



# An Integrated Regulatory Regime for Yukon Placer Mining

**Final Report to the Minister of Fisheries and Oceans**

Prepared by the  
Yukon Placer Implementation Steering Committee  
and the  
Yukon Placer Working Committee

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## SUMMARY

This report describes the new regulatory regime to govern placer mining in the Yukon. The proposed regime establishes an integrated structure that will accommodate the policy, regulatory and legal requirements of First Nations and the federal and territorial governments.

The regime is designed to balance the objectives of a sustainable Yukon placer mining industry and the conservation of fish and fish habitat supporting fisheries. It combines a structured risk-based process for making regulatory decisions, careful monitoring at the watershed level, adaptive management, and strong compliance and enforcement.

Above all, the regulatory regime sets clear, predetermined standards that will provide better protection of fish and fish habitat and greater certainty for placer miners in planning and conducting their operations.

The development of the regime was guided by the federal government's Smart Regulation initiative using a national risk management approach and decision tools tailored to the unique circumstances of Yukon placer mining. This work is also part of DFO's Environmental Process Modernization Program (EPMP).

Key features of this regime include:

- Predetermined rules for mining activities that reflect the degree of risk to fish and fish habitat;
- The consideration of traditional knowledge as an essential part of assessing the condition of watersheds; and
- Compliance and effectiveness monitoring that feeds into an adaptive management process to continuously improve the thresholds and standards for habitat protection and reduce uncertainties around the impacts of placer mining on fish habitat productivity.
- A new implementation structure to ensure that the regime is monitored and improved.

A Secretariat will be created to assist governments to implement the regime. This body will be responsible for a variety of functions, including the development of watershed authorizations, habitat inspections, and consultations with communities and First Nations. It will ensure that the regime operates within the context of the Yukon Environmental and Socio-economic Assessment Act (YESAA).

The Secretariat will be established once the regulatory regime has received approval. The regime itself is expected to be in place by 2007.

## 1.0 INTRODUCTION

In April 2004, a progress report on the development of an integrated regime to regulate placer mining in the Yukon was endorsed by the Yukon Placer Implementation Steering Committee (ISC) and the federal Minister of Fisheries and Oceans. The report described the framework for a regulatory regime acceptable to the Council of Yukon First Nations (CYFN), the Yukon Government (YG) and Fisheries and Oceans Canada (DFO), consistent with a Record of Agreement (ROA) signed in May 2003. It provided the history, background and context for the regime, an overview of the risk-based, watershed-focused framework to be used, and a process for completing development.

Since approval of that report, the ISC has responded to the Minister's direction to conduct outreach with groups and agencies that have a mandate related to the management of fisheries and mining. The Committee has overseen a major development effort, including extensive collection of field data, analysis and modeling to ensure that the proposed regime will achieve its anticipated objectives.

### **Outreach Activities Since April 2004**

Over the past year, meetings were held with the following parties:

- Members of the Yukon Fish and Wildlife Management Board and its Salmon Subcommittee (two meetings);
- Yukon Water Board;
- Yukon Environmental and Socio-Economic Assessment Board;
- Dawson city community leaders (business, city, First Nations, fishermen); and
- Nacho Nyak Dun First Nation and community members (in Mayo).

The proposal for an integrated regulatory regime is now complete. This proposal successfully balances the objectives of the Record of Agreement (ROA), which committed the three levels of government to developing a regime that would “recognize the importance of a sustainable placer industry to the Yukon, and the importance of conservation of fish and fish habitat supporting fisheries.”

The purpose of this report is to describe the proposed regulatory regime for Yukon placer mining. The discussion begins with the legislative and policy context for the regime and a rationale for its development. Then, an overview of the regime is provided, along with guiding principles and a description of key components. This is followed by an outline of the process for establishing and implementing the regulatory regime.

## **2.0 LEGISLATIVE AND POLICY CONTEXT**

The purpose of the regulatory regime for Yukon placer mining is to provide an integrated structure that will allow the three levels of government to satisfy their responsibilities under a variety of legislation and other legal and policy requirements.

### **2.1 Key Legislation, Policies and Agreements**

The regulatory regime will satisfy and integrate the requirements of key federal, territorial and First Nation legislation, policies and agreements.

#### **Fisheries Act**

The *Fisheries Act* is the primary legislation regulating the protection of fisheries resources and their supporting habitat. The Act's principal habitat protection provisions that apply to placer mining are Section 35 concerning the harmful alteration, disruption or destruction (HADD) of fish habitat and Section 36 concerning the deposit of deleterious substances. Other sections may also apply, including those dealing with sufficient flows for fish, fish passage, intake screening and the killing of fish other than by fishing.

In particular, the regulatory regime for Yukon placer mining manages sediment pursuant to section 35, which states:

*35. (1) No person shall carry on any work or undertaking that results in the harmful alteration, disruption or destruction of fish habitat.*

*(2) No person contravenes subsection (1) by causing the alteration, disruption or destruction of fish habitat by any means or under any conditions authorized by the Minister or under regulations made by the Governor in Council under this Act.*

#### **Yukon Environmental and Socio-economic Assessment Act**

Under this legislation passed in May 2003, the three levels of government established a new development assessment process that will replace the CEAA (*Canadian Environmental Assessment Act*) process in the Yukon. YESAA provides for the integration of traditional knowledge (TK) and establishes a single, impartial assessment process throughout the territory. Any regulatory regime for Yukon placer mining must be compatible with this assessment process as it is implemented in the territory.

YESAA requires the environmental and socio-economic assessment of placer mining projects prior to licensing. These assessments could occur at two levels. The Secretariat responsible for implementing the placer regulatory regime will request a review of watershed authorizations before recommending them for final approval to DFO. In addition, specific applications for water licenses and mining land use permits will require an evaluation under YESAA.

#### **Waters Act**

Most placer operations must obtain a water use license issued by the quasi-judicial Yukon Water Board (YWB) pursuant to the *Waters Act*. The Board has broad discretion to set terms and conditions of the license. Recommendations from the YESAA review and requirements of the watershed authorization established under the placer regulatory regime will be provided to the Board to ensure that habitat requirements are clearly articulated for miners and harmonized with the Yukon regulatory process.

## **Placer Mining Act (Yukon)**

The *Placer Mining Act* directs the disposition of mineral rights and title and establishes regulations for land use activities that are inspected and enforced by YG mining inspections staff. These land use regulations serve as mitigation for the integrated regulatory regime.

The Act includes a requirement for an approved placer mining land use Operating Plan. The responsibility for administering type IV placer mining land use plans has been delegated to the YWB.

## **Habitat Management Policy**

DFO's *Policy for the Management of Fish Habitat*<sup>1</sup> provides the context and guidance for implementing the habitat protection provisions of the *Fisheries Act*. For the integrated regulatory regime, it is the reference point for maintaining rigor, consistency and effectiveness. In keeping with the policy, DFO's objective is to ensure "No Net Loss" of productive capacity of fish habitat and to improve habitat protection, with the long-term goal of a net gain in habitat on a watershed level basis. Best management practices, habitat compensation and restoration are the primary means by which these goals will be achieved under the regime.

## **Wild Salmon Policy**

The draft *Wild Salmon Policy* aims to restore and maintain healthy and diverse salmon populations and their habitat for the benefit and enjoyment of Canadians.<sup>2</sup> Conservation is the first priority for resource management decisions and those decisions should balance biological, social and economic considerations. An important requirement of the policy is the preparation of long-term strategic plans that will integrate fisheries, habitat, other land and water uses, and social and cultural values. Elements of the regulatory regime, such as the indicators to monitor watershed health, will help in developing these plans for the Yukon.

## **Land Claims Agreements**

The regime is designed to be consistent with the Umbrella Final Agreement and First Nations Self Government Agreements. This is accomplished in a number of ways, including the requirement for active First Nation/community involvement in the design of the watershed authorizations, the application of legislative requirements that flow from the Umbrella Final Agreement (including YESAA) and provisions of the *Waters Act*. The Fish and Wildlife Board is mandated by the Final Agreement to be the primary instrument of fish and wildlife management in the Yukon. The Yukon Salmon Committee is mandated to be the main instrument of Salmon management in the Yukon.

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<sup>1</sup> DFO (1986), *Policy for the Management of Fish Habitat*.

<sup>2</sup> DFO (2004), *A Policy Framework for Conservation of Wild Salmon*.

## Smart Regulation

The regime incorporates recommendations from the final report of the External Advisory Committee on Smart Regulation (EACSR) titled *Smart Regulation: A Regulatory Strategy for Canada*.

The EACSR was established to provide external advice to the federal government on how the government could redesign its regulatory system to better serve the needs of Canadians. Many of the features of this regime are consistent with recommendations of this report, including:

- Federal and Territorial Regulatory Cooperation reflected in the creation of the Secretariat to implement this regime.
- Focus on results, as reflected by monitoring, inspection and enforcement;
- Emphasis on risk management that includes risk prioritization, risk assessment, communication and consultation.

*Smart Regulation* is about finding better, more effective ways to provide a high level of protection to Canadians, promote the transition to sustainable development and foster an economic climate that is dynamic and conducive to innovation and investment. It must exist in a system that sets clear policy objectives and is transparent and predictable - one that builds public trust in the quality of Canadian regulation and the integrity of the process. The recommendations contained in *Smart Regulation: A Regulatory Strategy for Canada* provide guidance on how to achieve these goals.<sup>1</sup>

## Environmental Processes Modernization Plan (EPMP)

This regime is part of a major initiative by DFO to contribute to a more efficient and effective delivery of its regulatory responsibilities consistent with the principles of sustainable development and smart regulation. It includes a new science-based risk management approach to properly address the various risks to fish habitat presented by various projects. Fundamental tenants of the EPMP are reflected in this regime through the risk-management framework; streamlining practices through watershed authorizations; improving coherence and predictability by creating authorization templates in advance with pre-determine regulatory requirements; and a renewed emphasis on partnerships through implementation by the Secretariat.

