



## **WSCAC Meeting**

Location: MWRA Facilities  
Southborough, MA  
October 13, 2016 – 10:00 A.M.

### **Members in Bold in Attendance:**

Whitney Beals, WSCAC Chair, NE Forestry  
Gerald Eves, Trout Unlimited  
Martha Morgan, Nashua River Watershed  
**Kurt Tramosch, Wayland Wells**  
**Terry Connolly, Town of Ware & Trout Unlimited**

Martin Pillsbury, MAPC  
**Andrea Donlon, CRWC**  
**Michael Baram, BU & CLF**  
**Paul Lauenstein, NepRWA**  
**Bill Fadden, OARS**

### **Non-Members in Attendance:**

Lexi Dewey, WSCAC staff  
Andreae Downs, WAC  
Wayne Chouinard, WAC  
Lou Taverna, Newton  
Katie Ronan, MWRA

David Coppes, MWRA  
Bridgit Brown, BWSC  
Stephen Mulloney, BWSC  
Sean Navin, MWRA  
Jami Walsh, MWRA

### **METROPOLITAN TUNNEL REDUNDANCY BY DAVID COPPES, MWRA DIRECTOR OF WATERWORKS**

#### **The Impact of the Drought on the MWRA System**

Dave began by briefly discussing the status of the drought. Much of the state is now in a drought warning state, according to the state drought plan. Dave explained that the MWRA communities are considered separately because MWRA has its own drought management plan; MWRA's plan was developed in 1989 during a drought situation. This plan is independent of the state's plan. The MWRA, however, sits on the Drought Management Task Force and is working with the EOEEA and MEMA so that MWRA's messaging regarding the drought coincides with the state's messaging.

MWRA's drought plan is based on the elevation in the Quabbin Reservoir. At the moment, the Quabbin is in its normal operating range. As of October 1<sup>st</sup>, the Quabbin is at 82.5% capacity. The MWRA's drought plan is designed so that the level that indicates "normal" varies with the time of year. If the reservoir were at 82.5% in April, then it would be below normal; but at this time of year, the reservoir is in its normal operating range. If conditions continue to remain the same, the reservoir may drop below its normal operating range. When the reservoir level drops below normal operating range, the goal is to try to keep demand levels at the prior year's numbers. Additionally, if the reservoir is below normal, the MWRA's reservoir transfer policy directs the MWRA to take any available water from the Ware River when there is water available during the transfer window.

Lexi and Whit asked Dave what the MWRA's plan is if there is no water available to take from the Ware River. Dave replied that at that point, it is educational outreach and conservation. Until MWRA gets to the drought

warning stage, there are no reductions necessary in water demand. Dave commented that the system is incredibly resilient. Nonetheless, the MWRA has reached out to all of their communities with conservation messaging and urged community members to use water as wisely as possible. In the MWRA's drought plan, conservation outreach increases when the reservoir crosses into the below normal operating range. Dave concluded that the MWRA is already going above and beyond what is required in their plan.

## **MWRA System Redundancy - Status of Existing Transmission System Facilities**

### ➤ MWRA Water Transmission System

As a means of orienting committee members to the MWRA Transmission System, Dave portrayed a map with the system divided into five discrete zones. The zones include the Chicopee Valley Aqueduct; the Quabbin Aqueduct; the Cosgrove Tunnel/the Wachusett Aqueduct; the MetroWest Tunnel/Hultman Aqueduct; and the Metropolitan Tunnels. In 2007, the MWRA provided redundant sections of pipeline to the Chicopee Valley Aqueduct zone. Presently, there is an internal inspection prepared for the Quabbin Aqueduct. In respect to the Cosgrove Tunnel/the Wachusett Aqueduct, the MWRA is in the process of building a pump station as a second means of bringing water to the Carroll Treatment Plant. From the Carroll Treatment Plant to 128, the MWRA used to rely solely on the Hultman Aqueduct, but in 2003 the MetroWest Tunnel went online. With the MetroWest Tunnel online, the MWRA was able to take the Hultman out of service and do some rehabilitation and provide some interconnections. So as of 2013, the MWRA now has two completely independent ways to bring water in for that part of the system.

