Wood-Pawcatuck Watershed Flood Resiliency Management Plan
DAM INSPECTION FIELD ASSESSMENT

DAM NAME		INSPECTION DATE
	OUTLET WORKS - removed/inoperable	
AREA INSPECTED	CONDITION	OBSERVATIONS
OUTLET WORKS	TYPE	unknown - no longer in place/in service
	INTAKE STRUCTURE	N/O ; possibly replaced by U/S wall
	TRASHRACK	N/O
	PRIMARY CLOSURE	N/O
	SECONDARY CLOSURE	N/O
	CONDUIT	N/O
	OUTLET STRUCTURE/HEADWALL	N/O; riprap/boulders @ probable former outlet channel
	EROSION ALONG TOE OF DAM	N/O
	SEEPAGE/LEAKAGE	N/O
	DEBRIS/BLOCKAGE	N/O
	UNUSUAL MOVEMENT	N/O
	DOWNSTREAM AREA	rock lined channel leading back to main channel below tailrace
	MISCELLANEOUS	
ADDITIONAL COMMENTS:		

Wood-Pawcatuck Watershed Flood Resiliency Management Plan
DAM INSPECTION FIELD ASSESSMENT

Potential Recommendation Notes

Removal? unlikely

Breach/Spillway Adjustments? N/A

Repurposing? possible if gates added to spillway

Fish/eel passage? little room for fish ladder - possible past location of outlet works or up side of aux spillway?

Notes:

Work completed on dam w/in last 5 years; concrete clearly new

possible gatehouse/sauna/powerhouse left side of dam

PHOTOS

PHOTOGRAPHS INSTRUCTION PAGE:

All photographs shall be color photographs. Photographs shall be clear and include scale references where applicable. Photographs shall include, but not be limited to the following:

1. *Overview of dam from upstream*
2. *Overview of dam from downstream*
3. *Overview of upstream face from right abutment*
4. *Overview of upstream face from left abutment*
5. *Overview of dam crest from right abutment*
6. *Overview of dam crest from left abutment*
7. *Overview of downstream face from right abutment*
8. *Overview of downstream face from left abutment*
9. *Overview of spillway from upstream*
10. *Overview of spillway from downstream (tailrace or channel area)*
11. *Overview of right training wall*
12. *Overview of left training wall*
13. *Overview of weir*
14. *Overview of stilling basin*
15. *Overview of downstream channel*
16. *Overview of gatehouse exterior*
17. *Overview of gatehouse interior*
18. *Overview of operators*
19. *Outlet inlets and discharge points*
20. *Overview of reservoir*
21. *Areas of specific deficiencies (e.g., cracks, erosion, displacement, seeps, deterioration, etc.)*

Each photograph shall include a caption indicating the subject of the photograph as well as highlighting any specific deficiencies pictured. All photographs shall be presented with no more than two (2) photos per page. Photo location and orientation shall be indicated on the site plan included in the section entitled "Figures". Alternatively, for clarity, a separate figure can be provided in this appendix to show figure locations.

Wood-Pawcatuck Watershed Flood Resiliency Management Plan
DAM INSPECTION FIELD ASSESSMENT

SKETCH

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM SAFETY INSPECTION

NAME OF DAM: Muzzy Meadow Dam STATE ID #:

AKA NAME: WATERCOURSE NAME:

DAM LOCATION INFORMATION

CITY/TOWN: Spencer LAT. / LONG.:

STATE: MA HAZARD CLASS:

GENERAL DAM INFORMATION

TYPE OF DAM: earth

PURPOSE OF DAM: ~~recreation~~, aesthetics; future skating, walking trail?

YEAR BUILT:

INSPECTION SUMMARY

DATE OF INSPECTION: 11/27/18 NAME OF INSPECTOR: RLW

TIME OF INSPECTION: 1:25 PM OTHER ATTENDEES: HF, PD

WEATHER CONDITIONS: Sunny, partly cloudy 40°F breezy

GENERAL DAM DATA

PRIMARY SPILLWAY TYPE: O AUXILIARY SPILLWAY TYPE: /

NUMBER OF OUTLETS: 1 TYPE OF OUTLETS: concrete culvert

HAS THE DAM BEEN BREACHED OR OVERTOPPED? unknown

IS THERE A FISH LADDER? (LIST TYPE IF PRESENT) NO

DOES THE CREST SUPPORT A PUBLIC ROAD? NO

ROADS/DRIVEWAY IMMEDIATELY DOWNSTREAM OF DAM? Maple St/ Rte 31

ACCESS CONDITIONS TO THE SITE: Walk/drive; NO recreation access

SECURITY DEVICES? gate on chain link fence around outlet

gateway project
D/S bwtell

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME		INSPECTION DATE
EMBANKMENT (D/S SLOPE)		
AREA INSPECTED	CONDITION	OBSERVATIONS
D/S SLOPE	TYPE (EARTH, CONCRETE, MASONRY)	earth
	WET AREAS (NO FLOW)	N/o
	SEEPAGE (EARTH) OR LEAKAGE (CONCRETE)	N/O
	SLIDE, SLOUGH, SCARP	N/O
	EMBANKMENT-ABUTMENT CONTACT	good
	SINKHOLE/ANIMAL BURROWS	N/O
	EROSION	past erosion covered in grass - evidence of prior overtopping
	UNUSUAL MOVEMENT	N/O
	VEGETATION (PRESENCE/CONDITION)	mowed grass
	CONDITION OF JOINTS (CONCRETE)	N/A

ADDITIONAL COMMENTS:

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME	MMD	INSPECTION DATE	
EMBANKMENT (U/S SLOPE)			
AREA INSPECTED	CONDITION	OBSERVATIONS	
U/S SLOPE	TYPE (EARTH, CONCRETE, MASONRY)	earth	
	SLIDE, SLOUGH, SCARP	slumped ~~etc~~ to right of outlet, left of outlet	
	SLOPE PROTECTION TYPE AND COND.	N/O	
	SINKHOLE/ANIMAL BURROWS	N/O - vegetation	
	EMBANKMENT-ABUTMENT CONTACT	good on left, fair/poor on right (crest higher than about)	
	EROSION	along entire upstream face	
	UNUSUAL MOVEMENT	soil loss either side of outlet	
	VEGETATION (PRESENCE/CONDITION)	grass (mowed), tall reeds/grasses/cattails (cut)	
	CONDITION OF JOINTS (CONCRETE)	N/A	

ADDITIONAL COMMENTS:

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME		INSPECTION DATE
EMBANKMENT (CREST)		
AREA INSPECTED	CONDITION	OBSERVATIONS
CREST	SURFACE TYPE	earth w/ grass
	SURFACE CRACKING	N/O
	SINKHOLES, ANIMAL BURROWS	N/O - but possible
	VERTICAL ALIGNMENT (DEPRESSIONS)	minor undulation
	HORIZONTAL ALIGNMENT	good
	RUTS AND/OR PUDDLES	N/O
	VEGETATION (PRESENCE/CONDITION)	mowed grass; some minor erosion; trees/shrubs/fence @ right about
	ABUTMENT CONTACT	good
	CONDITION OF JOINTS (CONCRETE)	N/A

ADDITIONAL COMMENTS:

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME MMD	INSPECTION DATE

INSTRUMENTATION

AREA INSPECTED	CONDITION	OBSERVATIONS
INSTR.	1. PIEZOMETERS	N/O
	2. OBSERVATION WELLS	N/O
	3. STAFF GAGE AND RECORDER	N/O
	4. WEIRS	N/O
	5. INCLINOMETERS	N/O
	6. SURVEY MONUMENTS	N/O
	7. DRAINS	N/O
	8. FREQUENCY OF READINGS	N/O
	9. LOCATION OF READINGS	N/O

ADDITIONAL COMMENTS:

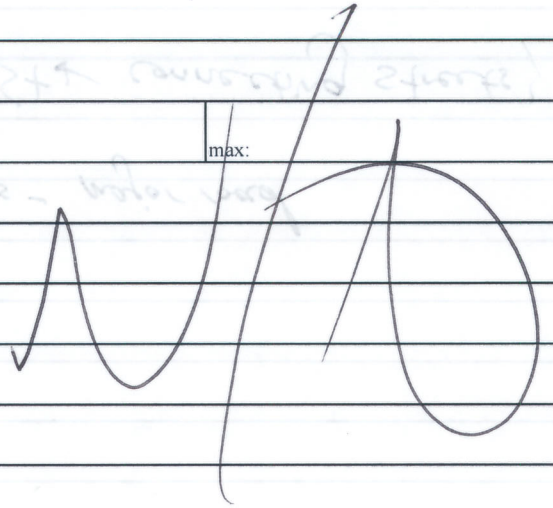
Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME		INSPECTION DATE		
DOWNSTREAM WALLS				
AREA INSPECTED	CONDITION	OBSERVATIONS		
D/S WALLS	1. WALL TYPE			
	2. WALL ALIGNMENT			
	3. WALL CONDITION			
	4. HEIGHT: TOP OF WALL TO MUDLINE	min:	max:	
	5. SEEPAGE OR LEAKAGE			
	6. ABUTMENT CONTACT			
	7. EROSION/SINKHOLES BEHIND WALL			
	8. ANIMAL BURROWS			
	9. UNUSUAL MOVEMENT			
	10. WET AREAS AT TOE OF WALL			
	11. VEGETATION			
	12. SCOUR/EROSION AT BASE OF WALL			
ADDITIONAL COMMENTS:				

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME MMD		INSPECTION DATE
UPSTREAM WALLS		
AREA INSPECTED	CONDITION	OBSERVATIONS
U/S WALLS	1. WALL TYPE	
	2. WALL ALIGNMENT	
	3. WALL CONDITION	
	4. HEIGHT: TOP OF WALL TO MUDLINE	min: max: avg:
	5. ABUTMENT CONTACT	
	6. EROSION/SINKHOLES BEHIND WALL	
	7. ANIMAL BURROWS	
	8. UNUSUAL MOVEMENT	
	9. VEGETATION	
	10. SCOUR/EROSION AT BASE OF WALL	

ADDITIONAL COMMENTS:



Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME		INSPECTION DATE
DOWNSTREAM AREA		
AREA INSPECTED	CONDITION	OBSERVATIONS
D/S AREA	ABUTMENT LEAKAGE	N/O
	FOUNDATION SEEPAGE	N/O
	SLIDE, SLOUGH, SCARP	N/O
	WEIRS	N/O
	DRAINAGE SYSTEM	N/O
	INSTRUMENTATION	N/O
	VEGETATION	N/O
	ACCESSIBILITY	highly access - major road
	DOWNSTREAM HAZARD DESCRIPTION	maple ~~road~~ St + connecting streets } homes + businesses

ADDITIONAL COMMENTS:

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME MMD		INSPECTION DATE
PRIMARY SPILLWAY		
AREA INSPECTED	CONDITION	OBSERVATIONS
	SPILLWAY TYPE	
	WEIR TYPE	
	SPILLWAY CONDITION	
	TRAINING WALLS	
	SPILLWAY CONTROLS AND CONDITION	
	UNUSUAL MOVEMENT	
	APPROACH AREA	
	DISCHARGE AREA	
	DEBRIS	
	WATER LEVEL AT TIME OF INSPECTION	

ADDITIONAL COMMENTS:

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME		INSPECTION DATE
AUXILIARY SPILLWAY		
AREA INSPECTED	CONDITION	OBSERVATIONS
SPILLWAY	SPILLWAY TYPE	
	WEIR TYPE	
	SPILLWAY CONDITION	
	TRAINING WALLS	
	SPILLWAY CONTROLS AND CONDITION	
	UNUSUAL MOVEMENT	
	APPROACH AREA	
	DISCHARGE AREA	
	DEBRIS	
	WATER LEVEL AT TIME OF INSPECTION	

ADDITIONAL COMMENTS:

Wood-Pawcatuck Watershed Flood Resiliency Management Plan
DAM INSPECTION FIELD ASSESSMENT

DAM NAME	MMD	INSPECTION DATE

OUTLET WORKS

AREA INSPECTED	CONDITION	OBSERVATIONS
OUTLET WORKS	TYPE	~~conc. culvert~~
	INTAKE STRUCTURE	conc. culvert
	TRASHRACK	yes - poor condition; bent/deformed
	PRIMARY CLOSURE	gate - iron?; unknown condition
	SECONDARY CLOSURE	
	CONDUIT	unknown
	OUTLET STRUCTURE/HEADWALL	unknown - stream buried
	EROSION ALONG TOE OF DAM	N/O; ~~some~~ moderate-severe erosion along sides of outlet structure
	SEEPAGE/LEAKAGE	N/O
	DEBRIS/BLOCKAGE	leaves in trashrack; some garbage visible under water
	UNUSUAL MOVEMENT	N/O
	DOWNSTREAM AREA	/
		/
	MISCELLANEOUS	

ADDITIONAL COMMENTS: water very dark - unable to see gate condition or debris extent underwater; some flow in approach area + audible in structure

Wood-Pawcatuck Watershed Flood Resiliency Management Plan
DAM INSPECTION FIELD ASSESSMENT

Potential Recommendation Notes

Removal?
No - town planner hopes to complete gateway project @ pond - limited space but highly visible

Breach/Spillway Adjustments?
Possible daylighting project

Repurposing?
No - not enough height

Fish/eel passage?
N/A - No downstream outlet to connect

Notes:
Problem w/public throwing dog waste into pond
- pet waste signs posted nearby

PHOTOS

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8. *Overview of downstream face from left abutment*
9. *Overview of spillway from upstream*
10. *Overview of spillway from downstream (tailrace or channel area)*
11. *Overview of right training wall*
12. *Overview of left training wall*
13. *Overview of weir*
14. *Overview of stilling basin*
15. *Overview of downstream channel*
16. *Overview of gatehouse exterior*
17. *Overview of gatehouse interior*
18. *Overview of operators*
19. *Outlet inlets and discharge points*
20. *Overview of reservoir*
21. *Areas of specific deficiencies (e.g., cracks, erosion, displacement, seeps, deterioration, etc.)*

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SKETCH

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM SAFETY INSPECTION

NAME OF DAM: Cranberry Meadow Pond Dam STATE ID #:

AKA NAME: WATERCOURSE NAME:

DAM LOCATION INFORMATION

CITY/TOWN: Spencer LAT. / LONG.:

STATE: MA HAZARD CLASS:

GENERAL DAM INFORMATION

TYPE OF DAM: Earth

PURPOSE OF DAM: Recreation - lakehouses, swimming, boating (motor? + non)

YEAR BUILT:

INSPECTION SUMMARY

DATE OF INSPECTION: 11/29/18 NAME OF INSPECTOR: RLW

TIME OF INSPECTION: 8:36 AM OTHER ATTENDEES: HF, PD

WEATHER CONDITIONS: Sunny, few clouds, 36°F, windy

GENERAL DAM DATA

PRIMARY SPILLWAY TYPE: concrete ramp AUXILIARY SPILLWAY TYPE: /

NUMBER OF OUTLETS: / TYPE OF OUTLETS: /

HAS THE DAM BEEN BREACHED OR OVERTOPPED? Unknown

IS THERE A FISH LADDER? (LIST TYPE IF PRESENT) No

DOES THE CREST SUPPORT A PUBLIC ROAD? No

ROADS/DRIVEWAY IMMEDIATELY DOWNSTREAM OF DAM? Yes - Cranberry Meadow Road

ACCESS CONDITIONS TO THE SITE: drive-up; ~~non~~ informal

SECURITY DEVICES? ~~None~~; Posted "Private Property"; Gate on right side of bridge across spillway

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME	CMPD	INSPECTION DATE	
EMBANKMENT (D/S SLOPE)			
AREA INSPECTED	CONDITION	OBSERVATIONS	
D/S SLOPE	TYPE (EARTH, CONCRETE, MASONRY)	earth ret. by masonry @ spillway (see D/S walls)	
	WET AREAS (NO FLOW)	~~N/O~~ covered by debris; moss observed	
	SEEPAGE (EARTH) OR LEAKAGE (CONCRETE)	~~N/O~~ unable to observe most of bank; some flow apparent	below right abut/right side of spillway
	SLIDE, SLOUGH, SCARP	unable to observe	
	EMBANKMENT-ABUTMENT CONTACT	~~N/A~~ fair - right partly eroded	
	SINKHOLE/ANIMAL BURROWS	N/O - debris	
	EROSION	~~N/A~~ moderate (past) now stabilized by debris	
	UNUSUAL MOVEMENT	N/O	
	VEGETATION (PRESENCE/CONDITION)	shrubs, small trees, moss	
	CONDITION OF JOINTS (CONCRETE)	N/A	

ADDITIONAL COMMENTS:

Debris appears to be dumped on right abut
Poss sinkhole/stump removal site
Slumping/erosion - soil drops off by ~6"
- poss evidence of past overtopping

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME	CMPD	INSPECTION DATE	
EMBANKMENT (U/S SLOPE)			
AREA INSPECTED	CONDITION	OBSERVATIONS	
U/S SLOPE	TYPE (EARTH, CONCRETE, MASONRY)	Earth	
	SLIDE, SLOUGH, SCARP	Slough/slump - u/s embank. is nearly vertical	
	SLOPE PROTECTION TYPE AND COND.	N/O	
	SINKHOLE/ANIMAL BURROWS	N/O - veg	
	EMBANKMENT-ABUTMENT CONTACT	good	
	EROSION	moderate - bank vertical but stabilized by veg ~~brush~~	
	UNUSUAL MOVEMENT	N/O	
	VEGETATION (PRESENCE/CONDITION)	Brush + small trees	
	CONDITION OF JOINTS (CONCRETE)	N/A	

ADDITIONAL COMMENTS:

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME		INSPECTION DATE
EMBANKMENT (CREST)		
AREA INSPECTED	CONDITION	OBSERVATIONS
CREST	SURFACE TYPE	earth
	SURFACE CRACKING	N/O
	SINKHOLES, ANIMAL BURROWS	N/O
	VERTICAL ALIGNMENT (DEPRESSIONS)	good/ N/O
	HORIZONTAL ALIGNMENT	good
	RUTS AND/OR PUDDLES	N/O
	VEGETATION (PRESENCE/CONDITION)	grass, mowed; small trees + brush on verges
	ABUTMENT CONTACT	good
	CONDITION OF JOINTS (CONCRETE)	N/A

ADDITIONAL COMMENTS: Bridge over top of spillway posted No Trespassing - could not access left abutment

