

**REDUCED RISK TIMING WINDOWS AND MEASURES FOR THE
CONSERVATION OF FISH AND FISH HABITAT FOR THE OMINECA REGION
Effective May 3, 2004**

**Environmental Stewardship Division
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1.0 PURPOSE AND OBJECTIVES

The purpose of this document is to provide timing windows (windows of reduced risk) and measures for work related to stream crossings within the Omineca Region. To facilitate compliance with the Forest Practices Act (FPC). Forest districts to which the document applies include: Fort St. James, Mackenzie, Prince George, Vanderhoof and Headwaters within the Omineca Region. The document has been prepared by Designated Environment Officials (DEOs) within the Omineca Region, using the best information currently available, and in consultation with Ministry of Water, Land and Air Protection (WLAP) fisheries staff; Fisheries and Oceans Canada (DFO); the Ministry of Forests (MOF); and forest licensees.

In order to meet FPC requirements, the direction provided in this document is designed to achieve the following objectives:

- Protect fish habitat at crossings and immediately upstream and downstream of crossing structures; and,
- Provide safe passage through stream crossing structures for all life stages of fish.

2.0 AUTHORITY

The Minister of WLAP has established Senior Habitat Biologists, Forest Ecosystem Specialists, Habitat Protection Officers, Senior Water Resource Specialists and Water Resource Specialists as DEOs for the purposes of Timber Harvesting and Silvicultural Practices Regulation (THSPR) 14(2), Forest Road Regulations (FRR) 9(1)(h), 14, and Woodlot Licence Forest Management Regulations (WLFMR) 49(1)(h)(i), 54 and 68(c).

The FPC authorizes the DEO to provide timing windows and measures for construction activity on all fish stream crossings, and for the construction, repair or removal of all temporary crossings of fish streams. In addition, for woodlot operations, the DEO may also establish timing windows and measures for the location, design and use of temporary crossings of fish streams.

3.0 RESPONSIBILITY

It is the responsibility of the proponents of forest operations to ensure compliance with these timing windows and measures, which are legally required to be applied to all operations to which the above FPC regulations apply. If followed, it is expected that risks to aquatic resources will be significantly reduced or eliminated. However, these timing windows and measures do not authorize anyone to conduct or participate in any activity that is contrary to any provincial or federal statute. No authorization to alter, disrupt or destroy fish habitat, or introduce deleterious substances to water frequented by fish, is expressed or implied, as such authorization is within the exclusive purview of the Minister of Fisheries and Oceans, Canada. **It is highly recommended that any proposed stream crossing installation be referred to the DFO, to ensure compliance with the *Canada Fisheries Act*.**

Any contract between a forest licensee or tenure holder and the MOF does not affect WLAPs mandate to monitor and, when necessary, investigate apparent violations of the regulations listed above.

4.0 REFERRALS AND EXEMPTIONS

- 4.1 Activities that are consistent with the identified timing windows and measures do not require referral to WLAP unless specifically requested by a DEO.
- 4.2 Works conducted pursuant to the FPC do not require *Water Act* authorization or notification.
- 4.3 Where a proponent wishes to conduct work outside the approved timing window or deviate from an approved measure as stated in this document, authorization must be requested from a DEO in writing. Any such request must include site-specific information (Stream Crossing Data Sheet - attached). Where, as a result of proposed activities, impacts to fish or fish habitat are likely, the DEO may also require submission of a Proponent Action Plan, as described in Section 4.7.

A request to vary from an approved timing window or measure may or may not be approved by a DEO.

- 4.4 Any request to vary from an approved timing window or measure must be received by a DEO at least fourteen days prior to the initiation of in-stream work.
- 4.5 No work may proceed until approval to vary from an approved timing window or measure is provided in writing by a DEO, and any such variance approval must be kept on the work site while work is being conducted.
- 4.6 Notwithstanding the measures set forth in this document, if any of the following conditions are met, the timing window extends from January 1 through December 31 of any given year.
 - 1. On fish streams, the stream channel is dry and the construction, repair, removal or deactivation activity will not result in the introduction of sediment into fish habitat;
 - 2. On fish streams, the crossing structure does not encroach into the stream channel, no work will be conducted within the stream channel or fisheries sensitive zone, and the risk of sediment delivery to fish habitat is low;
 - 3. On non-fish streams, the deactivation activity does not result in the introduction of sediment into fish habitat; or,
 - 4. A temporary winter crossing is constructed on a fish stream as directed in Section 6.4.

