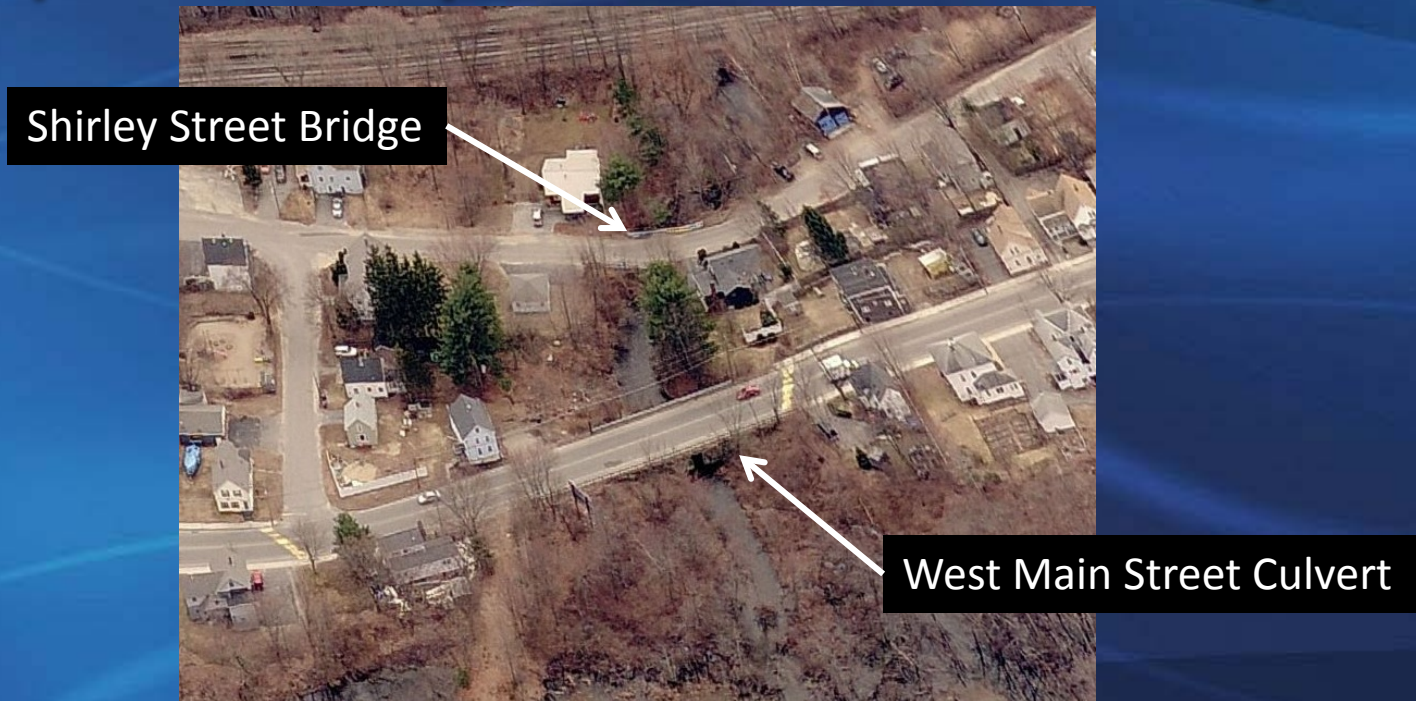


Shirley Street/ West Main Street Culvert Capital Improvement Project



Ayer Department of Public Works
January 2016

Existing Conditions – Shirley Street Bridge

- Open-Bottom style culvert carrying Shirley Street over Nonacoicus Brook
 - Maximum span is approximately 11.5 feet
 - Width approximately 34 feet
 - Stone abutments with jack-arch concrete deck
- Nonacoicus Brook is fed by Grove and Plow Shop Ponds and flows downstream to the Nashua River



Existing Conditions – Shirley Street Bridge

- Summer 2014 – Bridge closed after two washouts from heavy rain
- April 27, 2015 - MassDOT conducts Field Inspection in accordance with National Bridge Inspection Standards (NBIS)

