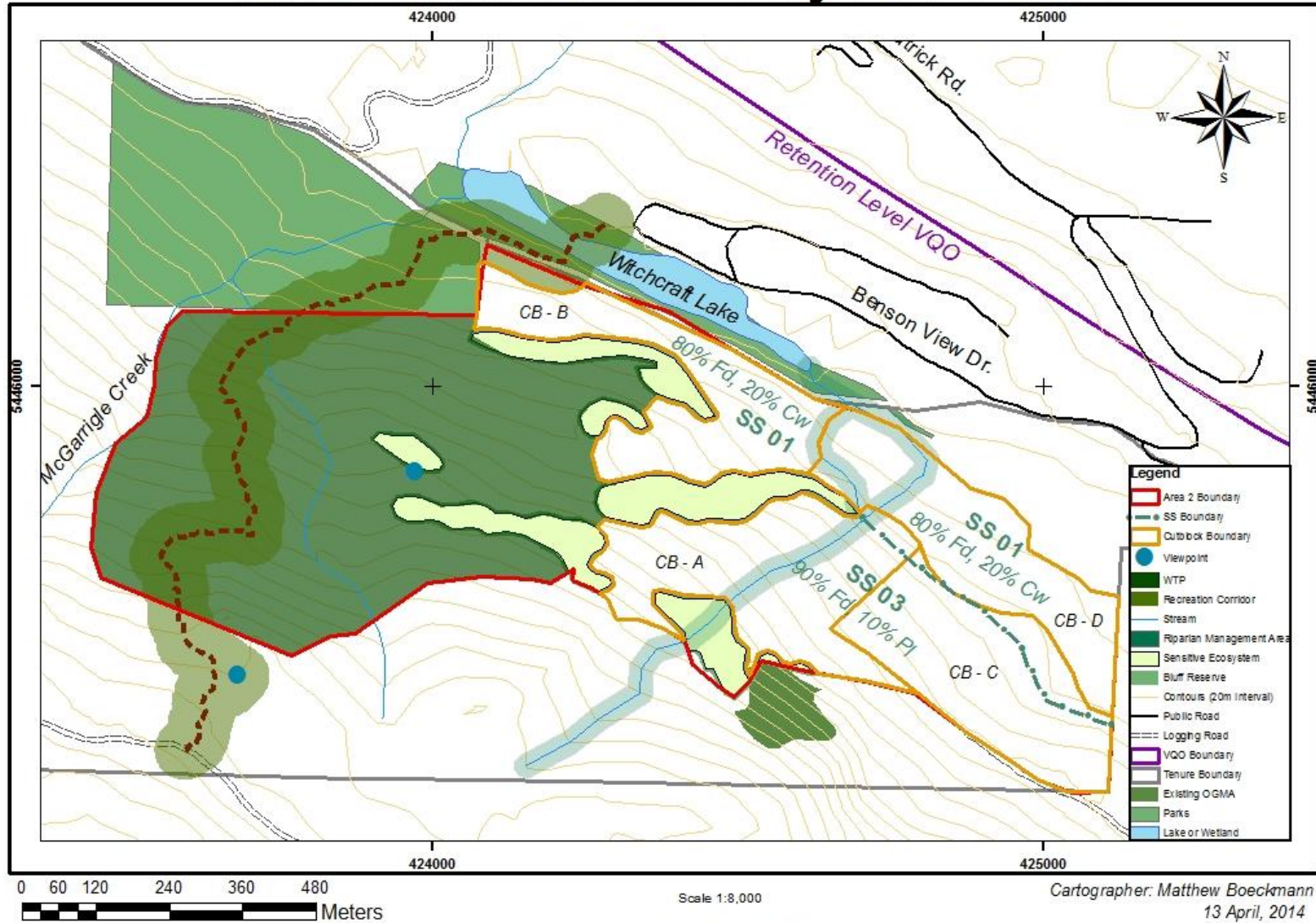
Area 2: Harvesting Plan (Initial Cutblock)



