

## **Moderate–Low Habitat Suitability Watercourses (Includes Tributaries to Large Lakes)**

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## Before You Begin

This workbook and associated worksheets are provided to assist with compiling information to support project proposals for submission to the Yukon Environmental and the Socio-economic Assessment Board (YESAB) and the Yukon Water Board (YWB). Once completed, the worksheets must be submitted for review as a component of both the YESAB and Yukon Water Board applications.

The guidance provided focuses on the requirements of the *Authorizations for Works or Undertakings affecting Fish Habitat for Specified Streams in the Yukon Territory* (Federal Fisheries Act) for watersheds in the Yukon (herein referred to as Watershed Authorizations). Please note that this workbook and associated worksheets may undergo revisions in the future, and users are encouraged to ensure that they use the current version.

**In order to achieve compliance with the Watershed Authorizations, the placer mining proposal must meet the requirements outlined in this workbook for the watershed type and specific habitat suitability type at the location where the activities are to occur (see Yukon Placer Fish Habitat Suitability Maps).**

In addition to this workbook and worksheets, the following documents provide the required information to support the development and submission of proposals for placer mining activities. All supporting documents are available online through the Yukon Placer Secretariat web page, [www.yukonplacersetariat.ca/howto\\_prepare\\_project\\_proposal.html](http://www.yukonplacersetariat.ca/howto_prepare_project_proposal.html) or through the web addresses given for the specific documents.

1. ***Authorization for Works or Undertakings affecting Fish Habitat for Specified Streams in the Yukon Territory***  
[www.yukonplacersetariat.ca/placer\\_authorizations.html](http://www.yukonplacersetariat.ca/placer_authorizations.html) – Provides the legal authority, with respect to placer mining, to carry on a work, undertaking or activity that results in the permanent alteration and destruction of fish habitat. Also specifies sediment discharge standards for placer mine effluent and the sensitivity category of the watershed (i.e. Category A or B). Please note that the death of fish is not authorized.
2. **Yukon Placer Fish Habitat Suitability Maps**  
[www.yukonplacersetariat.ca/maps.html](http://www.yukonplacersetariat.ca/maps.html) – Identifies the watershed sensitivity and habitat suitability of the watercourse where placer mining activities are proposed to occur.
3. **Guidebook of Mitigation Measures for Placer Mining in the Yukon**  
[www.yukonplacersetariat.ca/infocentre.html](http://www.yukonplacersetariat.ca/infocentre.html) – Provides technical information related to best management practices, mitigation measures, and design considerations to achieve compliance with the Watershed Authorizations and to assist with proposal development.

**Note: Complete and submit only the worksheets that are relevant to your operation.**

**Note: There are no Watershed Authorizations in place for the Liard and Alsek watersheds. Applications for review, forms and process to apply for a placer mine in the Liard or Alsek watershed can be obtained from the Yukon Placer Secretariat, contact information can be found online at, [www.yukonplacersetariat.ca/index.html](http://www.yukonplacersetariat.ca/index.html).**

For assistance completing the worksheets please contact the Yukon Placer Secretariat (contact information is available at, [www.yukonplacersetariat.ca/index.html](http://www.yukonplacersetariat.ca/index.html)) or the Yukon Government Client Services & Inspections office in your mining district (contact information is available at, [www.emr.gov.yk.ca/cmi/cmi\\_district\\_offices.html](http://www.emr.gov.yk.ca/cmi/cmi_district_offices.html)).

## If Your Project Does Not Comply With The Requirements

Placer mine operators are encouraged to design proposals that comply with the requirements described in this workbook. However, if the proposal is not able to achieve these requirements and the operator would like to proceed with the regulatory review process, an application for site-specific review should be submitted to Fisheries and Oceans Canada (DFO) for consideration **prior to the submission of the proposal to the YESAB and the YWB.**

When a proposal is submitted for site-specific review, DFO will review the information to determine whether a site-specific authorization is required. In some cases, DFO may recommend measures to avoid or mitigate the harm to fish and fish habitat to allow the application to proceed under the Watershed Authorization.

