

THE DEVELOPMENT OF THE YUKON PLACER AUTHORIZATION

SUMMARY

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INTRODUCTION

This document has been prepared to assist all interested individuals and groups to effectively participate in the 2001 review of the Yukon Placer Authorization (YPA). This "Summary" should provide the reader with an overview of how the YPA came to be. The separate "Backgrounder" provides a more in-depth description of the details of the YPA.

The Minister of Fisheries and Oceans Canada, The Honourable John Crosbie P.C., M.P., signed the YPA on June 23, 1993. The YPA was signed because DFO considered that it represented an improved environmental management regime that would ensure the viability of the fisheries of the Yukon would not be affected by placer mining.

The YPA is supported by the "Policy Directive for the Protection of Fish Habitat in the Yukon from the Effects of Placer Mining Activities". The directive affirms the desire of the Governments of Canada and Yukon to foster co-operative resource development that ensures the preservation and restoration of Yukon fisheries (aboriginal, commercial, and recreational) and the continuation of the Yukon placer mining industry. To foster this co-operation, Ministers of the Government endorsed the Policy Directive to provide guidance to departmental officials in the administration of legislation that relates both to Yukon fish habitat and to Yukon placer mining. It was signed by the Ministers of the Departments of Fisheries and Oceans (DFO), Indian Affairs and Northern Development (DIAND) and Environment Canada (EC) and the Government Leader for the Yukon.

Prior to 1986, there were conflicting rules for managing placer mining and there was no single process for the miners to follow when getting their permit to mine. As a consequence a mutual lack of trust between government and the industry had developed. In an effort to bring some resolution to the issue, Government commissioned two separate reviews during the early 1980's. The first was lead by Ione Christensen and the second by Tim Koepke. In 1986 the Government of Canada established the Yukon Fisheries Protection Authorisation (YFPA) and formed the Yukon Placer Implementation Review Committee (IRC).

The IRC was a government/industry committee put in place to provide advice to the Ministers of DFO and DIAND on the implementation of YFPA. One of the IRC's responsibilities was to carry out a review of the YFPA and report to the Minister of DFO any deficiencies and recommendations for changes. The intent of the review was to put the YFPA on a better scientific foundation so that it would:

- Continue to give the industry certainty from government ambiguities by using the application of the one-window approach,
- Be affordable,
- Ensure the fisheries of the Yukon would not be affected by placer mining, and
- Provide a better management regime for Government.

The review process took over six and a half years to complete and cost the participants \$1.5 million in scientific investigations. DFO's Minister John Crosbie accepted the recommendations of the IRC and signed into law the new Yukon Placer Authorization (YPA) on June 23, 1993.

With the signing of the YPA the IRC was disbanded and replaced with the Yukon Placer Committee (YPC). The YPC had a membership that was expanded to include a representative for the First Nations and one for the environmental organizations (Yukon River Salmon Sub-Committee became an ex-official member later). Its terms of reference included the responsibility to review the effectiveness of the YPA in 2001.

BASIS IN LAW

Section 35(2) gives the Minister of Fisheries and Oceans the power to authorize the alteration, disruption or destruction of fish habitat. The YPA is an authorization under Section 35 (2) and, as such, permits placer miners to discharge sediments into streams and work in streams that support fish and fish habitat as long as the conditions stipulated in the YPA are followed.

The conditions of the YPA embodied DFO's 'no-net-loss' principle and the United Nation's sustainable development principle that states, "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

INTENT OF YPA

The objectives of the YPA are to:

- Give the industry certainty from government intervention,
- Ensure the fisheries of the Yukon would not be affected by placer mining, and
- Provide a better management regime for Government.

The development of the YPA was based on the principles that:

- Fisheries and Placer mining are important to the economy of the Yukon.
- Fish and fish habitats are sensitive to sediment
- Sediments from placer mining move downstream
- Sediment concentrations are diluted as streams grow in size
- Risks to fish and fish habitat from the influences of sediment diminish with the decrease in sediment concentrations
- All allowable sediment concentrations in a mine discharge are measured above background concentrations in the receiving stream.

