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Bulkley Timber Supply Area Biomass Availability Estimation

Technical report no. 52 – March 2017

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Abstract

The Bulkley TSA biomass inventory was based on 50-year harvest and road network plans for Crown land provided by the BC Ministry of Forests, Lands and Natural Resource Operations (FLNRO). The biomass yield per hectare predicted for the Bulkley TSA is 25.2 oven-dried tonnes per hectare (odt/ha) from harvest residues. Over the next 50 years a total of 3.48 million odt of available biomass are predicted to be generated by harvest in the Bulkley TSA, or approximately 70,000 odt/yr. Of this, approximately 231,000 odt in total, or 4,600 odt/yr, is expected to be available at the economic price of $60 per oven-dried tonne.

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EXECUTIVE SUMMARY

Forest origin, harvest residue, biomass estimates were made by FPInnovations for the Bulkley Timber Supply Area (TSA), largely following the process previously established for several BC TSAs using FPInterface (2010-2017). The biomass inventory was based on 50-year harvest and road network plans for Crown land provided by the BC Ministry of Forests, Lands and Natural Resource Operations (FLNRO) and excludes Tree Farm Licenses, Community Forest Agreements, and First Nations tenures.

The biomass yield per hectare predicted for the Bulkley TSA is 25.2 oven-dried tonnes per hectare (odt/ha) from harvest residues. (Table 4 from the text, follows.)

Biomass yield
25.2 odt/ha

The biomass ratio, which is the ratio of recovered biomass to recovered merchantable roundwood, is estimated at 16.7%. Over the next 50 years a total of 3.48 million odt of available biomass are predicted to be generated by harvest in the Bulkley TSA, or approximately 70,000 odt/yr. Of this, approximately 230,000 odt in total, or 4,600 odt/yr, is expected to be available at the economic price of $60 per oven-dried tonne. Approximately three-quarters of the total predicted volume is expected to be available at $90/odt: a total of 2.52 million odt, or 50,000 odt/yr. (Table 5 from the text, follows.)

Biomass available (odt)		
at $60/odt	at $90/odt	total ($190/odt)
231,026	2,521,117	3,477,875
per year	per year	per year
4,621	50,422	69,558

A low-cost scenario was attempted with the grinding cost reduced by $5.05/odt. At the economic rate of $60/odt it increase availability by approximately 300,000 odt over 50 years, or about 6,000 odt/yr. If increases in efficiency or lowered cost can be realized, there could be an increase in available biomass by this amount.

Most biomass considered economically available (<= $60/odt) is closer to the delivery points (Smithers, Houston). The amount of economically available biomass decreases though the 50 years in the model, particularly in the last 10 year period. While there are fewer blocks planned in later years, the scale of decrease indicates that as time passes, more blocks are located further from the delivery points.

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1. INTRODUCTION

Forest origin, harvest residue, biomass estimates were made by FPInnovations for the Bulkley Timber Supply Area (TSA), largely following the process previously established for previous BC TSAs using FPInterface (2010-17). The biomass inventory was based on 50-year harvest and road network plans for Crown land provided by the BC Ministry of Forests, Lands and Natural Resource Operations (FLNRO) and excludes Tree Farm Licenses (TFLs), Community Forest Agreements (CFAs), and First Nations tenures. More detailed methodology may be found in the report "Estimating Quesnel Biomass Supply Using FPInterface®." It is hoped that the information in this report will assist in understanding biomass availability for industrial proposals**.**

2. OBJECTIVE

The objective of the project was to calculate the cost of forest-origin biomass as a feedstock in the Bulkley TSA.

Specific deliverables include:

a. An analysis showing the delivered cost of biomass from point of origin; and
b. An analysis showing the amount of biomass delivered at different price points. A value of $60 for one oven-dried tonne (odt) is regarded as the market value for biomass, in accordance with the previous analyses.

3. METHODS

Overall process

The basic methodology for determining biomass supply in western Canada was established during analysis of the Quesnel and Williams Lake Timber Supply Areas (TSAs). It is reviewed below.

This analysis focused on the Bulkley TSA and was based on polygon data (tree characteristics) and a road data set supplied by the Ministry. It did not include any nearby woodlots, CFA's, or any First Nations tenures. Including some of these areas could alter the available supply of biomass.

Additionally, small piece size stands that are not considered merchantable were not included in the analysis. The analysis focused on recovering harvest residues from merchantable stands. Purpose-harvesting unmerchantable stands for biomass could add to the biomass supply and further analysis could be undertaken to determine its profitability. Recent analysis has shown that harvesting these stands is not yet profitable.

The following process map (Figure 1) graphically displays the steps taken to build the final inventory of economically available biomass for the Quesnel TSA. A similar process was used for the Bulkley TSA.

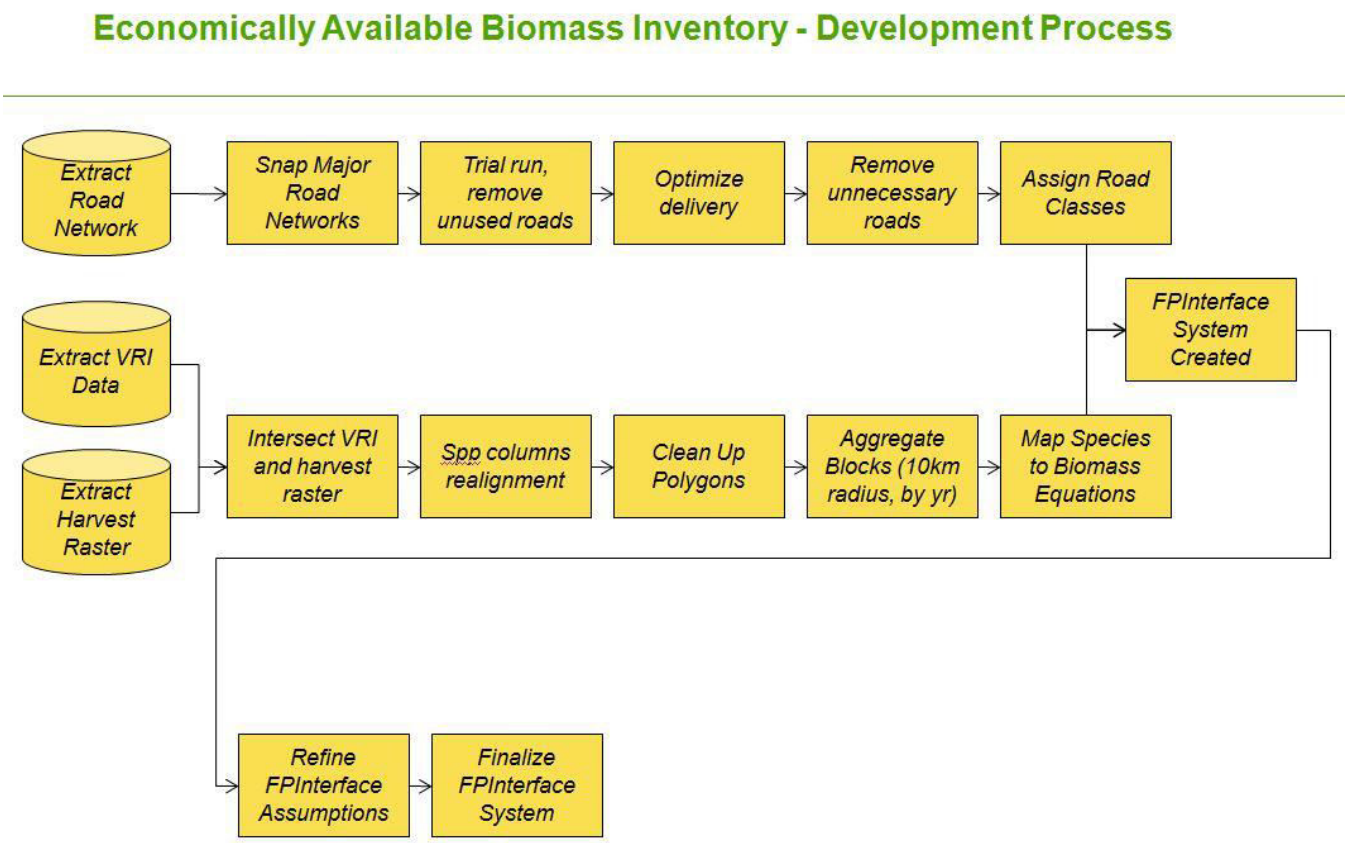


Figure 1. Inventory development process for economically available biomass

Data acquisition

Data layers were acquired from the Ministry for the Bulkley TSA (excluding woodlots, CFA areas, and any First Nations tenure areas), including VRI (Vegetation Resource Inventory) polygons with attributes, and road linework with attributes. The polygon data was for 50 years of harvest in five ten-year periods.

The total 50 year harvest raster is a point in time snapshot. It indicates which polygons are expected to be harvested in the next 50 years. No attempt was made to model possible growth or mortality during the 50 year horizon. Any projections of growth or mortality are already accounted for in the harvestable proportion contained in the harvest raster data.

Data transformation

FPInterface requires two major inputs – a polygon layer of harvestable blocks with attributes, and a road layer. The polygon layer must also have a harvest raster built into it, indicating which polygons are to be cut in which time period. To calculate biomass amounts, FPInterface requires both tree size data (or height and dbh (diameter at breast height)) and either stand density (stems per ha) or volume per ha by species in each polygon. When the polygon layer is uploaded it is necessary to tie species in the resultant to FPInterface species.

In order to speed calculation, polygons with little or no merchantable volume were targeted for elimination. Polygons with no volume were removed from the resultant. Some of these polygons resulted from the process of intersecting the VRI and the harvest raster layers. Aggregation rules meant blocks were grouped if they had an identical harvest year and were within a 10 km radius.

FPInterface calculates cost in part by finding a transport route from product origin in a polygon (block) to the mill or delivery site. It relies on a continuous path along the road network. If digital road segments are not joined together (snapped), the program is not able to find a path between block and mill, or may find a sub-optimal circuitous path.

Examination of the received data set showed that road snapping was required. A program was used to identify gaps in the road network and close them. A few polygons were still inaccessible after snapping, but since these represent far less than 1% of the total area, countless hours were not expended on finding the remaining gaps manually.

Biomass equations

To perform the analysis, tree species indicated in the inventory are tied to single-tree biomass equations in FPInterface. For the Quesnel analysis in 2010-11, these equations were based on "Canadian national tree above ground biomass equations" by Lambert, M.C., C.H. Ung, and F. Raulier, 1996-2008. Although this equation set includes trees from all across Canada including western and northern Canada, there were very few samples from BC. More recently, Lambert et al. have released tree equations for BC (accepted by the BC ministry) and these were incorporated into FPInterface for the Williams Lake and subsequent analyses, including this one.

FPInterface parameters

Tree species associations

Species associations were made as follows in Table 1.

Table 1. Species associations

FPInterface species	System label	Named	Original data set
Spruce, white	SX	Hybrid spruce	SX
Aspen, trembling	AT	Trembling aspen	AC, AT, ACT
Fir, alpine	BA, BL	Subalpine fir	BA, BL, B
Cedar, western red	CW	Western red cedar	CW
Birch, White	EP	White birch	EP, E
Hemlock, western	HW	Western hemlock	H, HW, HM
Pine, lodgepole	PL	Lodgepole pine	PL, PLC, PLI
Spruce, Engelmann	SE	Engelmann spruce	SE
Spruce, Black	SB	Black spruce	SB
Pine, Western white	PA	Whitebark pine	PA

Road classes

Unlike the Quesnel dataset, there were no road classes contained in the road data set. However, FPInterface has the ability to assign road classes based on the amount of volume hauled over each section of the road. The volume hauled is for merchantable volume as calculated by FPInterface. The volume and speeds associated with each road class were assigned according to Table 2.

Table 2. Road class associations

FPInterface road class	Minimum volume (m3)	Maximum volume (m3)	Road speed (95% / 85%*)
Paved	10,000,001	50,000,000	90 km/h (86 / 77)
Class 1 (off highway)	0	0	70 km/h (67 / 60)
Class 1	2,000,001	10,000,000	70 km/h (67 / 60)
Class 2	1,000,001	2,000,000	50 km/h (48 / 43)
Class 3	500,001	1,000,000	40 km/h (38 / 34)
Class 4	5,001	500,000	20 km/h (19 / 17)
Class 4 (operational)	0	0	20 km/h (19 / 17)
Class 5 (winter)	0	5,000	20 km/h (19 / 17)

*percent of posted speed

General parameters

The price of fuel can have significant impacts on model results. Some equipment in the model can use diesel and some is eligible for marked fuel. A price of $1.25/litre was assigned which is slightly higher than current rates for diesel but approximates a medium term average.

The program's default values for productivities and costs of forestry equipment rely on FPInnovations studies and information. If a user has specific values or costs they wish to apply to any phase or machine, these can be used instead of the defaults. For this project, only the default values were used.

Average slope for the area was assigned to CPPA Class 3 (20-32%). Ground strength was rated CPPA Class 3 (moderate), and ground roughness was rated CPPA Class 3 (uneven).

Comminution cost

Working time for BC conditions was based on previous base case studies and consists of one 12-hour shift per day, 200 days per year. Grinder utilization was set at 60% and fuel used per productive machine-hour for the grinder was the standard 135 L/PMH (litres per productive machine hour). These are the standard base case parameters used in past FPInnovations studies and enable comparisons to those studies. Here, they produced a grinding cost of $27.55/odt.

However, developments in the industry have lowered grinding costs so these parameters were changed in scenario 1 to 75% efficiency and fuel use of 100 L/PMH, in order to represent the new conditions. This produced a grinding cost of $22.50/odt. This is thought to be achievable for Bulkley TSA conditions by an experienced operator.

Topping diameter

Although BC regulations require a topping diameter of 10.0 cm for most merchantable species, this analysis used 12.5 cm to reflect more common industrial practise. Topping diameter can have a significant impact on the volume of a tree available for biomass use.

Parameters as entered into FPInterface

A summary of some of the parameters as entered into FPInterface follows for the base case, which produces grinding costs of $27.55/odt (Table 3). An alternate scenario (Bulkley – LowCostAll) was also attempted, producing a grinding cost of $22.50/odt. For this scenario the parameters highlighted in yellow were adjusted to 75% and 100 L/PMH.

Table 3. FPInterface parameters for the base case

Run descriptor	Base case - default grinding efficiency
run name	Bulkley Jan 23rd
output name	Biomass - Bulkley Jan23rd
block system	biomass_blocks_BUL.shp
road system	roads_v2.shp
transfer yard(s)	Smithers, Houston
cost per transfer yard, respectively	0
year(s) analyzed	All
species attribute linking	BC
automatic assignment of road class by volume	Yes
road maintenance	Yes
haul speeds	Graduated
haul speeds at 95% / 85% of posted	Yes
transport shifts / day	1
transport hours / shift	12
transport days / year	200
transport fuel price / litre	$1.25
ground strength	3 - moderate
ground roughness	3 - uneven
average slope %	20-32
slash used for biomass	Yes
full stem used for biomass	No
chip destination	Smithers, Houston
topping diameter	12.5 cm
truck used for logs	3-axle
truck used for chips	Tridem B-train
harvesting fuel price / litre (x3)	$1.25

harvesting shifts / day (x3)	1
harvesting hours / shift (x3)	12
harvesting days / year (x3)	200
harvesting system	full tree with roadside processing
felling & processing	mechanized and bunched
skid type	skidder with grapple
type of roadside processing	cut-to-length
on site biomass treatment (roadside)	comminution
recovery season	Winter
slash freshness	>3 months
slash pre-piled at roadside	Yes
grinder size type	horizontal 600 kW
biomass fuel price / litre (x2)	$1.25
biomass hours / shift (x2)	12
biomass shifts / day (x2)	1
Biomass days / year (x2)	200
grinder efficiency	60%
Grinder fuel use (L/PMH)	135
indirect costs - biomass ($ value)	$0.00
indirect costs - harvesting ($ value)	$0.00

Delivery locations

All harvest residues from in-woods operations (not from mills) were directed to West Fraser's Pacific Inland Resource mill in Smithers and Canfor's Houston mill. Initial comminution was set to take place at roadside, and costs are calculated for biomass delivered to the delivery locations.

Biomass calculations

The biomass calculations in FPInterface produce a volume of total available biomass once merchantable roundwood has been removed. For this project, only biomass transported to roadside was considered recoverable and biomass likely to remain at the stump or dispersed on the cutblock was not. Once it is transported to roadside, some biomass becomes unavailable due to handling and technical losses. The remainder is considered recovered biomass. Figure 2 shows this breakdown with the numbers from the 50-year harvest of the base case with normal grinder utilization of 60% and fuel usage of 135 L/PMH.

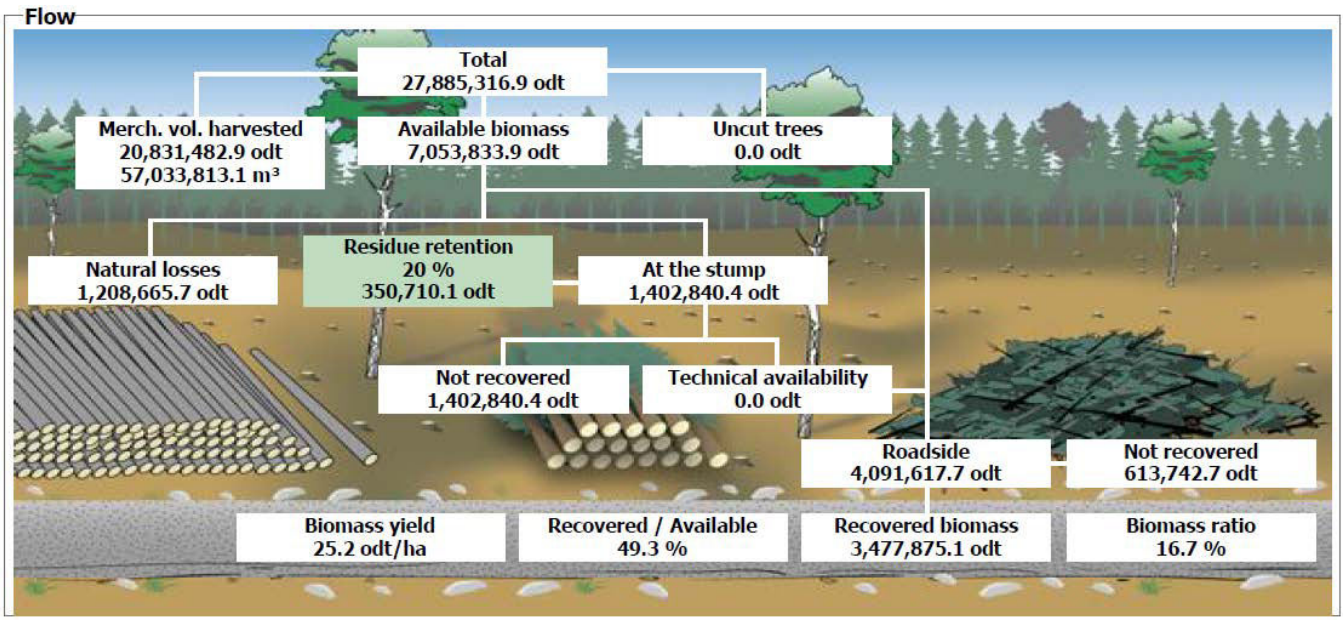


Figure 2. Recoverable biomass at delivery locations

4. RESULTS AND DISCUSSION

Summary of key results

All results from the different runs performed in FPInterface are summarized in Appendix 1. The FPInterface analysis of biomass supply in the Bulkley TSA, based on inventory information and the road network supplied by the Ministry, indicates an average biomass yield of 25.2 oven-dried tonnes (odt) per hectare for the base case. This is in the form of comminuted hog fuel and comes from harvest residues only – tops, branches, and other roadside logging waste. Mill residues are not predicted by the model. Biomass yield is shown in Table 4.

Table 4. Biomass yield for Bulkley TSA

Biomass Yield
25.2 odt/ha

Biomass amounts

In total, for the base case (normal grinder utilization of 60% and fuel usage of 135 L/PMH) there are predicted to be 3,477,875 odt that can be recovered from roadside and delivered to the delivery locations over the course of 50 years. The amount of biomass available in each 10-year period decreases over each period. Harvest planning may not known that far into the future and changes to the plan could increase the amount of available biomass in later periods. The amount of biomass available each year works out to approximately 70,000 odt/yr, at any price point in the study area. However, the amount of biomass available in each 10-year period varies from as much as 88,000 odt/yr in period 1 to as low as 48,000 odt/yr in period 5. (The economically available volume is estimated at 4,600 odt/year, as described below.) Key amounts of biomass availability are in Table 5.

Table 5. Key availability amounts

Biomass Available (odt)		
at $60/odt	at $90/odt	total ($190/odt)
231,026	2,521,117	3,477,875
per year	per year	per year
4,621	50,422	69,558

Additionally, the model indicates that there are about 2,962,000 odt of biomass that would be left on the cutblock and would not make it to roadside. This is nearly as much (86%) as the amount removed for biomass and includes material that falls off trees naturally and material that breaks off timber and is left on the ground during normal harvesting operations. This vast amount of material retained in the forest is much higher than that deemed necessary to replenish the forest floor and prevent nutrient degradation to the soil. Additionally, 614,000 odt of biomass material that makes it to roadside is not recovered due to technical handling efficiencies, that is, the material is too small or large for machine handling or is incorrectly positioned for economic accessibility.

Biomass ratio

The biomass ratio (BR) is the ratio of recovered biomass to recovered merchantable roundwood. The BR is 16.7% for the base case scenario. In this case 20,831,483 odt of roundwood are expected along with 3,477,875 odt of biomass. The BR is shown in Table 6.

Table 6. Biomass ratio

Biomass Ratio	
3,477,875	odt of biomass
20,831,483	odt of roundwood
16.7%	

Knowing the biomass ratio for an area can be useful in making rough predictions of the amount of available harvest residue if the amount of merchantable timber harvest is known.

Cost availability

FPInterface conveniently breaks down the available supply into delivered cost in $10 increments. At the presumed market rate of $60/odt, the amount available over 50 years is predicted at 231,025 odt or about 4,600 odt per year. The complete results in $10 increments for the entire 50 year period can be seen below in Table 7 and Figure 3.

Table 7. Bulkley biomass 'cost-availability' for base case

Base Case	Normal grinder utilization	
Cost $/odt	Odt Available	Odt/year
$10	-	-
$20	-	-
$30	-	-
$40	-	-
$50	18,541.6	370.8
$60	231,025.6	4,620.5
$70	911,582.2	18,231.6
$80	1,766,954.9	35,339.1
$90	2,521,117.4	50,422.3
$100	3,012,907.2	60,258.1
$110	3,258,456.5	65,169.1
$120	3,394,673.8	67,893.5
$130	3,437,112.6	68,742.3
$140	3,455,951.8	69,119.0
$150	3,469,002.6	69,380.1
$160	3,475,096.2	69,501.9
$170	3,476,771.2	69,535.4
$180	3,477,567.5	69,551.4
$190	3,477,875.1	69,557.5

The amounts are cumulative. So the amount available at $60/odt, for example, includes all the biomass at $50/odt and the additional biomass available between $50 and $60 per odt.

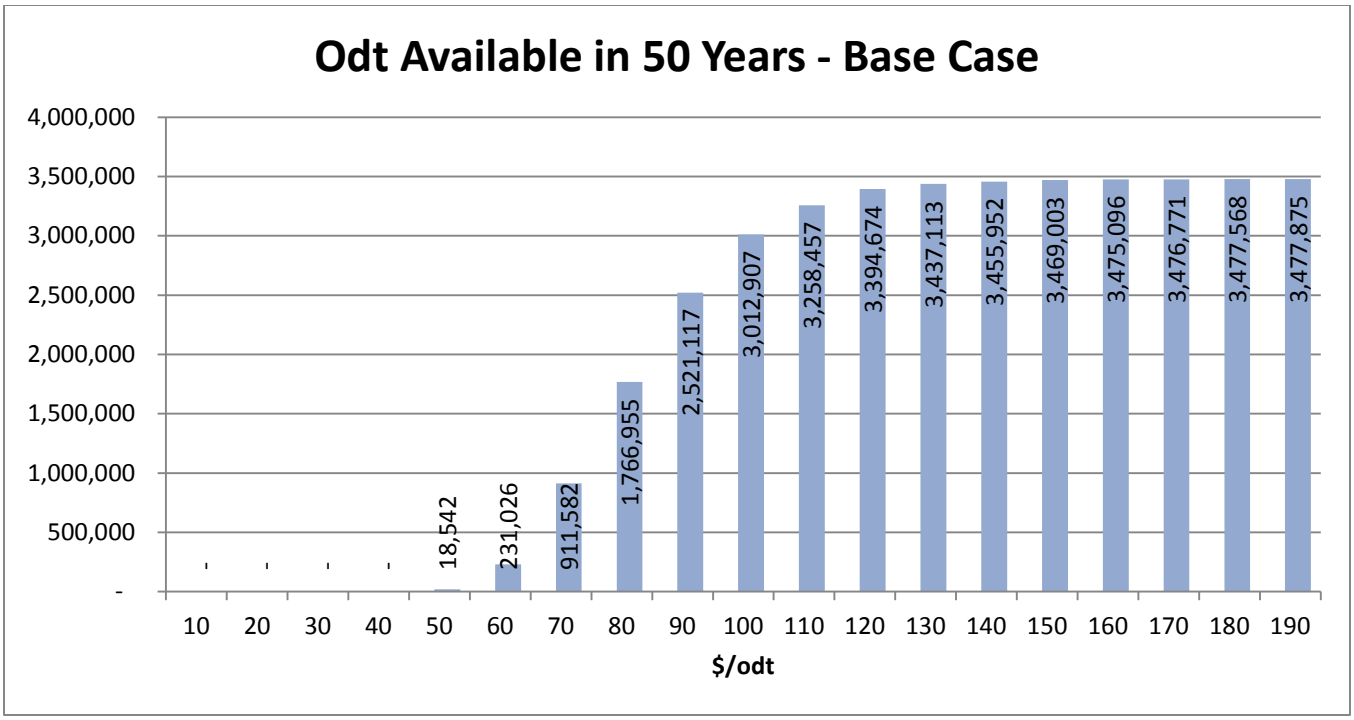


Figure 3. Bulkley biomass 'cost-availability' in base case

Low price scenario

In addition to the base case scenario with a grinding cost of $27.55/odt, a scenario with a grinding cost of $22.50/odt was examined ($5.05 below the base case). Although this was achieved by manipulating the grinder utilization and fuel consumption, it could represent increased operational efficiency or a lower fuel price, for example. The changes in operating cost changed the radius of economically accessible biomass, and produced the results in Table 8 and Figure 4, below.

Table 8. Bulkley biomass 'cost-availability' – scenario

	Base case - normal grinder utilization		Scenario - lower costs by $5.05/odt	
Cost $/odt	Odt Available	Odt/year	Odt Available	Odt Available
10	-	-	-	-
20	-	-	-	-
30	-	-	-	-
40	-	-	-	-
50	18,542	370.8	81,302.4	1,626.0
60	231,026	4,620.5	538,399.4	10,768.0
70	911,582	18,231.6	1,364,203.6	27,284.1
80	1,766,955	35,339.1	2,198,497.5	43,970.0
90	2,521,117	50,422.3	2,787,956.9	55,759.1
100	3,012,907	60,258.1	3,145,306.1	62,906.1

110	3,258,457	65,169.1	3,338,442.8	66,768.9
120	3,394,674	67,893.5	3,418,603.8	68,372.1
130	3,437,113	68,742.3	3,449,213.8	68,984.3
140	3,455,952	69,119.0	3,461,649.6	69,233.0
150	3,469,003	69,380.1	3,473,542.6	69,470.9
160	3,475,096	69,501.9	3,476,298.3	69,526.0
170	3,476,771	69,535.4	3,477,265.3	69,545.3
180	3,477,568	69,551.4	3,477,875.1	69,557.5
190	3,477,875	69,557.5	-	-

Graphically, this is represented in Figure 4.

