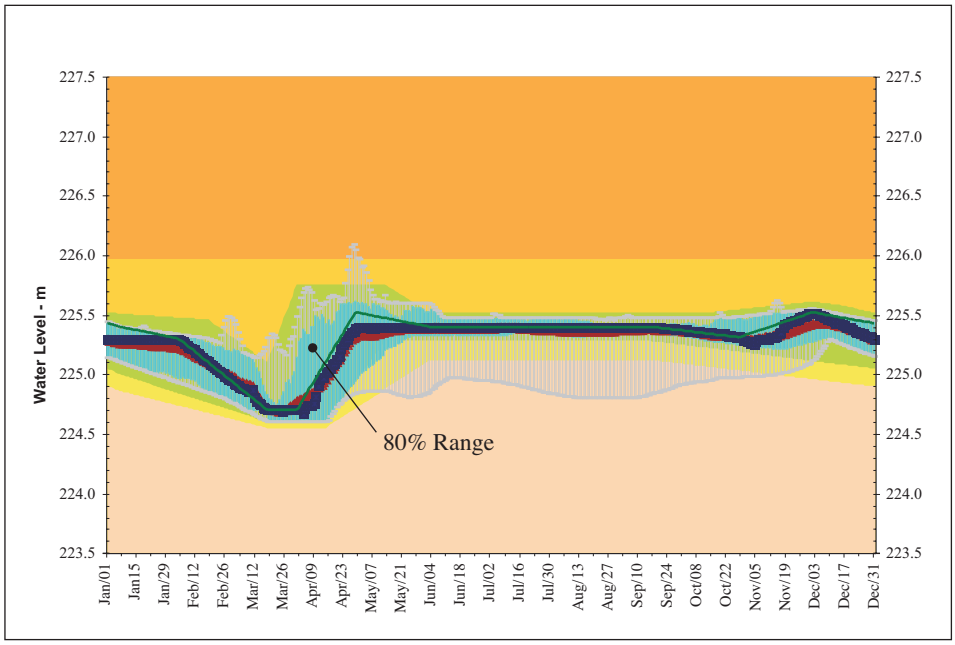
11.4.3 Lake Muskoka

The proposed plan is compared to the present operating plan in Table 11.4.3 and Figure 11.4.3. The proposed plan decreases the extent of the TOL, as well as the lower limit of the NOZ for the fall period. It is anticipated that a similar number of dam operations will be required to achieve the proposed water levels and flow regime.

