

9 Site summary

9.1 Mapping

The site and survey data on the front of the Soil Disturbance Summary Card (FS 889; see Appendix 6) should be filled out if calculations are performed manually; however, it is not necessary if the survey results are calculated using the spreadsheet method.

A site map should accompany any spreadsheet summary or card summary. The back of the FS 889 summary card can be used for mapping or else a separate map could be prepared.

The requirements for site mapping follow.

- ⇒ Use maps of a suitable scale (e.g., 1:5000 or 1:10 000).
- ⇒ Indicate the map scale and north arrow.
- ⇒ Mark the transects and point spacing or the grid bearing and grid spacing.
- ⇒ Number the transects or the grid centres, landings, and haul roads in the same way they were numbered on the field forms.
- ⇒ Clearly mark the boundaries of treatment units or standards units (if relevant).

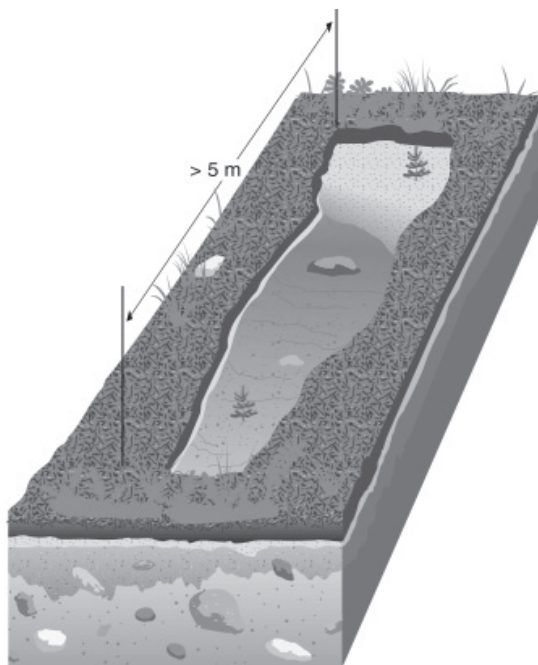
Appendix 1. Requirements and definitions for prescriptions approved under the Forest Practices Code 1995 Operational Planning Regulation (B.C. Reg. 174/95) (December 16, 1995–June 14, 1998)

The requirements and definitions of the 1995 regulation are the same as in the current 1998 Operational Planning Regulation, with the exceptions listed below.

1. Requirements for prescriptions approved under this regulation specified:
 - the maximum percentage of the NAR that could be occupied by temporary access structures and the action, if any, that would be taken to rehabilitate temporary access; and
 - the maximum percentage of the NAR that could be occupied by forest floor displacement.
2. Soil disturbance included continuous scalps as a category of counted soil disturbance.

The following provides a detailed description of continuous scalps and forest floor displacement.

Continuous scalp (C)



Continuous scalps were counted as a category of soil disturbance on areas under Forest Practices Code prescriptions approved or submitted for approval before June 15, 1998.

They are areas where the forest floor has been removed at the survey point and continuously for a length greater than 5 m. There is no width criterion for this category.

Continuous scalps are counted as soil disturbance on sites with:

- high or very high mass wasting hazard;
- high or very high surface erosion hazard;
- very high soil displacement hazard; and
- moderate or high likelihood of landslides, or where the hazards for soil displacement or surface soil erosion have not been assessed.

Forest floor displacement

Forest floor displacement, tallied by transect surveys (along with categories of soil disturbance), is symbolized on field survey forms with a circle drawn around the appropriate disturbance symbol.

Total forest floor displacement includes:

