

TOWN OF HOPKINTON

CULVERT ASSESSMENT FOR

AQUATIC ORGANISM PASSAGE



HOPKINTON CONSERVATION COMMISSION

NOVEMBER 2013

TOWN OF HOPKINTON CULVERT INVENTORY

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INTRODUCTION AND PURPOSE

The mission of the Hopkinton Conservation Commission (HCC) is to conserve the natural resources within the town. Rivers and streams are an important part of the town’s natural resources. They provide habitat for a wide range of aquatic and semiaquatic organisms, many of which depend on these water bodies for their survival. There are many kinds of fish (both cold-water species such as brook trout and warm-water species such as bass and perch); reptiles (such as wood turtles, snapping turtles and northern water snakes); amphibians (several kinds of frogs and salamanders), mammals (otter, beaver, muskrat, mink, raccoon, and others); and birds (ducks, waterthrushes and others). Some of these species are fully aquatic, while others use stream habitat regularly for foraging or travel corridors.

Streams also capture and convey runoff from developed and undeveloped land and inflow from smaller tributaries. During storm events, rivers and streams convey floodwaters from upstream areas via natural channels and floodplains. Streams also transport sediment, which is important in maintaining habitat and also in maintaining the stream in a state of equilibrium. Disruptions in sediment transport often lead to erosion and deposition problems that negatively impact habitat and land use downstream.

The existing road network crosses our stream systems in many places. The HCC is interested in determining which road crossings restrict the movement of fish and other aquatic organisms along the

stream channels. The HCC has focused on culverts along streams that are perennial (run year-round). We assume that bridges over the larger streams and rivers do not restrict animal movements, and therefore we have not addressed bridges over the Contoocook River, Blackwater River, or Warner River. We have also not reviewed most streams with a watershed of less than one square mile, since most of these streams do not run year-round and do not support fish. However these streams have important habitat value and may warrant attention in the future.

The purpose of this study is to identify the capability of each culvert to accommodate fish and other aquatic organisms; to prioritize the culverts most in need of improvement in order to accommodate these animals; and to provide input into future public works projects, land use planning, development recommendations, and conservation efforts. Although this assessment targets fish and wildlife passage, many of the characteristics that affect fish and wildlife passage similarly affect sediment transport and hydraulic performance. As such, the Town may find the results useful in identifying crossings that could be targeted to improve hydraulics, reduce erosion and deposition, and minimize future maintenance costs.

METHODS

A team of Conservation Commission members visited each culvert in the field to collect data. Jed Merrow, NH Certified Wetland Scientist, has done similar work in meeting NH Stream Rules (Env-Wt 900) for transportation projects, and supervised the inventory. A total of 25 culverts along 6 named and 2 unnamed streams were evaluated. Named streams included Deer Meadow Brook, Browns Brook, Hardy Spring Brook, Dolf Brook, One Stack Brook, and Boutwell Mill Brook. The only unnamed stream reviewed is a tributary to Hardy Spring Brook ("Unnamed Stream"). Locations of each culvert are shown on the *Culvert Locations* figure and on watershed maps accompanying each individual culvert report.

Field data was collected primarily in August through December 2012. Standard "Culvert Assessment Field Forms" for recording stream geomorphic and habitat features, provided by the NH Fish and Game Department (NHFGD), were used to collect data. (Geomorphic features are the main physical features of the stream channel, such as width, depth, scour, deposition, substrate type and size, and degree of sinuosity.) Data was collected using tape measures and visual observations. Photos were taken of each culvert's inlet and outlet and the channels upstream and downstream of each culvert. No ground survey equipment was used, and some measurements were visual estimates. Upstream watershed sizes were determined using the U.S. Geological Survey's Streamstats online tools (<http://water.usgs.gov/osw/streamstats/>). Stream lengths were measured using the Ruler function in Trimble's GPS MAPS application for iPad. Only the approximate lengths of perennial stream channels are reported. For purposes of this project, a stream was assumed to be perennial if it had an upstream watershed size of 0.5 square miles or more. It is likely that streams meander more than is shown on USGS maps, so stream length estimates may err on the low side. Fish data were provided by NHFGD. Data were summarized and evaluated and results reported on the accompanying individual culvert reports.

RESULTS AND RECOMMENDATIONS

The results are summarized in the accompanying table. The priority assigned to culverts refers to the prior for repair or replacement to facilitate fish and wildlife passage. The priority is based on the crossing's overall importance to fish and wildlife passage; the degree to which it functions as a barrier to passage; and in some cases other factors, such as the condition of the culvert or the cost of repairing it. High priority culverts are typically those that are the most important for fish or wildlife passage but whose ability to actually pass fish and wildlife is only fair to poor. These culverts would yield the greatest return in terms of fish and wildlife passage. Medium priority culverts may have moderate to high aquatic organism passage value, but are in otherwise good condition or would be very costly to replace, such as culverts under I-89, which are long, are under deep fills, and are not under the town's control. Low priority culverts are those that either have low value for fish and wildlife passage or already provide good passage. The high and medium priority culverts are summarized below.

High Priority Culverts

The highest priority culverts include:

Hardy Spring Brook under Railroad Grade (HSB1): This is an old stone structure under the former railroad line, between the Contoocook River and Pine Street. It appears to be on private property. Hardy Spring Brook is in generally good condition and has high quality fish and wildlife habitat along much of its length. The structure is much narrower (3 feet) than the bankfull width (18 to 25 feet) and is collapsing. If the structure is not repaired it may cause the collapse of the railroad grade, which would not only affect fish passage, but also could dam the stream flow. If this rail trail is no longer important, the structure could be removed altogether or repaired. A bridge or substantially larger culvert could be installed in its place.

Hardy Spring Brook under Clement Hill Road (HSB7): This is a 4 foot diameter, heavily rusted corrugated metal pipe, about 36 feet long, under Clement Hill Road. The structure is much narrower than the bankfull width and lacks a natural substrate, but has water within the structure and is not perched, so fish may find it passable much of the year. A larger structure spanning the bankfull width should be installed. The town is currently considering replacing this pipe.

Hardy Spring Brook under Bound Tree Road (HSB8): This is a 5 foot diameter corrugated metal pipe, about 60 feet long, under Bound Tree Road. The outlet is perched above the stream surface, which may prevent many aquatic species from passing through the structure. The culvert is also showing rust and there is erosion around the outlet. A larger structure should be installed at the low water flow elevation. The impact on water levels in the upstream ponded area and swamp should be taken into consideration in planning and design.

Dolf Brook under Briar Hill Road #2 (DB3): This is a 6 foot diameter, approximately 30 foot long concrete pipe under Briar Hill Road just south of Patch Road. Dolf Brook upstream of this crossing is in generally good condition with intact fish and wildlife habitat. The culvert is smaller than the bankfull

width (13 to 14 feet) and the outlet is perched, preventing passage of many fish and other aquatic organisms. A larger structure that is not perched should be installed.

Dolf Brook under Briar Hill Road #3 (DB4): This is a 6 foot diameter, approximately 70 foot long corrugated metal pipe under Briar Hill Road between Patch Road and Rollins Road. The culvert is much smaller than the bankfull width (25 to 30 feet) and the outlet is slightly perched, preventing passage of many fish and other aquatic organisms. A larger structure that is not perched should be installed.

One Stack Brook under Jewett Road (OSB): This is a 6 by 6 foot concrete box culvert, about 40 feet long, carrying One Stack Brook under Jewett Road. The culvert has a low slope, very shallow water, no natural substrate and a small outlet drop, making it poor for fish and wildlife passage. This is a fairly small perennial stream, but most of the watershed, above this crossing is high quality, intact fish and wildlife habitat. A larger structure with no outlet drop should be installed as opportunities arise.

Medium Priority Culverts

Hardy Spring Brook under I-89 Northbound (HSB3) and Southbound (HSB4): HSB3 is a long, 7-foot diameter corrugated metal pipe under I-89 northbound and a large fill slope. It is 7 feet in diameter and. HSB4 is a concrete 6 by 6 foot box culvert under I-89 southbound. Both culverts are long, narrower than the bankfull width, and lack a natural substrate. Over the long term, larger structures with natural substrates should be installed, but the length and location under the interstate will make replacement expensive. Both of these culverts are the state's responsibility.

Hardy Spring Brook under Bound Tree Road #2 (HSB6): This is a 6 foot diameter corrugated metal pipe, about 36 feet long, under Bound Tree Road. The culvert is undersized but has some aquatic organism passage capability. A larger structure spanning the bankfull width should be installed.

Dolf Brook under Briar Hill Road #1 (DB2): This is a 6 foot diameter corrugated metal pipe, about 65 feet long, under Briar Hill Road north of Patch Road. There is rust on the lower half of the culvert but the bank and bank armoring at both ends of the culvert are intact. Dolf Brook is in generally good condition and has intact, high quality fish and wildlife habitat along much of its length. The culvert currently allows aquatic organism passage but could be improved. When replacement is warranted, a larger structure should be installed.

Low Priority Culverts

Several other culverts are a lower priority for fish and wildlife passage. Two of these warrant attention in the near future. The Browns Brook culvert under Kearsage Avenue (BB4) is heavily rusted, while one of the Browns Brook culverts within the Fairgrounds (BB2) is heavily rusted and is already under a bridge and therefore appears to be unnecessary. Other low priority culverts warrant long-term replacement or repairs, while others appear to be in good condition for fish and wildlife passage, and no action is necessary in that regard. These culverts are listed in the accompanying tables.

TOWN OF HOPKINTON

CULVERT INVENTORY

FIGURE 1 - CULVERT LOCATIONS

HOPKINTON CONSERVATION

COMMISSION – 2013

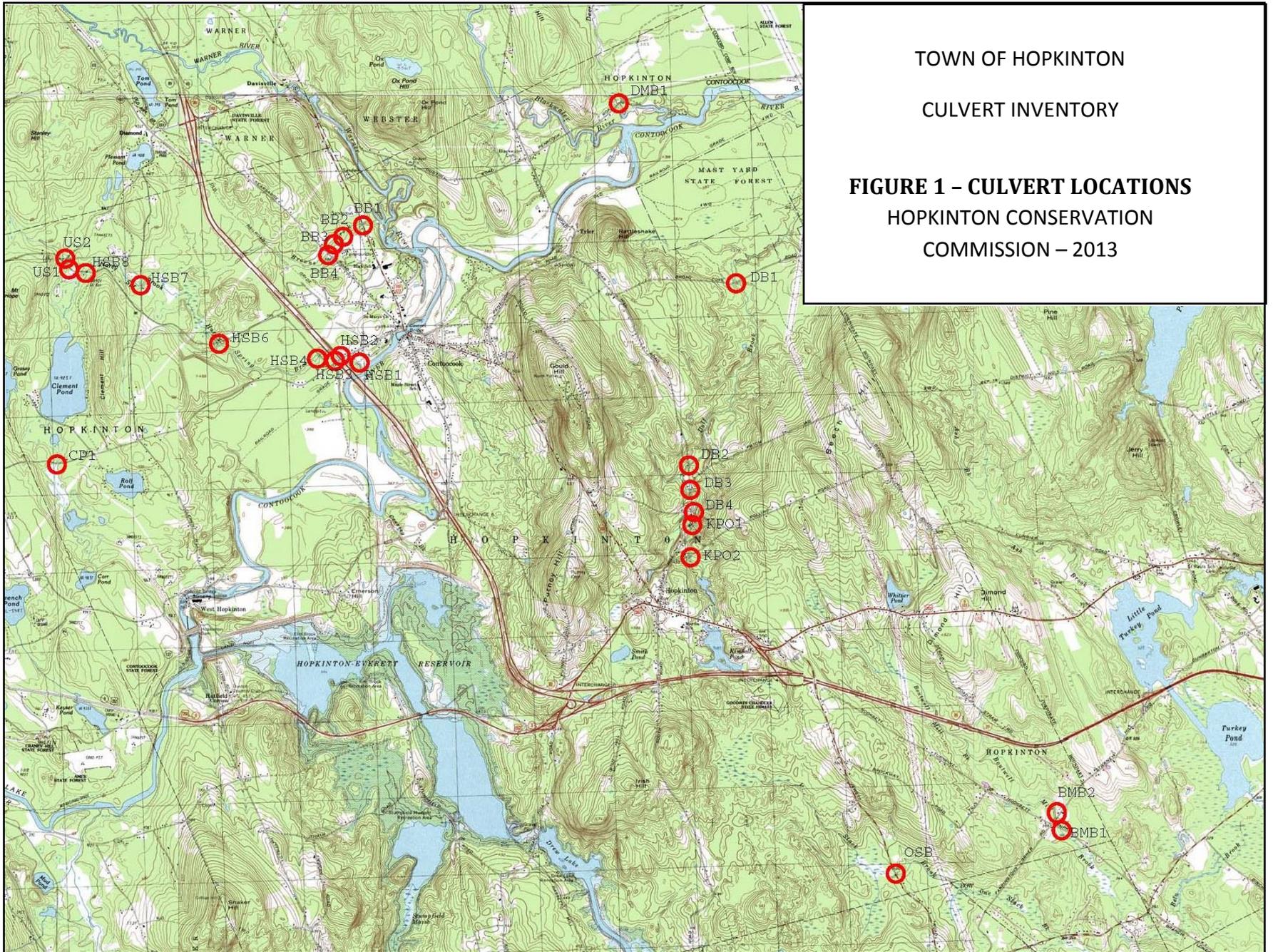


TABLE 1 - HOPKINTON PERENNIAL STREAM LENGTHS AND WATERSHED SIZES

HOPKINTON CONSERVATION COMMISSION							NOVEMBER 2013
Stream Name	Total Perennial Stream Length* (miles)	Road Name	Structure ID	Stream Length Downstream of Structure* (miles)	Stream Length Upstream of Structure* (miles)	Watershed Upstream of Structure (sq. miles)	Notes
Deer Meadow Brook	ND	Penacock Road	DMB	ND	ND	18.2	Mostly ponds and wetlands up and downstream
Browns Brook	1.5	Route 103	BB1	0.2	1.3	1.2	The perennial channel is assumed to start in the vicinity of the I-89 crossing; the watershed is 0.6 sq. mi. above the crossing.
		Fairgrounds east	BB2	0.4	1.0	1.0	
		Fairgrounds west	BB3	0.5	1.0	1.0	
		Kearsage Ave.	BB4	0.6	0.9	1.0	
		RR Grade	BB5	1.3	0.2	0.7	
Hardy Spring Brook	4.2	I-89	BB6+7	1.5	ND	0.6	The perennial channel is assumed to start in the vicinity of the Pine St. crossing; the watershed is 0.6 sq. mi. above that point, with extensive wetlands upstream. There are also wetlands and ponds interspersed throughout the watershed, so the stream channel may be discontinuous and channel length may be overestimated.
		RR Grade	HSB1	0.1	4.1	5.2	
		Pine Street	HSB2	0.2	4.0	5.2	
		I-89NB	HSB3	0.3	3.9	5.1	
		I-89SB	HSB4	0.4	3.9	5.1	
		Bound Tree Road	HSB5	0.5	3.8	5.1	
		Bound Tree Road	HSB6	1.6	2.6	4.3	
		Clement Hill Road	HSB7	3.0	1.3	3.8	
		Bound Tree Road	HSB8	3.6	0.6	3.5	
		Camp Merrimac Road	HSB9E+W	4.2	ND	1.9	
Unnamed Stream - HSB Trib	0.9	Bound Tree Road	US1	0.4	0.5	0.9	Channel length is measured beginning at a large beaver marsh upstream.
		Pleasant Pond Road	US2	0.4	0.5	0.9	
Contoocook Village Stream		Route 103	CVS	ND	ND	1.3	Not surveyed
Dolf Brook	5.0	Broad Cove Road	DB1	1.7	3.4	6.3	Total channel length was measured from the confluence with the Contoocook River upstream to the Rollins Road crossing. Upstream of Rollins Road, there are several wetlands and waterbodies with short stream segments.
		Briar Hill Road	DB2	3.9	1.2	3.8	
		Briar Hill Road	DB3	4.1	0.9	3.0	
		Briar Hill Road	DB4	4.4	0.6	2.9	
		Briar Hill Road	DB5	4.7	0.3	1.7	
		Rollins Road	DB6	5.0	ND	1.7	
Smith Brook	0.8	Route 103	SB1	0.6	0.2	0.8	Channel length is measured beginning at Route 202/9 and Smith Pond Bog.
		Routes 202/9	SB2	0.8	ND	0.5	
One Stack Brook	0.5	Jewett Road	OSB	0.5	ND	2.7	Much of the watershed is wetlands; the 0.5 miles of stream channel is downstream of Jewett Road.

