

# Manual of Aesthetic Design Practice



**BRITISH  
COLUMBIA**

Ministry of Transportation

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**Clearing and Grubbing - Vegetation Management**

# Clearing and Grubbing - Vegetation Management

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## Introduction

Natural vegetation within the right of way is bought and paid for. It is the most economical long term landscape material. Clearing and grubbing, if over-zealously carried out, or if done without knowledge of the ultimate design and aesthetics of the highway, can create major costs for revegetation and subsequent maintenance.

Clearing and grubbing is the first step in highway construction. Adequate control of clearing and grubbing requires that the objectives of aesthetics and vegetation management are identified and incorporated into the clearing and grubbing plans.

Well managed clearing and grubbing operations can play a major role in meeting the following objectives:

- screening **from the road** of unsightly conditions.
- reducing the visibility **from adjacent areas** of the road.
- reducing problems associated with headlight glare, sun glare, and snow and ice accumulation.
- creating visual interest along the highway.
- framing and focusing views.
- blending the highway into the adjacent natural landscape.

## Recommended Practices

The following pages outline recommended practices concerning the aesthetics of clearing and grubbing for highways in B.C., as summarized below:

**1.0 Before clearing commences, decide location, method and access routes to slash disposal areas.**

**2.0 Determine the method of clearing in response to the required scale and level of detail of clearing.**

**3.0 Undertake clearing in stages and allow for field adjustments to the clearing line.**

**4.0 Selective clearing shall be guided by highway safety requirements, utility and underground services and aesthetics.**

**5.0 Clearing and grubbing of roadside facility areas must be carried out with attention to detail, warranted by close on-site inspection.**

**Note:** Construction will not be considered complete until: all debris has been disposed of, revegetation of the site is complete, and erosion control has been accomplished.

## 1.0 Location of Disposal Areas

Before clearing commences, decide location, method and access roads to slash disposal areas.

.1 Burn all slash whenever possible, and bury only burnpile residue.

.2 Integrate slash residue disposal location with highways design and construction phasing.

- Locate slash residue in areas requiring non-structural fill during construction.
  - areas of non-structural fill
  - uphill lee sites
  - depressions within median
- Locate slash residue in areas requiring rehabilitation after highway construction.
  - borrow and waste pits
  - temporary construction camps
  - provide a vegetation screen of minimum 20 m wide exclusive of all possible future clearing.\*
- Do not use natural depressions outside of the median or water bodies for disposal of slash.

.3 Limit clearing access roads to within required clearance areas wherever feasible.

- Where not feasible, separate clearing roads by a 20m wide vegetative screen.
- Intersect access road with the primary road right of way at a 90 degree angle. The tangent of the access road at the intersection should be no longer than 15m, with the curve leading into this tangent of no less than 15 degrees.
- Revegetate routes not required for use after construction.\*\*

*\*refer to EARTHWORKS (Site Preparation) for co-ordination of sites*

*\*\*refer to REVEGETATION for revegetation*

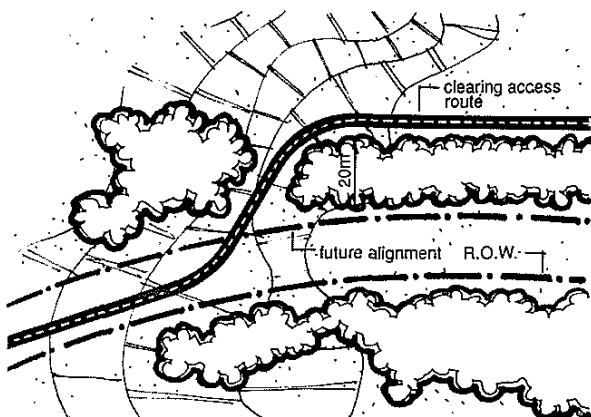


Figure E-1

Where clearing access routes cannot be contained within the right of way, separate the route from the highway by a 20 m buffer.

## 2.0 Method of Clearing

Determine the method of clearing in response to the required scale and level of detail of clearing.