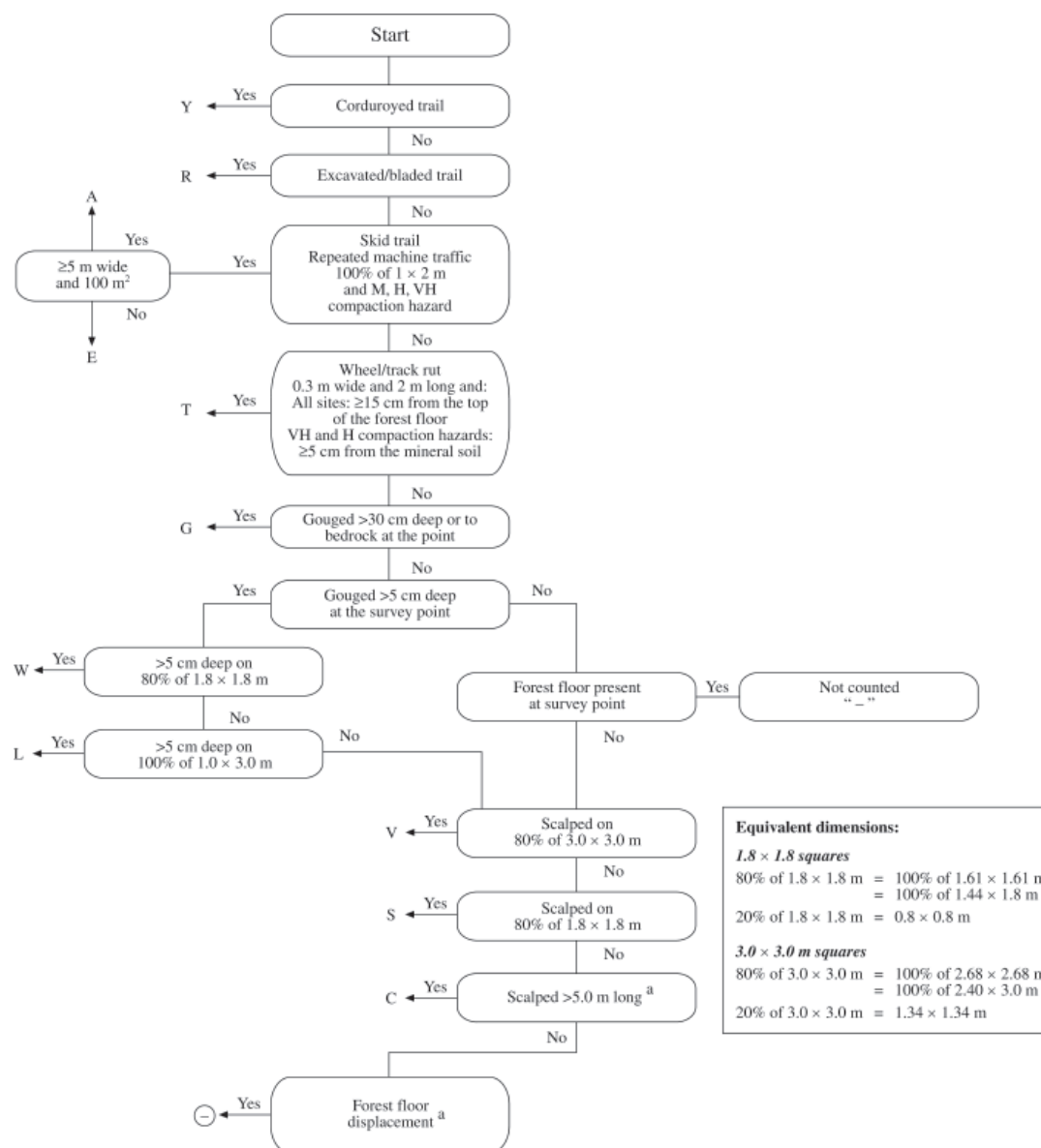
- any disturbance where forest floor has been removed;
- the exposed mineral soil surfaces of rehabilitated temporary access structures where forest floor is no longer present; and
- all areas where the forest floor has been completely consumed by prescribed burning.

Total forest floor displacement does **not** include:

- any disturbance where forest floor is not removed;
- intact or dislodged forest floor covered by deposits of mineral soil;
- any counted disturbance category covered with organic matter that does not qualify as forest floor removal (e.g., a rut where the forest floor is still intact);
- surfaces of rehabilitated temporary access structures where the forest floor has been restored in accordance with an approved rehabilitation plan (e.g., by application of a surface mulch);
- exposed mineral soil on mounds and berms created by mounding, disc-trenching, plowing, or other mechanical site preparation treatments, where the original forest floor is largely intact under the mound or berm; and
- exposed mineral soil resulting from mixing-type mechanical site preparation treatments, such as rototilling or bedding plow treatments.

Note: Do not count compacted areas, repeated machine traffic, or rut disturbance as forest floor displacement unless forest floor is removed at the survey point.

Appendix 2. Flow chart for correct assessment of soil disturbance survey points under the Forest Practices Code



^a These categories are not counted on areas covered under prescriptions approved in accordance with the 1998 Operational Planning Regulation.

Note: This flow chart does not address rehabilitated areas. Where planned rehabilitation has been successful, exposed mineral soil surfaces should be recorded as forest floor displacement, if required, and not as soil disturbance.

Appendix 3. Table of random numbers

Row number	Column number											
	1	2	3	4	5	6	7	8	9	10	11	12
1	20	288	215	98	44	202	323	226	162	262	248	276
2	331	171	204	131	185	39	183	338	209	352	285	333
3	250	142	85	145	348	55	327	137	289	135	146	282
4	259	226	225	215	219	306	267	181	29	328	247	280
5	143	103	64	332	199	215	159	145	84	87	135	250
6	234	261	211	152	181	198	59	179	99	29	106	342
7	360	61	177	310	265	150	23	8	83	122	303	112
8	86	103	313	117	254	284	17	347	296	196	153	251
9	120	191	52	93	297	209	290	251	155	210	47	357
10	6	105	155	77	191	147	356	245	262	36	268	32
11	37	2	259	115	3	24	105	115	130	246	256	61
12	357	180	52	190	311	20	48	348	12	322	223	355
13	326	227	40	93	217	100	336	262	272	83	179	48
14	336	322	174	335	94	358	303	337	253	253	42	163
15	240	213	217	8	184	72	219	136	211	64	154	217
16	289	327	291	216	112	106	147	181	33	311	7	111
17	140	32	297	319	342	15	30	53	54	55	10	139
18	125	81	128	59	121	236	307	264	328	120	247	127
19	351	21	132	172	148	91	93	334	74	126	223	62
20	80	91	98	280	41	146	219	271	248	246	185	179
21	198	255	26	201	330	134	100	19	41	50	192	349
22	80	225	321	260	161	330	260	333	195	145	42	169
23	66	54	140	179	179	46	311	87	340	341	287	98
24	19	185	137	346	163	224	13	72	208	48	124	288
25	281	321	20	16	5	48	70	91	122	305	240	75
26	126	61	317	336	188	184	23	31	174	280	115	88
27	355	267	117	253	186	72	1	221	345	86	89	355
28	321	327	358	78	320	261	187	325	100	91	179	184
29	201	341	29	14	341	63	253	249	226	170	311	127
30	308	233	229	344	215	341	318	334	144	326	70	148
31	195	42	88	337	122	97	84	215	298	168	300	312
32	22	115	136	100	110	73	219	290	133	70	23	55
33	48	190	121	352	200	249	135	55	336	17	263	269
34	175	225	341	307	283	280	359	348	143	230	102	283
35	133	17	293	356	45	151	49	69	334	340	151	251
36	188	43	324	343	104	302	168	92	97	43	321	268
37	133	103	334	241	207	12	208	168	16	153	121	268
38	351	360	102	5	85	226	246	16	155	323	113	260
39	80	354	191	267	197	169	172	348	271	231	40	164
40	299	311	165	41	211	64	281	91	95	186	283	299

Select a row from 1 to 40 and a column from 1 to 12. Use the number at the intersection of the selected row and column.