## 2.2 Rationale

The integrated regulatory regime for Yukon placer mining is designed to achieve the two priorities of promoting a sustainable mining industry and protecting fish and fish habitat supporting fisheries. Integral to the regime is the establishment in advance of clear rules for placer mining activity and a structured and transparent risk-based process for making regulatory decisions. Active monitoring at the watershed level will determine whether management objectives are being met and, if not, corrective action will be taken.

Together with a strong program of inspections and enforcement, these features will provide for better protection of fish and their habitat and greater certainty of regulation for the Yukon placer industry.

### A sustainable placer mining industry

Placer mining has been a vital economic force in the Yukon since the Klondike gold rush of the late 1800s. Today, it remains one of the territory's largest industries and seasonal employers, generating an estimated \$25 to \$48 million in direct economic activity in 2000.<sup>3</sup> Placer mining and its history continue to be a major tourist attraction. The industry contributes to a way of life for many Yukon families and placer mining has been a longtime activity in First Nations communities.

Yukon Placer Mining, 2004	
Number of operations <sup>a</sup>	163
Gold produced <sup>a</sup>	101,108 crude oz
Value of production <sup>a</sup>	\$43 million
Direct employment <sup>a</sup>	~ 500 people
Share of Yukon GDP <sup>b</sup>	2.4%
<sup>a</sup> Yukon Department of Energy, Mines and Resources	
<sup>b</sup> Statistics Canada	

Most of the placer gold deposits mined over the past century have been close to stream channels that offer fish habitat. In recent years, scientific knowledge has advanced concerning the fish and habitat impacts of sediment, as produced by both natural processes and human activities. To be sustainable over the long term, Yukon placer mining must be conducted in a manner that cost-effectively mitigates these potential environmental impacts.

Careful regulation, inspection and enforcement can be used to ensure a high level of habitat protection at a given placer operation. This protection, combined with reclamation of the mine site, means that a well-managed placer operation need not compromise the health of the aquatic system.

### Conservation of fish and fish habitat

Fisheries, like placer mining, are a major source of socio-economic and cultural benefits in the Yukon. The territory's longest standing fishery is the aboriginal fishery, which provides nutrition, cultural value and income to First Nations people and communities. The total value to Canadians from the Yukon aboriginal, commercial, recreational and domestic salmon fisheries is estimated at around \$1 million annually. In addition, Canada has obligations under the Pacific

Yukon Fisheries, 2002 <sup>a</sup>	
Commercial salmon licences	29 (8 First Nations)
Total angler licences	15,000 –17,000/yr
Canadian salmon catch	19,100
Recreational catch	263,000 caught 51,000 kept
Alaskan salmon catch (Canadian origin)	97,200
Total angler expenditures, 2000	\$14 million
<sup>a</sup> Numbers are being updated.	

<sup>3</sup> BDO Dunwoody LLP (2002), *Economic Study of the Yukon Placer Authorization Review*.

Salmon Treaty with the United States with respect to allocation and management of the salmon fisheries on Yukon River. The average landed value of the American component of the fisheries for chinook and chum was US\$1.6 million and US\$20,000, respectively.<sup>4</sup>

The conservation of fish and fish habitat in support of fisheries is a basic tenet of the *Fisheries Act* and DFO's Habitat Management Policy. It is also the primary principle that will guide resource management decisions under the Wild Salmon Policy now being finalized. Consistent with these policies and the Act, DFO seeks to improve the protection of fish habitat for Yukon fisheries.

### **The special case of Yukon placer mining**

The regulatory regime has been carefully tailored to the specific circumstances of placer mining and the Yukon's institutional structure, demographics and natural environment:

- Placer mining impacts – Placer mining is unique among mining activities. It does not use chemicals, but rather employs only gravity and water to separate and concentrate gold. Gold placers occur naturally. They do not normally contain other elements (e.g., toxic metals) that can have significant adverse environmental effects.
- Complex social and legislative environment – In the Yukon, different levels of government have responsibilities for managing water, fisheries and mining, each with its own legal obligations to satisfy and management objectives to meet. The proposed regulatory regime is designed to ensure that all governments are able to discharge their respective responsibilities in a cooperative manner.
- Self Government Agreements – An important component of the social and legislative environment are the specific land claims agreements negotiated for First Nations under the Umbrella Final Agreement. Placer mining occurs within traditional territories of several Yukon First Nations with final agreements. Each of these agreements establishes self-governing powers and management responsibilities on specific settlement lands within a Traditional Territory.
- Traditional knowledge – YESAA pays particular attention to traditional knowledge, which it defines as “the accumulated body of knowledge, observations and understanding about the environment, and about the living

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<sup>4</sup> The US-Canada Yukon River Salmon Agreement under the Pacific Salmon Treaty specifies the R&E Fund support programs, projects and associated research and management activities directed towards restoration, conservation and enhancement of Canadian-origin salmon stocks of the Yukon River in Alaska and the Yukon Territory, including the Porcupine River system. Within the Canadian portion of the Yukon River drainage, programs and projects can also be directed at developing stewardship of salmon habitat and resources, and at maintaining viable salmon fisheries. Through these efforts, both countries hope to see a return to productive salmon stocks and the long-term sustainability of the salmon fisheries.

beings with one another and the environment, that is rooted in the traditional way of life of First Nations.”<sup>5</sup>

- Intact and healthy watersheds – The Yukon has not experienced the same pressures on fish habitat, in particular from large-scale forestry, agriculture and community development, as other Canadian fisheries jurisdictions. Some Yukon watersheds have seen placer mining over an extended period, while others have been affected by small-scale forestry.
- Permafrost – Placer mining takes place mainly in areas of continuous or discontinuous permafrost, which has important implications for the timing of operations, construction and materials handling. Permafrost also affects the hydrology of watersheds, leading to more variable water flows and more flood-type events, which affects fish and fish habitat.
- Geology and placer gold – Yukon placer deposits are extremely rare and occur in a unique geological environment, covering less than 2% of the territorial land base. This environment is largely unglaciated, meaning that it escaped the scouring endured by much of Canada’s geology during three major glacial periods.
- Yukon placer mining – Placer mining in the Yukon is a family lifestyle and important source of income that, as a result of very short summers, must be condensed into a tight operating period of usually less than 100 open water days. A typical family operation requires significant capital investment, planning and preparation as well as equipment maintenance and repairs that begin in early spring and continue through late fall.

### **3.0 THE INTEGRATED REGULATORY REGIME**

The proposed regulatory regime is based on a national risk-based framework and decision tools developed by DFO’s Habitat Management Program in response to the federal Smart Regulation initiative. It represents a specific application of national policy to meet the legislative and regulatory requirements of Yukon placer mining. The regime integrates existing requirements into a comprehensive regulatory structure.

#### **3.1 Overview**

The risk management approach used to determine the regulatory regime involves a series of important steps (see Figure 1):<sup>6</sup>

- 1) A *Pathways of Effects tool* (see Figure 2) was set out in detail for the activities associated with Yukon placer mining, including potential water quality and sediment loading effects as well as more general physical habitat alterations.

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<sup>5</sup> *Yukon Environmental and Socio-economic Assessment Act.*

<sup>6</sup> See Appendix A for a more detailed explanation of the risk management approach.

- 2) A guidebook of *design standards and best management practices* was developed and will be applied in the development of watershed authorizations to mitigate and avoid potential adverse effects.
- 3) Where these adverse effects are not mitigated, the activities in question are evaluated in a *Risk Framework (Matrix)* for each of four categories of impacts, based on severity of impact and habitat importance and sensitivity:
  - Sediment discharge;
  - Stream channel diversions;
  - Instream works; and
  - Water acquisition.
- 4) Within the cells of these four risk matrices, the *standards* are set out for operating in two types of watersheds (high sensitivity and lower sensitivity) and several categories of reaches within watersheds with differing habitat requirements to the impacts above (see box below on indicators).
- 5) The content of the matrix cells will be transferred to *watershed authorizations* for the particular watershed among the 19 designated for the Yukon.
- 6) The watershed authorization terms and conditions will be provided to the Yukon Water Board for licensing (see Figure 1).

#### **Indicators for Watershed and Habitat Assessment**

The following indicators have been recommended for the watershed sensitivity and habitat suitability classification and for use in assessing the condition of watersheds:

##### Physical Parameters

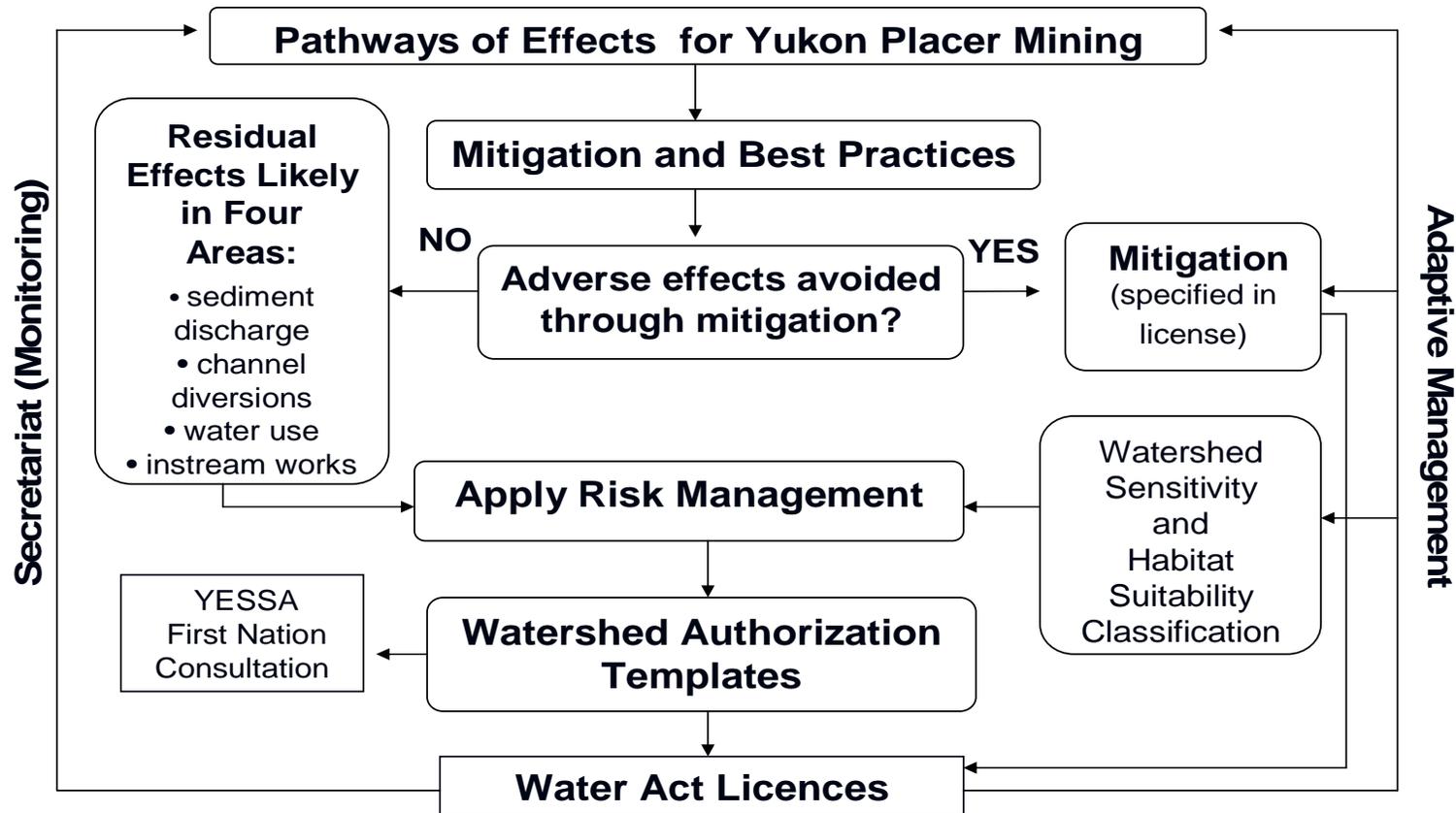
- Overall linear length of watercourses subjected to anthropogenic development where fish habitat productivity has been suppressed;
- Percentage of non-natal rearing habitat reaches suitable for juvenile chinook salmon that have been subjected to anthropogenic activities where fish habitat productivity has been suppressed;
- Overall water quality expressed as an average of open water total suspended solids concentrations within the principal tributary;

##### Biological Parameters

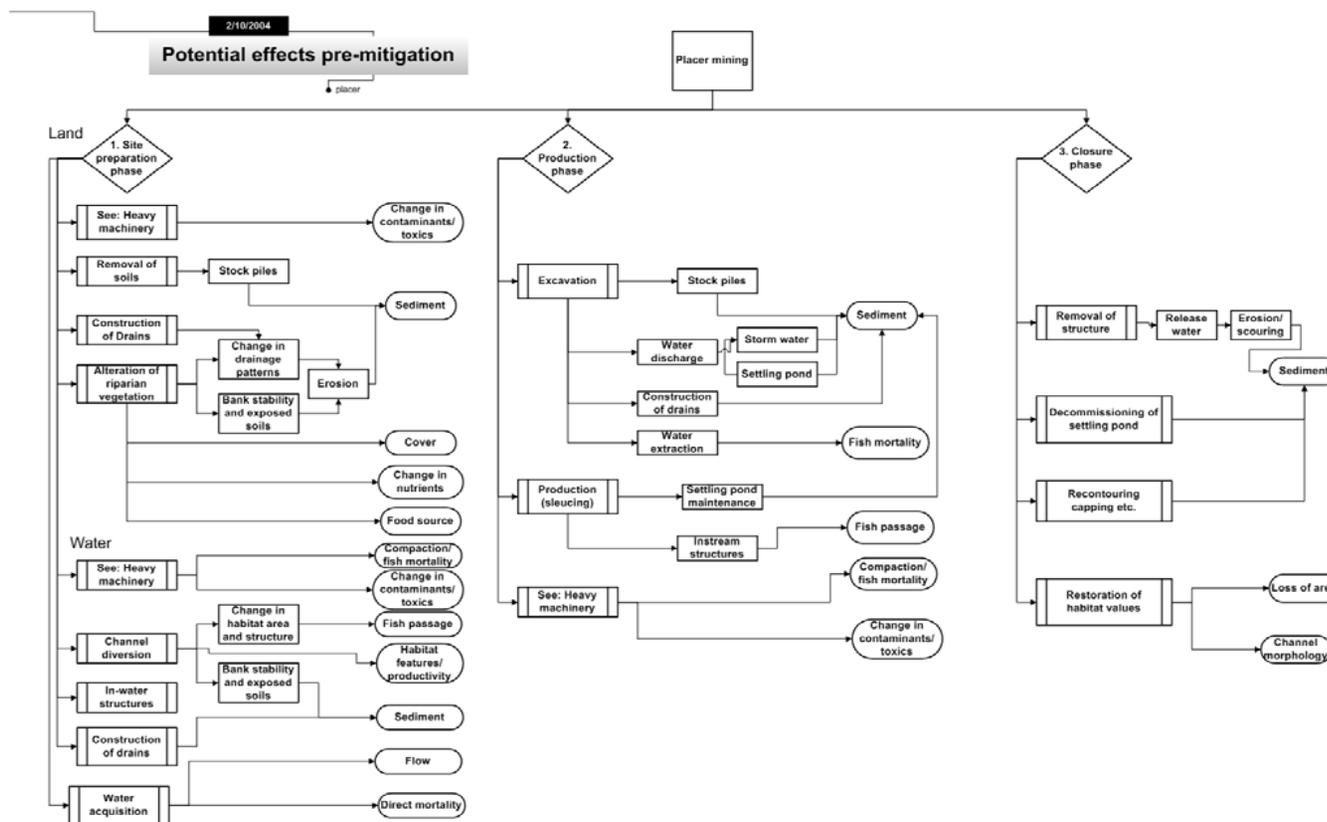
- Presence of Pacific salmon spawning areas;
- Known spawning areas (spawning well documented);
- Likely spawning areas (indicators present, spawning not clearly documented); and
- Traditional knowledge/historic areas (spawning not documented).

## NEW REGULATORY REGIME FRAMEWORK

**Fig. 1. Habitat Risk Framework and Predetermined Regulatory Requirements**



**Fig 2. Pathways of Potential Effects for Yukon Placer Mining**



To be effective, this risk-based approach requires that monitoring of both compliance and effectiveness feed into an active adaptive management process to continuously improve the thresholds and standards of the regime and reduce the uncertainties around the impacts of placer mining on fish habitat productivity.

The risk management approach will improve regulatory decisions by defining the degree of risk that is acceptable under certain conditions in habitats of varying sensitivity. Although the regulatory regime is aimed at balancing conservation of fish and fish habitat and a sustainable placer mining industry, it will eliminate risk in highly sensitive habitats, but tolerate more risk in habitats of lower sensitivity. Thus, the predetermined rules for activities proposed in higher sensitivity habitats are more restrictive than those for similar activities in lower sensitivity habitats.<sup>7</sup>

Overall, the proposed regime is complex and will require cooperation between governments and agencies with resource management responsibilities for placer mining in the Yukon. It reflects emerging ideas for improved resource management (e.g., the risk matrix) that are a departure from previous practices. The Yukon placer mining regime calls on governments to work in the spirit of integrated resource management and requires the ongoing engagement of communities, First Nations and the placer industry.

### **3.2 Guiding Principles**

Various principles have guided development of the regulatory regime for Yukon placer mining, including those proposed as part of the National Smart Regulation Initiative:<sup>8</sup>

- Consistency with established policy – The new regime is consistent with the *Fisheries Act*, the Fish Habitat Management Policy, the draft Wild Salmon Policy and other key legislation and policies. In particular, the risk management framework is a tool to implement the Habitat Policy's No Net Loss principle in a consistent but locally responsive manner.
- Effectiveness – The regime is based on clearly defined standards and performance targets derived from a risk assessment and supported by the latest empirical evidence and knowledge. The standards will be regularly reviewed and modified, as necessary, to incorporate scientific and technological advances and improved placer mining practices.
- Cost-efficiency – As a coordinated management approach across the three levels of government, the regime establishes a Secretariat to provide a single regulatory window and avoid overlap, duplication and inconsistency. It also sets out clear criteria, based on the risk to habitat, for initiating enforcement actions, so that scarce resources can be used wisely.

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<sup>7</sup> These predetermined habitat requirements are presented in Appendix B.

<sup>8</sup> External Advisory Committee on Smart Regulation (2004), *Smart Regulation: A Regulatory Strategy for Canada*.

- Timeliness – By establishing the basic management objectives for watershed authorizations in advance, regulatory decisions on specific projects can be made more efficiently and within established timeframes.
- Transparency – The regime is built on an open and transparent decision-making process from the definition of habitat sensitivity through compliance monitoring and enforcement. To encourage learning and information sharing, extensive information is available on the web as part of the Yukon Watershed Atlas (see Appendix A).
- Accountability and performance – Successful implementation involves ongoing watershed monitoring to determine whether management objectives for water quality and other important values are being achieved. The results of this monitoring will be used to modify standards in a way that is fair and consistent. Reporting to the public on the performance of the regime in meeting its objectives is a key component.
- Cooperation – In its development through the ISC and implementation through the Secretariat, the regime represents a high level of cooperation between the federal, territorial and First Nations governments. As well, it provides an opportunity to work with other bodies, notably the Yukon Salmon Subcommittee of the Yukon Fish and Wildlife Management Board.

### **3.3 Regime Components**

The risk management approach for defining the predetermined habitat requirements is explained in Appendix A. This section reviews other key components of the Yukon placer mining regulatory regime.

#### **Traditional Knowledge**

The application of traditional knowledge is required as an essential part of the regime's implementation. For each watershed, First Nations will be invited to contribute TK, which can be used to inform decisions on the watershed sensitivity classification as well as to contribute to assessments conducted under YESAA. In addition, the Secretariat which is responsible for implementing the regime will be tasked with ensuring that appropriate measures are taken to address consultation with Yukon First Nations.