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME CMPD		INSPECTION DATE
INSTRUMENTATION		
AREA INSPECTED	CONDITION	OBSERVATIONS
INSTR.	1. PIEZOMETERS	
	2. OBSERVATION WELLS	
	3. STAFF GAGE AND RECORDER	
	4. WEIRS	
	5. INCLINOMETERS	
	6. SURVEY MONUMENTS	
	7. DRAINS	
	8. FREQUENCY OF READINGS	
	9. LOCATION OF READINGS	

ADDITIONAL COMMENTS:

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME		INSPECTION DATE	
DOWNSTREAM WALLS			
AREA INSPECTED	CONDITION	OBSERVATIONS	
D/S WALLS	1. WALL TYPE	Masonry; unsure if mortared (appears not); prev. capped w/ Timbers	
	2. WALL ALIGNMENT	poor -	
	3. WALL CONDITION	poor - see align, etc.	
	4. HEIGHT: TOP OF WALL TO MUDLINE	min: NO ACCESS	max:
	5. SEEPAGE OR LEAKAGE	yes - visible @ base; possible but covered by debris above	
	6. ABUTMENT CONTACT	good - left; unknown - right	
	7. EROSION/SINKHOLES BEHIND WALL	unable to observe	
	8. ANIMAL BURROWS	unable to observe	
	9. UNUSUAL MOVEMENT	unable to observe	
	10. WET AREAS AT TOE OF WALL	yes - see 5	
	11. VEGETATION	brush, grass	
	12. SCOUR/EROSION AT BASE OF WALL	unable to observe	

ADDITIONAL COMMENTS: Wall covered by debris

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME CMPD		INSPECTION DATE		
UPSTREAM WALLS				
AREA INSPECTED	CONDITION	OBSERVATIONS		
U/S WALLS	1. WALL TYPE			
	2. WALL ALIGNMENT			
	3. WALL CONDITION			
	4. HEIGHT: TOP OF WALL TO MUDLINE	min:	max:	avg:
	5. ABUTMENT CONTACT			
	6. EROSION/SINKHOLES BEHIND WALL	NO		
	7. ANIMAL BURROWS			
	8. UNUSUAL MOVEMENT			
	9. VEGETATION			
	10. SCOUR/EROSION AT BASE OF WALL			

ADDITIONAL COMMENTS:

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME		INSPECTION DATE
DOWNSTREAM AREA		
AREA INSPECTED	CONDITION	OBSERVATIONS
D/S AREA	ABUTMENT LEAKAGE	unable to observe
	FOUNDATION SEEPAGE	N/O
	SLIDE, SLOUGH, SCARP	yes - steep slopes, somewhat stab. by veg + debris
	WEIRS	N/O
	DRAINAGE SYSTEM	N/O
	INSTRUMENTATION	N/O
	VEGETATION	small trees / shrubs
	ACCESSIBILITY	difficult walking - steep slopes
	DOWNSTREAM HAZARD DESCRIPTION	Cranberry Meadow Road crosses tailwater

ADDITIONAL COMMENTS:

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME	CMPD	INSPECTION DATE	
PRIMARY SPILLWAY			
AREA INSPECTED	CONDITION	OBSERVATIONS	
	SPILLWAY TYPE	Concrete chute	
	WEIR TYPE	wooden weir boards; leaking thru	
	SPILLWAY CONDITION	~~good~~; minor cracking in walls; outlet training walls ~~good~~ undermined, scoured solely 2' ϕ behind each	
(4)	TRAINING WALLS	minor cracking, minor aggregate exposure; small scour	
	SPILLWAY CONTROLS AND CONDITION	weir board - appear old, ~~start~~ early rot	
	UNUSUAL MOVEMENT	N/O	
	APPROACH AREA	clear,	
	DISCHARGE AREA	rocky tailwater, small scour pool	
	DEBRIS	small sticks + leaves against weir board	
	WATER LEVEL AT TIME OF INSPECTION	6" below weirboard; 0.3ft over spillway	

ADDITIONAL COMMENTS:

bridge directly over weir boards - provides foot + small vehicle (likely lawn mower, atv) access
lattice gate in front

(4) erosion behind training walls

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME		INSPECTION DATE
AUXILIARY SPILLWAY		
AREA INSPECTED	CONDITION	OBSERVATIONS
SPILLWAY	SPILLWAY TYPE	
	WEIR TYPE	
	SPILLWAY CONDITION	
	TRAINING WALLS	
	SPILLWAY CONTROLS AND CONDITION	
	UNUSUAL MOVEMENT	
	APPROACH AREA	
	DISCHARGE AREA	
	DEBRIS	
	WATER LEVEL AT TIME OF INSPECTION	

ADDITIONAL COMMENTS:

Wood-Pawcatuck Watershed Flood Resiliency Management Plan
DAM INSPECTION FIELD ASSESSMENT

DAM NAME CMPD		INSPECTION DATE
OUTLET WORKS		
AREA INSPECTED	CONDITION	OBSERVATIONS
OUTLET WORKS	TYPE	
	INTAKE STRUCTURE	
	TRASHRACK	
	PRIMARY CLOSURE	
	SECONDARY CLOSURE	
	CONDUIT	
	OUTLET STRUCTURE/HEADWALL	
	EROSION ALONG TOE OF DAM	
	SEEPAGE/LEAKAGE	
	DEBRIS/BLOCKAGE	
	UNUSUAL MOVEMENT	
	DOWNSTREAM AREA	
	MISCELLANEOUS	

ADDITIONAL COMMENTS:

Wood-Pawcatuck Watershed Flood Resiliency Management Plan
DAM INSPECTION FIELD ASSESSMENT

Potential Recommendation Notes

Removal? Lake assoc., private properties along shore

Breach/Spillway Adjustments?

Add ~~out~~ outlet to allow drawdown

↙

Repurposing? Insufficient height flexibility / due to properties, embankment height to raise embankment

Drawdown pass.

Fish/eel passage?

fish ladder or natural passage

↖ would be tight

Notes:

PHOTOS

PHOTOGRAPHS INSTRUCTION PAGE:

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2. *Overview of dam from downstream*
3. *Overview of upstream face from right abutment*
4. *Overview of upstream face from left abutment*
5. *Overview of dam crest from right abutment*
6. *Overview of dam crest from left abutment*
7. *Overview of downstream face from right abutment*
8. *Overview of downstream face from left abutment*
9. *Overview of spillway from upstream*
10. *Overview of spillway from downstream (tailrace or channel area)*
11. *Overview of right training wall*
12. *Overview of left training wall*
13. *Overview of weir*
14. *Overview of stilling basin*
15. *Overview of downstream channel*
16. *Overview of gatehouse exterior*
17. *Overview of gatehouse interior*
18. *Overview of operators*
19. *Outlet inlets and discharge points*
20. *Overview of reservoir*
21. *Areas of specific deficiencies (e.g., cracks, erosion, displacement, seeps, deterioration, etc.)*

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Wood-Pawcatuck Watershed Flood Resiliency Management Plan
DAM INSPECTION FIELD ASSESSMENT

SKETCH

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM SAFETY INSPECTION

NAME OF DAM: Lake Whittemore Dam STATE ID #: _____

AKA NAME: _____ WATERCOURSE NAME: _____

DAM LOCATION INFORMATION

CITY/TOWN: Spencer, MA LAT. / LONG.: _____

STATE: _____ HAZARD CLASS: _____

GENERAL DAM INFORMATION

TYPE OF DAM: earth

PURPOSE OF DAM: recreation

YEAR BUILT: _____

INSPECTION SUMMARY

DATE OF INSPECTION: 11/29/18 NAME OF INSPECTOR: RLW

TIME OF INSPECTION: 12:00 OTHER ATTENDEES: NF, PD

WEATHER CONDITIONS: 39°F, cloudy, breezy/windy

GENERAL DAM DATA

PRIMARY SPILLWAY TYPE: concrete, ogee AUXILIARY SPILLWAY TYPE: /

NUMBER OF OUTLETS: 1 TYPE OF OUTLETS: /

HAS THE DAM BEEN BREACHED OR OVERTOPPED? unknown

IS THERE A FISH LADDER? (LIST TYPE IF PRESENT) No

DOES THE CREST SUPPORT A PUBLIC ROAD? NO

ROADS/DRIVEWAY IMMEDIATELY DOWNSTREAM OF DAM? yes -

ACCESS CONDITIONS TO THE SITE: walk through private property

SECURITY DEVICES? gate - chain link fence around outlet

Knox Marsh Rd

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME		INSPECTION DATE
EMBANKMENT (D/S SLOPE)		
AREA INSPECTED	CONDITION	OBSERVATIONS
D/S SLOPE	TYPE (EARTH, CONCRETE, MASONRY)	earth
	WET AREAS (NO FLOW)	N/O; see veg
	SEEPAGE (EARTH) OR LEAKAGE (CONCRETE)	N/O
	SLIDE, SLOUGH, SCARP	N/O
	EMBANKMENT-ABUTMENT CONTACT	good
	SINKHOLE/ANIMAL BURROWS	N/O
	EROSION	possible? - surface not uniform; poss evidence of prev overtopping
	UNUSUAL MOVEMENT	N/O
	VEGETATION (PRESENCE/CONDITION)	grass (mowed); large patch mess under D/S pine trees
	CONDITION OF JOINTS (CONCRETE)	N/O

ADDITIONAL COMMENTS:

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME		INSPECTION DATE
EMBANKMENT (U/S SLOPE)		
AREA INSPECTED	CONDITION	OBSERVATIONS
U/S SLOPE	TYPE (EARTH, CONCRETE, MASONRY)	earth
	SLIDE, SLOUGH, SCARP	N/O
	SLOPE PROTECTION TYPE AND COND.	stone armor - v. poor / scattered
	SINKHOLE/ANIMAL BURROWS	N/O - obscured by veg
	EMBANKMENT-ABUTMENT CONTACT	good
	EROSION	eroded patch near dock installed @ right end of dam crest
	UNUSUAL MOVEMENT	N/O
	VEGETATION (PRESENCE/CONDITION)	grass, tall grass, shrubs + small trees (all cut)
	CONDITION OF JOINTS (CONCRETE)	N/O

ADDITIONAL COMMENTS:

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME		INSPECTION DATE
EMBANKMENT (CREST)		
AREA INSPECTED	CONDITION	OBSERVATIONS
CREST	SURFACE TYPE	earth w/ grass
	SURFACE CRACKING	N/O
	SINKHOLES, ANIMAL BURROWS	N/O - large surface
	VERTICAL ALIGNMENT (DEPRESSIONS)	minor undulations
	HORIZONTAL ALIGNMENT	good
	RUTS AND/OR PUDDLES	N/O
	VEGETATION (PRESENCE/CONDITION)	mowed grass
	ABUTMENT CONTACT	good; slightly lower (1") than crest @ left abutment
	CONDITION OF JOINTS (CONCRETE)	N/O

ADDITIONAL COMMENTS:

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME		INSPECTION DATE
INSTRUMENTATION		
AREA INSPECTED	CONDITION	OBSERVATIONS
INSTR.	1. PIEZOMETERS	
	2. OBSERVATION WELLS	
	3. STAFF GAGE AND RECORDER	
	4. WEIRS	
	5. INCLINOMETERS	
	6. SURVEY MONUMENTS	
	7. DRAINS	
	8. FREQUENCY OF READINGS	
	9. LOCATION OF READINGS	
ADDITIONAL COMMENTS:		

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME		INSPECTION DATE
	DOWNSTREAM WALLS	
AREA INSPECTED	CONDITION	OBSERVATIONS
D/S WALLS	1. WALL TYPE	
	2. WALL ALIGNMENT	
	3. WALL CONDITION	
	4. HEIGHT: TOP OF WALL TO MUDLINE	min: max:
	5. SEEPAGE OR LEAKAGE	
	6. ABUTMENT CONTACT	
	7. EROSION/SINKHOLES BEHIND WALL	
	8. ANIMAL BURROWS	
	9. UNUSUAL MOVEMENT	
	10. WET AREAS AT TOE OF WALL	
	11. VEGETATION	
	12. SCOUR/EROSION AT BASE OF WALL	

ADDITIONAL COMMENTS:

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME		INSPECTION DATE		
UPSTREAM WALLS				
AREA INSPECTED	CONDITION	OBSERVATIONS		
U/S WALLS	1. WALL TYPE	concrete		
	2. WALL ALIGNMENT	good		
	3. WALL CONDITION	good		
	4. HEIGHT: TOP OF WALL TO MUDLINE	min: 1'	max: 6-7'	avg: 5'
	5. ABUTMENT CONTACT	good		
	6. EROSION/SINKHOLES BEHIND WALL	some soil loss		
	7. ANIMAL BURROWS	N/O		
	8. UNUSUAL MOVEMENT	N/O		
	9. VEGETATION	sparse vines climbing wall; mass on to surface		
	10. SCOUR/EROSION AT BASE OF WALL	left - N/O		

ADDITIONAL COMMENTS:

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME		INSPECTION DATE
DOWNSTREAM AREA		
AREA INSPECTED	CONDITION	OBSERVATIONS
D/S AREA	ABUTMENT LEAKAGE	N/O
	FOUNDATION SEEPAGE	N/O
	SLIDE, SLOUGH, SCARP	N/O
	WEIRS	small rock weirs built by ppl?
	DRAINAGE SYSTEM	N/O; tailwater runs below toe of dam
	INSTRUMENTATION	N/O
	VEGETATION	grass, large + small trees
	ACCESSIBILITY	walk thru private property
	DOWNSTREAM HAZARD DESCRIPTION	2 houses (priv.), public road, more houses + businesses)
ADDITIONAL COMMENTS:		Bank Erosion undermining U/L large pine tree @ edge of tailwater

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME		INSPECTION DATE	
PRIMARY SPILLWAY			
AREA INSPECTED	CONDITION	OBSERVATIONS	
	SPILLWAY TYPE	concrete ogee	
	WEIR TYPE	broad crested	
	SPILLWAY CONDITION	good	
	TRAINING WALLS	concrete - straight @ spillway + 90° wingwalls @ discharge. Minor spalling + efflorescent cracking	
	SPILLWAY CONTROLS AND CONDITION	N/O	
	UNUSUAL MOVEMENT	N/O	
	APPROACH AREA	clear	
	DISCHARGE AREA	narrow tailwater w/ weir @ end of spillway; wingwalls negated by armor + soil in discharge area	
	DEBRIS	few large pieces of wood	
	WATER LEVEL AT TIME OF INSPECTION	4'1"; wind over lake increased flow over spillway (during gusts)	

ADDITIONAL COMMENTS:

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME		INSPECTION DATE
AUXILIARY SPILLWAY		
AREA INSPECTED	CONDITION	OBSERVATIONS
SPILLWAY	SPILLWAY TYPE	
	WEIR TYPE	
	SPILLWAY CONDITION	
	TRAINING WALLS	
	SPILLWAY CONTROLS AND CONDITION	
	UNUSUAL MOVEMENT	
	APPROACH AREA	
	DISCHARGE AREA	
	DEBRIS	
	WATER LEVEL AT TIME OF INSPECTION	

ADDITIONAL COMMENTS:

Wood-Pawcatuck Watershed Flood Resiliency Management Plan
DAM INSPECTION FIELD ASSESSMENT

DAM NAME		INSPECTION DATE
OUTLET WORKS		
AREA INSPECTED	CONDITION	OBSERVATIONS
OUTLET WORKS	TYPE	concrete box - drop inlet ?
	INTAKE STRUCTURE	drop inlet?
	TRASHRACK	Unknown
	PRIMARY CLOSURE	hydraulic gate
	SECONDARY CLOSURE	unknown
	CONDUIT	~~or~~ concrete - 12" or 15" ~~Ø mitered to slope~~ minor spalling
	OUTLET STRUCTURE/HEADWALL	mitered to slope; no headwall
	EROSION ALONG TOE OF DAM	N/O
	SEEPAGE/LEAKAGE	N/O
	DEBRIS/BLOCKAGE	N/O
	UNUSUAL MOVEMENT	N/O
	DOWNSTREAM AREA	small ~~stone~~ pool w/ armored slope joins main tailwater
	MISCELLANEOUS	

ADDITIONAL COMMENTS:

Wood-Pawcatuck Watershed Flood Resiliency Management Plan
DAM INSPECTION FIELD ASSESSMENT

Potential Recommendation Notes

Removal?

No - privately owned; rec + private properties

Breach/Spillway Adjustments?

No

Repurposing?

No

Fish/eel passage?

Possible nature like fishway

Notes:

PHOTOS

PHOTOGRAPHS INSTRUCTION PAGE:

All photographs shall be color photographs. Photographs shall be clear and include scale references where applicable. Photographs shall include, but not be limited to the following:

1. *Overview of dam from upstream*
2. *Overview of dam from downstream*
3. *Overview of upstream face from right abutment*
4. *Overview of upstream face from left abutment*
5. *Overview of dam crest from right abutment*
6. *Overview of dam crest from left abutment*
7. *Overview of downstream face from right abutment*
8. *Overview of downstream face from left abutment*
9. *Overview of spillway from upstream*
10. *Overview of spillway from downstream (tailrace or channel area)*
11. *Overview of right training wall*
12. *Overview of left training wall*
13. *Overview of weir*
14. *Overview of stilling basin*
15. *Overview of downstream channel*
16. *Overview of gatehouse exterior*
17. *Overview of gatehouse interior*
18. *Overview of operators*
19. *Outlet inlets and discharge points*
20. *Overview of reservoir*
21. *Areas of specific deficiencies (e.g., cracks, erosion, displacement, seeps, deterioration, etc.)*

Each photograph shall include a caption indicating the subject of the photograph as well as highlighting any specific deficiencies pictured. All photographs shall be presented with no more than two (2) photos per page. Photo location and orientation shall be indicated on the site plan included in the section entitled "Figures". Alternatively, for clarity, a separate figure can be provided in this appendix to show figure locations.

