

## Culvert Rating Criteria

### Good

Dependent of culvert material, consists of:

- No cracks, dents/spalls, or damage
- No to very minor surface rust
- No scaling due to high water or exposed rebar
- No obstructions around the inverts/within culvert
- No shifts in culvert lengths, separation between joints, or settlement
- No scour



'Good' RCP

### Satisfactory

Consists of one or more of the following, dependent of culvert material:

- No to minor cracks, dents/spalls, minor scaling due to high water, and/or damage
- Minor surface rust and/or exposed rebar
- No to minor obstructions around the inverts/within culvert
- No shifts in culvert lengths or settlement
- No to minor separation between joints and/or scour

### Fair

Consists of one or more of the following, dependent of culvert material:

- Minor to moderate cracks, dents/spalls, and/or damage that does not affect the integrity of the culvert
- Moderate surface rust, scaling due to high water and/or exposed rebar
- Minor obstructions around the inverts/within culvert
- Minor to moderate shifts in culvert lengths, settlement or separation between joints
- Minor to moderate scour

### Poor

Consists of more than one of the following, dependent of culvert material:

- Moderate cracks, dents/spalls, and/or damage that does affect the integrity of the culvert
- Moderate to severe rust, scaling due to high water and/or exposed rebar
- Moderate obstructions around the inverts/within culvert
- Moderate shifts in culvert lengths, settlement or separation between joints
- Moderate to severe scour

### Failing

Consists of more than one of the following:

- Severe cracks, dents/spalls, and/or damage that does affect the integrity of the culvert
- Severe rust/scaling/missing portions of pipe and/or severe exposed rebar
- Severe obstructions around the inverts/within culvert impeding flow
- Severe shifts in culvert lengths, settlement or separation between joints
- Severe scour, leading to structural distress from undermining



'Failing' Dry Laid Stone

## Embankment Rating Criteria

### Good

Consists of:

- No to very minor erosion
- No vegetation overgrowth
- No tree or root growth affecting the integrity of the structure



### Satisfactory

Consists of one or more of the following:

- Minor erosion
- Minor amounts of sediment seeping over and/or through headwall
- Very minor vegetation overgrowth
- Very minor tree and/or root growth that does not affect the integrity of the structure

### Fair

Consists of one or more of the following:

- Moderate erosion
- Moderate amounts of sediment seeping over and/or through headwall
- Minor to moderate vegetation overgrowth
- Minor tree and/or root growth affecting the integrity of the structure.



### Poor

Consists of more than one of the following:

- Moderate to severe erosion
- Moderate to severe sediment seeping over and/or through headwall
- Moderate vegetation overgrowth
- Moderate tree and/or root growth affecting the integrity of the structure

### Failing

Consists of more than one of the following:

- Severe erosion
- Severe sediment seeping over and/or through headwall
- Moderate to severe vegetation overgrowth
- Moderate to severe tree and/or root growth affecting the integrity of the structure

## Headwall/Wingwall/Retaining wall Rating Criteria



### Good

Dependent of wall material, consists of:

- No to very minor cracks
- No to minor scaling due to water
- No to minor spalling
- No to minor missing mortar/voids between stones/missing stones
- No moss growth
- No signs of rotation

### Satisfactory

Consists of one or more of the following, dependent of wall material:

- Sporadic areas of minor cracks/minor spalling
- Minor scaling due to water
- Minor missing mortar/voids between stones
- No to very minor stones missing that does not affect integrity of wall
- Minor moss growth
- No signs of rotation

### Fair

Consists of one or more of the following, dependent of wall material:

- Minor to moderate cracks/spalling
- Minor to moderate scaling due to water
- Minor to moderate missing mortar, voids between stones, stones missing that does not affect integrity
- Minor to moderate moss growth
- No to very minor signs of rotation

### Poor

Consists of more than one of the following, dependent of wall material:

- Moderate cracks/spalling
- Moderate scaling due to water
- Moderate missing mortar/ voids between stones
- Moderate stones missing/collapsing that does affect the integrity of the wall
- Moderate moss growth
- Minor to moderate signs of rotation

### Failing

Consists of more than one of the following, dependent of wall material:

- Severe cracks/spalling
- Severe scaling due to water
- Severe missing mortar/voids between stones
- Severe stones missing/collapsing/collapsed that does affect the integrity of wall and culvert
- Severe moss growth
- Moderate to severe signs of rotation





#### **CUL-35 – 139 Union Street (MA 139)**

Culvert CUL-35 carries an unnamed tributary to Tumbling Brook from south of Union Street. The inlet is located behind private property and is in fair condition. The outlet is located down the roadway embankment, with the headwall in failing condition. Due to the distance of the headwall to the roadway, this outlet is not considered 'critical', however TEC recommends replacement of the CUL-35 outlet headwall and addition of outlet scour protection to prevent further embankment scour and erosion.