Yukon First Nations are building a policy framework to guide the appropriate application of traditional knowledge. This framework will form the basis of the approach that will be used in the regulatory regime. In the interim, to facilitate the regime's implementation, it will be recognized that the knowledge held by each First Nation is unique to that group. Consequently, the consideration of TK in a particular watershed authorization or project review will need to be developed with the appropriate holders of the knowledge.

#### **Watershed Authorizations**

Templates for watershed authorizations (Type A and B for high and lower sensitivity watersheds respectively) will be created based on a standardized 35(2) authorization form or template. DFO will create the templates during implementation of the regulatory regime. Watershed authorizations will then be prepared for each of the designated

watersheds using the templates and watershed considerations such as local and traditional knowledge (see Figure 1)

Watershed authorizations are seen as an effective way to manage the potential cumulative effects of reductions in habitat productive capacity, while ensuring that regulators and placer miners have clear standards and conditions from which to make decisions and design operations, respectively. Although the authorization templates will have been completed in advance, the habitat risk decision framework and its supporting rationale will be reviewed periodically as part of an adaptive management process.

In situations where miners cannot meet the terms and conditions of the watershed authorization and can apply for a specific 35(2) authorization under the *Fisheries Act*, the risk management approach will be used to review site-specific applications. The basic intent of the regime has been to predetermine habitat regulatory requirements on a watershed basis, thereby reducing the need for site-specific authorizations.

### **Watershed Health Monitoring**

The regulatory regime incorporates a review process to monitor its performance on the goals of recognizing the importance of a sustainable placer mining industry and the importance of conservation and protection of fish and fish habitat supporting fisheries.

In designing the regime, indicators, practices and standards were developed using the best available information, including empirical data, professional expertise, traditional knowledge and industry experience. However, as in any natural system or industry environment, there are uncertainties. Adaptive management requires an effective monitoring program to test the validity of approaches and assumptions and to measure regime performance with respect to the primary goals.

The regime's monitoring program will provide information to:

- Describe watershed health and the specific objectives set out for watersheds, including water quality, the degree of watershed development and restoration and reclamation of mined areas, and habitat productivity;
- Describe the overall status and health of the placer mining industry, including its socio-economic effects;
- Help test specific assumptions used in the regime's development including:
  - Adequacy of discharge standards to meet water quality objectives;
  - Predictions of cumulative downstream effects on water quality objectives;
  - Relationship of settling pond design standards to action and compliance levels;
- Help assess the industry's performance and compliance with respect to discharge standards and best management practices;
- Help assess the impact of the new regime on a number of mining operations during the implementation phase;
- Establish a basis of information to measure progress in achieving a net gain of habitat through the use of best management practices under the regime; and

- Guide adaptive management of the regime.

There will be two timeframes of monitoring: annual monitoring and medium-term monitoring and evaluation conducted every three to five years. Biological, water quality, industry activity and habitat productivity indicators will be developed to measure watershed health. The biophysical indicators used to classify watersheds (e.g., presence of Pacific salmon spawning areas, overall length of watercourses affected by human development where fish habitat productivity has been suppressed) will also be used in watershed health monitoring.<sup>9</sup>

The Salmon Subcommittee of the Yukon Fish & Wildlife Management Board and Renewable Resources Councils for each First Nation Traditional Territory provide government with advice on the management of Yukon fisheries. These groups can provide significant experience and expertise to the design of the monitoring strategy to ensure an appropriate and effective implementation of this regime. The Secretariat will engage in discussions as part of implementation with these advisory boards to determine the best mechanism to understand how their expertise can best be utilized.

### **Adaptive Management**

Adaptive management has been defined as the process whereby management is initiated and then incrementally evaluated and refined.<sup>10</sup> Unlike traditional management, an adaptive approach recognizes uncertainty and the constraints of knowledge. It provides a process for using new information from monitoring and research to modify management practices. In particular, high-quality monitoring data from both successes and failures is key to improved decision-making.

For the regime, adaptive management is an important tool to address the uncertainties inherent in regulating the placer industry to achieve no net loss of habitat productivity. Through adaptive management, habitat conservation and protection measures can be adjusted over time.

Careful annual monitoring will form the basis of recommendations for changes. At least three to five years of monitoring the regime's performance will likely be required before considering adjustments. In the interim, changes may be considered in response to unforeseen circumstances of an exceptional nature.

The Secretariat will be responsible for recommending changes to a Steering Committee established by CYFN, YG and DFO (see Section 3.4). Before any change is made, the implications for existing licensed placer operations must be carefully examined. Modifications to the regulatory regime are to be implemented in a manner that is fair and understandable to industry.

Where industry's performance in fish and habitat protection exceeds expectations, and the level of risk is acceptable, changes that would allow for more lenient discharge standards may be considered.

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<sup>9</sup> These indicators are shown in Appendix A.

<sup>10</sup> Kershner (1997), "Monitoring and Adaptive Management."

## **Compliance Monitoring and Enforcement**

As part of the regime, YG and DFO have developed an agreement that provides a coordinated approach to habitat inspections under the *Fisheries Act* and inspections pursuant to the *Waters Act* and *Placer Mining Act*. Under the agreement, Yukon officials are made responsible for compliance monitoring and enforcement activities related to placer mining. Designations are provided that will give these officials authority under the *Fisheries Act*.

The agreement specifies roles and responsibilities for compliance monitoring and inspections, frequency of inspections, requirements for reporting and record keeping.

## **Licensing**

The *Waters Act* allows the Yukon Water Board to establish reasonable terms and conditions in a water use license. Under the placer regulatory regime, the requirements of a watershed authorization will be explicitly incorporated into water use licenses. The terms and conditions of water use licenses and approved mining land use Operating Plans are site-specific and fully enforceable. Individual placer miners are accountable for the activities governed by these approvals.

Thus, the new regime will make every operator individually accountable whether or not the operation falls under a watershed authorization. This responsibility will be assigned through the YWB through a formal agreement or other arrangement.

## **3.4 Transition and Implementation**

The integrated regulatory regime for Yukon placer mining is scheduled to be in place by 2007. To meet this timeline, it is essential that a Secretariat be established to complete the remaining development work necessary for implementation. Moreover, this Secretariat must be properly resourced for the transition and implementation phases in light of other government priorities and staff workloads.

There are a number of key challenges to successful implementation:

- Ability to demonstrate to regulators and public that the regime is working and that watershed health is being maintained;
- Clear accountability and objective reporting;
- Long-term commitment to adaptive management as an effective process for change;
- Regular and effective communication with communities, miners, stakeholders and special interest groups; and
- Establishment of a good working relationship with other agencies and organizations with an interest in resource management.

The implementation structure proposed below is designed to address these challenges.

### **Implementation through the Secretariat**

The implementation secretariat will function as an intergovernmental coordinating committee where each government agency brings their legislated regulatory

responsibilities to the team under the leadership of an executive director for the initial implementation and transition. Decision making remains the responsibility of the mandated government agencies and government employees who assist in implementation remain directly accountable to their respective employers.

The Secretariat will be developed in keeping with the following principles:

- The regulatory responsibilities of each government are not changed by this proposal.
- It should use existing resources applied to the resource management of placer mining as much as possible.
- It will not compromise the ability of each government to fulfill respective mandates for managing the mining and fisheries resources.
- It should have sufficient resources to achieve success.
- It should be perceived as fair and balanced.

The Secretariat's main responsibility is to implement the placer regime as directed by a Steering Committee consisting of DFO, YG and CYFN (and specific First Nations as appropriate) representatives. It will play an advisory role to governments as follows:

- To DFO on appropriate authorizations under the regime;
- To the YWB on appropriate terms and conditions of licenses to meet regime requirements consistent with the *Waters Act*, *Placer Mining Act* and *Fisheries Act*;
- To CYFN and specific First Nations governments on how the regime observes the *Umbrella Final Agreement* and appropriate First Nation land claims agreements, and how it may affect First Nations and communities.
- To the *Yukon Environmental and Socio-economic Assessment Board* on how the regime work satisfies YESAA requirements.
- To YG on management responsibilities for placer mining, water and lands.

It is essential the Secretariat engage the advice and expertise of stakeholders. There are many new concepts and processes in the new regime that directly affect miners and require their cooperation and active involvement in the technical and operational aspects of implementation. Conservation interests set up under the land claims agreements will be particularly interested to understand the process of watershed classifications and the development of watershed authorizations, and the monitoring of water quality objectives, watershed health and industry performance.

### **Implementation Schedule**

The proposed schedule for implementation is as follows:

- |                |  |
|----------------|--|
| May 2005       | ISC and Minister endorse the regime                                    |
| September 2005 | Establish Secretariat; initiate recruitment of the Executive Director, |

	<p>First Nation Liaison and GIS technician</p> <p>Initiate work on implementation protocols, to be completed before September</p> <p>Begin watershed classifications on a priority basis (requires contract GIS work)</p> <p>Initiate community and First Nations consultations.</p>
November 2005	<p>Secretariat initiates community work for the first set of watershed authorizations</p> <p>Secretariat continues discussions with the Yukon Water Board and Yukon Environmental and Socio-economic Assessment Board to establish administrative procedures for sharing information and coordinating approvals</p>
March 2006	<p>Secretariat recommends the first set of watershed authorizations for final approval</p>
June 2006	<p>Secretariat initiates water license amendments for all licenses that expire in 2007 or later</p>
January 2007	<p>Transition complete</p>

### **Implementation protocols**

Various protocols are being developed to support implementation of the new management regime. Their content and scheduling are indicated below:

- *Method of Measurement Protocol* – techniques for measuring sediment discharges in ml/l and total suspended solids (draft April 2005);
- *Protocol for Action and Compliance Level Approach* – concepts of the action level approach and voluntary and required actions when the design target, action level or compliance level are exceeded (draft April 2005);
- *Protocol for Identification of Physical Constraints to Settling Pond Design* – criteria used by the Secretariat to identify physical constraints to settling pond design (draft May 2005);
- *Water Quality Objectives Monitoring Protocol* – techniques including sampling design, measurement and data analysis (draft April 2005);
- *Watershed Health Monitoring Protocol* – techniques including sampling design, measurement and data analysis (draft May 2005);
- *Adaptive Management Protocol* – concepts of the adaptive management approach, including the process and data requirements for program review (draft June 2005); and

- *Watershed Sensitivity and Habitat Suitability Classification Protocol* – the indicators, measurement and scoring system (draft April 2005).

