Project Report

Piscataquog River Watershed Culvert Prioritization Model

Piscataquog River Watershed, New Hampshire
December 9, 2016

MILONE & MACBROOM
Engineering | Planning | Landscape Architecture | Environmental Science

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MMI #4040-02

ACKNOWLEDGEMENTS

This project was funded by the New Hampshire Department of Transportation and administered by the Southern New Hampshire Planning Commission. We thank the project technical advisory committee for their thoughtful guidance and reviews of the model. We also would like to thank the three pilot towns – Francestown, Goffstown, and Weare – for their participation in model development. We thank the following people for their work on this project.

Jamie Pike, Town Administrator, Town of Francestown
Adam Jacobs, Director of Public Works, Town of Goffstown
Naomi Bolton, Town Administrator, Town of Weare
Timothy Mallette, NH Department of Transportation
Shane Csiki, NH Geological Survey
Cheryl Bondi, NH Geological Survey
John Magee, NH Fish & Game Department
Melinda Bubier, NH Department of Environmental Services
Steve Couture, NH Department of Environmental Services
Heather Dunkerley, NH Homeland Security and Emergency Management
Colin Lawson, Trout Unlimited
Gabe Bolin, Trout Unlimited
Dick Ludders, Piscataquog River Local Advisory Committee
Peter Steckler, The Nature Conservancy
Bette Nowack, Stone Environmental
Denise Burchsted, Keene State College
Tom Ballestero, University of New Hampshire

EXECUTIVE SUMMARY

Milone & MacBroom (MMI) and the Southern New Hampshire Planning Commission (SNHPC), with assistance from the New Hampshire Department of Transportation (NHDOT), New Hampshire Department of Environmental Services (NHDES), Trout Unlimited (TU), New Hampshire Geological Survey (NHGS), New Hampshire Division of Homeland Security and Emergency Management, and others have developed a decision-making screening tool to aid communities in the Piscataquog River Watershed to select priority culvert replacement and stream crossing restorations. The new model draws on existing data and prioritizes culverts for replacement to improve flood resiliency and reconnect aquatic habitat. The model will aid communities in considering funding choices and grant opportunities when replacing priority culverts before they are damaged or washed out in a storm.

The model is a spreadsheet and map screening tool for prioritizing the replacement of culverts based on the following data:

1. **GC** – How well a culvert matches the stream channel (i.e., geomorphic compatibility);
2. **STR** – Structural condition and approximate hydraulic capacity;
3. **AOP** – Aquatic organism passage and habitat reconnection potential; and
4. **C** – How important the culvert is to the transportation network (i.e., criticality).

The model determines a risk (**R**) score based on the combination of GC, STR, and C. Structures are ranked and prioritized for replacement by the risk score. For example, if GC, STR, and C are all scored as high; than R is high and the priority level is 1 (highest). The model was developed to have flexible inputs ranging from general state database inputs to local information on specific structures.

The model was developed with input from the state and three pilot towns – Fancestown, Goffstown, and Weare. Maps and lists were provided to the Towns showing them the results of the culvert prioritization. The maps assimilate many data sources into one location to simplify interpretation of results and facilitate decision-making. The Towns will have access to the model spreadsheet should they choose to track culvert risk and changes electronically. Concept designs were prepared for the highest priority culvert in each of the pilot Towns.

The culvert screening model has many uses for municipalities and state agencies to reduce flood risks and improve the resiliency of the transportation system. Municipalities can plan for a more flood resilient local road network. The model enhances capital improvement planning and budgeting to target high risk locations first. The model can also provide a framework for local asset management. State agencies can use the model to inform the SADES management system. The model can be used to assist ranking and scoring priority replacement project for grant proposals. This model has the potential to serve as a template for the state to evaluate culverts and prioritize replacement of high risk culverts.

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1.0 INTRODUCTION

1.1 Background

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The new model draws on existing data and prioritizes culverts for replacement to improve flood resiliency and reconnect aquatic habitat. The model will aid communities in considering funding choices and grant opportunities when replacing priority culverts before they are damaged or washed out in a storm.

The model was developed based on a review and analysis of the scientific literature of important processes at crossing structures, existing culvert screening tools for structural geomorphic compatibility and aquatic organism passage, existing design guidelines, and previous work performed by MMI in developing culvert screening methods throughout the region.

This report summarizes the model development; the results of a pilot study in the three towns of Francestown, Goffstown, and Weare; and results for each town in the watershed where assessed culverts exist. A user guide accompanies this report that defines each variable used in the model, describes the model spreadsheet, and provides guidance on how to interpret the results of the model.

1.2 Uses and Benefits

The culvert screening model has many uses for municipalities and state agencies to reduce flood risks and improve the resiliency of the transportation system.

- Municipalities
  - Allows planning for a more flood resilient local road network
  - Screening and planning tool that informs governing boards and confirms local knowledge and experience
  - Enhances capital improvement planning and budgeting to target high risk locations first
  - Provides framework for local asset management
  - Provides data for hazard mitigation plan updates
  - Helps secure funding for culvert replacements

- State agencies
    - Information for SADES management systems
    - Assist agencies in ranking and scoring grant proposals
    - Identify sources of funding for culvert replacement such as Department of Transportation, Fish & Game, Wetlands (aquatic resource mitigation funds); and Department of Safety (FEMA hazard mitigation funding)
    - Potential template for the state to evaluate culverts and prioritize replacement of high risk culverts

2.0 METHODS

2.1 Model Overview

The Piscataquog River Watershed Culvert Prioritization Model is a spreadsheet and map screening tool for prioritizing the replacement of culverts based on the following data:

5. **GC** – How well a culvert matches the stream channel (i.e., geomorphic compatibility);
6. **STR** – Structural condition and approximate hydraulic capacity;
7. **AOP** – Aquatic organism passage and habitat reconnection potential; and
8. **C** – How important the culvert is to the transportation network (i.e., criticality).

The model generally runs on the following existing data:

- **Data Level 1** – State and regional GIS data (e.g., road network lines, traffic count data, proximity to public safety buildings);
- **Data Level 2** – Watershed and regional assessment data and GIS analysis (e.g., structure geomorphic assessment, approximate hydraulic capacity model, amount of habitat reconnected if aquatic organism passage is restored);
- **Data Level 3** – Local data (e.g., poor condition culverts, highly critical culverts).

The model determines a risk (**R**) score based on the combination of GC, STR, and C. Structures are ranked by the risk score. For example, if GC, STR, and C are all scored as high; than R is high and the priority level is 1 (highest).

The model also calculates a combined data level score based on the scale of data for each culvert (as identified above). The data level score allows the user to know the scale and quality of the date used to score and prioritize each culvert. The data level score is used as a sub-rank where culverts with a given risk score are prioritized higher with a higher level of data.

The model is a Microsoft Excel spreadsheet called 'Piscataquog Culvert Screening Tool'.

2.2 Data Sources

Most of the data used in the model exist from prior studies in the watershed or in existing databases.

The geomorphic compatibility (GC) data describe how a culvert matches the stream channel. GC data sources include:

- The width of the structure divided by the width of the bankfull channel expressed as a percent (%); and
- The results of a stream crossing assessment and inventory with data quality control review performed by NHGS at NHDES that includes assessment dates, location information for each structure (town, road, stream, latitude and longitude), geomorphic and steam characteristics, and the results of the New Hampshire Geomorphic Compatibility Screen (After Schiff et al., 2008);

The structural condition and approximate hydraulic capacity (STR) data describe the assessed condition of the structure and estimate how much flow the culvert can pass through. STR data sources include:

- Structural condition as assessed in the field by NHDES, NHGS, and other partners;
- The Piscataquog River Watershed Stream Crossing Vulnerability Assessment (TU and SNHPC, 2014) that shows how full a culvert is during the 2, 10, 25, 50, and 100-year floods.

The aquatic organism passage variable (AOP) describes if a fish or other aquatic organism can pass through the culvert. AOP data sources include:

- The results of the New Hampshire Aquatic Organism Passage Screen conducted by TU and SNHPC (TU and SNHPC, 2012);
- The results of a GIS habitat fragmentation analysis using the Barrier Assessment Tool (Hornby, 2008; TNC, 2010) to calculate the potential length of habitat made available to species located in the stream network if the barrier was removed.
- A local ranking of coldwater fish habitat in the Piscataquog River Watershed as identified by NHFG.

The criticality variable (C) describes how important the culvert and road are to the operation of the transportation system. C data sources include:

- Road highway tier and functional system information provided by NHDOT;
- Traffic count data from the state; and
- Local data on culvert and road importance.

2.1 Variables in the Model

Each variable was scored “HIGH”, “MODERATE”, or “LOW” based on the highest level of data available and displayed in a pie-shaped icon (Figure 2-1). This flexible approach allows for a model score to be calculated with varying levels / scales of data available. A “HIGH” (red) score indicates a culvert that should be prioritized for replacement based on the given variable, whereas a “LOW” (blue) score indicates a culvert with a lesser

need for replacement. The variable data level scores were summed to get a combined data level score for each structure. A high data level has a score between 6 and 8 while a low data level has a score between 2 and 4.

Culvert Scoring System (V.7)

Variable	Data Level 1 (Watershed and Regional Data)	Data Level 2 (Additional Regional Data)	Data Level 3 (Local Data)
GC	% Bankfull Width	NH Geomorphic Compatibility Screen (NHGS)	None
STR	Structural Condition (TU/SNHPC/NHGS)	+ Approximate Hydraulic Capacity (TU/SNHPC)	Local Data Indicating Poor Condition, Known to Cause Flooding, or Frequently Damaged
AOP	NH Aquatic Organism Passage Screen (TU/SNHPC)	+ Habitat Gain	+ Fisheries Prioritization (NHFG)
C	NHDOT Highway Tiers + Proximity to Public Safety	+ Average Annual Daily Traffic (AADT) (NHDOT)	Local Data on Critical Links, Floodprone Structures, etc.

Data Level Score = Sum of Variable Data Levels Used in the Risk Screen
6 to 8 = High ; 5 = Moderate; 2 to 4 = Low

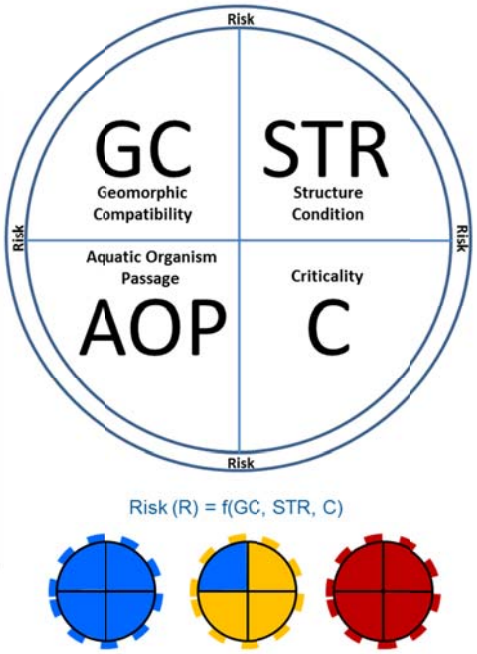


Figure 2-1: Culvert Scoring System

2.1.1 Geomorphic Compatibility (GC)

The GC variable indicates how a culvert matches a stream channel. The Level 1 data scores the culverts hydraulic width as a percent of the streams bankfull width. A culvert with a hydraulic width less than 75% of the bankfull channel width is scored "HIGH" (red), a culvert with a hydraulic width greater than or equal to 75% and less than 85% is scored "MODERATE" (orange), and a culvert with a hydraulic width greater than 85% of the streams bankfull width is scored "LOW" (blue) (Table 2-2).

Table 2-2: GC Level 1 Data Scoring

% of BFW	Score
Less Than 75%	
Greater Than 75% and Less Than 85%	
Greater Than 85%	

The Level 2 GC data are the results of the New Hampshire geomorphic compatibility screen as provided by NHGS. Results of "Fully incompatible" and "Mostly incompatible" were scored as "HIGH", "Partially compatible" scored as "MODERATE", and "Mostly

compatible" and "Fully compatible" scored as "LOW" (Table 2-3). Simplifying the GC score from five to three categories was performed for consistency and ease of interpretation. The GC score is displayed in the upper left quadrant of the display icon.

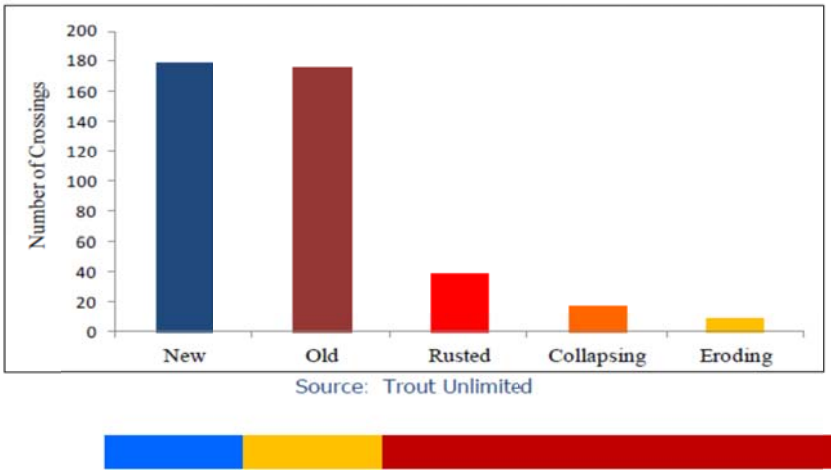
Table 2-3: GC Level 2 Data Scoring

Category Name	Screen Score	Threshold Conditions	Description of structure-channel geomorphic compatibility
Fully compatible	20<GC≤25	n/a	Structure fully compatible with natural channel form and process. There is a low risk of failure. No replacement anticipated over the lifetime of the structure. A similar structure is recommended when replacement is needed.
Mostly compatible	15<GC≤20	n/a	Structure mostly compatible with current channel form and process. There is a low risk of failure. No replacement anticipated over the lifetime of the structure. Minor design adjustments recommended when replacement is needed to make fully compatible.
Partially compatible	10<GC≤15	n/a	Structure compatible with either current form or process, but not both. Compatibility likely short term. There is a moderate risk of structure failure and replacement may be needed. Re-design suggested to improve geomorphic compatibility.
Mostly incompatible	5<GC≤10	% Bankfull Width + Approach Angle scores ≤ 2	Structure mostly incompatible with current form and process, with a moderate to high risk of structure failure. Re-design and replacement planning should be initiated to improve geomorphic compatibility.
Fully incompatible	0≤GC≤5	% Bankfull Width + Approach Angle scores ≤ 2 **AND** Sediment Continuity + Erosion and Armoring scores ≤ 2	Structure fully incompatible with channel and high risk of failure. Re-design and replacement should be performed as soon as possible to improve geomorphic compatibility.

2.1.2 Structural Condition and Approximate Hydraulic Capacity (STR)

The STR variable includes an indicator of the structural condition of a variable from field observations. Each assessed culvert is rated as "New", "Old", "Rusted", "Collapsing", or "Eroding" (REF: NH DOT). For the Level 1 screen, "New" culverts were scored "LOW", "Old" culverts were scored "MODERATE", and "Rusted", "Collapsing" and "Eroding" culverts were scored "HIGH" (Table 2-4).

Table 2-4: STR Level 1 Data Scoring (TU and SNHPC, 2012)



The Level 2 data combines the structural condition observations with approximate hydraulic capacity (TU and SNHPC, 2014). Culvert capacities were classified as passing (Hw/D < 0.85), transitional (0.85 < Hw/D < 1.0), or failing (Hw/D >1.0) for the modeled 2-, 10-, 25-, 50-, and 100-year floods

Since new structures are generally more resilient to floods than old or damaged structures, scoring for hydraulic capacity was scaled by condition (Table 2-5).

Table 2-5: STR Level 2 Data Scoring

NEW CONDITION

	Approximate Hydraulic Capacity		
Flood	**Pass**	**Transition**	**Fail**
(RI year)	**Hw/D<0.85**	**0.85-1.15**	**>1.15**
2	L	H	H
10	L	H	H
25	L	M	H
50	L	M	M
100	L	M	M

OLD, RUSTED, COLLAPSING, or ERODING

	Approximate Hydraulic Capacity		
Flood	**Pass**	**Transition**	**Fail**
(RI year)	**Hw/D<0.85**	**0.85-1.15**	**>1.15**
2	L	H	H
10	L	H	H
25	L	H	H
50	L	H	H
100	L	M	H

The Level 3 screen functions as an override based on local information provided by municipalities through NHGS interviews or recent discussions. If a municipality indicates that a culvert is in poor condition, is a known cause of flooding, or is frequently damaged, than it is scored as “HIGH” (red) (Table 2-6). The STR score is displayed in the upper right quadrant of the display icon.

Table 2-6: STR Level 3 Data Scoring

Possible Local Variables	Score
Known poor condition	
Known cause of flooding	
Frequently Damaged	
NHDOT Redlist Bridge (for culvert with D > 10 feet)	

2.1.3 Criticality (C)

The C variable is an indicator of the criticality of a structure, or its importance to a communities' transportation network. The Level 1 data is the NHDOT Highway Tier at the culvert (Table 2-7). Interstates, Turnpikes, and Divided Highways (Tier 1), Statewide Corridors (Tier 2), Regional Transportation Corridors (Tier 3) pass over culverts and were scored "HIGH". Culverts with Local Connectors (Tier 4) and Local Roads identified as minor collectors, major collectors, or minor arterials (Tier 5a) over them were scored "MODERATE". Culverts carrying all other Local Roads (Tier 5b), Off Network roads (Tier 6) and roads not assigned a Tier were scored "LOW".

Culverts within a half mile of public safety facilities (police, fire, hospitals, schools), as determined from GIS, were scored "HIGH". Culverts between 0.5 and 1 mile of public safety facilities were scored "MODERATE". The proximity to public safety data was used as an override so it replaced road tier scoring when a higher score was identified.

Table 2-7: C Level 1 Data Scoring

NHDOT Highway Tiers	Score	Total Length (Miles)	Percent
0 - Private, Not maintained		132.0	19.7%
Tier 1 – Interstates, Turnpikes, and Divided Highways		0.5	0.1%
Tier 2 – Statewide Corridors		17.0	2.5%
Tier 3 – Regional Transportation Corridors		54.2	8.1%
Tier 4 – Local Connectors		8.0	1.2%
Tier 5a – Local Roads (All Other*)		46.6	7.0%
Tier 5b – Local Roads		411.4	61.4%
Tier 6 – Off Network		0.1	0.0%

NOTES:
Assume that Tier 4 and 5 to be adjusted locally where Towns see as more critical.

Public Safety Proximity	Score
Within 0.5 mile of public safety (police, fire, hospital, schools)	
Between 0.5 and 1 mile of public safety	

The Level 2 C data scored culverts based on the Average Annual Daily Traffic (AADT) (Table 2-8). Culverts on roads with greater than 4000 AADT were also scored as "HIGH". Culverts on roads with 500 to 4000 AADT were scored as "MODERATE", and culverts with less than 500 AADT were scored "LOW".

Table 2-8: C Level 2 Data Scoring

Average Annual Daily Traffic (AADT)	Score
> 4000 trips	
500 to 4000 trips	
< 500 trips	

The Level 3 C data allows municipalities to enter a score of "HIGH" based on local information such as locally important links, culvert is in a floodprone area, and long detours would be required if the culvert washes out (Table 2-9). The C score is displayed in the bottom right quadrant of the display icon.

Table 2-9: C Level 3 Data Scoring

Possible Local Variables	Score
Critical links (adjust Tier 4 and 5)	
Critical structure in floodprone area	
Near infrastructure	
High local traffic volume	
Neighborhoods or Town centers	
Disruptive Detour	

2.1.4 Aquatic Organism Passage (AOP)

The AOP level 1 variable indicates the ability of aquatic organisms to pass through a culvert. The New Hampshire Aquatic Organism Passage Screen rated structures as "Full AOP for all aquatic organisms", "Reduced AOP for all aquatic organisms", "No AOP for all aquatic organisms except adult salmonids", or "No AOP for all aquatic organisms including adult salmonids" (Table 2-10). "Full AOP" structures were scored "LOW", "Reduced AOP" structures were scored "MODERATE", and "No AOP" structures were combined and scored "HIGH" for simplicity.

Table 2-10: AOP Level 1 Data Scoring

VT Aquatic Organism Passage Coarse Screen	Full AOP	Reduced AOP	No AOP	
Updated 2/25/2008	**for all aquatic organisms**	**for all aquatic organisms**	**for all aquatic organisms except adult salmonids**	**for all aquatic organisms including adult salmonids**
AOP Function Variables / Values	**Green (if all are true)**	**Gray (if any are true)**	**Orange**	**Red**
Culvert outlet invert type	at grade **OR** backwatered	cascade	free fall **AND**	free fall **AND**
Outlet drop (ft)	= 0		> 0 , < 1 ft **OR**	≥ 1 ft **OR**
Downstream pool present			= yes (= yes **AND**	= no **OR** (= yes **AND**
Downstream pool entrance depth / outlet drop			n/m ≥ 1)	n/a < 1) **OR**
Water depth in culvert at outlet (ft)				< 0.3 ft
Number of culverts at crossing	1	> 1		
Structure opening partially obstructed	= none	≠ none		
Sediment throughout structure	yes	no		

For the Level 2 screen, the AOP Screen is combined with the results of a current habitat connectivity analysis calculated by performing a GIS analysis using the Barrier Assessment Tool (Hornby, 2008; TNC, 2010) to determine the upstream miles of habitat gained if the structure becomes passable. Culverts rated as "Full AOP for all aquatic organisms" were scored "LOW". Culverts rated as "Reduced AOP for all aquatic organisms" with a less than 0.5 mile potential upstream habitat gain were also scored "LOW". Culverts rated as "Reduced AOP for all aquatic organisms" with greater than or equal to 0.5 mile but less than 0.75 mile potential upstream habitat gain were scored "MODERATE" (Table 2-11).

Table 2-11: AOP Level 2 Data Scoring

AOP Category	Upstream Habitat Gained	Score
All	N/A	
Reduced	No BAT Result	No BAT Result
	< .25 mile	
	>=.25, <.5	
	>=.5,< .75 mile	
	>=.75 mile	
Limited (strong swimmers only)	No BAT Result	No BAT Result
	< .25 mile	
	>=.25, <.5	
	>=.5,< .75 mile	
	>=.75 mile	
None	No BAT Result	No BAT Result
	< .25 mile	
	>=.25, < .75	
	>=.5,<.75 mile	
	>=.75 mile	

In the Level 3 AOP variable, coldwater fishery priority habitat information provided by NHFG were considered (Table 2-12). For example, culverts with "No AOP" in the South Branch and North Branch were all scored "HIGH". In the mainstem, structures were scored "MODERATE" if there was no habitat connectivity analysis available, or if the habitat gained was less than 0.25 miles, and "HIGH" if the habitat gained was greater than or equal to 0.25 miles. In the Middle Branch, structures were scored "LOW" if there was no habitat connectivity available or if the habitat gained was less than 0.25 miles, "MODERATE" if the habitat gained was less than 0.75 miles, and "HIGH" if the habitat gained was greater than or equal to 0.75 miles. The AOP score is displayed in the bottom left quadrant of the display icon.

Fisheries Priority Locations (NHFG)	Fishery Rank
South Branch	1
North Branch	2
Mainstem	3
Middle Branch	4

Table 2-12: AOP Level 3 Data Scoring

		Fishery Rank			
AOP Category	Minimum Habitat Gained	1	2	3	4
All	N/A				
Reduced	No BAT Result				
	< .25 mile				
	>=.25, <.5				
	>=.5,< .75 mile				
	>=.75 mile				
Limited (strong swimmers only)	No BAT Result				
	< .25 mile				
	>=.25, <.5				
	>=.5,< .75 mile				
	>=.75 mile				
None	No BAT Result				
	< .25 mile				
	>=.25, < .75				
	>=.5,<.75 mile				
	>=.75 mile				

2.1.5 Risk (R)

R is determined from the equally weighted combination of vulnerability (GC and STR) and criticality (C). AOP was not included in the calculation of R. A Risk score ("HIGH", "MODERATE", "LOW") and Risk (priority) level were calculated for all possible combinations of STR, GC, and C (Table 2-13). A risk level of 1, where GC, STR, and C are all high, is the highest. The risk score and level were selected based on experience gained during culvert failures and designs. The risk level was used to prioritize the need for culvert replacement with 1 being the most urgent replacement needs.

For Risk level combinations where no GC data were available, R was either a predetermined score (any GC score would result in the same R score), or was assigned an R score assuming the lowest possible GC score. This conservative assumption allowed all culverts to obtain a risk score. The risk score is shown on the outer ring of the display icon.

Table 2-13: R Scoring and Risk Levels

Vulnerability		Criticality	Risk	Risk Level	Notes
GC	STR	C	R		
				1	Highest risk level
				2	
				3	
				4	
				5	
				6	
				7	
				8	
				9	
			^	10	^Predetermined score
			^	11	^Predetermined score
			*	12	*Assumed (conservative)
			*	13	*Assumed (conservative)
				14	
				15	
				16	
				17	
				18	
				19	
				20	
				21	
				22	
				23	
			^	24	^Predetermined score
			^	25	*Assumed (conservative)
			^	26	*Assumed (conservative)
			*	27	*Assumed (conservative)
				28	
				29	
			^	30	^Predetermined score
				31	
				32	
				33	
				34	
				35	
				36	Lowest risk level

3.0 RESULTS

3.1 Pilot Data Summary

Data distributions for each variable selected into the model were reviewed for the entire watershed and for each pilot town throughout the project to advance model development (Appendix A). The pilot data summary includes plots of variables, data level plots, and the distribution of the risk levels broken down by high (R=1 to 13), moderate (R=14-27) and low (R=28 to 36). The data summary also includes culvert priority lists of the top 50 priority culverts for the watershed and the top 15 priority culverts for each pilot town.

