

Castine Drinking Water Infrastructure (Part 1)

By George Motycka, Utility Dept. Superintendent

The Castine Public Water System has provided almost continuous service for 150 years. The water source originally was the Battle Avenue ponds. From these collection reservoirs, the water was pumped by windmill to a manmade reservoir located on Witherle Hill which is the supply tank for the system. From Witherle Hill the water flows by gravity throughout the cast iron distribution pipes (water mains). The basic concept of the system has not changed, however surface water impounded on Battle Avenue is not currently being used, and water is now pumped by electricity. Today's distribution system serving the Castine village is about 5 miles long with water pressures from about 30 psi on Battle Avenue to 90 psi on Sea Street. The system consumes about 80,000 gallons per day.

To accommodate the growth of the town, the Castine water system has seen many extensions and modifications. This growth has increased the water flow demand on the original piping to the point where the pipe's size (internal diameter) can no longer carry the necessary amount of water to supply the demand. The very old water mains also have large rust deposits that further reduce the flow capacity of the pipes. These restrictions cause a reduction in flow and pressure downstream of the restriction when flow demands are high.

Water flows necessary for firefighting are of primary concern in a water system. It is crucial that the system provide the flows needed for firefighting without allowing water pressure to drop below a safe level. Maintaining sufficient water pressure insures that bacteria cannot enter the water pipes. In the event that a low pressure excursion does occur, all drinking water must be boiled by the consumer until the system is proven bacteria free. Adequate water flow capacity is of the utmost concern in the design of Castine's infrastructure improvement projects.

The present condition of the old water mains has a very large effect on the quality of the water at the consumer's faucet. The well water that supplies the system is of pristine quality, however when water spends time in these old corroded pipes, changes in color, taste, and odor result. Water quality is greatly improved in the areas where new water mains have been installed.

Water main breaks also frequently occur in the old cast iron pipes. Cast iron is very brittle and breaks easily when stressed by bending forces, especially where corrosion has been at work. Vehicle traffic and frost can cause such forces on to the water mains because of the inadequate and deteriorated road bed conditions in the town. Cast iron has not been used as water mains for many years. Ductile iron pipe which can withstand these bending forces is being used on the infrastructure improvement projects.

When a water main breaks, the affected area of pipe must be isolated from the system for repairs. Doing this depends on very old valves of questionable condition functioning properly. Dealing with malfunctioning valves is difficult for repair crews and also causes extended service interruptions for customers.

The infrastructure improvement Project (IIP) adopted by the town is addressing these shortcomings in the drinking water distribution system. The reconstruction of the water system started with the replacement of the condemned Witherle Reservoir in 2006. In phase 1 of the IIP (2010), the Battle Avenue water main was increased in size to provide proper water supply flow from the reservoir to the rest of the distribution system. Phase 2 of the IIP will focus on improving the water supply down Main Street to the downtown area. The (IIP) is also correcting problems with storm water and sewer systems, as well as road conditions. When all 4 phases of the (IIP) are completed, the upgraded system will serve the community very well for many years to come.

Until then, the present system must be maintained to meet all state and federal standards for the safe operation of a public drinking water system. So despite the fact that much of the system has aged beyond the intended service life, necessary repairs will continue.