

**Fish Habitat Design, Operation, Reclamation Requirements for  
Moderate–Moderate Habitat Suitability Watercourses  
(Includes Tributaries to Small Lakes)**

## **Fish Habitat Design, Operation, Reclamation Requirements for Moderate – Moderate Habitat Suitability Watercourses (includes Tributaries to Small Lakes)**

Moderate-moderate suitability habitats are defined as watercourses that are suitable for rearing juvenile Chinook salmon, although the habitat parameters and conditions are not as restricted as Moderate-high suitability habitats within the watershed. These watercourses are also highly suitable for a broad range of adult and juvenile resident fish species.

Please use the following instructions and information to complete the worksheets relevant to your proposal (located in Appendix A to G). The completed worksheets will be submitted as part of your project description to Yukon Environmental and Socio Economic Assessment Board (YESAB) and your application to the Yukon Water Board (YWB).

***Do you propose to undertake placer mining activities in or near a watercourse? Activities may include discharging effluent, constructing stream crossings, clearing riparian vegetation, constructing channel diversions, or withdrawing water.***

**NO** – No further review pursuant to the *Fisheries Act* is required.

**YES** – Proceed to Step A, Identification of Project Location

### **A) Identification of Project Location**

The first step in compiling a project proposal that involves activities proposed to occur in or around fish habitat areas is the completion of the ***Project Location Worksheet*** (Appendix A).

**A1.** *On the Project Location Worksheet enter the stream name, the watershed name (as per Yukon Placer Fish Habitat Suitability Maps), identify the watershed sensitivity, and habitat suitability classification for the reaches you proposed to work in, if any reaches are designated as “prior development” a short description of the location, the proposed duration of activities and a copy of a map of the specific location of the site.*

***Does the Previous Development designation apply to your project?***

**NO** – Proceed to the next question.

**YES** – See below.

### **Historical Development**

If your project falls within a “Historical Development” zone, the requirements for settling pond discharge, riparian zones, seasonal or temporary diversions, watercourse crossings, water acquisition and in-stream works that normally apply to Moderate-low suitability habitats will apply to your operation. **Please note that permanent diversion channels and all reclamation work must conform to the requirements for Moderate-moderate suitability habitats.**

**Moderate–Moderate Habitat Suitability (Includes Tributaries to Small Lakes)**

## **Current Development or Extensive Development**

If your project falls within a “Current Development” or “Extensive Development” zone, the requirements for settling pond discharge, riparian zones, seasonal or temporary diversions, watercourse crossings, water acquisition and in-stream works that normally apply to Low Habitat Suitability will apply to your operation. **Please note that permanent diversion channels and all reclamation work must conform to the requirements for Moderate-moderate suitability habitats.**

Once the sections noted above are complete in the *Project Location Worksheet*, proceed to the next question.

***Do you propose to discharge effluent from your mine site?***

**NO** – Proceed to Step C, Riparian Zones.

**YES** - Proceed to Step B, Settling Pond Discharge.

### **B) Settling Pond Discharge (effluent concentration)**

Point source sediment discharges from gold recovery processes are typically managed through the use of settling facilities. The action level approach is a key element of the risk-based approach to sediment management for Yukon placer mining. For more information on the action level approach or settling pond design, operation, recirculation systems, and settling pond reclamation refer to the *Guidebook of Mitigation Measures for Yukon Placer Mining*.

Water quality objectives and sediment discharge standards for settling ponds in Moderate-moderate suitability habitats are specified in the *Authorization for Placer Mining Works or Undertakings Affecting Fish Habitat* for the specific watershed you propose to work in (general requirements summarized below). Please ensure to verify your specific discharge standard in the respective watershed you plan to work in (specifically if any exemptions exist) prior to proceeding with your application.

| <b>Discharge Standard (Category A, Moderate-Moderate and Tributaries to Small Lakes)</b> | <b>Requirement</b> |
|--|--------------------|
| Design Target  | 200 mg/L           |
| Action Level   | 200 mg/L           |
| Compliance Level   | 200 mg/L           |

| <b>Discharge Standard (Category B, Moderate-Moderate)</b> | <b>Requirement</b> |
|---|--------------------|
| Design Target   | 0.2 ml/L           |
| Action Level  | 0.4 ml/L           |
| Compliance Level  | 0.8 ml/L           |

**B1.** Record the Design Target, Action Level and Compliance Level on the *Project Location Worksheet* (Appendix A).

Once the effluent discharge standards are recorded on the *Project Location Worksheet* proceed to the next question.

***Do you propose to build a Seasonal, Temporary or Permanent diversion channel?***

**NO** – Proceed to Step C, Riparian Zones.

**YES** – Proceed to Step D, Diversion Channels.

### **C) Riparian Zones**

The Riparian Zone is defined as the portion of the stream bank (either vegetated or not) immediately adjacent to the stream channel.

