Foghorn Integrated Visual Design

prepared for

Kamloops Timber Sales Office
BC Timber Sales

by

RDI Resource Design Inc
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Contract FI10TEB103
Forest Investment Account

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Introduction

RDI Resource Design Inc was engaged by the BCTS Kamloops Timber Sales Office, to prepare an Integrated Visual Design (IVD) for the Foghorn Operating Areas near Clearwater, in the Headwaters Forest District of the Southern Interior Forest Region.

The intent of the IVD was to provide direction for the long-term development of the visually sensitive component of the timber resource in the operating areas in a manner consistent with higher-level planning direction and respectful of other resource values. Employing a process that considers all resource values simultaneously in an integrated fashion, the IVD is a strategic plan focussed on optimising harvest opportunities without compromising desired visual quality. The process follows the approach defined in the guiding document: Integrated Visual Design Procedures and Standards, Revised April 10, 2008[1].

The process may be thought of in terms of three major phases (as paraphrased from the procedures document):

1) Inventory

Inventory is concerned with gathering information about a site's myriad abiotic, biotic, cultural, ecological and regulatory influences. The inventory first defined two areas for the IVD, called the visual design units (VDUs) (Figure 1)[2]. A critical step in the VDU delineation task was the selection of the project viewpoints. Project viewpoints were to be representative of the means of travel or use of the average resident or traveller in the area (e.g., vehicle on roads, boat on water, or on foot), and account for settlements, special features, road stops, viewpoints, traffic pull-offs, and traffic conditions). The VDU boundaries strongly reflect the visual force lines fully encompassing them: the main divide between the two units along Foghorn Creek, the visible ridge tops, the east boundary and west boundary creeks, and the North Thompson River.

[1] The procedures document is available for downloading at http://www.for.gov.bc.ca/hfp/publications/00040/FIA-Standards-Final.pdf.

[2] All maps and images were also provided to BCTS as individual pdf's for closer inspection. Each pdf is entitled with the figure number for easy cross-reference.

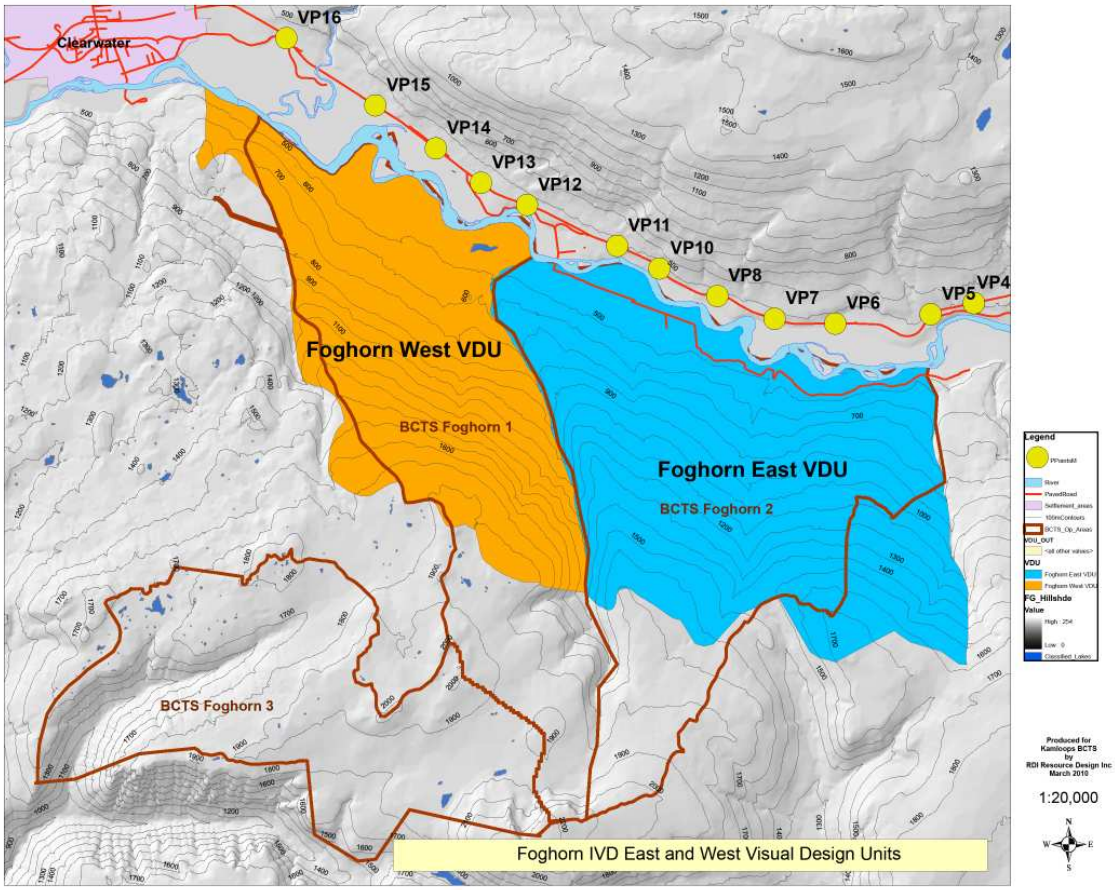


Figure 1 Foghorn Visual Design Units

The map also shows the outlines of the three Foghorn operating areas, and the portions included in the VDUs. Foghorn 3 was not visible from the north viewpoints and therefore is outside of the VDUs only a sliver of the operating area is seen south of the highway pullouts south of Clearwater (revealed in the composite viewshed prepared from viewpoints including highway viewpoints along the east side of the landform (Figure 2).

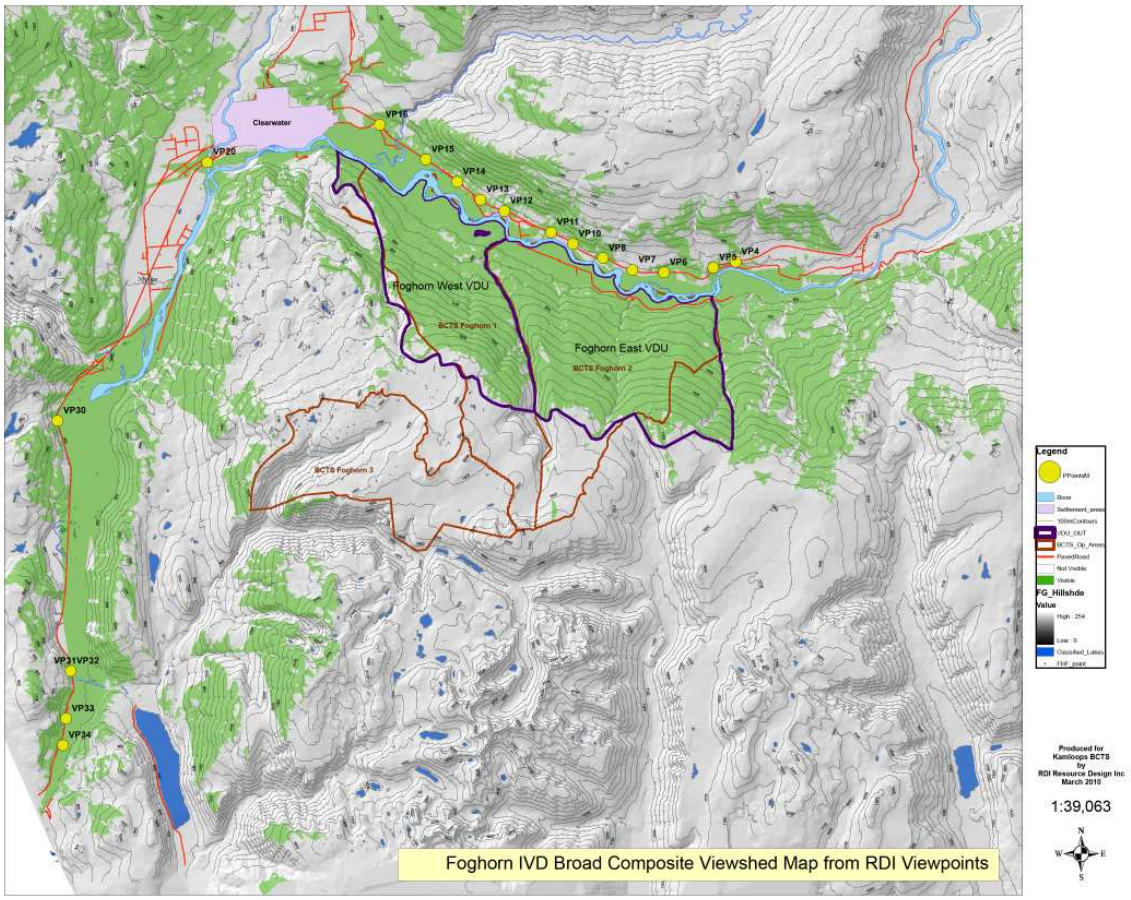


Figure 2 Foghorn Composite Viewshed (Visibility) Map

2) Analysis

Analysis is focused on identifying the dominant patterns, structures, and functions of a landscape. The process combines and interprets resource information such that its significance is understood as to what the site can actually produce in terms of timber and other resources, and the limitations and opportunities for use and management.

3) Design

Design employs the understanding gained about structure, function, and limitations or opportunities, to development, to guide the physical design of the VDUs. It fully incorporates visual considerations into the design, such as shape, scale, pattern, visual force analysis, verbal definitions of visual quality classes, and alteration limits assigned to those classes. Each of the criteria are assessed as would be experienced from the viewpoints, in the quest to assure that the established visual quality objectives can be achieved over the short and long term.

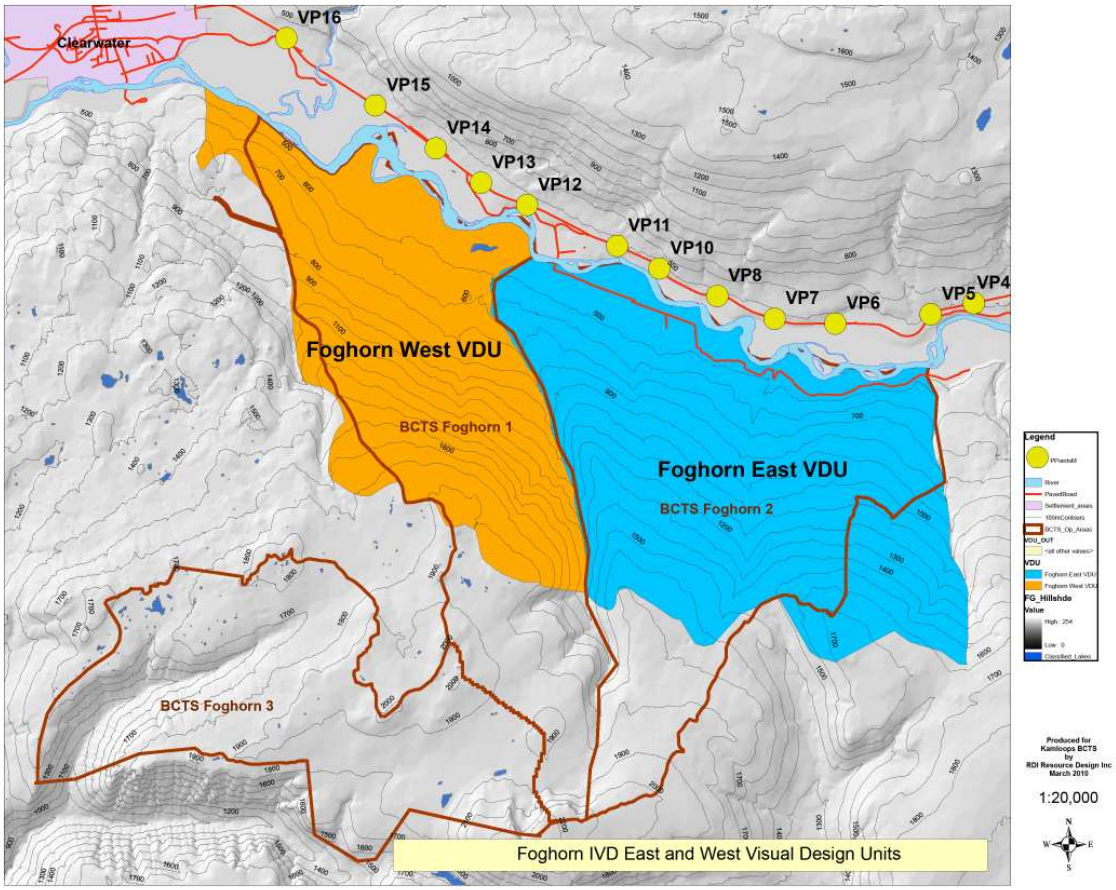
The IVD approximates how long-term forest development could occur over time within the Foghorn visual design units. It has been prepared on the basis of digital data, map projections, and with limited visual reconnaissance from highway viewpoints. As such, the plan should be considered conceptual only. To ensure the feasibility of plan implementation, further, more detailed, consideration and additional ground assessments are warranted.

This report offers a brief summary of the design objectives, assumptions, and criteria employed in the development of the plan, supported by graphic and numerical analyses.

The contract agreement set out the services that were to be provided. A checklist of required products is provided at the end of the report. These were:

1 Define Visual Design Units (VDUs)

Two VDUs - Foghorn East and Foghorn West - were defined by the visible, north-facing portions of the Foghorn Operating Areas, the North Thomson River shoreline, and ridgeline boundaries, as seen from viewpoints along Highway 5 on the opposite side of the river from the VDUs. Though the landforms are contiguous, topographically and visually, the upper size limitation of 5000 hectares per VDU required segmentation into the two units, with the Foghorn Creek providing the dividing boundary (Figure 1).



2 Conduct Phase 1 (Objectives)

2.1 Pre-work Meeting

Ken Fairhurst attended a pre-work meeting with the FIA contract administrator, Theresa Peters, on January 7, 2010. No BCTS staff or woodlot owners were available for the meeting. Telephone and email communications were conducted with Frank Kohlberger, BCTS planner.

2.2 Viewpoint Selection

A reconnaissance tour was conducted January 6, 2010. In all, 18 potential viewpoints were established over a 45 km section of Highway 5 starting from 19 km east of Clearwater to 26 km south of the town (Figure 3).

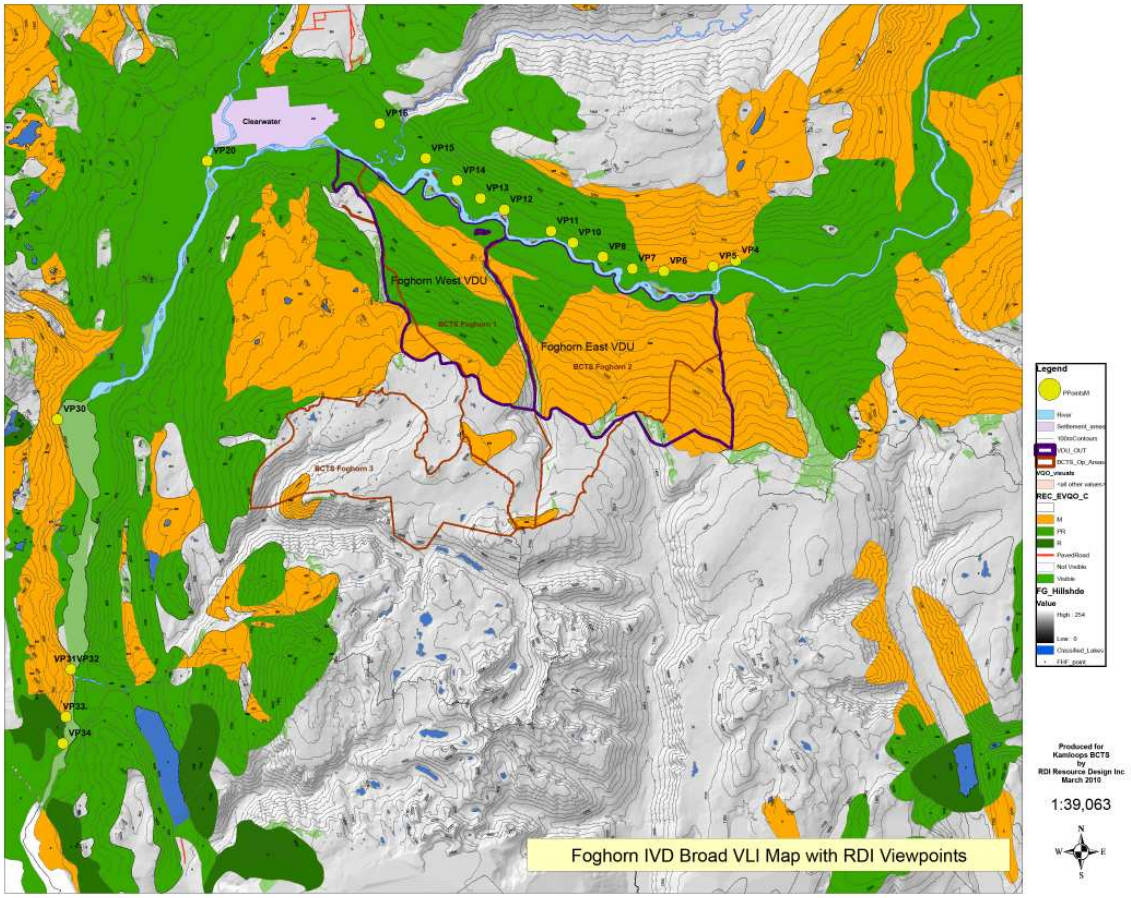


Figure 3 Broad VLI map with RDI Viewpoint Coverage

The large extent of the reconnaissance was necessitated by the Visual Landscape Inventory which indicated there were Visual Sensitivity Units in all three operating areas. The remote ones, such as VSU2 466 in Foghorn 3 had to be hunted down for viewpoints as no viewpoint information was provided in the VLI. Once confirmed by the composite viewshed analysis from the total array of 18 viewpoints as shown in Figure 3 that the Foghorn 3 operating area was not visible to any significant extent, 12 representative viewpoints (VPs 5-16; except for VP 9) were selected along Highway 5 east of Clearwater for both VDUs. There were no formal or very safe stopping points along highway. Viewpoint selection criteria were maximum open viewing opportunity, continuous coverage of the landforms within the VDUs, and coverage of the moving viewing experience.

2.3 Photo Coverage

Continuous photo coverage of the entire expanse of the VDUs was obtained from the 12 representative viewpoints (as well as from the remaining 6 viewpoints) on January 7, 2010. These were placed into panoramas, digitally, using Panorama Maker 4. Viewpoints

were registered by GPS attached to the camera, entered as an attribute for each photo and later mapped using GPS Photo Link. As anticipated, given the project timing starting in January, winter lighting conditions (low sun angle, back-lighting, glare) combined with the north-facing orientation of the landforms prohibited achieving acceptable photography standards. The VDUs will be re-photographed in spring/summer conditions as Phase 2A of the contract. Six final analysis viewpoints covering both VDUs were Viewpoints 5, 6, 8, 10, 12, and 14 shown in Fig. 2 and 3. These viewpoints were selected as providing adequate coverage and were used for computer visualization purposes.

2.4 Visual Design Unit Definition

The two VDUs, Foghorn East and Foghorn West, were defined primarily to incorporate the significant visible portions of the Foghorn operating areas. The VLI map was assessed to identify the main coverage area for the VDUs (Figure 3), and was refined by generating the composite visible area map (viewshed). Extensions were made to include significant, but limited, areas of neighbouring licences sharing common Visual Sensitivity Units (Canfor in the East VDU; Wells Gray Community Forest and Weyerhaeuser in the West VDU). The two VDUs are contiguous, both spatially and visually, divided by the deep incision of Foghorn Creek and are strongly defined by the visual force lines that encompass them. The plan assessed each VDU individually, but portrays them together in the analyses and simulations. The VDUs are part of a broader landscape and viewing experience from Clearwater to Vavenby. Activities within the VDUs will have an influence on neigbouring landscape units and vice versa. A broader plan could consider the entire corridor, but was outside of the terms of the IVD contract.

2.5 Resource Objectives

Design objectives identify the targets which the design plan aims to achieve. These were determined through 1) direct consultation, 2) reference to management goals and objectives, 3) reference to the specific resource management goals, and 4) reference to the relevant legislation and policy governing activities in the planning area.

Consultations were conducted primarily with Frank Kohlberger, BCTS Planning Forester. There are several woodlots within the VDUs and small portions of adjacent Forest Licences and community forest were incorporated to cover the immediate and relevant visible area (Figure 4).