Wood-Pawcatuck Watershed Flood Resiliency Management Plan
DAM INSPECTION FIELD ASSESSMENT

SKETCH

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM SAFETY INSPECTION

NAME OF DAM:	Sugden Reservoir Dam	STATE ID #:	MA00698
AKA NAME:		WATERCOURSE NAME:	

DAM LOCATION INFORMATION

CITY/TOWN:	Sugden	LAT. / LONG.:	
STATE:	MA	HAZARD CLASS:	

GENERAL DAM INFORMATION

TYPE OF DAM:	earth
PURPOSE OF DAM:	Recreation, poss. flood control
YEAR BUILT:	

INSPECTION SUMMARY

DATE OF INSPECTION:	11/27/19	NAME OF INSPECTOR:	RLW
TIME OF INSPECTION:	10:31	OTHER ATTENDEES:	WF, PD
WEATHER CONDITIONS:	Rain/snow, 36°F, windy, cloudy		

GENERAL DAM DATA

PRIMARY SPILLWAY TYPE:	ogee, concrete	AUXILIARY SPILLWAY TYPE:	N/O
NUMBER OF OUTLETS:	1 -	TYPE OF OUTLETS:	unknown
HAS THE DAM BEEN BREACHED OR OVERTOPPED?	NO		
IS THERE A FISH LADDER? (LIST TYPE IF PRESENT)	NO		
DOES THE CREST SUPPORT A PUBLIC ROAD?	NO		
ROADS/DRIVEWAY IMMEDIATELY DOWNSTREAM OF DAM?	Road - Paxton Road		
ACCESS CONDITIONS TO THE SITE:	drive to D/S area		
SECURITY DEVICES?	N/A		

TEC @ bridge; working w/ facilities on other bridge + culvert replacement work

Mike + Kim

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME	Sugden Reservoir Dam	INSPECTION DATE

EMBANKMENT (D/S SLOPE)

AREA INSPECTED	CONDITION	OBSERVATIONS
D/S SLOPE	TYPE (EARTH, CONCRETE, MASONRY)	earth
	WET AREAS (NO FLOW)	~~N/O - wet day~~ / faceneer left abutment VERY wet - "bouncy" under foot ↓"
	SEEPAGE (EARTH) OR LEAKAGE (CONCRETE)	N/O - wet day /
	SLIDE, SLOUGH, SCARP	N/O
	EMBANKMENT-ABUTMENT CONTACT	good
	SINKHOLE/ANIMAL BURROWS	N.O
	EROSION	N/O
	UNUSUAL MOVEMENT	N/O
	VEGETATION (PRESENCE/CONDITION)	grass, mowed
	CONDITION OF JOINTS (CONCRETE)	N/A

ADDITIONAL COMMENTS:

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME	Sugden Reservoir Dam	INSPECTION DATE	
EMBANKMENT (U/S SLOPE)			
AREA INSPECTED	CONDITION	OBSERVATIONS	
U/S SLOPE	TYPE (EARTH, CONCRETE, MASONRY)	earth, armored	
	SLIDE, SLOUGH, SCARP	~~N/O~~ little, immed below gatehouse (used for water access)	
	SLOPE PROTECTION TYPE AND COND.	armor, fair - see veg	
	SINKHOLE/ANIMAL BURROWS	N/O - veg	
	EMBANKMENT-ABUTMENT CONTACT	good	
	EROSION	N/O	
	UNUSUAL MOVEMENT	N/O	
	VEGETATION (PRESENCE/CONDITION)	cut trees + shrubs; roots/stumps still in place btwn armor stones	
	CONDITION OF JOINTS (CONCRETE)	N/O	
ADDITIONAL COMMENTS:			

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME	Sugden Reservoir Dam	INSPECTION DATE	

EMBANKMENT (CREST)

AREA INSPECTED	CONDITION	OBSERVATIONS
CREST	SURFACE TYPE	grass, mowed
	SURFACE CRACKING	N/O
	SINKHOLES, ANIMAL BURROWS	~~N/O~~ yes - at least one 3-4" ø
	VERTICAL ALIGNMENT (DEPRESSIONS)	good (N/O)
	HORIZONTAL ALIGNMENT	good
	RUTS AND/OR PUDDLES	N/O
	VEGETATION (PRESENCE/CONDITION)	grass only
	ABUTMENT CONTACT	good
	CONDITION OF JOINTS (CONCRETE)	N/O

ADDITIONAL COMMENTS:

Small area of sloughing/erosion on U/S side of crest

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME	Sugden Reservoir Dam	INSPECTION DATE

INSTRUMENTATION

AREA INSPECTED	CONDITION	OBSERVATIONS
INSTR.	1. PIEZOMETERS	
	2. OBSERVATION WELLS	
	3. STAFF GAGE AND RECORDER	
	4. WEIRS	
	5. INCLINOMETERS	
	6. SURVEY MONUMENTS	
	7. DRAINS	
	8. FREQUENCY OF READINGS	
	9. LOCATION OF READINGS	

N/A

ADDITIONAL COMMENTS:

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME Sugden Reservoir Dam		INSPECTION DATE
DOWNSTREAM WALLS		
AREA INSPECTED	CONDITION	OBSERVATIONS
D/S WALLS	1. WALL TYPE	
	2. WALL ALIGNMENT	
	3. WALL CONDITION	
	4. HEIGHT: TOP OF WALL TO MUDLINE	min: max:
	5. SEEPAGE OR LEAKAGE	
	6. ABUTMENT CONTACT	
	7. EROSION/SINKHOLES BEHIND WALL	
	8. ANIMAL BURROWS	
	9. UNUSUAL MOVEMENT	
	10. WET AREAS AT TOE OF WALL	
	11. VEGETATION	
	12. SCOUR/EROSION AT BASE OF WALL	

ADDITIONAL COMMENTS:

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME	Snyder Reservoir	INSPECTION DATE

UPSTREAM WALLS

AREA INSPECTED	CONDITION	OBSERVATIONS
U/S WALLS	1. WALL TYPE	
	2. WALL ALIGNMENT	
	3. WALL CONDITION	
	4. HEIGHT: TOP OF WALL TO MUDLINE	min: max: avg:
	5. ABUTMENT CONTACT	
	6. EROSION/SINKHOLES BEHIND WALL	
	7. ANIMAL BURROWS	
	8. UNUSUAL MOVEMENT	
	9. VEGETATION	
	10. SCOUR/EROSION AT BASE OF WALL	

N/A

ADDITIONAL COMMENTS:

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME	Snyder Reservoir Dam	INSPECTION DATE

DOWNSTREAM AREA

AREA INSPECTED	CONDITION	OBSERVATIONS
D/S AREA	ABUTMENT LEAKAGE	N/O
	FOUNDATION SEEPAGE	~~N/O~~ wet area D/S of spillway
	SLIDE, SLOUGH, SCARP	N/O
	WEIRS	N/O
	DRAINAGE SYSTEM	drain right of primary spillway
	INSTRUMENTATION	small trees in tailwater channels (N/O)
	VEGETATION	
	ACCESSIBILITY	drive/walk
	DOWNSTREAM HAZARD DESCRIPTION	Paxton Road, Utility pole ↳ 2 bridges

ADDITIONAL COMMENTS:

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME	Sugden Reservoir Dam	INSPECTION DATE

PRIMARY SPILLWAY

AREA INSPECTED	CONDITION	OBSERVATIONS
	SPILLWAY TYPE	concrete ogee
	WEIR TYPE	broad crested
	SPILLWAY CONDITION	good, ~~small~~ minor cracks + spall
	TRAINING WALLS	concrete, good
	SPILLWAY CONTROLS AND CONDITION	N/A
	UNUSUAL MOVEMENT	NO
	APPROACH AREA	clear
	DISCHARGE AREA	tailwater - bedrock
	DEBRIS	small amnt of large branches
	WATER LEVEL AT TIME OF INSPECTION	~1 ft below spillway

ADDITIONAL COMMENTS: stilling basin - conc wall @ toe

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME Snyder Reservoir Dam		INSPECTION DATE
AUXILIARY SPILLWAY		
AREA INSPECTED	CONDITION	OBSERVATIONS
SPILLWAY	SPILLWAY TYPE	
	WEIR TYPE	
	SPILLWAY CONDITION	
	TRAINING WALLS	
	SPILLWAY CONTROLS AND CONDITION	
	UNUSUAL MOVEMENT	
	APPROACH AREA	
	DISCHARGE AREA	
	DEBRIS	
	WATER LEVEL AT TIME OF INSPECTION	

ADDITIONAL COMMENTS:

Wood-Pawcatuck Watershed Flood Resiliency Management Plan
DAM INSPECTION FIELD ASSESSMENT

DAM NAME	Sugden Reservoir Dam	INSPECTION DATE

OUTLET WORKS

AREA INSPECTED	CONDITION	OBSERVATIONS
OUTLET WORKS	TYPE	Unknown
	INTAKE STRUCTURE	Tadwater is impandment, could not observe
	TRASHRACK	N/O
	PRIMARY CLOSURE	gatehouse, mech N/O
	SECONDARY CLOSURE	
	CONDUIT	concrete
	OUTLET STRUCTURE/HEADWALL	concrete, spalling along top, eroded around sides
	EROSION ALONG TOE OF DAM	N/O
	SEEPAGE/LEAKAGE	yes - above outlet + uc left D/S face of dam
	DEBRIS/BLOCKAGE	N/O
	UNUSUAL MOVEMENT	N/O
	DOWNSTREAM AREA	20' wide tailwater stream lined w/ small trees
	MISCELLANEOUS	

ADDITIONAL COMMENTS:

Sugden Reservoir Dam

~~Wood-Pawcatuck Watershed Flood Resiliency Management Plan~~

DAM INSPECTION FIELD ASSESSMENT

Potential Recommendation Notes

Removal?

~~Not~~ controversial

Breach/Spillway Adjustments?

Repurposing?

flood control - poss. drawdown as flood prep

Fish/eel passage?

ladder poss?
steep/limited space for natural passage

Notes:

Owned by town?
But operated by lake association?

PHOTOS

PHOTOGRAPHS INSTRUCTION PAGE:

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2. *Overview of dam from downstream*
3. *Overview of upstream face from right abutment*
4. *Overview of upstream face from left abutment*
5. *Overview of dam crest from right abutment*
6. *Overview of dam crest from left abutment*
7. *Overview of downstream face from right abutment*
8. *Overview of downstream face from left abutment*
9. *Overview of spillway from upstream*
10. *Overview of spillway from downstream (tailrace or channel area)*
11. *Overview of right training wall*
12. *Overview of left training wall*
13. *Overview of weir*
14. *Overview of stilling basin*
15. *Overview of downstream channel*
16. *Overview of gatehouse exterior*
17. *Overview of gatehouse interior*
18. *Overview of operators*
19. *Outlet inlets and discharge points*
20. *Overview of reservoir*
21. *Areas of specific deficiencies (e.g., cracks, erosion, displacement, seeps, deterioration, etc.)*

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Wood-Pawcatuck Watershed Flood Resiliency Management Plan
DAM INSPECTION FIELD ASSESSMENT

SKETCH

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM SAFETY INSPECTION

NAME OF DAM: Browning Pond Dam STATE ID #: MA00695

AKA NAME: \ WATERCOURSE NAME: Seven Mile River

DAM LOCATION INFORMATION

CITY/TOWN: Spencer, LAT. / LONG.: 42.3077862, -71.9971019S

STATE: MA HAZARD CLASS: Significant

GENERAL DAM INFORMATION

TYPE OF DAM: Earther

PURPOSE OF DAM: Recreation; controversy over recreational access

YEAR BUILT: 1700s? boat, fish, hike, swim?

INSPECTION SUMMARY

DATE OF INSPECTION: 11/27/18 NAME OF INSPECTOR: Rachael Weiter

TIME OF INSPECTION: ~850 OTHER ATTENDEES: Helena Farrell, Paul Dell'Aquila

WEATHER CONDITIONS: Clouds, Rain 35°F

GENERAL DAM DATA

PRIMARY SPILLWAY TYPE: ~~unknown - under water~~ Broad spill crest AUXILIARY SPILLWAY TYPE: ———

NUMBER OF OUTLETS: ~~culvert~~ 1 TYPE OF OUTLETS: culvert under water

HAS THE DAM BEEN BREACHED OR OVERTOPPED? appears yes - Paul will check

IS THERE A FISH LADDER? (LIST TYPE IF PRESENT) No

DOES THE CREST SUPPORT A PUBLIC ROAD? yes - Browning pond road

ROADS/DRIVEWAY IMMEDIATELY DOWNSTREAM OF DAM? No

ACCESS CONDITIONS TO THE SITE: Road pull-offs

SECURITY DEVICES? None

road slated for repair in near future
Dam too?

P20170390

CSI DAM ASM

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME		INSPECTION DATE
EMBANKMENT (D/S SLOPE)		
AREA INSPECTED	CONDITION	OBSERVATIONS
D/S SLOPE	TYPE (EARTH, CONCRETE, MASONRY)	earth
	WET AREAS (NO FLOW)	yes/difficult to tell in rain; low pt in road
	SEEPAGE (EARTH) OR LEAKAGE (CONCRETE)	unable to tell in rain/
	SLIDE, SLOUGH, SCARP	N/A
	EMBANKMENT-ABUTMENT CONTACT	OK
	SINKHOLE/ANIMAL BURROWS	veg - unable to determine
	EROSION	N/A
	UNUSUAL MOVEMENT	N/A
	VEGETATION (PRESENCE/CONDITION)	large + small trees; brush
	CONDITION OF JOINTS (CONCRETE)	N/A

ADDITIONAL COMMENTS:

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME		INSPECTION DATE
Browning Pond Dam		
EMBANKMENT (U/S SLOPE)		
AREA INSPECTED	CONDITION	OBSERVATIONS
U/S SLOPE	TYPE (EARTH, CONCRETE, MASONRY)	Earth
	SLIDE, SLOUGH, SCARP	med; retained by vegetation
	SLOPE PROTECTION TYPE AND COND.	N/A
	SINKHOLE/ANIMAL BURROWS	unable to determine - vegetation
	EMBANKMENT-ABUTMENT CONTACT	good
	EROSION	moderate, individual sites where pedestrian access/pullo ffs
	UNUSUAL MOVEMENT	N/A
	VEGETATION (PRESENCE/CONDITION)	large trees, small trees, brush
	CONDITION OF JOINTS (CONCRETE)	N/A

ADDITIONAL COMMENTS: gate @ right abutment; no gate; boat launch
^ posts

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME		INSPECTION DATE
EMBANKMENT (CREST)		
AREA INSPECTED	CONDITION	OBSERVATIONS
CREST	SURFACE TYPE	asphalt
	SURFACE CRACKING	yes
	SINKHOLES, ANIMAL BURROWS	N/A
	VERTICAL ALIGNMENT (DEPRESSIONS)	sig. vertical change, especially @ outlet
	HORIZONTAL ALIGNMENT	OK
	RUTS AND/OR PUDDLES	N/A
	VEGETATION (PRESENCE/CONDITION)	N/A
	ABUTMENT CONTACT	good
	CONDITION OF JOINTS (CONCRETE)	N/A

ADDITIONAL COMMENTS:

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME Browning Pond Dam		INSPECTION DATE
INSTRUMENTATION		
AREA INSPECTED	CONDITION	OBSERVATIONS
INSTR.	1. PIEZOMETERS	
	2. OBSERVATION WELLS	
	3. STAFF GAGE AND RECORDER	
	4. WEIRS	
	5. INCLINOMETERS	
	6. SURVEY MONUMENTS	
	7. DRAINS	
	8. FREQUENCY OF READINGS	
	9. LOCATION OF READINGS	

ADDITIONAL COMMENTS:

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME		INSPECTION DATE
DOWNSTREAM WALLS		
AREA INSPECTED	CONDITION	OBSERVATIONS
D/S WALLS	1. WALL TYPE	
	2. WALL ALIGNMENT	
	3. WALL CONDITION	
	4. HEIGHT: TOP OF WALL TO MUDLINE	min: max:
	5. SEEPAGE OR LEAKAGE	
	6. ABUTMENT CONTACT	
	7. EROSION/SINKHOLES BEHIND WALL	
	8. ANIMAL BURROWS	
	9. UNUSUAL MOVEMENT	
	10. WET AREAS AT TOE OF WALL	
	11. VEGETATION	
	12. SCOUR/EROSION AT BASE OF WALL	

ADDITIONAL COMMENTS:

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME Browning Pond Dam		INSPECTION DATE
UPSTREAM WALLS		
AREA INSPECTED	CONDITION	OBSERVATIONS
U/S WALLS	1. WALL TYPE	
	2. WALL ALIGNMENT	
	3. WALL CONDITION	
	4. HEIGHT: TOP OF WALL TO MUDLINE	min: max: avg:
	5. ABUTMENT CONTACT	
	6. EROSION/SINKHOLES BEHIND WALL	
	7. ANIMAL BURROWS	
	8. UNUSUAL MOVEMENT	
	9. VEGETATION	
	10. SCOUR/EROSION AT BASE OF WALL	

ADDITIONAL COMMENTS:

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME		INSPECTION DATE
DOWNSTREAM AREA		
AREA INSPECTED	CONDITION	OBSERVATIONS
D/S AREA	ABUTMENT LEAKAGE	None ~~noticed~~ observed
	FOUNDATION SEEPAGE	None ~~noticed~~ observed; water high
	SLIDE, SLOUGH, SCARP	~~N/A~~ none observed
	WEIRS	N/A
	DRAINAGE SYSTEM	none observed
	INSTRUMENTATION	None obs.
	VEGETATION	Small trees, brush, ~~grass~~, cattails - marshy
	ACCESSIBILITY	walk
	DOWNSTREAM HAZARD DESCRIPTION	

ADDITIONAL COMMENTS:

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME	Browning Pond Dam	INSPECTION DATE
	PRIMARY SPILLWAY	See west

AREA INSPECTED	CONDITION	OBSERVATIONS
	SPILLWAY TYPE	
	WEIR TYPE	
	SPILLWAY CONDITION	
	TRAINING WALLS	
	SPILLWAY CONTROLS AND CONDITION	
	UNUSUAL MOVEMENT	
	APPROACH AREA	
	DISCHARGE AREA	
	DEBRIS	
	WATER LEVEL AT TIME OF INSPECTION	

N/A

ADDITIONAL COMMENTS:

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME		INSPECTION DATE
AUXILIARY SPILLWAY		
AREA INSPECTED	CONDITION	OBSERVATIONS
SPILLWAY	SPILLWAY TYPE	
	WEIR TYPE	
	SPILLWAY CONDITION	
	TRAINING WALLS	
	SPILLWAY CONTROLS AND CONDITION	
	UNUSUAL MOVEMENT	
	APPROACH AREA	
	DISCHARGE AREA	
	DEBRIS	
	WATER LEVEL AT TIME OF INSPECTION	

ADDITIONAL COMMENTS:

Wood-Pawcatuck Watershed Flood Resiliency Management Plan
DAM INSPECTION FIELD ASSESSMENT

DAM NAME	Browning Pond Dam	INSPECTION DATE	
OUTLET WORKS			
AREA INSPECTED	CONDITION	OBSERVATIONS	
OUTLET WORKS	TYPE	Culvert, concrete headwalls	
	INTAKE STRUCTURE	N/O - water high	
	TRASHRACK	"	
	PRIMARY CLOSURE	"	
	SECONDARY CLOSURE	"	
	CONDUIT	Unable to observe	
	OUTLET STRUCTURE/HEADWALL	concrete - cracked, spalling (minor)	
	EROSION ALONG TOE OF DAM	N/O	
	SEEPAGE/LEAKAGE	N/O	
	DEBRIS/BLOCKAGE	N/O - water high	
	UNUSUAL MOVEMENT	sinkhole in road/ sinking of road immed. behind	
	DOWNSTREAM AREA	wetland/	
	MISCELLANEOUS		

