



RISK ASSESSMENT FORM

(For use when trees are being retained for landscape or other forest practices purposes adjoining public places*)

Date:

Forest Practices Plan No:

Coupe No:

Location:

Landowner:

Road or Place Name:

Person(s) Carrying Out Assessment:

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Signature(s):

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* Roads used by the public, buildings, picnic areas etc.

PROCEDURE FOR ASSESSING THE RISK TO PUBLIC SAFETY WHERE TREES ARE RETAINED UNDER THE FOREST PRACTICES SYSTEM

1. Describe individual hazardous trees requiring removal

The removal of individual hazardous trees may greatly reduce the risk to the public, providing adjoining retained trees are not damaged in the process. Hazardous trees are trees that should be inspected and marked for removal as part of the normal safety risk assessment procedure for a forest operation.

When conducting the risk assessment procedure described in the following sections, individual hazardous trees can be assumed to be still in place for “before harvesting” assessments, and to have been removed for “after harvesting” assessments.

Describe trees, attach sketch map, describe location, indicate how marked etc.

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2. Factors affecting the potential safety risk to the public

The factors to be considered are grouped into “Probability” and “Public Exposure” factors:

Probability	Factors affecting the likelihood of trees falling onto a public place*, thus potentially causing a public safety risk – called “Probability” in the Risk Assessment Calculator at the back of this procedure.
Public Exposure	The risk to the public as a consequence of a tree (or limb) falling onto a public place, determined by the level of public usage of a public place – called “Public Exposure” in the Risk Assessment Calculator at the back of this procedure.

2.1 Calculation of “Probability”

Assessment of factors affecting the likelihood of trees falling onto a public place

Harvesting can reduce the likelihood of trees falling onto a public place by removal of the trees. Alternatively, harvesting can increase the likelihood of trees falling onto a public place by increasing the exposure of retained trees to wind.

A number of factors will affect the likelihood of trees falling onto a public place. These are:

- 1) Slope and distance of trees from the public place
- 2) Drainage
- 3) Stand characteristics
- 4) Exposure to wind

These factors are evaluated both **(i) Before harvesting** and **(ii) After harvesting** to determine the “Probability” of trees falling onto a public place using a points score system (pages 4 – 8).

* Roads used by the public, buildings, picnic areas etc.

2.1.1 Slope and distance

Slope – Trees on the uphill side of the public place will obviously present a greater risk than trees on the downhill side. The steeper the slope, the greater the risk from trees on the uphill side, and the lesser the risk from trees on the downhill side.

Distance – Trees greater than one tree length from the public place will present a very small risk unless they are on a steep bank above the public place. Trees immediately adjoining the public place will obviously present the greatest risk of falling on the public place.

Scoring:

In the event of a tree or large limb falling, the chances of it falling onto the public place are:

- 0 = Slight - e.g. trees are downslope but some may potentially fall onto the public place, or the trees are at least half a tree length away from the public place on level ground
- 1 = Moderate
- 2 = High - e.g. trees are close to the public place and slightly upslope, or trees are over half a tree length from the public place but steeply upslope
- 3 = Very high - e.g. trees are close to the public place and steeply upslope

(i) Score before harvesting =

(ii) Score after harvesting =

Note: The score after harvesting will always be the same as or lower than the score before harvesting. A lower score after harvesting may result if some of the trees within a tree length of the public place are to be removed during harvesting.

Comments:

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2.1.2 Drainage

This category includes consideration of the factors that affect the wind firmness of trees. Poorly drained soils have low strength. This, combined with shallow tree rooting, results in a greater risk of windthrow. Seasonally saturated soils may be similar. There may be a history of windthrow in the area. Forestry activities can affect the potential for windthrow by directing water away or onto certain areas.

Scoring:

0 = Good drainage

1 = Moderate drainage

2 = Poor drainage

(i) **Score before harvesting** =

(ii) **Score after harvesting** =

Note: As harvesting is unlikely to affect drainage significantly the score after harvesting will nearly always be the same as before harvesting.

Comments:

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2.1.3 Stand characteristics

The factors that need to be considered here include the height of the stand, the size of the tree crowns, the species of trees, the soundness of individual trees (but see also the section regarding evaluation of hazardous trees on page 2), tree lean and stand age (regrowth, overmature etc.). In some cases the potential for large limbs blowing out of the tops of trees may constitute the greatest risk. If there is significant root damage to trees (e.g. caused by previous road construction) then consideration should be given to increasing the score.

