

# Appendix II

## Technical Standards and Guidelines for:

### - Suggested General Approaches

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## SUGGESTED GENERAL APPROACHES

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## **1. FIELD PROCEDURES**

### **1.1 Introduction**

Appendix I describes the Standards and Guidelines regarding forest road deactivation activities, in terms of the obligations and expectations for project personnel.

Appendix II is intended to provide Site Supervisors, Equipment Operators, and Technicians with practical proven techniques used in Road Deactivation. The intent is not to discuss field markings and prescriptions, as no definite standard exists; rather, it describes the approaches to be used when actions are prescribed. Each activity will be discussed and a suggested approach presented.

### **1.2 Objective**

The objective of Appendix II is to illustrate deactivation techniques and leave the Operator and Site Supervisor with practical alternative approaches to each activity in the deactivation prescriptions. If approached correctly, these activities can be completed in a safe, environmentally sensitive, and efficient manner.

### **1.3 Discussion**

It must be understood that these are general approaches, and due to variations in site conditions, they may not work in every situation. Be prepared to adapt the approach to the conditions encountered. If you are uncomfortable in a situation, stop work and seek advice before proceeding.

These suggested approaches should not be done unless the operator is fully experienced with machine operation and has a good understanding of deactivation principles.

## 2. SUMMARY

The material in this Appendix is meant to assist on site 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 13 - 1 Cross-ditch (road intact)

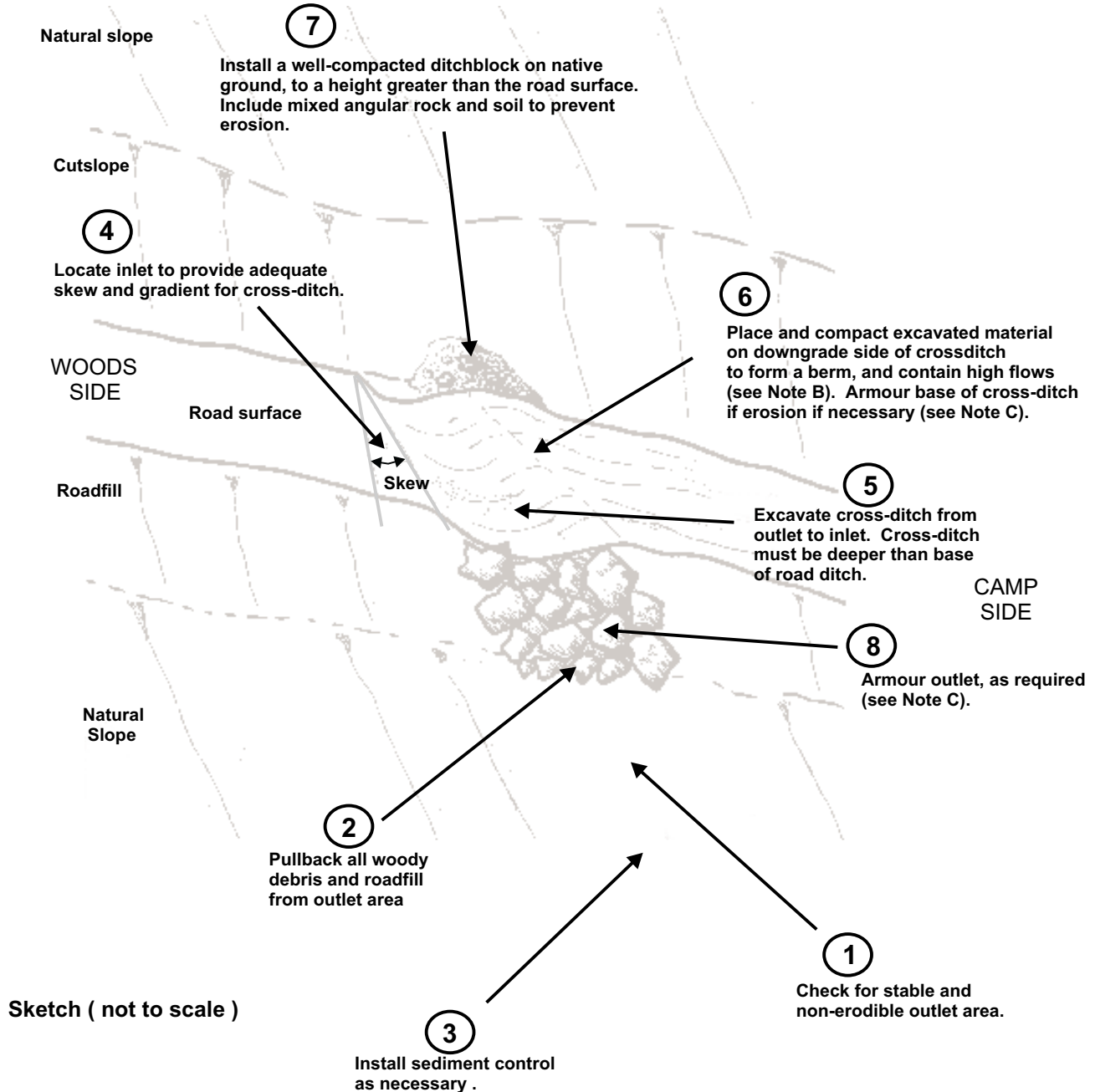
**Purpose:** Cross-ditches are used to capture road surface and ditchline water, and route it off and across the road to stable, non-erodible sites below the road. Usually no maintenance is required to ensure long term flow when properly constructed.

**General Notes:**

**Note A:** The size, depth, and shape of cross-ditch will depend on access requirements and expected flows. Frequent cross-ditches can also be used to disperse hillslope drainage where landslides may occur below the road.

For culvert removal in deep fills, see Note F.

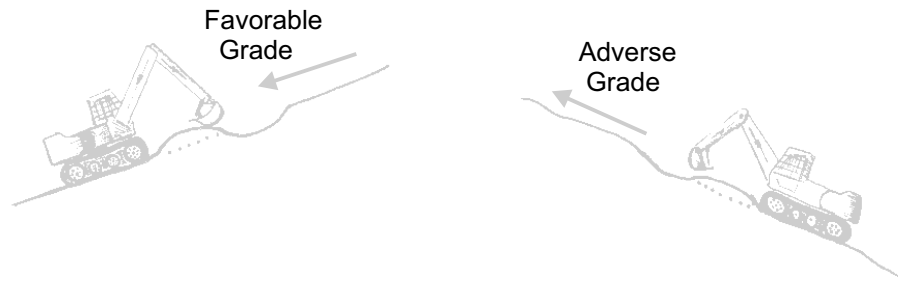
For backup cross-ditches, see Note G.



## Figure 13 - 2 Cross-ditch (road intact) NOTES

**Note B:** Install sediment control if water flowing at the cross-ditch is flowing directly to fish habitat, or a watercourse which is connected to fish habitat.

