

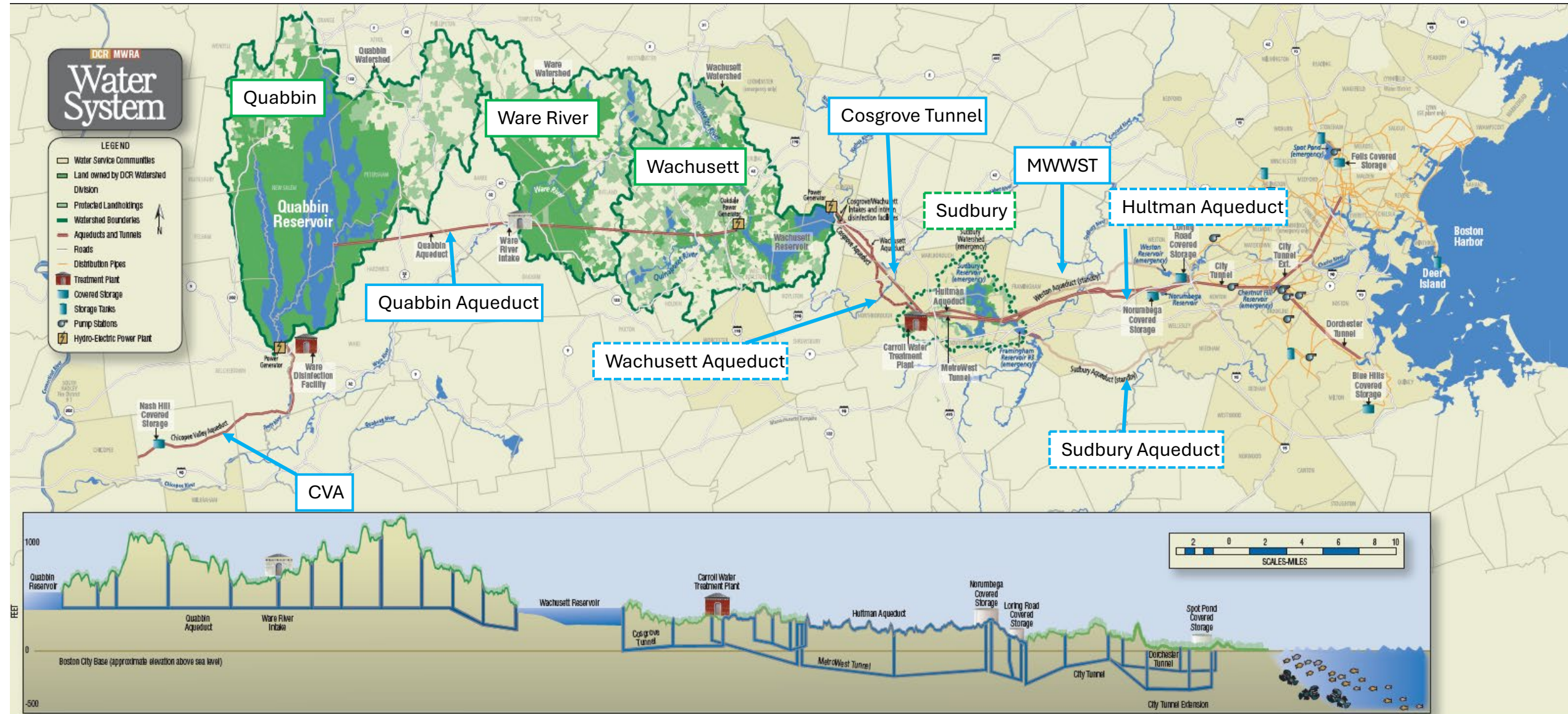


# **Western Operations Flood Control**

**Caulin Lauzon, Senior Engineer, Reservoir Operations**

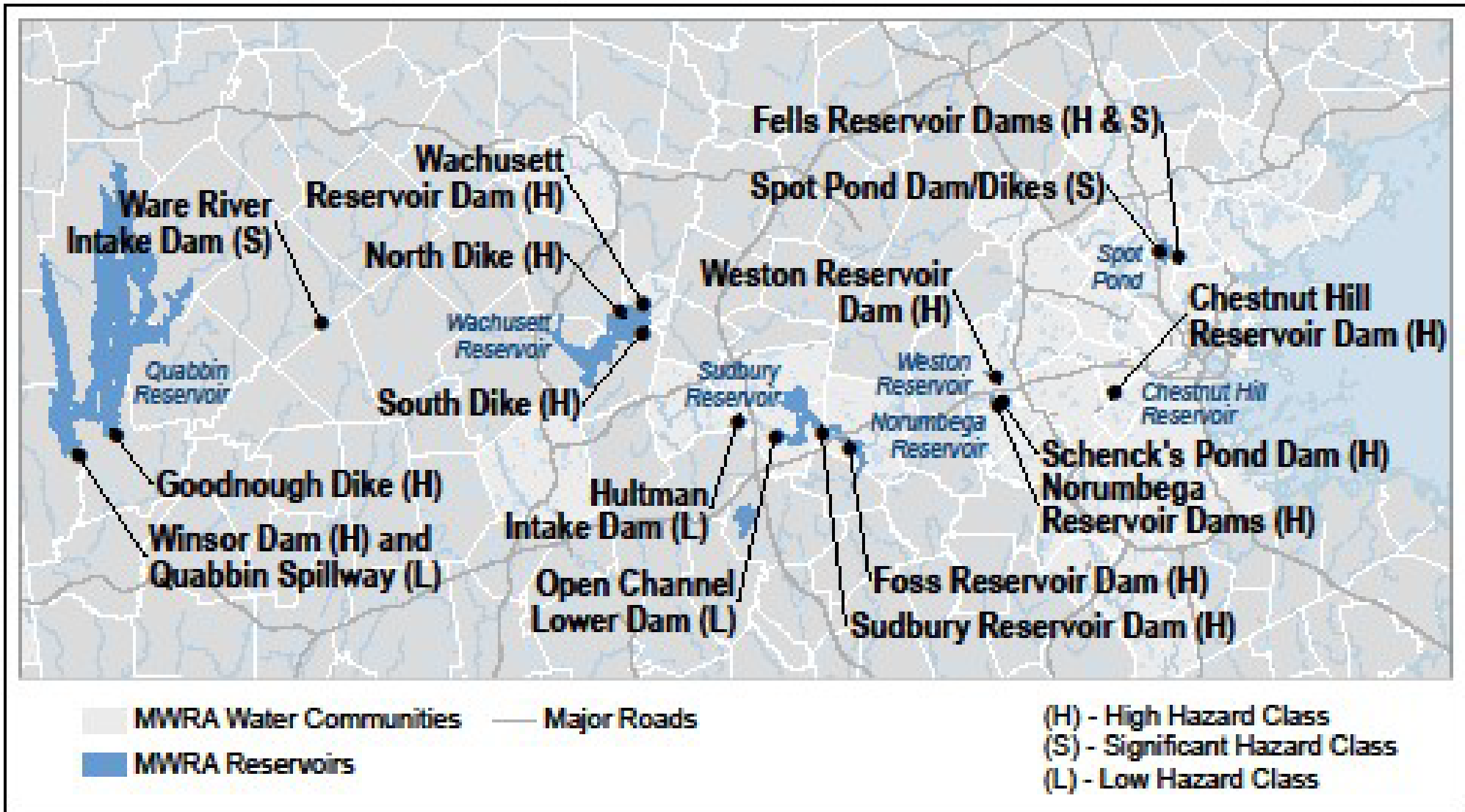


# MWRA Source Reservoirs and watersheds



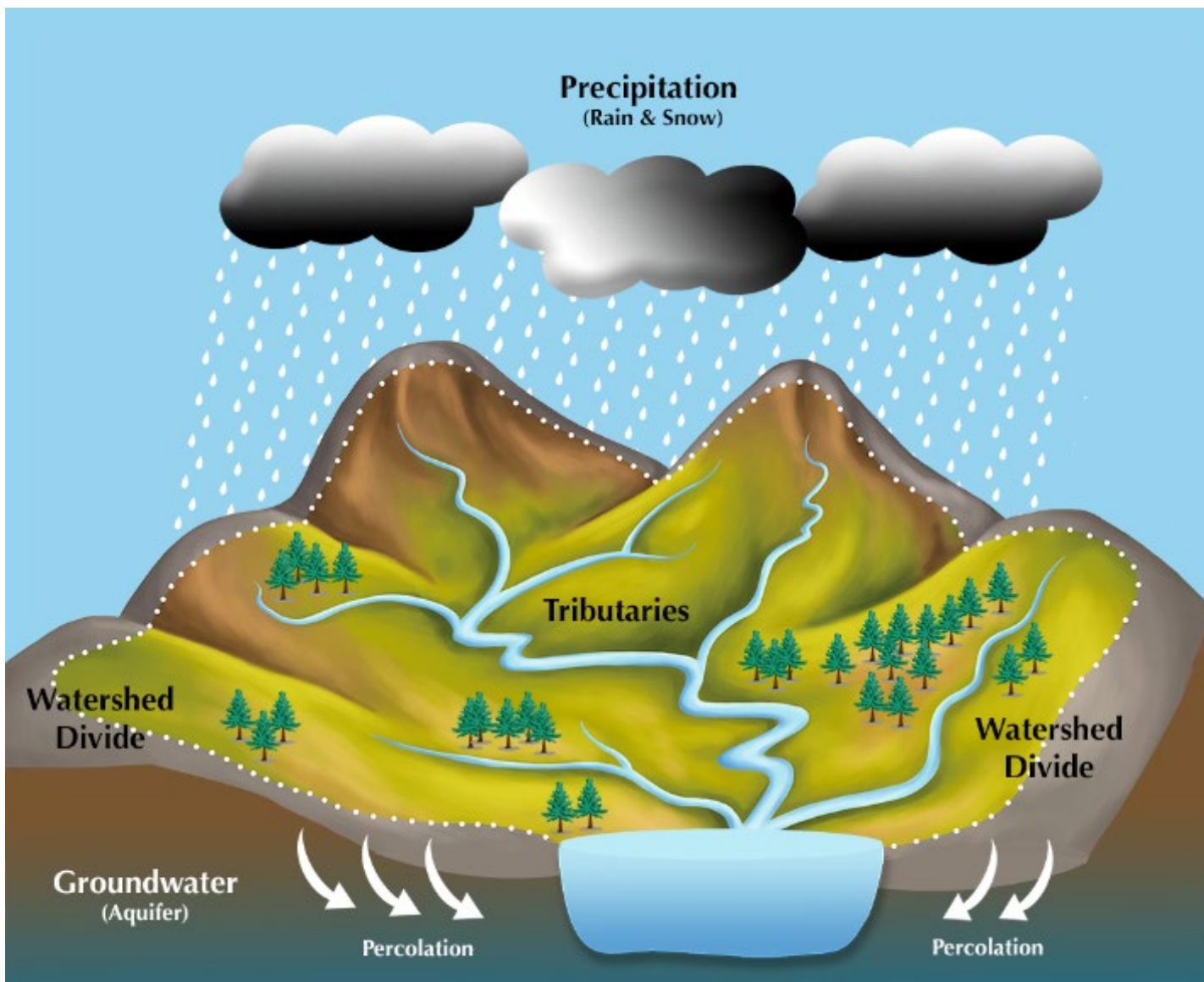


# MWRA Dams





# Watershed 101



For our reservoirs, we must balance out inflows and outflows to prevent exceeding operating bands, avoid uncontrolled spilling (& downstream flooding) and to meet Statutory release requirements.

Antecedent Moisture Conditions (AMC) is important. It is the relative wetness or dryness of a system, which can have a significant impact on rainfall-runoff dynamics.

The magnitude of the runoff (flow) from rainfall can be affected by how wet the drainage area is from prior conditions