#### **4.0 CONCLUSION**

This report has described an integrated regulatory regime for placer mining in the Yukon. The regime represents a new way of coordinating regulation that actively involves all governments with management responsibilities for fish, mining and water. It establishes a partnership that reflects the new role of First Nations and the Yukon Government in resource management.

## APPENDIX A: RISK MANAGEMENT APPROACH

The habitat risk management approach of the Yukon placer regulatory regime is based on the newly emerging DFO National Habitat Risk Management Framework and Pathway of Effects model, which were adapted for the Yukon placer mining case. It incorporates a process to designate Yukon watersheds and evaluate the sensitivity of their aquatic habitats to human activities. In the simplest terms, the risk management approach defines the sensitivity of habitat, determines the severity of impacts from placer mining, and establishes the predetermined habitat requirements that provide the input into template habitat authorizations.

### Pathway of Effects (PoE) Model

The national PoE model is a structured decision path used to identify and mitigate effects on aquatic systems. It begins by identifying the various terrestrial and in-water activities that may lead to adverse effects on fish or fish habitat. If the effects of a particular development proposal cannot be avoided through project relocation or redesign, an effort is made to reduce or eliminate them through mitigation measures. The residual adverse effects – defined as those that cannot be entirely eliminated through the application of any known or economically feasible technology – are then examined further using the National Habitat Risk Management Framework, or Risk Matrix (see below).

A PoE specific to Yukon placer mining was developed by consolidating the activities relevant to placer mining from the national model. The effectiveness of mitigation and Best Management Practices (BMP) to reduce or eliminate potential effects on the aquatic environment was evaluated. It was determined that adverse effects could be avoided or minimized only through existing or renewed mitigation measures for non-point sources of sediment associated with land use and other activities (e.g., fuel storage). The resulting residual effects of placer mining were placed in four broad categories of activity: sediment discharges, the construction of diversion channels, instream works and water acquisition. These residual effects were then evaluated using risk management, as described below.

### Risk Matrix

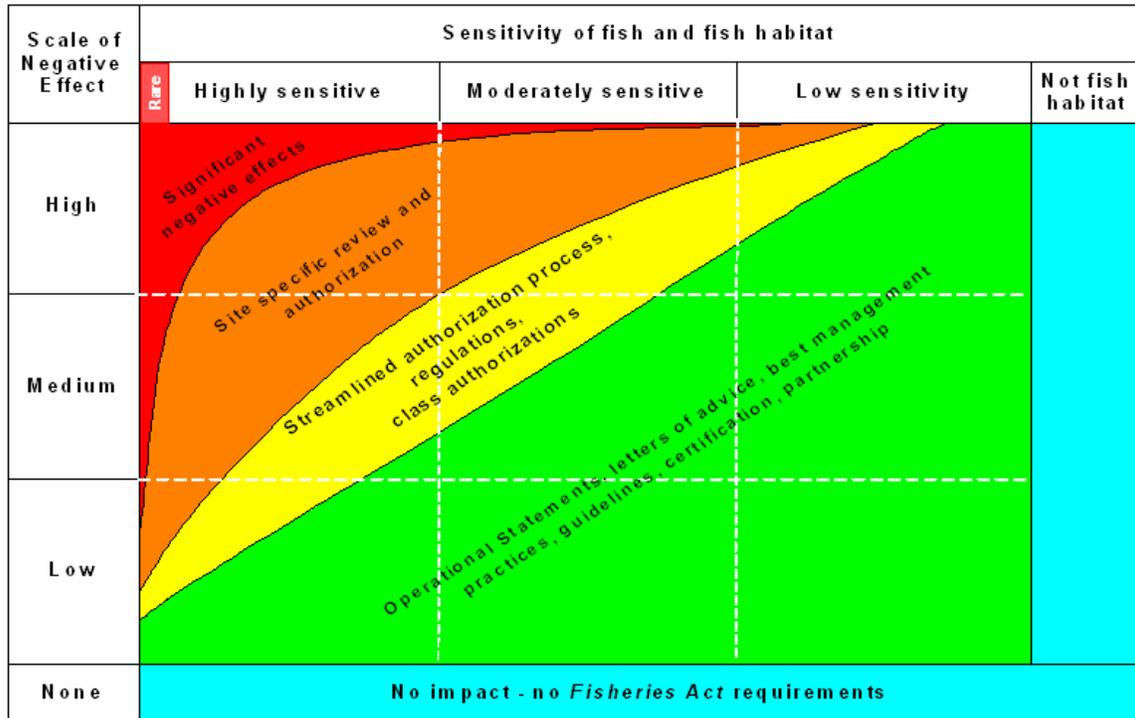
In the national model, the risk matrix uses the sensitivity of fish and fish habitat and the scale of negative residual effect to determine the management action needed (Figure 3). In the matrix, residual effects rated low, medium or high in severity are mapped against similarly rated habitat sensitivity. Moving from the bottom right-hand quadrant to the top left-hand quadrant of Figure 3, the degree of required management intervention increases.

The risk matrix is modified in the Yukon placer mining regime. Designated watersheds were grouped into two classifications of sensitivity (high and lower sensitivity) and then each was assessed in terms of six categories of habitat suitability.<sup>11</sup> For three of the four categories of mining activity above, a “potential severity of effect” table was developed

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<sup>11</sup> The categories are high, moderate-high, moderate-moderate, moderate-low, low, and low-water quality. See further below.

**Figure 3: National Habitat Risk Management Framework**



using indicators that comprehensively describe the level of impact the activity may have on the aquatic environment (see Tables 1, 2 and 3 in Appendix B).<sup>12</sup> The potential risk ratings (low, moderate and high) derived from this table were then matched with the habitat sensitivity evaluation in a risk matrix for the particular activity (see Figures 4, 5 and 6 in Appendix B).

These colour-coded risk matrices are used to establish habitat requirements specific to the degree of risk from the different placer mining activities occurring in habitats of varying sensitivity. The potential severity of effects tables and corresponding risk matrices provide the predetermined habitat requirements for stream channel diversions, instream works and water acquisition, as shown in Figures 5, 6 and 7, respectively. These and the comparable requirements for sediment discharges (see below) form the basis of the template watershed authorizations described in Section 3.3.2.

### Sediment Discharges

Sediments generated from placer mining activities in the Yukon are of natural origin. Under the integrated regulatory regime, they are managed using a risk-based approach. An integral component of this risk management approach is the initial application of the PoE model to identify where technically and economically feasible mitigation is available to eliminate or avoid adverse effects, before consideration of risk management related to

<sup>12</sup> This applies to the construction of diversion channels, instream works and water acquisition. A different approach was used for sediment discharges, which is explained below.

any residual effects. For the Yukon placer mining industry, the PoE model demonstrates that specific operating conditions can be applied to prevent or minimize sediment release from non-point sources (e.g., land use activities) into fish-bearing waters. Point source sediment discharges from sluicing are mitigated by treating mining process water in settling facilities.

The risk matrix for sediment discharges from settling ponds consists of effluent (end-of-pipe) discharge standards and water quality objectives determined in relation to watershed and habitat suitability (see Table 4 in Appendix B). Severity of effect indicators for sediment discharges were developed and these indicators, which are relatively site-specific, are factored into the action level approach used for sediment management in the new regime.

The action level protocol is a key element of the risk-based approach to sediment management for Yukon placer mining. It has three components: a settling facility “design target,” an “action level,” and a “compliance level”. The design target represents the best settling facility that can be constructed at any given site, based on the ground conditions. The action level represents the end-of-pipe sediment concentrations that on average must not be exceeded in order to prevent an unacceptable risk to fish and fish habitat supporting fisheries. The compliance level represents a maximum concentration that must never be exceeded and is legally enforceable. This approach will be described in a separate protocol document (see Section 3.4).

### **Water Quality Objectives**

Water quality objectives (WQO) and a new water quality model were developed as management tools to support the sediment discharge standards for Yukon Placer mining (Table 4 in Appendix B). While the WQO are not legally enforceable, they are one of several considerations, including sediment loading and bedload, taken into account when establishing sediment discharge standards.

The WQO were developed specifically for the Yukon with reference to the European Freshwater Fish Water Quality Criteria and the Canadian Council of Ministers of the Environment Water Quality Guidelines. Under the Yukon Placer Authorization (YPA), sediment standards were based solely on meeting WQO and a larger number of streams had no WQO. In the integrated regulatory regime, WQO will be set for all habitat types.

The objectives are risk-based in that the degree of protection or level of acceptable risk varies with habitat sensitivity. WQO in highly sensitive habitats will be set to eliminate risk entirely (i.e., no impact on the stream from adjacent placer mining), while those in habitats of lower sensitivity will balance the protection of fish and fish habitat with the viability of a sustainable placer mining industry. The WQO have been developed to protect juvenile chinook salmon because this species has the most specific and demanding requirements for suitable habitat. Given that other fish species will thrive in habitat suitable for chinook salmon, protecting salmon habitat also protects other fish habitat. WQO have also been developed for habitats that are far less likely to support chinook salmon, but where other species are known to thrive.

The WQO inform the action level approach and, together with watershed health monitoring, they feed into an adaptive management review process to evaluate the

adequacy of sediment discharge standards in protecting fish and their habitat (see Section 3.3).

### **Watershed Designation**

As a starting point for the regime's application, and for the habitat sensitivity assessment, a watershed designation process was established that resulted in 19 main or initial watersheds in the Yukon (Figure 4). Watersheds were delineated based on geography, geology, ecology and socio-economic factors. This approach consolidated similar adjacent basins and groupings of sub-basins that did not fall within the area covered under the YPA designations. Areas deemed to contain important mineral development, or that were geographically isolated, were separated out. By comparison, the YPA had divided the territory into 22 basins based primarily on geological considerations.