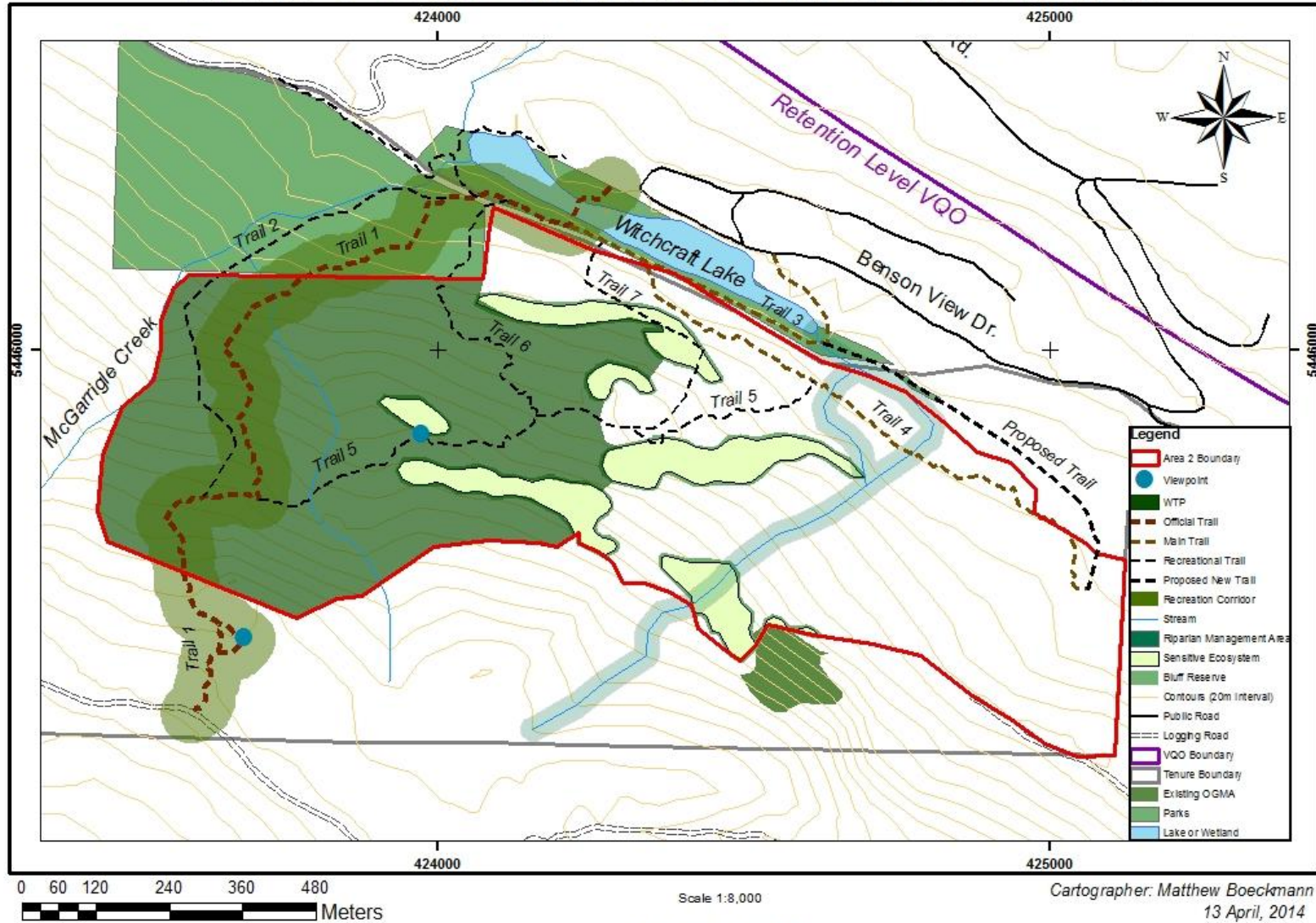
Area 2: Harvesting Plan