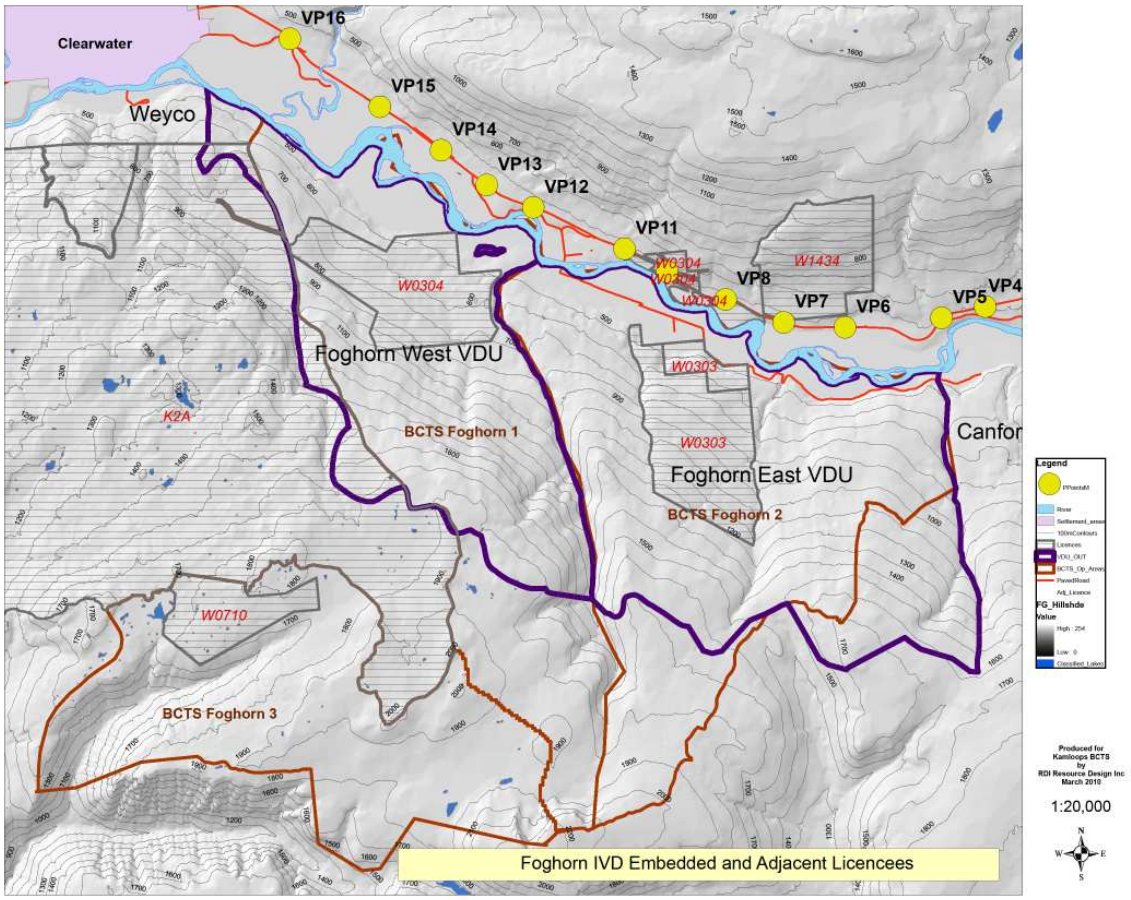


Figure 4 Licence Areas within and adjacent to the VDUs

The key additional players are:

Dave Dobi, Canadian Forest Products (adjacent licencee),
George Brcko, Wells Grey Community Forest,
Glen McNeill, Woodlot W0303 (embedded within Foghorn 1 Operating Area),
Joel Jensen Hauling, Woodlot W0304
(embedded within Foghorn 2 Operating Area), and
Dan Battistella, Weyerhaeuser Company (adjacent licencee).

Contact was also made through the FIA co-ordinator, Theresa Peters, with Gerry Matusky, Woodlot 0710 (embedded within Foghorn 3 Operating Area). His woodlot is outside of the visible area and therefore outside of the defined two Visual Design Units.

Reference was made to the specific resource management goals and objectives presented in the Kamloops LRMP, and BCTS Kamloops Forest Stewardship Plan Objectives Matrix. The Forest and Range Practices Act and its Regulations provided specific guidance in the IVD.

2.5.1 Resource Objectives

The following resource objectives and values were considered in the development of the plan:

Visual Quality Objectives

The plan was to meet the established VQOs of Partial Retention (PR) and Modification (M) as indicated in the provided Visual Landscape Inventory map (
Figure **3**).

Timber Flow (Annual AAC)

No AAC has been set for the Operating Areas. The objective was to maximize harvest opportunity while meeting VQOs. The plan was to incorporate all operable forest over one rotation in four phases of approximately 20 to 25 years per phase. The plan did not account for subsequent re-growth over the period no did it include re-growth in recently harvest areas. Embedded woodlots W0304A and W0303A have their own approved rate of cut. The Vegetation Resource Inventory provided the base information as to species, heights, volumes per hectare (not updated) (Figure 5).

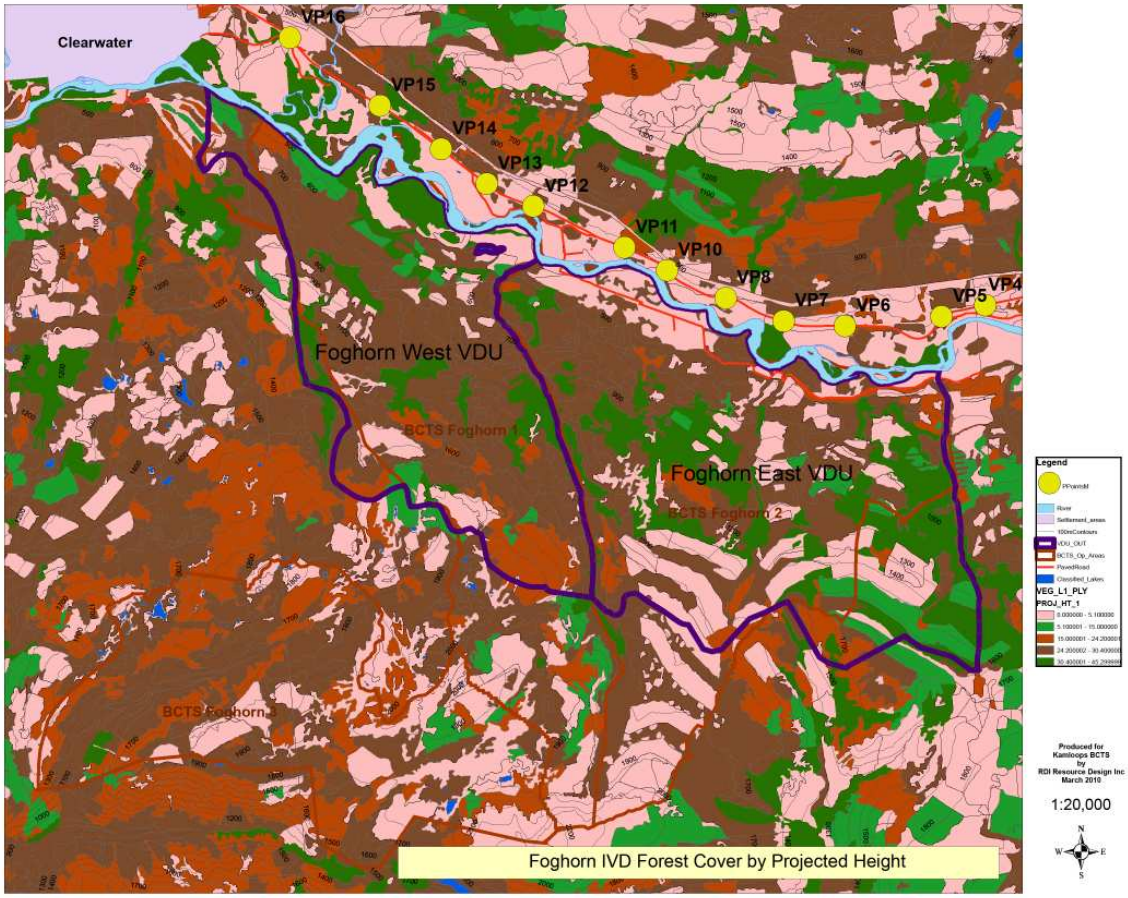


Figure 5 Forest Cover Projected Heights from VRI (not updated)

Recreation/Tourism (Experience, ROS)

ROS is mainly Roaded Modified (RM) with a narrow band along the river of Rural (Figure 6). No recreational features were identified, however, the North Thompson is an important recreational and salmonid-bearing river. The similarly important Clearwater River meets it nearby at the town of Clearwater.

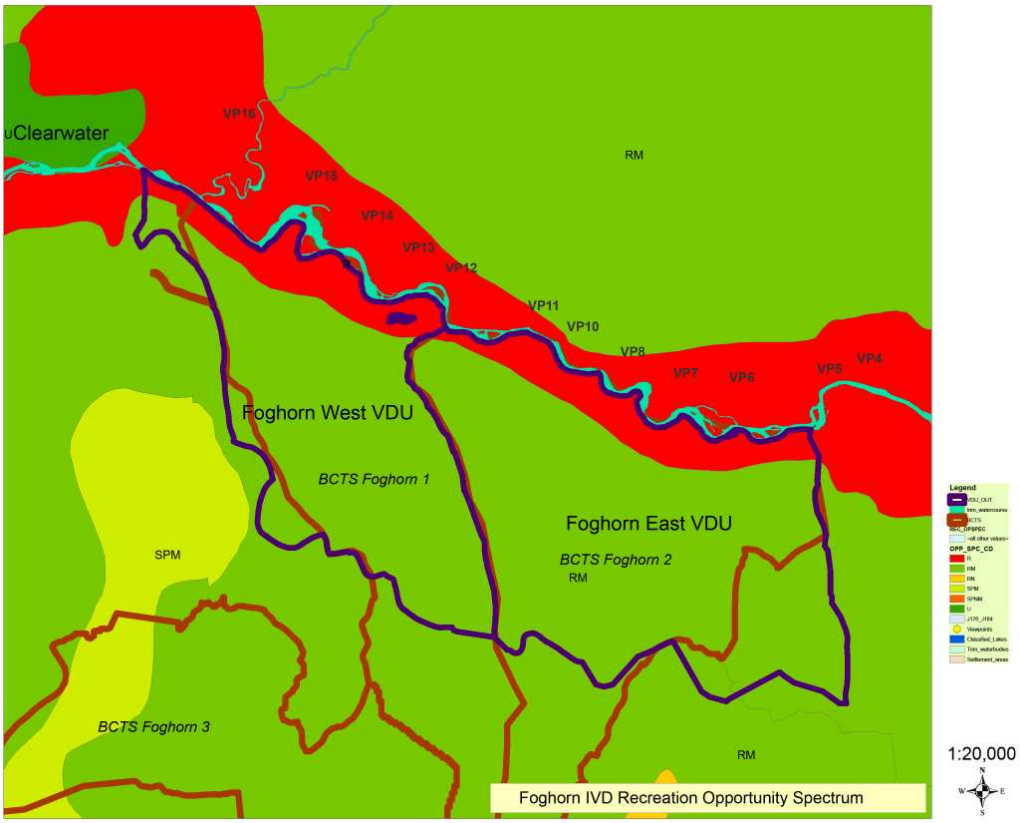


Figure 6 Recreation Opportunity Spectrum Map

Water Quality (Riparian areas, Community watersheds)

Riparian Management Zone, Classes 1-3, were identified in digital files provided by BCTS and included as reserve zones (Figure 7).

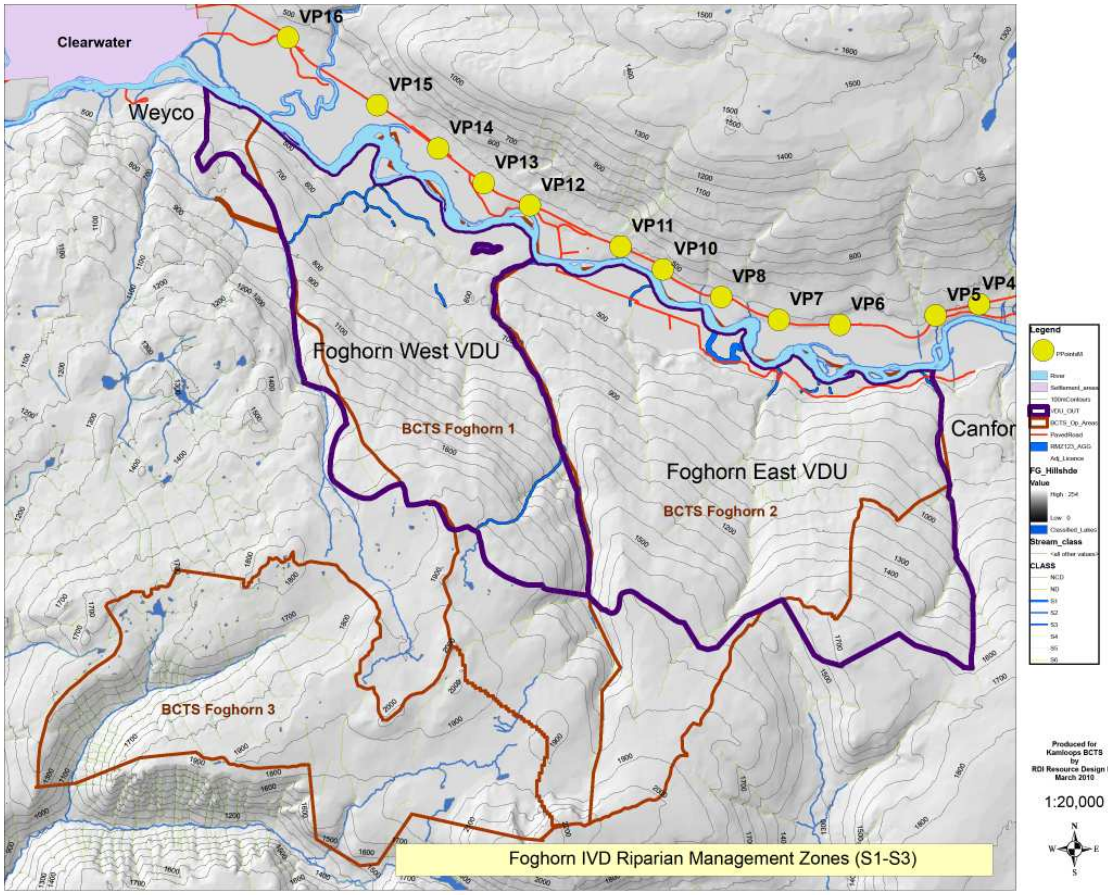


Figure 7 Riparian Management Zones

Landscape Level and Stand Level Biodiversity / Ecological Functioning

BCTS provided digital map layers for Old Growth Management Areas (OGMAs), riparian, and wildlife management areas (Figure 8). No wildlife tree patches were identified, nor determined in the plan.

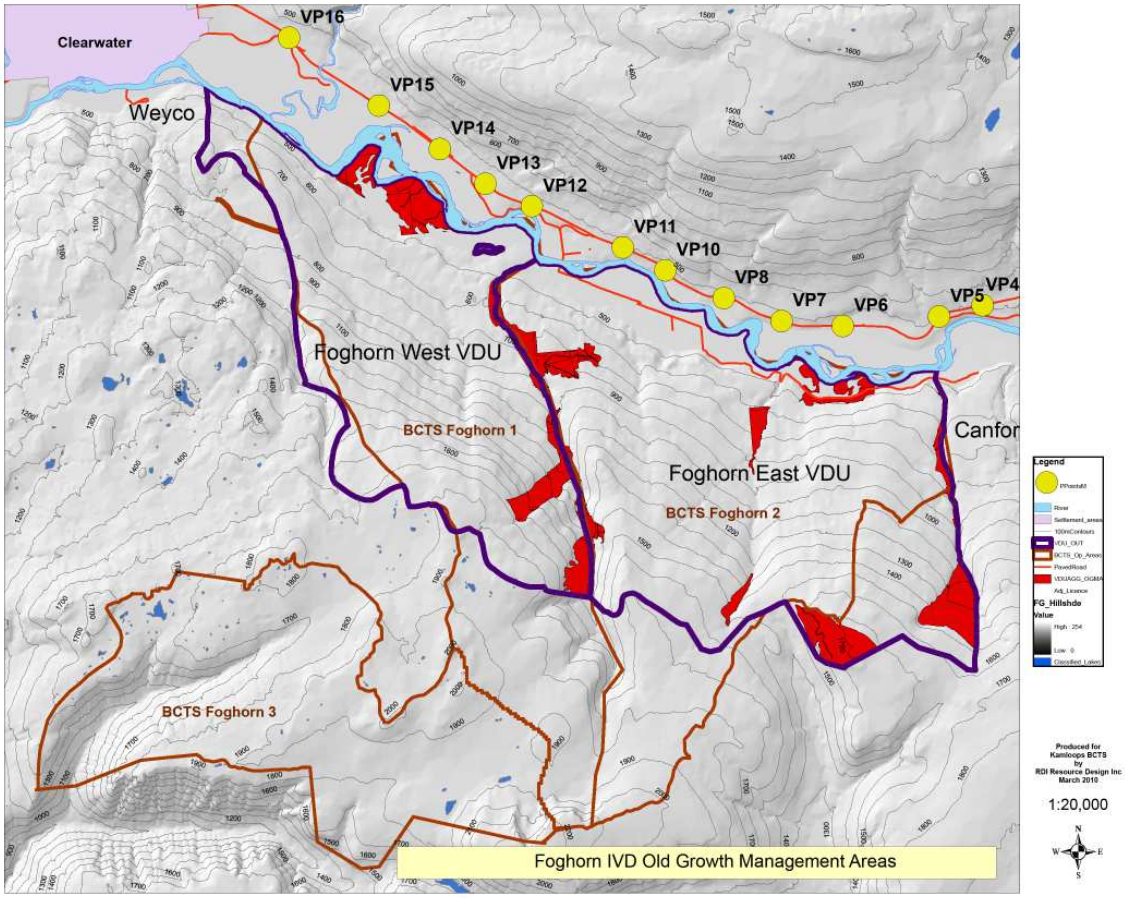


Figure 8 Old Growth Management Areas

Fish / Wildlife Resources

Riparian Management Zone, Classes 1-3, were identified in digital files provided by BCTS and included as reserve zones (Figure 6). No deer or goat areas were located in the area,. A moose habitat zone exists along the North Thompson River. While not excluding timber harvesting, the intent is to maintain thermal cover (Figure 9).

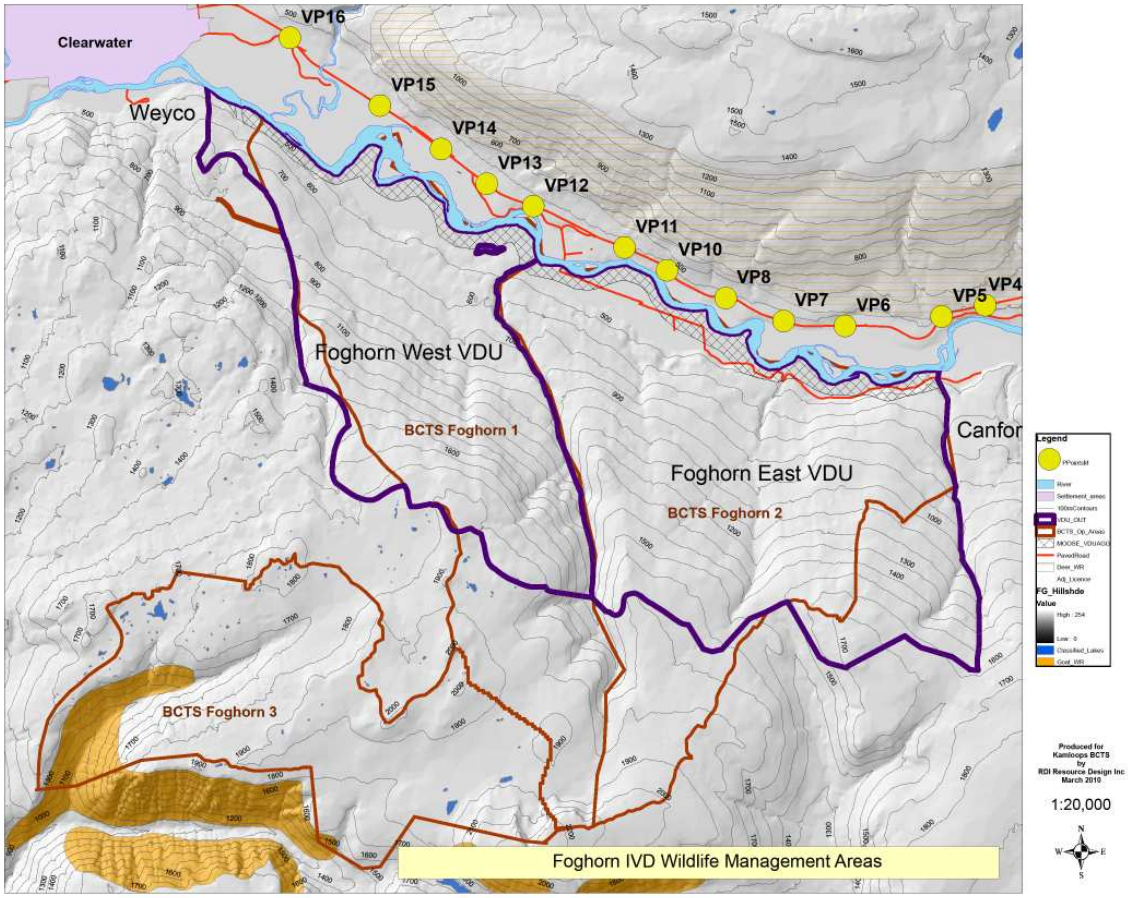


Figure 9 Wildlife Management Areas

Cultural Heritage

No information provided by BCTS. No communications with First Nations representatives have yet been conducted by RDI.