The designated **Riparian Zone** in Moderate-moderate habitats is **10 metres**, measured from the ordinary high water mark on each bank of the watercourse and following the shape of the channel.

The Riparian Zone designation applies to original (un-modified) channels, previously reclaimed channels and Permanent Diversion Channels. The Riparian Zone provisions set out below are not required for Seasonal or Temporary Diversion Channels.

Activities proposed within the Riparian Zone must comply with the following provisions (requirements of the watershed *Authorization for Placer Mining Works or Undertakings Affecting Fish Habitat*), or a site-specific authorization issued by DFO. In absence of compliance with either authorization, the only activity permitted within the Riparian Zone is the clearing of surface vegetation within a corridor to provide access to the stream (typically for water acquisition purposes). The maximum width of the corridor is to be no more than **5 metres**. Riparian Zones must be staked out by the operator prior to development.

***Do you propose to conduct surface or subsurface works in the Riparian Zone?***

**NO** – Proceed to Step D, Diversion Channels.

**YES** – Proceed to next question.

***Do you propose to construct a new stream crossing (ford)?***

**NO** – Proceed to next question.

**YES** – Review Step E, Watercourse Crossings, prior to proceeding to next question.

***Do you propose to clear surface vegetation only?***

**YES** – Proceed to Step C1, Surface Vegetation Clearing.

**NO** – The proposal includes both clearing of surface vegetation and subsurface works, proceed to Step C1, Surface Vegetation Clearing, followed by C2, Bank Modification.

### **Moderate–Moderate Habitat Suitability (Includes Tributaries to Small Lakes)**

## C1. Surface Vegetation Clearing

If works or undertakings are proposed to occur within the Riparian Zone, refer to the conditions identified in the tables below and use the information to fill out the **Riparian Zone / Bank Modification Worksheet** (Appendix B).

**C1a** – *On the Riparian Zone / Bank Modification Worksheet record the maximum duration the proposed Vegetation Clearing will be in place (see table below).*

**C1b** – *Record the habitat suitability type where Vegetation Clearing in the Riparian Zone is proposed.*

**C1c** – *Record the length (in metres) of proposed Vegetation Clearing in the Riparian Zone (see table below for restrictions).*

**C1d** – *Record the width (in metres) of proposed Vegetation Clearing in the Riparian Zone (see table below for restrictions).*

**C1e** – *Record the width (in metres) of Vegetation Setback in the Riparian Zone (see table below).*

**C1f** – *Draw a diagram of the proposed location where clearing of the Riparian Zone is proposed (include north arrow, flow direction) (use symbols identified on worksheet to compose your diagram).*

**C1g** – *Record a description of the required reclamation works (see table below).*

Conditions and reclamation required when proposing surface **Vegetation Clearing** in Riparian Zones in Moderate-moderate suitability habitats.

| <b>Design Component (Vegetation Clearing)</b> | <b>Requirement</b>    |
|---|-----------------------|
| Minimum Vegetated Setback from Stream         | 3.0 metres            |
| Maximum Length of Clearing                    | 200 metres            |
| Minimum Space Between Cleared Areas           | 300 metres            |
| Maximum Duration Prior to Reclamation         | 5 years               |
| Reclamation Requirement (surface)             | Full topsoil coverage |
| Reclamation Requirement (vegetation)          | 30% live staking      |

If proposing bank modification activities, proceed to step C2.

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## C2. Bank Modification

If works or undertakings are proposed to occur within the Riparian Zone, refer to the conditions identified in the tables below and use the information to further fill out the **Riparian Zone / Bank Modification Worksheet** (Appendix B).

Conditions related to subsurface **Bank Modification** in Riparian Zones authorized in Moderate-moderate habitats.

Note - If your proposal includes bank modification related to the construction of a ford, see step E for design conditions and requirements prior to proceeding to step C2a.

**C2a** – On the *Riparian Zone / Bank Modification Worksheet* enter length (in metres) of the proposed Bank Modification in the Riparian Zone (see table below for restrictions).

**C2b** – Record the width (in metres) of proposed Bank Modification (see table below).

**C2c** – Record the width (in metres) of the Bank Setback (see table below).

**C2e** – Draw a diagram of the proposed location of the Bank Modification (use symbols identified on worksheet to compose your diagram).