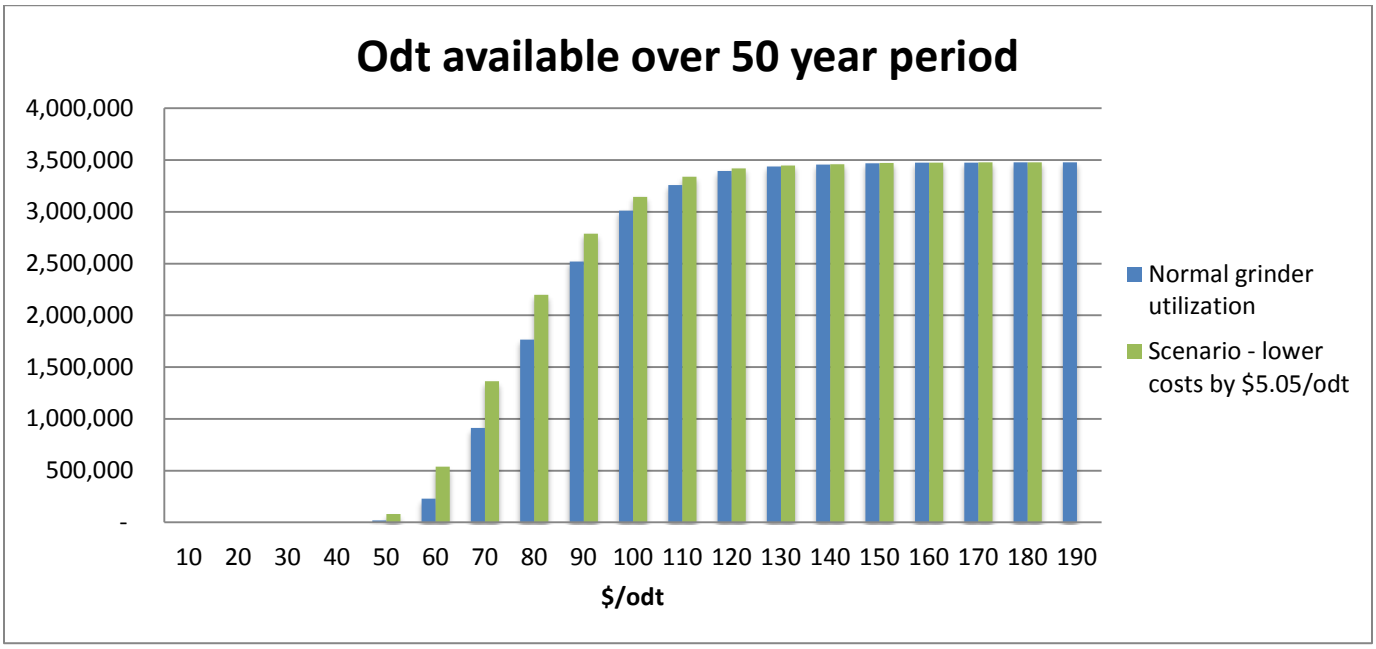


Figure 4. Bulkley biomass 'cost-availability' – base case and low-cost scenario

The lowering of costs by $5.05/odt produces some startling differences in availability. At $60/odt, there are over 300,000 odt more available over 50 years with the lowered grinding costs, over double the base case amount. This equates to over 6,000 odt more per year. This difference at $60/odt, the presumed market rate for biomass, is highlighted in Figure 5.

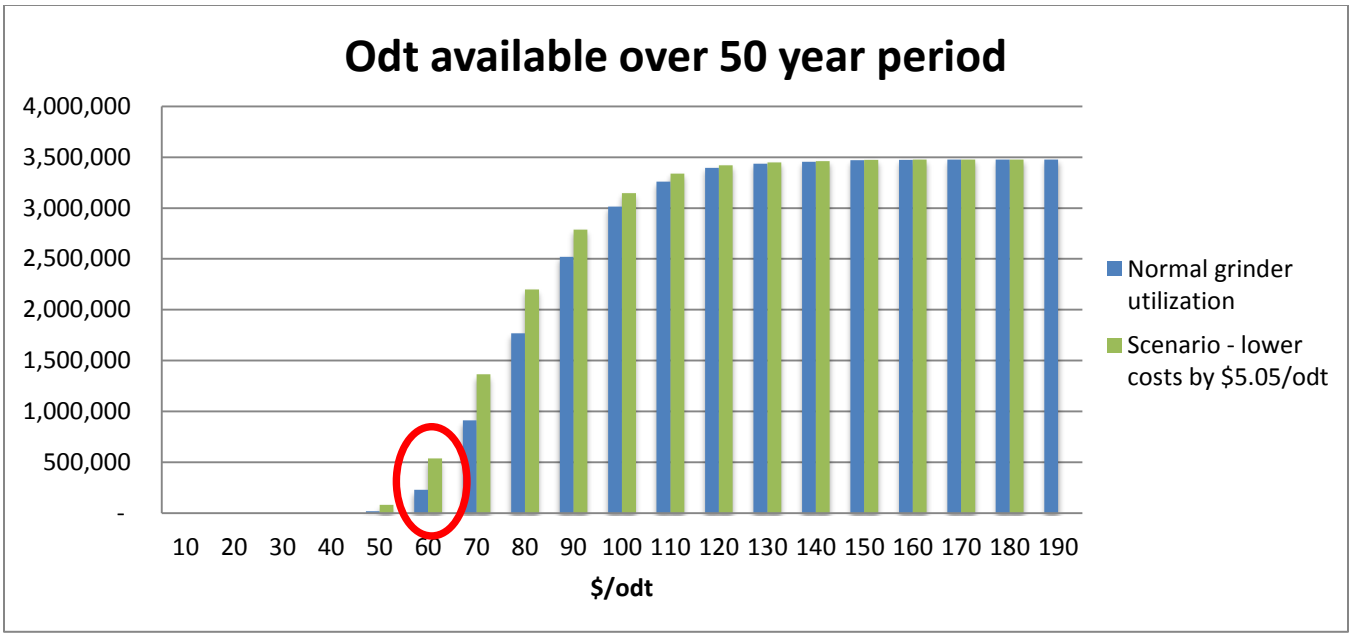


Figure 5. Bulkley biomass 'cost-availability' – difference at $60/odt

This means that much more biomass is available when fuel costs are lower. The actual difference in cost per delivered tonne of biomass is only $5.05, but the impact this has on availability is much greater because of the spatial distribution of biomass. The average price for delivered biomass across the study area is shown in Table 9.

Table 9. Average cost of delivered biomass across entire study area

Fuel price	Average cost of delivered biomass
Base case – grinding at $27.55/odt	81.76
Scenario – grinding at $22.50/odt	76.71

In this case, the difference in delivered costs has been created by changes to grinder utilization and fuel consumption. However, differences to delivered costs can also be created by changes to equipment or practices that raise or lower operating costs. Thus, if greater efficiency in grinding technology is realized, it can dramatically increase the amount of biomass that is economically available, especially, at the lower price points. This is the message of Figure 5, above.

Mapping

The distribution of costs by cutblock is shown graphically in FPInterface with a colour scale ranging from lime to pink, as in Figure 6, below. The costs range to $184/odt for the blocks farthest from the delivery point. The blocks are coloured in colour increments with the greenest points being the ones with the lowest delivered biomass costs, and the pinkest ones being the most expensive, with a gray transition in the middle.

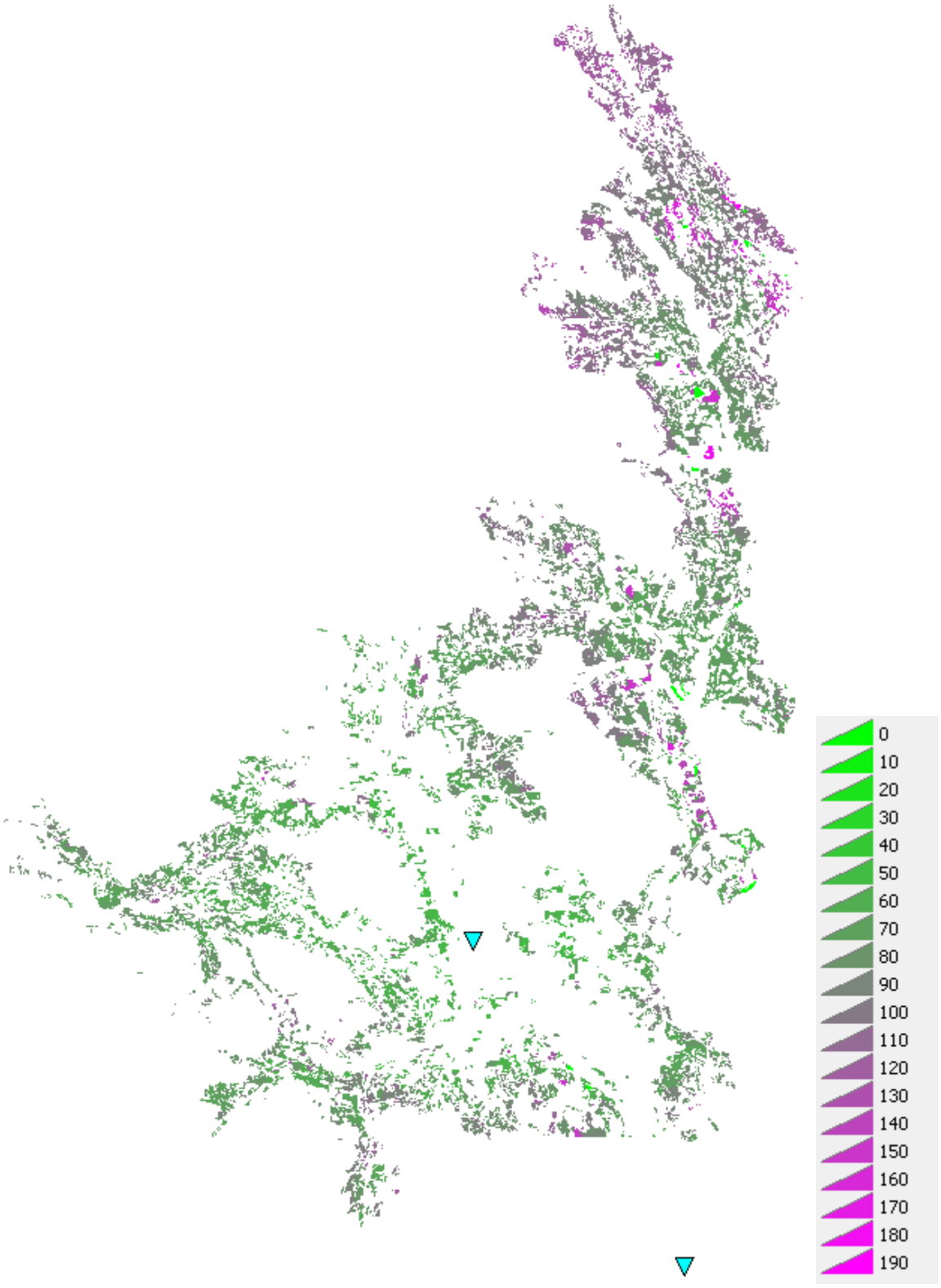


Figure 6. Spatial distribution of cutblocks by delivered biomass cost per odt

The delivery points (Houston and Smithers) are represented by the blue triangles. All biomass from the study area was scheduled for delivery to these points.

Showing the roads on the map makes it a little more difficult to distinguish the blocks but these are shown in Figure 7.

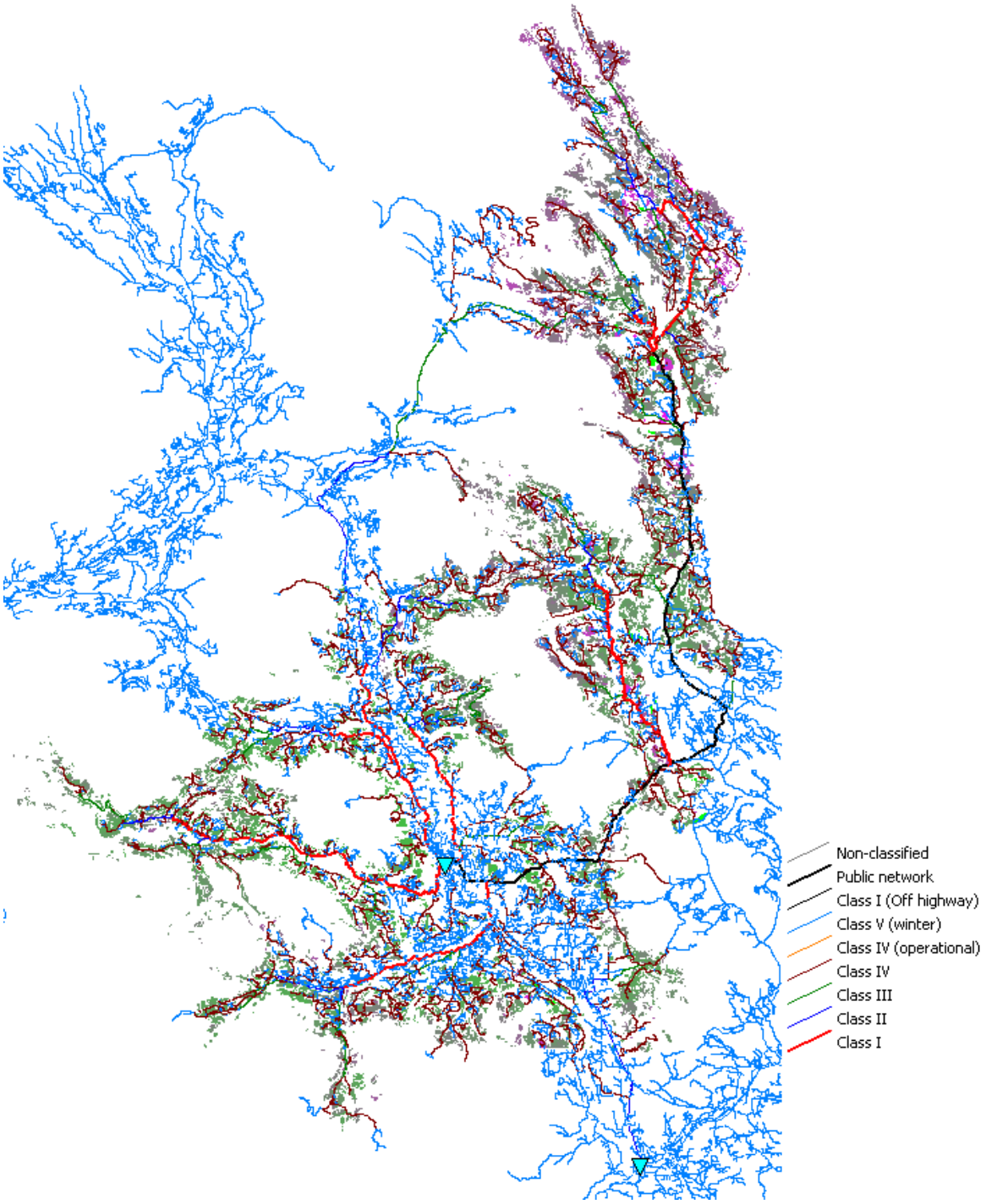


Figure 7. Blocks with roads in the Bulkley TSA

The different colours associated with the roads represent different classes of roads. Each road class has a unique set of speed associations for loaded and empty trucks that help to determine the cycle times used to calculate the delivery cost for biomass. Most of the slowest roads are in blue in this map, while the fastest ones are coloured red and black. Road class is determined by the amount of harvest that passes over the road.

Temporal distribution of harvest

The harvest data contains a temporal period assigned to each cutblock. There are five periods in the data representing ten-year periods. The first period covers the first ten years of cutblocks, and so on.

The harvest projection shows a gradual decline in available biomass between each harvest period, as shown in Figure 8. As previously stated, this lack of volume may be due to reduced harvest levels or to a lack of data about planned harvest in the latter periods.

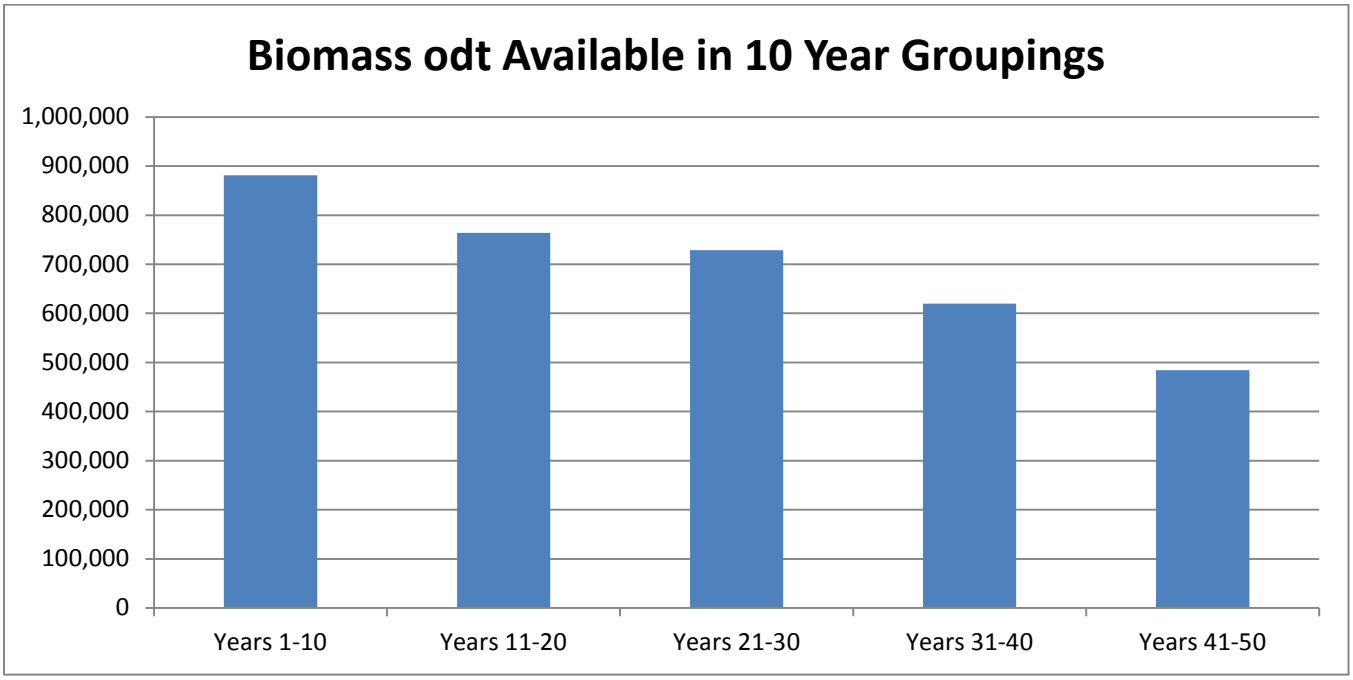


Figure 8. Biomass recoverable by period

Looking at the economic harvest available (the amount at $60/odt), Figure 9, there is a disproportionate decline (compared to Figure 8) in the last period. This indicates that the blocks tend to be further from the delivery points in the last period.

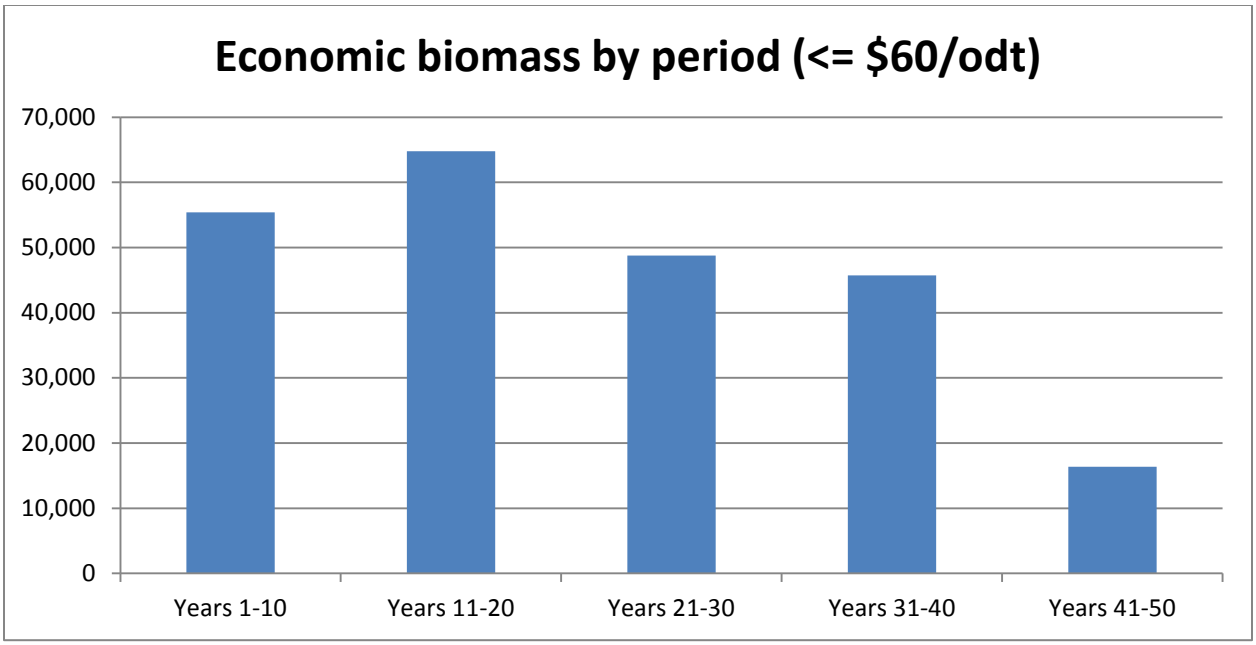


Figure 9. Economic biomass recoverable by 10-year grouping

The data for cost availability by period at all price points in $10 increments is shown in Table 10 and 11 for both the base case and low-cost scenario.

Table 10. Cost availability by period – base case

Base Case	Period 1 – years 1-10		Period 2 – years 11-20		Period 3 – years 21-30		Period 4 – years 31-40		Period 5 – years 41-50	
Cost $/odt	Odt Available	Odt/year	Odt Available	Odt/year	Odt Available	Odt/year	Odt Available	Odt/year	Odt Available	Odt/year
$10	-	-	-	-	-	-	-	-	-	-
$20	-	-	-	-	-	-	-	-	-	-
$30	-	-	-	-	-	-	-	-	-	-
$40	-	-	-	-	-	-	-	-	-	-
$50	12,011	1,201	2,540	254	3,092	309	185	18	712	71
$60	55,393	5,539	64,753	6,475	48,793	4,879	45,737	4,573	16,346	1634
$70	275,510	27,551	224,581	22,458	191,089	19,109	153,549	15,355	66,850	6685
$80	545,382	54,538	403,081	40,308	368,861	36,886	294,227	29,422	155,401	15540
$90	709,741	70,974	578,254	57,825	542,367	54,236	436,647	43,664	254,106	25410
$100	829,885	82,988	679,676	67,967	628,499	62,849	532,269	53,227	342,576	34257
$110	861,127	86,112	732,546	73,254	681,299	68,129	585,343	58,534	398,140	39814
$120	877,090	87,709	755,314	75,531	716,663	71,666	606,529	60,653	439,075	43907
$130	880,830	88,083	762,286	76,228	724,629	72,462	612,084	61,208	457,282	45728

$140	881,198	88,119	763,635	76,363	728,379	72,837	617,166	61,716	465,572	46557
$150	881,375	88,137	763,635	76,363	728,502	72,850	619,395	61,939	476,094	47609
$160	-	-	763,730	76,373	728,768	72,876	619,408	61,940	481,814	48181
$170	-	-	763,730	76,373	728,770	72,877	619,710	61,971	483,184	48318
$180	-	-	763,904	76,390	728,794	72,879	619,710	61,971	483,782	48378
$190	-	-	-	-	-	-	619,711	61,971	484,089	48408

Table 11. Cost availability by period – low-cost scenario

Low-Cost	Period 1 – years 1-10		Period 2 – years 11-20		Period 3 – years 21-30		Period 4 – years 31-40		Period 5 – years 41-50	
Cost $/odt	Odt Available	Odt/year	Odt Available	Odt/year	Odt Available	Odt/year	Odt Available	Odt/year	Odt Available	Odt/year
$10	-	-	-	-	-	-	-	-	-	-
$20	-	-	-	-	-	-	-	-	-	-
$30	-	-	-	-	-	-	-	-	-	-
$40	-	-	-	-	-	-	-	-	-	-
$50	22,636	2,264	24,707	2,471	12,363	1,236	17,354	1,735	4,242	424
$60	170,587	17,059	133,702	13,370	114,776	11,478	80,169	8,017	39,165	3,917
$70	410,183	41,018	319,552	31,955	288,805	28,880	233,012	23,301	112,652	11,265
$80	636,153	63,615	520,866	52,087	466,892	46,689	373,496	37,350	201,091	20,109
$90	773,467	77,347	632,990	63,299	585,142	58,514	483,214	48,321	313,144	31,314
$100	844,924	84,492	708,720	70,872	660,362	66,036	563,113	56,311	368,188	36,819
$110	866,415	86,641	746,844	74,684	706,313	70,631	596,760	59,676	422,111	42,211
$120	880,239	88,024	759,919	75,992	720,785	72,079	611,257	61,126	446,403	44,640
$130	881,068	88,107	763,484	76,348	725,949	72,595	616,445	61,644	462,268	46,227
$140	881,375	88,138	763,635	76,364	728,502	72,850	618,830	61,883	469,308	46,931
$150	881,375	88,138	763,730	76,373	728,768	72,877	619,395	61,940	480,274	48,027
$160	-	-	763,730	76,373	728,768	72,877	619,711	61,971	482,714	48,271
$170	-	-	763,904	76,390	728,795	72,879	619,711	61,971	483,480	48,348
$180	-	-	-	-	-	-	619,711	61,971	484,090	48,409
$190	-	-	-	-	-	-	-	-	-	-

Results appendices

Appendices summarizing the different runs performed in FPInterface and showing the results of each run are included in Appendix 1.

5. CONCLUSION

The biomass yield per hectare predicted for the Bulkley TSA is 25.2 oven-dried tonnes per hectare (odt/ha) from harvest residues. Over the next 50 years a total of 3.48 million odt of available biomass are predicted to be generated by harvest in the Bulkley TSA, or approximately, 70,000 odt/yr. Of this approximately 231,000 odt in total, or 4,600 odt/yr, is expected to be available at the economic price of $60 per oven-dried tonne. Approximately three-quarters of the available amount is expected to be available at $90/odt: a total of 2.52 million odt, or 50,000 odt/yr. The biomass ratio, which is the ratio of recovered biomass to recovered merchantable roundwood, is estimated at 16.7%.

A low-cost scenario was attempted with grinding costs reduced by $5.05/odt. At the economic rate of $60/odt it increased availability by approximately 300,000 odt over 50 years, or about 6,000 odt/yr. If increases in efficiency or lowered cost can be realized, there could be an increase in available biomass by this amount.

Most biomass considered economically available (<= $60/odt) is closer to the delivery points. The amount of economically available biomass decreases through the 50 years in the model, particularly in the last period. While there are fewer blocks planned in later years, the scale of decrease in the final period indicates that as time passes, more blocks are located further from the delivery points.