Soils and Terrain Hazard

Steep slopes greater than 60% and Terrain Classes IV and V were provided as digital mapping layers by BCTS. These areas were avoided in the plan (Figure 10)

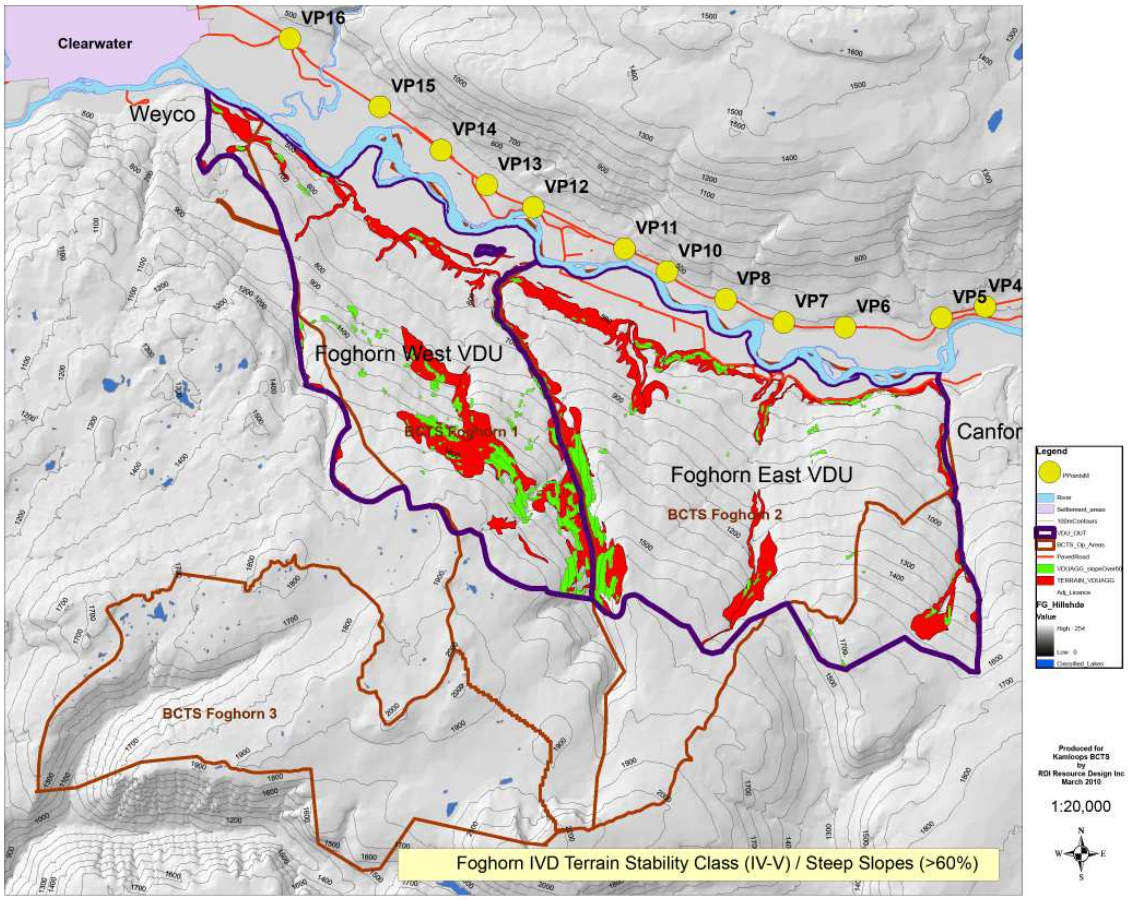


Figure 10 Steep Slopes and Terrain Hazard Areas

Forest Health

A Forest Health Factor digital map layer was provided by BCTS, indicating the locations of detected and low severity rating for bark beetles (mountain pine - IBM, Douglas fir - IBD/IBF, and western balsam - IBB), and cutworm defoliators (IDG) (Figure 11). Only IBB (in camouflage green on the map) and IBD (in light green on the map) are present in the VDUs. The presence of mountain pine was also assumed to be present to some extent in pine-leading forest types classified in the Vegetation Resource Inventory (VRI) acquired for the area. The emphasis is reportedly not as high as further east (Vavenby).

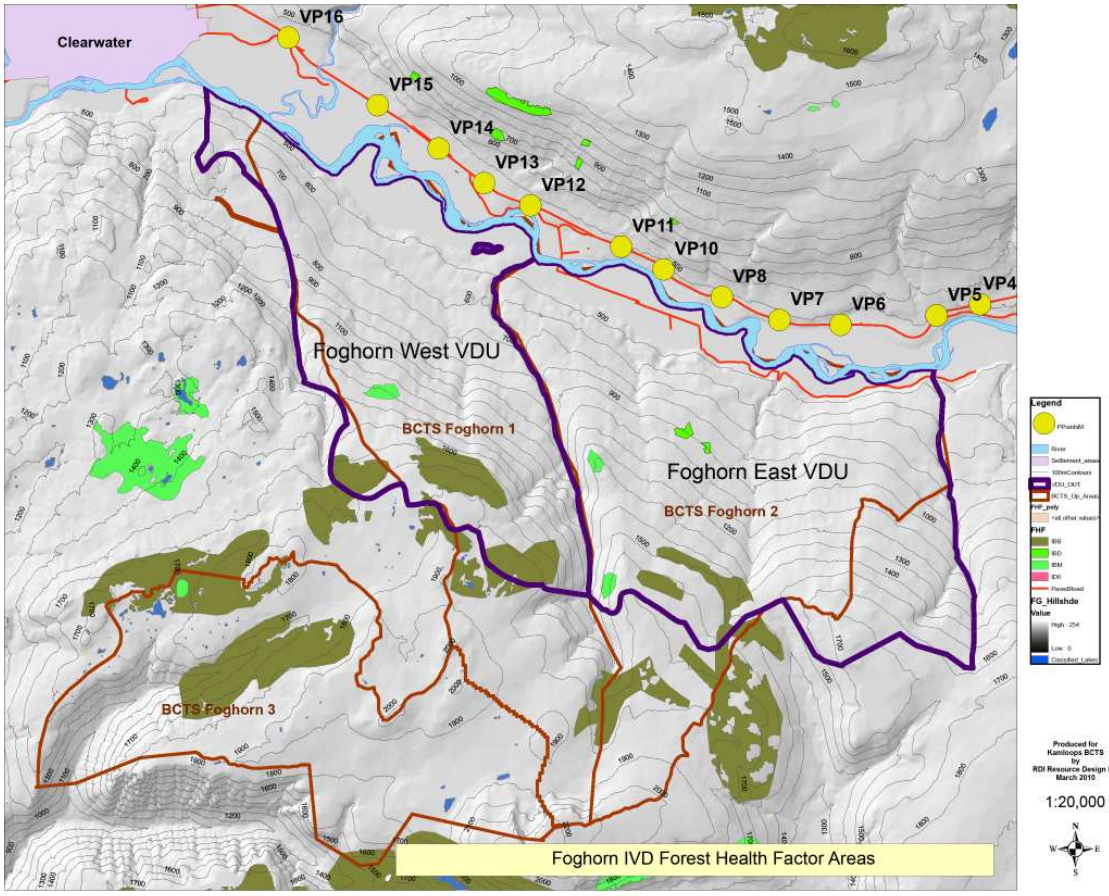


Figure 11 Forest Health Factor Areas

2.6 Resource Inventory

A resource inventory was completed for each VDU. In addition to the single resource representations already provided, the analyses are presented together in the maps and computer simulations as they can be viewed together and will influence each other. The information gathered for the analysis covered the following information in ArcMap feature classes or shapefiles. Each of the layers of information were added to the GIS project for analysis and output as map products. The inventory maps already presented and discussed in the previous section are referenced in the list below. Additional maps are referenced and presented following the list. The maps generally speak for themselves.

2.6.1 TRIM Contours (Figure 12)

2.6.2a Vegetation Resources Inventory (Figure 5)

2.6.2b TSR Operability

2.6.3 Visual Landscape Inventory (VQOs, EVC, VAC, VSC) (Figure 3)

2.6.4 Recreation Features Inventory (no features mapping available)

2.6.5 Recreation Opportunity Spectrum (Figure 6)

2.6.6 Riparian/Wetland (Stream Class S1-3) (Figure 7)

2.6.7 Wildlife Management Areas (moose, deer, goats) (Figure 9)

2.6.8 Terrain Hazard (Class IV and V); Slope >60% (Figure 10)

2.6.9 Forest Health Factors (beetles, cutworms) (Figure 11)

2.6.10 BCTS Cutblocks (existing) (Figure 13)

2.6.11 FTEN Cutblocks (existing) (Figure 13)

2.6.12 BCTS Roads, TRIM Roads, FTEN Roads (existing) (Figure 13)

2.6.13 Composite Visibility (Figure 2)

2.6.14 Old Growth Management Areas (Figure 8)

The feature classes and shapefiles were entered into ArcGIS 9 for analysis, and maps output for use in the report (pdf).

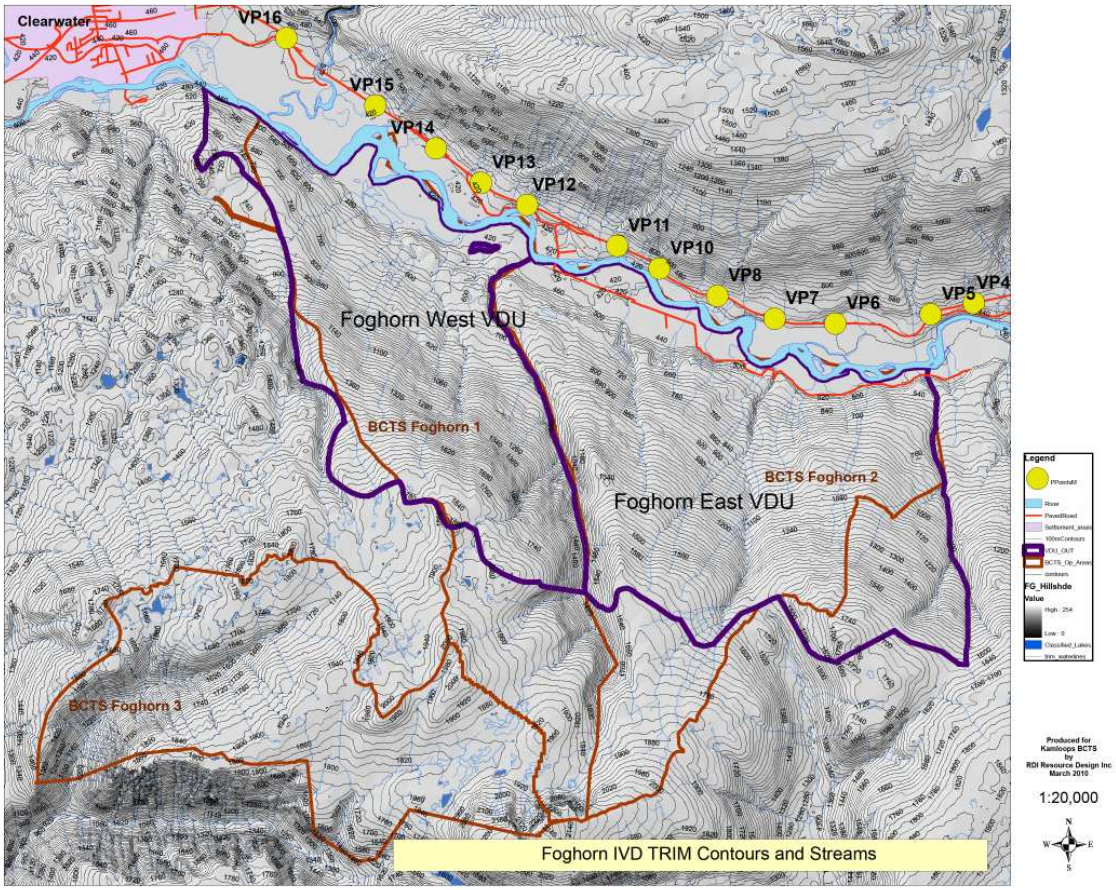


Figure 12 TRIM Contours and Streams Map

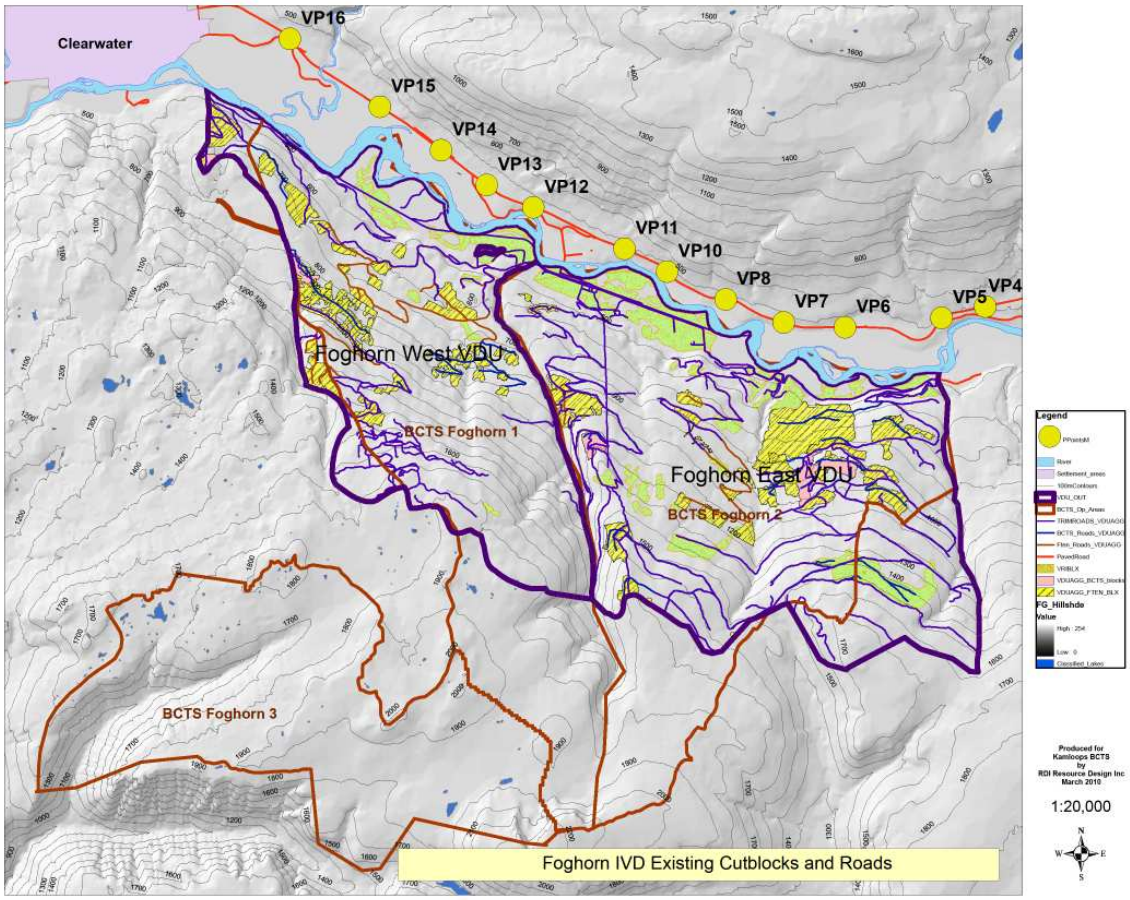


Figure 13 Existing Cutblocks and Roads within the VDUs

2.7 Embedded Woodlot Plans

Woodlots W0303 and W0304 are within the VDUs (Figure 4). According to Glen McNeill, no plans were intended for W0303 except to chase pine beetle. Plans were requested for W0304 but have not been received as of the report preparation date.

3 Phase 2a

Summer panoramas will be taken from the final project viewpoints.

4 Phase 2

4.1 Resource Analysis

The following analyses were completed:

4.1.1 Operability Assessment

The net operable forest was determined to be all forest net of exclusions for OGMAs, Riparian (S1-3), Steep Slopes (>60%), Volume/hectare < 100m3, non-productive brush, existing recent cut blocks. Forest polygons within the Moose habitat identified along the river were considered to be available but require thermal cover retention. The available forest is shown in the following map as it relates to the various ownership/licences within the VDUs (Figure 14).

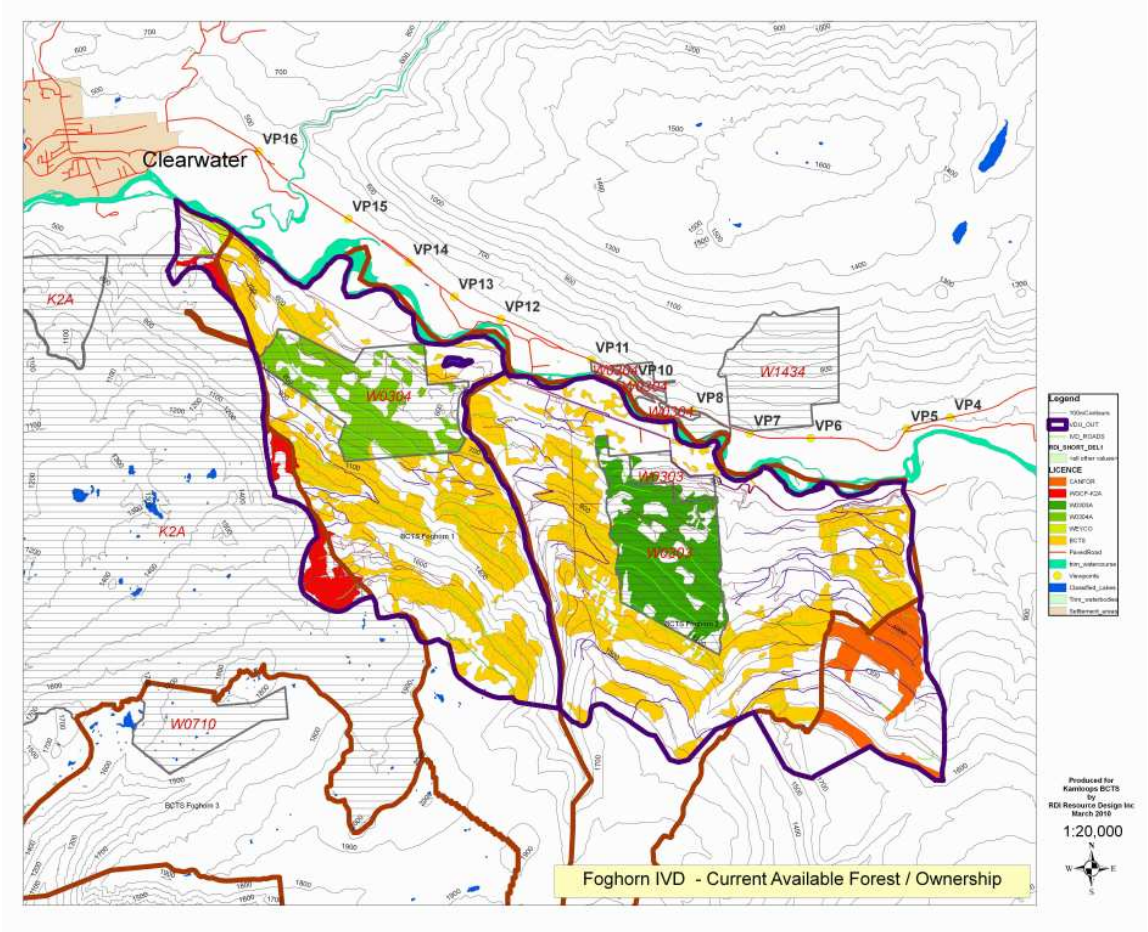


Figure 14 .Net Operable Forest Areas in the Foghorn VDUs

4.1.2 Visual Force Analysis

Visual force is a concept of how humans access and interpret the visual landscape. By convention, it is considered that the eye tracks up hollows (green) and down ridges (red). Visual force lines are also used to guide design. Main force lines indicate the structure and flow in the landscape. The main force lines in the landscape were first used to identify and shape the Visual Design Units themselves. Forest components under the force lines are prominent and important for maintaining the structure and flow. While these components can be considered for harvesting over the long term within a comprehensive visual design, alterations should be avoided which truncate or otherwise conflict with significant force lines, and should merge upwards in the hollows and downwards on the ridges. Visual force lines were developed in ArcMap for consistent application and tracking in planimetric and perspective analyses. The force lines were imported into Visual Nature Studio for the 3-D renderings. Lines are given a common weight as they indicate major ridges (red/down) and creek draws (green/up) (Figure 15).