Applications for site-specific review, forms and process to apply can be obtained from the Yukon Placer Secretariat, contact information can be found online at, [www.yukonplacersecreariat.ca/index.html](http://www.yukonplacersecreariat.ca/index.html). Should it be determined that a site-specific authorization is required, a more detailed application, including a fish habitat offsetting plan and a letter of credit, will have to be submitted to DFO. Information on the site-specific authorization application process, offsetting plans, and letters of credit can be found on DFO's Projects Near Water website, [www.dfo-mpo.gc.ca/pnw-ppe/reviews-revues/application-eng.html](http://www.dfo-mpo.gc.ca/pnw-ppe/reviews-revues/application-eng.html).

## Moderate–Low Habitat Suitability Watercourses (Includes Tributaries to Large Lakes)

## Fish Habitat Design, Operation and Reclamation Requirements for Moderate–Low Habitat Suitability Watercourses (Includes Tributaries to Large Lakes)

Moderate–Low habitat suitability watercourses are defined as watercourses suitable for rearing juvenile Chinook salmon, although utilization may be limited at times due to environmental factors or conditions. These watercourses are typically highly suitable for non-anadromous resident fish species such as Arctic grayling. The Moderate–Low habitat suitability classification also applies to Tributaries to Large Lake Trout Lakes (> 600 hectares).

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

### SUMMARY OF GENERAL RESTRICTIONS ON WORKS OR UNDERTAKINGS IN MODERATE–LOW HABITAT SUITABILITY WATERCOURSES

Activity Type / Operation	Restriction in Moderate–Low Habitat Suitability Watercourses
Riparian Zone	Designated Riparian Zone is 5 metres from the high water mark. Conditions and reclamation requirements apply to clearing surface vegetation and sub-surface works within the Designated Riparian Zone.
Fords	Construction of new Fords subject to design and construction restrictions and reclamation requirements. Mitigative measures should be applied to use of existing Fords.
Diversion Channels	Construction of diversion channels subject to design restrictions and construction and reclamation requirements.
In-stream Works	In-stream reservoirs constructed with cross channel dams not authorized. Conditions apply to construction of in-stream works. Construction of in-stream settling facilities or to use a stream channel as a conduit is conditional and may not be permitted.

To determine how to proceed, please answer the following questions regarding a work, undertaking or activity in or around Moderate–Low habitat suitability watercourses.

**Do you propose to undertake placer mining activities in, or within, 30 m of 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, Project Information.

## Moderate–Low Habitat Suitability Watercourses (Includes Tributaries to Large Lakes)

### A. Project Information

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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).

**Note: The Project Location Worksheet (Appendix A) is required for all applications.**

- 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 “previous/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, Current Development or Extensive Development**

If your project falls within a “Historical Development”, “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 watercourses will apply to your operation. Please note that permanent diversion channels and all reclamation work must conform to the requirements for Moderate–Low habitat suitability watercourses.

- A2. Based on the previous development type, please select the appropriate Operation and Restoration standard on the Project Location Worksheet.

Once the sections noted above are complete 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)

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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 Placer Mining in the Yukon (herein referred to as the Guidebook).

Water quality objectives and sediment discharge standards for settling ponds in Moderate–Low habitats are specified in the Watershed Authorizations for the specific watershed you propose to work in. 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.

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### 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 construct works other than diversion channels within the Riparian Zone (see Step C for the definition of the Riparian Zone) – this could include stripping, construction of reservoirs, construction of settling ponds, etc.?**

**NO:** Proceed to Step D, Diversion Channels

**YES:** Proceed to Step C, Riparian Zone

## 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–Low habitat suitability watercourses is **5 metres**, measured from the ordinary high water mark of the watercourse and following the pattern/morphology of the channel.

The Riparian Zone designation applies to original (un-modified) channels, previously reclaimed channels and Permanent Diversion Channels.

**Note: 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 surface vegetation clearing and bank modification provisions outlined below. The only other 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 **7 metres**. Riparian Zones must be staked out by the operator prior to development.

**Do you propose clearing of surface vegetation 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?**

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

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

### C1. Surface Vegetation Clearing

If vegetation clearing is proposed to occur within the Riparian Zone, fill out the appropriate sections of the Riparian Zone / Bank Modification Worksheet (Appendix B).