Scoring:

- 0 = Low risk - e.g. small to medium sized regrowth
- 1 = Moderate risk – e.g. large regrowth or mature trees with small sound crowns
- 2 = High risk – e.g. overmature trees, or mature trees with large crowns or significant lean toward the public place. Trees may have defective butts

(i) **Score before harvesting** =

(ii) **Score after harvesting** =

Note: The score after harvesting may be lower than that before harvesting where removal of hazardous trees is planned (as per page 2).

Comments:

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2.1.4 Exposure to wind

The relative risk exposure of the site should be judged considering factors such as position on slope, aspect, and exposure to prevailing strong winds, especially during winter/spring when soils may be saturated.

The wind exposure of trees adjoining a public place may be increased due to the proposed harvesting. The increase in exposure will relate to the harvesting system used (clearfall, heavy or light partial harvesting, thinning), and the width and dimensions of any strips or clumps of retained forest.

The main risk associated with harvesting will be a greater potential for windthrow in the first year after harvesting.

Scoring:

(i) Before harvesting

- 0 = Sheltered – the trees adjoining the public place are relatively sheltered from wind
- 1 = Exposed – the trees adjoining the public place are relatively exposed due to position on slope, aspect etc. or due to the presence of a large opening facing the strongest wind direction adjoining the public place

(ii) After harvesting

Add **0** to the “Before harvesting” score if harvesting will not affect the exposure of trees adjoining the public place, e.g. where a wide retention strip (say 50 to 100 m wide, depending on the circumstances) is retained between the harvested area and the public place.

Add **1** to the “Before harvesting” score if harvesting will cause some increase in the exposure of trees adjoining the public place, e.g. where a narrower retention strip is retained between the harvested area and the public place, or where light partial harvesting is undertaken with no retention strip.

Add **2** to the “Before harvesting” score if harvesting will cause a significant increase in exposure of trees adjoining the public place, e.g. where a narrow retention strip is retained between the harvested area and the public place, or where heavy partial harvesting is undertaken with no retention strip.

(i) **Score before harvesting = (must be 0 or 1)**

(ii) **Score after harvesting = (must be from 0 to 3)**

Comments:
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Calculation of “Probability” of trees falling onto a public place following harvesting

In this section the chance of trees or large limbs falling onto a public place both before and after harvesting is calculated.

(i) Before harvesting

- Score for:
- 1) Slope and distance (from page 4)
 - 2) Drainage (from page 5)
 - 3) Stand characteristics (from page 6)
 - 4) Exposure to wind (from page 7)
- Sum of 1) to 4) above = **PROBABILITY SCORE before harvesting**

(ii) After harvesting

- Score for:
- 1) Slope and distance (from page 4)
 - 2) Drainage (from page 5)
 - 3) Stand characteristics (from page 6)
 - 4) Exposure to wind (from page 7)
- Sum of 1) to 4) above = **PROBABILITY SCORE after harvesting**

Use the Probability Scores calculated above in the table below as a guide to assess the “Probability of Occurrence” of trees falling onto the public place and constituting a risk to public safety both (i) before harvesting and (ii) after harvesting.

TABLE 1

Probability Score	Probability of Occurrence	Description
10	Almost certain	The event is expected to occur in most circumstances
8 - 9	Very likely	The event will probably occur in most circumstances
6 - 7	Unusual but possible	The event should occur at some time
4 - 5	Remotely possible	The event could occur at some time
0 - 3	Very unlikely	The event may occur only in exceptional circumstances

Probability of Occurrence: (i) Before harvesting.....
(ii) After harvesting.....

2.2 Calculation of “Public Exposure”

The level of usage of a public place, (“Public Exposure” on the Risk Assessment Calculator located at the end of this document), will determine the chance of injury to the public should a tree fall onto the public place. The main risk will be associated with a vehicle colliding with a fallen tree, or of a tree falling on a building, camping area etc. whilst occupied. A much lesser risk will be that of a tree falling directly onto a vehicle. For **roads** make an estimate of the average number of vehicles per day (including those associated with forest operations) on a year round basis, or if the period of risk is considered very seasonal, for that period of the year.

In some circumstances the public exposure rating after harvesting may different to that before harvesting, e.g. it may be decided that to further reduce the public risk the road will be closed during periods of high winds in the first year after harvesting; or it may be decided to send out a patrol early each morning where there has been strong winds to remove any debris which has fallen on the road.