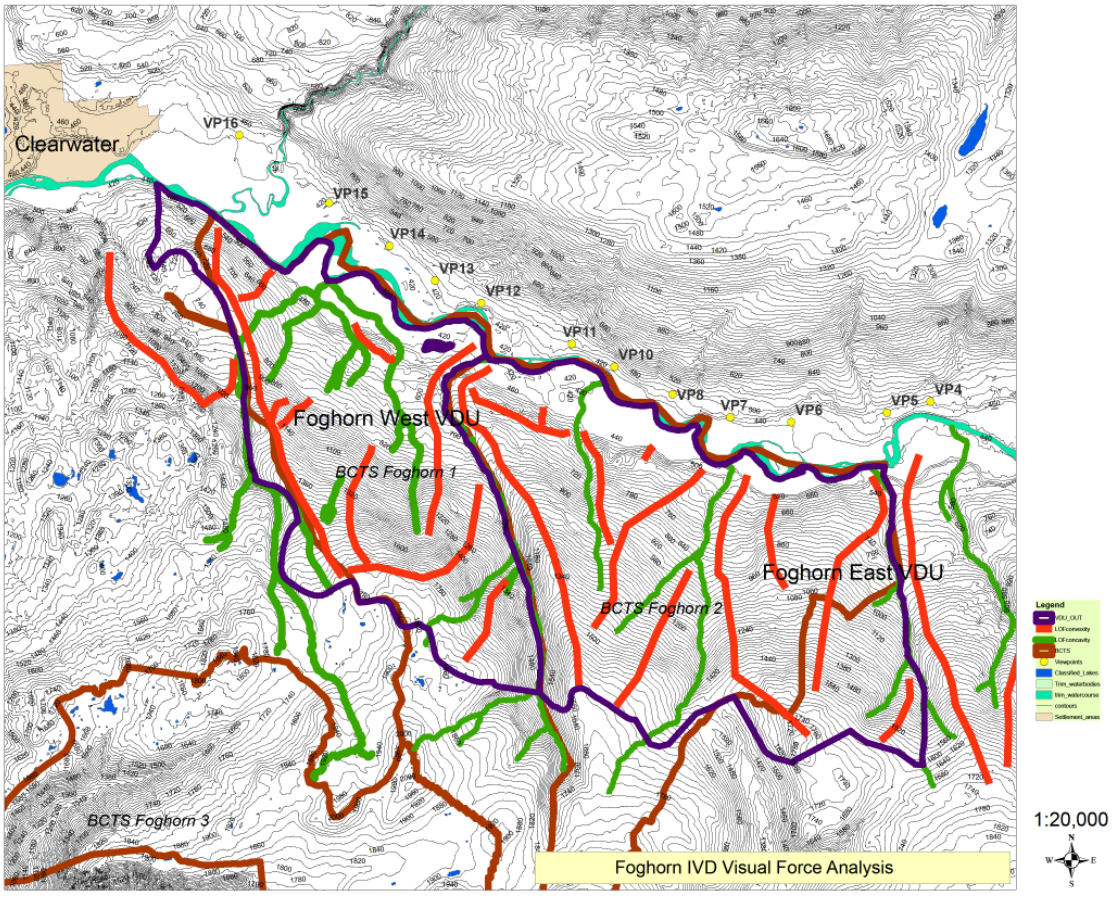


Figure 15. Visual Force Analysis - Planimetric

The Foghorn IVD procedure employed 3-dimensional simulation tools, using Visual Nature Studio software to examine the VDU analyses and plans in perspective view from the viewpoints. As an overview, and for orientation, an aerial oblique view was produced revealing the force lines in plan (top) and perspective (bottom). The top view is a representation of the planimetric map rotated 180 degrees for ease if comparison with the perspective view with North at the bottom (Figure 16).

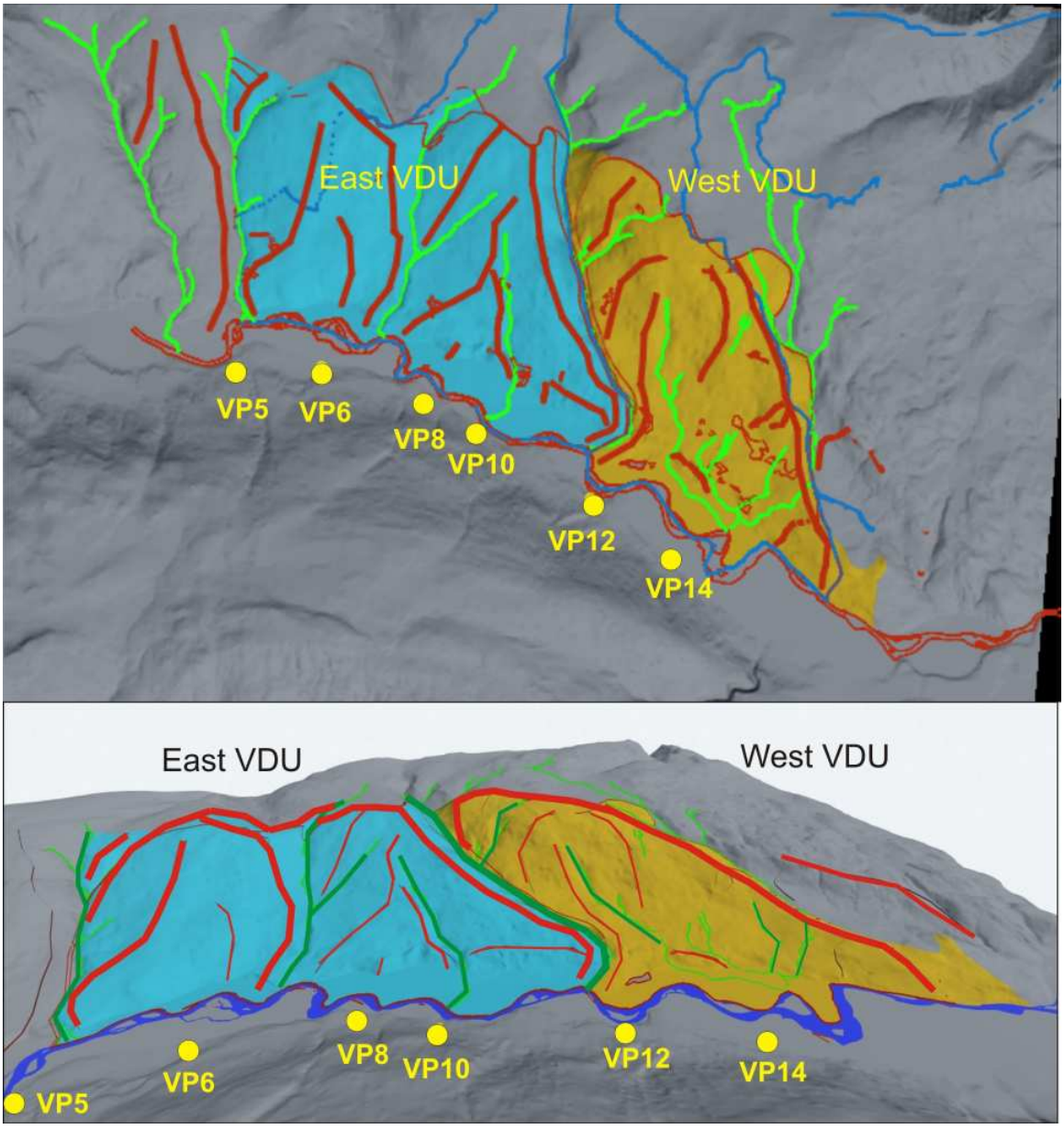


Figure 16 Visual Force Analysis in Plan and Perspective (Aerial Oblique) Views in VNS Model

Visual force analysis was also constructed from each of the 6 design viewpoints in perspective view. Viewpoints 5, 6, and 8 are presented in Figure 17, and viewpoints 10, 12, and 14 are in Figure 18.

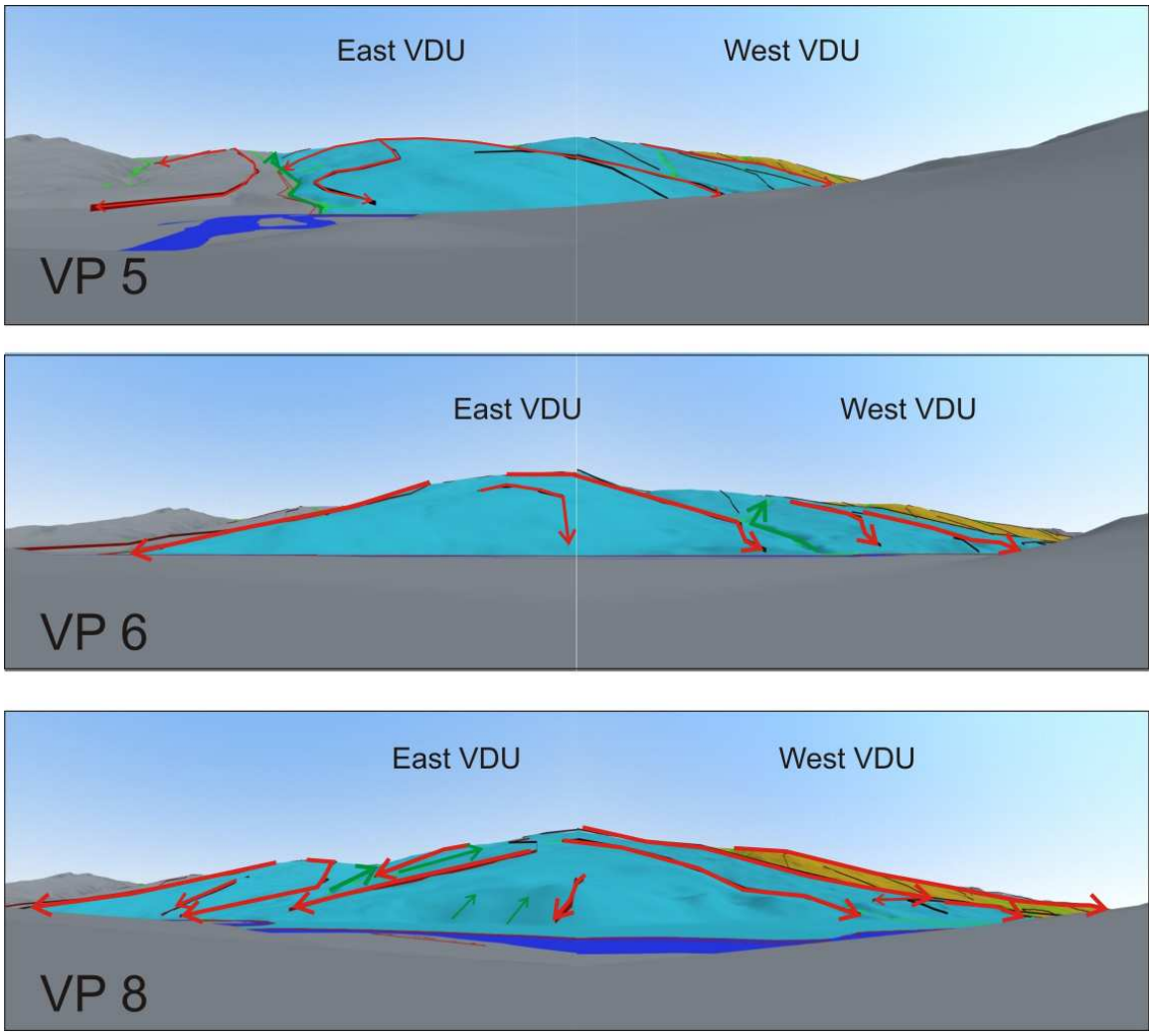


Figure 17 Visual Force Analysis from Viewpoints 5, 6, and 8

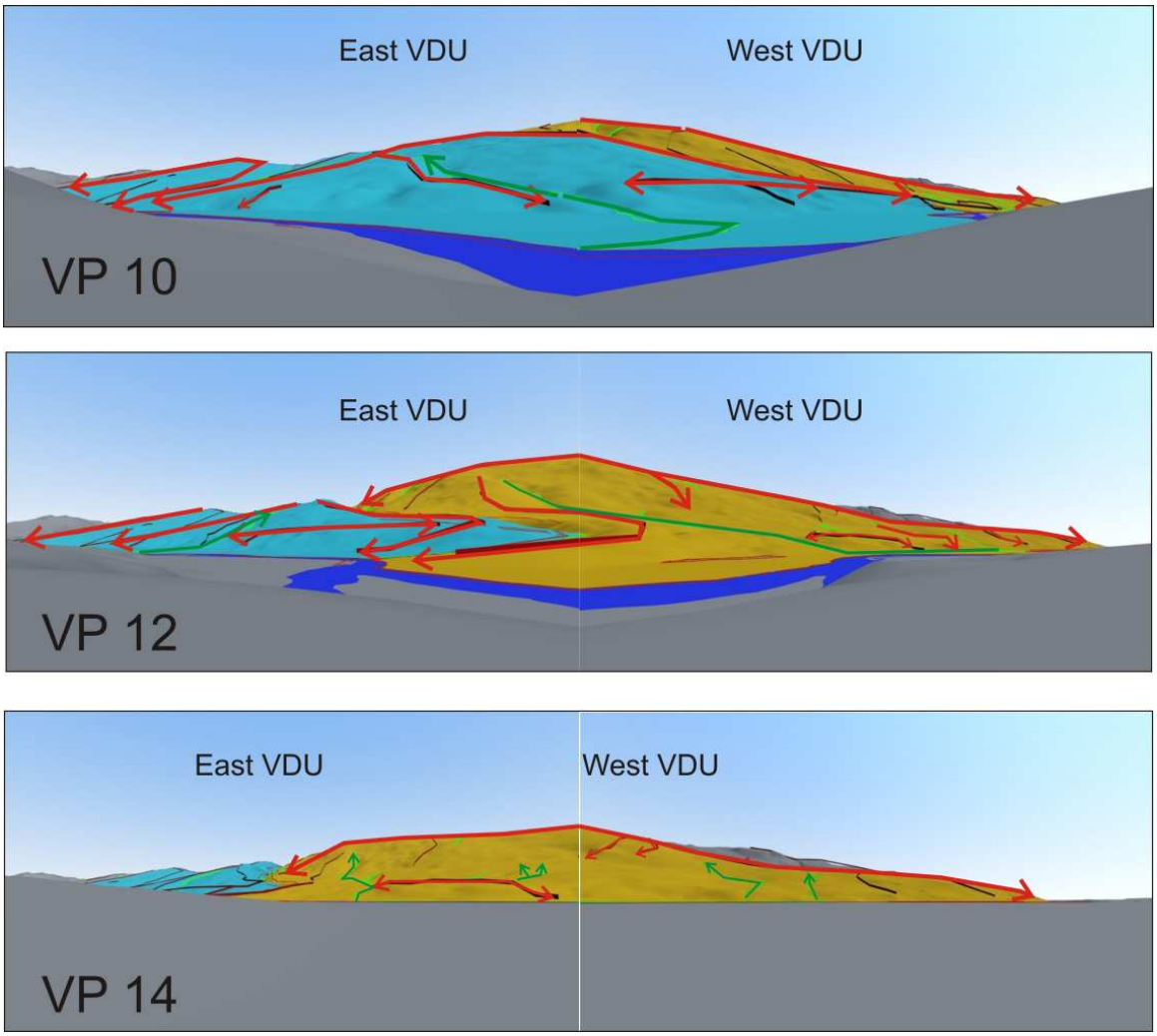


Figure 18 Visual Force Analysis from Viewpoints 10, 12 and 14

4.1.3 Land Feature Analysis

The photo-panoramas for the 6 design viewpoints were assembled for the analysis. Winter lighting and snow conditions made it difficult to observe much detail (Figure 19). Photography will be re-taken in summer conditions as Phase 2A of the contract.

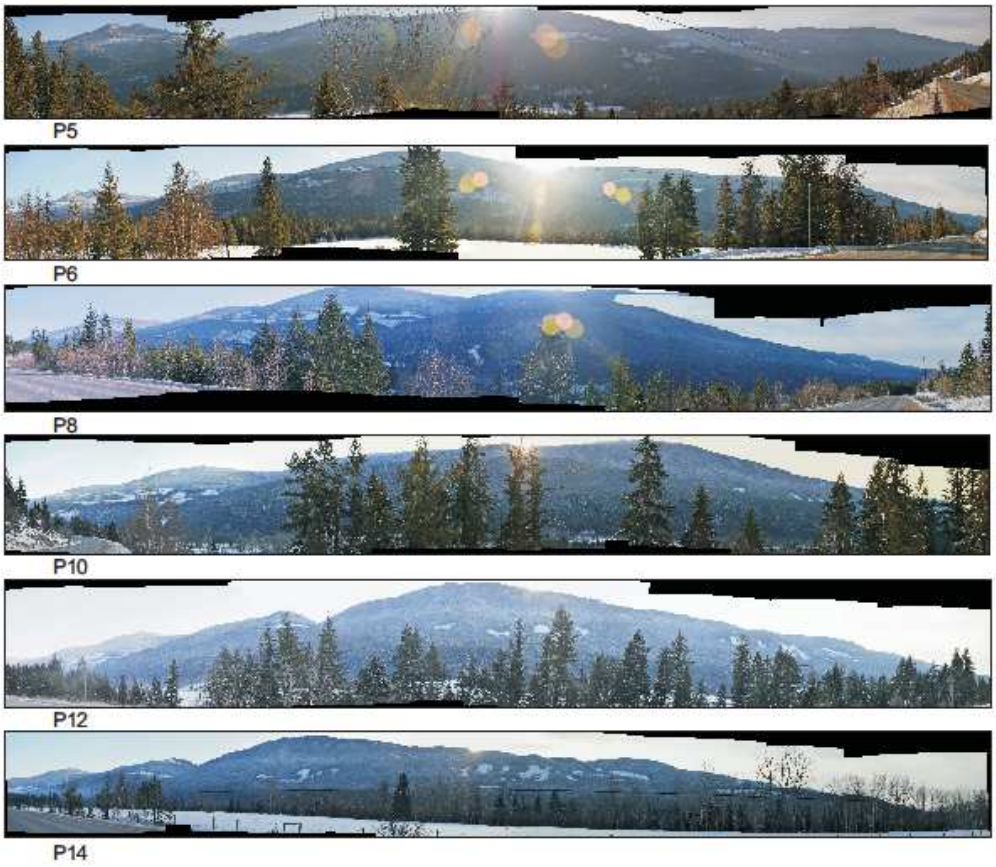


Figure 19 Photo-panoramas from the 6 Design Viewpoints

Using a single panorama (3-D) as an indicator, together with a key map, patterns and features were identified, including cut blocks, mountain features, Foghorn Creek, roadside screening, and the North Thompson River (Figure 20).