TABLE 2 – HOPKINTON PERENNIAL STREAM CULVERTS: AQUATIC ORGANISM PASSAGE CONDITION AND PRIORITY

HOPKINTON CONSERVATION COMMISSION									NOVEMBER 2013
Stream Name	Total Perennial Stream Length* (miles)	Road Name	Structure ID	Watershed Upstream of Structure (sq. miles)	AOP Importance	AOP Condition	Priority for Improvement	Recommendation	Remarks
Deer Meadow Brook	ND	Penacook Road	DMB	18.2	HIGH	GOOD	LOW	NO ACTION	In good condition for AOP
Browns Brook	1.5	Route 103	BB1	1.2	MODERATE	POOR	LOW	REPLACE (LONG TERM)	Not a town road
		Fairgrounds east	BB2	1.0	MODERATE	GOOD	LOW	REMOVE OLD PIPE	Old pipe appears redundant
		Fairgrounds west	BB3	1.0	MODERATE	GOOD	LOW	REPLACE (LONG TERM)	In good condition for AOP
		Kearsage Ave.	BB4	1.0	MODERATE	FAIR	LOW	REPLACE (NEAR TERM)	Rusted but low AOP value
		RR Grade	BB5	0.7					Did not survey
		I-89	BB6+7	0.6				Did not survey	
Hardy Spring Brook	4.2	RR Grade	HSB1	5.2	HIGH	FAIR	HIGH	REPAIR OR REPLACE	Major structural problems
		Pine Street	HSB2	5.2	HIGH	GOOD	LOW	NO ACTION	In good condition for AOP
		I-89NB	HSB3	5.1	HIGH	POOR	MEDIUM	REPLACE (LONG TERM)	Not a town road but
		I-89SB	HSB4	5.1	HIGH	POOR	MEDIUM	REPLACE (LONG TERM)	important for AOP
		Bound Tree Road	HSB5	5.1	HIGH	GOOD	LOW	REPLACE (LONG TERM)	In good condition for AOP
		Bound Tree Road	HSB6	4.3	HIGH	FAIR	MEDIUM	REPLACE (NEAR TERM)	High importance, fair AOP
		Clement Hill Road	HSB7	3.8	HIGH	FAIR	HIGH	REPLACE (NEAR TERM)	High importance, fair AOP, rusted
		Bound Tree Road	HSB8	3.5	HIGH	POOR	HIGH	REPLACE (NEAR TERM)	High importance, poor AOP
		Camp Merrimac Road	HSB9E+W	1.9	HIGH	GOOD	LOW	NO ACTION	Fairly new pipes; good AOP
		Pine Street	HSB10	0.6	MODERATE	POOR	LOW	NO ACTION	Impoundment
Unnamed Stream - HSB Trib	0.9	Bound Tree Road	US1	0.9	LOW	POOR	LOW	REPLACE (LONG TERM)	Low priority for AOP
		Pleasant Pond Road	US2	0.9	LOW	POOR	LOW	REPLACE (LONG TERM)	Low priority for AOP
Contoocook Village Stream		Route 103	CVS	1.3					Did not survey
Dolf Brook	5.0	Broad Cove Road	DB1	6.3	HIGH	GOOD	LOW	NO ACTION	In good condition for AOP
		Briar Hill Road	DB2	3.8	HIGH	MODERATE	MEDIUM	REPLACE (LONG TERM)	In moderate condition for AOP
		Briar Hill Road	DB3	3.0	HIGH	POOR	HIGH	REPLACE (NEAR TERM)	High importance, poor AOP
		Briar Hill Road	DB4	2.9	HIGH	POOR	HIGH	REPLACE (NEAR TERM)	High importance, poor AOP
		Briar Hill Road	DB5	1.7	LOW	POOR	LOW	REPLACE (LONG TERM)	Low priority for AOP
		Rollins Road	DB6	1.7	LOW	POOR	LOW	REPLACE (LONG TERM)	Impoundment
Smith Brook	0.8	Route 103	SPB1	0.8					Did not survey
		Routes 202/9	SPB2	0.5					Did not survey
One Stack Brook	0.5	Jewett Road	OSB	2.7	HIGH	POOR	HIGH	REPLACE (NEAR TERM)	High importance, poor AOP
Boutwell Mill Brook	4.2	Hooksett Turnpike	BMB1	3.6	HIGH	EXCELLENT	LOW	NO ACTION	In good condition for AOP
		Stickney Hill Road	BMB2	3.4	HIGH	EXCELLENT	LOW	NO ACTION	In good condition for AOP
		I-89	BMB3	2.0					Did not survey
		Routes 202/9	BMB4+5	0.5					Did not survey

NOTES
AOP = Aquatic Organism Passage
* Stream lengths include only segments with an upstream watershed of at least 0.5 square miles; these segments are likely to be perennial

**TOWN OF HOPKINTON CULVERT INVENTORY
HOPKINTON CONSERVATION COMMISSION**

INDIVIDUAL CULVERT REPORTS

Deer Meadow Brook under East Penacook Road (DMB)

GENERAL DESCRIPTION

This is an 11 foot wide, 12 feet high elliptical corrugated metal pipe, about 60 feet long, under East Penacook Road, next to the town transfer station. The stream is ponded both upstream and downstream of the road. The culvert appears to be sound. There is about 6 feet of water in the pipe. The substrate within the pipe could not be determined. The bank and bank armoring at both ends of the culvert are intact. There is no obvious erosion or scour, but there is woody material obstructing the inlet and some aggradation of sediments downstream of the outlet.

IMPORTANCE FOR AQUATIC ORGANISM PASSAGE: HIGH

Deer Meadow Brook has a long, narrow watershed that extends from Salisbury, through Webster and Boscawen, and into Hopkinton, where it empties into the Contoocook River just south of this road crossing. It has an 18.2 square mile watershed above the crossing and the stream appears to be in good condition with extensive, high quality fish and wildlife habitat. The stream flows through ponds and wetlands for much of its length, including both sides of this crossing, so it is assumed to be warm-water fish habitat. The stream channel is discontinuous so the length was not measured.

AQUATIC ORGANISM PASSAGE CONDITION: GOOD

The culvert is relatively large and has plenty of water for most fish and other aquatic organisms. There is no provision for terrestrial organisms but the ponding on both sides of the road make this less favorable for terrestrial species.

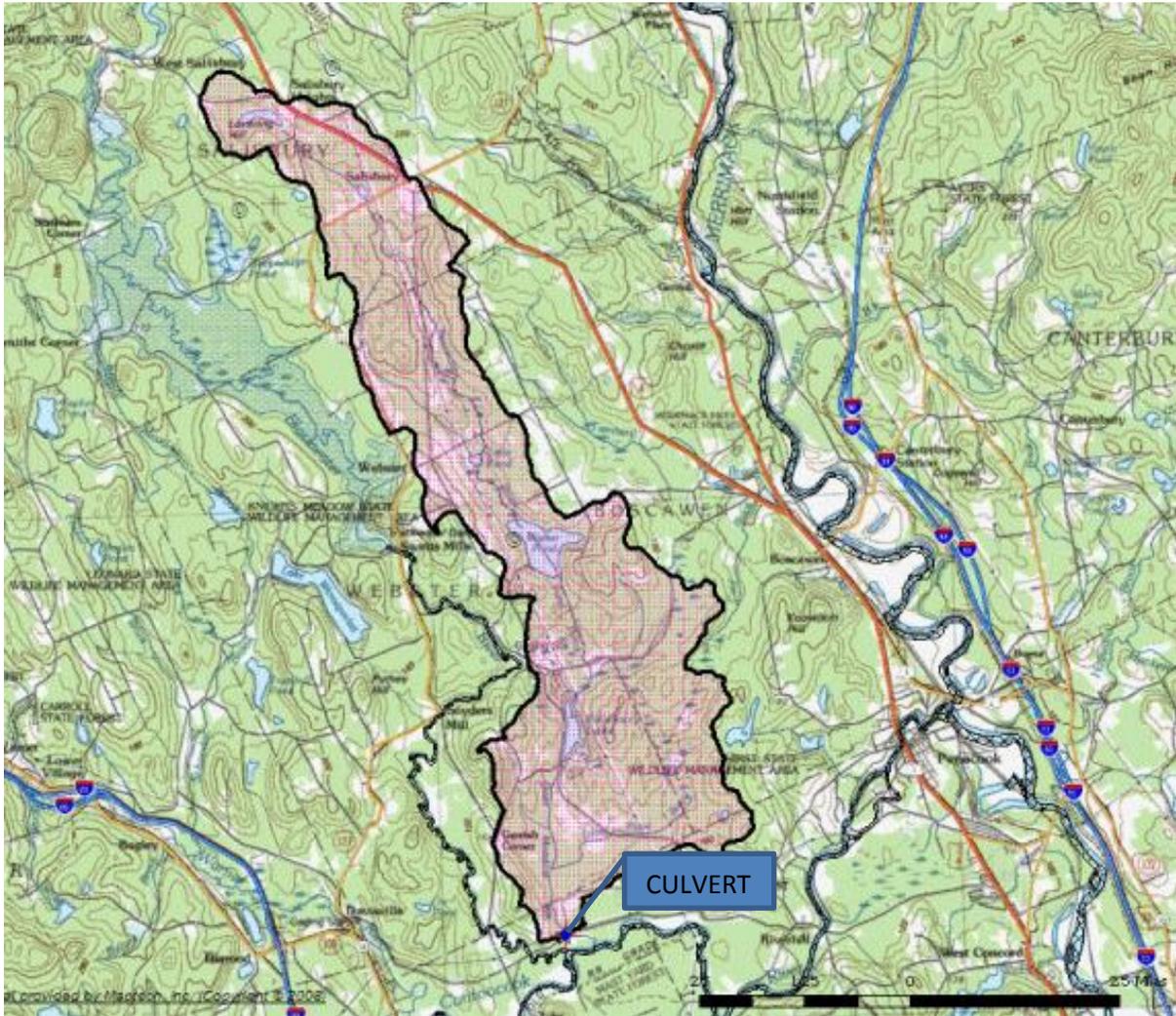
PRIORITY LEVEL FOR IMPROVEMENT: LOW

The culvert appears to be sound and currently allows aquatic organism passage.

RECOMMENDATION: NO ACTION

No action is recommended at this time.

Deer Meadow Brook under East Penacook Road (DMB)



Deer Meadow Brook under East Penacook Road (DMB)

Upstream



Downstream



Inlet



Outlet



Browns Brook under Route 103 (BB1)

GENERAL DESCRIPTION

The Browns Brook culvert under Route 103 is north of a Fairgrounds entrance. The culvert is a 3-foot diameter, 50 foot long concrete culvert. It appears to be intact, although the bank armoring is failing on the downstream end, and there is some undercutting of the culvert and wing walls. The slope of the pipe is lower than the stream slope, but the water depth and velocity are similar to the stream channel. The outlet is slightly perched above the stream level (5-inch drop) and there is a 2.5-foot deep pool below the outlet. There is some bank erosion and sediment aggradation downstream of the pipe.

IMPORTANCE FOR AQUATIC ORGANISM PASSAGE: MODERATE

This stream is in generally good condition and based on a 2012 survey has cold-water fish species, including brook trout. However, this stream is relatively small (1.2 sq. mi. watershed at this crossing, with about 1.5 miles total of perennial stream channel) and there are several culverts along its length, including one under Route 103, two in the Fairgrounds, one under Kearsarge Road, and two under I-89.

AQUATIC ORGANISM PASSAGE CONDITION: POOR

The culvert is much narrower (3 feet) than the stream's natural bankfull width (12 to 20 feet) and has a slightly perched outlet.

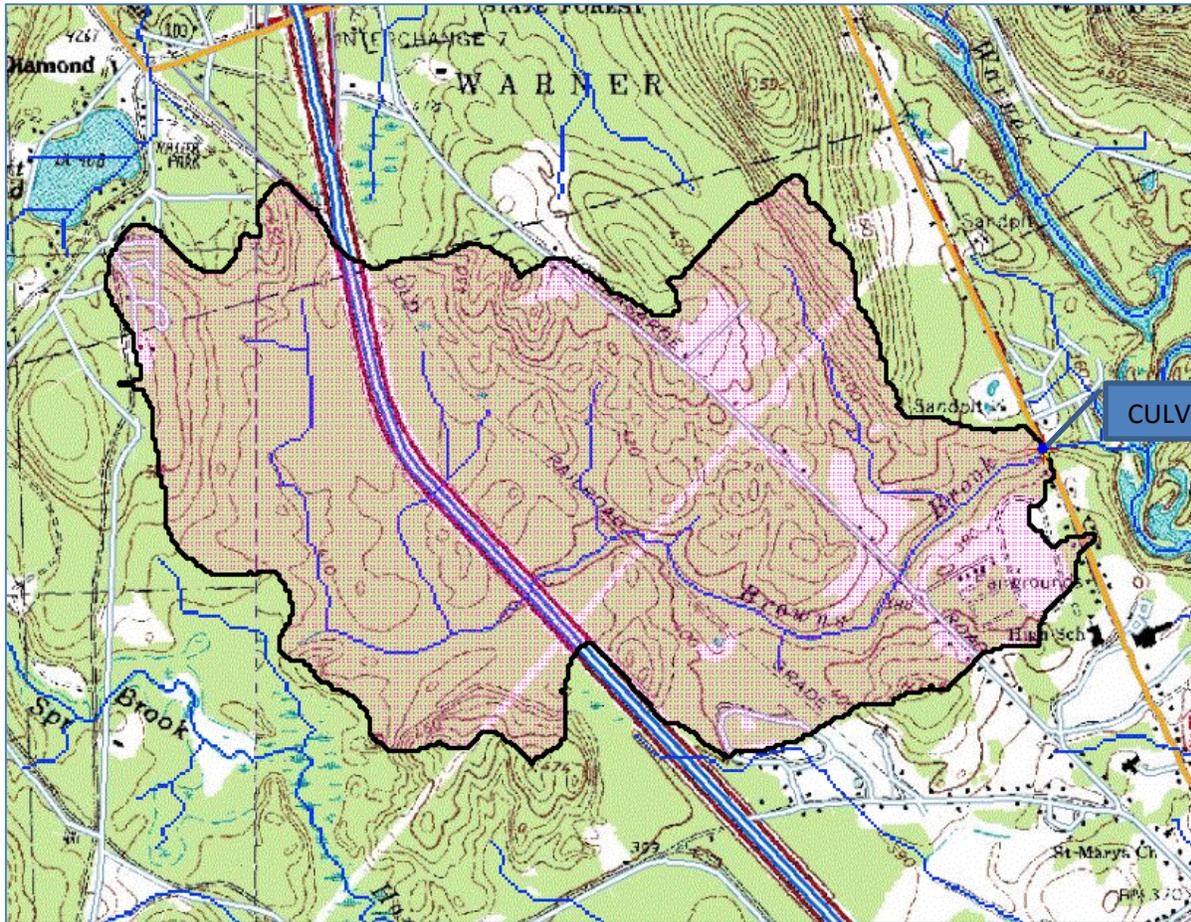
PRIORITY LEVEL FOR IMPROVEMENT: LOW

Because of the small size and many culverts along this stream, it is not a high priority for fish and wildlife passage.

RECOMMENDATION: REPLACE (LONG TERM)

The state or town may wish to inspect the structural integrity of the structure, especially at the downstream end. When the culvert is replaced, the road reconstructed, or other opportunities arise, the culvert should ideally be replaced with a larger structure that spans the bankfull width.

Browns Brook under Route 103 (BB1)



Browns Brook under Route 103 (BB1)

Upstream



Downstream



Inlet



Outlet



Browns Brook in Fairgrounds (East) (BB2)

GENERAL DESCRIPTION

This Browns Brook culvert is within the Fairgrounds under a parking lot entrance within the Fairgrounds. The culvert is a heavily rusted, 3-foot diameter, 20 feet long corrugated metal pipe under a relatively new wooden bridge. The bottom half of the culvert appears to be completely rusted away. The inlet is partially obstructed by sandbags and rip rap. There is a sharp, almost 90-degree bend in the brook on the upstream side, and it appears there had been some recent erosion and repairs, evidenced by the sandbags and riprap.

IMPORTANCE FOR AQUATIC ORGANISM PASSAGE: MODERATE

This stream is not a high priority because the upstream watershed is relatively small (1.0 sq. mi.) and there is only 1.0 mile of perennial stream channel upstream. There are also several culverts along its length, including one under Route 103, two in the Fairgrounds, one under Kearsarge Road, and two under I-89. Electrofishing in this area in 2012 yielded both blacknose dace and brook trout, indicating cold-water fish habitat.

AQUATIC ORGANISM PASSAGE CONDITION: GOOD

The culvert is much narrower (3 feet) than the stream's natural bankfull width (10 to 15 feet), but the bridge spans most of the bankfull width. However, there is soil and rip rap under the bridge up to the top of the culvert. The culvert is at the stream grade and is not perched, so it appears that fish can pass through the culvert, and terrestrial organisms can pass under the bridge. The road is small and appears to be lightly used most of the year, and there is forest on both sides, so most wildlife can cross this road without risk.