**C2f** – Draw the location of any new fords proposed (see step E for restrictions)

**C2g** – Record a description of the required reclamation works (see table below).

**Conditions and reclamation requirements when proposing Bank Modification in Riparian Zones in Moderate-moderate Habitats**

| <b>Design Component (Bank Modification)</b>   | <b>Requirement</b>      |
|---|-------------------------|
| Minimum Bank Setback From Stream              | 5.0 metres              |
| Maximum Width of Excavation                   | 50 metres               |
| Minimum Width Between Bank Modification Areas | 300 metres              |
| Maximum Duration Prior to Reclamation         | 5 years                 |
| Reclamation Requirement (grading)             | To pre-excavation grade |
| Reclamation Requirement (surface)             | Full topsoil coverage   |
| Reclamation Requirement (vegetation)          | 30% live staking        |

*Note – The “Minimum Bank Setback From Stream” provision identified above does not apply to the construction of watercourse crossings (fords). If your proposal includes the construction of a ford, please see step E.*

Once the *Riparian Zone / Bank Modification Worksheet* is completed, proceed to the next question.

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*Do you propose a Seasonal, Temporary or Permanent relocation of a channel?*

**NO** – Proceed to step E, Watercourse Crossings.

**YES** – Proceed to step D, Diversion Channels.

## **D) Diversion Channels**

Design and construction of a diversion channel is required if the proposal includes *Seasonal*, *Temporary* or *Permanent* relocation of a water course or channel. It is the responsibility of the applicant to ensure that when transferring water into a diversion channel, it is completed in such a manner as to avoid stranding of fish in the dewatered channel. If it is likely that stranding of fish will occur in a dewatered channel, the applicant should retain a qualified professional to conduct a fish salvage prior to dewatering the channel. More information on fish salvage requirements is available from Fisheries and Oceans Canada.

Provided the diversion channel design proposal meets the conditions identified in the following sections, the diversion channel may be constructed pursuant to the respective watershed *Authorization for Placer Mining Works or Undertakings Affecting Fish Habitat*. Specific criteria related to channel design and restoration requirements are described in the following sections while general information regarding design, construction and reclamation of diversion channels is provided in the *Guidebook of Mitigation Measures for Yukon Placer Mining*.

In order for a diversion channel to meet the requirements of the watershed *Authorization for Placer Mining Works or Undertakings Affecting Fish Habitat*, you must ensure that your proposed channel design achieves a total risk score of less than or equal to the maximum risk score threshold identified on the following Risk Scoring Tables. If your design exceeds this score you may wish to redesign your proposed channel in order to meet the maximum risk score, thus meeting the requirements of the authorization. If you are unable to meet the maximum risk score you are required to submit your proposal to Fisheries and Oceans Canada for site-specific review and authorization prior to proceeding.

### **D1. Original Channel and Site Parameters Worksheet**

*On the **Original Channel and Site Parameters Worksheet** (Appendix C), record the information for the original channel (pre-diversion conditions). Refer to guidebook reference sections identified on the worksheet to assist you with the data collection and entry process.*

*Note – The above worksheet must be completed prior to proceeding with the following steps.*

***Do you propose a Seasonal relocation of a channel?*** (A Seasonal Channel is in place for a period of less than one year and is replaced before winter).

**YES** – Not permitted in Moderate-moderate suitability habitat. Proceed to next question.

**NO** – Proceed to next question.

**Do you propose a *Temporary* relocation of a channel?** (*A Temporary Channel is in place for a period of less than five years*).

**YES** – Proceed to Step D3, Temporary Diversion Channels.

**NO** – Proceed to next question.

**Do you propose a *Permanent* relocation of a channel?** (*A Permanent Channel is in place for a period of five years or more*).

**NO** – Proceed to next question.

**YES** – Proceed to Step D4, Permanent Diversion Channels.

### ***D3. Temporary Diversion Channels***

Temporary diversion channels are in Moderate-moderate suitability habitats are defined as a constructed channel that will convey stream flow for a period of less than five years. Although not required, construction of fish habitat features may be incorporated in the channel design to reduce the overall risk score. To achieve this condition the channel must incorporate the required fish habitat features (based on channel configuration). Refer to the channel design considerations in the guidebook for more information on temporary diversion channels. You will need to complete and submit the ***Channel Design Flood Estimate Worksheet*** (Appendix D3) and the ***Channel Design Method Worksheet*** (Appendix E) for your Temporary Diversion Channel to YESAB and the YWB.

***Note – The Riparian Zone provisions do not apply to Temporary Diversion Channels.***

***Note – Flood design interval for Temporary Diversion Channels in Moderate-moderate Habitat is 1:10.***

**D3a.** *On the **Channel Design Flood Estimate Worksheet** (Appendix D3), enter the flood design interval (line 1).*

**D3b.** *On the **Design Flood Estimate Worksheet** (Appendix D3), enter the information required and complete the calculations. Refer to the guidebook reference sections identified on the worksheet to assist with the data collection, entry and calculation process. Please ensure to include the completed **Design Flood Estimate Worksheet** with your submission to the YESAB and the YWB.*

***Note – The Design Flood Estimate Worksheet must be completed prior to proceeding with the following steps.***

### ***D3c. Selecting a Channel Design Method***

The selection of a channel design method for channel construction is dependent upon the site geography, channel conditions and channel type. The design method selected is used to define the diversion channel dimensions and drop structure requirements.