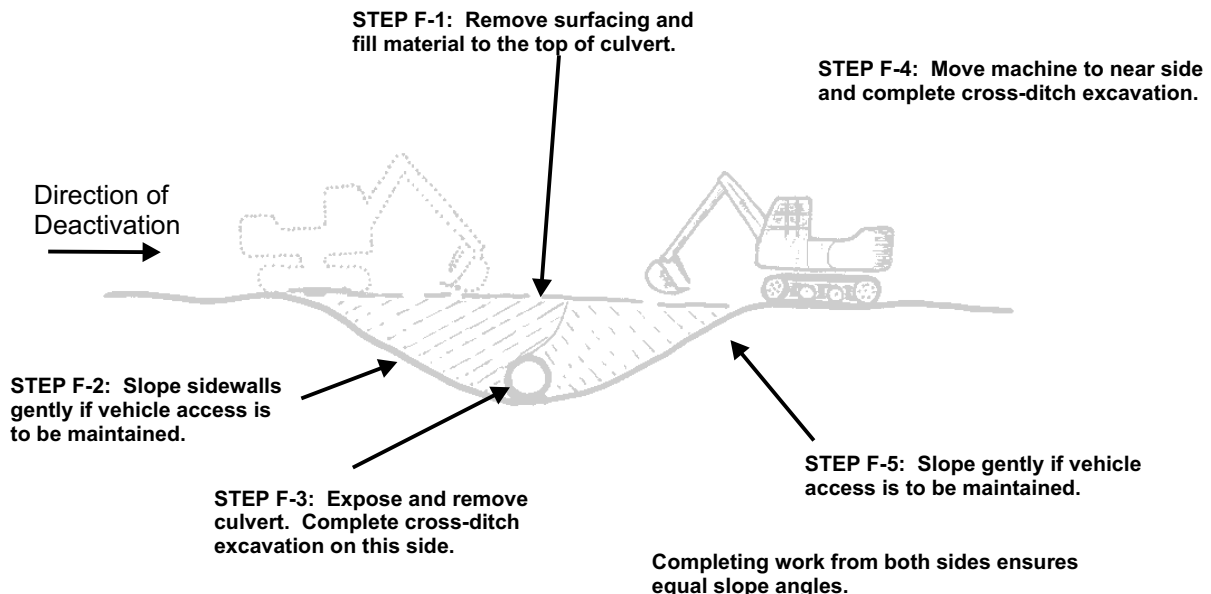
**Note C:** Always install the berm on the downgrade side of the cross-ditch, regardless of deactivation direction.



**Note D:** Armour outlet areas if erosion is expected, unless directed otherwise. Size and placement of armour will depend on anticipated flows and consequence. Use angular rock for armouring, large enough to remain in place during high flows but small enough not to divert or obstruct flows.

**Note E:** Larger expected flows and steeper grades will usually require deeper cross-ditches. If access is to be maintained, carefully grade the approaches to allow for vehicle access. Armour base if erosion is expected to cause problems for future traffic.

**Note F:** Removal of culverts in deep roadfills often requires four steps.



**Note G:** Backup cross-ditches are installed directly downgrade of a culvert location, unless otherwise directed. The backup cross-ditches should be equal in size to the channel high water area, and similar in design and shape to a regular cross-ditch.

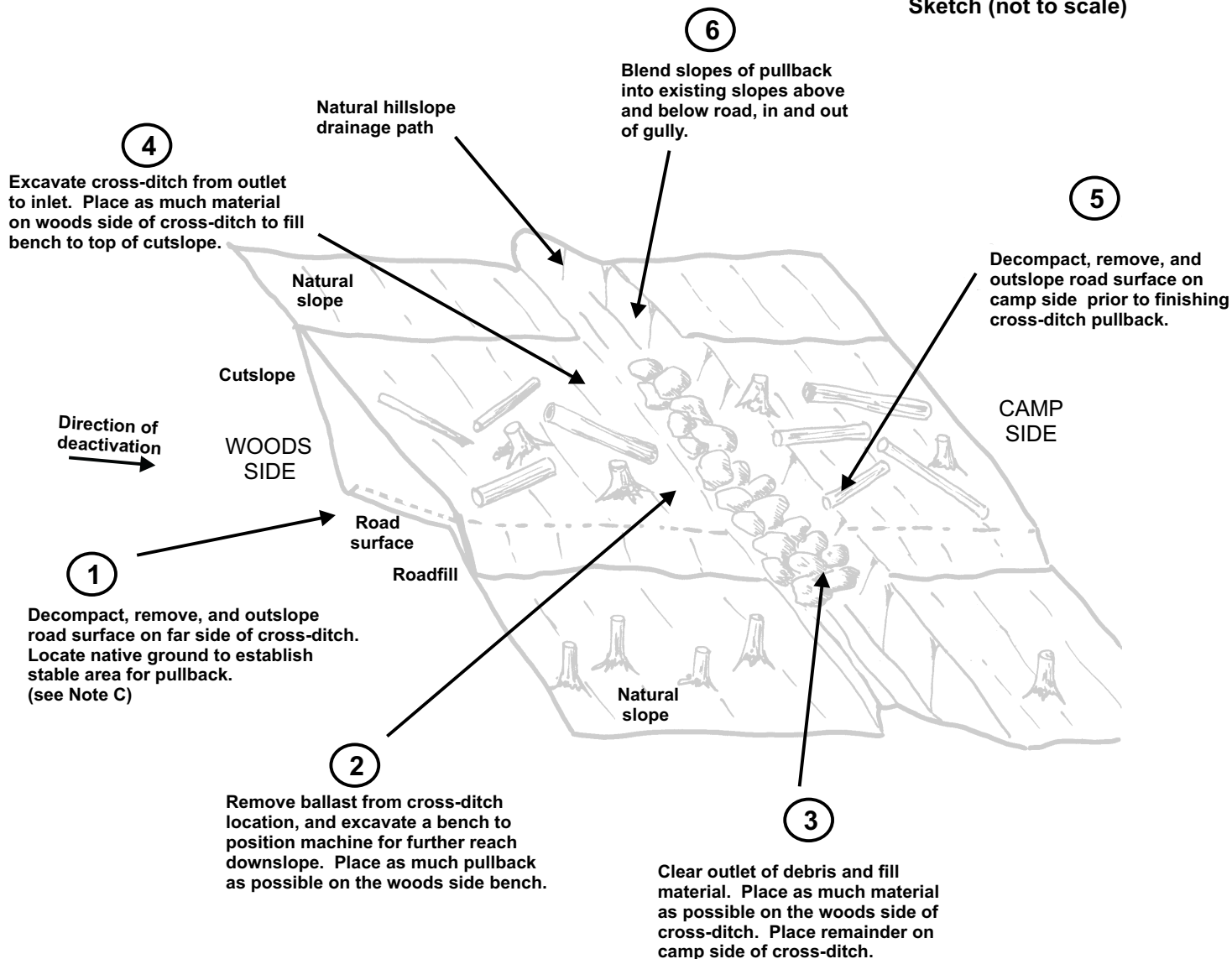
**Purpose:** Cross-ditches in pullback are used to restore natural hillslope drainage patterns to their historic (pre-construction) locations.

**General Notes:**

**Note A:** Cross-ditches in pullback are located at natural depressions, gully channels, and swales which have evidence of stream flow above the road.

**Note B:** The size, depth, and shape of cross-ditch to depend on hillslope and gully contours. The cross-ditch should mimic natural ground profiles and contours.

Sketch (not to scale)



**Note C:** Excavate the road surface starting at the ditchline and working toward the fillslope, overlapping bucket excavations, excavating deeper as you move away from the ditch. This method also quickly locates the edge of the stable natural bench for determining the safe working limit and amount of room for pullback.

**Note D:** Excavate cross-ditch by removing all roadfill and exposing native ground, unless otherwise directed.

**Note E:** Stockpile any rocks found during excavation to use as armour on the woods side of the cross-ditch. When excavating the outlet, place armour once outlet is defined.