Territory: Unknown territory
Sector: Unknown sector
Cut block: <Multiple selection>

Statistics - Selected Items

Area	138,087.3 ha
Number of cut blocks	4654
Recovered biomass	3,477,875.1 odt
Biomass yield	25.2 odt/ha
Biomass odt / Merchantable m³	0.0726 odt/m³
Delivered products	
• Chips	100 %
• Bundles	0 %
• Trunks and Residues	0 %
Energy balance	34 : 1
Available energy	12,909,544 MWh
Fuel consumption	12.7 L/odt

Cost

Harvesting	0.00 $/odt
Biomass recovery	27.55 $/odt
Transfer yard	0.00 $/odt
Transportation	34.33 $/odt
Loading/unloading	19.29 $/odt
Stumpage fees	0.00 $/odt
Road network - Maintenance	0.59 $/odt
Indirect costs	0.00 $/odt
Total	**81.76 $/ odt**

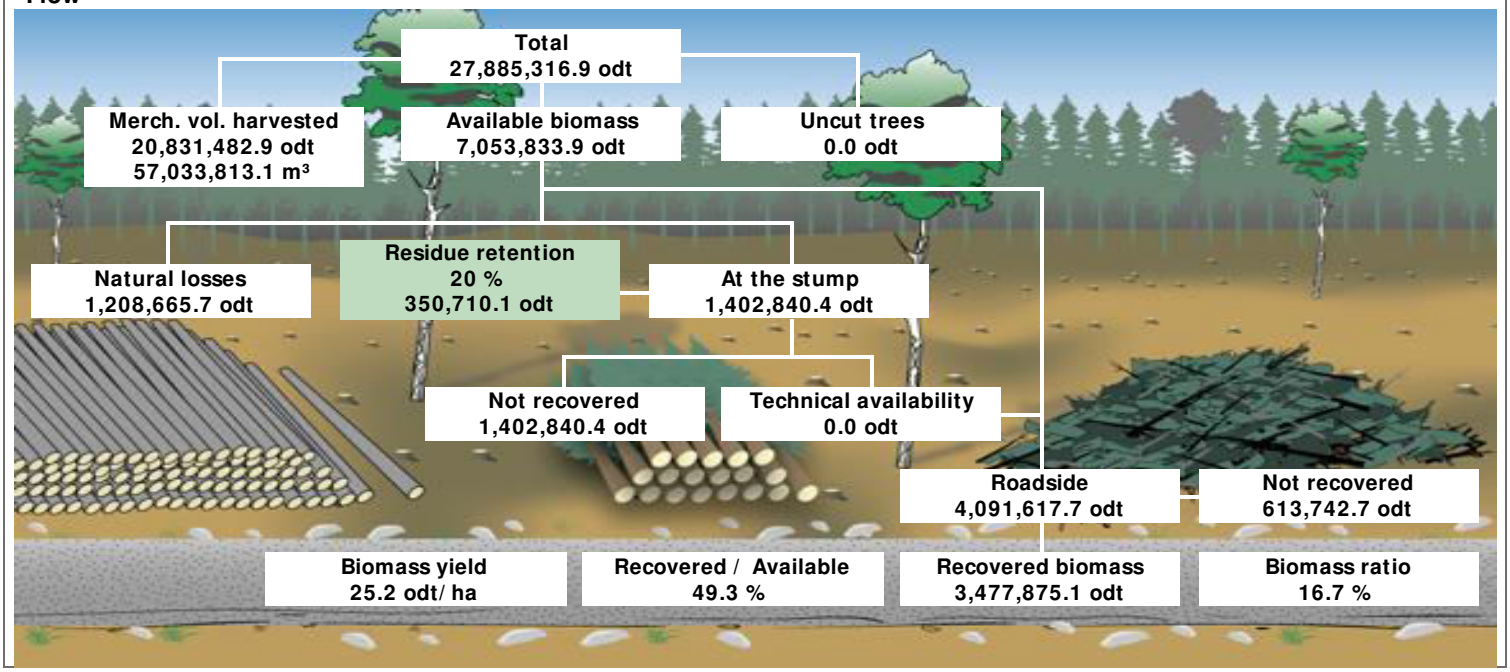
Revenue

Sale value	0.00 $/odt
Silvicultural discount	0.00 $/odt

Net

Profit	-81.76 $/odt

Flow



Products

Product name	odt	odt/ m³	odt/ ha
subalpine fir (residues)	1,411,184.5	0.0708	10.22
hybrid spruce (residues)	1,114,024.6	0.0863	8.07
lodgepole pine (residues)	566,791.5	0.0575	4.10
western hemlock (residues)	204,374.8	0.0687	1.48
Aspen (residues)	115,541.8	0.0842	0.84
Amabilis fir (residues)	31,546.3	0.0617	0.23
engelmann spruce (residues)	14,185.0	0.0897	0.10
White birch (residues)	12,848.2	0.1598	0.09
black spruce (residues)	6,162.7	0.0896	0.04
whitebark pine (residues)	978.8	0.1295	0.01
western red cedar (residues)	237.0	0.0742	0.00
	3,477,875.1	**0.0726**	**25.19**

Recovery summary

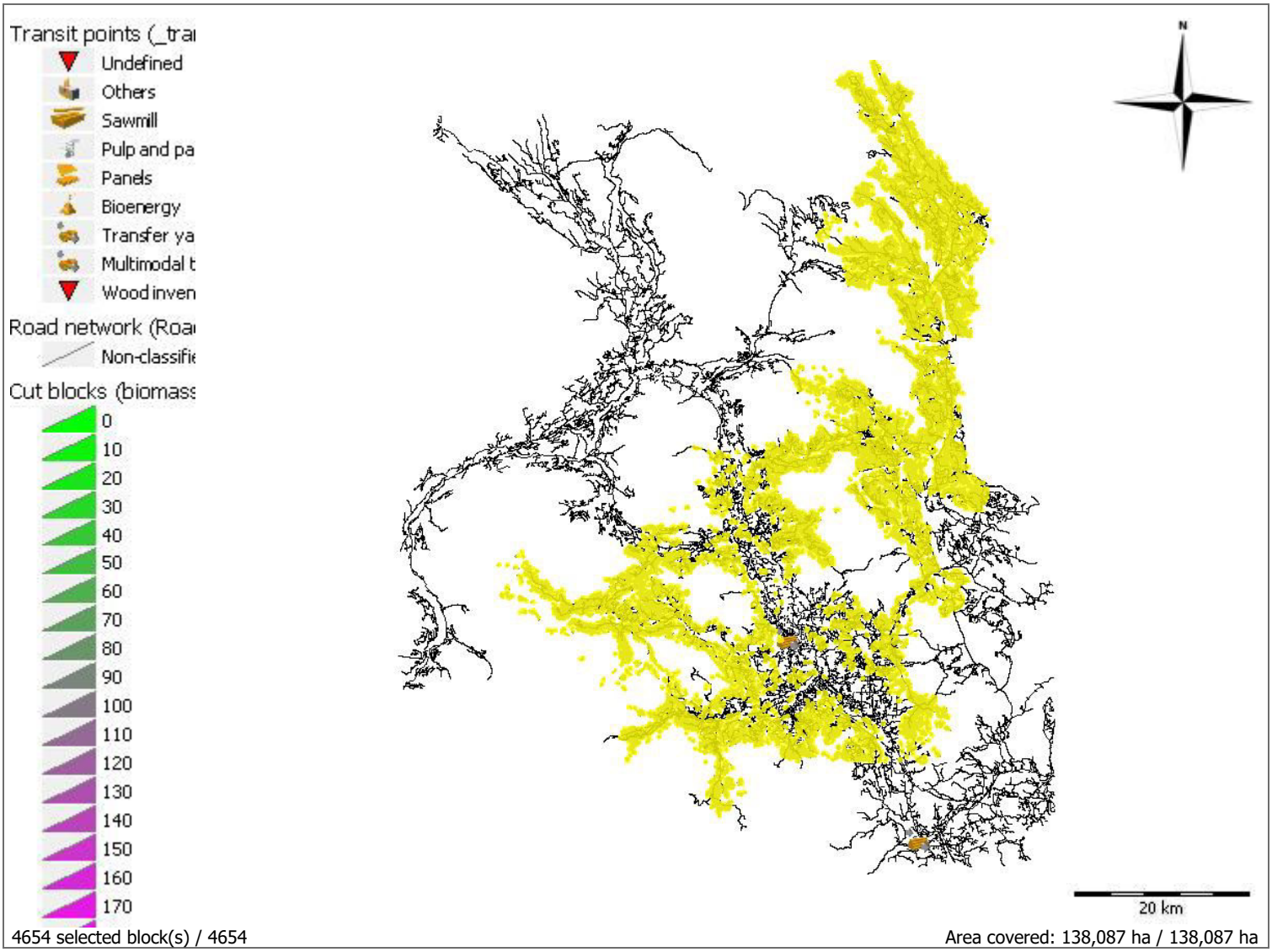
	Volume(odt)	Area(ha)	Number of cut blocks
• Biomass recovery location			
At the stump	0.0	0.0	0
Roadside	3,477,875.1	138,087.3	4,654
• Recovery season			
Summer	0.0	0.0	0
Winter	3,477,875.1	138,087.3	4,654
• Residue freshness			
Fresh	0.0	0.0	0
Brown	3,477,875.1	138,087.3	4,654
Brittle	0.0	0.0	0

Supply summary

Recovered biomass to	Merchantable volume (odt)	Residues (odt)	Total biomass (odt)
10 $/odt	0.0	0.0	0.0
20 $/odt	0.0	0.0	0.0
30 $/odt	0.0	0.0	0.0
40 $/odt	0.0	0.0	0.0
50 $/odt	0.0	18,541.6	18,541.6
60 $/odt	0.0	231,025.6	231,025.6
70 $/odt	0.0	911,582.2	911,582.2
80 $/odt	0.0	1,766,954.9	1,766,954.9
90 $/odt	0.0	2,521,117.4	2,521,117.4
100 $/odt	0.0	3,012,907.2	3,012,907.2
110 $/odt	0.0	3,258,456.5	3,258,456.5
120 $/odt	0.0	3,394,673.8	3,394,673.8
130 $/odt	0.0	3,437,112.6	3,437,112.6
140 $/odt	0.0	3,455,951.8	3,455,951.8
150 $/odt	0.0	3,469,002.6	3,469,002.6
160 $/odt	0.0	3,475,096.2	3,475,096.2
170 $/odt	0.0	3,476,771.2	3,476,771.2
180 $/odt	0.0	3,477,567.5	3,477,567.5
190 $/odt	0.0	3,477,875.1	3,477,875.1
Maximum cost	**0.00 $/ odt**	**184.42 $/ odt**	

Delivery to mills

Destination	Product	Format	odt	Transport average distance (Km)
Smithers				
	Amabilis fir (residues)	Chips	31,546	63
	Aspen (residues)	Chips	110,953	67
	black spruce (residues)	Chips	6,089	109
	engelmann spruce (residues)	Chips	14,185	154
	hybrid spruce (residues)	Chips	1,061,611	81
	lodgepole pine (residues)	Chips	529,080	82
	subalpine fir (residues)	Chips	1,375,699	80
	western hemlock (residues)	Chips	204,375	48
	western red cedar (residues)	Chips	237	46
	White birch (residues)	Chips	11,289	35
	whitebark pine (residues)	Chips	979	48
			3,346,043	**78**
Houston				
	Aspen (residues)	Chips	4,589	37
	black spruce (residues)	Chips	74	41
	hybrid spruce (residues)	Chips	52,414	39
	lodgepole pine (residues)	Chips	37,711	39
	subalpine fir (residues)	Chips	35,486	40
	White birch (residues)	Chips	1,559	39
			131,832	**39**
			3,477,875	**77**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Cut blocks (biomass
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20
30
40
50
60
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80
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120
130
140
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160
170
N
20 km
4654 selected block(s) / 4654
Area covered: 138,087 ha / 138,087 ha

Territory: Unknown territory
Sector: Unknown sector
Cut block: <Multiple selection>

Statistics - Selected Items

Area	32,939.3 ha
Number of cut blocks	1148
Recovered biomass	881,375.3 odt
Biomass yield	26.8 odt/ha
Biomass odt / Merchantable m³	0.0682 odt/m³
Delivered products	
• Chips	100 %
• Bundles	0 %
• Trunks and Residues	0 %
Energy balance	33 : 1
Available energy	3,266,781 MWh
Fuel consumption	12.8 L/odt

Cost

Harvesting	0.00 $/odt
Biomass recovery	27.55 $/odt
Transfer yard	0.00 $/odt
Transportation	33.17 $/odt
Loading/unloading	16.45 $/odt
Stumpage fees	0.00 $/odt
Road network - Maintenance	0.66 $/odt
Indirect costs	0.00 $/odt
Total	**77.83 $/ odt**

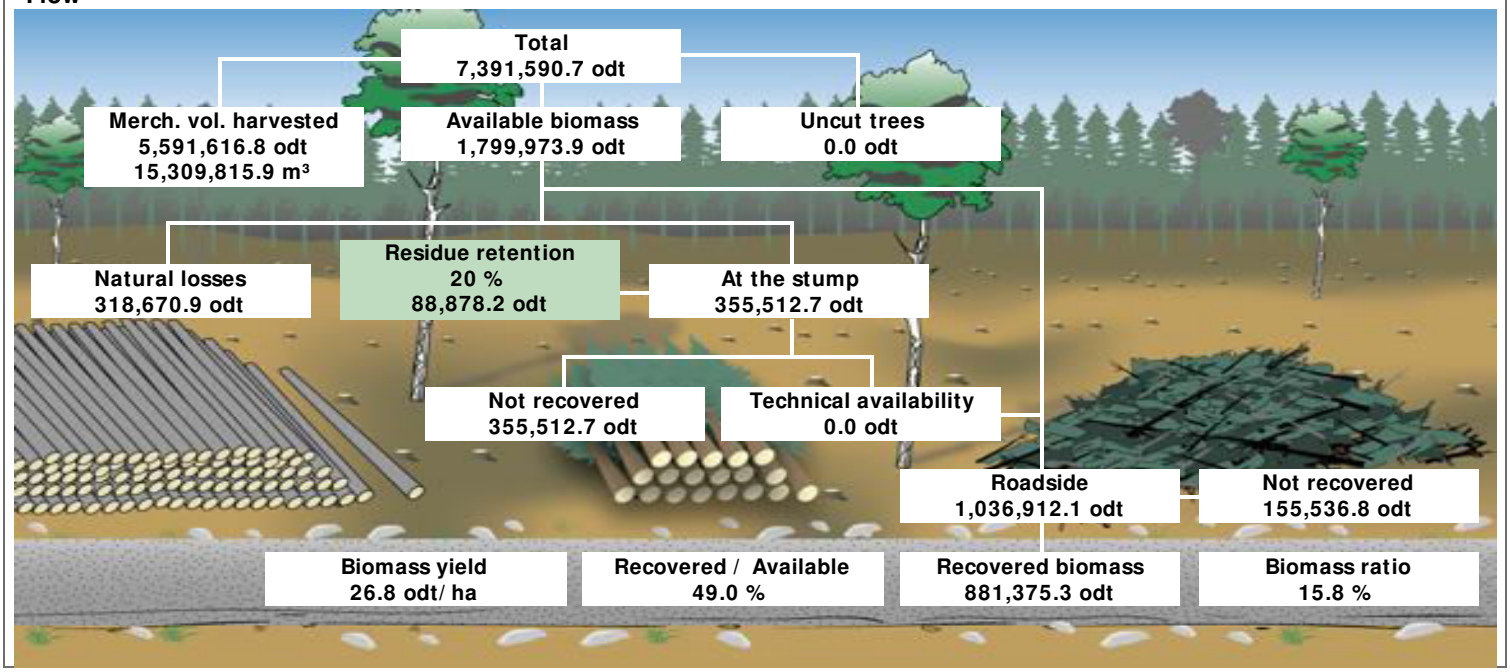
Revenue

Sale value	0.00 $/odt
Silvicultural discount	0.00 $/odt

Net

Profit	-77.83 $/odt

Flow



Products

Product name	odt	odt/ m³	odt/ ha
subalpine fir (residues)	362,721.2	0.0668	11.01
hybrid spruce (residues)	288,180.6	0.0802	8.75
lodgepole pine (residues)	103,761.5	0.0505	3.15
western hemlock (residues)	87,772.1	0.0661	2.66
Aspen (residues)	20,819.7	0.0747	0.63
Amabilis fir (residues)	11,568.3	0.0617	0.35
White birch (residues)	2,891.5	0.1409	0.09
engelmann spruce (residues)	2,227.2	0.0861	0.07
black spruce (residues)	1,011.9	0.0804	0.03
whitebark pine (residues)	404.3	0.1353	0.01
western red cedar (residues)	17.1	0.0654	0.00
	881,375.3	**0.0682**	**26.76**

Recovery summary

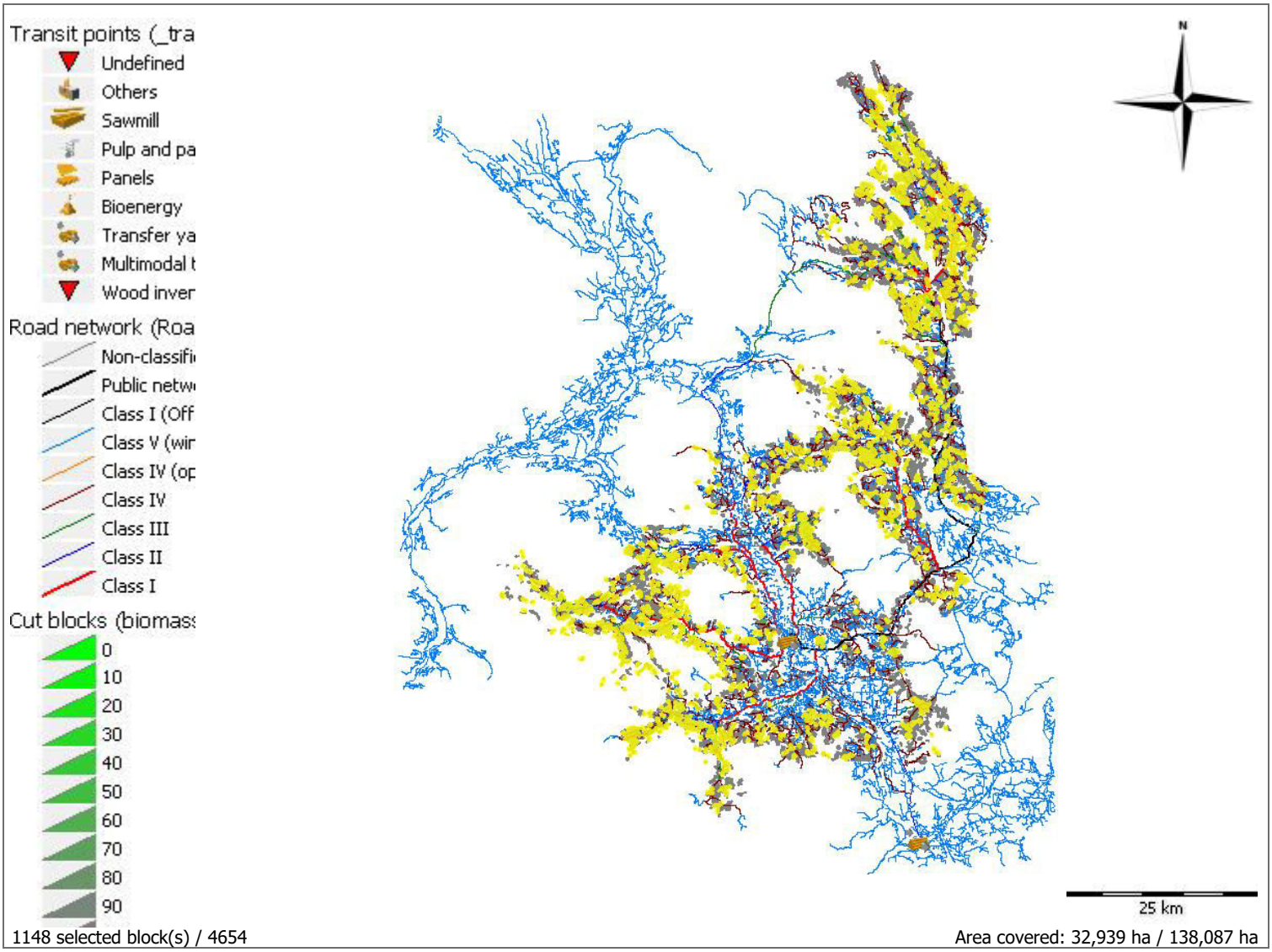
	Volume(odt)	Area(ha)	Number of cut blocks
• Biomass recovery location			
At the stump	0.0	0.0	0
Roadside	881,375.3	32,939.3	1,148
• Recovery season			
Summer	0.0	0.0	0
Winter	881,375.3	32,939.3	1,148
• Residue freshness			
Fresh	0.0	0.0	0
Brown	881,375.3	32,939.3	1,148
Brittle	0.0	0.0	0

Supply summary

Recovered biomass to	Merchantable volume (odt)	Residues (odt)	Total biomass (odt)
10 $/odt	0.0	0.0	0.0
20 $/odt	0.0	0.0	0.0
30 $/odt	0.0	0.0	0.0
40 $/odt	0.0	0.0	0.0
50 $/odt	0.0	12,011.6	12,011.6
60 $/odt	0.0	55,393.8	55,393.8
70 $/odt	0.0	275,510.4	275,510.4
80 $/odt	0.0	545,382.8	545,382.8
90 $/odt	0.0	709,741.7	709,741.7
100 $/odt	0.0	829,885.4	829,885.4
110 $/odt	0.0	861,127.3	861,127.3
120 $/odt	0.0	877,090.4	877,090.4
130 $/odt	0.0	880,830.4	880,830.4
140 $/odt	0.0	881,198.7	881,198.7
150 $/odt	0.0	881,375.3	881,375.3
Maximum cost	**0.00 $/ odt**	**147.03 $/ odt**	

Delivery to mills

Destination	Product	Format	odt	Transport average distance (Km)
Smithers				
	Amabilis fir (residues)	Chips	11,568	63
	Aspen (residues)	Chips	20,637	72
	black spruce (residues)	Chips	1,011	114
	engelmann spruce (residues)	Chips	2,227	141
	hybrid spruce (residues)	Chips	281,268	86
	lodgepole pine (residues)	Chips	98,435	88
	subalpine fir (residues)	Chips	357,629	81
	western hemlock (residues)	Chips	87,772	48
	western red cedar (residues)	Chips	17	50
	White birch (residues)	Chips	2,417	27
	whitebark pine (residues)	Chips	404	52
			863,386	**79**
Houston				
	Aspen (residues)	Chips	182	40
	black spruce (residues)	Chips	1	40
	hybrid spruce (residues)	Chips	6,913	40
	lodgepole pine (residues)	Chips	5,326	39
	subalpine fir (residues)	Chips	5,093	41
	White birch (residues)	Chips	475	44
			17,989	**40**
			881,375	**79**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Cut blocks (biomass
0
10
20
30
40
50
60
70
80
90
N
25 km
1148 selected block(s) / 4654
Area covered: 32,939 ha / 138,087 ha

Territory: Unknown territory
Sector: Unknown sector
Cut block: <Multiple selection>

Statistics - Selected Items

Area	28,774.3 ha
Number of cut blocks	852
Recovered biomass	763,904.1 odt
Biomass yield	26.5 odt/ha
Biomass odt / Merchantable m³	0.0691 odt/m³
Delivered products	
• Chips	100 %
• Bundles	0 %
• Trunks and Residues	0 %
Energy balance	33 : 1
Available energy	2,834,643 MWh
Fuel consumption	12.8 L/odt

Cost

Harvesting	0.00 $/odt
Biomass recovery	27.55 $/odt
Transfer yard	0.00 $/odt
Transportation	34.18 $/odt
Loading/unloading	17.55 $/odt
Stumpage fees	0.00 $/odt
Road network - Maintenance	0.58 $/odt
Indirect costs	0.00 $/odt
Total	**79.86 $/ odt**

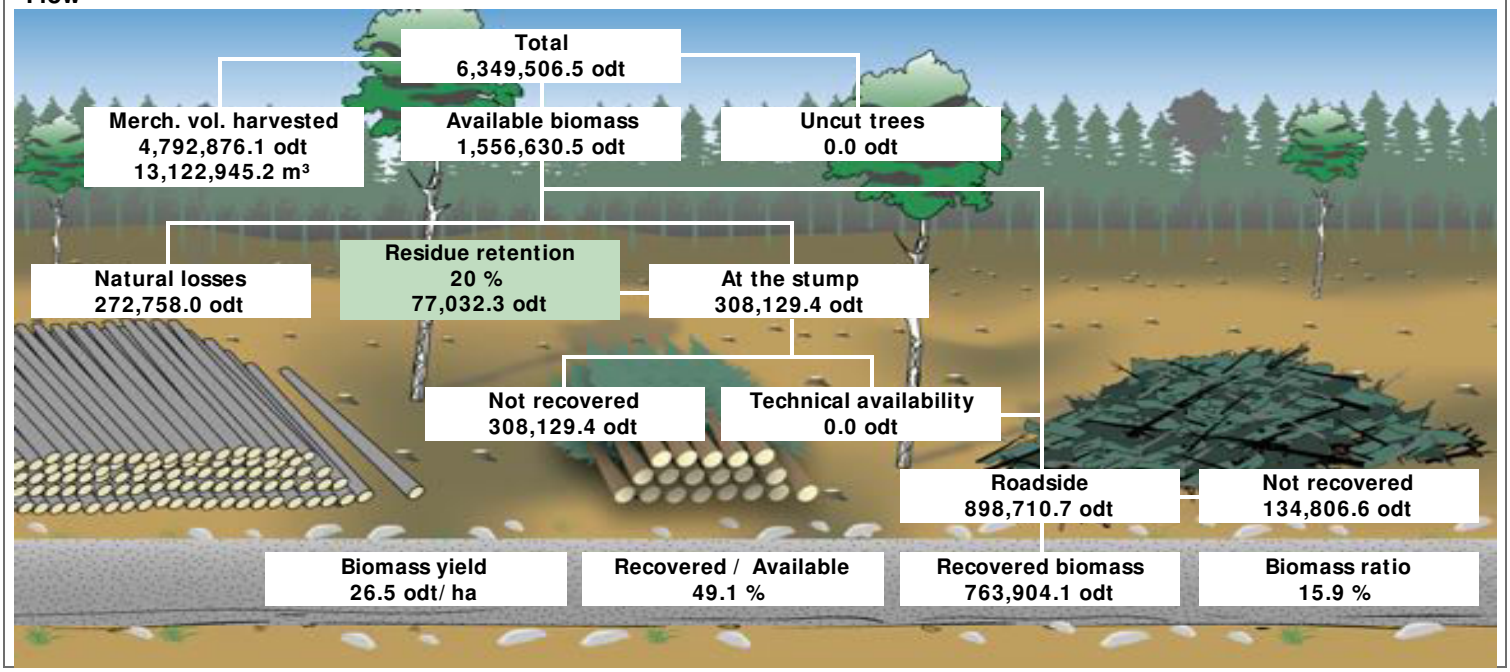
Revenue

Sale value	0.00 $/odt
Silvicultural discount	0.00 $/odt

Net

Profit	-79.86 $/odt

Flow



Products

Product name	odt	odt/ m³	odt/ ha
subalpine fir (residues)	317,322.6	0.0692	11.03
hybrid spruce (residues)	251,572.5	0.0820	8.74
lodgepole pine (residues)	119,270.4	0.0508	4.15
western hemlock (residues)	41,858.7	0.0678	1.45
Aspen (residues)	23,254.2	0.0774	0.81
Amabilis fir (residues)	5,661.3	0.0608	0.20
engelmann spruce (residues)	2,561.8	0.0867	0.09
White birch (residues)	1,175.6	0.1539	0.04
black spruce (residues)	1,006.3	0.0801	0.03
whitebark pine (residues)	151.9	0.1081	0.01
western red cedar (residues)	68.9	0.0705	0.00
	763,904.1	**0.0691**	**26.55**

Recovery summary

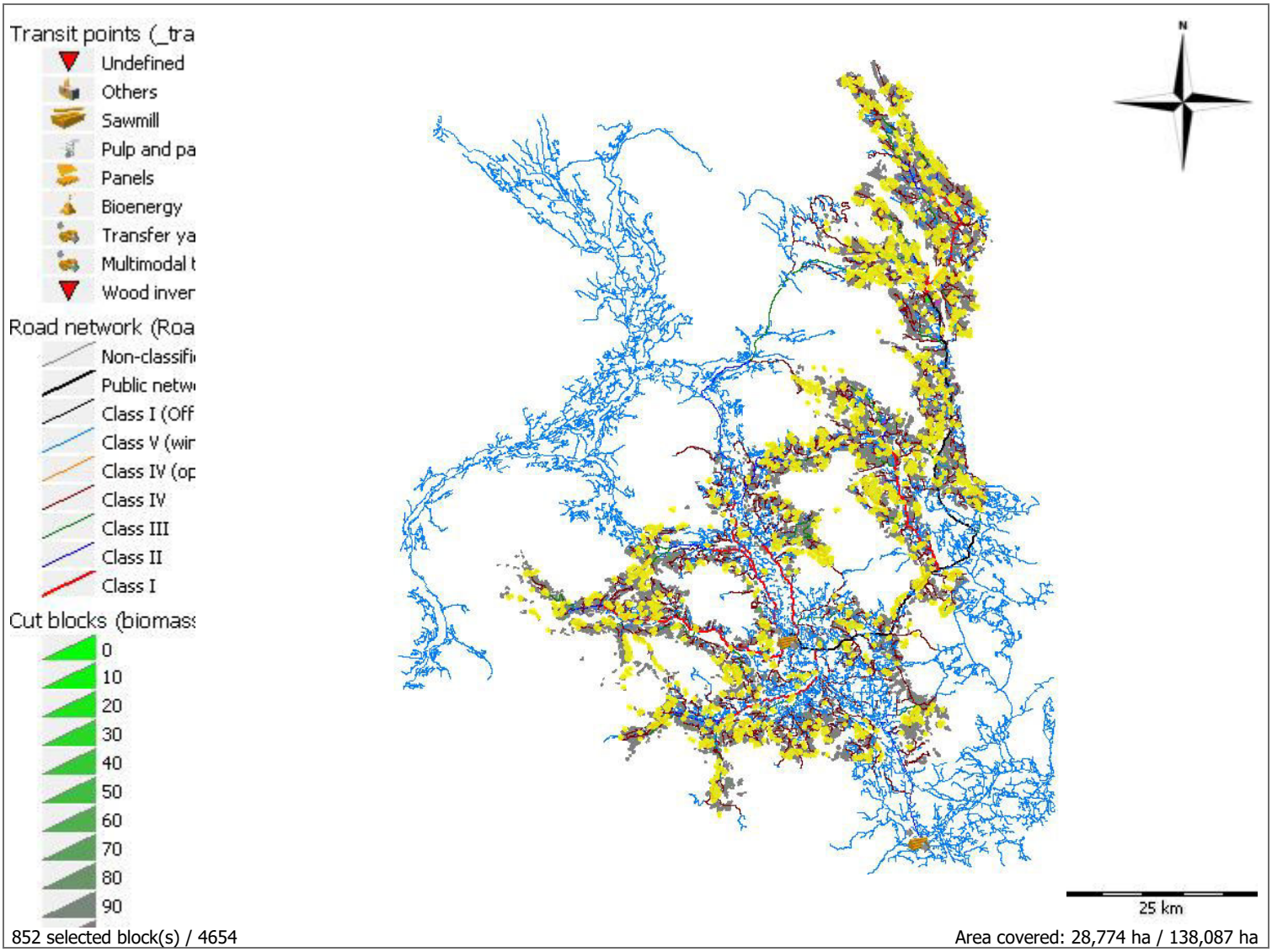
	Volume(odt)	Area(ha)	Number of cut blocks
• Biomass recovery location			
At the stump	0.0	0.0	0
Roadside	763,904.1	28,774.3	852
• Recovery season			
Summer	0.0	0.0	0
Winter	763,904.1	28,774.3	852
• Residue freshness			
Fresh	0.0	0.0	0
Brown	763,904.1	28,774.3	852
Brittle	0.0	0.0	0