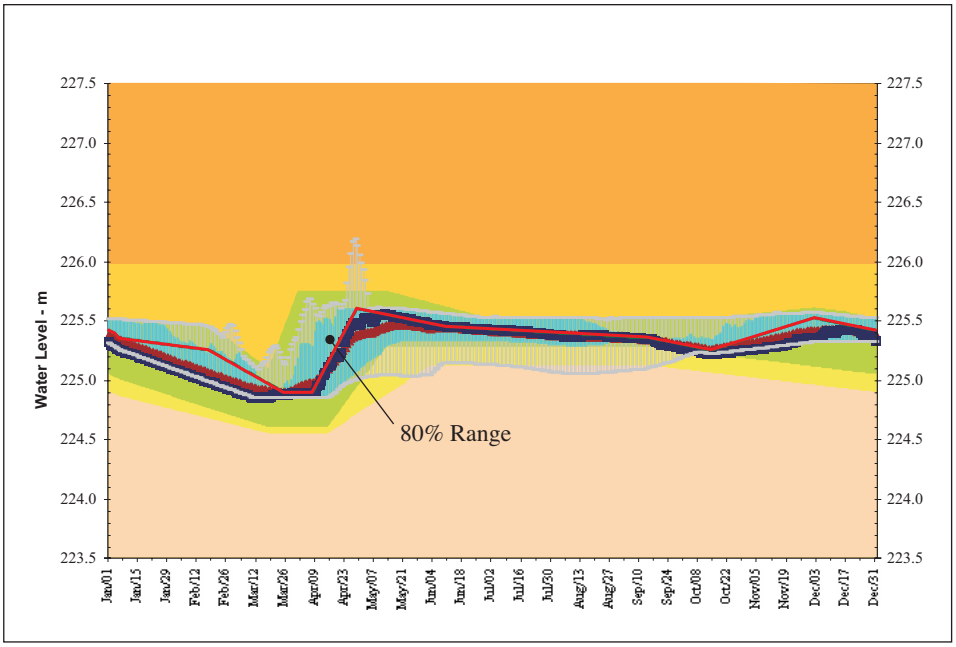
Table 11.4.3
Lake Muskoka

Component	Operating Characteristics	Present Plan	Proposed Plan	Comments
Spring Water Level (freshet to May 30)	Upper NOZ (m) Lower NOZ (m) TOL (m) Peak Date* TOL Change WL Direction	225.75 224.6 – 225.28 225.52 – 225.4 April 29 0.12 Down	225.75 224.6 – 225.28 225.6 – 225.48 May 1 0.12 Down	A slightly higher spring high water level, followed by a gradual summer drawdown to a target elevation approximately 0.05 m lower.
Summer Water Level (June 1 to Sept 15)	Upper NOZ (m) Lower NOZ (m) TOL (m) TOL Change WL Direction	225.75 – 225.52 225.28 225.4 0 -	225.75 – 225.52 225.28 225.48 – 225.35 0.13 Down	
Fall Water Level (Sept 16 to Nov 30)	Upper NOZ (m) Lower NOZ (m) TOL (m) TOL Change (m) WL Direction	225.52 – 225.61 225.28 – 225.12 225.4 – 225.31 0.09 Down, then natural rise to 225.52 by Dec 1	225.52 – 225.61 225.28 – 225.12 225.35 – 225.25 0.1 Down, then natural rise to 225.52 by Dec 1	Drawdown to 0.06 m lower October 15 level for lake trout spawning; followed by a natural rise to the same December 1 elevation prior to the winter drawdown.
Winter Water Level (Dec 1 to March 15)	Upper NOZ (m) Lower NOZ (m) TOL (m) TOL Change (m) WL Direction	225.61 – 225.1 225.12 – 224.6 225.52 – 224.7 0.82 Down	225.61 – 225.1 225.12 – 224.6 225.52 – 224.9 0.62 Down	Slow decline in over-winter level to slightly higher (0.2 m) winter target elevation.
Downstream River Reach and Lake Outflow Characteristics	Planned flow release Median Wkly Flow - Summer - Winter Minimum Daily Flow (7-d average) Maximum Daily Flow (50-yr average) 7Q2 (2-yr min) 7Q10 (10-yr min)	6 m^3/s summer, 0.82 m, Dec 1 to Mar 15 29.66 m^3/s 84.84 m^3/s 7.34 m^3/s 299.79 m^3/s 5.0 m^3/s 3.0 m^3/s	6 m^3/s summer, 0.62 m, Dec 1 to Mar 15 31.25 m^3/s 88.08 m^3/s 10.16 m^3/s 309.57 m^3/s 7.78 m^3/s 3.0 m^3/s	Higher summer flow, slightly more fall drawdown (September 15 to October 15) and less winter drawdown.

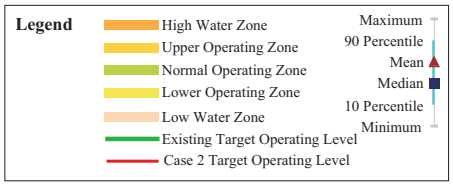
Lake Muskoka / Burgess GS



a) Existing Operating Plan and Water Level Statistics *



b) Proposed Operating Plan and Water Level Statistics *



* Derived from ARSP Model

Figure 11.4.3
Muskoka River Water Management Plan

Comparison of Present and Proposed Operating Strategies - Lake Muskoka

ACRES International

11.4.4 Burgess Generating Station

No changes are proposed to the operating plan for this facility. The facility is located on Lake Muskoka adjacent to the MNR controlled Bala North and Bala South dams, and provides a flow of 0.5 to 4 m^3/s into Bala Reach. The facility is advised (by MNR) when there is sufficient water to operate, and when it must shut down (typically when both Bala North and Bala South dams are closed and water levels on Lake Muskoka are falling below the NOZ). The facility will cease operations within 24 hrs of the notification by MNR to shut down.