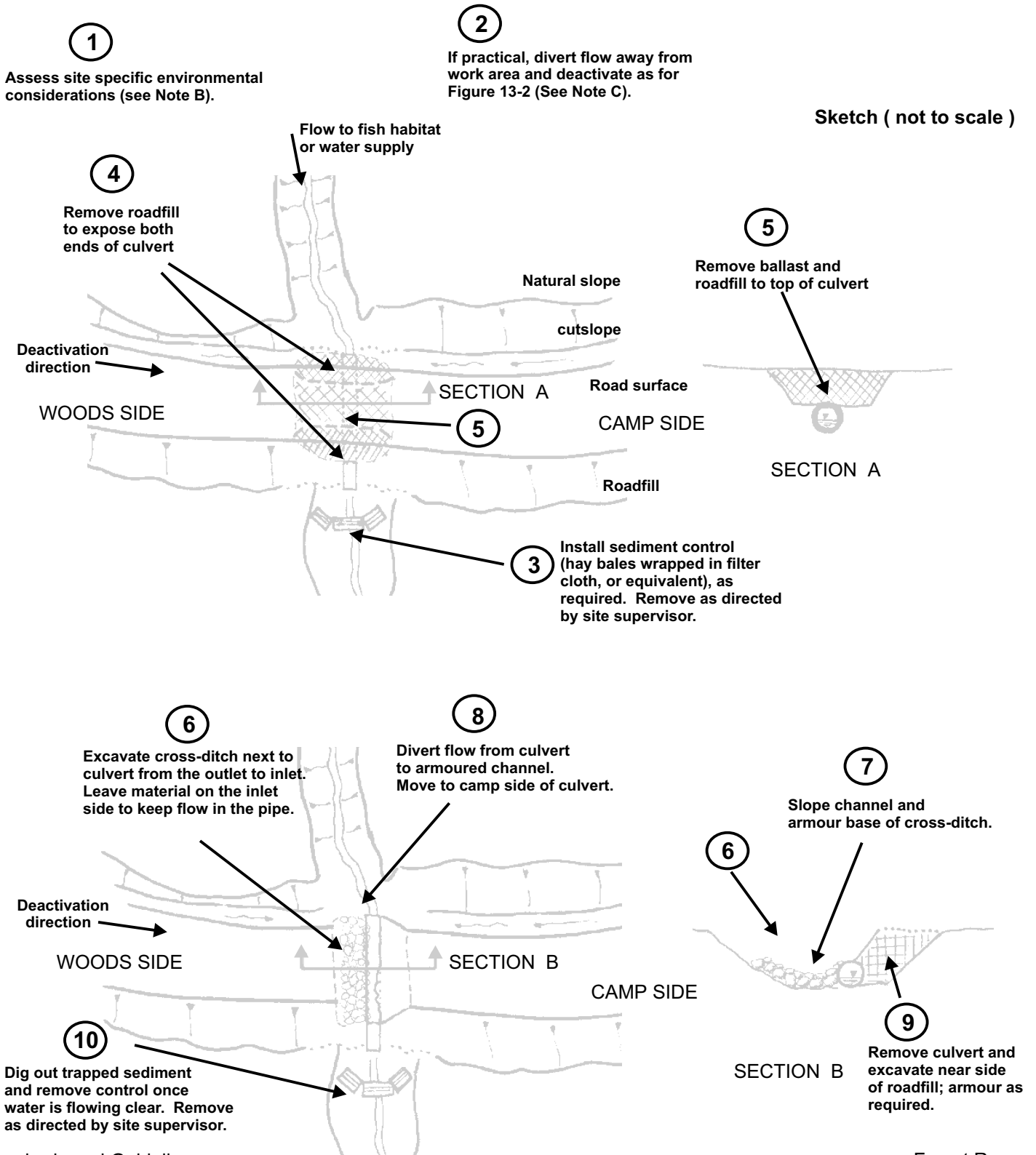
**Note F:** The order of pullback placement and scattering of woody debris is the same as for roadfill pullback (see Figure 21-1).

# Figure 15 - 1 Culvert Pipe Removal / Cross-ditch (water present)

**Purpose:** To remove the existing metal culvert with the least amount of sedimentation possible, and leave a cross-ditch at the location.

**General Notes:**

**Note A:** The size, depth, and shape of cross-ditch to depend on hillslope and creek/gully contours.



## Figure 15 - 2 Culvert Pipe Removal / Cross-ditch (water present)

### NOTES

**Note B:** Prior to removing any culvert and installing a cross-ditch in wet conditions, many factors need to be considered:

- What class of stream is involved? Are there fish present? If so, are approvals in to proceed?
- Is the stream connected to fish bearing waters?
- Are there any timing windows for the site?
- Is the stream connected to the water supply for a town or community?
- How much water is flowing?
- What is the weather forecast?
- How much sediment is expected?
- What are the access requirements for the site after completion, if any?

**Note C:** If at all practical, make the site as dry as possible. Prior to culvert removal, decide on a method to control the water. These may include:

- diverting the flow down the ditchline until the cross-ditch is constructed and the water can be directed into the cross-ditch;
- gravity divert flows with Big O pipe or similar until the cross-ditch is complete;
- construct a secondary cross-ditch to divert flows until the cross-ditch is complete;
- pump flows around workings (only if reliable pumps are on site).

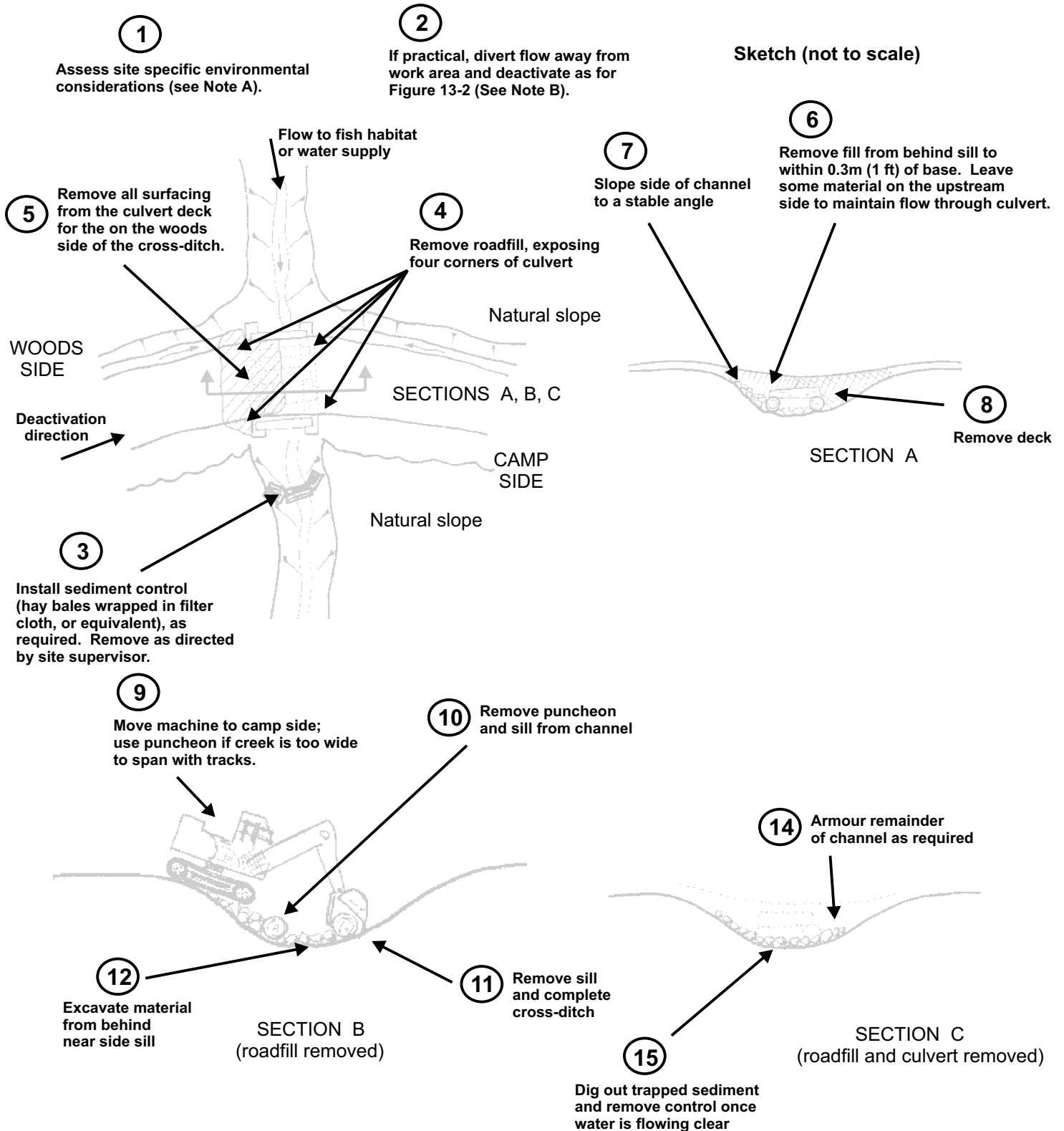
**Note D:** Each location is different and site specific approaches must be used. Discuss options for work at the site if with the site supervisor or road deactivation specialist if there are any questions regarding how to remove the culvert.

