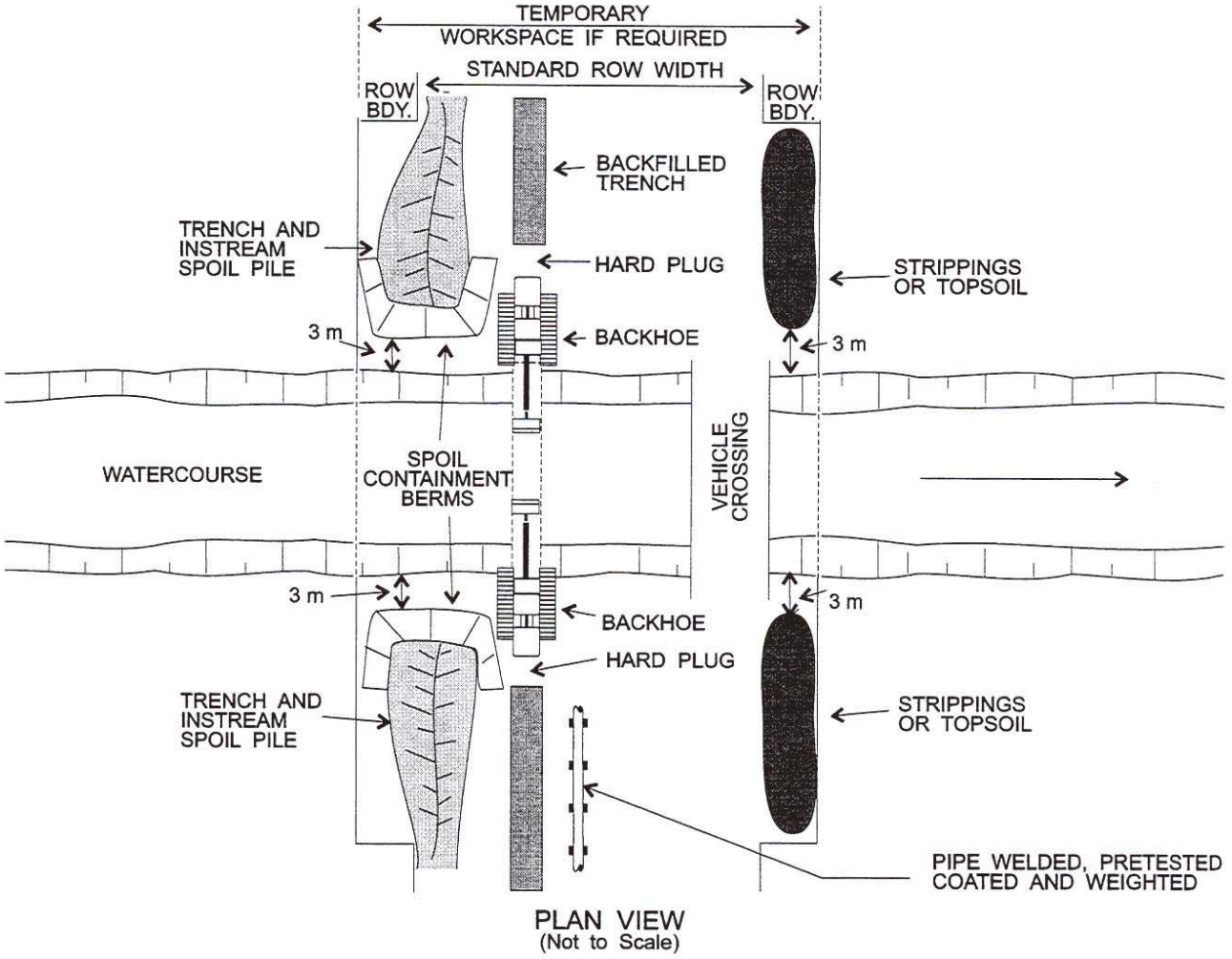
Appendix 13D.A Typical Drawings



PLAN VIEW
(Not to Scale)

Notes:

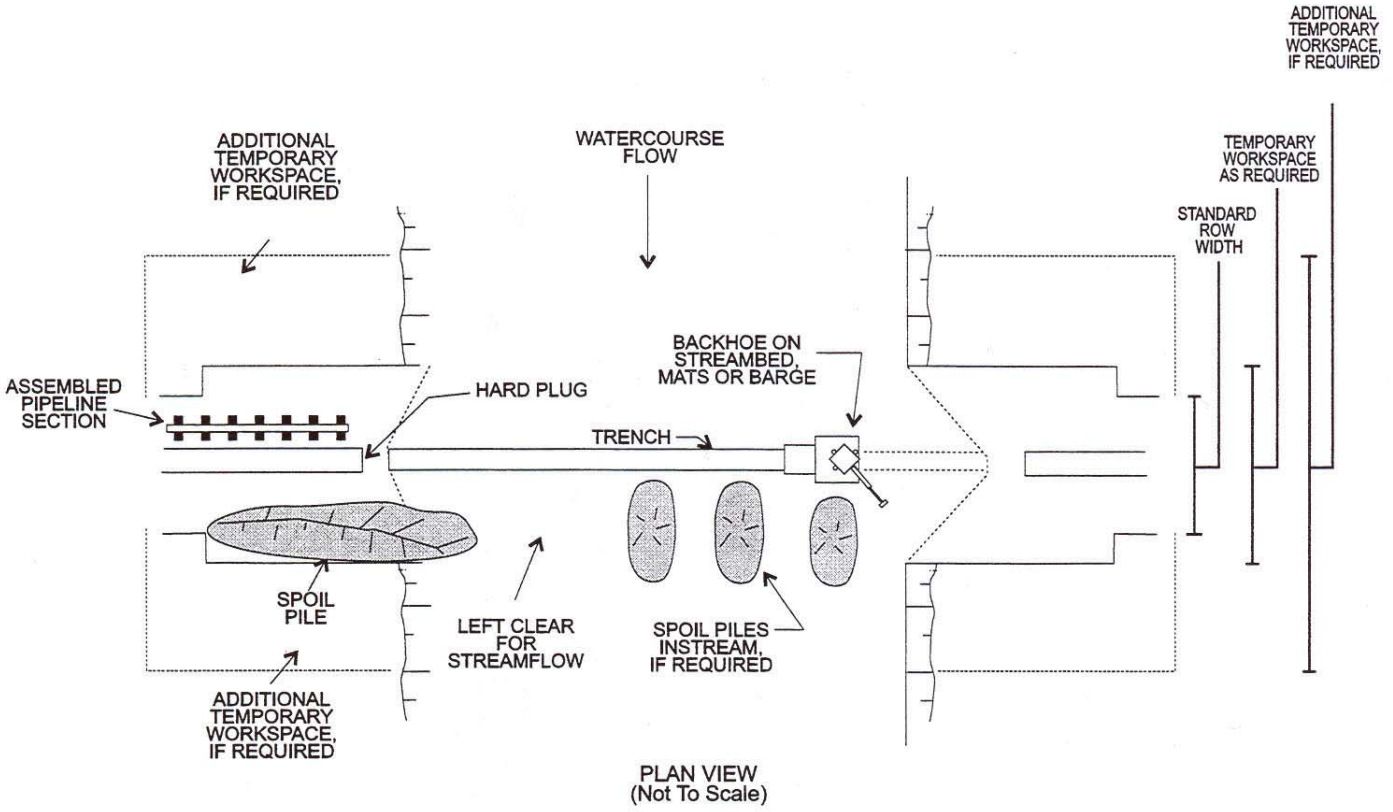
1. Obtain additional temporary workspace to allow instream spoil to be stored on banks.
2. Install vehicle crossing if warranted.
3. Leave hard plugs at end of standard trench.
4. Complete construction of the instream pipe section. Weight and pretest pipe, if warranted, prior to commencement of instream activity .
5. Trench through watercourse retaining hard plugs at each bank until just prior to pipe installation. Stockpile all instream spoil on banks. If necessary to control water flow and trench sloughing, install temporary soft plugs and dewater trench on to stable vegetated land, not directly to watercourse. Construct berms to prevent saturated spoil from flowing back into watercourse. Maintain streamflow, if present, throughout crossing construction. Lower-in and backfill immediately. Restore stream channel to approximate preconstruction profile and substrate. Attempt to complete all instream activity within 24 hours.
6. Restore and stabilize watercourse banks and approaches to as close to original grade as practical.

CPWCC WATERCOURSE CROSSINGS

CONSTRUCTION TECHNIQUE - TYPICAL OPEN CUT OF SMALL WATERCOURSES

Second Edition - CPWCC DWG. NO. 2

FIGURE NO. 13D.A-1



Notes:

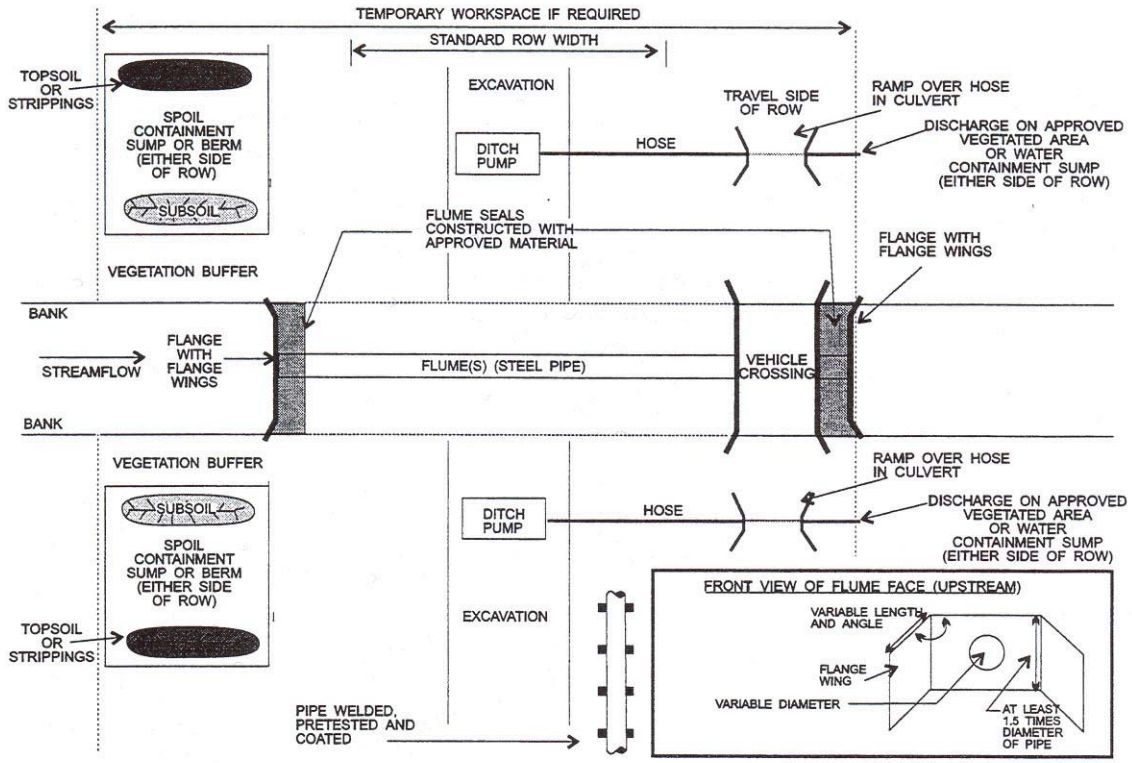
1. Obtain additional temporary workspace to allow as much instream spoil to be stored on the banks as is practical.
2. Leave hard plugs at bank.
3. Complete construction of the instream pipe section. Pretest and weight pipe well in advance of anticipated completion of instream trenching.
4. Trench through watercourse using hoes, retaining hard plugs at each bank until just prior to pipe installation. Stockpile as much spoil on banks as possible. Place instream storage spoil in piles avoiding areas of highest water velocity. Instream spoil should be piled in long piles parallel to flow in order to minimize erosion. Do not windrow spoil across the channel or block more than 2/3 of the channel. If necessary to control water flow and trench sloughing, install temporary soft plugs and dewater trench on to stable vegetated land, not directly to watercourse. Maintain streamflow, if present, throughout crossing construction. Exact trenching and spoil storage requirements will depend on local conditions and equipment used.
5. Lower in pipe and backfill immediately. Restore stream channel to approximate preconstruction profile and substrate. Attempt to complete all instream activity as quickly as practical.
6. Restore and stabilize watercourse banks and approaches to as close to original grades as practical.

CPWCC WATERCOURSE CROSSINGS

CONSTRUCTION TECHNIQUE - TYPICAL OPEN CUT OF LARGE WATERCOURSES

Second Edition - CPWCC DWG. NO. 3

FIGURE NO. 13D.A-2



PLAN VIEW
(Not to Scale)

Notes:

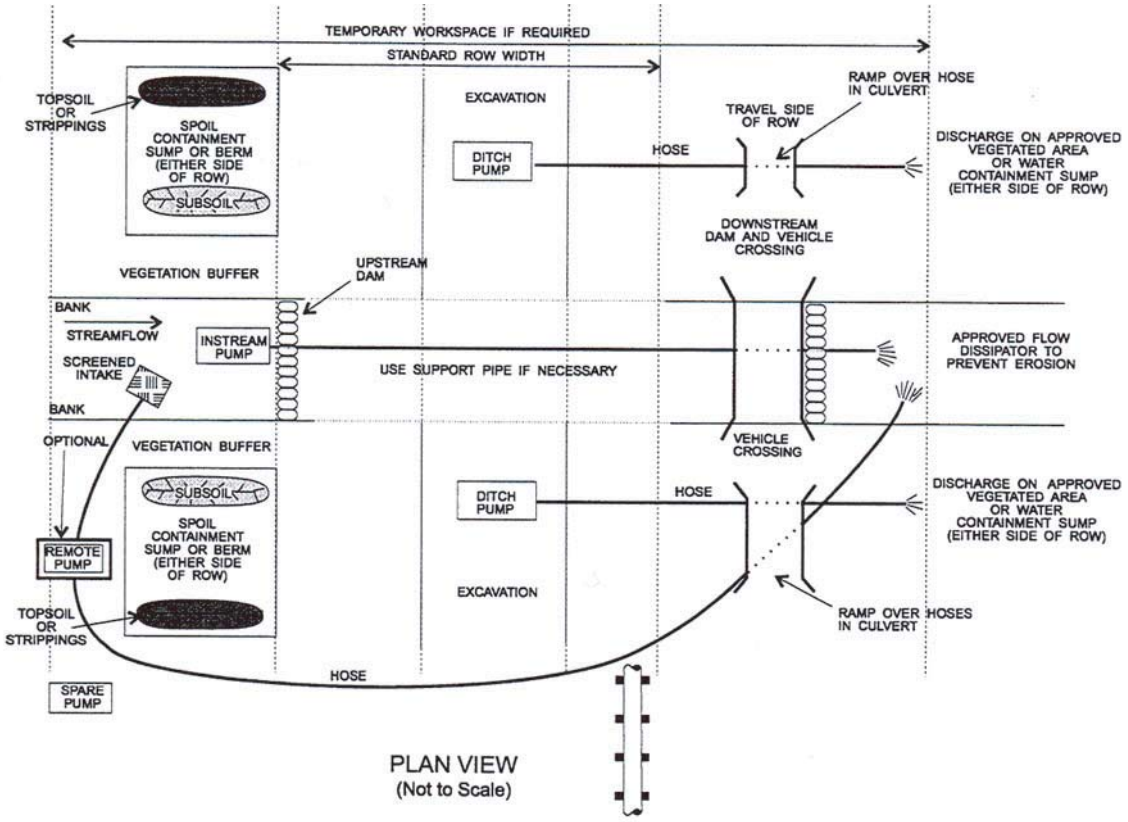
1. Size flume to handle anticipated flows (150% of anticipated flows or 5 year flood level).
2. Stockpile all required materials prior to beginning instream work. Complete construction of the instream pipe section. Weight and pretest pipe, if warranted, prior to commencing instream activity.
3. Install the vehicle crossing on the work side edge of the right-of-way to allow for a wide excavation.
4. Install a preassembled flume or construct a sandbag dam and flume.
5. Beginning in the early morning, excavate the trench as quickly as practical placing spoil out of the stream channel. Create spoil containment sumps, if warranted, to keep spoil from flowing back into the stream channel.
6. Pump excavation as required to prevent downstream flow of silted water. Direct the pumped water onto vegetated areas well back from the watercourse. Construct water containment sumps, if warranted.
7. Install pipe.
8. Backfill the stream channel first, squeezing the silted water into the bank excavations. Pump or drain the bank excavations while progressively backfilling from the stream channel outward.
9. Complete backfill.
10. Remove the downstream seal materials.
11. Remove upstream seal materials.
12. Remove the flume.
13. Restore bed and banks of stream channel to preconstruction profiles.