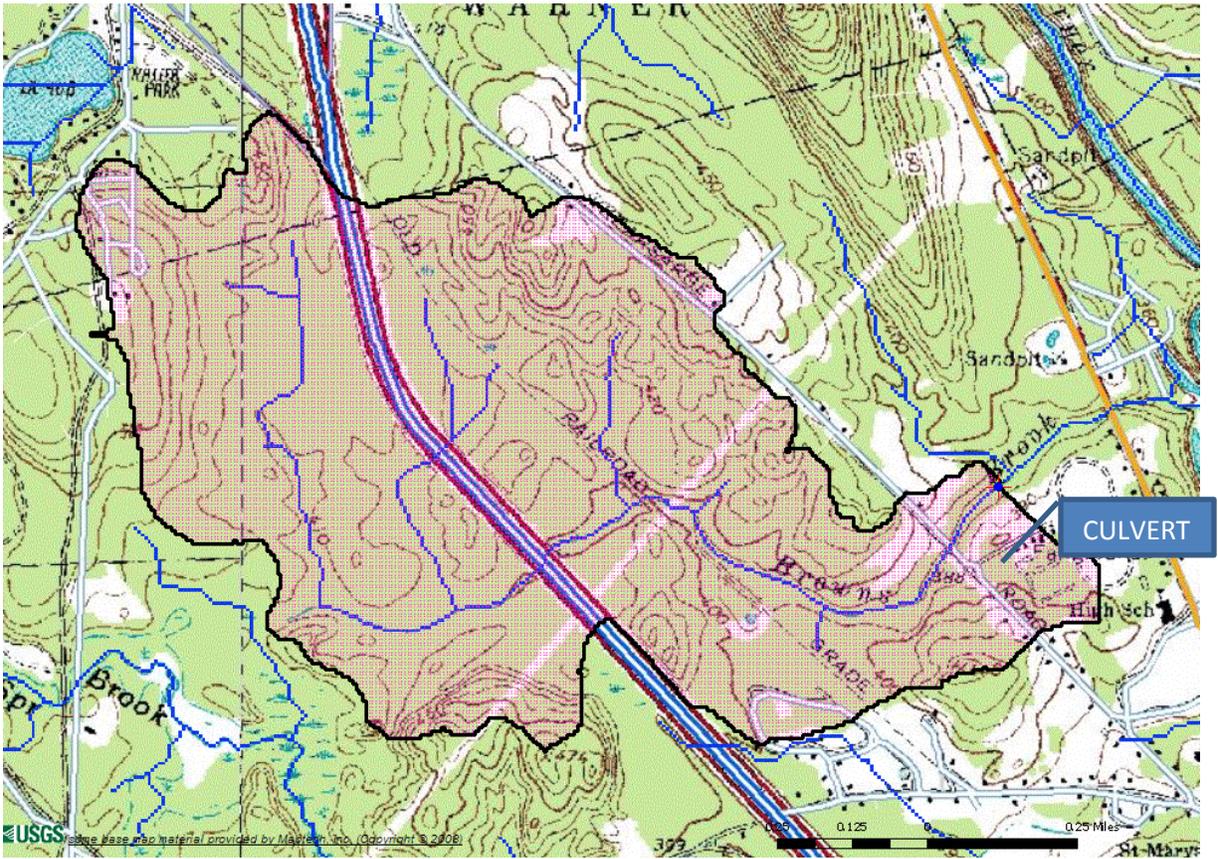
PRIORITY LEVEL FOR IMPROVEMENT: LOW

The culvert and bridge already appear to allow fish and other organism passage.

RECOMMENDATION: REMOVE OLD CULVERT AND IMPROVE CHANNEL UNDER BRIDGE

The landowner may wish to remove the rusted metal pipe and allow the brook to flow freely under the new bridge. If this is done, a more natural channel should be constructed under the bridge.

Browns Brook in Fairgrounds (East) (BB2)



Browns Brook in Fairgrounds (East) (BB2)

Upstream Left



Upstream Right



Inlet



Outlet



Downstream



Hardy Spring Brook under Railroad Grade (HSB1)

GENERAL DESCRIPTION

This is an old stone structure under the former railroad line, between the Contoocook River and Pine Street. It is 3 feet wide and 5 feet high and approximately 40 feet long. It is in line with the stream channel and matches the stream slope and depth. However, it is failing in the downstream portion of the structure, with several of the culvert's large quarry stones collapsed into the stream channel. This appears to have caused some erosion and collapsing of the railroad grade's banks.

IMPORTANCE FOR AQUATIC ORGANISM PASSAGE: HIGH

Hardy Spring Brook is in generally good condition and has high quality fish and wildlife habitat with extensive ponds and wetlands along much of its length. The brook has a 5.2 square mile watershed above this crossing and about 4.2 miles of perennial stream length, almost all of it above this crossing. Electrofishing conducted further upstream in 2013 yielded warm-water fish species, including brown bullhead, margined madtom, fallfish, golden shiner, creek chubsucker, chain pickerel and pumpkinseed sunfish. This is indicative of the extensive warm-water habitats, wetlands and ponds, within the watershed.

AQUATIC ORGANISM PASSAGE CONDITION: FAIR

The structure is much narrower than the bankfull width (18 to 25 feet) and is obstructed, but may pass fish and other small aquatic organisms.

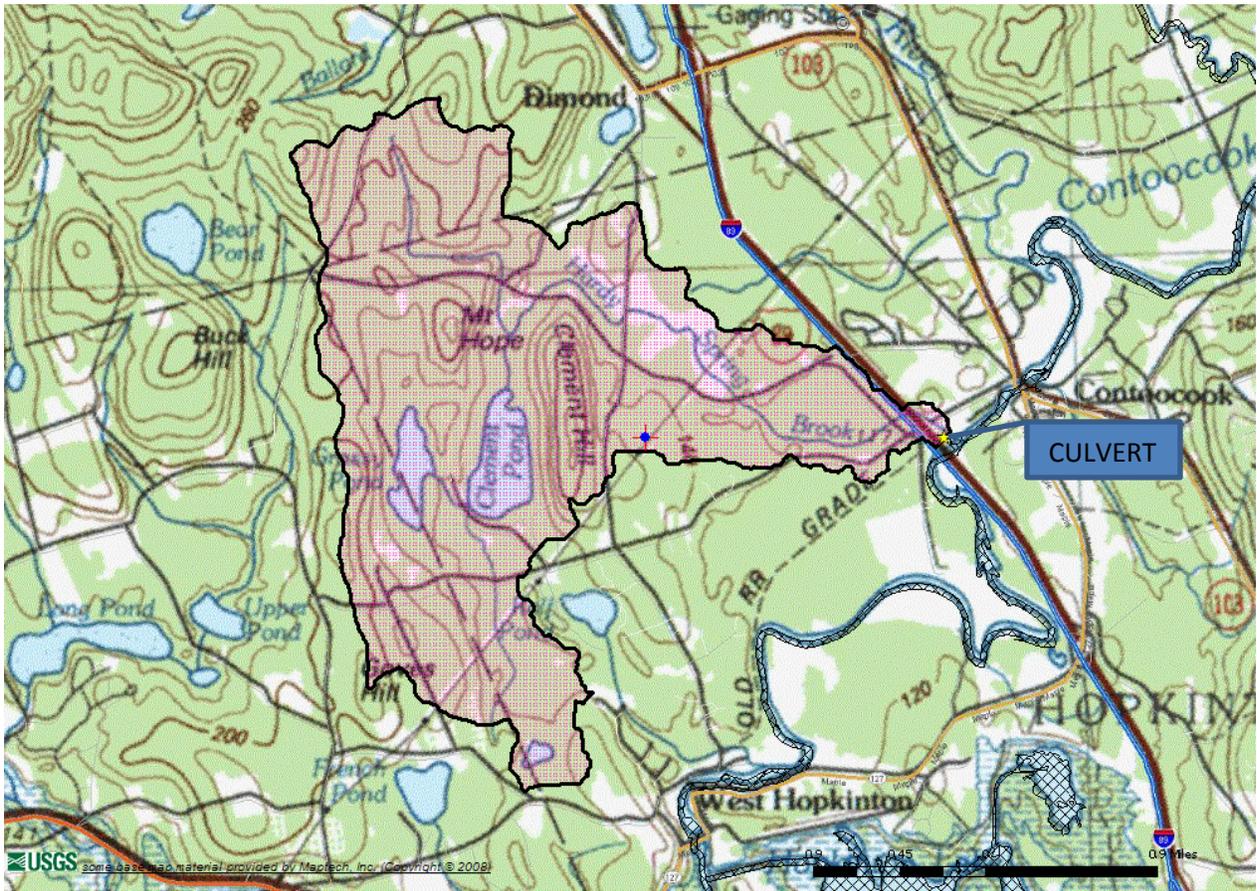
PRIORITY LEVEL FOR IMPROVEMENT: HIGH

The culvert appears to be failing and if it is not repaired may cause the collapse of the railroad grade. Collapse of the railroad grade would dam the brook, affecting fish passage and possibly flooding upstream properties and roadways.

RECOMMENDATION: REPAIR OR REPLACE

The structure appears close to completely failing. If this rail trail is no longer important, the structure could be removed altogether, or a bridge or substantially larger culvert could be installed in its place.

Hardy Spring Brook under Railroad Grade (HSB1)

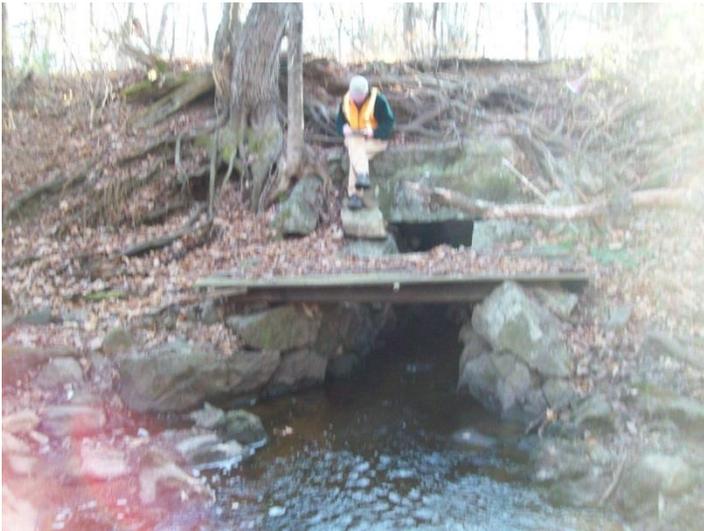


Hardy Spring Brook under Railroad Grade (HSB1)

Upstream



Downstream



Outlet



Inside Structure at Outlet



Hardy Spring Brook under Pine Street (HSB2)

GENERAL DESCRIPTION

This culvert is located under Pine Street just east of the Route I-89 northbound bridge. It is an elliptical corrugated metal pipe that is 8 feet wide by 6 feet high and approximately 60 feet long. It is in line with the stream channel and matches the stream slope and depth and has a cobble substrate. There was 1.8 feet of water in the pipe during the survey. There is a pool on the downstream end and modest erosion and sedimentation upstream and downstream.

IMPORTANCE FOR AQUATIC ORGANISM PASSAGE: HIGH

Hardy Spring Brook is in generally good condition and has high quality warm-water fish and wildlife habitat along much of its length. It has a 5.2 square mile watershed and about 4.0 miles of perennial stream channel above this crossing.

AQUATIC ORGANISM PASSAGE CONDITION: GOOD

The structure is narrower than the bankfull width (25 feet), but probably passes fish and other aquatic organisms most of the time.

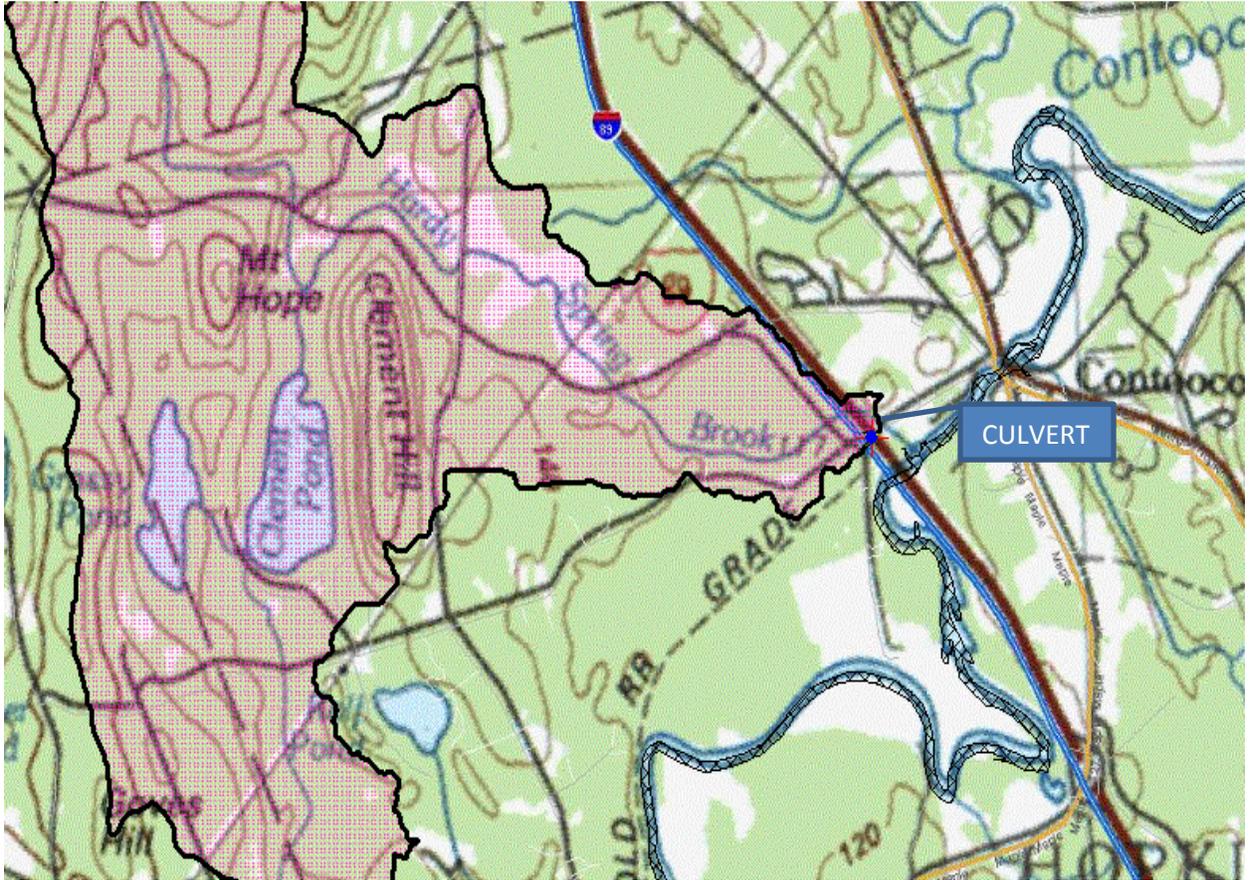
PRIORITY LEVEL FOR IMPROVEMENT: LOW

The culvert appears to be providing aquatic organism passage and to be sound.

RECOMMENDATION: NO ACTION

Over the long term, a larger structure or bridge could be installed, but the current structure appears to provide aquatic organism passage.

Hardy Spring Brook under Pine Street (HSB2)



Hardy Spring Brook under Pine Street (HSB2)

Upstream



Downstream



Inlet



Outlet



Hardy Spring Brook under I-89 Northbound (HSB3)

GENERAL DESCRIPTION

This is a long corrugated metal pipe under I-89 northbound and a large fill slope. It is 7 feet in diameter. The stream channel has a 90-degree bend at both upstream and downstream ends. There is a 5-foot deep pool at the downstream outlet. There was 1.0 foot of water depth but no substrate within the culvert.

IMPORTANCE FOR AQUATIC ORGANISM PASSAGE: HIGH

Hardy Spring Brook is in generally good condition, has high quality fish and wildlife habitat along much of its length, and has a 5.1 square mile watershed and 3.9 miles of perennial stream channel above this crossing.

AQUATIC ORGANISM PASSAGE CONDITION: POOR

The structure is long and is narrower than the bankfull width (16 to 20 feet), but may be able to provide fish passage under appropriate water conditions.