### .1 Pay attention to direction of falling.

- fell toward centre of area to be cleared/away from selectively cleared or retained plants
- fell away from water bodies

### .2 Specify method of clearing:

#### Manual and /or Horse, for:

- selective clearing for views, or selective thinning of roadside vegetation.
- selective clearing of dead, dying and wind susceptible trees
- areas with difficult accessibility
- environmentally sensitive areas
- rest area walkways
- roads with 1m limited clearing from pavement edge within roadside facilities and along pit /haul access roads.

#### Helicopter, for:

- areas with difficult accessibility
- environmentally sensitive areas

#### Vehicle, for:

- large scale clearance
- road with limited 1m clearing from the pavement edge which cannot be cleared by manual and/or horse due to scale, economics, and unavailability of other means.

### .3 Bury or dispose of off-site all non-combustible debris remaining after burning.

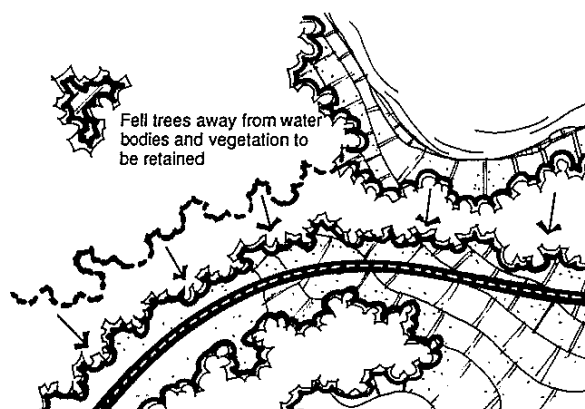


Figure E-2

During felling operations be careful not to disturb fragile areas.

### 3.0 Limits of Clearing

Allow for field adjustments to the clearing line, by clearing in stages as below:

#### .1 First, clear control line of alignment.

- for control line survey.
- for cross-section surveys.

#### .2 Second, clear so as to retain existing vegetation in the outer 10% of the distance between control line and the limit of clearing line.

- stake the no-cut/no-fill line and make minor field adjustments.
- assess specimen vegetation, rock outcrops, water bodies and natural banks to be retained.
- consider salvage of selected plant specimens in areas not to be retained, for potting, storage and revegetation at construction completion.\*
- assess plant material requiring removal for design speed setbacks.\*\*
- reassess proposed limit of clearing line, prior to removal of vegetation to the no-cut/no-fill line.\*\*\*

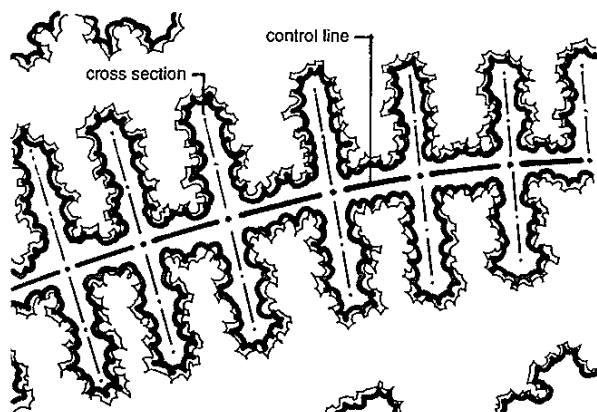


Figure E-3  
Initially, clear only the lines required for control line and cross section survey.

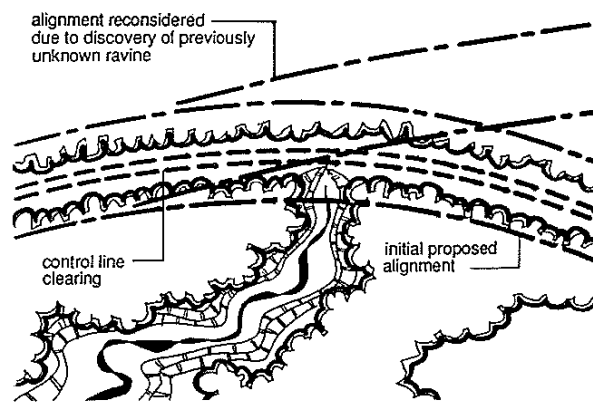


Figure E-4

Refine alignment to avoid special topography or features revealed during control line survey, prior to mass site clearing.

