

Appendix 1

Technical Standards and Guidelines for:

- Forest Road Deactivation /
Restoration Activities

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ROAD DEACTIVATION / RESTORATION ACTIVITIES

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1. BACKGROUND

1.1 Rationale for Standards and Guidelines

- 1.1.1 Forest road deactivation is carried out as part of the statutory obligations under the Forest Practices Code and Regulations, or through the Forest Renewal B.C. Watershed Restoration Program activities. In the past, the lack of experience with road deactivation techniques has led to many different approaches and large variations in effectiveness. Based on successes and failures experienced with earlier activities, road deactivation standards are changing. New deactivation techniques have been established in order to improve on earlier deactivation activities.
- 1.1.2 The primary goal of these guidelines is to ensure project personnel have a clear understanding of what is expected when road deactivation is carried out during Watershed Restoration Program Activities, or as required by the Forest Practices Code.

1.2 Overall Intent of Deactivation

The overall intent of road deactivation is to:

- I. Use safe, practical, proven techniques to minimize the potential for road-related landslide and erosion events.
- II. Re-establish forest hydrology (both surface and sub-surface);
- III. Enhance productive growing sites, where practicable;
- IV. Improve visual aesthetics;
- V. Minimize maintenance for inactive roads;
- VI. Maintain needed access requirements (where applicable).

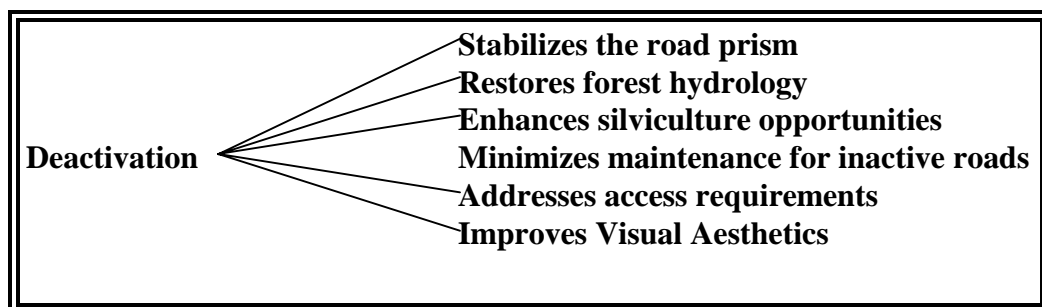


Fig. 1

2. TECHNICAL REFERENCE MATERIALS AND DOCUMENTS

2.1 The project personnel are to be familiar with the following reference materials (latest version):

Road Deactivation:

- I. Advanced Road Deactivation Course Manual (1997 MoF Forestry Continuing Studies Network)
- II. Forest Road Engineering Guidebook Forest Practices Code of British Columbia
- III. Watershed Restoration Technical Circular No. 4: *Forest Site Rehabilitation for Coastal British Columbia (Interim Methods), July 1994*
- IV. B.C. Ministry of Forests: *A Guide for Management of Landslide Prone Terrain in the Pacific Northwest: Land Management Handbook Number 18: Second Edition, 1994*
- V. Watershed Restoration Technical Circular No. 3: *Resource Road Rehabilitation Handbook: Planning and Implementation Guidelines (Interim Methods), July 1994*

Environment:

- I. WRP Guidelines for Work in and about a stream: *All weather guidelines - B.C. Environment memo dated February 20, 1996*
- II. B.C. Provincial Water Act - *Section 7 Users Guide - B.C. Environment*
- III. Government of Canada Fisheries Act (specifically sections 35 & 36)
- IV. B.C. Environment: *Summary of Environmental Standards & Guidelines for Fuel Handling, Transportation, and Storage: 2nd Edition*
- V. Forest Practices Code of British Columbia: *Fish-stream Identification Guidebook*
- VI. Forest Practices Code of British Columbia: *Soil Conservation Guidebook*
- VII. Forest Practices Code of British Columbia: *Riparian Management Area Guidebook*

Safety:

- I. Workers' Compensation Board of British Columbia: *Industrial Health & Safety Regulations (All applicable regulations)*
- II. Company: Emergency Response Procedures - *Operational Safety Plans - Wet Weather Shutdown Criteria Guidelines, Spill Response Procedures, WCB Job Safety Breakdown*
- III. Forest Road Engineering Guidebook, (specifically pages 127–133)
Forest Practices Code of British Columbia

3. COMPLIANCE WITH FOREST PRACTICES CODE OF BRITISH COLUMBIA ACT

- 3.1 Project activities must comply with the technical standards set out in the *Forest Practices Code of British Columbia Act and Regulations*. The project personnel must be aware of regulations that apply to work conducted within or below steep hillslopes that are unstable or potentially unstable. In cases where the technical specifications in this Appendix conflict with the Forest Practices Code of British Columbia Act and Regulations, the Act and Regulations apply.

4. QUALIFICATIONS

- 4.1 Forest road deactivation has become a specialized trade, where equipment operator and site supervisors have to make continuous judgment calls as site conditions vary. They must recognize the effects increased precipitation may have on slope stability, potential sedimentation, and access routes. The main objective for all personnel is to complete the work safely and to the required standard.

Prior to project commencement, personnel must be adequately trained, fully instructed, and have the following knowledge and skills:

- I. a clear understanding of required standards and guidelines;
- II. previous participation in the Advanced Road Deactivation Course and a demonstrated knowledge of road construction, maintenance, and deactivation practices;
- III. a demonstrated field knowledge of slope stability processes, and forest hydrology;
- IV. an understanding of the Forest Practices Code and Regulations, as related to road deactivation activities;
- V. an ability to recognize potential problems, and plan activities to avoid them;
- VI. the common sense to seek advice or assistance if conditions are encountered which may compromise safety or the environment.

5. SAFETY

- 5.1 Of paramount importance during any deactivation activity is that it be completed safely. Deactivation personnel work continuously in terrain that is steep, unstable, or potentially unstable, and on roads that are tension cracked and stressed. In many cases, work is also done on roads that have been previously deactivated. The nature of road deactivation work requires special attention to safety issues.

Project personnel be adequately trained, fully instructed, and have the following knowledge skills:

- I. A demonstrated knowledge of the Operational Safety Plans. Everyone must know what to do in case of an emergency.
- II. How to use the Operational Wet Weather Shutdown Criteria;
- III. The ability to recognize the following hazards:
 - unstable roadfills. Familiarize yourself with the fillslope and its composition
 - unstable cutslopes. Look at existing cutslopes for signs of instability. Cutslopes that appear stable when dry may be unstable when exposed to intense rain, high runoff or freezing conditions (either rock or soil)
 - tension cracks
 - displaced road sections
 - overhead obstacles (such as road overhangs)
 - snags or danger trees in the adjacent timber
 - degraded drainage structures (especially old bridges)
 - areas of poor radio reception
- IV. a demonstrated knowledge of safe work practices and applicable W.C.B. regulations;
- V. an understanding of the operational limits of the equipment and the common sense to stop if conditions are beyond its capability; appreciation of each operator's skills and experience, as well as the common sense to stop if a safe approach is not understood;
- VI. a demonstrated knowledge of safe approaches to complete the deactivation prescriptions.

6. PROTECTION OF THE ENVIRONMENT

- 6.1 All work carried out under this contract must comply with the *Forest Road Regulation*, *Forest Practices Code of British Columbia Act* and all other Federal and Provincial regulations. Reactivation and deactivation activities must not adversely affect the environment of fish producing streams, rivers, lakes, and other bodies of water.

The work must comply with any restrictions on timing, deactivation or access methods, and habitat restoration requirements specified by applicable Provincial and Federal Regulatory Agencies.

Work must cease immediately if instructed to do so by the Environmental Monitor, or it is reasonably assessed that due to weather conditions or site factors, the continuation of road deactivation activities may result, directly or indirectly, in:

- off site material movement (slumps or slides)
- excess sediment transported to creeks
- other significant damage to the environment

If road reactivation or deactivation is carried out which is beyond allowable environment limits, the Contractor must:

- stop the work in progress
- take immediate action to prevent or minimize any further damage to the environment
- notify the company representative
- take any remedial measures that the company representative requires

7. QUALITY OF WORK

7.1 Works carried out in this contract shall be in accordance with the guidelines contained in the Forest Road Engineering Guidebook of the *Forest Practices Code of British Columbia Act* and the detailed deactivation prescriptions. In addition the following conditions also apply:

7.2 Cross-ditches (Road intact; no roadfill pullback) Figure #1

- 7.2.1 A cross-ditch is a ditch excavated across the road to a depth equal to, or greater than, the depth of the ditch at the cutslope.
- 7.2.2 Cross-ditches are to be skewed and of sufficient gradient to ensure free water flow, such that it is not slowed down or made to abruptly change direction. The amount of skew will depend on road gradient, source, outlet location, and anticipated flows.
- 7.2.3 Material excavated from the cross-ditch should be compacted, placed parallel to and on the low side (down grade) to create a berm. The top side (up grade) of the cross-ditch should be unobstructed to accommodate surface water.
- 7.2.4 A well compacted ditchblock must be installed in the ditchline directly below the cross-ditch to ensure water is directed through the cross-ditch. The completed ditchblock shall have a completed height that is higher than the adjacent road surface. The material used for the ditch block shall have some coarse, preferably angular, rock.
- 7.2.5 Both inlet and outlet must be unobstructed. Potentially unstable roadfill on the road shoulder and fillslope must be pulled back from below and both sides of the outlet.
- 7.2.6 Cross-ditches must not be constructed in at a location that directs the flow onto any unstable or unprotected erodible material.
- 7.2.7 Armour placement (volume & size) is dependent on anticipated flows. Outlets must be armoured as well as the base if the cross-ditch is located in erodible material and the anticipated flows are significant. The armour must not be large enough, nor placed in a way to obstruct or divert flows. In some cases, the armour may not be necessary as directed in the prescriptions.
- 7.2.8 Cross-ditches have to be located and the sidewalls graded to accommodate access requirements as identified in the Access Management Plan.

7.3 **Cross-ditch (within recontoured slopes, no road ditch or road surface intact) Figure #2**

- 7.3.1 Cross-ditches, when incorporated into a recontoured slope, are installed to re-establish natural water courses. They are located at natural depressions, gullies, and swales, and do not necessarily drain ditchlines and road surfaces. Skew is not necessary unless lining up with natural sources and outlets. Restoring natural drainage patterns is highly important; therefore locating cross-ditches in natural, established stream paths is essential.
- 7.3.2 Cross-ditches should be constructed to blend with the natural ground profile and contours at each location. The depth should be down to native ground (original ground surface prior to road construction).
- 7.3.3 Armour placement (volume & size) is dependent on anticipated flows. Outlets should be armoured as well as the base if the cross-ditch is located in erodible material and the anticipated flows are high. The armour must not be large enough to obstruct or divert flows.
- 7.3.4 Cross-ditches must not be constructed in a manner which directs the flow onto any unstable or unprotected erodible material.
- 7.3.5 All potentially unstable material must be removed downslope of the cross-ditch outlet.

7.4 **Waterbars Figure #3**

- 7.4.1 A waterbar is a shallow ditch excavated across a road, skid trail, or backspare trail to prevent excessive flow down the road surface (or trail) resulting in erosion of surface materials. Waterbars are not installed to intercept ditchlines.
- 7.4.2 Waterbars are installed to divert road surface water off the road to the fillslope or across the road to the ditchline (reverse waterbar).
- 7.4.3 Typically the waterbar is shallow and skewed to allow unimpeded water flow off the surface. Skew will depend on road gradient, anticipated flows, and outfall stability.
- 7.4.4 A berm shall be constructed on the downgrade side of the waterbar. This berm must not impede expected vehicle traffic.
- 7.4.5 In erodible materials, the waterbar base and outlet must be armoured with rock of sufficient size to prevent erosion.
- 7.4.6 Waterbars must not be constructed in a manner which directs the flow onto any unstable or unprotected erodible material or roadfill.