ADDITIONAL COMMENTS: Intake culvert headwall - minor cracking; erosion under right wingwall
training walls - masonry w/ concrete - some concrete + stones missing

Wood-Pawcatuck Watershed Flood Resiliency Management Plan
DAM INSPECTION FIELD ASSESSMENT

Potential Recommendation Notes

Removal? would be controversial

Breach/Spillway Adjustments? Needs ~~sig.~~ large outlet/spillway

Repurposing? Too low

Fish/eel passage? room for natural channel or very small denil fish ladder

Notes:

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM SAFETY INSPECTION

NAME OF DAM: Buck Hill Cons. Dam STATE ID #: _____

AKA NAME: _____ WATERCOURSE NAME: _____

DAM LOCATION INFORMATION

CITY/TOWN: Spencer LAT. / LONG.: _____

STATE: _____ HAZARD CLASS: _____

GENERAL DAM INFORMATION

TYPE OF DAM: ~~Recreational~~

PURPOSE OF DAM: Recreational - boating, hiking, snowmobiling

YEAR BUILT: _____

INSPECTION SUMMARY

DATE OF INSPECTION: 11/27/18 NAME OF INSPECTOR: RLW

TIME OF INSPECTION: 9:45 OTHER ATTENDEES: WF, PD

WEATHER CONDITIONS: Rain/snow, ~~partly~~ mostly cloudy, 34°F

GENERAL DAM DATA

PRIMARY SPILLWAY TYPE: horseshoe AUXILIARY SPILLWAY TYPE: _____

NUMBER OF OUTLETS: 2 TYPE OF OUTLETS: _____

HAS THE DAM BEEN BREACHED OR OVERTOPPED? Unknown

IS THERE A FISH LADDER? (LIST TYPE IF PRESENT) N/A

DOES THE CREST SUPPORT A PUBLIC ROAD? trail

ROADS/DRIVEWAY IMMEDIATELY DOWNSTREAM OF DAM? driveways

ACCESS CONDITIONS TO THE SITE: walk from road, parking nearby

SECURITY DEVICES? N/A; possible bollards/gate prev Gyicg on gravel

7970 town hall
8031 buck@spfld

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME		INSPECTION DATE
EMBANKMENT (D/S SLOPE)		
AREA INSPECTED	CONDITION	OBSERVATIONS
D/S SLOPE	TYPE (EARTH, CONCRETE, MASONRY)	earth
	WET AREAS (NO FLOW)	surface wet from heavy rain - unknown
	SEEPAGE (EARTH) OR LEAKAGE (CONCRETE)	possible - wet ditch @ toe of embankment
	SLIDE, SLOUGH, SCARP	N/O
	EMBANKMENT-ABUTMENT CONTACT	good
	SINKHOLE/ANIMAL BURROWS	N/O - veg (likely)
	EROSION	N/O
	UNUSUAL MOVEMENT	N/O
	VEGETATION (PRESENCE/CONDITION)	tall grasses/brush
	CONDITION OF JOINTS (CONCRETE)	N/A

ADDITIONAL COMMENTS:

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME	Buck Hill Conservation Dam	INSPECTION DATE

EMBANKMENT (U/S SLOPE)

AREA INSPECTED	CONDITION	OBSERVATIONS
U/S SLOPE	TYPE (EARTH, CONCRETE, MASONRY)	EARTH
	SLIDE, SLOUGH, SCARP	N/O
	SLOPE PROTECTION TYPE AND COND.	N/O
	SINKHOLE/ANIMAL BURROWS	N/O - veg
	EMBANKMENT-ABUTMENT CONTACT	good, tree on right abut
	EROSION	N/O
	UNUSUAL MOVEMENT	N/O
	VEGETATION (PRESENCE/CONDITION)	grass, wildflowers, emergent aquatic plants
	CONDITION OF JOINTS (CONCRETE)	N/A

ADDITIONAL COMMENTS: wood pilings supporting bank U/S of left abut - old walkway?

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME		INSPECTION DATE
EMBANKMENT (CREST)		
AREA INSPECTED	CONDITION	OBSERVATIONS
CREST	SURFACE TYPE	grass
	SURFACE CRACKING	N/O
	SINKHOLES, ANIMAL BURROWS	N/O
	VERTICAL ALIGNMENT (DEPRESSIONS)	N/O - good
	HORIZONTAL ALIGNMENT	good
	RUTS AND/OR PUDDLES	N/O
	VEGETATION (PRESENCE/CONDITION)	grass - mowed/flattened
	ABUTMENT CONTACT	good
	CONDITION OF JOINTS (CONCRETE)	N/A

ADDITIONAL COMMENTS:

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME	Buck Hill Conservation Dam	INSPECTION DATE

INSTRUMENTATION

AREA INSPECTED	CONDITION	OBSERVATIONS
INSTR.	1. PIEZOMETERS	
	2. OBSERVATION WELLS	
	3. STAFF GAGE AND RECORDER	
	4. WEIRS	
	5. INCLINOMETERS	
	6. SURVEY MONUMENTS	
	7. DRAINS	
	8. FREQUENCY OF READINGS	
	9. LOCATION OF READINGS	

N/D

ADDITIONAL COMMENTS:

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME		INSPECTION DATE
DOWNSTREAM WALLS		
AREA INSPECTED	CONDITION	OBSERVATIONS
D/S WALLS	1. WALL TYPE	
	2. WALL ALIGNMENT	
	3. WALL CONDITION	
	4. HEIGHT: TOP OF WALL TO MUDLINE	min: max:
	5. SEEPAGE OR LEAKAGE	
	6. ABUTMENT CONTACT	
	7. EROSION/SINKHOLES BEHIND WALL	
	8. ANIMAL BURROWS	
	9. UNUSUAL MOVEMENT	
	10. WET AREAS AT TOE OF WALL	
	11. VEGETATION	
	12. SCOUR/EROSION AT BASE OF WALL	

ADDITIONAL COMMENTS:

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME Buck Hill Conservation Dam	INSPECTION DATE

UPSTREAM WALLS

AREA INSPECTED	CONDITION	OBSERVATIONS
U/S WALLS	1. WALL TYPE	
	2. WALL ALIGNMENT	
	3. WALL CONDITION	
	4. HEIGHT: TOP OF WALL TO MUDLINE	min: max: avg:
	5. ABUTMENT CONTACT	
	6. EROSION/SINKHOLES BEHIND WALL	
	7. ANIMAL BURROWS	
	8. UNUSUAL MOVEMENT	
	9. VEGETATION	
	10. SCOUR/EROSION AT BASE OF WALL	

ADDITIONAL COMMENTS:

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME		INSPECTION DATE
DOWNSTREAM AREA		
AREA INSPECTED	CONDITION	OBSERVATIONS
D/S AREA	ABUTMENT LEAKAGE	N/O
	FOUNDATION SEEPAGE	N/O - wet day
	SLIDE, SLOUGH, SCARP	N/O
	WEIRS	N/O
	DRAINAGE SYSTEM	ditch along toe of dam - partly full of wate
	INSTRUMENTATION	N/O
	VEGETATION	grasses, brush, trees (med, small)
	ACCESSIBILITY	walk
	DOWNSTREAM HAZARD DESCRIPTION	driveways & utility lines

ADDITIONAL COMMENTS:

very wet/marshy; no visible dam outlet but boil occurring @ potential outlet loc'n @ toe of dam

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME	Buck Hill Conservation Dam	INSPECTION DATE

PRIMARY SPILLWAY

AREA INSPECTED	CONDITION	OBSERVATIONS
	SPILLWAY TYPE	half/round
	WEIR TYPE	unknown due to debris
	SPILLWAY CONDITION	unknown "
	TRAINING WALLS	N/A
	SPILLWAY CONTROLS AND CONDITION	N/A
	UNUSUAL MOVEMENT	unknown "
	APPROACH AREA	clear except for underwater debris
	DISCHARGE AREA	D/S boil?
	DEBRIS	large amount, covering + plugging spillway
	WATER LEVEL AT TIME OF INSPECTION	over spillway (ht unknown)

ADDITIONAL COMMENTS:

Informal trash rack made of stacked wire fence

Debris left by beaver?

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME		INSPECTION DATE
AUXILIARY SPILLWAY		
AREA INSPECTED	CONDITION	OBSERVATIONS
SPILLWAY	SPILLWAY TYPE	
	WEIR TYPE	
	SPILLWAY CONDITION	
	TRAINING WALLS	
	SPILLWAY CONTROLS AND CONDITION	
	UNUSUAL MOVEMENT	
	APPROACH AREA	
	DISCHARGE AREA	
	DEBRIS	
	WATER LEVEL AT TIME OF INSPECTION	

ADDITIONAL COMMENTS:

Wood-Pawcatuck Watershed Flood Resiliency Management Plan
DAM INSPECTION FIELD ASSESSMENT

DAM NAME	Buck Hill Conservation Dam	INSPECTION DATE	
OUTLET WORKS			
AREA INSPECTED	CONDITION	OBSERVATIONS	
OUTLET WORKS	TYPE		
	INTAKE STRUCTURE		
	TRASHRACK		
	PRIMARY CLOSURE		
	SECONDARY CLOSURE		
	CONDUIT		
	OUTLET STRUCTURE/HEADWALL		
	EROSION ALONG TOE OF DAM		
	SEEPAGE/LEAKAGE		
	DEBRIS/BLOCKAGE		
	UNUSUAL MOVEMENT		
	DOWNSTREAM AREA		
	MISCELLANEOUS	boil indicates poss. location	

ADDITIONAL COMMENTS: Unable to observe due to high water, veg

~~-bott~~

Wood-Pawcatuck Watershed Flood Resiliency Management Plan
DAM INSPECTION FIELD ASSESSMENT

Potential Recommendation Notes

Removal?

controversial - rec
owned by DCR, rented by YH

Breach/Spillway Adjustments?

Need to fix spillway
Breach imposs - see above

Repurposing? raising for flood control would flood rec. property, trails

Fish/eel passage?

could add ladder
Natural passage would require moving/elevating trails/adding bridges

Notes:

PHOTOS

PHOTOGRAPHS INSTRUCTION PAGE:

All photographs shall be color photographs. Photographs shall be clear and include scale references where applicable. Photographs shall include, but not be limited to the following:

1. *Overview of dam from upstream*
2. *Overview of dam from downstream*
3. *Overview of upstream face from right abutment*
4. *Overview of upstream face from left abutment*
5. *Overview of dam crest from right abutment*
6. *Overview of dam crest from left abutment*
7. *Overview of downstream face from right abutment*
8. *Overview of downstream face from left abutment*
9. *Overview of spillway from upstream*
10. *Overview of spillway from downstream (tailrace or channel area)*
11. *Overview of right training wall*
12. *Overview of left training wall*
13. *Overview of weir*
14. *Overview of stilling basin*
15. *Overview of downstream channel*
16. *Overview of gatehouse exterior*
17. *Overview of gatehouse interior*
18. *Overview of operators*
19. *Outlet inlets and discharge points*
20. *Overview of reservoir*
21. *Areas of specific deficiencies (e.g., cracks, erosion, displacement, seeps, deterioration, etc.)*

Each photograph shall include a caption indicating the subject of the photograph as well as highlighting any specific deficiencies pictured. All photographs shall be presented with no more than two (2) photos per page. Photo location and orientation shall be indicated on the site plan included in the section entitled "Figures". Alternatively, for clarity, a separate figure can be provided in this appendix to show figure locations.

SKETCH

DAM SAFETY INSPECTION

NAME OF DAM: Cedar Mill Pond Dam STATE ID #: MA01995

AKA NAME: Cider Mill Pond Dam WATERCOURSE NAME:

DAM LOCATION INFORMATION

CITY/TOWN: Spencer LAT. / LONG.:

STATE: MA HAZARD CLASS:

GENERAL DAM INFORMATION

TYPE OF DAM: Earth

PURPOSE OF DAM: —

YEAR BUILT:

INSPECTION SUMMARY

DATE OF INSPECTION: 11/27/18 NAME OF INSPECTOR: RLW

TIME OF INSPECTION: 1:00 PM OTHER ATTENDEES: WF, PD

WEATHER CONDITIONS: Sunny, partly cloudy, breezy 38°-40°

GENERAL DAM DATA

PRIMARY SPILLWAY TYPE: 0 AUXILIARY SPILLWAY TYPE: 0

NUMBER OF OUTLETS: 1 TYPE OF OUTLETS:

HAS THE DAM BEEN BREACHED OR OVERTOPPED?

IS THERE A FISH LADDER? (LIST TYPE IF PRESENT) No

DOES THE CREST SUPPORT A PUBLIC ROAD? Parking Lot - Price Chopper plaza

ROADS/DRIVEWAY IMMEDIATELY DOWNSTREAM OF DAM?

ACCESS CONDITIONS TO THE SITE: No access

SECURITY DEVICES? Chainlink fence + gate, stats in chainlink

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME		INSPECTION DATE
EMBANKMENT (D/S SLOPE)		
AREA INSPECTED	CONDITION	OBSERVATIONS
D/S SLOPE	TYPE (EARTH, CONCRETE, MASONRY)	
	WET AREAS (NO FLOW)	
	SEEPAGE (EARTH) OR LEAKAGE (CONCRETE)	
	SLIDE, SLOUGH, SCARP	
	EMBANKMENT-ABUTMENT CONTACT	
	SINKHOLE/ANIMAL BURROWS	
	EROSION	
	UNUSUAL MOVEMENT	
	VEGETATION (PRESENCE/CONDITION)	
	CONDITION OF JOINTS (CONCRETE)	

ADDITIONAL COMMENTS:

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME CMPD		INSPECTION DATE
EMBANKMENT (U/S SLOPE)		
AREA INSPECTED	CONDITION	OBSERVATIONS
U/S SLOPE	TYPE (EARTH, CONCRETE, MASONRY)	
	SLIDE, SLOUGH, SCARP	
	SLOPE PROTECTION TYPE AND COND.	
	SINKHOLE/ANIMAL BURROWS	
	EMBANKMENT-ABUTMENT CONTACT	
	EROSION	
	UNUSUAL MOVEMENT	
	VEGETATION (PRESENCE/CONDITION)	
	CONDITION OF JOINTS (CONCRETE)	
ADDITIONAL COMMENTS:		

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME		INSPECTION DATE
EMBANKMENT (CREST)		
AREA INSPECTED	CONDITION	OBSERVATIONS
CREST	SURFACE TYPE	
	SURFACE CRACKING	
	SINKHOLES, ANIMAL BURROWS	
	VERTICAL ALIGNMENT (DEPRESSIONS)	
	HORIZONTAL ALIGNMENT	
	RUTS AND/OR PUDDLES	
	VEGETATION (PRESENCE/CONDITION)	
	ABUTMENT CONTACT	
	CONDITION OF JOINTS (CONCRETE)	

ADDITIONAL COMMENTS:

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME CMPD		INSPECTION DATE
INSTRUMENTATION		
AREA INSPECTED	CONDITION	OBSERVATIONS
INSTR.	1. PIEZOMETERS	
	2. OBSERVATION WELLS	
	3. STAFF GAGE AND RECORDER	
	4. WEIRS	
	5. INCLINOMETERS	
	6. SURVEY MONUMENTS	
	7. DRAINS	
	8. FREQUENCY OF READINGS	
	9. LOCATION OF READINGS	
ADDITIONAL COMMENTS:		

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME		INSPECTION DATE		
DOWNSTREAM WALLS				
AREA INSPECTED	CONDITION	OBSERVATIONS		
D/S WALLS	1. WALL TYPE			
	2. WALL ALIGNMENT			
	3. WALL CONDITION			
	4. HEIGHT: TOP OF WALL TO MUDLINE	min:	max:	
	5. SEEPAGE OR LEAKAGE			
	6. ABUTMENT CONTACT			
	7. EROSION/SINKHOLES BEHIND WALL			
	8. ANIMAL BURROWS			
	9. UNUSUAL MOVEMENT			
	10. WET AREAS AT TOE OF WALL			
	11. VEGETATION			
	12. SCOUR/EROSION AT BASE OF WALL			
ADDITIONAL COMMENTS:				

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME CMPD		INSPECTION DATE		
UPSTREAM WALLS				
AREA INSPECTED	CONDITION	OBSERVATIONS		
U/S WALLS	1. WALL TYPE			
	2. WALL ALIGNMENT			
	3. WALL CONDITION			
	4. HEIGHT: TOP OF WALL TO MUDLINE	min:	max:	avg:
	5. ABUTMENT CONTACT			
	6. EROSION/SINKHOLES BEHIND WALL			
	7. ANIMAL BURROWS			
	8. UNUSUAL MOVEMENT			
	9. VEGETATION			
	10. SCOUR/EROSION AT BASE OF WALL			

ADDITIONAL COMMENTS:

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME		INSPECTION DATE
DOWNSTREAM AREA		
AREA INSPECTED	CONDITION	OBSERVATIONS
D/S AREA	ABUTMENT LEAKAGE	
	FOUNDATION SEEPAGE	
	SLIDE, SLOUGH, SCARP	
	WEIRS	
	DRAINAGE SYSTEM	
	INSTRUMENTATION	
	VEGETATION	
	ACCESSIBILITY	
	DOWNSTREAM HAZARD DESCRIPTION	
ADDITIONAL COMMENTS:		

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME CMPD		INSPECTION DATE
PRIMARY SPILLWAY		
AREA INSPECTED	CONDITION	OBSERVATIONS
	SPILLWAY TYPE	
	WEIR TYPE	
	SPILLWAY CONDITION	
	TRAINING WALLS	
	SPILLWAY CONTROLS AND CONDITION	
	UNUSUAL MOVEMENT	
	APPROACH AREA	
	DISCHARGE AREA	
	DEBRIS	
	WATER LEVEL AT TIME OF INSPECTION	

ADDITIONAL COMMENTS:

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME		INSPECTION DATE
AUXILIARY SPILLWAY		
AREA INSPECTED	CONDITION	OBSERVATIONS
SPILLWAY	SPILLWAY TYPE	
	WEIR TYPE	
	SPILLWAY CONDITION	
	TRAINING WALLS	
	SPILLWAY CONTROLS AND CONDITION	
	UNUSUAL MOVEMENT	
	APPROACH AREA	
	DISCHARGE AREA	
	DEBRIS	
	WATER LEVEL AT TIME OF INSPECTION	
ADDITIONAL COMMENTS:		

Wood-Pawcatuck Watershed Flood Resiliency Management Plan
DAM INSPECTION FIELD ASSESSMENT

DAM NAME CMPD	INSPECTION DATE

OUTLET WORKS

AREA INSPECTED	CONDITION	OBSERVATIONS
OUTLET WORKS	TYPE	
	INTAKE STRUCTURE	
	TRASHRACK	
	PRIMARY CLOSURE	
	SECONDARY CLOSURE	
	CONDUIT	
	OUTLET STRUCTURE/HEADWALL	
	EROSION ALONG TOE OF DAM	
	SEEPAGE/LEAKAGE	
	DEBRIS/BLOCKAGE	
	UNUSUAL MOVEMENT	
	DOWNSTREAM AREA	
	MISCELLANEOUS	

ADDITIONAL COMMENTS: _____

Wood-Pawcatuck Watershed Flood Resiliency Management Plan
DAM INSPECTION FIELD ASSESSMENT

Potential Recommendation Notes

Removal?

