BC Timber Sales
Steep Slope Roles and Responsibilities Guide for Ground Based Equipment

Purpose

This document is intended to define BC Timber Sales staff roles and responsibilities for ground based equipment planned and operating on steep slopes for TSL holders and contractors. This guidance is to be implemented during planning and operations of all ground based equipment activities. Steep slopes present a hazard to ground base equipment and workers.

Applicable WorkSafe BC Occupational Health & Safety Regulation

26.16 Slope Limitations

(3) If the manufacturer's maximum slope operating stability limit for logging equipment is not known, the equipment must be operated within the following limits:

(a) **a rubber tired skidder must not be operated on a slope which exceeds 35%;**

(b) **a crawler tractor, feller-buncher, excavator and other similar equipment must not be operated on a slope which exceeds 40%;**

(c) any other forestry equipment specifically designed for use on a steep slope must not be operated on a slope which exceeds 50%.

(4) Despite subsections (2) and (3) but subject to subsection (5), logging equipment may be operated beyond the maximum slope operating stability limits specified in those subsections if

(a) a qualified person conducts a risk assessment of that operation, and

(b) a written safe work practices acceptable to the Board are developed and implemented to ensure the equipment's stability during operation.

(5) **Despite anything in this section, logging equipment must not be operated in a particular location or manner if its stability cannot be assured during that operation**.

Timber Sale Licence Activities

Planning Stage (Pre-TSL Award)

When slopes over 35% exist in a proposed project, BCTS staff and or planning development contractors will do the following:

1. Identify known slopes and relevant site information such as:
    - Long pitches of continuous slope
    - Terrain Stability Features e.g. fracture rock formation
    - Ground Roughness e.g. hummocks, depressions steep, ravines
    - Soil Conditions e.g. soil depth, exposed rock, loose gravels or soft mud.
    - Timber size and quality
    - Slopes or benches less than 35% but located above areas of greater slope
2. Identify logging system(s) that were considered in the design of each project area e.g. overhead cable and ground based.
3. Slope information to be documented/communicated on applicable project plan maps (HP), TSL

safety highlights and or 18-1.

TSL Award and Operations Stage

1. During pre-works BCTS staff should do the following:
   - ✓ Communicate steep slope information to TSL holder (Review TSL Safety and Highlights, 18-1).
   - ✓ Remind TSL holder of WSBC steep slope requirements 26.2 (completed risk assessment and safe work procedures).
   - ✓ Document details of items discussed.
2. During inspections, if staff observes ground based equipment exceeding slope limitations, they should ask the site supervisor if a site risk assessment has been completed, and if safe work practices have been developed. BCTS does not review or approve the site risk assessments or the safe work practices. Staff only asks if they are in place for each cut block. We can ask to see them, but only to prove they exist, not to determine their adequacy. Document your observations using appropriate checklists.
3. Despite a completed site risk assessment and a block specific safe work practice, if staff observes operations occurring that appear to put workers at risk, we should report and document potentially unsafe acts and or conditions to the site supervisor. If the client disregards our concerns and continues to put their workers at risk; we have an obligation under section 3.10 to report this to Worksafe BC.

Contract Activities e.g. mechanical site prep, mechanical felling.

Planning stage (Pre-contract Award)

When slopes over 35% exist in a proposed project, BCTS staff and or planning development contractors will do the following:

1. Identify known slopes and relevant site information, such as:
   - Long pitches of continuous slope
   - Terrain Stability Features e.g. fracture rock formation
   - Ground Roughness e.g. hummocks, depressions steep, ravines
   - Soil Conditions e.g. soil depth, exposed rock, loose gravels or soft mud.
   - Timber size and quality
   - Slopes or benches less than 35% but located above areas of greater slope.

Note, where possible utilize existing steep slope information collected e.g. TSL/HP maps.

2. Slope information to be documented/communicated on applicable project plan maps, information to bidders and or 19-1.

Contract Award and Operational Stage

1. During pre-works BCTS staff should do the following:
   - ✓ Communicate steep slope information to contractor (Review Info to Bidders, 19-1).
   - ✓ Remind Contractor of WSBC steep slope requirements 26.2 (completed risk assessment and safe work procedures).
   - ✓ Document details of items discussed.
2. During inspections BCTS staff should do the following:
   - ✓ Ensure contractor has conducted and documented a steep slope risk assessment
   - ✓ Ensure contractor has developed and implemented steep slope safety plan
   - ✓ Ensure contractor periodically evaluates effectiveness of the safety plan
   - ✓ Ensure you document your observations.

3. If staff observe operations occurring that appear to put worker at risk and or not meet WSBC requirements then BCTS should communicate observations to contractor or site supervisor and development of corrective action. Where necessary utilize contract provisions to remedy any unsafe conditions and or acts that are hazardous to the health or safety of workers e.g. stop work. If necessary report to Worksafe BC. Document observations using appropriate inspection checklists.