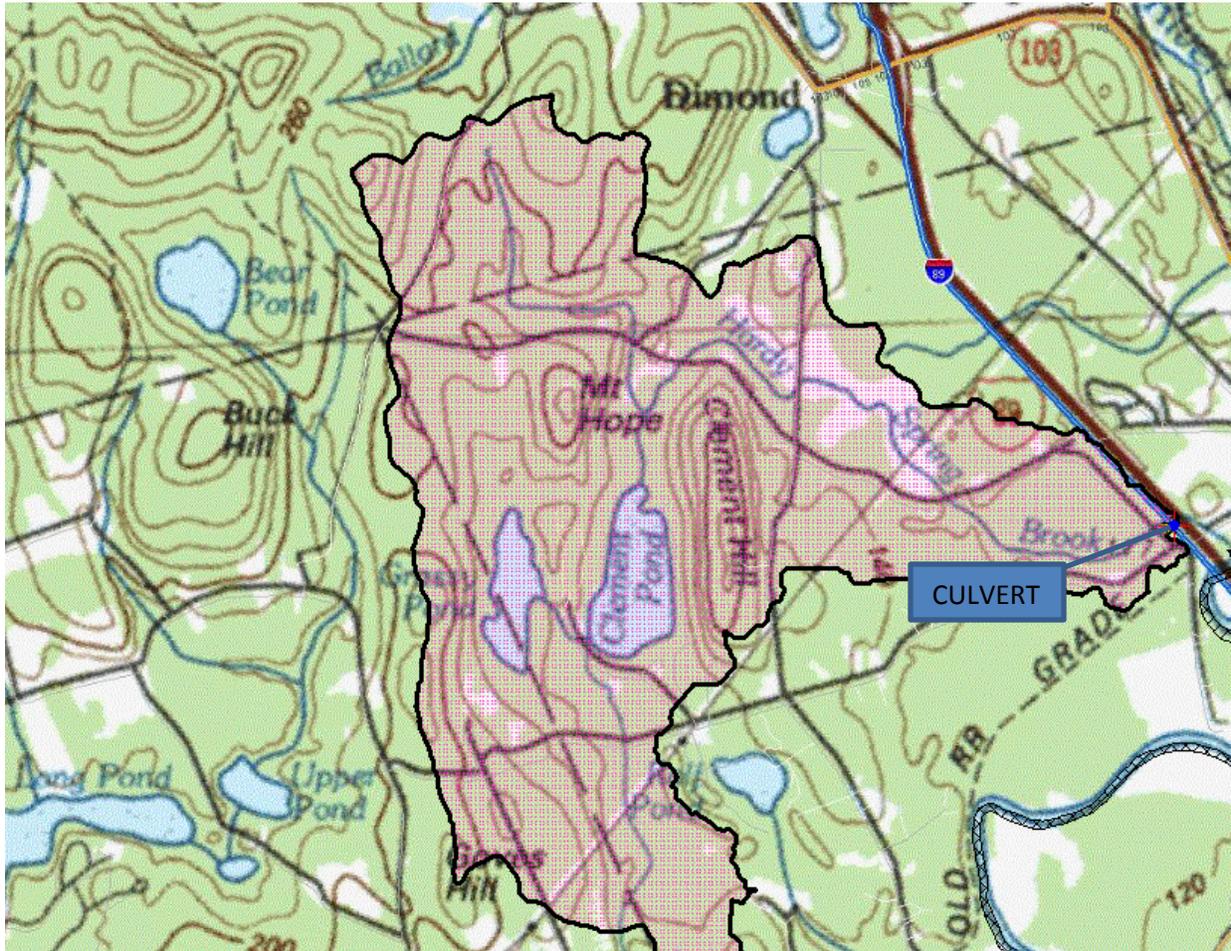
PRIORITY LEVEL FOR IMPROVEMENT: MEDIUM

The culvert may provide some fish passage but is long, lacks a natural substrate, and is narrower than the bankfull width.

RECOMMENDATION: REPLACE (LONG TERM)

Over the long term, a larger structure with a natural substrate should be installed, but the length and location under the interstate will make replacement expensive.

Hardy Spring Brook under I-89 Northbound (HSB3)



Hardy Spring Brook under I-89 Northbound (HSB3)

Upstream



Downstream



Inlet



Outlet



Hardy Spring Brook under I-89 Southbound (HSB4)

GENERAL DESCRIPTION

This is a concrete 6 by 6 foot box culvert under I-89 southbound. The culvert is reasonably in line with the stream channel and is at a similar slope, but there is no natural substrate within the culvert. There is a shallow pool at the downstream outlet. There is minimal erosion or aggradation.

IMPORTANCE FOR AQUATIC ORGANISM PASSAGE: HIGH

Hardy Spring Brook is in generally good condition, has high quality warm-water fish and wildlife habitat along much of its length, and has a 5.1 square mile watershed and 3.9 miles of perennial stream channel above this crossing.

AQUATIC ORGANISM PASSAGE CONDITION: POOR

The structure is narrower than the bankfull width (14 feet), flat-bottomed and shallow, but may be able to provide fish passage under higher water conditions.

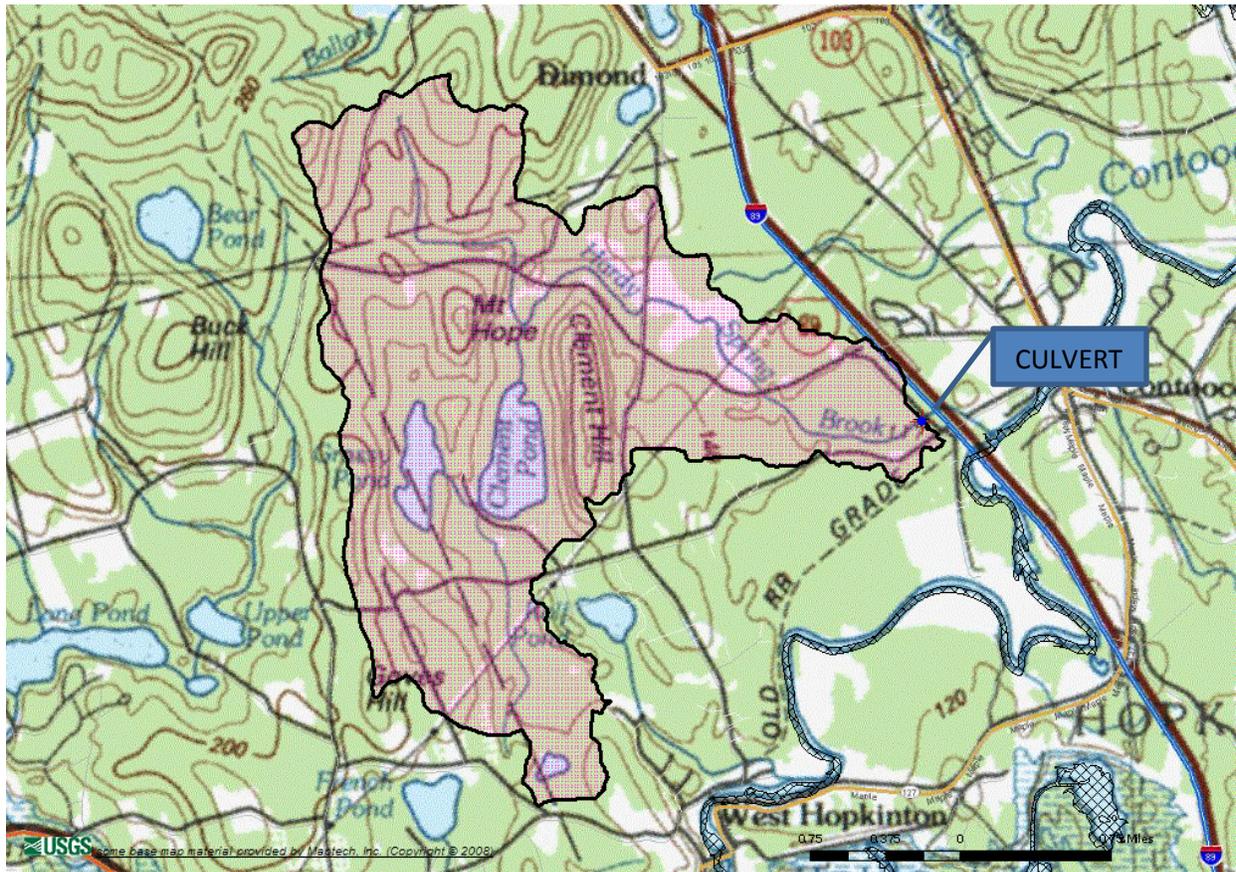
PRIORITY LEVEL FOR IMPROVEMENT: MEDIUM

The culvert may provide some fish passage but lacks a natural substrate and is narrower than the bankfull width.

RECOMMENDATION: REPLACE (LONG TERM)

Over the long term, a larger structure with a natural substrate should be installed.

Hardy Spring Brook under I-89 Southbound (HSB4)



Hardy Spring Brook under I-89 Southbound (HSB4)

Upstream



Downstream



Inlet



Outlet



Hardy Spring Brook under Bound Tree Road near Pine Street (HSB5)

GENERAL DESCRIPTION

This is a concrete 6 by 6 foot concrete box culvert under Bound Tree Road a short ways upstream from I-89. The culvert and wingwalls are intact. There is a slight bend in the stream on the upstream side. The culvert is at a similar slope and has a similar water depth as the stream, there are cobbles within the culvert, and inlet and outlet are close to the stream grade. There is a shallow pool below the downstream outlet. There is minimal erosion or aggradation in the stream channel.

IMPORTANCE FOR AQUATIC ORGANISM PASSAGE: HIGH

Hardy Spring Brook is in generally good condition and has high quality wildlife habitat and warm-water fish habitat along much of its length. It has a 5.1 square mile watershed and 3.8 miles of perennial stream channel above this crossing.

AQUATIC ORGANISM PASSAGE CONDITION: GOOD

The structure is narrower than the bankfull width (15 to 18 feet), but has a natural substrate and is at the stream grade, so fish and many other aquatic organisms can pass through. There is no provision for terrestrial organisms.

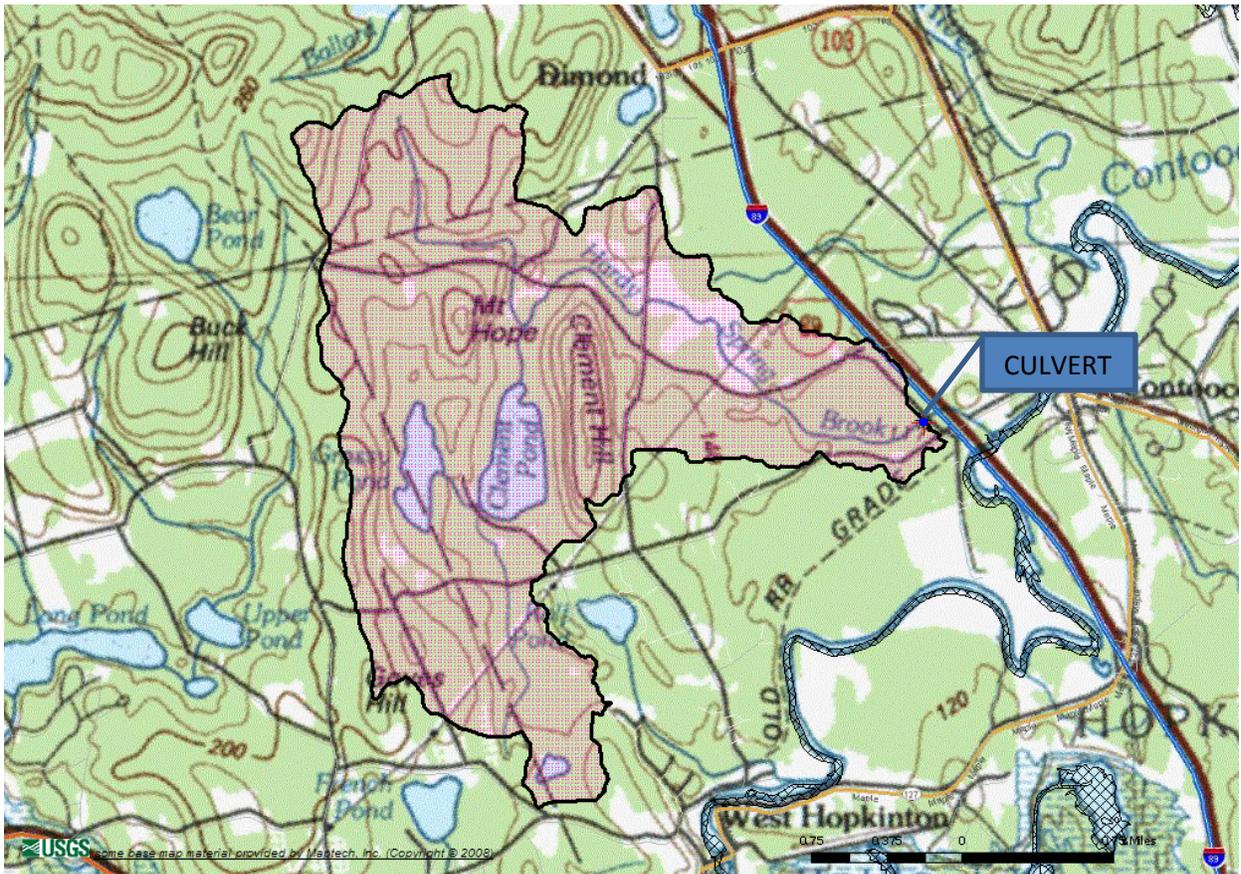
PRIORITY LEVEL FOR IMPROVEMENT: LOW

The culvert currently allows fish passage.

RECOMMENDATION: REPLACE (LONG TERM)

Over the long term, a larger structure spanning the bankfull width should be installed.

Hardy Spring Brook under Bound Tree Road near Pine Street (HSB5)



Hardy Spring Brook under Bound Tree Road near Pine Street (HSB5)

Upstream



Downstream



Inlet



Outlet



Hardy Spring Brook under Bound Tree Road #2 (HSB6)

GENERAL DESCRIPTION

This is a 6 foot diameter corrugated metal pipe, about 36 feet long, under Bound Tree Road. The culvert is in line with the stream channel and has a similar slope and water velocity, but is slightly deeper (water depth about one foot) than the stream channel. There is no natural substrate within the pipe. There is a former road crossing constricting the channel about 85 feet upstream, and there are pools between that constriction and the culvert inlet as well as downstream of the culvert. There is bank undercutting and a gravel bar downstream of the culvert.

IMPORTANCE FOR AQUATIC ORGANISM PASSAGE: HIGH

Hardy Spring Brook is in generally good condition, has high quality fish and wildlife habitat along much of its length, and has a 4.3 square mile watershed and 2.6 miles of perennial stream channel above this crossing. Fish sampling conducted in 2013 revealed a warm-water fish community.

AQUATIC ORGANISM PASSAGE CONDITION: FAIR

The structure is much narrower than the bankfull width (around 20 feet) and lacks a natural substrate, but has good water depth within the structure, so fish may find it passable much of the year.

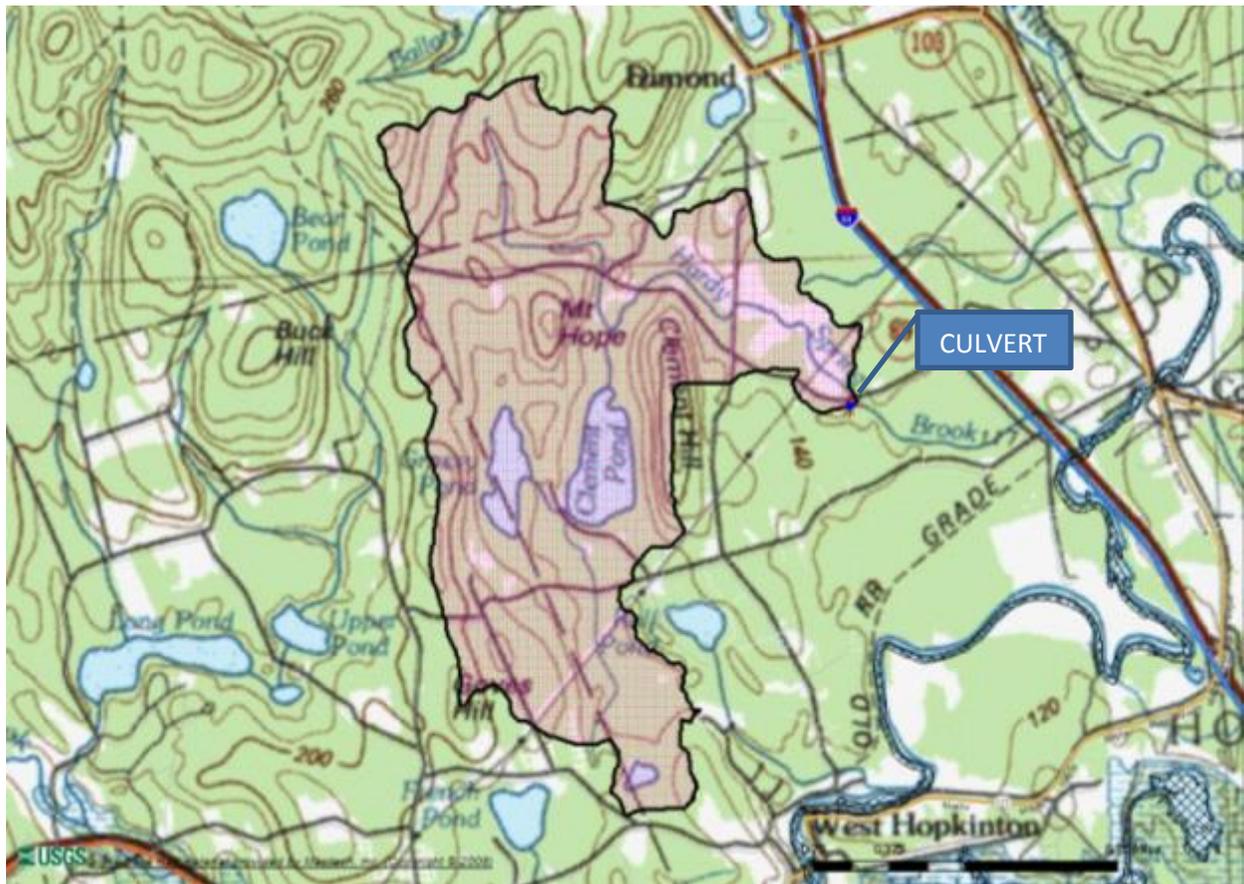
PRIORITY LEVEL FOR IMPROVEMENT: MEDIUM

The culvert is undersized but has some aquatic organism passage capability.