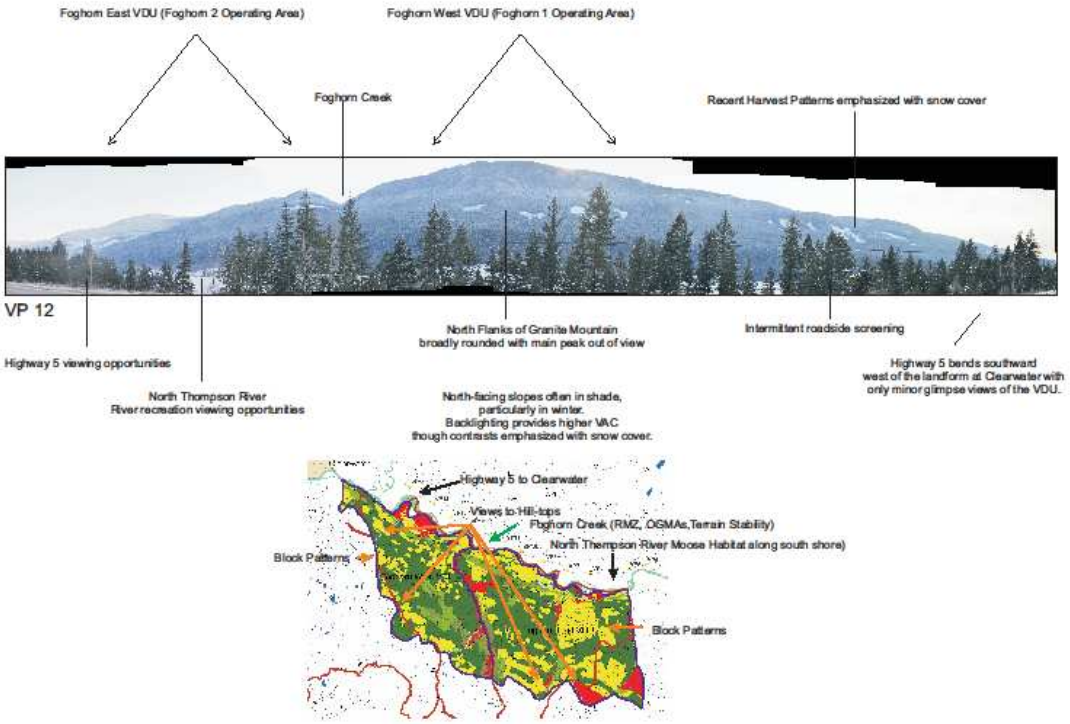


Figure 20 Land Feature Analysis in Plan View and Perspective View (VP 12)

4.1.4 Opportunities and Constraints Analysis

The collective constraints, in relation to the operable/available forest, were examined. Design issues were identified and considerations devised that could aid in the detailed design of harvest areas. A table of each resource/condition and the opportunities and limitations to development was created, as follows (Table 1):

Table 1 Design Issues and Opportunities

Design Issues and Opportunities	
Visual Force	Guide patterns of development
Land Features	Reveal existing patterns/focal points (natural/human made)
VQO/EVC	Go/no go and intensity
Riparian	Reserves are shaping influences
OGMA	Reserves are shaping influences
Steep Slopes	Reserves are shaping influences
Terrain Hazard	Reserves are shaping influences
Moose	Canopy retention (not reserve)
Cutovers	Guide patterns of development / scheduling consideration
Non-Productive	Guide patterns of development / scheduling consideration
Roads	Guide patterns of development / scheduling consideration
Forest Health	Guide patterns of development / scheduling consideration

The constraints identified in the resource inventories (Section 2.5.1 and 2.6) and the issues and opportunities described in the table above provide a significant and comprehensive influence on what might happen in the future in the Foghorn VDUs. By no means is the Foghorn a 'blank slate" for visual landscape design. When placed together, the Foghorn is a complex composite of constraints (Figure 21) and, shown previously, in response to the constraints, the forest available for integrated visual design (Figure 15).

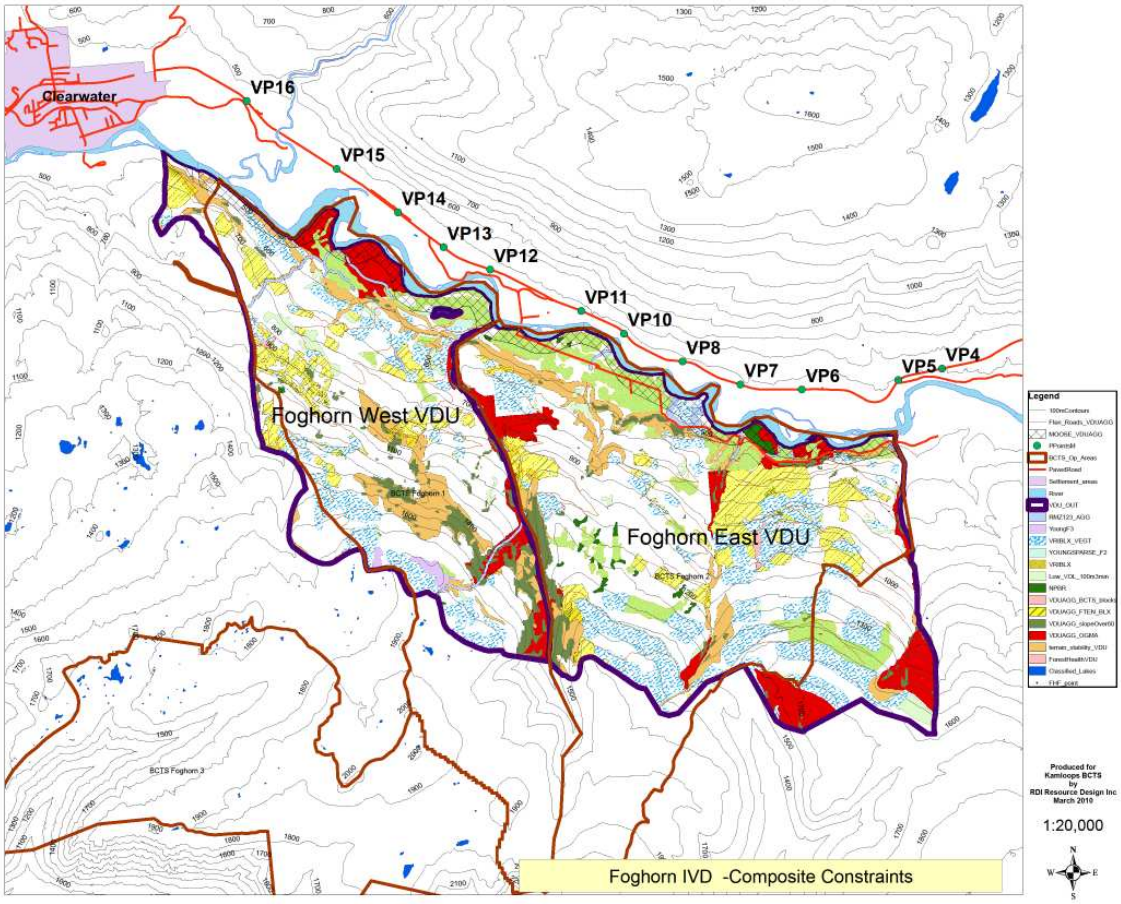


Figure 21 Composite Constraints Map

In the above map, the constraints have left only the white area within the VDUs as available forest. The moose habitat along the river is not excluded from harvesting activity.

The constraints were added to the VNS model in order to generate perspective 3-D views. A different, more distinctive colour coding approach was assigned to the constraints in the VNS model to provide greater distinction on the grey background of the terrain model. A planimetric image was generated and rotated to have the viewpoints at the bottom to relate more easily to the orientation of the views (Figure 22). The aerial perspective provides a 3-dimensionsal overview of the constraints on the landform. The constraints are also shown in perspective view from the viewpoints (Figures 23 and 24).

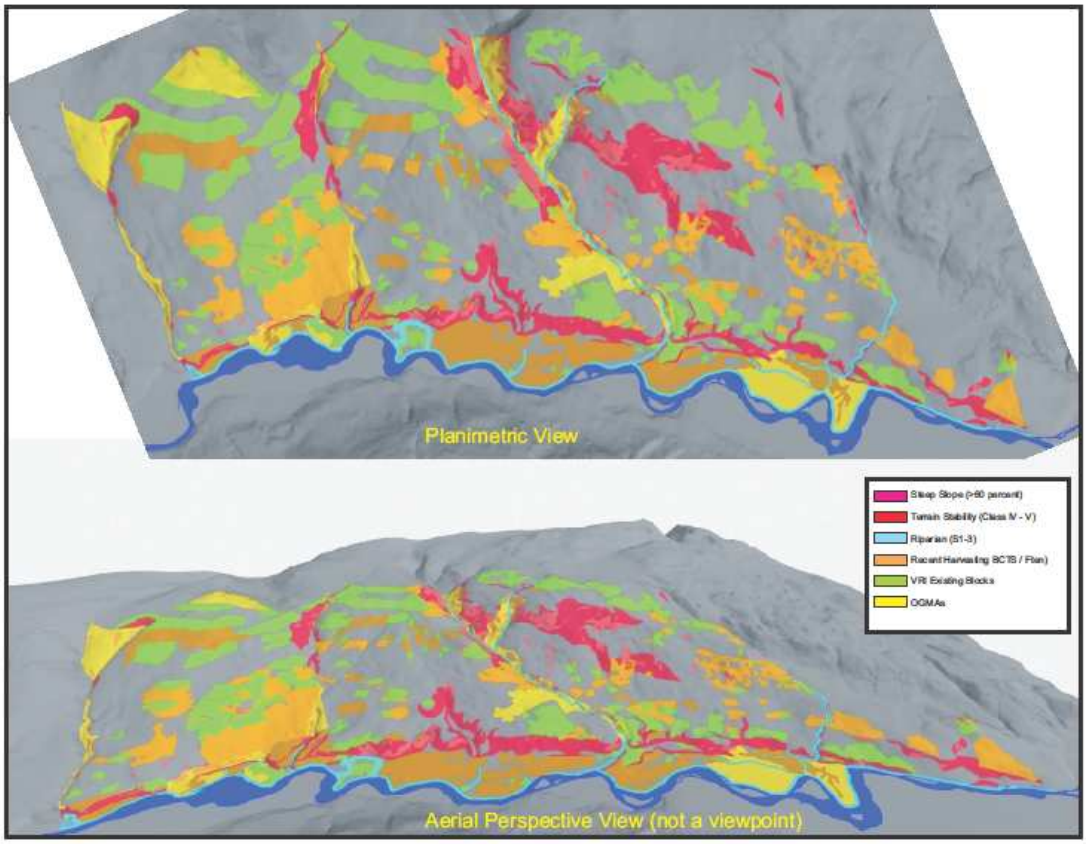


Figure 22 Composite Constraints - Planimetric View (VNS Model)

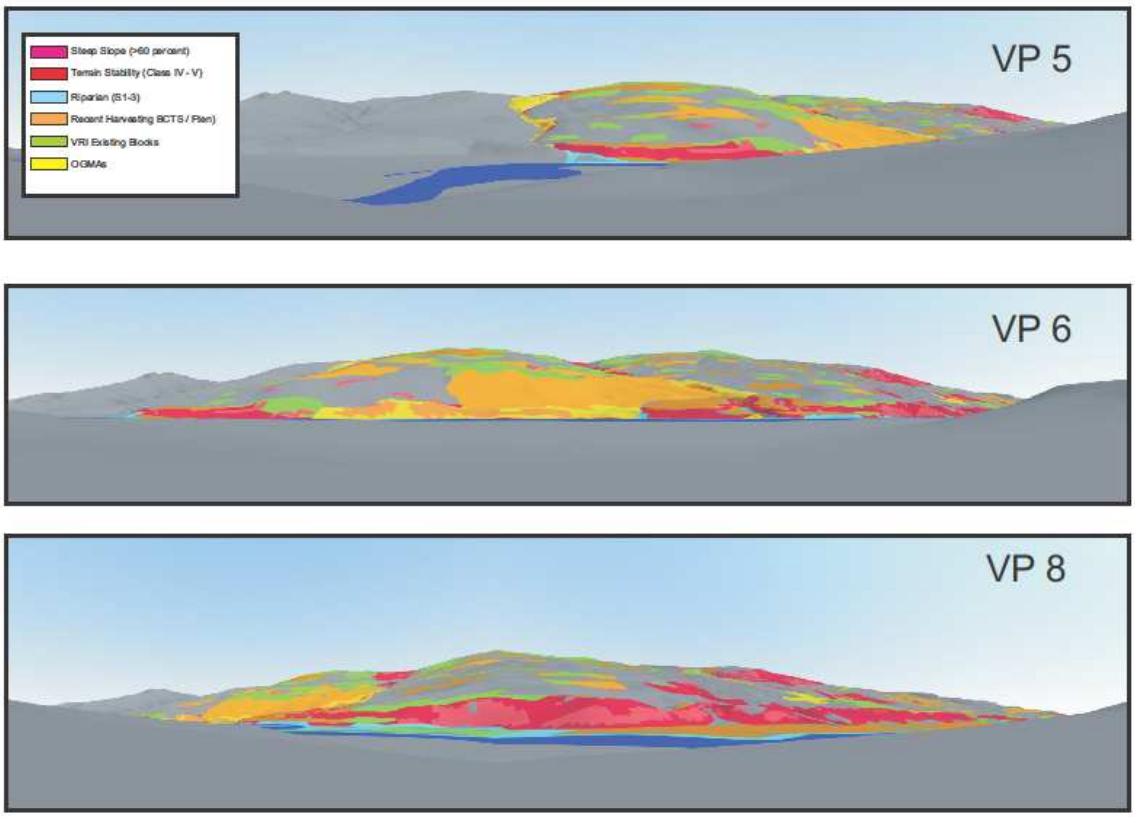


Figure 23 Composite Constraints - Viewpoints 5, 6, and 8

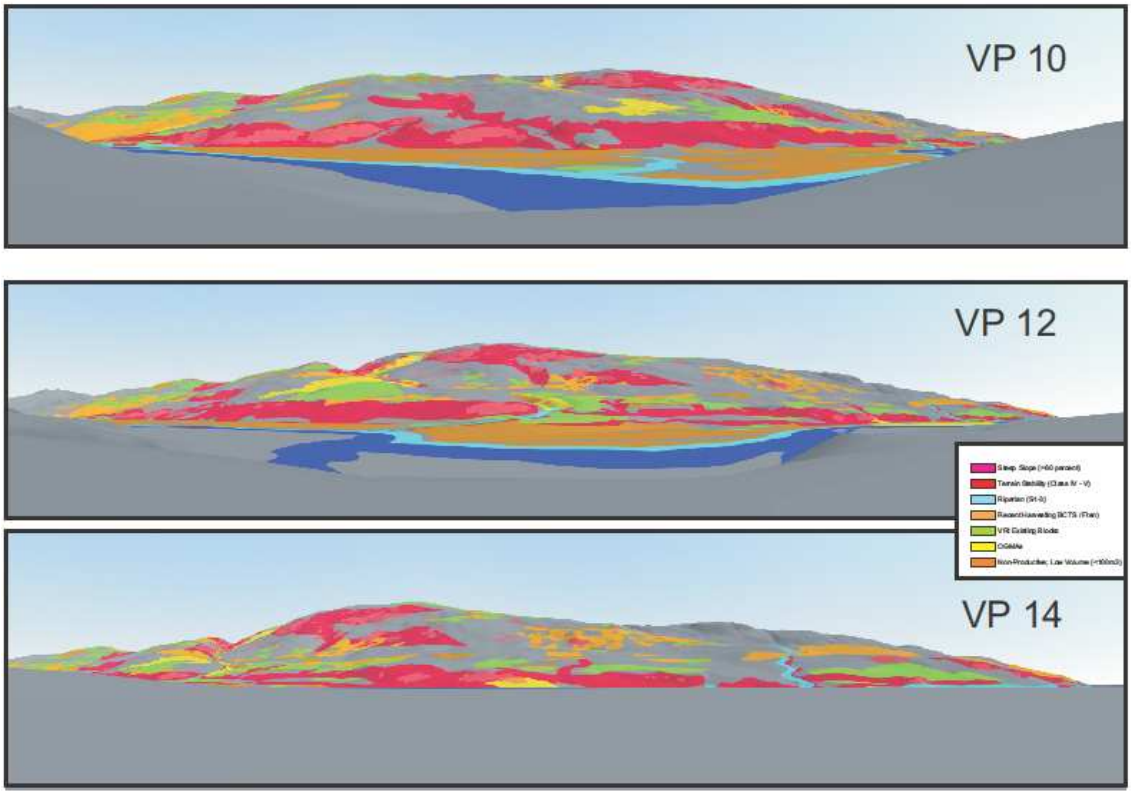


Figure 24 Composite Constraints -Viewpoints 10, 12, and 14

Phase 3 Design

The following procedures and products were completed for each VDU and collectively presented herein:

5.1 Concept Design Areas

The operable/available forest (Figure 15) was grouped into 16 Concept Design Areas (CDAs)[3] after netting out reserves, recent alteration, non-productive areas, low volume areas (<100m3 / ha). The design areas were determined by two principal influences - the available forest (location, patterns, and extent) in the VDUs, and the boundaries of the embedded licences (Figure 25). Importantly, major visual force lines were also used in the shaping of the CDAs, as they were used to initially define the Visual Design Units. Each CDA was comprised of many cells derived primarily from the forest cover

[3] Concept Design Area (CDA) is a name derived by RDI for the Foghorn project.

polygons. The attributes of the forest cover polygons were maintained in each cell to support decision-making in the detailed design stage (Section 5.2).

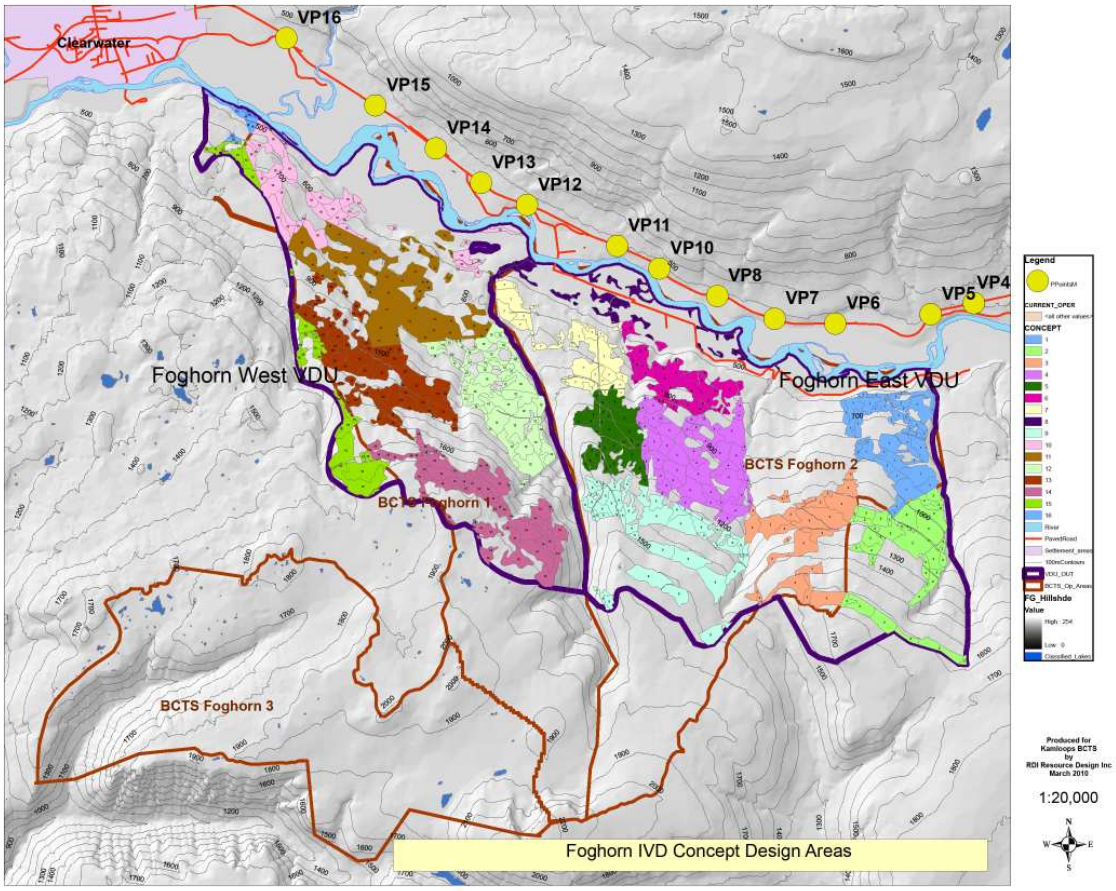


Figure 25 Concept Design Areas (CDAs) by Colour and Number Code

The available forest landbases of each of the two woodlots within the VDUs as well as the Canfor, Weyerhaeuser and Wells Grey Community Forest operating areas were assigned to separate Concept Design Areas within the VDUs:

Foghorn East VDU
- CDA 2 - Canfor
- CDA 4 - W0303A

Foghorn West VDU
- CDA 11 - W0304A
- CDA 15 - Wells Grey Community Forest
- CDA 16 - Weyerhaeuser.

The remaining CDAs are all within the BCTS operating areas.

By including the licence areas in the concept design, the CDAs could be tracked by their assigned number. As well, the unique identifiers, which follow through the entire plan, including potential block numbers, would also enable the individual operator independent access to their portions of the IVD planning file. The colour-coding also provided the means to rapidly assess the extents, shape and prominence of each CDA in plan and perspective views reveals the relationships of the CDAs to each other and as they relate to the two Visual Design Units overall (Figures 26 and 27).