Appendix 4. Grid spacing for large area method

For survey areas greater than 10 ha this table indicates the required number of grid centres and the spacing between them. Two perpendicular 30-m transects are established per grid centre.

Area	No. of	Spacing	Area	No. of	Spacing	Area	No. of	Spacing	Area	No. of	Spacing	Area	No. of	Spacing
(ha)	GCs ^a	(m)	(ha)	GCs ^a	(m)	(ha)	GCs ^a	(m)	(ha)	GCs ^a	(m)	(ha)	GCs ^a	(m)
11	30	61	33	30	105	55	31	133	76	36	145	97	40	156
12	30	63	34	30	106	56	32	132	77	36	146	98	40	157
13	30	66	35	30	108	57	32	133	78	36	147	99	40	157
14	30	68	36	30	110	58	32	135	79	36	148	100	40	158
15	30	71	37	30	111	59	32	136	80	36	149	101	41	157
16	30	73	38	30	113	60	32	137	81	37	148	102	41	158
17	30	75	39	30	114	61	33	136	82	37	149	103	41	158
18	30	77	40	30	115	62	33	137	83	37	150	104	41	159
19	30	80	41	30	117	63	33	138	84	37	151	105	41	160
20	30	82	42	30	118	64	33	139	85	37	152	106	42	159
21	30	84	43	30	120	65	33	140	86	38	150	107	42	160
22	30	86	44	30	121	66	34	139	87	38	151	108	42	160
23	30	88	45	30	122	67	34	140	88	38	152	109	42	161
24	30	89	46	30	124	68	34	141	89	38	153	110	42	162
25	30	91	47	30	125	69	34	142	90	38	154	111	43	161
26	30	93	48	30	126	70	34	143	91	39	153	112	43	161
27	30	95	49	30	128	71	35	142	92	39	154	113	43	162
28	30	97	50	30	129	72	35	143	93	39	154	114	43	163
29	30	98	51	31	128	73	35	144	94	39	155	115	43	164
30	30	100	52	31	130	74	35	145	95	39	156	116	44	162
31	30	102	53	31	131	75	35	146	96	40	155	117	44	163
32	30	103	54	31	132									

^a GCs = grid centres

Appendix 5. Field marking conventions

Transect surveys for areas 10 ha and smaller

Point of commencement (POC)

- Use two blue ribbons and two pink-striped ribbons.
- Label the first blue ribbon with “SDS” (for “soil disturbance survey”), the ID number on the survey form, the date, and the surveyor’s initials (e.g., SDS FFR-1 94/04/27 S.T.).
- Label the second blue ribbon with the distance and bearing to the baseline (or first transect, if not using a baseline) (e.g., 42 m @ 104° to B/L 0+000).

Baseline (optional)

Choose a convenient colour and mark the location of each transect.

Transects

- Mark the beginning and end of the transect with one pink-striped ribbon and one blue ribbon at each location.
- Label the ribbon with “SDS,” followed by start of transect (SOT) or end of transect (EOT), the transect number, and the bearing (e.g., SDS SOT T-3 @ 134°).
- Flag at 100-m intervals with pink-striped ribbon, labelling each ribbon with “SDS,” the transect number, the distance, and the bearing” (e.g., SDS T-3 0+100 m @ 134°).

Transect surveys for areas larger than 10 ha

POC

- Use two blue ribbons and two pink-striped ribbons.
- Label the first blue ribbon “SDS” (for “soil disturbance survey”), the ID number on survey form, the date, and the surveyor’s initials (e.g., SDS FFR-1 94/04/27 S.T.).
- Label the second blue ribbon with the distance and bearing to the first grid centre (e.g., 42 m @ 104° to GC-1).

Grid centres

- Use one blue ribbon and one pink-and-black-striped ribbon.
- Label the blue ribbon with “GC –,” followed by the grid centre number, and a random bearing (e.g., GC-101, 143°).

Transects

- Mark the ground with blue flagging at the start and end of each transect, exactly at the 0-m and 30-m marks (or the appropriate endpoint if the transect goes outside of the NAR).

Road traverses

POC

- Use a new POC for each type of road surveyed (e.g., a haul road, a spur road, and a permanent skid trail would require three separate POCs).
- Use two blue ribbons and two pink-striped ribbons.
- Label the first blue ribbon with the word “Road –,” followed by the road number, the ID number on survey form, the date, and the surveyor’s initials (e.g., Road-1, FFR-1, 94/04/27, S.T.).
- Label the second blue ribbon with the distance to the first width cross-section, followed by “to R –,” the road number, “x –,” and the cross-section number (e.g., 18 m to R-1, x-1).
- Leave a blue ribbon on the cutbank at each width-measuring station.

Landing surveys

- Mark the start and end of each landing length and width measurement with a blue ribbon and a pink-striped ribbon.
- Mark the location of each transect on a sketch map of the landing in the field notes.
- If traversing the landing:
 - mark the starting point of the traverse with a blue ribbon and a pink-striped ribbon;
 - label the blue ribbon with an “L –,” followed by the landing number and “POC Traverse” (e.g., “L-1 POC Traverse”); and
 - mark each station of the traverse by painting the ground with a blue cross or by leaving a blue ribbon.