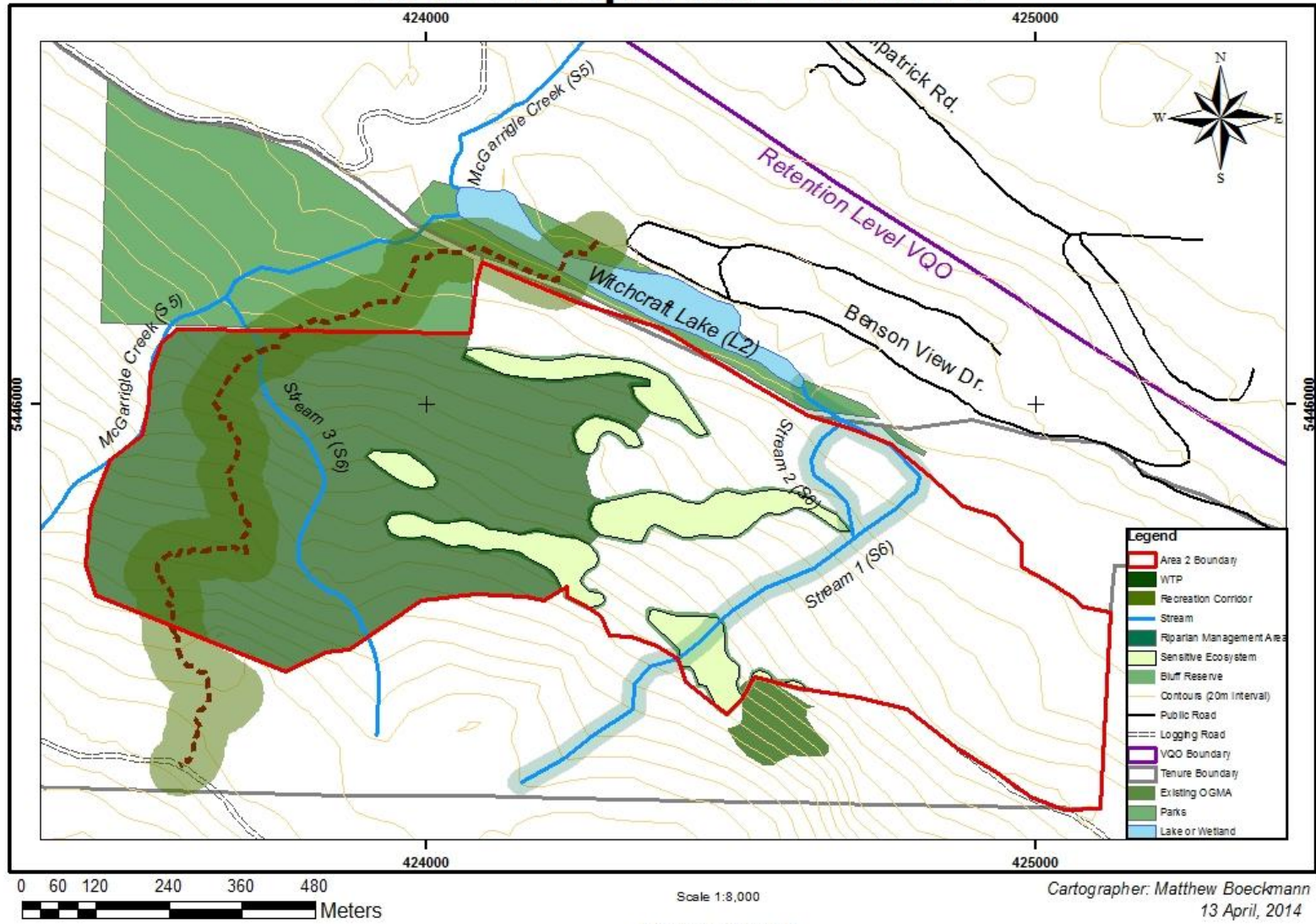
Area 2: Reforestation by Site Series