Breach/Spillway Adjustments?

Repurposing?

Fish/eel passage?

Notes:

PHOTOS

PHOTOGRAPHS INSTRUCTION PAGE:

All photographs shall be color photographs. Photographs shall be clear and include scale references where applicable. Photographs shall include, but not be limited to the following:

1. *Overview of dam from upstream*
2. *Overview of dam from downstream*
3. *Overview of upstream face from right abutment*
4. *Overview of upstream face from left abutment*
5. *Overview of dam crest from right abutment*
6. *Overview of dam crest from left abutment*
7. *Overview of downstream face from right abutment*
8. *Overview of downstream face from left abutment*
9. *Overview of spillway from upstream*
10. *Overview of spillway from downstream (tailrace or channel area)*
11. *Overview of right training wall*
12. *Overview of left training wall*
13. *Overview of weir*
14. *Overview of stilling basin*
15. *Overview of downstream channel*
16. *Overview of gatehouse exterior*
17. *Overview of gatehouse interior*
18. *Overview of operators*
19. *Outlet inlets and discharge points*
20. *Overview of reservoir*
21. *Areas of specific deficiencies (e.g., cracks, erosion, displacement, seeps, deterioration, etc.)*

Each photograph shall include a caption indicating the subject of the photograph as well as highlighting any specific deficiencies pictured. All photographs shall be presented with no more than two (2) photos per page. Photo location and orientation shall be indicated on the site plan included in the section entitled "Figures". Alternatively, for clarity, a separate figure can be provided in this appendix to show figure locations.

Wood-Pawcatuck Watershed Flood Resiliency Management Plan
DAM INSPECTION FIELD ASSESSMENT

SKETCH

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM SAFETY INSPECTION

NAME OF DAM: House Mill Pond Dam STATE ID #:

AKA NAME: WATERCOURSE NAME:

DAM LOCATION INFORMATION

CITY/TOWN: Spencer LAT. / LONG.:

STATE: MA HAZARD CLASS:

GENERAL DAM INFORMATION

TYPE OF DAM: Earth

PURPOSE OF DAM: Aesthetic/historic/cultural significance; former beach; picnic area

YEAR BUILT:

INSPECTION SUMMARY

DATE OF INSPECTION: 11/29/18 NAME OF INSPECTOR: RLW

TIME OF INSPECTION: 930 OTHER ATTENDEES: HF, DD

WEATHER CONDITIONS: Sunny, windy, partly cloudy

GENERAL DAM DATA

PRIMARY SPILLWAY TYPE: Stepped Masonry AUXILIARY SPILLWAY TYPE: concrete drop inlet

NUMBER OF OUTLETS: 0 TYPE OF OUTLETS: /

HAS THE DAM BEEN BREACHED OR OVERTOPPED? unknown

IS THERE A FISH LADDER? (LIST TYPE IF PRESENT) No

DOES THE CREST SUPPORT A PUBLIC ROAD? No

ROADS/DRIVEWAY IMMEDIATELY DOWNSTREAM OF DAM? Public road

ACCESS CONDITIONS TO THE SITE: walk on to dam; open public parking across road

SECURITY DEVICES? Minimal protection from falls; no gates

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME		INSPECTION DATE
EMBANKMENT (D/S SLOPE)		
AREA INSPECTED	CONDITION	OBSERVATIONS
D/S SLOPE	TYPE (EARTH, CONCRETE, MASONRY)	earth
	WET AREAS (NO FLOW)	N/O
	SEEPAGE (EARTH) OR LEAKAGE (CONCRETE)	N/O
	SLIDE, SLOUGH, SCARP	N/O
	EMBANKMENT-ABUTMENT CONTACT	left - good; right shore lower than dam crest
	SINKHOLE/ANIMAL BURROWS	~~Multiple 3-4' Ø sinkholes - previous tree to~~ N/O
	EROSION	~~N/O~~ One area - 4' wide
	UNUSUAL MOVEMENT	N/O
	VEGETATION (PRESENCE/CONDITION)	veg - moved; several large trees
	CONDITION OF JOINTS (CONCRETE)	N/A

ADDITIONAL COMMENTS:

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME	HMPD	INSPECTION DATE

EMBANKMENT (U/S SLOPE)

AREA INSPECTED	CONDITION	OBSERVATIONS
U/S SLOPE	TYPE (EARTH, CONCRETE, MASONRY)	Earth
	SLIDE, SLOUGH, SCARP	N/O
	SLOPE PROTECTION TYPE AND COND.	N/O
	SINKHOLE/ANIMAL BURROWS	
	EMBANKMENT-ABUTMENT CONTACT	
	EROSION	erosion @ end of D/S wall @ right abut
	UNUSUAL MOVEMENT	N/O
	VEGETATION (PRESENCE/CONDITION)	moved grass; ponding @ waters edge left side
	CONDITION OF JOINTS (CONCRETE)	N/A

ADDITIONAL COMMENTS:

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME		INSPECTION DATE
EMBANKMENT (CREST)		
AREA INSPECTED	CONDITION	OBSERVATIONS
CREST	SURFACE TYPE	earth
	SURFACE CRACKING	N/O
	SINKHOLES, ANIMAL BURROWS	Multiple 3'-4' ϕ sinkholes where large trees removed
	VERTICAL ALIGNMENT (DEPRESSIONS)	N/O
	HORIZONTAL ALIGNMENT	N/O
	RUTS AND/OR PUDDLES	N/O
	VEGETATION (PRESENCE/CONDITION)	grass-mowed; large trees
	ABUTMENT CONTACT	left-good; right - abutment & U/S area lower than dam crest
	CONDITION OF JOINTS (CONCRETE)	N/O

ADDITIONAL COMMENTS: Erosion behind corners of Masonry training walls

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME HMPD		INSPECTION DATE
INSTRUMENTATION		
AREA INSPECTED	CONDITION	OBSERVATIONS
INSTR.	1. PIEZOMETERS	N/A
	2. OBSERVATION WELLS	
	3. STAFF GAGE AND RECORDER	
	4. WEIRS	
	5. INCLINOMETERS	
	6. SURVEY MONUMENTS	
	7. DRAINS	
	8. FREQUENCY OF READINGS	
	9. LOCATION OF READINGS	

ADDITIONAL COMMENTS:

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME		INSPECTION DATE
DOWNSTREAM WALLS		
AREA INSPECTED	CONDITION	OBSERVATIONS
D/S WALLS	1. WALL TYPE	Mortared stone masonry
	2. WALL ALIGNMENT	good - left. Right - wall ⊥ to dam leaning outward @ end, bulging @ base
	3. WALL CONDITION	left good except @ ends + spillways; right - fair
	4. HEIGHT: TOP OF WALL TO MUDLINE	min: 2 ft max: 6'
	5. SEEPAGE OR LEAKAGE	N/O - left; right - heavy seepage in corner of wall
	6. ABUTMENT CONTACT	left - poor; right - poor; erosion around end
	7. EROSION/SINKHOLES BEHIND WALL	left - NO
	8. ANIMAL BURROWS	left NO; Right - N/O
	9. UNUSUAL MOVEMENT	N/O
	10. WET AREAS AT TOE OF WALL	left - N/O; right - large wet area @ corner
	11. VEGETATION	ferns - left of spillway; ferns + moss - right
	12. SCOUR/EROSION AT BASE OF WALL	left - N/O

ADDITIONAL COMMENTS: Voids (missing stones right of spillway

Stump @ end of wall holding but disrupting wall

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME	HMPD	INSPECTION DATE		
UPSTREAM WALLS				
AREA INSPECTED	CONDITION	OBSERVATIONS		
U/S WALLS	1. WALL TYPE	mortared stone masonry		
	2. WALL ALIGNMENT	left side of spillway - wall leaning out ~ 2" over 3 feet		
	3. WALL CONDITION	good		
	4. HEIGHT: TOP OF WALL TO MUDLINE	min: 1 ft	max: 6-8 ft	avg: 5-7 ft
	5. ABUTMENT CONTACT	left - fair; right - higher than abutment, erosion around end of wall		
	6. EROSION/SINKHOLES BEHIND WALL	yes - at corners of training walls - soil loss; also @ right end/abut		
	7. ANIMAL BURROWS	N/O		
	8. UNUSUAL MOVEMENT	N/O		
	9. VEGETATION	small trees cut or growing @ base of wall - few		
	10. SCOUR/EROSION AT BASE OF WALL	N/O		

ADDITIONAL COMMENTS:

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME		INSPECTION DATE
DOWNSTREAM AREA		
AREA INSPECTED	CONDITION	OBSERVATIONS
D/S AREA	ABUTMENT LEAKAGE	N/O
	FOUNDATION SEEPAGE	see D/S walls
	SLIDE, SLOUGH, SCARP	N/O
	WEIRS	N/O
	DRAINAGE SYSTEM	N/O @ dem; road storm drains to TW
	INSTRUMENTATION	N/O
	VEGETATION	trees, grass
	ACCESSIBILITY	walk, snowmobile; bridges
	DOWNSTREAM HAZARD DESCRIPTION	Road, footbridge; snowmobile trail off to right; parking area

ADDITIONAL COMMENTS:

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME	HMPD	INSPECTION DATE	
PRIMARY SPILLWAY			
AREA INSPECTED	CONDITION	OBSERVATIONS	
	SPILLWAY TYPE	stepped masonry spillway	
	WEIR TYPE	broad-crested weir	
	SPILLWAY CONDITION	fair	
	TRAINING WALLS	masonry on D/S ends failing; erosion behind training wall/corners	
	SPILLWAY CONTROLS AND CONDITION	N/O	
	UNUSUAL MOVEMENT	N/O	
	APPROACH AREA	clear of veg, debris	
	DISCHARGE AREA	masonry stilling basin discharging to stone raceway	
	DEBRIS	N/O	
	WATER LEVEL AT TIME OF INSPECTION	2-4" over high point of weir	
ADDITIONAL COMMENTS:		Mill wheel support still erect in spillway; loose masonry @ bottom of wheel slot	

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME		INSPECTION DATE
AUXILIARY SPILLWAY		
AREA INSPECTED	CONDITION	OBSERVATIONS
SPILLWAY	SPILLWAY TYPE	concrete drop inlet
	WEIR TYPE	broad crested concrete; small amount of grass + debris on weir
	SPILLWAY CONDITION	fair
	TRAINING WALLS	N/A
	SPILLWAY CONTROLS AND CONDITION	N/O
	UNUSUAL MOVEMENT	N/O
	APPROACH AREA	approach becoming choked by grass + pond weed; poss. sediment deposition
	DISCHARGE AREA	culverts under road to masonry-lined raceway
	DEBRIS	None in outlet
	WATER LEVEL AT TIME OF INSPECTION	~9" over weir
		Remnants of retaining wall right of inlet - covered by veg + fallen

ADDITIONAL COMMENTS:

Concrete box forming inlet in good condition
face of weir - condition uncertain
outlet of drop inlet - 2 concrete culverts each ~6'×5' wide
road side of inlet protected by metal rail @ edge +
wood split rail fence on small earth embankment

(btwn inlet + road)
- small animal burrows, holes in embank.

Masonry wingwalls @ culvert outlet misaligned, possibly unstable

Wood-Pawcatuck Watershed Flood Resiliency Management Plan
DAM INSPECTION FIELD ASSESSMENT

DAM NAME HMPD		INSPECTION DATE
OUTLET WORKS		
AREA INSPECTED	CONDITION	OBSERVATIONS
OUTLET WORKS	TYPE	
	INTAKE STRUCTURE	
	TRASHRACK	
	PRIMARY CLOSURE	
	SECONDARY CLOSURE	
	CONDUIT	
	OUTLET STRUCTURE/HEADWALL	
	EROSION ALONG TOE OF DAM	
	SEEPAGE/LEAKAGE	
	DEBRIS/BLOCKAGE	
	UNUSUAL MOVEMENT	
	DOWNSTREAM AREA	
	MISCELLANEOUS	

ADDITIONAL COMMENTS:

Wood-Pawcatuck Watershed Flood Resiliency Management Plan
DAM INSPECTION FIELD ASSESSMENT

Potential Recommendation Notes

Removal? Not approp

Breach/Spillway Adjustments?

Repurposing? Not likely

Fish/eel passage? ladder could be added to spillway but disrupt

Notes:

PHOTOS

PHOTOGRAPHS INSTRUCTION PAGE:

All photographs shall be color photographs. Photographs shall be clear and include scale references where applicable. Photographs shall include, but not be limited to the following:

1. *Overview of dam from upstream*
2. *Overview of dam from downstream*
3. *Overview of upstream face from right abutment*
4. *Overview of upstream face from left abutment*
5. *Overview of dam crest from right abutment*
6. *Overview of dam crest from left abutment*
7. *Overview of downstream face from right abutment*
8. *Overview of downstream face from left abutment*
9. *Overview of spillway from upstream*
10. *Overview of spillway from downstream (tailrace or channel area)*
11. *Overview of right training wall*
12. *Overview of left training wall*
13. *Overview of weir*
14. *Overview of stilling basin*
15. *Overview of downstream channel*
16. *Overview of gatehouse exterior*
17. *Overview of gatehouse interior*
18. *Overview of operators*
19. *Outlet inlets and discharge points*
20. *Overview of reservoir*
21. *Areas of specific deficiencies (e.g., cracks, erosion, displacement, seeps, deterioration, etc.)*

Each photograph shall include a caption indicating the subject of the photograph as well as highlighting any specific deficiencies pictured. All photographs shall be presented with no more than two (2) photos per page. Photo location and orientation shall be indicated on the site plan included in the section entitled "Figures". Alternatively, for clarity, a separate figure can be provided in this appendix to show figure locations.

Wood-Pawcatuck Watershed Flood Resiliency Management Plan
DAM INSPECTION FIELD ASSESSMENT

SKETCH

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM SAFETY INSPECTION

NAME OF DAM: Howe Reservoir Dam STATE ID #: _____

AKA NAME: _____ WATERCOURSE NAME: _____

DAM LOCATION INFORMATION

CITY/TOWN: Spencer LAT. / LONG.: _____

STATE: MA HAZARD CLASS: _____

GENERAL DAM INFORMATION

TYPE OF DAM: Earth

PURPOSE OF DAM: NOT drinking water

YEAR BUILT: _____

INSPECTION SUMMARY

DATE OF INSPECTION: 11/29/18 NAME OF INSPECTOR: RLW

TIME OF INSPECTION: ~1030 OTHER ATTENDEES: WF, PD

WEATHER CONDITIONS: Sunny, partly cloudy, windy

GENERAL DAM DATA

PRIMARY SPILLWAY TYPE: Concrete bc weir AUXILIARY SPILLWAY TYPE: /

NUMBER OF OUTLETS: 0 TYPE OF OUTLETS: _____

HAS THE DAM BEEN BREACHED OR OVERTOPPED? unknown

IS THERE A FISH LADDER? (LIST TYPE IF PRESENT) No

DOES THE CREST SUPPORT A PUBLIC ROAD? No - formerly supported trail + bridge

ROADS/DRIVEWAY IMMEDIATELY DOWNSTREAM OF DAM? No

ACCESS CONDITIONS TO THE SITE: walk/ski/ATV/snowmobile

SECURITY DEVICES? N/O

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME		INSPECTION DATE
EMBANKMENT (D/S SLOPE)		
AREA INSPECTED	CONDITION	OBSERVATIONS
D/S SLOPE	TYPE (EARTH, CONCRETE, MASONRY)	earth
	WET AREAS (NO FLOW)	small
	SEEPAGE (EARTH) OR LEAKAGE (CONCRETE)	N/O
	SLIDE, SLOUGH, SCARP	N/O
	EMBANKMENT-ABUTMENT CONTACT	good
	SINKHOLE/ANIMAL BURROWS	N/O
	EROSION	N/O.
	UNUSUAL MOVEMENT	N/O
	VEGETATION (PRESENCE/CONDITION)	grass - mowed; moss; large trees near abutment
	CONDITION OF JOINTS (CONCRETE)	N/O
ADDITIONAL COMMENTS:		

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME	HRD	INSPECTION DATE	
		EMBANKMENT (U/S SLOPE)	could not observe left of spillway closely
AREA INSPECTED	CONDITION	OBSERVATIONS	
U/S SLOPE	TYPE (EARTH, CONCRETE, MASONRY)	earth	
	SLIDE, SLOUGH, SCARP	NO	
	SLOPE PROTECTION TYPE AND COND.	~~Stone~~ armor - poor - covered in veg + scattered/nonuniform	
	SINKHOLE/ANIMAL BURROWS	NO	
	EMBANKMENT-ABUTMENT CONTACT	good	
	EROSION	v. minor	
	UNUSUAL MOVEMENT	NO	
	VEGETATION (PRESENCE/CONDITION)	mowed grass + reeds; cut shrubs + small trees (stumps)	
	CONDITION OF JOINTS (CONCRETE)	N/A	

ADDITIONAL COMMENTS:

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME		INSPECTION DATE
EMBANKMENT (CREST)		
AREA INSPECTED	CONDITION	OBSERVATIONS
CREST	SURFACE TYPE	earth w/ grass
	SURFACE CRACKING	N/O
	SINKHOLES, ANIMAL BURROWS	N/O
	VERTICAL ALIGNMENT (DEPRESSIONS)	minor undulations
	HORIZONTAL ALIGNMENT	good
	RUTS AND/OR PUDDLES	small ruts ~ ATV width
	VEGETATION (PRESENCE/CONDITION)	grass - mowed
	ABUTMENT CONTACT	left - good; right - good but abut thins @ turn in woods
	CONDITION OF JOINTS (CONCRETE)	N/A