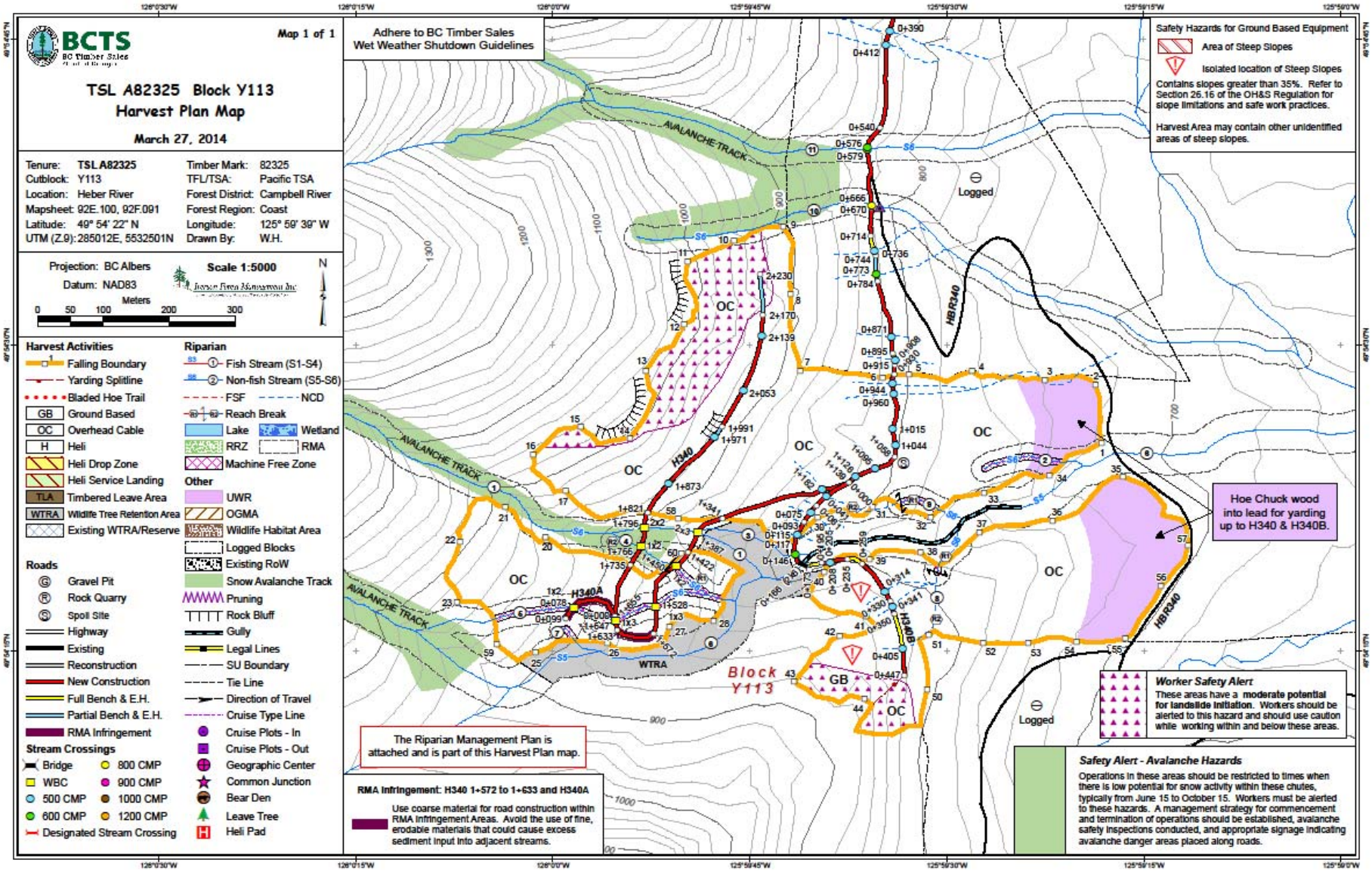
Appendix 1: Example of harvest plan map with known steep slopes identified.

