8.0 Implementation of Major Works

8.1 Introduction

Road deactivation and hillslope rehabilitation projects (termed "works" in this section) require significant planning as well as appropriate site supervision and inspections. This section discusses implementation of work once the prescriptions and treatments are developed and approved. Also presented are guidelines for pre-work planning, project scheduling, environmental and safety monitoring, as well as suggestions for inspecting completed work, reporting, and professional review.

8.2 Pre-Work Planning

Pre-work planning pulls together the "loose ends" of the project before equipment is moved to the site. For road deactivation works, a reactivation plan and prescription requirements will contain many of the essential elements for pre-work planning (See Section 3.4).

Pre-work planning may involve:

- Obtaining/confirming the necessary approvals from government agencies with jurisdiction over the planned activities (forests, fisheries, environment, mines);
- Reviewing sites that present safety concerns, and deciding if the available personnel can complete the deactivation work safely (or possibly identifying areas where more experienced operators are needed);
- Scheduling of equipment/activities to meet timing windows or other specific timing considerations for the work (such as seed windows for revegetation or access constraints);
- Reviewing work requirements and matching available equipment to required tasks to ensure that the work will be completed safely, effectively, and productively;
- Estimating materials needed on site (such as culverts, grass seed, and sediment control supplies);
- Deciding on the appropriate level of quality assurance needed for site supervision to coordinate deactivation work and revegetation, environmental monitoring at appropriate crossings/locations, and qualified registered professional inspections and reviews where appropriate.
- Coordinating work with ongoing forest operations in nearby areas.

Good pre-work planning anticipates and addresses problems before equipment starts deactivation work. It can also detail the sequence of work, especially with respect to timing windows for environmental monitoring and the availability of machinery and personnel.

On-Site Information Package for Deactivation Crews

Many of the items listed above will provide a basis for an on-site information package for field crews and site supervisors carrying out the work. Other useful information in this pre-work package may include:

- Standard Operating Procedures for the company or licensee relating to safety and environmental considerations;

- Objectives and site specific requirements for implementing sediment control techniques;
- Standard Operating Procedure for suspending operations during intense rainstorms or extremely wet conditions;
- Protocols for field inspections by the qualified registered professional taking responsibility for the completed deactivation work;
- An Emergency Response Plan with area and operation specific information regarding the steps to take in the event of a safety or environmental emergency.

Pre-work meeting. Prior to the start of deactivation or rehabilitation work, a meeting between the field crew, site supervisor, and if necessary, the qualified registered professional may be beneficial. The purpose of the meeting is to review the scope of the deactivation/rehabilitation work as well as site-specific information (prescriptions and pre-work package). Sediment control objectives and techniques can also be reviewed. It is also important to discuss the roles of the site supervisor, environmental monitor, and qualified registered professional on the project and to establish an open working relationship with all members of the deactivation/rehabilitation so problems are solved as they arise.

Before work begins, the field markings should be verified and re-established as necessary. This may involve re-chaining the stations using the Tables in the road deactivation report from a known point (or reference point) in the field. For landslide or gully rehabilitation, this may involve zoning of the rehabilitation area and re-establishing reference points.

It may be beneficial to have the qualified registered professional on site prior to the start of work, particularly in cases where the success of the deactivation depends on unknown subsurface conditions, or where unusual or complicated geotechnical/geological conditions exist that will affect the success of the work.

8.3 Work Scheduling

The type of the work and the potential safety or environmental risk determines the scheduling of any road deactivation and hillslope rehabilitation undertaking. Proper scheduling also sequences the availability of suitable equipment or experienced personnel to successfully complete the work. For example, the conditions for scheduling deactivation of large road fills on steep slopes may involve special considerations such as the availability of qualified operators (with proven experience in ramping and benching) and suitable equipment; scheduling the work for times of expected drier conditions, and using conservative rainfall shutdown guidelines to reduce exposure to upslope landslide hazards.

Revegetation treatments should be timed to coincide with favourable weather windows (see Sections 3.8, 4.3, 5.3, and 6.4). It may be logistically practical to apply a treatment during a less favourable time period (e.g., seeding of road deactivation typically occurs during the driest period of the year), thus, treatment effectiveness may be limited and further work may be necessary.

Fisheries habitat in the work area may affect the scheduling. During fisheries windows when the risks to important commercial, sport, and resident fish are reduced, some limited work in and around a stream may be possible. Consultation with fisheries specialists can help ascertain potential impacts to specific species present in the drainage. At locations where fish are present, fish salvage may be required.

Various federal and provincial legislation statutes may apply where deactivation or rehabilitation work could cause some level of soil disturbance that may pose a risk to aquatic resources, such as fish habitat or water quality in community watersheds. Practitioners are responsible for ensuring that the planning and implementation of the work meet all regulatory and legislative standards.