7.5 **Blanket Drains Figure #4**

- 7.5.1 Blankets are drainage structures installed to accommodate **seepage zones** on the roadcut. The objective of a blanket drain is to disperse low velocity flows over the hillslope rather than concentrate flows as is experienced with cross-ditches. Blanket drains are not meant to convey surface flows or replace open cross-ditches in areas of substantial flows.
- 7.5.2 A blanket drain consists of a layer of cobbles or shot rock material placed against seepage zones in cutslopes. The blanket extends down the cutslope and across the decompacted/outsloped road bench to the toe of the pulled back fill. Care must be taken to ensure the blanket does not extend to the top of the cut where surface flows will be intercepted.

- 7.5.3 Material in the blanket drain should consist of stones sorted from the nearby road fill. All stones 4 inches (100mm) in diameter and larger can be used in the blanket drain. The blanket thickness should be at least 16 inches (400mm). The width of the blanket drain will depend on the width of the seepage zone, but should be at least 10 feet (3 m). The blanket outfall should consist of a horizontal rock apron to further disperse any flows.
- 7.5.4 The blanket drain once constructed can be covered with pulled back fill material. Where the fill material is considerably finer than the drain material, the blanket drain must be thick enough so that the fill does not infill the pore spaces between the stones in the blanket or the blanket drain outlet.
- 7.5.5 Blanket drains must not be constructed in a manner which directs the flow onto any unstable or unprotected erodible material.
- 7.5.6 All potentially unstable material must be removed downslope of the blanket drain outlet.

7.6 Trench Drains Figure #5

- 7.6.1 Trench drains are drainage structures installed to accommodate **seepage zones** or small surface flows encountered during deactivation and consist of a cross-ditch which is filled with large rock and not covered with pullback. Trench drains are meant to convey water from areas of heavy seepage as well as surface water. Open cross-ditches use a large space on the road bench when constructed. Trench drains use this otherwise wasted space and are suitable for areas of heavy seepage or small intermittent/ephemeral creeks where bench space is limited. Trench drains are similar to blanket drains in design, but are not covered with pulled back roadfill. The rock is considerably larger and is meant to support retrieved fill material and buttress cutslopes.
- 7.6.2 Material in the trench drain should consist of cobbles or boulders sorted from the surrounding road fill. The width and height of the trench drain will depend on the width of the seepage zone and amount of retrieved fill material, but should be at least 3 metres (10 feet) in width. The outfall should have a rock apron to disperse any flows.
- 7.6.3 Trench drains must not be constructed in a manner which directs the flow onto any unstable or unprotected erodible material.
- 7.6.4 All potentially unstable material must be removed immediately downslope of the trench drain outlet.

7.7 French Drains Figure #6

- 7.7.1 A french drain is a sub-surface drainage structure installed to diffuse heavy seepage or ground water piping which may be encountered during road construction or road deactivation. French drains are used where cross-ditch installation is impractical, because:
- The seepage zone is extensive in length;
 - The retrieved fill material may be impermeable and when placed against the cut will block natural drainage patterns, or;
 - The stability of the recontoured fillslope may be in question.

- 7.7.2 Longitudinal french drains may be used where bank sloughing or slide debris may cover an open ditch, or where retrieved fill may cover a ditch. In these cases, the french drain will maintain flow in the ditch.
- 7.7.3 Material in the french drain should consist of cobbles and coarse gravel sorted from the surrounding road fill. The width and height of the french drain will depend on the width of the seepage zone. The drain outfall should consist of a rock apron to disperse any flows.
- 7.7.4 French drains must not be constructed in a manner which directs the flow onto any unstable or unprotected erodible material, or unstable slopes.
- 7.7.5 All potentially unstable material must be removed downslope of the french drain outlet.
- 7.7.6 French drains are similar to both blanket and trench drains, but unlike these are used primarily in applications to route surface flows along the road and to avoid saturating unstable slopes below the road.

7.8 Fords **Figure #7**

- 7.8.1 A ford is a depression constructed in the road bed at a stream crossing to maintain the natural surface drainage pattern while allowing vehicle access for deactivation activities. The road profile should dip into and out of the stream creating a depression of sufficient size so the stream cannot breach the channel and flow down the road.
- 7.8.2 Fords must be designed and constructed as instructed by the deactivation prescription. In many cases a ford will require a site specific design.
- 7.8.3 Fords cannot be constructed unless approved by the appropriate agencies:
- B.C. Ministry of Environment
 - Department of Fisheries and Oceans
 - B.C. Ministry of Forests
- 7.8.4 Fords are installed to accommodate vehicle access through *non-fish* bearing (S5 & S6) Streams.
- 7.8.5 Approaches should be surfaced with appropriate non-erodible material (such as crushed rock) to ensure sediment is not tracked into the ford causing stream sedimentation.
- 7.8.6 Fords must be armoured above the high watermark with rock of sufficient size to resist erosion. The largest rock in the adjacent channel is a minimum size to be used. Rock sizes should be specified in the deactivation prescription, along with different armouring heights (since greater armouring heights will be needed for permanent fords).

7.9 Armoured Swales **Figure #8**

- 7.9.1 An armoured swale is a rock filled depression installed in a road bed during spur reactivation. They allow water flow across the road and vehicle access during the deactivation, but are to be removed when deactivation activities are completed.
- 7.9.2 Armoured swales may or may not incorporate the use of culvert pipe(s).
- 7.9.3 Specific instructions for construction will be given in the reactivation prescription.

8. FULL SIDECAST PULLBACK

(Permanent Deactivation -No Access Required- Full Restoration) Figure #9

- 8.1 Permanent Deactivation with full pullback is undertaken to restore, as close as possible, the road and hillslope to its pre-construction natural state. Where pullback is indicated and where safety permits, all potentially unstable roadfill sidecast (sidecast which could initiate a landslide) must be retrieved. To achieve this objective, ramping and benching may be required. All surface hillslope drainage patterns must be re-established, as well as subsurface flow where necessary.
- 8.1.1 Prior to sidecast placement the road surface (where possible) must be removed, placed in the cut, and the subsurface outsloped to below the base of the ditch at an angle greater than the grade of the road. The result is a bench which is wider, safer, and lower allowing for increased machine reach to retrieve roadfill.
- 8.1.2 Road material is to be placed against the cutslope to buttress the cut and accommodate seepage. Road material should extend upslope on the cut to catch seepage and extend across the bench to be dispersed at the toe of the pullback roadfill.
- 8.1.3 The ditchline **must** be eliminated, unless otherwise instructed, and flow thru water management established.
- 8.1.4 All unstable sidecast, or sidecast that is potentially unstable, should be pulled back from the fillslope and placed over the road material, to the top of the cut or to its maximum angle of repose. Any areas that may trap water must be removed, including berms immediately below the pullback area. All material which is pulled back should be placed tight against the cutslope. All roadfill must be removed if sub surface drainage is established and seepage flows are directed onto potentially unstable fill.
- 8.1.5 All woody debris is to be randomly scattered over the recontoured fillslope to resist erosion both from surface water and rain splash. Woody debris placement should appear as random as the adjacent logging slash.
- 8.1.6 All natural water courses (surface flow channels) must remain free of pullback material unless these zones are accommodated by cross-ditches or trench drains. Subsurface flow must be accommodated by using cross-ditches, trench drains, blanket drains, or french drains.
- 8.1.7 The recontoured ground line should approximate the original ground line but should not exceed 65%. The surface of this re-established slope should be rough, to disperse the energy of any surface water and provide holding areas for seeds and microsites for tree seedlings.
- 8.1.8 No large woody debris is to be buried in the retrieved fill material. The retrieved fill material must be placed into the cut in the following order:
1. Road surface material (rock)
 2. Fillslope material consisting of overburden and soils
 3. Woody debris (randomly scattered) and other organic debris (slash, etc.)

- 8.1.9 No logs (raptor trees) are to be planted for biodiversity unless indicated in the approved deactivation prescriptions.

8.2 Partial Sidecast Pullback (Access Required) Figure #10

- 8.2.1 Partial pullback is carried out when full restoration is not necessary for roadfill stability, or access is to be maintained, or road use will be required at a future date. The stable portion of the original roadway surface is left intact for the planned vehicle access requirements for the road.
- 8.2.2 Retrieved fill is to be placed tight against the cutslope (if it is anticipated that this road will be permanently deactivated at a later date, then the road surface below this pullback should be decompacted and outsloped). If the retrieved fill volumes will fill the cut and access will not be maintained then endhauling of excess material will be required.
- 8.2.3 Cross-ditches must be installed directly prior to fill placement locations to ensure water does not flow into this fill material. These will be indicated in the deactivation prescriptions.
- 8.2.4 Ditchlines are intact under fill unless specified in the deactivation prescription.
- 8.2.5 No large woody debris is to be buried in the retrieved fill material. The retrieved fill material must be placed into the cut in the following order:
1. Road surface material(rock)
 2. Fillslope material consisting of overburden and soils
 3. Woody debris (randomly scattered, or left on the ground surface below the road grade), and other organic debris (slash, etc.)
- 8.2.6 All natural water courses must remain free of pullback material unless these zones are accommodated by *cross-ditches, trench drains, or french drains*. In some cases, wood box culverts may be left in place if the openings provide sufficient capacity to handle large peak flows and they are backed up by suitably large cross-ditch.
- 8.2.7 No insloping or outsloping of the intact road surface will be done unless directed to do so in the deactivation prescription.

8.3 Landing Pullback

- 8.3.1 Landing pullback is approached and completed similar to full sidecast pullback, but can take significantly longer because of greater material volumes and greater throw distance. All sidecast must be retrieved to re-establish ground profiles, natural water patterns maintained, and plantable sites re-established.
- 8.3.2 Prior to sidecast placement the road surface (where possible) must be removed, placed in the cut, and the subsurface outsloped at an angle greater than the road grade to a depth below the base of the ditch. The result is a bench which is wider, safer, and lower allowing for increased machine reach.
- 8.3.3 Road material is to be placed against the cutslope to buttress the cut and accommodate seepage. Road material should extend upslope on the cut to accommodate seepage and extend across the bench to allow unimpeded seepage dispersal to the toe of the re-established fillslope, unless otherwise stated in the deactivation prescriptions.
- 8.3.4 The ditchline must be eliminated, unless otherwise instructed, and flow thru water management established.
- 8.3.5 All unstable or potentially unstable sidecast similar to full sidecast pullback should be pulled back from the fillslope toe and placed over the road material to the top of the roadcut. No berms should be evident on the fillslope and all landing fill pullback must be placed tight to the roadcut. Any areas that may trap water must be removed. All fill must be removed if sub surface drainage will direct and seepage flows onto potentially unstable fill.
- 8.3.6 All woody debris is to be randomly scattered over the recontoured fillslope to reduce erosion both from surface water and rain splash. Woody debris placement should appear as random as the adjacent logging slash.
- 8.3.7 All natural water courses must remain free of pullback material unless these zones are accommodated by *cross-ditches*, *blanket drains*, *trench drains*, or *french drains*.
- 8.3.8 The recontoured ground line should approximate the original ground line but should not exceed 65% (in most cases) unless the underlying material is sufficiently coarse and angular. The surface of this re-established slope should be rough, to disperse the energy of any surface water and provide holding areas for seeds.
- 8.3.9 No large woody debris is to be buried in the retrieved fill material. The retrieved fill material must be placed into the cut in the following order:
1. Road surface material (rock)
 2. Fillslope material consisting of over burden and soils
 3. Woody debris (randomly scattered)
- 8.3.10 No logs (raptor trees) are to be planted for biodiversity unless indicated in the approved deactivation prescription.

