

Medora Corporation

Reservoir & South Tower

USMNPW-LOC860.001

Topics: potable, stratification/water age, chloramine, short-circuiting, ice buildup, nitrification

Aerial view of the Reservoir under three tennis courts; the Reservoir access hatch; the elevated South Tower.

Customer: Information is available upon request from Medora Corporation. 866-437-8076 info@medoraco.com

Overview: The Reservoir is a 2 MG underground storage reservoir (122' x 182' x 13.5' high) that typically holds about 1.5 MG at about 8' deep. Together with a 1 MG plant reservoir they serve the potable needs of about 8,000 residents. The combined reservoir systems service two 0.5 MG elevated storage tanks, North Tower and South Tower. Source water is surface water from a River, and chloramine is the disinfectant used. Average wintertime temperature of the water that is drawn into the plant and sent to the South Tower is 34°F.

Conditions / Objectives: In warm weather, the Reservoir and the South Tower experienced thermal stratification (temperatures varied 3-5° F from top to bottom), loss of residual chlorine, and some nitrification problems. In the winter, icing was a significant problem in the elevated North and South Towers. The Superintendent attended a webinar on mixing and became interested in the mixing philosophy. The city consulted with an Engineering firm, who offered Medora Corporation as a recommendation for solving their potable water problems.

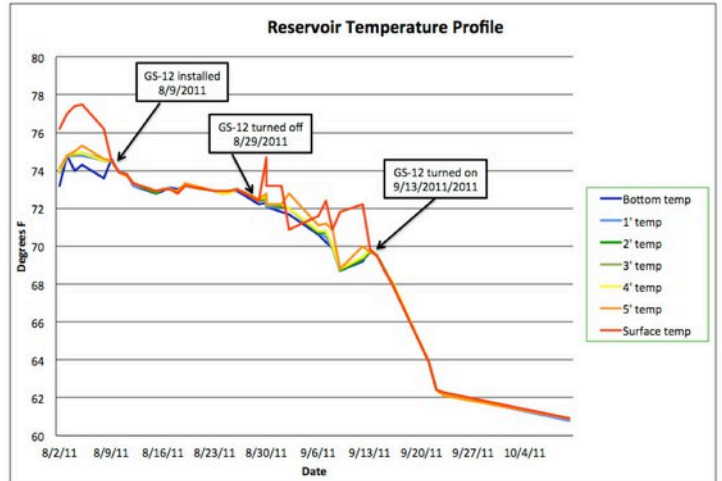
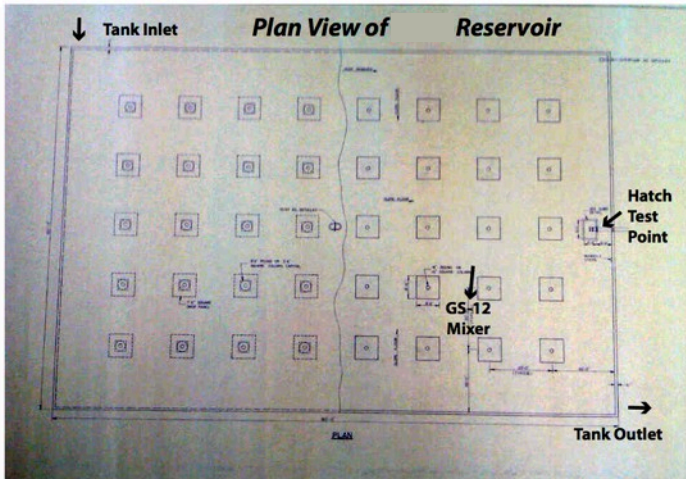
Solution: August 2011, the City's Water Department installed one GridBee GS-12 submersible mixer in the Reservoir. The GS-12 is located about 50' from the hatch test point, in the short-circuit path between inlet and outlet (see illustration on page 2). Following a successful year of mixing in Point Reservoir and the

summer 2012 repair, cleaning, and repainting of the South Tower, a second GS-12 mixer was installed in the South Tower in August 2012. The GS-12 is suspended below the hatch just above coned lower portion of the tank floor.

Results: During the month following the GS-12 installation in Point Reservoir, water temperatures converged throughout the tank showing less than 0.2°F separation from top to bottom. Daily temperature and chlorine residual measurements documented changes associated with alternating periods when the GS-12 was turned off and then turned back on. Results confirmed that the GS-12 did indeed meet expectations. When the GS-12 was on, temperatures throughout the reservoir converged to within approximately 0.2° F and chlorine residuals remained consistent at 2.5 mg/L, indicating complete mixing (see graph on page 2). When the GS-12 was off, temperature variances of more than 3°F quickly occurred and chlorine residuals frequently declined to about 1.5 mg/L. The City is extremely pleased with the GS-12 mixing performance and has raised the water depth to nearly 10 feet, increasing volume to 1.75 MG.

In the elevated South Tower, a tank inspection was performed in early March 2013. Though winter 2012 – 2013 has been much colder than the previous year, the southeast side of the tank had minimal surface ice formation while the remainder of the tank was ice-free. This tank had substantial ice buildup in winter 2011-2012. The City views this as a clear indication that the addition of the GS-12 mixer has provided sufficient mixing to effectively reduce ice formation during the cold winter months.

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The illustration above left is a plan view of the Reservoir, showing the locations of the inlet, outlet, the hatch where testing was conducted, and the GridBee GS-12 mixer. The graph above right shows the temperature profiles during the testing period Aug – Sep 2011, documenting the rapid temperature convergence when the GS-12 was turned on and the rapid return of thermal stratification when the GS-12 was turned off.



Despite the difficult photographic environment, the left photo shows significant ice buildup in the elevated South Tower in winter 2011-2012. The right photo shows virtually no ice one year later, following the installation of the GS-12 mixer in August 2012, despite the colder winter temperatures.