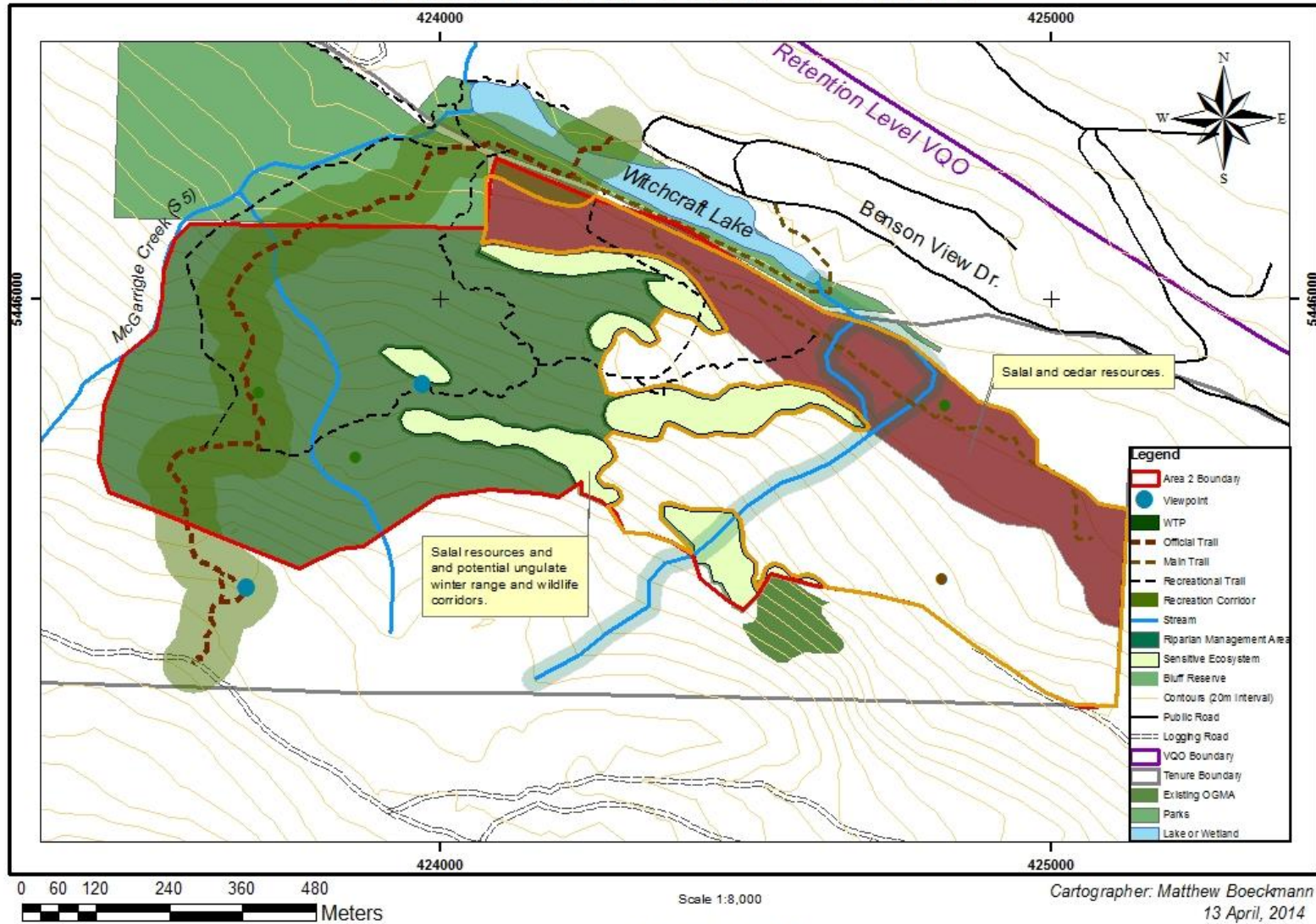
Area 2: Trails and Recreational Features