3.2 Town Data Summary

Data distributions for culvert risk, risk data level, culvert priority, and each variable are provided for each of the six towns that contain most of the culverts. The Town data also includes a table with culvert priority list that can be used to seek out new projects and track changes to culverts before entering back into the model spreadsheet.

- Deering (Appendix B)
- Dunbarton (Appendix C)
- Francestown (Appendix D)
- Goffstown (Appendix E)
- New Boston (Appendix F)
- Weare (Appendix G)
- Other towns with few assessed culverts in the watershed (Appendix H)

3.3 GC Score

Results from the GC variable showed that scores were distributed relatively evenly, with the most common score being “High” indicating incompatibility between a culvert and channel (Figure 3-1). This pattern was also mirrored in the results for the three pilot towns.

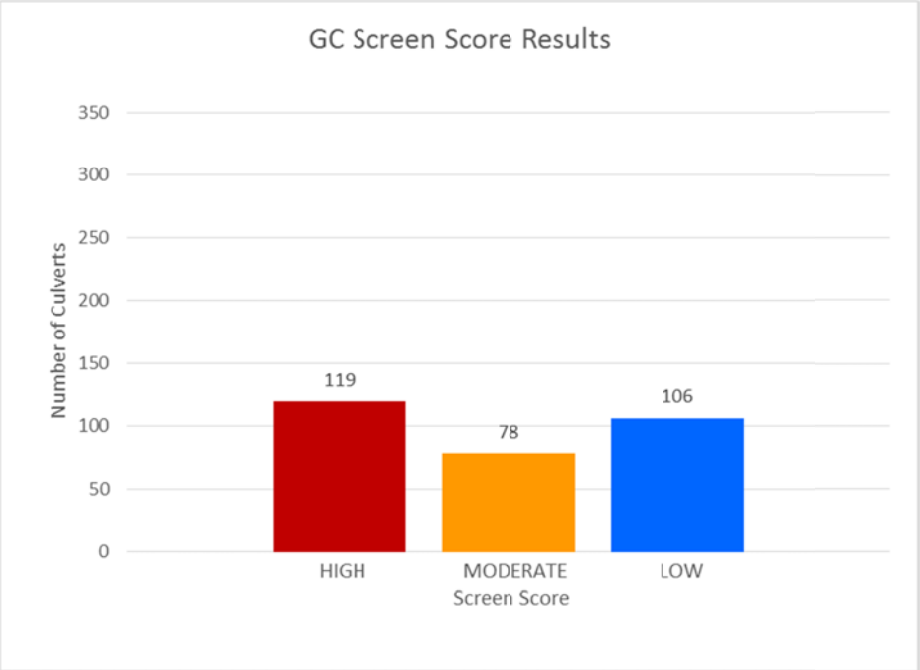


Figure 3-1: GC Variable Score Distribution

The majority of assessed culverts were screened based on Level 2 data for the GC variable (Figure 3.2). When Level 2 data were not available, culverts were screened using Level 1 data (i.e., percent bankfull width). Fifty-four of the assessed culverts in the watershed had no GC data.

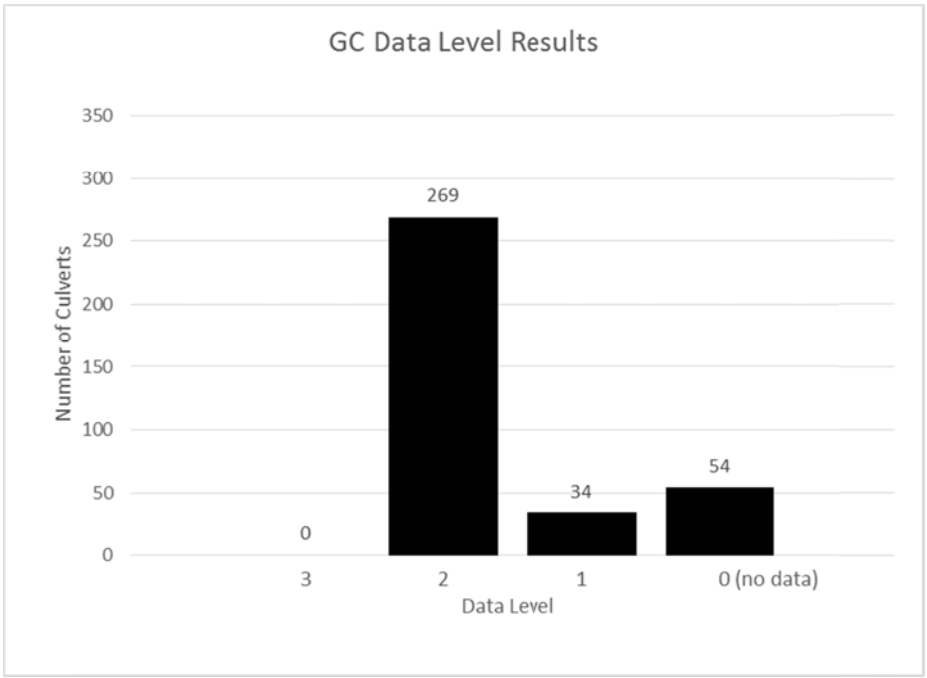


Figure 3-2: GC Data Level Distribution

3.4 STR Score

Results from the STR variable showed that a majority of assessed culverts were scored "High" (Figure 3-3). This result was anticipated based on initial findings that the majority of culverts in the watershed are undersized relative to the bankfull channel width and hydraulic capacity. These results were mirrored in the three pilot towns.

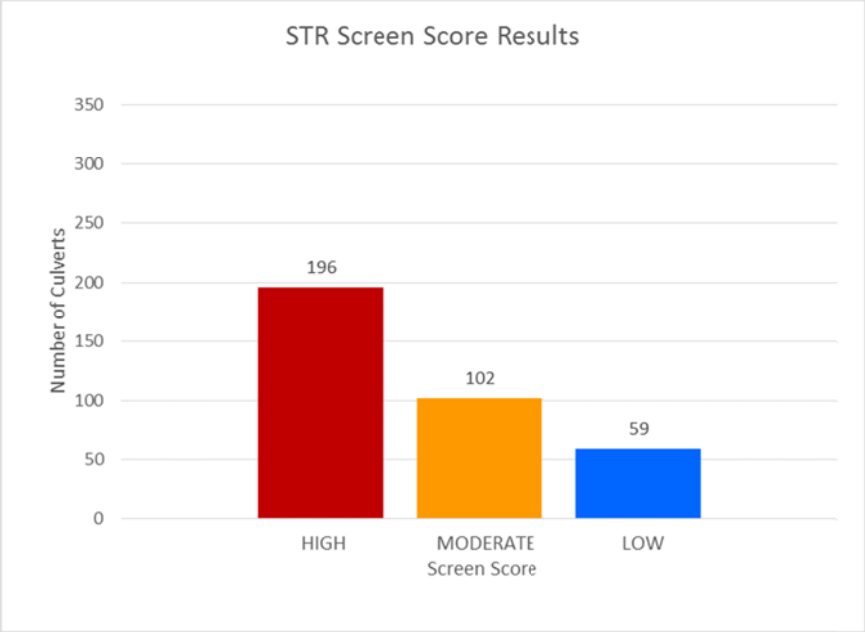


Figure 3-3: STR Variable Score Distribution

The majority of culverts were screened based on Level 2 STR data (Figure 3-4). Some Level 3 data were provided by the pilot towns.

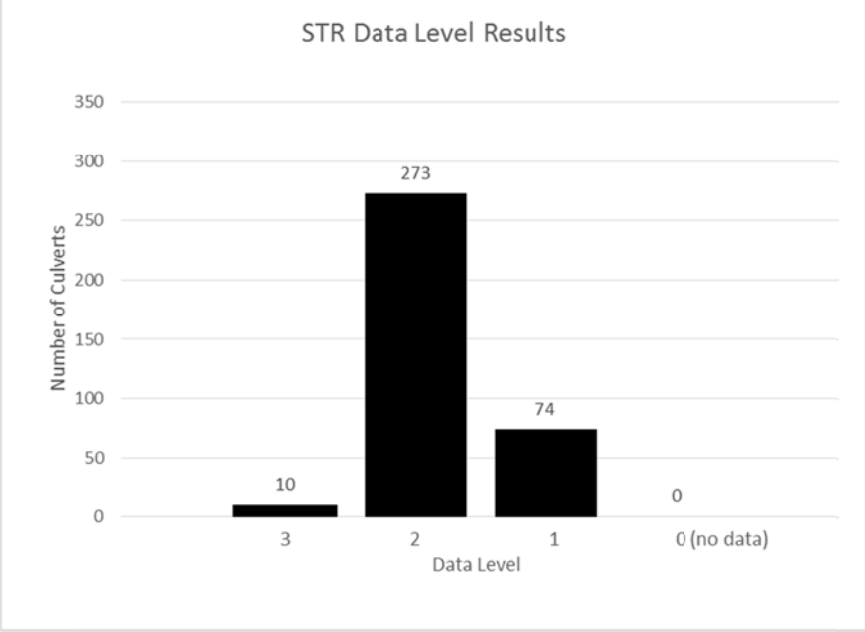


Figure 3-4: STR Data Level Distribution

3.5 C Score

A majority of assessed culverts were scored "Low" for C (Figure 3.5). This result is expected as most roads in the watershed are small, local roads in rural areas.

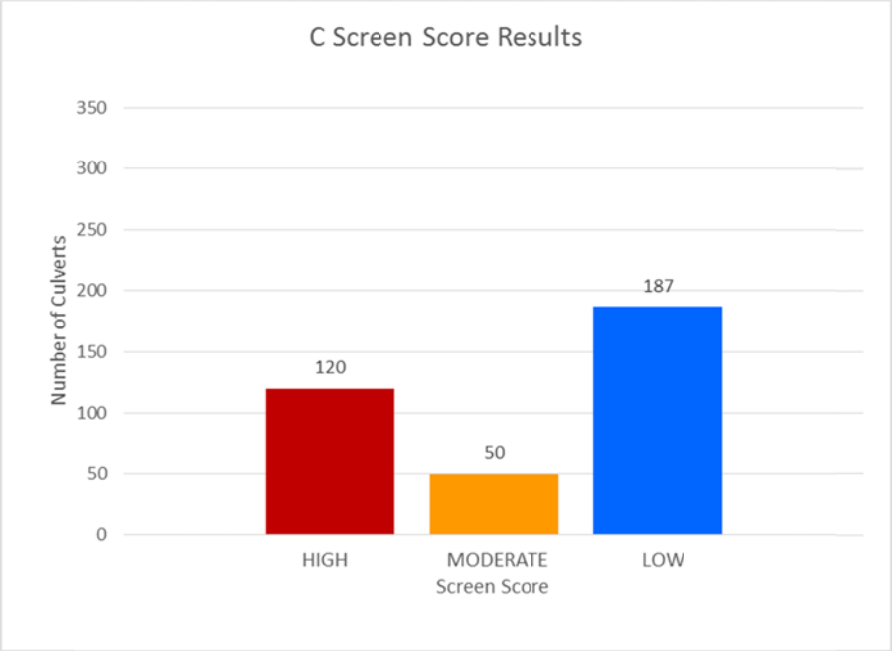


Figure 3-5: C Variable Score Distribution

Most culverts were scored using C Level 1 data (Figure 3-6). Some Level 3 data were provided for highly critical culverts located in the pilot towns.

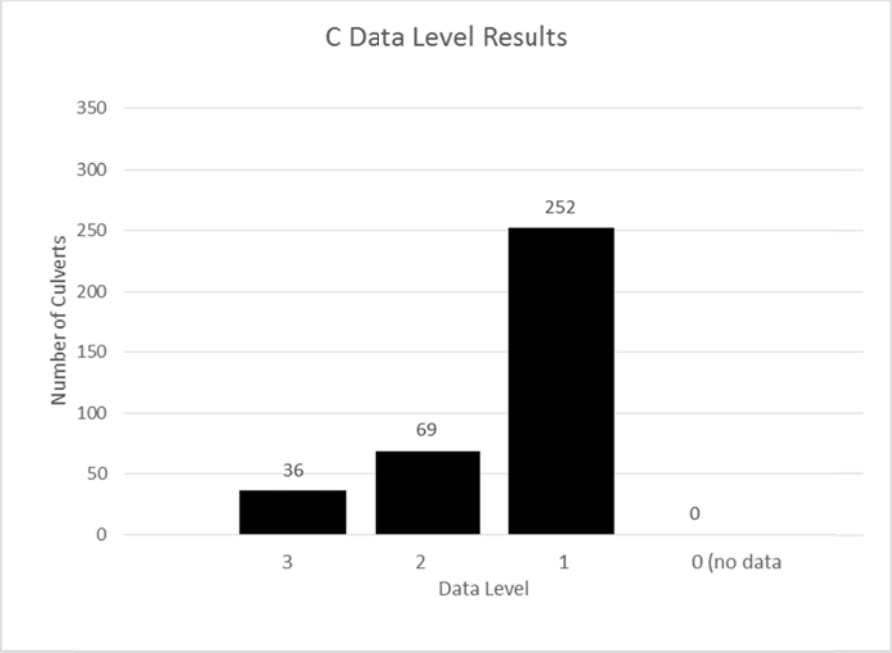


Figure 3-6: C Data Level Distribution

3.6 AOP Score

The most frequent score for the AOP variable was "High", followed by "Moderate", and then "Low" (Figure 3-7). The scoring by Town reflects the NHFG priority areas used in data level 3. Many of the culverts scored as "High" were in the priority coldwater habitat areas.

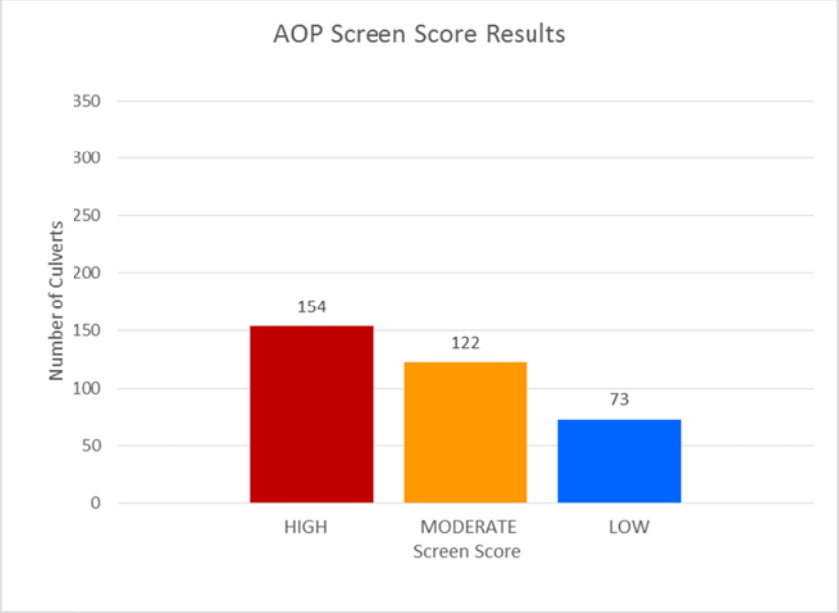


Figure 3-7: AOP Variable Score Distribution

Most culverts were screened using Level 3 data for AOP (Figure 3-8).

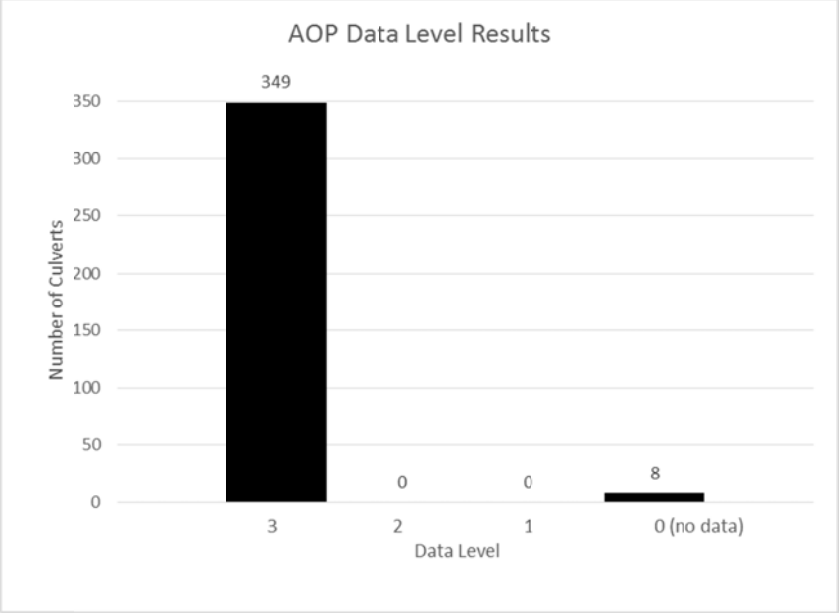


Figure 3-8: AOP Data Level Distribution

3.7 R Score

Results of the R scoring showed a relatively even distribution, with "Moderate" the most common score, followed by "High", then "Low" (Figure 3-9).

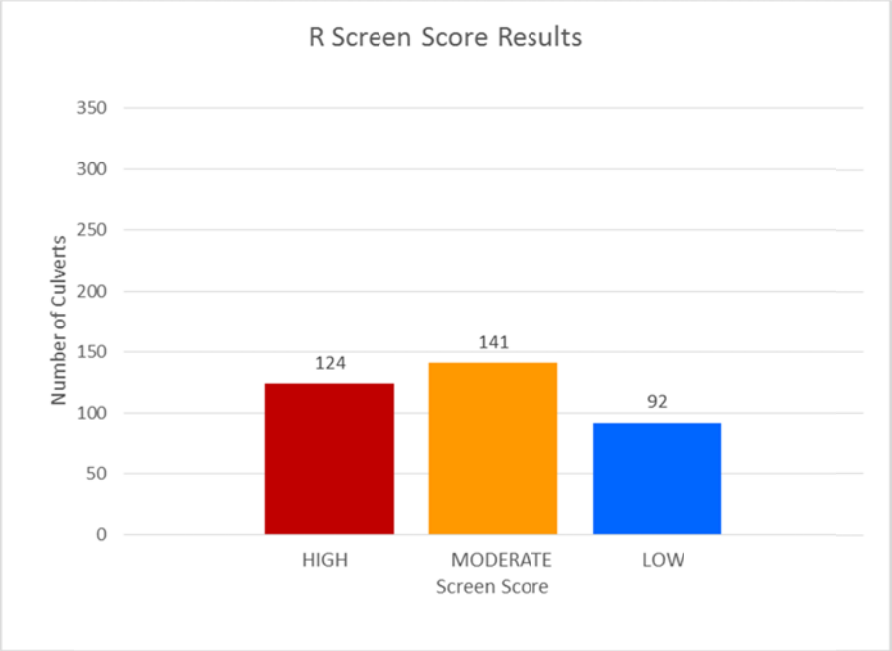


Figure 3-9: R Screen Score Distribution

R Data Level Scores were based on the numerically summed data levels of the GC, STR, and C variables. Most culverts had a "Moderate" Data Level score (Figure 3-10).

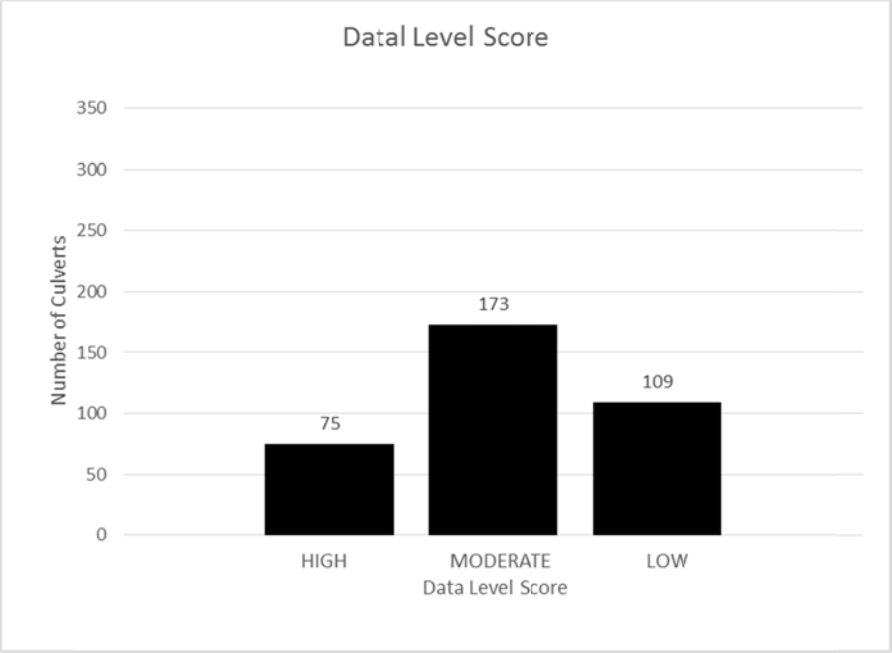


Figure 3-10: R Data Level Distribution

R results were further broken down by Risk Level to show how many culverts were scored at each risk level (Figure 3-11).

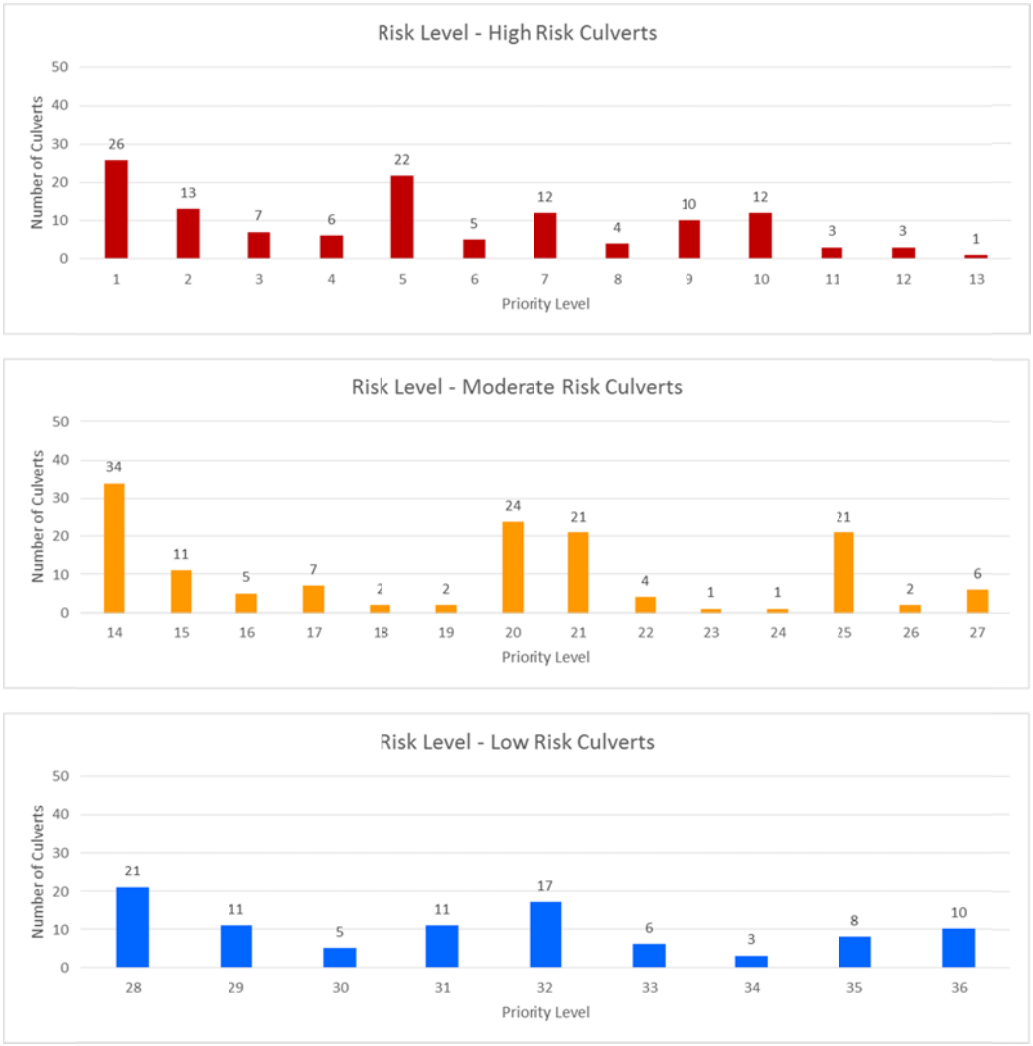


Figure 3-11: Risk Level Distribution

4.0 DISCUSSION

4.1 Model Use

The culvert screening model is considered to be a coarse screen based on available data. Findings should be verified in the field before making final decisions to replace a culvert and begin the design process.

Data may be out of date or inaccurate. The model has been designed to allow towns to update data for individual culverts and adjust prioritization.

4.2 Model Flexibility

Data availability varied across the Piscataquog River watershed and will vary across future watersheds, and thus the model was designed to be flexible. The model will calculate the screen with all Level 1 data that tends to be readily available. However, the priority ranking will be less accurate using these less accurate data. Screen results based on Level 2 and Level 3 local data will likely lead to better culvert replacement priority rankings.

4.3 Stream Power and Bed Resistance

Stream reaches, bridges, and culverts are more frequently being screened based on stream power (i.e., the ability of the channel to do work or erode the bed and banks) and bed resistance (Knighton, 1999; Kleinhans and van den Berg, 2011; Schiff et al., 2015). Power and resistance were initially proposed to be in the screen, yet ultimately were excluded as necessary data are not widely available. While specific stream power can be estimated based on remote sensing data, bed sediment particle size data or a suitable qualitative indicator of bed resistance such as dominant particle size are not available at the state level.

4.4 Local Data Review and Input

The three project pilot towns of Francestown, Goffstown, and Weare were consulted over the course of the project to verify the results of the screen as it evolved. The towns identified unexpected results such as when a culvert known to be structurally deficient scored “Low” for the STR variable. Pilot towns helped determine the cause of unexpected results – whether it was due to out of date data, incorrect data, or an issue with the structure of the model. The pilot towns helped identify useful categories for local input for the C and STR variables.