8.4 **Insloping and Outsloping Figure #12**

- 8.4.1 Insloping is the reshaping (sloping) of the road surface to direct surface water towards the roadcut and away from potentially unstable or erodible materials.
- 8.4.2 Outsloping is the reshaping (sloping) of the road surface to direct water off the road surface and onto the fillslope in a dispersed fashion. Fillslopes must be stable and erosion resistant.
- 8.4.3 Insloping and outsloping must not be undertaken unless indicated in the deactivation prescription.

8.5 **Scarification/Silviculture Fluffing**

- 8.5.1 Scarification (also known as silvicultural fluffing) is the breaking up of the road surface in an effort to promote and establish vegetation regeneration.
- 8.5.2 Scarification is only carried-out if specified in the deactivation prescription.
- 8.5.3 The road surface should be broken to below the ballast depth in order to expose some plantable soils.

8.6 **Decompaction**

- 8.6.1 Decompaction is the breaking up of road fill materials (ballast and subgrade) and is used primarily to encourage lateral water movement under retrieved road fills.
- 8.6.2 Decompaction is only done if specified in the deactivation prescription and only in areas specified in that prescription.
- 8.6.3 Decompaction must be done to a depth below the ditch invert and the subsurface outsloped to encourage flow thru water management. If the ditchline is not intercepted then decompaction will not be effective.

8.7 **Culvert and Debris Removal & Disposal**

- 8.7.1 All metal culverts or metal culvert material must be removed deactivation and stored at a designated site.
- 8.7.2 No metal culvert or material will be buried in the fill or left on site.
- 8.7.3 All wooden culvert material shall be:
 - Placed on top of the recontoured fillslope, or;
 - Removed, transported, and stored in an area designated by the company.
- 8.7.4 The guidelines also apply to steel cable, oil pails, and other metal logging debris.

8.8 Endhaul

- 8.8.1 Endhauling of road fill materials will be required if the volume of the roadfill to be retrieved exceeds the available capacity on the road bench. The project personnel must make every effort to ensure the cut is filled to capacity.
- 8.8.2 Endhauling may be necessary at locations where road reactivation or reconstruction is being carried out through cutslopes with excessive ravelling, or through old landslide debris.
- 8.8.3 If endhauling has been prescribed then the excess material has to be placed in an approved endhaul spoil site. These sites must be noted prior to project commencement.

8.9 Seeding/Fertilizing

- 8.9.1 All disturbed/exposed surfaces must be grass seeded in conjunction with deactivation activities.
- 8.9.2 Grass seed and fertilizer will be applied at the following ratios, unless specified otherwise by the revegetation specialist:

Seed - 80 to 100 kilograms per hectare

Fertilizer - 150 to 300 kilograms per hectare

9. SUMMARY

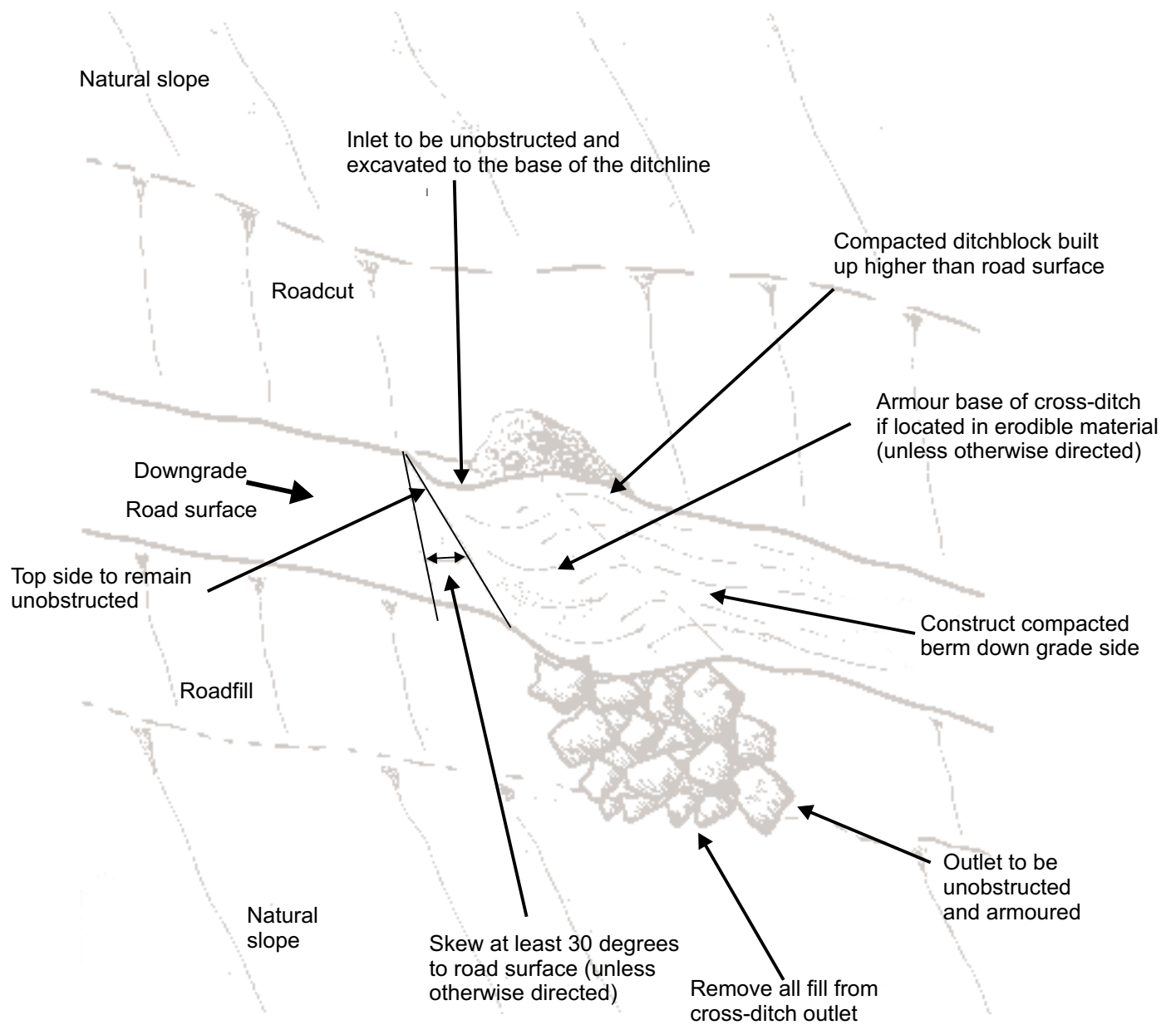
The material in this Appendix is meant to assist project personnel in successfully completing prescribed deactivation activities in a safe, environmentally sensitive, and efficient manner. It is only meant to address some of the basic difficulties that may be encountered; it is impossible to provide a solution to every conceivable situation. Common sense must still be applied.

Be prepared to question the prescription if you feel the action will put you at risk or have a negative impact on the environment. IF a situation is encountered with which you are uncomfortable, stop work and seek advice before proceeding.

It must be understood that these are general approaches, and due to varying site conditions, may not work in each situation encountered. Be prepared to vary the approach to completing a prescription depending on conditions encountered.

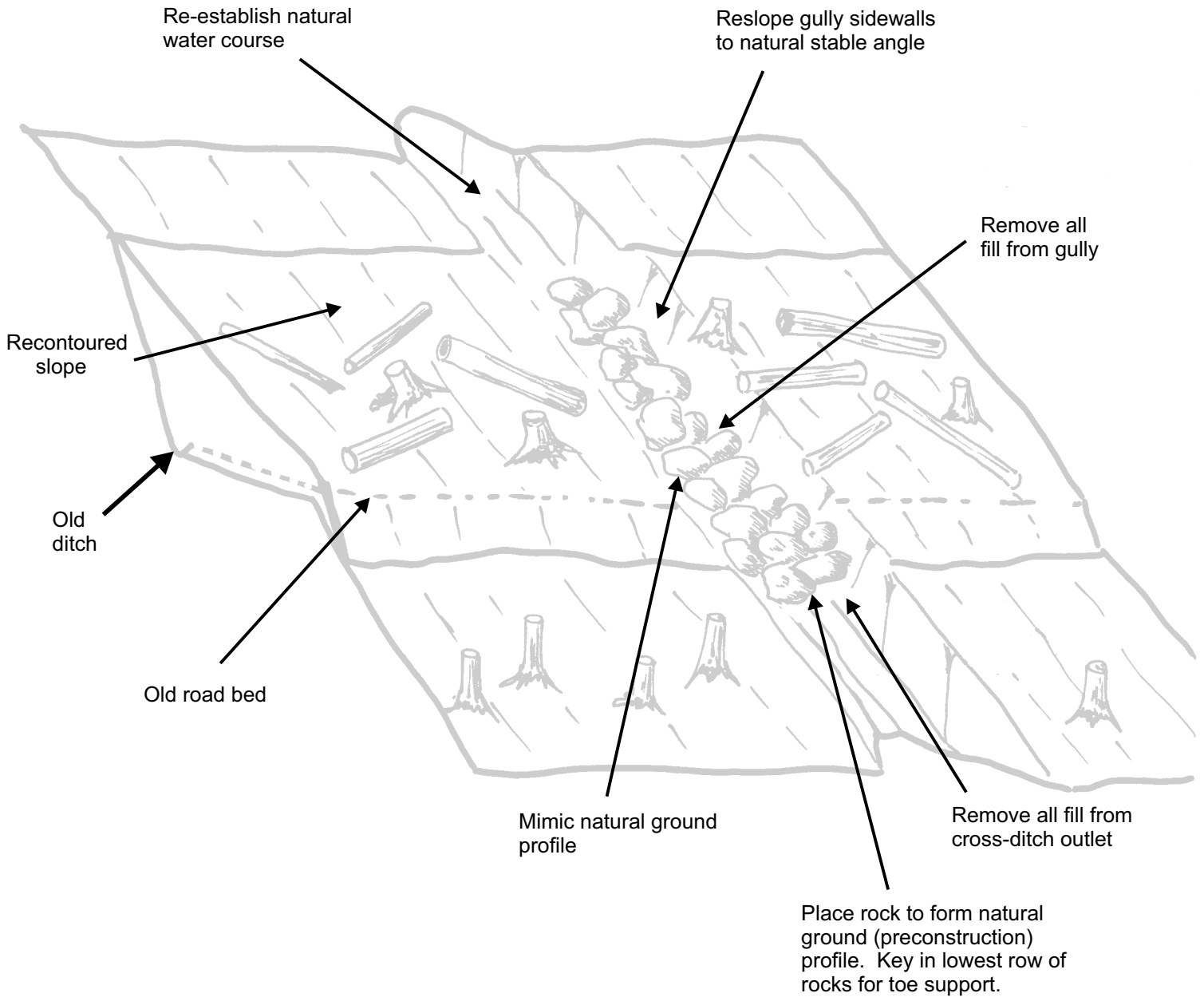
These suggested procedures should not be done unless the operator is fully experienced with machine operation and deactivation principles.