ADDITIONAL COMMENTS:

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME HRD		INSPECTION DATE
INSTRUMENTATION		
AREA INSPECTED	CONDITION	OBSERVATIONS
INSTR.	1. PIEZOMETERS	N/O
	2. OBSERVATION WELLS	
	3. STAFF GAGE AND RECORDER	
	4. WEIRS	
	5. INCLINOMETERS	
	6. SURVEY MONUMENTS	
	7. DRAINS	
	8. FREQUENCY OF READINGS	
	9. LOCATION OF READINGS	

ADDITIONAL COMMENTS:

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME		INSPECTION DATE
	DOWNSTREAM WALLS	
AREA INSPECTED	CONDITION	OBSERVATIONS
D/S WALLS	1. WALL TYPE	
	2. WALL ALIGNMENT	
	3. WALL CONDITION	
	4. HEIGHT: TOP OF WALL TO MUDLINE	min: max:
	5. SEEPAGE OR LEAKAGE	
	6. ABUTMENT CONTACT	
	7. EROSION/SINKHOLES BEHIND WALL	
	8. ANIMAL BURROWS	
	9. UNUSUAL MOVEMENT	
	10. WET AREAS AT TOE OF WALL	
	11. VEGETATION	
	12. SCOUR/EROSION AT BASE OF WALL	

ADDITIONAL COMMENTS:

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME HRD		INSPECTION DATE
UPSTREAM WALLS		
AREA INSPECTED	CONDITION	OBSERVATIONS
U/S WALLS	1. WALL TYPE	
	2. WALL ALIGNMENT	
	3. WALL CONDITION	
	4. HEIGHT: TOP OF WALL TO MUDLINE	min: max: avg:
	5. ABUTMENT CONTACT	
	6. EROSION/SINKHOLES BEHIND WALL	
	7. ANIMAL BURROWS	
	8. UNUSUAL MOVEMENT	
	9. VEGETATION	
	10. SCOUR/EROSION AT BASE OF WALL	

ADDITIONAL COMMENTS:

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME		INSPECTION DATE
DOWNSTREAM AREA		
AREA INSPECTED	CONDITION	OBSERVATIONS
D/S AREA	ABUTMENT LEAKAGE	N/O
	FOUNDATION SEEPAGE	N/O
	SLIDE, SLOUGH, SCARP	N/O
	WEIRS	N/O
	DRAINAGE SYSTEM	N/O
	INSTRUMENTATION	N/O
	VEGETATION	Shrubs/trees
	ACCESSIBILITY	walking
	DOWNSTREAM HAZARD DESCRIPTION	

ADDITIONAL COMMENTS:

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME	HRD	INSPECTION DATE	
PRIMARY SPILLWAY			
AREA INSPECTED	CONDITION	OBSERVATIONS	
	SPILLWAY TYPE	concrete broad crest low head	
	WEIR TYPE	broad crest	
	SPILLWAY CONDITION	good	
	TRAINING WALLS	left - good; right - severe undermining, spalling, of, erosion behind d/s end	
	SPILLWAY CONTROLS AND CONDITION	N/O	
	UNUSUAL MOVEMENT	N/O	
	APPROACH AREA	filled w/ debris - dam built by beaver	
	DISCHARGE AREA	some debris washed down from beaver dam	
	DEBRIS	see approach, discharge area	
	WATER LEVEL AT TIME OF INSPECTION	~4-6" over weir crest; water level raised further 4-6" by beaver dam @ entrance	
ADDITIONAL COMMENTS:	capped pipes set @ regular intervals in training walls - purpose unknown		

Charlton-Spencer Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
VISUAL DAM ASSESSMENT

DAM NAME		INSPECTION DATE
AUXILIARY SPILLWAY		
AREA INSPECTED	CONDITION	OBSERVATIONS
SPILLWAY	SPILLWAY TYPE	
	WEIR TYPE	
	SPILLWAY CONDITION	
	TRAINING WALLS	
	SPILLWAY CONTROLS AND CONDITION	
	UNUSUAL MOVEMENT	
	APPROACH AREA	
	DISCHARGE AREA	
	DEBRIS	
	WATER LEVEL AT TIME OF INSPECTION	

ADDITIONAL COMMENTS:

Wood-Pawcatuck Watershed Flood Resiliency Management Plan
DAM INSPECTION FIELD ASSESSMENT

DAM NAME HRD		INSPECTION DATE
OUTLET WORKS		
AREA INSPECTED	CONDITION	OBSERVATIONS
OUTLET WORKS	TYPE	
	INTAKE STRUCTURE	
	TRASHRACK	
	PRIMARY CLOSURE	
	SECONDARY CLOSURE	
	CONDUIT	
	OUTLET STRUCTURE/HEADWALL	
	EROSION ALONG TOE OF DAM	
	SEEPAGE/LEAKAGE	
	DEBRIS/BLOCKAGE	
	UNUSUAL MOVEMENT	
	DOWNSTREAM AREA	
	MISCELLANEOUS	

ADDITIONAL COMMENTS:

Wood-Pawcatuck Watershed Flood Resiliency Management Plan
DAM INSPECTION FIELD ASSESSMENT

Potential Recommendation Notes

Removal? possible

Breach/Spillway Adjustments?
could be breached / spillway reshaped

Repurposing?
Potential flood control if gates installed @ spillway

Fish/eel passage?
ladder could easily be added

Notes:
removing dam would connect ponds, possibly reduce beaver problems ~~but~~ or transfer them D/S to Howe Mill Dam

PHOTOS

PHOTOGRAPHS INSTRUCTION PAGE:

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2. *Overview of dam from downstream*
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4. *Overview of upstream face from left abutment*
5. *Overview of dam crest from right abutment*
6. *Overview of dam crest from left abutment*
7. *Overview of downstream face from right abutment*
8. *Overview of downstream face from left abutment*
9. *Overview of spillway from upstream*
10. *Overview of spillway from downstream (tailrace or channel area)*
11. *Overview of right training wall*
12. *Overview of left training wall*
13. *Overview of weir*
14. *Overview of stilling basin*
15. *Overview of downstream channel*
16. *Overview of gatehouse exterior*
17. *Overview of gatehouse interior*
18. *Overview of operators*
19. *Outlet inlets and discharge points*
20. *Overview of reservoir*
21. *Areas of specific deficiencies (e.g., cracks, erosion, displacement, seeps, deterioration, etc.)*

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SKETCH

Attachment C

Dam Assessment Scoring and Prioritization Results

Dam Assessment Scoring and Prioritization

Dam ID Number	Dam Name	Impoundment Name	Latitude	Longitude	Current Uses	Ability to Maintain	Failure Risk (Priority Rating)	Floot Mitigation Potential	Stream Continuity Potential	Management Recommendations
Town of Charlton										
MA00101	Glen Echo Dam	Glen Echo Lake	42.156434	-71.99218	Flood Control; Lakeside Property	Yes	Moderate (Medium)	No		Repair/Maintain
MA00103	Little Nugget Lake Dam	Little Nugget Lake	42.170699	-71.949266	Recreation	Yes	Low (Low)	No		Consider adding AOP
MA01829	Lambs Pond Dam	Lambs Pond	42.17737	-71.975891	Recreation	Yes, but owner has not removed beaver dam at spillway	Moderate (Medium)	No		Remove to increase stream continuity and to address beaver problems, or Repair and remove beaver debris.
MA00100	Ashworth Dam	Upper Sibley Pond	42.14837	-72.00935	Unknown	Unknown	Unknown (Unknown)	No		Remove or No Action
MA00099	Lower Sibley Pond Dam	Lower Sibley Pond	42.14487	-72.00608	None Known	No	Severe (High)	No	Low	Remove
MA01827	Wee Laddie Pond Dam	Wee Laddie Pond	42.174911	-71.956704	None Known; Formerly used for irrigation and as an ice pond	No	Severe (High)	No	Low	Remove
MA01838	Farm Pond Dam	Dodge Pond	42.13594	-71.94515	Recreation	Unknown	Low (Low)	No		Repair/Maintain and Consider adding AOP
MA01835	Mcintyres Pond Dam	McIntyre Pond	42.106299	-71.980322	Unknown	Unknown	Unknown (Unknown)	No		Consider removal; More information needed
MA01830	Rail Road Pond Dam	Rail Road Pond	42.174769	-71.976938	Supports Public Road (Old Spencer Road)	No	Severe (High)	No	Not Assessed	Remove
	Power Station Dam		42.147365	-71.98985	Former hydroelectric dam (once powered Charlton City)	No	Severe (High)	No	Not Assessed	Remove
MA03428	Carpenter Mill Pond Dam		42.145916	-71.990464	None Known	Unknown	Moderate (Medium)	No	Not Assessed	Consider removal; More information needed
	Dam 3		42.149948	-71.988338	Formerly associated with Charlton Woolen Mill	No	Severe (High)	No	Not Assessed	Remove
	Dam 4		42.148534	-71.988579	None Known; Formerly used for swimming lessons by Red Cross	No	Severe (High)		Not Assessed	Remove
Town of Spencer										
MA01997	Lac Marie Dam	Lac Marie Pond	42.291795	-72.001145	Recreation	Yes	Low (Low)	No	High	Consider adding AOP within limited space
MA02379	Muzzy Meadow Dam	Spencer Pond	42.241768	-71.991603	Aesthetics, Future Skating Pond/Trails	Yes	Moderate (Medium)	No	Low	No Action
MA02583	Moose Hill Pond Dam	Moose Hill Pond	42.271692	-71.959035	Flood Control, Emergency Water Supply	Yes	Low/Moderate (Low/Medium)	No		Consider adding AOP
MA00700	Cranberry Meadow Pond Dam	Cranberry Meadow Pond	42.192671	-72.001176	Recreation	Yes	Severe (High)	Yes	Low	Repair
MA00699	Lake Whittemore Dam	Lake Whittemore	42.254285	-71.989485	Recreation	Yes	Low/Moderate (Low/Medium)	Yes	Low	No Action
MA00698	Sugden (Reservoir) Dam	Sugden Reservoir	42.27283	-71.972491	Flood Control, Recreation	Yes	Moderate (Medium)	No		Consider modifying to allow drawdown for additional flood capacity; Consider adding AOP
MA00695	Browning Pond Dam	Browning Pond	42.37786	-71.997102	Recreation	No	Moderate (Medium)	No		Consider removal, or Repair/Maintain and add AOP
MA00901	Buck Hill Conservation Dam	Buck Hill Pond	42.289316	-71.9873	Conservation and Recreation	Yes	Moderate/Severe (Medium/High)	No		Repair/Maintain and consider adding AOP
MA01995	Cedar Millpond Dam (Cider Mill Pond Dam?)	Cider Mill Pond	42.245036	-71.994192	Supports Parking Lot	No	Low/Unknown (Low)	No	Low	More information needed
MA01175	Howe Mill Pond Dam	Howe Mill Pond (lower portion of Howe Pond)	42.21588	-71.999794	Recreation, Aesthetics, Cultural	Yes	Moderate (Medium)	No	Low	Repair/Maintain
MA02542	Howe Reservoir Dam	Howe Reservoir (upper portion of Howe Pond)	42.213324	-71.998913	Recreation	Yes	Moderate (Medium)	No	Low	Study Removal to possibly address beaver problems and provide stream continuity

FUSS & O'NEILL

Appendix D

Water and Wastewater Infrastructure Assessment Technical Memorandum

FUSS & O'NEILL

MEMORANDUM

TO: Project Steering Committee

FROM: Kevin M. Flood, P.E., Kurt A. Mailman, P.E.
Fuss & O'Neill, Inc.
1550 Main Street, Suite 400
Springfield, MA 01103

DATE: May 30, 2019

RE: **Water and Wastewater Infrastructure Vulnerability Assessment**
Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
MVP Action Grant - Town of Charlton & Town of Spencer

---

1 Introduction

This memorandum summarizes the evaluation of existing water and wastewater infrastructure in Charlton and Spencer, Massachusetts that is at risk of inland flooding. Specifically, the existing wastewater collection systems, the wastewater treatment facilities, the public drinking water source wells, and the water distribution systems were evaluated for flood-related vulnerabilities under present day and projected future climate change conditions. This assessment is part of the *Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan* project funded through the Massachusetts Municipal Vulnerability Preparedness (MVP) Program.

2 Data Collection

Spatial mapping and attribute data were compiled in GIS and Adobe PDF format as available and overlaid onto digital orthophotos to depict the water and wastewater distribution and collection systems within the two communities. Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps were overlaid onto GIS mapping for both communities to highlight existing flood hazard areas and their proximity to water and wastewater infrastructure. Mapped FEMA flood hazard areas and associated flood elevations were utilized to compare existing ground elevations and elevations of critical equipment in areas near water and wastewater infrastructure to assess potential flood-related vulnerabilities. Site-specific information including layouts, topography, elevations, equipment, and details for each of the sites evaluated were obtained from the municipalities and Central Massachusetts Regional Planning Commission (CMRPC).

3 Vulnerability Assessments

3.1 Identification of Facilities Vulnerable to Flooding

Vulnerable facilities were identified based on their proximity to flood hazard areas identified on FEMA Flood Insurance Rate Maps. For the purpose of this assessment, vulnerable facilities are those facilities:

1. Located within or adjacent to the area inundated by the 1 percent annual chance (100-year) flood, the 0.2 percent annual chance (500-year) flood, or regulatory floodway, or

2. Facilities within or in close proximity and hydraulically connected to a mapped flood hazard area, with critical infrastructure located at or below the published base flood elevation, where available.

The elevation of adaptation measures (i.e., critical elevation) was determined from the 1 percent annual chance flood elevation reported on FEMA Flood Insurance Rate Maps (FIRMs) plus three feet of freeboard, which is consistent with recommended guidance for critical facilities as described in the New England Interstate Water Pollution Control Commission (NEIWPCC) *Storm Resiliency and Adaptation Needs for Wastewater Conveyance and Treatment* and *Technical Resource 16 (TR-16) Guides for the Design of Wastewater Treatment Works* for wastewater infrastructure and *EPA's Climate Resilient Water Utilities* initiative for water infrastructure. For the purpose of this assessment, the vulnerable wastewater and water infrastructure in both communities were considered critical or essential facilities. The three feet of freeboard is also intended to account for potential increases in the 1 percent chance flood elevation based on anticipated increases in peak streamflow under projected future climate change conditions.

Where base flood elevations were not determined by FEMA (e.g., Zone A), the 1 percent annual chance flood elevation was estimated from LIDAR ground elevations and the 1 percent annual chance flood hazard area boundary in the vicinity of the site, as depicted on the FEMA FIRM. Estimated flood elevations may need to be refined through the use of hydraulic modeling to support future design and permitting of proposed facility-specific adaptation measures.

3.2 Limited Visual Assessments

Limited visual assessments were performed of the vulnerable facilities identified in both communities, including water and wastewater collection and distribution systems, facilities, and critical equipment. The limited visual assessments consisted of site visits at the vulnerable facilities while accompanied by Town personnel. Critical water and wastewater facilities were visited, visual observations made, relative elevations recorded, and photographs taken to compile data at each site including, but not limited to, the following:

- Ground elevations (by LIDAR) around critical facilities and relative elevations of critical equipment and facility components
- Equipment locations
- Site information including erosion potential and accessibility during climatic events
- Structural components and general condition
- HVAC, controls
- Power supply and reliability
- Chemical storage
- Obvious inflow sources.

The assessment findings are summarized in the following sections for each Town, including a listing of vulnerable facilities and preliminary recommended adaptation measures, (conceptual designs and budgetary level opinions of construction cost).

4 Town of Charlton

4.1 Water System

The Town of Charlton's water system is supplied from Sturbridge and includes a water distribution system that services a portion of the municipality including along Route 20, Route 169 to the south and west, South Sturbridge Road, Stafford Street, Hammond Road, Timber Valley Road and Northside Road in a loop with Route 20, and the interconnection with Sturbridge.

The water system also has two storage tanks that contains almost a million gallons of storage to manage higher system demands and provide fire flows. Finally, there is infrastructure to the west of Northside Road that was installed but not used due to a permit denial to transfer water from Oxford. See **Figure 1** for the overall layout of the system.

4.1.1 Water Availability

During initial discussions with each Town, we reviewed water supply and availability for the systems currently in place. Charlton receives water from Sturbridge and the supply is augmented by existing Storage Tanks that assist in meeting Peak supplies and providing fire protection. At this point, the Water and Sewer Superintendent believes there is sufficient water to serve the needs of the community and therefore no further investigation was completed.

4.2 Sewer System

The Town's wastewater system includes a Wastewater Treatment Facility (WWTF) that is just south of Route 20 between Route 169 and Carpenter Hill Road. The plant includes Rotating Biological Contactors (RBC's), clarification as well as disinfection prior to discharging to Cady Brook.

The collection system includes gravity sewer and force main throughout Town that totals almost 20 miles. Specific areas include the neighborhoods around Glen Echo Lake (4 pump stations in this area), and the area just north of the Massachusetts Turnpike near Stafford Street. The system is also south of Route 20 extending to the east near the existing schools in the area. The system also extends to the west along Route 20 ending adjacent to the Massachusetts Turnpike. See **Figure 2**.

The system also includes 10 pump stations; they are summarized in **Table 1** below.

Table 1 - Summary of Wastewater Pump Stations in Charlton, MA

Station Number	Pump Station	Address	Generator Make	Model Number	Serial Number	Pump 1 GPM Volume Design	Pump 2 GPM Volume Design	Fuel Capacity
8	Glen Echo Shore Dr.	149 Glen Echo Shore				176	176	
3	South Sturbridge Rd	10 S. Sturbridge Rd				120	120	30
1	Sturbridge Rd (MTA 5E)	Route 20 29 Sturbridge Rd	Caterpillar 508 634-3400 SE	MDL CD0S0		150	150	85
Treatment Plant	Worcester Rd	8A Worcester Rd	Cummins 781 287-7308	MDL 300REOZDD	S/N 2292368			1613
4	N. Main Street	53 N. Main Street	Cummins NE 781329-1750	MDL 60 DGCB	S/N C	280	280	173
7	Burlingame Rd	63 Burlingame Rd	ONAN/Cummins	MDL DGDA 4958772	S/N E 010236004	220	220	194
2	J Hammond Rd (MTA 6W)	43 J Hammond Rd	Caterpillar 508 634-3400	MDL CD 050		120	120	85
6	Muggett Hill Rd	143 Muggett Hill Rd				220	220	173
11	Vine Street	Vine Street	Cummins NE 7813291750	MDL 35.0 DGBB	S/N E000098242	220	220	100
9	Stevens Park Rd	65 Stevens Park				10	10	

4.2.1 Vulnerable Facilities Identified in Charlton

The following were identified as vulnerable facilities given their proximity to mapped flood hazard areas as shown in **Figure 2**.