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION										PAGE 1 OF 16	
STRUCTURES INSPECTION FIELD REPORT								BR. DEPT. NO.			
INITIAL ROUTINE INSPECTION								A-19-015			
2-DIST 03	B.I.N. 7QV	CITY/TOWN AYER		8-STRUCTURE NO. A19015-7QV-MUN-BRI	11-Kilo. POINT 000.000	41-STATUS K-CLOSED	90-ROUTINE INSP. DATE APR 27, 2015				
97-FACILITY CARRIED HWY SHIRLEY ST		MEMORIAL NAME/LOCAL NAME		25-YR BUILT 1850	100-YR REBUILT 1900	YR REHAB'D (NCR 100) 0000					
96-FEATURES INTERSECTED WATER NONACOCUS BROOK		26-FUNCTIONAL CLASS Urban Local		98-INSPECTOR ENGINEER [Signature]							
43-STRUCTURE TYPE 302 : Steel Stringer/Girder		22-OWNER Town		21-MAINTAINER Town Agency		23-TEAM LEADER Z. G. [Signature]					
107-DECK TYPE 1 : Concrete Cast-in-Place		WEATHER Cloudy		TEMP. (deg) 17°C		TEAM MEMBERS D. SIMKHOVICH [Signature]					
ITEM 58 DECK		ITEM 59 SUPERSTRUCTURE		ITEM 60 SUBSTRUCTURE		ITEM 61 PILLS					
1. Wearing surface		1. Stringers		1. Abutments		1. Piers or Bents					
2. Deck Condition		2. Floorbeams		a. Pedestals		a. Pile Caps					
3. Stay in place forms		3. Floor System Bracing		b. Bridge Seats		b. Piles					
4. Curbs		4. Girders or Beams		c. Backfills		c. Diagonal Bracing					
5. Median		5. Trusses - General		d. Breastwalls		d. Horizontal Bracing					
6. Sidewalks		a. Upper Chords		e. Minors		e. Fasteners					
7. Parapets		b. Lower Chords		f. Shape Paving/Slip-Res		f. Paving					
8. Railing		c. Web Members		g. Painting		g. Feeding					
9. Anti Missile Fence		d. Lateral Bracing		h. Piles		h. Scour					
10. Drainage System		e. Sway Bracing		i. Settlement		i. Settlement					
11. Lighting Standards		f. Portals		j. Settlement		j. Settlement					
12. Utilities		g. End Posts		k. Settlement		k. Settlement					
13. Deck Joints		6. Pin & Hangers		l. Settlement		l. Settlement					
14. Deck		7. Conn Plt's, Gussets & Angles		m. Settlement		m. Settlement					
15. Deck		8. Cover Plates		n. Settlement		n. Settlement					
16. Deck		9. Bearing Devices		o. Settlement		o. Settlement					
CURB REVEAL		10. Diaphragms/Cross Frames		p. Settlement		p. Settlement					
(in millimeters)		11. Rivets & Bolts		q. Settlement		q. Settlement					
N S		12. Welds		r. Settlement		r. Settlement					
N N		13. Member Alignment		s. Settlement		s. Settlement					
APPROACHES		14. Paint/Coating		t. Settlement		t. Settlement					
a. Appr. pavement condition		15. Year Painted		u. Settlement		u. Settlement					
1 C-H-A		N		v. Settlement		v. Settlement					
b. Appr. Roadway Settlement		COLLISION DAMAGE: Please explain		w. Settlement		w. Settlement					
1 C-H-A		None (X) Minor Moderate Severe		x. Settlement		x. Settlement					
c. Appr. Sidewalk Settlement		LOAD DEFLECTION: Please explain		y. Settlement		y. Settlement					
N -		None (X) Minor Moderate Severe		z. Settlement		z. Settlement					
d. Appr. Sidewalk Settlement		LOAD VIBRATION: Please explain		aa. Settlement		aa. Settlement					
N -		None (X) Minor Moderate Severe		ab. Settlement		ab. Settlement					
OVERHEAD SIGNS		Any Fracture Critical Member: (Y/N)		ac. Settlement		ac. Settlement					
(Attached to bridge)		N		ad. Settlement		ad. Settlement					
a. Condition of Voids		Any Cracks: (Y/N)		ae. Settlement		ae. Settlement					
N -		N		af. Settlement		af. Settlement					
b. Condition of Bolts				ag. Settlement		ag. Settlement					
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Existing Conditions – Shirley Street Bridge

- Summary of MassDOT Inspection Results:
 - Culvert is in poor-to-severe condition
 - Cracking, breakup, and heavy settlement throughout wearing surface
 - Up to 100% Section loss on bottom flange of north and south beams, varying section loss throughout all webs and bottom flanges of jack-arch
 - All walls contain varying degrees of voids, missing stones, loss of fill, and stability concerns
 - Northeast retaining wall is very unstable – shifted outward up to 18-inches from normal alignment
 - Severe embankment erosion on all four corners of the bridge except the northwest corner