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Under Vegetation Clearing record the following:

- Record the Habitat Suitability Type where vegetation clearing in the Riparian Zone is proposed.
- Record the Designated Riparian Zone (see the beginning of this section).
- Record the Proposed Duration of Vegetation Clearing prior to reclamation (cannot exceed restriction in table below).
- Record the Total Length of Proposed Vegetation Clearing in the Riparian Zone (cannot exceed restriction in table below).
- Record the Width of Proposed Vegetation Clearing in the Riparian Zone.
- From the table below record the Minimum Vegetation Setback from Stream.
- Record the width of the Proposed Vegetation Setback from Stream (cannot be less than the minimum setback distance).
- Record the Required Reclamation Works for Vegetation (see table below).
- In space provided on Appendix B, draw a diagram of the proposed location where vegetation clearing in the Riparian Zone is planned (include north arrow, flow direction and use symbols identified on worksheet to compose your diagram).

Conditions and reclamation required when proposing surface Vegetation Clearing in Riparian Zones in Moderate-Low habitat suitability watercourses.

### Conditions and Reclamation Required When Proposing Surface Vegetation Clearing in Riparian Zones in Moderate–Low Habitat Suitability Watercourses

Design Component (Vegetation Clearing)	Requirement
Minimum Vegetated Setback from Stream	1.0 metre
Maximum Length of Clearing	300 metres
Minimum Space Between Cleared Areas	100 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

Bank Modification includes any subsurface works proposed in the Riparian Zone.

If bank modification is proposed to occur within the Riparian Zone, fill out the appropriate sections of the Riparian Zone / Bank Modification Worksheet (Appendix B).

**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.**

Under Bank Modification record the following:

- Record the Habitat Suitability Type where bank modification in the Riparian Zone is proposed.
- Record the Designated Riparian Zone (see the beginning of this section).
- Record the Proposed Duration of Bank Modification prior to reclamation (cannot exceed restriction in table below).
- Record the Total Length of Proposed Bank Modification in the Riparian Zone (cannot exceed restriction in the table below).
- Record the Width of Proposed Bank Modification.
- From the table below record the Minimum Setback Distance from Stream.
- Record the width of Proposed Setback Distance from Stream (cannot be less than the minimum setback distance).
- Record the Required Reclamation Works for Bank Modification (see table below).
- In space provided on Appendix B, draw a diagram of the proposed location where bank modification is planned (use symbols identified on worksheet to compose your diagram. Draw the location of any new Fords proposed (see step E for restrictions)

### Conditions and Reclamation Required When Proposing Bank Modification in Riparian Zones in Moderate–Low Habitat Suitability Watercourses

Design Component (Bank Modification)	Requirement
Minimum Bank Setback From Stream	3.0 metres
Maximum Length of Excavation	100 metres
Minimum Space 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.**

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

**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

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Design and construction of a diversion channel is required if the proposal includes Seasonal, Temporary or Permanent relocation of a watercourse 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.

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. 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.

In order for a diversion channel to meet the requirements of the Watershed Authorization, 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 Watershed Authorization. If you are unable to meet the maximum risk score, see “If your project does not comply with the requirements” section at the beginning of this document.

#### 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 the 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).**

**NO:** Proceed to next question.

**YES:** Proceed to Step D2, Seasonal Diversion Channels and either Step D3, Temporary Diversion Channels or Step D4, Permanent Diversion Channels.

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

**NO:** Proceed to next question.

**YES:** Proceed to Step D3, Temporary Diversion Channels and Step D4, Permanent Diversion Channels.

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**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.

**D2. Seasonal Diversion Channels**

Seasonal diversion channels are defined as a constructed channel that will convey stream flow for no more than one operating season. This diversion channel type may not be used to convey stream flow between late fall and the following spring of any given year. Refer to the channel design considerations in the Guidebook for more information on Seasonal 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 Seasonal Diversion Channel to the YESAB and the YWB.

**Note: Riparian Zone provisions do not apply to Seasonal Diversion Channels.**

Flood design interval for Seasonal Diversion Channels in Moderate–Low habitat suitability is **1:1**.