### ➤ Metropolitan Tunnel System

The Metropolitan Tunnel System is comprised of the City Tunnel, the City Tunnel Extension, and the Dorchester Tunnel. Approximately 60% of total system flow is carried through the Metropolitan Tunnel System. The condition of the Metro Tunnel System is of concern. The tunnels themselves are structures that do not require much in terms of maintenance, as they are comprised of steel and concrete; there is little risk of failure. However, with respect to the surface piping, valves, and appurtenances, there is significant need for rehabilitation, replacement, and maintenance. One primary concern is the reliability of the valves; there are a number of valves that are known to be broken, and a number that are suspected to be broken. MWRA cannot exercise valves that do not work. Furthermore, access to the valves can be difficult as some are located next to rivers with high ground water tables and at times, there is standing water in some chambers. This leads to corrosion problems as well.

The MWRA has short term plans in place to reduce risk such as reducing the number of corroded bolts, replacing air valves, and installing heat tracing on pipes. These measures will reduce the risk of failure, but they will not completely eliminate the risk. There are specific locations of concern that cannot be mitigated by the aforementioned methods. The following locations are of concern:

1. Shaft 7
  - Junction point of all three tunnels
  - Valve operability uncertain
2. Shaft 5 & 9 Pump Chambers
  - Located at tunnel depth for the purpose of dewatering tunnels
  - Extremely difficult to access

## **Tunnel System Shut-Down Impacts**

If the MWRA were to shut-down the Metro Tunnel System, in a planned manner, there would be two problems to solve: service to the north and service to the south.

### **Planned Shut-Down – Service to the North**

- Partially supplied communities would be asked to use alternate supplies
- The Gillis Pump Station would be used to pump out of open Spot Pond Reservoir
- Reconfiguration of Northern High piping required
- Water chlorination required
- Water would not meet any drinking water regulations – boil order required
- Replenish the pond from Low Service supply lines – severe water restrictions

### **Planned Shut-Down – Service to South**

- Partially supplied communities use alternate supplies
- Chestnut Hill Emergency Pump Station would be used
- Water chlorination required
- Boil order required
- Replenish from Sudbury Aqueduct

Not all shut-downs are planned, however. The extent of the shut-down depends on the failure. Isolation takes a significant amount of time; there may be numerous shaft locations to isolate and multiple valves. The sudden shut-down of the Metropolitan Tunnel System would lead to:

- Loss of supply to high service areas
- Pumped service areas lose supply as tanks empty
- Entire system would be on boil order

Service restoration, Dave said, also takes a significant amount of time. Large areas of the MWRA and community systems would need to be refilled slowly to avoid breaking lines. Furthermore, flushing to remove air pockets could take days, perhaps even weeks. Finally, in order to lift a boil order, once service has been restored, hundreds of water quality samples must be taken; consecutive, clean results are required in order to lift the boil order.

## **Strategic Goals for Redundancy Improvements**

### **➤ Water System Operating Goals**

The main goals of operating the water system are: fire protection, providing sanitation, and the protection of public health. In terms of capacity for the redundant system, the baseline goal is to have average day demand capacity, but higher capacity is optimal because it would allow the MWRA to take the primary system out-of-service for repairs for a longer period of time. Dave explained that having the capability to do planned shut-downs is preferred over the capability for emergency-only shut-downs. Planned shut-down capability allows for maintenance of the system, and maintenance reduces the risk of failure.

Dave then reviewed examples of peer organization redundancy programs. San Francisco, Seattle, and New York City have implemented, or are in the process of carrying out, major water system

improvement programs. He then highlighted that redundancy has always been a goal at MWRA. Dave discussed examples of redundancy such as the two basins of Chestnut Hill Reservoir, the East and West Spot Pond Supply Mains, and the Brattle Court Pump Station/Spring Street Pump Station. In 2015, Spot Pond Pump Station was completed to provide redundancy to Gillis Pump Station. As a matter of fact, in 1936 when the city tunnel was being planned, it was going to be a loop – the concept of redundant supply is not new at MWRA.