RECOMMENDATION: REPLACE (NEAR TERM)

A larger structure spanning the bankfull width should be installed.

Hardy Spring Brook under Bound Tree Road #2 (HSB6)



Hardy Spring Brook under Bound Tree Road #2 (HSB6)

Upstream



Downstream



Inlet



Outlet



Hardy Spring Brook under Clement Hill Road (HSB7)

GENERAL DESCRIPTION

This is a 4 foot diameter, heavily rusted corrugated metal pipe, about 36 feet long, under Clement Hill Road. Part of the culvert has rusted through. There is a ponded shrub swamp on the upstream side but no pool on the downstream side. The culvert is generally in line with the stream channel and has a similar slope, water depth (15 inches) and water velocity. There is no natural substrate within the pipe, except where it has rusted through. There is a modest amount of erosion and aggradation downstream of the structure.

IMPORTANCE FOR AQUATIC ORGANISM PASSAGE: HIGH

Hardy Spring Brook is in generally good condition, has high quality fish and wildlife habitat along much of its length, and has a 3.8 square mile watershed and approximately 1.3 miles of perennial stream channel above this crossing (3.0 miles downstream). The watershed has extensive ponds and wetlands with warm-water fish habitat.

AQUATIC ORGANISM PASSAGE CONDITION: FAIR

The structure is much narrower than the bankfull width and lacks a natural substrate in most of its length, but has water within the structure and is not perched, so it may pass fish much of the year.

PRIORITY LEVEL FOR IMPROVEMENT: HIGH

The culvert is heavily rusted and is undersized, but has some aquatic organism passage capability.

RECOMMENDATION: REPLACE (NEAR TERM)

A larger structure spanning the bankfull width should be installed.

Hardy Spring Brook under Clement Hill Road (HSB7)



Hardy Spring Brook under Clement Hill Road (HSB7)

Upstream



Downstream



Inlet



Outlet



Hardy Spring Brook under Bound Tree Road (HSB8)

GENERAL DESCRIPTION

This is a 5 foot diameter corrugated metal pipe, about 60 feet long, under Bound Tree Road. The stream is ponded on the upstream side and there is a 3 foot deep pool on the downstream side. The outlet is perched above the stream surface, 3 inches at the time of the survey under relatively high flow conditions. The culvert is generally in line with the stream channel and has a similar slope, but velocity is faster within the culvert. There is no natural substrate within the pipe. The bank and bank armoring at the downstream end of the culvert has eroded away, resulting in the culvert end being exposed and perched. There is some erosion and aggradation downstream of the structure.

IMPORTANCE FOR AQUATIC ORGANISM PASSAGE: HIGH

Hardy Spring Brook is in generally good condition with extensive wetlands and generally high quality fish and wildlife habitat within its watershed. It has a 3.5 square mile watershed and roughly 0.6 miles of perennial stream channel above this crossing.

AQUATIC ORGANISM PASSAGE CONDITION: POOR

The perched condition of the outlet probably prevents many aquatic species from passing through the structure much of the year. The condition is probably worse in low water.

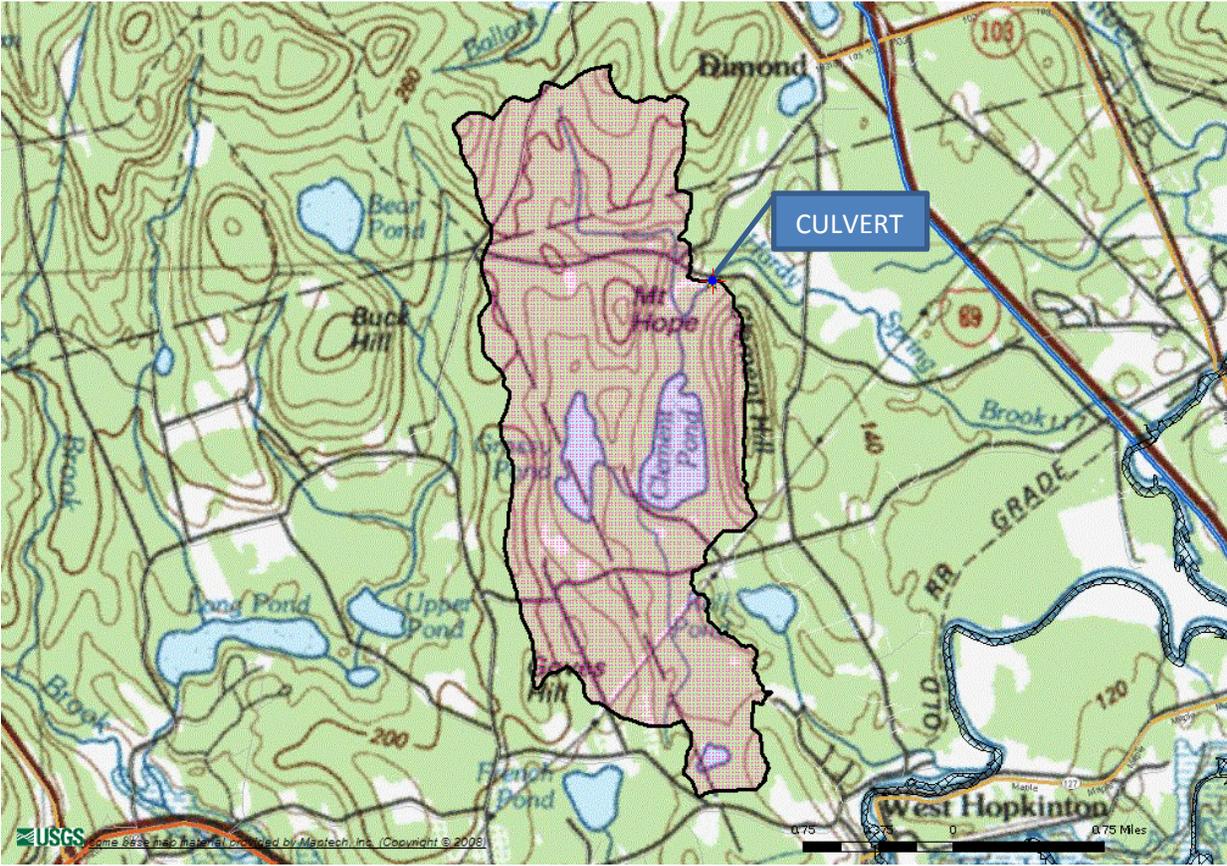
PRIORITY LEVEL FOR IMPROVEMENT: HIGH

The culvert is showing rust, there is erosion around the outlet, and the outlet is perched.

RECOMMENDATION: REPLACE (NEAR TERM)

A larger structure should be installed, but the impact on water levels in the upstream ponded area and swamp should be taken into consideration in planning and design.

Hardy Spring Brook under Bound Tree Road (HSB8)



Hardy Spring Brook under Bound Tree Road (HSB8)

Upstream



Downstream



Inlet



Outlet



Hardy Spring Brook Tributary under Camp Merrimac Road (HSB9)

GENERAL DESCRIPTION

At this location there is a large vegetated wetland south (upstream) of Camp Merrimac Road and Clement Pond north of the road. There are culverts under the road in three locations. Near the middle of the wetland/pond crossing, there are four black PVC pipes in a single stone headwall structure. These are fairly new and appear in good condition. There are two other structures further west, closer to the camp. Both are reinforced concrete pipes that appear to be intact. One has a grate over both inlet and outlet to prevent beavers from plugging the pipe. All of these culverts appear to function as equalizing culverts, i.e., they have little gradient and slow flow and most are below the water level on both ends. There are no defined stream channels on either side.

IMPORTANCE FOR AQUATIC ORGANISM PASSAGE: HIGH

The area contains important fish and wildlife resources, with extensive wetlands and uplands. The culvert separates a ponded area from a large pond. The watershed above the crossing is 1.9 square miles.

AQUATIC ORGANISM PASSAGE CONDITION: GOOD

The submerged condition of most inverts (pipe bottoms) suggests fish can pass through the culverts. The road is not heavily traveled so wildlife can presumably cross the road unimpeded.

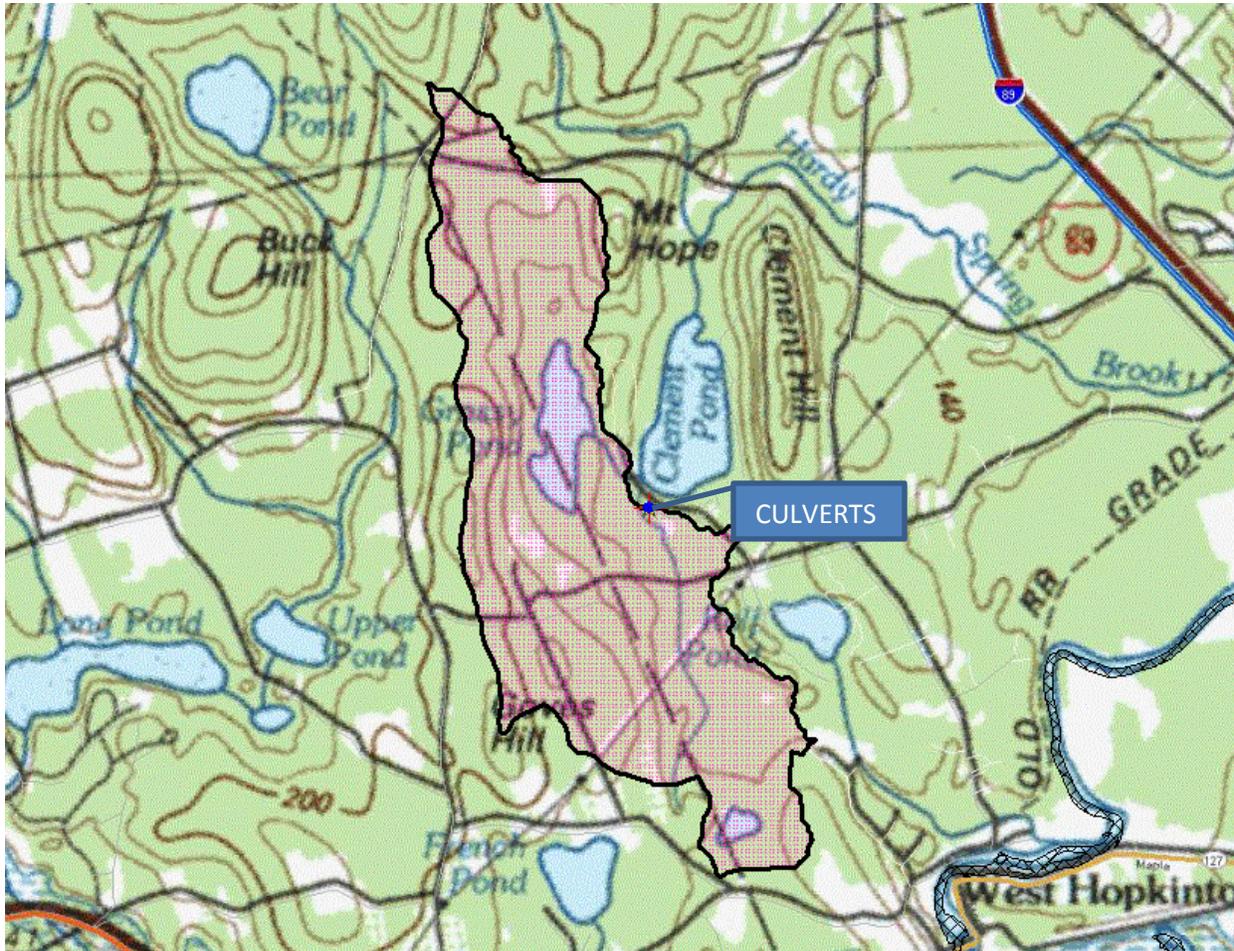
PRIORITY LEVEL FOR IMPROVEMENT: LOW

Most of the structures are fairly new and already provide for aquatic organism passage.

RECOMMENDATION: NO ACTION AT THIS TIME

When replacement of the structures is warranted in the future, particularly if the road becomes more heavily traveled, ways to accommodate wildlife under the road could be considered.

Hardy Spring Brook Tributary under Camp Merrimac Road (HSB9)



Hardy Spring Brook Tributary under Camp Merrimac Road (HSB9)

Upstream/Inlet (East Pipes)



Downstream (East Pipes)



Outlet (East Pipes)



Upstream/Inlet (Middle)



Downstream/Outlet (Middle)



Upstream/Inlet (West)



Downstream/Outlet (West)



Hardy Spring Brook Tributary under Pine Street (HSB10)

GENERAL DESCRIPTION

There are two two-foot diameter corrugated plastic culverts about 28 feet long under Pine Street at this location. Upstream is a large marshy pond. Downstream, there is a stream channel with a small pool at the pipe outlet. The outlets are perched about 9 inches above the stream surface. There is no natural substrate within the pipes. The bank and bank armoring are intact and the structures appear to be relatively recently constructed. There is sedimentation on the downstream side due to runoff from Pine Street.

IMPORTANCE FOR AQUATIC ORGANISM PASSAGE: MODERATE

The area contains important fish and wildlife resources, with extensive wetlands and uplands. The culvert separates a ponded area from a small perennial stream channel. The watershed above the crossing is only 0.6 square miles and lacks perennial stream channels.

AQUATIC ORGANISM PASSAGE CONDITION: POOR

The perched condition of the outlets prevents most if not all aquatic species from passing through the structures.

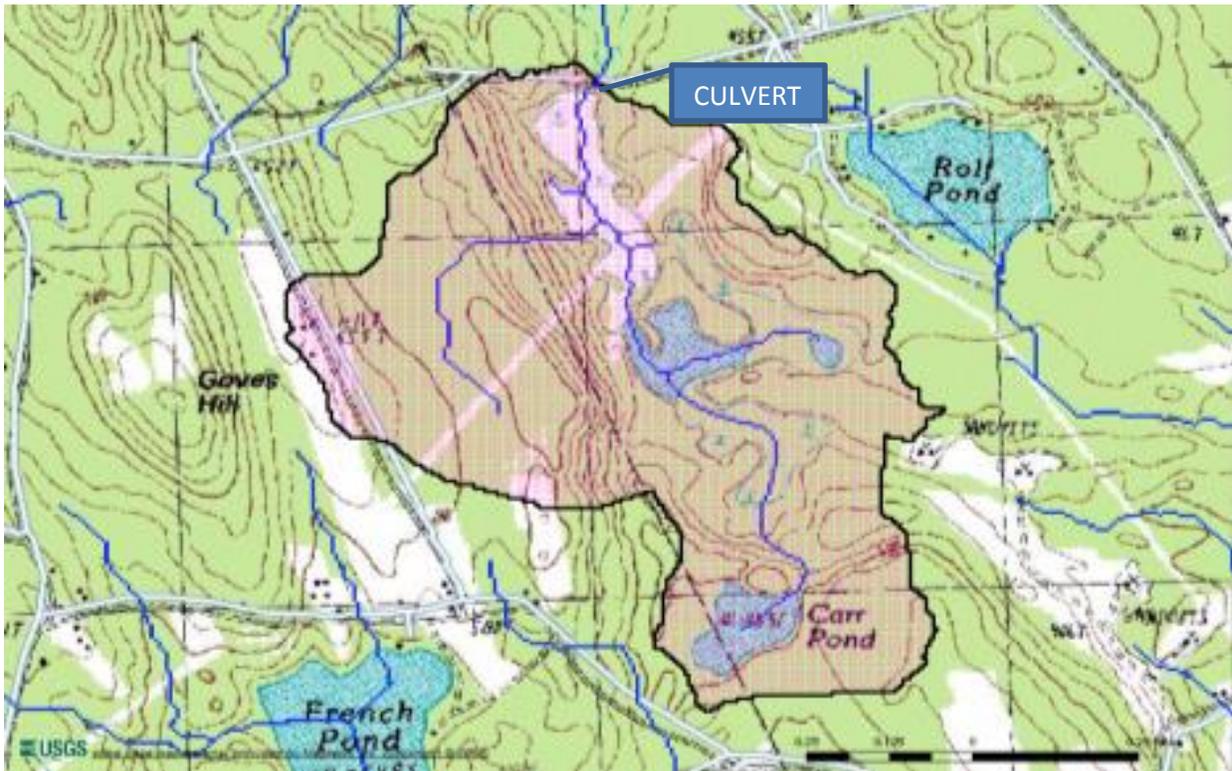
PRIORITY LEVEL FOR IMPROVEMENT: LOW

The structures are fairly new and it may be difficult to provide for fish passage while maintaining the pond's water elevation.

RECOMMENDATION: NO ACTION AT THIS TIME

When replacement of the structures is warranted in the future, ways to accommodate fish and wildlife under the road should be considered, but it may be difficult to improve on the existing structure.