# Variety of Weather Resources

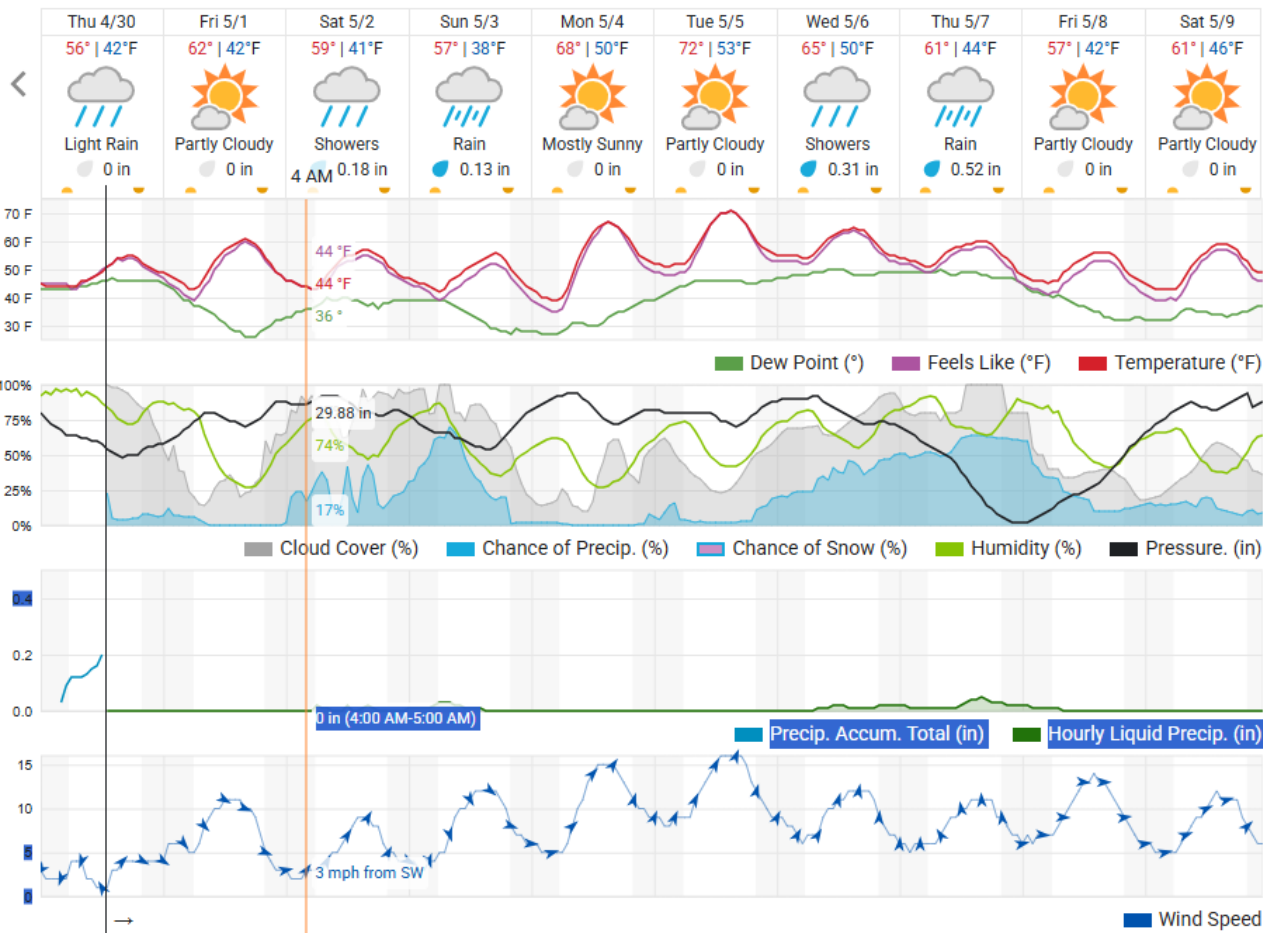
Elev 272 ft, 42.3 °N, 71.51 °W

## Southborough, MA 10-Day Weather Forecast

50° SOUTHBOROUGH STATION | CHANGE

TODAY HOURLY 10-DAY CALENDAR HISTORY WUNDERMAP

Customize



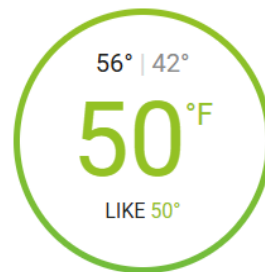
Elev 272 ft, 42.3 °N, 71.51 °W

## Southborough, MA Weather Conditions

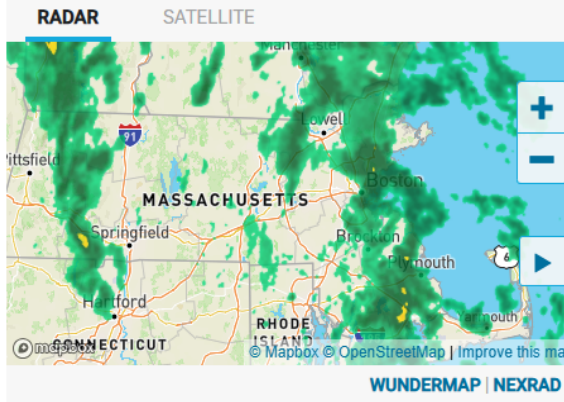
50° SOUTHBOROUGH STATION | CHANGE

TODAY HOURLY 10-DAY CALENDAR HISTORY WUNDERMAP

12:43 PM EDT on April 30, 2026 (GMT -4) | Updated 5 minutes ago



Today's temperature is forecast to be **COOLER** than yesterday.



**TODAY**  
THU 04/30  
HIGH 56°F

78% Precip. / 0.00 in  
Cloudy with periods of light rain. High 56F. Winds light and variable. Chance of rain 80%.

**TONIGHT**  
THU 04/30  
LOW 42°F

11% Precip. / 0.00 in  
Cloudy skies early, then partly cloudy after midnight. Low 42F. Winds NW at 5 to 10 mph.

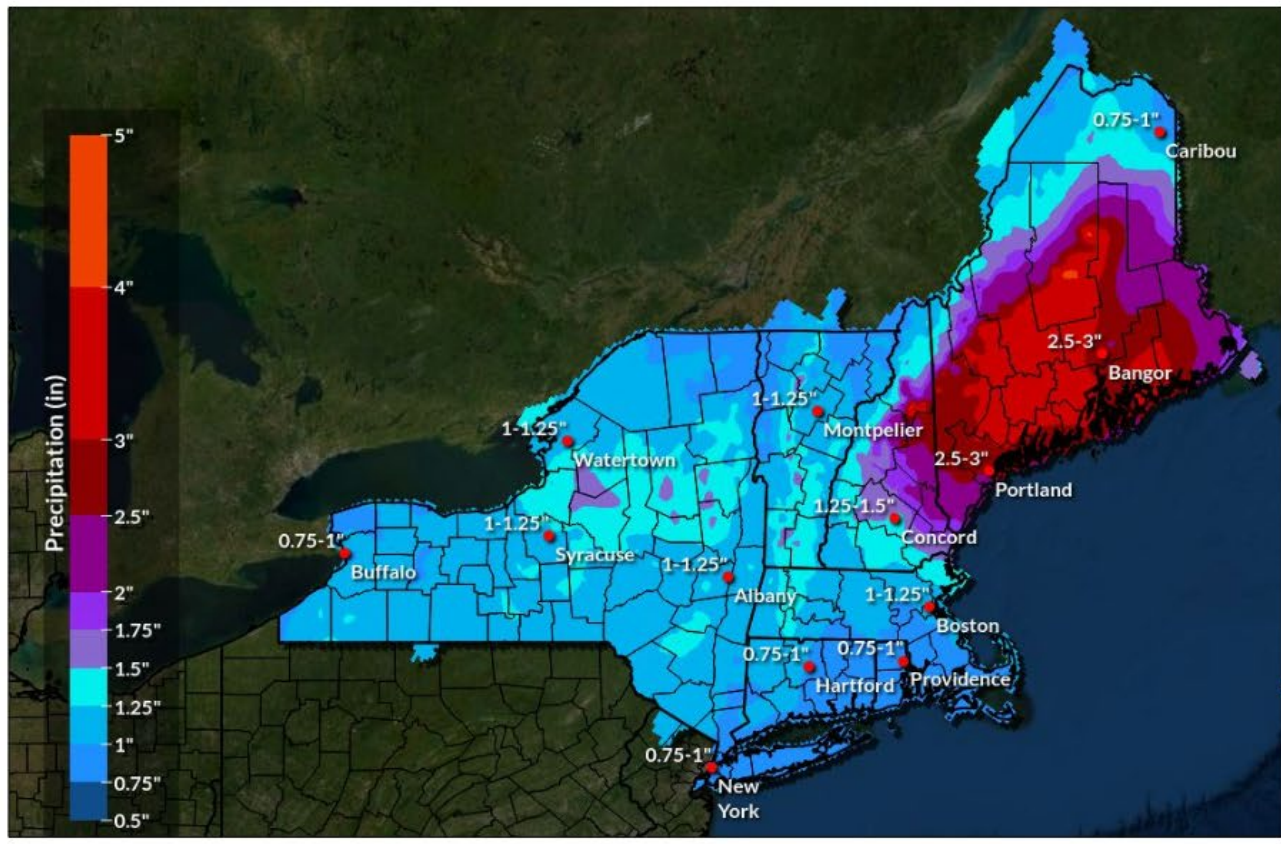
**TOMORROW**  
FRI 05/01  
HIGH 62 | 42°F

4% Precip. / 0.00 in  
Partly cloudy skies. High 62F. Winds WNW at 10 to 15 mph.

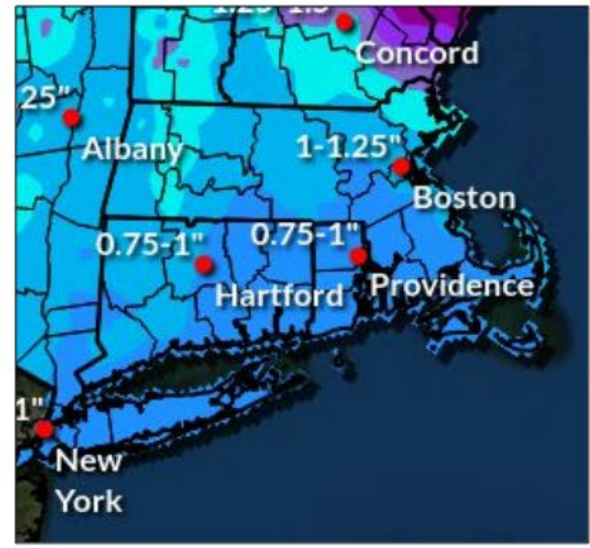


# 7 Day Precipitation Forecast

April 27, 2026  
10:00 AM



- Beneficial rainfall this week of up to 1.25"
- No flooding expected aside from minor poor drainage areas
- Most of the rain falls Thursday



# RESERVOIR OPERATIONS SYSTEM OVERVIEW SCHEMATIC

REV. 1

Click the Buttons Below to Access the PI Diagrams

Daily Elevations

Quabbin Reservoir

Wachusett Reservoir

Sudbury and Framingham Reservoirs

Norumbega Reservoir and Schenck's Pond

All Reservoirs Trends

USGS Stations Website

MGD = CFS x 0.65

Current Level

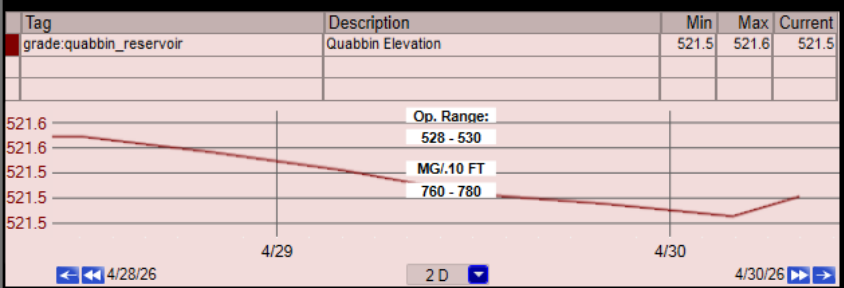
Operating Range

Sudbury Reservoir	256.86	FT BCB	256.50 - 257.50
Reservoir #3	182.20	FT BCB	182.00 - 183.50
Reservoir #2	No PI Data	FT BCB	176.00 - 176.99
Reservoir #1	167.81	FT BCB	167.00 - 168.50
Sudbury River	156.69	FT BCB	Not Defined
Wachusett LGH	388.87	FT BCB	388.00 - 395.00
Quabbin Reservoir	521.52	FT BCB	522.00 - 530.00
Norumbega Reservoir	271.38	FT BCB	271.00 - 273.00
Schenck's Pond	246.48	FT BCB	000.00 - 000.00
Chestnut Hill Reservoir	I/O Timeout	FT BCB	129.50 - 132.50
Weston Reservoir	199.18	FT BCB	198.50 - 199.98