The upper and lower limits are typically the NOZ of Lake Muskoka, but these are not a compliance zone for the facility. As outflow from Lake Muskoka increases, flow is sequentially allocated to Burgess GS, then Bala South and lastly Bala North dam. Under declining flows, the priority of flow sequence is reversed.

Burgess Generating Station				
Component	**Operating Characteristics**	**Present Plan**	**Proposed Plan**	**Comments**
Spring Water Level (freshet to May 30)	Upper NOZ (m) Lower NOZ (m) TOL (m) Peak Date*	225.75 224.6 – 225.28	225.75 224.6 – 225.28	Operating range is the same as that of Lake Muskoka. No change is proposed. Facility will shut down at MNR's request if insufficient flow is available in the system.
Summer Water Level (June 1 to Sept 15)	Upper NOZ (m) Lower NOZ (m) TOL (m) TOL Change WL Direction	225.75 – 225.52 225.28	225.75 – 225.52 225.28	
Fall Water Level (Sept 16 to Nov 30)	Upper NOZ (m) Lower NOZ (m) TOL (m) TOL Change (m) WL Direction	225.52 – 225.61 225.28 – 225.12	225.52 – 225.61 225.28 – 225.12	
Winter Water Level (Dec 1 to March 15)	Upper NOZ (m) Lower NOZ (m) TOL (m) TOL Change (m) WL Direction	225.61 – 225.1 225.12 – 224.6	225.61 – 225.1 225.12 – 224.6	
Downstream River Reach and Lake Outflow Characteristics	Planned flow release Median Wkly Flow - Summer - Winter Minimum Daily Flow (7-d average) Maximum Daily Flow (50-yr average) 7Q2 (2-yr min) 7Q10 (10-yr min)	4.0 m^3/s annual average (for power) 4.0 m^3/s 4.0 m^3/s 2.23 m^3/s 4.0 m^3/s 0 m^3/s 0 m^3/s	4.0 m^3/s annual average (for power) 4.0 m^3/s 4.0 m^3/s 2.62 m^3/s 4.0 m^3/s 0 m^3/s 0 m^3/s	Consistent spring, summer, fall and winter flow when Lake Muskoka water levels are within the desired levels. During low flow periods, Burgess GS will be shut down (as per MNR's request) to allow MNR to assume control of Lake Muskoka levels and outflows.

11.4.5 Bala Reach, Ragged Rapids GS and Moon Dam

The proposed operating plan for Bala Reach is presented in Table 11.4.4 and Figure 11.4.4. Levels on Bala Reach are affected by both the operation of the upstream Bala dams, and the operation of the downstream waterpower facility (Ragged Rapids) and control dam (Moon Dam). Water level management is further complicated by the action of Moon Chutes (a natural constriction at the downstream end of Bala Reach) which restricts water passage out of Bala Reach at river flows above approximately 85 m^3/s. Water level management in Bala Reach is a joint effort between MNR and OPG, as MNR controls input into the reach, while the Moon Chutes and OPG control outflow from the reach.

During high flow events (>100 m^3/s), high water levels are a common occurrence in Bala Reach due to the constriction at Moon Chutes. Under these conditions, water levels in Bala Reach are typically inversely correlated with Ragged Rapids water levels, as the Moon Dam is opened to pass excess flow down the Moon River (see Figures 11.4.4a and b). This in turn lowers the Ragged Rapids head-pond level, although the constriction at Moon Chutes reduces the effectiveness of these actions as flows progressively exceed 85 m^3/s. Low levels at Ragged Rapids are utilized to "draw" water through the Moon Chutes, in order to achieve lower water levels in Bala Reach.

The present operational regime for Bala Reach includes a TOL band, a NOZ and Upper and Lower Operating Zones (see Figure 11.4.4a). The summer TOL band was revised in 2003 as a result of discussions between OPG and the Moon River Cottage Owners Association. As a result, the summer (June 1 to October 15) TOL is from 219.0 to 219.3 m, while the fall, winter and spring (June 16 to May 30) TOL remained from 219.2 to 219.5 m. The NOZ extends upward to 219.6 m during the summer period, and to 220.38 m during the remainder of the year.