Supply summary

Recovered biomass to	Merchantable volume (odt)	Residues (odt)	Total biomass (odt)
10 $/odt	0.0	0.0	0.0
20 $/odt	0.0	0.0	0.0
30 $/odt	0.0	0.0	0.0
40 $/odt	0.0	0.0	0.0
50 $/odt	0.0	2,540.1	2,540.1
60 $/odt	0.0	64,753.8	64,753.8
70 $/odt	0.0	224,581.3	224,581.3
80 $/odt	0.0	403,081.6	403,081.6
90 $/odt	0.0	578,254.5	578,254.5
100 $/odt	0.0	679,676.7	679,676.7
110 $/odt	0.0	732,546.1	732,546.1
120 $/odt	0.0	755,314.2	755,314.2
130 $/odt	0.0	762,286.9	762,286.9
140 $/odt	0.0	763,635.1	763,635.1
150 $/odt	0.0	763,635.1	763,635.1
160 $/odt	0.0	763,730.1	763,730.1
170 $/odt	0.0	763,730.1	763,730.1
180 $/odt	0.0	763,904.1	763,904.1
Maximum cost	**0.00 $/ odt**	**170.04 $/ odt**	

Delivery to mills

Destination	Product	Format	odt	Transport average distance (Km)
Smithers				
	Amabilis fir (residues)	Chips	5,661	62
	Aspen (residues)	Chips	22,660	73
	black spruce (residues)	Chips	1,006	115
	engelmann spruce (residues)	Chips	2,562	151
	hybrid spruce (residues)	Chips	243,549	84
	lodgepole pine (residues)	Chips	111,272	82
	subalpine fir (residues)	Chips	314,693	80
	western hemlock (residues)	Chips	41,859	47
	western red cedar (residues)	Chips	69	42
	White birch (residues)	Chips	1,106	38
	whitebark pine (residues)	Chips	152	59
			744,588	**79**
Houston				
	Aspen (residues)	Chips	594	35
	black spruce (residues)	Chips	0	46
	hybrid spruce (residues)	Chips	8,023	40
	lodgepole pine (residues)	Chips	7,998	40
	subalpine fir (residues)	Chips	2,629	40
	White birch (residues)	Chips	70	39
			19,316	**40**
			763,904	**78**



852 selected block(s) / 4654

Area covered: 28,774 ha / 138,087 ha

Territory: Unknown territory
Sector: Unknown sector
Cut block: <Multiple selection>

Statistics - Selected Items

Area	28,221.7 ha
Number of cut blocks	976
Recovered biomass	728,794.6 odt
Biomass yield	25.8 odt/ha
Biomass odt / Merchantable m³	0.0731 odt/m³
Delivered products	
• Chips	100 %
• Bundles	0 %
• Trunks and Residues	0 %
Energy balance	34 : 1
Available energy	2,702,424 MWh
Fuel consumption	12.6 L/odt

Cost

Harvesting	0.00 $/odt
Biomass recovery	27.55 $/odt
Transfer yard	0.00 $/odt
Transportation	33.94 $/odt
Loading/unloading	19.32 $/odt
Stumpage fees	0.00 $/odt
Road network - Maintenance	0.64 $/odt
Indirect costs	0.00 $/odt
Total	**81.45 $/ odt**

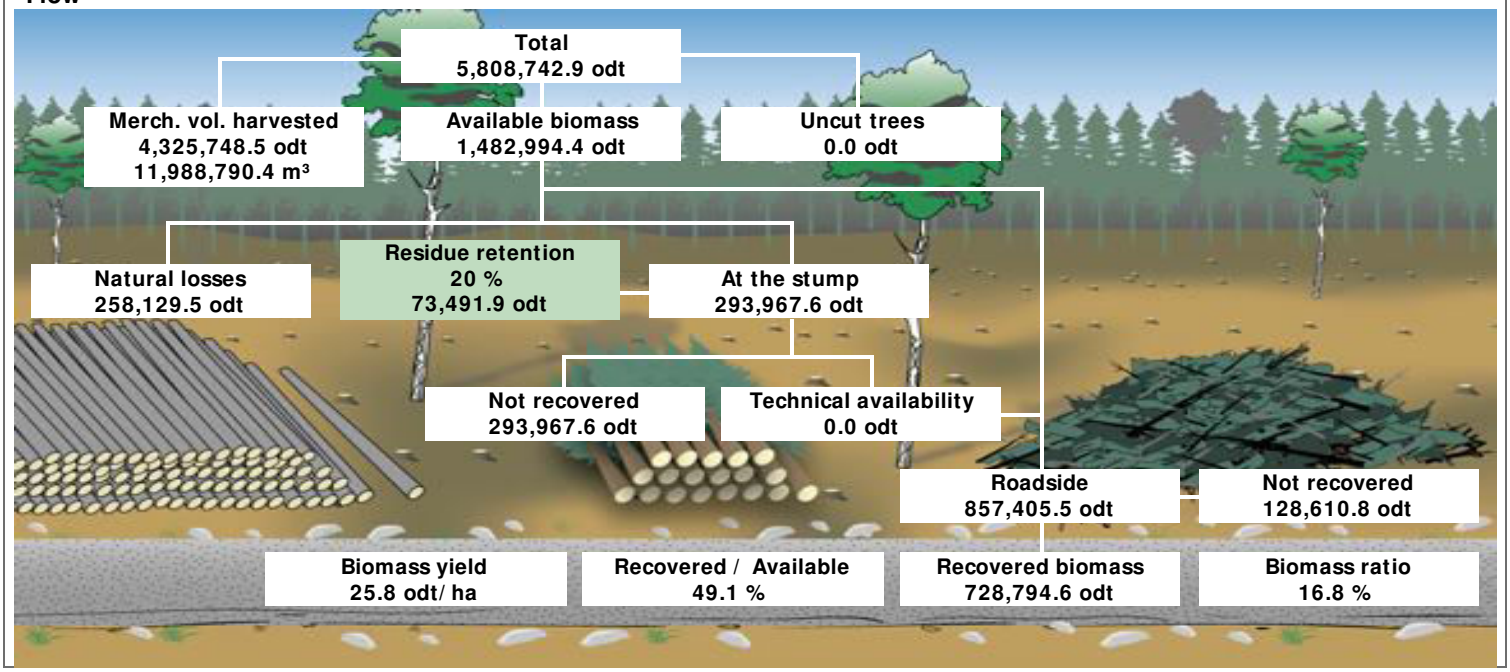
Revenue

Sale value	0.00 $/odt
Silvicultural discount	0.00 $/odt

Net

Profit	-81.45 $/odt

Flow



Products

Product name	odt	odt/ m³	odt/ ha
subalpine fir (residues)	333,592.4	0.0705	11.82
hybrid spruce (residues)	224,936.2	0.0870	7.97
lodgepole pine (residues)	100,860.8	0.0576	3.57
western hemlock (residues)	33,871.8	0.0697	1.20
Aspen (residues)	21,375.8	0.0838	0.76
Amabilis fir (residues)	6,001.7	0.0617	0.21
engelmann spruce (residues)	3,327.5	0.0922	0.12
White birch (residues)	3,131.4	0.1612	0.11
black spruce (residues)	1,250.2	0.0855	0.04
whitebark pine (residues)	366.3	0.1301	0.01
western red cedar (residues)	80.5	0.0800	0.00
	728,794.6	**0.0731**	**25.82**

Recovery summary

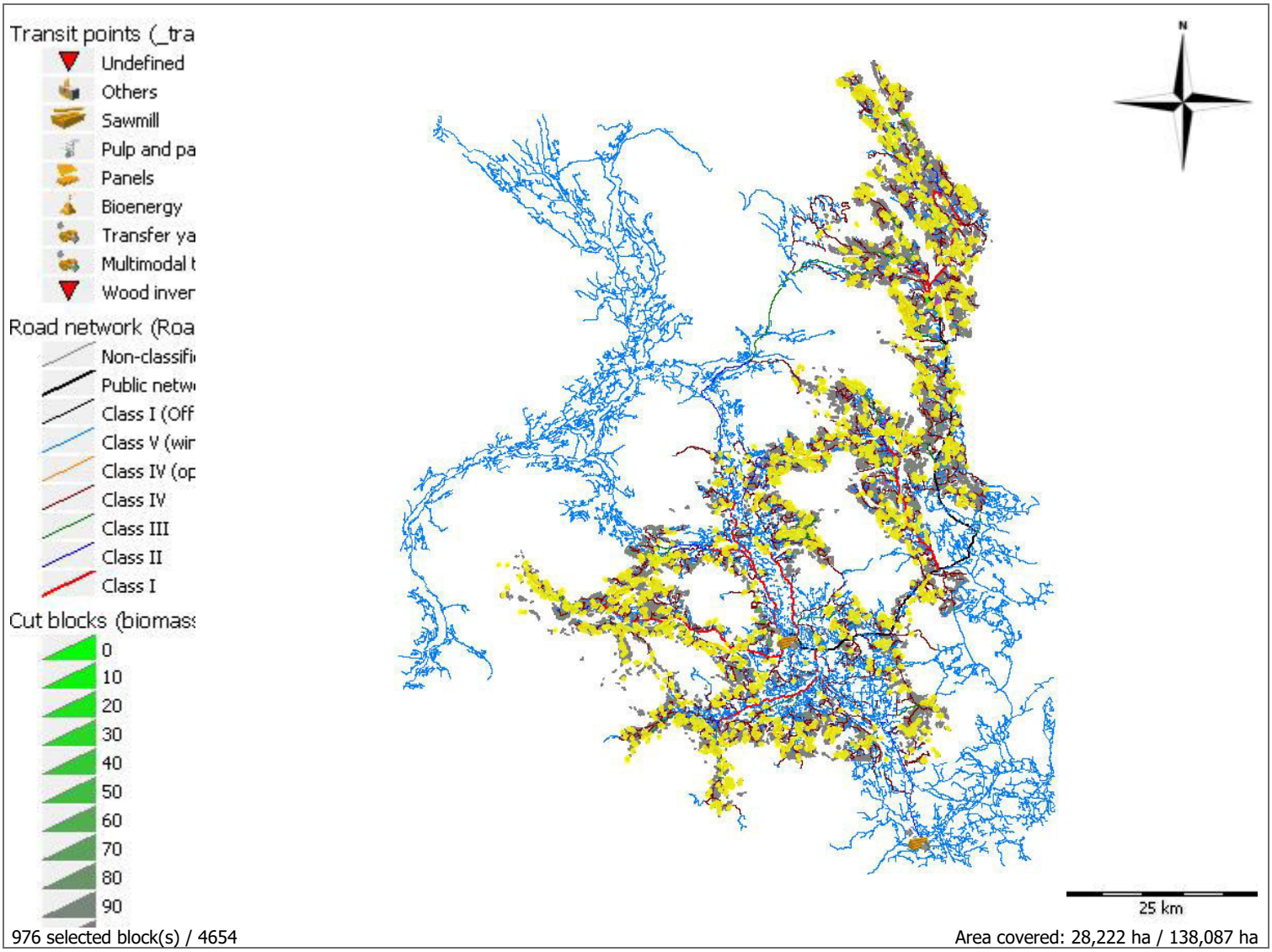
	Volume(odt)	Area(ha)	Number of cut blocks
• Biomass recovery location			
At the stump	0.0	0.0	0
Roadside	728,794.6	28,221.7	976
• Recovery season			
Summer	0.0	0.0	0
Winter	728,794.6	28,221.7	976
• Residue freshness			
Fresh	0.0	0.0	0
Brown	728,794.6	28,221.7	976
Brittle	0.0	0.0	0

Supply summary

Recovered biomass to	Merchantable volume (odt)	Residues (odt)	Total biomass (odt)
10 $/odt	0.0	0.0	0.0
20 $/odt	0.0	0.0	0.0
30 $/odt	0.0	0.0	0.0
40 $/odt	0.0	0.0	0.0
50 $/odt	0.0	3,092.7	3,092.7
60 $/odt	0.0	48,793.9	48,793.9
70 $/odt	0.0	191,089.7	191,089.7
80 $/odt	0.0	368,861.9	368,861.9
90 $/odt	0.0	542,367.0	542,367.0
100 $/odt	0.0	628,499.2	628,499.2
110 $/odt	0.0	681,299.2	681,299.2
120 $/odt	0.0	716,663.8	716,663.8
130 $/odt	0.0	724,629.0	724,629.0
140 $/odt	0.0	728,379.2	728,379.2
150 $/odt	0.0	728,502.3	728,502.3
160 $/odt	0.0	728,768.0	728,768.0
170 $/odt	0.0	728,770.4	728,770.4
180 $/odt	0.0	728,794.6	728,794.6
Maximum cost	**0.00 $/ odt**	**172.74 $/ odt**	

Delivery to mills

Destination	Product	Format	odt	Transport average distance (Km)
Smithers				
	Amabilis fir (residues)	Chips	6,002	66
	Aspen (residues)	Chips	20,451	59
	black spruce (residues)	Chips	1,203	97
	engelmann spruce (residues)	Chips	3,328	154
	hybrid spruce (residues)	Chips	213,634	75
	lodgepole pine (residues)	Chips	93,644	73
	subalpine fir (residues)	Chips	326,860	79
	western hemlock (residues)	Chips	33,872	50
	western red cedar (residues)	Chips	81	44
	White birch (residues)	Chips	2,732	36
	whitebark pine (residues)	Chips	366	37
			702,171	**75**
Houston				
	Aspen (residues)	Chips	925	36
	black spruce (residues)	Chips	47	41
	hybrid spruce (residues)	Chips	11,302	40
	lodgepole pine (residues)	Chips	7,217	40
	subalpine fir (residues)	Chips	6,733	39
	White birch (residues)	Chips	400	36
			26,624	**39**
			728,795	**74**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Class III
Class II
Class I
Cut blocks (biomass
0
10
20
30
40
50
60
70
80
90
N
25 km
976 selected block(s) / 4654
Area covered: 28,222 ha / 138,087 ha

Territory: Unknown territory
Sector: Unknown sector
Cut block: <Multiple selection>

Statistics - Selected Items

Area	25,039.5 ha
Number of cut blocks	774
Recovered biomass	619,711.1 odt
Biomass yield	24.7 odt/ha
Biomass odt / Merchantable m³	0.0753 odt/m³
Delivered products	
• Chips	100 %
• Bundles	0 %
• Trunks and Residues	0 %
Energy balance	34 : 1
Available energy	2,306,179 MWh
Fuel consumption	12.4 L/odt

Cost

Harvesting	0.00 $/odt
Biomass recovery	27.55 $/odt
Transfer yard	0.00 $/odt
Transportation	33.81 $/odt
Loading/unloading	20.56 $/odt
Stumpage fees	0.00 $/odt
Road network - Maintenance	0.51 $/odt
Indirect costs	0.00 $/odt
Total	**82.44 $/ odt**

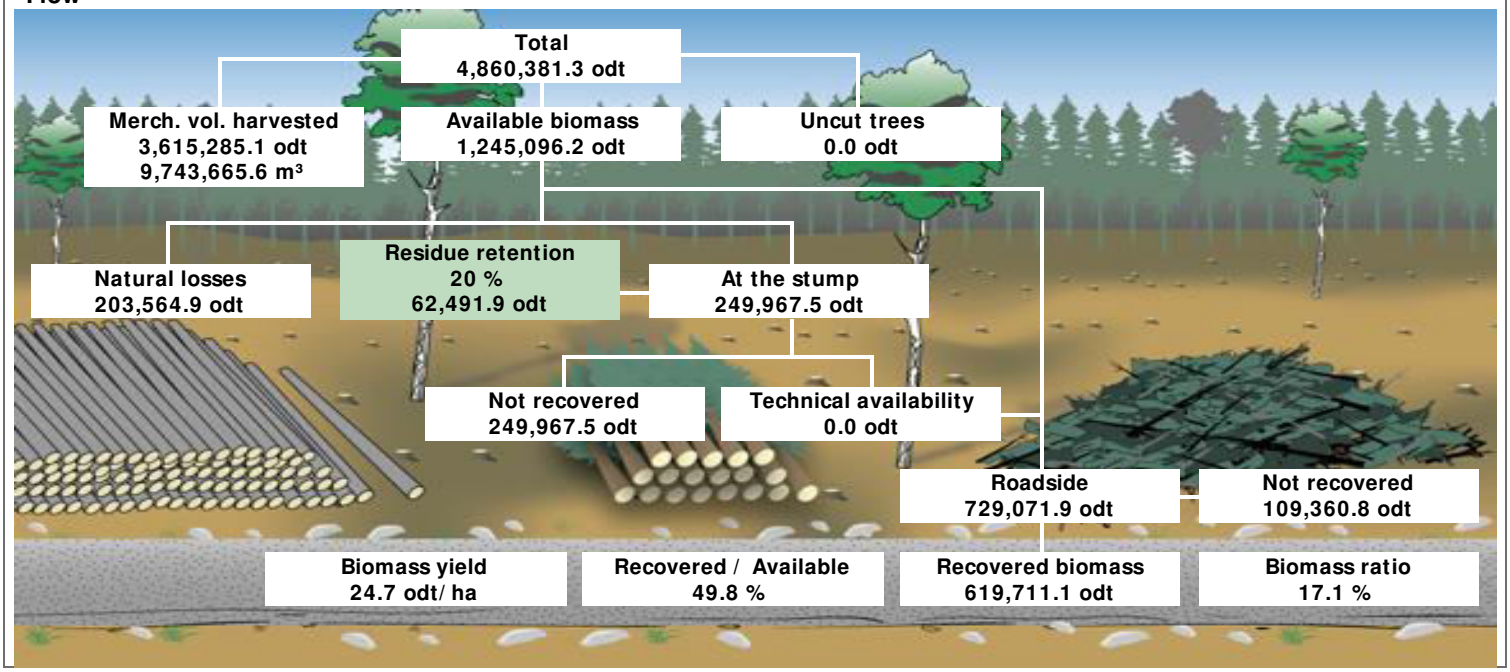
Revenue

Sale value	0.00 $/odt
Silvicultural discount	0.00 $/odt

Net

Profit	-82.44 $/odt

Flow



Products

Product name	odt	odt/ m³	odt/ ha
subalpine fir (residues)	209,351.3	0.0741	8.36
hybrid spruce (residues)	199,004.8	0.0910	7.95
lodgepole pine (residues)	142,762.0	0.0604	5.70
western hemlock (residues)	27,850.9	0.0723	1.11
Aspen (residues)	27,017.8	0.0867	1.08
Amabilis fir (residues)	5,379.3	0.0599	0.21
White birch (residues)	3,613.8	0.1672	0.14
engelmann spruce (residues)	3,288.3	0.0898	0.13
black spruce (residues)	1,421.1	0.0879	0.06
western red cedar (residues)	20.1	0.0837	0.00
whitebark pine (residues)	1.7	0.1083	0.00
	619,711.1	**0.0753**	**24.75**

Recovery summary

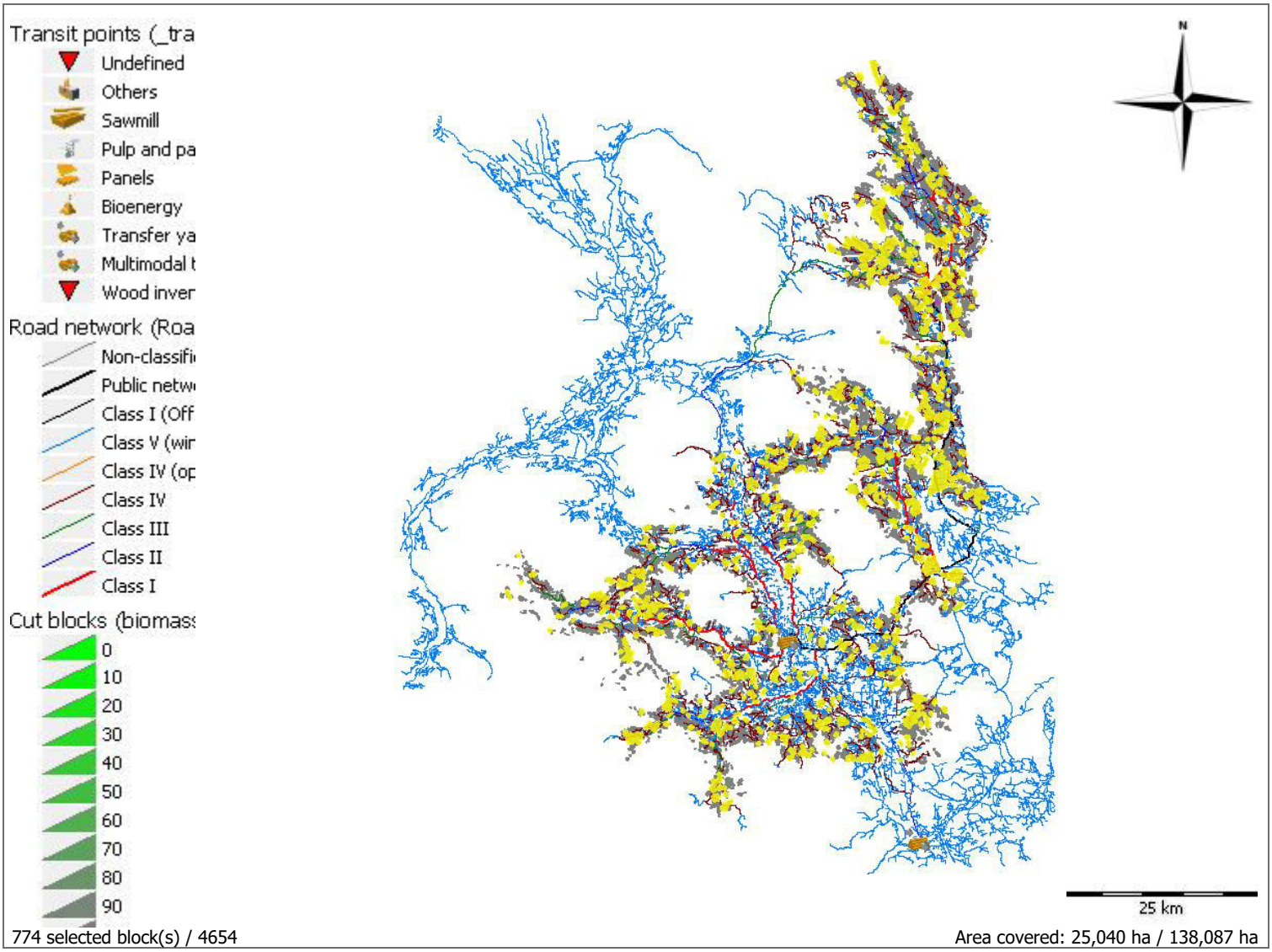
	Volume(odt)	Area(ha)	Number of cut blocks
• Biomass recovery location			
At the stump	0.0	0.0	0
Roadside	619,711.1	25,039.5	774
• Recovery season			
Summer	0.0	0.0	0
Winter	619,711.1	25,039.5	774
• Residue freshness			
Fresh	0.0	0.0	0
Brown	619,711.1	25,039.5	774
Brittle	0.0	0.0	0

Supply summary

Recovered biomass to	Merchantable volume (odt)	Residues (odt)	Total biomass (odt)
10 $/odt	0.0	0.0	0.0
20 $/odt	0.0	0.0	0.0
30 $/odt	0.0	0.0	0.0
40 $/odt	0.0	0.0	0.0
50 $/odt	0.0	185.0	185.0
60 $/odt	0.0	45,737.4	45,737.4
70 $/odt	0.0	153,549.9	153,549.9
80 $/odt	0.0	294,227.5	294,227.5
90 $/odt	0.0	436,647.4	436,647.4
100 $/odt	0.0	532,269.9	532,269.9
110 $/odt	0.0	585,343.7	585,343.7
120 $/odt	0.0	606,529.9	606,529.9
130 $/odt	0.0	612,084.3	612,084.3
140 $/odt	0.0	617,166.7	617,166.7
150 $/odt	0.0	619,395.4	619,395.4
160 $/odt	0.0	619,408.5	619,408.5
170 $/odt	0.0	619,710.8	619,710.8
180 $/odt	0.0	619,710.8	619,710.8
190 $/odt	0.0	619,711.1	619,711.1
Maximum cost	**0.00 $/ odt**	**181.78 $/ odt**	

Delivery to mills

Destination	Product	Format	odt	Transport average distance (Km)
Smithers				
	Amabilis fir (residues)	Chips	5,379	63
	Aspen (residues)	Chips	25,885	66
	black spruce (residues)	Chips	1,415	108
	engelmann spruce (residues)	Chips	3,288	154
	hybrid spruce (residues)	Chips	188,234	77
	lodgepole pine (residues)	Chips	133,082	77
	subalpine fir (residues)	Chips	202,292	76
	western hemlock (residues)	Chips	27,851	47
	western red cedar (residues)	Chips	20	49
	White birch (residues)	Chips	3,353	37
	whitebark pine (residues)	Chips	2	59
			590,799	**75**
Houston				
	Aspen (residues)	Chips	1,133	36
	black spruce (residues)	Chips	7	42
	hybrid spruce (residues)	Chips	10,771	40
	lodgepole pine (residues)	Chips	9,680	38
	subalpine fir (residues)	Chips	7,060	43
	White birch (residues)	Chips	261	40
			28,912	**40**
			619,711	**73**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Class II
Class I
Cut blocks (biomass
0
10
20
30
40
50
60
70
80
90
N
25 km
774 selected block(s) / 4654
Area covered: 25,040 ha / 138,087 ha

Territory: Unknown territory
Sector: Unknown sector
Cut block: <Multiple selection>

Statistics - Selected Items

Area	23,112.5 ha
Number of cut blocks	904
Recovered biomass	484,089.9 odt
Biomass yield	20.9 odt/ha
Biomass odt / Merchantable m³	0.0851 odt/m³
Delivered products	
• Chips	100 %
• Bundles	0 %
• Trunks and Residues	0 %
Energy balance	33 : 1
Available energy	1,799,517 MWh
Fuel consumption	13.0 L/odt

Cost

Harvesting	0.00 $/odt
Biomass recovery	27.55 $/odt
Transfer yard	0.00 $/odt
Transportation	37.91 $/odt
Loading/unloading	25.56 $/odt
Stumpage fees	0.00 $/odt
Road network - Maintenance	0.50 $/odt
Indirect costs	0.00 $/odt
Total	**91.52 $/ odt**