For **other public places** (buildings, camping areas etc.), make your own determination on whether usage is continuous (e.g. occupied buildings), frequent, occasional, infrequent or rare.

Use the following tables as a guide to calculate the “Public Exposure” rating before harvesting and after harvesting (usually the same):

TABLE 2A - ROADS

Estimated no. of vehicles per day	Typical Road Type	Public Exposure Rating (refer Risk Assessment Calculator)
>100	Mostly sealed roads - highway, major tourist road, link road etc.	Frequent
25-100	Main country road, major logging road	Occasional
10-25	Mostly unsealed roads - minor country road, major logging road	Infrequent
<10	Minor logging road	Rare

TABLE 2B – OTHER PUBLIC PLACES

Type of Public Place	Public Exposure Rating (refer Risk Assessment Calculator)
Occupied building	Continuous
High usage camping or picnic area	Frequent
Low usage camping or picnic area, walking track etc.	Rare to Occasional

Public Exposure Rating: (i) Before harvesting.....

(ii) After harvesting.....

3. Possible Consequences

“Possible Consequences” on the Risk Assessment Calculator will be based on a judgement of the most likely degree of injury should an accident occur due to a tree or limb falling (or having fallen) on a public place.

Roads

Consider factors such as:

- Typical speed of vehicles (affects the ability to stop, and the speed of impact in a collision). This will be determined by the standard of road.
- The sight distance when a fallen tree first becomes visible from a vehicle. The normal stopping distance for a vehicle travelling at 60 km/hr is about 45 m on a dry bitumen road, or at least 60 m on a wet bitumen road or gravel road.
- Types and numbers of vehicles using the road (e.g. the road may frequently be used by tour buses).
- Likely time taken to clear the hazard from the road.
- Size of the trees or limbs that are likely to fall on the road.

As a guide it can be assumed that if a vehicle collides with a large tree and the speed at impact is 60 km or over, then fatalities are likely. On a gravel road the speed of impact would normally be below 60 km/hr, so fatalities are unlikely.

For an occupied building, camping area etc. you will have to take into account the number of occupants/users and frequency of occupation/use.

Buildings, camping areas, walking tracks etc.

The main risk will be from a tree or large limb falling directly onto a building or onto people. The consequences are likely to be serious injuries or fatalities.

Before and after harvesting

The possible consequences are unlikely to change following harvesting. However, there are circumstances where they may change e.g. improved sight distance along a road due to harvesting may reduce the possible consequences.

What is the most likely Possible Consequence? (of those listed on the Risk

Assessment Calculator):

Before harvesting:

After harvesting:

Comments:

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4. Using the Risk Assessment Calculator

The notes below indicate how to use the Risk Assessment Calculator graph. For each factor below you will need to plot on the graph the risk:

- (i) **before harvesting – use a dashed line;** and
- (ii) **after harvesting – use a solid line**

Probability

Mark the point on the “Probability” line on the Risk Assessment Calculator as determined in Table 1 (page 8). The point can be plotted based on the Probability Score (0 to 10) or the Probability of Occurrence category, whichever is considered most appropriate.

Public Exposure

Mark the point on the “Public Exposure” line on the Risk Assessment Calculator as determined in Table 2A or 2B (page 9).

Possible Consequences

Mark the point on the “Possible Consequences” line on the Risk Assessment Calculator as determined under section 3 (page 10).

Risk Score

The Risk Score is calculated as follows:

- Draw a straight line on the Risk Assessment Calculator from the calculated Probability (as above) through the calculated Public Exposure (as above) to the Tie Line.
- Draw a straight line on the Risk Assessment Calculator from the point on the Tie Line above through the calculated Possible Consequences (as above) to intersect the Risk Score line.
- The intersect point becomes the Risk Score. Write the Risk Score result on the Risk Assessment Calculator form at the bottom.

What risk is acceptable?

The risk is acceptable where the action of harvesting does not significantly alter the overall risk.