### **Watershed Sensitivity Classification**

In order to evaluate the sensitivity of watersheds to human activities, and thereby determine the degree of fish and habitat protection required, a series of indicators were considered that could be used to establish the relative environmental condition of the 19 designated watersheds. Each indicator was evaluated against two main criteria: (1) the availability of information with which to assess its status, and (2) the overall usefulness or value of the indicator for assessing watershed condition.

Based on this evaluation, the following indicators were recommended as the most efficient, effective and useful ones to assess the condition of a designated watershed:

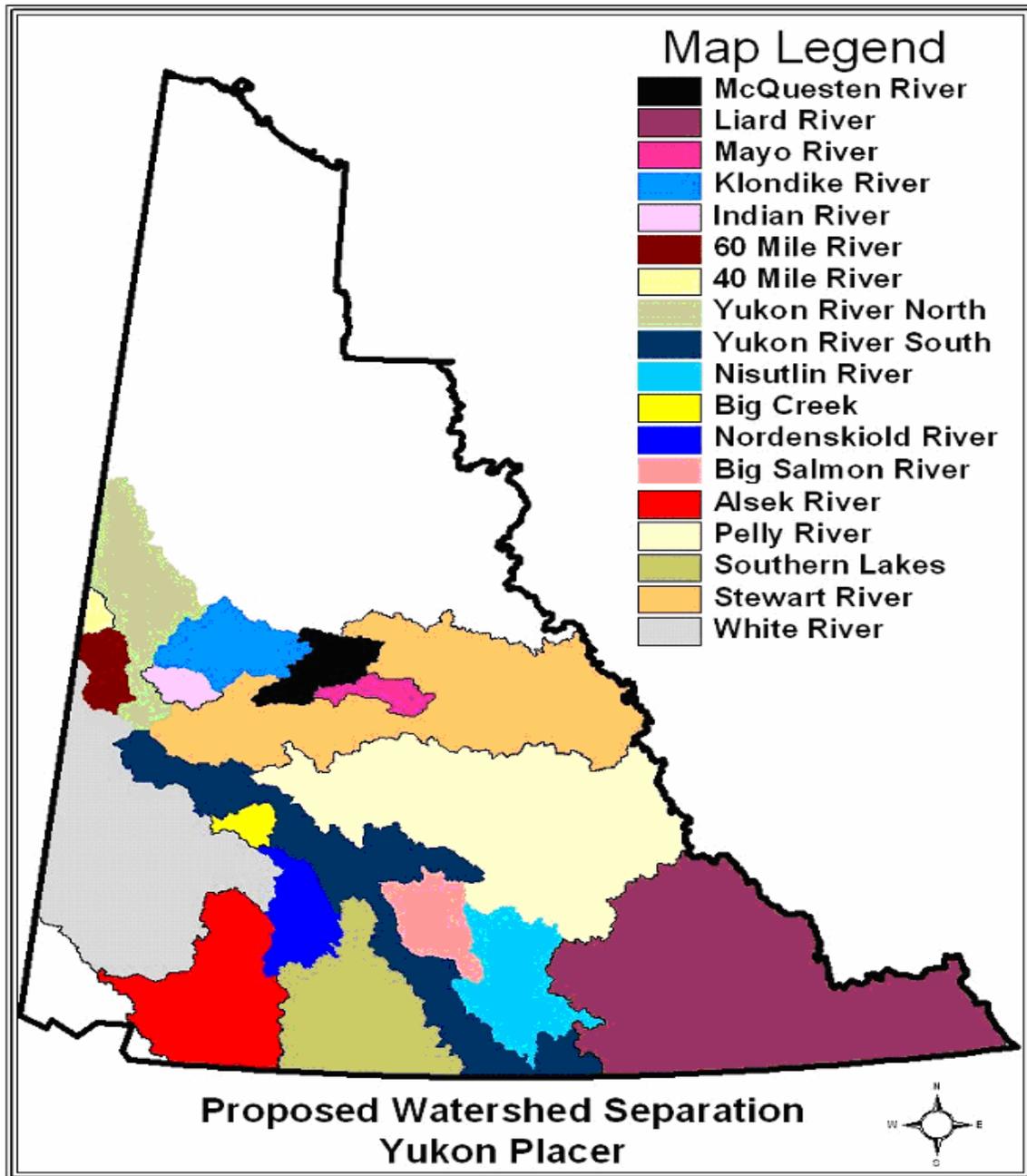
#### *Physical Parameters*

- Overall linear length of watercourses subjected to anthropogenic development where fish habitat productivity has been suppressed;
- Percentage of non-natal rearing habitat reaches suitable for juvenile chinook salmon that have been subjected to anthropogenic activities where fish habitat productivity has been suppressed;
- Overall water quality expressed as an average of open water total suspended solids concentrations within the principal tributary;

#### *Biological Parameters*

- Presence of Pacific salmon spawning areas;
- Known spawning areas (spawning well documented);
- Likely spawning areas (indicators present, spawning not clearly documented); and
- Traditional knowledge /historic areas (spawning not documented, restoration potential).

Each designated watershed was assessed through a systematic process that evaluated, categorized and "scored" the various indicators. A cumulative watershed score was then determined to identify the relative condition and allocate the watershed to one of two classifications, Type A and Type B, as explained below.



**Figure 4: Results of the Watershed Designation Process**

Type A watersheds are more sensitive to development and habitat disruption mainly due to the presence and importance of spawning salmon. The level of salmon spawning in a watershed is correlated with water quality, the abundance of juvenile salmon and the requirement for salmon rearing habitat. A higher level of protection is required for spawning and rearing habitat, not only to maintain the productivity of this high value habitat, but also to protect the integrity and genetic diversity of the populations concerned.

Type B watersheds, on the other hand, have lower sensitivity because in general the natural level of water quality is lower, as is the level of spawning and requirement for rearing habitat.

### **Habitat Suitability Classification**

To determine sensitivity at the reach scale, a new habitat classification system was developed that allows fish habitat to be differentiated by degree of sensitivity to anthropogenic disturbance.

Under the risk management approach, the level of fish and fish habitat sensitivity is represented by the suitability of aquatic habitats for selected species. For example, habitats that are deemed critical to a particular species and life stage of fish, and that are of relatively limited abundance (e.g., spawning habitat), would be considered highly sensitive. Other habitats, such as areas that may only be accessible for short periods of time (e.g., ephemeral streams) and that do not provide a critical function in the survival of a particular species or life stage of fish would be considered of lower sensitivity.

The objective for the classification system is to adopt appropriate fish habitat suitability indicators based on factors such as the availability of information, degree of scientific confidence and overall effectiveness in differentiating habitat suitability. A number of indicators were evaluated against known data sets relating to fish and fish habitats within the Yukon.

The National Habitat Risk Management Framework identifies three categories of fish and fish habitat sensitivity (high, moderate and low). The habitat suitability classification system for Yukon placer mining specifies six suitability categories:

- *High* includes all identified spawning areas for Pacific salmon species in the Yukon (chinook, chum, coho and sockeye) as well as spawning areas for lake trout, rainbow trout, bull trout and dolly varden. Spawning areas are identified using field data and current or historic records of spawning activity.
- *Moderate-High* includes highly suitable habitats for rearing juvenile chinook salmon. These areas may also be highly suitable for and used by non-anadromous resident fish species, such as whitefish sp., Arctic grayling, and burbot.
- *Moderate-Moderate* includes moderately suitable habitats for rearing juvenile chinook salmon. As above, these areas may also be highly suitable for non-anadromous resident fish species.

- *Moderate-Low* includes habitats that are suitable for rearing juvenile chinook salmon but unlikely to support large densities or abundance of fish due to limiting factors.
- *Low* refers to areas that are unsuitable for rearing juvenile chinook salmon, but may be highly suitable for and used by non-anadromous resident fish species, including northern pike and longnose sucker.
- *Low-Water Quality* refers to areas that may be inaccessible to fish but provide water flow and contribute nutrients to downstream habitats supporting them.

The proposed indicators for the Moderate and Low habitat suitability categories include stream gradient, proximity to juvenile chinook salmon production areas (identified as high habitat suitability areas) and general water quality (naturally occurring suspended sediment concentrations). The degree of prior disturbance will also be considered by identifying habitat areas that have been developed and not restored or reclaimed to current standards.

Sites with prior disturbance and insufficient restoration of fish habitat will be designated as previously developed (PD) in addition to their habitat suitability classification. This designation will allow certain mining activities and practices to be accommodated, providing there is an expressed commitment to restore the habitats to current standards once activities have ceased. It is anticipated that this approach will result in a net gain of productive fish habitat capacity. Once PD designated areas have been restored to the current restoration standards, the designation will be removed.

### **Yukon Watershed Atlas**

The Yukon Watershed Atlas is a Geographic Information System (GIS) based atlas that provides access to information on fish and fish habitat, geology and mining, hydrology, resource and land use, and socio-economic information related to the territory's First Nations and local communities. This tool will be used to inform the interactions between placer mining, fish habitat and fisheries. The Atlas will provide the raw data for assessing habitat values and sensitivities as part of the risk management approach.

## **Appendix B: Predetermined Habitat Requirements**

### **Potential Severity of Effects Tables**

Tables 1, 2 and 3 are designed to show the potential risk posed to fish and fish habitat by the construction of diversion channels, instream works construction and the acquisition of water for mining purposes, respectively. Characteristics of these activities relevant to fish and fish habitat are represented by the indicators in the left-hand column of the table. A simple additive scoring system is used to produce a potential risk rating based on the characteristics of each activity type being evaluated. The ranges in these tables may be refined during consultation in the implementation phase.

### **Risk Matrices**

Based on its potential severity of effect table, each proposed activity will receive a potential risk rating. This risk rating is matched with an evaluation of habitat sensitivity in the risk matrix, as shown in Figures 5 (diversion channels), 6 (instream works) and 7 (water acquisition). The risk matrix describes the rules that will apply to each activity in the different categories of habitat. The contents of the cells in the risk matrices will be refined during consultation in the implementation phase.