4.7 Proponent Action Plan

A Proponent Action Plan encompasses five major components that describe the proposed works, possible impacts on fish or fish habitat, and steps that will be undertaken to minimize or avoid possible negative impacts. The plan must be prepared by a qualified professional or technician with adequate training and knowledge of fish habitat assessment and requirements for fish habitat protection and restoration.

The plan must detail:

1. Fisheries Resource Values

A description is required of the existing fisheries resource values of the area that could be affected by the proposed works, including hydrologic features, water quality, species of fish that frequent the waterbody, fish habitat present (spawning, rearing, overwintering, migration) and riparian vegetation. The sensitivity of the habitat to disturbance must also be described in this section (e.g., soil type, bank stability, substrate type, gradient).

2. Description of Proposed Activities

The plan must include a description of the proposed works and a site plan, and describe how the works will be carried out, all machinery and materials to be used, road maintenance requirements and deactivation plans. A project time schedule is required, which will include activities and applicable timing windows that may apply. Methods to maintain fish passage for the lifespan of the structure must also be clearly stated.

3. Impacts to the Fisheries Resources

Anticipated impacts to fisheries and fish habitat must be discussed, including the identification of the nature, duration, magnitude and location of potential impacts and effects on fish and fish habitat in downstream areas. All anticipated changes to fish habitat as a result of construction, maintenance and deactivation activities must be stated, including predicted changes to downstream flows, sediment and debris transport, bars and stream banks. Justification for any changes to fish habitat must be provided.

4. Mitigation Proposed

A description of all measures (actions and contingencies) that will be taken to avoid, reduce or eliminate any adverse impacts described in Point # 3 is required. Proposed measures should include a discussion of any proposed habitat compensation works in order to achieve *no net loss of fish habitat*.

5. Environmental Monitoring

An environmental monitor may be required where construction occurs in critical or important habitats or where construction will occur outside of the normal timing window. The monitor acts at *arms length* from the proponent and the proponent's contractors, reports to the DEO, and ensures that all proposed activities are completed to the satisfaction of the DEO. Construction activities may be continually monitored or periodically inspected, depending on the sensitivity of the site to disturbance and the nature of construction. It is expected that the monitor will photographically document critical or sensitive phases of the project, and record important observations. The monitor must be

given authority by the proponent to modify or stop operations in case of non-compliance with approved conditions or where it is anticipated that unforeseen circumstances are likely to cause environmental problems. By allowing the monitor to represent the concerns of the DEO, costly shutdowns and complications can be avoided.

After the installation is completed, the monitor will prepare a post-construction report that will detail the effectiveness of the Proponent Action Plan, identify problem areas, and make recommendations regarding further required mitigative measures and future monitoring of the site. This report must be made available to the DEO on request.

An environmental monitor must be a qualified professional or technician with adequate training and knowledge of fish habitat assessment and requirements for fish habitat protection and restoration.

5.0 TIMING WINDOWS

Work in or around streams can result in harmful effects to fish and fish habitat, including the harmful alteration or destruction of spawning habitat, introduction of sediment and the destruction of fish eggs and alevins prior to emergence from gravels, and displacement or other behavioral impacts on fish. Therefore, such work must be undertaken during times or periods when such harmful effects will be minimized.

Reduced risk timing (in-stream work) windows for the Omineca region are shown in the following Table.

White (non-shaded) areas in the Table represent time periods when in-stream work must be conducted. Numbers in the Table represent an approved start or end date for in-stream work.

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Species												
A. grayling				31				15				
Rainbow tr.				15				15				
Steelhead									15	15		
Bull trout							15		15			
Dolly Vard.								15	31			
Kokanee						1			31			
M. whitefish						1				15		
Spring and Fall Spawners								15	15			
Anadromous – Contact the DFO for appropriate timing window												
Salmon												

District-specific timing windows are as follows. These timing windows replace the general timing windows provided above.