## **2011 Plan – Surface Piping with Northern and Southern Components**

In 1990, the MetroWest Tunnel project began. At the time, the plan was to tunnel all the way to Chestnut Hill so that there would be full redundancy for the city tunnel. A decision was made, however, to defer construction of the last segment of tunnel to the future, provided that a northern tunnel loop was included in the plan. A recommendation was made to the Board of Directors that the Authority should build the MetroWest Tunnel and come back at a later date to build the Northern Loop. In 2008, Dave explained, the MWRA undertook a study to figure out if there was a way to provide redundancy without building the Northern Loop Tunnel. The concept was to utilize the existing piping network to provide redundancy. In 2011, the MWRA developed a plan. The idea was to replace the WASM3 pipeline from a 60’’ pipeline (56’’ at some points) to a 72’’ pipeline. The replacement would provide adequate capacity to the north to Gillis Pump Station to pump to the high service area. Additionally, MWRA planned to slip-line the Sudbury Aqueduct to Chestnut Hill and then provide either a large diameter pipe or a tunnel so that the MWRA could supply to the south. The MWRA started to move in 2011 to implement this plan; in 2013 they began working on the projects, but encountered a number of problems.

### ➤ Problems with plan

In order to implement the plan for the north, over seven miles of large diameter surface line through Waltham and Belmont was required. The MWRA encountered problems that were bigger and more difficult than they had initially thought. The following issues arose:

- Traffic congestion and gridlock
- Business disruption
- Permitting and approval
- Community disruptions, such as noise and detours

Dave reviewed images and diagrams that depicted the breadth of the impact. Dave explained how challenging the process is and added that it just gets more difficult over time. The MWRA once again looked to peer organizations throughout the country. Many utilities in Washington, the East Bay, and Southern California have constructed tunnels to avoid surface pipe construction impacts

## **Evaluation of Alternatives**

After incurring problems with the 2011 plan, the MWRA reviewed a great deal of alternatives. Previous and new alternatives were evaluated including pipelines, pumping and tunnels. The MWRA added thirteen alternatives to the north and fourteen alternatives to the south. To the north, there are three categories of alternatives, and to the south, there are three categories of alternatives.

#### Northern Component – Category 1

- Push existing system to its limits
- Convert part of WASM4 and entire West Spot Pond pipeline to high service
- Cost: \$10 million
- Not reliable for planned maintenance shut down of tunnel system

#### Northern Component – Category 2

- Increase capacity to north (larger pipe and/or pump station)
- Cost: \$138 million - \$473 million (six alternatives)
- Large diameter pipelines are extremely difficult to construct through congested urban areas

#### Northern Component – Category 3

- Increase capacity to north (tunnel)
- Cost: \$472 million - \$1,292 million (six alternatives)
- Would provide redundancy to WASM3 pipeline
- Meets redundancy goals under all demands
- Allows year round maintenance of tunnel system (in combo with a southern solution)

#### Southern Component – Category 1

- Increase capacity to Chestnut Hill (tunnel or pipeline)
- Cost: \$293 million - \$629 million (nine alternatives)
- Large diameter pipelines are extremely difficult to construct through congested urban areas

#### Southern Component – Category 2

- Increase capacity to south (pipeline with or without pump station)
- Cost: \$363 million - \$390 million (two alternatives)
- Large diameter pipelines are extremely difficult to construct through congested urban areas

#### Southern Component – Category 3

- Increase capacity to south (tunnel)
- Cost: \$716 million - \$1,034 million (three alternatives)
- Meets redundancy goals under all demands
- Allows year round maintenance of tunnel system (in combination with a northern solution)

### **Staff Preferred Alternative**

Dave explained that MWRA staff did not make a recommendation regarding the alternatives to the Board of Directors; however, they expressed a preference. Staff did recommend a number of interim measures that would improve system response capabilities and reduce the tunnel system's risk of failure. Some examples include tunnel-shaft pipeline improvements, Chestnut Hill Pump Station Improvements, and WASM 3 rehabilitation. The MWRA believes that these projects are very important and are currently working to move forward with them as they improve the Authority's capability to respond to the needs of the system.