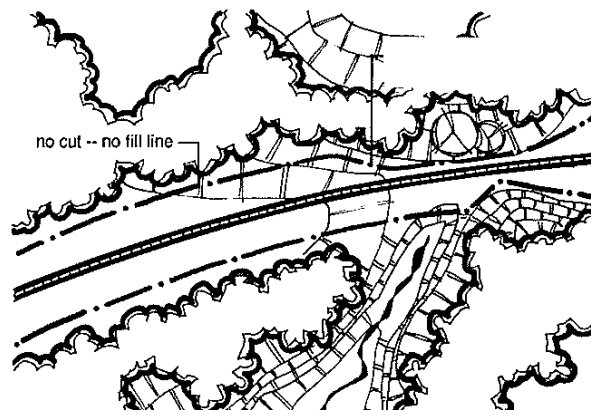


Figure E-5

Inspect the outer 10% of the proposed clearing to find landscape features which might be saved by minor readjustment to proposed grading.

\*refer to *CLEARING AND GRUBBING* for plant storage and planting techniques.

\*\*refer to *CLEARING AND GRUBBING (Selective Clearing)* for setback requirements

\*\*\*refer to *CLEARING AND GRUBBING (Roadside Facilities)*, and *ROADSIDE FACILITIES* for details of clearing for all functions of facilities

\*\*\*refer to *EARTHWORKS, REVEGETATION, and ROADWAY STRUCTURES (Retaining Walls)* for implications of slope design and retention



.3 Mark vegetation to be selectively cleared to the proposed clearing line.

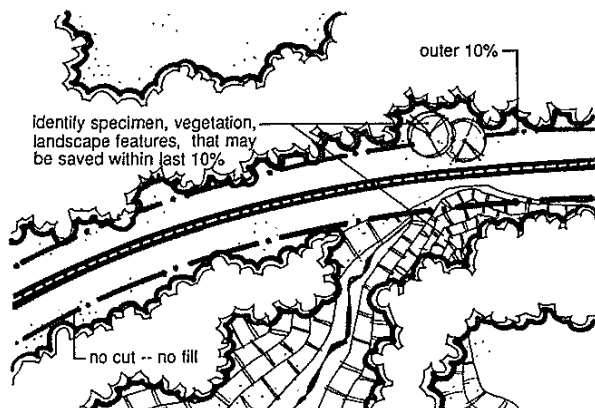


Figure E-6  
Prior to clearing the outer 10%, assess visual screen and noise abatement requirements.\*

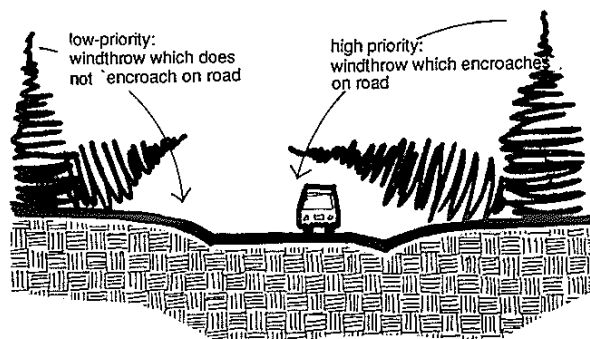


Figure E-7  
Assess dead, dying and wind susceptible plantings, removing only those which pose a threat to the area within paving edge, future above ground utility lines, sight lines and sight triangles.\*\*

.4 Clear within remainder of right-of-way and/or within scenic easement outside right-of-way only those areas deemed necessary and so marked in the field.\*\*\*

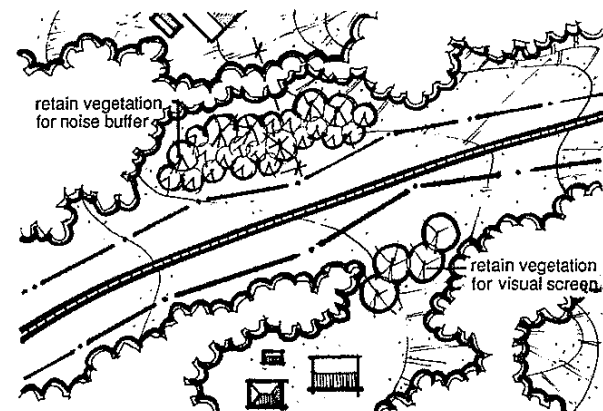


Figure E-8  
Finished clearing should respect objectives for visual, and environmental factors, in addition to engineering requirements.