MacKenzie Forest District

Bull trout – July 1st -August 15th

Mountain whitefish – July 15th -August 31st

Vanderhoof Forest District

Kokanee – June 1st -August 15th – Cluculz Creek watershed

Fort St. James Forest District

Kokanee – June 1st - July 31st – Tsilcoh River watershed

If fish species information for a particular stream is not available, the in-stream timing window for both spring and fall spawners must be used.

Proponents are reminded that stream inventory data for fish presence/absence are critical to establishing the widest possible timing windows.

6.0 MEASURES

Guidelines such as the *FPC Fish-stream Crossing Guidebook* (BCMOF March 2002) and the *Land Development Guidelines for the Protection of Aquatic Habitat* (Chilibeck et al 1992) should be consulted for potential culvert and bridge installation options to minimize the risk of damage to fish and fish habitat. However, the additional direction in this document takes precedence over such guidelines and best management practices, where there is a difference.

The following measures must be implemented during the construction, repair or removal of a temporary stream crossing and other operations in a fish stream (THSPR 14(2), WLFMR 68(c), while constructing or modifying a crossing in a fish stream (FRR 9(1)(h), WLFMR 49(1)(h)(i), or during road deactivation works in and around stream crossings (FRR 14, WLFMR 54).

Sections 6.1, 6.2 and 6.3 of this document are applicable to crossings of streams that are not considered to be temporary winter crossings. Section 6.4 applies specifically to temporary winter crossings.

6.1 Planning Measures

- 6.1.1 Stream crossings should not be located where streams are meandering, braided or located on alluvial fans.
- 6.1.2 Fords are generally not approved for fish streams. Any application for construction of a ford must include submission of a Stream Crossing Data Sheet and a Proponent Action Plan.
- 6.1.3 Culverts or bridges must be installed at crossings of fish streams on permanent or planned five-year roads in approved road permits.
- 6.1.4 Streams having a channel width of two or more metres must be crossed using a bottomless structure.

Stream channel width is defined as: *the horizontal distance between streambanks on opposite sides of the stream measured at right angles to the general orientation of the banks. The point on each bank from which width is measured is usually indicated by a definite change in vegetation and sediment texture. This border is the "normal" high-water mark of the stream and is sometimes shown by the edges of rooted terrestrial vegetation. Above this border, the soils and terrestrial plants appear undisturbed by recent stream erosion. Below this border, the banks typically show signs of both scouring and sediment deposition.*

6.1.5 Closed-bottom culverts may not be installed in the following circumstances:

1. In critical fish habitat. Critical fish habitat is defined as habitat that is critical in sustaining the local population of a species listed in Operational Planning Regulation (OPR) 1 of the FPC, because of its rareness, productivity and sensitivity. Critical fish habitat is indicated by the presence of high value spawning or rearing habitat. This is evidenced by the abundance of suitably-sized spawning gravels, or by deep pools, undercut banks and/or stable debris which are critical to the fish population present. **It is highly recommended that a fish habitat assessment be carried out at any potential stream crossing site, prior to the selection of a stream crossing structure. In order to identify critical fish habitat which may be present, this assessment should be carried out by a qualified professional or technician with adequate training in fish habitat assessment.**
2. In areas of channel instability, such as in areas of past or current beaver activity upstream of the proposed stream crossing site; in areas prone to lateral channel movement; or in areas where the stream channel in the vicinity of the proposed stream crossing site is aggrading or degrading.

6.1.6 **Closed-bottom culverts must be embedded into the substrate.** Pipe arch or elliptical culverts measuring 1000 millimetres or greater in diameter must be embedded below the natural streambed a minimum of 0.3 metres, or 20 percent of the culvert height - whichever is greater. Pipe arch or elliptical culverts smaller than 1000 millimetres in diameter must be embedded a minimum of 20 percent of the culvert height. Round culverts must be embedded a minimum of 40 percent of the culvert diameter.