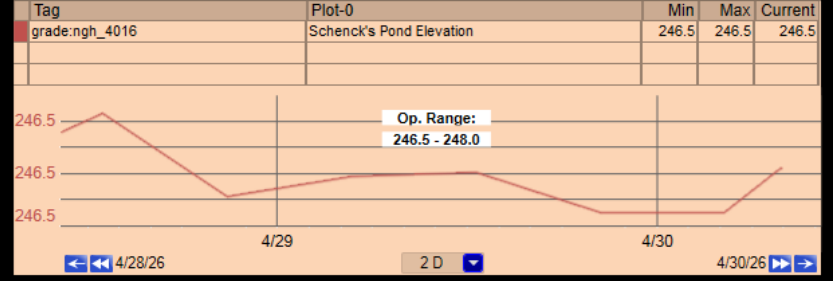
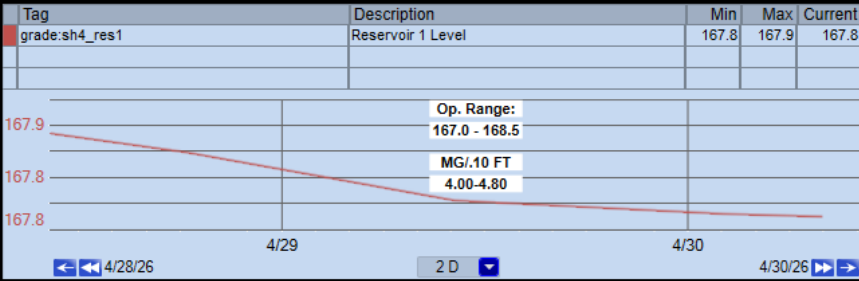
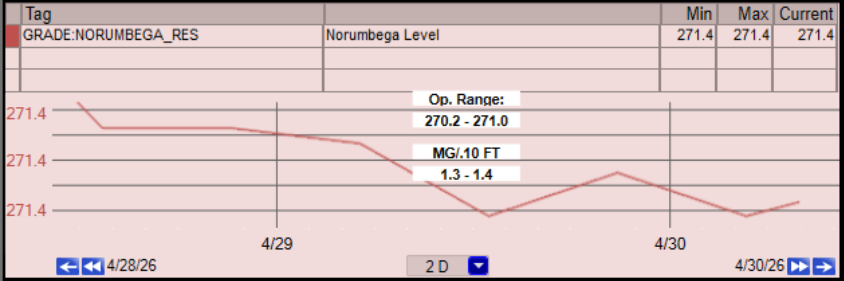
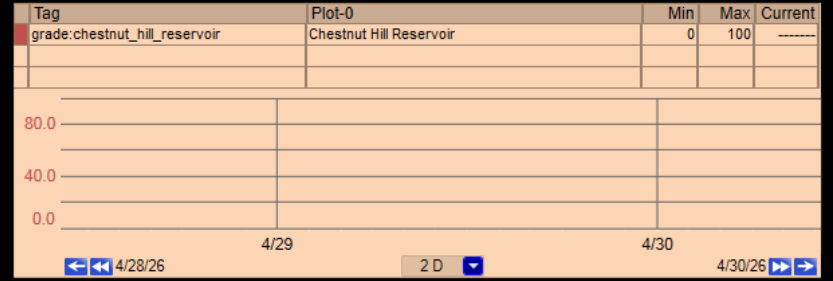
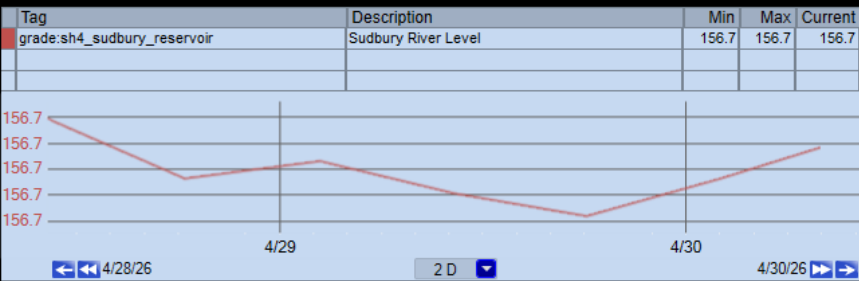
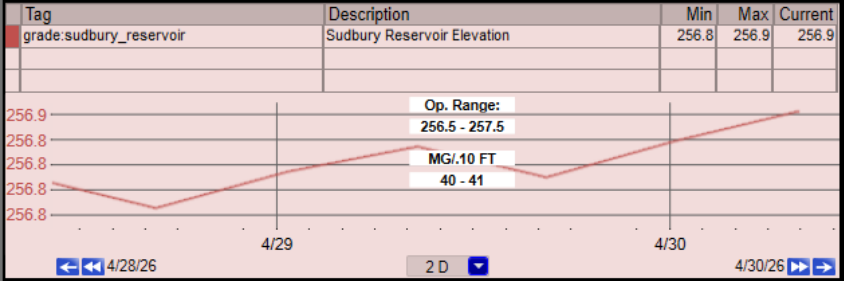
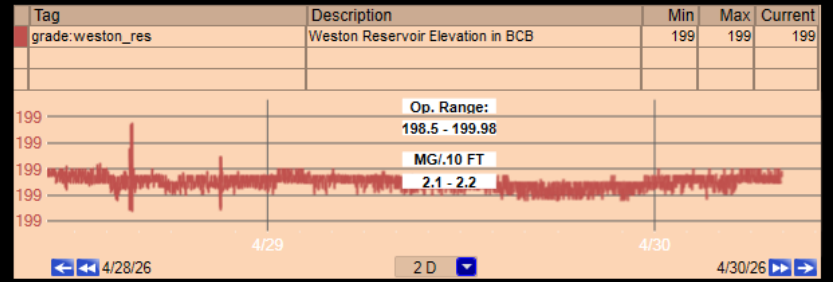
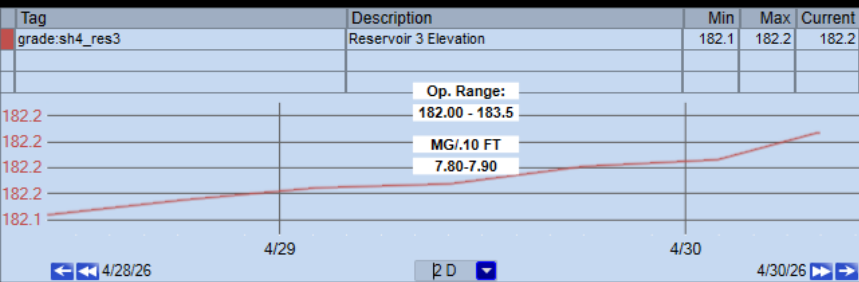
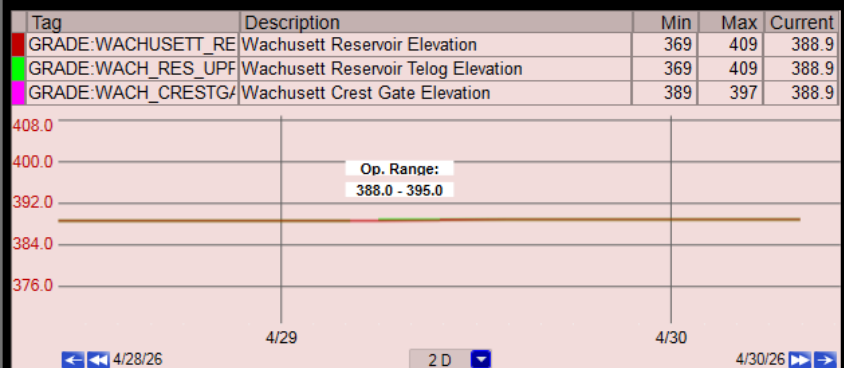
87.9 %

84.4 %

93.2 %



Main Menu





## My Favorites

Showing 2 out of 5 Continuous data types  
Not showing Daily data  
Not showing Field Measurement data  
Not showing Discrete data  
-- Make selections in [Change data shown](#)

- Show only data types with data in last 120 days
- Show data type period of record details

**IMPORTANT** Data may be [provisional](#)

[Show all latest values](#)

[View Monitoring location page](#)

Sudbury River at Ashland, MA - USGS-01097480

[Show latest values](#)

[View Monitoring location page](#)

Cochituate BK BL Lake Cochituate at Framingham, MA - USGS-01098500

[Show latest values](#)

[View Monitoring location page](#)

Sudbury River at Saxonville, MA - USGS-01098530

[Show latest values](#)

[View Monitoring location page](#)

Ware River at Intake Works Near Barre, MA - USGS-01173000

[Show latest values](#)

[View Monitoring location page](#)

Nashua River, Water Street Bridge, at Clinton, MA - USGS-01095503

[Show latest values](#)

[View Monitoring location page](#)

Swift River at West Ware, MA - USGS-01175500

[Show latest values](#)

[View Monitoring location page](#)

Connecticut River at Montague City, MA - USGS-01170500

[Show latest values](#)

[View Monitoring location page](#)

Stillwater River Near Sterling, MA - USGS-01095220

[Show latest values](#)

[View Monitoring location page](#)

Quinapoxet River at Canada Mills Near Holden, MA - USGS-01095375

[Show latest values](#)

[View Monitoring location page](#)

Ware R Intake Works NR Barre, MA Precipitation - USGS-422328072035300

[Show latest values](#)

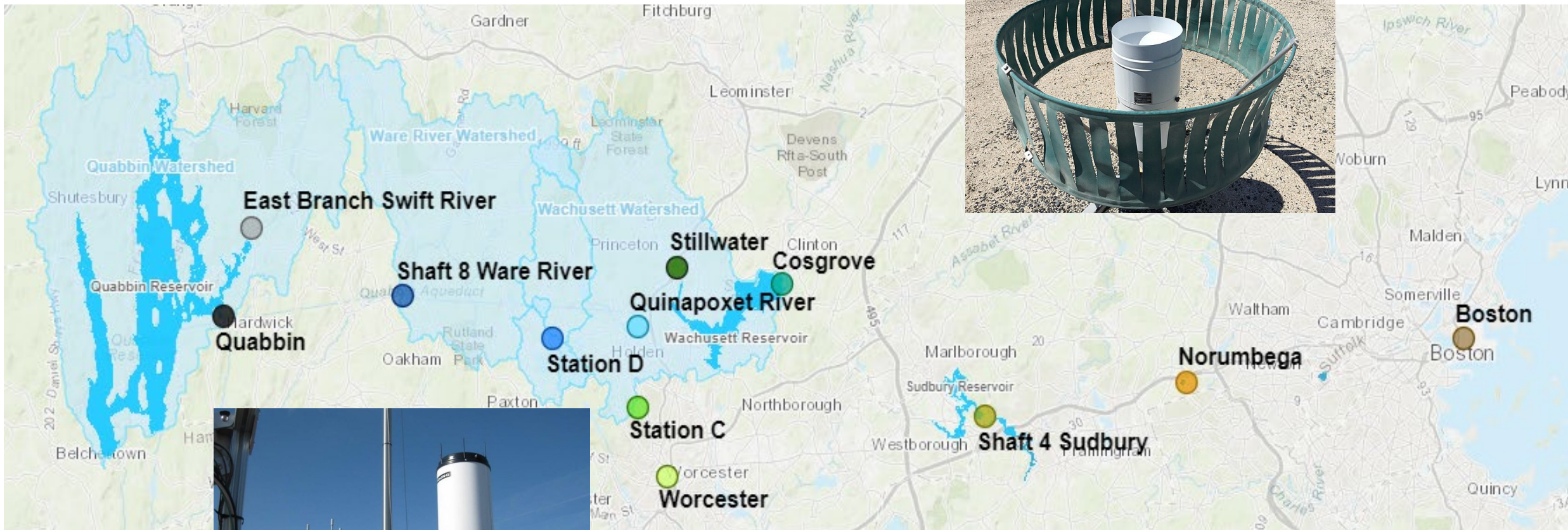
[View Monitoring location page](#)

East BR Swift R NR Hardwick, MA Precipitation - USGS-422336072142100

[Show latest values](#)