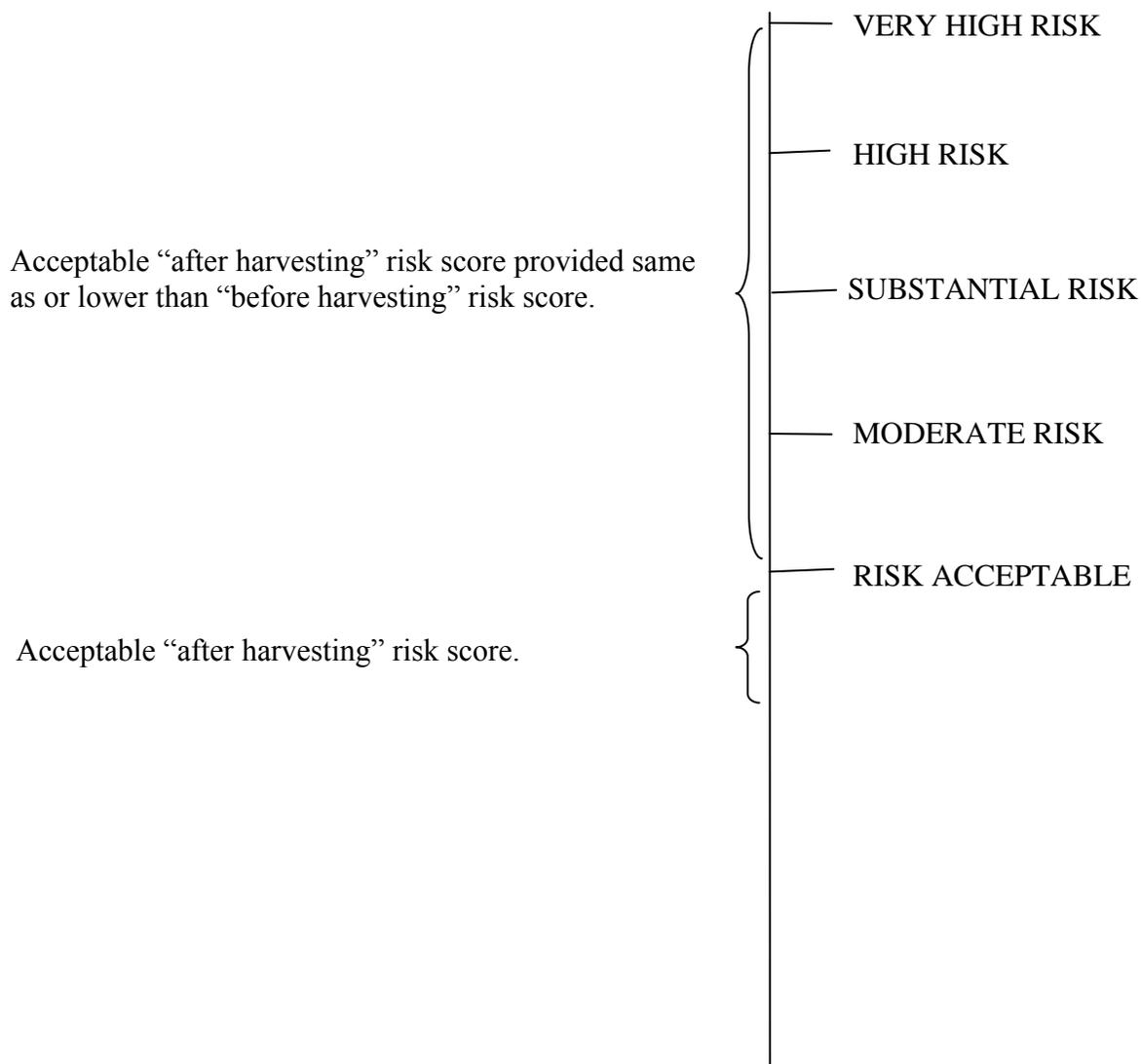
The following are **acceptable outcomes**:

- where the risk score “after harvesting” is the same as or lower than the “before harvesting” risk score.
- where the risk score “after harvesting” is below the “risk acceptable” score.

The following is an **unacceptable outcome** and action needs to be taken under section 5 (page 13) or the planned harvesting abandoned:

- where the risk score is above “risk acceptable” and the risk score “after harvesting” is above the risk score “before harvesting”.

These outcomes are shown more diagrammatically below.



5. Actions in the event that the calculated public risk is unacceptable

If the outcome using the Risk Assessment Calculator is unacceptable (as determined on the previous page), then the operation should not proceed until a review of alternative options is undertaken. This will usually entail some further consultation with the appropriate Forest Practices specialist.

In the case of trees retained for visual reasons beside a road, this may mean removal of some trees at the front of the screen (nearest to the road), and addition of some additional trees to the back of the screen, for example. Alternatively, it may mean increasing the width of a screen to reduce the wind exposure factor.