Appendix 6. Soil conservation survey field, calculation, and summary forms

Number	Name	Purpose/Comments
FS 880 HSP 96/9	Traverse Survey Field Card (double-sided)	For collecting measurement data on roads, permanent logging trails, and pre-Code fireguards and backspar trails.
FS 885 HSP 96/8	Transect Survey Field Card (double-sided)	For collecting soil disturbance data in the NAR. Used for small <i>and</i> large area transect surveys.
FS 886 HSP 96/8	Landing Area Calculation Card (single-sided)	For collecting representative width and length measurements, and calculating areas, for landings.
FS 889 HSP 96/10	Soil Disturbance Summary / Field Map (double-sided)	Summary sheet for all soil disturbance survey calculations, including permanent roads and landings—for both small and large areas. Back side used for sketching map of survey strata.
FS 895 HSP 96/10	Transect Survey Calculation Card, including Calculation Procedure (double-sided)	For calculating statistical information from FS 896 tally card. Confidence limits entered into FS 889 form. <i>Note: there is also an MOF spreadsheet program to do calculations—available from the Forest Practices Branch.</i>
FS 896 HSP 96/10	Transect Survey Tally Card (single-sided)	For transferring data from FS 885 field cards. Used to tally large area transect survey totals.
FS 897 HSP 96/9	Small Area Survey Calculation Card / Table of 90% Confidence Interval Half-Widths (double-sided)	Summary card for small area survey of soil disturbance in the NAR (i.e., summary of FS 885 data).

Note: Forms can be downloaded or ordered through the forms index on Ministry of Forests website at: <http://www.for.gov.bc.ca/isb/forms>

FS 881 HSP 96/8 – Soil disturbance survey – Transverse survey calculation card



SOIL DISTURBANCE SURVEY

TRAVERSE SURVEY CALCULATION CARD

SURVEYOR	DATE	Y	M	D	IDENTIFICATION NO.
A. Nybody	96	06	13	FFR-NE10	

	MAIN AND SPUR ROADS			FIREGUARDS AND BACKSPAR TRAILS		
	MAIN		TOTAL			TOTAL
LENGTH (m)	291.0					
AVERAGE WIDTH (m)	20.11					
STD WIDTH (m)	1.856					
NUMBER OF WIDTHS MEASURED	10					
√ Number of Widths	3.16					
CI WIDTH (m): CI_{Width}	0.812					
Area (ha)	0.585		0.585			
AREA ERROR (ha): "AE"	0.0376					
AE ²	0.0014		0.0014			
GCA OR NAR (ha)		GCA (ha)	19.3		NAR (ha)	
AREA (%)			3.03			
AREA ERROR (%)			0.195			
AREA % LCL ₉₀			2.84			

CALCULATION PROCEDURE

- Complete separate summaries for: a) main and spur roads, and b) fireguards and backspare trails (for areas approved prior to full compliance with the Forest Practices Code).
- Calculate the average and standard deviation (STD) of the widths measured.
- Calculate the road width confidence interval (CI_{Width}): $CI_{Width} = \frac{t \times STD_{Width}}{\sqrt{\text{Number of Widths}}}$ where "t" is from the t Table
- Multiply length (in metres) by average width (in metres) and divide by 10,000 to calculate the road area in hectares. Enter the sum of the road areas in the column labelled "Total".
- Calculate Area Errors (AE) in hectares for each type of road: $AE = \text{Road Area} \times \sqrt{.0025 + \frac{(CI_{Width})^2}{\text{Average Width}^2}}$
 where Total Road Area = the total area disturbed by all haul roads, or all fireguards and backspare trails, as appropriate.
- Calculate the squares of the Area Errors (AE) and enter the sum of these squares in the column labelled "Total".
- Calculate the percentage area disturbed: $\text{Area \%} = \frac{\text{Area (ha)}}{\text{GCA or NAR (ha)}} \times 100$.
 Use Gross Cutblock Area (GCA) for permanent roads, and Net Area to be Reforested (NAR) for fireguards and backspare trails.
- Calculate the Area Error in hectares: $\text{Area Error (ha)} = \sqrt{\text{sum of AE}^2}$
- Calculate the Area Error in percent: $\text{Area Error (\%)} = \frac{\text{Area Error (ha)}}{\text{GCA or NAR (ha)}} \times 100$.
- Calculate the lower 90% confidence limit for area % (LCL₉₀): $\text{Area \%} - \text{Area Error \%}$

t TABLE 90%, one-sided	
n - 1*	t
5	1.476
6	1.440
7	1.415
8	1.397
9	1.383
10	1.372
11	1.363
12	1.356
13	1.350
14	1.345
15	1.341
16	1.337
17	1.333
18	1.330
19	1.328
20	1.325
21	1.323
22	1.321
23	1.319
24	1.318
25	1.316
26	1.315
27	1.314
28	1.313
29	1.311
30	1.310
>30	1.310

where "n" is the number of road widths or grid centres (not transects).