1. Old Worcester Road Pump Station (feeds into the North Main Street Pump Station) - This station is adjacent to areas prone to flooding and the station type (partially buried with all equipment below existing grade) results in critical equipment that could be affected if the areas flood.
2. North Main Street Pump Station - This station is adjacent to areas prone to flooding and the station type (partially buried with all equipment below existing grade) results in critical equipment that could be affected if the areas flood.
3. Muggett Hill Pump Station - This has flooded in the past and was converted from a Smith & Loveless partially buried station to a submersible pump station with a larger wetwell to handle additional flows.
4. South Sturbridge Road Pump Station - This facility is adjacent to Cady Brook and a former truck/equipment garage. During our visit, the area was quite wet and in a low lying area. The station was partially covered in water and the adjacent brook was running above normal elevation.
5. Stevens Park Road Pump Station - This facility is at the southern end of the lake adjacent to the road and at the bottom of a large slope that has significant runoff during wet weather events that has affected the pump station's critical components include the power and control cabinet, the security fencing and gate and the odor control equipment.
6. Route 20 (MTA 5E) Pump Station - This facility is just off Route 20 and adjacent to a 100 year flood zone. The station has critical components below grade that could flood in an extreme wet weather event.
7. J Hammond Road (MTA 6W) Pump Station - This station is at the east end of the collection system. This is adjacent to areas prone to flooding and have critical equipment below grade which could be affected.
8. Pressure Regulating Vault - This is in place along the edge of Route 20 just east of North Main Street which reportedly flooded in the past due to significant runoff in the area.

Ground elevations, 1% annual chance flood elevations, and critical elevations are summarized in the following table. One Hundred a Year flood elevations, if not available on FIRM Maps, are estimated based on location of outline for 100 year and 500 year elevations outlined on FEMA maps and comparing them to LIDAR elevations and contours shown on **Figure 1** and **Figure 2** located here:

LOCATION	LIDAR Ground Elev. (ft.)	1% Annual Chance Flood Elevation (ft.)	Critical Elevation (1% Annual Chance Flood Elevation + 3 Feet of Freeboard)
91 OLD WORCESTER ROAD	786.6	780.0*	783.0
53 NORTH MAIN STREET	860.2	855.0*	858.0
143 MUGGETT HILL ROAD	683.8	683.0*	686.0
SOUTH STURBRIDGE ROAD	645.2	645.0	648.0
STEVENS PARK ROAD	772.8	777.0*	780.0
ROUTE 20 PUMP STATION	637.0	638.0*	641.0
J HAMMOND ROAD	885.5	885.0*	888.0
PRESSURE REGULATING VAULT	820.0	817.0*	820.0

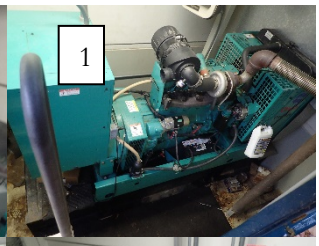
*Estimated Flood Elevation - Base flood elevations not determined by FEMA for these locations (e.g., Zone A). Base flood elevations were estimated from LIDAR ground elevations and the 1 percent annual chance flood hazard area boundary depicted on the FEMA FIRM.

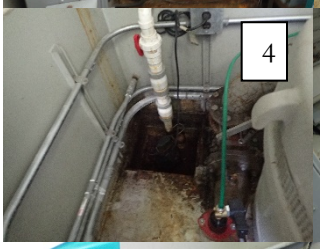
4.2.2 Vulnerabilities Identified at Facilities in Charlton

Old Worcester Road Pump Station - This station is just south of an area designated as a 500 year floodplain, lies between two streams and is in a low-lying area on the south side of Old Worcester Road. The floor of the station itself is 50 inches below the current grade of 786.6 based on LIDAR elevations. Critical equipment below grade at approximate elevation of 782.4 +/- includes:

- Backup generator (1)
- Automatic transfer switch (2)
- power transformer (2)
- control panel, (3)
- the two pumps (3)
- Sump (4)

The floor of the station shows rust and there is distress at the joint between the wall and floor as seen in Photo (5).





The exterior of the station has a ventilation system for the wetwell. This is adjacent to the main electrical service for the station. See Photo (6).

The facility accepts flow from the Muggett Hill Station just to the south and east of this station and pumps wastewater west to the North Main Street Station.

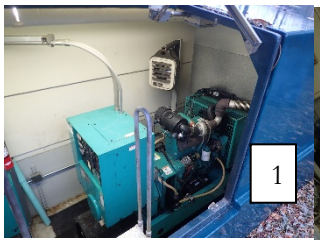
Barriers are recommended to protect the station and its critical components below grade against flooding. Further, the main service outside should be protected against flooding. This can be accomplished through walls around the facility or by upgrading the facility and elevating critical components above grade in a new structure.

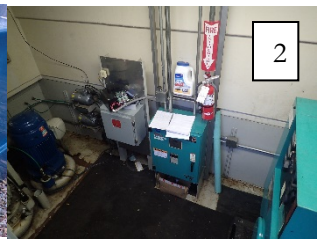
North Main Street Pump Station

This is another below grade station very similar to the Old Worcester Road Pump station. It receives flow from the Old Worcester Station before sending it to the Wastewater Treatment Facility. The station is directly adjacent to an existing stream and located between two areas designated as 500 year flood zones. The floor of the station itself is 50 inches below the current grade of 860.2 based on LIDAR elevations.

Critical equipment below grade at approximate elevation of 856.0 +/- includes:

- Backup generator (1)
- Automatic transfer switch (2)
- power transformer (2)
- control panel,
- the two pumps (3)
- Sump (4)



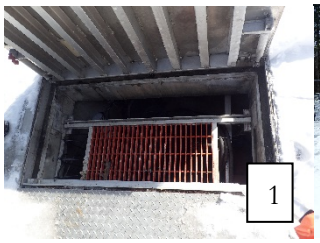


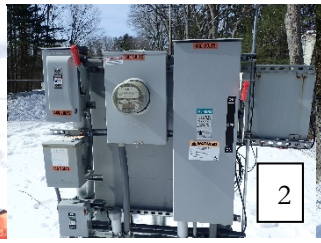
The exterior of the station has a ventilation system for the wetwell. This is adjacent to the main electrical service for the station. See Photo (5).

Barriers are recommended to protect the station and its critical components below grade against flooding. Further, the main service outside should be protected against flooding. This can be accomplished by installing walls around the facility or by upgrading the facility and elevating critical components above grade in a new structure.

Muggett Hill Pump Station

The Muggett Hill Pump Station is located just south of Dodge Pond, a 500 year flood zone and adjacent to a tributary of the Quinebaug River which is in a 100 year flood zone. The station used to be a partially buried pump station like the North Main Street and Old Worcester Road facilities, but there was significant flooding and the facility was damaged and then renovated. The station currently has a wetwell with submersible pumps (Photo 1). Above the wetwell, there is the main service and disconnects for the pumps installed in the wetwell (Photo 2) as well as a control panel for operating and monitoring alarms (Photo 3). The facility is surrounded by fencing and its ground elevations is 683.8 based on LIDAR information.





This facility still is in a vulnerable area prone to flooding. The facility will require further fortification by relocating the critical electrical equipment to a higher elevation to protect the power and controls from damage.

South Sturbridge Road Pump Station

This pump station is a wetwell submersible pump facility located just north of Route 20 and the entrance to the Wastewater Treatment Facility. It is located at the end of a parking

area for a truck company that has a variety of trucks and equipment parked on site. The Station is within a small fenced in area just north of Cady Brook and is within the 100 and 500 year floodplains delineated in **Figure 2**.

The facility has a panel for power and control beside the wetwell. It also has a ventilation and odor control system pulling air from the wetwell. Adjacent to the wetwell is an access manhole for the station's valve vault to access the force main leaving the station.

This facility is vulnerable to flooding given its proximity to Cady Brook and flood zones. The critical equipment, the electrical cabinet and Ventilation system should be raised to platforms above the 100 year flood elevation (El. 645) to protect them against damage during the 1 percent annual chance flood event.

Stevens Park Road Pump Station

This facility is at the southern end of Glen Echo Lake and it collects wastewater from homes in the area before pumping back to Route 31 (City Depot Road). The pump station is at the base of a large undeveloped woodland area which is just north of a solar field. The station also is at the low point in the road adjacent to a small stream that flows past it. The ground elevation in the area is 772.8 based on LIDAR information. The pump station is a wetwell submersible station with an electrical power/control panel, a ventilation system and it is surrounded by fencing for security.

Over the last few years, the surface runoff from the hill just to the south of the station (Photo 1 and Photo 2) and the road runoff from Steven's Park Road to the east have caused issues at the station. Specifically, the fence posts have heaved and the concrete pad for the electrical panel has lifted and stressed the conduit and cabinet sitting on top of the pad.

The Town has worked to limit the surface runoff from the road area by installing a small swale that collects runoff and directs the flow in front of the existing station.

The runoff from the hill just south of the station still needs to be re-directed. The Town will look to submit an application for an MVP Action Grant to address this runoff and repair the pump station including the fencing around the facility and electrical power/control cabinet. Installing drains and bioswales around the facility is recommended to capture and redirect the runoff to the small stream adjacent to the station.

Route 20 (MTA 5E) Pump Station

This station is located along the south side of Route 20 just west of State Route 169. This was one of two stations provided by the Massachusetts Transportation Authority (MTA) to provide sewers as a result of groundwater contamination. The facility is a dry pit submersible facility that has two levels; an upper level with normal power, backup power, an automatic transfer switch, and single phase power panels for lighting and other single phase uses. The elevation of the first floor is approximately 637.0+/- with the ground generally sloping toward the entrance. Behind the facility is a groundwater well that enters the lower level of the building and is used to provide water to the facility's pumps for seal water.

The lower level has two Fairbanks Morse centrifugal pumps (Photo 4) that pull wastewater from the underground wetwell (Photo 1) adjacent to the wellhouse and convey the wastewater to the east toward the wastewater treatment facility. The lower level also includes a hydropneumatic tank (Photo 5) to maintain pressure from the well water being supplied for seal water, a sump pump for any water that gets on the ground, ventilation through a large diameter (16 inch) PVC pipe from the upper level, a dehumidifier that drains to the sump and a unit heater.

This facility is within the 100 year floodplain that extends from Sibley's Pond to the south and east before connecting to Cady Brook. The most vulnerable components in the facility are in the lower level but the conduit and receptacles are protected and watertight.

A barrier is recommended to redirect flood flows away from the building and the entrance to limit the possibility of water entering the facility and causing damage.

J Hammond Road (MTA 6W) Pump Station

This station is located on J. Hammond Road just north of the Massachusetts Turnpike (Route 90) adjacent to one of the service areas. This was the other station provided by the Massachusetts Transportation Authority (MTA) to provide sewers as a result of groundwater contamination. The facility is a dry pit submersible facility that has three levels; an upper level with normal power, backup power, an automatic transfer switch, and single phase power panels for lighting and other single phase uses. The elevation of the first floor is approximately 895.5+/- with the ground generally sloping back from the road toward the entrance. Behind the facility is a groundwater

well that enters the second level of the building and is used to provide water to the facility's pumps for seal water.

The facility is 30 feet deep with the intermediate level (10 feet below first floor elevation) that includes a hydropneumatic tank (Photo 3) to maintain pressure from the well water being supplied for seal water. The lowest level (20 feet below grade) has two Fairbanks Morse centrifugal pumps (Photo 4) that pull wastewater from the underground wetwell adjacent to the wellhouse and convey the wastewater to the west toward the wastewater treatment facility.

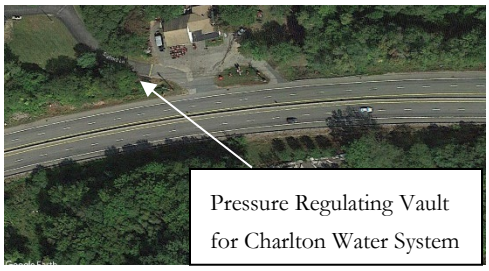
The lower level also includes a sump pump for any water that gets on the ground, ventilation through a large diameter (16 inch) PVC pipe from the upper level, a dehumidifier that drains to the sump and a unit heater.

This facility is just south of a 500 year flood zone that runs to the east and south of Route 90 toward three other 500 year flood zones. The most vulnerable components in this facility are also in the lower levels but the conduits and receptacles are protected and watertight.

A barrier is recommended to redirect flood flows away from the building and the entrance to limit the possibility of water entering the facility and causing damage.

Pressure Regulating Vault

A Pressure Regulating Vault (PRV) for the water system on the north side of Route 20 that floods occasionally due to surface runoff and high groundwater levels. The vault is in front of commercial buildings just west of Stafford Lane and adjacent to a grass swale along Route 20.



Runoff should be redirected around the facility and the vault should be modified with a watertight cover to reduce the potential for flooding and water entering the structure.

5 Town of Spencer

5.1 Water System

Spencer's water system consists of two sources of supply, the Seven Mile River Wellfield and the Cranberry Wellfield. Each produces enough water to service the entire community. The Seven Mile Wellfield is adjacent to the Water Treatment Plant on Meadow Road and just east of the Seven Mile River and the regulatory floodway. The Cranberry Wellfield is off South Spencer Road and just south of the existing Wastewater Treatment Facility. See **Figure 3.**

The distribution system's spine runs along Route 9 from the edge of East Brookfield through the center of Town and out to the east to the Town of Leicester and Shaw Pond. There are also numerous feeds to the north and to the south from Route 9 for the distribution system. See **Figure 3.** There are two storage tanks, the Moose Hill Tank and the Highland Street Tank, within the system providing additional supply for peak demands, emergency supply and fire protection.

5.1.1 Water Availability

Spencer has two sources of supply, the Cranberry and the Seven Mile River wells. Each well is capable of meeting daily demands within the system and the supplies are again enhanced by two existing storage tanks that help with meeting peak demands and providing fire protection. Having two wells, both capable of meeting demands and ample storage, resulted in no further investigation into assessing water availability in this study.

5.2 Wastewater System

The wastewater collection system is shown in **Figure 4**. The system is predominantly gravity fed with only one (1) pump station on Meadow Street adjacent to Fourth Avenue. This pump station carries an approximately 10 percent of the wastewater from the northern portion of Town down to the Wastewater Treatment Facility (WWTF) which is off Route 9 just to the east of the Podunk Turnpike.

5.2.1 Vulnerable Facilities Identified in Spencer

The following were identified as vulnerable facilities given their proximity to mapped flood hazard areas as shown in **Figure 3** and **Figure 4**.

1. Seven Mile River Wellfield - The wellfield is located just west of the Seven Mile River and the existing water treatment plant. There is a small access road and it has been affected by beaver activity re-routing portions of the river and leading to flooding potential impacts on the power and control equipment adjacent to the well.
2. The Cranberry Wellfield – The wellfield is located south and east of the existing wastewater treatment facility of South Spencer Road. The wellfield includes 3 buildings; the building which houses the well and electrical equipment; and the building used to store and inject chemicals for the water supply including sodium hypochlorite and sodium hydroxide for pH adjustment. The third building is used for material and equipment storage.
3. The Wastewater Pump Station on Meadow Road - This facility is along the edge of the road and directly adjacent to the Seven Mile River and regulatory floodway as well as Fourth Avenue. Given it conveys (10%) of the flows to the wastewater treatment facility, this critical station, if flooded or disabled, could result in significant discharge of untreated wastewater to the river.

4. UV disinfection system at the discharge end of the Wastewater Treatment Facility - This equipment is in a low-lying area just south of the existing lagoons and just prior to the discharge to the Cranberry River.
5. Low-lying area off Adams Street near Spencer Pond - There is sewer pipe and water main in this area that could be affected by flooding or overflow of the Pond during extreme wet weather events.

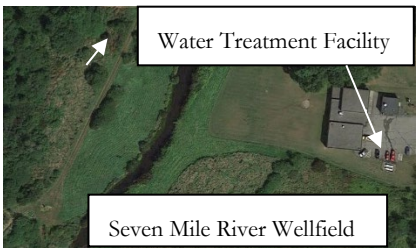
Ground elevations, 1% annual chance flood elevations, and critical elevations are summarized below. One Hundred Year flood elevations, if not available on FIRM Maps, are estimated based on location of outline for 100 year and 500 year elevations outlined on FEMA maps and comparing them to LIDAR elevations and contours shown on **Figure 3** and **Figure 4** located here:

LOCATION	LIDAR Ground Elev. (ft.)	1% Annual Chance Flood Elevation (ft.)	Critical Elevation (1% Annual Chance Flood Elevation+3 Feet of Freeboard)
SEVEN MILE RIVER WELLFIED	631.3	635.5	638.5
CRANBERRY WELLFIED	634.6	642.0	645.0
MEADOW ROAD PUMP STATION	635.0	634.5	637.5
UV DISINFECTION SYSTEM AT WWTF	634.1	641.1	644.1
LOW LYING AREAS - ADAMS STREET	812.6	816.0*	819.0

*Estimated Flood Elevation - Base flood elevations not determined by FEMA for these locations (e.g., Zone A). Base flood elevations were estimated from LIDAR ground elevations and the 1 percent annual chance flood hazard area boundary depicted on the FEMA FIRM.

5.2.2 Vulnerabilities Identified at Facilities in Spencer

Seven Mile River Wellfield



This is one of the two groundwater supplies for the Town. Each well is capable of providing enough supply for the entire community. This well is within the 100 year flood zone and regulatory floodway area associated with the Seven Mile River See **Figure 3** for the Water System). The well is west of the Water Treatment Facility and in close proximity to the western edge (85 feet) of the River.

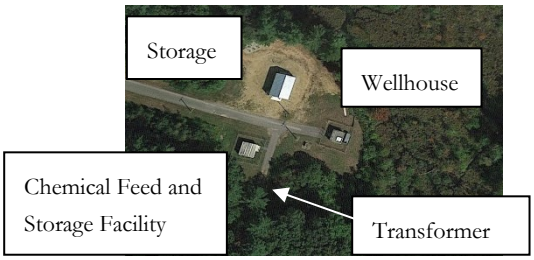
The well casing extends 6 feet 8 inches (See Photo 1) above the ground elevation of approximately 631.3 using LIDAR elevations. This is 2 feet 6 inches above the 100 year flood elevation of 635.5 based on FEMA mapping.