\*refer to ALIGNMENT (Secondary Aesthetic Impacts) for widths

\*\*refer to CLEARING AND GRUBBING (Selective Clearing) and REVEGETATION for details

\*\*\*refer to CLEARING AND GRUBBING (Roadside Facilities) and ROAD-SIDE FACILITIES for separate clearing and grubbing policies and practices

## 4.0 Selective Clearing

Selective clearing will be guided by highway design safety requirements, utility and underground services, and aesthetics.

### .1 Respect operational highway design safety requirements.

- Provide design speed setbacks to trees with diameter larger than 100mm.

90km/h or greater	=	10m from pavement edge
80-90 km/h	=	7m from pavement edge
60 - 80km/h	=	6m from pavement edge
60km/h or less	=	2m from pavement edge
- Relaxation of the above setback distances can and should be taken where concrete traffic barriers or equivalent are used.

### .2 Use clearing techniques to reinforce highway design speed.

- Emphasize the need to slow down at off-ramps and "reduce speed" zones by leaving vegetation closer to the roadway as design speed reduces.
- Retain shrubs, saplings, and trees with diameters less than 100mm adjacent to deceleration zones to provide added visual stimulus for deceleration. Exact setback distances in these cases should be determined by field judgments in response to vegetation species and desired speed reduction.

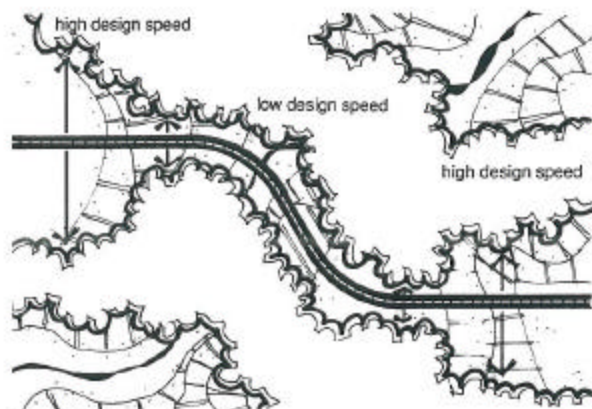


Figure E-9  
Vegetation closer to the highway can help slow down traffic where the design speed is reduced.

### .3 Where clearing is only for sight distance requirements, leave vegetation whose mature height will not exceed 600mm above the finished elevation of the highway pavement.



Figure E-10  
Retain vegetation whose mature height will not exceed 600mm above the finished elevation of the highway.



Figure E-11  
Selective clearing should be guided by highway safety requirements and aesthetic considerations.

#### .4 Provide setbacks to treeline for special conditions as follows:

- passing -** distance to allow minimum passing sight distance at design speed
  - signs -** minimum horizontal distance setback of 2m or as necessary not to obscure reading of sign
  - intersections -** distance required to respond and react
  - driveways and access roads -** minimum horizontal distance of 2m
  - rail crossings -** distance, measured from the crossing, of the minimum stopping distance for the highway design speed and distance, measured from the crossing, as travelled by the train equivalent to the interval required for the vehicle to stop. Must comply with Railway Act requirements for sight distance.
- Where tree branches extend over the roadway remove lower limbs to a vertical height of 5m above the travelled portion of the road.

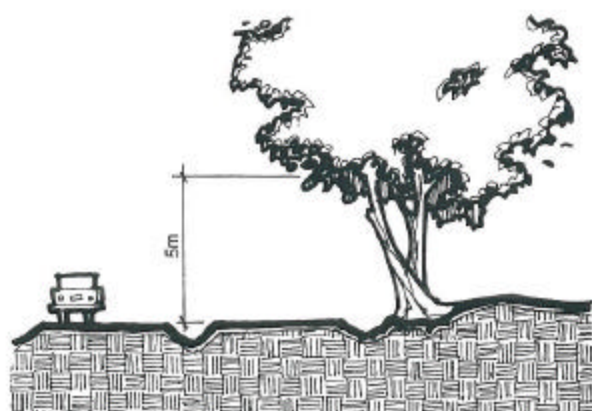


Figure E-12  
Clear lower limbs of overhanging trees to 5m clear height.