Local flood risk information was collected by NHGS in each town in the watershed in 2015. These data were plotted in GIS; categorized as high, medium, or low risk; and then grouped by the primary culvert issue (Appendix I).

- Past or potential flooding (F)
- Unspecified damage (D)
- Washout (W)
- Overtopping (O)
- Failure (X)
- Blocked by debris (B)

Data were updated, as needed, by the pilot towns. This information was initially used as a quality control check during model development, and was then added to the model as Level 3 data. It is anticipated that other towns in the Piscataquog River Basin will continue to add their own Level 3 data to improve the local prioritization of culverts.

4.5 Future Implementation

Concept designs were prepared for a high-priority culvert in both Francestown and Goffstown to begin the design process (Appendix J). Initial design recommendations follow general culvert design recommendations to reduce flood risk and promote aquatic organism passage, and adhere to the New Hampshire Wetlands Crossing Rules (UNH, 2009; Crystall, 2010).

During model development the potential expansion of this culvert prioritization model to other watersheds and perhaps the state was discussed. The model has been set up to be readily expanded to other area if the necessary data are available. The model requires the structural condition of each culvert, the Highway Tier, and the functional system of the road over the culvert to assign a risk score and priority rank. As indicated above, improved data would allow for a better prioritization.

5.0 REFERENCES

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TU and SNHPC, 2014. Piscataquog River Watershed Stream Crossing Vulnerability Assessment Project: Evaluating Stream Crossing Vulnerability to Storm Event Flows (Http://Www.Snhpc.Org/Pdf/Piscataquogstreamxingreport020413.Pdf). Prepapred by Trout Unlimited and Southern New Hampshire Planning Commission, Concord, NH.

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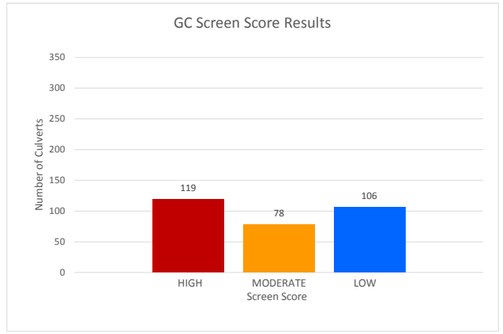
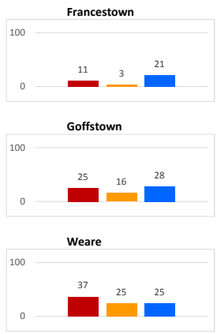
APPENDIX A

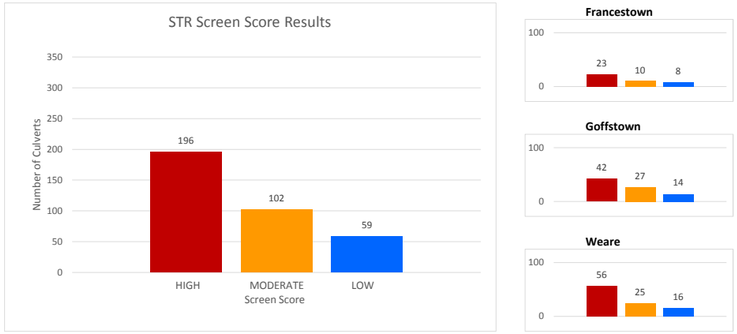
WATERSHED AND PILOT TOWN RESULTS SUMMARY

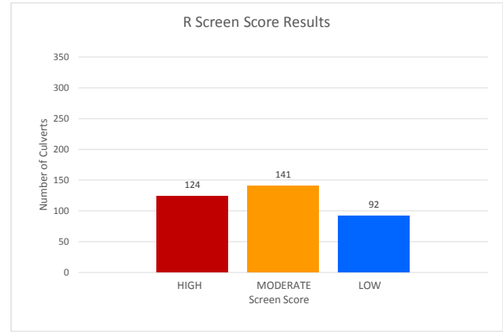
Piscataquog River Watershed Culvert Prioritization Model Pilot Data Summary

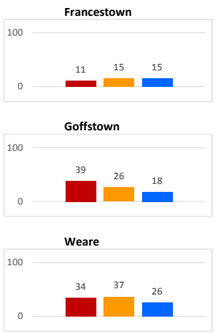
November 1, 2016

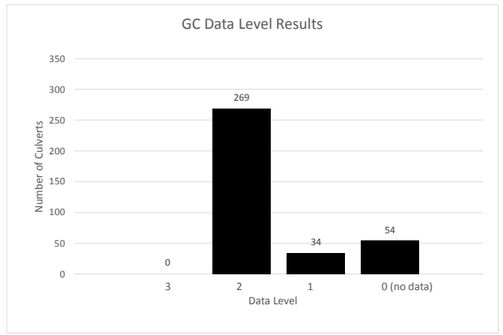


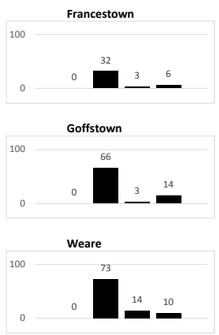


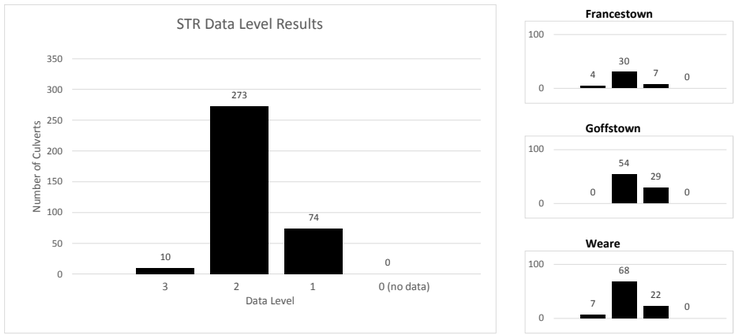


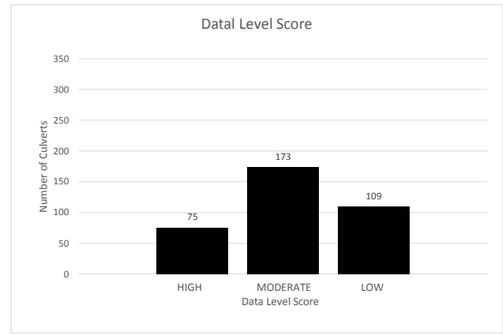


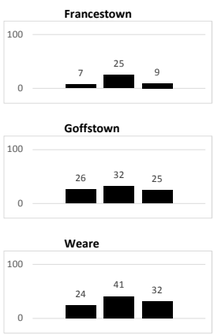


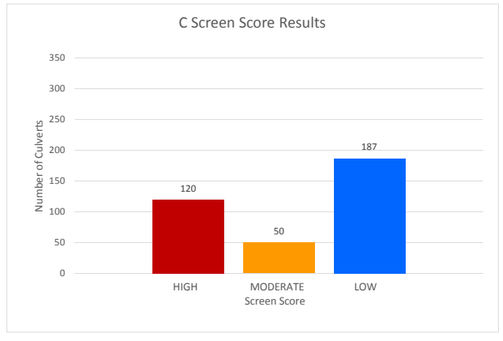


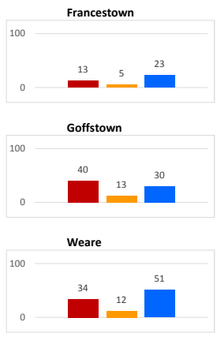


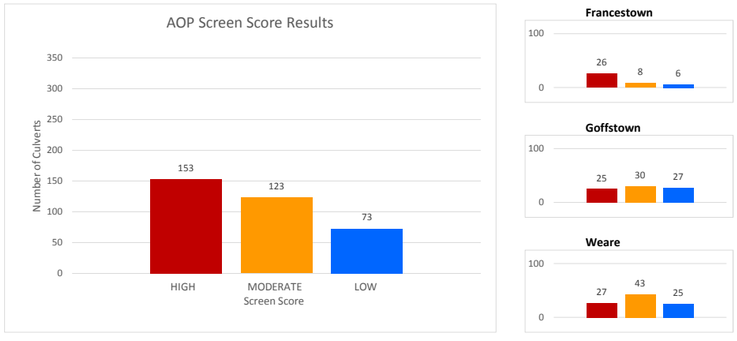


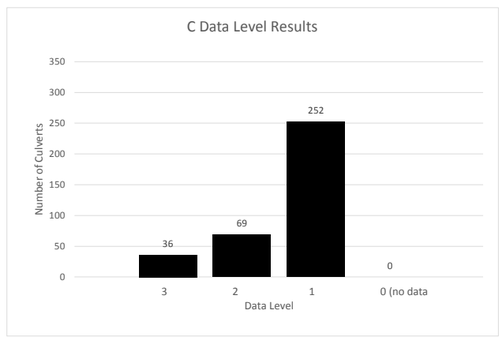


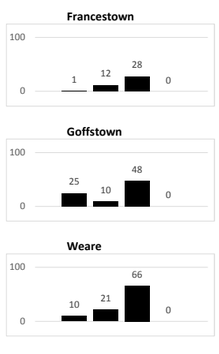


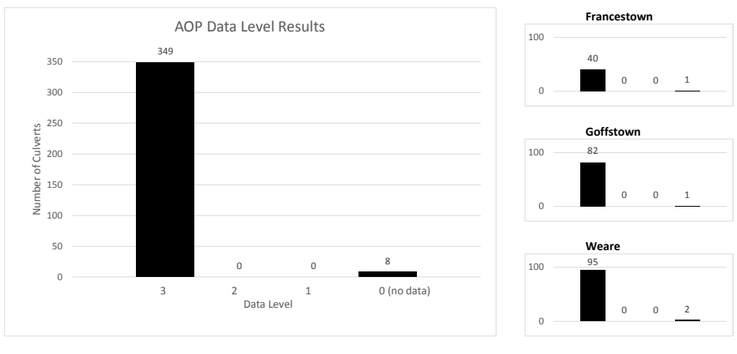


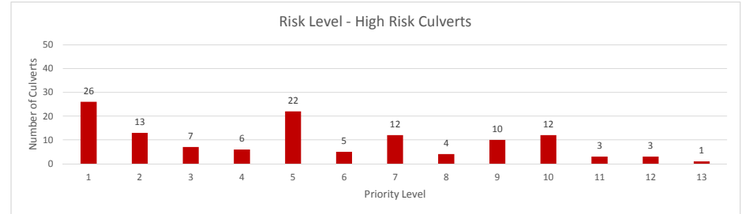


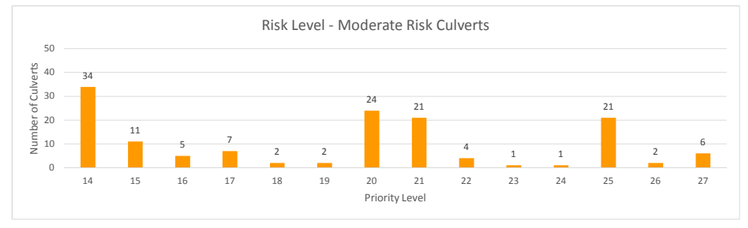


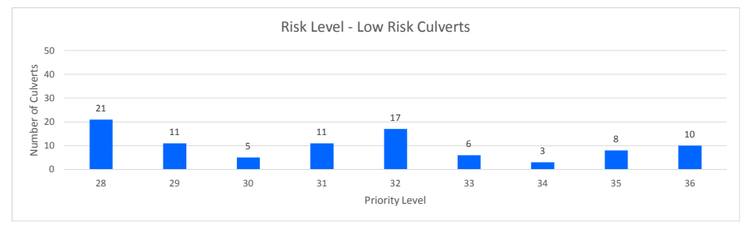












SADES_ID	Town	Road	Stream	Risk Level
771	Goffstown	Elm St	Piscataquog	1
772	Goffstown	Elm St	Piscataquog	1
928	Weare	River Rd		1
1010	Goffstown	Wallace	Dan Little Brook	1
1024	Goffstown	Juniper Dr	Henry Brook	1
1030	Goffstown	Autumn	Piscataquog	1
1036	Goffstown	Stinson	Piscataquog	1
1057	Goffstown	rt 114	Piscataquog	1
1058	Manchester	Rockland	Rockland Creek	1
1068	Weare	poor farm road	currier brook	1
1070	Weare	rte 149	hillside brook	1
1079	New Boston	Francestown Road	Middle Branch Piscataquog	1
1083	New Boston	francestown road		1
1085	New Boston	rte 77		1
1093	Weare	rte 149	Meadow Brook	1
1094	Weare	Gen Knox Rd		1
1111	Weare	Deering Center Road	Peacock Brook	1
1114	Weare	Deering Center Road	Peacock Brook	1
1148	Francestown	Bennington Rd	Collins Brook	1
1231	New Boston	Old Coach	Piscataquog	1
1233	New Boston	Mont Vernon	Piscataquog	1
1234	New Boston	Francestown Rd	Piscataquog	1
1273	Deering	Zoski	Piscataquog	1
1274	Deering	Fisher		1
5187	Weare	Mountain Rd.	Buxton Brook	1
5281	Weare	reservoir road	Piscataquog Trib	1
765	Goffstown	Center Street	Cemetary Brook	2
908	Weare	N John Stark Highway	Breed Brook	2
909	Weare	Center Rd		2
1040	Goffstown	Maple	Piscataquog	2
1044	Goffstown	Paige Hill Rd	Piscataquog	2
1045	Goffstown	Glenwood Dr	Piscataquog	2
1065	Weare	Cram	Buxton Brook	2
1072	Weare	Oak Hill RD	Hillside Brook	2
1213	New Boston	Mont Vernon	Meadow Brook	2
1244	New Boston	Rte 13	Piscataquog	2
1271	Deering	Fisher		2
1272	Deering	Fisher		2
5194	Goffstown	Rt. 114/Stark Highway (GRB-1)	Gorham Brook	2
937	Weare	River Rd	Piscataquog	3
1042	Goffstown	S Main St	Piscataquog	3
1047	Goffstown	Goffstown Back Rd	Piscataquog	3
1277	Deering	E Deering Rd		3
4869	Goffstown	Mast Rd		3
4873	Goffstown	Greer Rd		3
5228	Goffstown	New Boston Rd (Bog Brook 1)	Bog Brook	3
806	New Boston	Hooper Hill Road		4
921	Weare	reservoir rd		4
993	Goffstown	Roby Rd	Bog Brook	4
1004	New Boston	Bedford	Bog Brook	4

15 Highest Priority Culverts - Francestown

SADES_ID	Town	Road	Stream	Risk Level
1148	Francestown	Bennington Rd	Collins Brook	1
1186	Francestown	Birdsall	South Branch Piscataquog	4
1180	Francestown	Reid RD	South Branch Piscataquog	5
1161	Francestown	Bennington Rd	Dinsmore Brook	5
1187	Francestown	Birdsall	South Branch Piscataquog	5
1155	Francestown	Bennington Rd	Dinsmore brook	6
1166	Francestown	greenfield rd	rand brook	6
1154	Francestown	Bennington	Dinsmore Brook	7
1182	Francestown	Muzzey	South Branch Piscataquog	9
1124	Francestown	Rte 136		10
1176	Francestown	Russell Station	Rand Brook	14
801	Francestown	Avery Rd	Piscataquog	14
1123	Francestown	Dennison Pond Rd		14
1159	Francestown	2nd NH Turnpike	Dinsmore Brook	14
1160	Francestown	Mountain Rd	Dinsmore Brook	14

15 Highest Priority Culverts - Goffstown

SADES_ID	Town	Road	Stream	Risk Level
772	Goffstown	Elm St	Piscataquog	1
1010	Goffstown	Wallace	Dan Little Brook	1
771	Goffstown	Elm St	Piscataquog	1
1036	Goffstown	Stinson	Piscataquog	1
1057	Goffstown	rt 114	Piscataquog	1
1024	Goffstown	Juniper Dr	Henry Brook	1
1030	Goffstown	Autumn	Piscataquog	1
765	Goffstown	Center Street	Cemetary Brook	2
5194	Goffstown	Rt. 114/Stark Highway (GRB-1)	Gorham Brook	2
1040	Goffstown	Maple	Piscataquog	2
1044	Goffstown	Paige Hill Rd	Piscataquog	2
1045	Goffstown	Glenwood Dr	Piscataquog	2
1042	Goffstown	S Main St	Piscataquog	3
1047	Goffstown	Goffstown Back Rd	Piscataquog	3
5228	Goffstown	New Boston Rd (Bog Brook 1)	Bog Brook	3

15 Highest Priority Culverts - Weare

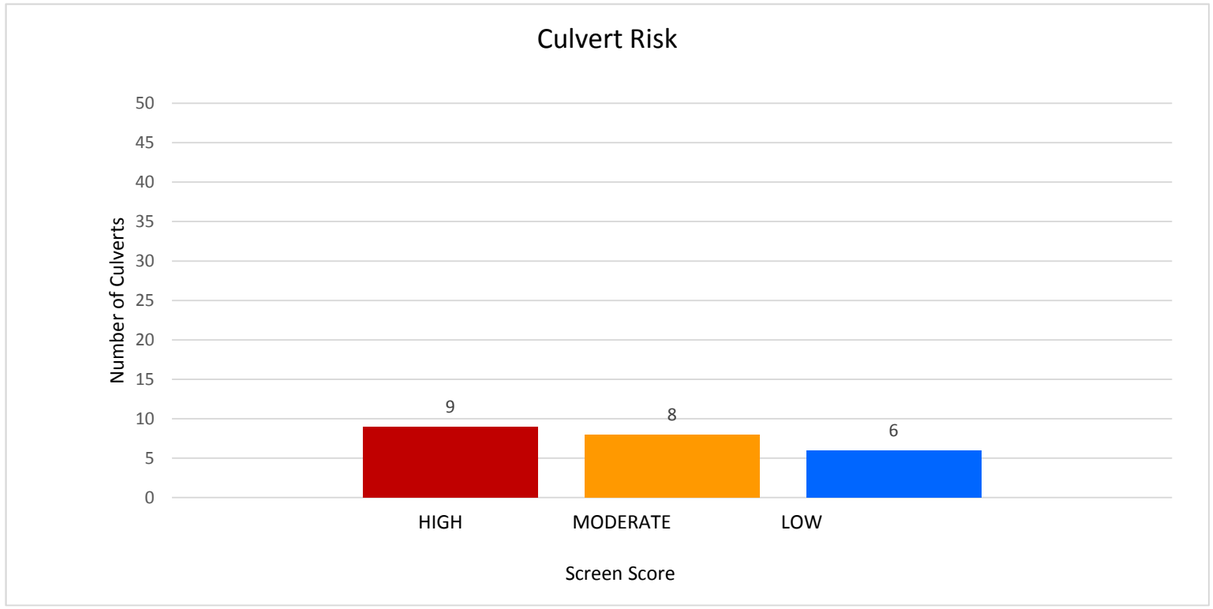
SADES_ID	Town	Road	Stream	Risk Level
928	Weare	River Rd		1
1068	Weare	poor farm road	currier brook	1
5187	Weare	Mountain Rd.	Buxton Brook	1
1070	Weare	rte 149	hillside brook	1
1094	Weare	Gen Knox Rd		1
1114	Weare	Deering Center Road	Peacock Brook	1
5281	Weare	reservoir road	Piscataquog Trib	1
1093	Weare	rte 149	Meadow Brook	1
1111	Weare	Deering Center Road	Peacock Brook	1
1065	Weare	Cram	Buxton Brook	2
1072	Weare	Oak Hill RD	Hillside Brook	2
908	Weare	N John Stark Highway	Breed Brook	2
909	Weare	Center Rd		2
937	Weare	River Rd	Piscataquog	3
921	Weare	reservoir rd		4