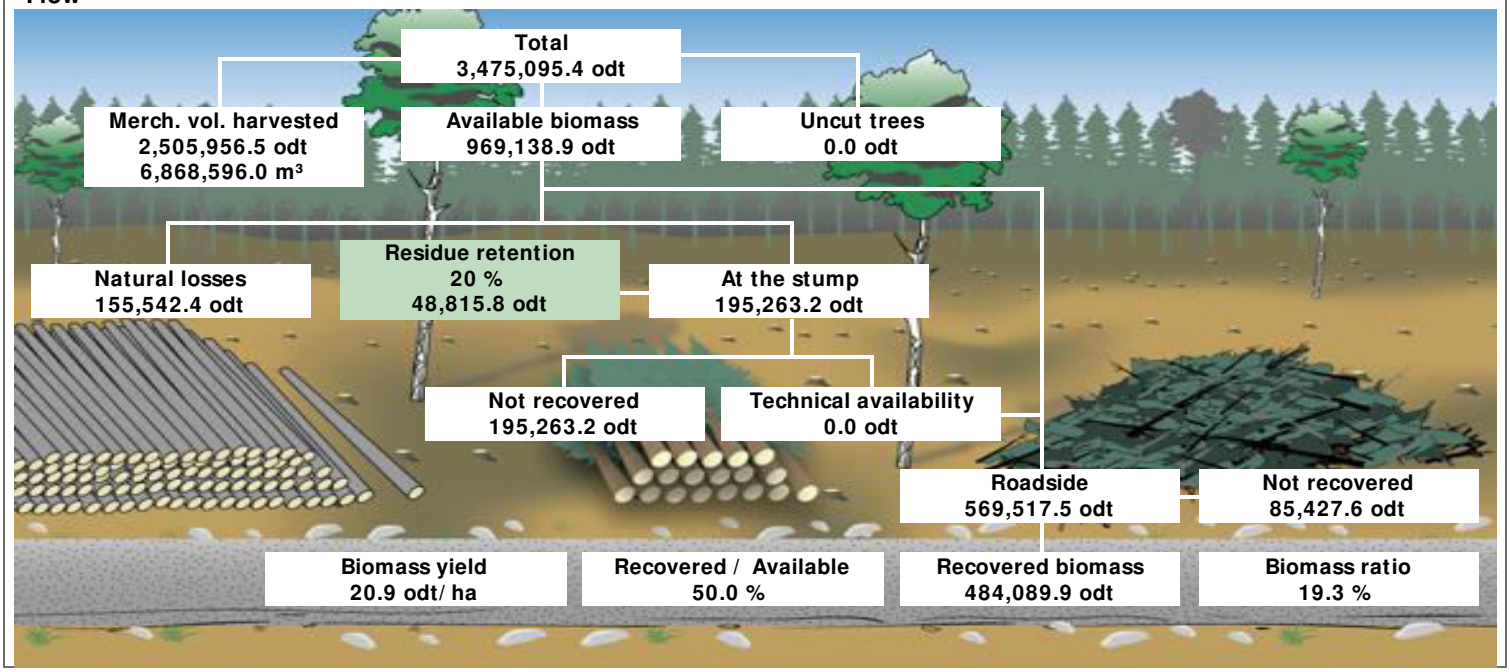
Revenue

Sale value	0.00 $/odt
Silvicultural discount	0.00 $/odt

Net

Profit	-91.52 $/odt

Flow



Products

Product name	odt	odt/ m³	odt/ ha
subalpine fir (residues)	188,197.0	0.0794	8.14
hybrid spruce (residues)	150,330.5	0.1010	6.50
lodgepole pine (residues)	100,136.9	0.0744	4.33
Aspen (residues)	23,074.3	0.1023	1.00
western hemlock (residues)	13,021.4	0.0821	0.56
Amabilis fir (residues)	2,935.7	0.0676	0.13
engelmann spruce (residues)	2,780.1	0.0929	0.12
White birch (residues)	2,035.9	0.1819	0.09
black spruce (residues)	1,473.2	0.1151	0.06
whitebark pine (residues)	54.6	0.1637	0.00
western red cedar (residues)	50.3	0.0712	0.00
	484,089.9	**0.0851**	**20.94**

Recovery summary

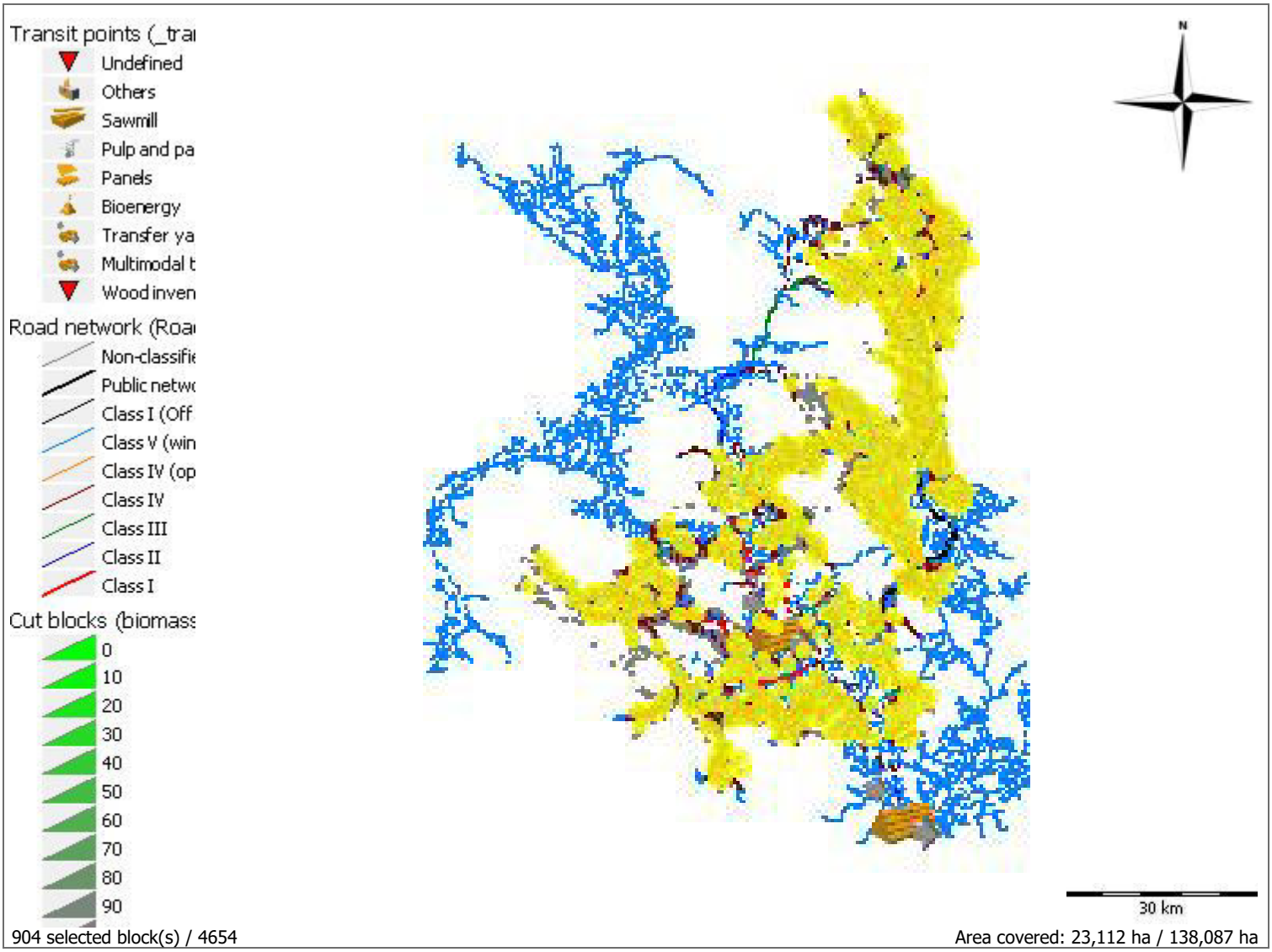
	Volume(odt)	Area(ha)	Number of cut blocks
• Biomass recovery location			
At the stump	0.0	0.0	0
Roadside	484,089.9	23,112.5	904
• Recovery season			
Summer	0.0	0.0	0
Winter	484,089.9	23,112.5	904
• Residue freshness			
Fresh	0.0	0.0	0
Brown	484,089.9	23,112.5	904
Brittle	0.0	0.0	0

Supply summary

Recovered biomass to	Merchantable volume (odt)	Residues (odt)	Total biomass (odt)
10 $/odt	0.0	0.0	0.0
20 $/odt	0.0	0.0	0.0
30 $/odt	0.0	0.0	0.0
40 $/odt	0.0	0.0	0.0
50 $/odt	0.0	712.3	712.3
60 $/odt	0.0	16,346.7	16,346.7
70 $/odt	0.0	66,850.9	66,850.9
80 $/odt	0.0	155,401.1	155,401.1
90 $/odt	0.0	254,106.8	254,106.8
100 $/odt	0.0	342,576.0	342,576.0
110 $/odt	0.0	398,140.3	398,140.3
120 $/odt	0.0	439,075.6	439,075.6
130 $/odt	0.0	457,282.1	457,282.1
140 $/odt	0.0	465,572.2	465,572.2
150 $/odt	0.0	476,094.5	476,094.5
160 $/odt	0.0	481,814.2	481,814.2
170 $/odt	0.0	483,184.7	483,184.7
180 $/odt	0.0	483,782.7	483,782.7
190 $/odt	0.0	484,089.9	484,089.9
Maximum cost	**0.00 $/ odt**	**184.42 $/ odt**	

Delivery to mills

Destination	Product	Format	odt	Transport average distance (Km)
Smithers				
	Amabilis fir (residues)	Chips	2,936	64
	Aspen (residues)	Chips	21,321	66
	black spruce (residues)	Chips	1,454	114
	engelmann spruce (residues)	Chips	2,780	165
	hybrid spruce (residues)	Chips	134,926	78
	lodgepole pine (residues)	Chips	92,647	95
	subalpine fir (residues)	Chips	174,226	83
	western hemlock (residues)	Chips	13,021	53
	western red cedar (residues)	Chips	50	51
	White birch (residues)	Chips	1,682	41
	whitebark pine (residues)	Chips	55	65
			445,099	**82**
Houston				
	Aspen (residues)	Chips	1,753	39
	black spruce (residues)	Chips	19	41
	hybrid spruce (residues)	Chips	15,405	38
	lodgepole pine (residues)	Chips	7,490	37
	subalpine fir (residues)	Chips	13,971	38
	White birch (residues)	Chips	353	37
			38,991	**38**
			484,090	**79**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Cut blocks (biomass
0
10
20
30
40
50
60
70
80
90
N
30 km
904 selected block(s) / 4654
Area covered: 23,112 ha / 138,087 ha

FPInterface™

Summary report

Forest supply

[Bulkley Jan23rd]

Territory:	Unknown territory
Sector:	Unknown sector
Cut block:	<Multiple selection>

Cut blocks

Area	138,087.3 ha
Number of cut blocks	4654
Harvested volume	47,907,952 m³
Average skidding dist.	250 m
Volume/km	0 m³/km
Area/km	0 ha/km
Cut type	
Clearcut	138,087.3 ha
Harvesting system	
Full-tree with roadside processing	138,087.3 ha

Costs

Harvesting	17.38 $/m³
Equipment transport	0.75 $/m³
Road network - Construction	0.00 $/m³
Road network - Repair	0.00 $/m³
Road network - Improvement	0.00 $/m³
Road network - Maintenance	0.21 $/m³
Transportation	8.47 $/m³
Loading/unloading	2.50 $/m³
Transfer yard	0.00 $/m³
Stumpage fees	0.00 $/m³
Indirect costs	0.00 $/m³
Stand establishment	N/A
Total	**29.31 $/ m³**

Revenue

Value	0.00 $/m³
Reimbursements (silv.)	N/A

Net

Profit	-29.31 $/m³

FPInnovations

Products

Name	Format	m³	m³ / ha	m³ / stem	% / total
subalpine fir	Logs	19,941,356	144.4	0.470	42
hybrid spruce	Logs	12,917,425	93.5	0.516	27
lodgepole pine	Logs	9,873,162	71.5	0.471	21
western hemlock	Logs	2,974,347	21.5	0.629	6
Aspen	Logs	1,372,416	9.9	0.483	3
Amabilis fir	Logs	511,249	3.7	0.698	1
engelmann spruce	Logs	158,091	1.1	0.437	0
White birch	Logs	80,385	0.6	0.460	0
black spruce	Logs	68,768	0.5	0.431	0
whitebark pine	Logs	7,558	0.1	0.247	0
western red cedar	Logs	3,193	0.0	0.586	0
		47,907,952	**346.9**	**0.492**	**100**

Delivery to mills

Destination	Product	Format	m³	Transport average distance (Km)
Smithers				
	Amabilis fir	Logs	511,249	64
	Aspen	Logs	1,323,186	66
	black spruce	Logs	67,962	108
	engelmann spruce	Logs	158,091	155
	hybrid spruce	Logs	12,359,440	80
	lodgepole pine	Logs	9,270,575	82
	subalpine fir	Logs	19,482,946	79
	western hemlock	Logs	2,974,347	48
	western red cedar	Logs	3,193	46
	White birch	Logs	70,857	34
	whitebark pine	Logs	7,558	48
			46,229,405	**78**

Houston

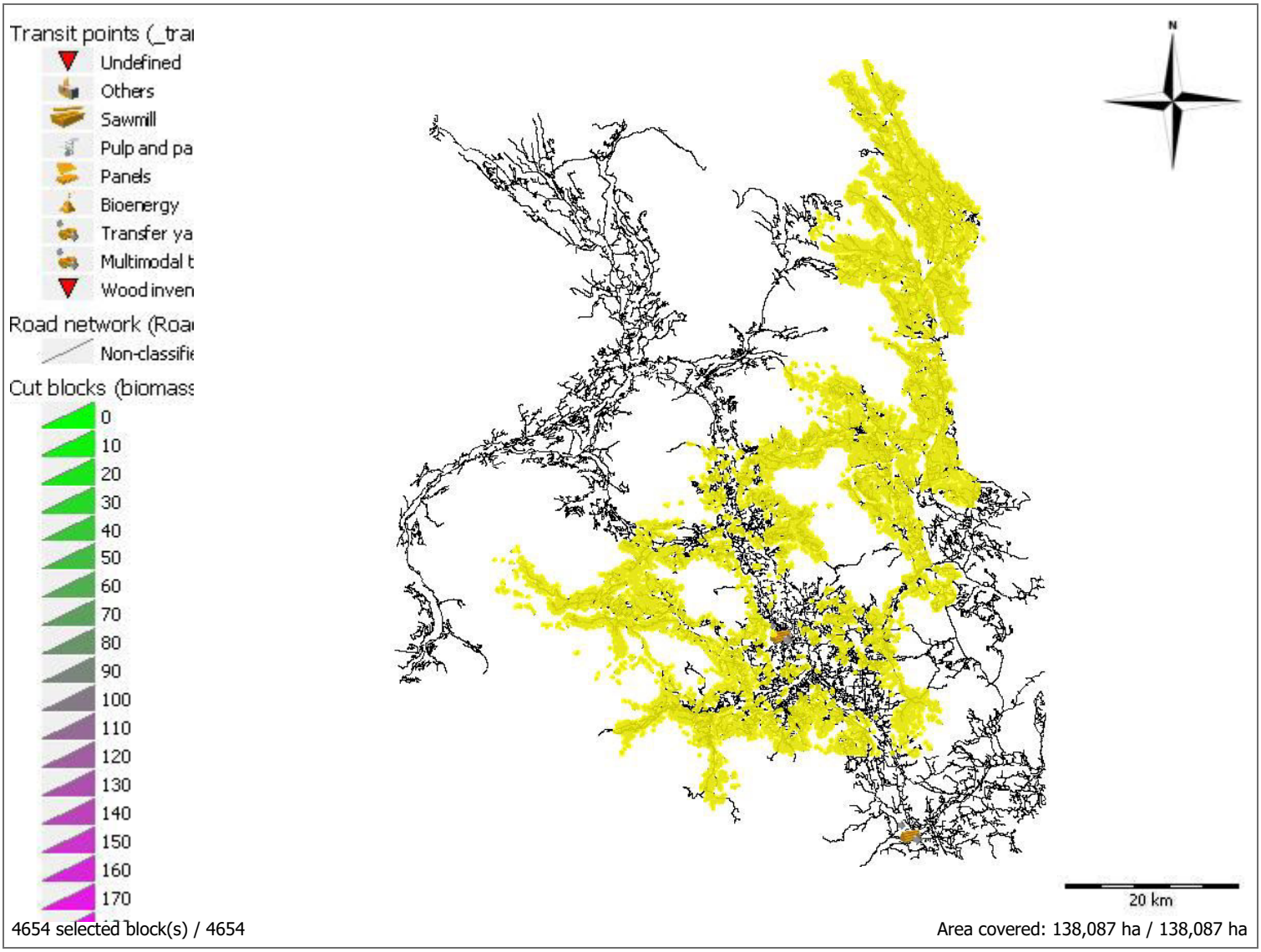
	Aspen	Logs	49,230	37
	black spruce	Logs	806	41
	hybrid spruce	Logs	557,986	39
	lodgepole pine	Logs	602,587	39
	subalpine fir	Logs	458,410	40
	White birch	Logs	9,528	40
			1,678,547	**39**
			47,907,952	**76**

Harvesting season

	m³	ha
Summer	0	0.0
Fall	0	0.0
Winter	47,907,952	138,087.3
	47,907,952	**138,087.3**

Terrain conditions

CPPA class	Ground strength (%)	Roughness (%)	Slope (%)
1	-	-	-
2	-	-	-
3	100	100	100
4	-	-	-
5	-	-	-



4654 selected block(s) / 4654

Area covered: 138,087 ha / 138,087 ha

Territory: Unknown territory
Sector: Unknown sector
Cut block: <Multiple selection>

Cut blocks

Area	32,939.3 ha
Number of cut blocks	1148
Harvested volume	12,929,784 m³
Average skidding dist.	250 m
Volume/km	0 m³/km
Area/km	0 ha/km
Cut type	
Clearcut	32,939.3 ha
Harvesting system	
Full-tree with roadside processing	32,939.3 ha

Costs

Harvesting	15.73 $/m³
Equipment transport	0.75 $/m³
Road network - Construction	0.00 $/m³
Road network - Repair	0.00 $/m³
Road network - Improvement	0.00 $/m³
Road network - Maintenance	0.24 $/m³
Transportation	8.53 $/m³
Loading/unloading	2.50 $/m³
Transfer yard	0.00 $/m³
Stumpage fees	0.00 $/m³
Indirect costs	0.00 $/m³
Stand establishment	N/A
Total	**27.74 $/ m³**

Revenue

Value	0.00 $/m³
Reimbursements (silv.)	N/A

Net

Profit	-27.74 $/m³

Products

Name	Format	m³	m³ / ha	m³ / stem	% / total
subalpine fir	Logs	5,429,270	164.8	0.548	42
hybrid spruce	Logs	3,591,226	109.0	0.624	28
lodgepole pine	Logs	2,053,321	62.3	0.581	16
western hemlock	Logs	1,327,472	40.3	0.673	10
Aspen	Logs	278,762	8.5	0.654	2
Amabilis fir	Logs	187,500	5.7	0.698	1
engelmann spruce	Logs	25,880	0.8	0.477	0
White birch	Logs	20,518	0.6	0.720	0
black spruce	Logs	12,585	0.4	0.552	0
whitebark pine	Logs	2,989	0.1	0.233	0
western red cedar	Logs	262	0.0	0.756	0
		12,929,784	**392.5**	**0.588**	**100**

Delivery to mills

Destination	Product	Format	m³	Transport average distance (Km)
Smithers				
	Amabilis fir	Logs	187,500	63
	Aspen	Logs	276,704	70
	black spruce	Logs	12,575	113
	engelmann spruce	Logs	25,880	141
	hybrid spruce	Logs	3,509,588	86
	lodgepole pine	Logs	1,952,328	89
	subalpine fir	Logs	5,354,759	80
	western hemlock	Logs	1,327,472	47
	western red cedar	Logs	262	50
	White birch	Logs	17,327	26
	whitebark pine	Logs	2,989	52
			12,667,383	**79**

Houston

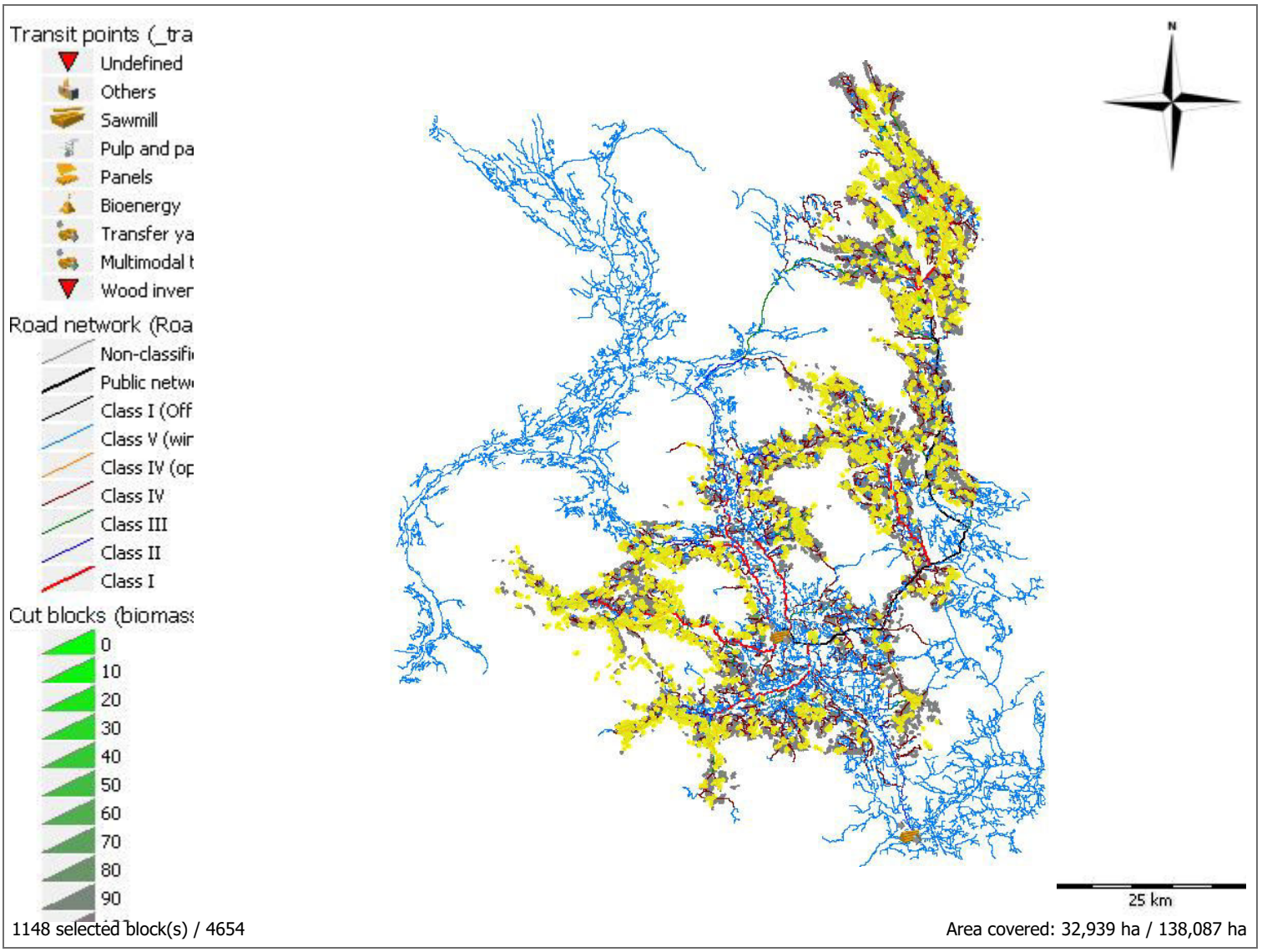
	Aspen	Logs	2,058	40
	black spruce	Logs	10	40
	hybrid spruce	Logs	81,638	40
	lodgepole pine	Logs	100,993	40
	subalpine fir	Logs	74,511	41
	White birch	Logs	3,190	43
			262,401	**40**
			12,929,784	**78**

Harvesting season

	m^3	ha
Summer	0	0.0
Fall	0	0.0
Winter	12,929,784	32,939.3
	12,929,784	**32,939.3**

Terrain conditions

CPPA class	Ground strength (%)	Roughness (%)	Slope (%)
1	-	-	-
2	-	-	-
3	100	100	100
4	-	-	-
5	-	-	-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Road network (Roa
Non-classifi
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Class IV (op
Class IV
Class III
Class II
Class I
Cut blocks (biomass
0
10
20
30
40
50
60
70
80
90
N
25 km
1148 selected block(s) / 4654
Area covered: 32,939 ha / 138,087 ha

FPInterface™

Summary report

Forest supply

[Bulkley Jan23rd]

Territory:	Unknown territory
Sector:	Unknown sector
Cut block:	<Multiple selection>

Cut blocks

Area	28,774.3 ha
Number of cut blocks	852
Harvested volume	11,063,206 m³
Average skidding dist.	250 m
Volume/km	0 m³/km
Area/km	0 ha/km
Cut type	
Clearcut	28,774.3 ha
Harvesting system	
Full-tree with roadside processing	28,774.3 ha

Costs

Harvesting	16.38 $/m³
Equipment transport	0.75 $/m³
Road network - Construction	0.00 $/m³
Road network - Repair	0.00 $/m³
Road network - Improvement	0.00 $/m³
Road network - Maintenance	0.21 $/m³
Transportation	8.64 $/m³
Loading/unloading	2.50 $/m³
Transfer yard	0.00 $/m³
Stumpage fees	0.00 $/m³
Indirect costs	0.00 $/m³
Stand establishment	N/A
Total	**28.47 $/ m³**

Revenue

Value	0.00 $/m³
Reimbursements (silv.)	N/A

Net

Profit	-28.47 $/m³

FPInnovations

Products

Name	Format	m³	m³ / ha	m³ / stem	% / total
subalpine fir	Logs	4,587,055	159.4	0.498	41
hybrid spruce	Logs	3,066,559	106.6	0.589	28
lodgepole pine	Logs	2,346,056	81.5	0.575	21
western hemlock	Logs	617,601	21.5	0.644	6
Aspen	Logs	300,610	10.4	0.598	3
Amabilis fir	Logs	93,177	3.2	0.736	1
engelmann spruce	Logs	29,561	1.0	0.470	0
black spruce	Logs	12,567	0.4	0.555	0
White birch	Logs	7,637	0.3	0.515	0
whitebark pine	Logs	1,404	0.0	0.319	0
western red cedar	Logs	977	0.0	0.646	0
		11,063,206	**384.5**	**0.548**	**100**

Delivery to mills

Destination	Product	Format	m³	Transport average distance (Km)
Smithers				
	Amabilis fir	Logs	93,177	62
	Aspen	Logs	293,544	72
	black spruce	Logs	12,565	115
	engelmann spruce	Logs	29,561	153
	hybrid spruce	Logs	2,975,586	84
	lodgepole pine	Logs	2,214,193	82
	subalpine fir	Logs	4,548,645	79
	western hemlock	Logs	617,601	47
	western red cedar	Logs	977	41
	White birch	Logs	7,183	35
	whitebark pine	Logs	1,404	58
			10,794,438	**79**