Appendix 2: Example of steep slope hazard assessment and safety plan

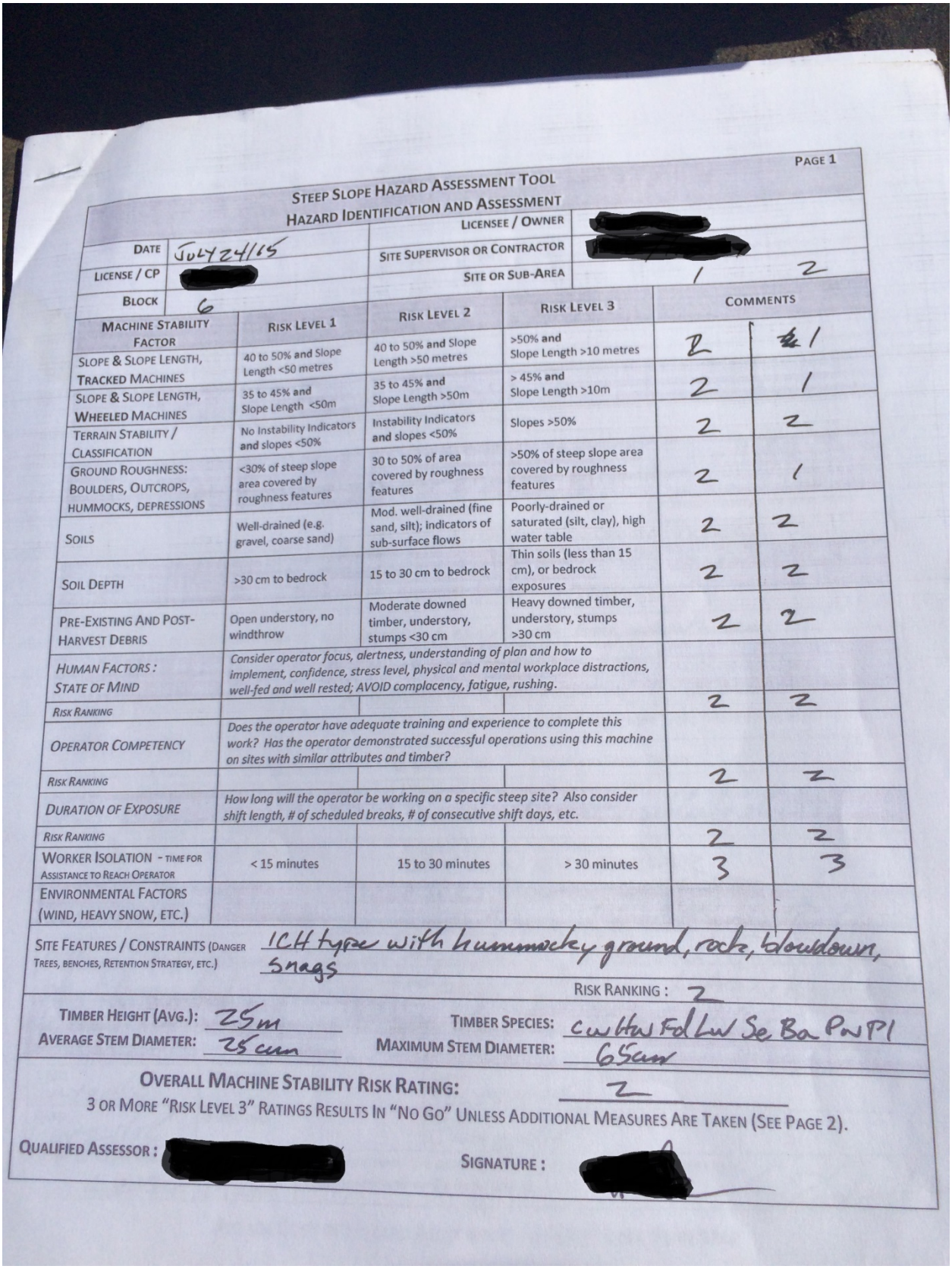
References

- ✓ **BC Forest Safety Council Draft Industry Guidance *"Mechanical Equipment Operation on Steep Slopes".*** http://www.bcforestsafe.org/steep_slope.html

Appendix 1 Harvest Plan Map example showing steep slope information



Appendix #2 Example: Steep slope hazard assessment and safety plan



PAGE 1

STEEP SLOPE HAZARD ASSESSMENT TOOL
HAZARD IDENTIFICATION AND ASSESSMENT

DATE	July 24/15	LICENSEE / OWNER	[redacted]
LICENSE / CP	[redacted]	SITE SUPERVISOR OR CONTRACTOR	[redacted]
BLOCK	6	SITE OR SUB-AREA	1 / 2

MACHINE STABILITY FACTOR	RISK LEVEL 1	RISK LEVEL 2	RISK LEVEL 3	COMMENTS	
SLOPE & SLOPE LENGTH, TRACKED MACHINES	40 to 50% and Slope Length <50 metres	40 to 50% and Slope Length >50 metres	>50% and Slope Length >10 metres	2	2/1
SLOPE & SLOPE LENGTH, WHEELED MACHINES	35 to 45% and Slope Length <50m	35 to 45% and Slope Length >50m	> 45% and Slope Length >10m	2	1
TERRAIN STABILITY / CLASSIFICATION	No Instability Indicators and slopes <50%	Instability Indicators and slopes <50%	Slopes >50%	2	2
GROUND ROUGHNESS: BOULDERS, OUTCROPS, HUMMOCKS, DEPRESSIONS	<30% of steep slope area covered by roughness features	30 to 50% of area covered by roughness features	>50% of steep slope area covered by roughness features	2	1
SOILS	Well-drained (e.g. gravel, coarse sand)	Mod. well-drained (fine sand, silt); indicators of sub-surface flows	Poorly-drained or saturated (silt, clay), high water table	2	2
SOIL DEPTH	>30 cm to bedrock	15 to 30 cm to bedrock	Thin soils (less than 15 cm), or bedrock exposures	2	2
PRE-EXISTING AND POST-HARVEST DEBRIS	Open understory, no windthrow	Moderate downed timber, understory, stumps <30 cm	Heavy downed timber, understory, stumps >30 cm	2	2
HUMAN FACTORS: STATE OF MIND	*Consider operator focus, alertness, understanding of plan and how to implement, confidence, stress level, physical and mental workplace distractions, well-fed and well rested; AVOID complacency, fatigue, rushing.*				
RISK RANKING				2	2
OPERATOR COMPETENCY	*Does the operator have adequate training and experience to complete this work? Has the operator demonstrated successful operations using this machine on sites with similar attributes and timber?*				
RISK RANKING				2	2
DURATION OF EXPOSURE	*How long will the operator be working on a specific steep site? Also consider shift length, # of scheduled breaks, # of consecutive shift days, etc.*				
RISK RANKING				2	2
WORKER ISOLATION - TIME FOR ASSISTANCE TO REACH OPERATOR	< 15 minutes	15 to 30 minutes	> 30 minutes	3	3
ENVIRONMENTAL FACTORS (WIND, HEAVY SNOW, ETC.)					

