

CHAPTER 5
APPENDIX 5D

Mayo Hydroelectric Facility
Flow Reduction Ramping Procedures



OBJECTIVE

As part of its commitment to environmental responsibility, Yukon Energy endeavours to protect and, where possible enhance wild indigenous fish populations in the aquatic systems in which it operates. One of these actions is related to managing potential fisheries impacts associated with flow regulation at the Mayo Hydroelectric Generating Facility. Rapid flow reduction events, in the Wareham spillway and at the Mayo Lake control structure, have the potential to lead to fish stranding events. Accordingly, the magnitude of flow reductions are to be managed over a period of time, where and to the degree practical.

The primary objective of this procedure is to mitigate the impact of flow reductions from the Mayo facilities on the native and transient fish species of the Mayo River. This procedure provides specific explicit guidance to be followed by Yukon Energy's Mayo operating staff in regards to managing flow changes where practical.

SCOPE

The key operating decision affected by this procedure is the discharge reduction ramping rate, so as to minimize fish stranding (pools and interstitial spaces). Procedures are applicable for all locations of water flow control into and along the Mayo River.

The geographic scope of this procedure is the approximate 50 km long section of the Mayo River, from Mayo Lake to the Stewart River. The priority area for management is the portion of the river from Wareham Dam to the Stewart River, but also includes the reaches of the Mayo River immediately downstream of Mayo Lake.

REGULATORY AUTHORIZATION OF MAYO RIVER FLOW ALTERATIONS

Yukon Energy is authorized by the Yukon Water Board, pursuant to Water Use Licence HY99-012, to regulate water levels in Mayo Lake as well as flows in the Mayo River downstream of the Lake. The licence directs Yukon Energy to, at all times, maintain a minimum flow rate of $2.8\text{m}^3/\text{s}$ of water in the Mayo River, with the exception of the portion of the river between the Wareham Dam and the existing powerhouse.



SYSTEM FLOW CONTROL POINTS AND INFRASTRUCTURE

Flow control of the Mayo River is maintained at the:

- Mayo Lake Control Structure
 - Adjustable control valves allow for flows through the structure from 0 m³/s to 36m³/s (at the full supply level of Mayo Lake).
- Wareham Dam Spillway
 - Adjustable spillway gates allow for flows through the dam from 0 m³/s to in excess of 100 m³/s.

FLOW RAMPING PROCEDURES

Flow reduction ramping rates have been established based on a range of 25-50% of current flow. For all of the available control points the following criteria shall be used to execute required flow reductions in the Mayo River:

- **High Sensitivity Conditions:** For discharge changes when flows are currently set ≤ 10 m³/s, use a 1 to 2.5 m³/s per hour flow reduction ramp rate (although some situations may require a higher ramp rate).
- **Moderate Sensitivity Conditions:** For discharge changes when flows are currently set between 20 m³/s and 10 m³/s, use a 5 to 6.5 m³/s per hour flow reduction ramp rate until the flows rate reaches 10 m³/s, thereafter use a 1 to 2 m³/s per hour ramp rate (although some situations may require a higher ramp rate).
- **Low Sensitivity Conditions:** For discharge changes when flows are currently set between >40 m³/s and 20 m³/s, use a 10 m³/s per hour flow reduction ramp rate until the flows rate reaches 20 m³/s, thereafter use a 5 to 6.5 m³/s per hour ramp rate (although some situations may require a higher ramp rate).
- Do not lower flows below 2.8 m³/s in the Mayo River under any circumstance other than in an emergency situation, except as allowed between Wareham Dam and the existing Powerhouse. Such emergency circumstances should be immediately relayed to the Yukon Energy's System Control Centre for further direction on procedural requirements and decision-making.
- A fish stranding survey shall also be undertaken for the section of the Mayo River between the Wareham Dam Spillway and the Powerhouse when flows are scheduled to be reduced to



0 m³/s in this reach of the River for more than 5 days during the period from July 1st to August 31st of any year. Any fish observed to be stranded in the main channel or in the plunge pool shall be salvaged and deposited back into the Mayo River downstream of the Powerhouse¹.

- When reducing flow rates for each of the above conditions the specified maximum reduction per hour should be completed as gradually as is practical – e.g., if the flow reduction is required to go from 20 m³/s to 10 m³/s, ideally efforts can be made to make the required 5 to 6.5 m³/s flow reduction in several increments over the hour.

The following is an example of the steps and time necessary to reduce flows at the Mayo Lake Control Structure when there is a requirement to reduce flow to the licence minimum (2.8 m³/s) from the maximum flow rate at the structure (~36 m³/s).

- Hour 1 (Current Flow = 36 m³/s) – Gradually reduce the total flow by 10 m³/s.
- Hour 2 (Current Flow = 26 m³/s) – Gradually reduce the total flow by 10 m³/s.
- Hour 3 (Current Flow = 16 m³/s) – Gradually reduce the total flow by 6.5 m³/s.
- Hour 4 (Current Flow = 9.5 m³/s) – Gradually reduce the total flow by 2.5 m³/s.
- Hour 5 (Current Flow = 7 m³/s) – Gradually reduce the total flow by 2.5 m³/s.
- Hour 6 (Current Flow = 4.5 m³/s) – Gradually reduce the total flow by 1.7 m³/s.

At the end of Hour 6, the target flow of 2.8 m³/s will have been reached.

¹ Such a procedure will ensure that fish, most notably Chinook salmon, in this section of the River that did not drop back downstream during the flow reduction period, are moved downstream to provide a suitable environment.