

**ASSESSMENT OF THE
UPPER BONDSVILLE DAM**

**SWIFT RIVER
BELCHERTOWN, MASSACHUSETTS**

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Prepared for:

Pioneer Valley Planning Commission
60 Congress Street, First Floor
Springfield, Massachusetts 01104-3419

Prepared by:

MILONE & MACBROOM, INC.
99 Realty Drive
Cheshire, Connecticut 06410
(203) 271-1773
www.miloneandmacbroom.com

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Appendix A Laboratory Analysis

1.0 INTRODUCTION

1.1 Project Background

The Pioneer Valley Planning Commission retained Milone & MacBroom, Inc. to evaluate the Upper Bondsville Dam relative to the potential cost for its repair or removal. The dam is located on the Swift River between the towns of Belchertown and Palmer, Massachusetts. It is registered with the Office of Dam Safety as a "significant hazard" dam and has been reported as being in fair to poor condition. Figure 1 is a location plan of the dam and surrounding area.

The owner of the dam (the Belchertown Land Trust) is exploring options for the future of this structure. The Pioneer Valley Planning Commission is working with the land trust in this exploration through a grant from the Massachusetts Environmental Trust.

The specific work tasks undertaken in this phase of work include the following:

- Review existing data and reports
- Delineate the upstream extent of the impoundment
- Develop a cost estimate of dam rehabilitation
- Develop a cost estimate of dam removal
- Characterize the physical quality of sediment
- Present results to the land trust and the public

This report presents the results of data collection and analysis.

1.2 Existing Data and Reports

The following is a partial list of data and reports that were consulted in preparing this memorandum:

- The Commonwealth of Massachusetts, Executive Office of Environmental Affairs. 2005. Chicopee River Basin Five-Year Watershed Action Plan 2005-2010.
- Department of the Army, New England Division, Corps of Engineers. 1979. Textile Printing Co. (Upper) Dam Phase I Inspection Report.
- Fay Engineering Services. 2010. Bondsville Upper Dam 6-Month Follow Up Inspection/Evaluation Report.
- Federal Emergency Management Agency. 1981. Flood Insurance Study. Town of Belchertown, Massachusetts. Hampshire County. Community Number 250157.
- Gomez and Sullivan Engineers, P.C. 2003. Overview of Water Use and Transfer in the Chicopee River Basin.
- Root Engineering. 1999. Inspection/Evaluation Report Bondsville Upper Dam.
- Tighe & Bond, Inc. 2009. Bondsville Upper Dam Phase I Inspection/Evaluation Report.

2.0 EXISTING CONDITIONS

2.1 Project Setting

The lower Swift River is located in Hampshire County, Massachusetts along the town of Belchertown's border with Ware and Palmer. The lower Swift River generally flows from the Quabbin Reservoir in a southerly direction to the Ware River. In the project

area, the river meanders to the west, flowing in an east/west orientation before it turns south once again. Downstream, the Ware River joins the Quaboag River to form the Chicopee River, which in turn flows into the Connecticut River.

Three dams are located along the Swift River. The Winsor Dam impounds the Quabbin Reservoir, which provides water to the metropolitan Boston area. The Upper Bondsville Dam is located approximately 5.5 miles downstream of the Winsor Dam. The last dam, the Lower Bondsville Dam, is located between Depot Street (Route 181) and State Street downstream of the Upper Bondsville Dam.

2.2 Hydrologic Setting

The Swift River watershed is approximately 215 square miles in size at its confluence with the Ware River in Palmer, Massachusetts. The Ware River joins the Chicopee River a short distance downstream from its confluence with the Swift River, eventually flowing to the Connecticut River. The Swift River watershed is predominantly controlled by the upstream Winsor Dam, constructed in the 1930s to form Quabbin Reservoir. The watershed to the Quabbin Reservoir is 187.6 square miles in size and extends into the towns of Athol, Barre, Belchertown, Hardwick, New Salem, Orange, Pelham, Petersham, Phillipston, Shutesbury, Ware, and Wendell, Massachusetts.

The Upper Bondsville Dam is located approximately 1.5 miles upstream of Jabish Brook, and the watershed at the dam is approximately 194.8 square miles. The water from Quabbin Reservoir is diverted out of the Swift River watershed through two aqueducts. Consequently, stream flows in the Swift River below Quabbin Reservoir have been significantly altered since 1939 when the dam was constructed.

The Quabbin Reservoir is one of the largest public water supply reservoirs in the world and is the primary source of water to most cities and towns within 15 miles of Boston. Water is diverted from Quabbin Reservoir to Wachusett Reservoir in the Nashua River basin through

the Quabbin Aqueduct. Water is also diverted from the reservoir to the Chicopee Aqueduct for public drinking water supply to the city of Chicopee and for the towns of South Hadley and Wilbraham. By law, at least 20 million gallons per day (mgd) of water must be released from the Quabbin Reservoir to the Swift River to augment low flows. At times, water from the Ware River is also diverted to either the Quabbin or the Wachusett Reservoir.