#### **CUL-36 – 2 Mear Road**

Structure CUL-36 is an approximately 20' clear span bridge which serves the dead-end Mear Road and the businesses on it. The Cochato River runs beneath it carries water from Lake Holbrook towards Sylvan Lake. The crossing in general is in satisfactory condition, with the only noted deficiency being the damaged and sub-standard traffic safety features. TEC recommends the replacement of existing traffic safety features along the span, and the addition of them along the approach. TEC also recommends a full bridge inspection for this structure.



#### **CUL-37 – 373 Union Street (MA 139)**

Structure CUL-37 carries Union Street (MA 139) over the Cochato River (approximately 1000 feet downgradient of CUL-36). The crossing is comprised of a 13 foot, mortared stone culvert split with a central pillar dividing the two 5-foot clear spans. The culvert is in fair condition with voids and deteriorating mortar observed throughout. TEC recommends rethinking and mortaring the crossing to extend it's service life, with the recommendation of a full replacement with a three-sided box culvert in the future.



# Critical Culvert CUL-38

## Address:

North of 36 Centre Street

## Length:

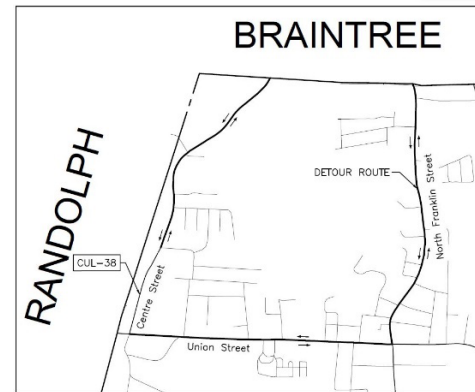
±40'

## Materials:

40' wide, dry-laid stone culvert

## Waterway:

Cochato River



Detour Route

## Introduction

Culvert CUL-38 is located on Centre Street east of Sylvan Lake, and carries the beginnings of the Cochato River as well as overflow from Sylvan Lake. The crossing is comprised of a dry laid stone culvert separated into 3 spans totaling approximately 40 feet. The dry laid stone culvert supports a concrete slab which is beneath the roadway. There are significant deficiencies including missing stones and collapsed supports throughout the crossing, and both the inlet and outlet were given a 'failing' rating. According to StreamStats, this crossing has a watershed of approximately 4.38 square miles, and can see up to 241 CFS during the 10 year storm event. Culvert CUL-38 is considered a Critical Culvert due to its condition, and high risk to the Town in the event of failure.



**Outlet (Failing):** The outlet matches the inlet in both construction and condition. The dry-laid stones are in various states of failure with missing and shifted stones observed. Vegetation was present in the outlet supports as well as embankment, and the granite headers were observed to be offset. The outlet is approximately 225 feet upstream of an MBTA crossing.

## Existing Conditions

**Inlet (Failing):** The inlet of the dry-laid stone culvert is actively failing, with large supporting stones observed to have fallen into the river, obstructing the flow. Severe scour and undermining was also observed at all structure elements, contributing to support shifting. The inlet is also heavily vegetated, and the river takes an approximate 90 degree eastern bend 50 feet upstream of the crossing.



## Additional Notes, Recommendations, and Cost

Overhead wires and drainage structures were are present near the culvert's outlet, with a water line observed over the inlet. Through further research, TEC determined that there is also a gas line passing over the bridge. A concrete wall barrier in satisfactory condition is present on both sides of the roadway. The estimated remaining service life for this culvert is less than 5 years, with immediate action recommended. TEC recommends a full culvert replacement with a three-sided box culvert. The estimated cost of replacement is \$2.5 to \$3.0 million (including utility relocations), depending on the results of the field survey, hydraulic study, and geotechnical investigations.

## Critical Culvert CUL-39

**Address:**

Centre Street over Tumbling Brook

**Length:**

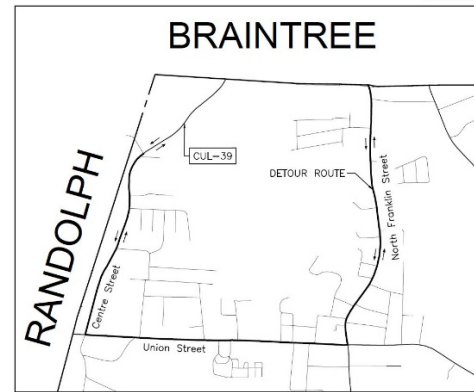
± 46'

**Materials:**

36" CMP, Mortared Stone and Concrete Headwall

**Waterway:**

Tumbling Brook



Detour Route

## Introduction

Culvert CUL-39 carries Tumbling Brook under Centre Street, through a 36-inch CMP with approximately 3 feet of cover between pipe and roadway. According to StreamStats the crossing has a watershed of a little over a square mile and can see up to 75.9 CFS in the 10-year storm event. CUL-39 is considered a Critical Culvert due to its condition, and risk to the Town in the event of failure resulting in both major traffic disruptions and upstream flooding.