# Figure 16 - 1 Wooden Culvert Removal / Cross-ditch (water present)

**Purpose:** To remove the existing wood box culvert with the least amount of sedimentation possible, and leave a cross-ditch at the location.

**General Notes:**

**Note A:** The size, depth, and shape of cross-ditch to depend on hillslope and creek/gully contours.



## Figure 16 - 2 Cross-ditch (road intact) NOTES

**Note A:** Prior to removing any culvert and installing a cross-ditch in wet conditions, many factors need to be considered:

- What class of stream is involved? Are there fish present? If so, are approvals in to proceed?
- Is the stream connected to fish bearing waters?
- Are there any timing windows for the site?
- Is the stream connected to the water supply for a town or community?
- How much water is flowing?
- What is the weather forecast?
- How much sediment is expected?
- What are the access requirements for the site after completion, if any?

**Note B:** If at all practical, make the site as dry as possible. Prior to culvert removal, decide on a method to control the water. These may include:

- diverting the flow down the ditchline until the cross-ditch is constructed and the water can be directed into the cross-ditch;
- gravity divert flows with Big O pipe or similar until the cross-ditch is complete;
- construct a secondary cross-ditch to divert flows until the cross-ditch is complete;
- pump flows around workings (only if reliable pumps are on site).

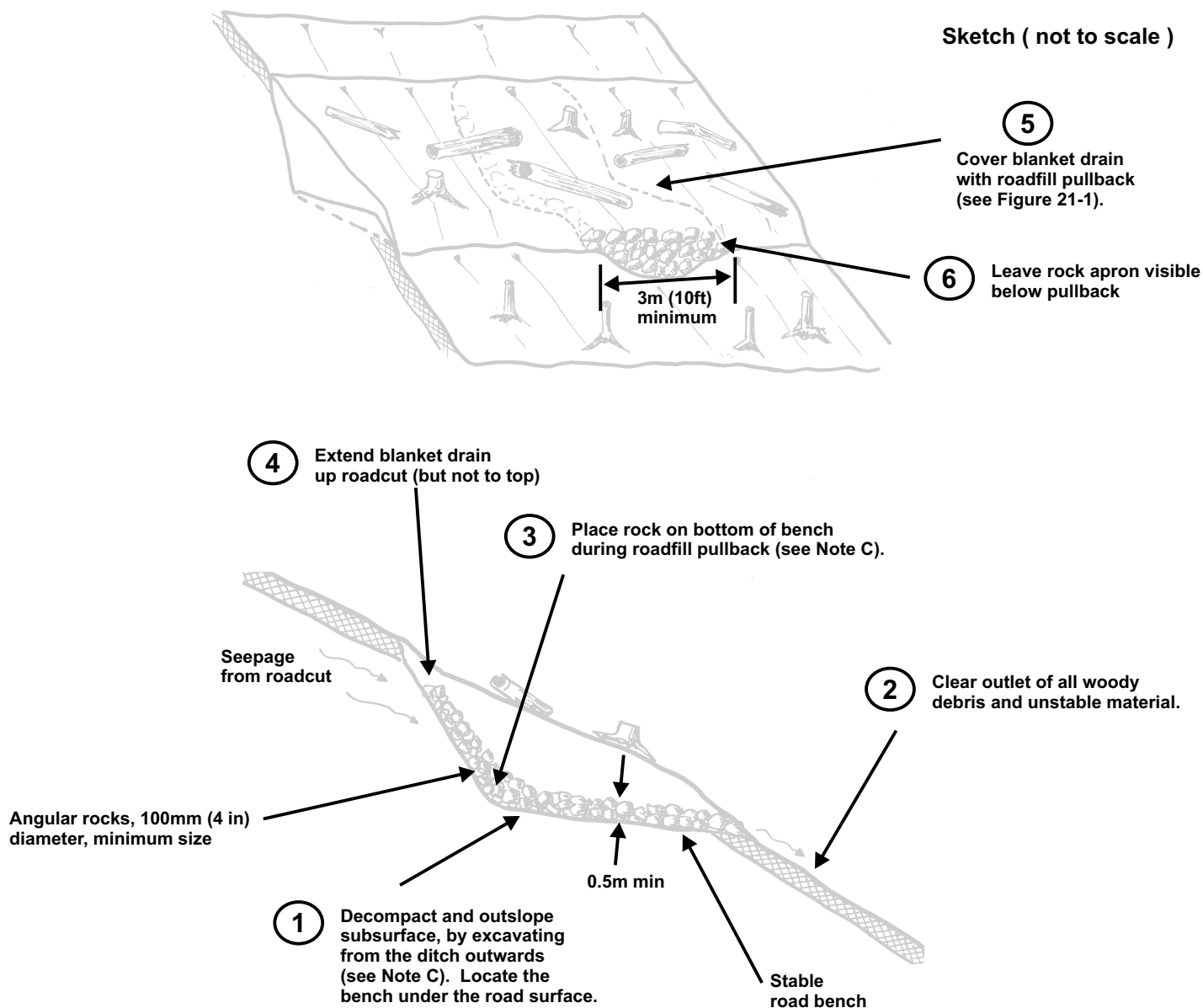
**Note C:** Each location is different and site specific approaches must be used. Discuss options for work at the site with the site supervisor or road deactivation specialist if there are any questions regarding how to remove the culvert.

**Purpose:** To route seepage from the cutslope across the road under the roadfill pullback.

**General Notes:**

Note A: Blanket drains should be used when seepages are evident on the cutslope, in areas where full pullback is prescribed, unless directed otherwise.

Note B: Blanket drains can also be used at locations where it is necessary to disperse subsurface water flows rather than concentrate water flows (as with a cross-ditch or trench drain).



**Notes:**

Note C: Excavate the road surface starting at the ditchline and working toward the fillslope, overlapping bucket excavations, excavating deeper as you move away from the ditch. This method also quickly locates the edge of the stable natural bench for determining the safe working limit and amount of room for pullback..

Note D: Letting rocks in the pullback roll down to the bench (by sprinkling the pullback into the roadcut) will sort the material and create a blanket drain.