**Note: Stream flow in Seasonal Diversion Channels must be returned to a Temporary or Permanent Restoration Channel at the end of the mining season. Your application should include worksheets for construction of a Temporary or Permanent Restoration Channel (Steps D3 and D4).**

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D2a. On the Channel Design Flood Estimate Worksheet (Appendix D3), enter the flood design interval (line 1).

The following table is to be used to assess the total risk when designing a seasonal diversion channel. The channel design proposed must achieve a risk score of no higher than the maximum risk score identified.

<b>Severity of Effects Assessment for Seasonal Diversion Channels</b>		
<b>Design Component</b>	<b>Range</b>	<b>Risk Score</b>
Channel Gradient	3.51% to 5.0%	3
	1.51% to 3.5%	2
	0 to 1.5%	1
Length of Diversion Channel	1000 metres to 2000 metres	2
	<1000 metres	1
Relative Length of Diversion Channel	Shorter than original	1
	Equal or Longer than original	0
Permafrost in Diversion Channel	Present	3
	Absent	0
Primary Material in Diversion Channel	Silt / Sand	2
	Gravel / Cobble / Bedrock	1
Location of Diversion Channel	Perched (valley wall)	4
	Confined (valley floor)	2
	Incised (valley floor)	1
<b>MAXIMUM PERMITTED SCORE FOR SEASONAL DIVERSION CHANNELS</b>		<b>11</b>

D2b. Calculate your total score and maximum permitted score on the Severity of Effects Assessment for Seasonal Diversion Channel Worksheet (Appendix D1), and record your total score on the Channel Design Flood Estimate Worksheet (Appendix D3).

D2c. On the Channel 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 Channel Design Flood Estimate Worksheet with your submission to the YESAB and the YWB.

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

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## D2d. 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
Channel Replication	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)
<b>Note: Optional when channel gradient is &lt; 2%</b>		
Floodplain Design	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
<b>Note: Can be used in areas with no floodplain when relocation site has space to support floodplain</b>		
Regime Channel	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
<b>Note: Use when site data is insufficient to use other methods</b>		

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

**Note: Each diversion channel planned requires only one channel design method.**

## Moderate–Low Habitat Suitability Watercourses (Includes Tributaries to Large Lakes)

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

**D2e. 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.**

**Note: A plan for a Seasonal Diversion Channel must be accompanied by plans for a Temporary and / or Permanent Diversion Channel (See sections D3 and / or D4).**

Once the Channel Design Method Worksheet is completed, proceed to Step D3, Temporary Diversion Channels or D4, Permanent Diversion Channels.

### D3. Temporary Diversion Channels

Temporary diversion channels are defined as a constructed channel that will convey stream flow for a period of one to 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 the YESAB and the YWB.

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

Flood design interval for Temporary Diversion Channels in Moderate–Low habitat suitability is **1:5**.

**Note: Temporary Diversion Channels can only be in place for 5 years and as such, your application should include worksheets for the construction of a Permanent Restoration Channel (Step D4).**

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

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.

Severity of Effects Assessment for Temporary Diversion Channels		
Design Component	Range	Risk Score
Channel Gradient	3.51% to 5.0%	3
	1.51% to 3.5%	2
	0 to 1.5%	1
Length of Diversion Channel	2000 metres to 5000 metres	3
	500 metres to 2000 metres	2
	<500 metres	1
Relative Length of Diversion Channel	Shorter than original	1
	Equal or Longer than original	0
Permafrost in Diversion Channel	Present	2
	Absent	0
Primary Material in Diversion Channel	Silt / Sand	2
	Gravel / Cobble / Bedrock	1
Location of Diversion Channel	Perched (valley wall)	4
	Confined (valley floor)	2
	Incised (valley floor)	1
Fish Habitat Features (rock islands / boulder groupings only)	30% of total required for permanent channel	-1
<b>MAXIMUM PERMITTED SCORE FOR TEMPORARY DIVERSION CHANNELS</b>		<b>10</b>

D3b. 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 the Channel Design Flood Estimate Worksheet (Appendix D3).

D3c. On the Channel 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 Channel Design Flood Estimate Worksheet with your submission to the YESAB or the YWB.