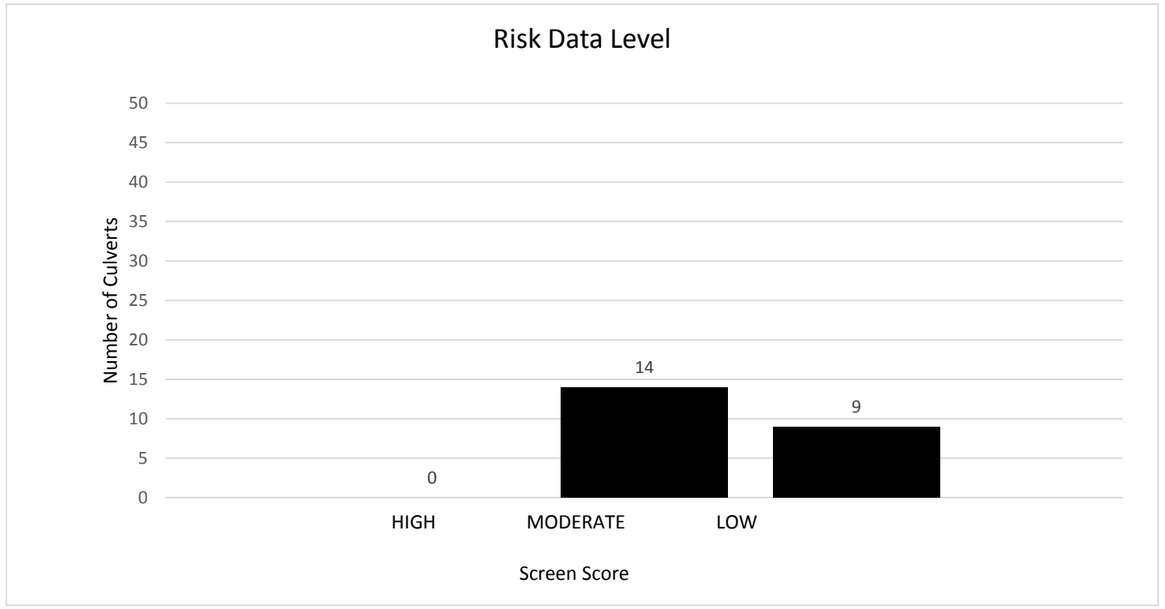
APPENDIX B

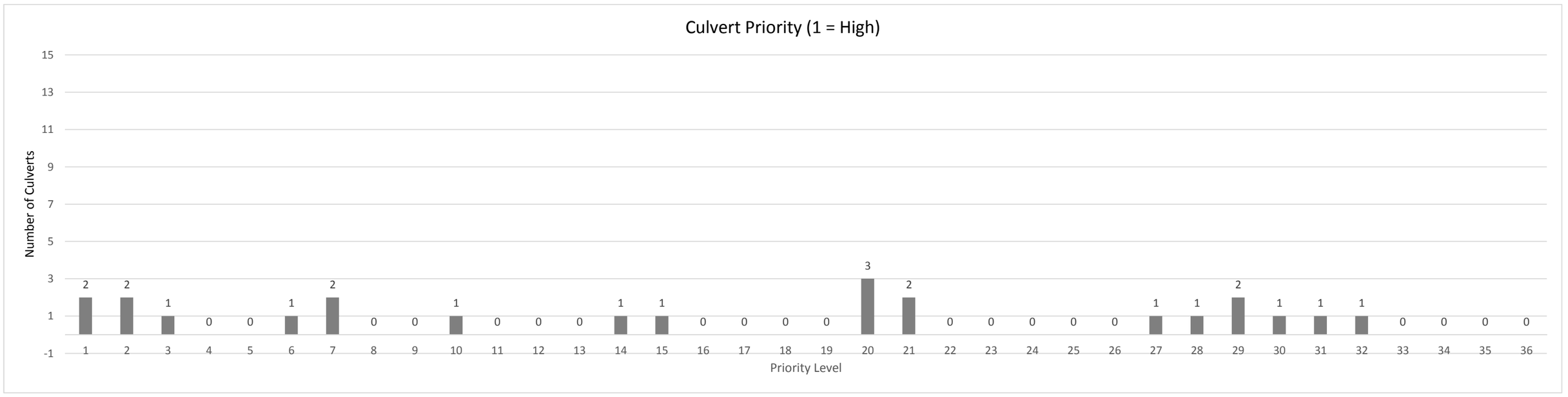
DEERING

DEERING
Culvert Summary Data
November 1, 2016

Risk and Priority Data

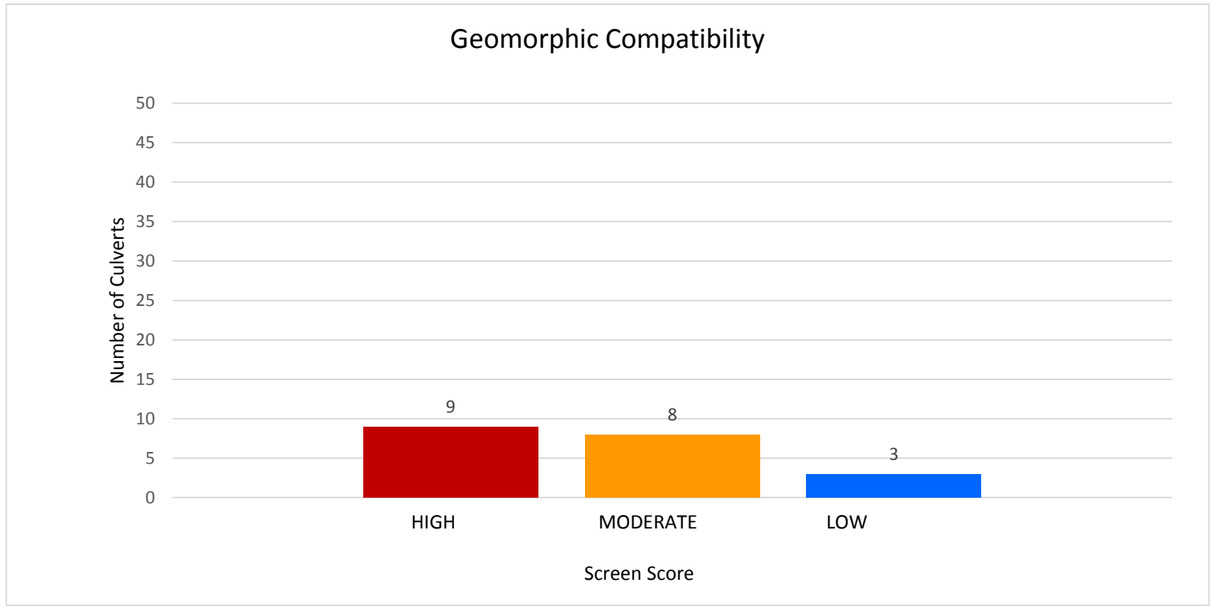


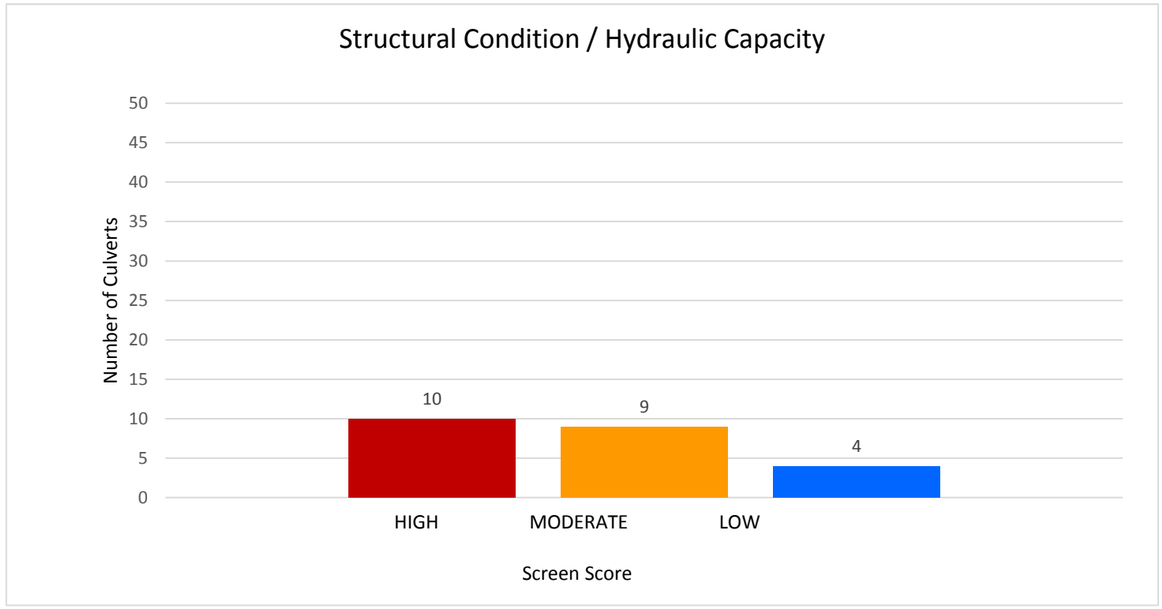


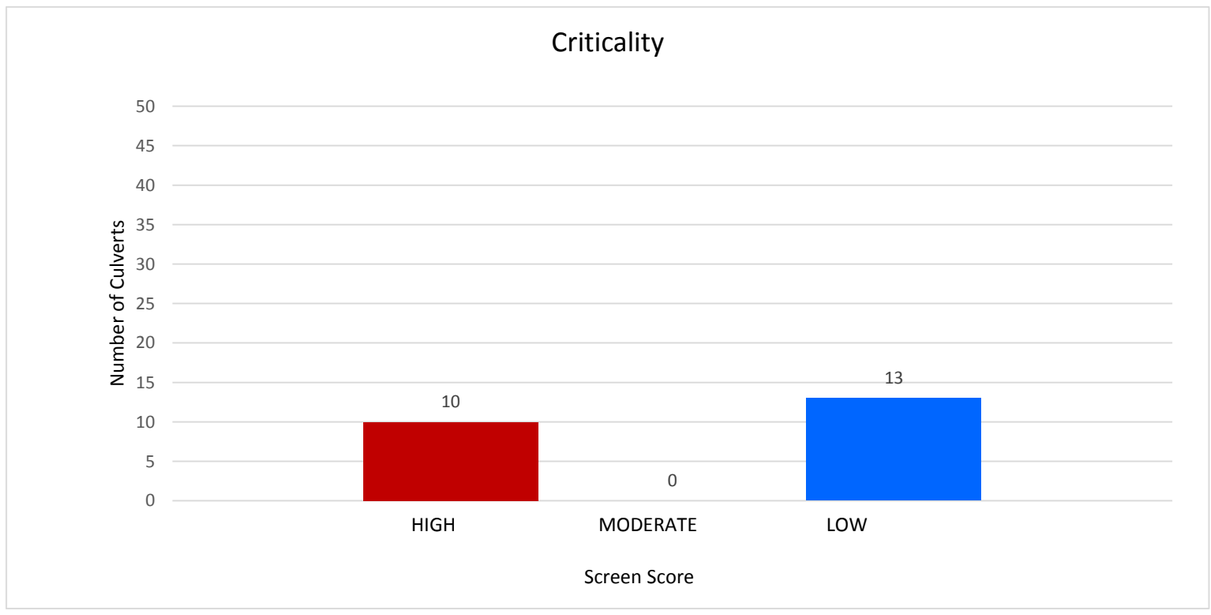


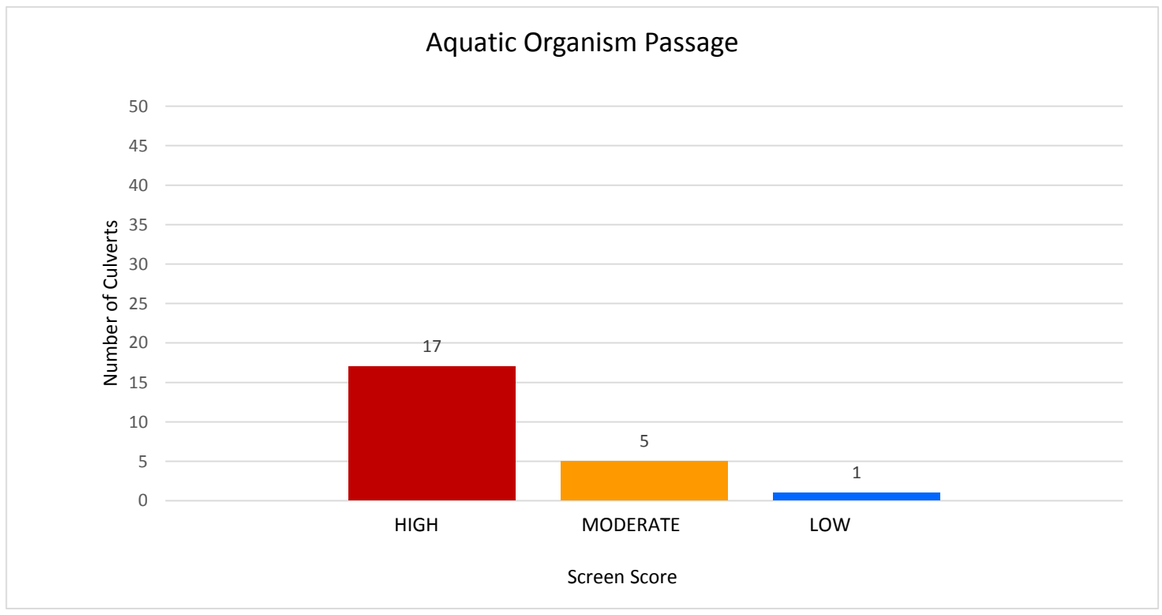
DEERING
Culvert Summary Data
November 1, 2016

Variable Data









Select Town: Deering

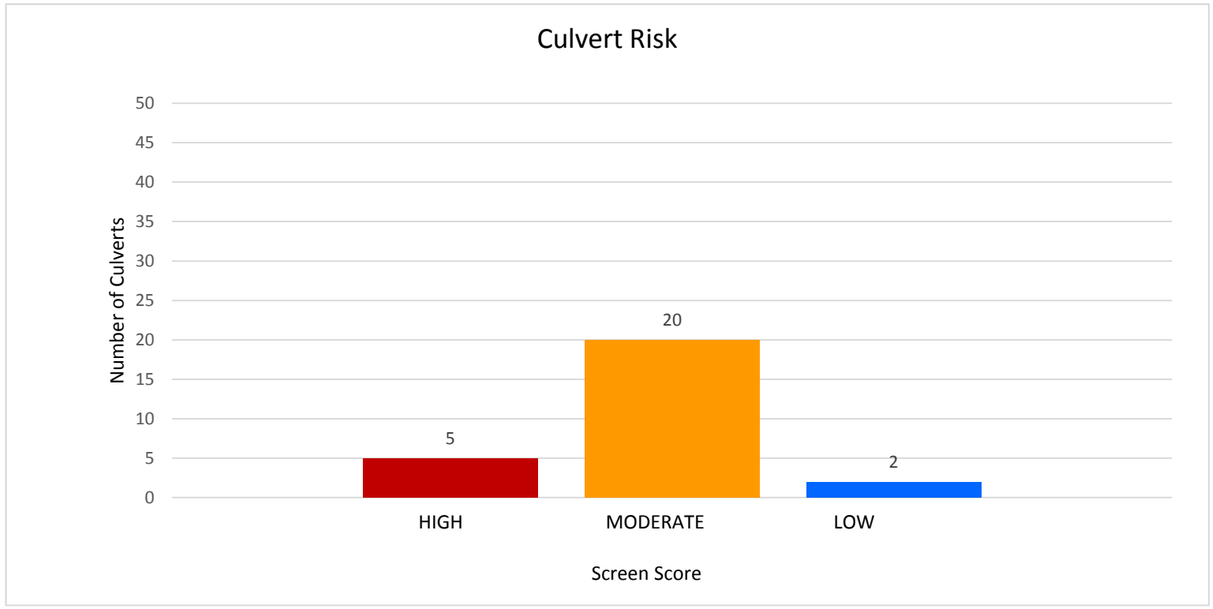
SADES_ID	Town	Road	Stream	Owner	AOP	GC	STR	C	R	Data Score	Risk Level	Red Listed	Town CIP	10-year Road Plan	Structural Reinspection	Replaced with	Replacement date	Replacement cost	Local ID
1274	DEERING	Fisher	unk		HIGH	HIGH	HIGH	HIGH	HIGH	MODERATE	1								
1273	DEERING	Zoski	Piscataquog		HIGH	HIGH	HIGH	HIGH	HIGH	MODERATE	1								
1272	DEERING	Fisher	unk		HIGH	MODERATE	HIGH	HIGH	HIGH	MODERATE	2								
1271	DEERING	Fisher	unk		MODERATE	MODERATE	HIGH	HIGH	HIGH	MODERATE	2								
1277	DEERING	E Deering Rd	unk	NH DOT	MODERATE	HIGH	MODERATE	HIGH	HIGH	MODERATE	3								
1278	DEERING	E Deering	unk	NH DOT	HIGH	HIGH	LOW	HIGH	HIGH	MODERATE	6								
1275	DEERING	Zoski	Piscataquog		HIGH	MODERATE	MODERATE	HIGH	HIGH	MODERATE	7								
1270	DEERING	E Deering Rd	unknown	NH DOT	HIGH	MODERATE	MODERATE	HIGH	HIGH	MODERATE	7								
1283	DEERING	Deering rd	piscatatquog	NH DOT	LOW	Unable to Score	HIGH	HIGH	HIGH	LOW	10								
1269	DEERING	Old County	Piscataquog		HIGH	HIGH	HIGH	LOW	MODERATE	LOW	14								
1293	DEERING	E deering	unk	NH DOT	MODERATE	LOW	MODERATE	HIGH	MODERATE	MODERATE	15								
1265	DEERING	Glenn Rd	Dudley Brook		HIGH	MODERATE	HIGH	LOW	MODERATE	MODERATE	20								
1264	DEERING	Gove Rd	Dudley Brook		HIGH	MODERATE	HIGH	LOW	MODERATE	MODERATE	20								
1261	DEERING	Dudley Pond rd	Dudley Brook		MODERATE	MODERATE	HIGH	LOW	MODERATE	MODERATE	20								
1268	DEERING	Falls Rd	Piscataquog		HIGH	HIGH	MODERATE	LOW	MODERATE	LOW	21								
1294	DEERING	Clement Hill	Smith Brook		HIGH	HIGH	MODERATE	LOW	MODERATE	LOW	21								
1282	DEERING	camp rd	unk		HIGH	Unable to Score	MODERATE	LOW	MODERATE	LOW	27								
1260	DEERING	Quaker	Dudley Brook		HIGH	LOW	HIGH	LOW	LOW	MODERATE	28								
1281	DEERING	cross rd	Piscataquog		MODERATE	HIGH	LOW	LOW	LOW	LOW	29								
1267	DEERING	Pond	Patten Brook		HIGH	HIGH	LOW	LOW	LOW	LOW	29								
1295	deering	Clement Hill Rd	smith brook		HIGH	Unable to Score	LOW	LOW	LOW	LOW	30								
1296	DEERING	North Rd	Smith Brook		HIGH	MODERATE	MODERATE	LOW	LOW	LOW	31								
1297	DEERING	North Rd	Smith Brook		HIGH	LOW	MODERATE	LOW	LOW	MODERATE	32								

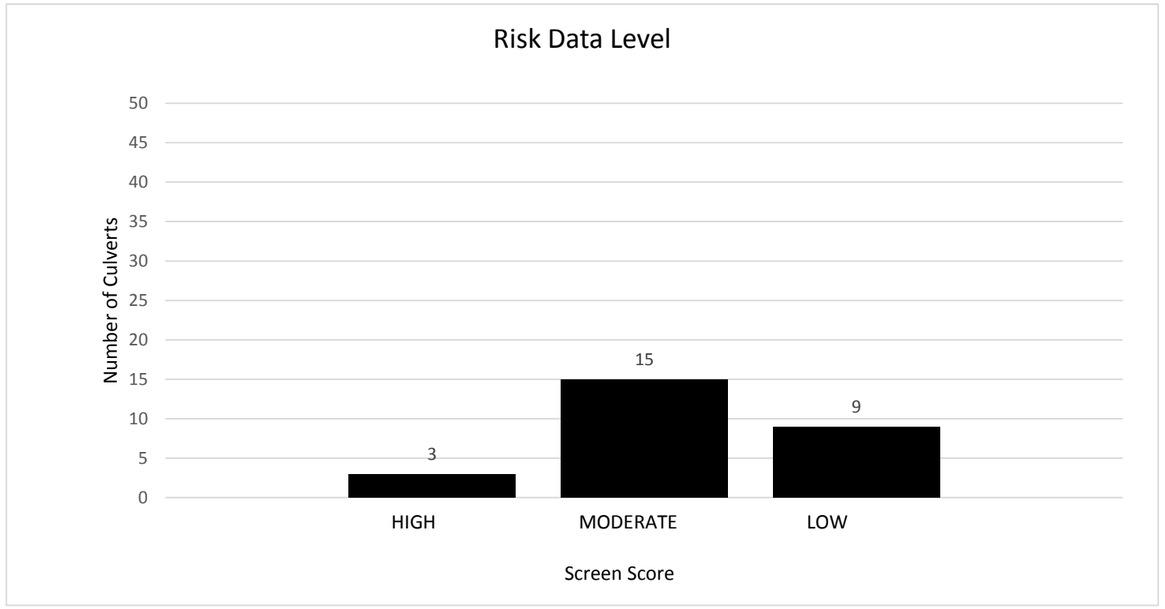
APPENDIX C

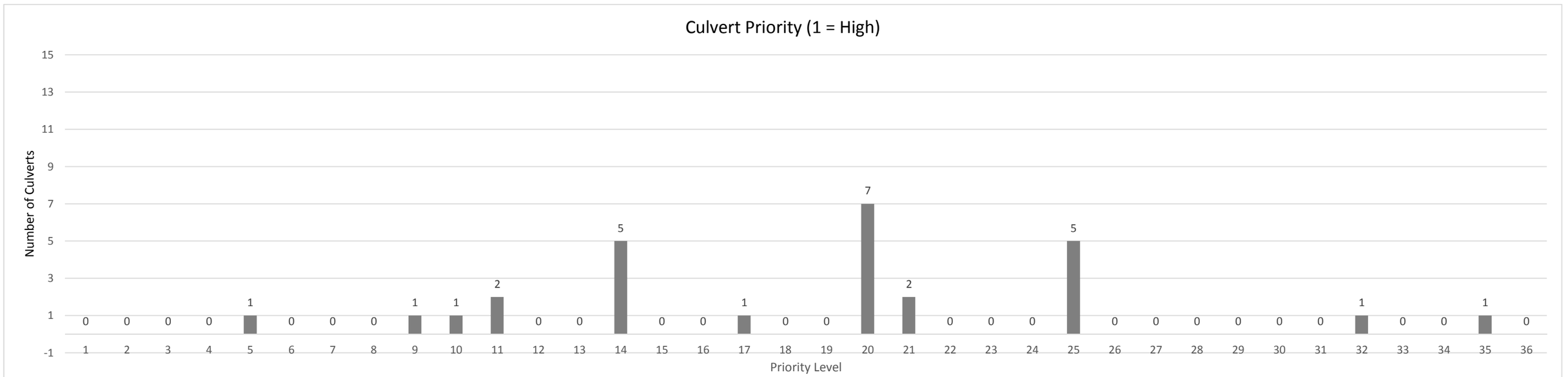
DUNBARTON

DUNBARTON
Culvert Summary Data
November 1, 2016

Risk and Priority Data

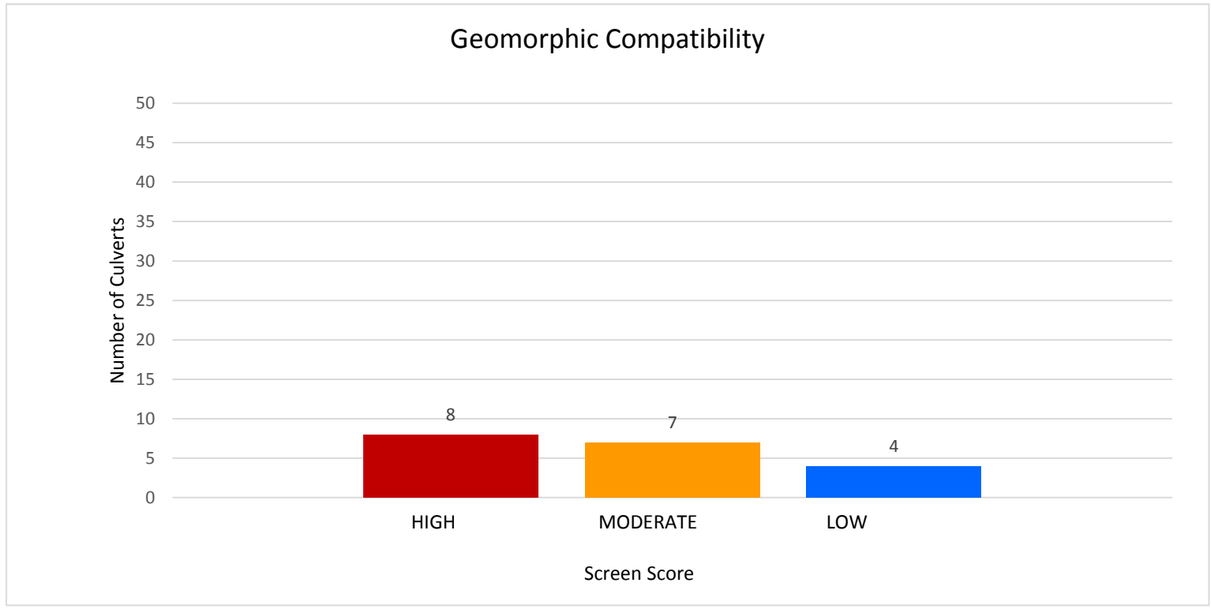


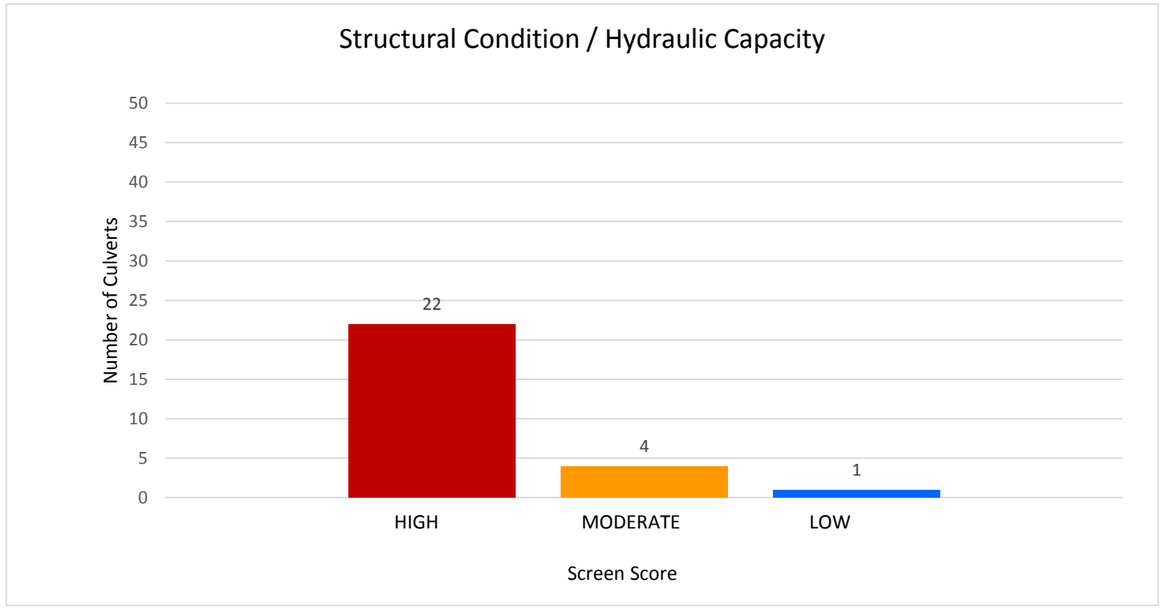


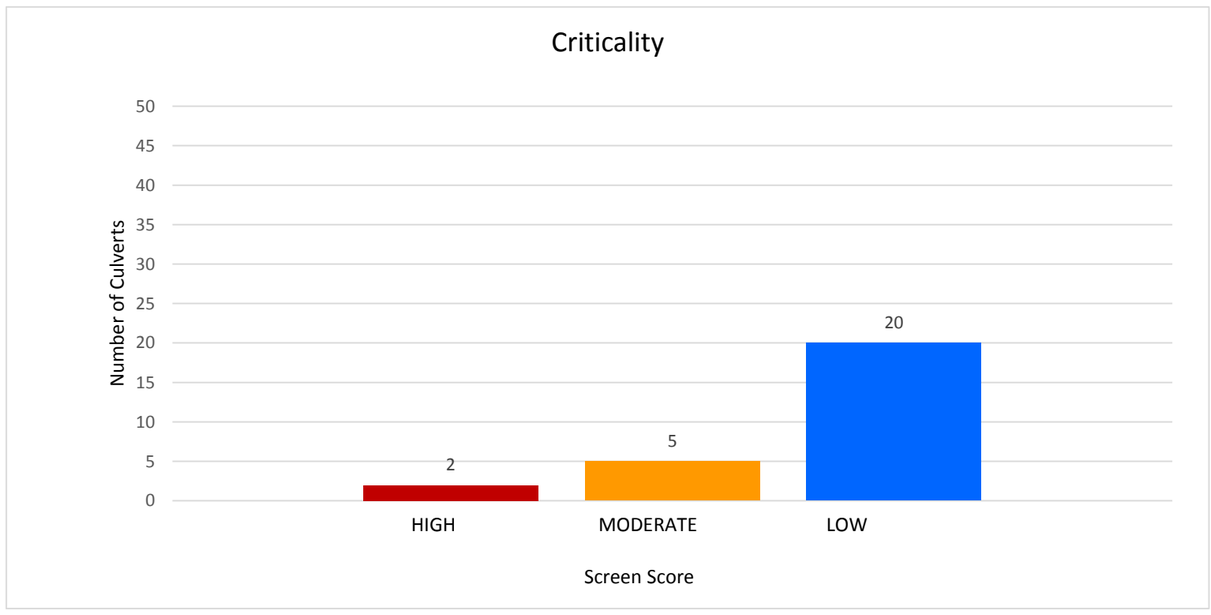


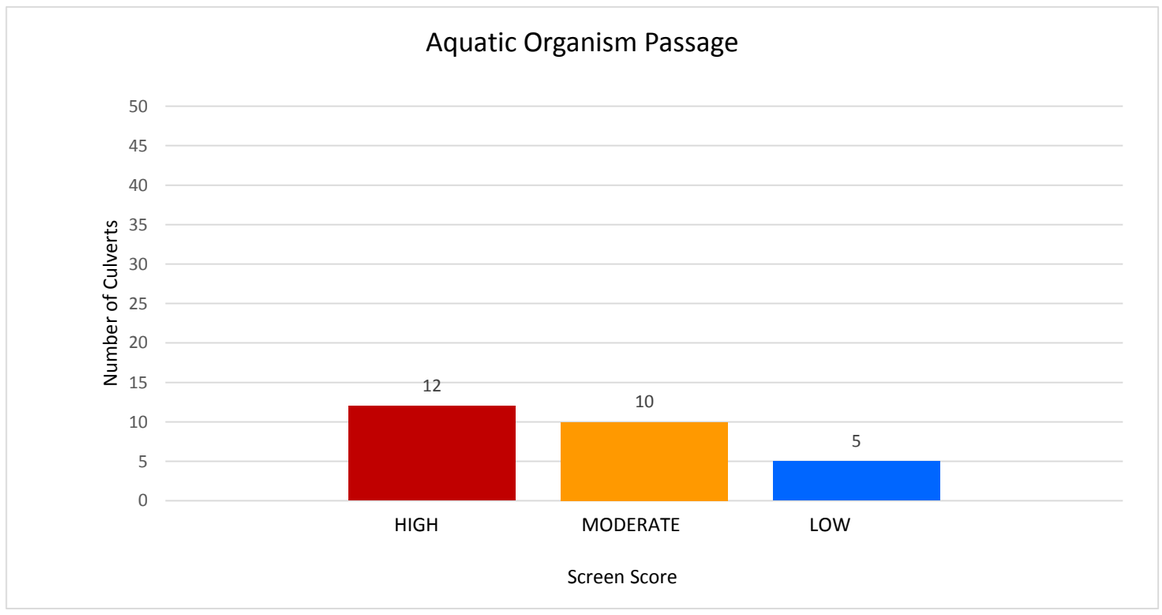
DUNBARTON
Culvert Summary Data
November 1, 2016