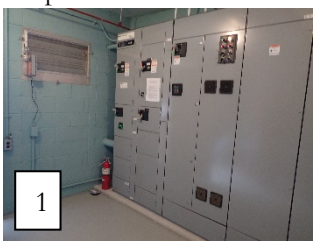
The power junction box and conduit is only 8 inches about the ground surface (Photo 2). This was surrounded by water during our visits and could be flooded/damaged during significant rain events and beaver activity that could lead to re-routing the river and expansion of the water to this area.

Raising the electrical junction box or relocating this box and installing watertight conduit would further protect this supply from not being available during flooding events.

The Cranberry Wellfield

This is the other groundwater Supply for the Town. The facility is located off of South Spencer Road and consists of three buildings; the wellhouse, the chemical treatment, and a storage facility for materials and equipment. The facility lies within the 100 year flood zone of the Cranberry River that wraps around the wellhouse facility.

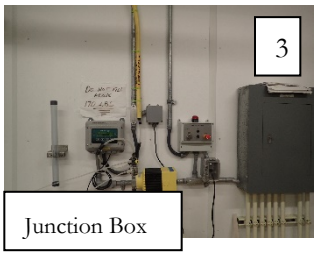




The floor elevation for the wellhouse is approximately 634.6 which is over 7 feet above the 100 year flood elevation. The only electrical equipment which is susceptible to flooding is the MCC which rest on a housekeeping pad only 4 inches above the floor (Photo 1) and an electrical control cabinet which is 33 inches above the floor.

Just outside the building is the main power transformer for the site which rests on the ground (Photo 2). This would be adversely affected if the site was flooded. This should be raised to protect it against potential flooding.

The chemical feed building includes storage and containment for sodium hypochlorite (used for disinfection) and sodium hydroxide (used for pH adjustment). There are also cabinets for electrical power and control, chemical analyzers, and ventilation equipment.



All equipment is well above the floor except a junction box which is only 6 inches above the floor (Photo 3).

This junction box should be relocated to a higher elevation to protect wiring for the critical equipment in the building.

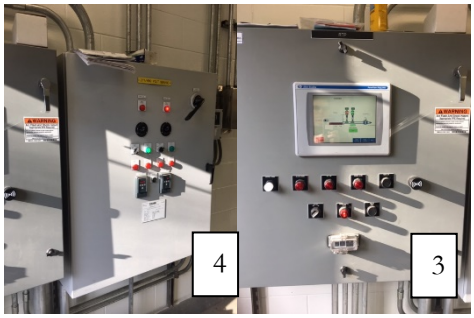
The Wastewater Pump Station on Meadow Road

This facility is on Meadow Road just south of Fourth Avenue. It lies on the west side of the road and is adjacent to the 100 year flood zone and regulatory floodway associated with the Seven Mile River. The elevation of the pump station is 635. 0 +/- based on LIDAR elevations. This very close to the 100 year flood elevation in the area of 634.5 (See Photo 1). The station entrance is flush with the ground elevation in the area and there is critical equipment very close to the ground elevation. This includes the backup generator (6 inches off the

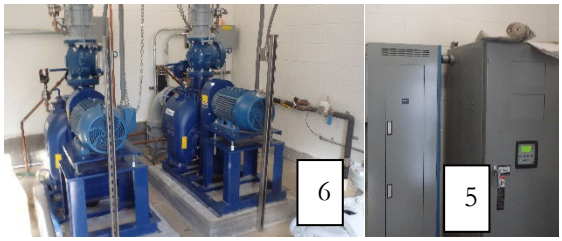
ground on a housekeeping pad) and the liquid propane storage tank (also on a concrete pad just 6 inches off the ground). See Photo 2.

Other critical components include:

- SCADA Control Panel (3 feet off the floor - Photo 3)
- Pump Control Panel (3 feet off the floor - Photo 4)
- Three Phase Panel (19 in. off floor - Photo 5)
- Auto. Transfer Switch (ATS) (17 in. off floor - Photo 5)
- Centrifugal Pumps (30 in. off floor - Photo 6)



Because the elevations of critical components of the pump station are very close to the 100 year flood elevation, fortification of the critical equipment including the backup generator, and propane storage tank as well as the items less than 3 feet off the floor should be considered. This would require the electrical cabinets, the ATS and the pumps be raised at least 3 feet above the floor.



<u>UV Disinfection System at the Discharge of the Wastewater Treatment Facility</u>

The Spencer Treatment Facility has a UV disinfection system for its wastewater prior to being discharged to the Cranberry River. The UV Disinfection System is at the end of the Treatment Facility and runs through a channel before being directed to the discharge for the plant.

Adjacent to the UV System is small control building that has power and control features for the system. This includes a power panel, a transformer for single phase power and a control panel for the UV system. The elevation

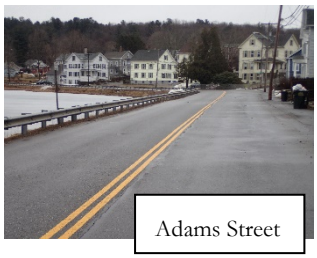
of the area is approximately 639.7 based on LIDAR elevations. All electrical components are at least 3.5 feet above the floor elevation and should not be affected by the 1 percent chance of flood.

The top of the channel for the UV system is 74 inches below the floor of the main building for the UV system or at an elevation of approximately 634.1. This is an estimated 7 feet above the 100 year flood elevation in the Cranberry River for this area. James LaPlante, WWTP Superintendent, has stated however, that he has seen waters at just below the top of the wall for the UV channel in the past during flooding and heavy rainfall events.

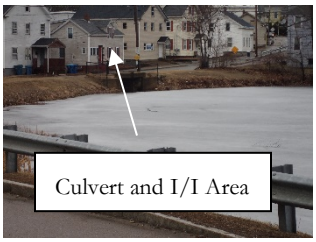
The Town has discussed the possibility of relocating this facility if additional treatment is required and added. Specifically, if tertiary treatment is added in lieu of the existing lagoons, the Town feels moving the UV system up closer to the plant would alleviate the potential for this system to be compromised, if flooding occurs.

In the meantime, the addition of a flood protection barrier is recommended to mitigate possible flooding in the area as seen in the past.

Low lying area off Adams Street near Spencer Pond



This area around the Spencer Pond has a sewer collection system and water main within Adams Street that could potentially be flooded or exposed during a major rainfall event that causes scour or erosion. Further, this area has a downstream culvert and gate structure on Charlton Road that could become blocked or plugged leading to water levels increasing in the Pond and causing local flooding in this area.



Finally, the area has been identified by others as having a significant Infiltration/Inflow problem based on studies and investigations completed previously. Any flooding could result in additional I/I entering the system which could be conveyed to the plant and adversely affect the wastewater treatment facility and lead to violations of the discharge permit.

This area should be monitored during heavy rainfall events to confirm water is flowing through the outlet culvert so as not to allow water levels to rise in the pond and local flooding to occur.

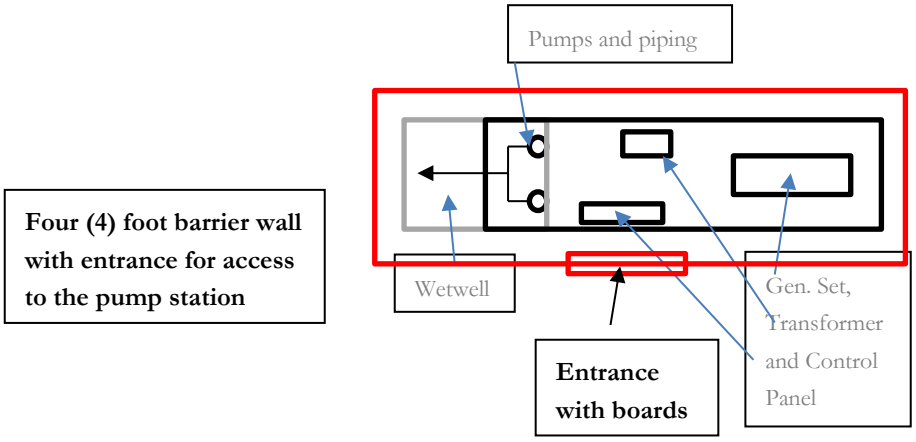
6 Resiliency Recommendations - Charlton

The following are recommendations for the critical facilities and equipment identified within the Town of Charlton. Each is discussed in more detail below and budgetary level opinions of cost are included for each facility in Appendix A.

Old Worcester Road Pump Station and North Main Street Pump Station

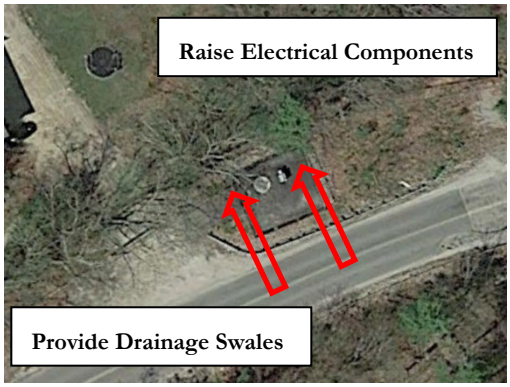
These pump stations are partially buried pump stations within Old Worcester Road pumping to North Main Street. The facilities are 50 inches below grade with all critical equipment including the pumps, generator, automatic transfer switch, transformer, and control panel included. Resiliency

recommendations to protect the facility from flooding given their proximity to flood zones range from providing a barrier around the structure to minimize floodwaters from entering the partially buried station to constructing a new above-ground facility and locating all critical components above the base flood elevation. For this effort, we have budgeted for providing a barrier around the existing structure. A conceptual layout of the proposed improvements is included in the sketch shown below.



Muggett Hill Pump Station

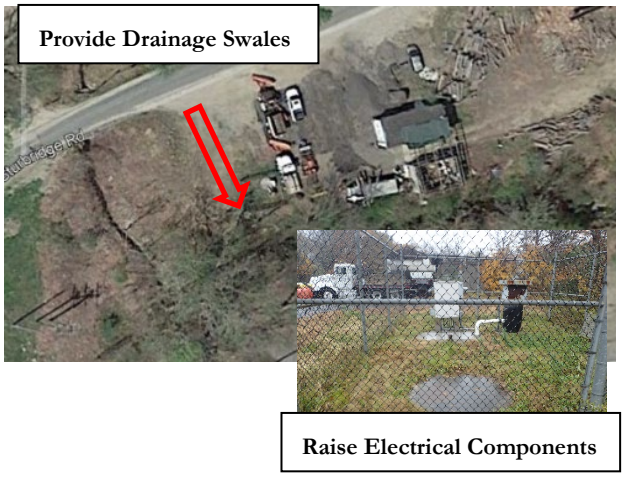
This station has flooded in the past and was converted from a partially buried station to a submersible pump station with a larger wetwell to handle additional flows with a local service, control panel and communications located on a stand over three (3) feet above ground. There is no generator for backup power. This facility is directly downstream from Dodge Pond and a 500 year flood zone.



Resiliency improvements for this site include providing drainage swales to guide runoff and floodwaters away from the structures and raising the electrical equipment to further fortify these critical items.

South Sturbridge Road Pump Station

This facility is another wetwell pump station which is in a low lying area adjacent to a truck parking area and garage. The facility has a power/control panel and ventilation/odor control system above grade within the fenced in area. The station is adjacent to the 100 and 500 year flood zones for Cady Brook. There is no generator for backup power.

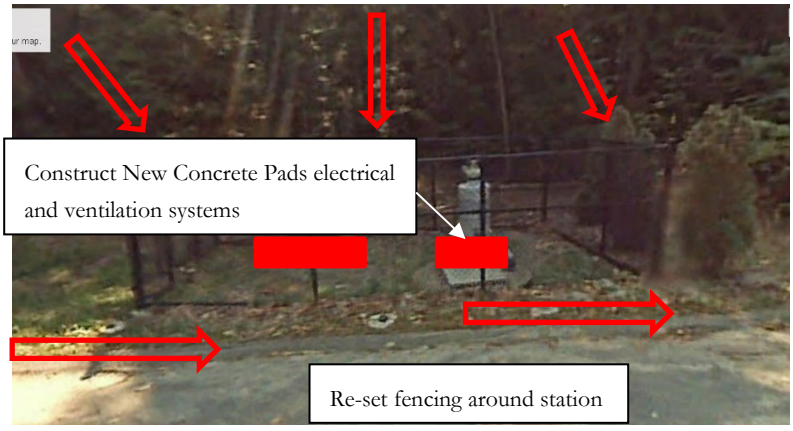


Resiliency improvements for this site include providing drainage swales to guide runoff and floodwaters away from the structures and raising the electrical equipment to further fortify these critical items.

Stevens Park Road Pump Station

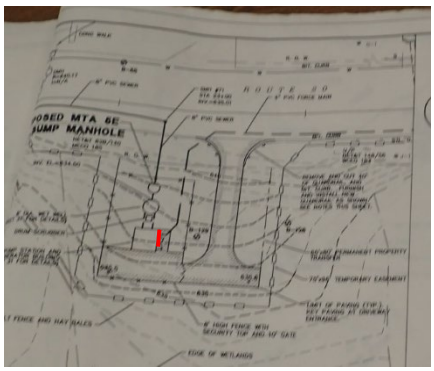
This facility is at the southern end of Glen Echo Lake adjacent to Stevens Park Road and at the bottom of a large slope that has significant runoff during wet weather events. This runoff has affected the pump station's critical components including the power and control cabinet, the security fencing and gate and the ventilation/odor control equipment.

Recommendations include:



- Re-direct runoff from the hill to the north of the station,
- Better define and guide street runoff from the road east of the station,
- Re-set electrical panel on new concrete pad,
- Re-set fencing around the facility to mitigate poles and fencing that have heaved,
- Re-set ventilation system in new concrete pad at higher elevation
- Grading improvements around station to accommodate new drainage work and improve water quality through bioswales

Route 20 (MTA 5E) Pump Station



This facility is just off Route 20 and adjacent to a 100 year flood zone associated with Sibley's Pond to the west and draining towards Cady Brook which runs south.

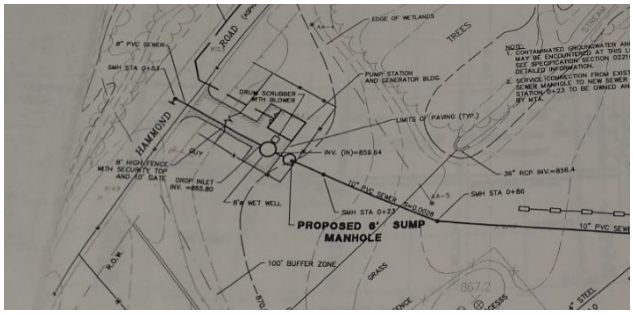
The building has two stories with the upper level housing the generator, transfer switch, power and control panels and a transformer for single phase equipment. Most electrical panels are above the floor (>3 feet) and conduit and receptacles are watertight. The lower level has the piping, pumps, a dehumidifier, unit heater and hydropneumatic tank and piping for the seal water for the pumps. All conduit and receptacles in this area are watertight.

Resiliency recommendations for this facility would include:

- Providing a protective barrier for the main entrance to minimize water entering the building
- Install a watertight hatch over the access entrance to the lower level of the facility
- Seal penetrations between main level and lower level (conduits and ventilation)

Watertight Hatch

J Hammond Road (MTA 6W) Pump Station



This station is located just north of the Massachusetts Turnpike (Route 90) adjacent to one of the service areas. The facility is just south of a 500 year flood zone and is adjacent to a small stream which flows by the facility.

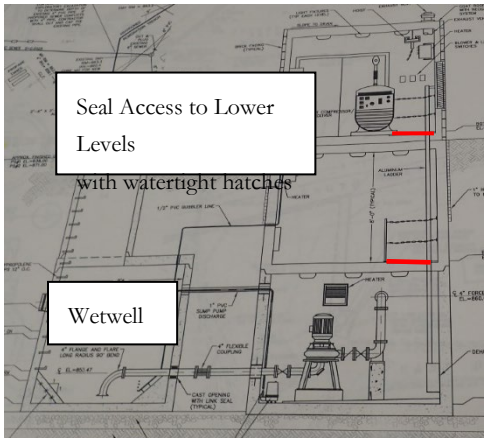
The building has three stories with the upper level housing the generator, transfer switch, power and control panels and a transformer for single phase equipment. Most electrical panels are above the floor (>3 feet) and conduit and receptacles are watertight.

The middle level has piping from the groundwater well that feeds a hydropneumatic tank to maintain pressure for water being provided to the pumps for seal water. This level has conduits that extend to the lower level as well as a 16 inch PVC pipe used for ventilation for the lower level.

The lowest level (20 feet below grade) includes piping, pumps, a dehumidifier, unit heater, sump and pump and piping for the seal water for the pumps. All conduit and receptacles in this area are watertight.

Resiliency recommendations for this facility would include:

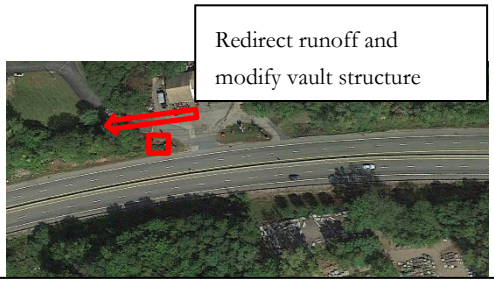
- Providing a protective barrier for the main entrance to minimize water entering the building
- Install a watertight hatch over the access entrance to the lower levels of the facility
- Seal penetrations between main level and lower levels (conduits and ventilation)



Pressure Regulating Vault

There is a Pressure Regulating Vault (PRV) for the water system on the north side of Route 20 in front of commercial buildings just west of Stafford Lane and adjacent to a grass swale along Route 20. This vault occasionally floods due to surface runoff and high groundwater levels.

Resiliency measures proposed include: 1) re-directing runoff in the area and 2) modifying the vault structure to minimize water and groundwater inflow.



Pressure Regulating Vault - Charlton Water System

7 Resiliency Recommendations - Spencer

The following are recommendations for the critical facilities and equipment identified within the Town of Spencer. Each is discussed in more detail below and budgetary level opinions of cost are included for each facility in Appendix B.

Seven Mile River Wellfield

This is one of two wells that provide all the water supply for the Town. It is located just west of the Seven Mile River and the associated 100 year flood zone and regulatory floodway. It is also west of the existing water treatment plant which it provides water to. There is a small access road to the wellhead off Smithville Road.

The well and its associated electrical equipment has been affected by beaver activity re-routing portions of the river and leading to potential flooding impacts on the power and control equipment adjacent to the well.

Raise Electrical Equipment