- Retain strips of native vegetation to minimize headlight glare between opposing directions of traffic, and between the highway and frontage roads where medians of 20m width or more exist, and where conditions allow. Inclusion of trees within these areas may be subject to safety restrictions.
  - retain vegetation within median, outside no-cut/no-fill line, whose mature height exceeds 1.5m minimum above the finished elevation of the highway pavement (1.8m minimum where truck traffic is prevalent).
  - retained vegetation should be 2m minimum width for shrubs, 10m minimum width for trees. Supplement with vegetation under revegetation management where minimum width can not be retained.
  - retain plant material in median at end of tangents where two alignments converge
- When clearing is undertaken to minimize the impact of adverse climatic conditions care must be taken to incorporate aesthetic design practices.

\*refer to EARTHWORKS, and CLEARING AND GRUBBING.



Figure E-13  
Native vegetation retained within the median can help reduce the impact of oncoming headlights



.5 Clear present and future locations of utility and underground services.

- Clear trees which at maturity will exceed trunk diameters of 100mm to setbacks as below:

luminaire standards	6.0m
utility poles	3.0m
underground services	1.5m
catchbasins	2.0m
manholes	1.5m
valve boxes	1.5m
fire hydrants	3.0m

- In utility alignments retain native vegetation wherever it does not obstruct drainage, conflict with service lines, or impede emergency services.



Figure E-14  
Note how utility lines are concealed by Arbutus trees retained at the roadway edge.

.6 Avoid disturbance of water bodies.

- Retain vegetation as required to preserve the ecological integrity of fish bearing water bodies.
- Retain vegetation adjacent to all other year-round water courses.
- Meet all applicable environmental standards.
- Ensure that tree felling does not affect waterbodies or vegetation adjacent to waterbodies.



Figure E-15  
Retain vegetation along the shores of waterbodies.

*\*refer to VEGETATION MANAGEMENT for maintenance of clearance*

*\*\*refer to EARTHWORKS for integration with adjacent site conditions*



## .7 Reflect natural vegetation habitat.

- Undulate the forest edge.
  - vary clearing from the minimum width approximately 15m into the tree stand.
  - avoid straight dominant cut lines.
  - do not vary clearing width in a regular pattern.
  - vary clearing so as to minimize disturbance to water bodies.
- Fragment the forest edge by leaving tree clumps in the midst of cleared areas.
  - in semi-open areas, clearing should match the pattern of the adjacent vegetation, distances between created tree clumps reflecting distances between naturally occurring tree clumps.
  - leaving tree clumps at transitions between clearings and forests acclimatizes the driver to potential icing of roadway, and high to low light conditions.
- Feather the forest edge.
  - reflect gradation of natural forest edge. This cross section would follow forbs and grasses, shrubs, pioneer trees, through to mature forest.
  - within this buffer cut trees, leaving intact top-soil and root systems to encourage root sprout of pioneer species. This buffer zone prevents sun scald on trees whose bark is sensitive to new exposure of sunlight, and reduces susceptibility of adjacent shallow rooted trees to wind-throw.\*
  - where slope exceeds 3:1, begin buffer 1m beyond end of rounding of slope.\*\*



Figure E-16

Vary the edge of the clearing line to create an undulating forest edge. Avoid a forest edge which has a regular undulating pattern. Keep undulations random, and similar to adjacent natural conditions.

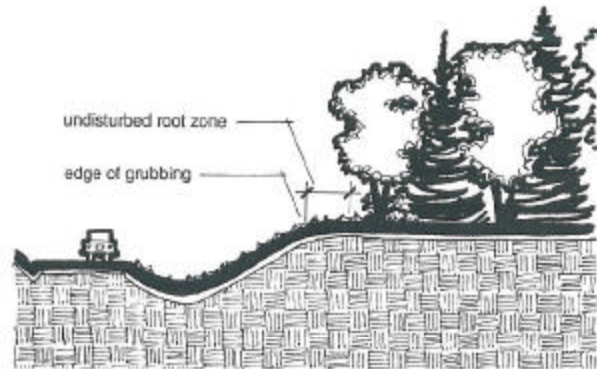


Figure E-17

Retain undisturbed root zone as required to protect trees to remain from potential wind throw hazard.