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

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### D3d. 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
Channel Replication	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)
<b>Note: Optional when channel gradient is &lt; 2%</b>		
Floodplain Design	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
<b>Note: Can be used in areas with no floodplain when relocation site has space to support floodplain</b>		
Regime Channel	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
<b>Note: Use when site data is insufficient to use other methods</b>		

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

**Note: Each diversion channel planned requires only one channel design method.**



## Moderate–Low Habitat Suitability Watercourses (Includes Tributaries to Large Lakes)

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.

### D3e. 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).

### 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 (place feature every X channel width)
Rock Island (channel width < 5 metres)	18
Boulder Grouping (channel width > 5 metres)	16
Rip-rap	Based on channel design method

### FISH HABITAT RECLAMATION REQUIREMENTS FOR TEMPORARY DIVERSION CHANNELS

Step-pool and Cascade Channel Type	
Select Fish Habitat Feature Based on Diversion Channel Width	Spacing Requirements (place feature every X channel width)
Rock Island (channel width < 5 metres)	15
Boulder Grouping (channel width > 5 metres)	9
Rip-rap	Based on channel design method

D3f. 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 (Ford).
- F, proposing to acquire water.

**Moderate–Low Habitat Suitability Watercourses (Includes Tributaries to Large Lakes)****D4. Permanent Diversion Channel**

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 the YESAB and the YWB.

Flood design interval for Permanent Diversion Channels in Moderate–Low habitat suitability is **1:10**.

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

**D4b.** On the Channel 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 Channel Design Flood Estimate Worksheet with your submission to the YESAB and the YWB.

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

## Moderate–Low Habitat Suitability Watercourses (Includes Tributaries to Large Lakes)

## 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
Channel Replication	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)
	<b>Note: Optional when channel gradient is &lt; 2%</b>	
Floodplain Design	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
	<b>Note: Can be used in areas with no floodplain when relocation site has space to support floodplain</b>	
Regime Channel	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
	<b>Note: Use when site data is insufficient to use other methods</b>	

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

**Note: Each diversion channel planned requires only one channel design method.**

## Moderate–Low Habitat Suitability Watercourses (Includes Tributaries to Large Lakes)

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 Channel 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.

Design Restrictions for Permanent Diversion Channels	
Design Component (Permanent Diversion)	Criteria
Overall Length of Diversion Channel	< 5000 metres
Conveyance (flood design) Capacity	1:10
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.**

## 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 < 5 metres)	6
Boulder Grouping (channel width > 5 metres)	4
Anchored or Buried Trees	20
Top Soil Spreading	Continuous (both banks)
Willow Staking	Inside bank, alternating meander bends
Transplanting	At sharp bends
Rip-rap	Based on channel design method

## Moderate–Low Habitat Suitability Watercourses (Includes Tributaries to Large Lakes)

## CONSTRUCTION AND RECLAMATION REQUIREMENTS FOR PERMANENT DIVERSION CHANNELS

Step-pool and Cascade 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 < 5 metres)	5
Boulder Grouping (channel width > 5 metres)	3
Anchored or Buried Trees	14
Top Soil Spreading	Continuous (both banks)
Willow Staking	Inside bank, alternating 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 (5 metres), willow planting 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 G) 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.

## 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.

## Moderate–Low Habitat Suitability Watercourses (Includes Tributaries to Large Lakes)

### 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 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.

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.

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

Design Component (Construction of New Ford)	Requirement
Approach Angle	90° to bank
Maximum Width of Approach Zone Clearing (surface)	10 metres
Minimum Watercourse Distance Between Ford Sites OR Not to exceed more than	800 metres 3 Fords every 2000 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)	10 metres
Approach Surface Ground Coverage	Gravel / Cobble
Construction Timing	Low water period
Reclamation	Full topsoil coverage

**Note: The above design considerations are not required for Construction of Fords in Seasonal Diversion Channels.**

## Moderate–Low Habitat Suitability Watercourses (Includes Tributaries to Large Lakes)

- 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. (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–Low habitat suitability watercourse?**

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

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

## F. Water Acquisition

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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.

### F1. Water Intake Screens

In order to meet the requirement of the *Fisheries Act*, all water intakes must be screened. A general summary of the screening requirements are provided in the Guidebook.