CPWCC WATERCOURSE CROSSINGS

CONSTRUCTION TECHNIQUE - TYPICAL FLUME

Second Edition - CPWCC DWG. NO. 5

FIGURE NO. 13D.A-3



Notes:

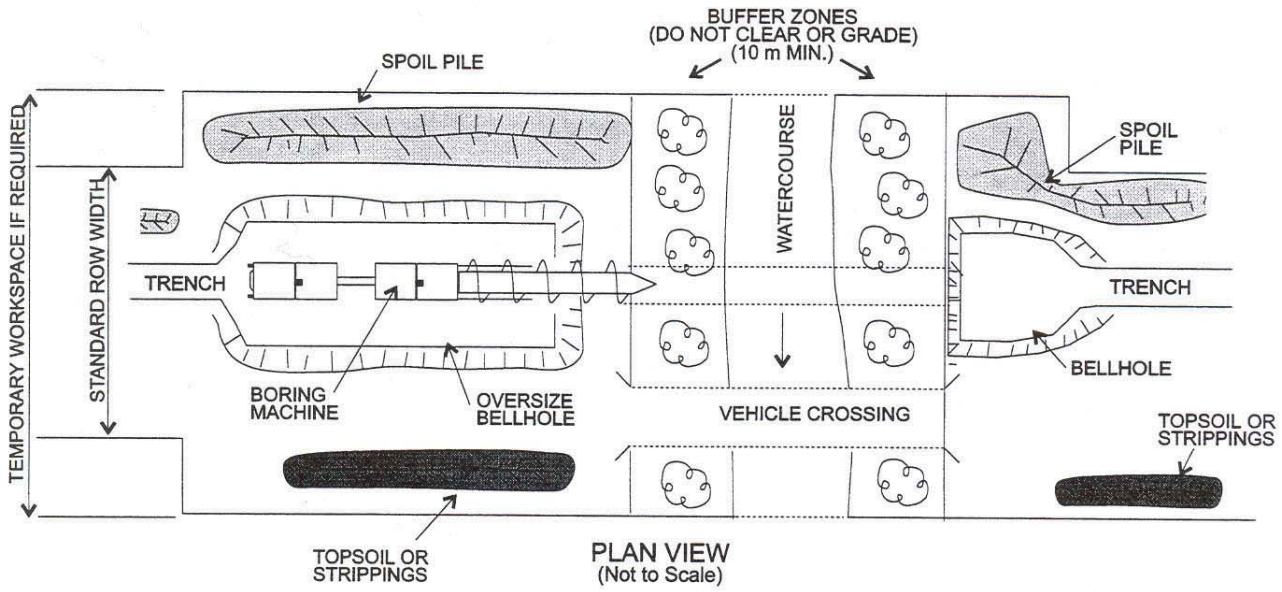
1. Install the vehicle crossing on the work side edge of the right-of-way to allow for a wide excavation.
2. Stockpile all required materials and equipment onsite prior to beginning instream work.
3. Complete construction of the instream pipe section. Weight, coat and pretest pipe, if warranted, prior to commencement of instream activity .
4. Begin the operation in the early morning to allow for same day installation if practical.
5. Install pumps and check operation to equalize flow.
6. Construct the upstream dam. Dam should be constructed on the edge of the temporary workspace to allow for a wide excavation. Ensure dam is impermeable by installing a polyethylene liner. Dam may be constructed with sand bags, aquadam, sheet piling or other approved material that ensures a tight seal of the bed and banks.
7. Plug the vehicle crossing culvert or construct the downstream dam. Where a bridge is used, the bridge and dam should be installed as close to the edge of the temporary workspace as practical to allow for a wide excavation.
8. Excavate trench as rapidly as possible. Create spoil containment sumps, if warranted, to keep spoil from flowing back into the stream channel.
9. Install pipe.
10. Backfill the stream channel first pushing the silted water back into the bank excavations. Pump or drain the bank excavations while progressively backfilling from the stream channel outward. Construct water containment sumps if warranted.
11. Restore bed and banks of stream channel to preconstruction profiles.
12. Remove the downstream dam or vehicle crossing plug.
13. Remove the upstream dam or vehicle crossing plug.

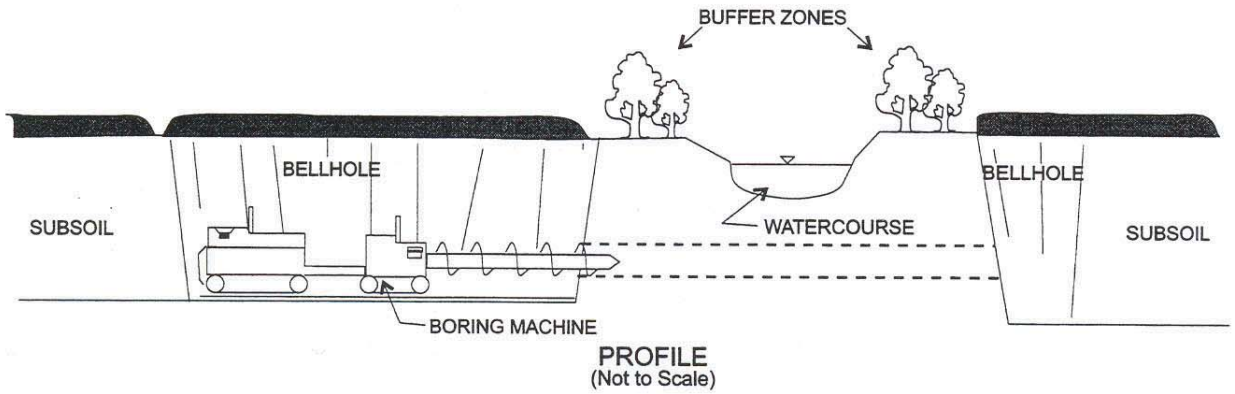
CPWCC WATERCOURSE CROSSINGS

CONSTRUCTION TECHNIQUE - TYPICAL DAM AND PUMP

Second Edition - CPWCC DWG. NO. 6

FIGURE NO. 13D.A-4





Notes:

1. Acquire and mark additional temporary workspace.
2. Set up equipment a minimum of 10 m from the edge of the watercourse; do not clear or grade within 10 m zone except along the work side, if temporary vehicle crossing is installed.
3. Excavate bellhole. Store spoil on opposite side of right-of-way.
4. Complete boring and tie-in to mainline.
5. Pump bellhole dry if seepage becomes a problem. Dewater bellholes onto stable, vegetated land, not directly back into watercourse.
6. Backfill and compact. Leave a crown to allow for subsidence.

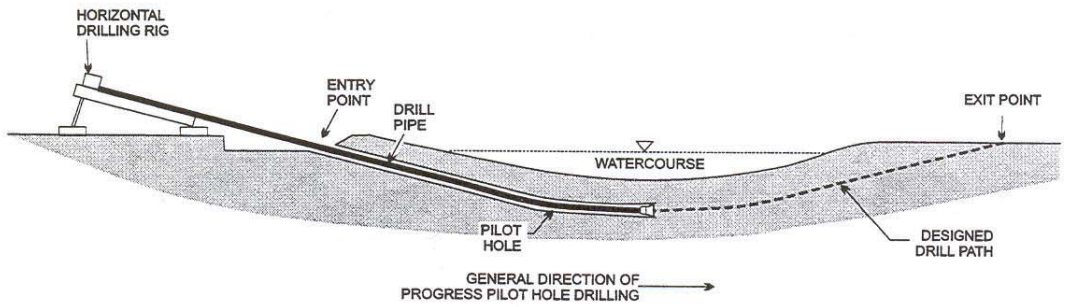
CPWCC **WATERCOURSE CROSSINGS**

CONSTRUCTION TECHNIQUE - TYPICAL BORE OR PUNCH

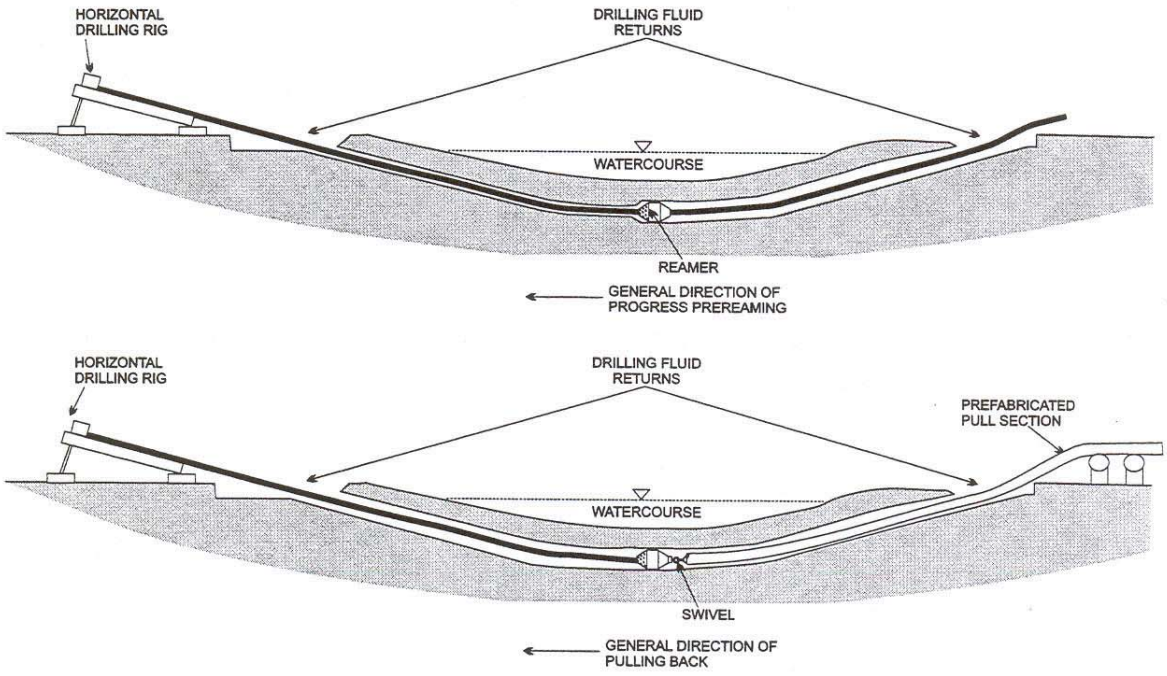
Second Edition - CPWCC DWG. NO. 10

FIGURE NO. 13D.A-5

STAGE 1: PILOT HOLE DIRECTIONAL DRILLING



STAGE 2: REAMING AND PULLING BACK



PROFILE
(Not to Scale)

Notes:

1. Obtain geotechnical data prior to initiating drilling. Drilling may not be feasible in some materials such as gravels.
2. Prepare a drilling mud release contingency plan.
3. Set up drilling equipment a minimum of 150 m from the centre of the watercourse.
   Do not clear or grade within zone except for vehicle access.
4. Employ full time inspectors to observe for an inadvertent mud release into the watercourse.
5. Ensure that only bentonite based drilling mud is used. Do not allow the use of any additives to the drilling mud without the approval of appropriate regulatory authorities.
6. Install suitable drilling mud tanks or sumps to prevent contamination of watercourse.
7. Install berms downslope from the drill entry and anticipated exit points to contain any release of drilling mud.
8. Dispose of drilling mud in accordance with the appropriate regulatory authority requirements.