The guidelines adopted by the IRC in developing the YPA were:

- It would be scientifically based,
- It would provide for sustaining the fisheries of today and ensure the development future fisheries would not be compromised.

FEATURES OF THE YPA

The IRC developed the YPA by progressively investigating its many components using consultants and special technical committees (biological, physical, economic). The components and a summary of the IRC's deliberations are:

FISHERIES MANAGEMENT STRATEGIES

- **Freshwater Species:** While all freshwater species are covered by the YPA, the predominant ones that the IRC has encountered in their deliberations are arctic grayling, rainbow trout and lake trout. Freshwater fish do not require specific habitat locations to effectively reproduce their species and if they find one habitat location unsuitable, they would seek out alternate spawning and rearing locations. This does not apply, however, to indigenous rainbow trout or lake trout populations, as they are known to emulate the habits of

anadromous species (see below). Not all freshwater species contribute to existing Yukon fisheries. The harvest of these species generally occurs at known locations in the Yukon.

- **Anadromous Species:** These are species whose life cycle is spent in both fresh and salt water. In the case of the Yukon they are chum and chinook salmon. Adults of these species, having spent as many as six years in the ocean, return to the stream in which they hatched and deposit and fertilize the eggs that will make up the next generation of that particular stock. The hatchlings of the new brood spend their early life stages, a few weeks to several years, in the fresh water environment. Rearing chum leave the Yukon system each spring before mining starts. Rearing chinook take several years to leave the Yukon system. The nominal capacity of the Yukon River for chinook adults returning to spawn was reported by DFO to be 300,000 adults. Current escapements are less than 50,000; therefore, existing rearing capacity is under-utilized. All salmon stocks contribute to existing Yukon fisheries. They are harvested at known locations in the Yukon.

STREAM CLASSIFICATIONS

Streams in the Yukon affected by placer mining are now classified for their capability to produce fish and whether those fish contribute to existing Yukon fisheries. There are five classification types and when completed, the classification becomes the basis for determining the effluent standards and how the principles of 'no net loss' and 'sustainable development' will be applied. These classifications are predominantly determined by the presence or absence of fish in the stream being classified.

- **Type I:** These streams and stream reaches support spawning and incubation of salmon, rainbow trout and lake trout eggs and alevins. Proposed habitat disruptions must be replaced with compensatory habitat before mining commences. There are to be no discharges into a Type I stream that have sediment concentrations that exceed the background concentration in the stream. For example if water is taken in with a sediment concentration of 1000mg/L, water can be discharged with a sediment concentration of 1000mg/L.
- **Type II:** These streams and stream reaches support rearing salmon fry/yearlings, rainbow trout and lake trout for all or part of the year. Proposed habitat disruptions must be replaced with compensatory habitat before mining commences. Discharges from a placer mine into a Type II stream are to be no more than 200 mg/L above the background concentrations.
- **Type III:** These streams and stream reaches support spawning, juvenile rearing and adult residency for all other freshwater species that contribute to known fisheries in the Yukon. Proposed disruption must be compensated before mining commences. Discharges from a placer mine into a Type III stream are to be no more than 200 mg/L above the background concentrations.
- **Type IV:** These are streams not seen to be important for the maintenance of the existing fisheries of the Yukon. If a stream/reach supports fish, it will be classified as a Type IVA and the stream's habitat productive capacity must be fully restored when mining is complete. If the stream/reach has no fish habitat, it will be classified as a Type IVB and will be fully stabilized when mining is complete. Discharges from a placer mine into a Type IV stream are determined through the application of procedures defined in the YPA. Type V: These are all streams not previously classified. These streams will be classified as Type I, II, III, or IV upon request.