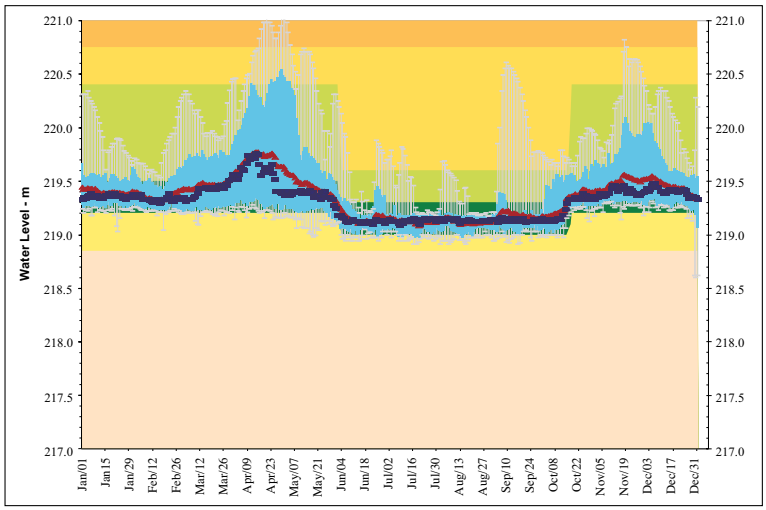
The Bala Reach TOL band (219.0 to 219.3 m from June 1 to October 15, and 219.2 to 219.5 m during the remainder of the year) will become the compliance zone (see Section 13 for definition of compliance) for the Ragged Rapids and Moon Dam facilities, and will create legally enforceable upper and lower limits during normal operating conditions.

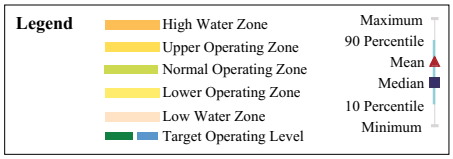
Due to the need to utilize the Ragged Rapid GS and Moon Dam to maintain Bala Reach water levels within the TOL during normal hydrologic conditions, and to try to reduce water levels in Bala Reach during extreme flow events (i.e., >85 m^3/s), no compliance zone is established for the Ragged Rapids head pond. The current operating zones for the Ragged Rapids head pond will be maintained by OPG for information, and to assist with their day-to-day operations. It is anticipated that a similar number of dam operations will be required to achieve the proposed water levels and flow regime.