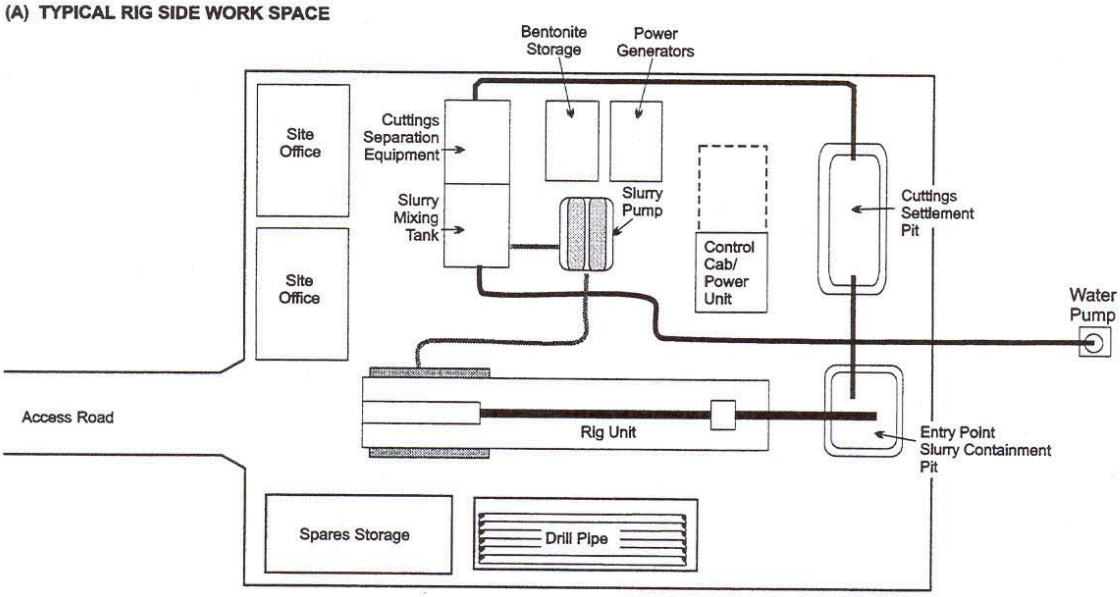
CPWCC WATERCOURSE CROSSINGS

CONSTRUCTION TECHNIQUE - TYPICAL HORIZONTAL DIRECTIONAL DRILL

Second Edition - CPWCC DWG. NO. 11(a)

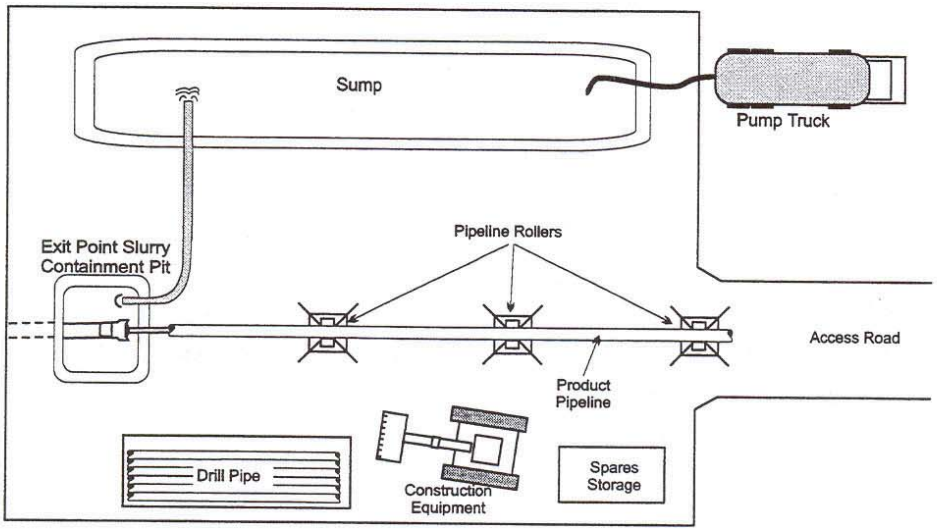
FIGURE NO. 13D.A-6

(A) TYPICAL RIG SIDE WORK SPACE



PLAN VIEW
(Not to Scale)

(B) TYPICAL PIPE SIDE LAYOUT



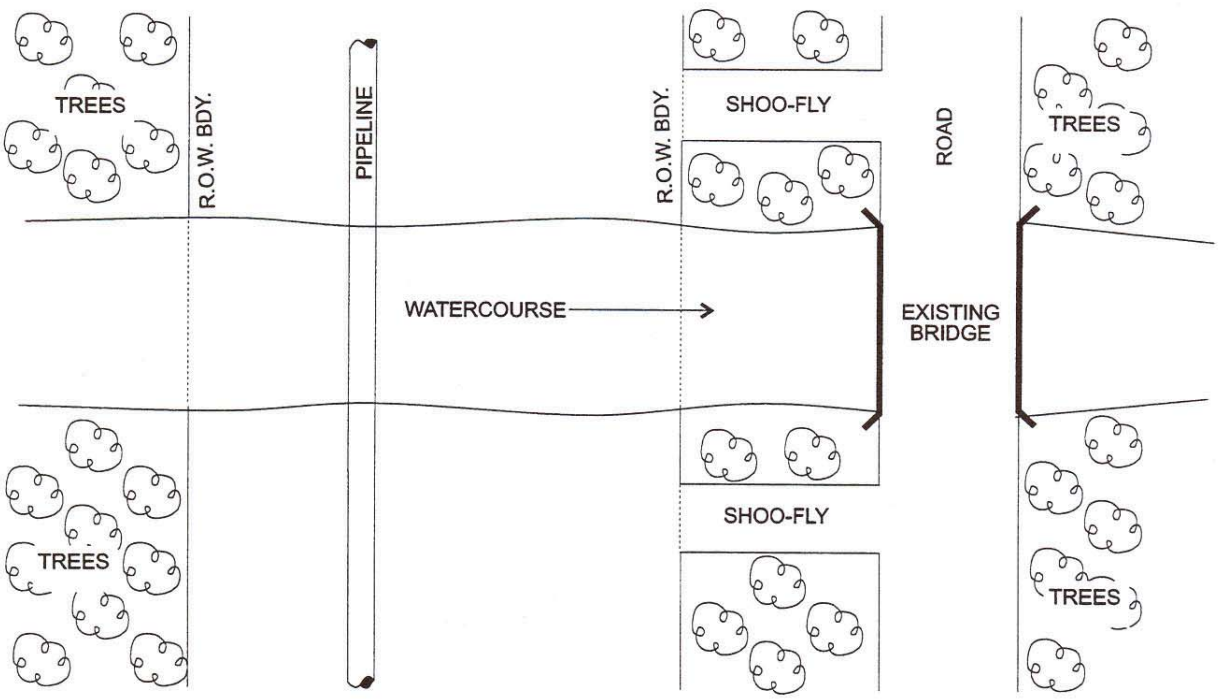
PLAN VIEW
(Not to Scale)

CPWCC WATERCOURSE CROSSINGS

CONSTRUCTION TECHNIQUE - TYPICAL HORIZONTAL DIRECTIONAL DRILL

Second Edition - CPWCC DWG. NO. 11(b)

FIGURE NO. 13D.A-7



PLAN VIEW
(Not to Scale)

Notes:

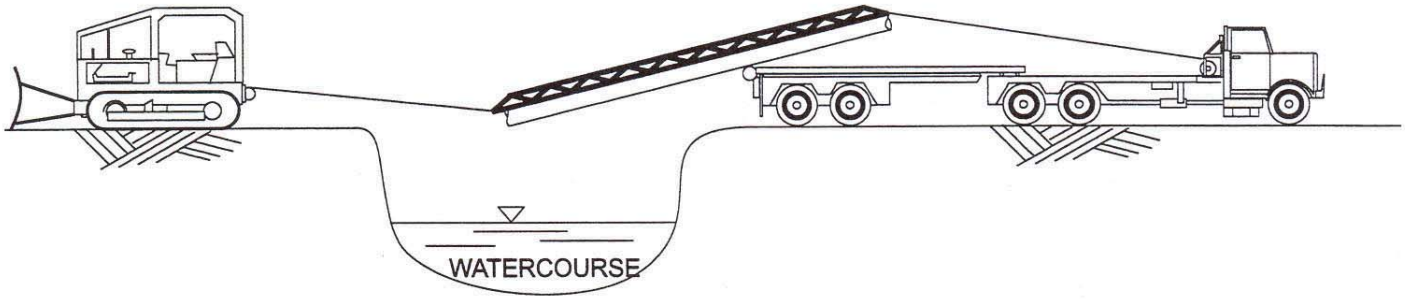
1. Use existing bridge wherever practical to prevent sedimentation of watercourse, bank disturbance and alteration of streambeds caused by vehicles crossing the watercourse.
2. Locate shoo-flies as far from watercourse as practical to minimize clearing and grading in proximity to watercourse.
3. Restore shoo-files as part of the main right-of-way clean up.

CPWCC WATERCOURSE CROSSINGS

VEHICLE CROSSING - TYPICAL EXISTING BRIDGE

Second Edition - CPWCC DWG. NO. 12

FIGURE NO. 13D.A-8



PROFILE
(Not to Scale)

Notes:

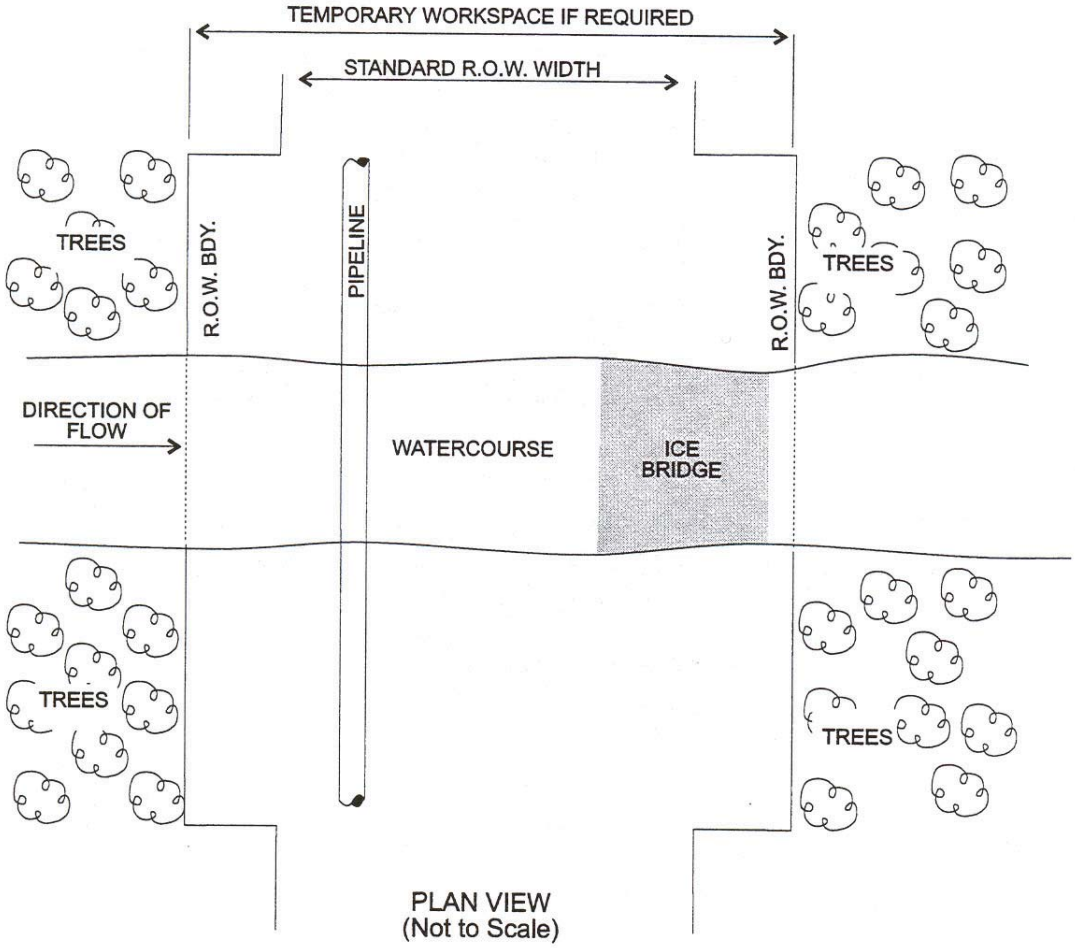
1. Install a temporary bridge to allow vehicles to cross watercourses that are sensitive or that have unstable bed and banks. Bridges are also used where watercourses are too deep, wide or fast to permit an alternate crossing structure. This method minimizes sedimentation of the watercourse, and bank and bed restoration work. Bridge length can be doubled if an abutment is constructed within the watercourse and a portable bridge is spaced over each side.
2. Transport bridge to crossing site and winch into position with a bulldozer or an equivalent method as appropriate.
3. Utilize approach fills of clean granular material rather than cuts in streambanks to minimize erosion potential. Do not constrict flow with approach fill or support structures. Ensure adequate free-board to handle anticipated streamflows. If bridge is to remain in place through spring break-up to access final clean-up, it must be designed for spring floods and ice jams. Use a geotextile liner under bridge if dirt may fall into watercourse.
4. Install a curb stringer of logs or plywood, if the prefabricated bridge does not have a curb stringer, to ensure that fill material does not spill into the watercourse.
5. Remove bridge immediately after use. Remove support structures and approach fills. Restore and stabilize banks.

CPWCC WATERCOURSE CROSSINGS

VEHICLE CROSSING - TYPICAL TEMPORARY BRIDGE - PORTABLE

Second Edition - CPWCC DWG. NO. 14

FIGURE NO. 13D.A-9



Notes:

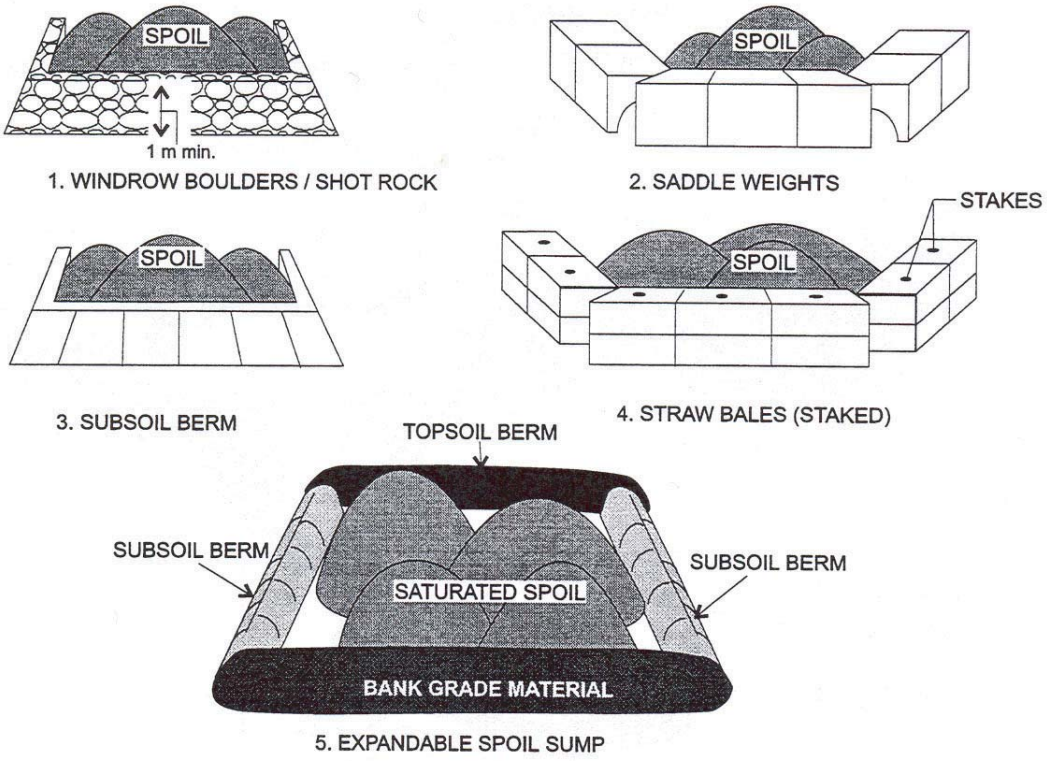
1. Install ice bridges on winter projects when a safe ice thickness can be maintained.
2. Locate ice bridges at sites with gently sloping banks to minimize cuts in watercourse banks. Use snow and ice to slope approaches, rather than cut banks.
3. Flood ice surface with water and cover with snow to increase load bearing capacity .Logs may be used as a base to strengthen the bridge. The ice bridge should not impede flow. Remove logs and breach ice bridge by physical means prior to spring break-up.
4. Ice bridges must not interfere or impede winter flow of watercourse.
5. Maintain ice regularly and remove all debris from the ice surface.
6. Remove broken ice from trench area to prevent ice jamming against and under the ice bridge.
7. Restore and stabilize banks and approaches prior to spring break-up.