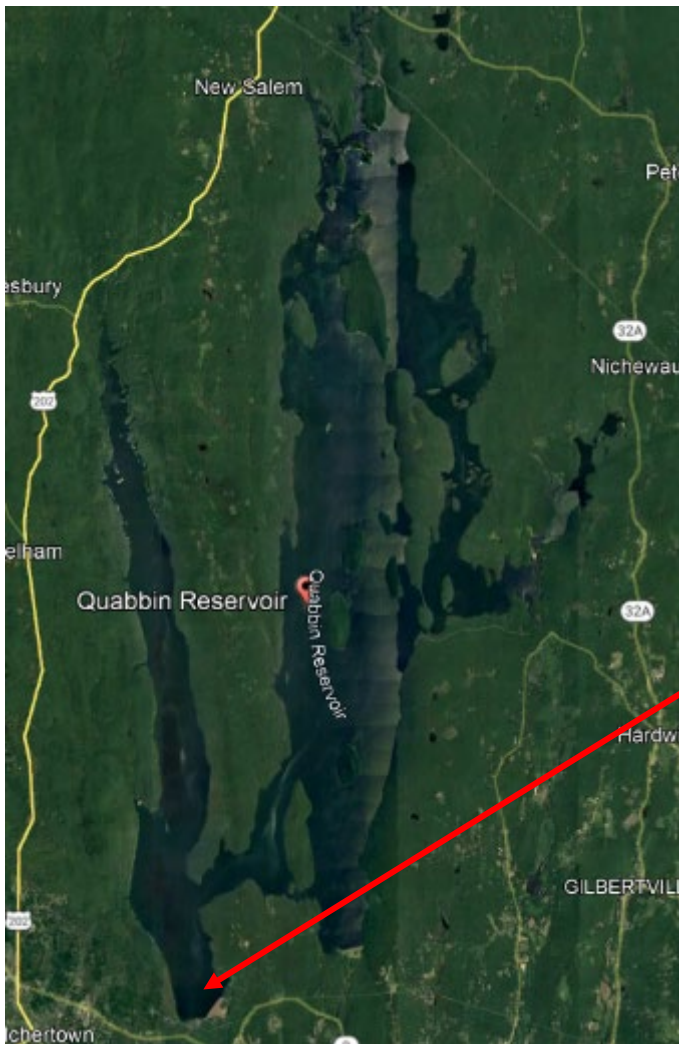


# 12 Rain Gages Monitored



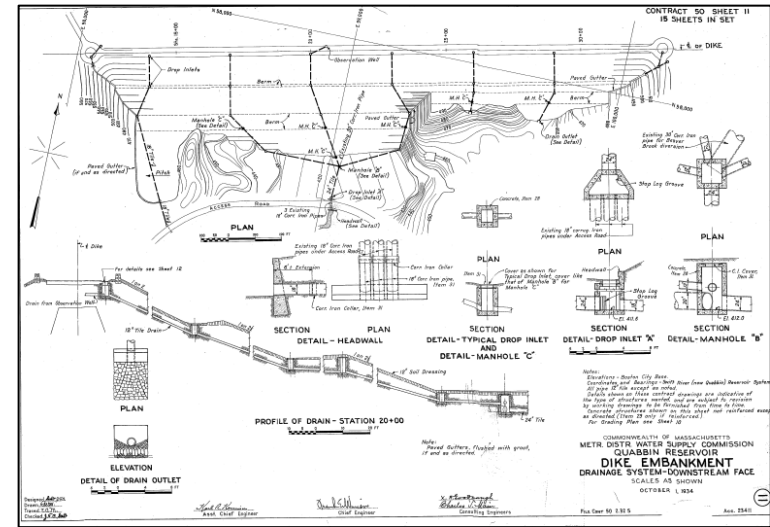


# Quabbin Reservoir – Winsor Dam and Goodnough Dike



Winsor Dam

Goodnough Dike





# Quabbin Reservoir- Winsor Dam and release infrastructure



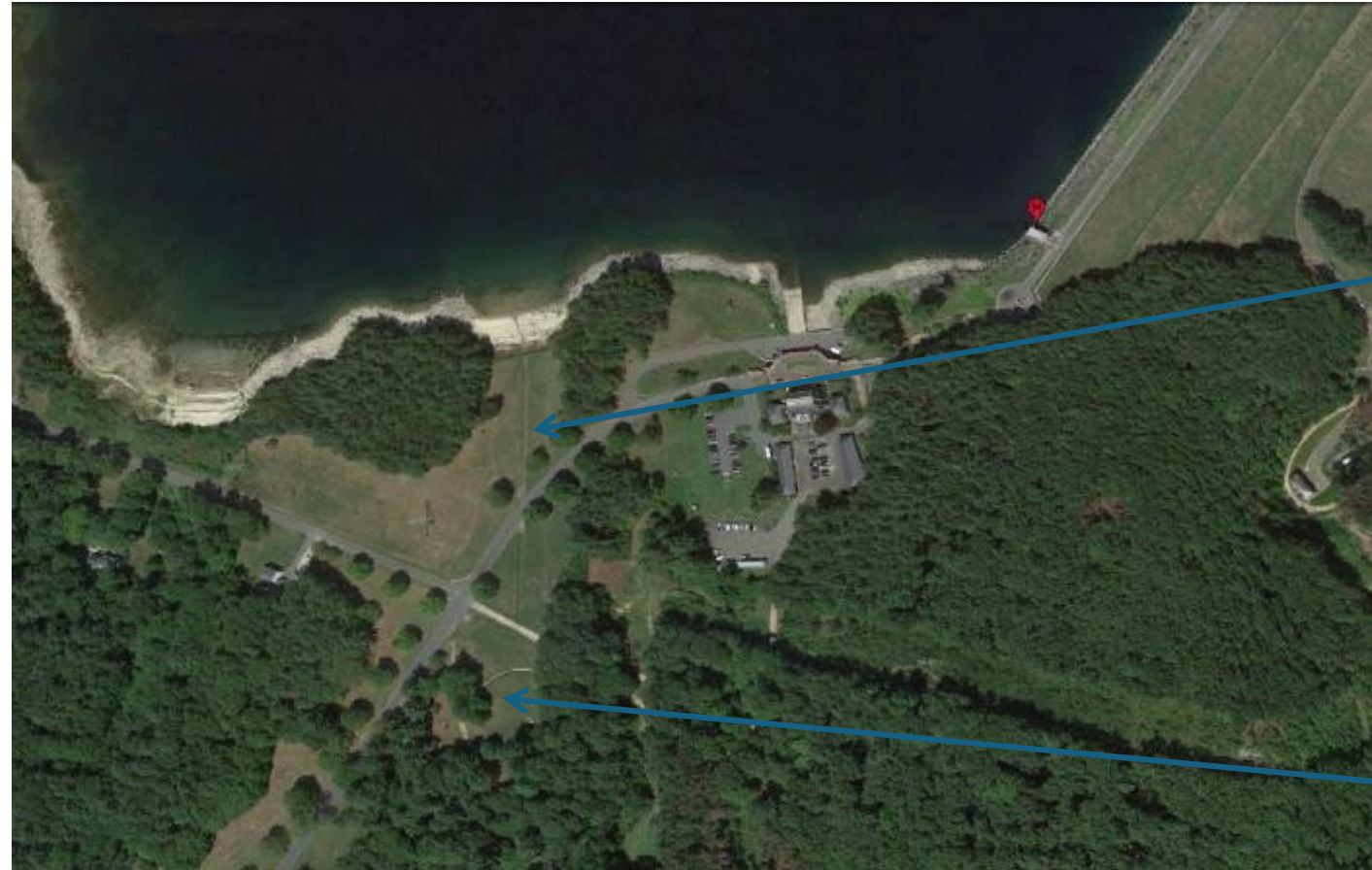


# Quabbin Primary Spillway and Lower Spillway w/stoplog options





# Quabbin Auxiliary Spillway @ 536.00'





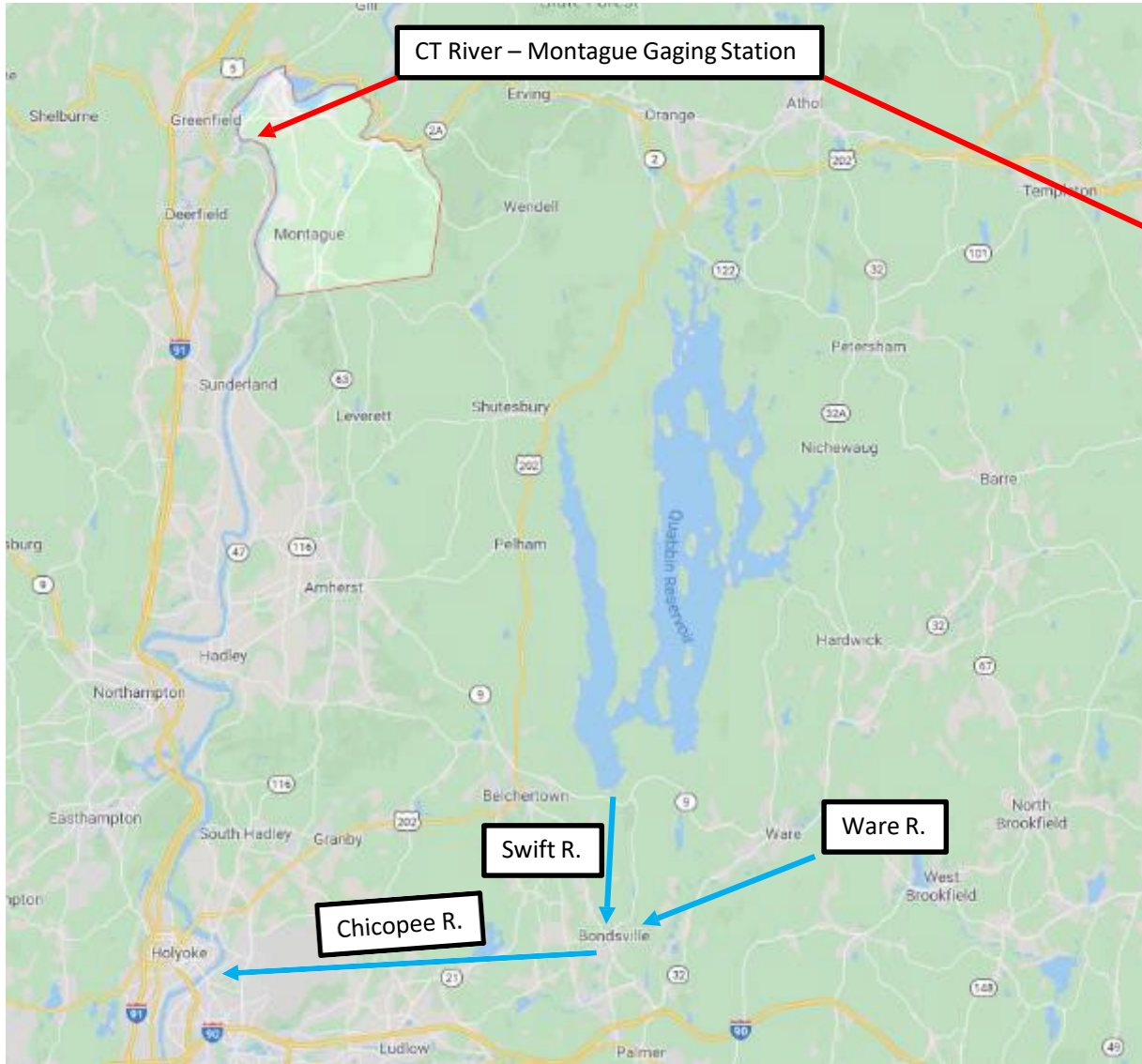
## Quabbin Statutory Releases from Winsor Power Station (WPS)

- CT River @ Montague: USGS gaging station monitoring location related to Swift R. releases at Winsor Dam to Swift River: “War Department Permit, 1930” –
  - Maintain 20 MGD as measured at Bondsville at all times.
- From June 1<sup>st</sup> – November 30:<sup>th</sup>
  - *When CT River is between 4650 cfs and 4900 cfs, increase release to Swift R. to 70 cfs (45 MGD) – **Not typically employed***
  - When CT River is <4650 cfs, increase release to Swift River to 110 cfs (71 MGD)





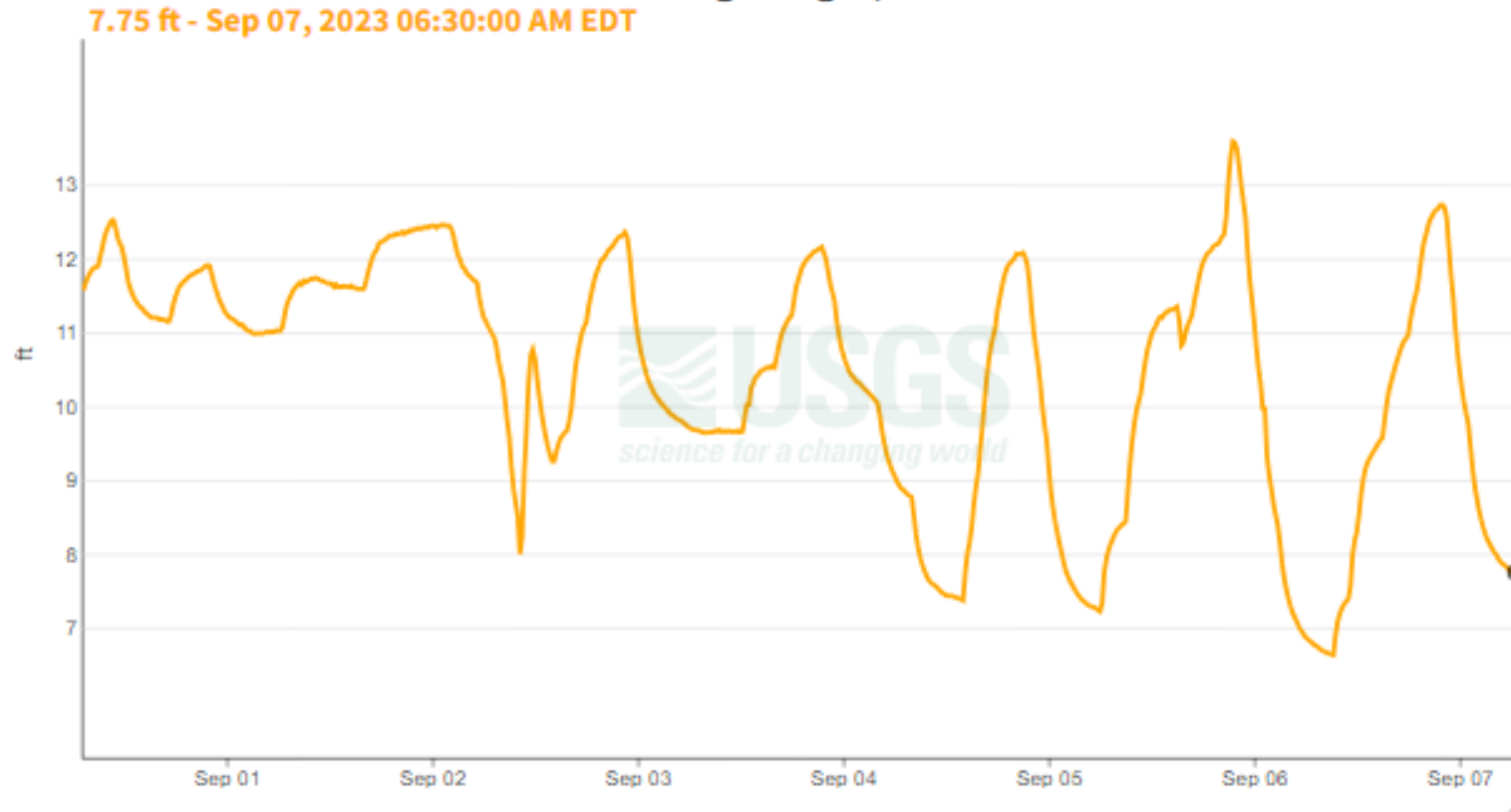
# CT River at Montague





# Connecticut River at Montague City, MA - 01170500

August 31, 2023 - September 7, 2023  
Gage height, feet



3-day Average < 4650 cfs  
Requires a 110 cfs (71 MGD)  
release to Swift R. from WPS

However, if the hydropower ops puts a lot more water back in, as in this case ([see peaks](#)), we may avoid the trigger.

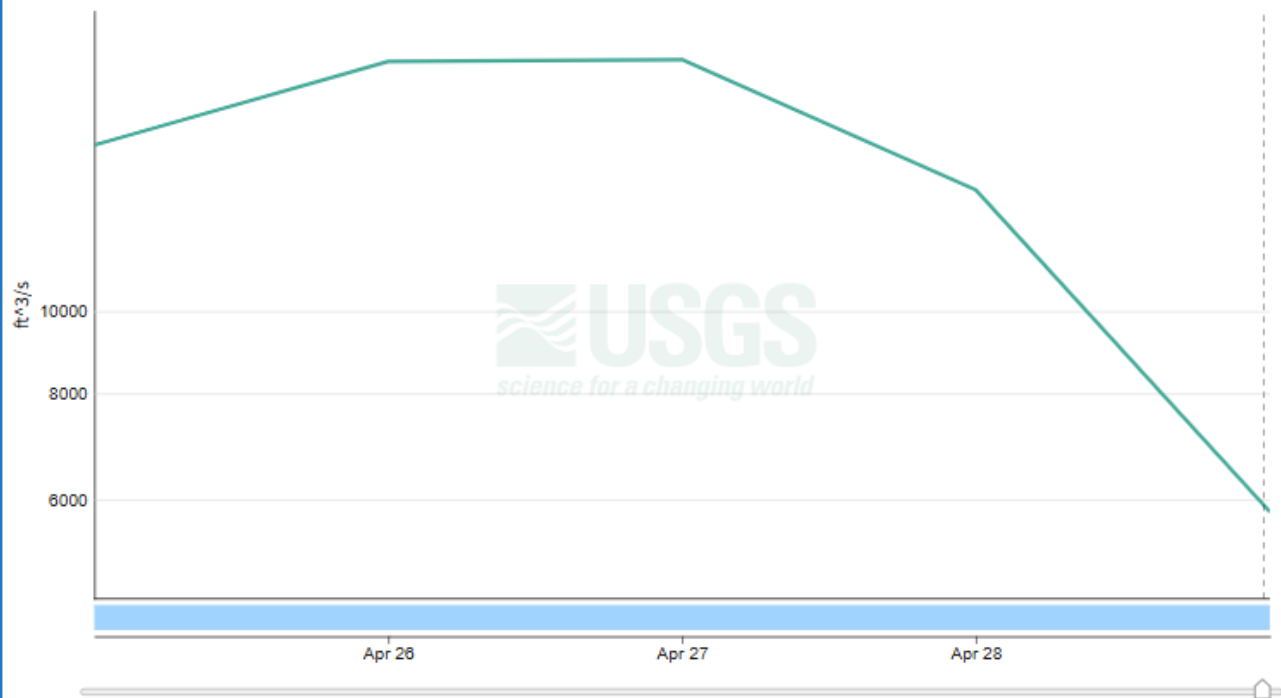


# 3-Day Average

## Daily data

### Connecticut River at Montague City, MA - USGS-01170500

- using custom time span -  
April 25, 2026 - April 29, 2026  
Discharge, cubic feet per second