Figure 1 Cross-ditch (Typical)



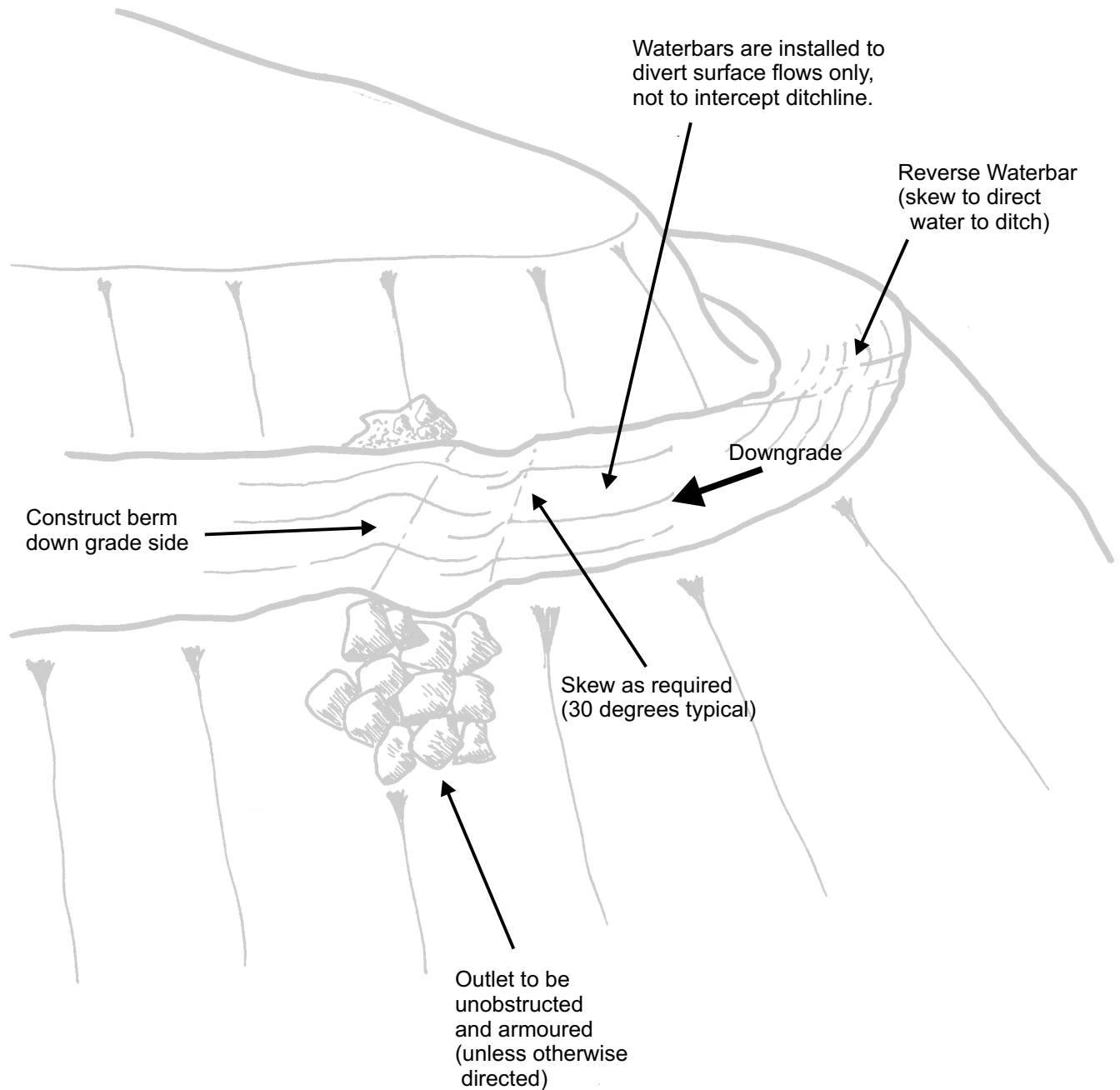
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Figure 2 Cross-ditch - Within Roadfill Pullback (Typical)



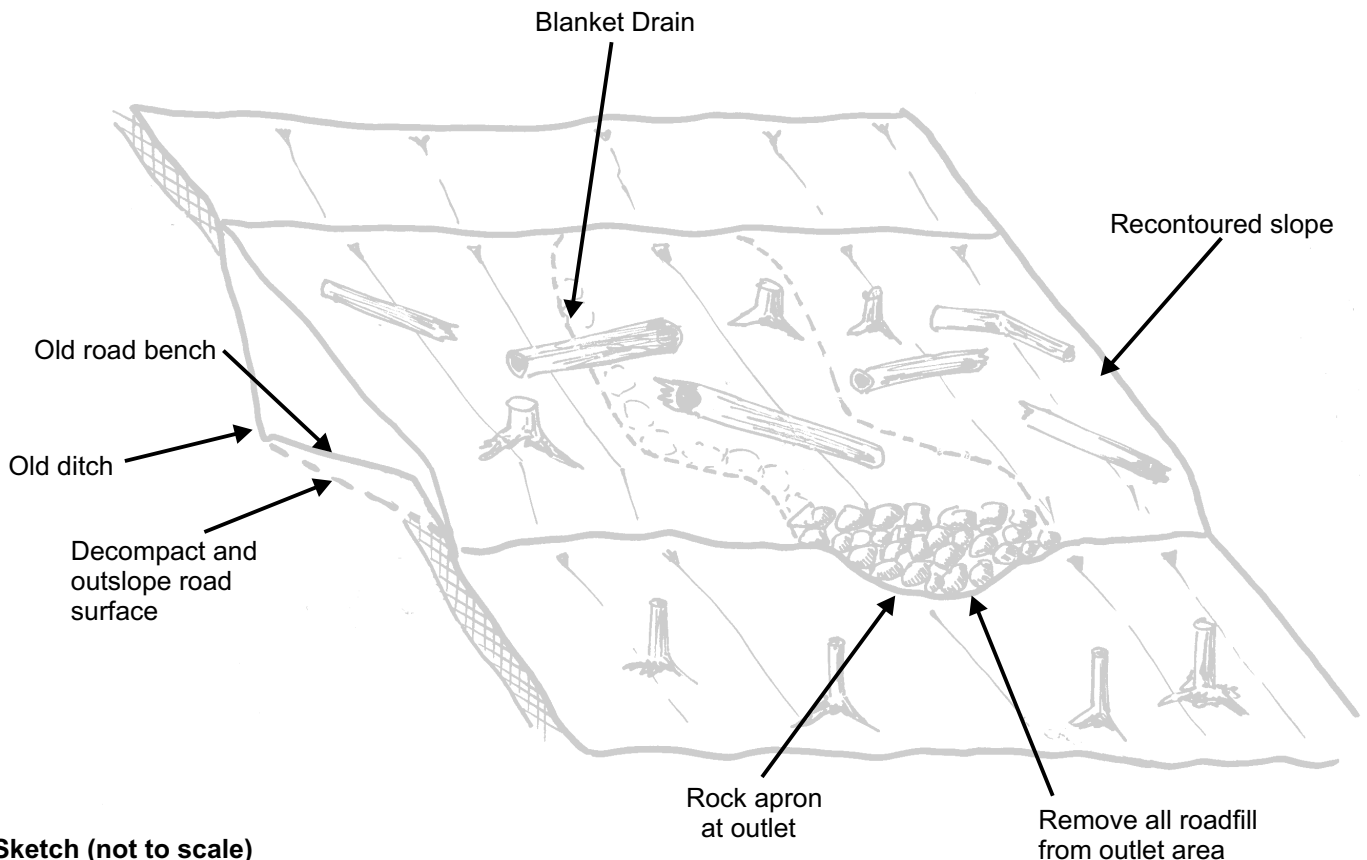
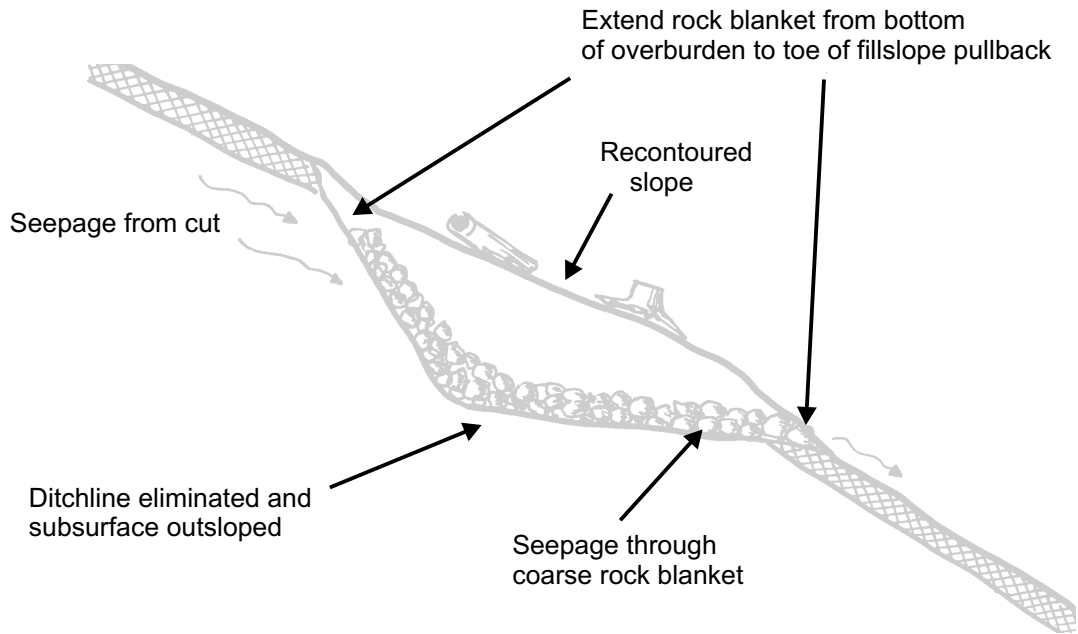
Sketch (not to scale)

Figure 3 Waterbar (Typical)