CPWCC **WATERCOURSE CROSSINGS**

VEHICLE CROSSING - TYPICAL ICE BRIDGE

Second Edition - CPWCC DWG. NO. 15

FIGURE NO. 13D.A-10



Not to Scale

Notes:

1. Construct sump or berms to contain excavated instream spoil so that silty runoff does not enter watercourse or flow off right-of-way.
2. Strip topsoil from area to be used as spoil storage.
3. Maintain sufficient buffer from the top of the streambank.
4. Berms which do not adequately prevent leakage, such as those made of boulders, shot rock or saddle weights may need a geotextile liner to prevent silty water from entering watercourse.

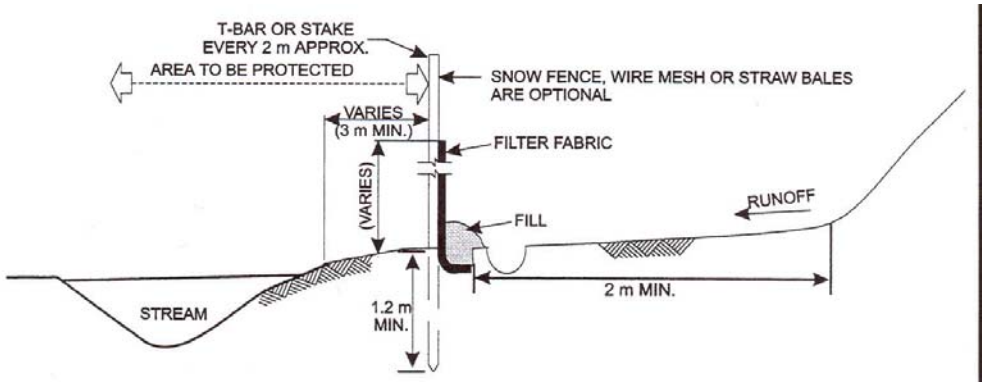
CPWCC WATERCOURSE CROSSINGS

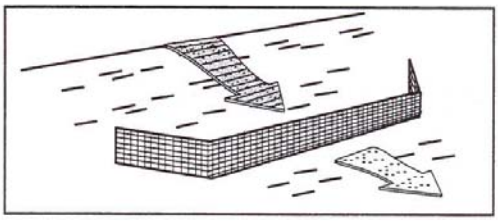
SEDIMENT CONTROL - TYPICAL SPOIL BERMS AND SUMP

Second Edition - CPWCC DWG. NO. 19

FIGURE NO. 13D.A-11

SIDE VIEW
OF SILT FENCE
(Not To Scale)





Not To Scale

Notes:

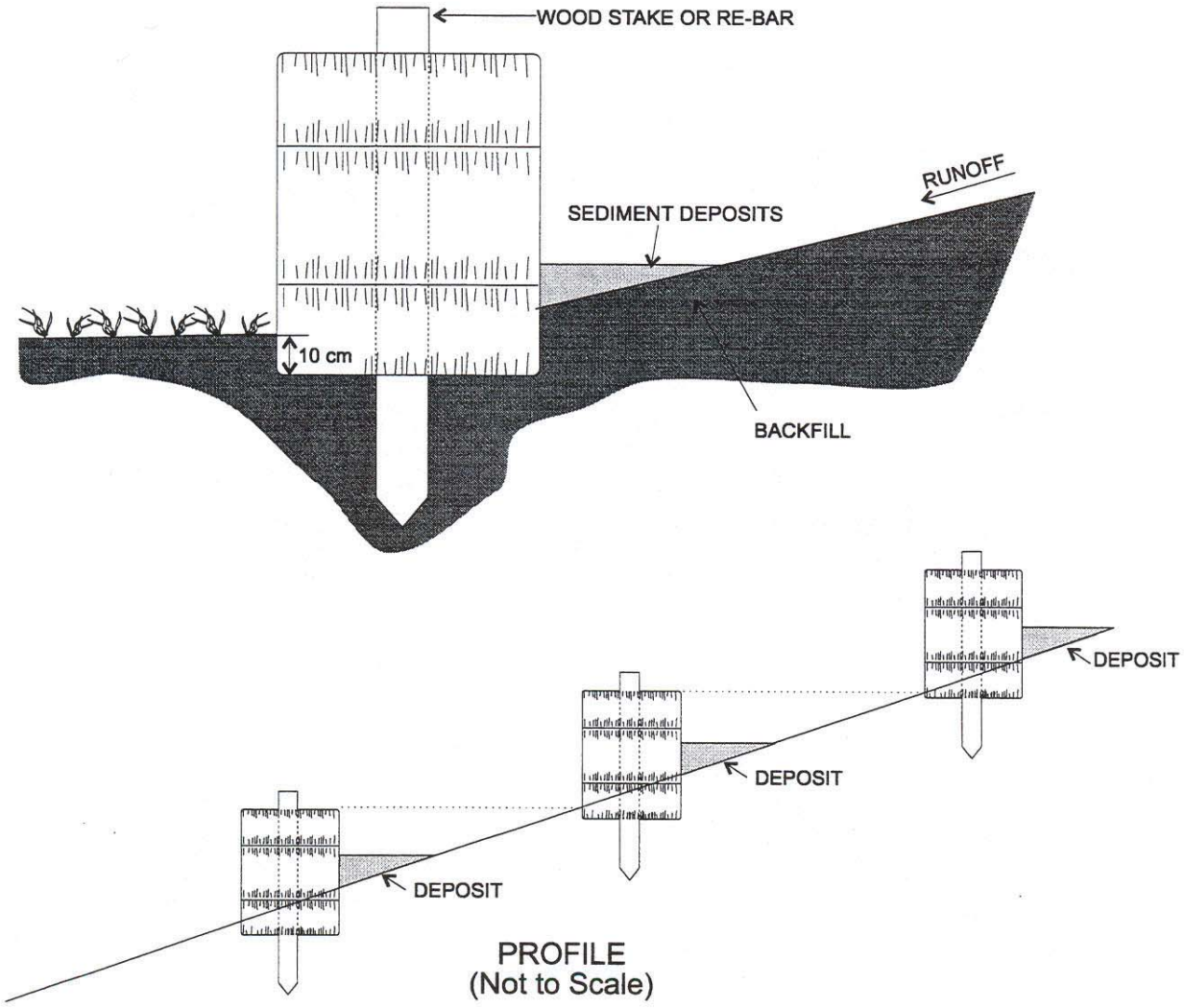
1. Watercourses that have moderate to high sensitivity of fish habitat and/or have steep approach slopes at the proposed crossings may need silt fences during construction, as determined by the Environmental Inspector.
2. Install silt fences at the base of approach slopes following clearing and grading using the method and materials above or other approved designs.
3. Place silt fences a minimum 2 m, if feasible, from the toe of the slope in order to increase ponding volume.
4. Maintain silt fences throughout construction.
5. Ensure that silt fences, if removed or damaged, are reinstalled or repaired prior to the end of the work day.
6. Maintain silt fences in place at the base of the approach slopes until revegetation of the right-of-way is complete.
7. In areas with frequent traffic, install two or more silt fences in a staggered and overlapped configuration to allow vehicle passage without removal or opening of the silt fence.

CPWCC WATERCOURSE CROSSINGS

SEDIMENT CONTROL - TYPICAL SILT FENCES

Second Edition - CPWCC DWG. NO. 20

FIGURE NO. 13D.A-12



Notes:

1. Construct straw bale filters to contain excavated instream spoil so that silty run off does not enter watercourse or flow off right-of-way.
2. Use straw bale filters on long unprotected slopes to prevent surface erosion from entering watercourse.
3. Where several lines of bales are installed on a slope in a more permanent application, erosion will be minimized if the top of the downslope bale is on the same level as the bottom of the next line up.

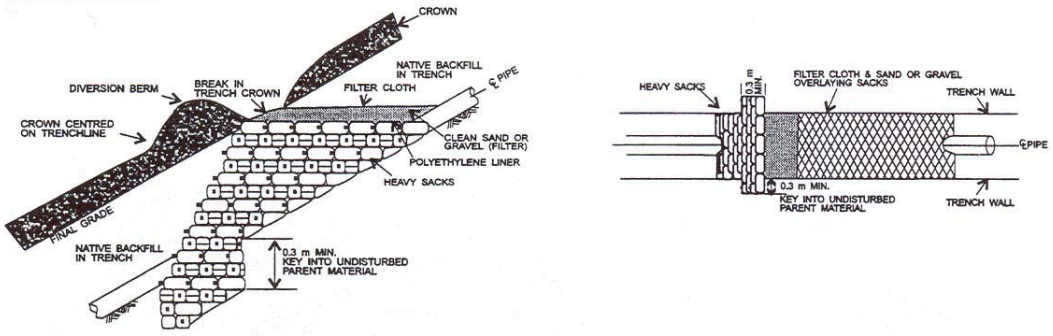
CPWCC WATERCOURSE CROSSINGS

SEDIMENT CONTROL - TYPICAL STRAW BALES

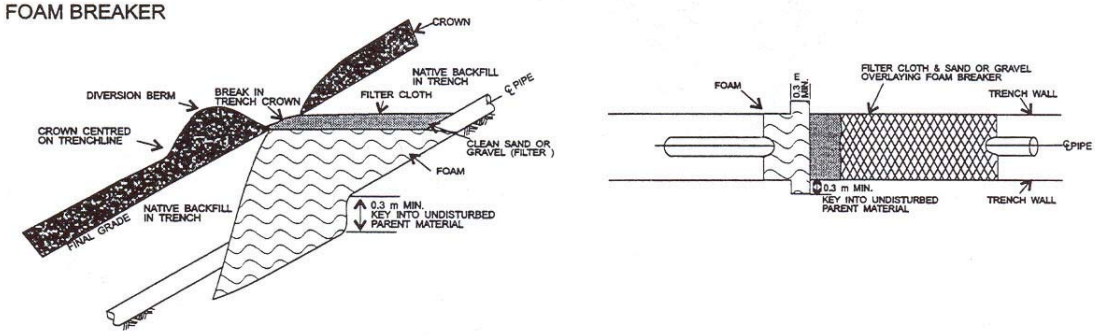
Second Edition - CPWCC DWG. NO. 21

FIGURE NO. 13D.A-13

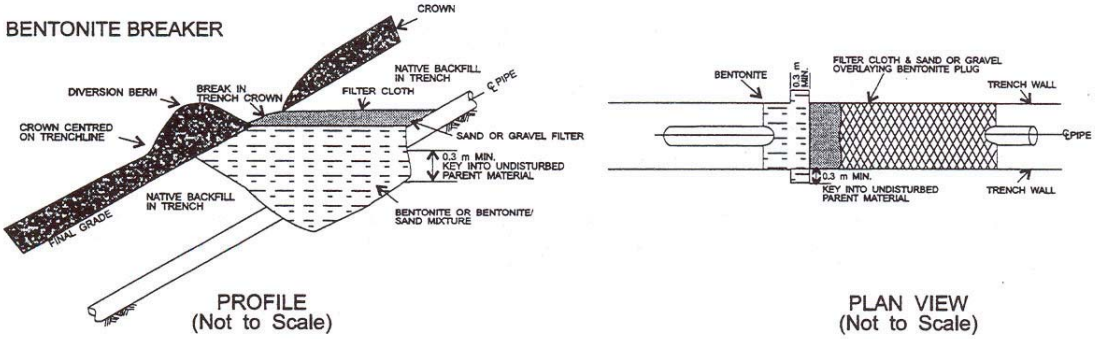
SACK BREAKER



FOAM BREAKER



BENTONITE BREAKER



PROFILE
(Not to Scale)

PLAN VIEW
(Not to Scale)

Notes:

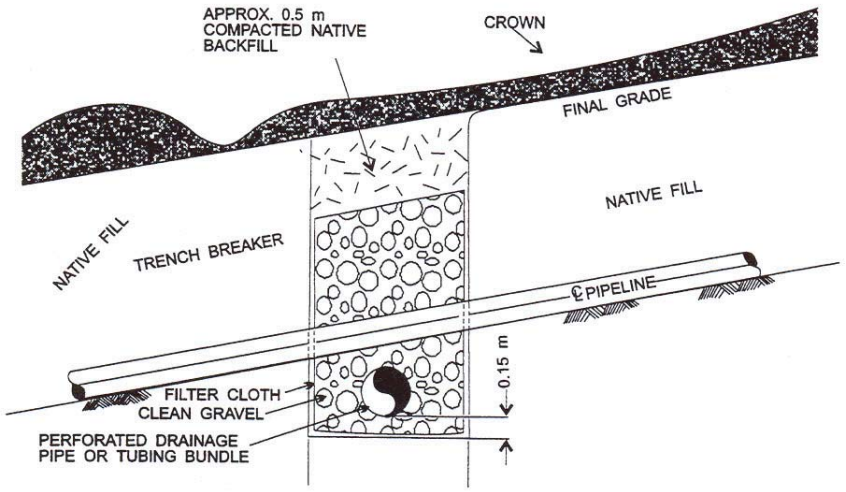
1. Install trench breakers (ditch plugs) to control water seepage along the trench line and prevent erosion of backfill materials.
2. Trench breakers may be constructed using earth filled sacks, bentonite, foam or equivalent materials to provide a barrier to water seepage.
3. The drawings above provide a schematic representation of trench breaker installation. Final locations and design of trench breakers will be determined by the project engineer based on site specific conditions at the time of construction.
4. Dig keys into trench bottom and sides to the extent feasible for added stability.
5. Install a prefabricated drain or a layer of sand or gravel covered with filter cloth over the breaker.
6. Backfill native material and mark location of breaker.
7. Ensure cross ditches are located over the end of the drain.
8. Construct diversion berms downslope from the breaker but not over the end of the drain.
9. Ensure that trench crown does not encroach upon the breaker drain or cross ditch.
10. Backfill trench on downslope side of breaker before up slope side.