**Note:** The objective behind the installation of intake screens is to prevent the death of fish caused by 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.

**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.

## Moderate–Low Habitat Suitability Watercourses (Includes Tributaries to Large Lakes)

### G. In-stream Works

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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 fish 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 the YESAB and your application for water use license to the YWB.

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

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

##### Moderate–Low Habitat Suitability Watercourses

In-stream settling facilities and use of a stream channel as a conduit to transport process water to out-of-stream settling ponds may be authorized under the auspices of a Watershed Authorization in Moderate–Low habitat suitability watercourses under strictly specified conditions. In order to determine whether your site qualifies, complete the flowchart found in Section I below and record this information on the Worksheet for In-stream Settling Ponds and Use of Stream Channels as Conduit (Appendix H).

In-stream reservoirs constructed with cross-channel dams are not authorized under Watershed Authorizations in Moderate–Low habitat suitability watercourses, unless a previously authorized in-stream settling pond is used for this purpose prior to stream channel restoration. Operators may apply to Fisheries and Oceans Canada for a site-specific review of plans to construct in-stream reservoirs using cross-channel dams.

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### SECTION I

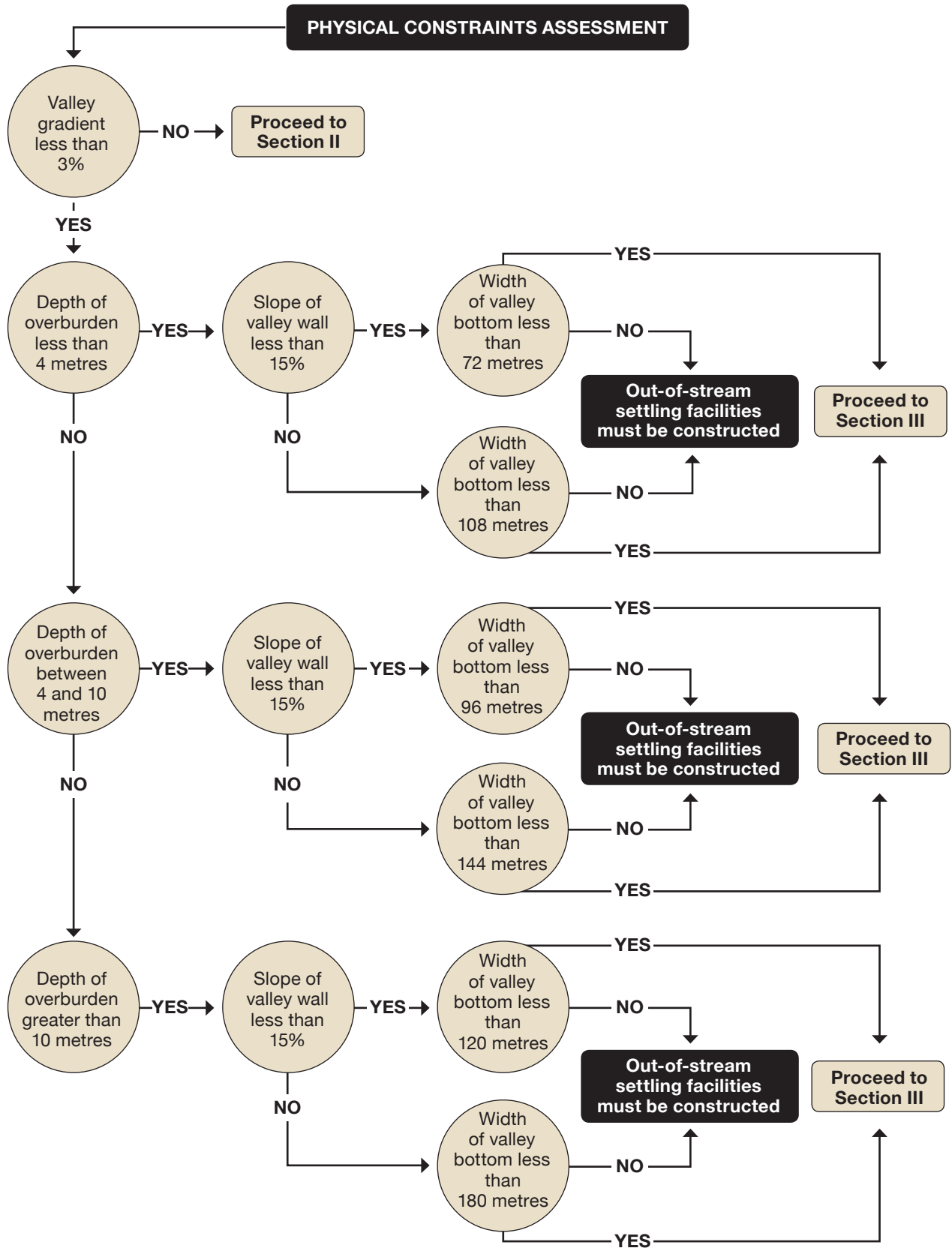
Use the following flowchart to evaluate whether your site is suitable for construction of in-stream settling facilities or the use of a stream channel as a conduit.