6.1.7 Culverts must be sized to accommodate the 100-year return period peak flow after embedment.

6.1.8 **Stream channel width at a fish stream crossing, at any point within the stream channel, may not be constricted by crossing structures, bridge abutments, sill logs, riprap or by anything else associated with the stream crossing.**

6.1.9 Closed-bottom culverts in fish streams must be set at the average channel slope for the site.

6.1.10 Closed-bottom culverts may not be installed at gradients that exceed 5 percent.

6.1.11 **To promote fish passage and mitigate against the loss of the productive capacity of a stream where it flows through a culvert, substrate material**

must be placed throughout the barrel of all closed-bottom culverts measuring 1400 millimetres or greater in diameter that are installed in fish streams. This material must fill the culvert to the elevation of the natural stream bed in areas where it is placed.

A heterogeneous mixture of various substrate sizes that contains enough fine materials to seal the stream bed is recommended. A homogeneous substrate such as large, coarse rock, or washed gravel, should be avoided - particularly where such substrates are relatively thick and are placed at steeper gradients - as this can lead to subsurface flow during low-flow periods and the creation of a barrier to fish movement. This is especially problematic when there is little input of bedload from upstream areas to seal the substrate, such as when there is a wetland or pond immediately upstream of the culvert.

Recommended mixtures are shown in the following Table*.

D _{max} (centimetres)	Particle Size Distribution (centimetres)			
			30%	30%
20		40% <5	5-12	12-20
30		40% <8	8-18	18-30
45	15% <3	25% 3-13	13-28	28-45
60	10% <3	30% 3-15	15-36	36-60
75	10% <3	30% 3-20	20-46	46-75

* Adapted from Washington Dept. of Fish and Wildlife (1999).

** D_{max} - the mean diameter of the largest material within the stream channel in the vicinity of the stream crossing that is moveable by flowing water. The largest moveable particle does not include large lag boulders deposited during periods with distinctly different streamflow regimes (e.g., immediately post-glacial) or boulders that have fallen into the stream from surrounding glacial moraines, colluvial fans, etc. D_{max} material should show evidence of movement by flowing water during the past decade, i.e., it should be surrounded by other sediment and not be an isolated particle, distinctly different from all others in the vicinity.

In many cases, it will be necessary to combine a select pit run with cobbles and boulders or riprap to achieve the recommended fraction of larger materials.

- 6.1.12 Substrate placement within culverts must be done at the time of culvert installation or modification.
- 6.1.13 Larger (D_{max}) material must be distributed throughout the culvert barrel. This is particularly important where a closed-bottom culvert is installed at a gradient that exceeds three percent. At such gradients, the culvert must be large enough to allow for the physical placement and orientation of the larger substrate elements, to assist in preventing scour and the loss of substrate from within the culvert.
- 6.1.14 **The width of the streambed placed within closed-bottom culverts must equal or exceed the natural width of the stream channel at the crossing location.**
- 6.1.15 Substrate material placed within closed-bottom culverts should be free of silt or other substances deleterious to aquatic life.

- 6.1.16 **Substrate material must be placed throughout the barrel of all closed-bottom culverts measuring less than 1400 millimetres in diameter that are installed in fish streams at gradients that exceed 0.5 percent. This material must fill the culvert to the elevation of the natural streambed in areas where it is placed.** If substrate material is not placed within such culverts, upstream movement of juvenile fish past the culvert inlet is often not possible in situations where the culvert barrel does not infill naturally (e.g., in small headwater streams not subject to significant variation in flow rates and lacking bedload movement within the stream channel). For this reason, any application to vary from the requirement to place substrate material within such culverts must clearly demonstrate that significant bedload movement occurs in the vicinity of the culvert.
- 6.1.17 Substrate material is not required to be placed throughout the barrel of closed-bottom culverts measuring less than 1400 millimetres in diameter that are installed essentially flat, at gradients of 0.5 percent or less.
- 6.1.18 Bridges and culverts must be designed and installed to permit the passage of bedload and debris. This is especially important for fish streams or direct tributaries to fish streams that have high gradients, exhibit evidence of channel instability or debris torrenting, or have unstable terrain or highly-erodible soils within the inner gorge.
- 6.1.19 Baffled culverts should only be used where all other practicable options have been exhausted. Application to use baffled culverts must be made to the DEO. Poulin *et al* (1999) describe the disadvantages of baffled culverts.
- 6.1.20 Pile driving or blasting that will result in vibrations harmful to fish is subject to the timing windows set forth in Section 5.0 of this document.