**FS 885 HSP 96/8 – Soil disturbance survey –
Transect survey field card – example for large block method**



**BRITISH
COLUMBIA**



**SOIL DISTURBANCE
SURVEY**

**TRANSECT SURVEY
FIELD CARD**

SURVEYOR A. Nybody				DATE Y M D 96 07 29		IDENTIFICATION NO. FFR-NE16	
RANDOM NO. ROW COLUMN 15 6		POC BEARING AND DISTANCE 72° 34 m	GRID / TRANSECT SPACING 68 m		45° OFFSET SPACING (spacing x 1.41) 95.9 m		POINT SPACING 1.0 m

GC/TRAN- SECT NO.	101		102		103		104		105		106	
BEARING	56	146	100	190	186	276	92	182	286	16	86	176
1	X	○	—	—	○	—	—	—	—	—	—	○
2	○	○	—	—	—	—	○	○	—	—	—	—
3	—	—	—	—	—	○	—	—	—	—	—	○
4	—	—	—	—	○	○	—	—	—	—	○	○
5	—	○	—	—	○	○	—	○	○	—	○	X
6	○	○	○	○	—	—	○	—	○	—	—	—
7	○	○	○	○	—	—	○	—	—	—	—	—
8	—	○	—	—	—	—	—	—	—	—	○	○
9	—	—	—	—	—	○	—	○	—	○	—	○
10	—	—	—	○	—	—	—	—	—	○	—	—
11	—	○	—	○	X	—	○	—	—	○	—	—
12	—	—	—	—	○	X	—	—	—	○	—	—
13	—	—	—	○	○	—	—	X	○	—	○	—
14	○	—	—	○	—	○	—	—	○	—	○	—
15	○	—	—	—	—	—	○	—	—	—	○	—
16	—	—	X	—	—	—	○	—	—	—	○	—
17	○	—	X	—	—	○	○	—	—	○	—	○
18	○	—	—	○	—	—	—	—	○	—	—	—
19	—	○	—	○	—	—	—	○	—	—	—	—
20	—	—	○	○	○	—	—	—	—	—	—	—
21	○	—	—	—	—	—	—	○	○	○	○	○
22	X	○	—	—	—	○	—	—	—	—	○	○
23	—	○	—	—	○	○	—	—	—	—	—	○
24	—	—	—	—	○	—	—	○	X	—	X	○
25	—	—	○	○	○	○	○	—	—	—	—	—
26	○	—	—	○	○	○	○	—	—	—	—	—
27	○	—	—	—	—	—	—	—	X	—	—	—
28	—	—	—	—	—	—	—	—	—	○	—	—
29	—	—	—	—	—	—	—	—	—	—	—	—
30	—	○	—	—	—	○	—	—	—	—	—	○

FS 885 HSP 96/8

FS 886 HSP 96/8 – Soil disturbance survey – Landing area calculation card

	BRITISH COLUMBIA		SOIL DISTURBANCE SURVEY	LANDING AREA CALCULATION CARD*
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SURVEYOR <div style="text-align: center;">A. Nybody</div>	DATE Y M D <div style="text-align: center;">96 06 21</div>	IDENTIFICATION NO. <div style="text-align: center;">FFR-NE12</div>
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LANDING SUMMARY TABLE*							
LANDING NUMBER	1	2	3				
LENGTH 1 (m)	55.5	33.2	69.1				
LENGTH 2 (m)	49.7	33.0	52.4				
AVG. LENGTH (m)	52.6	33.1	60.8				
WIDTH 1 (m)	33.1	5.9	43.4				
WIDTH 2 (m)	28.9	11.0	38.6				
AVG. WIDTH (m)	31.0	8.45	41.0				

	TOTAL						
AREA (ha)	0.163	0.028	0.249				0.440

GCA (ha)	12.5
AREA (%)	3.52
AREA ERROR (%)	0.25
LOWER AREA LIMIT(%)	3.27

CALCULATION PROCEDURE:

1. Calculate the average of the two length measurements for each landing.
2. Calculate the average of the two width measurements for each landing.
3. Calculate the area of each landing in hectares by multiplying the average length by average width and dividing by 10,000.
4. Sum the area of all **landings** and enter this value in the column labelled "Total."
5. Divide the total **landing** area in hectares by the **gross** cutblock area (GCA) and multiply by 100 to calculate the percent area.
6. Calculate the area error by multiplying the area (%) by .0707
(e.g., 3.30% x .0707 = .23%).
7. Calculate the lower area limit by subtracting the area error % from the area %
(e.g., 3.3% - .23% = 3.07%).