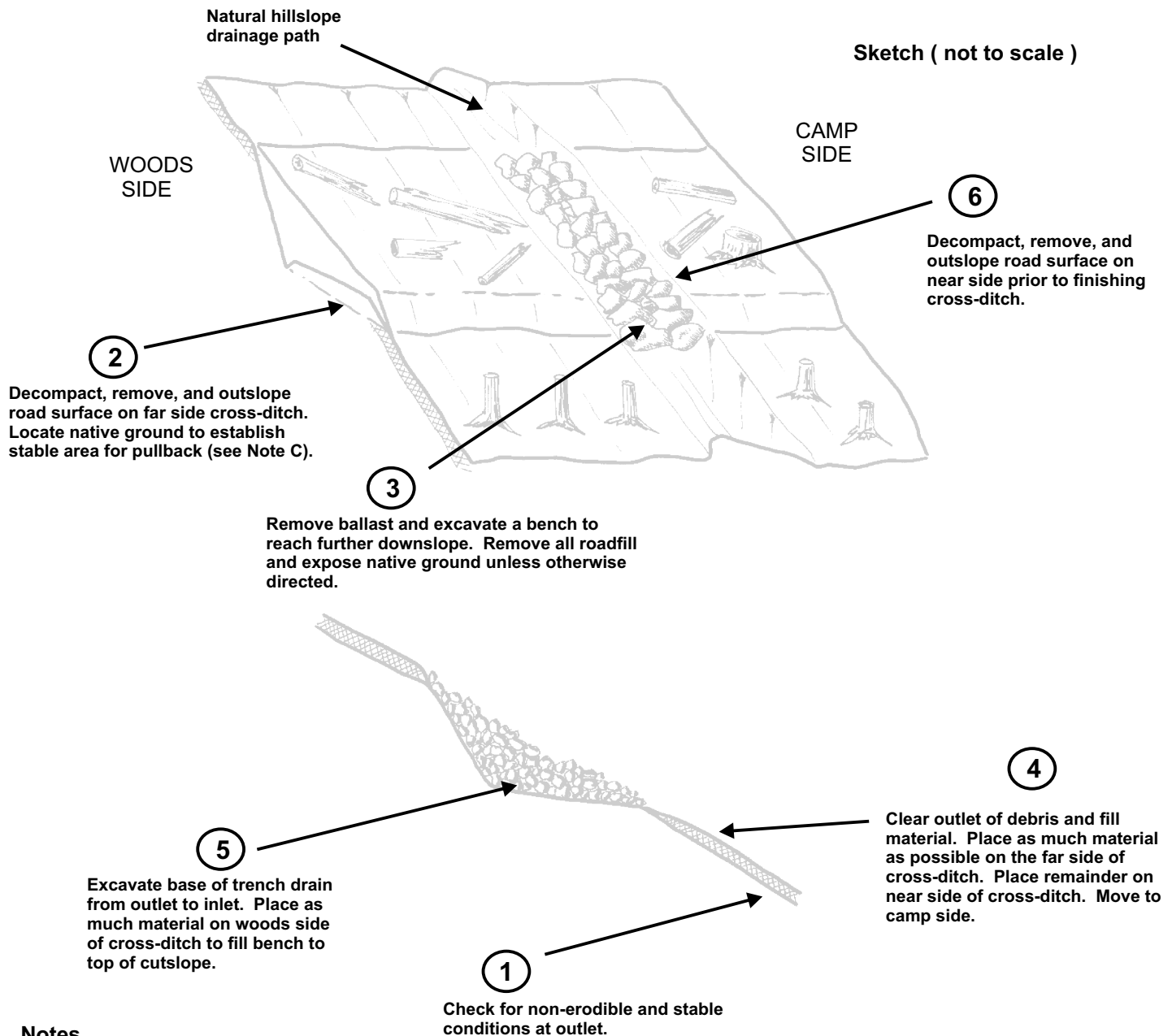
# Figure 18 Trench Drain

**Purpose:** To route seepage from the cutslope across the road under the roadfill pullback.

**General Notes**

**Note A:** The angular rock used in trench drains is larger than the rock for blanket drains, and meant to support the cutslope.

**Note B:** Trench drains can be substituted for cross-ditches in pullback areas where all the space on the stable bench must be used for roadfill. Using trench drains may reduce or eliminate the need for end-hauling of roadfill.



**Notes**

**Note C:** Excavate the road surface starting at the ditchline and work towards the fillslope, excavating deeper as you move away from the ditch. This method also quickly locates the edge of the stable natural bench for determining the safe working limit and amount of room for pullback.

**Note D:** Stockpile any rocks found during excavation for use in the construction of the trench drain.

**Note E:** Trench drains are infilled with coarse rock and built up as the fill is retrieved.

# Figure 19 French Drain

**Purpose:** To carry heavy seepage from the cutslope either across the slope (across grade) or along the slope (longitudinal) under roadfill pullback.

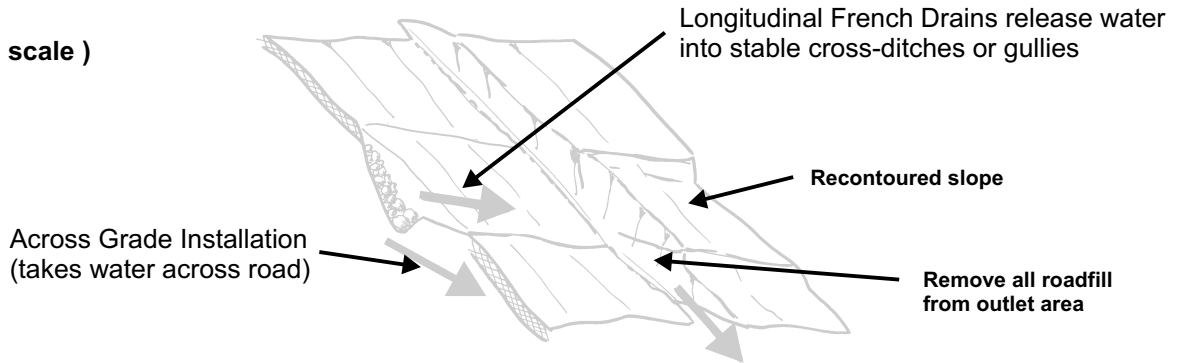
### General Notes

**Note A:** French drains can be used where: the seepage zones in the cutslope are relatively long; the pullback must remain unsaturated; and to route flows under pullback and around unstable slopes below the road grade, to stable creeks or gully channels.

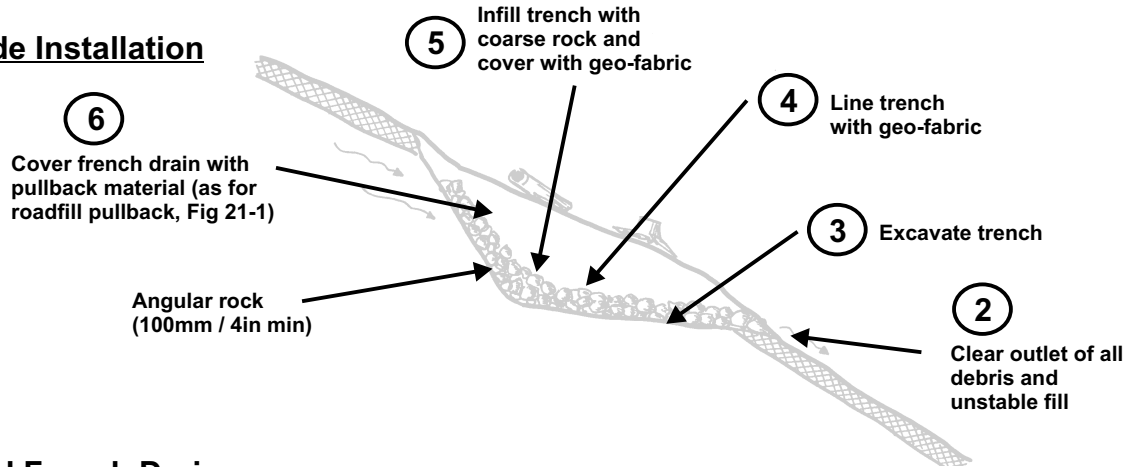
**Note B:** Stockpiling of angular rock may be needed, based on the type of french drain (longitudinal vs across grade).