8.4 Safety

A Health and Safety Plan is recommended for all field activities from assessment to implementation. All field personnel should be familiar with potential safety hazards associated with carrying out a specific task at a particular work site. For work in remote locations, GPS tagged helicopter pads can help to minimize response time during emergencies.

Potential hazards at hillslope work sites may include landslides (debris slides, debris flows, rockslides), and rockfalls. Snow avalanches and windthrow (danger trees) may also present a hazard. Intense rainstorms, windstorms, and rain-on-snow events increase the likelihood of road fill landslides and suspending operations may be prudent. Monitoring rainfall at the worksite is important and suspending operations when thresholds are reached can decrease the hazard exposure. Rainfall shutdown criteria provided for the specific area of work should be determined and followed.

Where landslide or gully rehabilitation activities are carried out on steep or unstable slopes (e.g., seeding, planting, soil bioengineering) standard operating procedures can be used to increase the safety of workers on these slopes. In many cases, the hazard associated with slippery basal tills and rockfalls can increase with intense rainstorms. Frost and wind action on root wads can pry rocks loose. In these cases, activities in safer areas (such as collecting cuttings or organizing materials) can often be carried out when work on the slopes is unsafe.

Safety is the responsibility of everyone involved in the project. While planning and assessment may identify some potential safety hazards at a work site, other hazards may not present themselves until the work is carried out. If a safe approach is not evident for a particular task, site supervisors or qualified registered professionals should be consulted.

Note that Workers' Compensation Board regulations apply to all work, especially work below unstable slopes, danger trees, and blasting areas. Many companies and licensees also have standard operating procedures for safety that must be followed. Practitioners are responsible for ensuring the work is planned and carried out in a safe manner and that all appropriate regulations and standard operating procedures are observed.

8.5 Environmental Monitoring

The objectives of environmental monitoring are:

- To ensure that the work is carried out in compliance with applicable regulations and legislation;
- To assist in minimizing the impacts of the deactivation work on the aquatic environment;
- To provide due diligence for deactivation work near aquatic habitat.

Environmental monitoring may not be necessary for some activities carried out under the Forest Practices Code or within times indicated by fisheries windows for specific operating areas. In

these cases, field crews carry out monitoring on a daily basis and a designated environmental monitor may not be needed.

When required, environmental monitoring includes on-site inspections to:

- Evaluate the effectiveness of sediment control measures and specific techniques;
- Observe site conditions and record activities;
- Carry out any necessary fish salvage;
- Promote environmental awareness to deactivation crews; and
- Liaise with regulatory agencies.

Fig. 8.01 *Fish salvage is necessary when conducting work in and about fish streams.*

8.6 Site Supervision and Inspections

Site supervision and on-going inspections verify the quality of the work carried out and solve problems as they arise.

Site supervisors must have an understanding of how to implement the prescriptions in a cost-effective manner, given the crew expertise and equipment available. On a road deactivation project, for instance, the site supervisor must understand:

- The overall project objectives for the deactivation work and the objectives of the specific techniques in the prescriptions;
- The techniques applied to specific sites, and how they can be completed cost-effectively;
- The extent to which the techniques can be modified to adjust for local conditions (such as reducing the amount of coarse rock required for erosion protection, where such rock is not readily available).
- The capability of the equipment and the experience of the crews to deal with the work;
- The need for inspections by others (environmental monitors, qualified registered professionals) at appropriate sites.

For road deactivation, the extent of site supervision will depend on the number of machines on site, the experience of the operators, the complexity of the road and hillslope stability conditions, the difficulty of the deactivation work to be carried out, and the number of safety hazards along the road. Where an experienced operator is carrying out straightforward deactivation, only intermittent site supervision may be warranted. However, full time supervision may be required in cases where less experienced operators are working, or more complicated prescriptions are being implemented. The amount of supervision should also be discussed with the qualified registered professional. Usually, increased supervision is less expensive than correcting mistakes later, and much less expensive than reconstructing access through heavy pullback areas.

Inspections are commonly carried out to establish the quality of the completed deactivation work and provide feedback to site personnel. When reviewing the completed deactivation work, it is important to determine if the objectives have been met.

During monitoring and inspections, it is important to discuss the completed work with operators. Questions that can be useful in evaluating the completed work include:

- Were there any discrepancies between the prescriptions and ground conditions? (Did prescriptions make sense based on the ground conditions, have the ground conditions changed significantly since prescriptions were completed?)
- Does the operator expect problems in completing the prescriptions ahead?
- Is there anything ambiguous in the prescriptions?
- Are there places where the prescriptions could not be met and significant residual risk remains?

The effectiveness of sediment control techniques at specific sites should also be checked to determine if improvements are possible.

During inspections, it is important to walk the deactivated road and make direct observations. For pullback areas, walk both the top of the pullback and the lower edge of the pullback. The table in Figure 8.02 lists a number of site indicators that can be evaluated for some types of deactivation work.