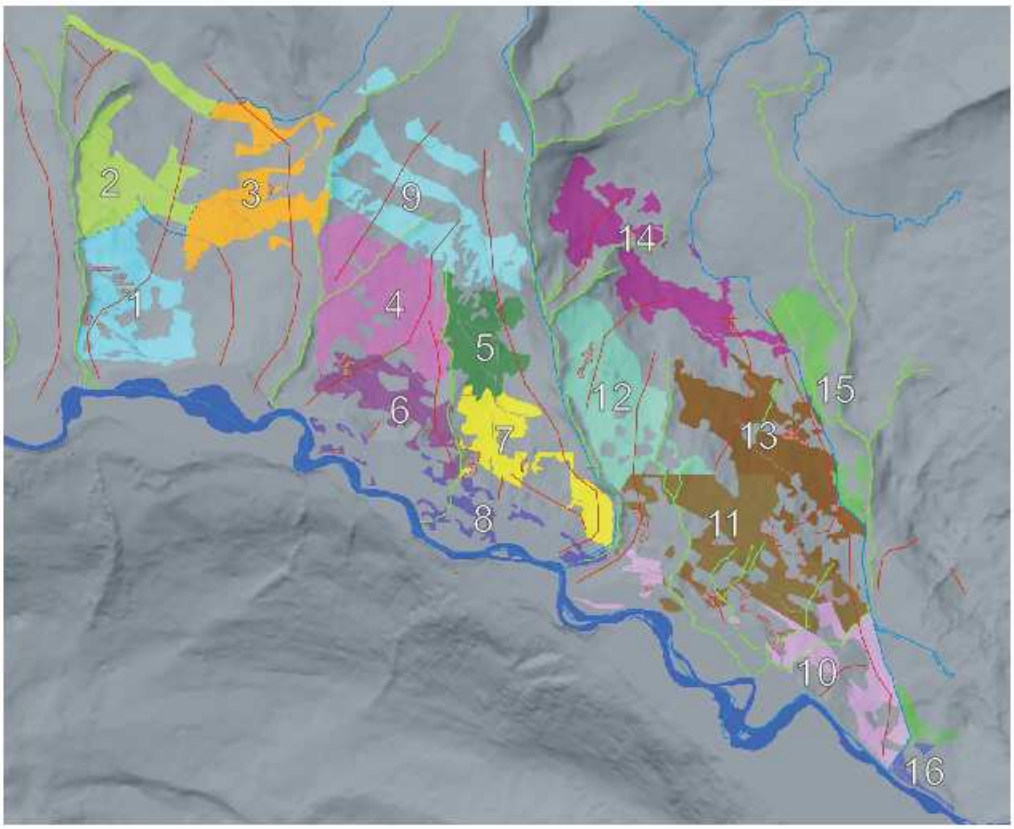


Figure 26 Concept Design Areas in Plan View (VNS) with LOF (North at bottom of map)

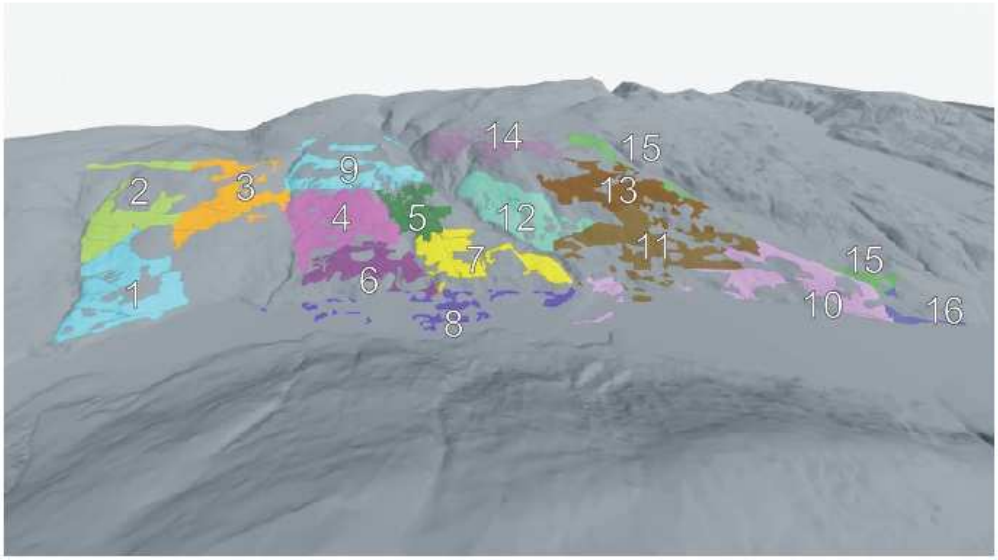


Figure 27 Concept Design Areas in Aerial Perspective View

The concept design was also rendered from each viewpoint in VNS (Figures 28 and 29).

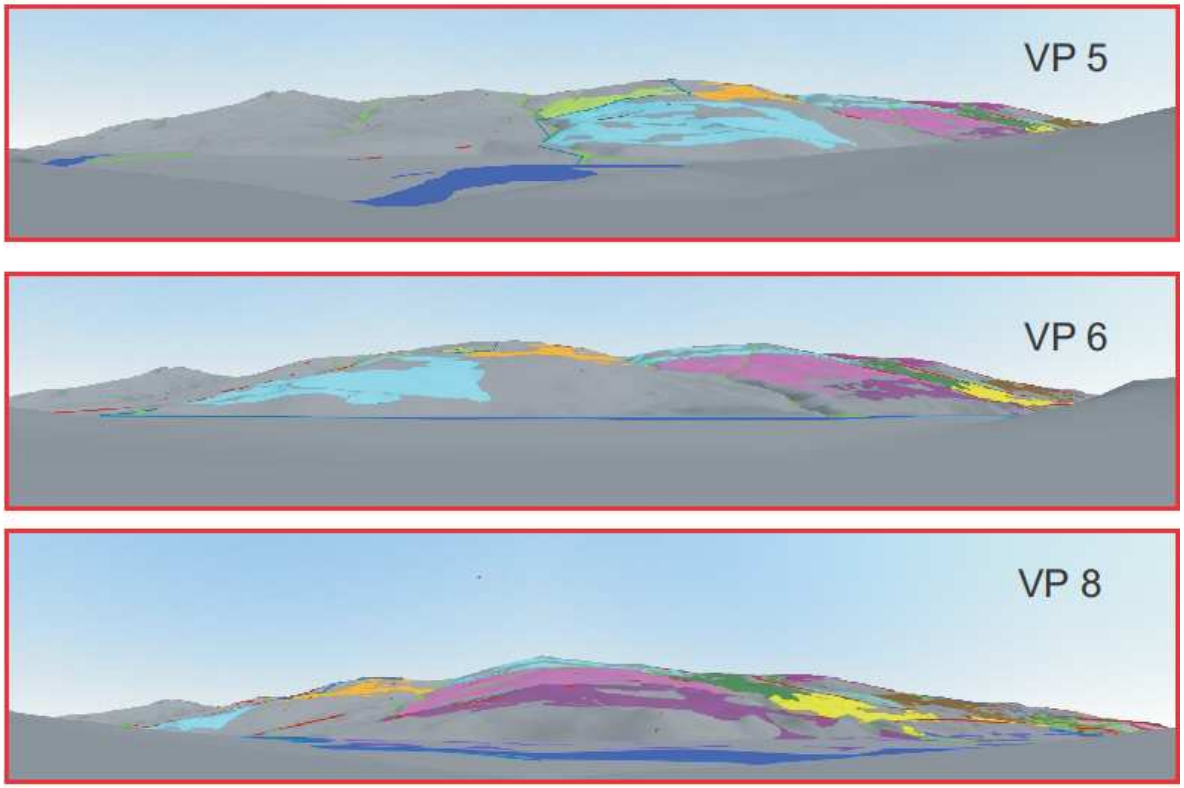


Figure 28 Concept Design Areas from Viewpoints 5, 6, and 8

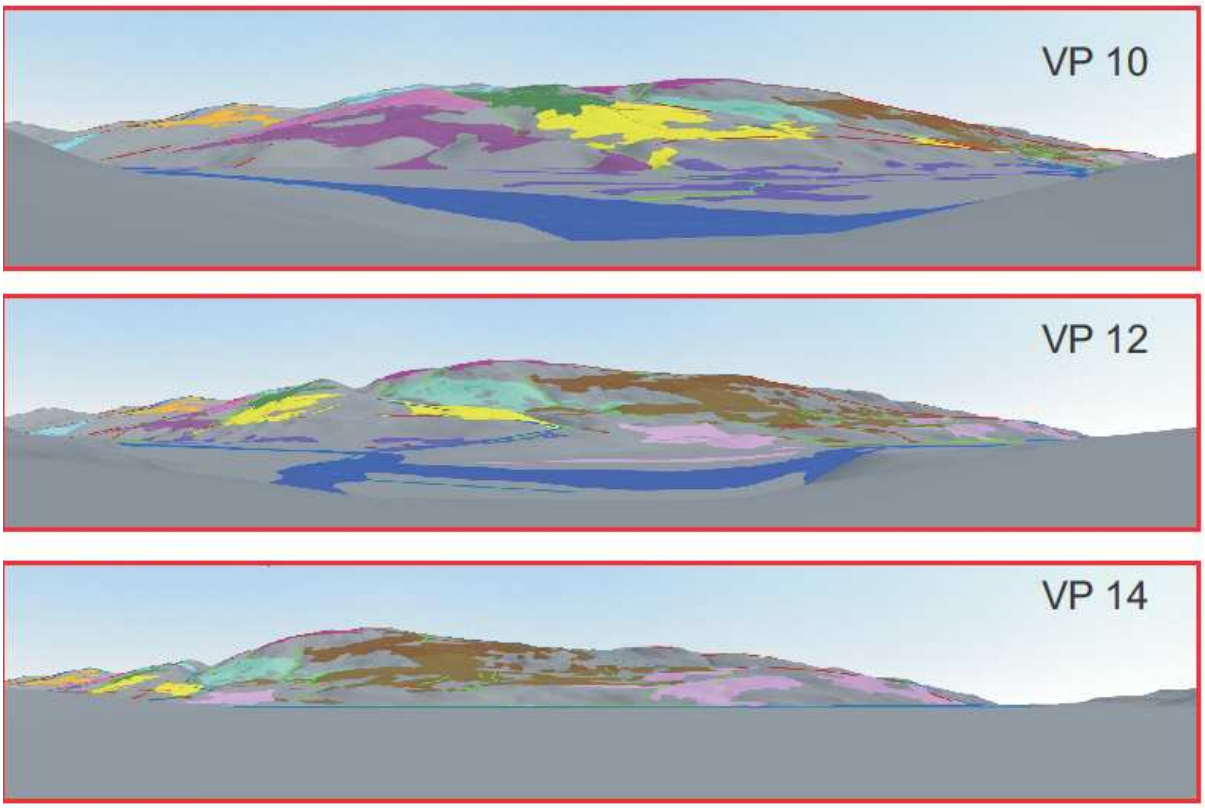


Figure 29 Concept Design Areas from Viewpoints 10, 12, and 14

5.2 Detailed Design

5.2.1 Complete Pattern of Shapes (Design Blocks)

The concept design was refined through iterations to develop a complete pattern of shapes (design blocks) depicting all possible harvest opportunities over the period of one rotation (80-100 years). Four phases of 20-25 years were determined to be appropriate.

The design blocks were comprised of the individual cells identified in the concept design. In some cases, individual cells were assigned as a harvest units, in other cases, groups of cells were assigned as a unit, in others again, larger cells were divided into workable design blocks (Figure 30).

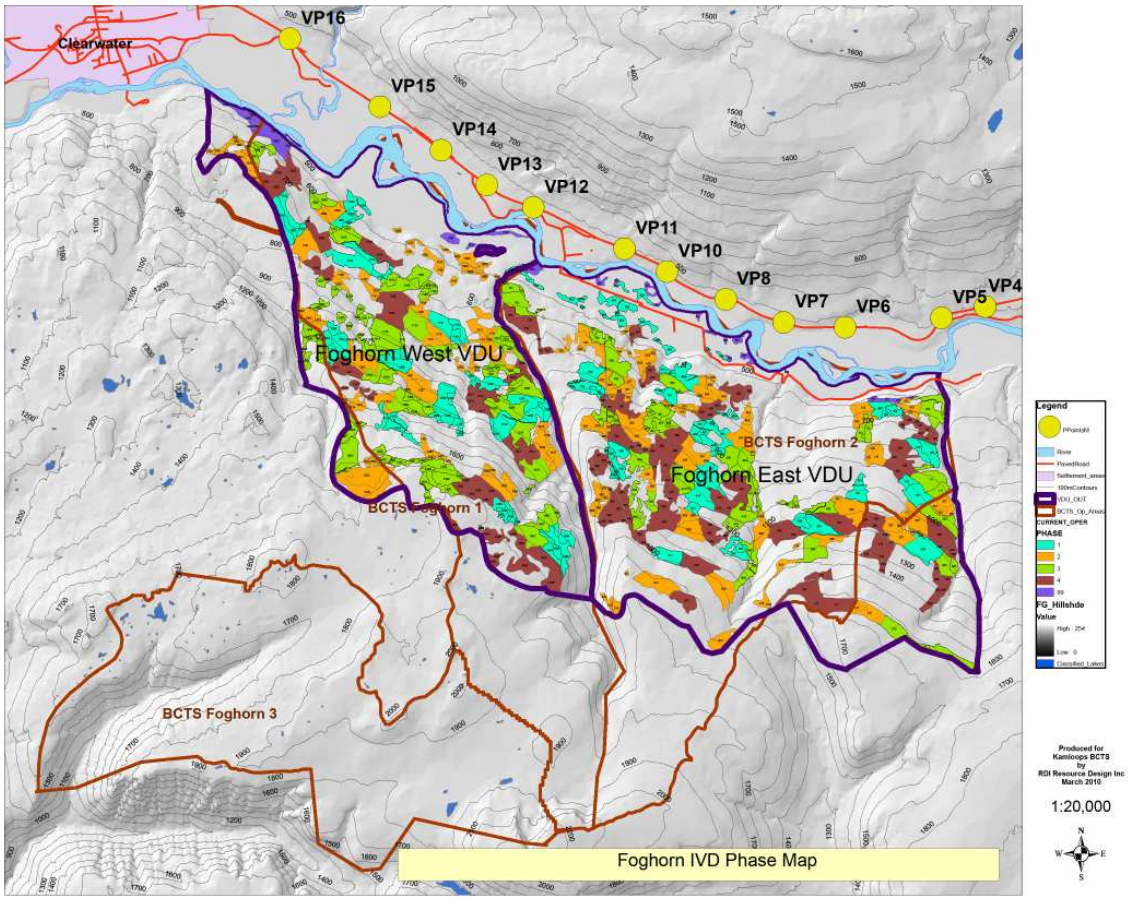


Figure 30 Detailed Design Blocks, Scheduled into 1 of 4 Phases

The blocking process regarded visual force lines, topography, prominence in the landscape, existing patterns and conditions such as recent timber harvest areas, retention areas such as riparian, steep slopes and unstable terrain, and the shapes and patterns that would be created in each phase. Visual force lines were regarded in two major ways: 1) to influence the shape, and 2) to set the schedule for a particular unit. Fortunately, the major upward force lines (green) such as in Foghorn Creek and the other major creeks were largely off-limits due to other resource constraints, thereby providing strong visual cohesion of unaltered forest ranging from bottom to the top of the VDUs. Units following major downward force line (red) were considered for retention over the shorter term to maintain the structure of the landscape, but added into the schedule in later phases, mainly in Phase 4. Inevitably, when planning the entire visible, operable forest, conflicts arose with shapes and patterns. The existing harvested areas played a strong role in the design, frequently imposing geometric patterns which were sometimes difficult to mitigate. Where particular units exhibit too much angularity, detailed interventions will be required, such as disbursed or grouped variable retention, or corners left un-harvested. Existing road access was utilized to maximum extent. Where existing roads were deemed inadequate in the plan to reach any particular design unit, road extensions were created in

ArcMap. In all, 599 individual design cells were scheduled within 177 design block groupings with a total area of 3382 hectares and volume of 1,149,445 m3. The following table summarizes the scheduling (Table 2):

Table 2 Phase Areas and Volumes

Phase	# Blocks	Area (ha)	Vol. (m3)
1	34	663	222561
2	55	856	298011
3	42	912	316514
4	40	880	298267
99	6	71	14092
Total	**177**	**3382**	**1149445**

The harvest systems are all conventional (e.g. skidder or feller-buncher). The silvicultural systems are clear-cut and/or variable retention. Stand diversity, ecological functioning, visual apparency, and scale and pattern from the viewpoint(s) will direct the silvicultural system selection. Portrayal of the harvest units is non-retention (clear cut). As each phase is 20-25 years, early cuts in the phase will achieve a measure of visually effective green-up (VEG) as new openings evolve. For portrayal purposes only, each phase was assigned re-growth when portraying the subsequent phase (5m for a single phase of regrowth; 10m for two phases of re-growth, 15m for three phases of re-growth). The growth is considered somewhat optimistic in the single phase re-growth, but somewhat conservative over the three phase re-growth (average site index at 50 years is 17.7 m across all harvest units). Available forest volumes were as determined in the VRI. No growth factor was added to either the available forest or to volume growth in cutover areas (conservative volume calculation).

The 177 design blocks with their scheduling are conceptual only and should not be interpreted to be an actual plan. The scheduling of the 599 block units is fully and easily adjustable in ArcMap. Each unit has all attributes from the VRI attached, such as projected height, volume per hectare, species, and licence ownership. Fuller discussion should take place with all involved parties. The complete table of the design block array is presented at the end of the report (Table .3).

5.2.2 Block / Pass Response to Landscape Structure

A visual force analysis was performed in plan view and in perspective view, as seen from the design viewpoints, to assess how well each block / pass responds to the underlying landscape structure. This analysis was ran together with the design tests in a combined, interactive operation (see 5.3).

5.3 Testing the Design

5.3.1 Perspective Modelling

Each harvest phase (pass) was modelled in perspective view, using Visual Nature Studio, from the key design viewpoints to determine how well design criteria have been addressed in terms of functional, visual, environmental and economic objectives. The display of block groupings in each phase was assigned a colour for ease of recognition and differentiation amongst the phases. The colour emphasized the block contrast to a greater extent than would a more natural colour, exaggerating perceived visual impacts (Figures 31-34).