Hardy Spring Brook Tributary under Pine Street (HSB10)



Hardy Spring Brook Tributary under Pine Street (HSB10)

Upstream



Downstream



Inlet



Outlet



Unnamed Stream (Tributary of Hardy Spring Brook) under Bound Tree Road (US1)

GENERAL DESCRIPTION

This is a 4 foot diameter corrugated metal pipe, about 50 feet long, carrying a tributary of Hardy Spring Brook under Bound Tree Road near the junction with Pleasant Lake Road. There is sedimentation from road runoff from the two roads, and as a result the upstream segment has multiple channels and there are sediments partially obstructing the inlet. The culvert has a similar slope and water depth as the stream, but the outlet is perched about 5 inches above the stream channel. There is a 2-foot deep pool at the outlet. There is no natural substrate within the pipe and the pipe is partially rusted. There is erosion around the outlet and some aggradation (gravel bar) downstream. The bank armoring is partially failing at both the inlet and outlet.

IMPORTANCE FOR AQUATIC ORGANISM PASSAGE: LOW

The stream is in generally good condition, but is small, with only a 0.9 square mile watershed, roughly 0.5 miles of perennial stream channel above this crossing and 0.4 miles of channel downstream. There are steep slopes upstream.

AQUATIC ORGANISM PASSAGE CONDITION: POOR

The perched condition of the outlet may prevent most aquatic species from passing through the structure. The pipe is much smaller than the bankfull width (about 12 feet).

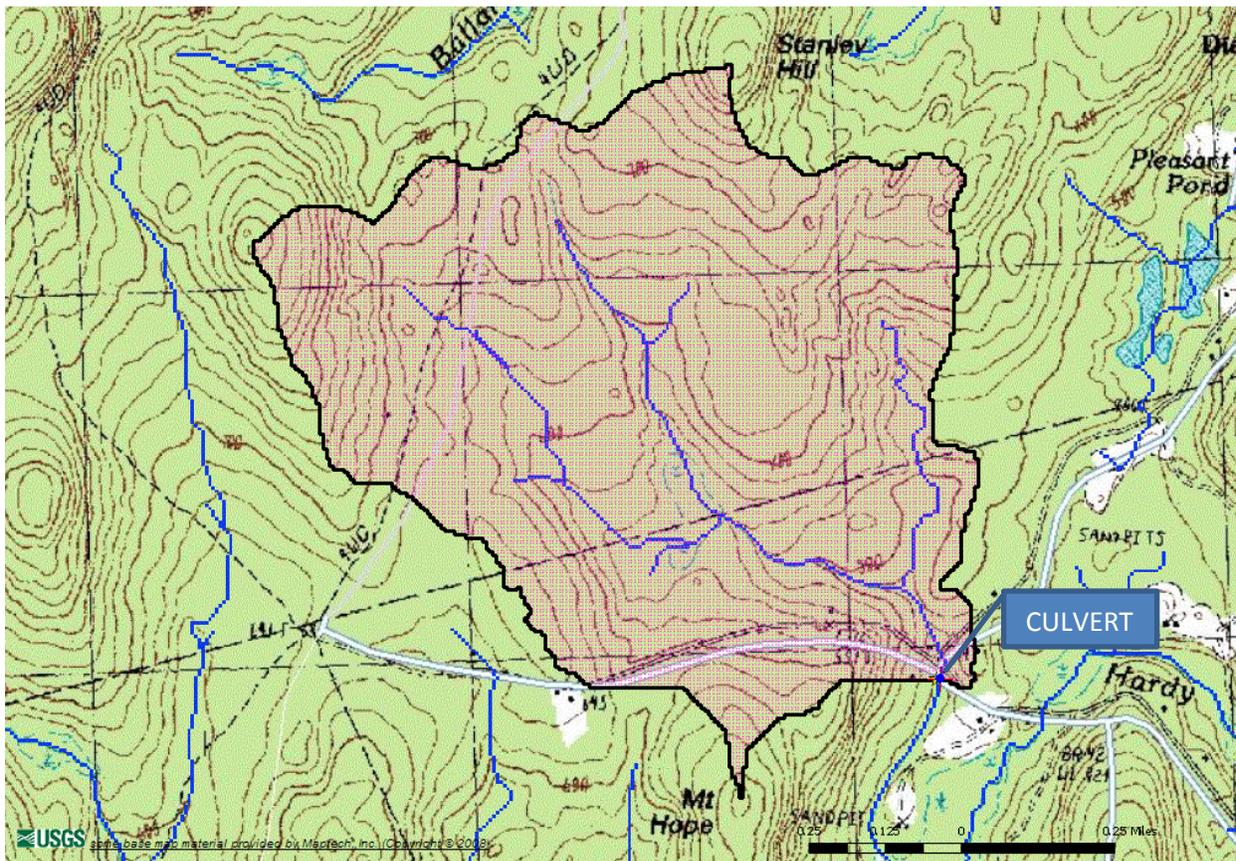
PRIORITY LEVEL FOR IMPROVEMENT: LOW

The culvert is showing rust, there is erosion around the outlet, and the outlet is perched.

RECOMMENDATION: REPLACE (LONG TERM)

When the culvert is due for replacement, a larger structure should be installed at stream grade.

Unnamed Stream (Tributary of Hardy Spring Brook) under Bound Tree Road (US1)



Unnamed Stream (Tributary of Hardy Spring Brook) under Bound Tree Road (US1)

Upstream



Downstream



Inlet



Outlet



Dolf Brook under Broad Cove Road (DB1)

GENERAL DESCRIPTION

This is a 10 foot wide, 6.5 feet high elliptical corrugated metal pipe, about 50 feet long, under Broad Cove Road. The stream is ponded both upstream and downstream of the road, and there is a beaver dam about 130 feet downstream. The culvert appears to be sound. There is about 4.5 feet of water depth and a cobble substrate within the pipe. The bank and bank armoring at both ends of the culvert are intact.

IMPORTANCE FOR AQUATIC ORGANISM PASSAGE: HIGH

Dolf Brook is in generally good condition, has intact, high quality fish and wildlife habitat along much of its length, and has a 6.3 square mile watershed above this crossing. Dolf Brook has approximately 5.0 miles of perennial stream channel total, with about 3.4 miles above this crossing and 1.7 miles of channel downstream.

AQUATIC ORGANISM PASSAGE CONDITION: GOOD

The culvert is relatively large and has plenty of water for most fish and other aquatic organisms. There is no provision for terrestrial organisms but the ponding on both sides of the road make this less favorable for terrestrial species.

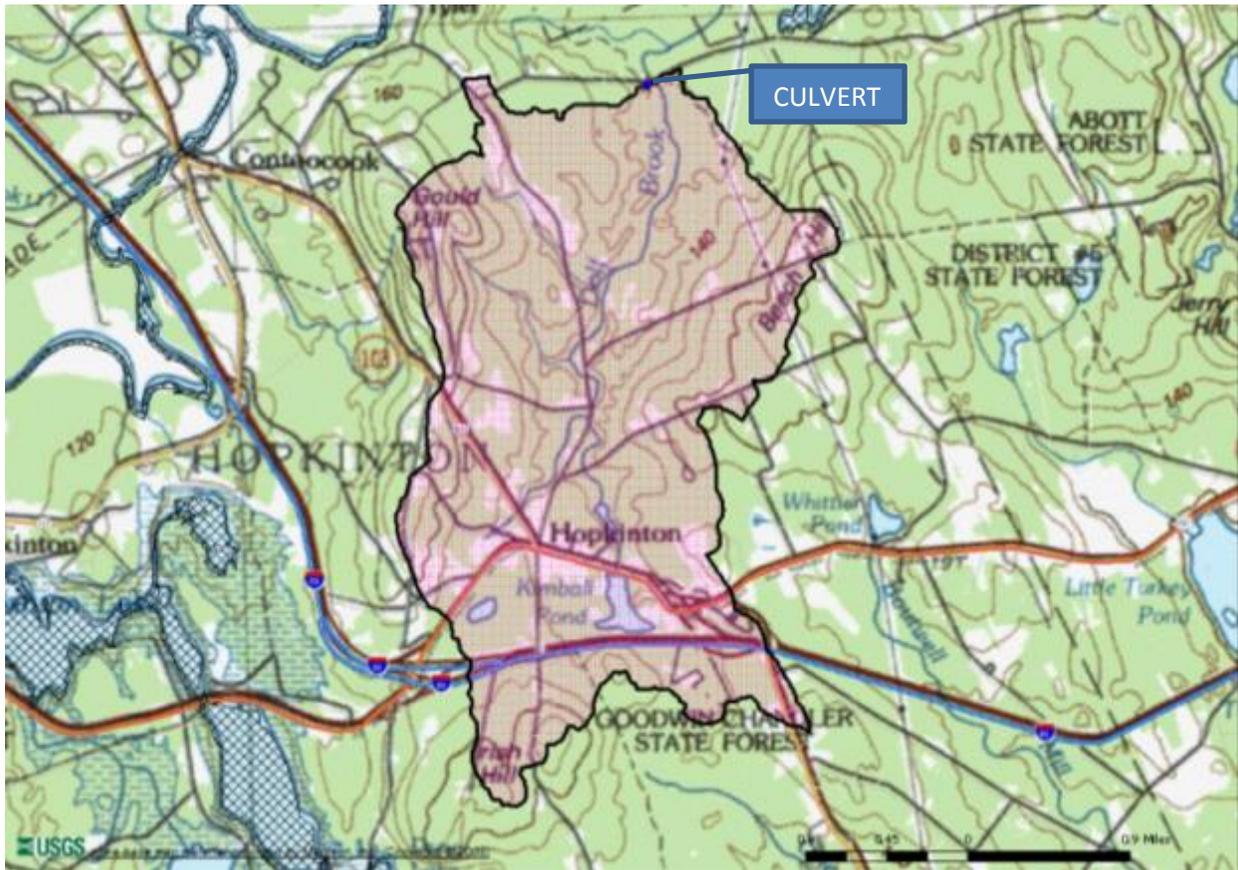
PRIORITY LEVEL FOR IMPROVEMENT: LOW

The culvert appears to be sound and currently allows aquatic organism passage.

RECOMMENDATION: NO ACTION

No improvements for aquatic organism passage are recommended at this time.

Dolf Brook under Broad Cove Road (DB1)



Dolf Brook under Broad Cove Road (DB1)

Upstream



Downstream



Inlet



Outlet



Dolf Brook under Briar Hill Road #1 (DB2)

GENERAL DESCRIPTION

This is a 6 foot diameter corrugated metal pipe, about 65 feet long, under Briar Hill Road north of Patch Road. The channel is sluggish here, with a sand and silt substrate. The culvert seems to have a similar slope, water depth and water velocity as the stream channel, and there was 2.2 feet of water and a sand/silt substrate within the pipe. There is rust on the lower half of the culvert. The bank and bank armoring at both ends of the culvert are intact. There is some sediment aggradation upstream and downstream.

IMPORTANCE FOR AQUATIC ORGANISM PASSAGE: HIGH

Dolf Brook is in generally good condition, has intact, high quality fish and wildlife habitat along much of its length, and has a 3.8 square mile watershed above this crossing. There is roughly 1.2 miles of perennial stream channel above this crossing and 3.9 miles of channel downstream.

AQUATIC ORGANISM PASSAGE CONDITION: MODERATE

The culvert appears to be much smaller than the bankfull width but sufficient water for most fish and other aquatic organisms. There is no provision for terrestrial organisms.

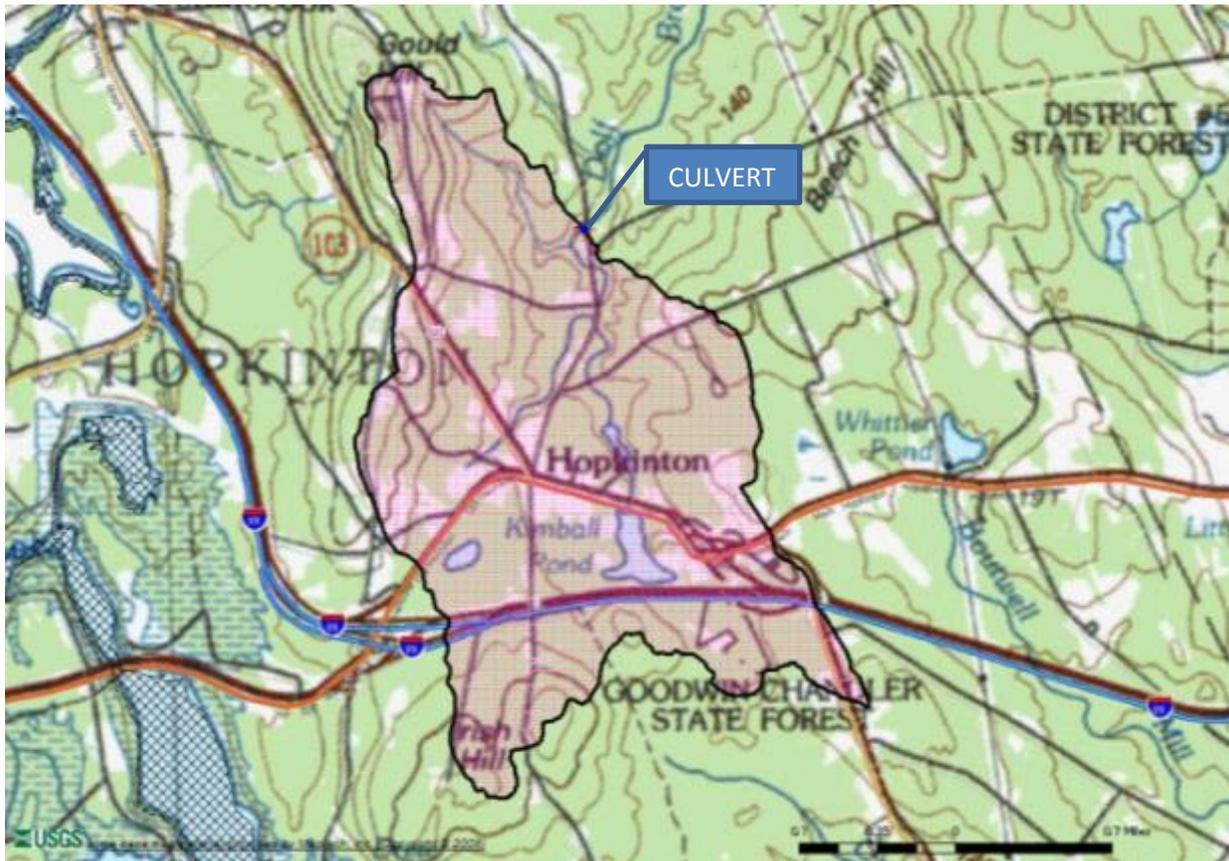
PRIORITY LEVEL FOR IMPROVEMENT: MEDIUM

The culvert currently allows aquatic organism passage but could be improved.

RECOMMENDATION: REPLACE (LONG TERM)

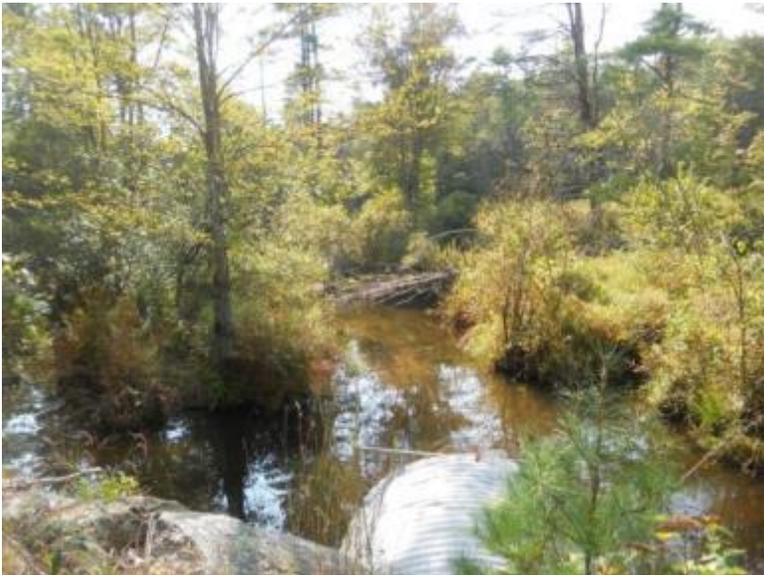
When replacement is warranted, a larger structure should be installed at stream grade.

Dolf Brook under Briar Hill Road #1 (DB2)



Dolf Brook under Briar Hill Road #1 (DB2)

Upstream



Downstream



Inlet



Outlet



Dolf Brook under Briar Hill Road #2 (DB3)

GENERAL DESCRIPTION

This is a 6 foot diameter, approximately 30 foot long concrete pipe under Briar Hill Road just south of Patch Road. The water velocity in the pipe is faster than the stream and there is no natural substrate in the pipe. There was 5 inches of water in the pipe and an outlet drop of 4 inches at the time of the visit. There is minor bank erosion both upstream and downstream, and erosion around the upstream wingwalls and the outlet. There is a deep pool on the downstream side.

IMPORTANCE FOR AQUATIC ORGANISM PASSAGE: HIGH

Dolf Brook upstream of this crossing is in generally good condition with intact fish and wildlife habitat and a 3.0 square mile upstream watershed. There is roughly 0.9 miles of perennial stream channel above this crossing and 4.1 miles of channel downstream.