Houston

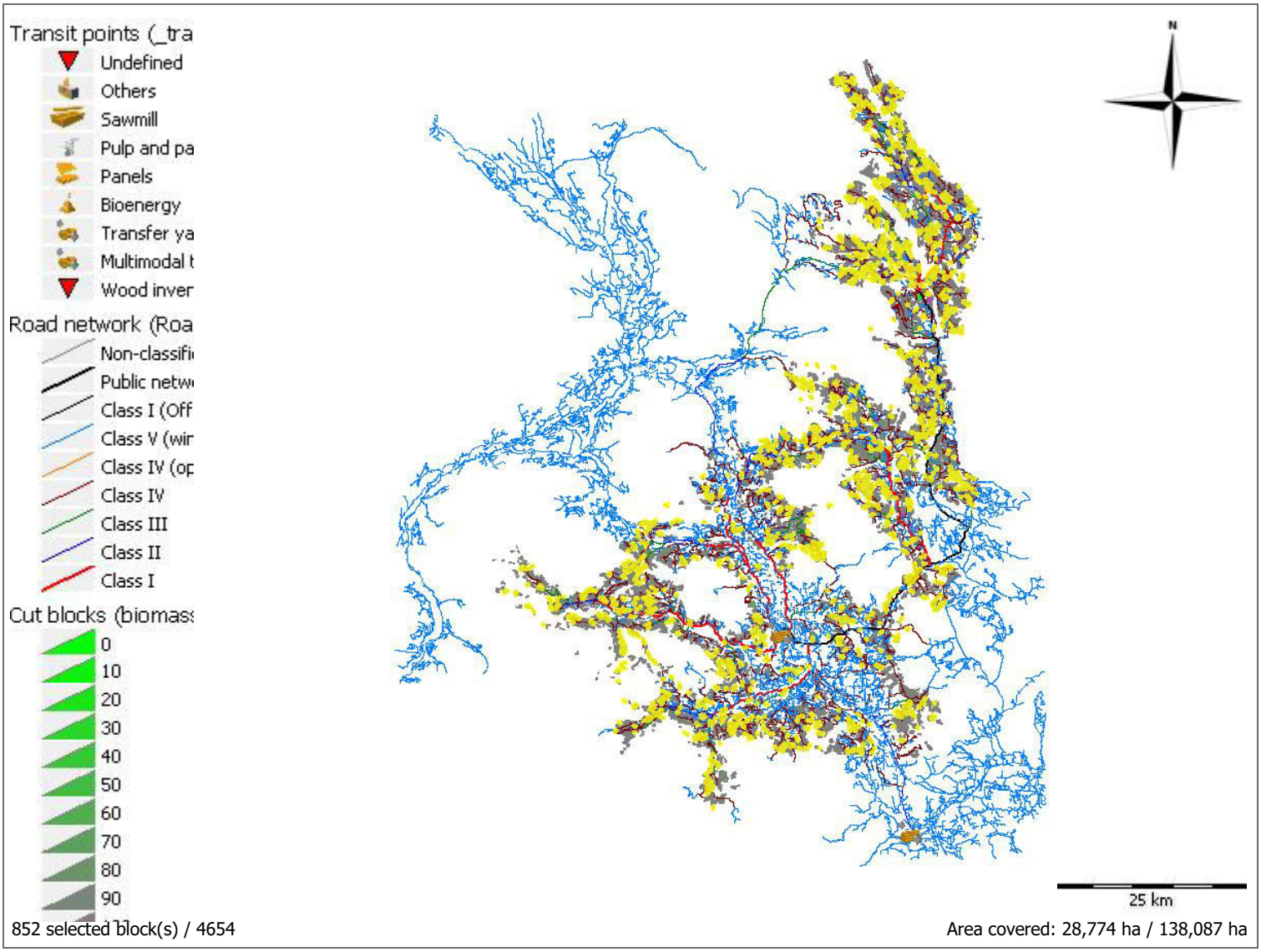
	Aspen	Logs	7,065	36
	black spruce	Logs	2	46
	hybrid spruce	Logs	90,973	40
	lodgepole pine	Logs	131,863	40
	subalpine fir	Logs	38,409	40
	White birch	Logs	454	39
			268,768	**40**
			11,063,206	**78**

Harvesting season

	m³	ha
Summer	0	0.0
Fall	0	0.0
Winter	11,063,206	28,774.3
	11,063,206	**28,774.3**

Terrain conditions

CPPA class	Ground strength (%)	Roughness (%)	Slope (%)
1	-	-	-
2	-	-	-
3	100	100	100
4	-	-	-
5	-	-	-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Wood inver
Road network (Roa
Non-classifi
Public netw
Class I (Off
Class V (wir
Class IV (op
Class IV
Class III
Class II
Class I
Cut blocks (biomass
0
10
20
30
40
50
60
70
80
90
N
25 km
852 selected block(s) / 4654
Area covered: 28,774 ha / 138,087 ha

Territory: Unknown territory
Sector: Unknown sector
Cut block: <Multiple selection>

Cut blocks

Area	28,221.7 ha
Number of cut blocks	976
Harvested volume	9,978,293 m³
Average skidding dist.	250 m
Volume/km	0 m³/km
Area/km	0 ha/km
Cut type	
Clearcut	28,221.7 ha
Harvesting system	
Full-tree with roadside processing	28,221.7 ha

Costs

Harvesting	17.51 $/m³
Equipment transport	0.75 $/m³
Road network - Construction	0.00 $/m³
Road network - Repair	0.00 $/m³
Road network - Improvement	0.00 $/m³
Road network - Maintenance	0.23 $/m³
Transportation	8.21 $/m³
Loading/unloading	2.50 $/m³
Transfer yard	0.00 $/m³
Stumpage fees	0.00 $/m³
Indirect costs	0.00 $/m³
Stand establishment	N/A
Total	**29.21 $/ m³**

Revenue

Value	0.00 $/m³
Reimbursements (silv.)	N/A

Net

Profit	-29.21 $/m³

Products

Name	Format	m³	m³ / ha	m³ / stem	% / total
subalpine fir	Logs	4,730,283	167.6	0.474	47
hybrid spruce	Logs	2,584,267	91.6	0.507	26
lodgepole pine	Logs	1,751,310	62.1	0.471	18
western hemlock	Logs	485,736	17.2	0.613	5
Aspen	Logs	255,448	9.1	0.492	3
Amabilis fir	Logs	97,296	3.4	0.700	1
engelmann spruce	Logs	36,076	1.3	0.414	0
White birch	Logs	19,428	0.7	0.464	0
black spruce	Logs	14,628	0.5	0.479	0
whitebark pine	Logs	2,815	0.1	0.245	0
western red cedar	Logs	1,006	0.0	0.511	0
		9,978,293	**353.6**	**0.489**	**100**

Delivery to mills

Destination	Product	Format	m³	Transport average distance (Km)
Smithers				
	Amabilis fir	Logs	97,296	66
	Aspen	Logs	245,638	58
	black spruce	Logs	14,028	94
	engelmann spruce	Logs	36,076	155
	hybrid spruce	Logs	2,460,412	75
	lodgepole pine	Logs	1,632,873	72
	subalpine fir	Logs	4,636,963	79
	western hemlock	Logs	485,736	49
	western red cedar	Logs	1,006	44
	White birch	Logs	16,979	36
	whitebark pine	Logs	2,815	37
			9,629,823	**75**

Houston

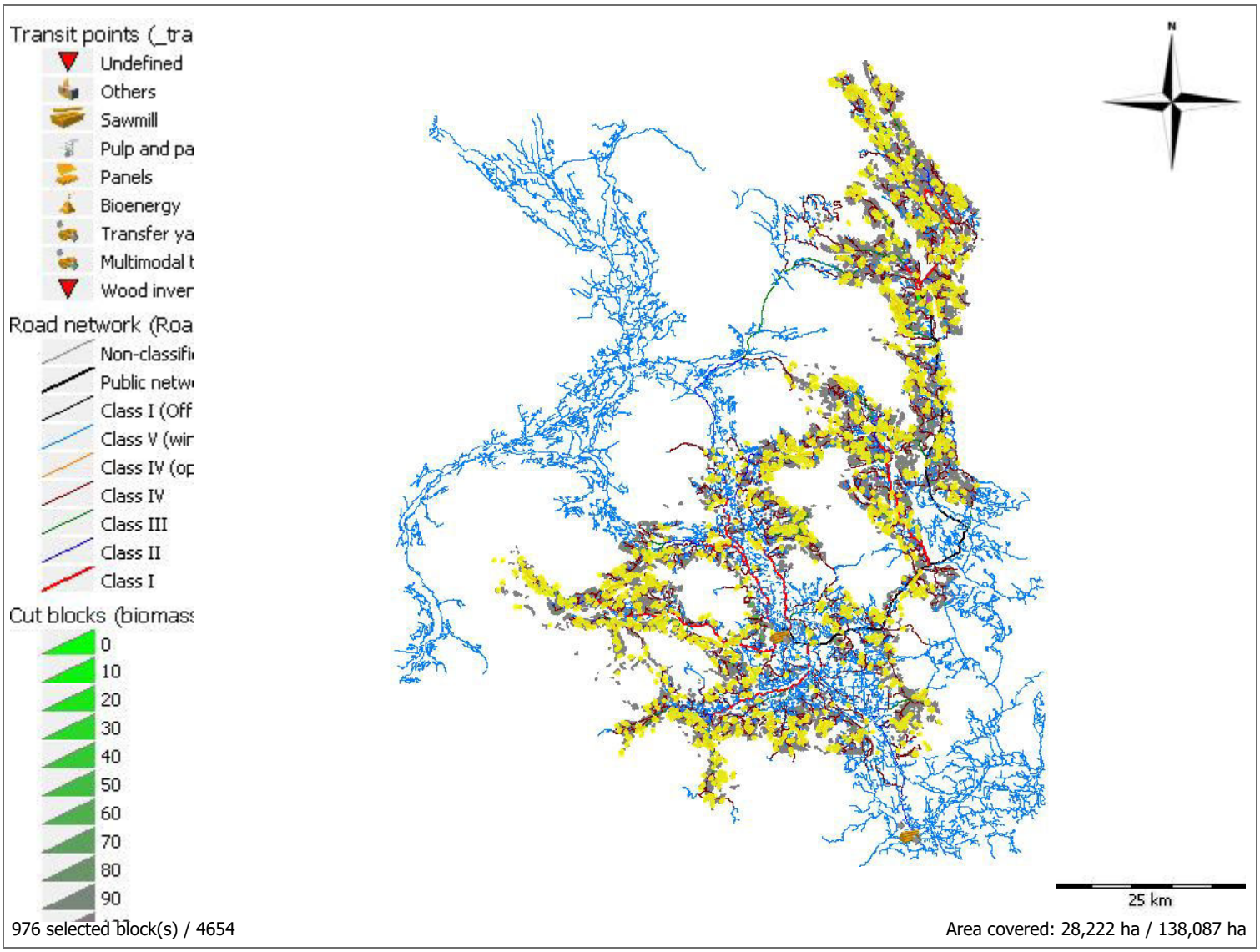
	Aspen	Logs	9,810	36
	black spruce	Logs	600	41
	hybrid spruce	Logs	123,855	40
	lodgepole pine	Logs	118,436	40
	subalpine fir	Logs	93,320	39
	White birch	Logs	2,449	37
			348,470	**40**
			9,978,293	**73**

Harvesting season

	m³	ha
Summer	0	0.0
Fall	0	0.0
Winter	9,978,293	28,221.7
	9,978,293	**28,221.7**

Terrain conditions

CPPA class	Ground strength (%)	Roughness (%)	Slope (%)
1	-	-	-
2	-	-	-
3	100	100	100
4	-	-	-
5	-	-	-



976 selected block(s) / 4654

Area covered: 28,222 ha / 138,087 ha

Territory: Unknown territory
Sector: Unknown sector
Cut block: <Multiple selection>

Cut blocks

Area	25,039.5 ha
Number of cut blocks	774
Harvested volume	8,236,653 m³
Average skidding dist.	250 m
Volume/km	0 m³/km
Area/km	0 ha/km
Cut type	
Clearcut	25,039.5 ha
Harvesting system	
Full-tree with roadside processing	25,039.5 ha

Costs

Harvesting	18.61 $/m³
Equipment transport	0.75 $/m³
Road network - Construction	0.00 $/m³
Road network - Repair	0.00 $/m³
Road network - Improvement	0.00 $/m³
Road network - Maintenance	0.19 $/m³
Transportation	8.32 $/m³
Loading/unloading	2.50 $/m³
Transfer yard	0.00 $/m³
Stumpage fees	0.00 $/m³
Indirect costs	0.00 $/m³
Stand establishment	N/A
Total	**30.37 $/ m³**

Revenue

Value	0.00 $/m³
Reimbursements (silv.)	N/A

Net

Profit	-30.37 $/m³

Products

Name	Format	m³	m³ / ha	m³ / stem	% / total
subalpine fir	Logs	2,823,818	112.8	0.419	34
lodgepole pine	Logs	2,365,187	94.5	0.438	29
hybrid spruce	Logs	2,186,652	87.3	0.454	27
western hemlock	Logs	384,985	15.4	0.576	5
Aspen	Logs	311,481	12.4	0.456	4
Amabilis fir	Logs	89,857	3.6	0.775	1
engelmann spruce	Logs	36,637	1.5	0.437	0
White birch	Logs	21,607	0.9	0.401	0
black spruce	Logs	16,173	0.6	0.451	0
western red cedar	Logs	241	0.0	0.472	0
whitebark pine	Logs	16	0.0	0.318	0
		8,236,653	**328.9**	**0.443**	**100**

Delivery to mills

Destination	Product	Format	m³	Transport average distance (Km)
Smithers				
	Amabilis fir	Logs	89,857	63
	Aspen	Logs	299,361	65
	black spruce	Logs	16,071	106
	engelmann spruce	Logs	36,637	155
	hybrid spruce	Logs	2,070,397	77
	lodgepole pine	Logs	2,220,836	78
	subalpine fir	Logs	2,735,059	75
	western hemlock	Logs	384,985	46
	western red cedar	Logs	241	49
	White birch	Logs	20,261	36
	whitebark pine	Logs	16	60
			7,873,721	**75**

Houston

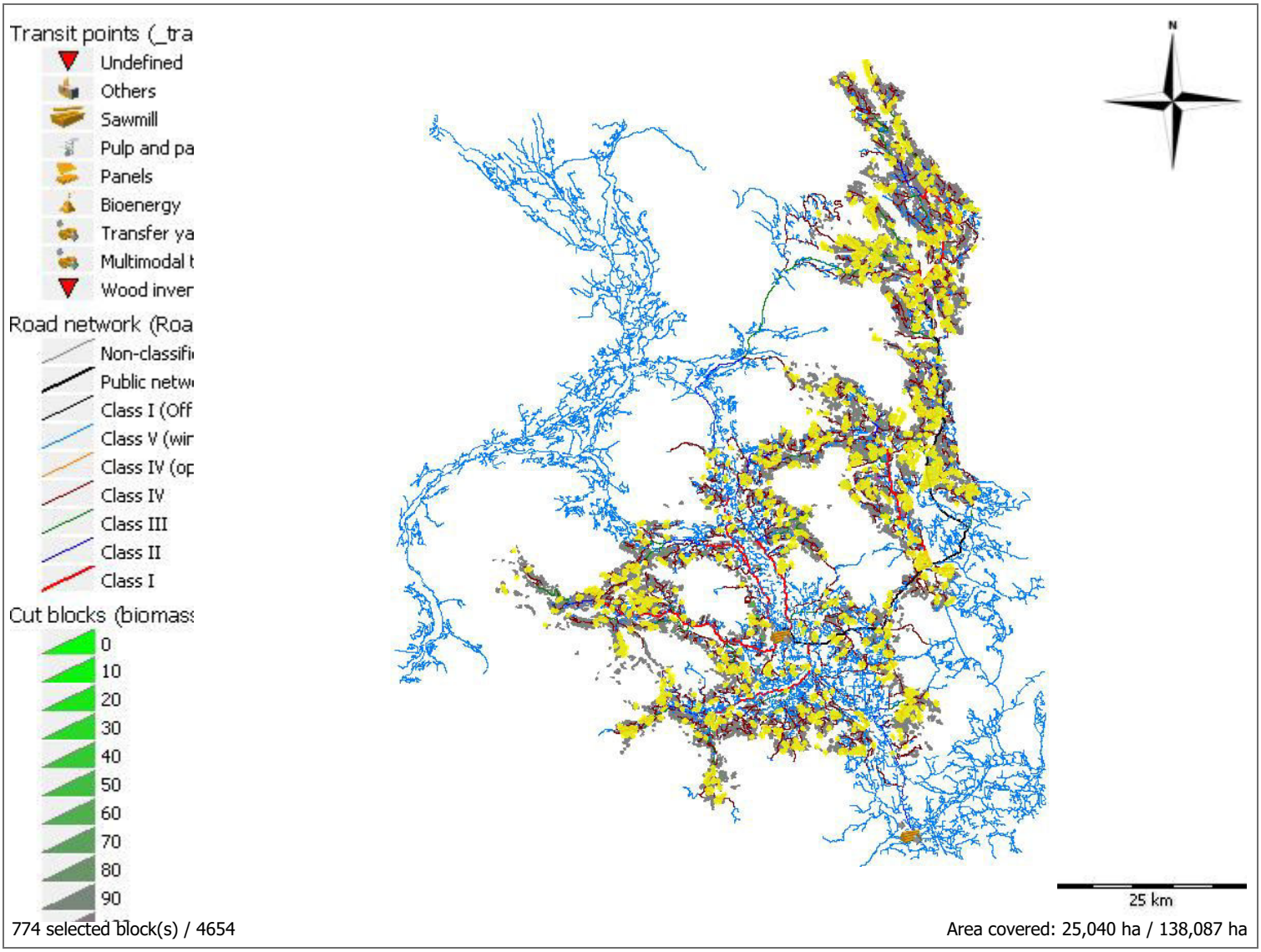
	Aspen	Logs	12,120	36
	black spruce	Logs	102	42
	hybrid spruce	Logs	116,255	40
	lodgepole pine	Logs	144,351	39
	subalpine fir	Logs	88,759	43
	White birch	Logs	1,346	40
			362,932	**40**
			8,236,653	**73**

Harvesting season

	m³	ha
Summer	0	0.0
Fall	0	0.0
Winter	8,236,653	25,039.5
	8,236,653	**25,039.5**

Terrain conditions

CPPA class	Ground strength (%)	Roughness (%)	Slope (%)
1	-	-	-
2	-	-	-
3	100	100	100
4	-	-	-
5	-	-	-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Sawmill
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Wood inver
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Class I (Off
Class V (wir
Class IV (op
Class IV
Class III
Class II
Class I
Cut blocks (biomass
0
10
20
30
40
50
60
70
80
90
N
25 km
774 selected block(s) / 4654
Area covered: 25,040 ha / 138,087 ha

Territory: Unknown territory
Sector: Unknown sector
Cut block: <Multiple selection>

Statistics - Selected Items

Area	32,939.3 ha
Number of cut blocks	1148
Recovered biomass	881,375.3 odt
Biomass yield	26.8 odt/ha
Biomass odt / Merchantable m³	0.0682 odt/m³
Delivered products	
• Chips	100 %
• Bundles	0 %
• Trunks and Residues	0 %
Energy balance	37 : 1
Available energy	3,266,781 MWh
Fuel consumption	11.4 L/odt

Cost

Harvesting	0.00 $/odt
Biomass recovery	22.50 $/odt
Transfer yard	0.00 $/odt
Transportation	33.17 $/odt
Loading/unloading	16.45 $/odt
Stumpage fees	0.00 $/odt
Road network - Maintenance	0.66 $/odt
Indirect costs	0.00 $/odt
Total	**72.77 $/ odt**

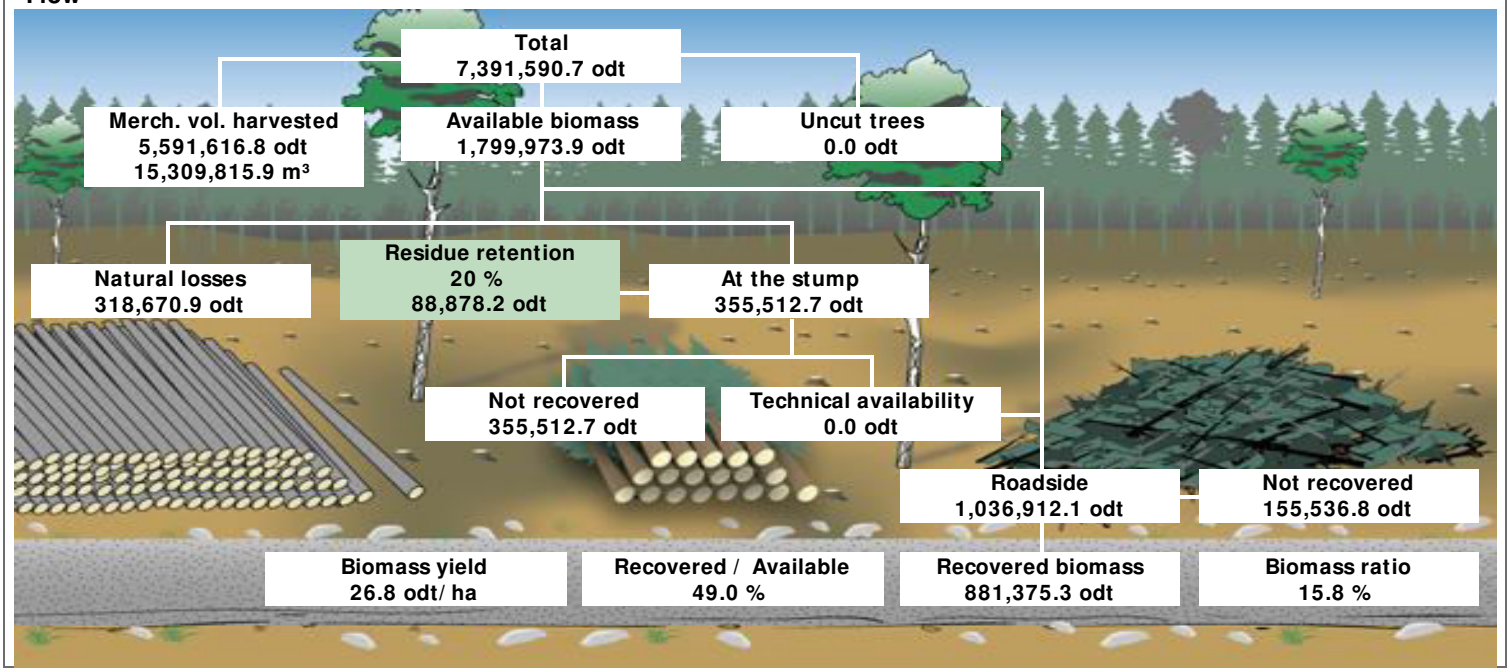
Revenue

Sale value	0.00 $/odt
Silvicultural discount	0.00 $/odt

Net

Profit	-72.77 $/odt

Flow



Products

Product name	odt	odt/ m³	odt/ ha
subalpine fir (residues)	362,721.2	0.0668	11.01
hybrid spruce (residues)	288,180.6	0.0802	8.75
lodgepole pine (residues)	103,761.5	0.0505	3.15
western hemlock (residues)	87,772.1	0.0661	2.66
Aspen (residues)	20,819.7	0.0747	0.63
Amabilis fir (residues)	11,568.3	0.0617	0.35
White birch (residues)	2,891.5	0.1409	0.09
engelmann spruce (residues)	2,227.2	0.0861	0.07
black spruce (residues)	1,011.9	0.0804	0.03
whitebark pine (residues)	404.3	0.1353	0.01
western red cedar (residues)	17.1	0.0654	0.00
	881,375.3	**0.0682**	**26.76**

Recovery summary

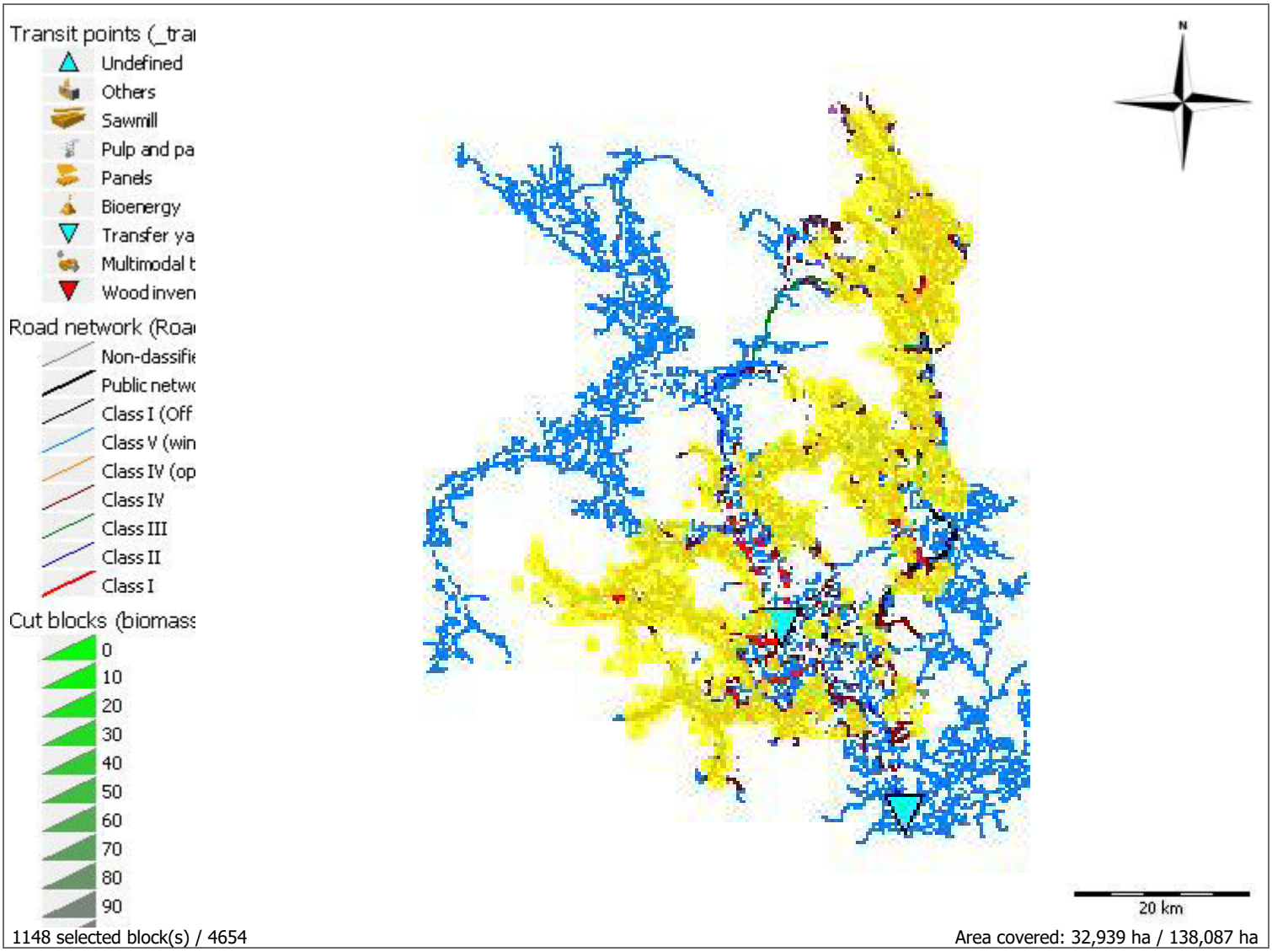
	Volume(odt)	Area(ha)	Number of cut blocks
• Biomass recovery location			
At the stump	0.0	0.0	0
Roadside	881,375.3	32,939.3	1,148
• Recovery season			
Summer	0.0	0.0	0
Winter	881,375.3	32,939.3	1,148
• Residue freshness			
Fresh	0.0	0.0	0
Brown	881,375.3	32,939.3	1,148
Brittle	0.0	0.0	0

Supply summary

Recovered biomass to	Merchantable volume (odt)	Residues (odt)	Total biomass (odt)
10 $/odt	0.0	0.0	0.0
20 $/odt	0.0	0.0	0.0
30 $/odt	0.0	0.0	0.0
40 $/odt	0.0	0.0	0.0
50 $/odt	0.0	22,636.4	22,636.4
60 $/odt	0.0	170,587.2	170,587.2
70 $/odt	0.0	410,183.1	410,183.1
80 $/odt	0.0	636,152.5	636,152.5
90 $/odt	0.0	773,467.3	773,467.3
100 $/odt	0.0	844,923.6	844,923.6
110 $/odt	0.0	866,414.7	866,414.7
120 $/odt	0.0	880,238.8	880,238.8
130 $/odt	0.0	881,067.8	881,067.8
140 $/odt	0.0	881,375.3	881,375.3
150 $/odt	0.0	881,375.3	881,375.3
Maximum cost	**0.00 $/ odt**	**141.98 $/ odt**	

Delivery to mills

Destination	Product	Format	odt	Transport average distance (Km)
Smithers				
	Amabilis fir (residues)	Chips	11,568	63
	Aspen (residues)	Chips	20,637	72
	black spruce (residues)	Chips	1,011	114
	engelmann spruce (residues)	Chips	2,227	141
	hybrid spruce (residues)	Chips	281,268	86
	lodgepole pine (residues)	Chips	98,435	88
	subalpine fir (residues)	Chips	357,629	81
	western hemlock (residues)	Chips	87,772	48
	western red cedar (residues)	Chips	17	50
	White birch (residues)	Chips	2,417	27
	whitebark pine (residues)	Chips	404	52
			863,386	**79**
Houston				
	Aspen (residues)	Chips	182	40
	black spruce (residues)	Chips	1	40
	hybrid spruce (residues)	Chips	6,913	40
	lodgepole pine (residues)	Chips	5,326	39
	subalpine fir (residues)	Chips	5,093	41
	White birch (residues)	Chips	475	44
			17,989	**40**
			881,375	**79**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Class III
Class II
Class I
Cut blocks (biomass
0
10
20
30
40
50
60
70
80
90
N
20 km
1148 selected block(s) / 4654
Area covered: 32,939 ha / 138,087 ha

Territory: Unknown territory
Sector: Unknown sector
Cut block: <Multiple selection>

Statistics - Selected Items

Area	28,774.3 ha
Number of cut blocks	852
Recovered biomass	763,904.1 odt
Biomass yield	26.5 odt/ha
Biomass odt / Merchantable m³	0.0691 odt/m³
Delivered products	
• Chips	100 %
• Bundles	0 %
• Trunks and Residues	0 %
Energy balance	37 : 1
Available energy	2,834,643 MWh
Fuel consumption	11.4 L/odt