**Note C:** Record installation with pictures.

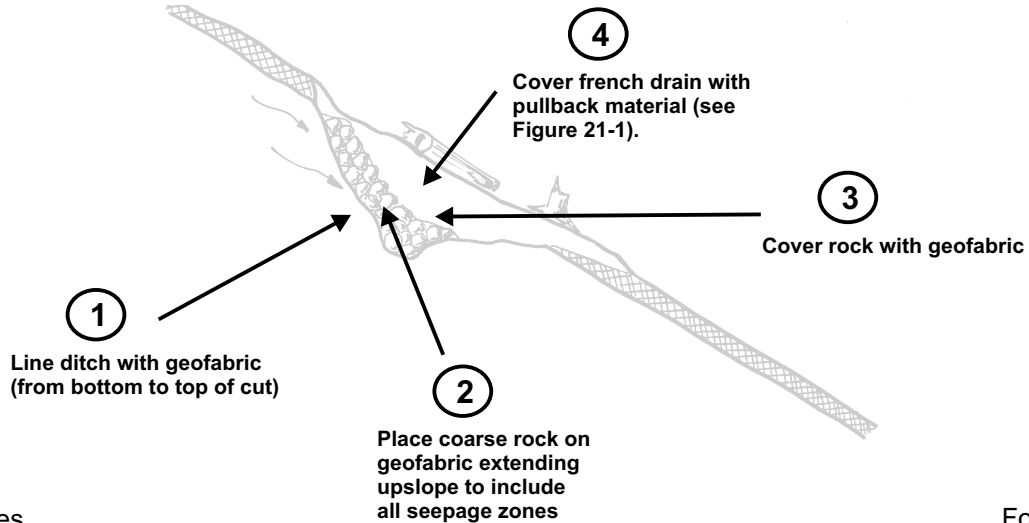
Sketch ( not to scale )



### Across Grade Installation



### Longitudinal French Drain



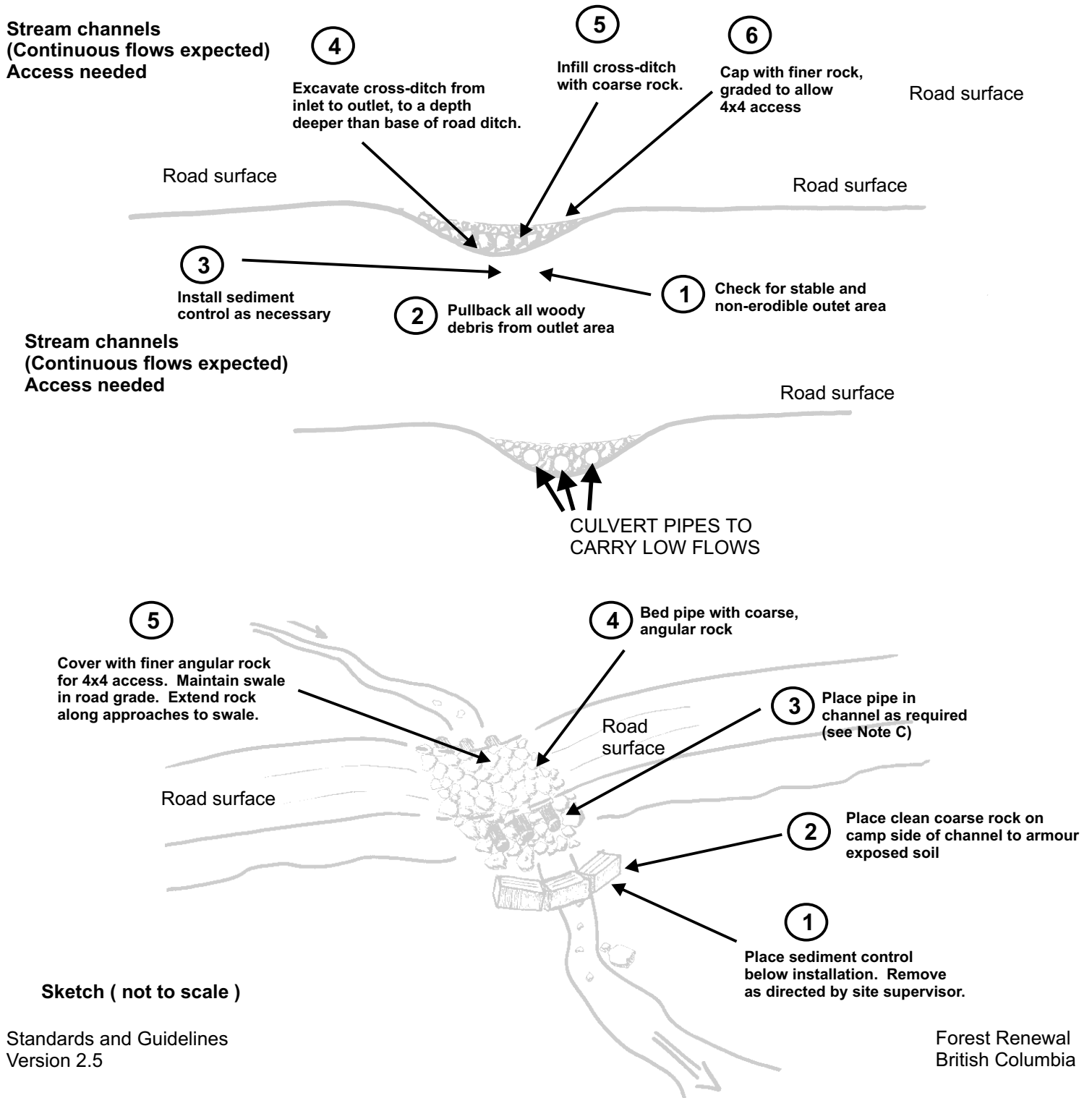
**Purpose:** To capture minor road surface or ditchline water, and route it across the road to stable, non-erodible sites below the road. In some cases, armoured swales are also used to temporarily cross small non-fish creeks for deactivation work.

**General Notes**

**Note A:** Coarse rock is placed in the cross-ditch to allow water to flow through during low flow conditions.

**Note B:** Maintain slight depression at swale location that will ensure water is contained should overflow condition occur. Do not use erodible material.

**Note C:** Number of culverts required will depend on anticipated flows, and should be noted in the prescriptions.

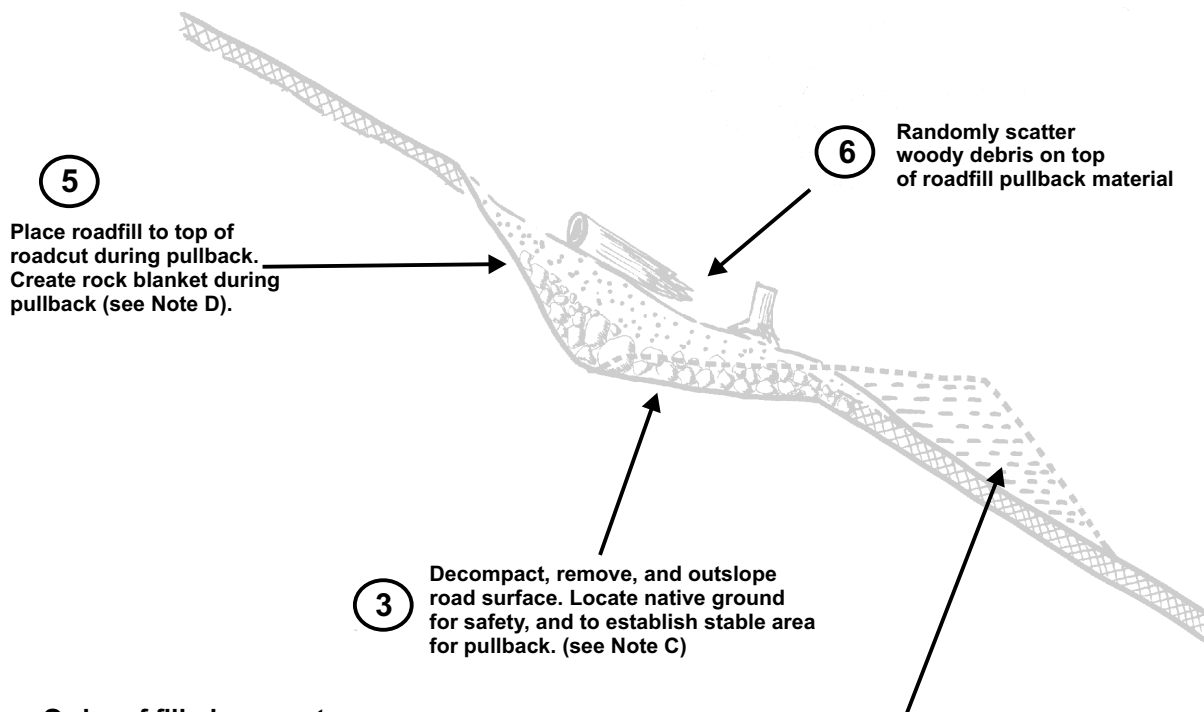
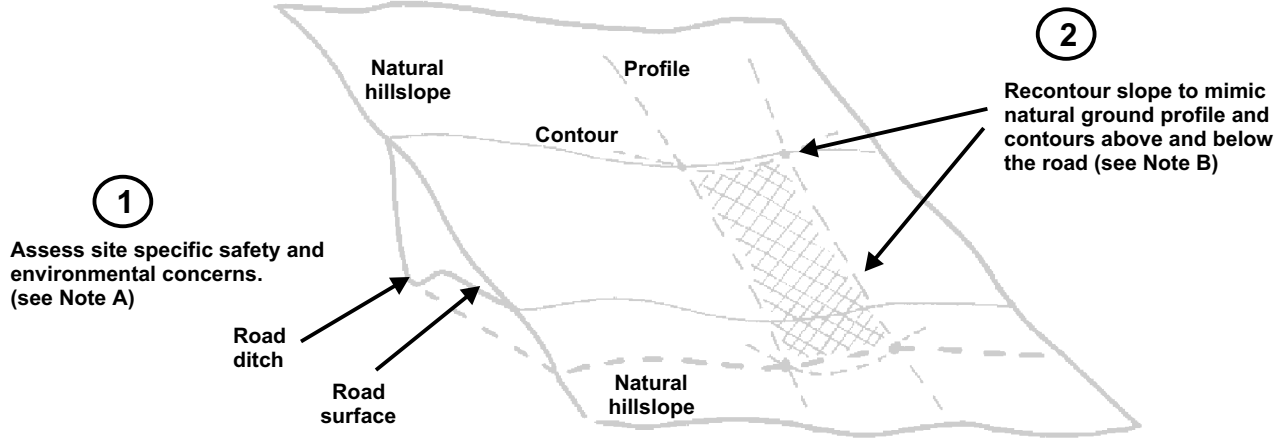