Area 2: Riparian Features



Area 2: Non-Timber Values

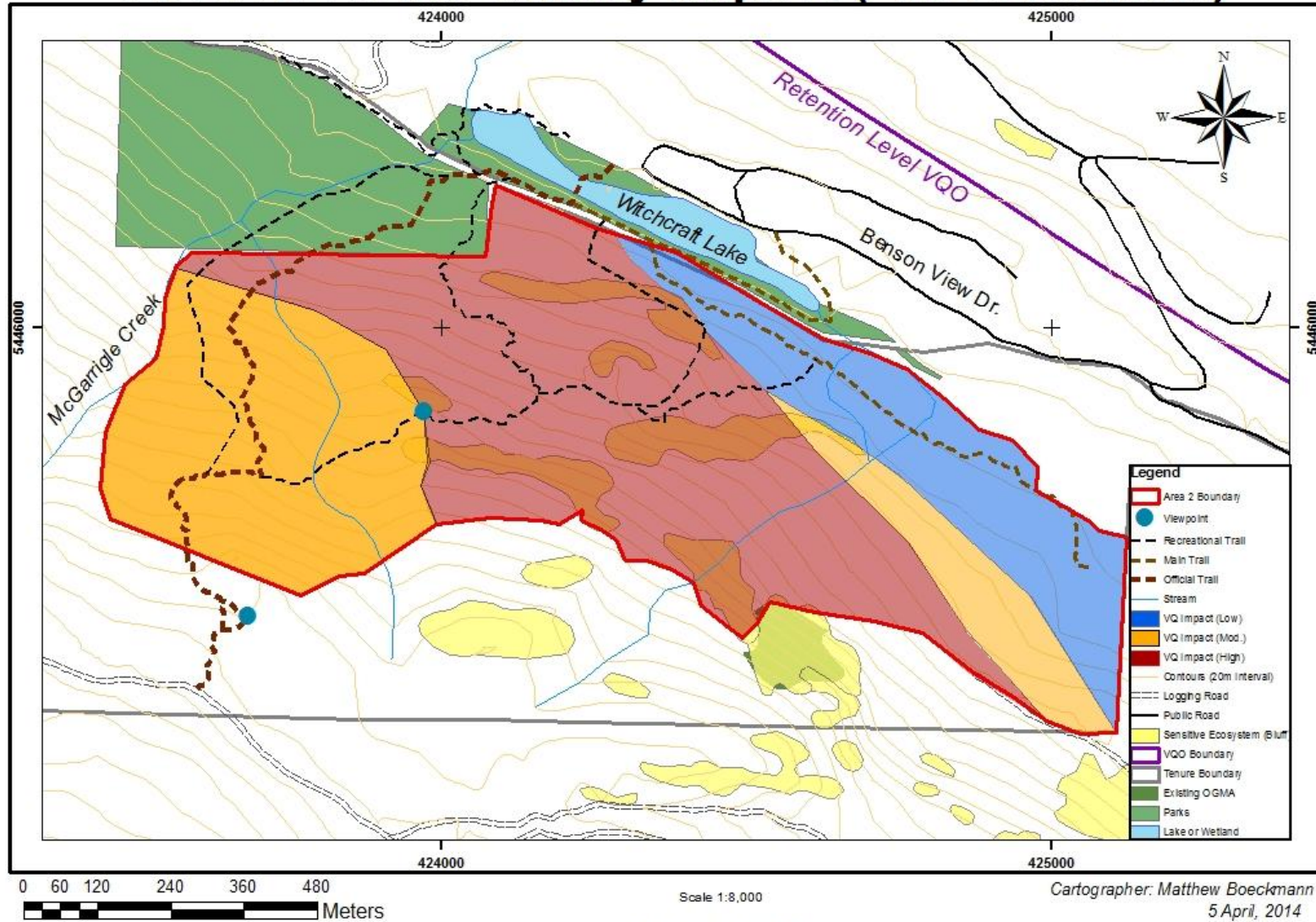


Appendix VII