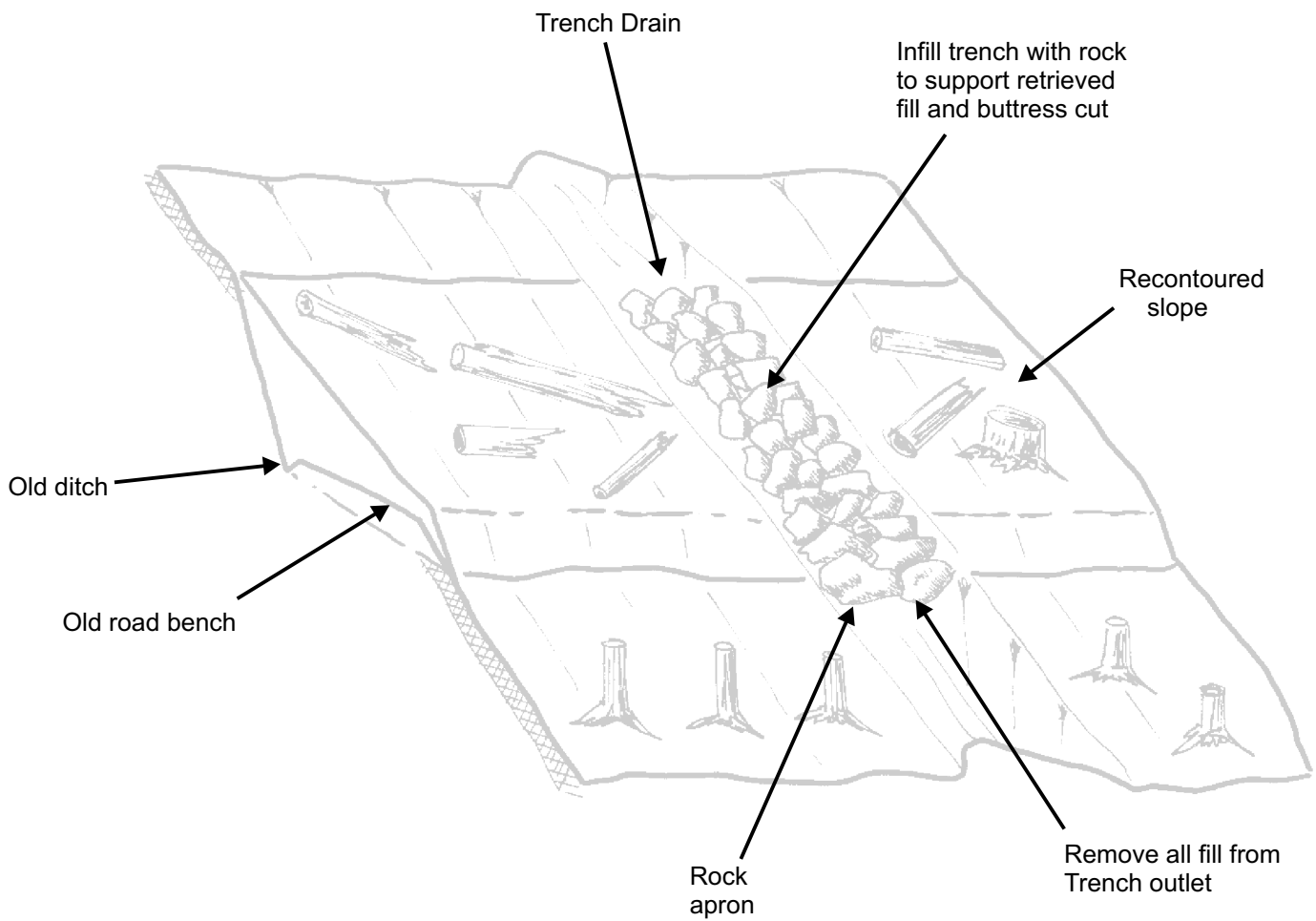
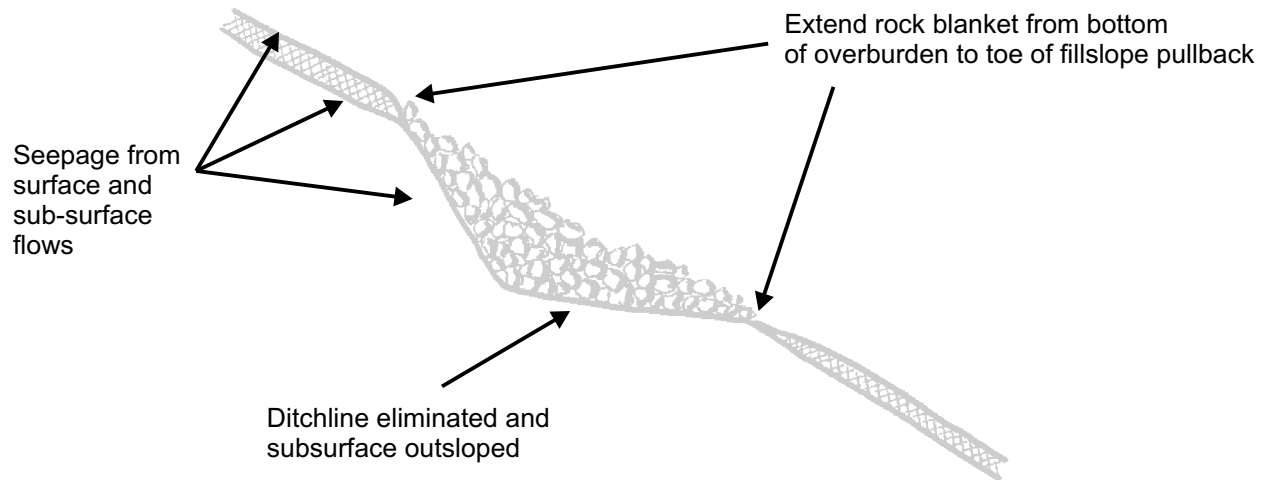
Sketch (not to scale)

Figure 4 Blanket Drain (Typical)



Sketch (not to scale)

Figure 5 Trench Drain (Typical)



Sketch (not to scale)

Figure 6 French Drain (Typical)

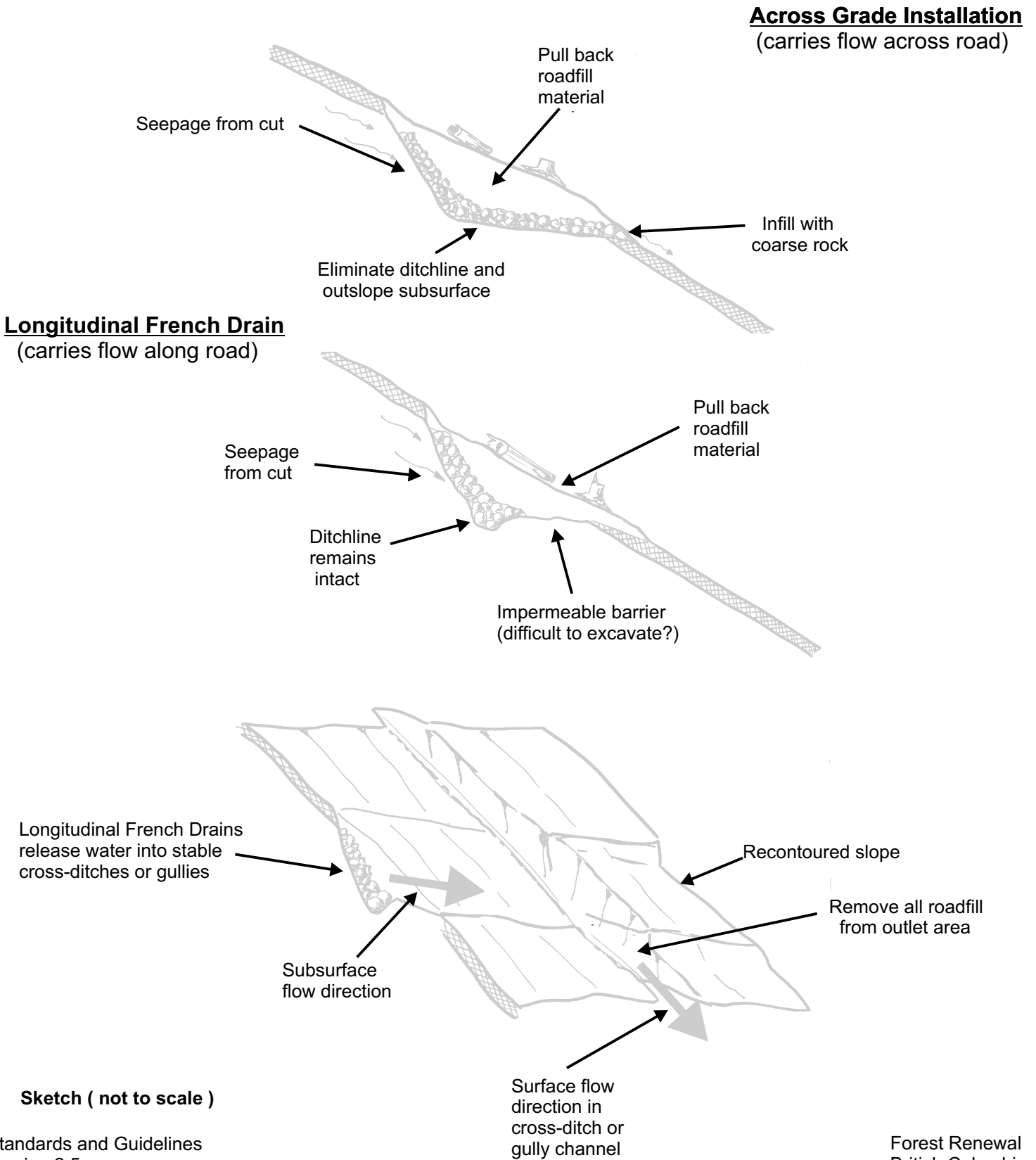
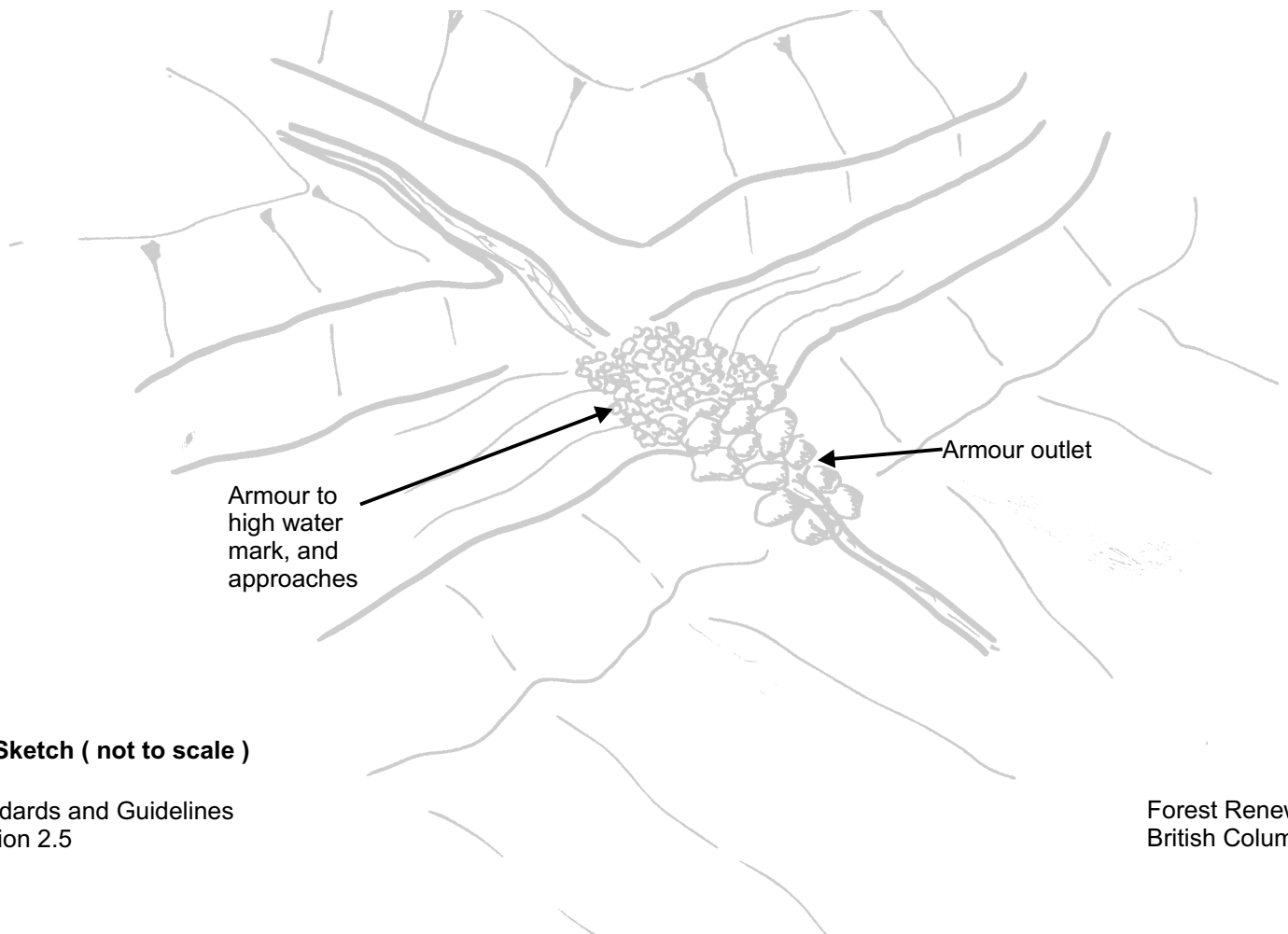
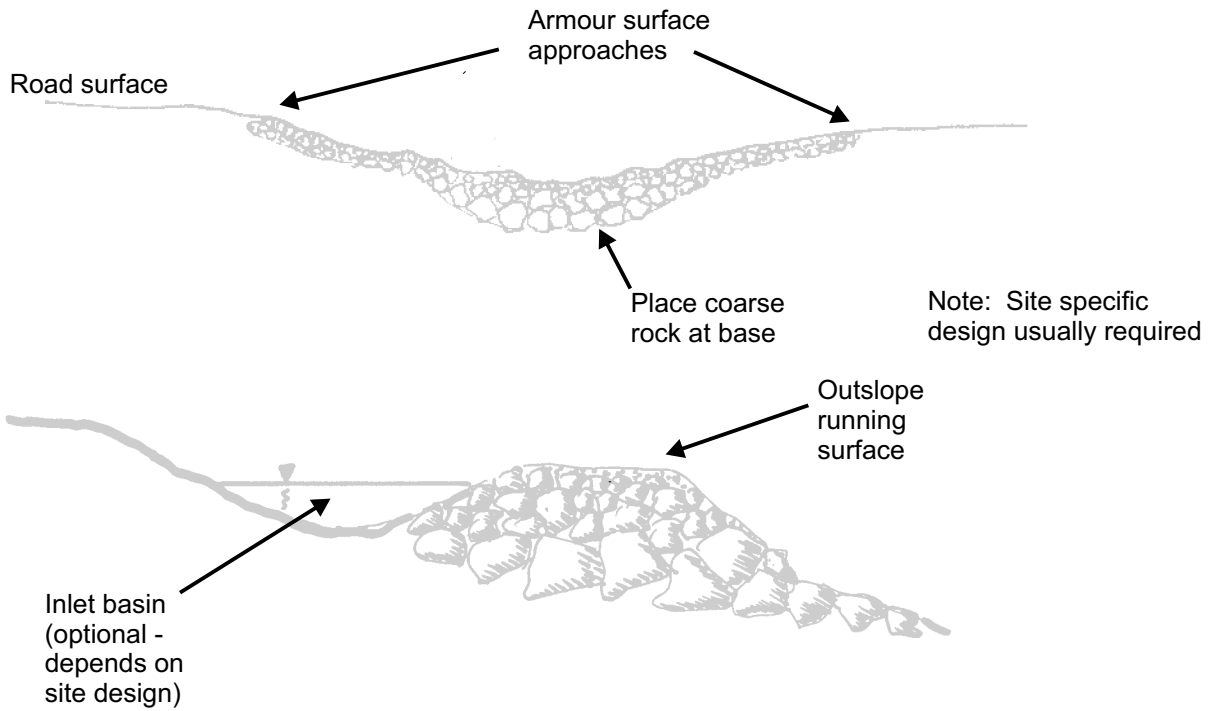