Variable Data









Select Town: Dunbarton

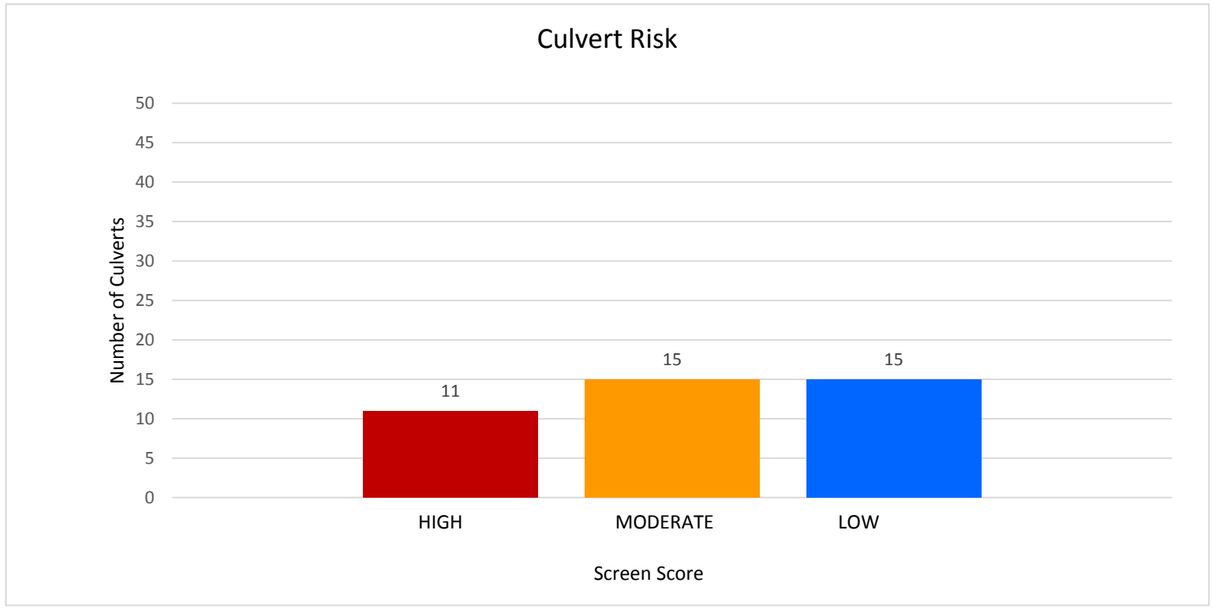
SADES_ID	Town	Road	Stream	Owner	AOP	GC	STR	C	R	Data Score	Risk Level	Red Listed	Town CIP	10-year Road Plan	Structural Reinspection	Replaced with	Replacement date	Replacement cost	Local ID
942	DUNBARTON	Stark Hwy N	Stark Brook	NH DOT	HIGH	LOW	HIGH	HIGH	HIGH	HIGH	5								
945	DUNBARTON	Stark	Stark Brook	NH DOT	MODERATE	LOW	HIGH	MODERATE	HIGH	MODERATE	9								
866	DUNBARTON	Rte 13	Gorham Brook	NH DOT	LOW	Unable to Score	HIGH	HIGH	HIGH	LOW	10								
892	DUNBARTON	Barnard Hill Rd	Barnard Brook		MODERATE	Unable to Score	HIGH	MODERATE	HIGH	LOW	11								
943	DUNBARTON	stark lane	Stark Brook	NH DOT	HIGH	Unable to Score	HIGH	MODERATE	HIGH	LOW	11								
1315	DUNBARTON	Gorham Pond rd	Gorham Brook		HIGH	HIGH	HIGH	LOW	MODERATE	MODERATE	14								
1246	DUNBARTON	Gorham Lake Rd	unk		MODERATE	HIGH	HIGH	LOW	MODERATE	MODERATE	14								
947	DUNBARTON	Winslow	Stark Brook		HIGH	HIGH	HIGH	LOW	MODERATE	MODERATE	14								
938	DUNBARTON	Old Hopkinton	Stark Brook		MODERATE	HIGH	HIGH	LOW	MODERATE	MODERATE	14								
1013	DUNBARTON	black brook rd	unk		HIGH	HIGH	HIGH	LOW	MODERATE	LOW	14								
946	DUNBARTON	Stark	Stark Brook	NH DOT	MODERATE	HIGH	MODERATE	MODERATE	MODERATE	MODERATE	17								
894	DUNBARTON	Mansion Rd	Barnard Brook	NH DOT	HIGH	MODERATE	HIGH	LOW	MODERATE	HIGH	20								
893	DUNBARTON	Mansion Rd	Barnard Brook	NH DOT	HIGH	MODERATE	HIGH	LOW	MODERATE	HIGH	20								
5279	DUNBARTON	Stephanie Rd	Gorham Brook		LOW	MODERATE	HIGH	LOW	MODERATE	MODERATE	20								
1016	DUNBARTON	black brook rd	harry brook		MODERATE	MODERATE	HIGH	LOW	MODERATE	MODERATE	20								
941	DUNBARTON	Tenney Hill Rd	Stark Brook		HIGH	MODERATE	HIGH	LOW	MODERATE	MODERATE	20								
940	DUNBARTON	Tenney Hill	Stark Brook		HIGH	MODERATE	HIGH	LOW	MODERATE	MODERATE	20								
1247	DUNBARTON	Karen Rd	gorham Brook		MODERATE	HIGH	MODERATE	LOW	MODERATE	MODERATE	21								
1015	DUNBARTON	Long Pond Rd	Harry Brook		HIGH	HIGH	MODERATE	LOW	MODERATE	MODERATE	21								
1314	DUNBARTON	Gorham Pond Rd	unk		HIGH	Unable to Score	HIGH	LOW	MODERATE	LOW	25								
1313	DUNBARTON	Gorham Pond Rd	Gorham Brook		MODERATE	Unable to Score	HIGH	LOW	MODERATE	LOW	25								
1245	DUNBARTON	gorham lake rd	unk		MODERATE	Unable to Score	HIGH	LOW	MODERATE	LOW	25								
1014	DUNBARTON	MoosePoint Rd	Harry Brook		LOW	Unable to Score	HIGH	LOW	MODERATE	LOW	25								
1012	DUNBARTON	Powell Ln	unk		LOW	Unable to Score	HIGH	LOW	MODERATE	LOW	25								
944	DUNBARTON	Stinson	Stark Brook		MODERATE	LOW	MODERATE	LOW	LOW	MODERATE	32								
895	DUNBARTON	Everett Dam Rd	Barnard Brook	NH DOT	HIGH	LOW	LOW	MODERATE	LOW	MODERATE	35								

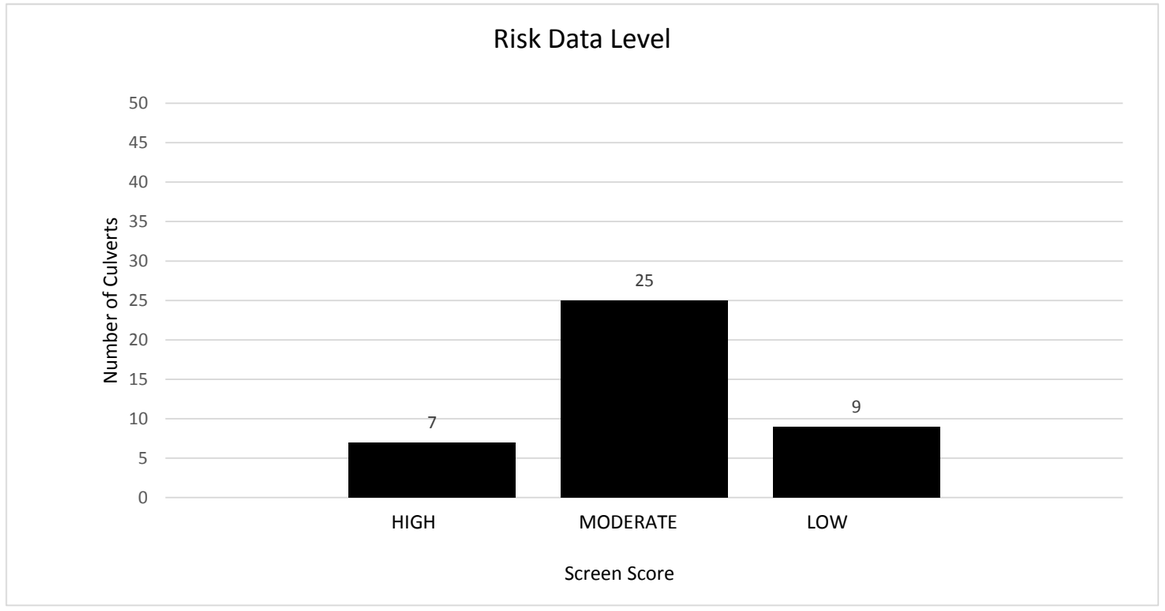
APPENDIX D

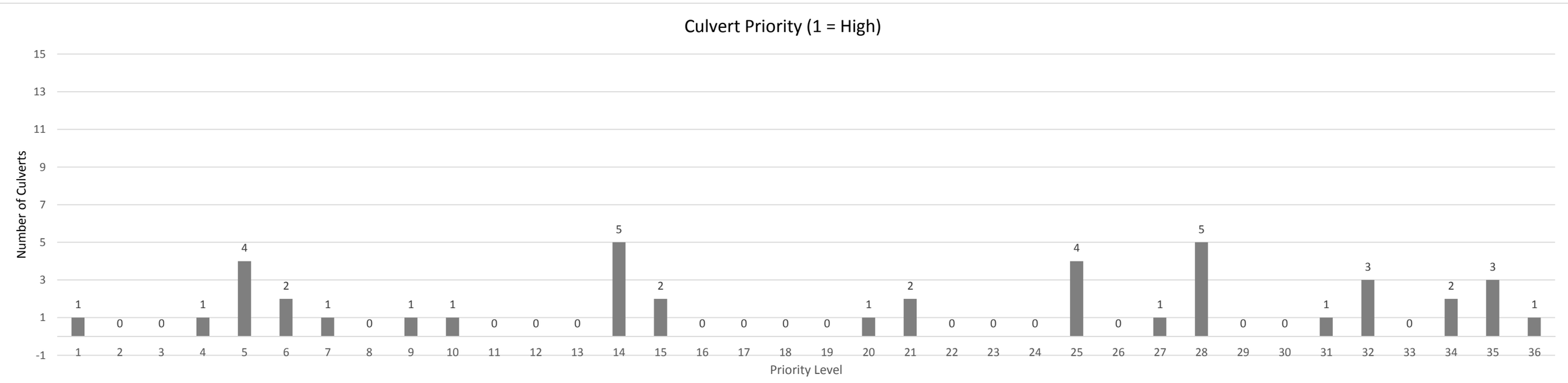
FRANCESTOWN

FRANCESTOWN
Culvert Summary Data
November 1, 2016

Risk and Priority Data

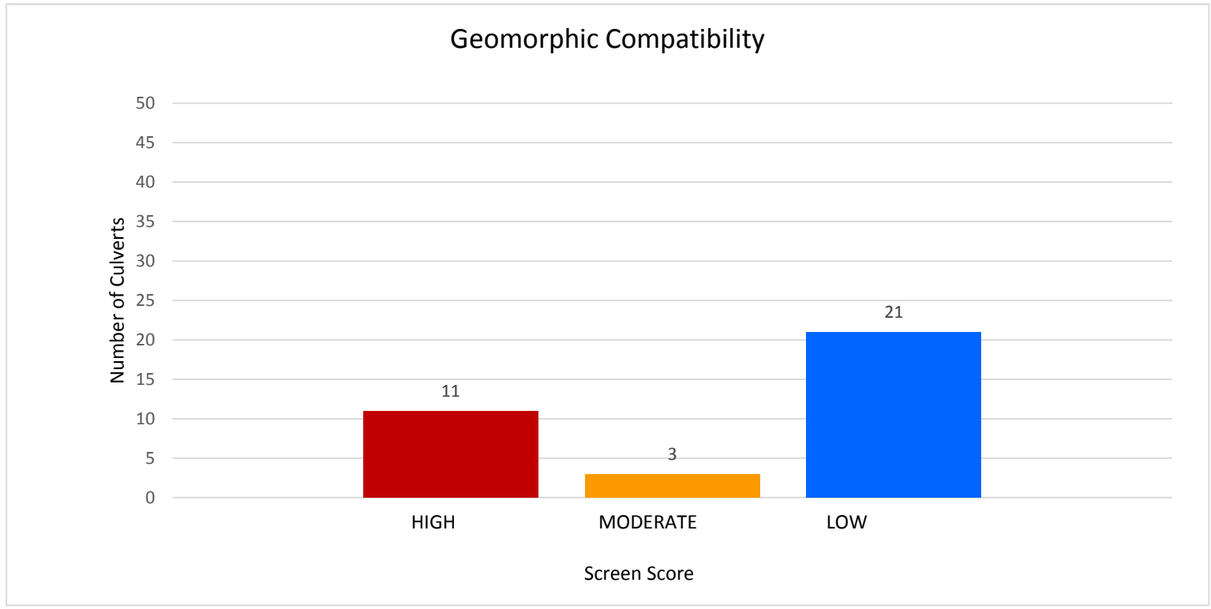


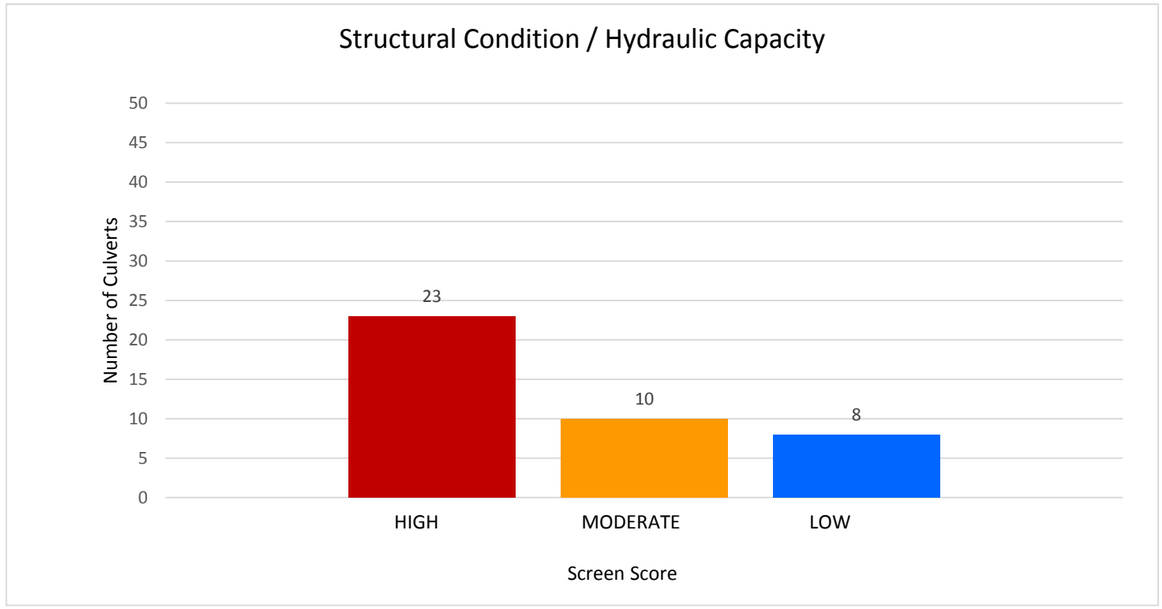


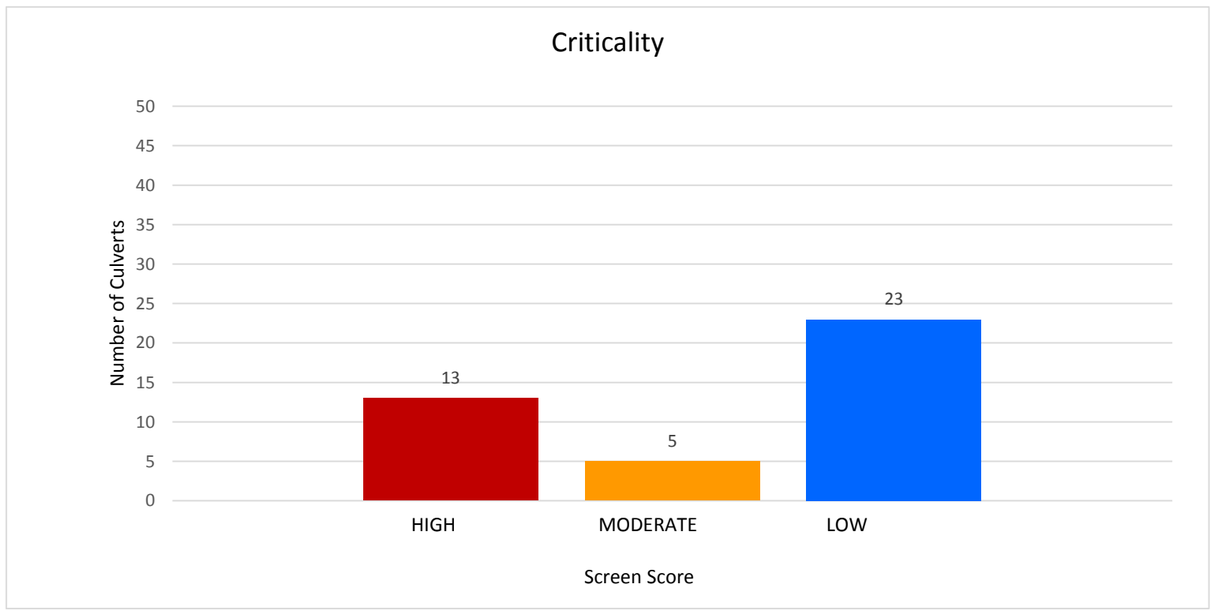


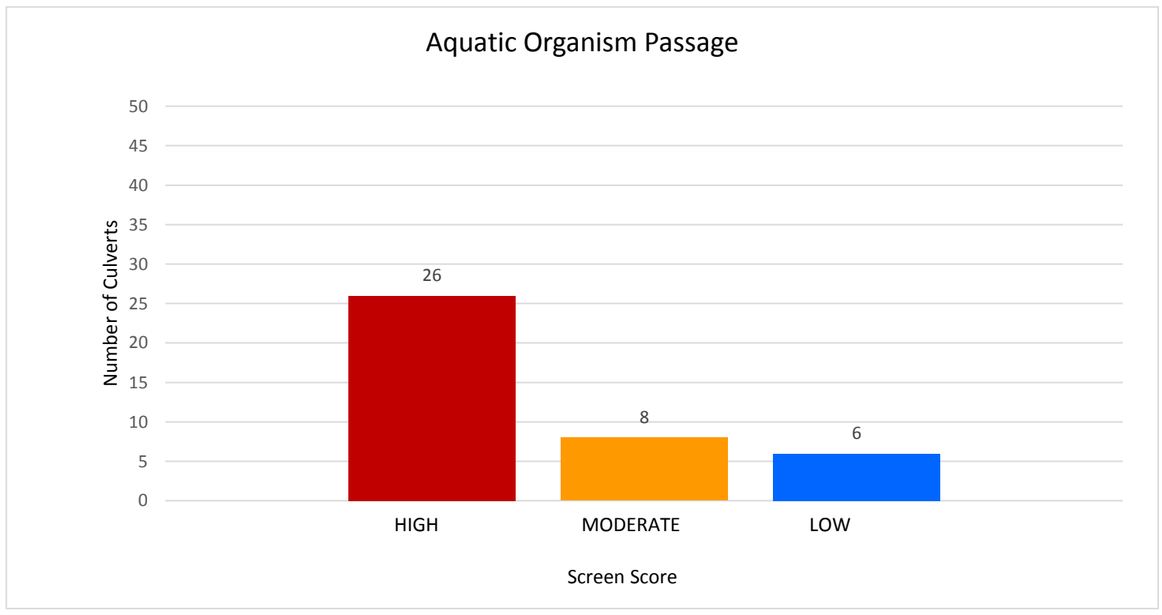
FRANCESTOWN
Culvert Summary Data
November 1, 2016

Variable Data









Select Town: Francestown

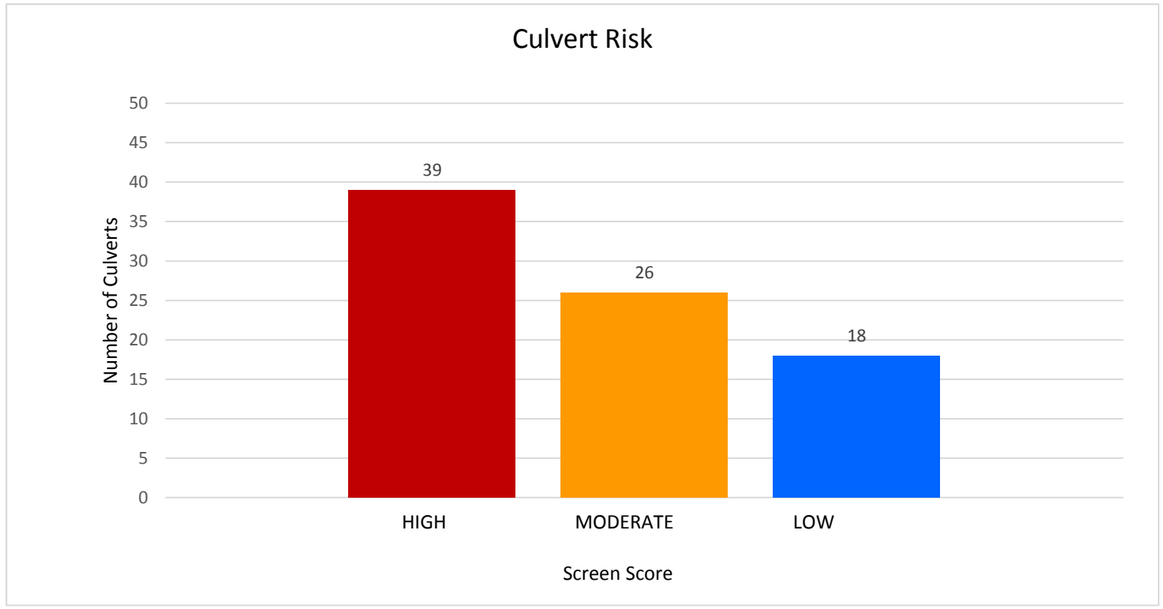
SADES_ID	Town	Road	Stream	Owner	AOP	GC	STR	C	R	Data Score	Risk Level	Red Listed	Town CIP	10-year Road Plan	Structural Reinspection	Replaced with	Replacement date	Replacement cost	Local ID
1148	FRANCESTOWN	Bennington Rd	Collins Brook	NH DOT	HIGH	HIGH	HIGH	HIGH	HIGH	MODERATE	1								
1186	FRANCESTOWN	Birdsall	South Branch Piscataquog		MODERATE	HIGH	HIGH	MODERATE	HIGH	LOW	4								
1150	FRANCESTOWN	Old County	collins Brook		HIGH	LOW	HIGH	HIGH	HIGH	HIGH	5								
1180	FRANCESTOWN	Reid RD	South Branch Piscataquog	Municipal	HIGH	LOW	HIGH	HIGH	HIGH	HIGH	5								
1187	FRANCESTOWN	Birdsall	South Branch Piscataquog		MODERATE	LOW	HIGH	HIGH	HIGH	MODERATE	5								
1161	FRANCESTOWN	Bennington Rd	Dinsmore Brook	NH DOT	HIGH	LOW	HIGH	HIGH	HIGH	MODERATE	5								
1155	FRANCESTOWN	Bennington Rd	Dinsmore brook	NH DOT	HIGH	HIGH	LOW	HIGH	HIGH	HIGH	6								
1166	FRANCESTOWN	greenfield rd	rand brook	NH DOT		HIGH	LOW	HIGH	HIGH	MODERATE	6								
1154	FRANCESTOWN	Bennington	Dinsmore Brook	NH DOT	HIGH	MODERATE	MODERATE	HIGH	HIGH	MODERATE	7								
1182	FRANCESTOWN	Muzzey	South Branch Piscataquog		HIGH	LOW	HIGH	MODERATE	HIGH	MODERATE	9								
1124	FRANCESTOWN	Rte 136	unk	NH DOT	LOW	Unable to Score	HIGH	HIGH	HIGH	LOW	10								
1176	FRANCESTOWN	Russell Station	Rand Brook		HIGH	HIGH	HIGH	LOW	MODERATE	HIGH	14								
1160	FRANCESTOWN	Mountain Rd	Dinsmore Brook		HIGH	HIGH	HIGH	LOW	MODERATE	MODERATE	14								
1159	FRANCESTOWN	2nd NH Turnpike	Dinsmore Brook		HIGH	HIGH	HIGH	LOW	MODERATE	MODERATE	14								
1123	FRANCESTOWN	Dennison Pond Rd	unk		MODERATE	HIGH	HIGH	LOW	MODERATE	MODERATE	14								
801	FRANCESTOWN	Avery Rd	Piscataquog		HIGH	HIGH	HIGH	LOW	MODERATE	LOW	14								
1119	FRANCESTOWN	rte 136	unk	NH DOT	MODERATE	LOW	MODERATE	HIGH	MODERATE	HIGH	15								
1177	FRANCESTOWN	Poor Farm	South Branch Piscataquog		HIGH	LOW	MODERATE	HIGH	MODERATE	MODERATE	15								
1152	FRANCESTOWN	Mountain Rd	Dinsmore Brook		HIGH	MODERATE	HIGH	LOW	MODERATE	MODERATE	20								
1162	FRANCESTOWN	Abbott Ln	Dinsmore Brook		HIGH	HIGH	MODERATE	LOW	MODERATE	MODERATE	21								
1153	FRANCESTOWN	Back Mtn Rd	Dinsmore Brook		HIGH	HIGH	MODERATE	LOW	MODERATE	MODERATE	21								
803	FRANCESTOWN	Dodge Rd	piscataquog		HIGH	Unable to Score	HIGH	LOW	MODERATE	LOW	25								
1158	FRANCESTOWN	2nd NH Turnpike	Dinsmore Brook		MODERATE	Unable to Score	HIGH	LOW	MODERATE	LOW	25								
1116	FRANCESTOWN	bible hill rd ext	whiting brook		LOW	Unable to Score	HIGH	LOW	MODERATE	LOW	25								
1179	FRANCESTOWN	Udall Rd	unk		HIGH	Unable to Score	HIGH	LOW	MODERATE	LOW	25								
1120	FRANCESTOWN	red house rd	unk		MODERATE	Unable to Score	MODERATE	LOW	MODERATE	LOW	27								
1156	FRANCESTOWN	School House Rd	Dinsmore Brook	Municipal	HIGH	LOW	HIGH	LOW	LOW	HIGH	28								
5272	FRANCESTOWN	S New boston Rd	Piscataquog		HIGH	LOW	HIGH	LOW	LOW	MODERATE	28								
1189	FRANCESTOWN	Woodward Hill	Piscataquog		HIGH	LOW	HIGH	LOW	LOW	MODERATE	28								
1126	FRANCESTOWN	scobie	whiting brook		MODERATE	LOW	HIGH	LOW	LOW	MODERATE	28								
1117	FRANCESTOWN	bible hill rd	Whiting Brook		LOW	MODERATE	MODERATE	LOW	LOW	MODERATE	31								
1157	FRANCESTOWN	2nd NH Turnpike	unk		LOW	LOW	MODERATE	LOW	LOW	MODERATE	32								
1149	FRANCESTOWN	Fisher Hill	Collins Brook		HIGH	LOW	MODERATE	LOW	LOW	MODERATE	32								
802	FRANCESTOWN	Dodge Hill Rd	Piscataquog		MODERATE	LOW	MODERATE	LOW	LOW	LOW	32								
5267	FRANCESTOWN	Rt. 136 (New Boston Rd.)	South Branch River	NH DOT	LOW	LOW	LOW	HIGH	LOW	MODERATE	34								
5266	FRANCESTOWN	Francestown Turnpike	South Branch River		HIGH	LOW	LOW	MODERATE	LOW	MODERATE	35								
1185	FRANCESTOWN	Juniper Hill	South Branch Piscataquog		HIGH	LOW	LOW	MODERATE	LOW	MODERATE	35								
1147	FRANCESTOWN	Old Cty Rd	Collins Brook		HIGH	LOW	LOW	LOW	LOW	HIGH	36								