**Moderate–Moderate Habitat Suitability (Includes Tributaries to Small Lakes)**

The Channel Design Method table provides a list of recommendations to guide the selection of a suitable channel design method.

| <b>Design Method</b>              | <b>Parameter</b>  | <b>Condition</b>   |
|-----------------------------------|---|--|
| <b><i>Channel Replication</i></b> | Channel Duration  | Seasonal or Temporary or Permanent   |
|                                   | Channel Gradient  | > 2%   |
|                                   | Channel Material in Diversion   | Similar or Coarser than Original (not in seasonal channel)                         |
|                                   | Diversion Channel Length  | Any  |
|                                   | Floodplain  | Limited to none  |
|                                   | Valley Type   | Incised or entrenched  |
|                                   | Channel Stability   | Stable (if original channel is diversion it must have been in place for >10 Years) |
| <i>Notes</i>                      | <i>Optional when channel gradient is &lt; 2%</i>  |  |
| <b><i>Floodplain Design</i></b>   | Channel Duration  | Permanent  |
|                                   | Channel Gradient  | < 2%   |
|                                   | Channel Material in Diversion   | All  |
|                                   | Diversion Channel Length  | At least 2/3 length of original channel  |
|                                   | Floodplain  | Narrow to Wide   |
|                                   | Valley Type   | Narrow to Wide   |
|                                   | Channel Stability   | Any  |
| <i>Notes</i>                      | <i>Can be used in areas with no floodplain when relocation site has space to support floodplain</i> |  |
| <b><i>Regime Channel</i></b>      | Channel Duration  | Seasonal or Temporary or Permanent   |
|                                   | Channel Gradient  | All  |
|                                   | Channel Material in Diversion   | Similar or Coarser than Original (not in seasonal channel)                         |
|                                   | Diversion Channel Length  | Any  |
|                                   | Floodplain  | Narrow to Wide   |
|                                   | Valley Type   | Narrow to Wide   |
|                                   | Channel Stability   | Any  |
| <i>Notes</i>                      | <i>Use when site data is insufficient to use other methods</i>                                      |  |

**Select a Channel Design Method based on the criteria listed in the table above.**

**In the following steps you will need to use a specific worksheet for the Channel Design Method you have selected (Channel Replication Worksheet (Appendix E1), Floodplain Design Worksheet (Appendix E2) or Regime Channel Worksheet (Appendix E3)). Do not proceed until you have selected a Channel Design Method.**

**Note – The Design Flood Estimate Worksheet must be completed prior to proceeding with the following sections.**

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**D3d.** On the *Channel Design Method Worksheet* you have selected, enter the information required and complete the design calculations. Refer to the guidebook reference sections identified on the worksheets to assist with the data collection, entry and calculation process. Please ensure to include the completed *Channel Design Method Worksheet* with your submission to the YESAB and the YWB.

The following table is to be used when designing Temporary Diversion Channels. The channel design proposed must achieve a risk score of no higher than the maximum risk score identified to be in compliance with the respective watershed *Authorization for Placer Mining Works or Undertakings Affecting Fish Habitat*.

**Severity of Effects Assessment for Temporary Diversion Channels**

| <b>Design Component (Temporary Diversion)</b>                   | <b>Range</b>                                | <b>Risk Score</b> |
|---|---|-------------------|
| Channel Gradient  | 3.51% to 5.0%                               | N/A               |
|   | 1.51% to 3.5%                               | 2                 |
|   | 0 to 1.5%                                   | 1                 |
| Length of diversion channel                                     | 1000 m to 2000 m                            | 3                 |
|   | 500m to 1000 m                              | 2                 |
|   | <500 m                                      | 1                 |
| Relative length of diversion channel                            | Shorter than original                       | 1                 |
|   | Equal or Longer than original               | 0                 |
| Permafrost in diversion channel                                 | Present                                     | N/A               |
|   | Absent                                      | 0                 |
| Primary material in diversion channel                           | Silt / Sand                                 | 2                 |
|   | Gravel / Cobble / Bedrock                   | 1                 |
| Location of diversion channel                                   | Perched (valley wall)                       | N/A               |
|   | Confined (valley floor)                     | 2                 |
|   | Incised (valley floor)                      | 1                 |
| Fish habitat features (rock islands / boulder groupings only)   | 50% of total required for permanent channel | -1                |
| <b>Maximum Permitted Score for Temporary Diversion Channels</b> |   | <b>7</b>          |

**D3e.** Calculate your total score and maximum permitted score on the *Severity of Effects Assessment for Temporary Diversion Channel Worksheet* (Appendix D2), and record your total score on line 2 of the *Channel Design Flood Estimate Worksheet* (Appendix D3).