***Use for landings, borrow pits, truck pull-outs, etc.**

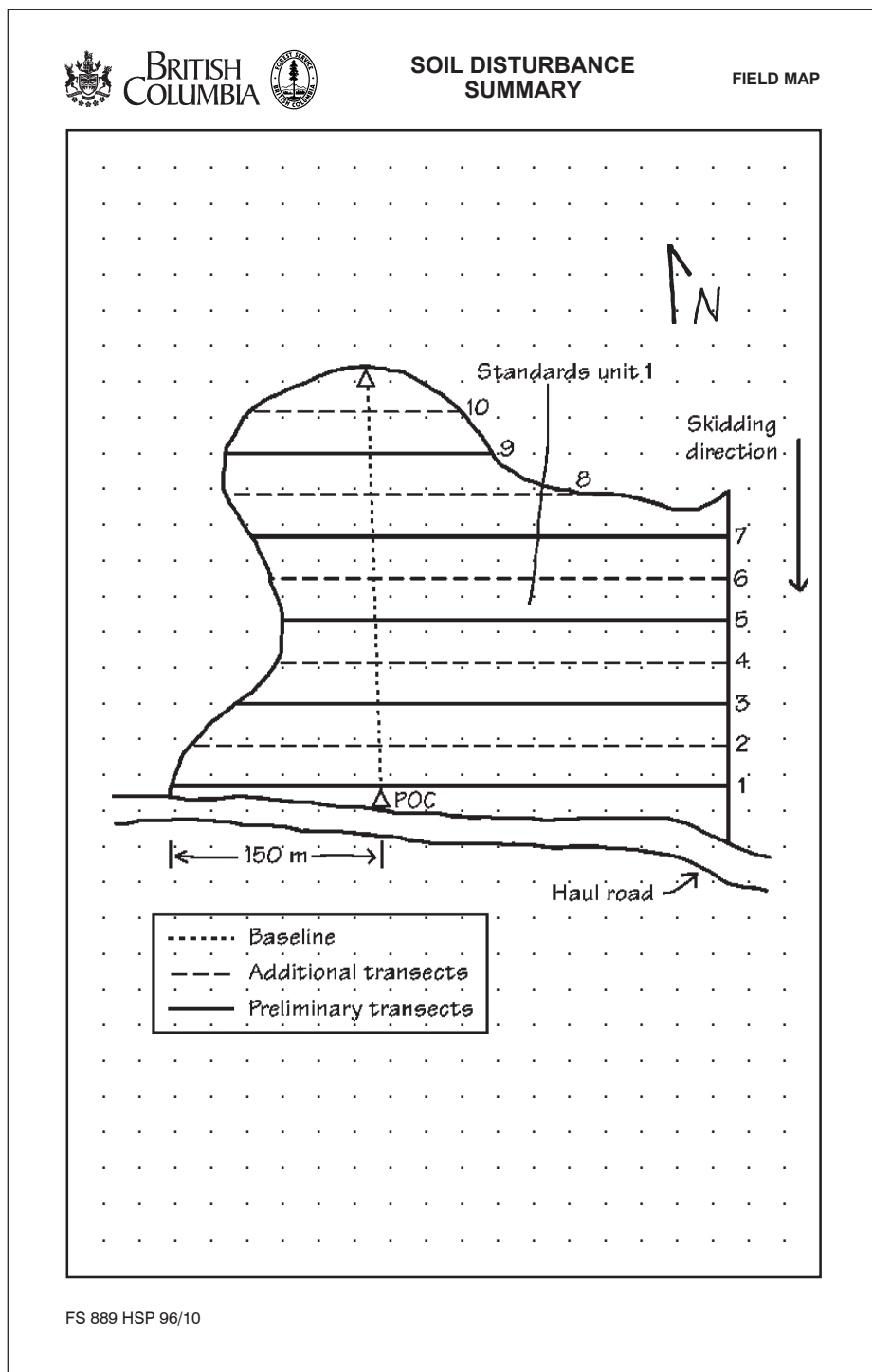
FS 886 HSP 96/8

**FS 889 HSP 96/10 (front) – Soil disturbance survey –
Soil disturbance summary
(example from large block data on the FS 885 form)**

BRITISH COLUMBIA		SOIL DISTURBANCE SUMMARY							
SURVEYOR A. Nybody				DATE Y M D 96 06 19		IDENTIFICATION NO. FFR-NE16			
LICENSE NO. A99423		LICENSEE LOGWANA		CP 10	BLOCK 4	BCGS OPENING 82K 044-009			
REGION		DISTRICT			TU OR SUSTRATUM Number 1 of 1				
GCA	NAR	SOIL HAZARD RATINGS	COMPAC- TION	DISPLACE- MENT	EROSION	MASS WASTING	FOR FLOOR DISPLACE- MENT		
			H	H	H	M	H		
COUNTED SOIL DISTURBANCE CATEGORIES (please 3)		☐ COMPACTED AREAS ☐ REPEATED MACHINE TRAFFIC ☐ WIDE SCALPS ☐ 5 cm DEEP WHEEL / TRACK RUTS ☐ CONTINUOUS SCALPS							
		SOIL DISTURBANCE SUMMARY							
		PERMANENT ACCESS STRUCTURES				SUMMARY			
			LANDINGS	HAUL ROADS	PERMANENT TRAILS	PERMANENT ACCESS		SP ALLOWABLE	LOWER 90% CL
	MEAN					COUNTED DISTURBANCE	10.0%	10.1%	0.1%
	AE %					DISPLACE- MENT	25.0%	24.5%	0.0%
				LCL:		PERMANENT ACCESS			
FOREST FLOOR REDUCTION:						SP LIMIT	UPPER 90% CL	NON-COMPLI- ANCE AMOUNT	
AVERAGE DEPTH OF FOREST FLOOR REMAINING AFTER BURNING:						cm			
CALCULATION PROCEDURE FOR LOWER CONFIDENCE LIMIT (LCL) FOR LANDINGS AND PERMANENT ACCESS STRUCTURES:									
1. Enter the Percentage Area Errors (AE) from the calculation cards corresponding to each disturbance type.									
2. Calculate the pooled Confidence Interval:									
$CI_{\text{Permanent Access}} = \sqrt{AE \%^2_{\text{Landings}} + AE \%^2_{\text{Roads}} + AE \%^2_{\text{Permanent Trails}}}$									
3. Calculate the Lower Confidence Limit as:									
$LCL_{\text{Permanent Access}} = \text{Total Permanent Access} - CI_{\text{Permanent Access}}$ similarly for Counted Disturbance and Forest Floor Displacement.									
COMMENTS <hr/>									

FS 889 HSP 96/10

FS 889 HSP 96/10 (back) – Soil disturbance summary – Field map



FS 895 HSP 96/10 (back) – Soil disturbance survey – Calculation procedure for large area method

CALCULATION PROCEDURE (retain four decimals in intermediate calculations):

1. Total each column in Row 1.
2. Calculate the mean number of surveyed points per grid centre in Cell H2.
3. Use the cell references in brackets to calculate the proportion of the total points surveyed with Counted Disturbance, Total Displacement and Skidroads.*

$$\text{Proportion Counted Disturbance} = \frac{[I1]}{[H1]} \quad \text{Proportion Total Displacement} = \frac{[J1]}{[H1]} \quad \text{Proportion Skidroads} = \frac{[K1]}{[H1]}$$

where the text in square brackets specifies the cell references on the form (e.g., [H1] = Total of Points Surveyed).