**Purpose:** Roadfill pullback is done to remove the driving weight of an existing or potential landslide, and to restore the slope to its natural profile and contours. Sorting of material is done to re-establish the natural subsurface drainage patterns..

**General Notes**

**Note A:** Walk site prior to starting work. Familiarize yourself with site characteristics (bench width roadfill material, seepage, etc) as well as potential safety hazards above and below the road. Use experience in adjacent areas and similar areas to anticipate problems. If a safe approach is not apparent, ask for help.

**Sketch (not to scale)**



**Order of fill placement:**

- #1 Road surface material / rock onto cutslope
- #2 Roadfill material on top of #1 (OB and soils)
- #3 Woody debris on top of #2 (randomly scattered)

## Figure 21-2 Full Roadfill (Sidecast) Pullback

### NOTES

**Note B:** Prior to starting roadfill pullback, visualize the natural ground profile and contours of the hillslope above and below the road. During pullback, the natural ground surface contours should be re-established unless otherwise directed. In some cases, this may require moving material along the road using multiple throws or end-haul.

**Note C:** Decompact the road surface by excavating from the ditchline and working toward the fillslope, overlapping bucket excavations, and excavating deeper away from the ditch. This method also quickly locates the edge of the stable natural bench for determining the safe working limit and amount of room for pullback (see Figure C).

**Note D:** Roadfill is removed and placed on top of rock in the cut. Releasing this material up the slope will allow rocks to roll down to the bench creating a rock blanket (see Figure D).

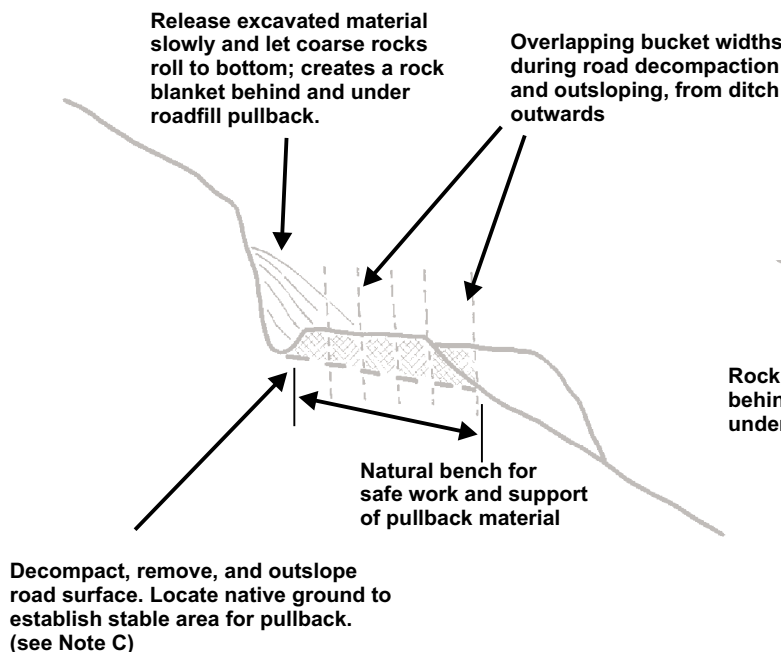


FIGURE C ROAD DECOMPACTION AND OUTSLOPING

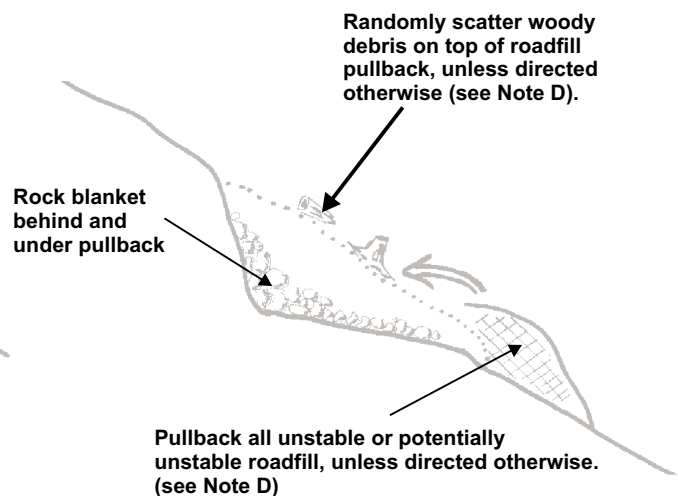
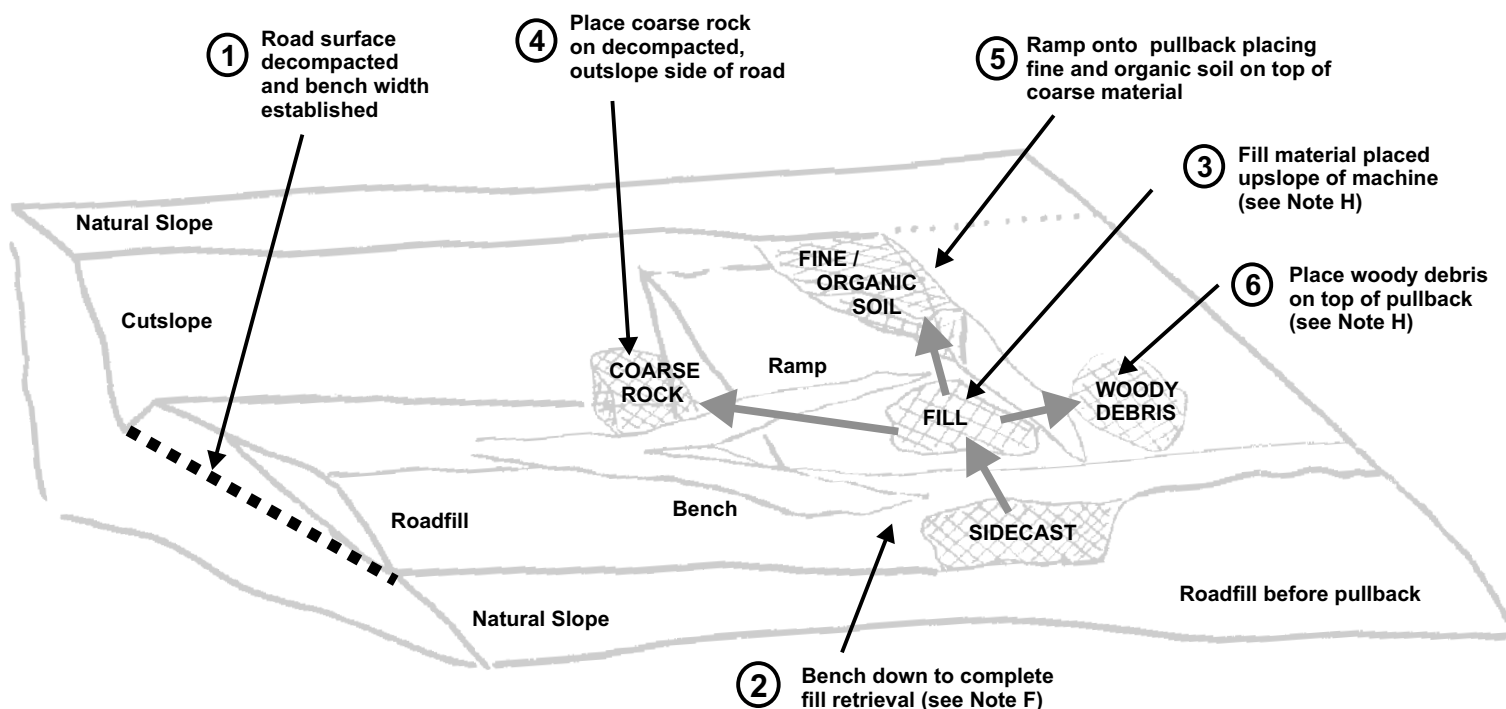