**IMPORTANT** Data may be [provisional](#)

[Show legend](#) ▾

[Hide graph details](#) ^

	Value	Status	Date
● Mean	5800 ft <sup>3</sup> /s	Provisional	April 29, 2026

[Hide graph details](#) ^

Quabbin Reservoir Spillway in M.G. to Swift River	USGS Gage Swift River Release M.G.	USGS 01170500 Connecticut River at Montague City, Ma. (CFS)	3 Day Average USGS 01170500 Connecticut River at Montague City, Ma. (CFS)
0.00	28.31	6,390	6,593
0.00	28.31	5,900	5,683
0.00	28.50	4,600	5,630
0.00	29.08	5,210	5,237
0.00	28.63	6,850	5,553
0.00	33.41	11,500	7,853
0.00	28.31	9,170	9,173
0.00	26.50	8,930	9,867
0.00	28.18	3,210	7,103
0.00	28.37	6,420	6,187
0.00	28.24	4,440	4,690
0.00	28.18	5,390	5,417
0.00	27.53	7,000	5,610
0.00	27.53	4,650	5,680
0.00	27.53	3,410	5,020
0.00	27.15	4,130	4,063
0.00	26.63	5,960	4,500
0.00	27.34	3,150	4,413
0.00	27.73	3,170	4,093
0.00	27.14	3,500	3,273
0.00	27.21	4,240	3,637
0.00	27.53	6,760	4,833
0.00	26.69	3,060	4,687
0.00	26.50	3,890	4,570
0.00	26.63	5,090	4,013
0.00	27.21	3,120	4,033
0.00	29.60	7,190	5,133
0.00	28.24	12,300	7,537
0.00	27.40	16,800	12,097
0.00	27.14	12,600	13,900

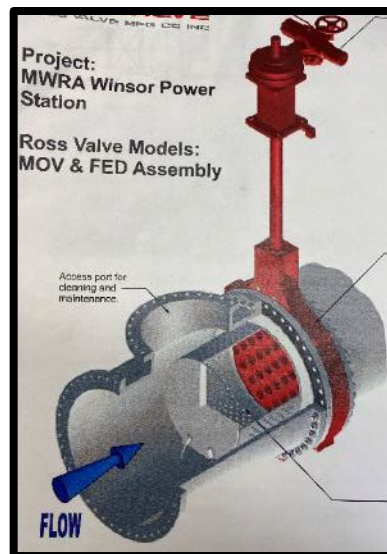
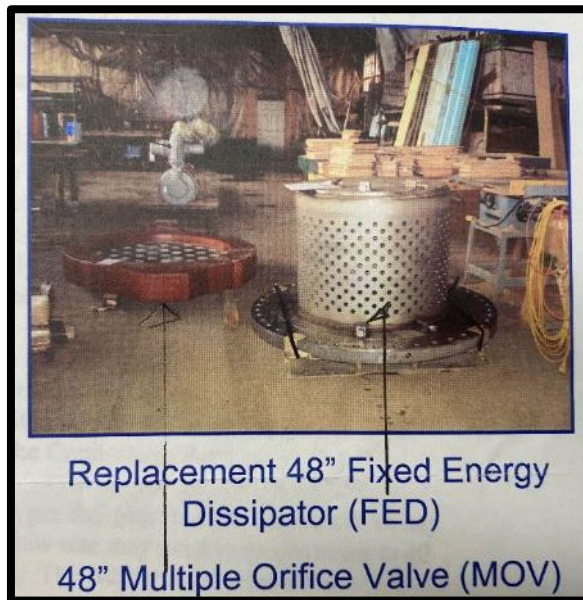


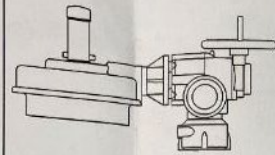
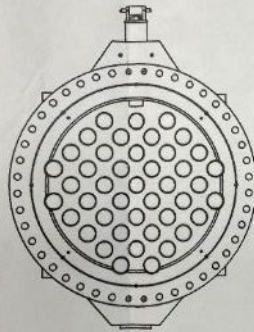
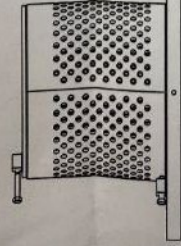
# WPS Valving – Fixed Energy Dissipater/Multiple Orifice Valve (FED/MOV)

The primary settings for the combination valve (FED/MOV) are 45 MGD and 71 MGD. MOV not used long term under 40 MGD due to cavitation issues. We generally go above 65-70% opening to reach 71 MGD.

Western O&M prefers to ignore the 45 MGD release and go directly to the 71 MGD setting because the interim setting adds little value and substantial work by the valve crew if the CT River Gage changed requiring the upper release (which is likely).

For baseflow statutory release of 20 MGD, only the bypass is used.



	<b>Specifications</b> Actuator: Rotork IQ-35 Gear Box: Rotork IB-13 Weight: 592 lbs Features: <ul style="list-style-type: none"><li>• Dual limit switches</li><li>• Feedback signal (4-20mA)</li><li>• Coupled to Ross MOV via Extension Shaft Assembly and appropriate hardware</li></ul>
	<b>Specifications</b> Model: MOV Size: 48 inch Serial #: L08639 Materials: Mild Steel body (epoxy coated), Series 400 Stainless Steel plates Orifice Qty: 43 Orifice Size: 3.8 in dia (approx.) Leakage Rate: ≤ 40 GPM Weight: 3,600 lbs (approx.) Feature: Coupled to actuator via single connection pin
	<b>Specifications</b> Model: FED Size: 48 inch Serial #: L08640 Materials: Stainless Steel Orifice Qty: 504 Orifice Size: 7/8 in dia Weight: 2,830 lbs

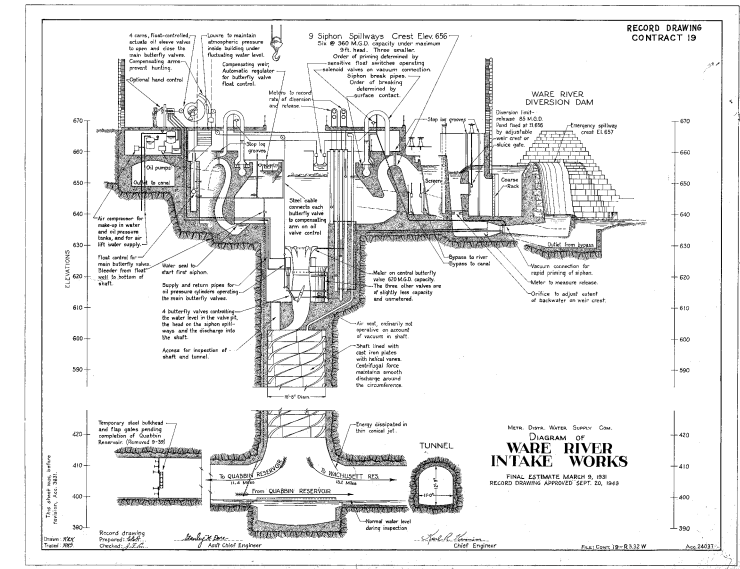


# General Shaft 8 Operations



## Detailed SOP for facility operations:

- Flood skim above 85 MGD
- Oakdale/Shaft 1 closed
- Shaft 12 shutters reversed to allow flow to exit Shaft 11A into Quabbin Reservoir.





- Ware River at Coldbrook: “War Department Permit, 1926” – Diversion of Ware River may only occur when flows are above 131 cfs (85 MGD).

### Timelines:

- December 1 – June 1 we can divert any time needed.
- June 1 – December 1– diversion requires notification of MA DEP.
- No diversions June 15 – October 15 permitted

Exceptions: US ACE request to divert for flood control

### MWRA added constraint:

-- Water temp must be 10 Deg. C or less for 30 days prior to diversion for aquatic invasives concerns.

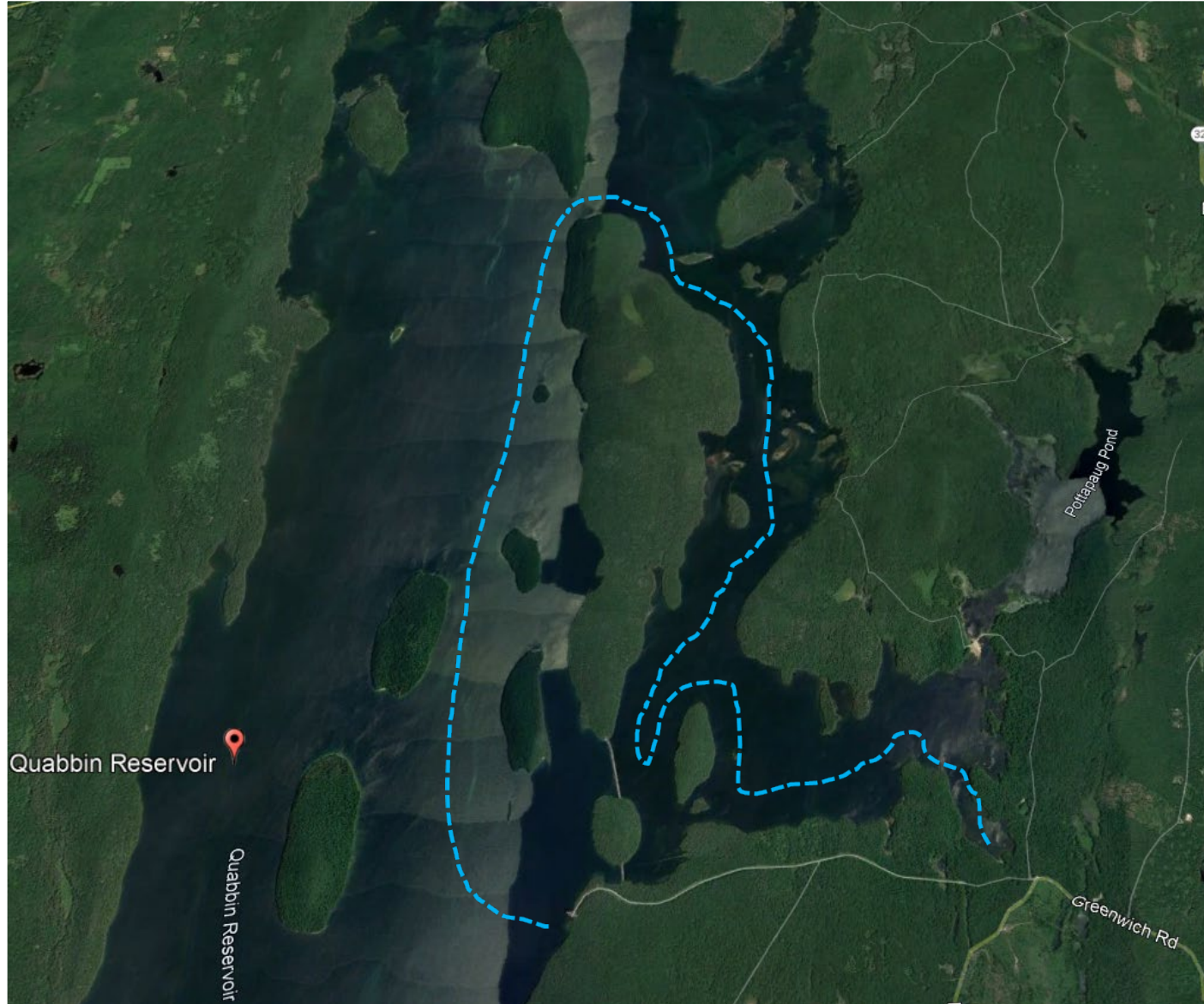


# Shaft 8/Ware River Ops





# Baffle Dams and Shaft 11 A at Quabbin Reservoir





# Wachusett Reservoir



IN: Oakdale Transfer  
110 MGD – 300 MGD

IN: Quinapoxet River and  
Stillwater River - varies

OUT: Cosgrove Intake  
180- 300 MGD seasonally

OUT: Crest  
Gate/spillway for  
elevation control  
Varies based on need

OUT: Fountain for statutory release  
5 MGD

OUT: Lower Gatehouse MOVs  
for elevation control up to 300  
MGD



# Wachusett Crest Gate



Crest Gate range 390.00' (lower spillway sill) to 395.00'.  
 Typical upper release limit 300 MGD to Nashua River.

Crest tip elevation	<b>390.20</b>
Reservoir Elevation	<b>391.37</b>
Crest C	3.25

$Q=C*L*(H^{1.5})$	
Todays Elevation	391.37
crestgate Tip elevation	390.20
Head	1.17
H	1.265548
C	3.25
L	98
conversion to mgd	0.646317
MGD	260.50