**D3f. Fish Habitat Features**

If you have included Fish Habitat Features in your proposed Temporary Diversion Channel you must select the appropriate spacing of features based on the Channel Type identified on the *Original Channel and Site Parameters Worksheet*. Refer to the fish habitat feature considerations in the guidebook for more information. Use the following tables as a guide to fill out information requirements in the *Fish Habitat Feature Worksheet* (Appendix F).

**Moderate–Moderate Habitat Suitability (Includes Tributaries to Small Lakes)**

## Fish Habitat Reclamation Requirements for Temporary Diversion Channels

### Pool-riffle / Dune-riffle and Plane-bed channel type

| Select Fish Habitat Feature Based on Diversion Channel Width | Spacing Requirements<br>(place feature every X channel width) |
|--|---|
| Rock Island (channel width < 5m)                             | 12  |
| Boulder Grouping (channel width > 5m)                        | 10  |
| Rip-rap  | Based on channel design method                                |

### Step-pool and Cascade channel type

| Select Fish Habitat Feature Based on Diversion Channel Width | Spacing Requirements<br>(place feature every X channel width) |
|--|---|
| Rock Island (channel width < 5m)                             | 8   |
| Boulder Grouping (channel width > 5m)                        | 6   |
| Rip-rap  | Based on channel design method                                |

**D3g.** Enter the required information on the *Fish Habitat Feature Worksheet* (Appendix F) to identify the type, spacing and relative location of the fish habitat features. Draw a diagram of the diversion channel (include north arrow, flow direction) (use symbols identified on worksheet to compose your diagram).

**Note – If your Temporary Diversion Channel includes fish habitat features, and you propose to construct a crossing (new ford) be sure to identify the location of the ford on the *Fish Habitat Features Worksheet* (see step E2).**

Proceed to following steps if:

- D4, constructing a *Permanent Diversion Channel*.
- E, proposing to construct a new stream crossing.
- F, proposing to acquire water.

### D4. Permanent Diversion Channels

Permanent diversion channels are defined as a constructed channel that will convey stream flow for a period of over five years. All permanent diversion channels must include provisions for construction of fish habitat features. Refer to the channel design considerations in the *Guidebook of Mitigation Measures for Yukon Placer Mining* for more information on permanent diversion channels. You will need to complete and submit the *Channel Design Flood Estimate Worksheet* (Appendix D3), the *Channel Design Method Worksheet* (Appendix E) and the *Fish Habitat Features Worksheet* (Appendix F) for your Permanent Diversion Channel to YESAB and the YWB.

**Note – Flood design interval for Permanent Diversion Channels in Moderate-moderate Habitat is 1:20.**

**D4a.** On the *Channel Design Flood Estimate Worksheet* (Appendix D3), enter the flood design interval (line 1).

**D4b.** On the *Design Flood Estimate Worksheet* (Appendix D3), enter the information required and complete the calculations. Refer to the guidebook reference sections identified on the worksheet to assist with the data collection, entry and calculation process. Please ensure to include the completed *Design Flood Estimate Worksheet* with your submission to the YESAB and the YWB.

**Note – The Design Flood Estimate Worksheet must be completed prior to proceeding with the following steps.**

**D4c. Selecting a Channel Design Method**

The selection of a channel design method for channel construction is dependent upon the site geography, channel conditions and channel type. The design method selected is used to define the diversion channel dimensions and drop structure requirements.

The Channel Design Method table provides a list of recommendations to guide the selection of a suitable channel design method.

| <b>Design Method</b>       | <b>Parameter</b>  | <b>Condition</b>   |
|----------------------------|---|--|
| <b>Channel Replication</b> | Channel Duration  | Seasonal or Temporary or Permanent   |
|                            | Channel Gradient  | > 2%   |
|                            | Channel Material in Diversion   | Similar or Coarser than Original (not in seasonal channel)                         |
|                            | Diversion Channel Length  | Any  |
|                            | Floodplain  | Limited to none  |
|                            | Valley Type   | Incised or entrenched  |
|                            | Channel Stability   | Stable (if original channel is diversion it must have been in place for >10 Years) |
| <i>Notes</i>               | <i>Optional when channel gradient is &lt; 2%</i>  |  |
| <b>Floodplain Design</b>   | Channel Duration  | Permanent  |
|                            | Channel Gradient  | < 2%   |
|                            | Channel Material in Diversion   | All  |
|                            | Diversion Channel Length  | At least 2/3 length of original channel  |
|                            | Floodplain  | Narrow to Wide   |
|                            | Valley Type   | Narrow to Wide   |
|                            | Channel Stability   | Any  |
| <i>Notes</i>               | <i>Can be used in areas with no floodplain when relocation site has space to support floodplain</i> |  |
| <b>Regime Channel</b>      | Channel Duration  | Seasonal or Temporary or Permanent   |
|                            | Channel Gradient  | All  |
|                            | Channel Material in Diversion   | Similar or Coarser than Original (not in seasonal channel)                         |
|                            | Diversion Channel Length  | Any  |
|                            | Floodplain  | Narrow to Wide   |
|                            | Valley Type   | Narrow to Wide   |
|                            | Channel Stability   | Any  |
| <i>Notes</i>               | <i>Use when site data is insufficient to use other methods</i>                                      |  |