CPWCC WATERCOURSE CROSSINGS

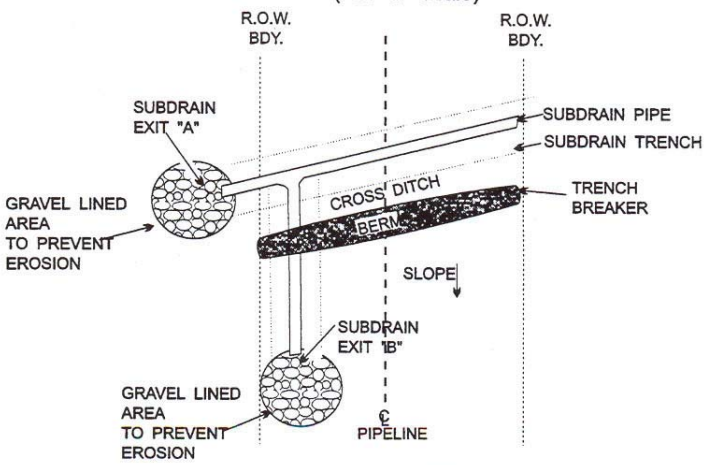
SUBSURFACE DRAINAGE CONTROL - TYPICAL TRENCH BREAKERS / DITCH PLUGS

Second Edition - CPWCC DWG. NO. 22

FIGURE NO. 13D.A-14



PROFILE
(Not To Scale)



PLAN VIEW
(Not To Scale)

Notes:

1. Install a subdrain to divert shallow groundwater flow away from the pipeline, to improve slope stability. Clean gravel and a filter cloth ditch liner, permits drainage aiding in retention of backfill. In certain circumstances, a parallel drain may be installed lengthwise down the slope underneath the pipeline. A geotechnical engineer can advise as to which method is most appropriate.
2. Install trench breaker downslope of drain, where drains cross pipeline trench, to prevent drain water flowing down pipe trench.
3. Determine the location of drain by on-site investigation considering such factors as groundwater conditions in trench, soil types, local topography, and drainage patterns. Discharge may either be off right-of-way on the downslope side of the subdrain (see Subdrain Exit "A"), or on right-of-way downslope of the berm (see Subdrain Exit "8"). Special permission will be required from the appropriate regulatory authority and landowner to construct a subdrain exit off right-of-way. Ensure discharge is into a well protected area with gravel, riprap or vegetation.
4. Skew cross drain 5° off horizontal to ensure sufficient drainage.
5. The above drawing is a schematic diagram. A geotechnical engineer should be consulted for the detailed site specific drain design and the incorporation of the trench breaker.

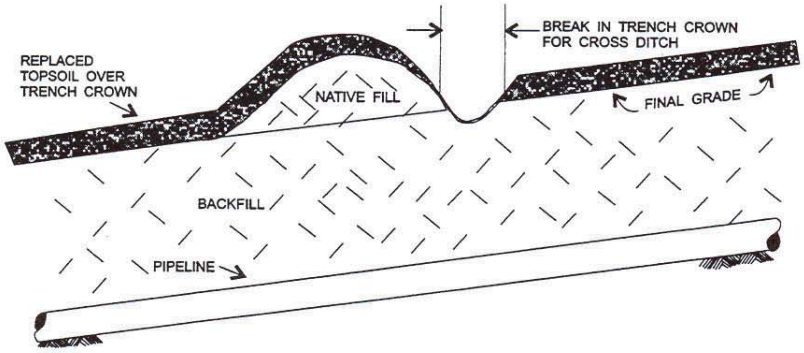
CPWCC WATERCOURSE CROSSINGS

SUBSURFACE DRAINAGE CONTROL - TYPICAL SUBDRAIN

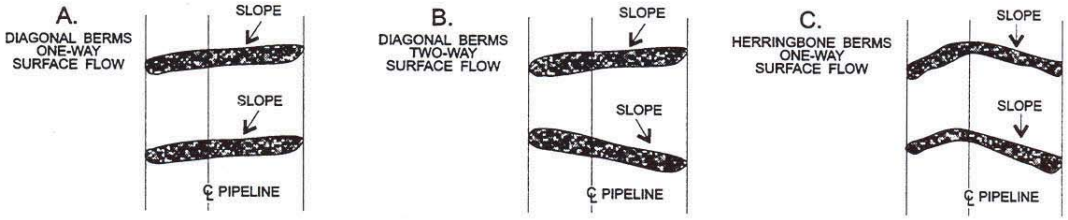
Second Edition - CPWCC DWG. NO. 23

FIGURE NO. 13D.A-15

PROFILE
(Not to Scale)



PLAN VIEW
(Not to Scale)



Notes:

1. Install diversion berm and cross ditch in conjunction with final clean-up and reclamation on moderate and steep slopes to divert surface water off the right-of-way. Also install berms immediately downslope of trench breakers to collect seepage forced to the surface.
2. Skew berm across the right-of-way at downhill gradient of 5%-10%.
3. Construct diversion berm of compacted native soils where extensive disturbance of the sod layer has occurred. Diversion berms should be constructed of timbers, imported logs,strawbales or sandbags if disturbance of the sod layer is limited. Avoid use of organic material. Where native material is highly erodible, protect up slope of berm and base of cross ditch with sod or by burying a geotextile liner 16 to 20 cm below the surface or armour up slope face of berm with earth filled sand bags.
4. Typical diversion berm height is approximately 30 cm to 75 cm. Inspect berms after heavy rains and the first spring following construction; replace or restore berms if warranted.
5. Leave a break in trench crown immediately up slope of diagonal berm and cross ditch to allow passage of water across right-of-way.
6. Use diagonal berms where direction of slope and surface water movement is oblique to pipeline right-of-way.
7. Use herringbone berm and cross ditch where direction of slope and surface water movement is parallel to right-of-way so runoff does not cross ditch line.
8. Determine location and direction of berm based on local topography and drainage patterns. Skew benT1s with downhill gradient of 5%-10%.
9. Typical diversion berm spacing

Slope Gradient (;%)	Typical Spacing (m) *
<8; <15	as required
8-14. 15-25	45
14-17; 25-30	34
17-20; 30-35	20
>20; >35	10-15

* Rely on field judgment to determine appropriate spacing. For example - install berms approximately 50% closer than indicated on highly erodibl.e material.s such as glacial-lacustrine deposits.

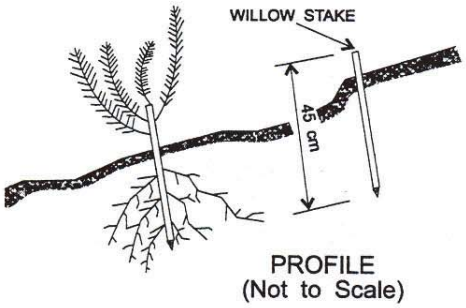
10. To facilitate traffic on the right-of-way during temporary applications, straw bales may be inserted in the berm as a "gate". The bales may be removed for access, but replaced each night.

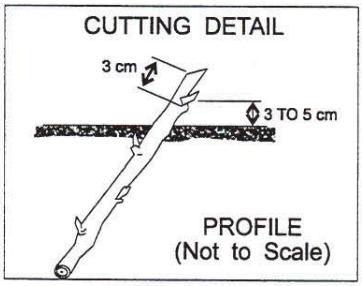
CPWCC WATERCOURSE CROSSINGS

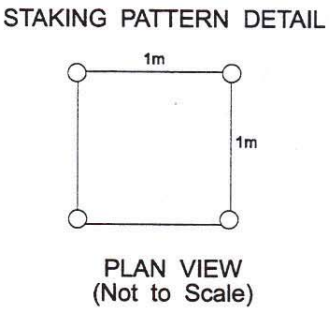
SURFACE EROSION CONTROL - TYPICAL CROSS DITCHES AND DIVERSION BERMS

Second Edition - CPWCC DWG. NO. 25

FIGURE NO. 13D.A-16

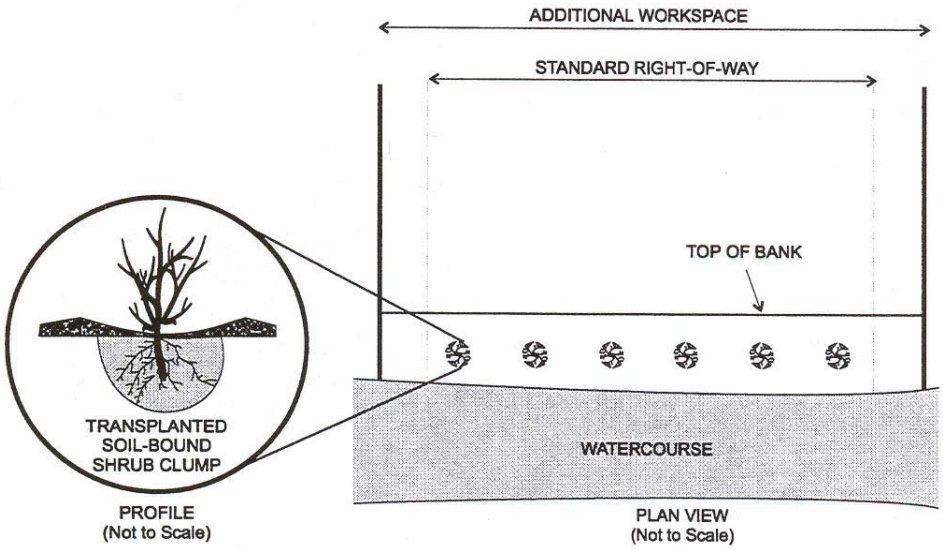






Notes:

1. Install stakes of suitable species (e.g. willow, dogwood) on watercourse banks.
2. Make clean cuts with unsplit ends using pruning shears, hand saw or chain saw.
3. Select stock from bottom of branches not tips.
4. Mark basal ends to ensure correct installation.
5. Ensure at least one lateral bud above surface and three below. Plant cutting at an angle.
6. Protect material from drying out. Install as quickly as practical.
7. Trim side shoots close to main stock.
8. Use frost pin to make pilot hole. Minimize damage to stake when driving by using a neoprene lined post hole pounder or rubber mallet.
9. Install live stakes on banks and 1.5 m (approximately) back from banks for entire disturbed width of right-of-way.



Notes:

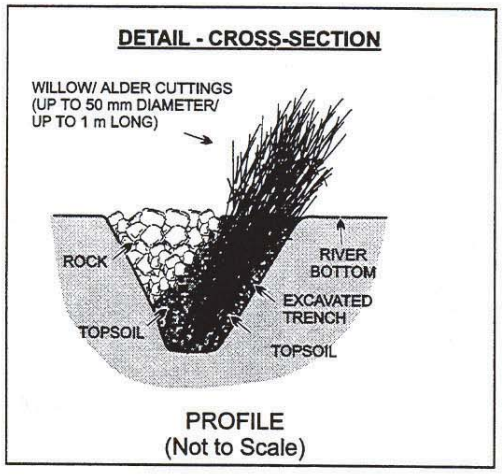
1. Salvage and replace shrubs on all watercourse banks where shrubs are present on the right-of-way.
2. Salvage whole bushes from the right-of-way during grading of banks. Ensure bulk of root mass is surrounded by soil.
3. Store salvaged shrubs on edge of right-of-way, cover with soil and do not let dry out.
4. Transplant as quickly as practical when reconstructing watercourse banks.
5. Soak the ground around the transplant with water.

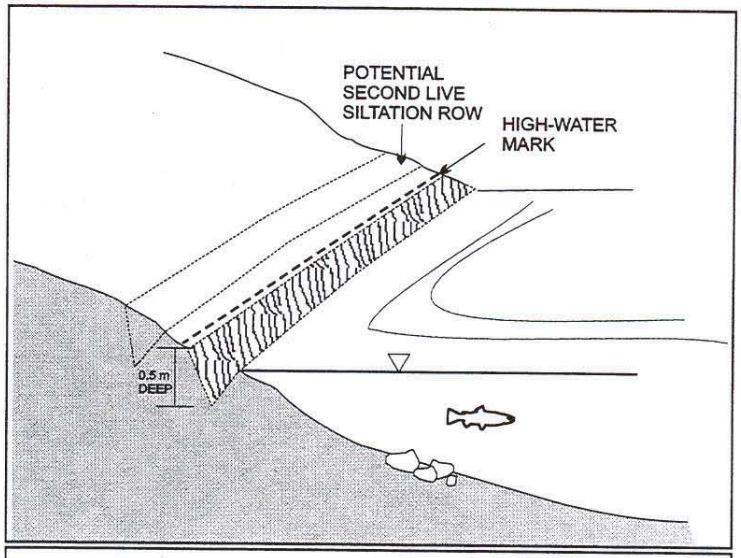
CPWCC WATERCOURSE CROSSINGS

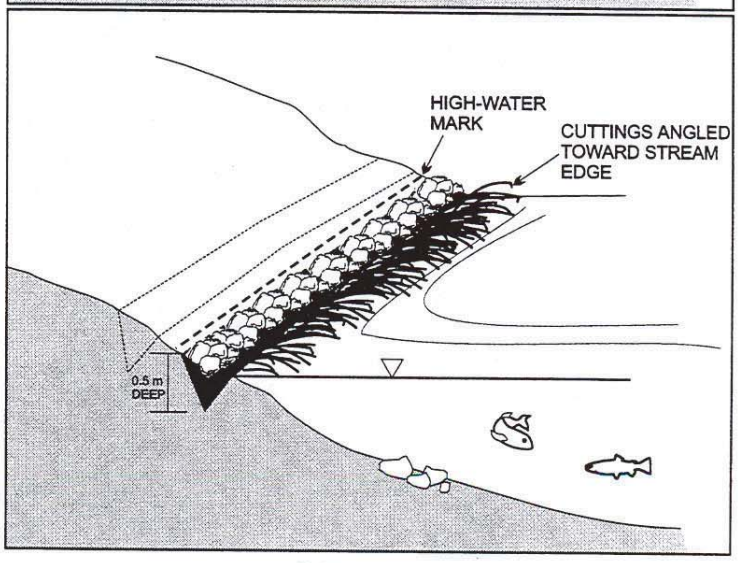
STREAMBANK PROTECTION - TYPICAL SHRUB RESTORATION

Second Edition - CPWCC DWG. NO. 32

FIGURE NO. 13D.A-17







(Not to Scale)