# Oakdale Transfer Ops

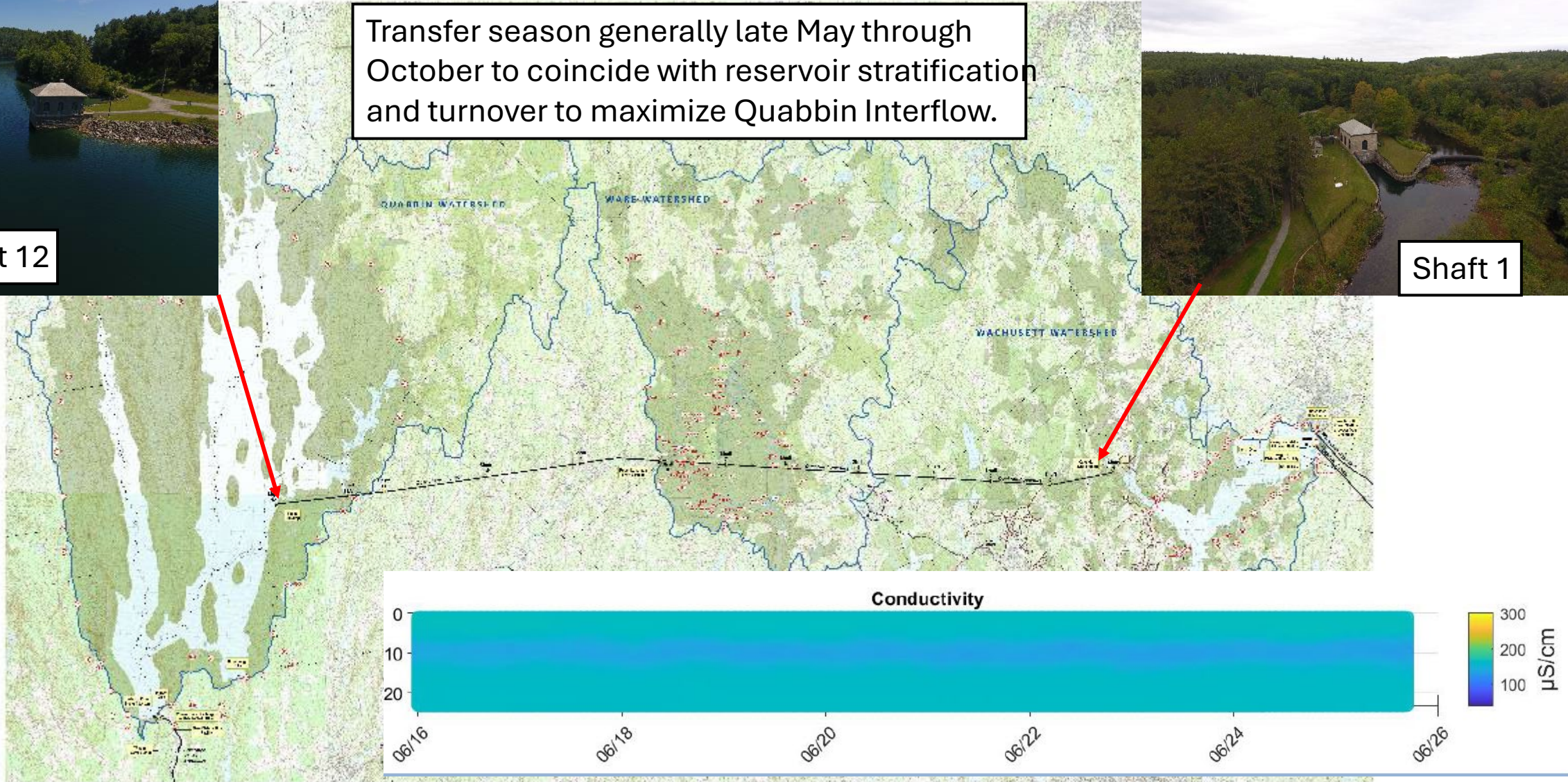


Shaft 12

Transfer season generally late May through October to coincide with reservoir stratification and turnover to maximize Quabbin Interflow.



Shaft 1



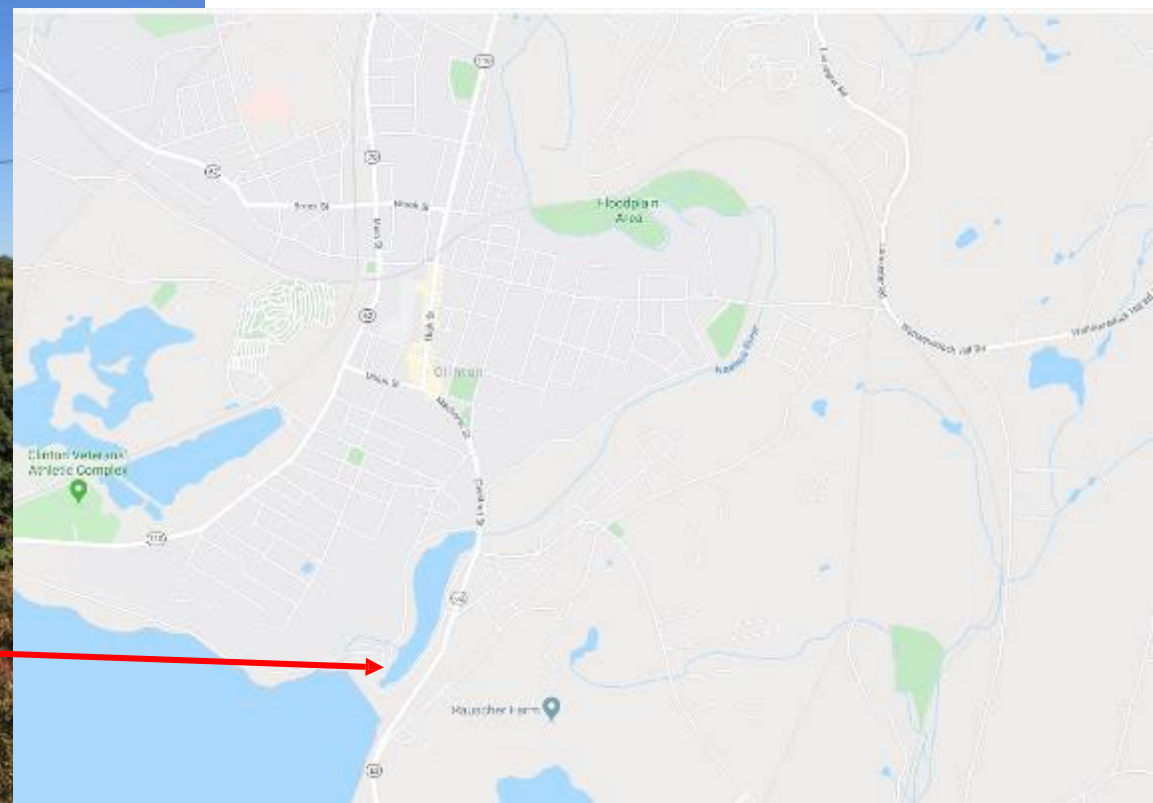


# Oakdale Power Station



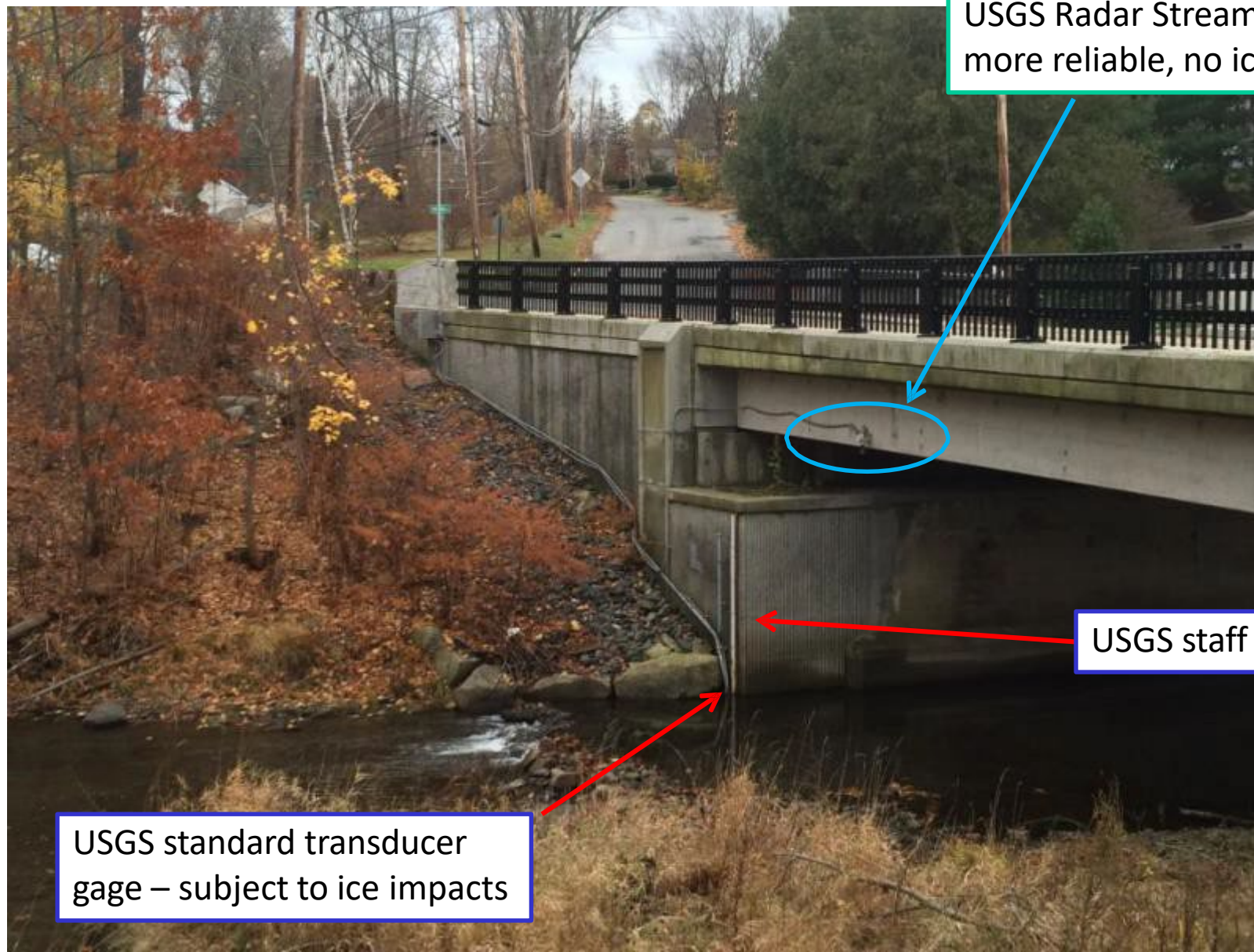


# Wachusett Dam release to Nashua River: “Acts of 1895” – 12 MG per week or 1.72 MGD





# Redundancy at Nashua River gaging station below Wachusett Dam



USGS Radar Stream Gage –  
more reliable, no ice impacts

USGS staff gage

USGS standard transducer  
gage – subject to ice impacts



## Current Conditions for DCR-DWSP and MWRA -- 18 site(s) found

PROVISIONAL DATA SUBJECT TO REVISION

--- Predefined displays ---    Group table by    Select sites by  
 Massachusetts DCR, Division of Water-Supply Protection    Major River Basin   

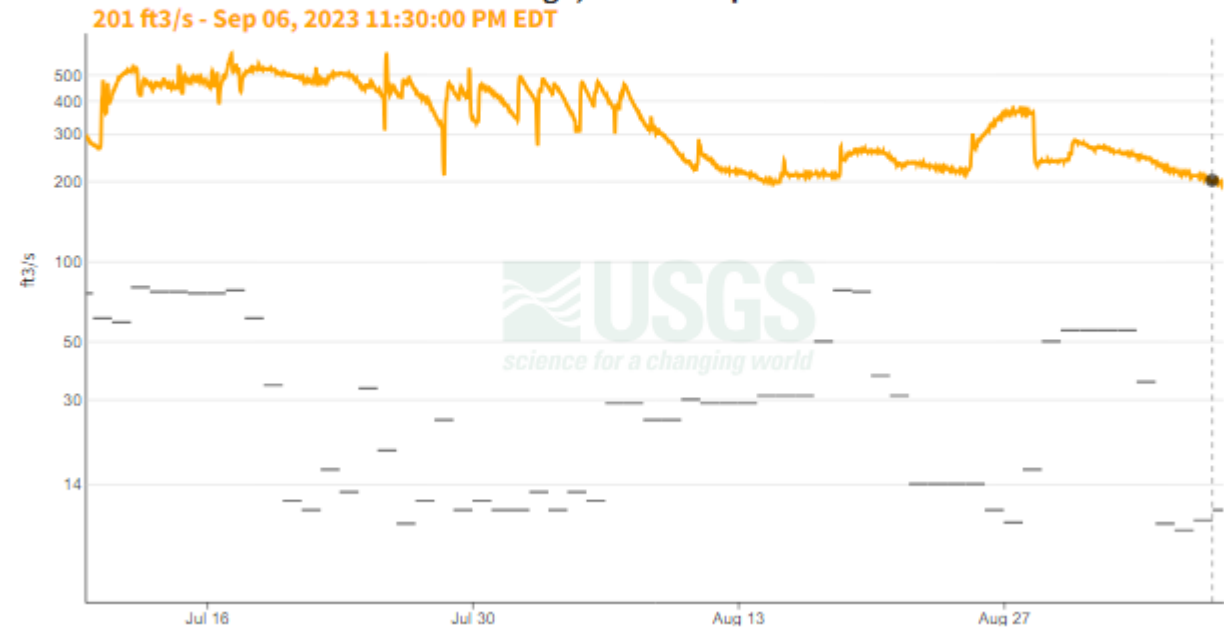
Station Number	Station name
<b>■ Undefined</b>	
<a href="#">422341071464901</a>	MA-WSW 26 WEST BOYLSTON, MA
<b>■ MERRIMACK RIVER BASIN</b>	
<a href="#">01094500</a>	NORTH NASHUA RIVER NEAR LEOMINSTER, MA
<a href="#">01095220</a>	STILLWATER RIVER NEAR STERLING, MA
<a href="#">01095375</a>	QUINAPOXET RIVER AT CANADA MILLS NEAR HOLDEN, MA
<a href="#">01095434</a>	GATES BROOK NEAR WEST BOYLSTON, MA
<a href="#">01095503</a>	NASHUA RIVER, WATER STREET BRIDGE, AT CLINTON, MA RADAR
<a href="#">01096500</a>	NASHUA RIVER AT EAST PEPPERELL, MA
<a href="#">01098500</a>	COCHITUATE BK BL LAKE COCHITUATE AT FRAMINGHAM, MA
<a href="#">01098530</a>	SUDBURY RIVER AT SAXONVILLE, MA
<b>■ CONNECTICUT RIVER BASIN</b>	
<a href="#">01170500</a>	CONNECTICUT RIVER AT MONTAGUE CITY, MA
<b>■ CHICOOPEE RIVER BASIN</b>	
<a href="#">01172500</a>	WARE RIVER NEAR BARRE, MA
<a href="#">01173000</a>	WARE RIVER AT INTAKE WORKS NEAR BARRE, MA
<a href="#">01173500</a>	WARE RIVER AT GIBBS CROSSING, MA
<a href="#">01174500</a>	EAST BRANCH SWIFT RIVER NEAR HARDWICK, MA
<a href="#">01174565</a>	WEST BRANCH SWIFT RIVER NEAR SHUTESBURY, MA
<a href="#">01175500</a>	SWIFT RIVER AT WEST WARE, MA
<a href="#">422328072035300</a>	WARE R INTAKE WORKS NR BARRE, MA PRECIPITATION
<a href="#">422336072142100</a>	EAST BR SWIFT R NR HARDWICK, MA PRECIPITATION