### **Watershed Sensitivity**

The risk matrices below were developed without considering the differences between higher sensitivity (Type A) and lower sensitivity (Type B) watersheds. In practice, the indicators may be the same for type A and Type B watersheds however the risk matrix for each residual effect will reflect the appropriate risks acceptable in each watershed type.

### **Water Quality and Sediment Discharge Standards**

These standards are presented in Table 4. Appendix A outlines how they were determined.

**Table 1: Potential Severity of Effects Table for the Residual Effects of Placer Mining – Stream Channel Diversions**

<b>Physical Disruption: Diversion Channels</b>	<b>High Risk (Score 3)</b>	<b>Moderate Risk (Score 2)</b>	<b>Low Risk (Score 1)</b>
Return period used for channel design (flood flows)	< 1:2 year	1:2 year to 1:5 year	> 1:5 year
Duration diversion channel is in place	< 2 years (i.e., little opportunity for return to productivity)	2 to 10 years (stable, well-designed, some potential for fish utilization)	> 10 years [stable, well-designed, permanent (“final restoration channel”)]
Location of diversion channel	Perched	Confined	Lowest point in valley
Length of diversion channel	> 1 km	> 100 m < 1 km.	< 100 m
Material channel is constructed in	Permafrost	Easily eroded, fine material	Stable material
Habitat features	None	Few	Satisfactory

**High risk: 13 to 18**

**Moderate risk: 7 to 12**

**Low risk: 1 to 6**

**Figure 5: Risk Matrix for the Residual Effects of Placer Mining – Stream Channel Diversions**

Potential Risk: Diversion Channels	Habitat Sensitivity					Water Quality
	High (5)	Moderate-High (4)	Moderate-Moderate (3)	Moderate-Low (2)	Low (1)	
<b>High (3)</b>	(8) Site-specific review and authorization, or no HADD authorized <sup>1</sup>	(7) Site-specific review and authorization <sup>1</sup>	(6) Site-specific review and authorization <sup>1</sup>	(5) Restoration requirements specified in licence <sup>2</sup> ; short-term suppression of productivity accepted <sup>3</sup>	(4) Restoration requirements specified in licence <sup>2</sup> ; suppression of productivity accepted until completion of mining <sup>4</sup>	Local habitat considerations not relevant <sup>5</sup>
<b>Moderate (2)</b>	(7) Site-specific review and authorization <sup>1</sup>	(6) Site-specific review and authorization <sup>1</sup>	(5) Restoration requirements specified in licence <sup>2</sup> ; short-term suppression of productivity accepted <sup>3</sup>	(4) Restoration requirements specified in licence <sup>2</sup> ; suppression of productivity accepted until completion of mining <sup>4</sup>	(3) Restoration requirements specified in licence <sup>2</sup> ; suppression of productivity accepted until completion of mining <sup>4</sup>	Local habitat considerations not relevant <sup>5</sup>
<b>Low (1)</b>	(6) Site-specific review and authorization <sup>1</sup>	(5) Restoration requirements specified in licence <sup>2</sup> ; short-term suppression of productivity accepted <sup>3</sup>	(4) Restoration requirements specified in licence <sup>2</sup> ; suppression of productivity accepted until completion of mining <sup>4</sup>	(3) Restoration requirements specified in licence <sup>2</sup> ; suppression of productivity accepted until completion of mining <sup>4</sup>	(2) Restoration requirements specified in licence <sup>2</sup> ; suppression of productivity accepted until completion of mining <sup>4</sup>	Local habitat considerations not relevant <sup>5</sup>

Aggregate Risk Score: High risk acceptable – 2 to 4; Moderate risk acceptable – 5; Low risk acceptable – 6 to 8

## Footnotes – Stream Channel Diversions

A guidebook for placer mining is currently under development. When completed, it will be possible to make direct links between the guidebook’s mitigation measures, placer mining activities described in the Pathway of Effects, and the requirements of watershed authorizations.

1. Proposals to divert these stream reaches will likely be subject to a site-specific review and may be permitted by a separate authorization. Final restoration channels for reaches of higher sensitivity must be designed and constructed to a standard that ensures only a low risk to fish and fish habitat supporting fisheries. “Like-for-like” compensatory features must be in place and the diversion channels must be inspected and approved prior to commissioning.
2. Watershed authorizations will describe the habitat features and other physical characteristics required for diversion channels in habitats of moderate or low sensitivity. These features will address potential aquatic effects identified on the Pathways of Effects (PoE) as erosion/scouring, sediment, cover, loss of area, change in nutrients, food source, channel morphology, fish passage, fish mortality and suppressed productivity. Specific mitigation measures and “like-for-like” compensatory features will be stipulated in the terms and conditions of water use licenses.
3. Final restoration channels for these reaches must be designed and constructed to a standard that ensures only a moderate risk to fish and fish habitat. Depending on the habitat sensitivity, “like-for-like” compensatory features may have to be established and the diversion channels inspected and approved prior to commissioning.
4. Final restoration channels for these reaches must be constructed when mining has been completed. Specific mitigation measures and “like-for-like” compensatory features will be stipulated in the terms and conditions of water use licenses. “Temporary” diversion channels may be constructed, provided that the aquatic effects identified on the PoE as erosion/scouring and sediment are mitigated and the effects identified as fish passage and fish mortality are avoided.
5. These reaches are upstream of significant barriers to fish passage. Final restoration channels for these reaches must be constructed to provide long-term stability, preventing the aquatic effects identified on the PoE as erosion/scouring and sediment.

**Table 2: Potential Severity of Effects Table for the Residual Effects of Placer Mining – Instream Works**

<b>Physical Disruption: Instream Works</b>	<b>High Risk (Score 3)</b>	<b>Moderate Risk (Score 2)</b>	<b>Low Risk (Score 1)</b>
Return period (flood flows) used for design of structures	< 1:2 year	1:2 year to 1:5 year	> 1:5 year
Reservoirs	Cross-valley dam	Wing dam or deflection berm	Dug-out
Settling ponds	No mechanical cleaning; no bypass for flood flows; does not meet design criteria	Infrequent mechanical cleaning	Frequent mechanical cleaning; ability to bypass flood flows
Conduit for sediment transport	Long channel; shallow gradient		Short channel; steep gradient; leads to out-of-stream settling alternative to higher risk instream facility
Fords	Frequent; fine substrate		Infrequent; coarse substrate
Return period (flood flows) used for design of structures	< 1:2 year	1:2 year to 1:5 year	> 1:5 year

**High risk: 11 to 15    Moderate risk: 6 to 10    Low risk: 1 to 5**

**Figure 6: Risk Matrix for the Residual Effects of Placer Mining – Instream Works**

	Habitat Sensitivity					Water Quality
Potential Risk: Instream Works	High (5)	Moderate-High (4)	Moderate-Moderate (3)	Moderate-L (2)	Low (1)	
<b>High (3)</b>	(8) No instream works permitted <sup>1</sup> (fording may be conducted according to Letter of Advice)	(7) No instream works permitted <sup>1</sup> (fording may be conducted according to Letter of Advice)	(6) No instream works permitted <sup>1</sup> (fording may be conducted according to Letter of Advice)	(5) Activities require mitigative measures specified in license <sup>2</sup>	(4) Activities require mitigative measures recommended in placer mining guidebook <sup>3</sup>	Local habitat considerations not relevant <sup>4</sup>
<b>Moderate (2)</b>	(7) No instream works permitted <sup>1</sup> (fording may be conducted according to Letter of Advice)	(6) No instream works permitted <sup>1</sup> (fording may be conducted according to Letter of Advice)	(5) Activities require mitigative measures specified in license <sup>2</sup>	(4) Activities require mitigative measures recommended in placer mining guidebook <sup>3</sup>	(3) Activities require mitigative measures recommended in placer mining guidebook <sup>3</sup>	Local habitat considerations not relevant <sup>4</sup>
<b>Low (1)</b>	(6) No instream works permitted <sup>1</sup> (fording may be conducted according to Letter of Advice)	(5) Activities require mitigative measures specified in license <sup>2</sup>	(4) Activities require mitigative measures recommended in placer mining guidebook <sup>3</sup>	(3) Activities require mitigative measures recommended in placer mining guidebook <sup>3</sup>	(2) Activities require mitigative measures recommended in placer mining guidebook <sup>3</sup>	Local habitat considerations not relevant <sup>4</sup>

Aggregate Risk Score: High risk acceptable – 2 to 4; Moderate risk acceptable – 5; Low risk acceptable – 6 to 8

## Footnotes – Instream Works

A guidebook for placer mining is currently under development. When completed, it will be possible to make direct links between the guidebook's mitigation measures, placer mining activities described in the Pathway of Effects, and the requirements of watershed authorizations.

1. It is unlikely that instream works will be authorized in reaches of higher sensitivity. Fording may be permitted under the conditions specified in a Letter of Advice, providing it does not require any modification to the bed or banks of a stream (unless specifically addressed by a water use license).
2. Some instream works could lead to aquatic effects identified on the Pathways of Effects (PoE) as erosion/scouring, sediment, loss of area, change in nutrients, food source, channel morphology, fish passage, fish mortality and suppressed productivity. Specific mitigation measures to address these potential effects will be stipulated in the terms and conditions of water use licenses.
3. Instream works in these reaches may lead to the potential aquatic effects described above. Specific mitigation measures to address these potential effects will be described in the placer mining guidebook and must be implemented by any operation utilizing instream works.
4. These reaches are upstream of significant barriers to fish passage. Instream works in these reaches must be constructed to provide long-term stability, preventing the aquatic effects identified on the PoE as erosion/scouring and sediment.