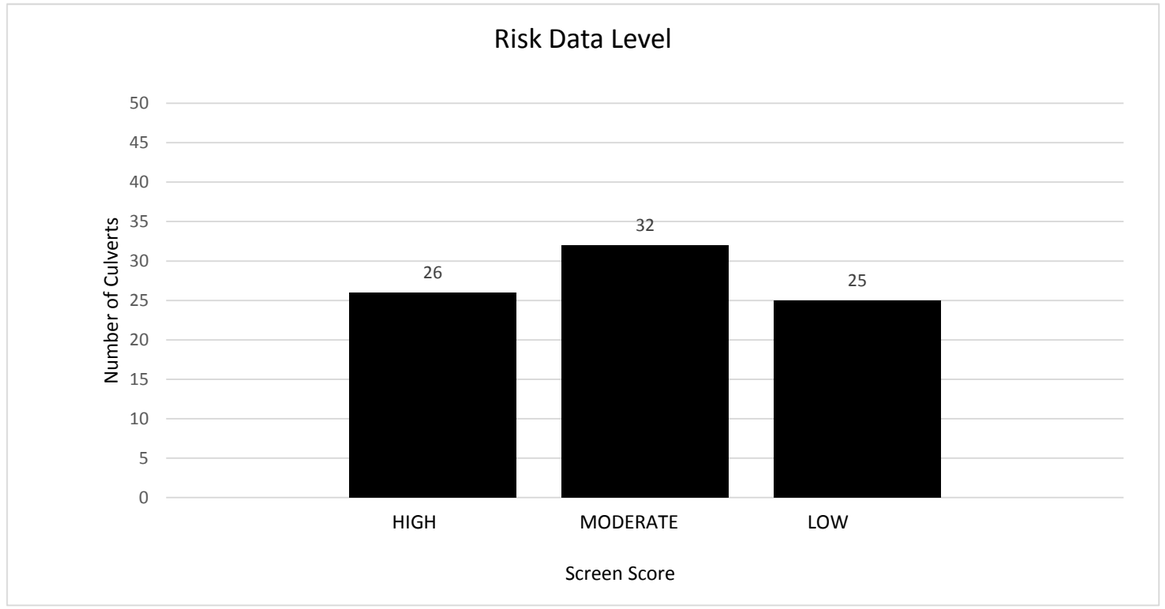
APPENDIX E

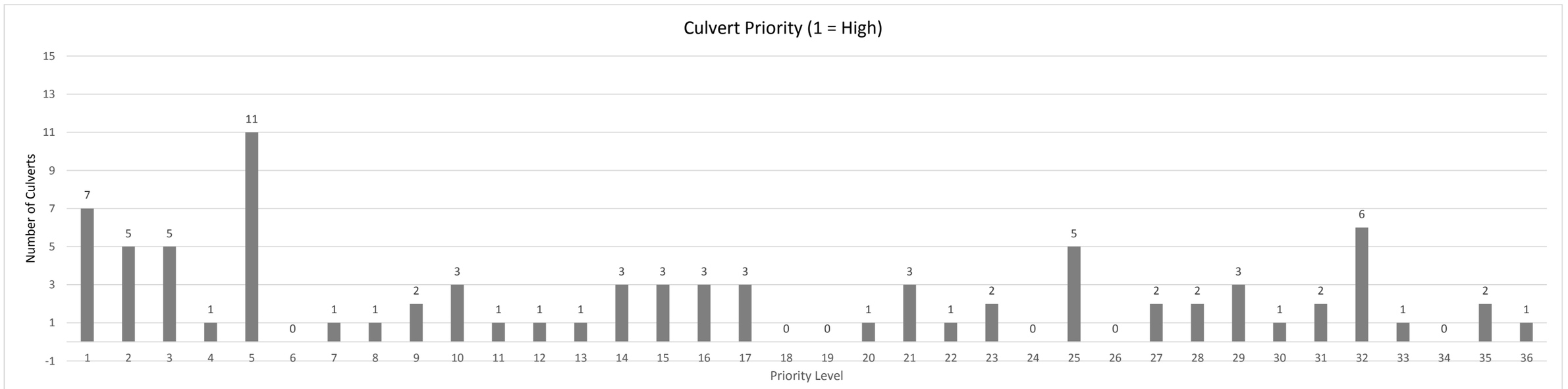
GOFFSTOWN

GOFFSTOWN
Culvert Summary Data
November 1, 2016

Risk and Priority Data

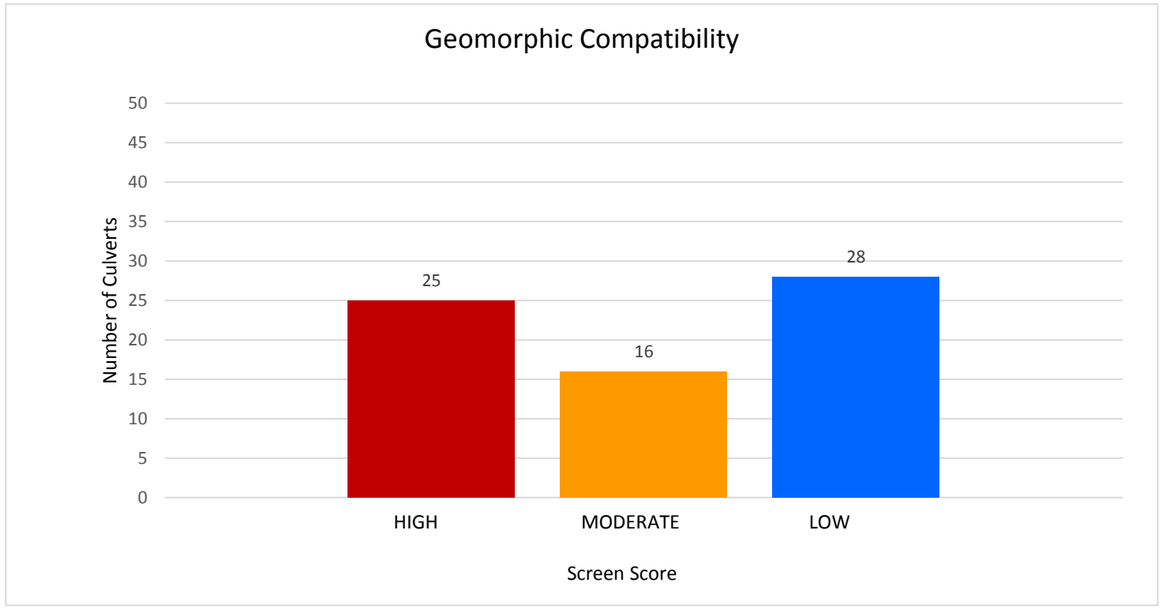


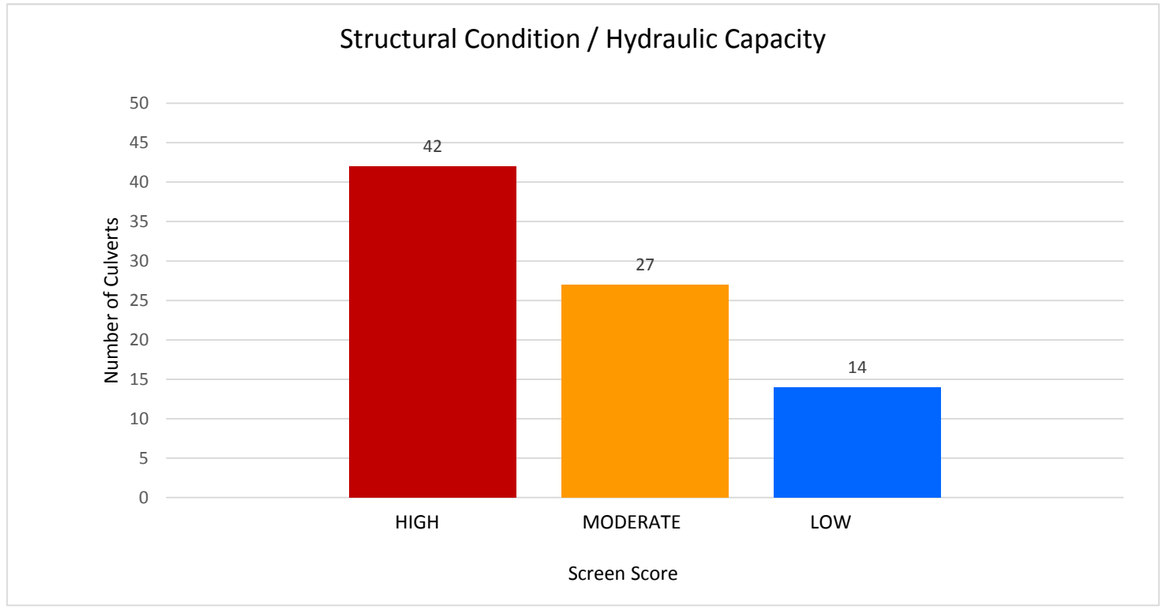


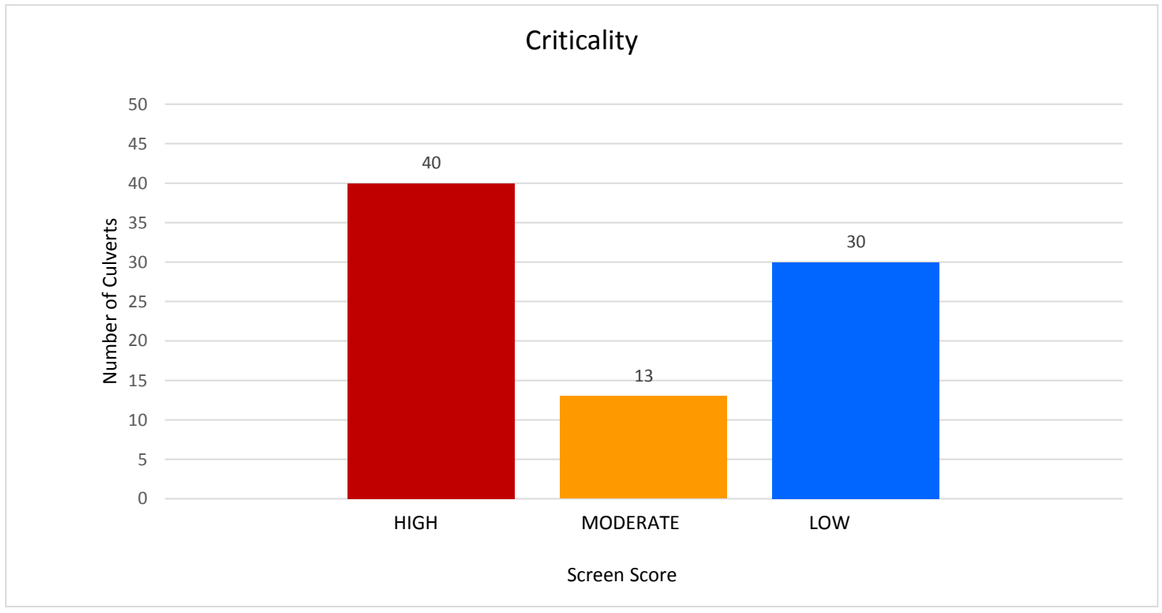


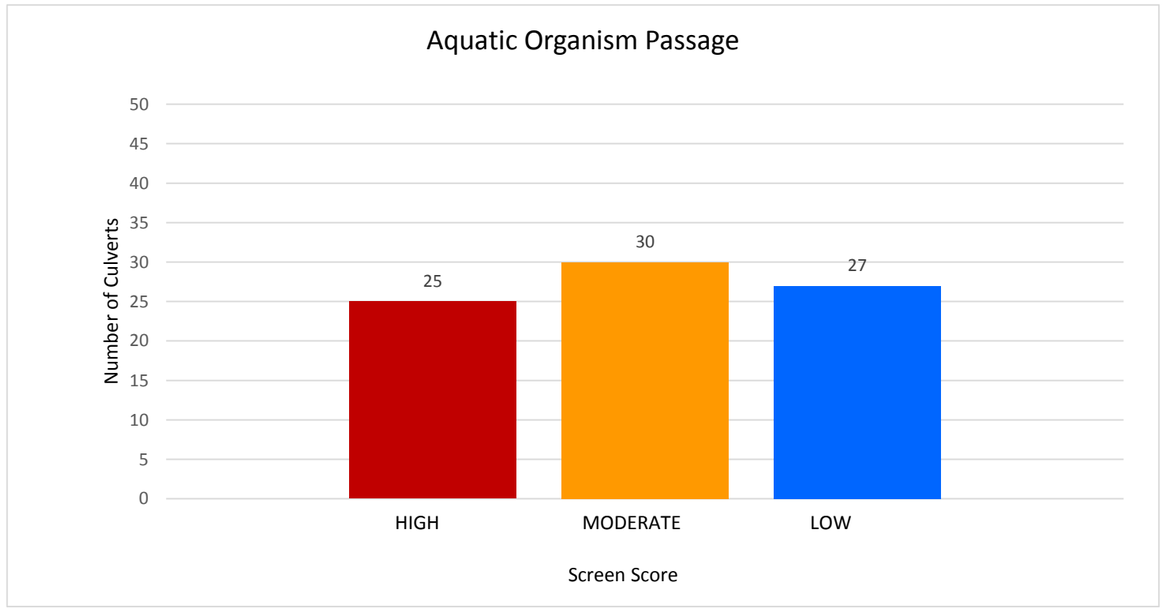
GOFFSTOWN
Culvert Summary Data
November 1, 2016

Variable Data









Select Town: Goffstown

SADES_ID	Town	Road	Stream	Owner	AOP	GC	STR	C	R	Data Score	Risk Level	Red Listed	Town CIP	10-year Road Plan	Structural Reinspection	Replaced with	Replacement date	Replacement cost	Local ID
1010	GOFFSTOWN	Wallace	Dan Little Brook		MODERATE	HIGH	HIGH	HIGH	HIGH	HIGH	1								4685
772	GOFFSTOWN	Elm St	Piscataquog		MODERATE	HIGH	HIGH	HIGH	HIGH	HIGH	1								3872
1057	GOFFSTOWN	rt 114	Piscataquog	NH DOT	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	1								0
1036	GOFFSTOWN	Stinson	Piscataquog	Municipal	LOW	HIGH	HIGH	HIGH	HIGH	HIGH	1								4593
771	GOFFSTOWN	Elm St	Piscataquog		HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	1								1852
1030	GOFFSTOWN	Autumn	Piscataquog		LOW	HIGH	HIGH	HIGH	HIGH	MODERATE	1								3764
1024	GOFFSTOWN	Juniper Dr	Henry Brook		MODERATE	HIGH	HIGH	HIGH	HIGH	MODERATE	1								4465
765	GOFFSTOWN	Center Street	Cemetary Brook		HIGH	MODERATE	HIGH	HIGH	HIGH	HIGH	2								2016
5194	GOFFSTOWN	Rt. 114/Stark Highway (GRB	Gorham Brook	NH DOT	HIGH	MODERATE	HIGH	HIGH	HIGH	HIGH	2								4545
1045	GOFFSTOWN	Glenwood Dr	Piscataquog		MODERATE	MODERATE	HIGH	HIGH	HIGH	MODERATE	2								3855
1044	GOFFSTOWN	Paige Hill Rd	Piscataquog		LOW	MODERATE	HIGH	HIGH	HIGH	MODERATE	2								108
1040	GOFFSTOWN	Maple	Piscataquog		LOW	MODERATE	HIGH	HIGH	HIGH	MODERATE	2								3762
1047	GOFFSTOWN	Goffstown Back Rd	Piscataquog		LOW	HIGH	MODERATE	HIGH	HIGH	HIGH	3								3131
1042	GOFFSTOWN	S Main St	Piscataquog	Municipal	LOW	HIGH	MODERATE	HIGH	HIGH	HIGH	3								649
5228	GOFFSTOWN	New Boston Rd (Bog Brook :	Bog Brook	Municipal	HIGH	HIGH	MODERATE	HIGH	HIGH	HIGH	3								4002
4873	GOFFSTOWN	Greer Rd			LOW	HIGH	MODERATE	HIGH	HIGH	MODERATE	3								4353
4869	GOFFSTOWN	Mast Rd		Municipal	MODERATE	HIGH	MODERATE	HIGH	HIGH	MODERATE	3								3485
993	GOFFSTOWN	Roby Rd	Bog Brook		MODERATE	HIGH	HIGH	MODERATE	HIGH	HIGH	4								4766
1059	GOFFSTOWN	Goffstown Back Rd	<Null>		MODERATE	LOW	HIGH	HIGH	HIGH	HIGH	5								0
1046	GOFFSTOWN	Elm st	Piscataquog		MODERATE	LOW	HIGH	HIGH	HIGH	HIGH	5								3854
1037	GOFFSTOWN	Rte 13	Piscataquog	Municipal	MODERATE	LOW	HIGH	HIGH	HIGH	HIGH	5								3215
1033	GOFFSTOWN	N Mast Rd	Piscataquog	Municipal	HIGH	LOW	HIGH	HIGH	HIGH	HIGH	5								2734
1025	GOFFSTOWN	Tibbett Hilll Rd	Henry Brook		MODERATE	LOW	HIGH	HIGH	HIGH	HIGH	5								4462
4870	GOFFSTOWN	Mast Rd.		NH DOT	MODERATE	LOW	HIGH	HIGH	HIGH	HIGH	5								0
1039	GOFFSTOWN	Smith	Piscataquog		HIGH	LOW	HIGH	HIGH	HIGH	MODERATE	5								3756
1038	GOFFSTOWN	Hemlock	Piscataquog		MODERATE	LOW	HIGH	HIGH	HIGH	MODERATE	5								3229
1032	GOFFSTOWN	Summer st	Piscataquog		MODERATE	LOW	HIGH	HIGH	HIGH	MODERATE	5								3835
1031	GOFFSTOWN	Whipple	Piscataquog		LOW	LOW	HIGH	HIGH	HIGH	MODERATE	5								3280
1027	GOFFSTOWN	1st Ave	Piscataquog		LOW	LOW	HIGH	HIGH	HIGH	MODERATE	5								3780
4888	GOFFSTOWN	Tibbets Hill Rd			HIGH	MODERATE	MODERATE	HIGH	HIGH	HIGH	7								2112
773	GOFFSTOWN	Dumont Park Rd	Piscataquog		MODERATE	MODERATE	HIGH	MODERATE	HIGH	MODERATE	8								4785
994	GOFFSTOWN	Roby	Bog Brook		LOW	LOW	HIGH	MODERATE	HIGH	HIGH	9								4767
775	GOFFSTOWN	Tirrell Hill Rd	<Null>		LOW	LOW	HIGH	MODERATE	HIGH	HIGH	9								2848
1021	GOFFSTOWN	Range Rd	Henry Brook		MODERATE	Unable to Score	HIGH	HIGH	HIGH	MODERATE	10								4510
1018	GOFFSTOWN	Tibetts Hill Rd	Henry Brook		LOW	Unable to Score	HIGH	HIGH	HIGH	MODERATE	10								950
1252	GOFFSTOWN	Mast	Gorham Brook	NH DOT		Unable to Score	HIGH	HIGH	HIGH	LOW	10								4533
766	GOFFSTOWN	Mosett	Catamount Brook		MODERATE	Unable to Score	HIGH	MODERATE	HIGH	LOW	11								1464
4882	GOFFSTOWN	Elm St			HIGH	Unable to Score	MODERATE	HIGH	HIGH	LOW	12								0
1035	GOFFSTOWN	Depot Rd	Piscataquog		LOW	Unable to Score	LOW	HIGH	HIGH	LOW	13								1033
1048	GOFFSTOWN	Addison	Piscataquog		MODERATE	HIGH	HIGH	LOW	MODERATE	MODERATE	14								2555
4872	GOFFSTOWN	Roby Rd			HIGH	HIGH	HIGH	LOW	MODERATE	LOW	14								4764
1051	GOFFSTOWN	Addison	Piscataquog		HIGH	HIGH	HIGH	LOW	MODERATE	LOW	14								984
1041	GOFFSTOWN	Elm	Piscataquog		HIGH	LOW	MODERATE	HIGH	MODERATE	HIGH	15								1076
1020	GOFFSTOWN	Tibetts Hill Rd	Henry Brook		HIGH	LOW	MODERATE	HIGH	MODERATE	HIGH	15								4509
1019	GOFFSTOWN	Stark Hwy	Harry Brook	NH DOT	HIGH	LOW	MODERATE	HIGH	MODERATE	HIGH	15								4608
5231	GOFFSTOWN	Wallace Road (DLB-4)	Dan Little Brook		LOW	MODERATE	LOW	HIGH	MODERATE	HIGH	16								1375
5190	GOFFSTOWN	Route 114 (DLB-1)	Dan Little Brook	NH DOT	HIGH	MODERATE	LOW	HIGH	MODERATE	HIGH	16								4306
770	GOFFSTOWN	Henry Bridge Rd	Henry Brook		HIGH	MODERATE	LOW	HIGH	MODERATE	HIGH	16								0
1028	GOFFSTOWN	Pasrsons Dr	Piscataquog		MODERATE	HIGH	MODERATE	MODERATE	MODERATE	MODERATE	17								4571
4878	GOFFSTOWN	Winter Hill Rd			MODERATE	HIGH	MODERATE	MODERATE	MODERATE	LOW	17								1952
4871	GOFFSTOWN	Ridgewood Dr.			HIGH	HIGH	MODERATE	MODERATE	MODERATE	LOW	17								4666
1250	GOFFSTOWN	Gorham Pond Rd	Gorham Brook		HIGH	MODERATE	HIGH	LOW	MODERATE	MODERATE	20								2908
1053	GOFFSTOWN	Magnolia	Piscataquog		HIGH	HIGH	MODERATE	LOW	MODERATE	MODERATE	21								1251
774	GOFFSTOWN	Walnut Hill	Piscataquog		LOW	HIGH	MODERATE	LOW	MODERATE	MODERATE	21								2562
4879	GOFFSTOWN	Bog Rd			MODERATE	HIGH	MODERATE	LOW	MODERATE	LOW	21								4749
1029	GOFFSTOWN	Parsons Dr	Piscataquog		MODERATE	LOW	MODERATE	MODERATE	MODERATE	MODERATE	22								4573
5269	GOFFSTOWN	Mountain Rd (Reach 3)	Whittle Brook		HIGH	MODERATE	LOW	MODERATE	MODERATE	MODERATE	23								4136
1251	GOFFSTOWN	Saunders Rd	Gorham Brook		LOW	Unable to Score	HIGH	LOW	MODERATE	LOW	25								2929
1009	GOFFSTOWN	Norman	Dan Little Brook		LOW	Unable to Score	HIGH	LOW	MODERATE	LOW	25								4680
991	GOFFSTOWN	Back Mtn Rd	Bog Brook		LOW	Unable to Score	HIGH	LOW	MODERATE	LOW	25								1638