**Select a Channel Design Method based on the criteria listed in the table above.**

***In the following steps you will need to use a specific worksheet for the Channel Design Method you have selected (Channel Replication Worksheet (Appendix E1), Floodplain Design Worksheet (Appendix E2) or Regime Channel Worksheet (Appendix E3)). Do not proceed until you have selected a Channel Design Method.***

***Note – The Design Flood Estimate Worksheet must be completed prior to proceeding with the following sections.***

**D4d.** On the ***Channel Design Method Worksheet*** you have selected, enter the information required and complete the design calculations. Refer to the guidebook reference sections identified on the worksheets to assist with the data collection, entry and calculation process. Please ensure to include the completed ***Channel Design Method Worksheet*** with your submission to the YESAB and the YWB.

The following tables identify design restrictions and fish habitat reclamation requirements for Permanent Diversion Channels which must be incorporated to be in compliance with the respective watershed *Authorization for Placer Mining Works or Undertakings Affecting Fish Habitat*.

#### **Design Restrictions for Permanent Diversion Channels**

| <b>Design Component (Permanent Diversion)</b> | <b>Criteria</b>                  |
|---|----------------------------------|
| Overall length of diversion channel           | < 2000 m                         |
| Conveyance (flood design) capacity            | 1:20                             |
| Channel design                                | As per channel design worksheets |
| Fish Habitat Features                         | As per reclamation tables        |

**Note – in the next step you will need to refer to the *Original Channel and Site Parameters Worksheet (Appendix C)* in order to select the appropriate category of the original channel type (Pool-riffle, Dune-riffle, Plane-bed, Step-pool or Cascade Channel). For more information on channel types see the *Guidebook of Mitigation Measures for Yukon Placer Mining*.**

#### **Construction and Reclamation Requirements for Permanent Diversion Channels**

**Pool-riffle / Dune-riffle and Plane-bed channel type.**

| <b>Fish Habitat Features</b>          | <b>Spacing Requirements</b><br>(multiply the number in this column by the width of the channel in metres) |
|---------------------------------------|---|
| Rock Island (channel width < 5m)      | 5   |
| Boulder Grouping (channel width > 5m) | 4   |
| Anchored or Buried trees              | 14  |
| Top Soil Spreading                    | Continuous (both banks)   |
| Willow Staking                        | Inside bank, all meander bends  |
| Transplanting                         | At sharp bends  |
| Rip-rap                               | Based on channel design method  |

**Note - Topsoil spreading is to occur for the full width of the Riparian Zone (10 metres), willow staking is to be completed to a width of 3 metres from the bank, willow staking / Transplanting is not required for the floodplain design method.**

**Construction and Reclamation Requirements for Permanent Diversion Channels**

**Step-pool and Cascade Channel type**

| <b>Fish Habitat Feature</b>           | <b>Spacing Requirements</b><br>(multiply the number in this column by the width of the channel in metres) |
|---------------------------------------|---|
| Rock Island (channel width < 5m)      | 5   |
| Boulder Grouping (channel width > 5m) | 3   |
| Anchored or Buried trees              | 12  |
| Top Soil Spreading                    | Continuous (both banks)   |
| Willow staking                        | Inside bank, all meander bends  |
| Transplanting                         | At sharp bends  |
| Rip-rap                               | Based on channel design method  |

**Note - Topsoil spreading is to occur for the full width of the Riparian Zone (10 metres), willow staking is to be completed to a width of 3 metres from the bank, willow staking / Transplanting is not required for the floodplain design method.**

**D4e.** Use the information above to complete the *Fish Habitat Feature Worksheet* (Appendix F) to identify the type, spacing and relative location of the fish habitat features. Draw a diagram of the diversion channel (include north arrow, flow direction and reclaimed Riparian Zone) (use symbols identified on worksheet to compose your diagram).

**Note – If you propose to construct a crossing (new ford) be sure to identify the location of the ford on the *Fish Habitat Feature Worksheet* (see section E2).**

Once the *Fish Habitat Feature Worksheet* is completed, proceed to the next question.