Record below any actions taken to reduce the risk to acceptable levels, and ensure that appropriate prescriptions are placed in the Forest Practices Plan. **It is suggested that you re-plot the risks before and after harvesting on a new Risk Assessment Calculator sheet, and mark across the top of the sheet Final Outcome - After Harvesting Modifications. The original sheet could be marked Initial Outcome – Before Harvesting Modifications.**

Actions taken to reduce risk to acceptable levels:

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Note:

- a) **The above may not be a complete list of all the factors that should be considered when carrying out a risk assessment for trees that are to be retained for forest practices purposes.**
- b) **The Forest Safety Code (Tasmania) should be referred to for information on general safety requirements.**
- c) **The Workplace Safe – “Using the SAFE steps to undertake a Risk Assessment” may also be useful.**

Risk Assessment Calculator

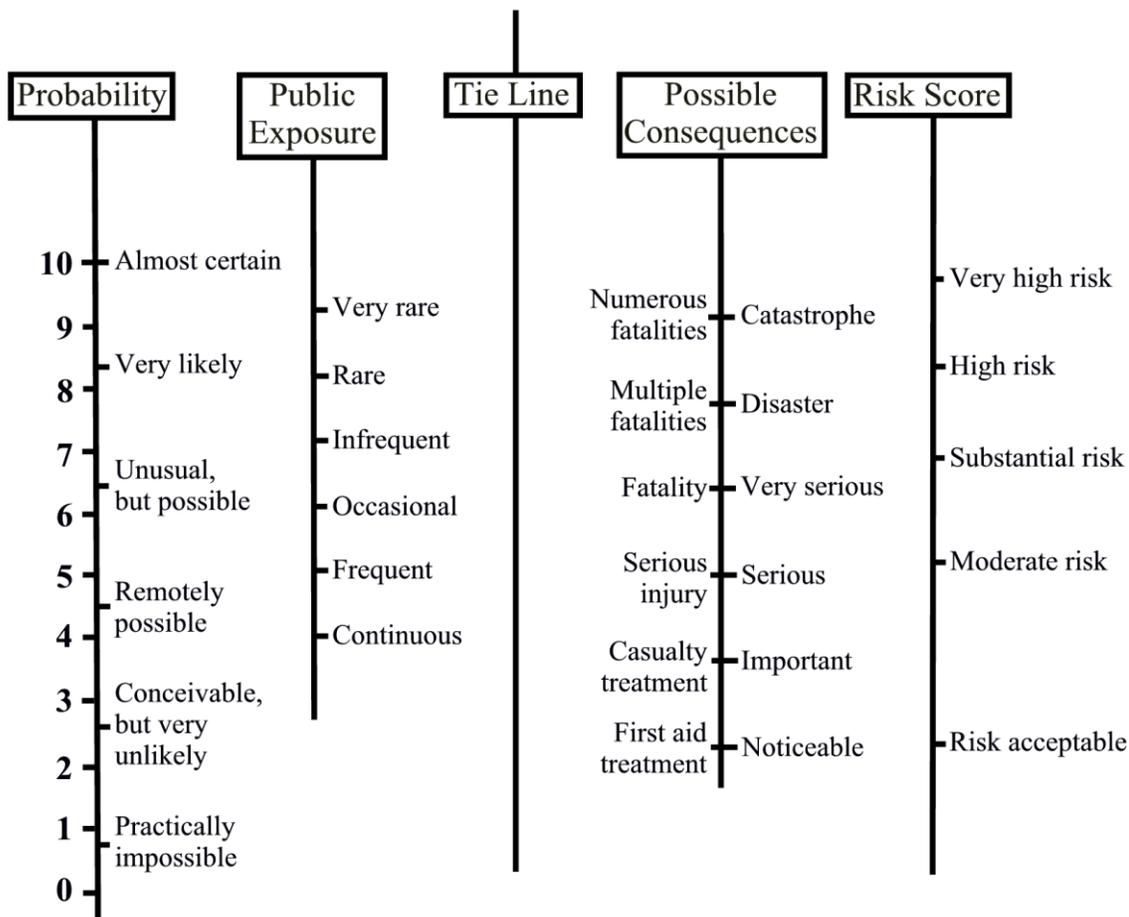
This document is currently under review

Date.....

FPP Number/Coupe

Road/Location

Person(s) carrying out risk assessment



Calculated Risk Score

Before harvesting
(dashed line - - - - -)

After harvesting
(solid line ———)

Risk considered acceptable? **Yes/No**
(If No, complete Section 4, page 13 and recalculate risk)