Fig. 8.02 *Example observations related to the inspection of deactivation work*

Road Fill Pullback	
General	♦ Do operator and site supervisor know machine location in relation to both reactivation and deactivation prescriptions?
Prescriptions	♦ Do the limits and extent of the road fill match the prescriptions? Was more or less pullback needed than prescribed?
Full Road Fill Pullback	♦ Does fill remain supported at toe? ♦ Is this material stable? What is the residual hazard and risk? ♦ Has adequate level of access been maintained where specified?
Road Fill Placement	♦ Is the material placed tight to the road cut? If not, what is residual hazard? ♦ Are hollows and depressions evident on pullback surface, to mimic topography above and below the road? ♦ Is recontoured slope straight, concave, convex in profile? What is residual hazard? ♦ Is all woody debris randomly on top of the pullback material? Woody debris should be oriented for reduction of surface erosion. Random placement helps to intercept surface flow before rilling and erosion develop. This is especially important in fine-textured soils. ♦ What is the composition of material on recontoured slope? (The composition of the pullback material on the slope compared to the road cut can provide information on how the pullback was carried out).

Water Management	
General	♦ If sediment control measure were installed, have they been removed?
Prescribed actions	♦ Can the prescribed techniques (cross-ditches, etc) be located in the field? Are they functioning as intended?
Cross-ditches	♦ Does cross-ditch restore natural drainage path? How does its width compare to the natural channel above and below the road? ♦ Does the profile of the cross-ditch mimic the natural ground profile, (in pullback areas)? ♦ Has sufficient road fill been retrieved at outlet? ♦ If necessary, is armour present, properly located, and of adequate size, given anticipated flows? A general rule is to mimic armour composition and size located in the channel or depression above and below the cross-ditch location. ♦ Will armour placed in the channel impede or divert flows? What is residual hazard? ♦ Are fillslopes adjacent to location adequately resloped? ♦ Are the sides of the cross-ditch appropriately sloped? ♦ Is base V-notched or U shaped? Is slumping expected from adjacent road fill into the cross-ditch? ♦ Is the cross-ditch grade steep enough? Will water flow across or pool? ♦ Do cross-ditches allow required level of access?
Blanket Drains	♦ Is water evident at the toe of the blanket drain?

These site observations are examples only and not intended as a complete list. Inspections should always concentrate on whether the site objectives were met by the work carried out.

Information from inspections should be compiled in a summary of completed deactivation work. The qualified registered professional may review this summary as part of a quality assurance review of the completed work. This summary can be a valuable complement to a site review to determine suitable sites for effectiveness evaluation.

8.7 Example Protocol for Professional Field Reviews

The table in Figure 8.03 is an example of a protocol that was used on road deactivation projects for coastal areas. The professional involved had worked previously on several projects with both the senior site staff as well as some of the operators. The objective in developing the protocol was to set out guidelines for consultation with the qualified registered professional responsible for the work, yet allow site supervisors to make some minor changes without consultation. Use of a protocol such as this is at the discretion of the qualified registered professional.

No consultation with qualified registered professional required; add changes to as-built documents	♦ Changing a cross-ditch to a blanket drain or trench drain in heavy pullback (outside stream areas) ♦ Adding or changing locations or cross-ditches to suit site conditions in areas with less than 50% slopes below the road and with no evidence of landslides ♦ Adding or eliminating non-stability related items such as heli-pad locations, etc. (that do not affect the amount of prescribed pullback) ♦ Limited increases to the length or amount of road fill pullback in permanent deactivation where no access is planned following deactivation
Discussion with qualified registered professional required; field review may be needed prior to work	♦ Decreasing the amount of road fill pullback (low consequences) ♦ Varying from the approved work plan (where timing windows are present) ♦ Working outside the fish timing window as outlined in the deactivation prescriptions ♦ Deactivation on low risk roads found on flat slopes that were previously not assessed; may require agency approval ♦ Eliminating cross-ditches without installing any other water control structures (such as blanket drains, trench drains, etc) ♦ Adding or changing the locations of cross-ditches in areas with slopes greater than 50%, or slopes with landslides
Discussion with qualified registered professional; field review of site usually required prior to work	♦ Decreasing the amount of road fill pullback (high consequences) ♦ Changing the level of deactivation as approved on the plan for access management (such as adding an ATV trail in full pullback areas, or eliminating access in areas where access was to be maintained) ♦ Unable to fully implement the prescription due to safety concerns, or excessive large woody debris, etc.; where mechanical work was not feasible or where blasting may be required to remove/reduce residual risk ♦ Roads on steep slopes that were previously not assessed, and will be isolated by deactivation activities ♦ Substantial changes required to prescriptions after the road has been brushed out and/or reactivated.

Fig. 8.03 *Example protocol for making field revisions to approved road deactivation prescriptions.*

All revisions should be fully documented for the work completion reports. Where appropriate, sketches and/or photos should be included to provide the best possible information about the conditions during and immediately after the work.