Notes:

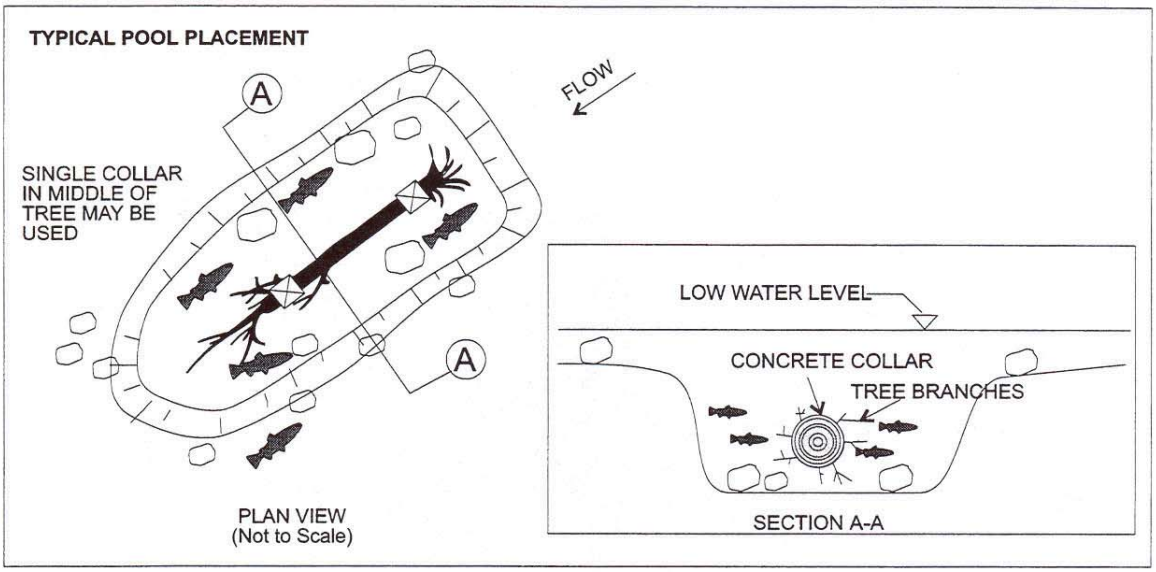
1. Proper placement and design is critical and qualified specialists should be involved.
2. Excavate a V-shaped trench (approx. 0.5 m deep) at the ordinary high water mark parallel to the toe of the streambank.
3. Insert a thick layer of 1 m long willow branches in the trench with the cuttings angled toward the watercourse.
4. Backfill with gravel/topsoil mix and secure with a covering of large cobbles/wattles/coir logs.
5. Ensure both up and downstream are securely tied into astable streambank to prevent washing out.
6. More than one row is generally recommended.

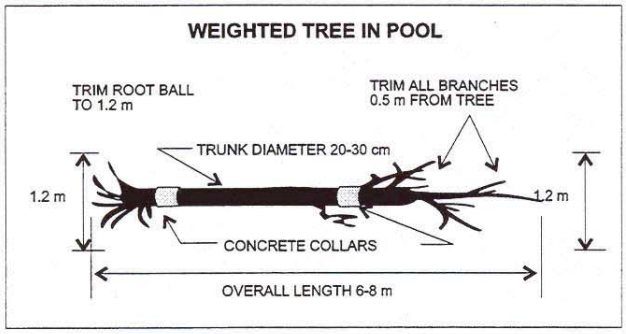
CPWCC WATERCOURSE CROSSINGS

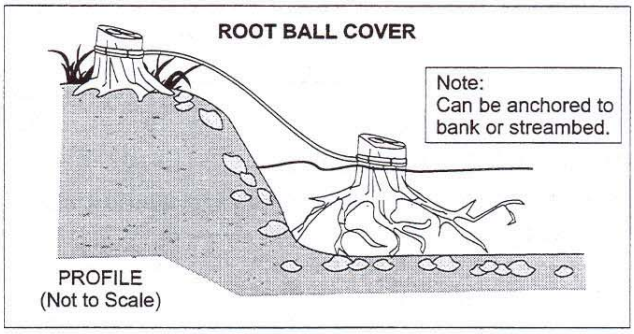
STREAMBANK PROTECTION - TYPICAL LIVE SILTATION

Second Edition - CPWCC DWG. NO. 35

FIGURE NO. 13D.A-18







Construction Notes - Weighted Tree in Pool:

1. Proper placement and design is critical and qualified specialists should be involved.
2. Select only sound, straight coniferous trees with adequate branches and root ball, 6 to 8 m in length, with a minimum diameter of 0.4 m in diameter.
3. Trim the root ball and all branches so that they remain 0.6 m below the surface of the pool and will not snag any canoeists or debris.
4. Place 100 lb (50 kg) or more concrete pipe weights on each end of the tree where the trunk will support the heavy weights and move the tree into the pool area, utilizing two backhoes if feasible. Carefully lower the tree to the bottom of the upstream end of the pool (breakage may occur due to heavy pipe weights).
5. Place Rock Clusters in and around the pool as desired.
6. Weighted trees may be added to or removed from pools at any time after construction to change shelter provisions.

Construction Notes - Root Ball Cover:

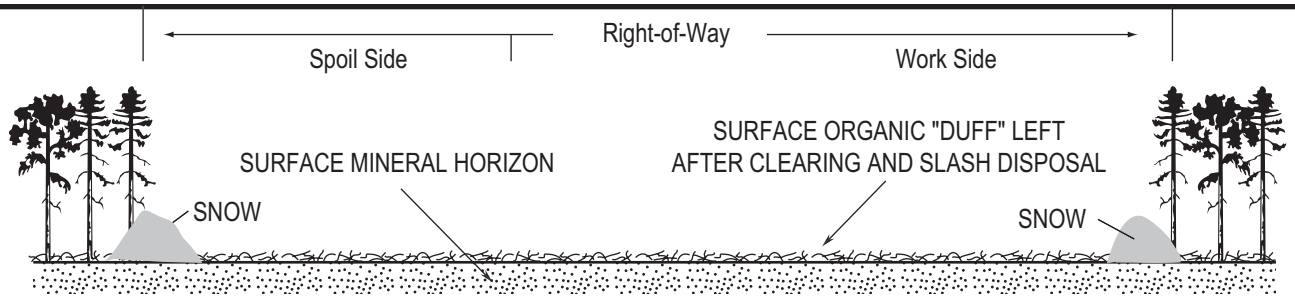
1. Proper placement and design is critical and qualified specialists should be involved.
2. Select and clean large coniferous root balls.
3. Trim and anchor root balls securely to bank or streambed so that they remain 0.6 m below the water surface.

CPWCC WATERCOURSE CROSSINGS

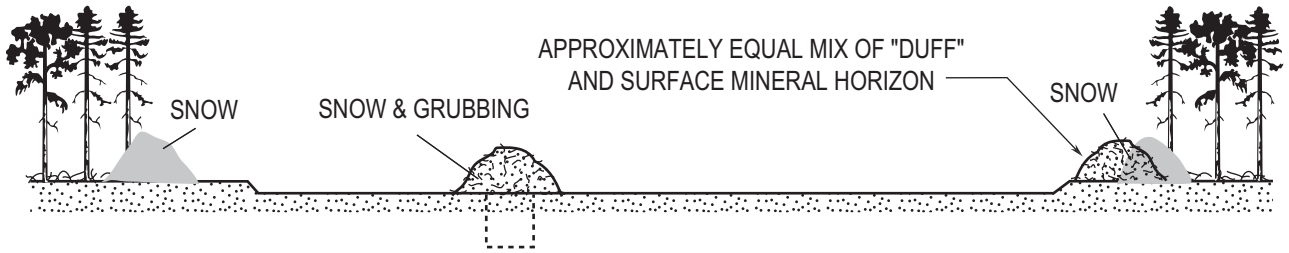
INSTREAM COVER - TYPICAL LOG / ROOT BALLS

Second Edition - CPWCC DWG. NO. 38

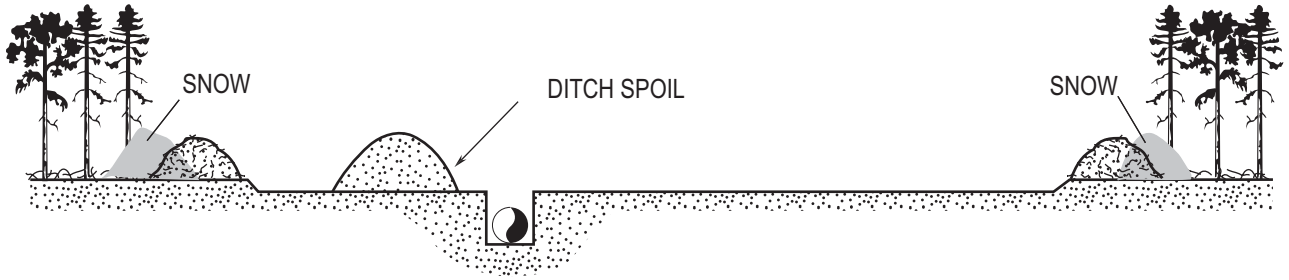
FIGURE NO. 13D.A-19



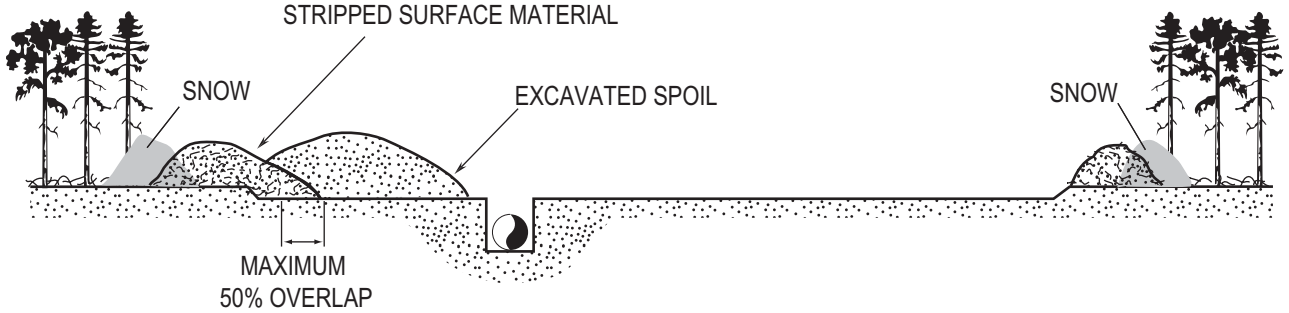
Step 1. Clear timber from RoW. Snow will be placed in existing clearings or along RoW boundary.



Step 2. Prepare RoW surface for construction activities. Form roach over ditchline with snow and grubbing from the spoil side of the RoW. In areas of fairly level terrain, grubbing will be minimized allowing the workside to be graded level by incorporating snow to provide a level work surface. Grubbing of the workside will be conducted as necessary at grade areas or to create a suitable work surface. Grubbings from the work side are placed on the work side edge of the RoW.



Step 3a. Excavate ditch, maintaining separation between ditch spoil and salvaged organics.

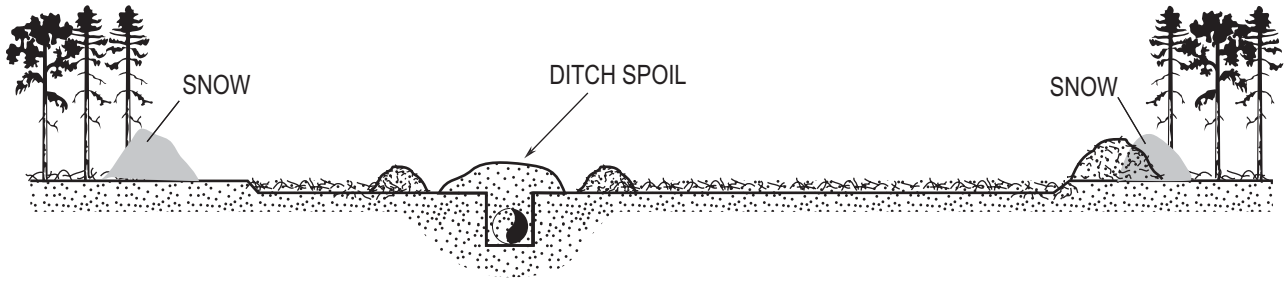


Step 3b. Where workspace is limited, subsoil material may overlap up to 50% of the surface material but must be separated during clean-up.

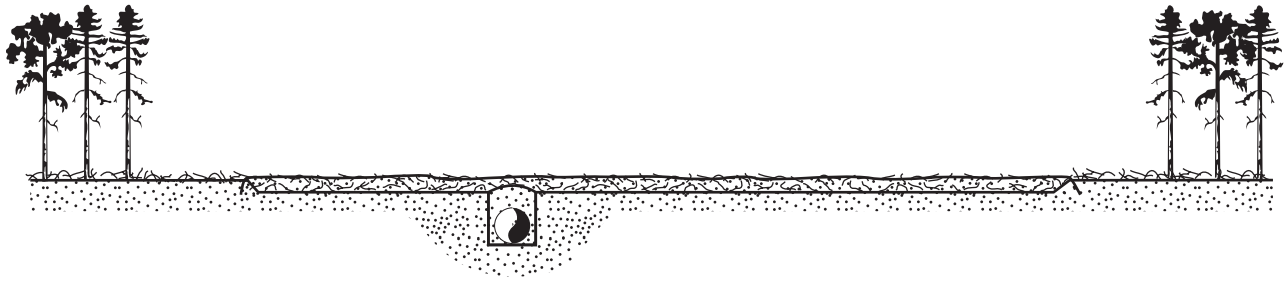
Green Area Grubbing - Winter Construction

AXYS | Environmental Consulting Ltd

FIGURE NO.	13D.A-20
DATE	February 2003
DRAWN	L.A.T.
CHECKED	R.M.
PROJECT	POG1045



Step 4. Backfill. Spread salvaged organic material (grubbing piles) evenly over the RoW in an uncompacted fashion. Do not replace grubbings over ditch line. Allow time for settlement.



Step 5. Following ditch settlement during the following spring, pack ditch line and feather remaining material evenly over the ditch line area. Remove residual stubs and roots as required.

NOTES:

1. To be implemented on treed areas wherever grading of the right-of-way is employed by the contractor after clearing operations. Grubbing will not be conducted in areas that provide a suitable level working surface. Muskeg areas are exempt from this procedure.

2. Root grubbing will be minimized where feasible within 1 to 2 m of the edge of the right-of-way.

3. Salvaged material will consist of equal quantities of surface organic "duff" (i.e., moss, leaf litter, etc.) and underlying mineral soil. Removing the duff layer only, is not acceptable.