**Note: Authorization to construct in-stream settling facilities or to use a stream channel as a conduit is conditional and these works may not be permitted. Depending upon the scale of operation or size of earth-moving equipment out-of-stream settling facilities may be required in proximity to working areas.**



Moderate-Low Habitat Suitability Watercourses (Includes Tributaries to Large Lakes)

Flowchart for In-stream Settling Ponds and Use of Stream Channels as Conduit



## Moderate–Low Habitat Suitability Watercourses (Includes Tributaries to Large Lakes)

### SECTION II

The valley bottom you intend to mine is not ideal for the construction of settling ponds, due to its steep gradient. Use of the stream channel as a conduit for transporting process water to the nearest suitable site for out-of-stream settling ponds may be permitted.

**Do you have the right to construct settling facilities on placer claims immediately below your working area where the valley gradient is less than or equal to 3%, and the habitat classification remains Moderate–Low or Low?**

**NO:** Your project may not meet the conditions of a Watershed Authorization, see “If your project does not comply with the requirements” section at the beginning of this document.

**YES:** Use the flowchart in Section I to evaluate whether the site below your working area is suitable for construction of out-of-stream settling facilities.

### SECTION III

The valley bottom you intend to mine cannot accommodate an out-of-stream settling facility, due to its narrow width. If you have the right to construct out-of-stream settling facilities on placer claims immediately below your working area, and the habitat classification remains Moderate–Low or Low, use of the stream as a conduit for transporting process water to this downstream location may be permitted. If not, construction of in-stream settling ponds may be permitted. The following conditions apply to construction of these in-stream works:

- Construction and maintenance of a pre-settling pond is mandatory;
- 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.;
- Only compactable material (fine gravel and sand) may be used as core material in dam construction, while coarse material should be used on the surfaces to prevent erosion;
- Material must be placed in shallow (< 0.3 metre) lifts and compacted when dams are constructed;
- Sluicing must be terminated if stream flows increase to bank-full width in response to rainfall events;
- Settling ponds must be mechanically cleaned and equipped with well-armoured spillways in order to maintain stability during spring freshet; or
- A stable bypass channel must be constructed to protect the settling pond cells from high flows during spring freshet; and
- Stream channel restoration must commence once these in-stream works are no longer required for current mining activities.

The following table is to be used to evaluate the risk of proposed in-stream works in Moderate–Low habitat suitability watercourses. 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.

**Note: In-stream settling ponds must be constructed from compactable material that is placed and compacted in shallow lifts.**

## Moderate–Low Habitat Suitability Watercourses (Includes Tributaries to Large Lakes)

Design Component	Range	Risk Score
Channel Width Constriction	>30% channel constriction	3
	5% - 30% of the channel	2
	< 5%	1
Above and Below the Structure – Difference in Water Surface Level	>2.0 metres	3
	0.3 – 2.0 metres	2
	< 0.3 metres	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 (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
<b>MAXIMUM PERMITTED SCORE FOR IN-STREAM WORKS</b>		<b>14</b>

Calculate and record 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). Please ensure to include the completed In-stream Works Worksheets (Appendices G1 and G2) with your submission to the YESAB and the YWB.

**Moderate–Low Habitat Suitability Watercourses (Includes Tributaries to Large Lakes)**