**Data status codes:**  
 -- Parameter not determined

## Nashua River, Water Street Bridge, at Clinton, MA - 01095503

July 9, 2023 - September 7, 2023

Discharge, cubic feet per second



09/01 12:00 EDT	11.7	1.52	--	--	--	--	0
09/01 12:15 EDT	49.6	2.19	--	--	--	--	0
09/01 12:15 EDT	--	--	--	--	--	--	0
09/01 12:30 EDT	--	--	--	--	--	--	0



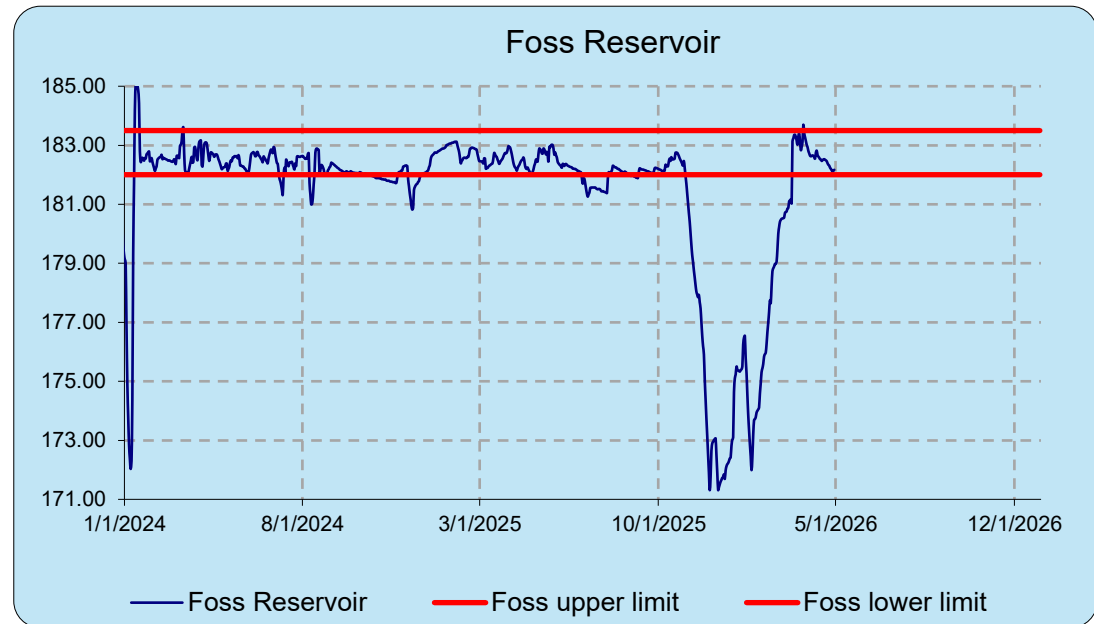
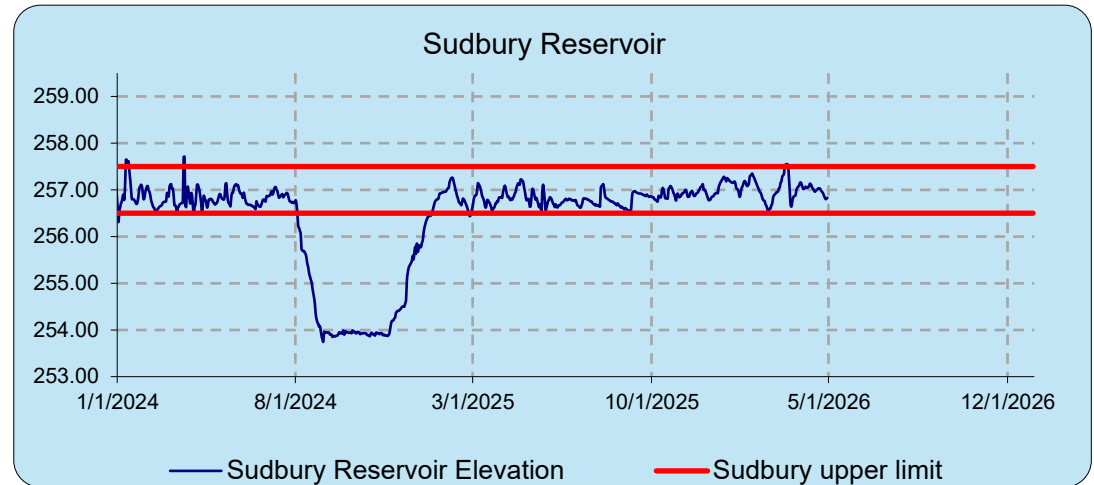
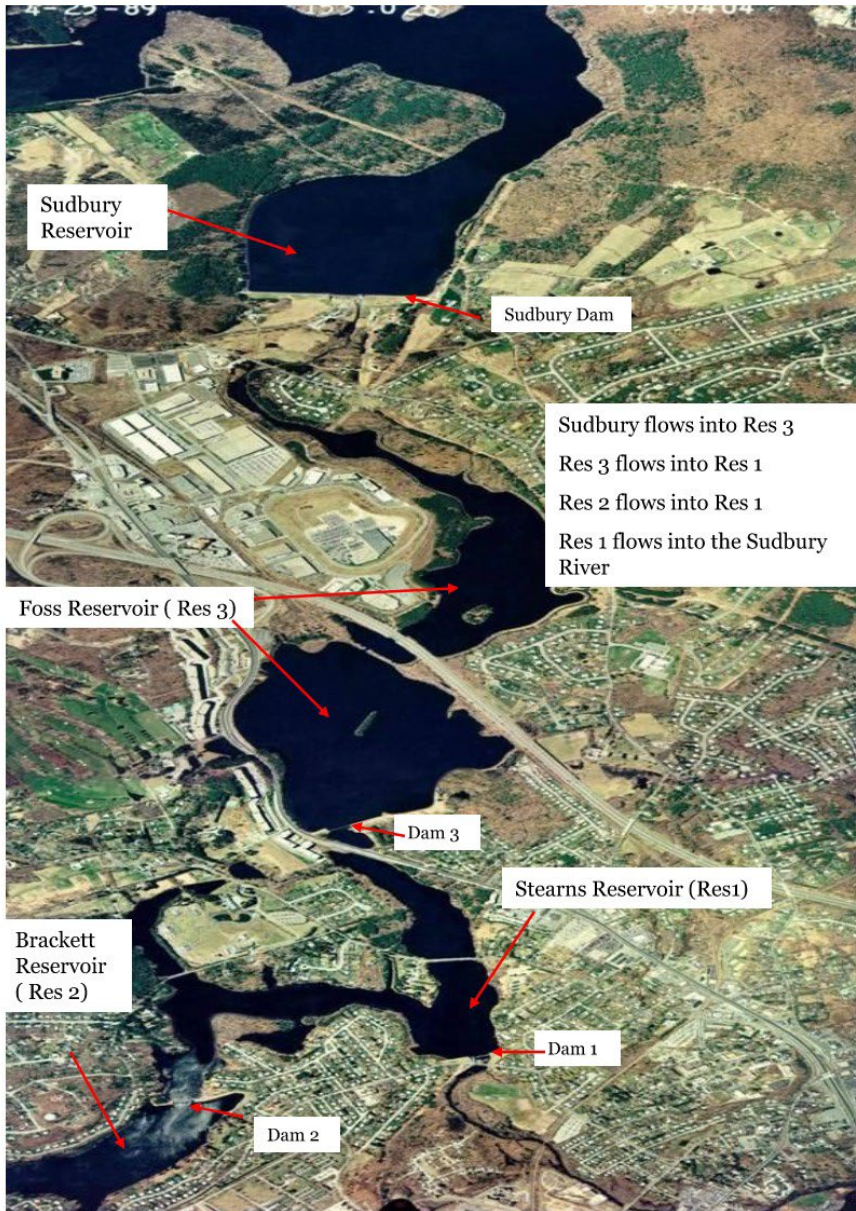
# Nashua River "Canary"

**Staff gage installed**





# Sudbury & Framingham Reservoirs





# Valve Opening Calculations

Sudbury Reservoir		
GIVEN		
Today's Elevation	256.96	
w = gate width in feet	3.25	
C = Coefficient of Discharge = 0.6883	0.69	
G = Gate opening in feet	0.53	10%
A = Area of gate opening in square feet	1.72	
Sg = sill elevation of gate	223	
H = elevation of Sudbury Reservoir - Sg-1/2(G)	33.565	
g = 32.2	32.20	
2gh =	64.40	
Square Root of 2g	8.02	
Square Root of H	5.79	
Million Gallon Constant	0.646317	
	<b>35.63</b>	mgd

Foss Reservoir		
48" pipeline "A" - Gate # 9 (sill elevation 162.40)		
Today's Elevation	182.32	
w = gate width in feet	4.50	
C = Coefficient of Discharge = 0.474307	0.47	
G = Gate opening in feet	0.40	10%
A = Area of gate opening in square feet	1.80	
Sg = sill elevation of gate	168.55	
H = elevation of Foss Reservoir - Sg-1/2(G)	13.57	
g = 32.2	32.20	
2gh =	64.40	
Square Root of 2g	8.02	
Square Root of H	3.68	
Million Gallon Constant	0.646317	
	<b>16.31</b>	mgd

Foss Reservoir		
Gates 2 , 4 & 6 (sill elevation 173.76)		
Today's Elevation	182.15	
w = gate width in feet	4.00	
C = Coefficient of Discharge = 0.474307	0.47	
G = Gate opening in feet	0.75	15%
A = Area of gate opening in square feet	3.00	
Sg = sill elevation of gate	173.76	
H = elevation of Foss Reservoir - Sg-1/2(G)	8.015	
g = 32.2	32.20	
2gh =	64.40	
Square Root of 2g	8.02	
Square Root of H	2.83	
Million Gallon Constant	0.646317	
	<b>32.33</b>	mgd

Foss Reservoir		
Gates 1, 3, 5 & 7 (sill elevation 162.40)		
Today's Elevation	183.14	
w = gate width in feet	4.00	
C = Coefficient of Discharge = 0.474307	0.47	
G = Gate opening in feet	0.50	10%
A = Area of gate opening in square feet	2.00	
Sg = sill elevation of gate	162.40	.....
H = elevation of Foss Reservoir - Sg-1/2(G)	20.49	
g = 32.2	32.20	
2gh =	64.40	
Square Root of 2g	8.02	
Square Root of H	4.53	
Million Gallon Constant	0.646317	
	<b>34.46</b>	mgd

**\* LOWER GATES \***

Use this formula for gates 2 & 4 (sill elevation 173.76)



# Sudbury River at Saxonville

## My Favorites

Showing 2 out of 5 Continuous data types  
Not showing Daily data  
Not showing Field Measurement data  
Not showing Discrete data  
-- Make selections in [Change data shown](#)

- Show only data types with data in last 120 days
- Show data type period of record details

**IMPORTANT** Data may be [provisional](#)

[Show all latest values](#)

<a href="#">View Monitoring location page</a> Sudbury River at Ashland, MA - USGS-01097480	<a href="#">Show latest values</a>
<a href="#">View Monitoring location page</a> Cochituate BK BL Lake Cochituate at Framingham, MA - USGS-01098500	<a href="#">Show latest values</a>
<a href="#">View Monitoring location page</a> Sudbury River at Saxonville, MA - USGS-01098530	<a href="#">Show latest values</a>
<a href="#">View Monitoring location page</a> Ware River at Intake Works Near Barre, MA - USGS-01173000	<a href="#">Show latest values</a>
<a href="#">View Monitoring location page</a> Nashua River, Water Street Bridge, at Clinton, MA - USGS-01095503	<a href="#">Show latest values</a>
<a href="#">View Monitoring location page</a> Swift River at West Ware, MA - USGS-01175500	<a href="#">Show latest values</a>
<a href="#">View Monitoring location page</a> Connecticut River at Montague City, MA - USGS-01170500	<a href="#">Show latest values</a>
<a href="#">View Monitoring location page</a> Stillwater River Near Sterling, MA - USGS-01095220	<a href="#">Show latest values</a>
<a href="#">View Monitoring location page</a> Quinapoxet River at Canada Mills Near Holden, MA - USGS-01095375	<a href="#">Show latest values</a>
<a href="#">View Monitoring location page</a> Ware R Intake Works NR Barre, MA Precipitation - USGS-422328072035300	<a href="#">Show latest values</a>
<a href="#">View Monitoring location page</a> East BR Swift R NR Hardwick, MA Precipitation - USGS-422336072142100	<a href="#">Show latest values</a>

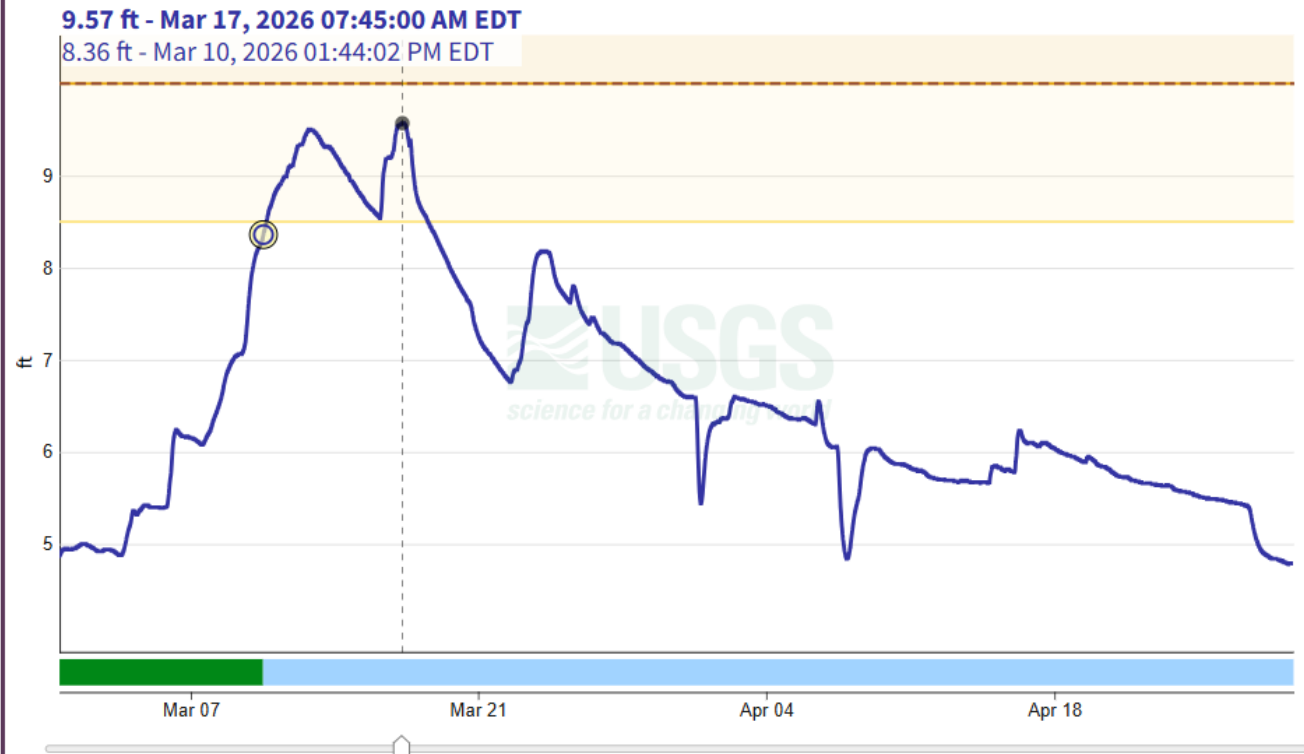
[Questions or Comments](#)