4. Where entire right-of-way is graded, salvaged material will be windrowed to one or both sides of the right-of-way or stored in approved temporary workspace. Surficial material and spoil pile storage locations may vary depending on site specific conditions (such as restricted workspace, grade, sideslopes, etc).

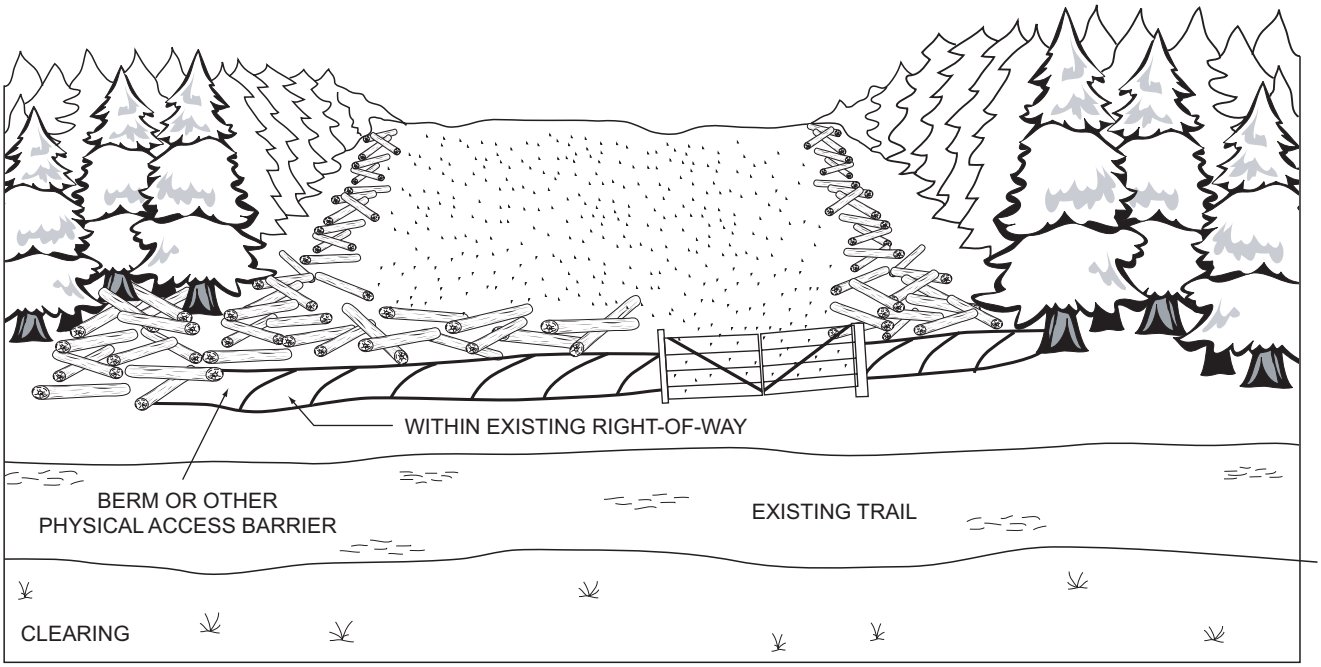
5. In heavily graded areas (i.e., grade cuts of >1m), salvaged material will be removed first and stored separately from remaining grade spoil.

(Adapted from NOVA 1993)

Green Area Grubbing - Winter Construction

AXYS | Environmental Consulting Ltd

FIGURE NO.	13D.A-21
DATE	February 2003
DRAWN L.A.T.	CHECKED R.M.
PROJECT	POG1045



NOTES:

1. Temporary workspace for storage of rollback will require regulatory approval prior to clearing.
2. Windrow stumps along, and into the edge of standing timber on both sides of the right-of-way.
3. Maintain existing access (i.e, trails, seismic lines) across right-of-way.
4. Construct berm or install other physical barrier across right-of-way, excluding gateway.
5. Install gate and locking mechanism.
6. Redistribute rollback along right-of-way side of the barrier, excluding gateway. Placement of rollback may vary depending on line-of-sight issues and local terrain.

Typical Gate Installation for Access Control

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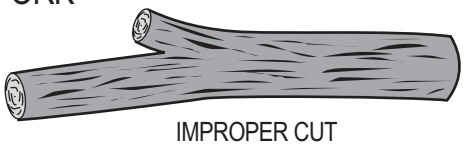
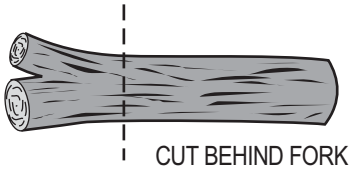
FIGURE NO.	13D.A-22		
DATE	February 2003		
DRAWN L.A.T.	CHECKED R.M.	PROJECT POG1045	

FORK



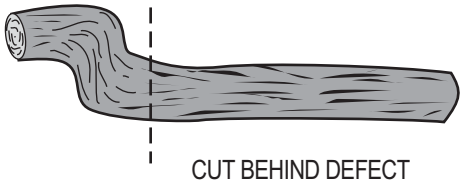
IMPROPER CUT

IMPROPER CUT



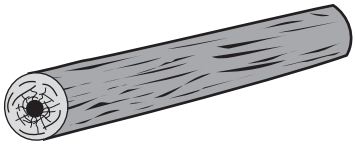
CUT BEHIND FORK

PISTOL BUTT, BUTT FLARE, BUTT ROT



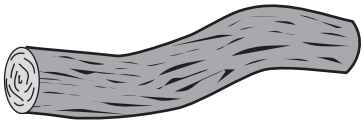
CUT BEHIND DEFECT

CUT BEHIND FLARE

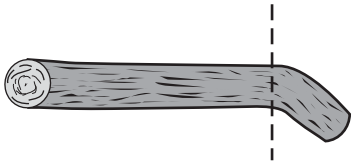


MUST BE <50% BUTT ROT

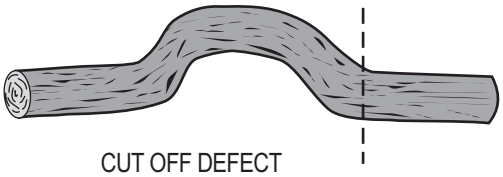
CROOK, DOG LEG



SORT TO PULP



CUT OFF DEFECT



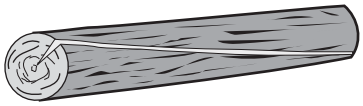
CUT OFF DEFECT

SWEEP

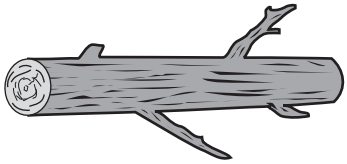
UN-ACCEPTABLE IF >6" IN 12' OR
>18" IN TREE LENGTH

ACCEPTABLE IF <6" IN 12' OR
<18" IN TREE LENGTH

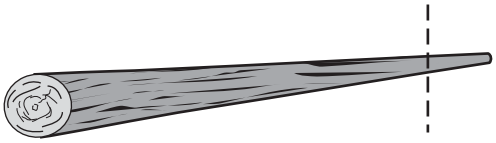
SPIRAL CHECK, LIMBS, RAT TAIL



SORT TO PULP



CUT FLUSH WITH STEM



MUST BE >4" TOP

NOTES:

1. All of the above defects must be removed from salvage wood unless otherwise specified by the contract documents or authorized representative.

2. No dead trees.

Timber Salvage and Defects

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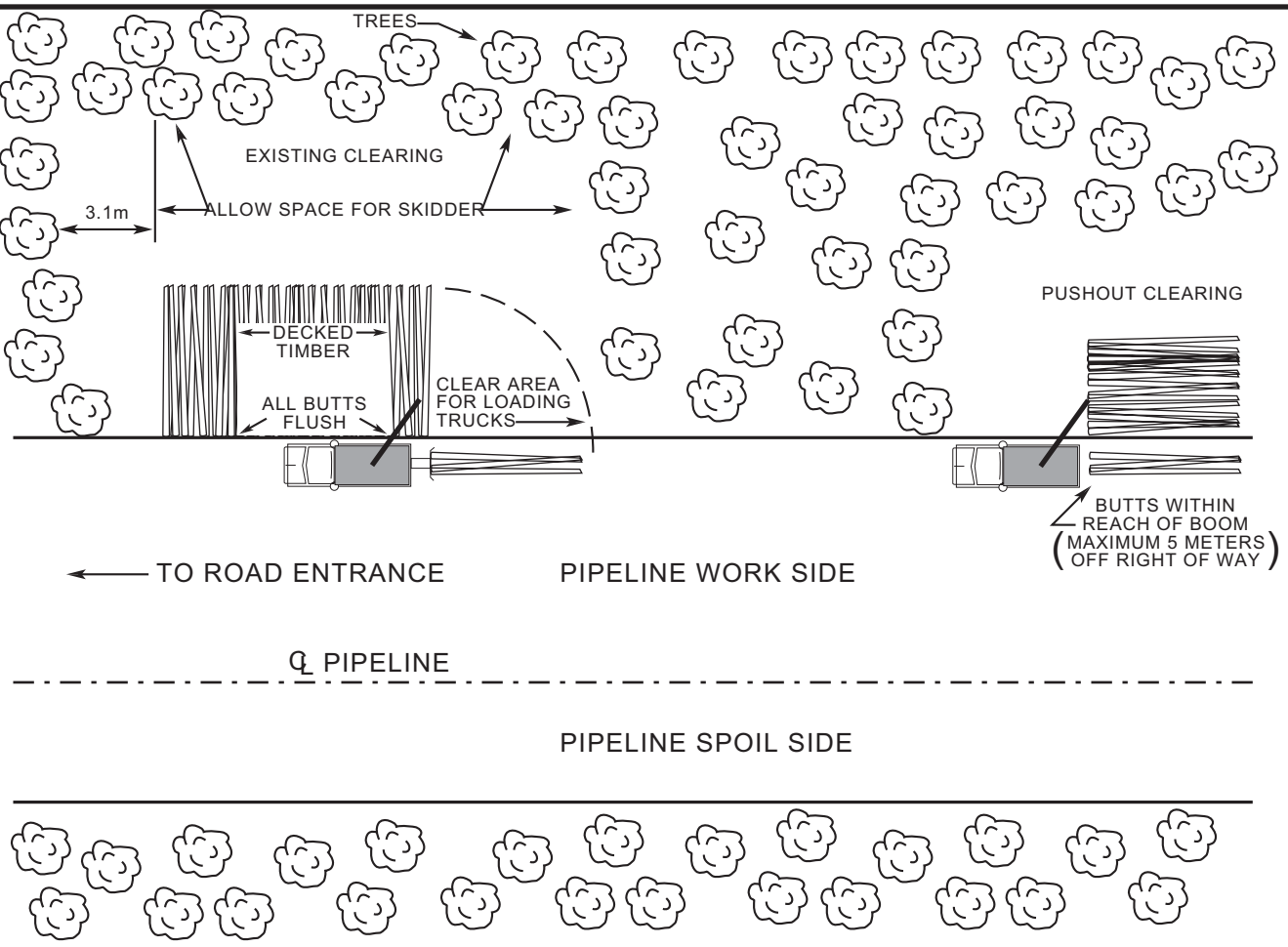
FIGURE NO.	13D.A-23
DATE	February 2003
DRAWN L.A.T.	CHECKED R.M.
PROJECT	POG1045



NOTES:

1. Timber will be salvaged according to government specifications .

2. Salvaged logs will not be skidded through watercourses, wet areas or thawed muddy ground on the right-of-way.

3. Timber decks will be located on approved additional temporary workspace. Deck sites will be developed, in order of preference, on existing cleared areas, in non-merchantable timber stands, and lastly, in merchantable timber stands. Reforested cutovers will not be used for decking sites. Deck sites will be flat and free of stumps.

4. Salvaged logs will be limbed (flush with the stems) and topped to specifications away from deck site to avoid incorporating slash into decks. Logs will then be decked with butt ends facing in the same direction (see drawing above).

5. Coniferous and deciduous salvage will be decked in separate piles.

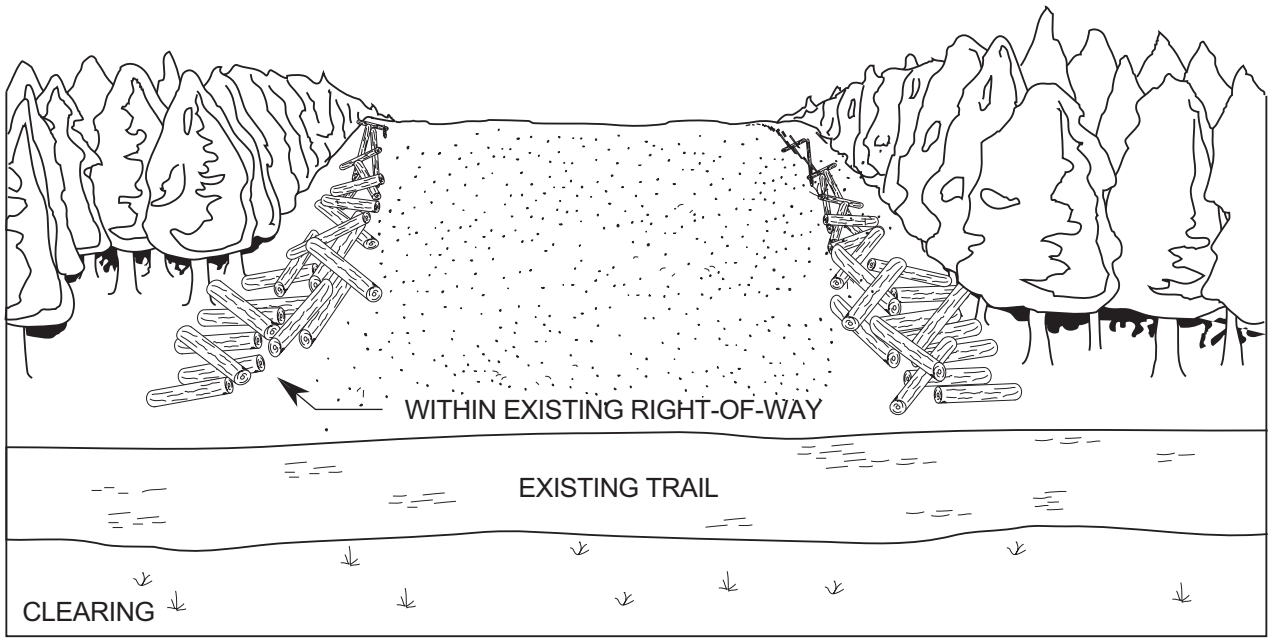
6. Log decks will be oriented to facilitate loading by trucks and removal from the right-of-way (see drawing above). Perpendicular deck face will be within 3 m of the access road along the right-of-way. Parallel decks will be within 5 m of the access road along the right-of-way