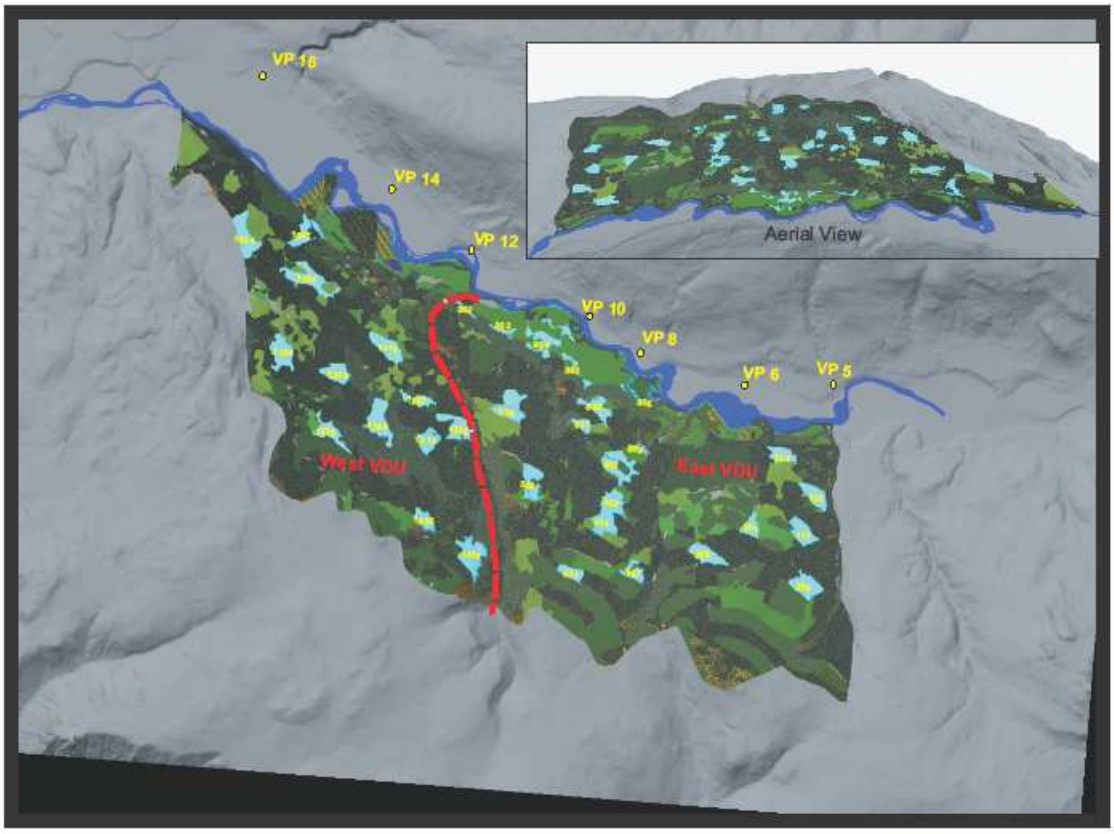


Figure 31 Phase 1 Design Blocks

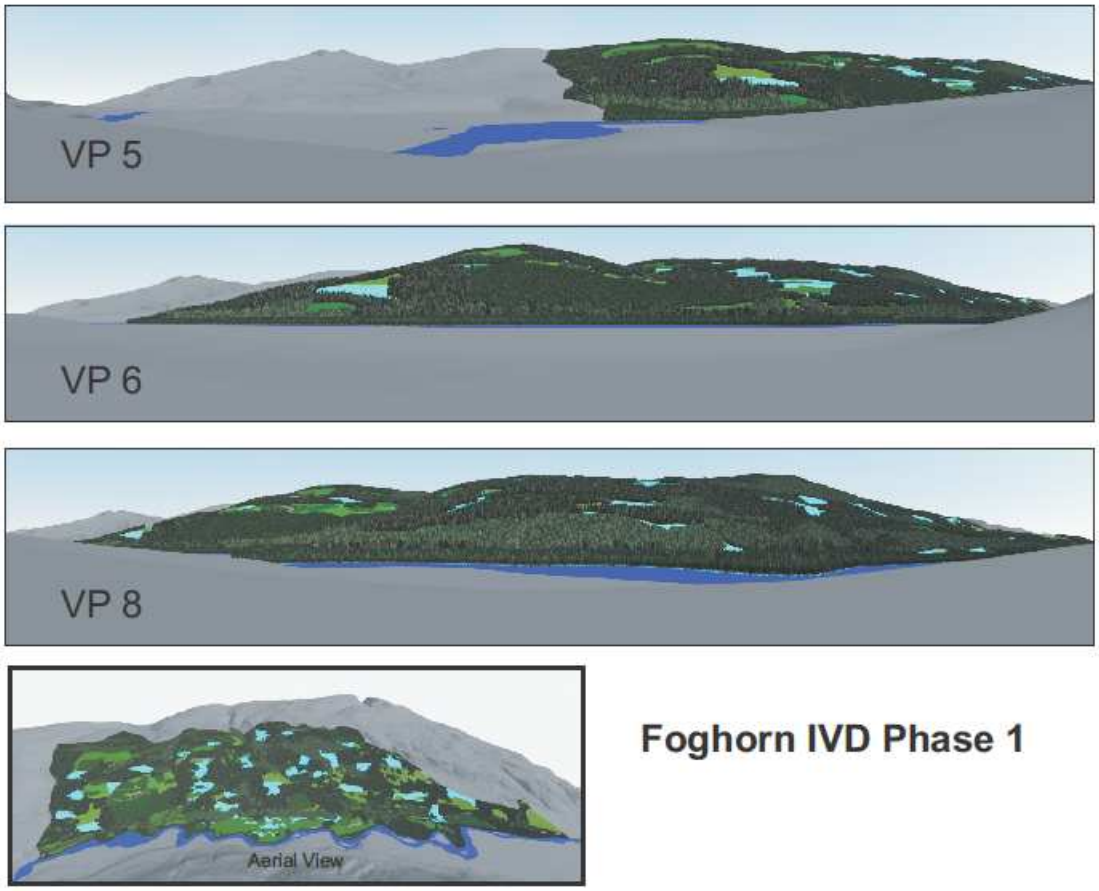


Figure 32 Phase 1 Design Blocks from Viewpoints 5,6 and 8

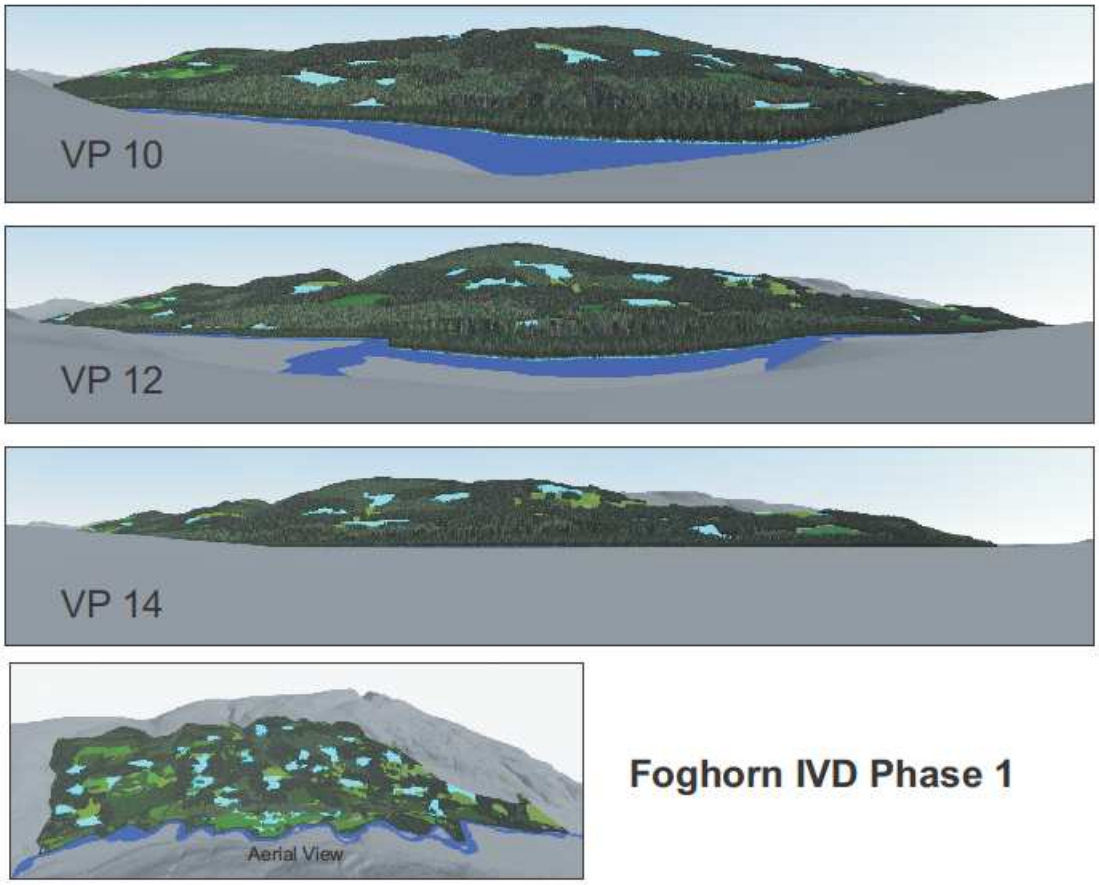


Figure 33 Phase 1 Design Blocks from Viewpoints 10, 12 and 14

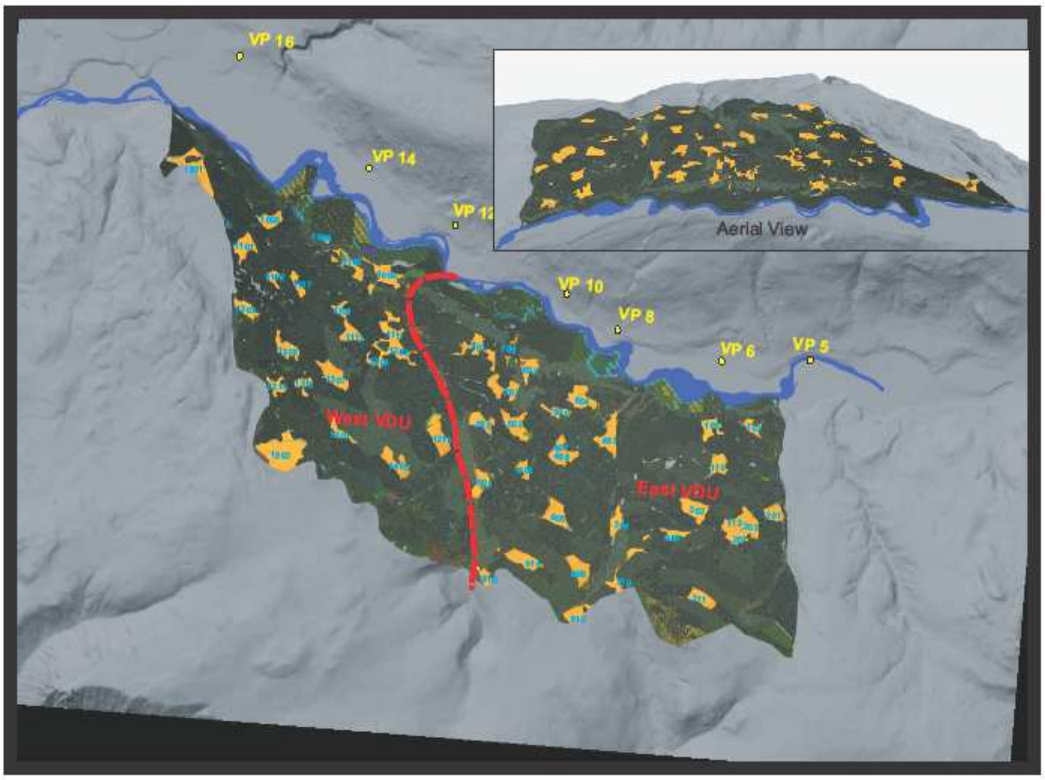


Figure 34 Phase 2 Design Blocks

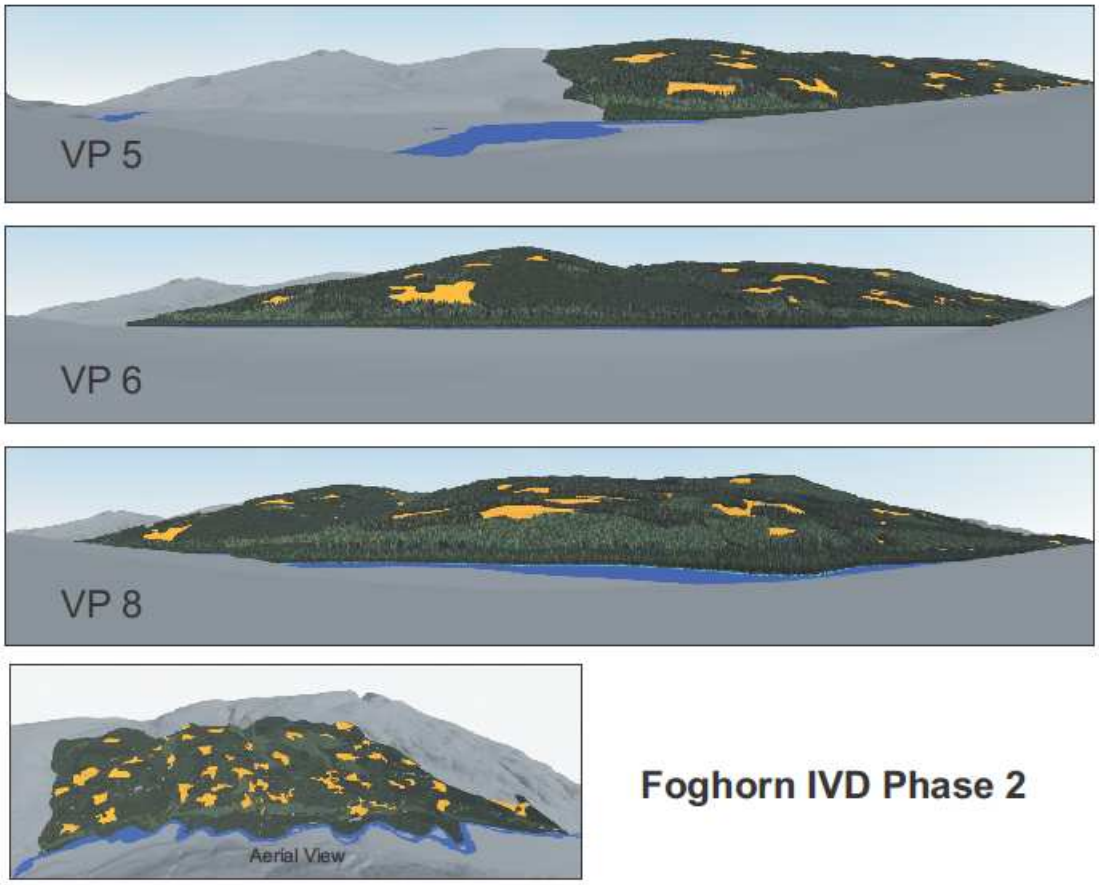


Figure 35 Phase 2 Design Blocks from Viewpoints 5, 6 and 8

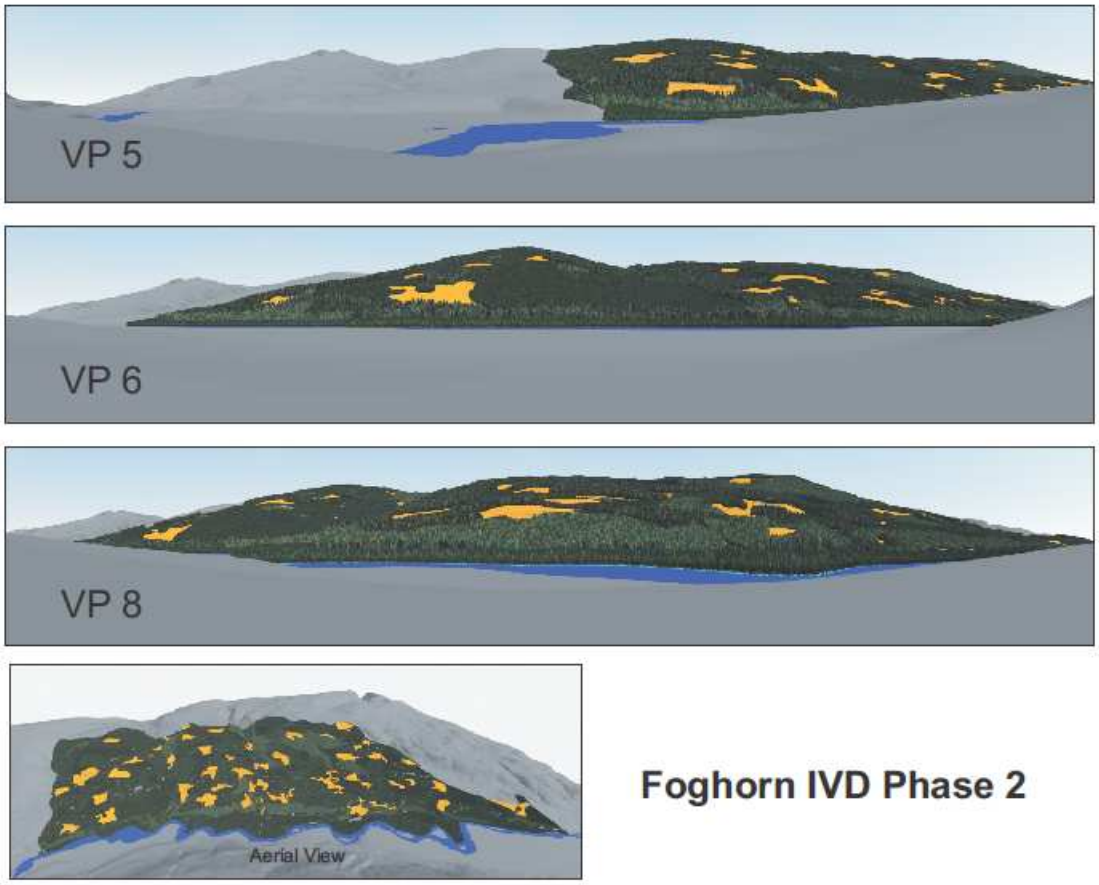


Figure 36 Phase 2 Design Blocks from Viewpoints 10, 12 and 14

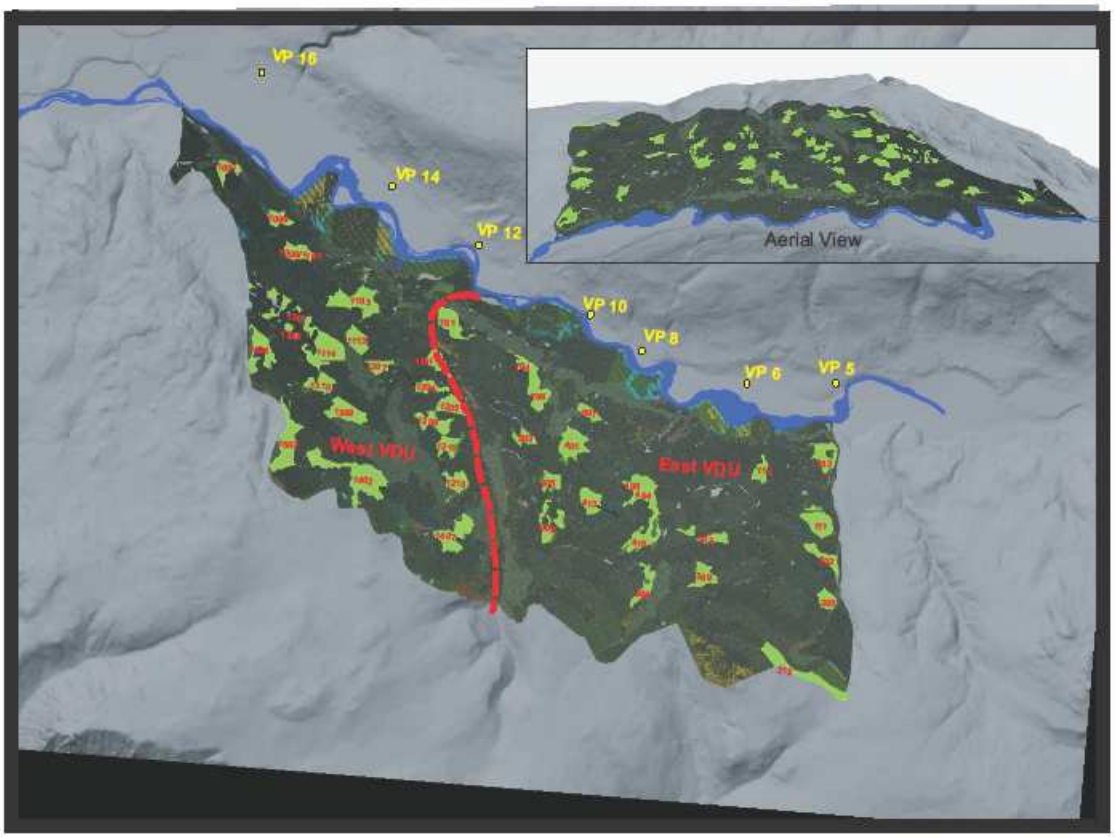


Figure 37 Phase 3 Design Blocks

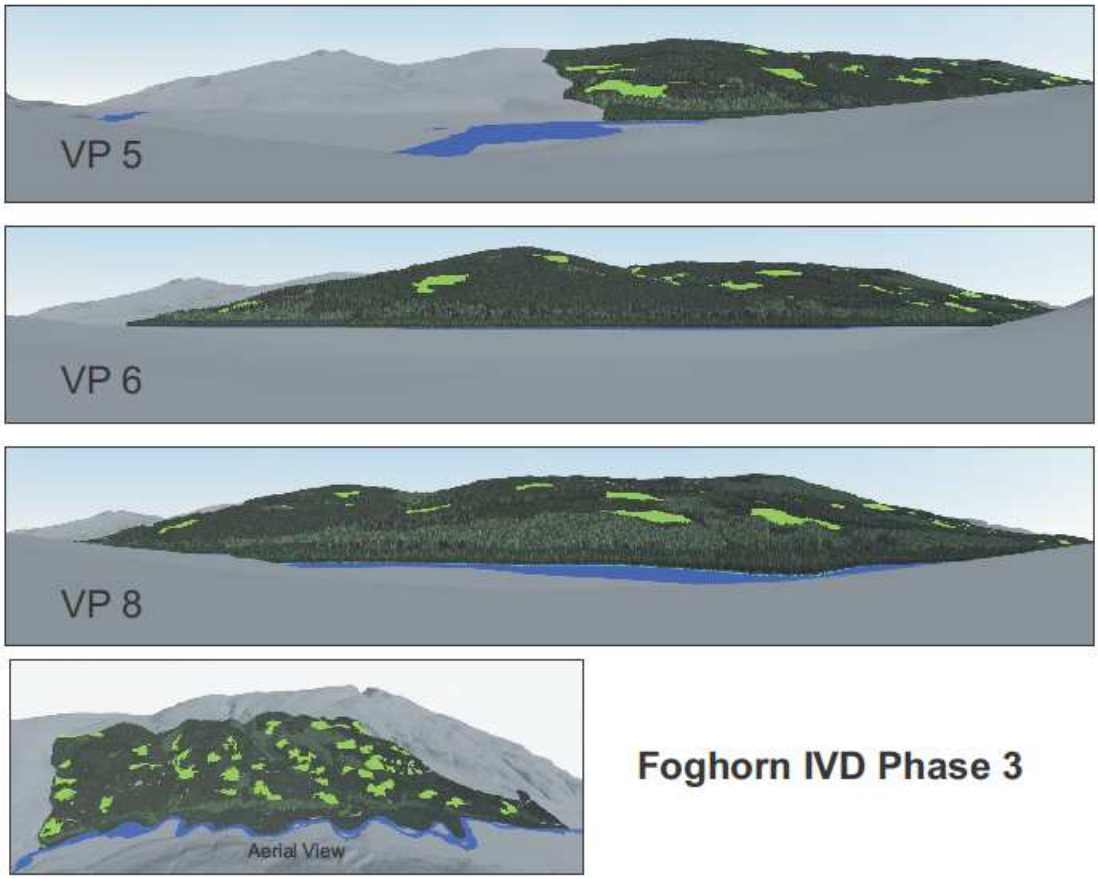


Figure 38 Phase 3 Design Blocks from Viewpoints 5, 6 and 8

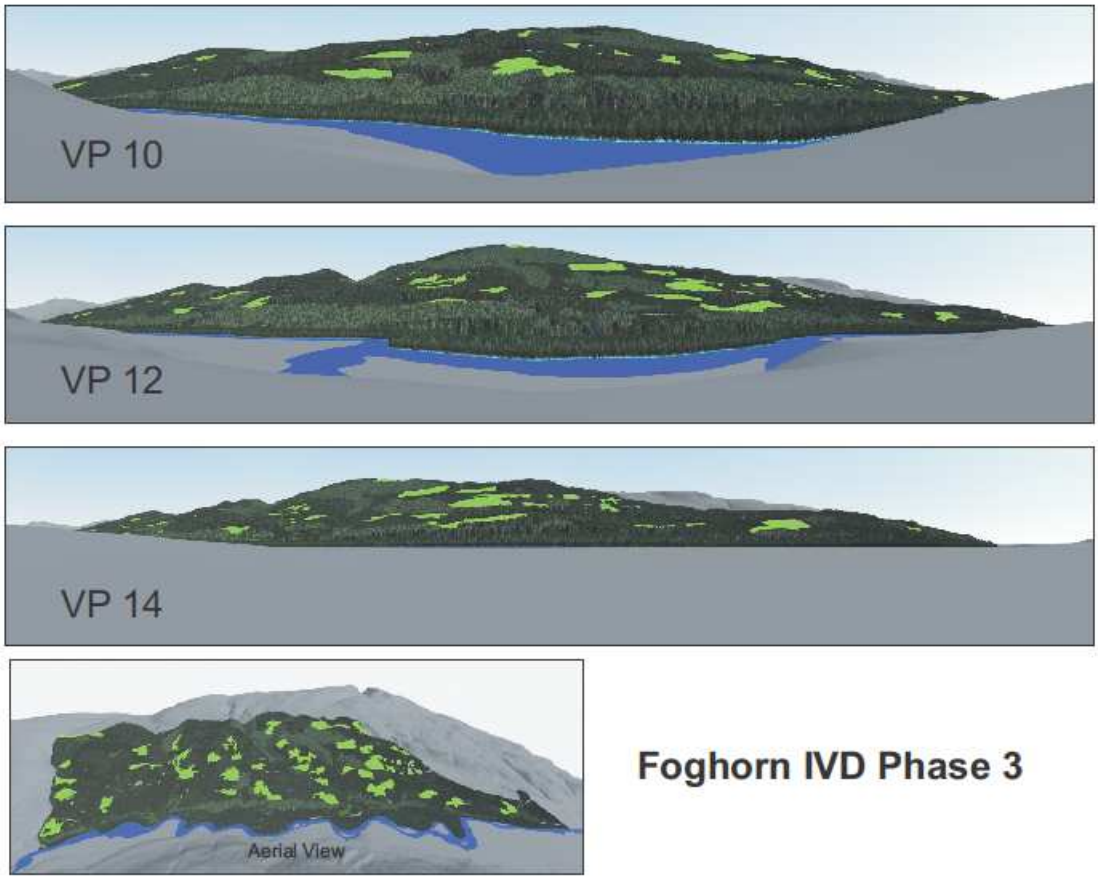


Figure 39 Phase 3 Design Blocks from Viewpoints 10, 12 and 14

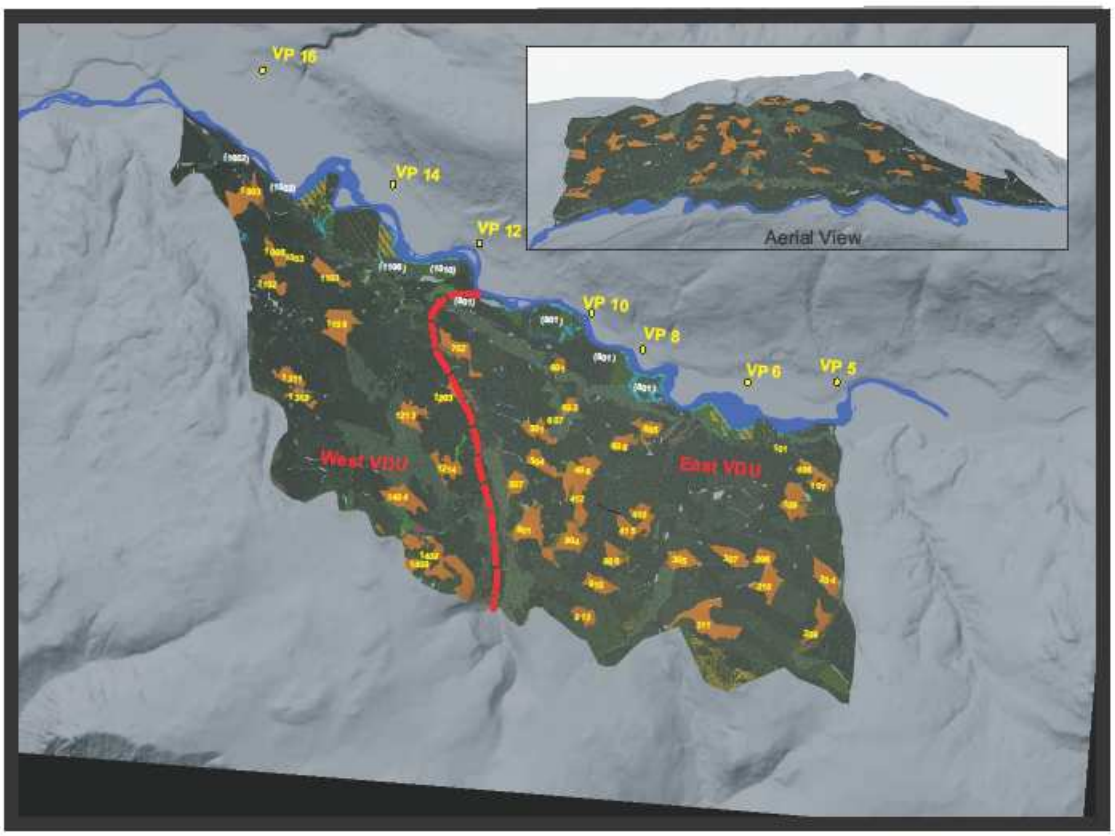


Figure 40 Phase 4 Design Blocks

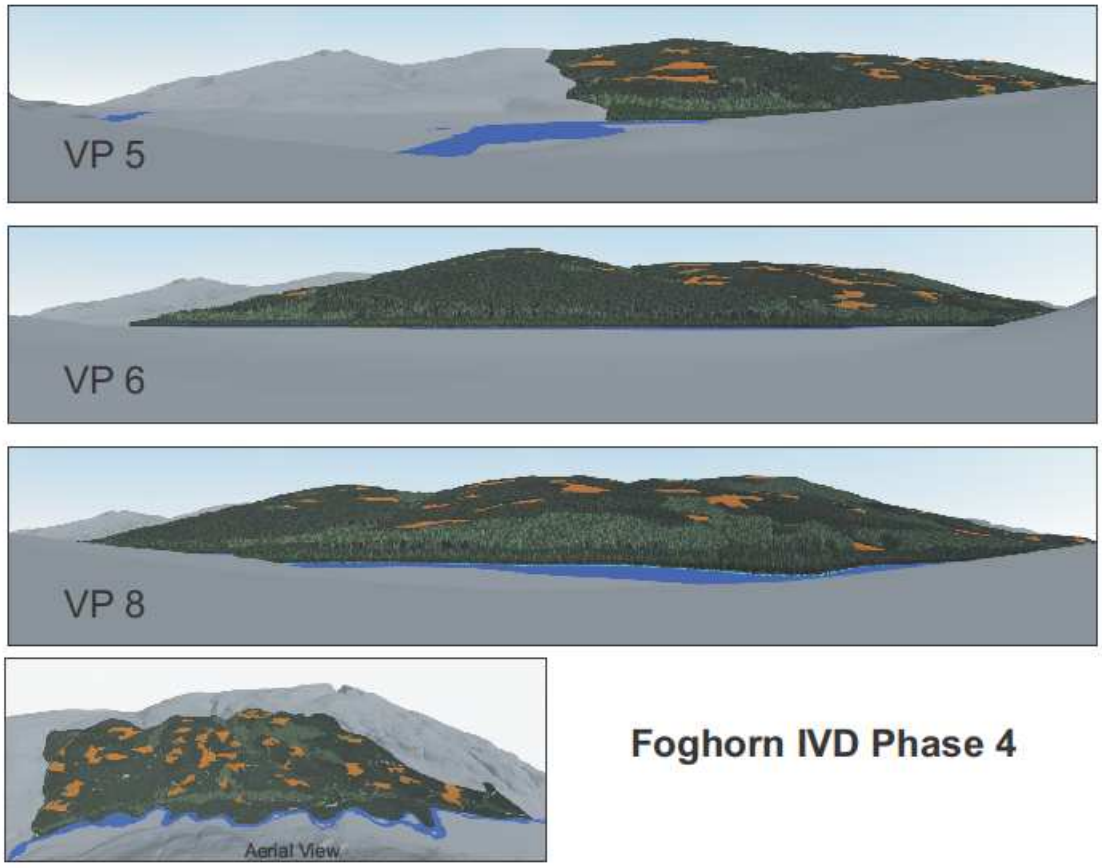


Figure 41 Phase 4 Design Blocks from Viewpoints 5, 6 and 8

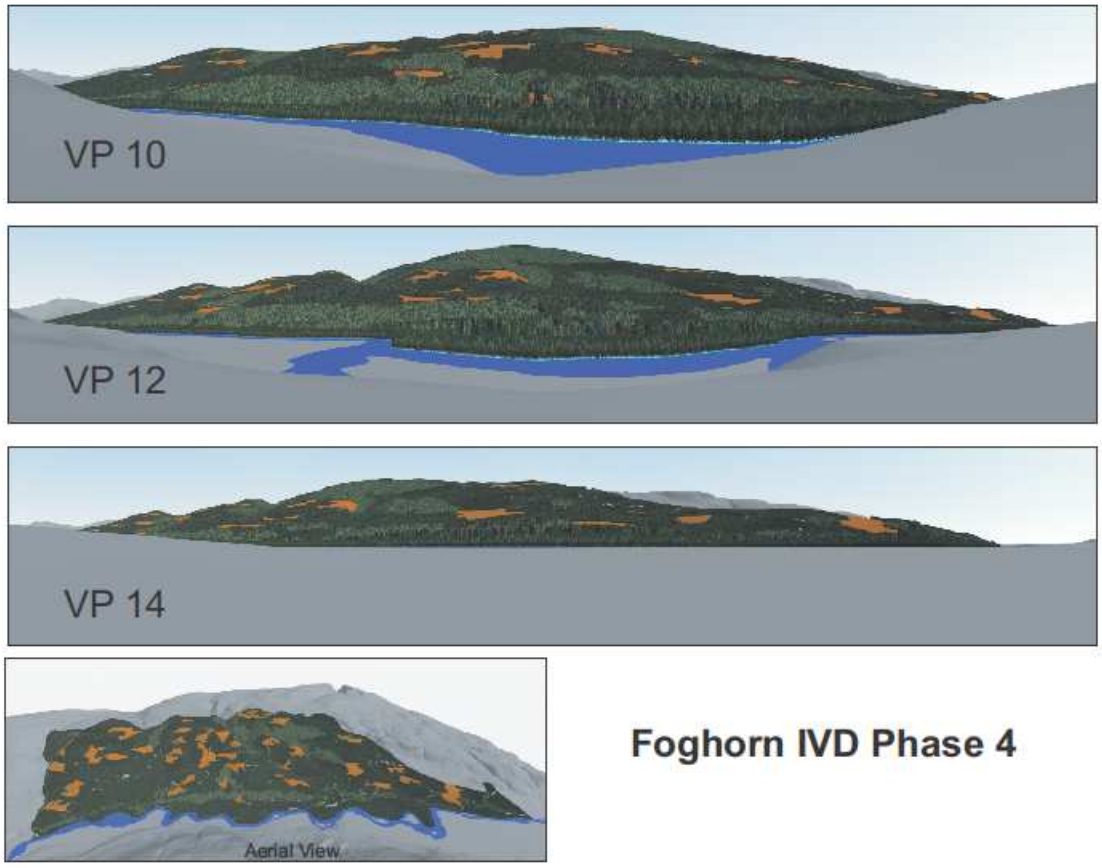


Figure 42 Phase 4 Design Blocks from Viewpoints 10, 12 and 14

The design blocks in the 4-phase design are summarized in the following table (Table 3).

Table 3 Design Block Summary Table

PHASE	BLOCK	AREA_H	NET_VOL
Phase 1			
1	104	15	4602
1	108	19	7067
1	112	21	9975
1	208	25	9425
1	301	13	7293
1	306	22	10184
1	402	29	12060
1	409	22	11062
1	414	22	5419
1	506	21	9598
1	603	22	4378
1	609	3	971
1	611	9	1803
1	708	28	7690
1	802	8	1456
1	803	6	1096
1	804	26	4966
1	805	5	900
1	806	2	308
1	907	12	4431
1	911	13	4160
1	1004	28	8888
1	1007	21	6471
1	1104	34	10251
1	1110	25	7233
1	1207	14	4892
1	1208	29	11696
1	1212	19	7460
1	1304	29	10498
1	1306	21	9349
1	1308	34	10637
1	1315	19	5830
1	1406	14	3270
1	1408	33	7282
Phase 1 Total	34	663	222561

PHASE	BLOCK	AREA_H	NET_VOL
Phase 2			
2	103	9	1664
2	105	16	5820
2	110	14	6235
2	113	7	3147
2	201	14	6258
2	203	16	5649
2	207	22	11728
2	211	17	5260
2	302	24	13132
2	304	14	9440
2	308	9	3834
2	310	13	3132
2	403	25	8523
2	407	12	6072
2	408	12	6072
2	502	24	14412
2	505	15	7441
2	508	8	3126
2	602	16	3307
2	604	8	1576
2	606	14	3421
2	610	9	2696
2	703	22	4682
2	705	5	1341
2	707	20	6397
2	902	16	6163
2	905	22	6727
2	909	21	6720
2	912	13	2158
2	914	21	4200
2	915	9	2987
2	1006	26	7722
2	1008	1	261
2	1009	19	5323
2	1101	19	5643
2	1102	7	2653
2	1105	16	5300
2	1107	10	3179
2	1109	8	3080
2	1111	19	5772
2	1112	15	4884
2	1202	15	3289
2	1206	12	3663
2	1210	27	8709
2	1303	14	5842
2	1305	18	7254
2	1307	26	9704
2	1309	1	328
2	1313	9	3285
2	1314	10	4459
2	1401	9	2701
2	1405	24	5824
2	1501	25	7314
2	1502	56	16812
2	1601	3	734
Total Phase 2	55	856	298011

PHASE	BLOCK	AREA_H	NET_VOL
Phase 3			
3	102	22	3558
3	111	28	13300
3	114	12	4714
3	202	16	5472
3	205	14	4986
3	212	32	9948
3	303	15	6330
3	309	18	4374
3	401	31	12256
3	404	19	7324
3	405	13	6578
3	411	13	5167
3	413	20	4340
3	416	19	6574
3	503	11	4470
3	505	13	4667
3	607	12	2488
3	701	25	7579
3	704	9	2312
3	706	24	5352
3	903	20	5645
3	908	17	6636
3	1001	13	3149
3	1006	26	7722
3	1103	16	4990
3	1106	38	12310
3	1114	49	19187
3	1201	16	6262
3	1204	12	3957
3	1205	19	7757
3	1207	12	4452
3	1209	20	5360
3	1211	15	6120
3	1215	34	13026
3	1301	15	5965
3	1302	19	7593
3	1309	30	13544
3	1310	18	8688
3	1402	59	20332