Table 11.4.4
Bala Reach, Ragged Rapids Generating Station and Moon Dam

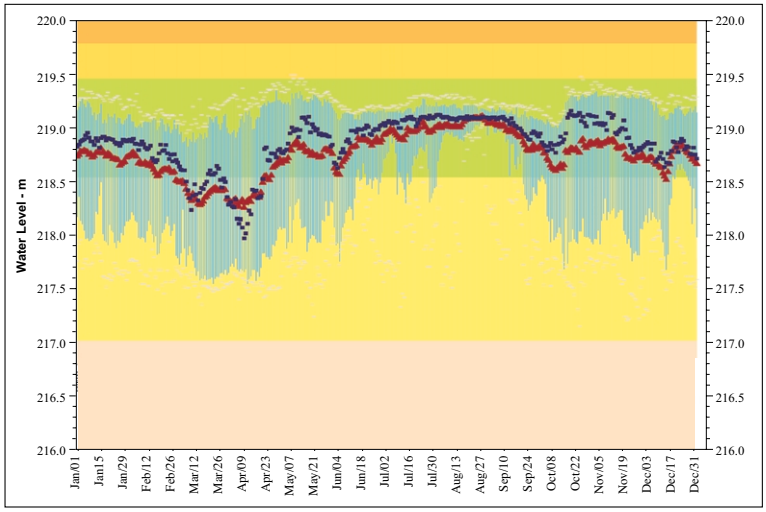
Component	Operating Characteristics (Bala Reach)	Present Plan	Proposed Plan	Comments
Spring Water Level (freshet to May 30)	Upper Limit (m) Upper NOZ (m) Upper TOL (m) Lower TOL (m) Lower NOZ (m) Lower Limit (m) HFT (m^3/s) LFT (m^3/s)	220.74 220.38 219.5 219.2 219.2 218.85 None None	Upper TOL Upper TOL 219.5 219.2 Lower TOL Lower TOL 85 6	Ragged Rapids head pond is actively used to decrease Bala Reach water levels during high flow conditions. The previous TOL band will become the compliance zone for the facility, in conjunction with a HFT that takes into account the action of Moon Chutes on flows and levels.
Summer Water Level (June 1 to Oct 15)	Upper Limit (m) Upper NOZ (m) Upper TOL (m) Lower TOL (m) Lower NOZ (m) Lower Limit (m) HFT (m^3/s) LFT (m^3/s)	220.74 219.6 219.3 219.0 219.0 218.85 None None	Upper TOL Upper TOL 219.3 219.0 Lower TOL Lower TOL 85 6	
Fall Water Level (Oct 16 to Nov 30)	Upper Limit (m) Upper NOZ (m) Upper TOL (m) Lower TOL (m) Lower NOZ (m) Lower Limit (m) HFT (m^3/s) LFT (m^3/s)	220.74 220.38 219.5 219.2 219.2 218.85 None None	Upper TOL Upper TOL 219.5 219.2 Lower TOL Lower TOL 85 6	
Winter Water Level (Dec 1 to March 15)	Upper Limit (m) Upper NOZ (m) Upper TOL (m) Lower TOL (m) Lower NOZ (m) Lower Limit (m) HFT (m^3/s) LFT (m^3/s)	220.74 220.38 219.5 219.2 219.2 218.85 None None	Upper TOL Upper TOL 219.5 219.2 Lower TOL Lower TOL 85 6	
Downstream River Reach and Lake Outflow Characteristics below Ragged Rapids	Planned flow release Median Wkly Flow - Summer - Winter Minimum Daily Flow (7-d average) Maximum Daily Flow (50-yr average) 7Q2 (2-yr min) 7Q10 (10-yr min)	53.9 m^3/s annual average (for power) 27.66 m^3/s 81.41 m^3/s 0 m^3/s 92.23 m^3/s 5.03 m^3/s 0 m^3/s	54.18 m^3/s annual average (for power) 31.34 m^3/s 84.79 m^3/s 0 m^3/s 88.88 m^3/s 5.73 m^3/s 0 m^3/s	A minimum target flow of 14 m^3/s will be provided as a best management practice from April 15 to June 1 for walleye spawning at Moon Falls when flows exceed 20 m^3/s or greater. When 20 m^3/s cannot be sustained, flows may be reduced to 8 to 10 m^3/s on the Moon River and 4 to 6 m^3/s on the Musquash River. An adaptive management approach will be followed to provide a flow regime that addresses spring walleye spawning issues and Moon River habitat during other parts of the year.

Bala Reach and Ragged Rapids

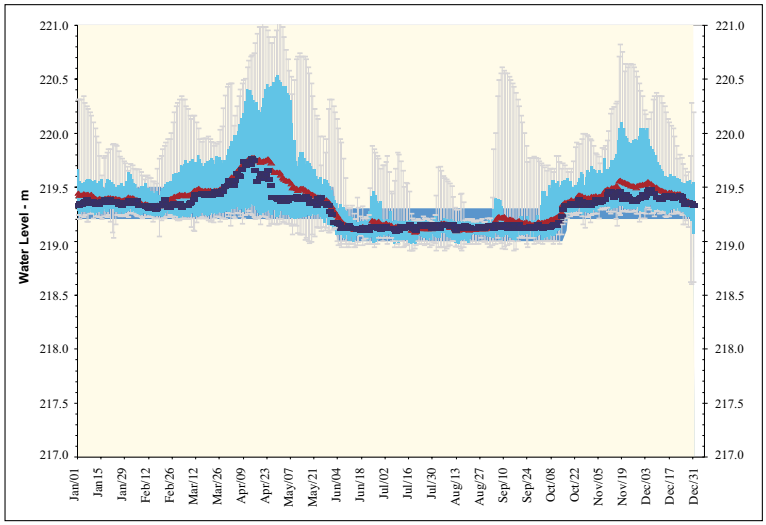




a) Existing Operating Plan and Historical Water Level Statistics - Bala Reach



b) Existing Operating Plan and Historical Water Level Statistics - Ragged Rapids



c) Proposed Operating Plan and Historical Water Level Statistics - Bala Reach

Figure 11.4.4
Muskoka River Water Management Plan
Comparison of Present and Proposed Operating Strategies - Bala Reach and Ragged Rapids

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