**Table 3: Potential Severity of Effects Table for the  
Residual Effects of Placer Mining – Water Acquisition**

<b>Physical Disruption: Water Acquisition</b>	<b>High Risk (Score 3)</b>	<b>Moderate Risk (Score 2)</b>	<b>Low Risk (Score 1)</b>
Volume of water acquired	Total streamflow	20% to 80% of total streamflow	<20% of total streamflow
Method of acquisition	Gravity ditch, deflection berm, wing dam		Screened pump intake, groundwater

**High risk: 5 to 6      Moderate risk: 3 to 4      Low risk: 1 to 2**

**Figure 7: Risk Matrix for the Residual Effects of Placer Mining – Water Acquisition**

	Habitat Sensitivity					
Potential Risk: Water Acquisition	High (5)	Moderate-High (4)	Moderate-Moderate (3)	Moderate-Low (2)	Low (1)	Water Quality
<b>High (3)</b>	(8) Site-specific authorization <sup>1</sup> , or no HADD authorized	(7) Site-specific authorization for methods involving physical works <sup>1</sup>	(6) Site-specific authorization for methods involving physical works <sup>1</sup>	(5) Terms and conditions for physical works specified in license <sup>2</sup>	(4) Terms and conditions for physical works specified in license; limited suppression of productivity accepted <sup>3</sup>	Local habitat considerations not relevant <sup>4</sup>
<b>Moderate (2)</b>	(7) Site-specific authorization for methods involving physical works <sup>1</sup>	(6) Site-specific authorization for methods involving physical works <sup>1</sup>	(5) Terms and conditions for physical works specified in license <sup>2</sup>	(4) Terms and conditions for physical works specified in license; limited suppression of productivity accepted <sup>3</sup>	(3) Terms and conditions for physical works specified in license; limited suppression of productivity accepted <sup>3</sup>	Local habitat considerations not relevant <sup>4</sup>
<b>Low (1)</b>	(6) Site-specific authorization for methods involving physical works <sup>1</sup>	(5) Terms and conditions for physical works specified in license <sup>2</sup>	(4) Terms and conditions for physical works specified in license; limited suppression of productivity accepted <sup>3</sup>	(3) Terms and conditions for physical works specified in license; limited suppression of productivity accepted <sup>3</sup>	(2) Terms and conditions for physical works specified in license; limited suppression of productivity accepted <sup>3</sup>	Local habitat considerations not relevant <sup>4</sup>

Aggregate Risk Score: High risk acceptable – 2 to 4; Moderate risk acceptable – 5; Low risk acceptable – 6 to 8

## **Footnotes – Water Acquisition**

A guidebook for placer mining is currently under development. When completed, it will be possible to make direct links between the guidebook's mitigation measures, placer mining activities described in the Pathway of Effects, and the requirements of watershed authorizations.

1. Proposals for acquiring water by any means other than a screened pump intake will be subjected to a site-specific review and may be permitted by a separate authorization.
2. Some methods of water acquisition could lead to aquatic effects identified on the Pathways of Effects (PoE) as flow, erosion/scouring, sediment, channel morphology, fish passage, fish mortality and suppressed productivity. Specific mitigation measures to address these potential effects will be stipulated in the terms and conditions of water use licenses.
3. Water acquisition in these reaches may lead to the aquatic effects described above. While a higher degree of risk will be tolerated in reaches of lower sensitivity, specific mitigation measures to address these potential effects will be stipulated in the terms and conditions of water use licenses.
4. These reaches are upstream of significant barriers to fish passage. Water acquisition in these reaches must be managed to provide long-term stability and prevent potentially deleterious aquatic effects downstream.

**Table 4: Water Quality Objectives and Sediment Discharge Standards**

**Watersheds of Higher Sensitivity**

<b>Habitat Sensitivity</b>	<b>Sensitivity Indicators</b>	<b>Description</b>	<b>WQO<sup>9</sup></b>	<b>Sediment Discharge Standard</b>
<b>High</b>	<b>Tier 1<sup>1</sup></b>	<b>Salmonid spawning<sup>4</sup></b>	<b>&lt; 25 mg/L</b>	<b>0 mg/L<sup>10</sup></b>
<b>Moderate-H</b>	<b>Tier 2<sup>2</sup></b>	<b>Rearing CH<sup>5</sup> High</b>	<b>&lt; 25 mg/L</b>	<b>&lt; 200 mg/L<sup>11</sup></b>
<b>Moderate-M</b>	<b>Tier 2</b>	<b>Rearing CH<sup>5</sup> Moderate</b>	<b>&lt; 50 mg/L</b>	<b>&lt; 200 mg/L</b>
<b>Moderate-L</b>	<b>Tier 2</b>	<b>Rearing CH Low  Rearing Other High<sup>6</sup></b>	<b>&lt; 80 mg/L</b>	<b>Design Target: 0.2 ml/L<sup>12</sup> Action Level:<sup>13</sup> 0.8 ml/L<sup>15</sup> Compliance Level:<sup>14</sup> 1.2 ml/L</b>
<b>Low</b>	<b>Tier 3<sup>3</sup></b>	<b>Rearing Other Low<sup>7</sup></b>	<b>&lt; 200 mg/L</b>	<b>Design Target: 0.2 ml/L<sup>12</sup> Action Level: 1.0 ml/L Compliance Level: 1.5 ml/L</b>
<b>Water Quality</b>	<b>Field</b>	<b>No Fish<sup>8</sup></b>	<b>None</b>	<b>Standard to meet downstream Water Quality<sup>16</sup></b>

**Table 4: Water Quality Objectives and Sediment Discharge Standards (cont'd)**

**Watersheds of Lower Sensitivity**

<b>Habitat Sensitivity</b>	<b>Sensitivity Indicators</b>	<b>Description</b>	<b>WQO<sup>9</sup></b>	<b>Sediment Discharge Standard</b>
<b>High</b>	<b>Tier 1<sup>1</sup></b>	<b>Salmonid spawning<sup>4</sup></b>	<b>&lt; 25 mg/L</b>	<b>0 mg/L<sup>10</sup></b>
<b>Moderate-H</b>	<b>Tier 2<sup>2</sup></b>	<b>Rearing CH<sup>5</sup> High</b>	<b>&lt; 25 mg/L</b>	<b>&lt; 200 mg/L<sup>11</sup></b>
<b>Moderate-M</b>	<b>Tier 2</b>	<b>Rearing CH<sup>5</sup> Moderate</b>	<b>&lt; 100 mg/L</b>	<b>Design Target: 0.2 ml/L<sup>12</sup> Action Level:<sup>13</sup> 0.4 ml/L<sup>15</sup> Compliance Level:<sup>14</sup> 0.8 ml/L</b>
<b>Moderate-L</b>	<b>Tier 2</b>	<b>Rearing CH Low Rearing Other High<sup>6</sup></b>	<b>&lt; 200 mg/L</b>	<b>Design Target: 0.2 ml/L<sup>12</sup> Action Level: 1.0 ml/L Compliance Level: 2.0 ml/L<sup>17</sup></b>
<b>Low</b>	<b>Tier 3<sup>3</sup></b>	<b>Rearing Other Low<sup>7</sup></b>	<b>&lt; 300 mg/L</b>	<b>Design Target: 0.2 ml/L<sup>12</sup> Action Level: 1.0 ml/L Compliance Level: 2.5 ml/L<sup>18</sup></b>
<b>Water Quality</b>	<b>Field</b>	<b>No Fish<sup>8</sup></b>	<b>None</b>	<b>Standard to meet downstream Water Quality<sup>16</sup></b>

## Footnotes to Table 4

1. Tier 1 indicators are the presence of salmonid spawning or natal production areas.
2. Tier 2 indicators are gradient, proximity to natal production areas and water quality.
3. Tier 3 indicators are gradient, distance from natal productions areas and, in some cases, significant changes in habitat suitability.
4. Includes all species of Pacific salmon, lake trout, rainbow trout, bull trout, dolly varden; grayling are excluded.
5. Emphasis is for chinook salmon and the habitat sensitivity classification is based on habitat suitability for this species, not fish presence.
6. Emphasis is for chinook and non-anadromous (juvenile chinook may be present but the habitat suitability is low for chinook).
7. Emphasis is for grayling and other non-anadromous species using classification based on habitat suitability. This habitat is unlikely to support chinook as the habitat is unlikely to be suitable for this species, chiefly due to the distance from natal production areas.
8. "No Fish" means habitat inaccessible to fish and it must be confirmed by field verification of the presence of physical barriers to fish passage.
9. For higher sensitivity habitats a mixing zone model applies where the WQO is measured upstream of each operation and downstream at a distance between 2 or 3 times the river width to a maximum distance of 200 m. Elsewhere, a designated WQO monitoring site will be chosen that is representative for the habitat classification that is readily accessible and has sufficient flows. See WQO monitoring protocol for details.
10. This equates to a total recirculation system, mining practices with no direct discharges, or no mining in habitat of this sensitivity.
11. This is roughly equivalent to a total or partial recirculation system, or advanced effluent treatment (e.g. filtering through coarse tailings).
12. The design target is the best settling facility that can be established at a site given the prevailing site characteristics. A well-designed facility operated under optimal conditions can reduce effluent discharges to the 0.2 ml/l range, but physical restraints prevent construction of a facility of this effectiveness at some sites. The average performance for normal conditions (excluding non-compliance events) in the Yukon Placer industry was 0.3 ml/L in 2003 and 0.5 ml/L in 2004. A protocol for identification of physical constraints to settling will identify the appropriate design target.
13. The action level is the sediment discharge concentration that triggers action in the form of increased monitoring and/or implementation of remedial measures designed to bring discharges below the action level and closer to the design target.
14. The compliance level is the maximum concentration that is never to be exceeded and which triggers enforcement action.
15. Yukon-wide averages for the correlation between settleable solids (ml/L) and TSS (mg/L) are: 0.2 ml/L = 192 mg/L; 0.4 ml/L = 287 mg/L; 0.5 ml/L = 334 mg/L; 1.0 ml/L = 572 mg/L; 1.5 ml/L = 812 mg/L; 2.0 ml/L = 1054 mg/L. There is significant variation within these averages.
16. In the "no-fish" category the discharge standard will be set to maintain acceptable water quality in downstream habitats of greater sensitivity.
17. 2.0 ml/L is an interim standard with transition to 1.5 ml/L within three to five years subject to monitoring and adaptive management.
18. 2.5 ml/L is an interim standard with transition to 2.0 ml/L within three to five years subject to monitoring and adaptive management. The compliance level of 2.0 ml/L will apply in the 60 Mile watershed.