***Do you propose to use an Existing Ford?***

**NO** – Proceed to next question.

**YES** – Proceed to Step E, Watercourse Crossings, then E1, Use of Existing Ford.

***Do you propose to construct a New Ford?***

**NO** – Proceed to Step F, Water Acquisition.

**YES** – Proceed to Step E, Watercourse Crossings.

**Moderate–Moderate Habitat Suitability (Includes Tributaries to Small Lakes)**

### **E. Watercourse Crossings (Fords)**

Fording is defined as the crossing of creeks, streams and / or rivers at locations where a bridge, causeway or elevated embankment does not exist or is not utilized by a vehicle or equipment. Fording typically involves driving directly through a watercourse, across the banks and bed. In some instances, Fording locations (*Fords*) have been “improved” or constructed through watercourses by way of adding materials such as rocks or gravel, the modification of approaches, or the modification of the bed of a watercourse.

#### ***E1. Use of Existing Ford***

Use of existing Fords is often the least preferred option for crossing watercourses however it is recognized that there are instances where it is the only viable option. Refer to the *Guidebook of Mitigation Measures for Yukon Placer Mining* for additional information on Fords. The following measures should be adhered to when utilizing existing Fords.

***NOTE – Please identify if you intend to use Existing Fords on the Project Location Worksheet (Appendix A).***

- Ensure water depth is sufficiently shallow to allow passage of vehicle / equipment.
- Plan your activities in advance to minimize the number of crossings required.
- Avoid crossing during extreme rain or flood events.
- Access approaches at 90° to the bank, when entering or exiting the ford.
- Maintain speed at a very slow and steady pace throughout the crossing.
- Avoid rapid acceleration while on approaches or while in the water.

#### ***E2. Construction of New Fords***

Construction of new Fords should be limited to locations or applications where deemed to be absolutely necessary. More permanent or high use locations should employ the construction and use of a bridge as the primary crossing structure where possible. For more information on construction of stream crossings refer to the *Guidebook of Mitigation Measures for Yukon Placer Mining*.

The location of new Fords must be identified when proposed for original channels, Temporary Channels (with Fish Habitat Features), and Permanent Diversion Channels. The new ford proposed must achieve the design, construction and reclamation requirements identified in the table below to be in compliance with the respective watershed *Authorization for Placer Mining Works or Undertakings Affecting Fish Habitat*.

#### **Design and Construction Restrictions and Reclamation Requirements for New Fords**

| <b>Design Component (Construction of new Ford)</b>                               | <b>Requirement</b>                           |
|--|--|
| Approach angle   | 90° to bank                                  |
| Maximum width of approach zone clearing (surface)                                | 7 metres                                     |
| Minimum watercourse distance between Ford sites<br>or<br>Not to exceed more than | 2000 metres<br><br>2 fords every 4000 metres |
| Site Selection (Watercourse)   | Shallow Water Depth                          |

|  |  |
|--|--|
| Site Selection (Approach / Bank Composition) | Gravel / Cobble                          |
| Construction                                 | Equipment to Work from Bank              |
| Maximum width of bank grading (subsurface)   | 7 metres                                 |
| Approach surface ground coverage             | Gravel / Cobble                          |
| Construction timing                          | Low Water Period                         |
| Reclamation                                  | Full Topsoil Coverage and Willow staking |

**E2a.** *If the construction of a new ford is proposed for an original channel or previously restored channel, identify the location of the new ford(s) on the **Riparian Zone / Bank Modification Worksheet** (see step C, Riparian Zones and Appendix B).*

**E2b.** *If the construction of a new ford is proposed for a Temporary Diversion Channel (with fish habitat features) or a Permanent Diversion Channel, identify the location of the new ford(s) on the **Fish Habitat Feature Worksheet** (see step D3d or D4b and Appendix F).*

Once the location and specification of the new ford is identified on either the completed **Riparian Zone / Bank Modification Worksheet** or the **Fish Habitat Feature Worksheet** proceed to the next question.

**Do you propose to withdraw water from a Moderate-moderate habitat suitability watercourse?**

**NO** – Proceed to Step G, In-stream Works.

**YES** – Proceed to Step F, Water Acquisition.

### **F. Water Acquisition**

Acquisition of water is required for processing materials during placer mining. Effective water management is a key consideration at all placer mine sites. The following requirements must be achieved to meet compliance with the respective watershed *Authorization for Placer Mining Works or Undertakings Affecting Fish Habitat*.

#### **F1. Water Intake Screens**

In order to meet the requirement of the *Fisheries Act*, all water intakes must be screened in accordance with requirements identified in the Fisheries and Oceans Canada Intake End-of-Pipe Fish Screen Guidelines. A general summary of the guideline requirements are provided in the following table. For more information regarding fish screens, please refer to the guidebook or for more specialized applications please refer to the Fisheries and Oceans Canada Intake End-of-Pipe Fish Screen Guidelines (available online or through Fisheries and Oceans Canada).