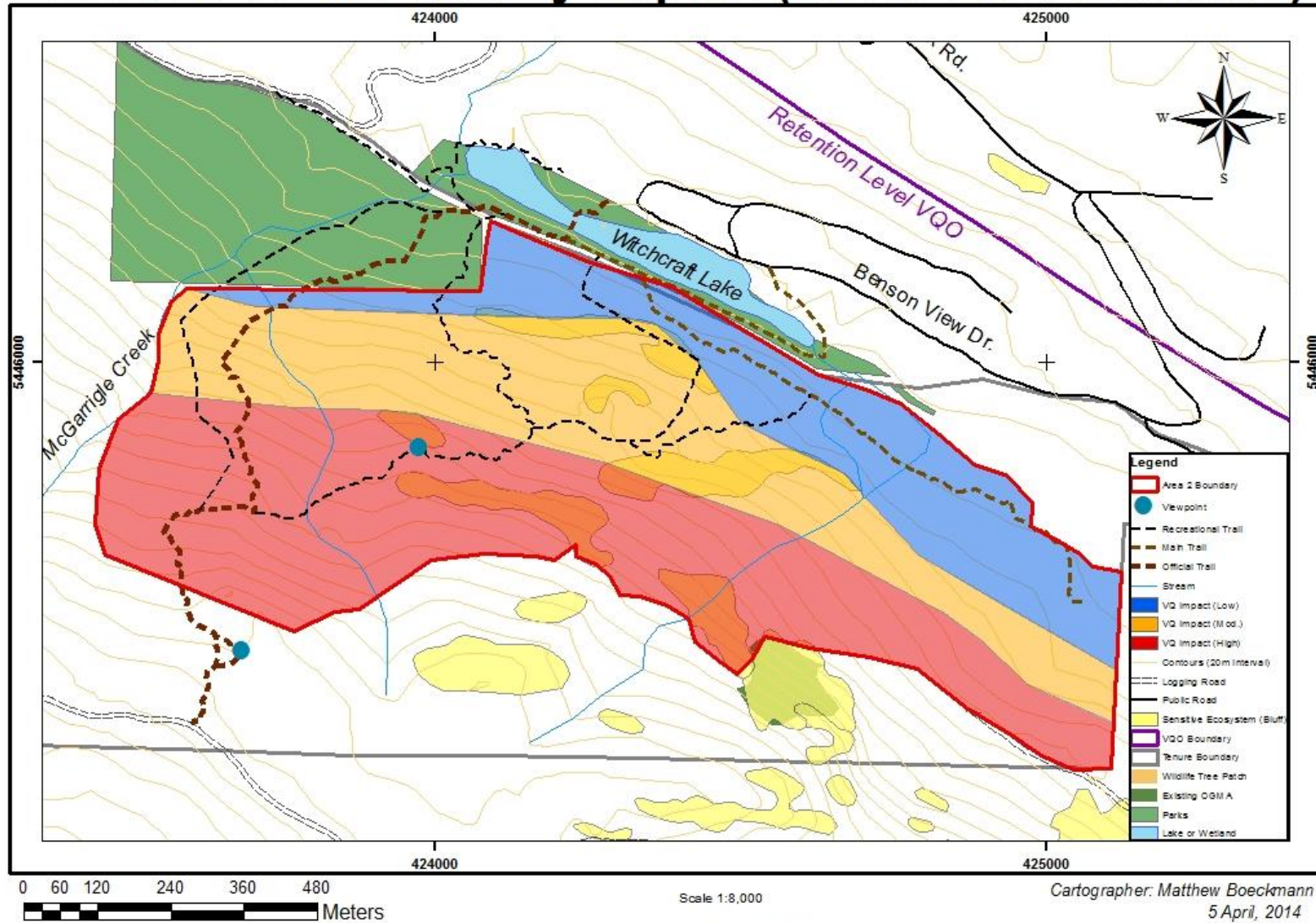
Map of Geocaches near Witchcraft Lake
Courtesy of Geocaching.com and Groundspeak.