SITE FEATURES / CONSTRAINTS (DANGER TREES, BENCHES, RETENTION STRATEGY, ETC.) ICH type with hummocky ground, rocks, blowdown, snags

RISK RANKING : 2

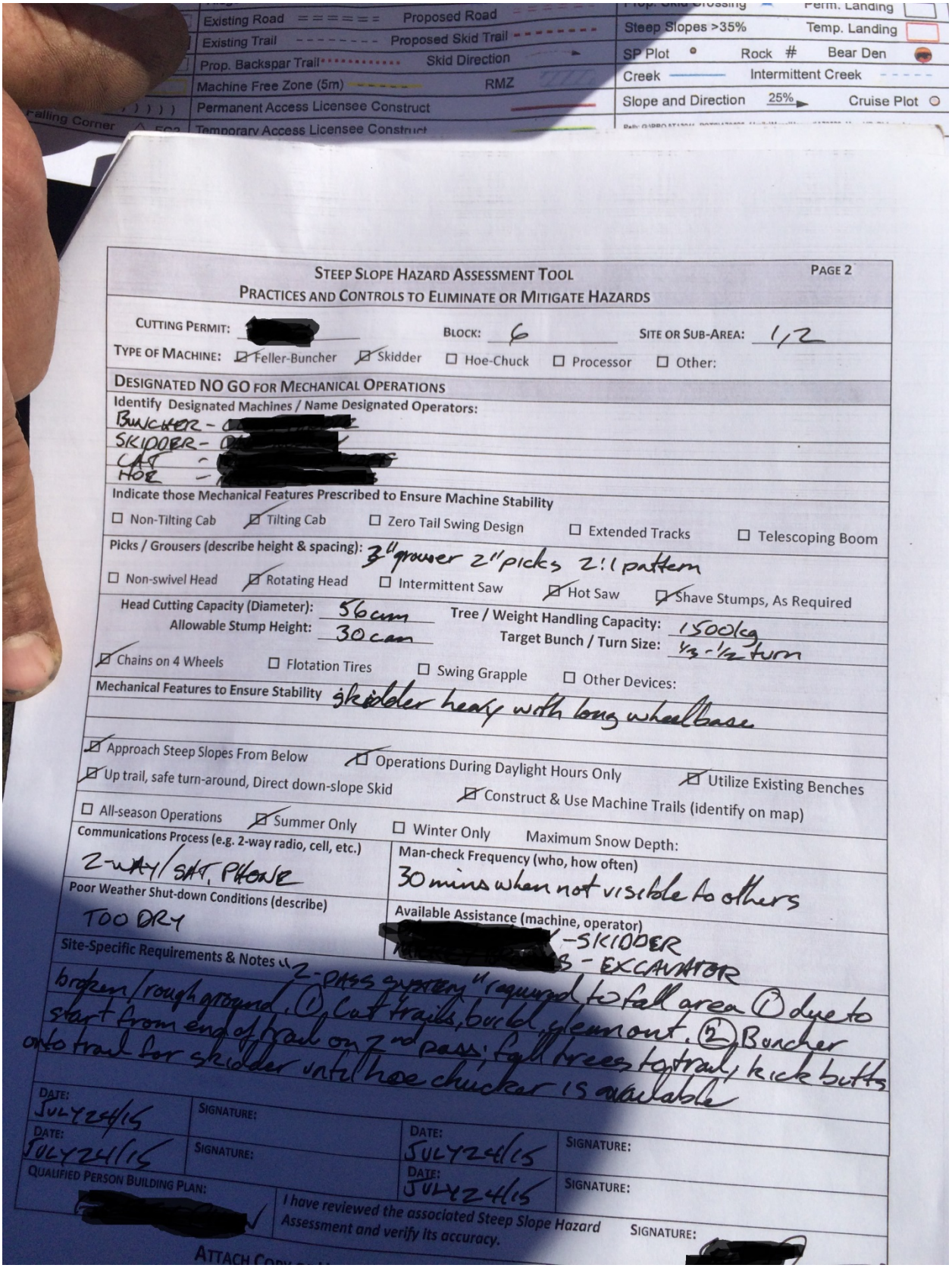
TIMBER HEIGHT (AVG.): 25m
AVERAGE STEM DIAMETER: 25cm
TIMBER SPECIES: Cw Hw Fd Lw Se Ba Pw Pl
MAXIMUM STEM DIAMETER: 65cm

OVERALL MACHINE STABILITY RISK RATING: 2

3 OR MORE "RISK LEVEL 3" RATINGS RESULTS IN "NO GO" UNLESS ADDITIONAL MEASURES ARE TAKEN (SEE PAGE 2).

QUALIFIED ASSESSOR : [redacted]

SIGNATURE : [redacted]