## Existing Conditions

Inlet (Fair): The inlet consisted of a mortared stone head and wingwall which was in fair condition, around a 36 inch CMP. The CMP was in poor condition with rusting and minor separation from the headwall observed. A scour determination was not made due to ice conditions at time of inspection, however no obstruction was felt while probing. Traffic safety features in poor condition were present.

Outlet (Fair): The outlet was completely submerged, but consisted of a mortared stone head and wingwall in fair condition. The CMP was completely submerged, but no obstruction was felt while probing. Pipe condition was not able to be observed, however it is assumed to be of a similar condition to the inlet. Evidence of previous traffic safety features were present, however there is currently no functioning barrier.



## Additional Notes, Recommendations, and Cost

Overhead wires are present over the culvert's inlet, with concrete pillars for traffic safety controls in poor condition at the inlet and failed condition at the outlet. The estimated remaining service life for this culvert is 5 to 10 years. TEC recommends a full culvert replacement with a three-sided box culvert. The estimated cost of replacement is \$700,000 to \$800,000, depending on the results of the field survey, hydraulic study, and geotechnical investigations.



Town of Holbrook - Culvert Recommendations

April 15, 2022

Retain	Structure	Address	Type	Risk Potential Score	Recommendation	Notes
1	CUL - 23	313 Sycamore St	48" RCP	Medium	Retain	No outlet found. Potentially ties into closed drainage system/CUL-61 Accessory outlet control structure to dam
2	CUL - 25	119 Abington Ave	48" RCP	Medium	Retain	
3	CUL - 30	728 Plymouth St	132" Concrete Box	Medium	Retain	
4	CUL - 43	341 S Franklin St	24" RCP	Medium	Retain	
5	CUL - 54	54 N. Shore Rd	50" RCP	Medium	Retain	
6	CUL - 1	2 Mossesso Drive	Triple RCP	Low	Retain	
7	CUL - 19	8 Kathleen Dr	Twin 24" RCP	Low	Retain	Flows through closed drainage system between 819 S Franklin (inlet) and behind 776 S Franklin (outlet) Private sump pump observed to discharge through retaining wall into water from 539 S Franklin Street
8	CUL - 20	3 Oak St	108" Concrete Box	Low	Retain	
9	CUL - 21	7 Oak St	Double 20" RCP	Low	Retain	
10	CUL - 22	9 Oak St	Triple 18" RCP	Low	Retain	
11	CUL - 29	4 Cedar Brook Cir	Double 36" RCP	Low	Retain	
12	CUL - 41	776 S Franklin	18" RCP Inlet, 42" RCP Outlet	Low	Retain	
13	CUL - 42	2 Reeds Ln	30" RCP	Low	Retain	
14	CUL - 60	5 Oak St	108" Box	Low	Retain	
15	CUL - 62	Longmeadow Dr (Wetland)	24" RCP	Low	Retain	
Rehabilitate	Structure	Address	Type	Risk Potential Score	Recommendation	Notes
1	CUL - 56	427 S. Franklin St	72" Elliptical CMP	High	Rehabilitate/Replace	CMP failing throughout span. Crossing is a potentially good candidate for centrifugal concrete lining to prevent full replacement.
2	CUL - 37	373 Union St	136" Mortared Stone Box with center pillar	High	Rehabilitate/Replace	At a minimum, stones should be rechinked and remortared, particularly along water line.
3	CUL - 36	2 Mear Rd	20' Bridge	High	Rehabilitate	Add traffic safety features along approach and repair traffic safety features along span
4	CUL - 44	67 South St	60" RCP	High	Rehabilitate	Inlet headwall to have minor mortar repairs, outlet headwall to be replaced with new headwall or riprapped slope. Private culvert upstream from inlet, headwall in failing condition
5	CUL - 66	620 South St	48" RCP (Inlet)/48"Box (Outlet)	High	Rehabilitate	Embankment and outlet headwall should be repaired
6	CUL - 45	115 South St	24" CMP	High	Rehabilitate	Outlet to be cleared of fallen riprap, and embankment restabilized
7	CUL - 55	43 S. Shore Rd	120" Open Bottom Box	High	Rehabilitate	Clear overgrown vegetation
8	CUL - 61	331 S. Franklin St	48" Box	High	Rehabilitate	Culvert should be cleared of vegetation on both inlet and outlet
9	CUL - 11	157 Weymouth St	24" RCP	Medium	Rehabilitate	Culvert tied into closed drainage system. Recommend reinforce outlet embankment. Addition of defined curb would prevent sheet flow erosion of embankment.