## Continuous data

Sudbury River at Saxonville, MA - USGS-01098530

[Subscribe to WaterAlert](#)

- using custom time span -  
February 28, 2026 - April 29, 2026  
**Gage height, feet**



**IMPORTANT** Data may be [provisional](#)

[Show legend](#) ▾

[Hide graph details](#) ^

Value

Status

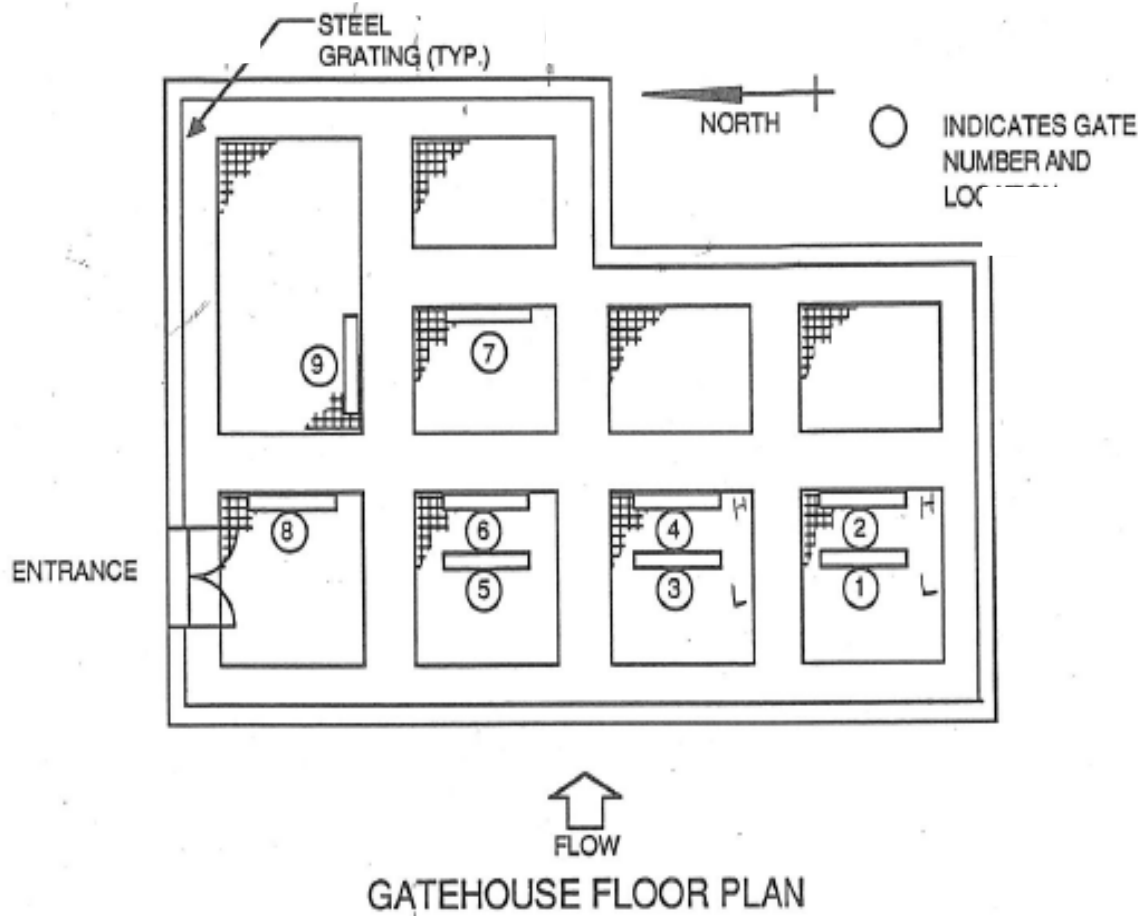
Time



# Foss Reservoir Gatehouse

a)

## Framingham Dam 3 Site



b)





# Sudbury Aqueduct Gate

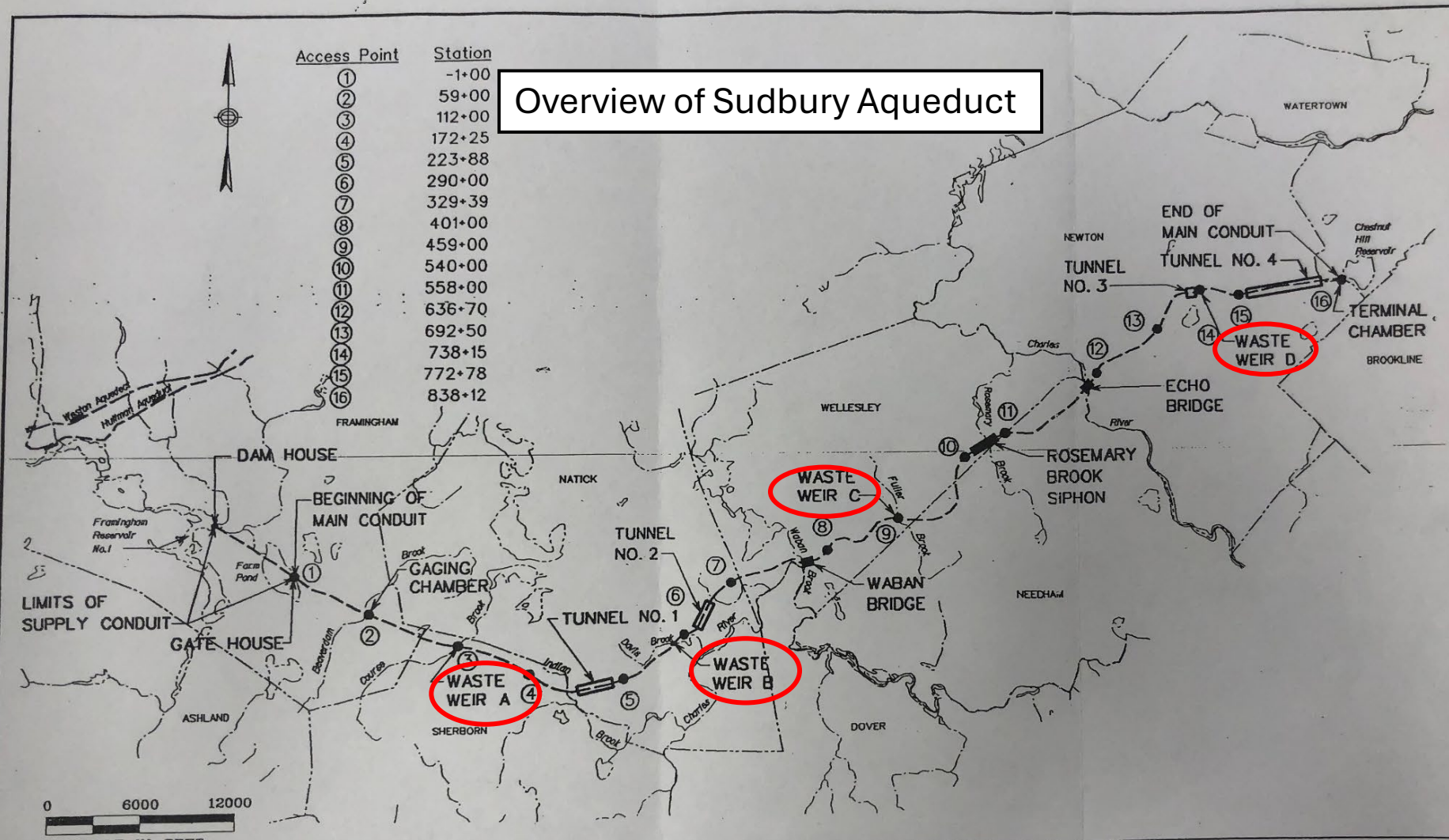


Reservoir #1  
Gatehouse

10



# Sudbury Aqueduct Waste Weirs

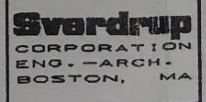


DATE: 7/15/04  
PROJECT: SUDBURY AQUEDUCT REHABILITATION AND CONNECTING TUNNELS  
DRAWN BY: J. B. [unreadable]  
CHECKED BY: [unreadable]  
SCALE: AS SHOWN  
DATE OF PLOT: 10/04/04 (Using STANDARD TBL.)



MASSACHUSETTS  
WATER RESOURCES AUTHORITY

SUDBURY AQUEDUCT REHABILITATION  
AND  
CONNECTING TUNNELS



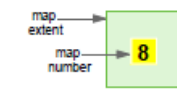
LOCUS  
EXISTING SUDBURY AQUEDUCT



# Sudbury Aqueduct

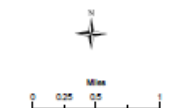
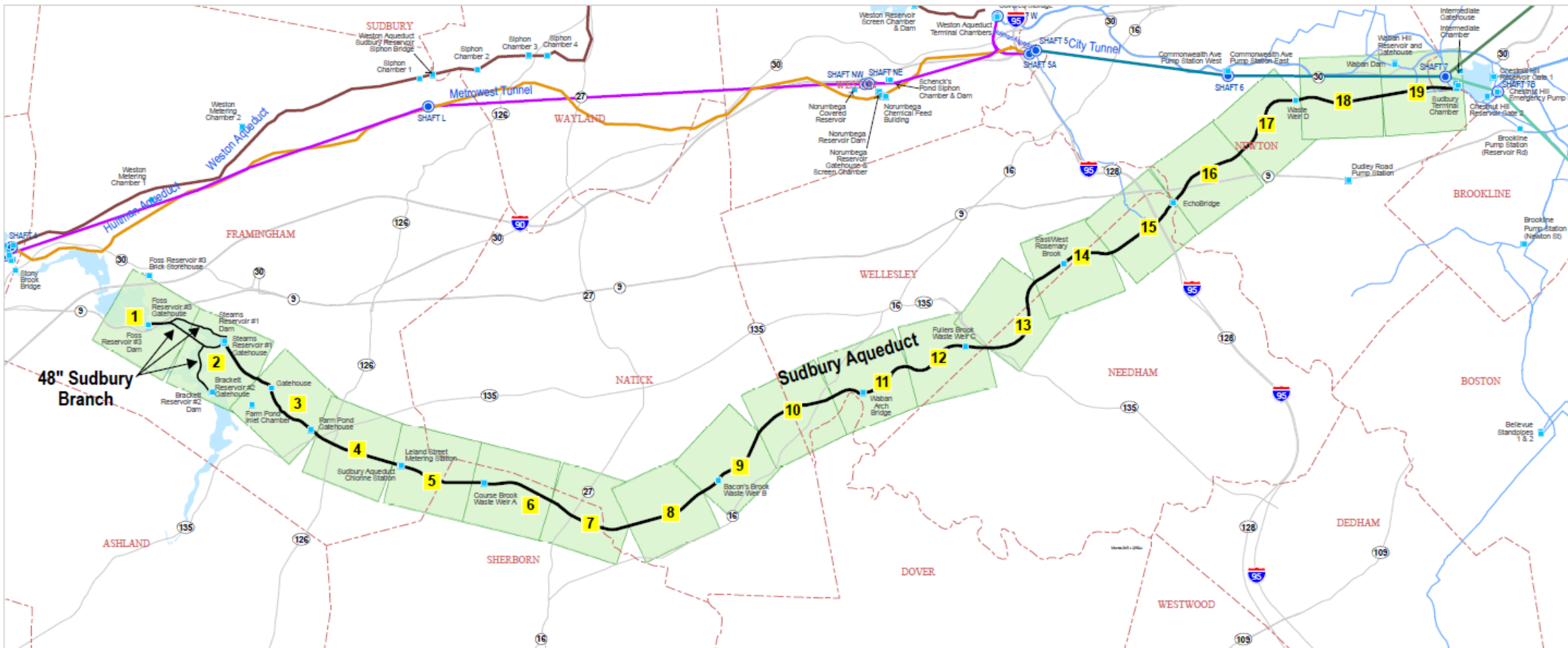
### To view a map:

1. Hover the "hand" icon over a map number.
2. When the "hand" icon changes to "hand-finger", click on it.



### LEGEND

- Sudbury Aqueduct -offline
- Sudbury Branch - offline
- Other Transmission Shafts
- Chicopee Valley Aqueduct
- Hullman Aqueduct
- City Tunnel
- City Tunnel Extension
- Cochituate Aqueduct
- Cosgrove Tunnel
- Dorchester Tunnel
- Metrowest Tunnel
- Quabbin Aqueduct
- Weston Aqueduct
- Municipal Boundary
- Major Highways
- MWRA Reservoirs



SECURITY - OPERATIONAL  
For MWRA Reference Only  
Duplication or Further Distribution Prohibited



# Chestnut Hill Terminal Chamber and Bellmouth