Cost

Harvesting	0.00 $/odt
Biomass recovery	22.50 $/odt
Transfer yard	0.00 $/odt
Transportation	34.18 $/odt
Loading/unloading	17.55 $/odt
Stumpage fees	0.00 $/odt
Road network - Maintenance	0.58 $/odt
Indirect costs	0.00 $/odt
Total	**74.81 $/ odt**

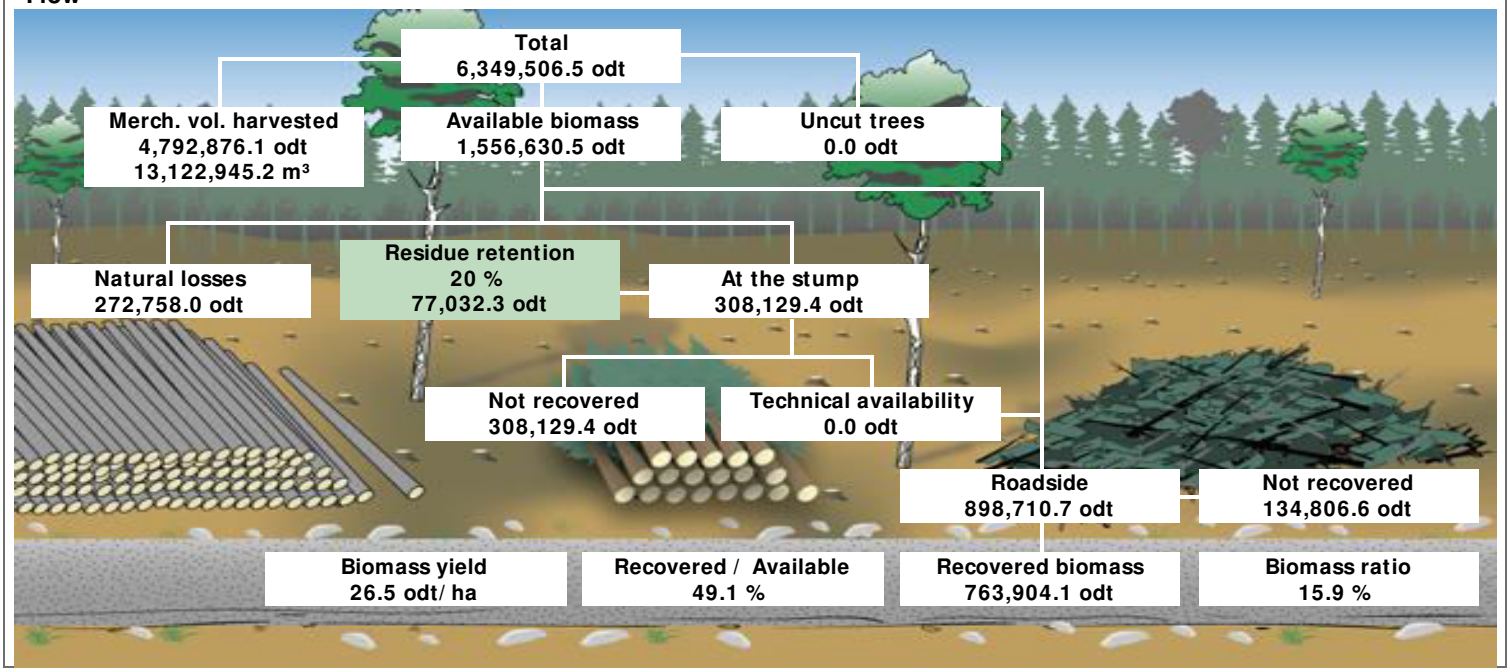
Revenue

Sale value	0.00 $/odt
Silvicultural discount	0.00 $/odt

Net

Profit	-74.81 $/odt

Flow



Products

Product name	odt	odt/ m³	odt/ ha
subalpine fir (residues)	317,322.6	0.0692	11.03
hybrid spruce (residues)	251,572.5	0.0820	8.74
lodgepole pine (residues)	119,270.4	0.0508	4.15
western hemlock (residues)	41,858.7	0.0678	1.45
Aspen (residues)	23,254.2	0.0774	0.81
Amabilis fir (residues)	5,661.3	0.0608	0.20
engelmann spruce (residues)	2,561.8	0.0867	0.09
White birch (residues)	1,175.6	0.1539	0.04
black spruce (residues)	1,006.3	0.0801	0.03
whitebark pine (residues)	151.9	0.1081	0.01
western red cedar (residues)	68.9	0.0705	0.00
	763,904.1	**0.0691**	**26.55**

Recovery summary

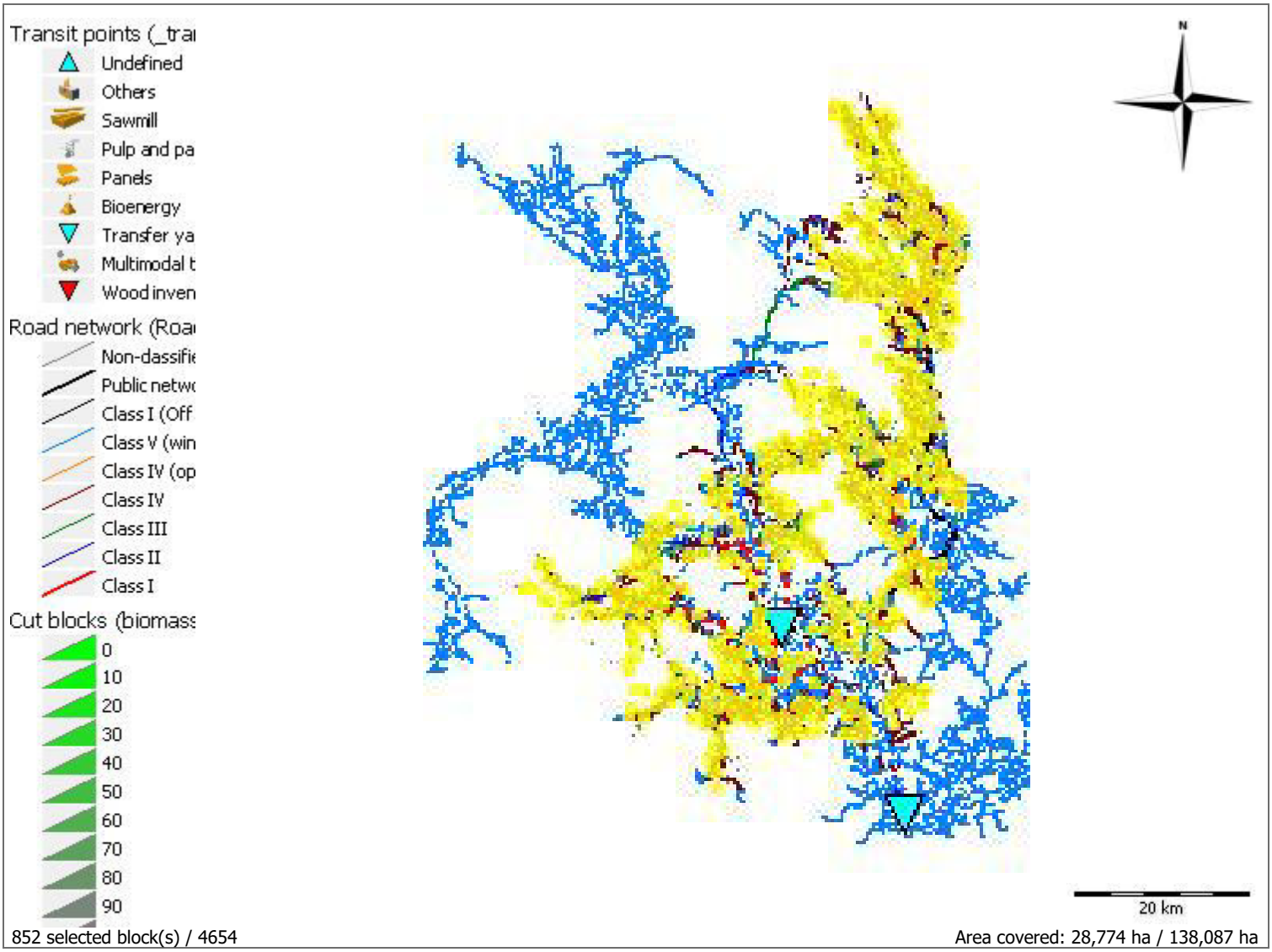
	Volume(odt)	Area(ha)	Number of cut blocks
• Biomass recovery location			
At the stump	0.0	0.0	0
Roadside	763,904.1	28,774.3	852
• Recovery season			
Summer	0.0	0.0	0
Winter	763,904.1	28,774.3	852
• Residue freshness			
Fresh	0.0	0.0	0
Brown	763,904.1	28,774.3	852
Brittle	0.0	0.0	0

Supply summary

Recovered biomass to	Merchantable volume (odt)	Residues (odt)	Total biomass (odt)
10 $/odt	0.0	0.0	0.0
20 $/odt	0.0	0.0	0.0
30 $/odt	0.0	0.0	0.0
40 $/odt	0.0	0.0	0.0
50 $/odt	0.0	24,706.8	24,706.8
60 $/odt	0.0	133,702.2	133,702.2
70 $/odt	0.0	319,552.3	319,552.3
80 $/odt	0.0	520,866.0	520,866.0
90 $/odt	0.0	632,989.8	632,989.8
100 $/odt	0.0	708,719.5	708,719.5
110 $/odt	0.0	746,843.9	746,843.9
120 $/odt	0.0	759,919.1	759,919.1
130 $/odt	0.0	763,484.0	763,484.0
140 $/odt	0.0	763,635.1	763,635.1
150 $/odt	0.0	763,730.1	763,730.1
160 $/odt	0.0	763,730.1	763,730.1
170 $/odt	0.0	763,904.1	763,904.1
Maximum cost	**0.00 $/ odt**	**164.99 $/ odt**	

Delivery to mills

Destination	Product	Format	odt	Transport average distance (Km)
Smithers				
	Amabilis fir (residues)	Chips	5,661	62
	Aspen (residues)	Chips	22,660	73
	black spruce (residues)	Chips	1,006	115
	engelmann spruce (residues)	Chips	2,562	151
	hybrid spruce (residues)	Chips	243,549	84
	lodgepole pine (residues)	Chips	111,272	82
	subalpine fir (residues)	Chips	314,693	80
	western hemlock (residues)	Chips	41,859	47
	western red cedar (residues)	Chips	69	42
	White birch (residues)	Chips	1,106	38
	whitebark pine (residues)	Chips	152	59
			744,588	**79**
Houston				
	Aspen (residues)	Chips	594	35
	black spruce (residues)	Chips	0	46
	hybrid spruce (residues)	Chips	8,023	40
	lodgepole pine (residues)	Chips	7,998	40
	subalpine fir (residues)	Chips	2,629	40
	White birch (residues)	Chips	70	39
			19,316	**40**
			763,904	**78**



852 selected block(s) / 4654

Area covered: 28,774 ha / 138,087 ha

Territory: Unknown territory
Sector: Unknown sector
Cut block: <Multiple selection>

Statistics - Selected Items

Area	28,221.7 ha
Number of cut blocks	976
Recovered biomass	728,794.6 odt
Biomass yield	25.8 odt/ha
Biomass odt / Merchantable m³	0.0731 odt/m³
Delivered products	
• Chips	100 %
• Bundles	0 %
• Trunks and Residues	0 %
Energy balance	38 : 1
Available energy	2,702,424 MWh
Fuel consumption	11.2 L/odt

Cost

Harvesting	0.00 $/odt
Biomass recovery	22.50 $/odt
Transfer yard	0.00 $/odt
Transportation	33.94 $/odt
Loading/unloading	19.32 $/odt
Stumpage fees	0.00 $/odt
Road network - Maintenance	0.64 $/odt
Indirect costs	0.00 $/odt
Total	**76.40 $/ odt**

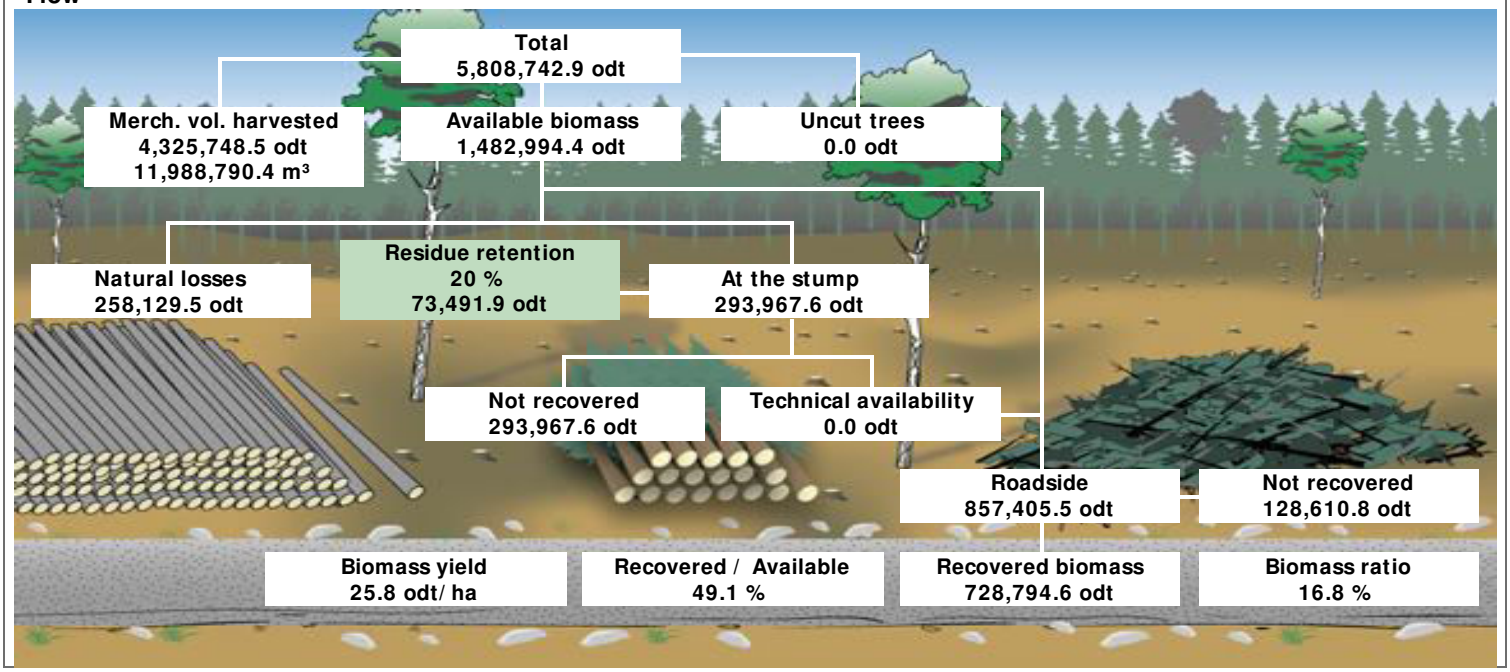
Revenue

Sale value	0.00 $/odt
Silvicultural discount	0.00 $/odt

Net

Profit	-76.40 $/odt

Flow



Products

Product name	odt	odt/ m³	odt/ ha
subalpine fir (residues)	333,592.4	0.0705	11.82
hybrid spruce (residues)	224,936.2	0.0870	7.97
lodgepole pine (residues)	100,860.8	0.0576	3.57
western hemlock (residues)	33,871.8	0.0697	1.20
Aspen (residues)	21,375.8	0.0838	0.76
Amabilis fir (residues)	6,001.7	0.0617	0.21
engelmann spruce (residues)	3,327.5	0.0922	0.12
White birch (residues)	3,131.4	0.1612	0.11
black spruce (residues)	1,250.2	0.0855	0.04
whitebark pine (residues)	366.3	0.1301	0.01
western red cedar (residues)	80.5	0.0800	0.00
	728,794.6	**0.0731**	**25.82**

Recovery summary

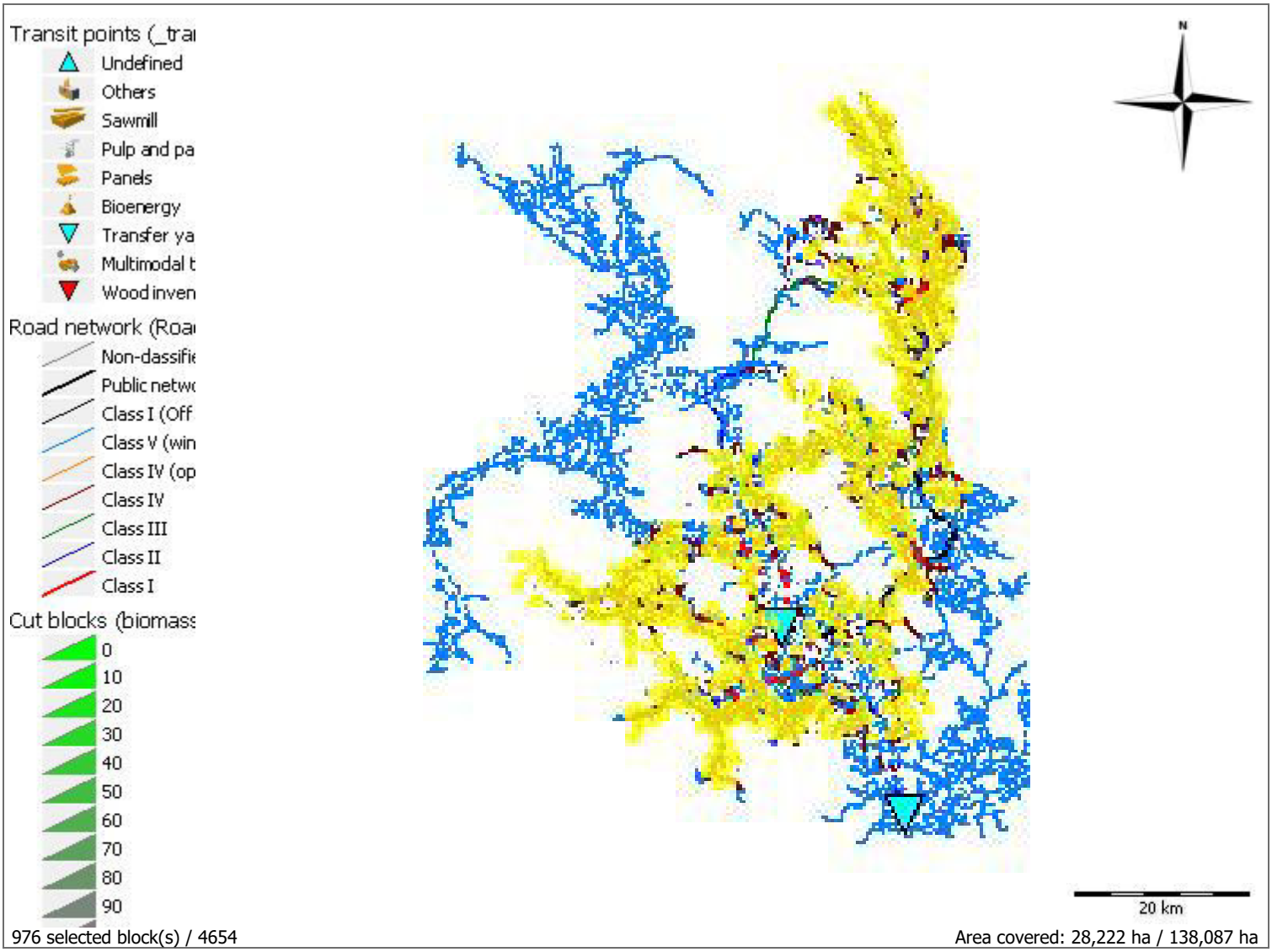
	Volume(odt)	Area(ha)	Number of cut blocks
• Biomass recovery location			
At the stump	0.0	0.0	0
Roadside	728,794.6	28,221.7	976
• Recovery season			
Summer	0.0	0.0	0
Winter	728,794.6	28,221.7	976
• Residue freshness			
Fresh	0.0	0.0	0
Brown	728,794.6	28,221.7	976
Brittle	0.0	0.0	0

Supply summary

Recovered biomass to	Merchantable volume (odt)	Residues (odt)	Total biomass (odt)
10 $/odt	0.0	0.0	0.0
20 $/odt	0.0	0.0	0.0
30 $/odt	0.0	0.0	0.0
40 $/odt	0.0	0.0	0.0
50 $/odt	0.0	12,362.6	12,362.6
60 $/odt	0.0	114,776.2	114,776.2
70 $/odt	0.0	288,804.5	288,804.5
80 $/odt	0.0	466,892.2	466,892.2
90 $/odt	0.0	585,141.8	585,141.8
100 $/odt	0.0	660,362.2	660,362.2
110 $/odt	0.0	706,312.8	706,312.8
120 $/odt	0.0	720,785.3	720,785.3
130 $/odt	0.0	725,949.1	725,949.1
140 $/odt	0.0	728,501.6	728,501.6
150 $/odt	0.0	728,768.0	728,768.0
160 $/odt	0.0	728,768.0	728,768.0
170 $/odt	0.0	728,794.6	728,794.6
Maximum cost	**0.00 $/ odt**	**167.69 $/ odt**	

Delivery to mills

Destination	Product	Format	odt	Transport average distance (Km)
Smithers				
	Amabilis fir (residues)	Chips	6,002	66
	Aspen (residues)	Chips	20,451	59
	black spruce (residues)	Chips	1,203	97
	engelmann spruce (residues)	Chips	3,328	154
	hybrid spruce (residues)	Chips	213,634	75
	lodgepole pine (residues)	Chips	93,644	73
	subalpine fir (residues)	Chips	326,860	79
	western hemlock (residues)	Chips	33,872	50
	western red cedar (residues)	Chips	81	44
	White birch (residues)	Chips	2,732	36
	whitebark pine (residues)	Chips	366	37
			702,171	**75**
Houston				
	Aspen (residues)	Chips	925	36
	black spruce (residues)	Chips	47	41
	hybrid spruce (residues)	Chips	11,302	40
	lodgepole pine (residues)	Chips	7,217	40
	subalpine fir (residues)	Chips	6,733	39
	White birch (residues)	Chips	400	36
			26,624	**39**
			728,795	**74**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Cut blocks (biomass
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50
60
70
80
90
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20 km
976 selected block(s) / 4654
Area covered: 28,222 ha / 138,087 ha

Territory: Unknown territory
Sector: Unknown sector
Cut block: <Multiple selection>

Statistics - Selected Items

Area	25,039.5 ha
Number of cut blocks	774
Recovered biomass	619,711.1 odt
Biomass yield	24.7 odt/ha
Biomass odt / Merchantable m³	0.0753 odt/m³
Delivered products	
• Chips	100 %
• Bundles	0 %
• Trunks and Residues	0 %
Energy balance	39 : 1
Available energy	2,306,179 MWh
Fuel consumption	11.0 L/odt

Cost

Harvesting	0.00 $/odt
Biomass recovery	22.50 $/odt
Transfer yard	0.00 $/odt
Transportation	33.81 $/odt
Loading/unloading	20.56 $/odt
Stumpage fees	0.00 $/odt
Road network - Maintenance	0.51 $/odt
Indirect costs	0.00 $/odt
Total	**77.39 $/ odt**

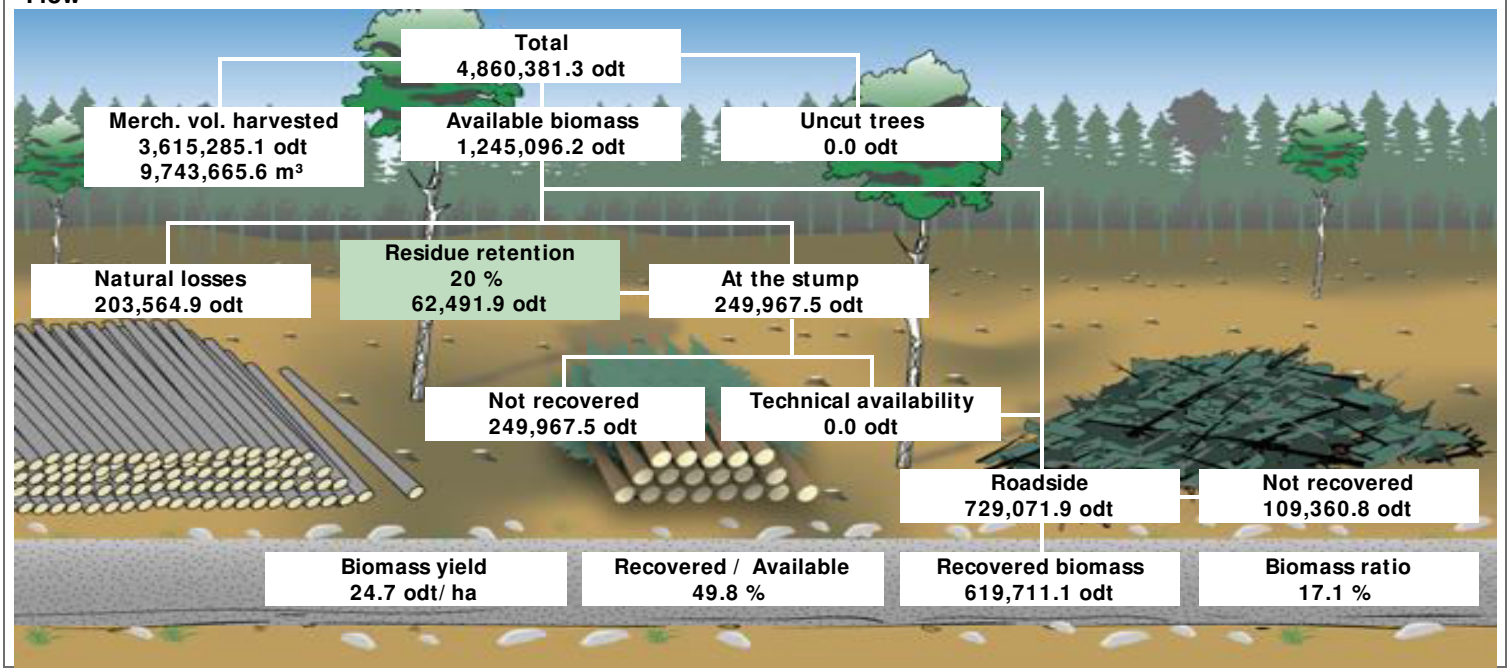
Revenue

Sale value	0.00 $/odt
Silvicultural discount	0.00 $/odt

Net

Profit	-77.39 $/odt

Flow



Products

Product name	odt	odt/ m³	odt/ ha
subalpine fir (residues)	209,351.3	0.0741	8.36
hybrid spruce (residues)	199,004.8	0.0910	7.95
lodgepole pine (residues)	142,762.0	0.0604	5.70
western hemlock (residues)	27,850.9	0.0723	1.11
Aspen (residues)	27,017.8	0.0867	1.08
Amabilis fir (residues)	5,379.3	0.0599	0.21
White birch (residues)	3,613.8	0.1672	0.14
engelmann spruce (residues)	3,288.3	0.0898	0.13
black spruce (residues)	1,421.1	0.0879	0.06
western red cedar (residues)	20.1	0.0837	0.00
whitebark pine (residues)	1.7	0.1083	0.00
	619,711.1	**0.0753**	**24.75**