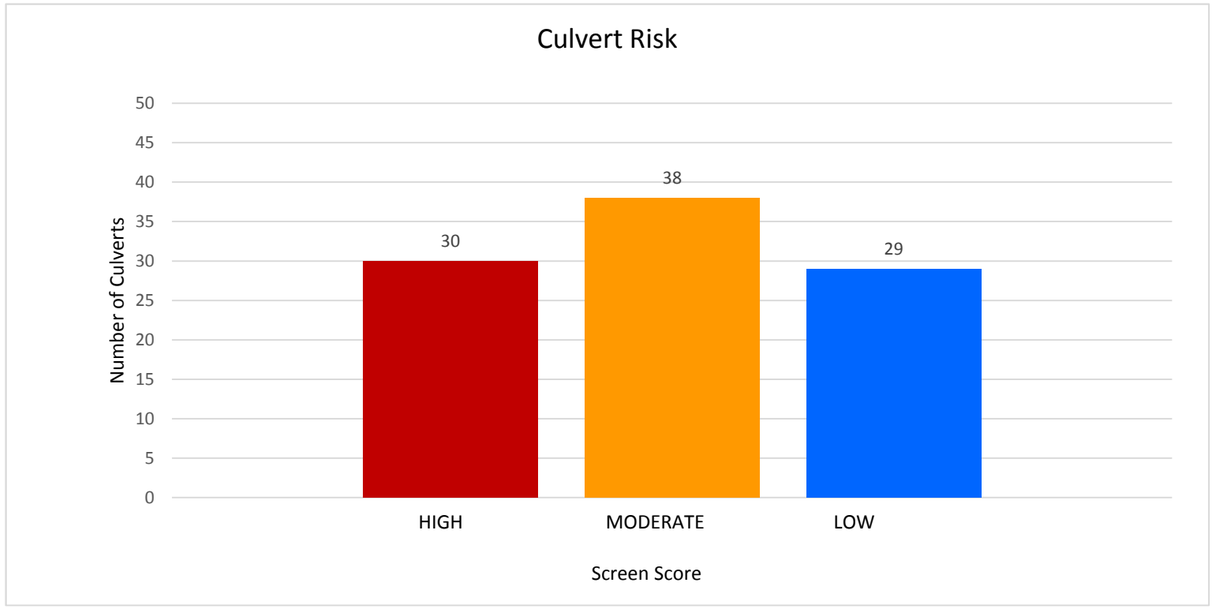
SADES_ID	Town	Road	Stream	Owner	AOP	GC	STR	C	R	Data Score	Risk Level	Red Listed	Town CIP	10-year Road Plan	Structural Reinspection	Replaced with	Replacement date	Replacement cost	Local ID
768	GOFFSTOWN	Keith Dr	Catamount Brook		LOW	Unable to Score	HIGH	LOW	MODERATE	LOW	25								1473
4880	GOFFSTOWN	Stinson Rd			MODERATE	Unable to Score	HIGH	LOW	MODERATE	LOW	25								4388
1248	GOFFSTOWN	Gorham Pond Rd	Gorham Brook		MODERATE	Unable to Score	MODERATE	LOW	MODERATE	LOW	27								2953
4884	GOFFSTOWN	Horizon Dr			LOW	Unable to Score	MODERATE	LOW	MODERATE	LOW	27								0
1026	GOFFSTOWN	Snook	Piscataquog		MODERATE	LOW	HIGH	LOW	LOW	MODERATE	28								0
4881	GOFFSTOWN	Paige Hill Rd			HIGH	LOW	HIGH	LOW	LOW	LOW	28								4373
5233	GOFFSTOWN	Worthley Hill Rd (DLB-5)	Dan Little Brook		LOW	HIGH	LOW	LOW	LOW	LOW	29								1528
5232	GOFFSTOWN	Mountain Base Road (DLB-5	Dan Little Brook		MODERATE	HIGH	LOW	LOW	LOW	LOW	29								0
5192	GOFFSTOWN	Mountain Base Road (DLB-4	Dan Little Brook		HIGH	HIGH	LOW	LOW	LOW	LOW	29								4706
1007	GOFFSTOWN	Bog Brook Rd	Bog Brook		LOW	Unable to Score	LOW	LOW	LOW	LOW	30								0
767	GOFFSTOWN	Miles Ave	Catamount Brook		HIGH	MODERATE	MODERATE	LOW	LOW	MODERATE	31								3062
4868	GOFFSTOWN	Walnut Hill Rd			MODERATE	MODERATE	MODERATE	LOW	LOW	LOW	31								2562
1249	GOFFSTOWN	Snook Rd	Gorham Brook		MODERATE	LOW	MODERATE	LOW	LOW	MODERATE	32								4581
1023	GOFFSTOWN	Range Road	Henry Brook		LOW	LOW	MODERATE	LOW	LOW	MODERATE	32								4435
1022	GOFFSTOWN	Horizon Dr	Henry Brook		LOW	LOW	MODERATE	LOW	LOW	MODERATE	32								2096
1008	GOFFSTOWN	Leach Hill Rd	Bog brook		MODERATE	LOW	MODERATE	LOW	LOW	MODERATE	32								4760
769	GOFFSTOWN	Durango Dr	Catamount Brook		MODERATE	LOW	MODERATE	LOW	LOW	MODERATE	32								2421
4883	GOFFSTOWN	Range Rd			LOW	LOW	MODERATE	LOW	LOW	LOW	32								4435
1055	GOFFSTOWN	Shirley Hill	Piscataquog		HIGH	MODERATE	LOW	LOW	LOW	LOW	33								2563
1043	GOFFSTOWN	Winter Hill Rd	Piscataquog		LOW	LOW	LOW	MODERATE	LOW	MODERATE	35								4319
1011	GOFFSTOWN	ridgewood dr	Dan Little Brook		MODERATE	LOW	LOW	MODERATE	LOW	LOW	35								4662
1054	GOFFSTOWN	Shirley Hill Rd	Piscataquog		LOW	LOW	LOW	LOW	LOW	MODERATE	36								2564

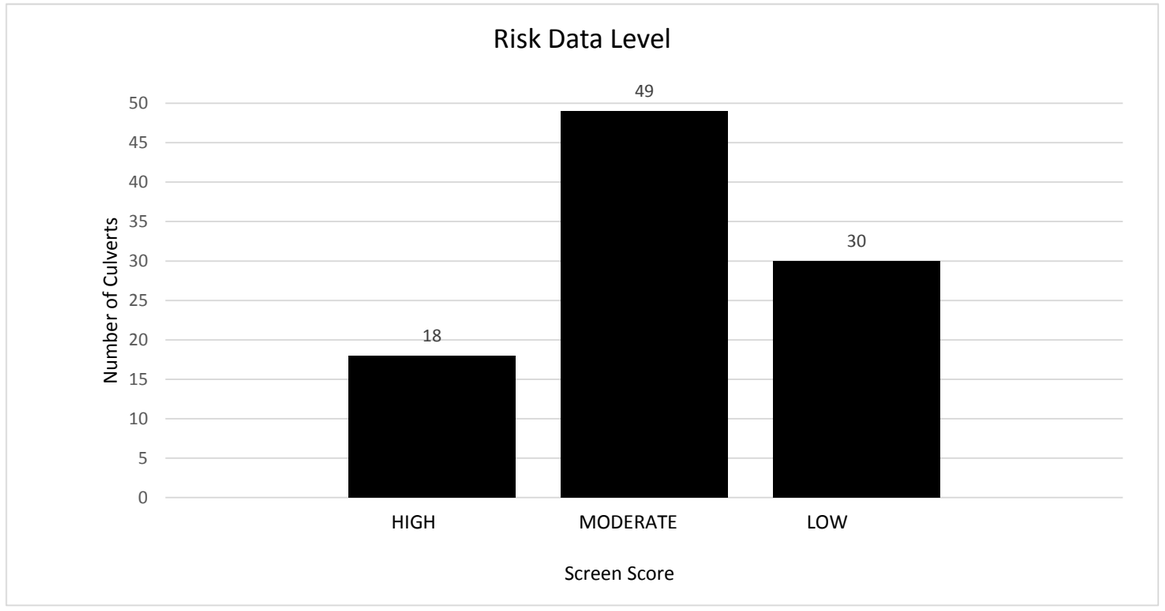
APPENDIX F

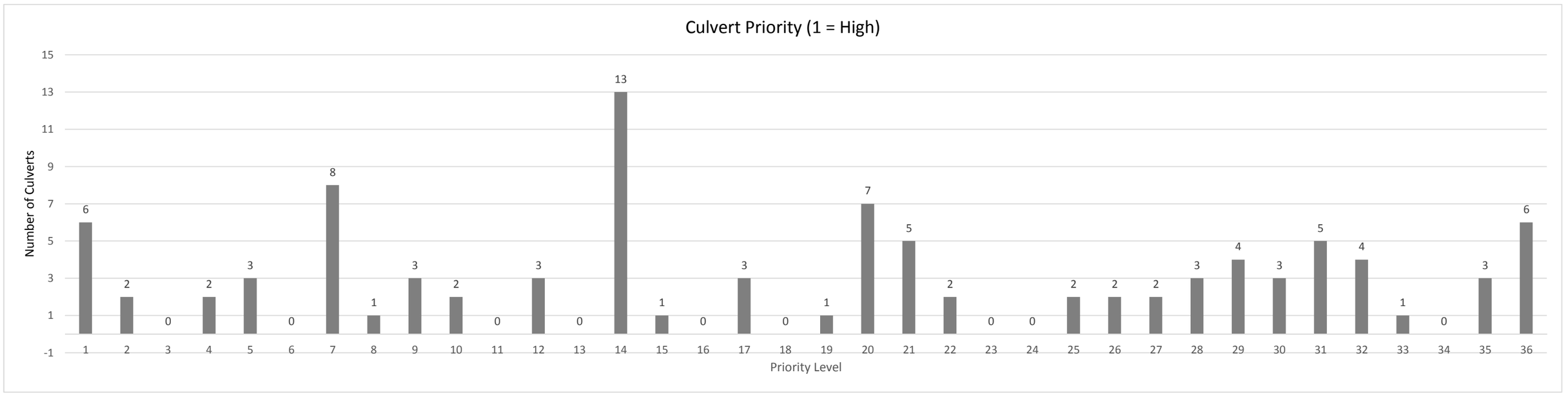
NEW BOSTON

NEW BOSTON
Culvert Summary Data
November 1, 2016

Risk and Priority Data

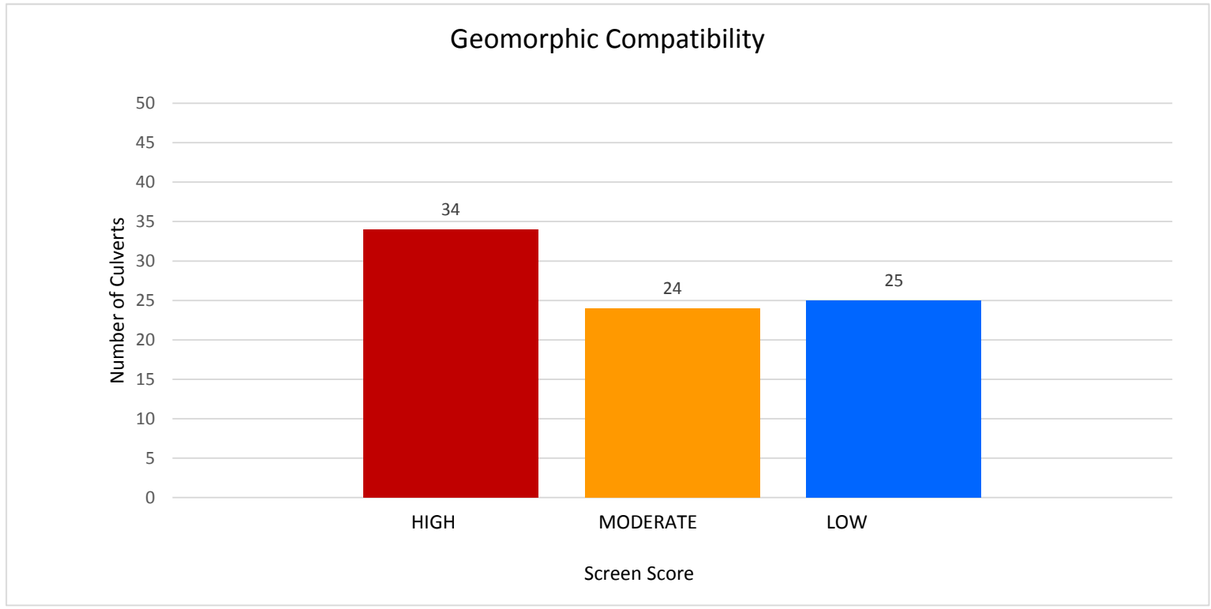


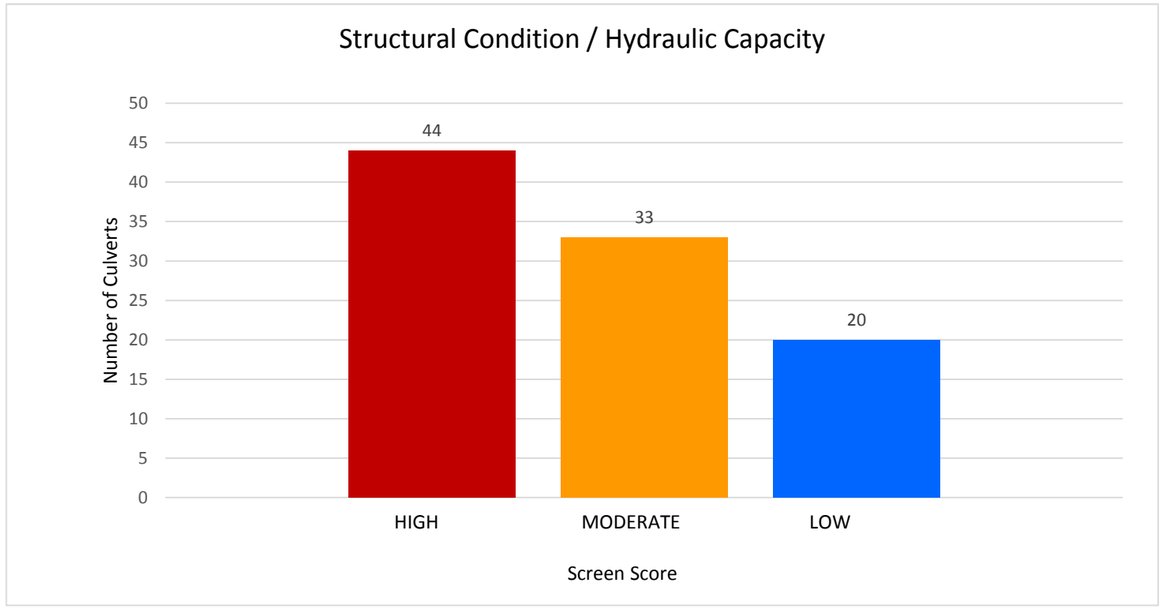


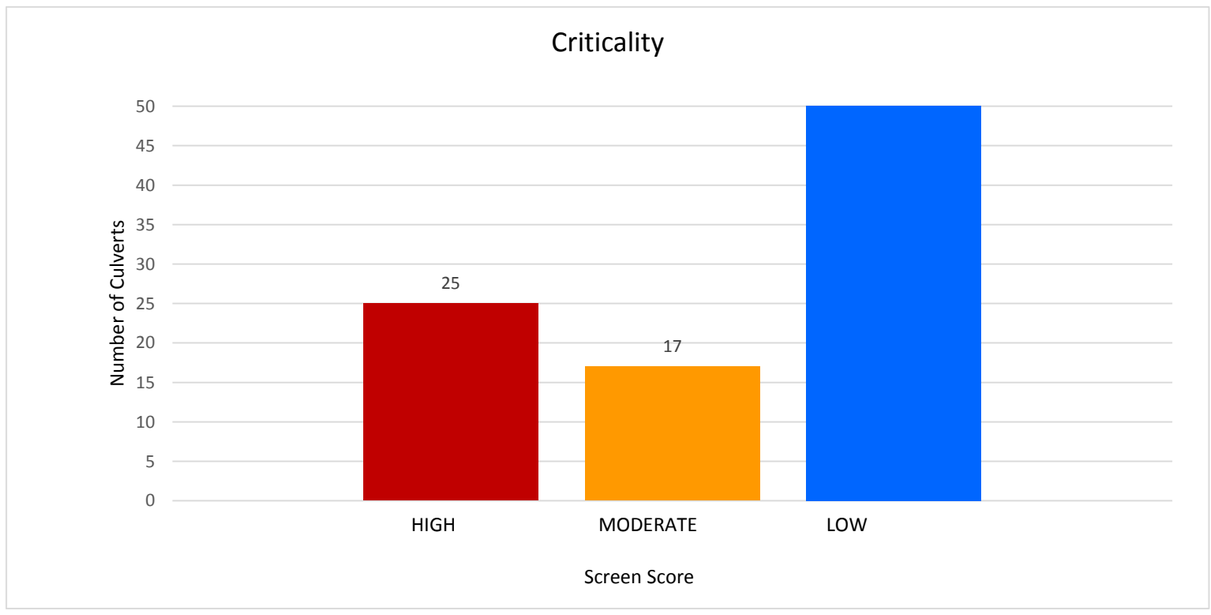


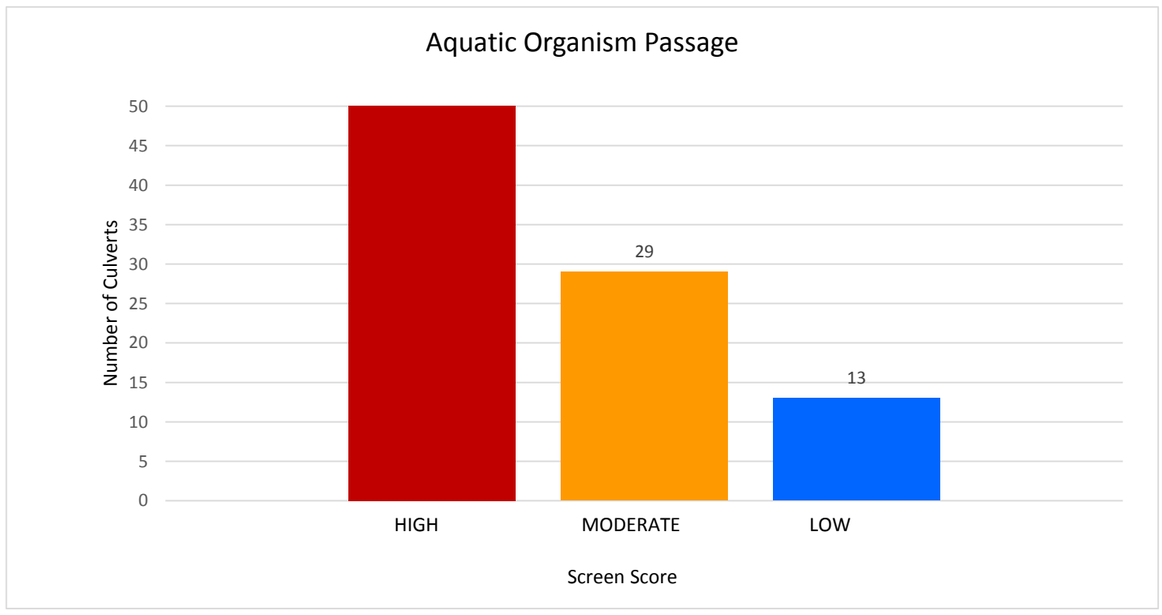
NEW BOSTON
Culvert Summary Data
November 1, 2016

Variable Data









Select Town: New Boston

SADES_ID	Town	Road	Stream	Owner	AOP	GC	STR	C	R	Data Score	Risk Level	Red Listed	Town CIP	10-year Road Plan	Structural Reinspection	Replaced with	Replacement date	Replacement cost	Local ID
1233	NEW BOSTON	Mont Vernon	Piscataquog	NH DOT	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	1								
1085	NEW BOSTON	rte 77	unk	NH DOT	LOW	HIGH	HIGH	HIGH	HIGH	HIGH	1								
1234	NEW BOSTON	Francestown Rd	Piscataquog	NH DOT	MODERATE	HIGH	HIGH	HIGH	HIGH	MODERATE	1								
1079	NEW BOSTON	Francestown Road	Middle Branch Piscataquog	NH DOT	MODERATE	HIGH	HIGH	HIGH	HIGH	MODERATE	1								
1231	NEW BOSTON	Old Coach	Piscataquog		MODERATE	HIGH	HIGH	HIGH	HIGH	LOW	1								
1083	NEW BOSTON	francestown road	unk	NH DOT	LOW	HIGH	HIGH	HIGH	HIGH	LOW	1								
1244	NEW BOSTON	Rte 13	Piscataquog	NH DOT	HIGH	MODERATE	HIGH	HIGH	HIGH	HIGH	2								
1213	NEW BOSTON	Mont Vernon	Meadow Brook	NH DOT	HIGH	MODERATE	HIGH	HIGH	HIGH	HIGH	2								
1004	NEW BOSTON	Bedford	Bog Brook		HIGH	HIGH	HIGH	MODERATE	HIGH	MODERATE	4								
806	NEW BOSTON	Hooper Hill Road	unk		HIGH	HIGH	HIGH	MODERATE	HIGH	MODERATE	4								
1075	NEW BOSTON	Francestown Road	Middle Branch Piscataquog T	NH DOT	LOW	LOW	HIGH	HIGH	HIGH	HIGH	5								
807	NEW BOSTON	river rd	Cochrane Brook	NH DOT	HIGH	LOW	HIGH	HIGH	HIGH	HIGH	5								
1236	NEW BOSTON	Bedford Rd	Piscataquog		HIGH	LOW	HIGH	HIGH	HIGH	MODERATE	5								
5280	NEW BOSTON	Mont Vernon	Piscataquog	NH DOT	HIGH	MODERATE	MODERATE	HIGH	HIGH	HIGH	7								
5275	NEW BOSTON	River Rd	Piscataquog	NH DOT	HIGH	MODERATE	MODERATE	HIGH	HIGH	HIGH	7								
5271	NEW BOSTON	Rte 13	Piscataquog	NH DOT	HIGH	MODERATE	MODERATE	HIGH	HIGH	HIGH	7								
1206	NEW BOSTON	Mont Vernon	Meadow Brook	NH DOT	HIGH	MODERATE	MODERATE	HIGH	HIGH	MODERATE	7								
1082	NEW BOSTON	Francestown Road	Piscataquog River	NH DOT	MODERATE	MODERATE	MODERATE	HIGH	HIGH	MODERATE	7								
1217	NEW BOSTON	2nd NH Turnpike	Piscataquog		MODERATE	MODERATE	HIGH	MODERATE	HIGH	MODERATE	8								
1228	NEW BOSTON	Old Coach Rd	Piscataquog		HIGH	LOW	HIGH	MODERATE	HIGH	MODERATE	9								
986	NEW BOSTON	Chestnut Hill Rd	Bog Brook	NH DOT	HIGH	LOW	HIGH	MODERATE	HIGH	MODERATE	9								
798	NEW BOSTON	Francestown Tpk	Cold Bk		MODERATE	LOW	HIGH	MODERATE	HIGH	MODERATE	9								
1200	NEW BOSTON	Mont Vernon Rd	Meadow brook	NH DOT	HIGH	Unable to Score	HIGH	HIGH	HIGH	LOW	10								
1230	NEW BOSTON	Town Farm	Piscataquog		HIGH	Unable to Score	HIGH	HIGH	HIGH	LOW	10								
1077	NEW BOSTON	Francestown Road	Piscataquog River	NH DOT	MODERATE	Unable to Score	MODERATE	HIGH	HIGH	LOW	12								
5282	NEW BOSTON	Clark Hill Rd	Piscataquog			Unable to Score	MODERATE	HIGH	HIGH	LOW	12								
1199	NEW BOSTON	Meadow Rd	Meadow Brook		MODERATE	HIGH	HIGH	LOW	MODERATE	HIGH	14								
1226	NEW BOSTON	McCollum	Piscataquog		MODERATE	HIGH	HIGH	LOW	MODERATE	MODERATE	14								
1221	NEW BOSTON	S Hill rd	Piscataquog		HIGH	HIGH	HIGH	LOW	MODERATE	MODERATE	14								
1210	NEW BOSTON	Houghton	Meadow Brook		HIGH	HIGH	HIGH	LOW	MODERATE	MODERATE	14								
1198	NEW BOSTON	Joe English Rd	Meadow Brook		HIGH	HIGH	HIGH	LOW	MODERATE	MODERATE	14								
1125	NEW BOSTON	Scoby Rd. (MBPR 24)	Middle Branch		MODERATE	HIGH	HIGH	LOW	MODERATE	MODERATE	14								
1074	NEW BOSTON	Bunker Hill Road	Middle Branch tributary	Municipal	MODERATE	HIGH	HIGH	LOW	MODERATE	MODERATE	14								
997	NEW BOSTON	Carriage Rd	Bog Brook		LOW	HIGH	HIGH	LOW	MODERATE	MODERATE	14								
776	NEW BOSTON	Bunker Hill Rd	Bukston Brook		LOW	HIGH	HIGH	LOW	MODERATE	MODERATE	14								
5245	NEW BOSTON	Tucker Hill Road	Peacock Brook		MODERATE	HIGH	HIGH	LOW	MODERATE	LOW	14								
1078	NEW BOSTON	Colburn	Middle Branch Trib		LOW	HIGH	HIGH	LOW	MODERATE	LOW	14								
1000	NEW BOSTON	McCurdy	Bog Brook		MODERATE	HIGH	HIGH	LOW	MODERATE	LOW	14								
1242	NEW BOSTON	Rte 13	Piscataquog	NH DOT	HIGH	LOW	MODERATE	HIGH	MODERATE	HIGH	15								
1229	NEW BOSTON	Greenfield Rd	Piscataquog		HIGH	HIGH	MODERATE	MODERATE	MODERATE	MODERATE	17								
797	NEW BOSTON	Francestown Tpk	Cold Brook		MODERATE	HIGH	MODERATE	MODERATE	MODERATE	MODERATE	17								
1002	NEW BOSTON	Bedford Rd	bog brook		MODERATE	HIGH	MODERATE	MODERATE	MODERATE	LOW	17								
5189	NEW BOSTON	Bedford Rd. (Bog Brook 7)	Bog Brook		HIGH	HIGH	LOW	MODERATE	MODERATE	LOW	19								
1243	NEW BOSTON	Parker	Piscataquog		HIGH	MODERATE	HIGH	LOW	MODERATE	MODERATE	20								
1225	NEW BOSTON	S Hill Rd	Piscataquog		HIGH	MODERATE	HIGH	LOW	MODERATE	MODERATE	20								
1222	NEW BOSTON	S Hill Rd	Piscataquog		MODERATE	MODERATE	HIGH	LOW	MODERATE	MODERATE	20								
1220	NEW BOSTON	Lyndeborough Rd	Piscataquog		HIGH	MODERATE	HIGH	LOW	MODERATE	MODERATE	20								
1192	NEW BOSTON	Mtn Rd	cold Brook		HIGH	MODERATE	HIGH	LOW	MODERATE	MODERATE	20								
1076	NEW BOSTON	Pine Road	Middle Branch Trib		LOW	MODERATE	HIGH	LOW	MODERATE	MODERATE	20								
777	NEW BOSTON	Saunders Hill Road	no name		LOW	MODERATE	HIGH	LOW	MODERATE	MODERATE	20								
1239	NEW BOSTON	Byam	Piscataquog		HIGH	HIGH	MODERATE	LOW	MODERATE	MODERATE	21								
1224	NEW BOSTON	Mc Collum	Piscataquog		HIGH	HIGH	MODERATE	LOW	MODERATE	MODERATE	21								
1219	NEW BOSTON	Cochran Hill Rd	Piscataquog		HIGH	HIGH	MODERATE	LOW	MODERATE	MODERATE	21								
1197	NEW BOSTON	Joe English Rd	Meadow Brook		HIGH	HIGH	MODERATE	LOW	MODERATE	MODERATE	21								
1087	NEW BOSTON	Lull Rd	unk		MODERATE	HIGH	MODERATE	LOW	MODERATE	MODERATE	21								
987	NEW BOSTON	Bedford	Bog Brook		HIGH	LOW	MODERATE	MODERATE	MODERATE	HIGH	22								
1194	NEW BOSTON	Francestown Tpk	Lords Brook		HIGH	LOW	MODERATE	MODERATE	MODERATE	MODERATE	22								
1086	NEW BOSTON	Beard Rd	unk		LOW	Unable to Score	HIGH	LOW	MODERATE	LOW	25								
778	NEW BOSTON	Dennison Road	unk		LOW	Unable to Score	HIGH	LOW	MODERATE	LOW	25								
995	NEW BOSTON	Bedford rd	Bog Brook		LOW	Unable to Score	LOW	MODERATE	MODERATE	LOW	26								