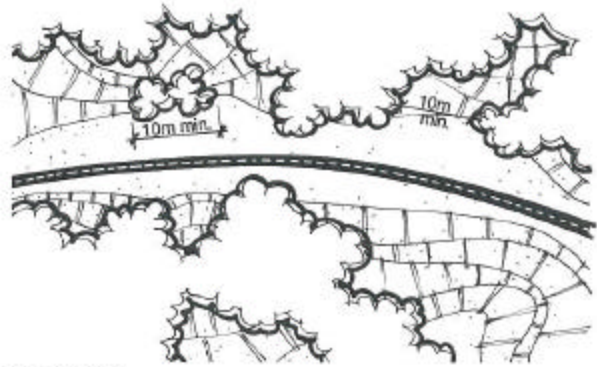


Figure E-18

Tree clumps provide variety within forest clearings.



Figure E-19

Clearing should emulate the natural forest edge transition from grasses to shrubs to pioneer trees to mature forest.

.8 Clear in response to view **from** the road and **toward** the road.

- Expose designated view for a minimum length of 0.5 seconds at the highway design speed, if **fleeting** view is desired.
- Expose designated view for a minimum length of 5 seconds at the highway design speed, if **panoramic** view is desired.
  - consider the option of limbing trees to the height required to gain desired view.
  - if the clearing length is greater than 5 seconds, consider retaining excellent tree specimens.
  - if the clearing length is greater than 10 seconds, consider retaining pattern of fragmented clump or specimen tree, typical of adjacent sites.

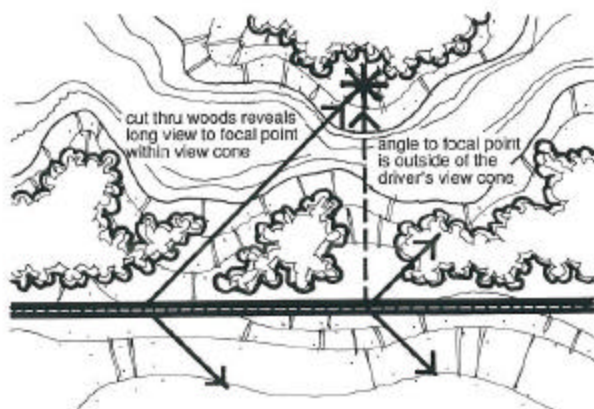


Figure E-20  
Clear sufficient length and at an angle to expose the view at the design speed.



Figure E-21  
Limbing trees can offer filtered views.



Figure E-22  
In long clearings, consider retaining specimens or clumps to break up the view.

- Ensure that the minimum angle of clearing equals that of the area of effective vision.
- Minimize views of adjacent timber cuts and unsightly land uses.
- Minimize the view toward the road, especially in extreme cut/fill situations.

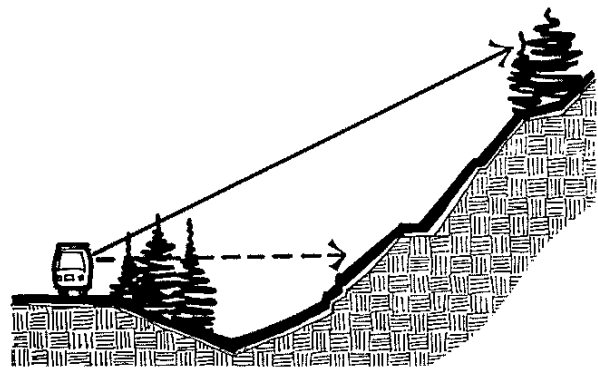


Figure E-23

Minimize views to timber cuts uphill from the road.

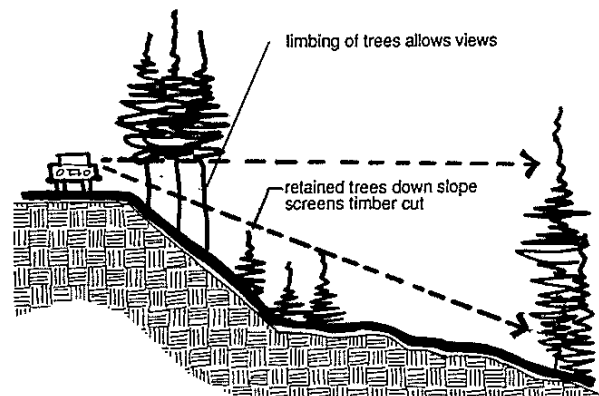


Figure E-24

Techniques for screening downhill timber cuts can be quite different than for uphill cuts.