Existing Conditions – Shirley Street Bridge

- Photos



Severe Hazard: 100% Section Loss in all stay-in-place forms,
severe spalling to concrete deck where visible

Existing Conditions – Shirley Street Bridge

- Photos



Severe Hazard: Severe concrete deterioration and separation
on southeast retaining wall

Existing Conditions – Shirley Street Bridge

- Photos



Severe Hazard: Separation of the retaining wall and large voids at the northeast corner of the bridge

Existing Conditions – Shirley Street Bridge

- Photos



Critical Hazard: Outward displacement at the east end of the northeast retaining wall

Existing Conditions – Shirley Street Bridge

- Photos



Critical Hazard: Hole in northeast retaining wall below the collapsed embankment

Existing Conditions – Shirley Street Bridge

- Photos



Critical Hazard: Severe cracking, moderate breakup and heavy settlement throughout the east approach pavement

Existing Conditions – West Main Street Culvert

- Open-Bottom style culvert carrying West Main Street over Nonacoicus Brook
 - Span varies from 7 to 10 feet
 - Width approximately 52 feet
 - Stone abutments with railroad rail supported deck
 - Serves approximately 8,000 vehicles per day
- Approximately 130-feet downstream of Shirley Street Bridge



Existing Conditions – West Main Street Culvert

- August 13, 2015 – Hoyle, Tanner & Associates, Inc. (HTA) conduct Field Inspection in accordance with National Bridge Inspection Standards (NBIS)

October 1, 2015

Mr. Mark Wetzel, P.E.
Superintendent – Public Works Department
Town of Ayer
25 Brook Street
Ayer, MA 01432

**Hoyle, Tanner
& Associates, Inc.**
159 Dow Street
Manchester, New Hampshire 03101
603-669-5555
603-669-4168 Fax
www.hoyletanner.com

Re: West Main Street over Nonacocus Brook
Culvert Evaluation Report
Hoyle, Tanner Project No. 923501

Dear Mr. Wetzel:

Hoyle, Tanner & Associates, Inc. (Hoyle, Tanner) herein submits this Letter Report presenting our findings and recommendations for the above referenced culvert in accordance with our Agreement dated July 24, 2015.

Existing Conditions

The open-bottom culvert carrying West Main Street over Nonacocus Brook is located in the western portion of the Town of Ayer, approximately 0.6 miles east of the Devens, MA town line, and approximately 0.4 miles west of the Mill Street & Park Street intersection with West Main Street. The original construction date of the culvert is unknown, and no construction plans or drawings of the culvert were available. The culvert is comprised of a concrete slab deck supported by steel railroad rails which bear on stone masonry sidewalls. The culvert opening, or span length, varies from 7 to 10 feet wide and the total culvert length is approximately 52 feet. The culvert carries two lanes of traffic, a sidewalk, and multiple utilities. Nonacocus Brook is fed by Grove Pond and Plow Shop Pond and it reaches the confluence with the Nashua River approximately one mile downstream of the culvert. The roadway over the culvert is open to traffic; however, the nearby Shirley Street culvert is currently closed to traffic.



Looking Downstream at Culvert

Prior to the site visit discussed herein, Hoyle, Tanner and Associates (Hoyle, Tanner) team members reviewed the Department of Public Works's Preliminary Inspection Memorandum dated July 2, 2015 and the Department's Presentation to the Ayer Board of Selectmen dated July 14, 2015. A brief meeting was held with Superintendent, Mark Wetzel, P.E. and Town Engineer, Dan Van Schalkowky, P.E. prior to the field investigation to discuss the culvert and to gather any additional available information pertinent to the inspection.

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Existing Conditions – West Main Street Culvert

- HTA Inspection Results:

- Culvert is in poor-to-severe condition
- Inlet and wingwalls suffer from scour and erosion
- Culvert is not aligned with brook, causing scour conditions
- Numerous utility penetrations and inconsistent masonry repairs are compromising the sidewalls
- Absence of mortar in certain areas is leading to movement of masonry stones
- Concrete patching (parging) is deteriorating and failing

