1. GENERAL

1.1 General

.1 This section presents design guidelines for reservoirs installed within the Black Mountain Irrigation District (BMID)

.2 Where the water utility infrastructure is located on private or public lands that are not common road right of way, the infrastructure must be located on legally designated right-of-way. Minimum right-of-way width is to be 6.0 metres for road access and buried pipe access.

.3 Right of way is required for routes for watermain, road access and electrical service (if required) to the reservoir site.

.4 The location of building from property lines or right-of-way boundary should exceed the minimum zoning requirement setback of the local municipal authority.

1.2 Pre-Design/Design Requirements

.1 The Developer must retain a Professional Engineer to design and certify the works. Engineer is to submit a Pre-design Report listing service area, reservoir location, serviced number of lots and expected future development lots/units within this reservoir service pressure zone;

.2 Report to be acceptable to BMID prior to proceeding with Detailed Design;

.3 Detailed Design to be reviewed by BMID staff and their Engineer prior to construction

.4 Interior Health Authority approval is to be obtained from the Public Health Engineer. A copy of approval to be provided to BMID prior to construction.

1.3 Reservoir Size

.1 Reservoir size to be based on the formula; A + B + C = Total Storage Required;

A = Balancing Storage = Maximum daily water demand for service area for 6 hours;
B = Fire Storage = Highest fire demand for area for time span as specified by F.U.S;
C = Emergency Storage = 25% of the sum of A and B.

.2 Volume of reservoir may be reduced if emergency storage and fire protection can be supplied from a higher elevation reservoir and the controls are in place. Balancing storage is to be provided at the local elevation. Water can may be cascaded through no more than one reservoir facility / pressure zone.

.3 Reservoir is to be a minimum of two compartments with interconnection and mixing equipment to promote turnover of reservoir water. Maximizing turn over of water is to be incorporated into the design. An approved baffle system is preferred but alternative mixing systems will be considered.

.4 A minimum freeboard of 0.3 m is to be provided above high water level. This volume is not to be included in calculating the reservoir storage capacity

1.4 Reservoir Design

.1 Reservoirs are to be below ground covered concrete structures. Reservoirs can be circular if no additional reservoir storage will be constructed at the site. If additional storage may be possible, then a rectangular reservoir is required. Sufficient land area must be set in place to allow for reservoir expansion.

.2 Piping set up is to accommodate reservoir site expansion.

.3 Reinforced concrete walls, base, roof and other structural components are to be designed by a professional engineer. Design is to be to current standard for concrete water retaining structures: American Concrete Institute Manual ACI 350R.

.4 Exposed concrete walls that protrude greater than 0.3m out of the ground are to have an aesthetically pleasing finish. A powder coated hand rail is required around the perimeter for any reservoir wall protruding 1.0m or more above ground level. Formed concrete is not aesthetically acceptable.

.5 Each reservoir cell to have ½ of total required volume. Each cell is to have the capability to be operated with the other cell off-line for cleaning and maintenance.

.6 Reservoir roof to slope to sides so no water is left standing on roof;

.7 Lockable 900 mm x 900 mm aluminum hatches to be provided in roof of reservoir. Hatch required for each cell to allow for operations and maintenance. Hatch to have a drip proof cover with weatherproof seal so that no water may drip into the reservoir. Pedestrian access to reservoir roof is to be provided. Aluminum ladder is to be bolted onto reservoir interior wall adjacent to each reservoir hatch. MSU Model M-4 or approved equal. Hatch fasteners to concrete to be stainless steel. Inset plates to be stainless steel or aluminum. Provide intrusion alarm and connect to SCADA.

.8 All pipe protrusions through concrete to be minimum Schedule 40 PVC. All attachments securing components within the reservoir is to be stainless steel.

.9 Survey control monument to be cast into reservoir roof near the hatches. Geodetic elevation is to be inset in the monument.

.10 A sump is to be provided in the base slab to promote draining and cleaning of the reservoir. Reservoir floor is to drain to sump. Sump to be located near access ladders. Size is to be 600mm x 600mm x 300mm deep. Reservoir drain piping outlet to be at bottom of sump.

.11 Sub-drains to be provided to divert groundwater and seepage away from the reservoir base;

.12 Single watermain to the reservoir is acceptable, provided that proper check valve and pipe arrangement is installed to promote reservoir turnover.

.13 Ventilation piping to be in place to allow expelling and inflow of air into reservoir, c/w bird screens. Size to be checked to ensure vacuum does not form with maximum outflow of water from reservoir (watermain break).