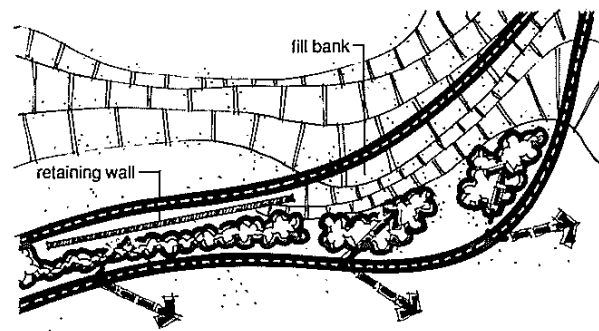


Figure E-25

Careful selective clearing and leave areas can screen fill banks and retaining walls.

## 5.0 Clearing of Roadside Facility Areas

Clearing and grubbing of roadside facility areas must be carried out with attention to detail, as warranted by the close inspection from pedestrians.

.1 Clear in stages to allow for reassessment of aesthetic potential.

- Step 1 -** Produce construction information including: detailed site contour survey, complete detailed site analysis, site plans, and grading plans.
- Step 2 -** After construction drawings have been prepared, clear the centre line of access/egress alignment and through lane of parking, perform detailed centre line and cross section survey, and refine road alignments and grading accordingly.
- Step 3 -** Field assess the site plan. Stake out major site plan elements, including building sites, recreation areas and views, and parking areas. Make adjustments to site plan in response to existing conditions and site features. Flag vegetation blocks, rock outcrops, water bodies and natural elements to be retained.
- Step 4 -** Complete mass clearing to limits of parking and building locations, ensuring that leave areas in parking lot islands and near buildings are protected.
- Step 5 -** Lay out no-cut/no-fill line, and make minor adjustments to grading plan in the field, and then clear to no-cut/no-fill line
- Step 6 -** Mark individual trees to remain or areas to be selectively cleared. Complete selective clearing of these areas. Clear all remaining dead, dying and wind susceptible trees, except where a snag is sound and serves habitat enhancement.



.2 Retain natural vegetation wherever feasible in roadside amenity areas.

- Allow vegetation to encroach to the pavement edge with the following exceptions:
  - for lengths of road requiring snow removal provide a cleared strip 3m wide.
  - clear only that plant material exceeding 600mm height in sight lines and site triangles required by design speeds for signs and intersections.
  - remove branches extending over pavement to a height of 5m.
  - clear all plant material exceeding 300mm height for 5m radius at building entrances.
  - clear all plant material for 1m width around picnic benches.
  - clear other plant material to provide for walkways and manicured open space where required.

.3 Bury all residue of trees, brush, weeds, roots, matted leaves, structures and other debris remaining after burning.



Figure E-26  
In most roadways within roadside facilities, native vegetation should be allowed to meet the pavement edge.

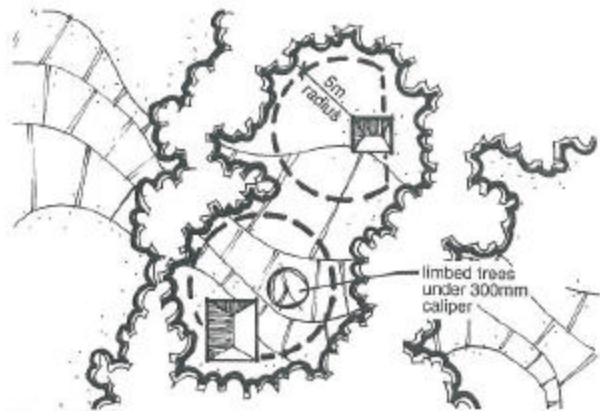


Figure E-27  
Native vegetation higher than 300 mm should be removed within a 5m radius of entrances to buildings or other structures.



Figure E-28  
Where picnic tables are located in the woods, allow a minimum of 1 m between table pads and trees. In this example one of these tables should have been located further away from the existing trees.