Existing Conditions – West Main Street Culvert

- Photos



Masonry Crack on East Sidewall

Existing Conditions – West Main Street Culvert

- Photos



Concrete Facing Failure on East Sidewall

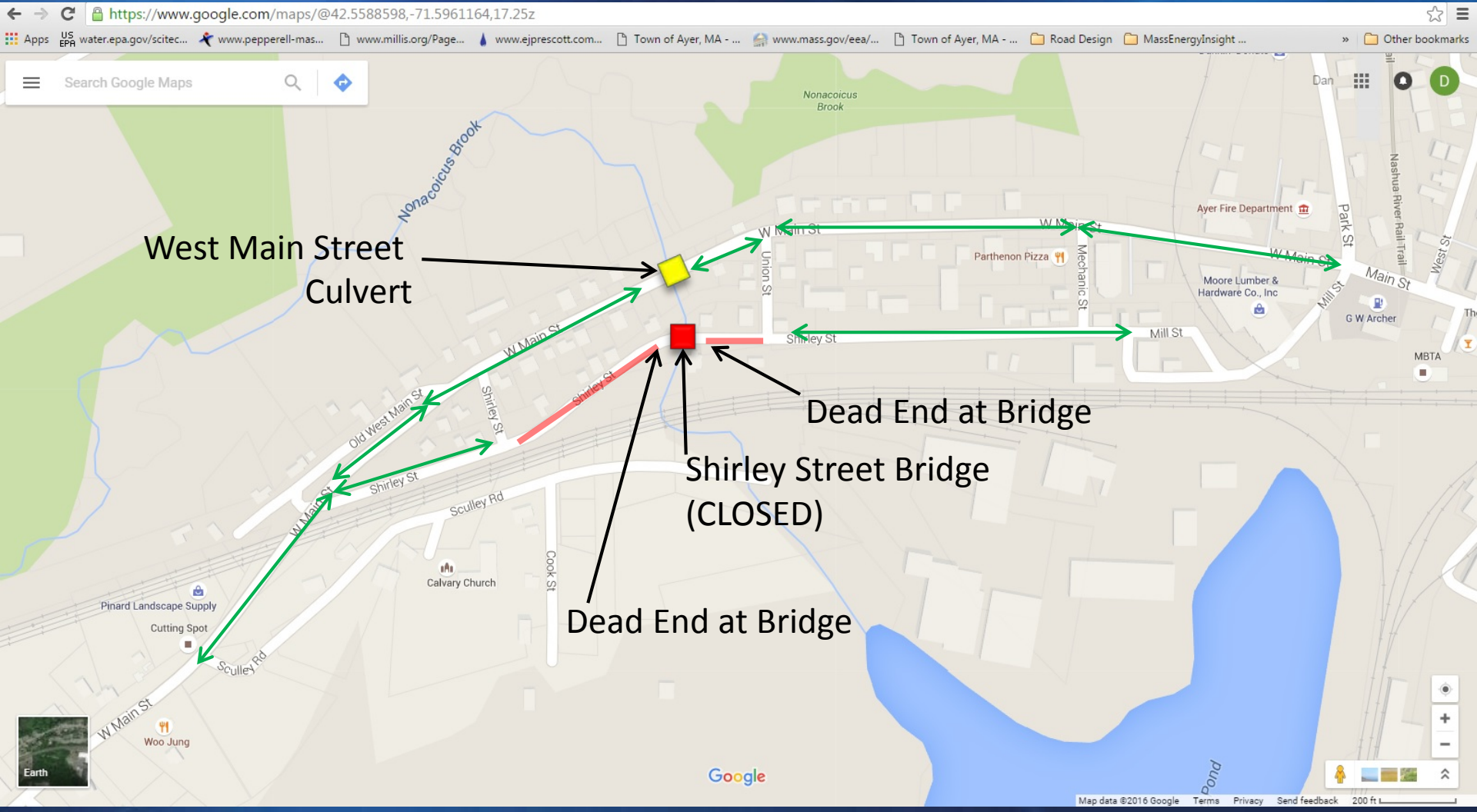
Existing Conditions – West Main Street Culvert