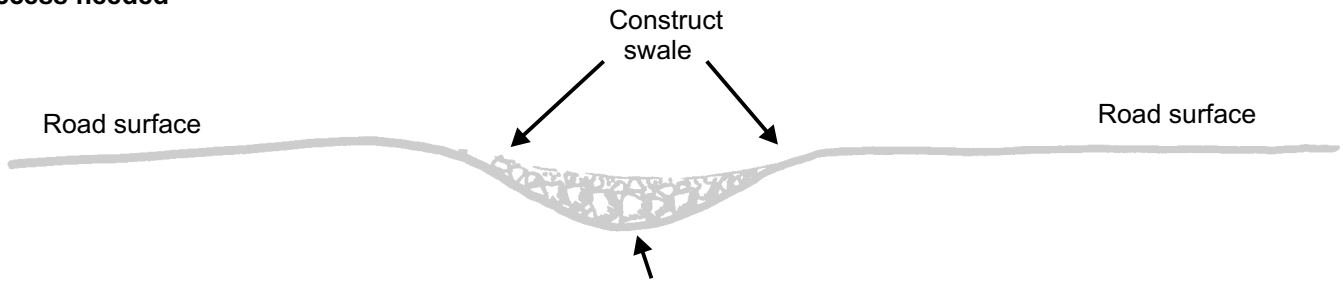
Figure 7 Ford (Typical)
D.F.O., M.O.E. & M.O.F. approval needed



Sketch (not to scale)

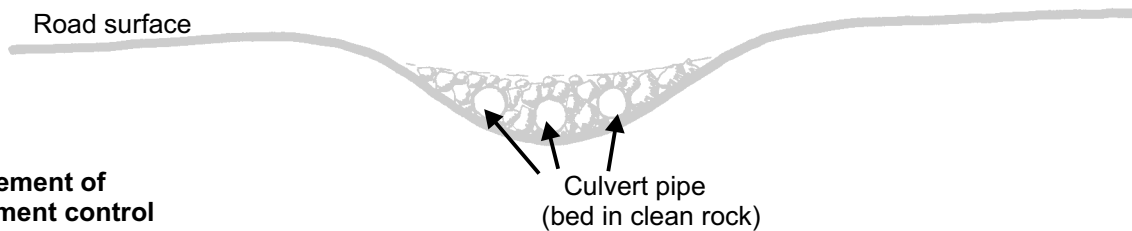
Figure 8 Armoured Swale (Typical)