DEFERMENT

In the context of the YPA, 'deferment' means that the productive capability of a stream/reach is reduced or eliminated for a period of time (a few days or until the mine plan is complete) to facilitate placer mining. Experience showed that sediments would no longer be deposited after mining stopped and with the application of the good management practices embodied in the YPA there would no longer be non-point sources of sediment from old workings. In addition, with the application of restoration technology, the stream would soon cleanse itself through natural processes and become fully productive. The authority to defer rests only with the Minister of DFO.

The premise for the application of deferment is that:

- Risks to fish can be elevated under certain circumstances, and
- Chinook rearing habitats are under-utilised.

Accordingly there are two types of deferment, a water quality deferment, Class Di, and a physical habitat deferment, class Dii. In all cases, the habitat conditions that existed before deferment are expected to be fully restored at the end of the time allowed for the deferment.

Water quality deferments (Class Di) may be applied to Type I, II and III streams.

Physical habitat deferments (Class Dii) may be applied to Type II streams.

MANAGING EFFLUENT DISCHARGES USING WATER QUALITY OBJECTIVES

The stream classification process clearly identifies which streams require the protection of the YPA. A 1964 report published by the United Nations, established that suspended sediment put fish at varying degrees of risk, depending on the concentrations they were exposed to. The risk categories provided in the report are:

None (0 mg/L);	Very Low (0-25 mg/L)	Low (25-100 mg/L)
Moderate (100-200 mg/L)	High (200-400 mg/L)	Unacceptable (>400 mg/L)

Based on this information the YPA uses the very low risk range (0 - 25 mg/L) as the water quality objective for the protection of fish. The target used for calculating effluent standards was the middle of the range, 12.5 mg/L, selected to ensure conservatism. This objective is applied to all Type I, II and III streams. This value could be increased as the result of a successful application for a Class Di deferment.

DILUTION MODEL

Effluent standards are calculated using a simple mathematical model that calculates the concentration of placer sediments at any location in the river system. Therefore, knowing that the water quality in the stream/reach that requires protection must be 12.5 mg/L, the model can calculate the amount of sediment that can be released from a placer operation to meet that standard. To make the calculation the model requires two addition pieces of information; the discharge from the placer mine and the flows in the receiving stream including all the tributary flows between the mine and the area requiring the protection.

Mine discharges were set at 1830 gallons per minute (0.13 cubic metres per second). This determination was based on the adjusted average of the water withdrawals stipulated in all the water licenses held by placer miners in 1989. The adjustment takes into account fact that the full amount allowed in the licenses was seldom fully utilized and that large-scale operators

generally re-circulate their water without discharging back to the stream. The period of discharge used in the YPA was mid-June, after spring freshet, to mid-October.

The mid-summer mean flow was selected for use in the model. While use of this flow could potentially increase the risk to fish during the low flow period during the late summer and early fall, it was not considered to be significant because of the conservativeness of the WQO established for the protection of fish, 12.5 mg/L, and the mine discharge volumes.

Determination of the average mid-summer mean flows was done using existing rainfall and stream flow data and prediction models developed by government scientists. The flow of each tributary and stream is determined in this way.

CALCULATION OF EFFLUENT STANDARDS

The effluent standard is calculated by inserting all the known information into the computer model and letting the computer make the determination. Knowing the water quality objective for the place in the stream that requires protection, the computer model calculates the allowable concentration of placer sediment at any location along the stream. It does this by comparing the flow and the sediment concentration at the point requiring protection with the flow and sediment concentration at the location being considered for a mine discharge to ensure that sediment loading remains the same at each place. This calculation is carried back to the point of discharge from the placer operation. The resultant calculated concentration of sediment in the discharge becomes the allowable effluent standard used in the YPA. This standard is measured as a suspended sediment concentration.

The model can also be applied to situations where there are multiple placer mines on the same stream system to ensure that there is no cumulative effect of placer sediments. (Note that this consideration of cumulative effects was a requirement of EARP and the then proposed CEAA.)

EFFLUENT DETERMINATION WHEN DEFERMENTS ARE APPLIED.