10	CUL - 35	130 MA-139 Union St	30" RCP	Medium	Rehabilitate	Outlet headwall completely undermined, headwall should be replaced.
11	CUL - 59	395 Weymouth St	18" RCP	Medium	Rehabilitate	Culvert should have vegetation removed and cleaned/jetted to remove sediment buildup
12	CUL - 63	37 King Rd	48" Box	Medium	Rehabilitate	Culvert should be cleared of vegetation on both inlet and outlet
13	CUL - 18	5 Kathleen Dr	12" RCP	Low	Rehabilitate	Rehabilitation of failing embankment recommended to prevent roadway and abutter washout
14	CUL - 26	330 Plymouth St	30" RCP	Low	Rehabilitate	Replace traffic safety features, clear vegetation, minor mortar repairs on head and wing wall
15	CUL - 27	899 MA139	24" RCP	Low	Rehabilitate	Culvert should be cleaned/jetted to remove sediment buildup
16	CUL - 31	2 Damon Ave	18" RCP	Low	Rehabilitate	Outlet embankment should be repaired/replaced
17	CUL - 40	22 Francis St	Triple 30" RCP	Low	Rehabilitate	Minor mortar repairs in headwall, minor erosion repair on embankments
18	CUL - 46	20 Morgan Rd	36" RCP	Low	Rehabilitate	Inlet to be cleared of vegetation and headwall restacked/mortared; outlet could not be located - potentially runs under private property
19	CUL - 48	241 Pond St	15" PVC	Low	Rehabilitate	Restack fallen headwall blocks
20	CUL - 49	386 Weymouth St	Unknown	Low	Rehabilitate	Inlet headwall located, culvert buried. Outlet not found. Culvert to be cleared/jetted to restore potential flow.
21	CUL - 51	Longmeadow Dr (Wetland)	24" RCP	Low	Rehabilitate	Culvert should be cleaned/jetted to remove sediment buildup
22	CUL - 57	152 Centre St	18" RCP	Low	Rehabilitate	Culvert should be cleaned/jetted, vegetation removed around outlet, and inlet headwall repaired.
23	CUL - 58	Centre St (500ft NE of Tum)	18" CMP	Low	Rehabilitate	Culvert should be cleaned out and reevaluated, headwalls to have mortar repairs. Roadway observations include culvert at low point with no drainage system, recommendation to add drainage (closed system or country drainage) to prevent roadway ponding and embankment washout.
24	CUL - 64	45 Overlook Rd	12" CMP	Low	Rehabilitate	Culvert should be cleared of sediment at both inlet and outlet
25	CUL - 65	12 Fagus Rd	12" CMP	Low	Rehabilitate	Embankments should be repaired on both inlet and outlet
26	CUL - 68	20 Water Street	12" CMP	Low	Rehabilitate/Replace/Remove	Culvert should be cleared of vegetation, sediment jetted, and outlet embankment stabilized. May be better to replace (or remove) as it is at the end of a dead end road.
Replace	Structure	Address	Type	Risk Potential Score	Recommendation	Notes
1	CUL - 34	349 MA 37 N. Franklin St	40" RCP	High	Replace	Failing and heavily scoured headwalls, undersized crossing (35.1 CFS during 10-year storm) should be replaced within 5 years
2	CUL - 38	83 Centre St	480" Dry-Laid Stone Box	High	Replace	Failing crossing should be replaced immediately
3	CUL - 39	314 Centre St	36" CMP	High	Replace	Crossing submerged during inspection, but based on material, assumed age, and undersized nature (75.6 CFS during a 10-year storm (Stream Stats)), combined with risk to town if failure occurs, crossing should be replaced
4	CUL - 14	375 Weymouth St	12" RCP	Medium	Replace	Culvert in poor condition and undersized based on the flow it sees during the 10-year storm (12.5 CFS - Stream Stats)
5	CUL - 15	477 Weymouth St	48" Mortared Stone Box	Medium	Replace	Replace aging crossing within 10 years or replace failing inlet headwall and wingwall, repair embankment sooner to prevent shoulder washout
6	CUL - 53	3 English Rd	54" RCP	Medium	Replace	Crossing should be replaced to avoid further embankment undercutting and erosion due to undersized crossing, and pipe misalignment mid span causing roadway subgrade washout. Crossing sees up to 85 CFS during large storm events (Stream Stats). Closely abutted by neighbors and dead end crossing.
Remove	Structure	Address	Type	Risk Potential Score	Recommendation	Notes
1	CUL - 67	Water Street	Dry Laid Stone Bridge	Medium	Remove	Depending on historic and/or foot bridge connection value, structure should be removed to prevent failure and upstream flooding