Seasonal or Ephemeral channels
(Low flows or seepage expected)
Access needed



Place coarse rock in base to accommodate seepage

Stream channels
(Continuous flows expected)
Access needed



Placement of sediment control in stream channels

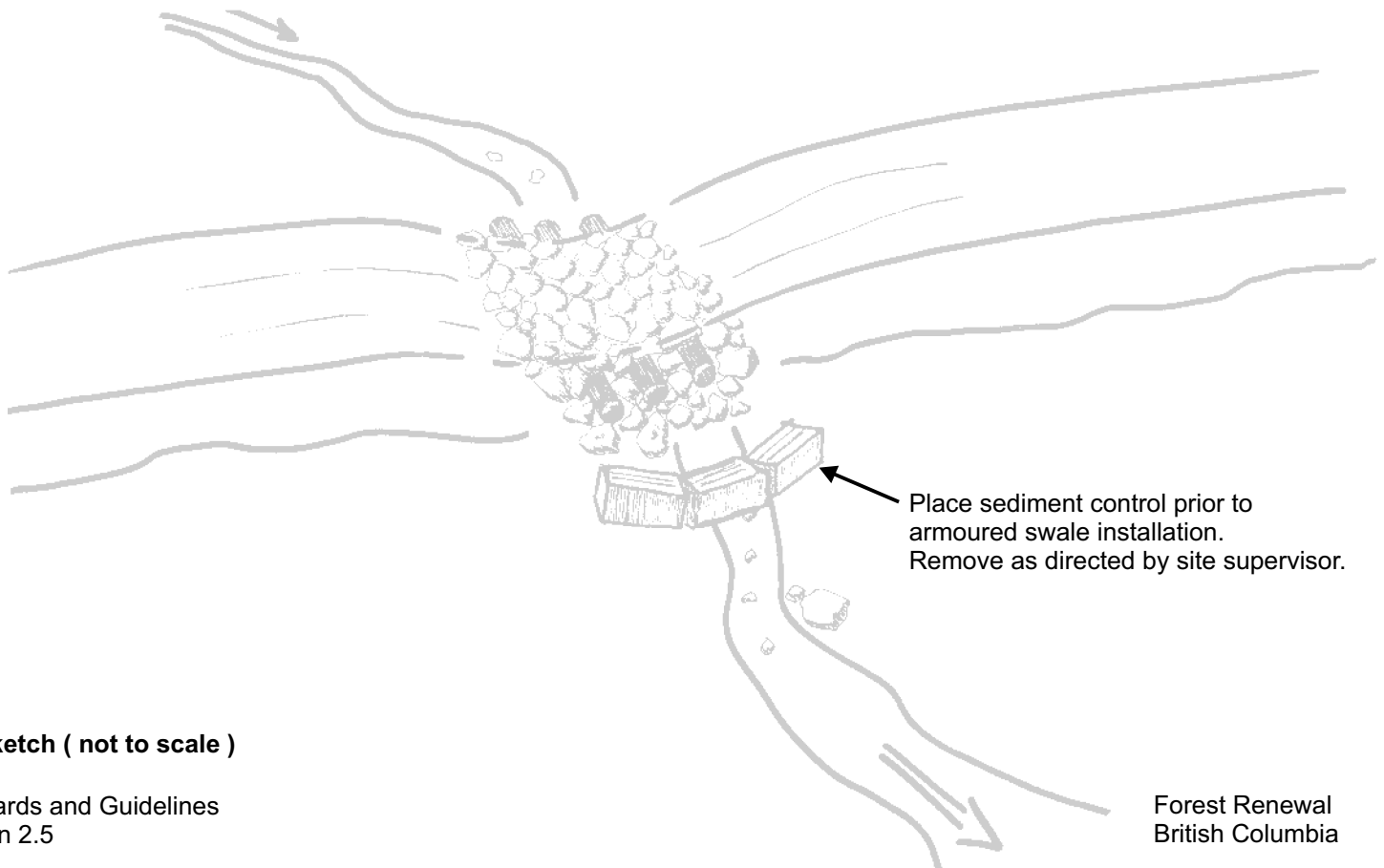
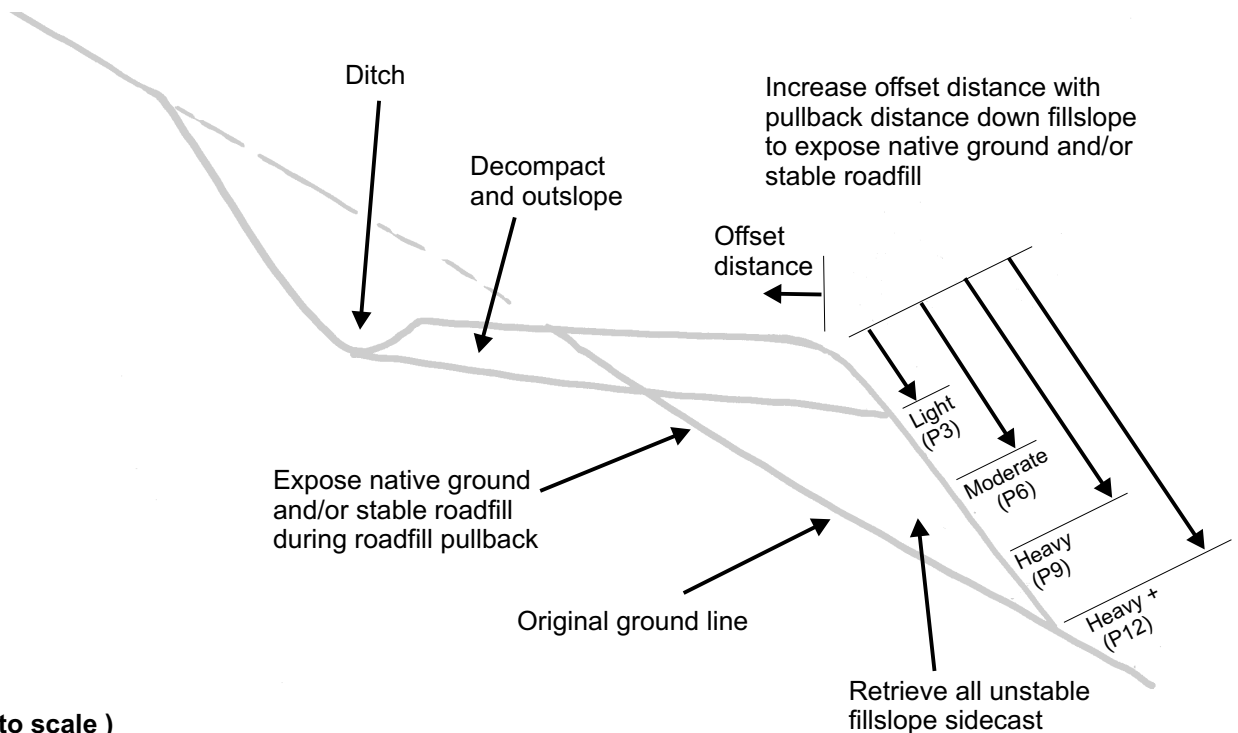
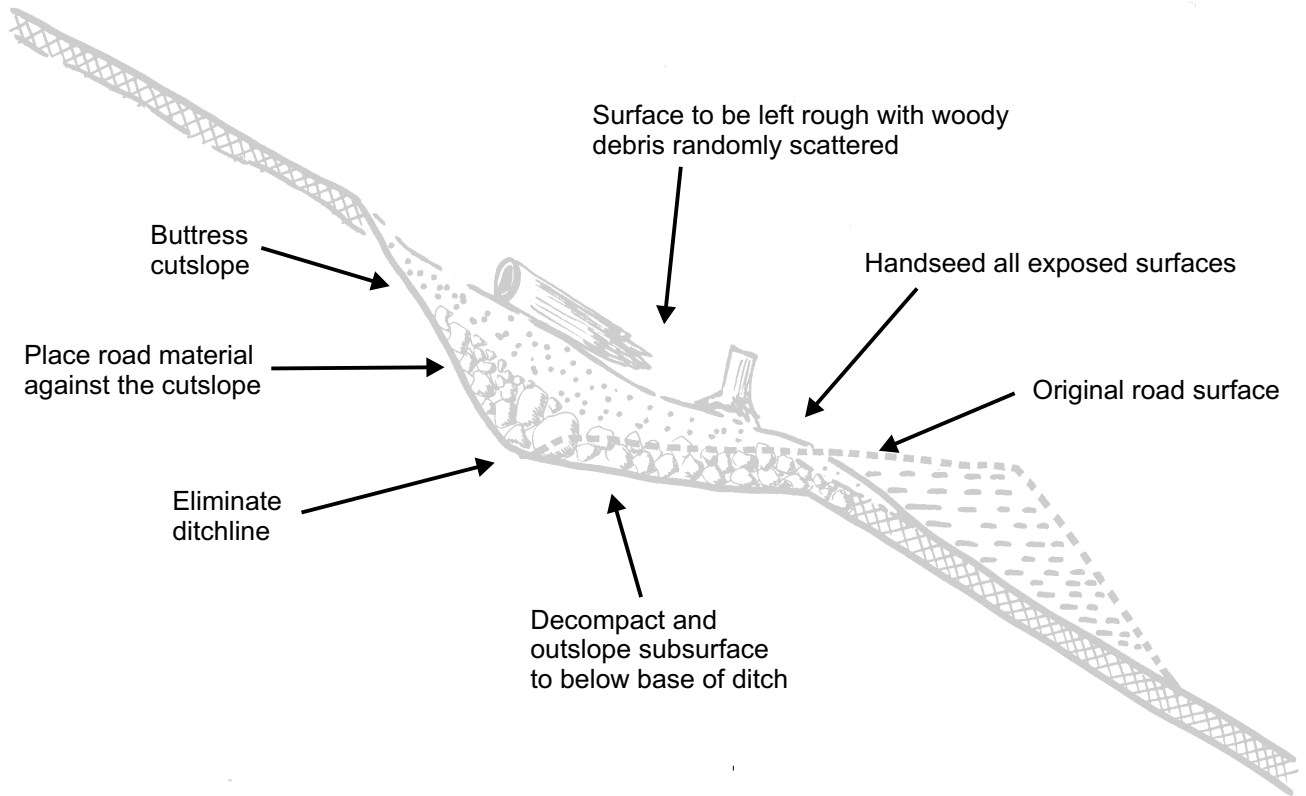
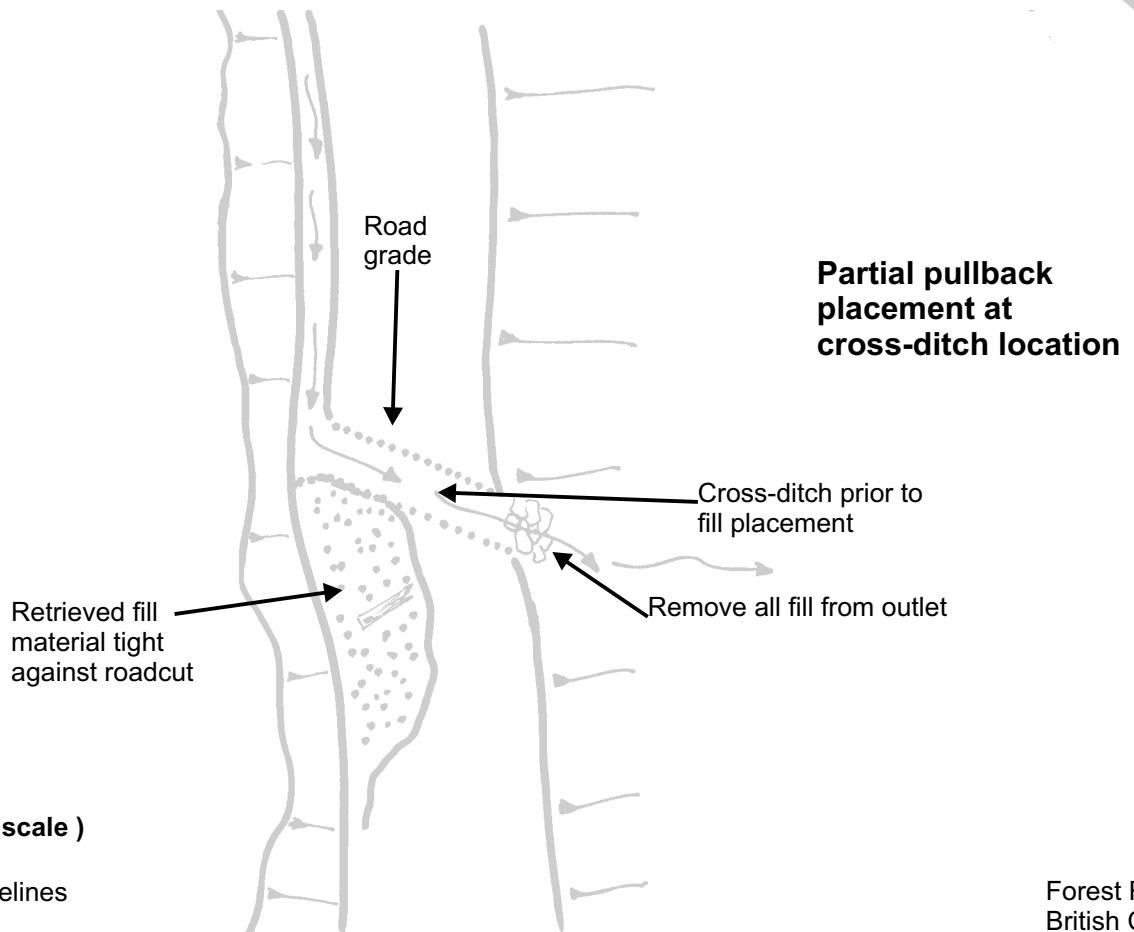
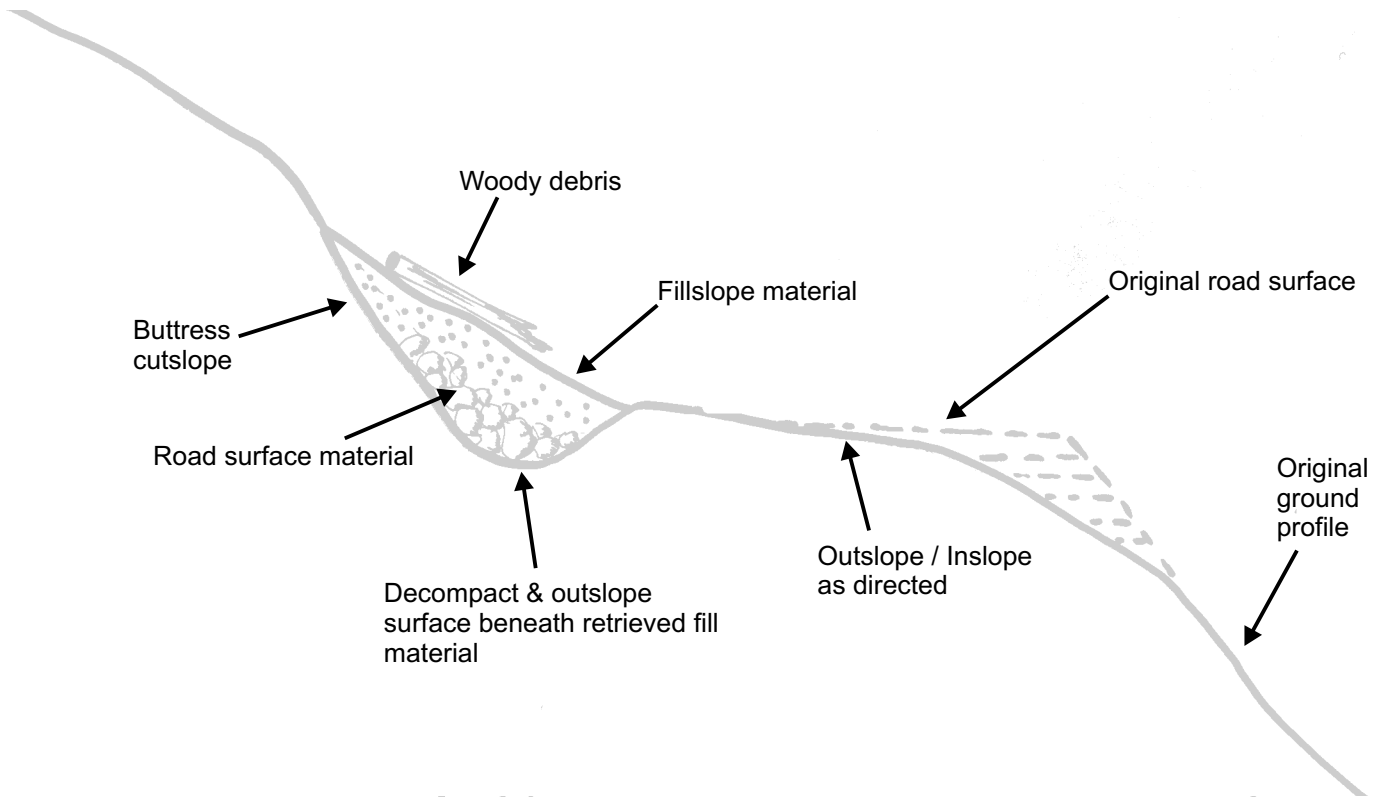


Figure 9 Full Sidecast Pullback (Typical)