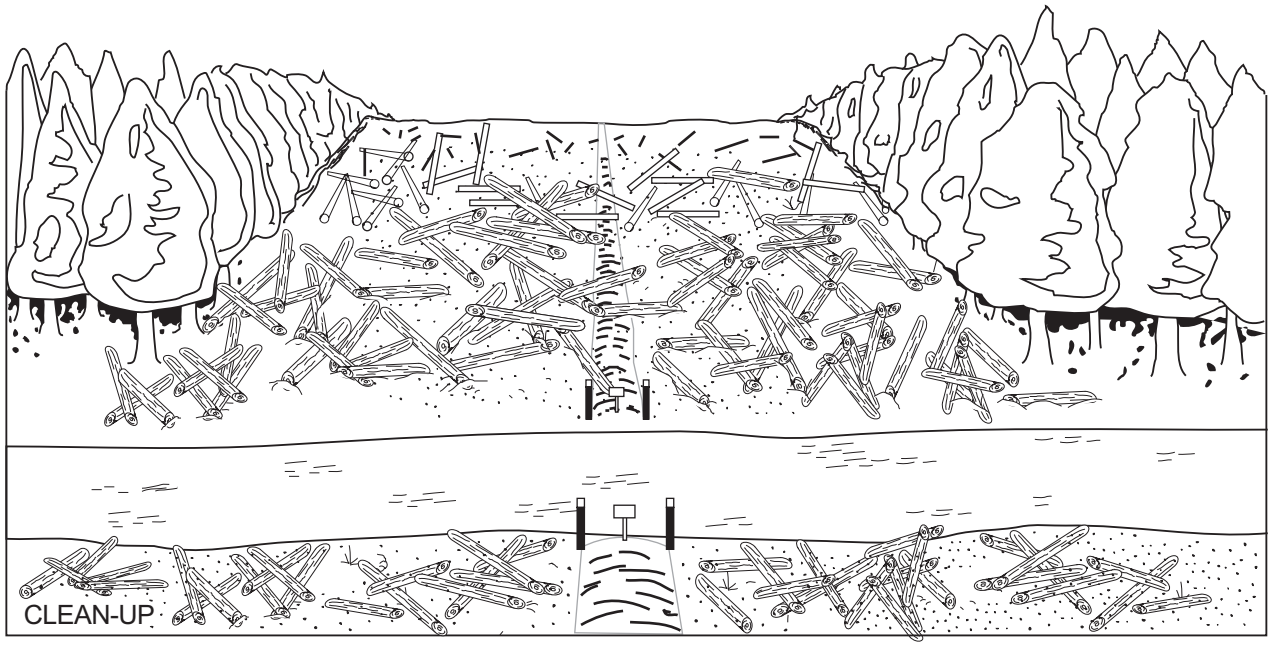
7. All salvage will be removed from the right-of-way prior to machine clean-up.

Salvage of Merchantable Timber

AXYS | Environmental Consulting Ltd

FIGURE NO.	13D.A-24
DATE	February 2003
DRAWN	L.A.T.
CHECKED	R.M.
PROJECT	POG1045





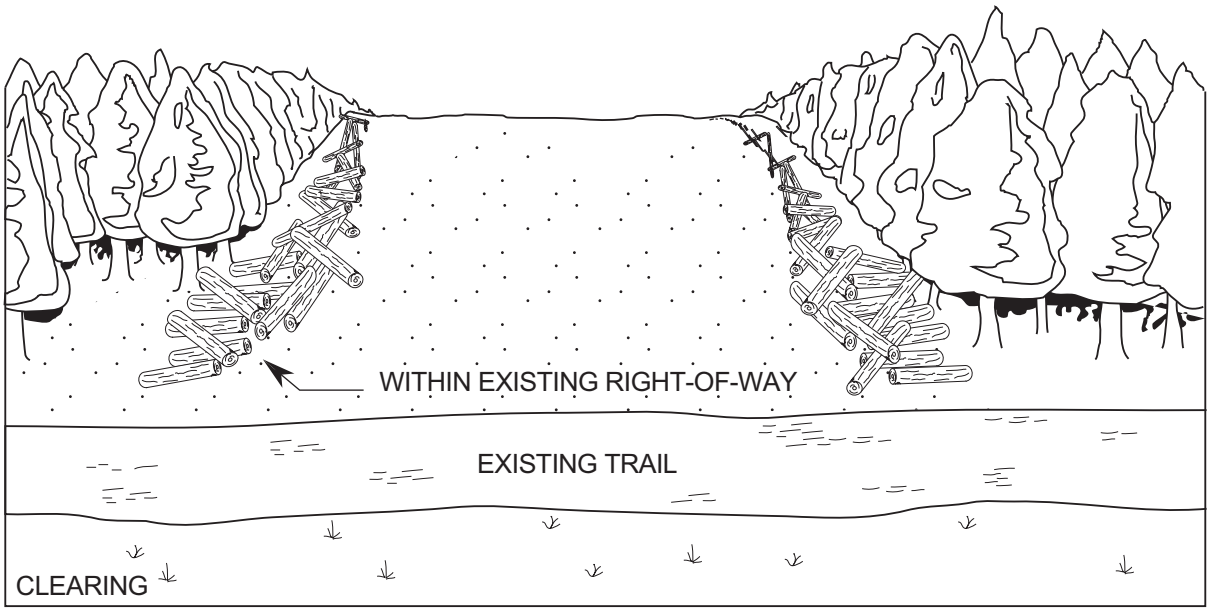
NOTES:

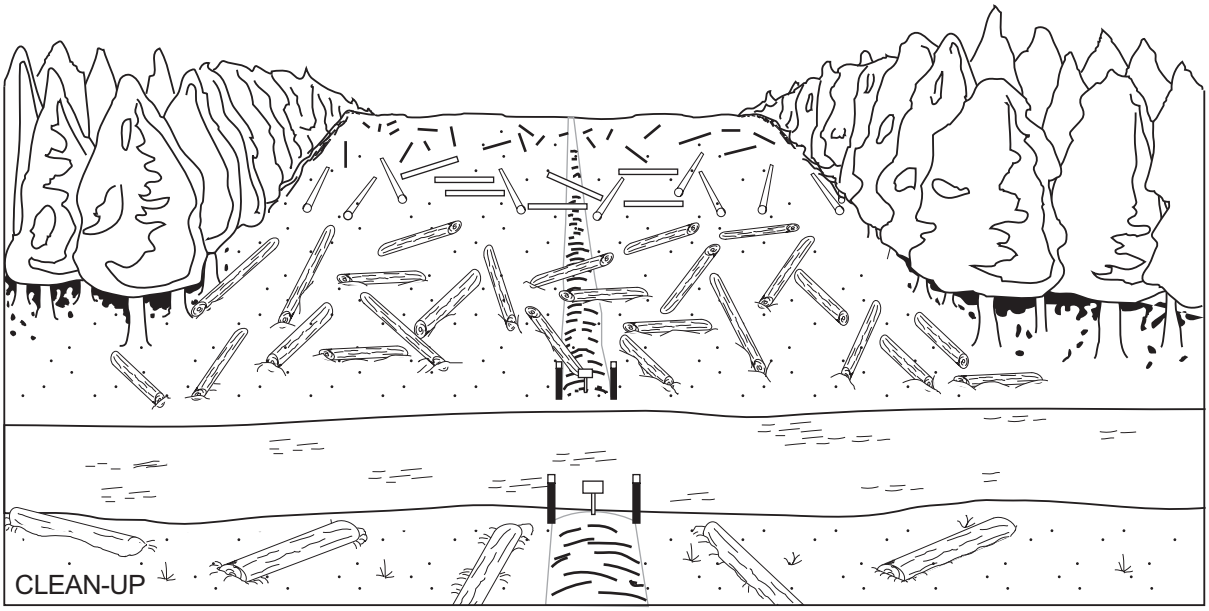
1. Windrow slash along standing timber on both sides of the right-of-way.
2. Temporary workspace for storage of rollback will require regulatory approval prior to clearing.
3. Maintain existing access (i.e, trails, seismic lines) across right-of-way.
4. Rollback should be evenly distributed over right-of-way in an uncompacted fashion.
5. Length of rollback provided in Environmental Alignment Sheets is a guideline. Quality of rollback for access control is a more important determinant than length. Length of rollback may be varied depending on line of sight issues and the local terrain. Specific rollback requirements will be determined by field inspection at the time of construction.

Typical Rollback for Access Control

AXYS | Environmental Consulting Ltd

FIGURE NO.	13D.A-25
DATE	March 2003
DRAWN	L.A.T.
CHECKED	R.M.
PROJECT	POG1045





1. Windrow slash along standing timber on both sides of the right-of-way.

2. Portion of trees 15 cm in diameter or greater are not suitable for erosion control and will be salvaged or burned as required.

3. Temporary workspace for storage of rollback will require approval from a Public Lands Officer.

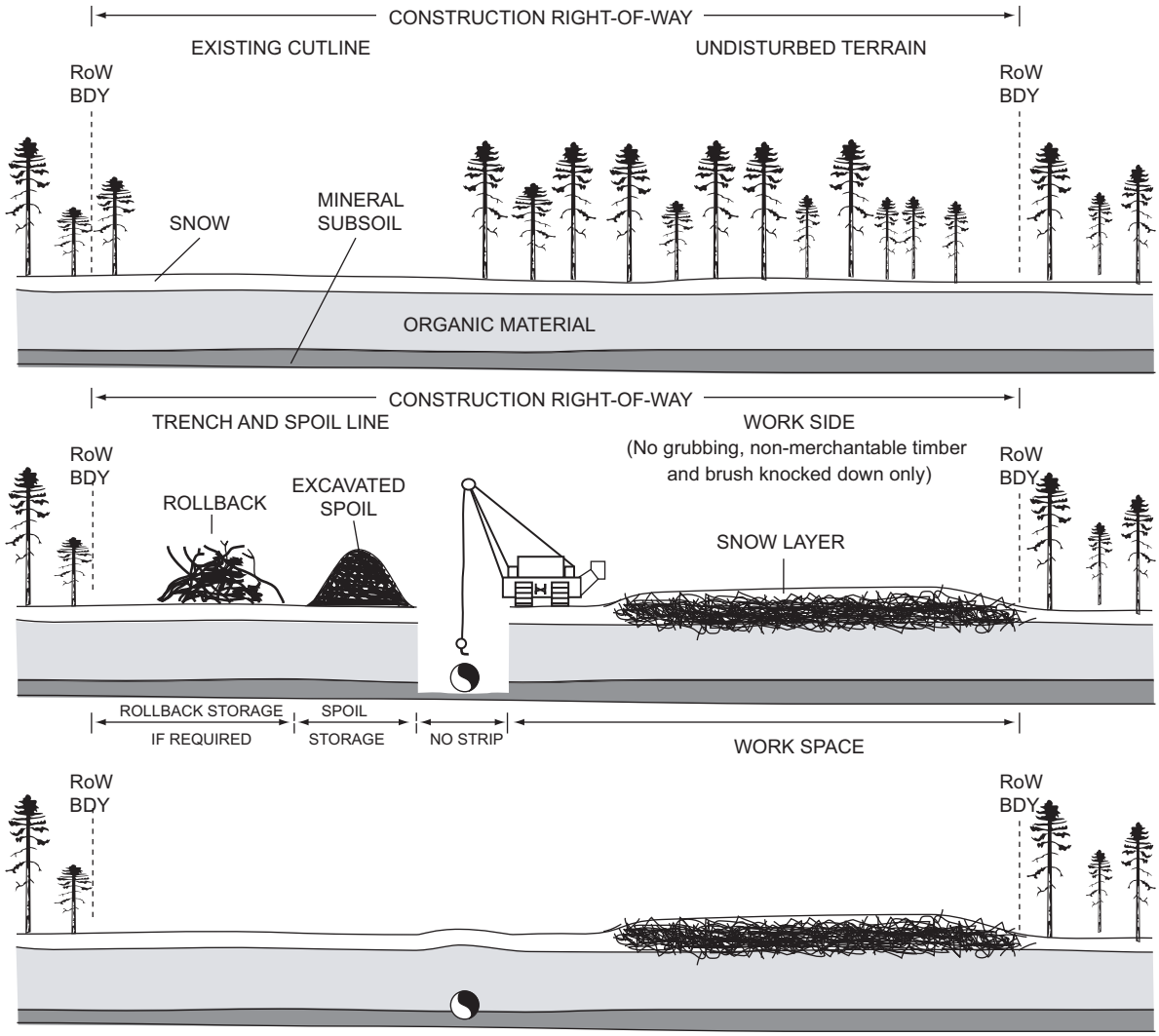
4. Maintain existing access (i.e., trails, seismic lines) across right-of-way.

5. Rollback should be evenly distributed over right-of-way and compacted flush with a dozer. Avoid overlap of rollback.

Typical Rollback for Erosion Control

AXYS | Environmental Consulting Ltd

FIGURE NO.	13D.A-26		
DATE	February 2003		
DRAWN L.A.T.	CHECKED R.M.	PROJECT POG1045	



ACTIVITIES:

1. Prepare Right-of-Way
2. Excavate Trench and Stockpile
3. Backfill Trench
4. Clean up

NOTES:

- remove and deck all merchantable timber prior to right-of-way clearing; decking sites to be located in existing clearings or areas approved by regulators
- walk down vegetation in existing cutline portion of right-of-way
- clear trees and shrubs from undisturbed portion of right-of-way using a bulldozer equipped with a cutter (KG) blade to prevent disturbance of frozen upper surface material
- limit grubbing to trench area only
- ramp snow from existing cutline onto undisturbed portion of right-of-way to smooth surface for equipment travel in this area
- pack snow on work side and spoil side to protect ground surface, drive in frost and facilitate backfilling
- spread snow on spoil side to fill in depressions
- trench spoil to be placed on snow layer to prevent disturbance of soil surface during backfilling
- install pipe within existing cutline portion of right-of-way
- store spoil on top of frozen snow-covered undisturbed surface material on existing cutline
- backfill and compact trench if feasible. Crown the trench to allow for settlement. Leave breaks in the crown at obvious drainages.
- avoid scalping surface layer when retrieving spoil pile off frozen undisturbed surface layer.
- leave woody debris across undisturbed portion of the right-of-way
- spread rollback over trench
- do not seed muskeg areas

Right-of-way Configuration in Permafrost Areas

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FIGURE NO. 13D.A-27			
DATE February 2003			
DRAWN L.A.T.	CHECKED R.M.	PROJECT POG1045	