The same calculation process is followed for determining all effluent standards. When a Class Di deferment is applied to a stream, the point of protection (i.e. where the 12.5 mg/L is applied) will move downstream where the flow is larger. This has the effect of increasing the sediment concentration in the miner's allowable discharge.

METHODS OF MEASURING EFFLUENT QUALITY

The discharge standards, as determined by the model, are a suspended sediment standard. However, measuring effluent concentrations as suspended sediments is time consuming and costly for the government inspectors and the miners. Neither would know, until several days later, if, at the time the sample was taken, the standards were being met or not. The IRC investigated whether or not an alternative method of measure might be found that could be used as a replacement for the suspended sediment measure.

Three measurement options were available; suspended solids, settleable solids (Imhoff Cone), and turbidity. The difficulty for the IRC was two-fold. The placer sediments have a different mix of materials (sand, silt, clay and organic) in different parts of the Yukon. In addition the sediments from any one location are not always the same. Therefore, before any decision about alternatives could be made, a better understanding of the sediments was required.

Consultants and government scientists reviewed all available information about placer sediments and geology in the Yukon and determined that there are six different sediment types corresponding to six Yukon watersheds. They next conducted a detailed review of the data

specific to those watersheds and developed graphical relationships between suspended solids and settleable solids and between suspended solids and turbidity. As suspected, these relationships showed a high degree of variability.

Using a known mathematical tool, the regression analysis, the IRC was able to gain a clearer understanding of the variability of Yukon sediments. As well, they were able to better understand how the use of settleable solids as a measure of the sediment concentration in a mine discharge might affect achieving the water quality objective in the zone of protection. Further investigations showed, however, that there is a suspended sediment concentration that defined when a settleable solids measure could be used instead of the calculated suspended solids concentration without compromising the protection of the fish in the zone of protection. Accordingly the YPA contains discharges effluent standards in both suspended solids and settleable solids measures.

Measures using turbidity were not considered at that time because the technology for measuring turbidity was not well enough advanced to make it reliable or affordable. This topic will be one of the subjects discussed during the 2001 YPA review.

PUBLIC CONSULTATIONS

The IRC developed a draft YPA in 1992 and conducted a public discussion of the draft. The comments received were carefully reviewed and the final version was written. This version was circulated to the interested parties along with a report about the issues raised by the public and how the IRC addressed them in the YPA with the invitation to provide further comments.

The Minister received no significant comments and he signed the YPA into law on June 23, 1993.

ASSUMPTIONS REQUIRING FURTHER STUDY

During the development of the YPA information about certain assumptions regarding the physical characteristics of sediment was not available. Accordingly, these assumptions were targeted for additional studies during the period leading up to the 2001 review. The subjects to be studied were 'mixing zones' and 'sediment transport'.

A 'mixing zone' is that area in a river system where flow from a tributary becomes fully mixed into the larger stream. The length of this zone is dependent on the differences in water temperature and flow characteristics between the tributary and the receiving stream and therefore, the zone can be quite short or of considerable length. The concern requiring review is whether or not existing fisheries are being adversely affected because of the risk to fish cause by their exposure to the higher sediment concentrations in the mixing zone. This is of particular concern where a Type II tributary receives a Class Di deferment or where a Type VI stream discharges into a Type III, II, or I stream.

The YPA considers that the potential risks to fish in the mixing zone will have no detrimental effects on the existing fisheries of the Yukon.

"Sediment transport" is the physical movement of sediments in a stream of river. Sediments are known to move downstream with the flow of the water in the stream. The rate of movement is dependent on the velocity of the flow and as such, the ability for the stream to transport sediments is reduced when the flows are low. Sediments move downstream either in suspension or by bouncing along the bottom of the stream. As the stream slows down, sediments that once were suspended, begin to bounce and those that bounced, settle in those areas of the stream that are particularly slow. When the flow increases the sediments begin to move once again. In this way the stream can be expected to cleanse itself every year during the spring and fall flood events. The

sediments that will now be released under the YPA are much finer than under older management regimes and, accordingly, the YPA considers that there will be no accumulations of placer sediments that will be harmful to the existing fisheries of the Yukon.