1.5 Reservoir Controls

.1 Telemetry control of water level, ie. Pump control is to be hard wired to reservoir level where possible. Reservoir level is to be monitored by a continuous level-measuring device with a 4 – 20 ma output. True reservoir level is to be measured via an independent sensing line.

Reservoir level is to be displayed in the valve chamber; recorded and displayed at the booster station and connected to the BMID SCADA System.

.2 Telemetry controls and equipment to be developed with consultation from the BMID and their advisor on instrumentation works.

.1 Low pressure alarm is to be transmitted back to booster station for display and connection to the BMID SCADA System.

.3 Modulating inlet valve to be installed where there is more than one reservoir servicing the local pressure zone. Valve to have:

.1 Non contact 0 – 100% valve position indicator with 4 – 20 ma output. Output to be transmitted back to booster station for display and connection to the BMID SCADA System.

.2 Be hydraulically operated with a booster pump/pressure tank system sized to operate valve 3 cycles during power failure. Low pressure alarm and pump station to be transmitted back to booster station for display and connection to BMID SCADA System.

.3 Be complete with hydraulically operated diaphragm actuated globe or angle pattern valve of 'Powertrol' type

.4 Pilot system to be protected by single continuous flow 100 micron filter.

.5 Low pressure alarm to be transmitted back to booster station for display and connection to the BMID SCADA System.

.4 Overflow pipe with downstream outlet to a safe drainage route is required. Overflow pipe to be minimum 250mm diameter or have 110% capacity of maximum potential inlet flow.

.5 All instrumentation equipment is to be provided with surge/lightening protection equipment.

1.6 Reservoir Valve Chamber

.1 Engineer to check with BMID to determine if room for rechlorination equipment will be required at the proposed site.

.2 Entrance to valve chamber is to be at grade. Door size to allow largest pieces of equipment to be removed and replaced. Lifting beams and hoists are required where there are heavy components installed.

.3 Provide floor drains.

.4 Pipe and valving set up within vault to set out inlet and outlet flow to the reservoir. Check valves to be in-line to ensure one way flow to and from the reservoir cells.

.5 19mm sampling ports to be in place to allow sampling of inlet and outlet water from each cell of the reservoir. Sampling port to be complete with isolating ball valve. Inlet location within reservoir to be set considering mixing and reservoir turn over method incorporated.

.6 19mm Schedule 80 piping is to be provided into each reservoir cell complete with isolating ball valve. Pressure transmitter to be located in valve chamber for water level sensing.

.7 Electrical service to valve chamber is to be a minimum of 30 amp, 120 VAC.

.8 Heat, light and ventilation to meet WCB requirements.

.9 Coat all interior piping to AWWA Standards,

Inlet piping	Mid Blue
Outlet piping	Dark Green
Drain piping	Gull Grey

.10 Outlet watermain to system to have vacuum relief pipe or valve. Situation is to be in place if reservoir is off-line during watermain break.

1.7 Reservoir Access

.1 All season access road to be provided to allow maintenance vehicles to the reservoir;

.2 Maximum road grade to be 15%. Maximum crossfall on road is 4.0%.

.3 Minimum finished road width to be 4.0 metres;

.4 Minimum R.O.W. for roadway to be 6.0 metres;

.5 In rock areas, qualified geotechnical information to be provided with recommedations for rock scaling and debris risks.

.6 Black chain link perimeter fence complete with lockable 3.5 m lockable gate to be installed.

.7 Site irrigation requirement to be set out by BMID.

1.8 Reservoir Disinfection and Commissioning

.1 Reservoir Disinfection is to be to most recent version of AWWA Standard C652. A minimum of two successive samples taken at 24 hour intervals indicating 0 coliform growth and 0 coliform background is to be provided to BMID.

.2 Chlorinate reservoir only after all pipeworks and other water infrastructure components are functional and accepted by BMID. Disinfect reservoir within one week prior to commissioning of Reservoir. If chlorination is undertaken and reservoir is commissioned, then repeat of disinfection may be required.

.3 Dispose of highly chlorinated water in accordance with allowed practices by the Ministry of Water Land and Air Protection and the Ministry of Sustainable Resources guidelines.

.4 Sign off for reservoir commissioning to be performed with signatures required by the Contractor performing the disinfection, the Engineer/Consultant certifying the installation, and a representative from the BMID.

.5 Operations and Maintenance Manual are to be provided at completion of installation. Three (3) copies of a 3-ring binder are to be provided to BMID. Hard covered, plastic jacket, cardboard dividers denoting table of contents and sections for all parts, shop drawings, equipment, model numbers, serial numbers, supplier, contractor, engineering consultant, as built drawings and full description of operation of features.