AQUATIC ORGANISM PASSAGE CONDITION: POOR

The culvert appears to be smaller than the bankfull width (13 to 14 feet) and the outlet is perched, preventing passage of many fish and other aquatic organisms.

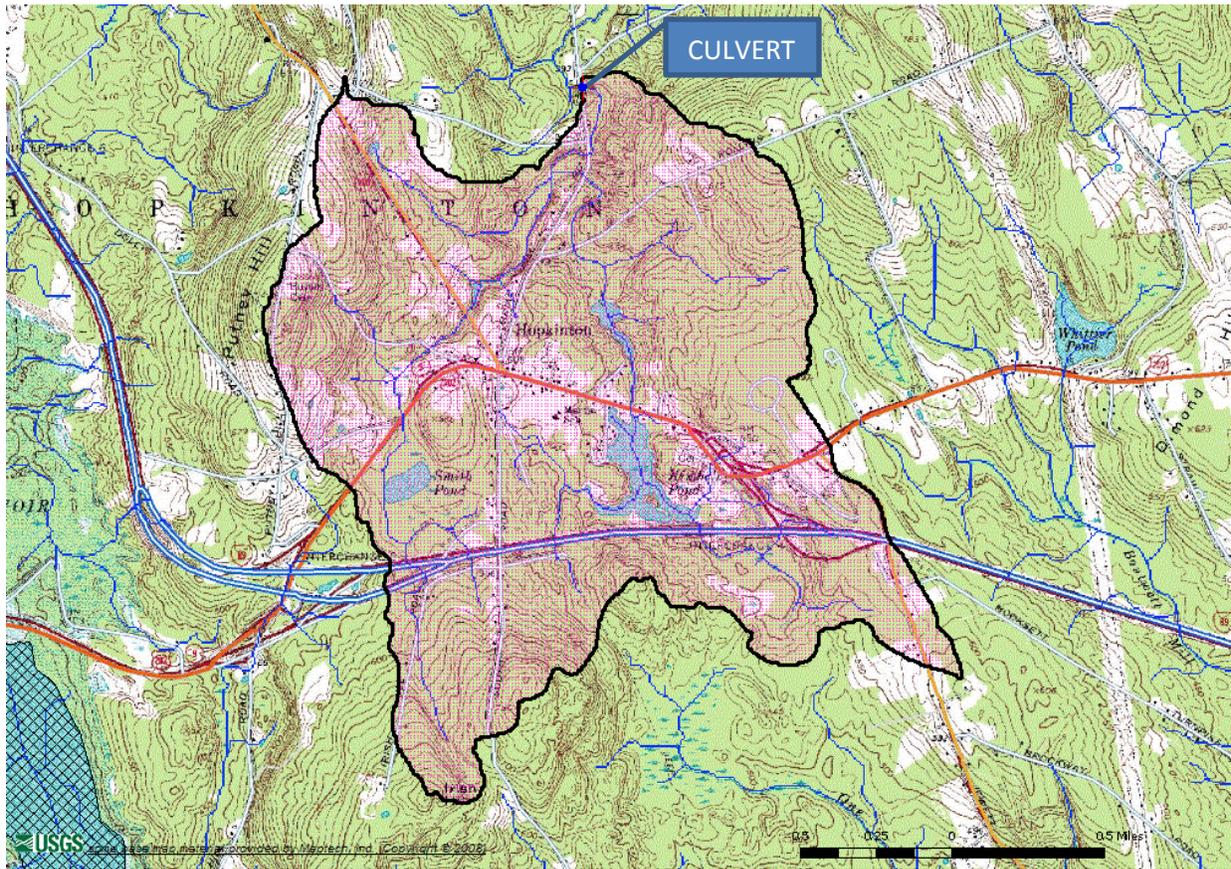
PRIORITY LEVEL FOR IMPROVEMENT: HIGH

The culvert has high potential but is currently in poor condition for aquatic organism passage.

RECOMMENDATION: REPLACE (NEAR TERM)

A larger structure should be installed at stream grade.

Dolf Brook under Briar Hill Road #2 (DB3)



Dolf Brook under Briar Hill Road #2 (DB3)

Upstream



Downstream



Inlet



Outlet



Dolf Brook under Briar Hill Road #3 (DB4)

GENERAL DESCRIPTION

This is a 6 foot diameter, approximately 70 foot long corrugated metal pipe under Briar Hill Road between Patch Road and Rollins Road. The pipe is at a steeper slope than the stream channel and the water is shallower and the velocity is faster in the pipe than the stream channel. There is no natural substrate in the pipe. There was 2 inches of water in the pipe and an outlet drop of 2 inches at the time of the visit. There is a 2.5-foot deep pool and minor bank erosion and aggradation downstream of the outlet, but the stone embankments on both ends of the pipe are intact.

IMPORTANCE FOR AQUATIC ORGANISM PASSAGE: HIGH

Dolf Brook upstream of this crossing is in generally good condition with intact fish and wildlife habitat and a 2.9 square mile watershed. There is only 0.6 miles of perennial stream channel above this crossing (4.4 miles of channel downstream).

AQUATIC ORGANISM PASSAGE CONDITION: POOR

The culvert is much smaller than the bankfull width (25 to 30 feet) and the outlet is slightly perched, preventing passage of many fish and other aquatic organisms.

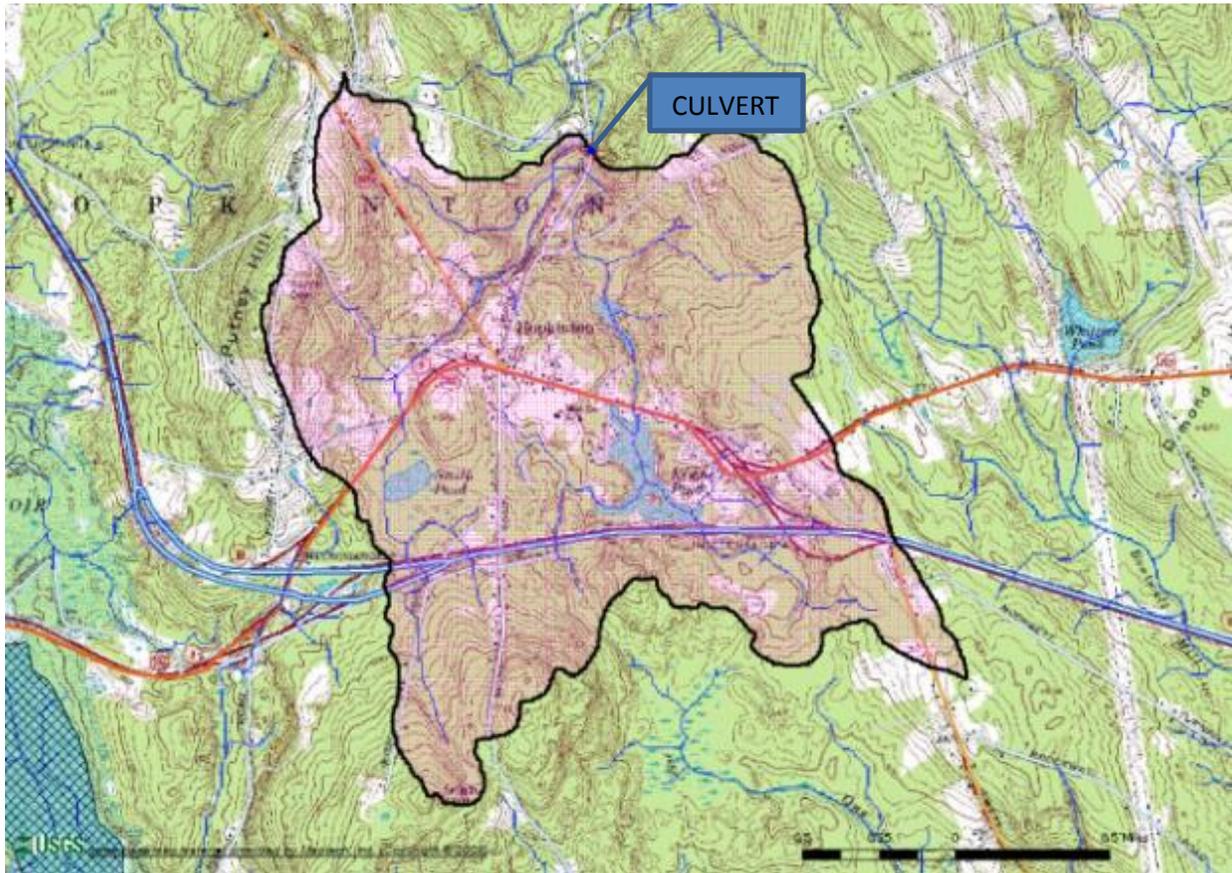
PRIORITY LEVEL FOR IMPROVEMENT: HIGH

The culvert has high potential but is currently in poor condition for aquatic organism passage.

RECOMMENDATION: REPLACE (NEAR TERM)

A larger structure should be installed at stream grade.

Dolf Brook under Briar Hill Road #3 (DB4)



Dolf Brook under Briar Hill Road #3 (DB4)

Upstream



Downstream



Inlet



Outlet



Dolf Brook under Briar Hill Road #4 (DB5)

GENERAL DESCRIPTION

This structure carries Dolf Brook, upstream of its confluence with Smith Brook and downstream of Kimball Pond, under Briar Hill Road north of the Rollins Road intersection. The upstream end of this culvert is an approximately 6 by 6 foot stone culvert and the downstream end is a round concrete pipe. The structure is about 60 feet long. The pipe is at a similar slope as the stream channel and the water depth and velocity are comparable as well. There is a gravel substrate in the stone box culvert but no natural substrate in the concrete pipe. There is a 2-foot deep pool below the outlet along with substantial bank erosion and aggradation, but the upstream stone embankment is intact.

IMPORTANCE FOR AQUATIC ORGANISM PASSAGE: LOW

Dolf Brook at this crossing is a relatively small perennial stream with a 1.7 square mile watershed and roughly 0.3 miles of perennial stream channel upstream. Kimball Pond and Kimball Lake are both upstream and both have outlet structures that may inhibit fish and other organism passage.

AQUATIC ORGANISM PASSAGE CONDITION: POOR

The culvert is smaller than the bankfull width (15 feet) and the pipe is steeper and shallower than the stream channel, preventing passage of many fish and other aquatic organisms during times of low stream flow.

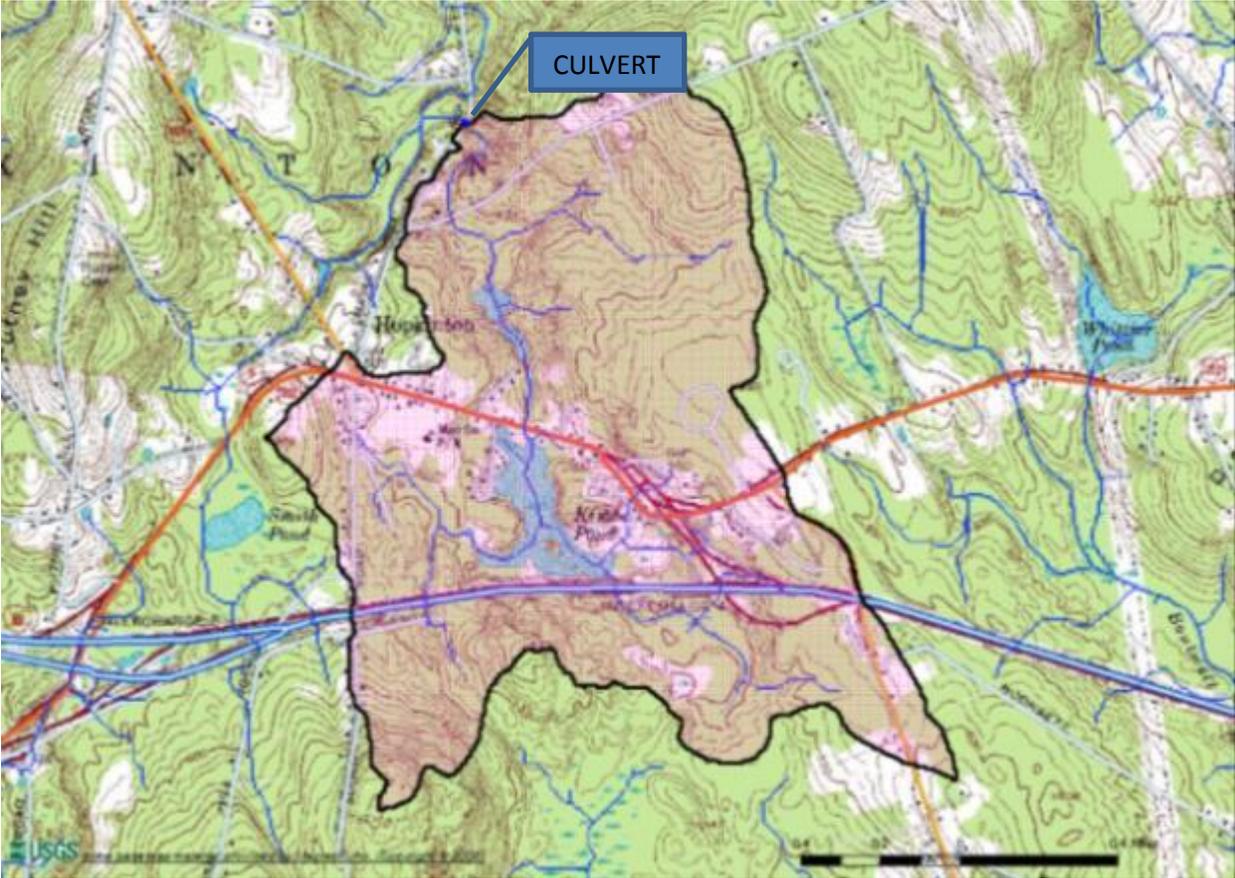
PRIORITY LEVEL FOR IMPROVEMENT: LOW

The stream is not a high priority for aquatic organism passage.

RECOMMENDATION: REPLACE (LONG TERM)

A larger structure should be installed at stream grade when the structure is due for replacement.

Dolf Brook under Briar Hill Road #4 (DB5)



Dolf Brook under Briar Hill Road #4 (DB5)

Upstream



Downstream



Outlet



Inlet



Dolf Brook under Rollins Road (DB6)

GENERAL DESCRIPTION

This is a 5-foot diameter corrugated metal pipe carrying Dolf Brook under Rollins Road east of the entrance to the Kimball Pond swimming area. The structure is about 65 feet long. The upstream side is a shallow, ponded and marshy area with evidence of beaver activity and a grate over the inlet. The downstream side cascades to a perennial stream channel. The slope of the culvert is steeper than the bottom of the marshy area, but less steep than the downstream channel. The water in the pipe is shallower and swifter than the downstream channel. There is no natural substrate within the culvert. There is a 7-inch drop from the outlet to the stream channel and a 3-foot deep pool below the outlet.

IMPORTANCE FOR AQUATIC ORGANISM PASSAGE: LOW

This is a relatively small perennial stream with a 1.7 square mile watershed. There are large ponds and wetlands upstream, including Kimball Pond and Kimball Lake, which have outlet structures that may inhibit fish and other organism passage. There appears to be little perennial stream channel upstream of this culvert.

AQUATIC ORGANISM PASSAGE CONDITION: POOR

The culvert outlet is perched above the stream channel, the pipe is smaller than the bankfull width (20 feet) and flow within the pipe is swifter and shallower than the stream channel, preventing passage of many fish and other aquatic organisms.