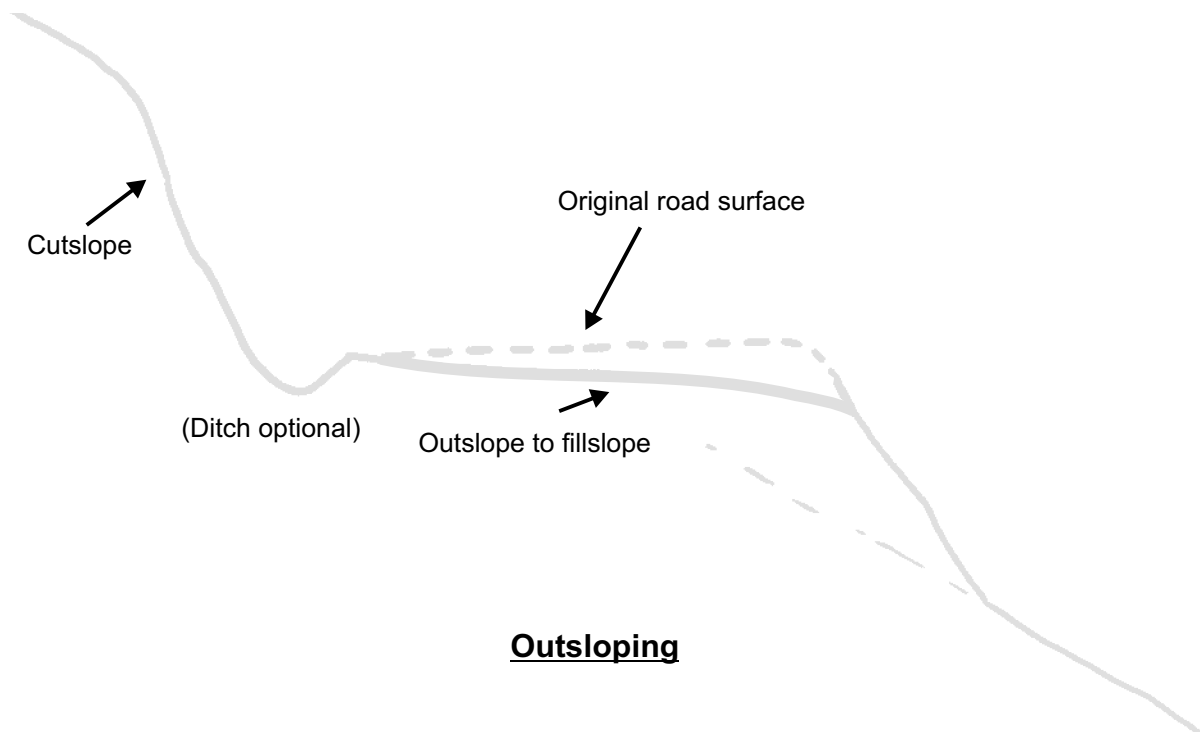
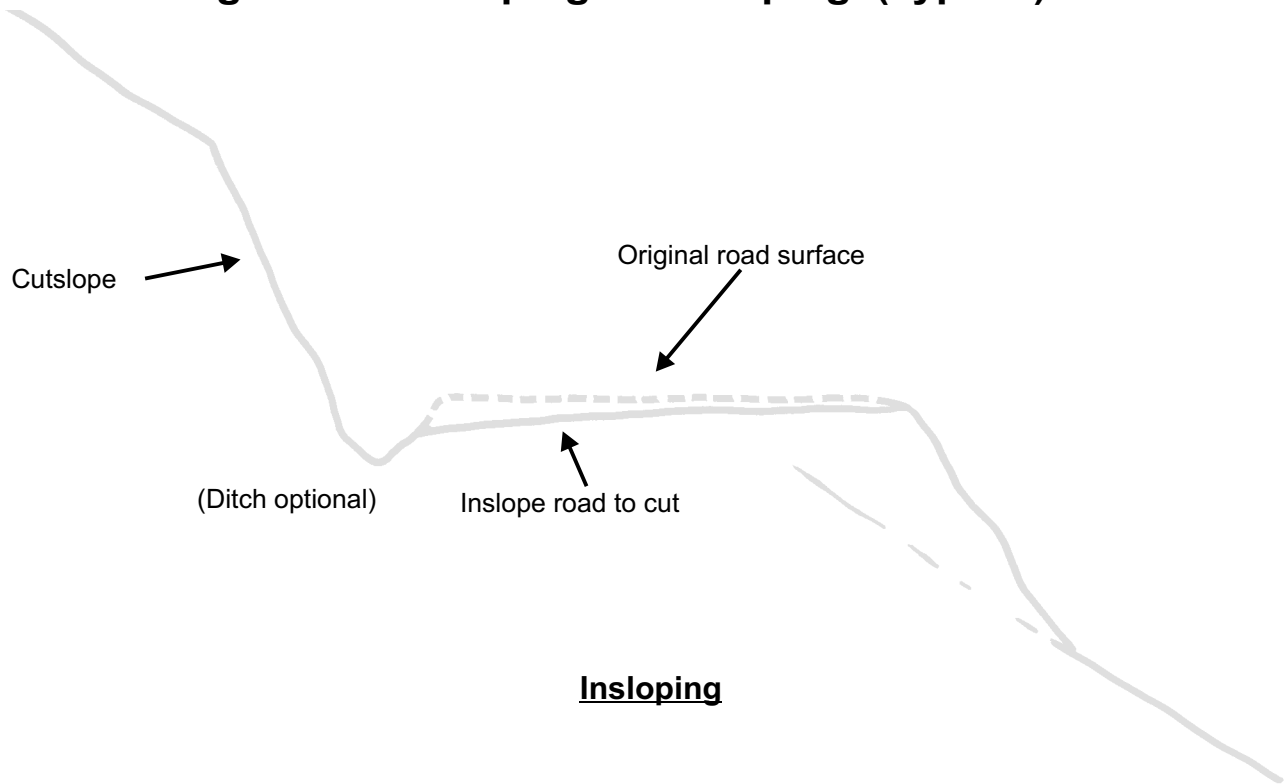
Sketch (not to scale)

Figure 10 Partial Sidecast Pullback (Typical)



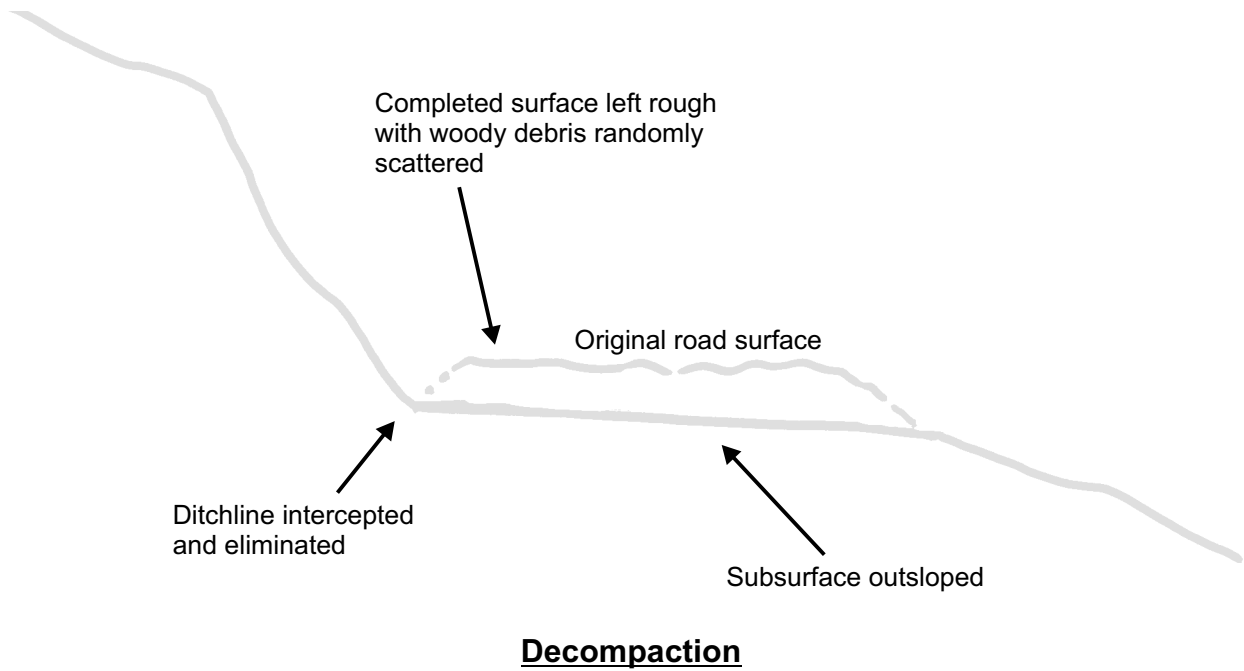
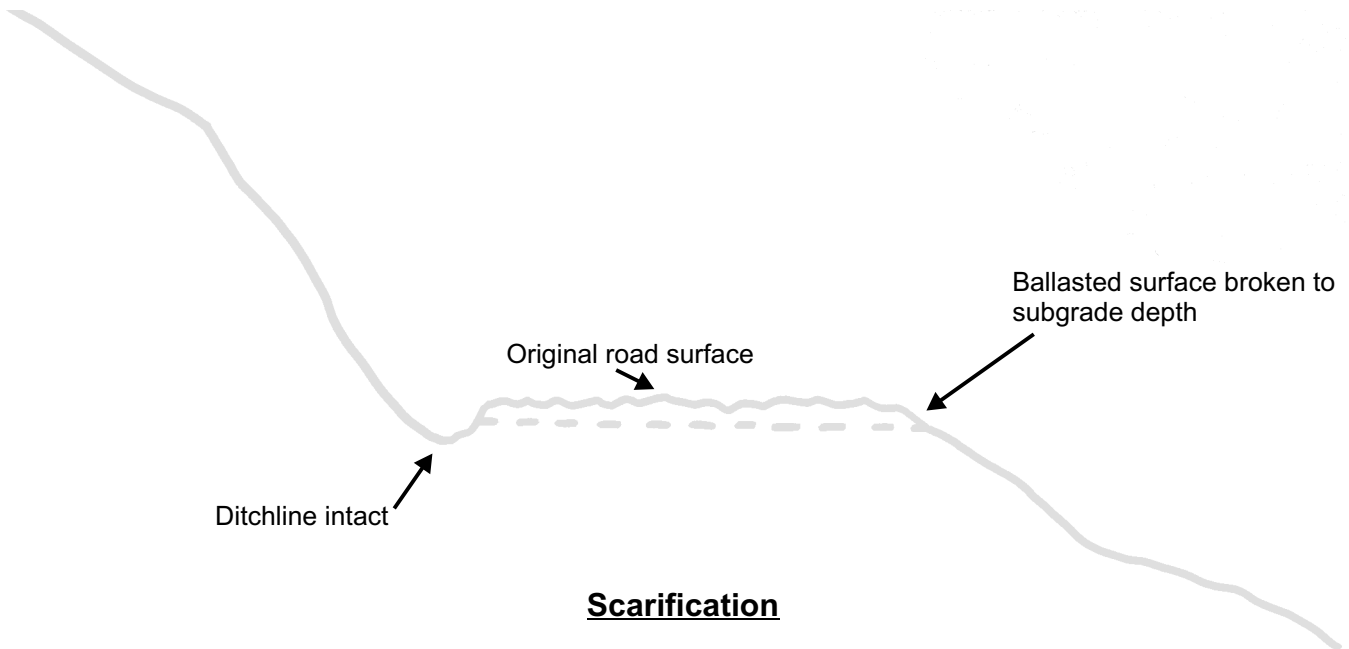
Sketch (not to scale)

Figure 11 Insloping / Outsloping (Typical)



Sketch (not to scale)

Figure 12 Scarification / Decompaction (Typical)



Sketch (not to scale)