Existing Road ====== Proposed Road
Existing Trail -------- Proposed Skid Trail
Prop. Backspar Trail ..... Skid Direction
Machine Free Zone (5m) RMZ
Permanent Access Licensee Construct
Temporary Access Licensee Construct
Steep Slopes >35% Temp. Landing
SP Plot Rock # Bear Den
Creek Intermittent Creek
Slope and Direction 25% Cruise Plot

STEEP SLOPE HAZARD ASSESSMENT TOOL PAGE 2
PRACTICES AND CONTROLS TO ELIMINATE OR MITIGATE HAZARDS

CUTTING PERMIT: [redacted] BLOCK: 6 SITE OR SUB-AREA: 1/2
TYPE OF MACHINE: ☒ Feller-Buncher ☒ Skidder ☐ Hoe-Chuck ☐ Processor ☐ Other:

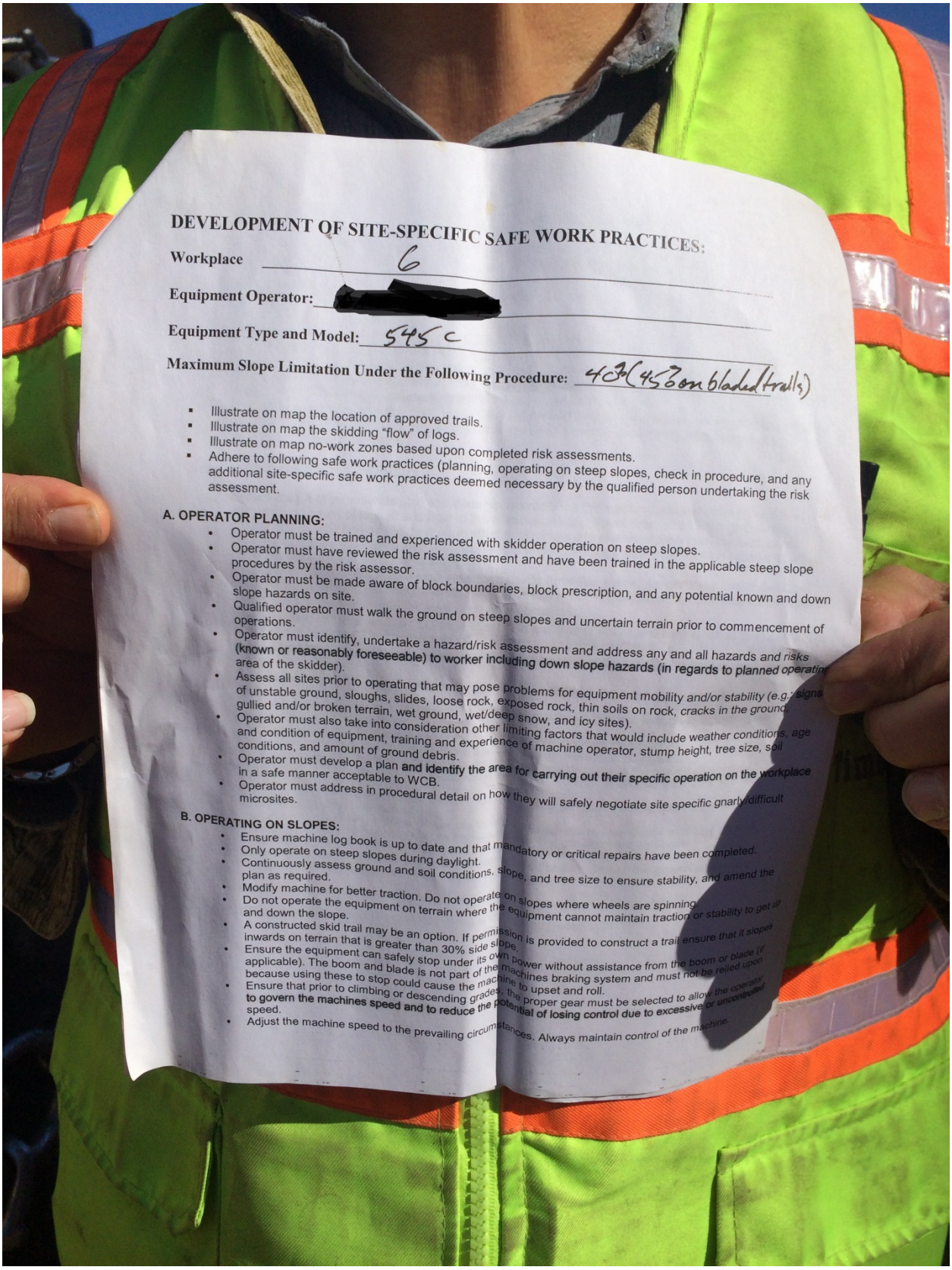
DESIGNATED NO GO FOR MECHANICAL OPERATIONS
Identify Designated Machines / Name Designated Operators:
BUNCHER - [redacted]
SKIDDER - [redacted]
CAT -
HOE - [redacted]