* For Forest Practices Code surveys, calculate Counted Disturbance and Total Displacement.

For areas with prescriptions approved under the 1994 Silviculture Practices Regulations, if you are on a site with a High Soil Displacement or High Surface Erosion Hazard, also calculate Skidroads.

4. Calculate the square of the proportions (Proportion²).
5. For Counted Disturbance, Total Displacement and Skidroads, calculate: Mean % = 100% x Proportion (from Step 3).
6. Calculate the Standard Error (SE %) for Counted Disturbance, Total Displacement and Skidroads, using the cell references shown in the formulas below (the text in square brackets indicates the cell references on the form (e.g., [H2] = Mean of Points):

$$SE_{\text{Counted \%}} = 100\% \times \sqrt{\frac{[E1] - (2 \times [I3] \times [A1]) + ([I4] \times [D1])}{n \times (n - 1) \times [H2]^2}}$$

$$SE_{\text{Displacement \%}} = 100\% \times \sqrt{\frac{[F1] - (2 \times [J3] \times [B1]) + ([J4] \times [D1])}{n \times (n - 1) \times [H2]^2}}$$

$$SE_{\text{Skidroads \%}} = 100\% \times \sqrt{\frac{[G1] - (2 \times [K3] \times [C1]) + ([K4] \times [D1])}{n \times (n - 1) \times [H2]^2}}$$

where n = number of grid centres.

7. Calculate the Lower Confidence Limit (LCL %): LCL% = Mean % - t x SE

where 't' is the value from the t-Table shown on the Traverse Survey Calculation Card (FS 881).

**FS 897 HSP 96/9 (front) –
Small area survey calculation card
(data have not been provided for these calculations)**



**BRITISH
COLUMBIA**



**SOIL DISTURBANCE SURVEY
SMALL AREA SURVEY CALCULATION CARD**

SURVEYOR A. Nybody		DATE Y M D 96 07 29			IDENTIFICATION NO. FFR-NE15	
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TOTAL POINTS	PRELIMINARY SURVEY	+	ADDITIONAL TRANSECTS	=	FINAL SURVEY
Counted (C)	28		33		61
Displaced (D)	51		56		107
Total (T)	255		255		510

COUNTED DISTURBANCE	PRELIMINARY SURVEY		FINAL SURVEY
Proportion (%) (C/T) x 100%	11.0%		12.0%
CI	2.7%		2.0%
Proportion (%) - CI	8.3%		10.0%
Proportion (%) + CI	13.7%		9.0%
			1.0%

FOREST FLOOR DISPLACEMENT	PRELIMINARY SURVEY		FINAL SURVEY
Proportion (%) (D/T) x 100%	20.0%		21.0%
CI	3.4%		2.4%
Proportion (%) - CI	16.6%		18.6%
Proportion (%) + CI	23.4%		30.0%
			-

COMMENTS Soil disturbance would have been higher if rehabilitation of
excavated trails had not been completed.