6.2 Construction and Deactivation Measures

- 6.2.1 The installation period must be minimized.
- 6.2.2 Equipment must be located on and work from the stream bank or naturally dry channel rather than within the wetted perimeter of the stream.
- 6.2.3 Temporary sediment control structures must be installed to reduce the risk of sediment delivery to a fish stream. These structures must be functional, maintained, cleaned out on a regular basis and cleaned prior to removal. Maintaining the natural vegetation in the vicinity of stream crossings serves as the best sediment control measure.
- 6.2.4 The work area must be isolated from flowing water, to limit sediment mobilization and introduction into streams.
- 6.2.5 Silt-laden water may not be discharged from the work site to the channel of a fish stream during the course of works and prior to the re-establishment of streamflow.
- 6.2.6 If channel de-watering is conducted, fish must be salvaged from the de-watered area and returned to the stream. Fish salvaging requires a fish collection permit from the regional office of WLAP.
- 6.2.7 Two pre-installation crossings (across - first crossing; back - second crossing) by heavy equipment (e.g., hoe) are permitted for installation of crossing structures during the appropriate timing window, providing the stream bed and banks are comprised of relatively stable, non-erodible materials. If, however, the stream bed and banks are highly erodible (e.g., dominated by organic materials, silt, silt loams, etc.), and significant erosion and stream sedimentation or bank or stream channel degradation will result from heavy equipment crossings (e.g., streamflow is relatively high), a temporary work bridge must be used for fish stream crossings for the purpose of installing a crossing structure. If multiple crossings of a fish stream are required in association with the installation of a crossing structure, an appropriate temporary or permanent crossing structure (e.g., bridge, culvert) must be installed.
- 6.2.8 Materials such as riprap or gabion rock that is placed within a stream channel should be free of silt or other substances deleterious to aquatic life.
- 6.2.9 All equipment used on site should be in good repair and free of excess grease and oil. All refueling and servicing must be conducted outside of the Riparian Management Area (RMA).
- 6.2.10 Where wood containing a wood preservative that is potentially toxic to fish is placed within the channel of a fish stream, the recommendations of Hutton and Samis (2000) must be followed. Treated wood so utilized must be treated with preservatives according to Best Management Practices as described by the Canadian Institute of Treated Wood and the Western Wood Preservers Institute (1997).

Treated wood fines or cut ends may not be deposited within a fish stream.

- 6.2.11 All cast-in-place concrete and grouting must be completely isolated from fish-bearing waters for a minimum of 48 hours if the ambient air temperature is greater than 0 degrees C, or for 72 hours if the ambient air temperature is less than 0 degrees C.
- 6.2.12 Where there is an ongoing risk of sediment delivery to a fish stream from road surfaces or ditches at the crossing location, permanent sediment control structures must be installed and properly maintained. Structures that are utilized - both temporary and long-term - must be functioning immediately after completion of the construction or deactivation activity. Suggested measures include, but are not limited to, those outlined in BCMOF (2002) and Chilibeck *et al* (1992).
- 6.2.13 During deactivation, the crib of a wooden culvert or bridge that is stable and integrated into the channel of a fish stream may not be removed. However, loose or unembedded components of such structures must be removed. Soil or other backfill material behind the crib that could enter the stream must be removed and placed in a location where it cannot enter the stream channel.
- 6.2.14 During construction or deactivation activities, damage to the stream channel, banks and vegetation in the vicinity of the work area must be minimized.
- 6.2.15 During periods of heavy or persistent rainfall, work that could result in sediment delivery to a fish stream must stop. During the shutdown period, measures to minimize the risk of sediment delivery to the stream must be implemented.
- 6.2.16 If migrating adults or redds of species of fish that are associated with a fish stream, as listed in OPR 1 of the FPC, are observed in or downstream of the work area, work activities must be suspended and a DEO notified.
- 6.2.17 As part of construction or deactivation activities, the stream channel, banks and other affected work areas at the site must be restored to their approximate original configuration. Any fill material that has been temporarily added to the stream channel must be removed and deposited in a location where it cannot enter the stream channel.
- 6.2.18 Upon completion of construction or deactivation activities, material that is no longer being used and has the potential to harm fish or fish habitat must be placed above the normal high-water mark. These materials must be removed from the stream floodplain prior to the spring freshet.
- 6.2.19 All soils exposed as a result of work activities that have significant potential for delivery to a fish stream must be promptly stabilized and re-vegetated to prevent erosion and stream sedimentation. A seed mix that is ecologically suitable and minimally palatable to livestock should be used. Fertilizers applied through hand seeding may not be used where they will directly enter a fish stream.