HOW THE YPA WORKS

The administration of the YPA is based on an agreement between the Ministers of DFO, DIAND, and EC and the YTG. DIAND is responsible for monitoring, inspection and enforcement activities. DFO provides technical support to the placer miners for the development of the fish habitat compensation/restoration plan that is required as part of their overall mine plan.

The YPC provides the forum for information exchange regarding issues associated with industry performance, effectiveness of the YPA, stream classifications and deferral. They are also responsible for conducting a review of the YPA in 2001. The YPC, through its chairperson, reports to the Ministers of DFO and DIAND and makes recommendation to the Minister of DFO regarding stream classifications and stream deferrals.

STUDIES UNDERTAKEN

A number of studies have been undertaken as a result of the signing of the YPA in 1993. They address a broad cross-section of work including: General Studies about the Yukon, McQuesten River Studies, Water Quality Monitoring, Sediment Studies, Instrumentation Research, and Fisheries Studies. This information will be used by the YPC during the review.

TOPICS TO BE DISCUSSED DURING THE REVIEW

- The effectiveness of the YPA in protecting the fisheries of the Yukon.
- The appropriateness of water quality objectives used to protect important fish and fish habitat.
- Use of the measure of turbidity as a surrogate to the measure of suspended sediment concentrations and the measure of settleable solids currently used in the YPA.
- Effectiveness of the YPC in implementing the YPA. Are there changes that should be made?
- The appropriateness of the assumptions regarding fish behaviour, biology and habitat utilization used to develop the YPA. If not what changes should be considered?
- The potential for placer mining to release toxic metals to the waterways of the Yukon.
- The potential for cumulative effects of placer mining on the productive capability of the Yukon River system.
- The one window enforcement/inspection model. Is it working? Should a new model be considered, especially with the advent of devolution?

Questions to be Addressed During the Public Meetings

1. Has the YPA protected the fisheries of the Yukon? How and/or Why?
2. Has the YPA allowed placer mining to continue to make a contribution to the Yukon economy? How and/or Why?
3. Does the YPA stream classification system properly identify fish values in Yukon streams? How and/or Why?
4. Is the YPA's requirement for habitat compensation (i.e. habitat development before mining starts) appropriate? How and/or Why?
5. Is the YPA's requirement for habitat restoration (i.e. habitat reconstruction after mining is finished) appropriate? How and/or Why?
6. Has the application of the principle of "deferment" harmed the fisheries of the Yukon? How and/or Why?
7. Has the application of the principle of "deferment" worked for the placer industry? How and/or Why?
8. Allowable suspended sediment concentrations in placer discharges are based on meeting a sediment concentration objective of 12.5 mg/L in the zone of protection. Is this degree of protection appropriate? Why or Why Not?
9. The discharge concentrations are calculated using a dilution model. Is this method of calculation appropriate? Why or Why Not?
10. Streams with fish that do not support known fisheries or with fish habitat that is not needed to support known fisheries, receive less protection from placer sediment. Is this approach appropriate? Why or Why Not?
11. Allowable sediment concentrations are calculated as a suspended sediment measure. In certain circumstances, a settleable solids measure has been used as a surrogate for the suspended solids measure. Is this appropriate? Why or Why Not?
12. DIAND inspectors carry out one-window inspections of the placer industry performance. Is this appropriate? Why or Why Not?
13. The YPC has representation from DFO, DIAND, YTG, KPMA, YCS, Yukon First Nations, and Yukon salmon subcommittee. The committee provides advice to the Minister on stream classifications, deferments, and discharge concentrations. Is the membership appropriate? Why or Why Not?
14. The decision process adopted by the YPC is based on consensus. Is this appropriate? Why or Why Not?
15. Any additional comments about the YPA?

Written Comments can be submitted to Robert Hornal, 2576 West 7th Ave, Vancouver, BC, V6K 1Y9 Fax: 604 731 0244 on or before Feb 15, 2002.

