

**Fish Habitat Design, Operation, Reclamation Requirements for
Moderate–High Habitat Suitability Watercourses**

Fish Habitat Design, Operation, Reclamation Requirements for Moderate – High Habitat Suitability Watercourses

Moderate-high suitability habitats are defined as watercourses that are highly suitable for rearing juvenile Chinook salmon. Typically these watercourses provide locally desirable conditions for feeding, growth and development. These watercourses also provide habitats that are 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 involves completing 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-moderate suitability habitats will apply to your operation. **Please note that permanent diversion channels and all reclamation work must conform to the requirements for Moderate-high suitability habitats.**

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 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-high suitability habitats.**

Once the sections noted above are completed on 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-high suitability habitats are identified 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.

| Discharge Standard (Moderate-High Suitability) | Requirement |
|---|--------------------|
| Design Target | < 200 mg/l |
| Action Level | < 200 mg/l |
| Compliance Level | < 200 mg/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.

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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-high habitats is **20 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.

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 **3 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 - Not permitted without a site-specific authorization from Fisheries and Oceans Canada. Proceed to next question

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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-high suitability habitats.

| Design Component (Vegetation Clearing) | Requirement |
|---|-----------------------|
| Minimum Vegetated Setback from Stream | 5.0 metres |
| Maximum Length of Clearing | 100 metres |
| Minimum Space Between Cleared Areas | 500 metres |
| Maximum Duration Prior to Reclamation | 5 years |
| Reclamation Requirement (surface) | Full topsoil coverage |
| Reclamation Requirement (vegetation) | 30% live staking |

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.

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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*. If you are unable to achieve the requirements described in the following sections you are required to submit your proposal to DFO 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-high 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 – Not permitted in Moderate-high suitability habitat. Proceed to next question.

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).

YES – Proceed to Step D4, Permanent Diversion Channels.

NO – Proceed to next question.

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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 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-high suitability habitat is 1:50.

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.

| Design Method | Parameter | Condition |
|-----------------------------------|-------------------------------|---|
| <i>Channel Replication</i> | 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 < 2%</i> |
| <i>Floodplain Design</i> | 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> |
| <i>Regime Channel</i> | 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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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

| Design Component (Permanent Diversion) | Criteria |
|---|----------------------------------|
| Overall length of diversion channel* | < 500 m |
| Conveyance (flood design) capacity | 1:50 |
| 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.

| Fish Habitat Features | Spacing Requirements (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 | 10 |
| Top Soil Spreading | Continuous (both banks) |
| Willow staking | Continuous (both banks) |
| 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 (20 metres), willow planting is to be completed to a width of 5 metres from the bank, Willow planting / Transplanting is not required for the floodplain design method.

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Construction and Reclamation Requirements for Permanent Diversion Channels.

Step-pool and Cascade Channel type

| Fish Habitat Feature | Spacing Requirements (multiply the number in this column by the width of the channel in metres) |
|---------------------------------------|--|
| Rock Island (channel width < 5m) | 4 |
| Boulder Grouping (channel width > 5m) | 3 |
| Anchored or Buried trees | 8 |
| Top Soil Spreading | Continuous (both banks) |
| Willow Staking | Continuous (both banks) |
| Transplanting | At sharp bends only |
| Rip-rap | Based on channel design method |

Note - Topsoil spreading is to occur for the full width of the Riparian Zone (20 metres), willow planting is to be completed to a width of 5 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).

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 – Not permitted without a site-specific authorization from Fisheries and Oceans Canada. Proceed to next question.

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.

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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 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 vehicles / 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.

Do you propose to withdraw water from a Moderate-high 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 requirements 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 inches 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 ² of open screen area per 45 imperial / 55 US gallons per minute of water withdrawn is required. |
| Screen Area (Metric) | 929 cm ² 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).

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.

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.

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

Habitats of Moderate-High 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-high 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-high suitability provided that design conditions are met. In-stream works permitted are limited to the construction of 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-high 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*.

The maximum permitted score in this habitat suitability zone is twelve.

| Design Component | Range | Risk Score |
|---|---|------------|
| Channel Width Construction | >30% channel constriction | N/A |
| | 5% - 30% of the channel | 2 |
| | < 5% | 1 |
| Above and Below the Structure – Difference in Water Surface Level | >2.0 m | N/A |
| | 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 | Moderately compacted/ placement | 2 |
| | Compacted shallow lift (or rip-rap, gabions, or boulders) | 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 |
| MAXIMUM PERMITTED SCORE FOR IN-STREAM WORKS | | 12 |

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.