Indicate those Mechanical Features Prescribed to Ensure Machine Stability
☐ Non-Tilting Cab ☒ Tilting Cab ☐ Zero Tail Swing Design ☐ Extended Tracks ☐ Telescoping Boom
Picks / Grousers (describe height & spacing): 3" grouser 2" picks 2:1 pattern
☐ Non-swivel Head ☒ Rotating Head ☐ Intermittent Saw ☒ Hot Saw ☒ Shave Stumps, As Required
Head Cutting Capacity (Diameter): 56cm Tree / Weight Handling Capacity: 1500kg
Allowable Stump Height: 30cm Target Bunch / Turn Size: 1/3-1/2 turn
☒ Chains on 4 Wheels ☐ Flotation Tires ☐ Swing Grapple ☐ Other Devices:
Mechanical Features to Ensure Stability skidder heavy with long wheelbase

☒ Approach Steep Slopes From Below ☒ Operations During Daylight Hours Only ☒ Utilize Existing Benches
☒ Up trail, safe turn-around, Direct down-slope Skid ☒ Construct & Use Machine Trails (identify on map)
☐ All-season Operations ☒ Summer Only ☐ Winter Only Maximum Snow Depth:

Communications Process (e.g. 2-way radio, cell, etc.): 2-WAY / SAT. PHONE
Man-check Frequency (who, how often): 30 mins when not visible to others
Poor Weather Shut-down Conditions (describe): TOO DRY
Available Assistance (machine, operator): [redacted] -SKIDDER [redacted] - EXCAVATOR
Site-Specific Requirements & Notes: 2-PASS system required to fall area ① due to broken/rough ground. ① Cat trails, build, plan out. ② Buncher start from end of trail on 2nd pass; fall trees to trail, kick butts onto trail for skidder until hoe chucker is available

DATE: JULY 24/15 SIGNATURE:
DATE: JULY 24/15 SIGNATURE:
DATE: JULY 24/15 SIGNATURE:
QUALIFIED PERSON BUILDING PLAN: [redacted] I have reviewed the associated Steep Slope Hazard Assessment and verify its accuracy. SIGNATURE: [redacted]
ATTACH CO...



DEVELOPMENT OF SITE-SPECIFIC SAFE WORK PRACTICES:

Workplace 6

Equipment Operator: [redacted]

Equipment Type and Model: 545 C

Maximum Slope Limitation Under the Following Procedure: 40% (45% on bladed trails)

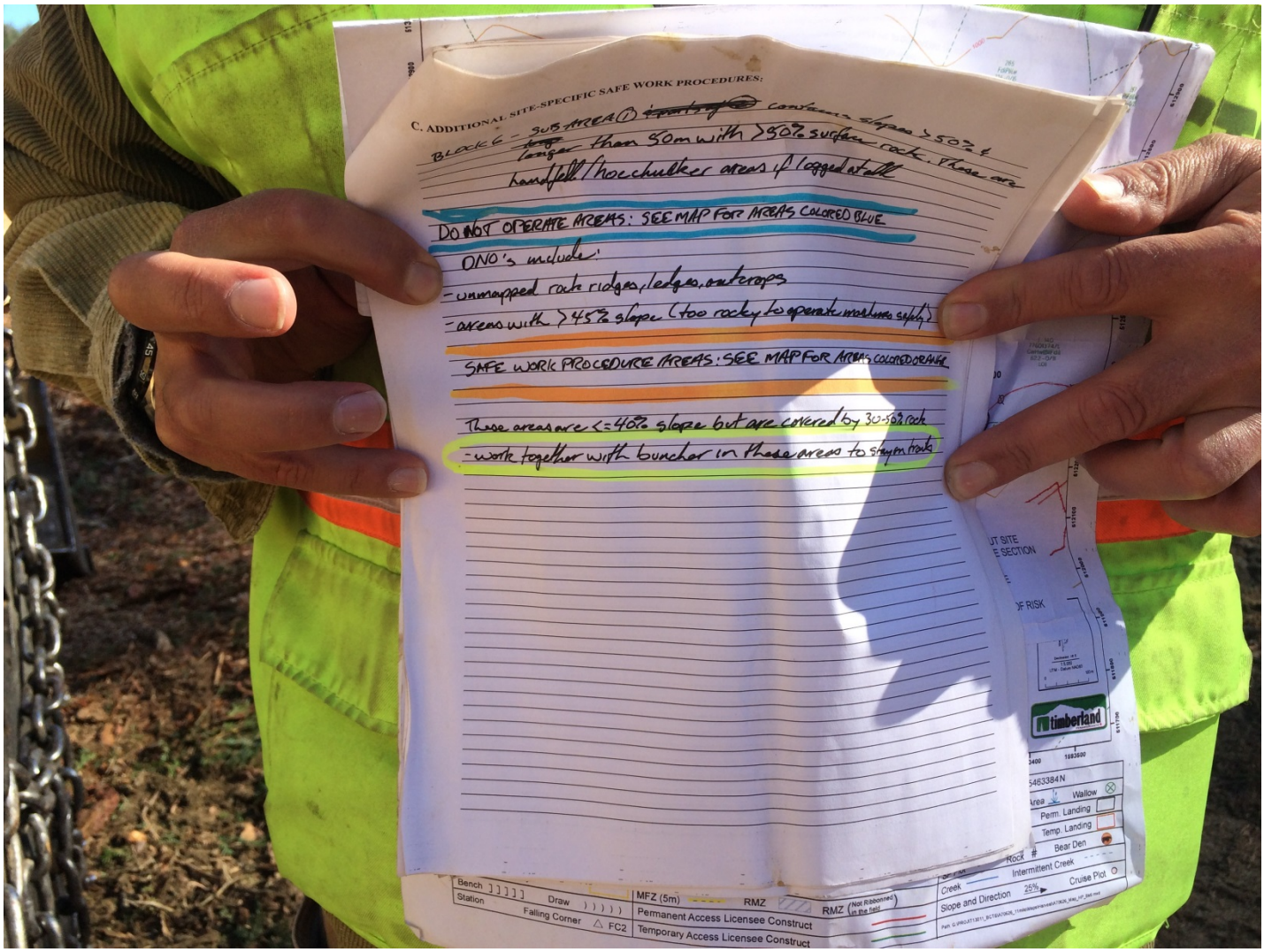
- Illustrate on map the location of approved trails.
- Illustrate on map the skidding "flow" of logs.
- Illustrate on map no-work zones based upon completed risk assessments.
- Adhere to following safe work practices (planning, operating on steep slopes, check in procedure, and any additional site-specific safe work practices deemed necessary by the qualified person undertaking the risk assessment.