6.3 Emergency Situations

If emergency works are required to protect roads, stream environments or crossing structures, or a stream crossing structure has failed, the incident and remediation activities undertaken must be reported to a DEO as soon as possible, within normal business hours.

Section 38(4) of the *Canada Fisheries Act* states that where a person is responsible for the deposition of a deleterious substance (which includes silt) into water frequented by fish, or where there is a serious and eminent danger of such an occurrence, the occurrence must be reported to the DFO. Furthermore, pursuant to Section 38(5) of the *Canada Fisheries Act*, a person responsible for such an occurrence must take all reasonable measures to prevent the occurrence or to counteract, mitigate or remedy any adverse effects that result or may reasonably be expected to result therefrom.

6.4 Temporary Winter Crossings

The following conditions apply to temporary winter crossings (i.e., in place for one winter only) of fish streams, including any temporary winter crossing to be approved in a silviculture prescription. Conditions applicable to stream crossings by heavy equipment, and the selection and installation of crossing structures, are included.

Temporary winter crossings are subject to the following conditions:

1. Timber will be skidded or hauled across streams over acceptable crossing structures. No hauling or skidding will occur through the channel of any stream.
2. Up to three one way crossings of S4 streams by heavy tracked equipment are permitted, providing they are associated with the installation of an acceptable crossing structure. It is recognized that such crossings are necessary for site preparation at crossing locations, right-of-way bunching, the installation of crossing structures, etc.
3. Crossings through a stream channel by wheeled equipment are not permitted.
4. Up to two one way crossings of S3 streams by heavy tracked equipment are permitted, providing they are associated with the installation of an acceptable crossing structure.
5. If at a crossing location the stream bed and banks are highly erodible (e.g., dominated by organic materials, silt, silt loams, etc.), and bank or stream channel degradation would result from heavy equipment crossings, a bridging structure must be used to cross the stream.
6. Applications for heavy equipment crossings of S1 or S2 streams will be considered on a case-by-case basis, and must be referred to a DEO.
7. All crossing structures, including geotextile material, must be removed from streams prior to the spring melt, and by April 15 at the latest, unless the district manager waives this requirement pursuant to THPR 21(4) or WLFMR 68(d).
8. After a crossing structure has been removed, all appropriate measures must be taken to control erosion and stabilize and revegetate disturbed areas.
9. Crossing structures must be selected from the following Table.

Options for Temporary Winter Crossing Structures

Stream Class	Log Bundle	Frozen Soil Bridge (Plywood Culvert)	Non-embedded Culvert	Log or Bottomless Culvert	Temporary Bridge
S4 – no water	Yes	Yes	Yes	Yes	Yes
S4 – flowing water	No	No	Yes	Yes	Yes
S3	No	No	No	Yes	Yes

Required installation procedures for these crossing structures are provided below.

6.4.1 Log Bundles

Log bundles must be installed as follows:

1. Installation may only occur after the stream has frozen solid to the bottom.
2. The log bundle will be tightly lashed. Loose logs may not be placed within a stream channel.
3. The bundle will be comprised of clean, limbed and topped logs.
4. The bundle will be placed in the stream channel.
5. A geotextile will be utilized to cover the stream banks, stream channel and bundle at the crossing site.
6. Clean snow will be placed into the stream channel and frozen/compacted to serve as a running surface. The snow covering will be of sufficient depth to protect the geotextile from tearing due to machine traffic.