## General Guidelines for Intake Screens

| Design Component (Fish Screens) | Requirement   |
|---------------------------------|---|
| Screen Openings (Imperial)      | No less than 8 openings per lineal inch, with openings no greater than 1/8 inch along any given side of the screen. If a punch plate or similar material is used, openings no greater than 1/8 inch in length or width are permitted. |
| Screen Openings (Metric)        | No less than 3.5 openings per lineal cm, with openings no greater than 3.2 mm along any given side of the screen. If a punch plate or similar material is used, openings no greater than 3.2 mm in length or width are permitted.     |
| Screen Area (Imperial)          | 1 ft <sup>2</sup> of open screen area per 45 imperial / 55 US gallons per minute of water withdrawn is required.  |
| Screen Area (Metric)            | 929 cm <sup>2</sup> of open screen area per 205 litres per minute of water withdrawn is required.   |

Note: the objective behind the installation of intake screens is to prevent the destruction of fish through the acquisition of water. If screens of the correct mesh size are deployed between a watercourse and the intake to a water reservoir or gravity feed ditch, it is not necessary to screen the pump intake that removes water from within these structures provided these structures do not already contain fish. In the case of total recirculation systems, the operator shall ensure that any areas where fish could enter the system have barriers to prevent the entry of fish (unless the pump intake is appropriately screened).

***Do you propose to carry out in-stream works within a watercourse? In-stream works may include small dugouts or wing dams to facilitate water acquisition, in-stream settling facilities, in-stream reservoirs, and use of a stream channel as a conduit to transport process water to out-of-stream settling ponds.***

**NO** – Proceed to next question.

**YES** – Proceed to Step G, In-stream Works.

### **G. In-stream Works**

In-stream works are defined as works that occur within the high water mark of a watercourse, but do not include diversion channels or fords. Some in-stream works can lead to effects on fish and fish habitat such as erosion/scouring, sediment inputs, loss of habitat area, changes in channel morphology, blockages to passage, and reduced productivity.

### **Moderate–Moderate Habitat Suitability (Includes Tributaries to Small Lakes)**

***Do you propose to carry out in-stream works within a watercourse? In-stream works may include small dugouts or wing dams to facilitate water acquisition, in-stream settling facilities, in-stream reservoirs, and use of a stream channel as a conduit to transport process water to out-of-stream settling ponds.***

**NO** – Review complete – proceed with submission of all completed worksheets along with your project description to YESAB and your application for water use license to YWB.

**YES** – Proceed to Step G1, Severity of Effects Assessment.

**G1 - Severity of Effects Assessment and Risk Management Decisions for In-stream Works**

Habitats of Moderate-Moderate Suitability

In-stream settling facilities, in-stream reservoirs, and use of a stream channel as a conduit to transport process water to out-of-stream settling ponds are not authorized under the auspices of a watershed-based authorization in habitats of Moderate-moderate suitability.

Certain physical works that pose a low risk to fish and fish habitat are authorized under watershed *Authorization for Placer Mining Works or Undertakings Affecting Fish Habitat* in habitats of Moderate-moderate suitability provided that design conditions are met. Physical works authorized are limited to the construction of a small dugouts or wing dams to facilitate water acquisition.

The following table is to be used to evaluate the risk of proposed in-stream works in Moderate-moderate suitability habitats. The design elements of the proposed works must achieve a risk score of no higher than the maximum risk score identified to be in compliance with the respective watershed *Authorization for Placer Mining Works or Undertakings Affecting Fish Habitat*.

| <b>Design Component</b>                                     | <b>Range</b>                       | <b>Risk Score</b> |
|---|------------------------------------|-------------------|
| Channel Width Construction                                  | >30% channel constriction          | 3                 |
|   | 5% - 30% of the channel            | 2                 |
|   | < 5%                               | 1                 |
| Above and Below the Structure – Difference in Water Surface | >2.0 m                             | 3                 |
|   | 0.3 – 2.0 m                        | 2                 |
|   | < 0.3 m                            | 1                 |
| Material Type   | Fine (silt-sand)                   | N/A               |
|   | Compactable (fine gravel and sand) | 2                 |
|   | Metal/ riprap/ structure           | 1                 |
| Construction Method   | Non-compaction/ dumped             | 3                 |
|   | Moderately compacted/ placement    | 2                 |
|   | Compacted shallow lift             | 1                 |
| Amount of In-water Work                                     | Completely in water                | 3                 |
|   | Partially in water (more than ½)   | 2                 |
|   | In dry                             | 1                 |
| Structure Height  | Above bank full                    | 3                 |
|   | Between bank full and channel bed  | 2                 |
|   | Below channel bed                  | 1                 |
| <b>MAXIMUM PERMITTED SCORE FOR IN-STREAM WORKS</b>          |                                    | <b>12</b>         |

**G1.** Calculate your total score and maximum permitted score on the **Severity of Effects Assessment for In-stream Works Worksheet** (Appendix G1), and record details of proposed in-stream works on the **In-stream Works Worksheet** (Appendix G2). Proceed with submission of proposal.