3	1407	34	8411
3	1503	36	12106
3	1504	28	11515
Total Phase 3	42	912	316514

PHASE	BLOCK	AREA_H	NET_VOL
Phase 4			
4	106	9	2247
4	107	10	3106
4	109	31	14571
4	204	25	8744
4	206	13	7205
4	209	20	6163
4	210	26	8318
4	305	21	10206
4	307	20	8520
4	311	50	15548
4	406	30	15021
4	410	21	10626
4	412	26	10219
4	415	25	8650
4	501	18	5762
4	504	19	10077
4	507	15	5364
4	601	8	1764
4	602	9	1942
4	605	16	5776
4	608	14	3993
4	702	25	7211
4	901	35	10218
4	904	33	9983
4	906	16	5418
4	910	19	6080
4	913	12	2400
4	1003	49	13347
4	1005	14	4159
4	1008	2	628
4	1102	14	4158
4	1103	15	4710
4	1108	38	13662
4	1203	10	3491
4	1213	23	8439
4	1214	22	6708
4	1311	16	6304
4	1312	9	3900
4	1404	32	9146
4	1409	72	14483
Total Phase 4	40	880	298267

Phase 99 (unallocated)			
99	101	6	1248
99	801	24	4408
99	1002	17	2890
99	1010	6	1410
99	1106	5	1150
99	1602	13	2986
Total Phase 99	6	71	14092

IVD Total	177	3382	1149445
	(Blocks)	(Area)	(Vol-m3)

Foghorn IVD Block Summary

5.3.2 Design Evaluation

The design of each phase was evaluated to confirm if it meets visual and/or other resource objectives. The block groupings are not necessarily intended for single entry harvesting and could be spread across the 20-25 year planning horizon of each phase as necessary to accomplish the VQO. The appearance will help guide decisions such as the application of variable retention, and detailed scheduling within each block.

Percent Alteration Calculation

Percent alteration in perspective view was calculated for each phase from each of the 6 design viewpoints. The results all fell within Partial Retention (1.6% - 7% alteration) except for Phase 4 VP 5 (7.35%). The results are shown in Table 4.

Table 4 Percent Alteration in Perspective View from Viewpoints Summary, by Phase

Phase 1			
VP	VDU AREA*	Block Area*	% Alt
5	190674	6694	3.51%
6	321575	10933	3.40%
8	440064	10644	2.42%
10	465239	13759	2.96%
12	412919	13327	3.23%
14	264014	9237	3.50%

Phase 2			
VP	VDU AREA*	Block Area*	% Alt
5	191294	12546	6.56%
6	321575	15686	4.88%
8	440064	19302	4.39%
10	465239	13346	2.87%
12	412919	14510	3.51%
14	264014	8858	3.36%

Phase 3			
VP	VDU AREA*	Block Area*	% Alt
5	191294	12732	6.66%
6	321575	10666	3.32%
8	440064	16200	3.68%
10	465239	16959	3.65%
12	412919	20374	4.93%
14	264014	18523	7.02%

Phase 4			
VP	VDU AREA*	Block Area*	% Alt
5	191294	14067	7.35%
6	321575	10141	3.15%
8	440064	14673	3.33%
10	462932	13997	3.02%
12	410452	13740	3.35%
14	261728	13342	5.10%

* digitizer units

Existing alteration, was considered to have visually effective greenup (VEG) and was not measured. There are non-VEG areas that could not be determined in winter conditions which will raise the percent alteration in Phase 1. Each phase was considered to achieve VEG at the start of the next phase.

5.3.3 Design Revision

The design was revised as needed to meet visual and/or other resource objectives. The shape of some blocks remains too angular. They should be re-shaped during operational implementation using variable retention and / or appropriate scheduling of block units.

5.4 Final Design and Documentation

The draft summary report, mapping and simulations were submitted March 8, 2010 for preliminary review by Jacques Marc, Senior Landscape Specialist, MoFR. Final submission date was March 19, 2010.