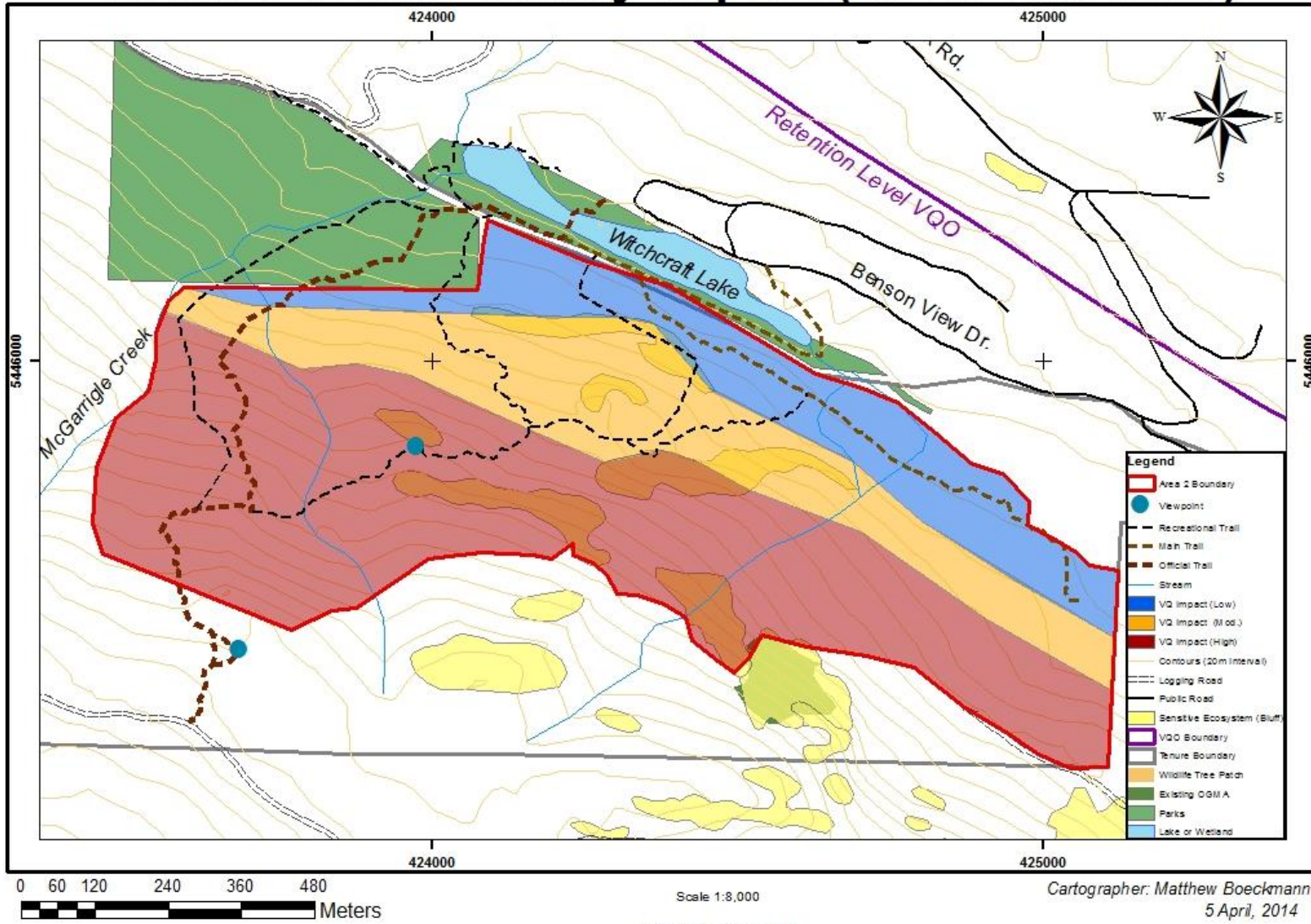
Area 2: Visual Quality Impact (East Nanaimo)



Area 2: Visual Quality Impact (North-East Nanaimo)



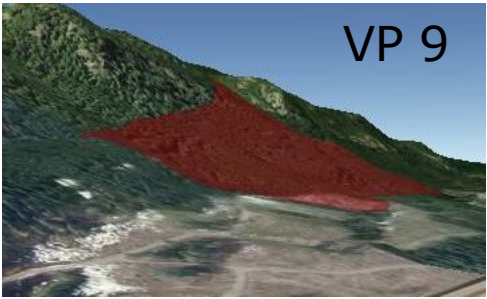
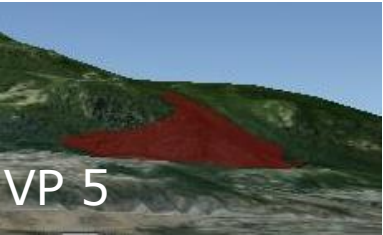
Area 2: Visual Quality Impact (North Nanaimo)



Appendix X

Viewpoint Pictures

Some images courtesy of Google Earth.



Appendix XI

Viewpoints Map
Courtesy of Google Earth.



Appendix XII

Trail Recce Pictures