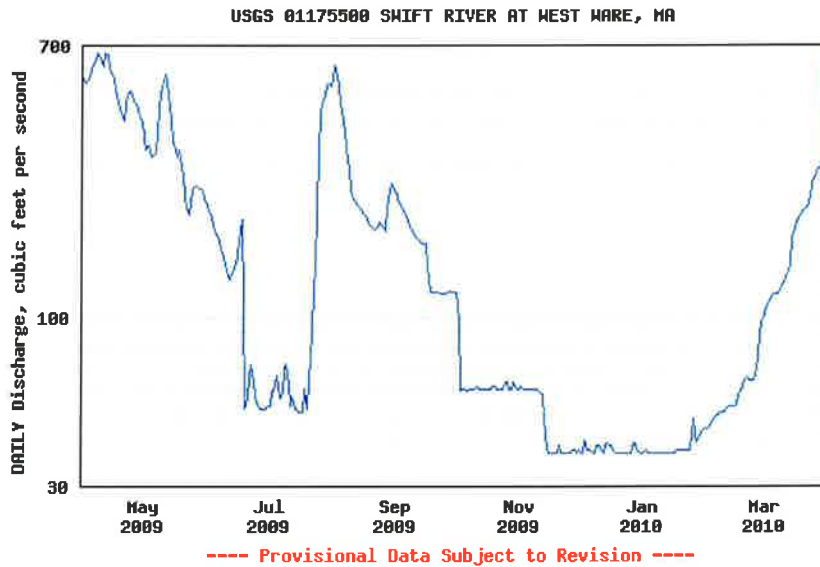
Water users withdrew approximately 80,771 million gallons (MG) in 2001 within the Swift River watershed. This accounted for 91.5 percent of the total water withdrawn from the Chicopee River basin. Water withdrawal and transfer patterns in the Swift River watershed are generally controlled by the Massachusetts Water Resource Authority (MWRA). The MWRA withdrawals accounted for approximately 79,119 MG (217 mgd) or 98 percent of the total water withdrawn from the Swift River watershed (Gomez & Sullivan).

Drainage areas to the Swift River are reported as follows:

Drainage Area	Value (square miles)
Swift River at Winsor Dam	187.6
Swift River at Upper Bondsville Dam	194.8
Swift River at confluence with Ware River	215.0

Source: Fay Engineering

The U.S. Geological Survey (USGS) has continuously operated the Swift River at West Ware, Massachusetts gauge (#01175500) 1.4 miles downstream from the Quabbin Reservoir since 1910 (Lat 42°16'04", Long 72°19'59"). The drainage area of the contributing Swift River watershed at the gauge is 189 mi², which includes 1.6 mi² drained by Beaver Brook, the flow of which is diverted from the Ware River basin. Readings taken prior to January 1937 were for a watershed of 186 mi². The following figure shows recent flows at the West Ware gauge.



2.3 Upper Bondsville Dam

The Upper Bondsville Dam is a run-of-the-river stone masonry dam. The impoundment behind the dam extends northward along the Swift River into the town of Ware on the east side and the town of Belchertown on the west side. The dam is located approximately 5.5 miles downstream of the Quabbin Reservoir and 3.5 miles upstream of the confluence with the Ware River. The Swift River flows generally in a southerly direction from the Quabbin Reservoir before turning westerly at the dam site. The dam is located to the north of Main Street and can be easily seen from the roadway. An old railroad bed parallels the river on the north side of the dam (right bank looking downstream). The closest bridge over the Swift River is located at Depot Street, approximately one-half mile downstream of the dam.

The main axis of the dam lies in a north/south orientation, perpendicular to the flow of the river. The river flows over the main spillway on the right or north side of the river. A training wall to the left or south of the main spillway extends in an east/west direction and divides flow between the main river and an old mill canal. The canal is located to the left or south side of the dam. Historically, it extended approximately 1,100 feet from the dam along the left side of the river to supply water to the then active mill buildings. In the mid 1990s, an earthen dike was constructed across the upper end of the canal following several drowning fatalities. The only hydraulic connection between the upper and lower canal appears to be a 12-inch plastic pipe that runs beneath the earthen dike.



Historic records indicate that a dam was constructed at or near the site in 1849 for the Boston Duck Company. The current Upper Bondsville Dam (aka The Textile Printing Company Upper Dam) was reportedly constructed in 1900 in order to provide water power and process water to the Old Bondsville Factory site. The factory dates back as early as 1845 and included the operation of a textile manufacturing facility. The mill complex at its peak occupied a quarter mile stretch of Main Street, with multistory buildings. The mill employed an estimated 400 to 500 people from the area. The complex was completely destroyed by a fire in October 1968. After the fire, the dam was no longer needed to provide water to the mill operation and, as is often the case, has

received little if any maintenance over the last 40 years. The Old Bondsville Factory site is a confirmed hazardous waste disposal site according to a site summary report by the Massachusetts Department of Environmental Protection dated August 31, 2004.

2.4 Impoundment Delineation

Previous reports have identified the extent of the Upper Bondsville Dam impoundment as 8,000 feet upstream of the dam at normal pool level, with a surface area of 60 acres and a storage volume of 460 acre-feet. Milone & MacBroom, Inc. conducted an impoundment investigation on April 20, 2010, whereby the river upstream of the dam was visually observed along its length. At that time, water was flowing approximately one foot over the dam's spillway. The Swift River is fairly flat through this reach, making distinction of the pool somewhat challenging. However, observations revealed a transition from the calm pool to faster moving riffles. Points along the impoundment were located using survey grade global positioning system (GPS) technology. The extent of the impoundment was subsequently mapped using GPS data and is depicted on Figure 2.

Bathymetric data for the reach of the Swift River between the Upper Bondsville Dam and the Quabbin Reservoir were taken from mapping dated May 17, 1934 and revised July 12, 1934 provided by the Commonwealth of Massachusetts Metropolitan District Water Supply Commission. Field observations compared favorably with the historic mapping.

The Upper Bondsville Dam's impoundment is not a classic pool. Rather, it is quite linear, particularly upstream of Cold Spring Road, where the channel is fairly uniform in width and only marginally impounded. If the dam were to be removed, it is anticipated that only minor adjustments in water levels would occur, perhaps on the order of several inches; however, detailed survey, hydraulic modeling, and mapping would be necessary to definitively quantify such changes.