Recovery summary

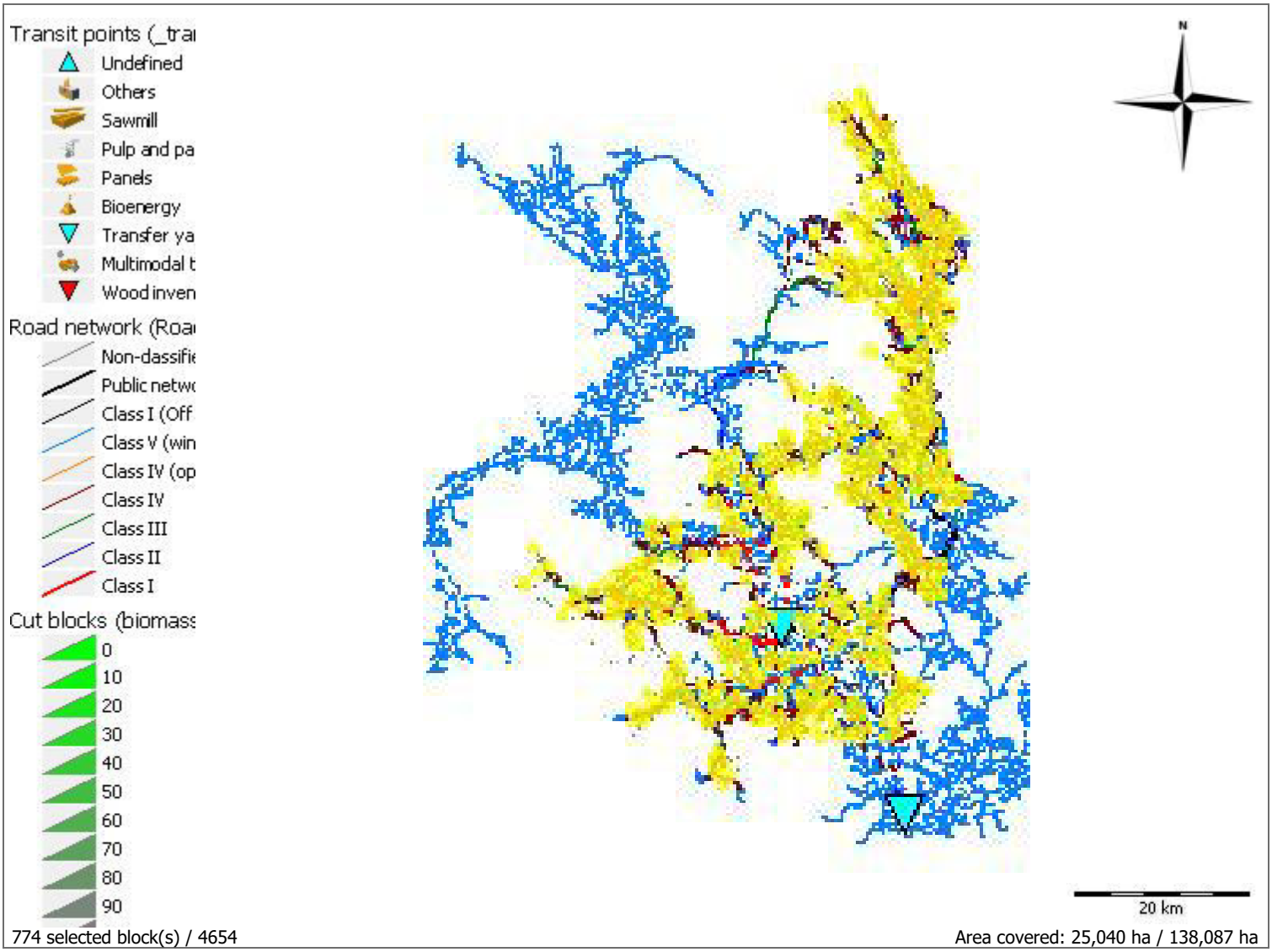
	Volume(odt)	Area(ha)	Number of cut blocks
• Biomass recovery location			
At the stump	0.0	0.0	0
Roadside	619,711.1	25,039.5	774
• Recovery season			
Summer	0.0	0.0	0
Winter	619,711.1	25,039.5	774
• Residue freshness			
Fresh	0.0	0.0	0
Brown	619,711.1	25,039.5	774
Brittle	0.0	0.0	0

Supply summary

Recovered biomass to	Merchantable volume (odt)	Residues (odt)	Total biomass (odt)
10 $/odt	0.0	0.0	0.0
20 $/odt	0.0	0.0	0.0
30 $/odt	0.0	0.0	0.0
40 $/odt	0.0	0.0	0.0
50 $/odt	0.0	17,354.2	17,354.2
60 $/odt	0.0	80,168.5	80,168.5
70 $/odt	0.0	233,012.0	233,012.0
80 $/odt	0.0	373,495.5	373,495.5
90 $/odt	0.0	483,214.1	483,214.1
100 $/odt	0.0	563,112.8	563,112.8
110 $/odt	0.0	596,760.2	596,760.2
120 $/odt	0.0	611,257.2	611,257.2
130 $/odt	0.0	616,444.9	616,444.9
140 $/odt	0.0	618,830.0	618,830.0
150 $/odt	0.0	619,395.4	619,395.4
160 $/odt	0.0	619,710.8	619,710.8
170 $/odt	0.0	619,710.8	619,710.8
180 $/odt	0.0	619,711.1	619,711.1
Maximum cost	**0.00 $/ odt**	**176.72 $/ odt**	

Delivery to mills

Destination	Product	Format	odt	Transport average distance (Km)
Smithers				
	Amabilis fir (residues)	Chips	5,379	63
	Aspen (residues)	Chips	25,885	66
	black spruce (residues)	Chips	1,415	108
	engelmann spruce (residues)	Chips	3,288	154
	hybrid spruce (residues)	Chips	188,234	77
	lodgepole pine (residues)	Chips	133,082	77
	subalpine fir (residues)	Chips	202,292	76
	western hemlock (residues)	Chips	27,851	47
	western red cedar (residues)	Chips	20	49
	White birch (residues)	Chips	3,353	37
	whitebark pine (residues)	Chips	2	59
			590,799	**75**
Houston				
	Aspen (residues)	Chips	1,133	36
	black spruce (residues)	Chips	7	42
	hybrid spruce (residues)	Chips	10,771	40
	lodgepole pine (residues)	Chips	9,680	38
	subalpine fir (residues)	Chips	7,060	43
	White birch (residues)	Chips	261	40
			28,912	**40**
			619,711	**73**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Cut blocks (biomass
0
10
20
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40
50
60
70
80
90
N
20 km
774 selected block(s) / 4654
Area covered: 25,040 ha / 138,087 ha

Territory: Unknown territory
Sector: Unknown sector
Cut block: <Multiple selection>

Statistics - Selected Items

Area	23,112.5 ha
Number of cut blocks	904
Recovered biomass	484,089.9 odt
Biomass yield	20.9 odt/ha
Biomass odt / Merchantable m³	0.0851 odt/m³
Delivered products	
• Chips	100 %
• Bundles	0 %
• Trunks and Residues	0 %
Energy balance	37 : 1
Available energy	1,799,517 MWh
Fuel consumption	11.6 L/odt

Cost

Harvesting	0.00 $/odt
Biomass recovery	22.50 $/odt
Transfer yard	0.00 $/odt
Transportation	37.91 $/odt
Loading/unloading	25.56 $/odt
Stumpage fees	0.00 $/odt
Road network - Maintenance	0.50 $/odt
Indirect costs	0.00 $/odt
Total	**86.47 $/ odt**

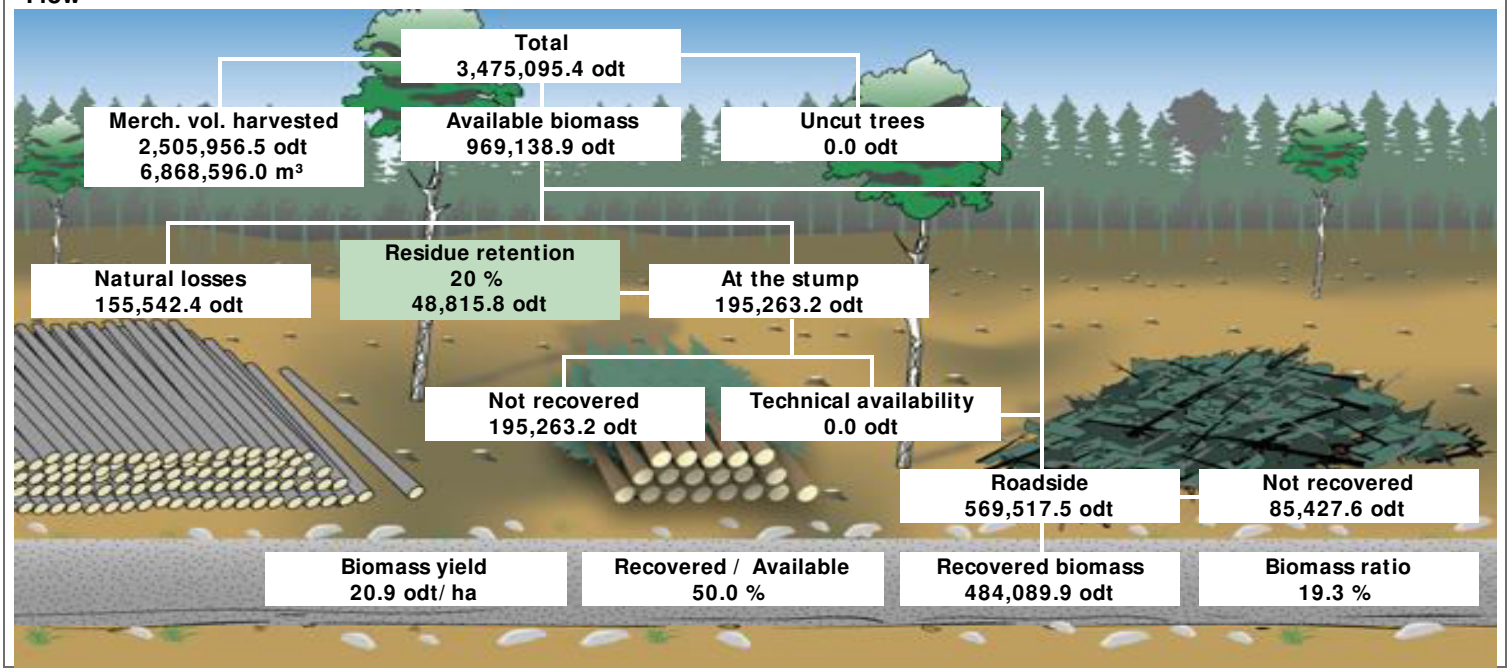
Revenue

Sale value	0.00 $/odt
Silvicultural discount	0.00 $/odt

Net

Profit	-86.47 $/odt

Flow



Products

Product name	odt	odt/ m³	odt/ ha
subalpine fir (residues)	188,197.0	0.0794	8.14
hybrid spruce (residues)	150,330.5	0.1010	6.50
lodgepole pine (residues)	100,136.9	0.0744	4.33
Aspen (residues)	23,074.3	0.1023	1.00
western hemlock (residues)	13,021.4	0.0821	0.56
Amabilis fir (residues)	2,935.7	0.0676	0.13
engelmann spruce (residues)	2,780.1	0.0929	0.12
White birch (residues)	2,035.9	0.1819	0.09
black spruce (residues)	1,473.2	0.1151	0.06
whitebark pine (residues)	54.6	0.1637	0.00
western red cedar (residues)	50.3	0.0712	0.00
	484,089.9	**0.0851**	**20.94**

Recovery summary

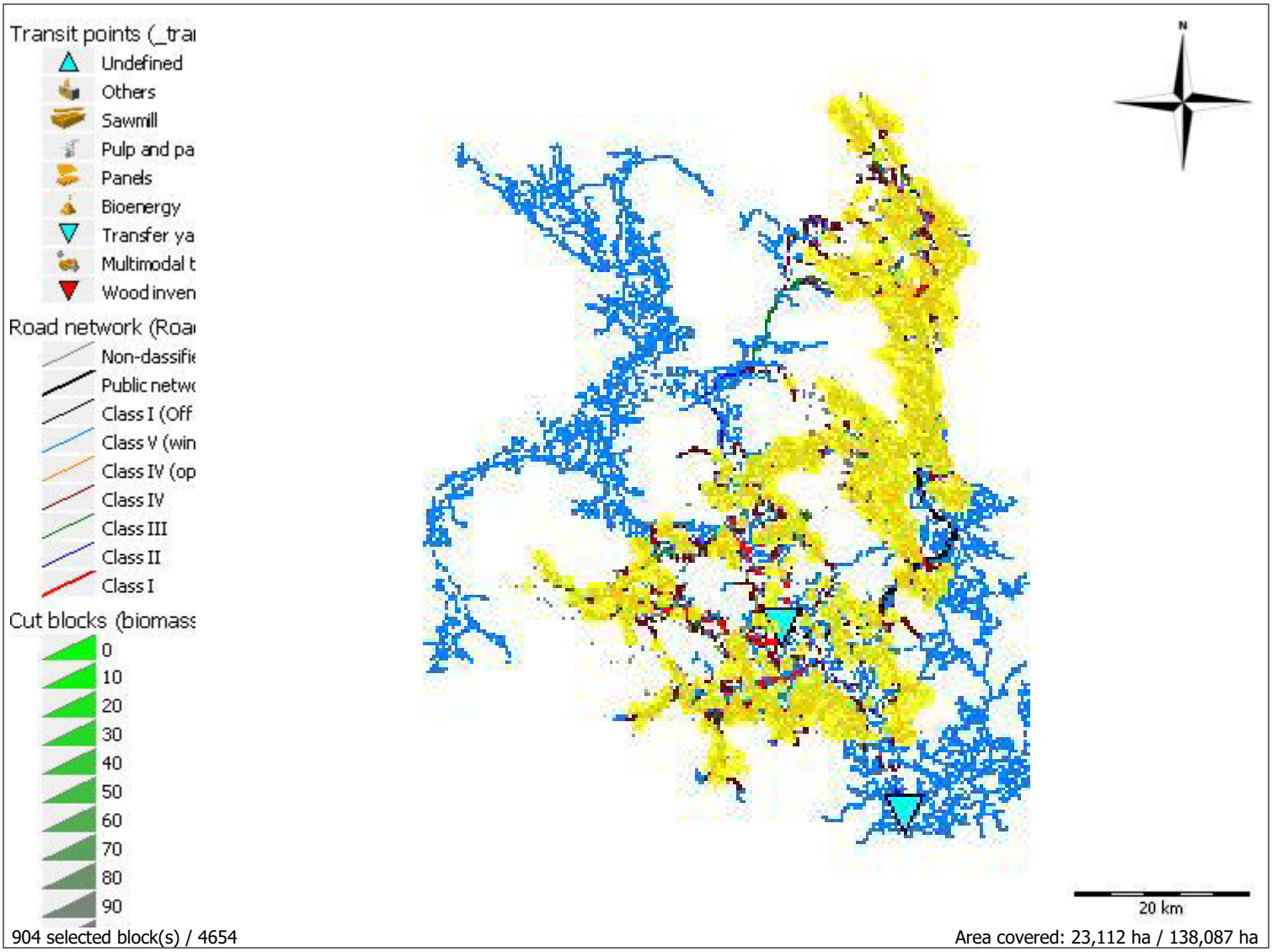
	Volume(odt)	Area(ha)	Number of cut blocks
• Biomass recovery location			
At the stump	0.0	0.0	0
Roadside	484,089.9	23,112.5	904
• Recovery season			
Summer	0.0	0.0	0
Winter	484,089.9	23,112.5	904
• Residue freshness			
Fresh	0.0	0.0	0
Brown	484,089.9	23,112.5	904
Brittle	0.0	0.0	0

Supply summary

Recovered biomass to	Merchantable volume (odt)	Residues (odt)	Total biomass (odt)
10 $/odt	0.0	0.0	0.0
20 $/odt	0.0	0.0	0.0
30 $/odt	0.0	0.0	0.0
40 $/odt	0.0	0.0	0.0
50 $/odt	0.0	4,242.4	4,242.4
60 $/odt	0.0	39,165.3	39,165.3
70 $/odt	0.0	112,651.7	112,651.7
80 $/odt	0.0	201,091.3	201,091.3
90 $/odt	0.0	313,143.8	313,143.8
100 $/odt	0.0	368,188.0	368,188.0
110 $/odt	0.0	422,111.3	422,111.3
120 $/odt	0.0	446,403.4	446,403.4
130 $/odt	0.0	462,268.1	462,268.1
140 $/odt	0.0	469,307.6	469,307.6
150 $/odt	0.0	480,273.7	480,273.7
160 $/odt	0.0	482,714.1	482,714.1
170 $/odt	0.0	483,480.4	483,480.4
180 $/odt	0.0	484,089.9	484,089.9
Maximum cost	**0.00 $/ odt**	**179.37 $/ odt**	

Delivery to mills

Destination	Product	Format	odt	Transport average distance (Km)
Smithers				
	Amabilis fir (residues)	Chips	2,936	64
	Aspen (residues)	Chips	21,321	66
	black spruce (residues)	Chips	1,454	114
	engelmann spruce (residues)	Chips	2,780	165
	hybrid spruce (residues)	Chips	134,926	78
	lodgepole pine (residues)	Chips	92,647	95
	subalpine fir (residues)	Chips	174,226	83
	western hemlock (residues)	Chips	13,021	53
	western red cedar (residues)	Chips	50	51
	White birch (residues)	Chips	1,682	41
	whitebark pine (residues)	Chips	55	65
			445,099	**82**
Houston				
	Aspen (residues)	Chips	1,753	39
	black spruce (residues)	Chips	19	41
	hybrid spruce (residues)	Chips	15,405	38
	lodgepole pine (residues)	Chips	7,490	37
	subalpine fir (residues)	Chips	13,971	38
	White birch (residues)	Chips	353	37
			38,991	**38**
			484,090	**79**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Cut blocks (biomass
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N
20 km
904 selected block(s) / 4654
Area covered: 23,112 ha / 138,087 ha

Territory: Unknown territory
Sector: Unknown sector
Cut block: <Multiple selection>

Statistics - Selected Items

Area	138,087.3 ha
Number of cut blocks	4654
Recovered biomass	3,477,875.1 odt
Biomass yield	25.2 odt/ha
Biomass odt / Merchantable m³	0.0726 odt/m³
Delivered products	
• Chips	100 %
• Bundles	0 %
• Trunks and Residues	0 %
Energy balance	38 : 1
Available energy	12,909,544 MWh
Fuel consumption	11.3 L/odt

Cost

Harvesting	0.00 $/odt
Biomass recovery	22.50 $/odt
Transfer yard	0.00 $/odt
Transportation	34.33 $/odt
Loading/unloading	19.29 $/odt
Stumpage fees	0.00 $/odt
Road network - Maintenance	0.59 $/odt
Indirect costs	0.00 $/odt
Total	**76.71 $/ odt**

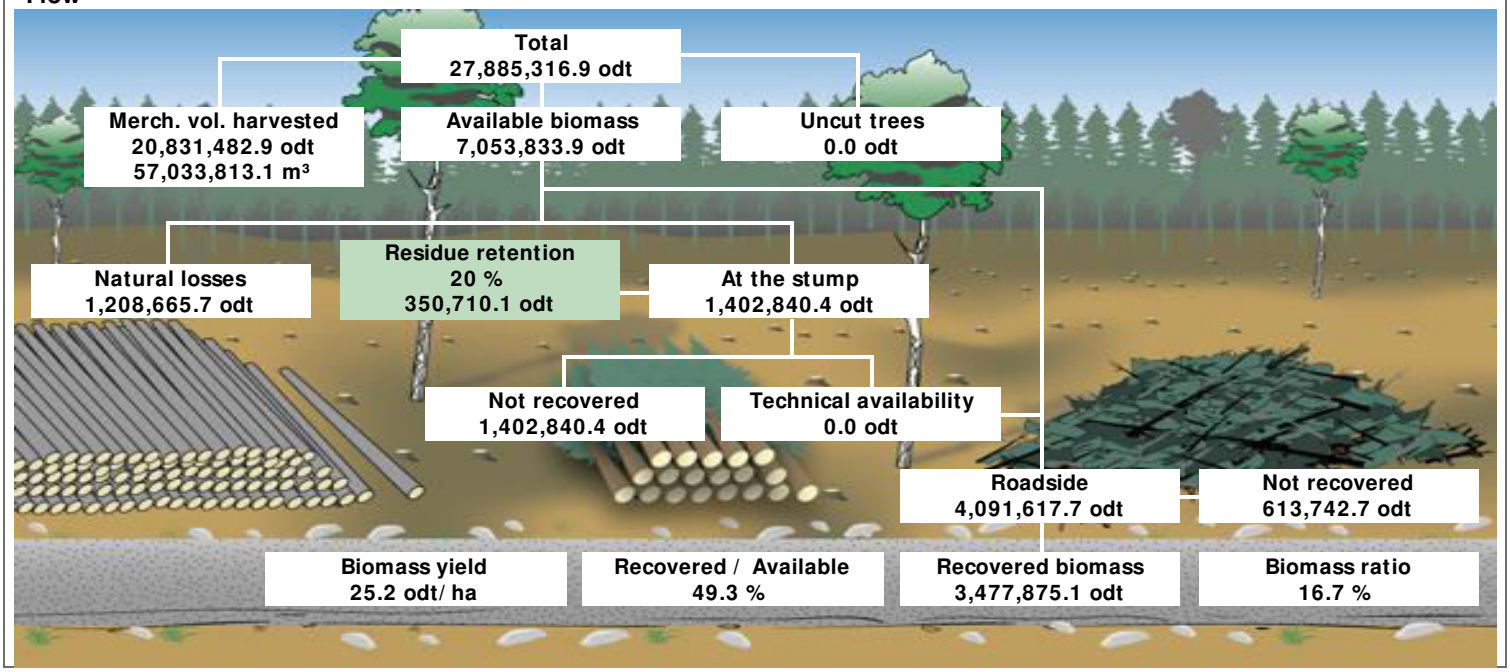
Revenue

Sale value	0.00 $/odt
Silvicultural discount	0.00 $/odt

Net

Profit	-76.71 $/odt

Flow



Products

Product name	odt	odt/ m³	odt/ ha
subalpine fir (residues)	1,411,184.5	0.0708	10.22
hybrid spruce (residues)	1,114,024.6	0.0863	8.07
lodgepole pine (residues)	566,791.5	0.0575	4.10
western hemlock (residues)	204,374.8	0.0687	1.48
Aspen (residues)	115,541.8	0.0842	0.84
Amabilis fir (residues)	31,546.3	0.0617	0.23
engelmann spruce (residues)	14,185.0	0.0897	0.10
White birch (residues)	12,848.2	0.1598	0.09
black spruce (residues)	6,162.7	0.0896	0.04
whitebark pine (residues)	978.8	0.1295	0.01
western red cedar (residues)	237.0	0.0742	0.00
	3,477,875.1	**0.0726**	**25.19**

Recovery summary

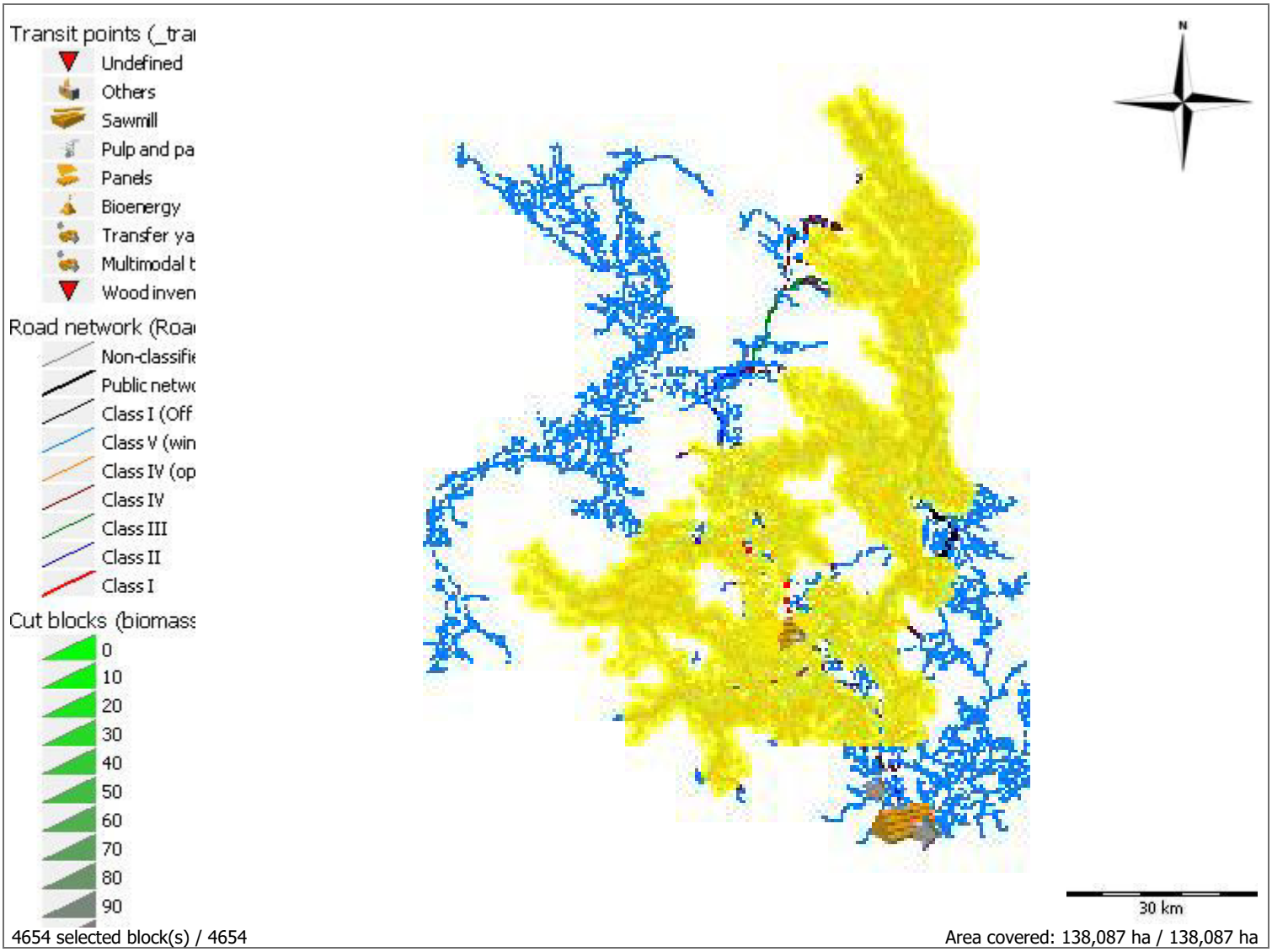
	Volume(odt)	Area(ha)	Number of cut blocks
• Biomass recovery location			
At the stump	0.0	0.0	0
Roadside	3,477,875.1	138,087.3	4,654
• Recovery season			
Summer	0.0	0.0	0
Winter	3,477,875.1	138,087.3	4,654
• Residue freshness			
Fresh	0.0	0.0	0
Brown	3,477,875.1	138,087.3	4,654
Brittle	0.0	0.0	0

Supply summary

Recovered biomass to	Merchantable volume (odt)	Residues (odt)	Total biomass (odt)
10 $/odt	0.0	0.0	0.0
20 $/odt	0.0	0.0	0.0
30 $/odt	0.0	0.0	0.0
40 $/odt	0.0	0.0	0.0
50 $/odt	0.0	81,302.4	81,302.4
60 $/odt	0.0	538,399.4	538,399.4
70 $/odt	0.0	1,364,203.6	1,364,203.6
80 $/odt	0.0	2,198,497.5	2,198,497.5
90 $/odt	0.0	2,787,956.9	2,787,956.9
100 $/odt	0.0	3,145,306.1	3,145,306.1
110 $/odt	0.0	3,338,442.8	3,338,442.8
120 $/odt	0.0	3,418,603.8	3,418,603.8
130 $/odt	0.0	3,449,213.8	3,449,213.8
140 $/odt	0.0	3,461,649.6	3,461,649.6
150 $/odt	0.0	3,473,542.6	3,473,542.6
160 $/odt	0.0	3,476,298.3	3,476,298.3
170 $/odt	0.0	3,477,265.3	3,477,265.3
180 $/odt	0.0	3,477,875.1	3,477,875.1
Maximum cost	**0.00 $/ odt**	**179.37 $/ odt**	

Delivery to mills

Destination	Product	Format	odt	Transport average distance (Km)
Smithers				
	Amabilis fir (residues)	Chips	31,546	63
	Aspen (residues)	Chips	110,953	67
	black spruce (residues)	Chips	6,089	109
	engelmann spruce (residues)	Chips	14,185	154
	hybrid spruce (residues)	Chips	1,061,611	81
	lodgepole pine (residues)	Chips	529,080	82
	subalpine fir (residues)	Chips	1,375,699	80
	western hemlock (residues)	Chips	204,375	48
	western red cedar (residues)	Chips	237	46
	White birch (residues)	Chips	11,289	35
	whitebark pine (residues)	Chips	979	48
			3,346,043	**78**
Houston				
	Aspen (residues)	Chips	4,589	37
	black spruce (residues)	Chips	74	41
	hybrid spruce (residues)	Chips	52,414	39
	lodgepole pine (residues)	Chips	37,711	39
	subalpine fir (residues)	Chips	35,486	40
	White birch (residues)	Chips	1,559	39
			131,832	**39**
			3,477,875	**77**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Panels
Bioenergy
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Road network (Roa
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Public netwo
Class I (Off
Class V (win
Class IV (op
Class IV
Class III
Class II
Class I
Cut blocks (biomass
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10
20
30
40
50
60
70
80
90
N
30 km
4654 selected block(s) / 4654
Area covered: 138,087 ha / 138,087 ha

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