- Photos

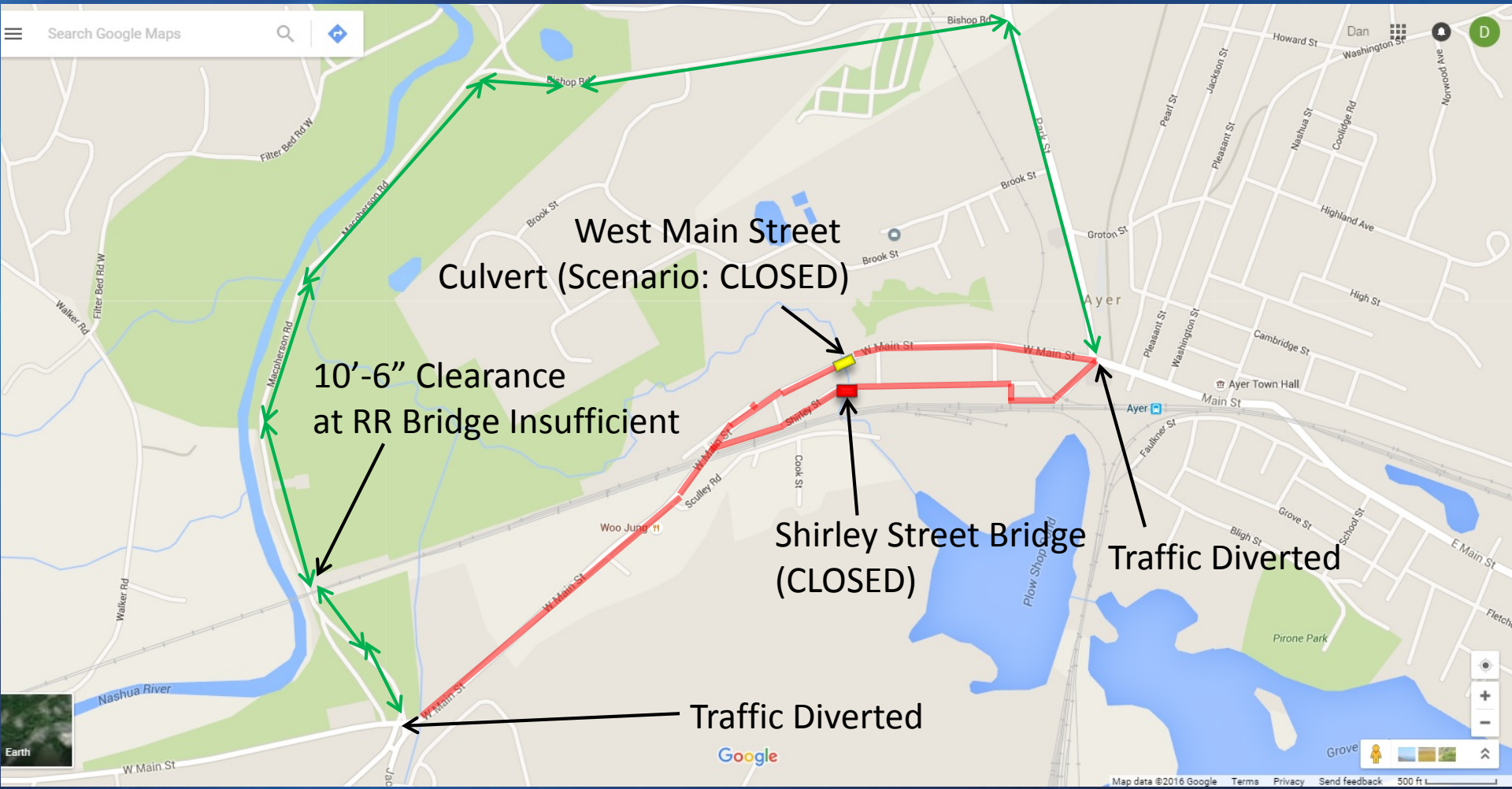


Southeast Wingwall Degradation

Traffic Management/Emergency Access - Existing



Traffic Management/Emergency Access – Scenario: West Main St Culvert Closed



Issues – Traffic

Management/Emergency Access

- If both Shirley Street Bridge and West Main Street Culvert are closed:
 - Traffic diverted to Macpherson Road
 - Insufficient vehicle clearance on Macpherson Road for public safety vehicles and other tall vehicles
 - Macpherson Road has issues with flooding
 - Vehicles that do not meet clearance of Macpherson Road would likely divert to Barnum Road and through Devens

In Summary

- Both bridges are deficient and near the end of their useful lives
- Replacement of the West Main Street Culvert is vital for local traffic, residents and public safety vehicle access to the west side of Town
- Replacement would be more costly under emergency conditions

Capital Planning Committee

- DPW presentation to Capital Planning Committee resulted in several questions regarding temporary bridges, time required to replace, design alternatives, costs, etc.
- Committee recommended the DPW hire a consulting engineer to evaluate alternatives and begin design
- CPC voted to recommend BOS vote to authorize use of \$100,000 of UDAG funds for engineering of this project.

Thank You

Dan Van Schalkwyk, P.E.
Town Engineer
Ayer Department of Public Works
dvanschalkwyk@ayer.ma.us