6.4.2 Frozen Soil Bridges (Plywood Culverts)

Frozen soil bridges (attached Drawing No. 2046-100, Revision E) have been successfully used in the Prince George Forest District over the past few years, and their design and use has been approved by the District Manager – Prince George Forest District. These structures are typically used on relatively flat ground where there is not enough snow available to cover a log bundle.

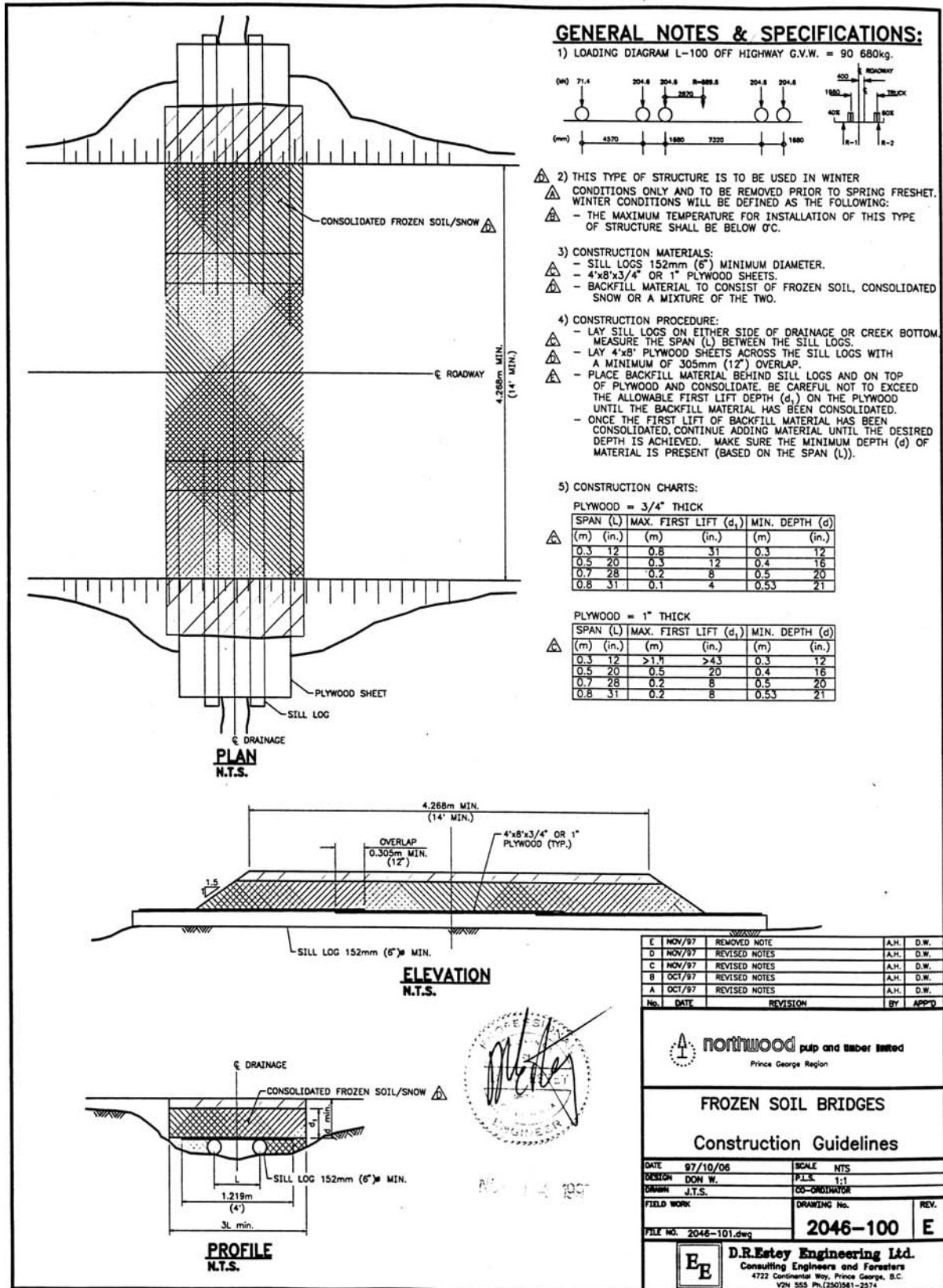
6.4.3 Non-embedded Culverts

1. **A non-embedded culvert may not be installed where stream channel alterations are necessary to install the culvert, i.e., excavating material from the stream channel, re-aligning the channel to accommodate a rigid pipe, etc., is prohibited.**
2. After the culvert has been placed within the stream channel, a geotextile must be utilized to cover the stream banks, stream channel and culvert at the crossing site.
3. Clean snow must be placed into the stream channel and frozen/compacted to serve as a running surface. The snow covering must be of sufficient depth to protect the geotextile from tearing due to machine traffic.

6.4.4 Log Culverts

Log stringers must be covered with a non-woven geotextile cloth with a minimum grab strength of 700 N, to prevent fines and other material from entering the stream. Shot rock and gravel or other suitable material that is used as a roadbed must be placed over the geotextile.

Frozen Soil Bridge (Plywood Culvert) – D.R. Estey Engineering Ltd. (1997).



7.0 REFERENCES

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STREAM CROSSING DATA SHEET
Ministry of Water, Land & Air Protection – Omineca Region

STREAM CLASS:		CONTACT PERSON / LICENSEE:	
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Administrative Information:

Stream Name:		General Location:	
Tributary to:		Watershed:	
Fish species present in system and what information was used to determine this (anecdotal, F.I.S.S. maps, sampling):			
Road Permit No.:		CP/Block No.:	
Date Surveyed:		Field Crew:	
BCGS Mapsheet :		Air Photo No.:	

Crossing Structure Information:

Type and Dimensions of Crossing Structure (bridge/culvert/arch):	
Culvert Gradient:	
Permanent or Temporary Installation:	
Proposed Dates of Work (start / finish):	
In-stream Work Window:	

Stream Channel Information:

Average channel width (m):		Average wetted width (m):	
Average water depth (m):		High water mark (m):	
Left bank height (m):		Left bank sideslope (%):	
Right bank height (m):		Right bank sideslope (%):	
Stream gradient (%):		Flow estimate: (Low / Moderate / High)	
Permanent / ephemeral:		Length surveyed:	

Note that left and right banks are designated when facing downstream.

Stream Bed Material:	Percent (%)
Fines/Organics (clay, silt, sand (<2 mm))	
Small Gravels (.2-1.0 cm)	
Large Gravels(1-6 cm)	
Small Cobbles (6-12 cm)	
Large Cobbles (13-25 cm)	
Boulders (>25 cm)	
Bedrock	

Habitat Type (%)*	Above Crossing	At Crossing	Below Crossing
Pool			
Riffle			
Glide			
Other			
Side channels			

*** Definitions (as per DFO Stream Survey Field Guide):**

- **Pool:** portions of the stream with reduced current velocity at low flow and with deeper water than the surrounding areas
- **Riffle:** shallow rapids where the water flows swiftly over completely or partially submerged materials to produce surface agitation
- **Glide:** areas of swiftly flowing water, without surface waves, which approximate uniform flow
- **Other:** rapids, chutes, marsh, slough
- **Side channels:** lateral channels which flow roughly parallel to mainstem and are fed by water from the mainstem.

General Comments: Streambank vegetation and material composition, habitat components present (cutbanks, boulders, deep pools, instream vegetation, overhanging vegetation, etc.), channel debris, obstructions, how aquatic resources will be adequately managed and conserved given timing of in-stream operations. Use extra page if necessary.

	Sketch of Stream/Valley Cross-section
<p>Please attach the following: 1. 1:50,000 location map 2. 1:20,000 or better topographical map showing site location 3. A ground-based photo series (upstream, right and left banks at site, downstream) to assist in visualizing the site.</p>	