Dave continued to say that no matter what the MWRA does, they cannot rely on the current capacity of the system. The MWRA needs to increase system capacity in order to meet their strategic goals for long-term redundancy. Furthermore, the Chestnut Hill Emergency Pump Station cannot reliably supply enough water to the south with the Dorchester Tunnel shut down. Dave then reiterated the very real challenge of implementing long-distance large diameter surface pipelines in urban areas. The MWRA must seriously consider that challenge, regardless of the decision it makes regarding redundancy.

Whit commented that the cost of disruption to local businesses should also be considered. Although it may not be captured in MWRA's cost figures of implementing surface pipelines in urban communities, it is an actual cost. Whit reasoned that that cost would be avoided with a deep rock tunnel.

Kurt asked if there is an inherent vulnerability to surface pipelines that the MWRA would not encounter with a deep rock tunnel. Dave replied that they did a cost per mile comparison between surface pipeline alternatives and tunnel alternatives. The differences are stark, he said. Most of the tunnel options have a useful life of one hundred years, whereas the pipelines might have a fifty year useful life.

Dave returned to his discussion of the staff preferred alternative. Of all of the tunnel alternatives considered, a two tunnel option with a 4.5 mile tunnel to the north that connects to the mid-point of WASM 3 in the Waltham/Belmont area and a 9.5 mile southern tunnel that connects to Shaft 7C and the southern surface mains is preferred. This option meets a lot of the MWRA's objectives, such as shutting the system down with no boil order. The midpoint of construction cost is \$1,470 - \$1,700 million. This figure does not include baseline/interim improvement costs.

Dave further explained that there is a way that the MWRA could complete the project in a phased manner. The northern tunnel and the southern tunnel each independently provide benefits to the system. If a phased approach is a goal, staff would recommend that the northern tunnel be constructed first. The sections of the system the MWRA is most concerned with would be addressed if they built the northern section first.

Dave concluded by recapping the key points of his presentation. He explained that MWRA staff must continue to engage with the MWRA Advisory Board and stakeholders in order to share their findings before they can come to a conclusion about which direction they will take.

The committee thanked Dave for his presentation.

#### **PROJECT REVIEWS, BY JAMI WALSH, MWRA CONSTRUCTION COORDINATOR**

Jami introduced herself and explained that she is coordinating two projects in the Quabbin area. The first project is power and security upgrades at eight different locations on MWRA and DCR-DWSP property. Jami explained that the MWRA started the project with a notice to proceed in February. Currently, the project is on-schedule, if not ahead of schedule. The project is to be completed by April of 2017. The contract amount was \$3.199 billion, but due to several change orders, the cost has increased to about \$3.5 billion. Despite the additional work added by the change orders, the contractor is still ahead of schedule – Jami considers that to be phenomenal. The work includes trenching and conduit installation; about ninety-eight percent of that work is completed to-date. Additionally, about 170 utility poles needed to be installed. As of Monday, all of those poles were installed; nearly half have already had their wires installed. The MWRA is just waiting for National Grid to come in and make the connection. Shaft 12 will then have power – up until now, it has only run on generators. Jami

continued to discuss how well the contractor has conducted themselves in respect to environmental concerns, such as reseeded grass for retention.

Jami then discussed the Hatchery Pipeline and Hydropower Project which connects the Chicopee Valley Aqueduct (CVA) to the Department of Fish and Wildlife's trout hatchery. The cost of this project is about \$3.6 million. Jami explained that the cost of this project is actually expected to decrease; the contractor has been tremendous to work with and has helped find ways to keep the cost in control without impacting the integrity of the project. The contractor mobilized to the site on May 18<sup>th</sup> and they are on schedule. The deadline for the project is September of 2017. More importantly, by the end of 2016, water needs to be flowing from the CVA to fish hatchery. Currently, the contractor is on schedule to meet that deadline, but it will be December 31<sup>st</sup> when the water flows.

The committee thanked Jami for her presentation.

The meeting was adjourned.