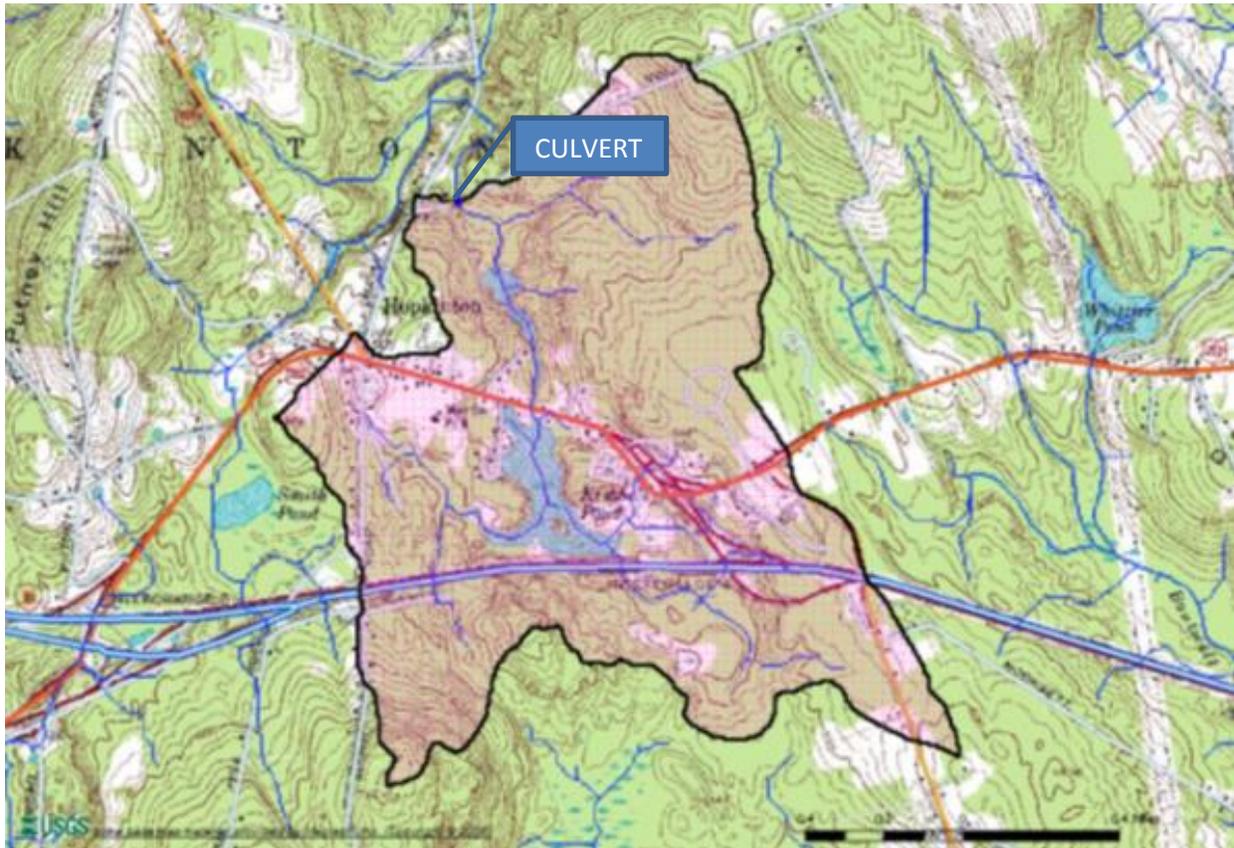
PRIORITY LEVEL FOR IMPROVEMENT: LOW

The stream is not a high priority stream for aquatic organism passage.

RECOMMENDATION: REPLACE (LONG TERM)

A larger structure could be installed at stream grade when the structure is due for replacement, but any changes should take effects on the upstream ponded area into consideration.

Dolf Brook under Rollins Road (DB6)



Dolf Brook under Rollins Road (DB6)

Upstream



Downstream



Inlet



Outlet



One Stack Brook under Jewett Road (OSB)

GENERAL DESCRIPTION

This is a 6 by 6 foot concrete box culvert, about 40 feet long, carrying One Stack Brook under Jewett Road. The slope of the culvert is lower than the stream and the water depth was shallower (1 inch) at the time of the survey. There is no natural substrate within the culvert. There is a 2-inch drop from the outlet to the stream channel and a 3-foot deep pool below the outlet.

IMPORTANCE FOR AQUATIC ORGANISM PASSAGE: HIGH

This is a fairly small perennial stream with a 2.7 square mile watershed. There are extensive wetlands and high quality, intact fish and wildlife habitat both upstream and downstream of the crossing. There is only about 0.5 miles of perennial stream channel, mostly downstream of the crossing. Electrofishing conducted in 2008 from 70 meters downstream to 20 meters upstream of the culvert yielded warm water species, including brown bullhead, common sunfish, eastern chain pickerel, golden shiner, and yellow perch.

AQUATIC ORGANISM PASSAGE CONDITION: POOR

The water depth within the culvert is shallow and the outlet is slightly perched above the stream channel, probably inhibiting the passage of many fish and other aquatic organisms.

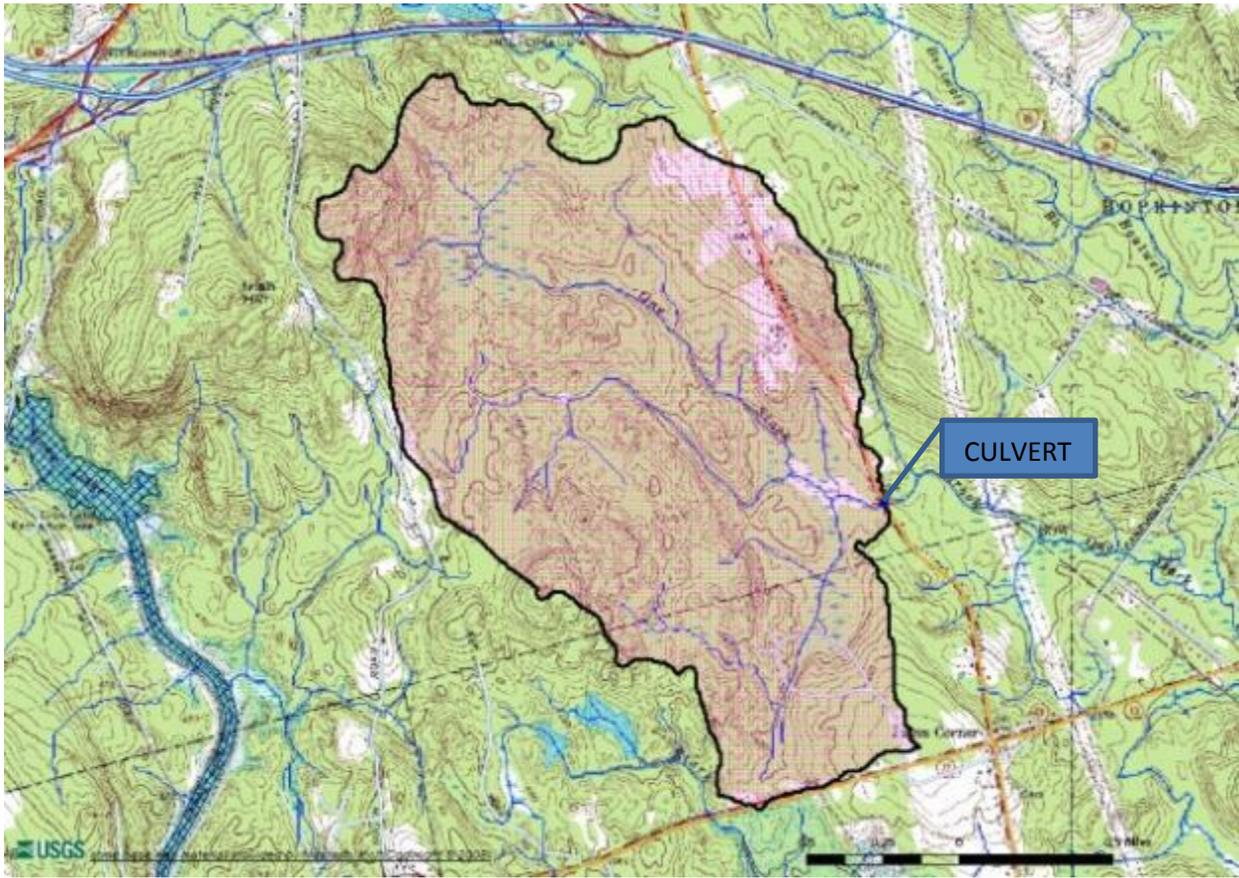
PRIORITY LEVEL FOR IMPROVEMENT: HIGH

The stream is a high priority for aquatic organism passage.

RECOMMENDATION: REPLACE (NEAR TERM)

A larger structure should be installed at stream grade as opportunities arise.

One Stack Brook under Jewett Road (OSB)



One Stack Brook under Jewett Road (OSB)

Upstream



Downstream



Inlet



Outlet



Boutwell Mill Brook under Hooksett Turnpike (BMB1)

GENERAL DESCRIPTION

This concrete box culvert is a new structure that is 8 feet wide by 4 feet tall and approximately 35 feet long. It is under Hooksett Turnpike a short way downstream of the culvert under Stickney Road (BMB2). The structure is in new condition, is in line with the stream channel, and matches the stream slope and depth. It has a sand substrate. There is a small amount of erosion upstream, and a pool and aggradation (sediment deposition) downstream.

IMPORTANCE FOR AQUATIC ORGANISM PASSAGE: HIGH

Boutwell Mill Brook is in generally good condition and has high quality fish and wildlife habitat along much of its length. It has a 3.6 square mile watershed and 3.0 miles of perennial stream channel above this crossing (1.2 miles downstream). It crosses under both I-89 and Routes 202/9 upstream.

AQUATIC ORGANISM PASSAGE CONDITION: EXCELLENT

There is no impediment to aquatic organism passage, although the crossing was not observed in unusually low water conditions.

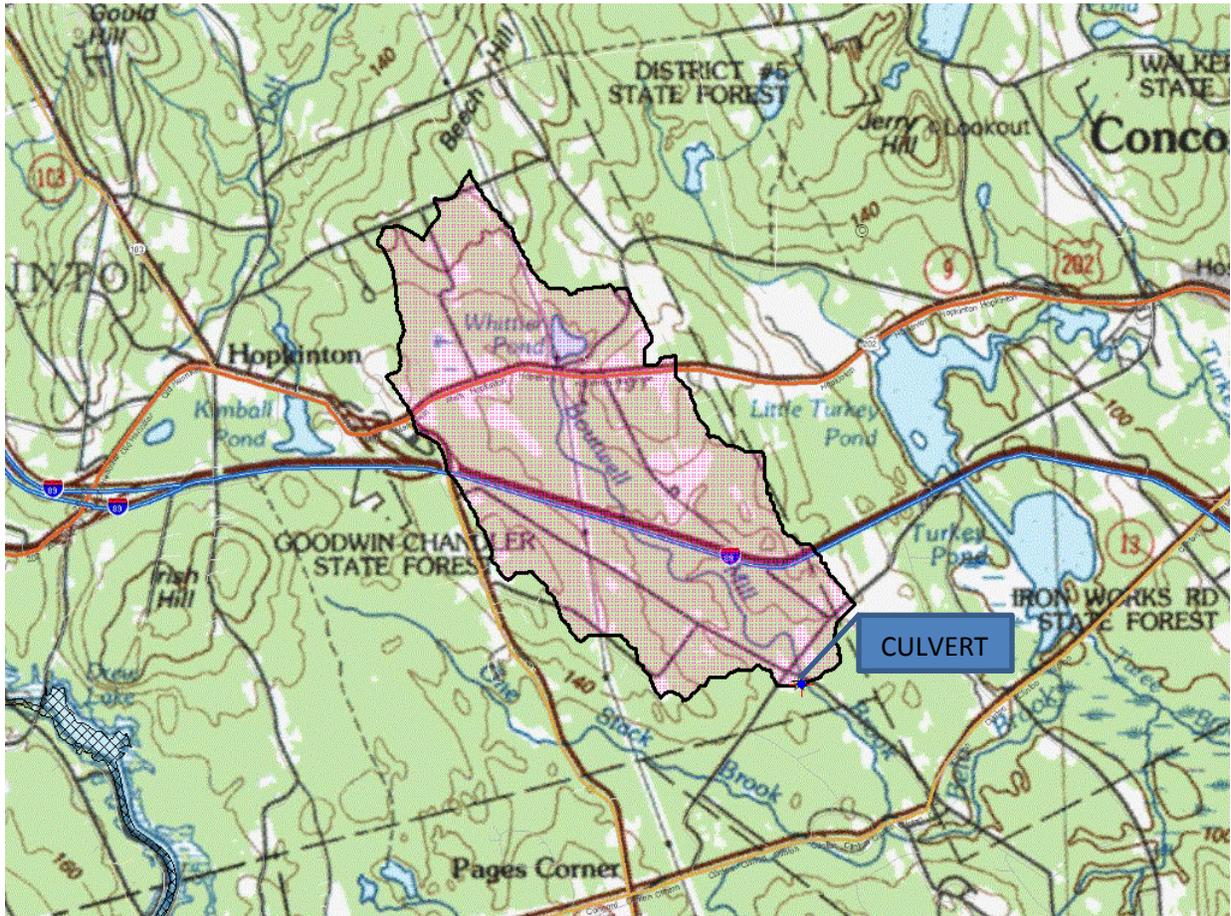
PRIORITY LEVEL FOR IMPROVEMENT: LOW

The culvert is new and already appears to allow fish and other organism passage.

RECOMMENDATION: NO ACTION

No action is recommended except for maintenance of existing conditions.

Boutwell Mill Brook under Hooksett Turnpike (BMB1)



Boutwell Mill Brook under Hooksett Turnpike (BMB1)

Upstream



Downstream



Inlet



Outlet



Boutwell Mill Brook under Stickney Road (BMB2)

GENERAL DESCRIPTION

This corrugated metal pipe is 10 feet wide by 7.5 feet high and approximately 70 feet long. It is under Stickney Road a short way upstream of the culvert under Hooksett Turnpike. The structure appears to be in good condition and has a sand and gravel substrate. It is in line with the stream channel and matches the stream slope and depth. There is some bank undercutting upstream and some sediment deposition downstream.

IMPORTANCE FOR AQUATIC ORGANISM PASSAGE: HIGH

Boutwell Mill Brook is in generally good condition and has high quality fish and wildlife habitat along much of its length. It has a 3.4 square mile watershed and 2.9 miles of perennial stream channel above this crossing (1.3 miles downstream). I-89 and Routes 202/9 (upstream) and Route 13 (downstream) all pass through its watershed.

AQUATIC ORGANISM PASSAGE CONDITION: EXCELLENT

There is no impediment to aquatic organism passage, although the crossing was not observed in unusually low water conditions.

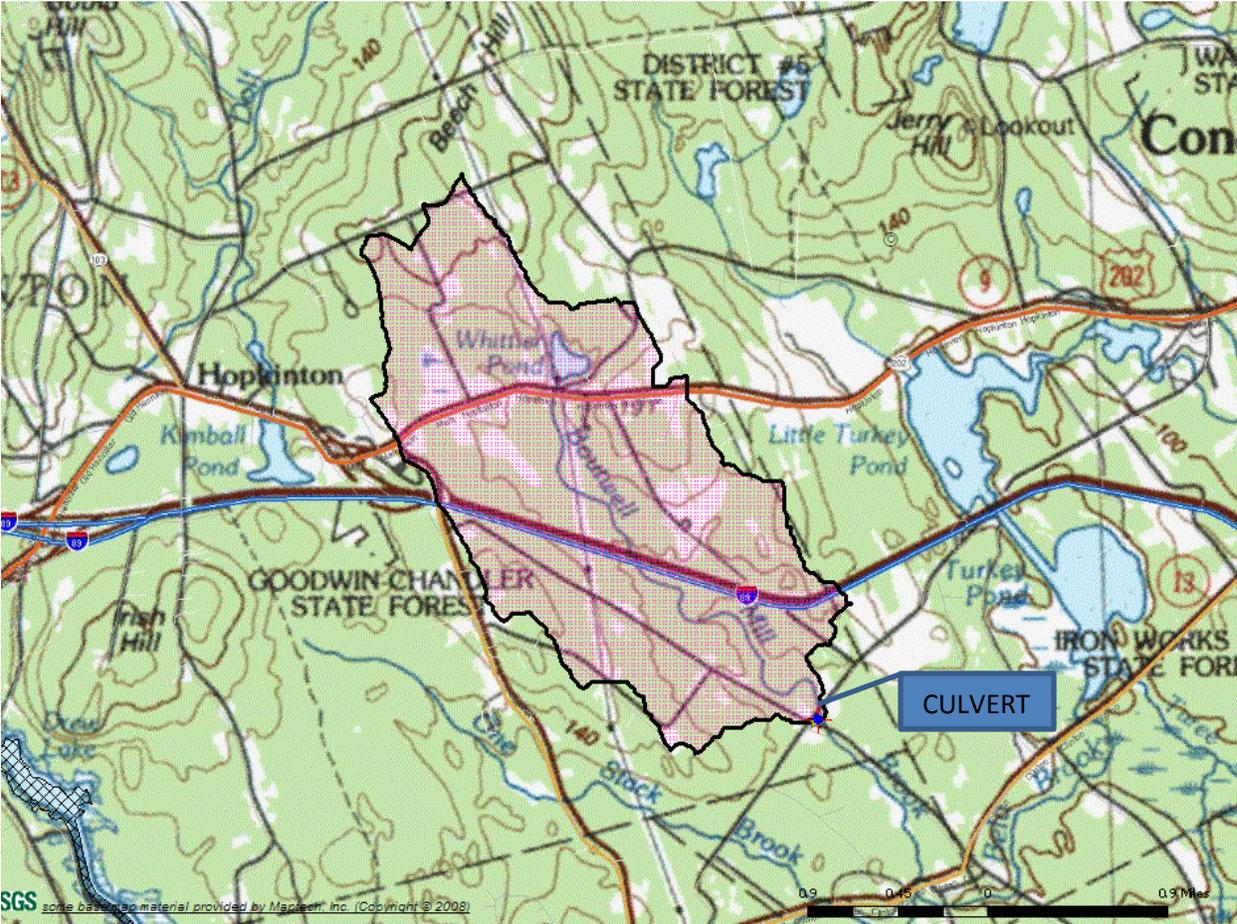
PRIORITY LEVEL FOR IMPROVEMENT: LOW

The culvert appears to be sound and to allow fish and other organism passage.

RECOMMENDATION: NO ACTION

No action is recommended except for maintenance of existing conditions.

Boutwell Mill Brook under Stickney Road (BMB2)



Boutwell Mill Brook under Stickney Road (BMB2)

Upstream



Downstream



Inlet



Outlet