FIGURE D ROADFILL PULLBACK

**Figure 21-3 Full Roadfill (Sidecast) Pullback Machine Positioning**



**FIGURE E RAMPING AND ROADFILL PLACEMENT DURING PULLBACK**

**Note E:** With the surface prepared, start fill pullback. With the road surface removed the re-established bench is wider and lower, increasing machine reach. Additional excavation (benching) may be required to complete fill pullback. **Benching is only done by experienced operators, only into native ground, with an escape route available at all times.**

**Note F:** Road fill is removed and placed on top of rock in the cut. Releasing this material up the slope will allow rocks to roll down to the bench creating a rock blanket. If this subsurface blanket is created, all fill must be pulled back from immediately below the blanket. The length of the prepared area will depend on: bench width, fill volumes, and fillslope length. Generally it should be kept short to ensure completion of each section.

**Note G:** Roadfill is swung up to and on top of the rock which has been placed in the cut. If the road is wide and this overburden cannot be swung to the top of the cut in one pass, raming will be required to distribute the pullback correctly using multiple throws. Positioning the machine in a pattern resembling the letter Y will make fill placement easier (Figure E).

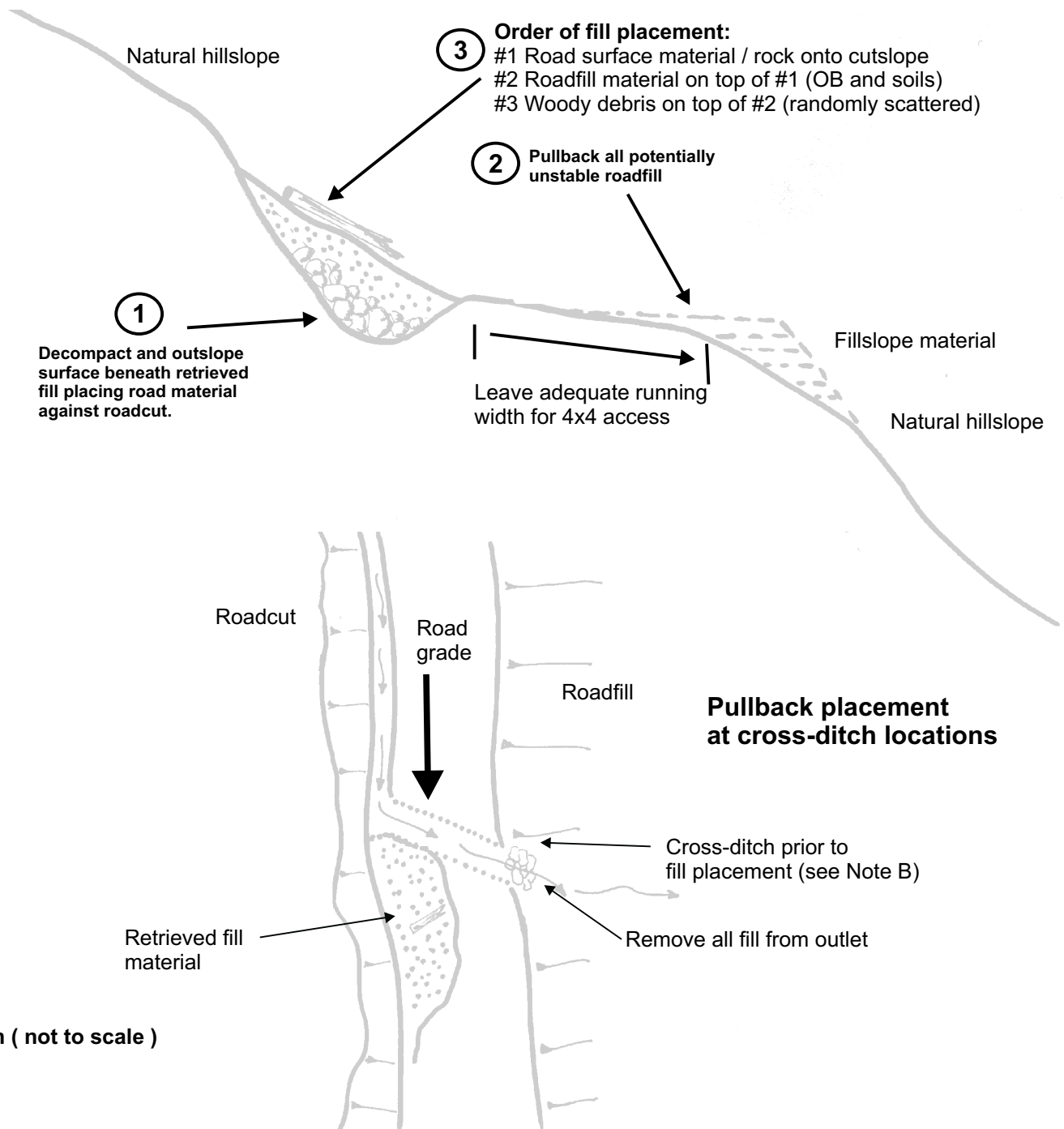
**Note H:** Finish lower side swinging overburden upslope to where it can be reached from above. Scatter woody debris over this lower completed surface before moving. Place excess debris in a position that can be reached from the ramp above. When the fill placement is complete this debris can be reached and scattered, ensuring all woody debris is on top of the recontoured slope.

**Purpose:** Partial pullback is done when full sidecast pullback is not immediately required for roadfill stability and access is to be maintained, or road use will be required at a later date.

**General Notes:**

**Note A:** The site below where fill is to be placed should be prepared as would the surface beneath full pullback. Road surface removed and cut buttressed to address seepage. In the event that at a later date additional pullback is done this material will not have to be removed, since the order of fill placement is correct.

**Note B:** Install cross-ditch prior to fill placement locations to ensure water does not flow into fill material.



Sketch ( not to scale )