



BLACK MOUNTAIN IRRIGATION DISTRICT WATER TREATMENT PLANT



WATER QUALITY

Water quality is an issue that has gained a great deal of attention in recent years. With outbreaks of water-borne diseases such as *E. coli*, *Cryptosporidium*, and *Giardia Lamblia* (beaver fever) across the country in recent years, the security and safety of our public water supplies is of utmost importance. Safe quality drinking water is in high demand.

SUPPLY WATER

The Black Mountain Irrigation District water treatment plant receives its water from Mission Creek. BMID has 3 high elevation lakes within the watershed of which Belgo Lake and Greystoke Lake are the largest. BMID also has two lakes in the Scotty Creek watershed. Water quality in Mission Creek is normally within the Guidelines for Canadian Drinking Water Quality (GCDWQ) throughout the year except during spring run-off when rainfall and snowmelt can cause the water quality to quickly deteriorate.



Mission Creek Intake

Black Mountain Irrigation District had encountered numerous water quality problems in the past in Mission Creek, especially in 1997 when heavy rains and mudslides upstream of the intake produced poor water quality conditions. Black Mountain Irrigation District took a proactive role in determining the most feasible plan to treat the annual spring run-off and maintain drinking water standards within the Guidelines for Canadian Drink Water

Quality (GCDWQ). A water treatment facility was pilot tested, designed, and then constructed to provide the necessary means of treating Mission Creek water.

WATER TREATMENT

PROCESS

OPERATION

The Black Mountain Irrigation District operates a Class IV water treatment plant and water distribution system. They both require use of a SCADA system although manual control of the plant and system is possible in the case of an emergency. The plant has produced very good results since its construction. These include; reduction in total organic carbon (TOC) by 50% (TOC can produce trihalomethanes when combined with chlorine), reduction in turbidity in the water distribution system of less than 1.0 NTU even though turbidity in Mission Creek can exceed 150 NTU on occasion, and reliable reduction of colour to within GCDWQ. A description of the water treatment process follows.

1. INTAKE

Water is first coarsely screened at Mission Creek to protect the intake valves from objects such as logs, branches or large rocks and to prevent these objects from entering the process. Water enters the treatment process through a dual piping system consisting of two 900 mm diameter pipes and automated slide gates.

2. GRIT POND

Water enters the grit pond and flows slowly through it allowing heavier particles such as sand and silt to settle out. When the water reaches the end of the grit pond, process water for the plant is screened through 1.5 mm fish screens and excess water is bypassed and returned through a fish channel that allows fish and floating debris back to Mission Creek.



Grit Pond and Fish Screens

3. RAPID MIX

Process water is metered by 2 magnetic flow meters. From this point, it enters the one of 2 rapid mixer tanks where coagulant (Isopac) is added along with a cationic polymer. Water and coagulants are then rapid mixed for upwards of one minute.

4. FLOCCULATORS

Flocculation begins at the first of three flocculation tanks with anionic polymer addition taking place in the second flocculation tank. By the time the process water reaches the third flocculation tank, floc forms and is clearly visible.

5. SEDIMENTATION CLARIFIERS

The water then enters one of two clarifiers for sedimentation. Water flows through the clarifiers passing a HDPE baffle curtain. The curtain creates a “plug” flow through the clarifier and allows clear water to flow through it and the sludge to settle out. Once

the sludge settles out of the water, the sludge is collected and pumped to a sludge holding pond where it is further processed. The clear water from the top of the clarifiers is diverted to the first of two balancing reservoirs.



Sedimentation Clarifier

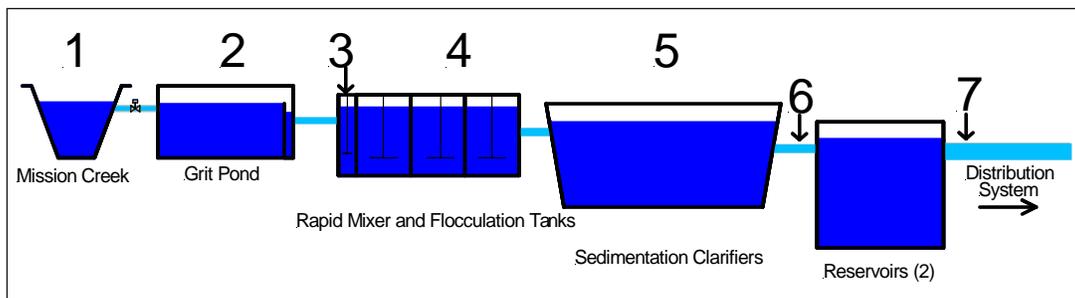
6. pH ADJUSTMENT

Prior to the treated water entering the first of two reservoirs, pH adjustment must occur for corrosion control. Caustic soda is added to the clarified water to provide water with a minimum alkalinity of at least 15 mg/L and a pH of 7.5.

7. DISINFECTION

Once the water has moved through Stevens and Hadden Reservoirs and given further time to settle out particulate matter, chlorine disinfection occurs. A fine screening process occurs at this point to screen out any material that may have entered either reservoir. From here the water enters the distribution system.

Treatment Plant Schematic



Plant Parameters

Design capacity 105 ML/day 1,200 L/s
 Average Flow 2002 54 ML/day 625 L/s
 Peak Flow 2002 115 ML/day 1,350 L/s

Process

Grit Pond

Volume: 3,600 m³
 Retention Time: 0.83 hours
 Dimensions (m): 90 x 20 x 2

Rapid Mixer 2 (1 per train)

Volume: 31 m³
 Retention Time: 1 minute

Flocculator Tanks 6 (3 per train)

Volume per tank: 250 m³
 Retention time: 10 minutes
 Dimensions (m): 7 x 7 x 6

Clarifiers 2 (1 per train)

Volume of clarifier: 10,692 m³
 Retention time: 7 hours at peak flow
 Dimensions (m): 100 x 35 x 6

Reservoirs 2

Volume of reservoirs: 190,000 m³

Distribution System

Pressure Reducing Stations 13_
 Additional Supply: Scotty Creek Intake
 3 Groundwater wells
 Length of pipe underground: 167 km

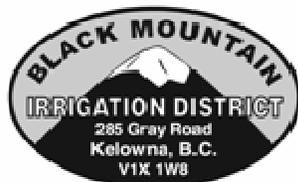
WATER QUALITY PARAMETERS

Mission Creek (April to July Annually)

	Low	High	Average
Turbidity (NTU)	0.9	270	18
Colour (TCU)	23	68	44
pH	6.7	7.7	7.3
Alkalinity (mg/L)	10	31	20
Particle Counts (#>2µ/ml)	2100	35000	9000

Treated Water

	Low	High	Average
Coagulant Dose (mg/L)	21	44	30
Caustic Dose (mg/L)	3	7	4
Turbidity (NTU)	0.5	1.7	1
Colour (TCU)	5	11	5
pH	7.1	8.1	7.6
Alkalinity (mg/L)	13	25	18
Particle Counts (#>2µ/ml)	250	1100	600



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