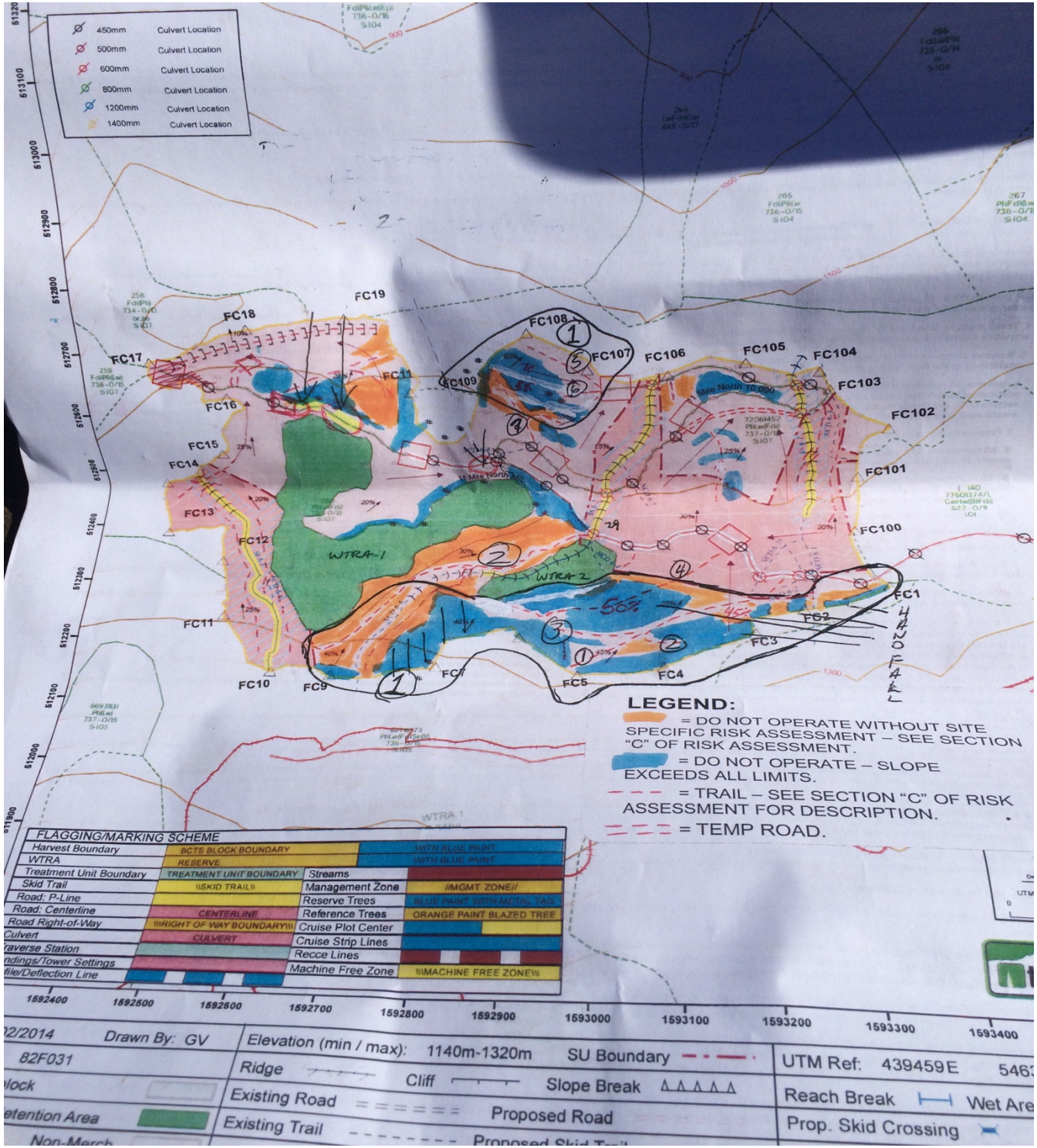
A. OPERATOR PLANNING:

- Operator must be trained and experienced with skidder operation on steep slopes.
- Operator must have reviewed the risk assessment and have been trained in the applicable steep slope procedures by the risk assessor.
- Operator must be made aware of block boundaries, block prescription, and any potential known and down slope hazards on site.
- Qualified operator must walk the ground on steep slopes and uncertain terrain prior to commencement of operations.
- Operator must identify, undertake a hazard/risk assessment and address any and all hazards and risks (known or reasonably foreseeable) to worker including down slope hazards (in regards to planned operating area of the skidder).
- Assess all sites prior to operating that may pose problems for equipment mobility and/or stability (e.g.: signs of unstable ground, sloughs, slides, loose rock, exposed rock, thin soils on rock, cracks in the ground, gullied and/or broken terrain, wet ground, wet/deep snow, and icy sites).
- Operator must also take into consideration other limiting factors that would include weather conditions, age and condition of equipment, training and experience of machine operator, stump height, tree size, soil conditions, and amount of ground debris.
- Operator must develop a plan and identify the area for carrying out their specific operation on the workplace in a safe manner acceptable to WCB.
- Operator must address in procedural detail on how they will safely negotiate site specific gnarly/difficult microsites.

B. OPERATING ON SLOPES:

- Ensure machine log book is up to date and that mandatory or critical repairs have been completed.
- Only operate on steep slopes during daylight.
- Continuously assess ground and soil conditions, slope, and tree size to ensure stability, and amend the plan as required.
- Modify machine for better traction. Do not operate on slopes where wheels are spinning.
- Do not operate the equipment on terrain where the equipment cannot maintain traction or stability to get up and down the slope.
- A constructed skid trail may be an option. If permission is provided to construct a trail ensure that it slopes inwards on terrain that is greater than 30% side slope.
- Ensure the equipment can safely stop under its own power without assistance from the boom or blade (if applicable). The boom and blade is not part of the machines braking system and must not be relied upon because using these to stop could cause the machine to upset and roll.
- Ensure that prior to climbing or descending grades, the proper gear must be selected to allow the operator to govern the machines speed and to reduce the potential of losing control due to excessive or uncontrolled speed.
- Adjust the machine speed to the prevailing circumstances. Always maintain control of the machine.


C. ADDITIONAL SITE-SPECIFIC SAFE WORK PROCEDURES:
BLOCK 6 - 305 AREA ① contains slopes >50% & longer than 50m with >50% surface rock. These are landfall/shoreline areas if logged at all
DO NOT OPERATE AREAS: SEE MAP FOR AREAS COLORED BLUE
ONO's include:
- unmapped rock ridges/ledges, outcrops
- areas with >45% slope (too rocky to operate machine safely)
SAFE WORK PROCEDURE AREAS: SEE MAP FOR AREAS COLORED ORANGE
These areas are <=40% slope but are covered by 30-50% rock
- work together with buncher in these areas to strategize
Timberland
Wallow
Perm. Landing
Temp. Landing
Bear Den
Intermittent Creek
Cruise Plot
Creek
Slope and Direction
Bench
Station
Draw
Falling Corner
FC2
MFZ (5m)
RMZ
RMZ (Not Ribboned in the field)
Permanent Access Licensee Construct
Temporary Access Licensee Construct


450mm Culvert Location
500mm Culvert Location
600mm Culvert Location
800mm Culvert Location
1200mm Culvert Location
1400mm Culvert Location
FC1
FC2
FC3
FC4
FC5
FC6
FC7
FC8
FC9
FC10
FC11
FC12
FC13
FC14
FC15
FC16
FC17
FC18
FC19
FC100
FC101
FC102
FC103
FC104
FC105
FC106
FC107
FC108
FC109
WTRA-1
WTRA-2
HANO FAEL
LEGEND:
= DO NOT OPERATE WITHOUT SITE SPECIFIC RISK ASSESSMENT – SEE SECTION "C" OF RISK ASSESSMENT.
= DO NOT OPERATE – SLOPE EXCEEDS ALL LIMITS.
= TRAIL – SEE SECTION "C" OF RISK ASSESSMENT FOR DESCRIPTION.
= TEMP ROAD.
FLAGGING/MARKING SCHEME
Harvest Boundary
WTRA
Treatment Unit Boundary
Skid Trail
Road: P-Line
Road: Centerline
Road Right-of-Way
Culvert
Traverse Station
Landings/Tower Settings
Rifle/Deflection Line
BCTS BLOCK BOUNDARY
RESERVE
TREATMENT UNIT BOUNDARY
\\SKID TRAIL\\
CENTERLINE
\\\RIGHT OF WAY BOUNDARY\\\
CULVERT
WITH BLUE PAINT
WITH BLUE PAINT
Streams
Management Zone
Reserve Trees
Reference Trees
Cruise Plot Center
Cruise Strip Lines
Recce Lines
Machine Free Zone
//MGMT ZONE//
BLUE PAINT WITH METAL TAG
ORANGE PAINT BLAZED TREE
\\\MACHINE FREE ZONE\\\
1592400
1592500
1592600
1592700
1592800
1592900
1593000
1593100
1593200
1593300
1593400
Drawn By: GV
Elevation (min / max): 1140m-1320m
SU Boundary
UTM Ref: 439459E
82F031
Ridge
Cliff
Slope Break
Reach Break
Wet Are
Existing Road
Proposed Road
Prop. Skid Crossing
Existing Trail