FS 897 HSP 96/9

**FS 897 HSP 96/9 (back) –
Small area transect survey calculation card**

**ONE-SIDED 90% CONFIDENCE INTERVAL HALF-WIDTHS (%)
FOR THE BINOMIAL DISTRIBUTION**

%	SAMPLE SIZE												
	100	150	200	250	300	350	400	450	500	550	600	650	700
1	1.8	1.4	1.2	1.0	0.9	0.8	0.8	0.7	0.7	0.6	0.6	0.6	0.6
2	2.3	1.8	1.5	1.3	1.2	1.1	1.0	1.0	0.9	0.9	0.8	0.8	0.8
3	2.7	2.1	1.8	1.6	1.4	1.3	1.2	1.1	1.1	1.0	1.0	0.9	0.9
4	3.0	2.4	2.0	1.8	1.6	1.5	1.4	1.3	1.2	1.2	1.1	1.1	1.0
5	3.3	2.6	2.2	2.0	1.8	1.6	1.5	1.4	1.4	1.3	1.2	1.2	1.1
6	3.6	2.8	2.4	2.1	1.9	1.8	1.6	1.5	1.5	1.4	1.3	1.3	1.2
7	3.8	3.0	2.6	2.3	2.1	1.9	1.8	1.7	1.6	1.5	1.4	1.4	1.3
8	4.0	3.2	2.7	2.4	2.2	2.0	1.9	1.8	1.7	1.6	1.5	1.4	1.4
9	4.2	3.3	2.8	2.5	2.3	2.1	2.0	1.8	1.7	1.7	1.6	1.5	1.5
10	4.4	3.5	3.0	2.6	2.4	2.2	2.0	1.9	1.8	1.7	1.7	1.6	1.5
11	4.5	3.6	3.1	2.7	2.5	2.3	2.1	2.0	1.9	1.8	1.7	1.7	1.6
12	4.7	3.7	3.2	2.8	2.6	2.4	2.2	2.1	2.0	1.9	1.8	1.7	1.6
13	4.8	3.9	3.3	2.9	2.7	2.4	2.3	2.1	2.0	1.9	1.8	1.8	1.7
14	5.0	4.0	3.4	3.0	2.7	2.5	2.4	2.2	2.1	2.0	1.9	1.8	1.8
15	5.1	4.1	3.5	3.1	2.8	2.6	2.4	2.3	2.1	2.0	2.0	1.9	1.8
16	5.2	4.2	3.6	3.2	2.9	2.7	2.5	2.3	2.2	2.1	2.0	1.9	1.8
17	5.3	4.3	3.7	3.3	3.0	2.7	2.5	2.4	2.3	2.1	2.1	2.0	1.9
18	5.4	4.4	3.7	3.3	3.0	2.8	2.6	2.4	2.3	2.2	2.1	2.0	1.9
19	5.6	4.5	3.8	3.4	3.1	2.8	2.6	2.5	2.4	2.2	2.1	2.1	2.0
20	5.7	4.5	3.9	3.4	3.1	2.9	2.7	2.5	2.4	2.3	2.2	2.1	2.0
21	5.7	4.6	4.0	3.5	3.2	2.9	2.7	2.6	2.4	2.3	2.2	2.1	2.0
22	5.8	4.7	4.0	3.6	3.2	3.0	2.8	2.6	2.5	2.4	2.3	2.2	2.1
23	5.9	4.8	4.1	3.6	3.3	3.0	2.8	2.7	2.5	2.4	2.3	2.2	2.1
24	6.0	4.8	4.1	3.7	3.3	3.1	2.9	2.7	2.6	2.4	2.3	2.2	2.1
25	6.1	4.9	4.2	3.7	3.4	3.1	2.9	2.7	2.6	2.5	2.4	2.3	2.2
26	6.1	4.9	4.2	3.8	3.4	3.2	2.9	2.8	2.6	2.5	2.4	2.3	2.2
27	6.2	5.0	4.3	3.8	3.5	3.2	3.0	2.8	2.6	2.5	2.4	2.3	2.2
28	6.3	5.0	4.3	3.8	3.5	3.2	3.0	2.8	2.7	2.5	2.4	2.3	2.2
29	6.3	5.1	4.4	3.9	3.5	3.3	3.0	2.9	2.7	2.6	2.5	2.4	2.3
30	6.4	5.1	4.4	3.9	3.6	3.3	3.1	2.9	2.7	2.6	2.5	2.4	2.3
31	6.5	5.2	4.5	4.0	3.6	3.3	3.1	2.9	2.8	2.6	2.5	2.4	2.3
32	6.5	5.2	4.5	4.0	3.6	3.3	3.1	2.9	2.8	2.6	2.5	2.4	2.3
33	6.6	5.3	4.5	4.0	3.7	3.4	3.1	3.0	2.8	2.7	2.5	2.4	2.4
34	6.6	5.3	4.6	4.0	3.7	3.4	3.2	3.0	2.8	2.7	2.6	2.5	2.4
35	6.6	5.3	4.6	4.1	3.7	3.4	3.2	3.0	2.9	2.7	2.6	2.5	2.4
36	6.7	5.4	4.6	4.1	3.7	3.4	3.2	3.0	2.8	2.7	2.6	2.5	2.4
37	6.7	5.4	4.6	4.1	3.7	3.5	3.2	3.0	2.9	2.7	2.6	2.5	2.4
38	6.8	5.4	4.7	4.1	3.8	3.5	3.2	3.0	2.9	2.7	2.6	2.5	2.4
39	6.8	5.5	4.7	4.2	3.8	3.5	3.3	3.1	2.9	2.8	2.6	2.5	2.4
40	6.8	5.5	4.7	4.2	3.8	3.5	3.3	3.1	2.9	2.8	2.6	2.5	2.4
45	6.9	5.6	4.8	4.2	3.9	3.6	3.3	3.1	3.0	2.8	2.7	2.6	2.5
50	6.9	5.6	4.8	4.3	3.9	3.6	3.3	3.1	3.0	2.8	2.7	2.6	2.5

Appendix 7. Counted soil disturbance categories and recommended limits according to hazard ratings

Soil disturbance hazard ^a	Soil sensitivity rating	Categories counted in allowable soil disturbance ^b	Allowable soil disturbance (% NAR)	
			Coast and Interior	
Assessment of soil hazards not required		Always + S + E + T5 + A	5	
Likelihood of landslides	M, H	Always + S	5	
Soil erosion	VH	Always + S	5	
Soil displacement	VH	Always + S	5	
Soil compaction	VH	Always + S + E + T5 + A	5	
			Coast	Interior
Soil erosion	H	Always	5	10
Soil erosion	M, L	Always	5	10
Soil displacement	H, M, L	Always	5	10
Soil compaction	H	Always + E + T5 + A	5	10
Soil compaction	M	Always + E + A	5	10
Soil compaction	L	Always	5	10
Likelihood of landslides	L	Always	5	10

^a Assessing the hazards for soil compaction, soil displacement, and soil erosion need not be done if the harvesting method is cable or aerial.

^b Under the “Categories counted” column, the term “Always” includes soil disturbance that is always counted, namely excavated or bladed trails, corduroyed trails, 15-cm-deep ruts, deep gouges, long gouges, wide gouges, very wide scalps. The meaning of the other symbols are: “S”: wide scalps; “T5”: 5-cm-deep ruts; “E”: repeated machine traffic; and “A”: compacted areas.

Combine the categories measured for different hazard ratings if that will result in more categories being counted or a lower allowable disturbance limit. For example, on a site with a Very High compaction hazard and a High surface erosion hazard, the categories counted are “Always + S + E + A + T5,” the soil disturbance limit would be 5%.