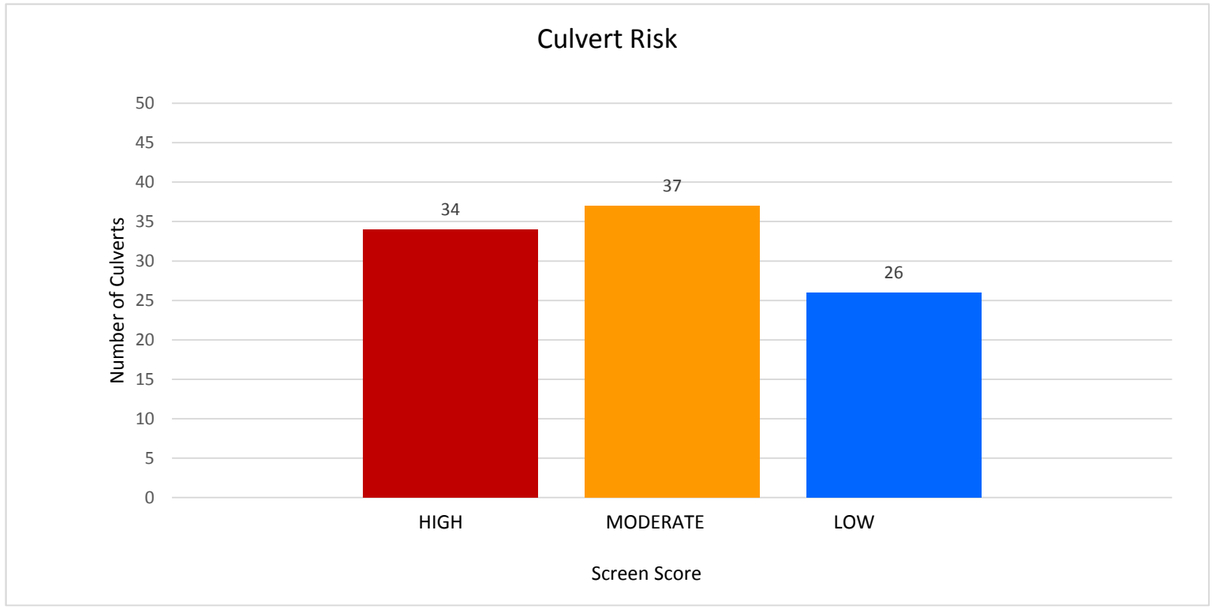
SADES_ID	Town	Road	Stream	Owner	AOP	GC	STR	C	R	Data Score	Risk Level	Red Listed	Town CIP	10-year Road Plan	Structural Reinspection	Replaced with	Replacement date	Replacement cost	Local ID
1005	NEW BOSTON	Bedford Rd	Bog Brook			Unable to Score	LOW	MODERATE	MODERATE	LOW	26								
1216	NEW BOSTON	New Rd	Piscataquog		HIGH	Unable to Score	MODERATE	LOW	MODERATE	LOW	27								
1201	NEW BOSTON	Meadow Rd	Meadow Brook		HIGH	Unable to Score	MODERATE	LOW	MODERATE	LOW	27								
800	NEW BOSTON	Lyndeborough Road	Meadow Brook		HIGH	LOW	HIGH	LOW	LOW	HIGH	28								
1193	NEW BOSTON	Lyndborough	Cold Brook		HIGH	LOW	HIGH	LOW	LOW	MODERATE	28								
1069	NEW BOSTON	Bunker Hill Rd	currier brook		LOW	LOW	HIGH	LOW	LOW	MODERATE	28								
996	NEW BOSTON	Carriage rd	Bog Brook		MODERATE	HIGH	LOW	LOW	LOW	MODERATE	29								
1209	NEW BOSTON	Meadow Rd	Meadow		MODERATE	HIGH	LOW	LOW	LOW	LOW	29								
5276	NEW BOSTON	Byam Rd	Piscataquog		HIGH	HIGH	LOW	LOW	LOW	LOW	29								
804	NEW BOSTON	Old Coach	Piscataquog		MODERATE	Unable to Score	LOW	LOW	LOW	LOW	30								
1218	NEW BOSTON	Old Coach Rd	Piscataquog			Unable to Score	LOW	LOW	LOW	LOW	30								
805	NEW BOSTON	Butterfield Mill Rd	piscataquog		HIGH	Unable to Score	LOW	LOW	LOW	LOW	30								
5278	NEW BOSTON	Byam Rd	unk		HIGH	MODERATE	MODERATE	LOW	LOW	MODERATE	31								
1223	NEW BOSTON	Pearson Ln	Piscataquog		HIGH	MODERATE	MODERATE	LOW	LOW	MODERATE	31								
1202	NEW BOSTON	McCollum	Piscataquog		HIGH	MODERATE	MODERATE	LOW	LOW	MODERATE	31								
1084	NEW BOSTON	Dodge rd	unk		MODERATE	MODERATE	MODERATE	LOW	LOW	LOW	31								
1128	NEW BOSTON	scobie rd	whiting brook		MODERATE	LOW	MODERATE	LOW	LOW	MODERATE	32								
1003	NEW BOSTON	Indian Falls Rd	Bog Brook		MODERATE	LOW	MODERATE	LOW	LOW	MODERATE	32								
999	NEW BOSTON	Carriage Rd	Bog Brook		MODERATE	LOW	MODERATE	LOW	LOW	MODERATE	32								
998	NEW BOSTON	Carriage Rd	Bog Brook		MODERATE	LOW	MODERATE	LOW	LOW	MODERATE	32								
5236	NEW BOSTON	Tucker Mill Rd.	Middle Branch		MODERATE	MODERATE	LOW	LOW	LOW	LOW	33								
1195	NEW BOSTON	Francestown Turnpike	Lords Brook		HIGH	LOW	LOW	MODERATE	LOW	HIGH	35								
990	NEW BOSTON	Bedford	Bog Brook		LOW	LOW	LOW	MODERATE	LOW	HIGH	35								
1238	NEW BOSTON	bedford rd	Piscataquog		HIGH	LOW	LOW	MODERATE	LOW	MODERATE	35								
1240	NEW BOSTON	Byam	Piscataquog		HIGH	LOW	LOW	LOW	LOW	MODERATE	36								
1196	NEW BOSTON	Joe English Rd	Meadow Brook		HIGH	LOW	LOW	LOW	LOW	MODERATE	36								
1191	NEW BOSTON	New Rd	cold Brook		HIGH	LOW	LOW	LOW	LOW	MODERATE	36								
5237	NEW BOSTON	Colburn Rd.	Middle Branch		MODERATE	LOW	LOW	LOW	LOW	LOW	36								
1006	NEW BOSTON	Bog Brook Rd	Bog Brook		MODERATE	LOW	LOW	LOW	LOW	LOW	36								
1001	NEW BOSTON	McCurdy Rd	Bog Brook		HIGH	LOW	LOW	LOW	LOW	LOW	36								

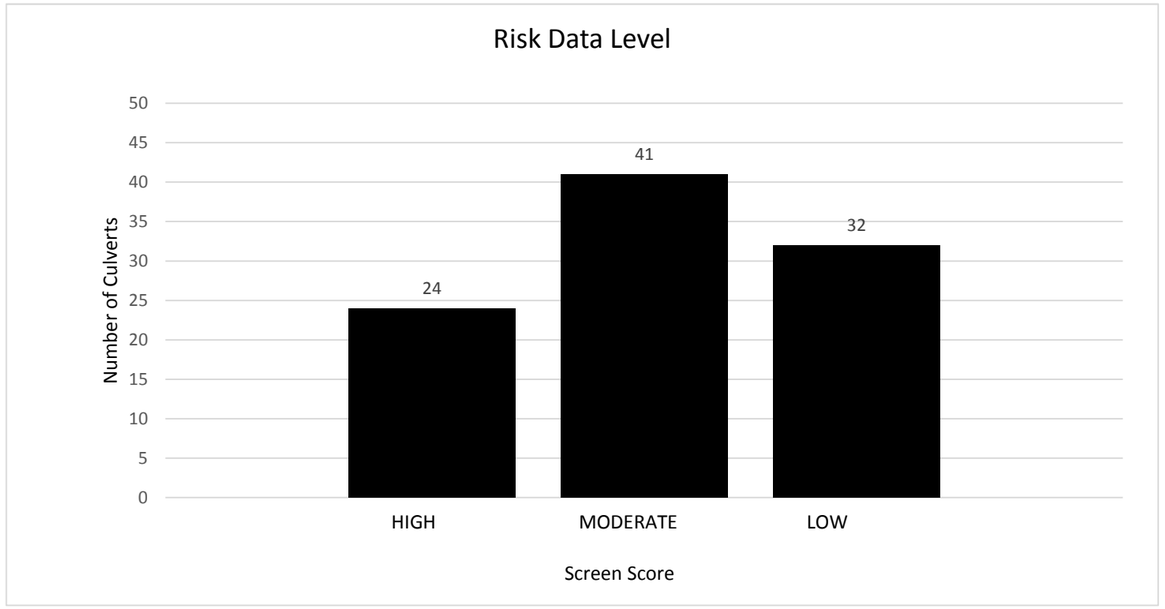
APPENDIX G

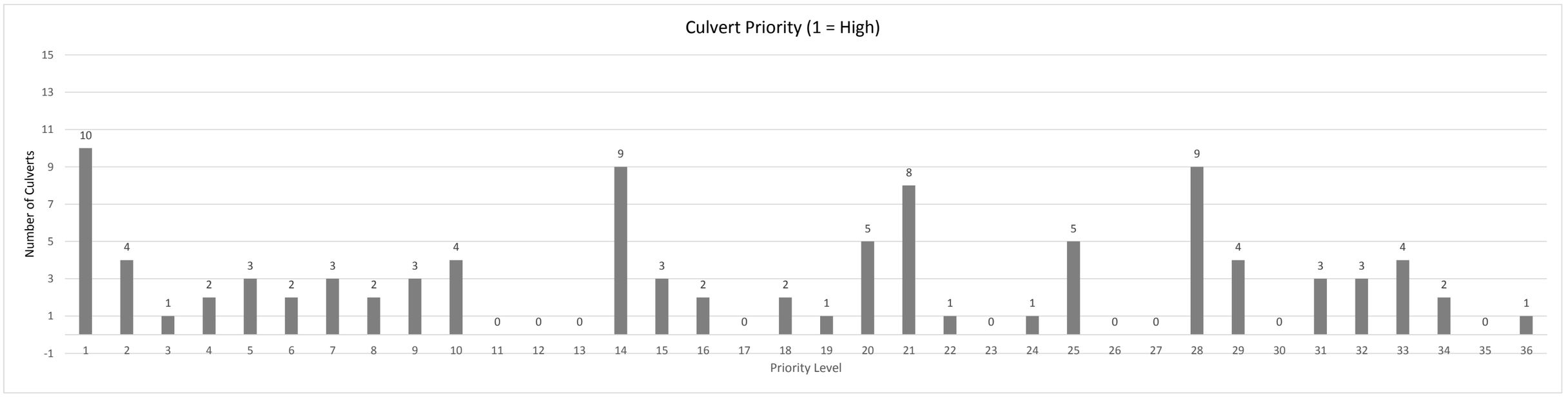
WEARE

WEARE
Culvert Summary Data
November 1, 2016

Risk and Priority Data

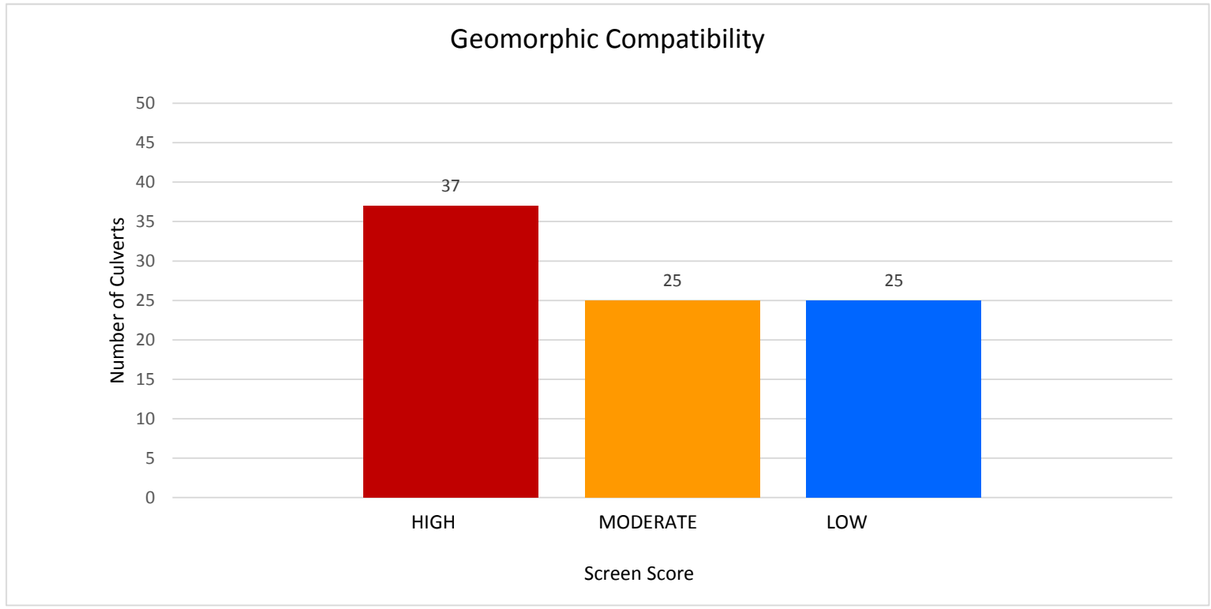


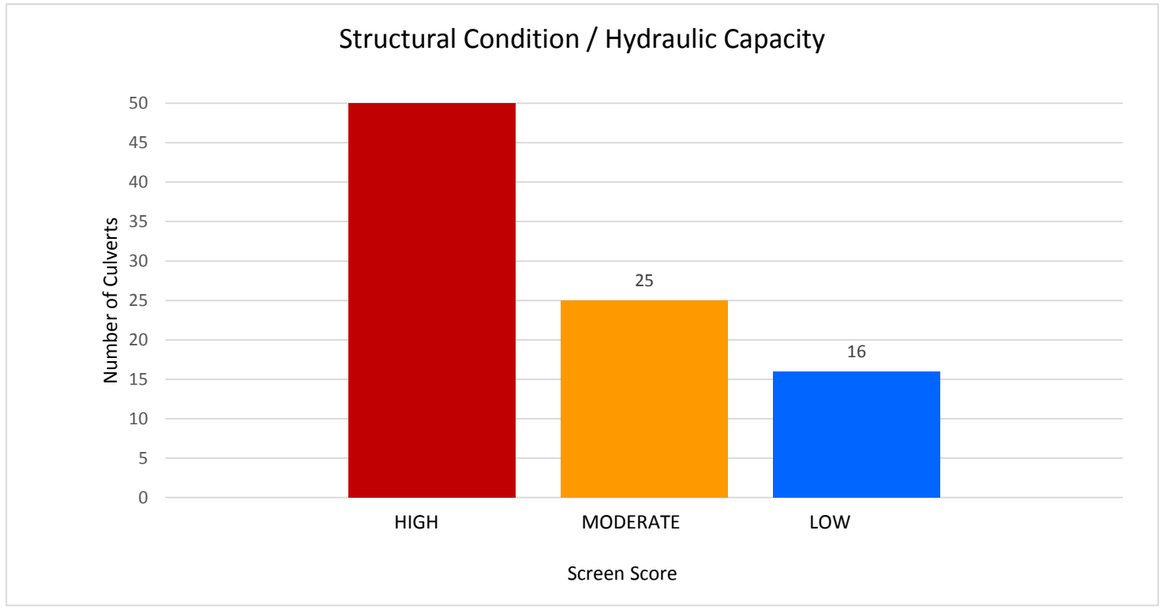


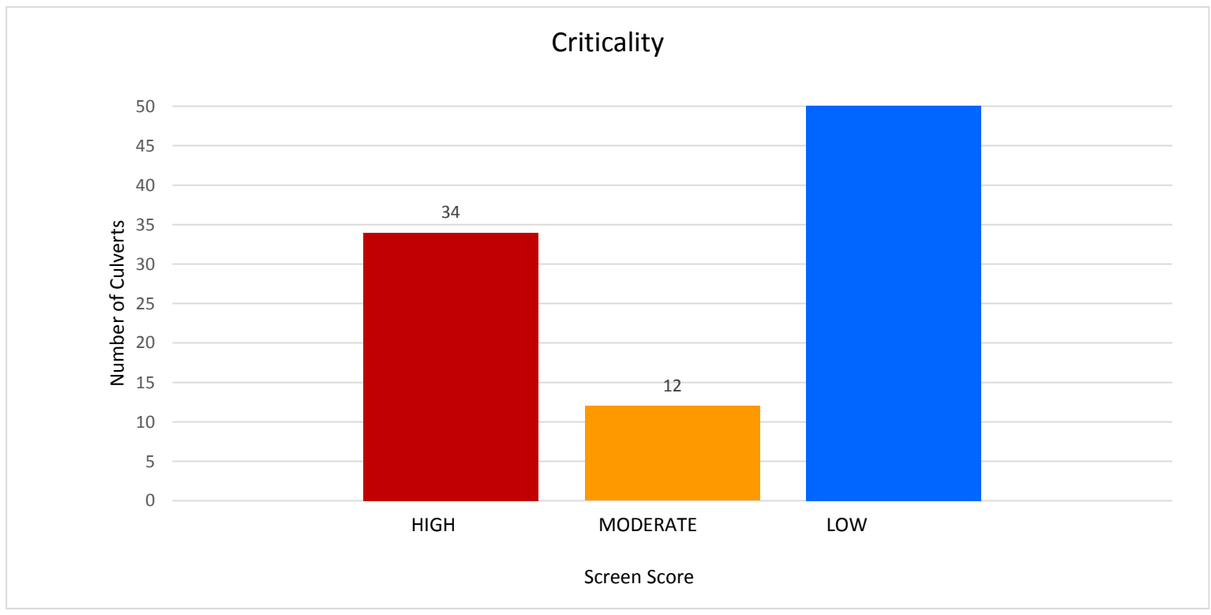


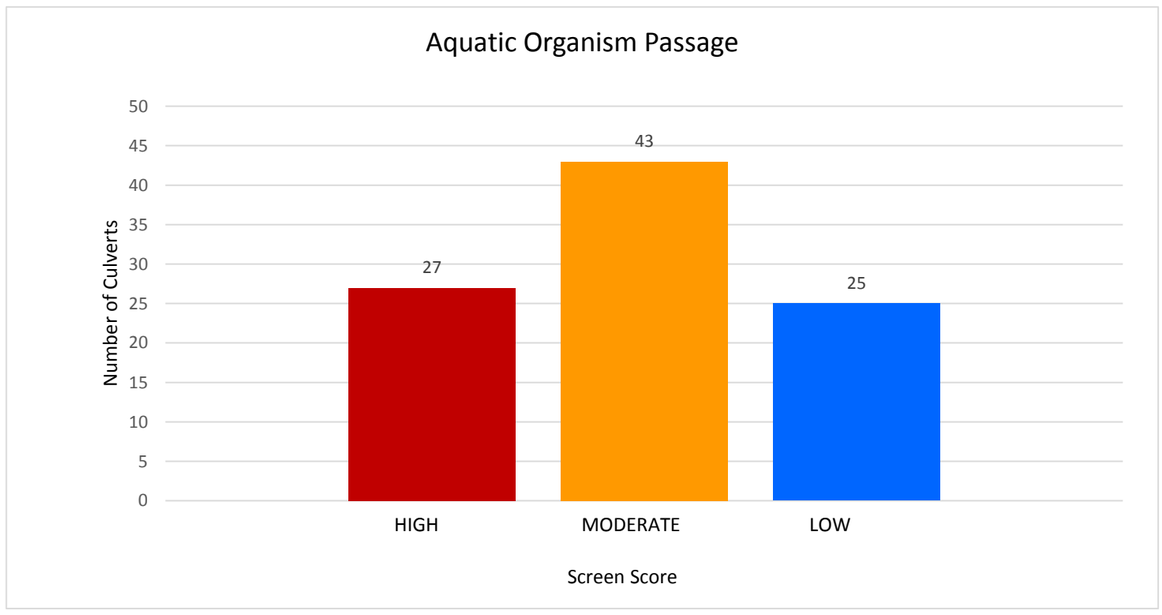
WEARE
Culvert Summary Data
November 1, 2016

Variable Data









Select Town: Weare

SADES_ID	Town	Road	Stream	Owner	AOP	GC	STR	C	R	Data Score	Risk Level	Red Listed	Town CIP	10-year Road Plan	Structural Reinspection	Replaced with	Replacement date	Replacement cost	Local ID
5187	WEARE	Mountain Rd.	Buxton Brook		MODERATE	HIGH	HIGH	HIGH	HIGH	HIGH	1								
1068	WEARE	poor farm road	currier brook		MODERATE	HIGH	HIGH	HIGH	HIGH	HIGH	1								
928	WEARE	River Rd	unk		MODERATE	HIGH	HIGH	HIGH	HIGH	HIGH	1								
5281	WEARE	reservoir road	Piscataquog Trib	Municipal	MODERATE	HIGH	HIGH	HIGH	HIGH	MODERATE	1								
1114	WEARE	Deering Center Road	Peacock Brook	NH DOT	LOW	HIGH	HIGH	HIGH	HIGH	MODERATE	1								
1094	WEARE	Gen Knox Rd	unk		MODERATE	HIGH	HIGH	HIGH	HIGH	MODERATE	1								
1070	WEARE	rte 149	hillside brook	NH DOT	MODERATE	HIGH	HIGH	HIGH	HIGH	MODERATE	1								
1111	WEARE	Deering Center Road	Peacock Brook	NH DOT	MODERATE	HIGH	HIGH	HIGH	HIGH	LOW	1								
1093	WEARE	rte 149	Meadow Brook	NH DOT	LOW	HIGH	HIGH	HIGH	HIGH	LOW	1								
1072	WEARE	Oak Hill RD	Hillside Brook		LOW	MODERATE	HIGH	HIGH	HIGH	HIGH	2								
1065	WEARE	Cram	Buxton Brook		LOW	MODERATE	HIGH	HIGH	HIGH	HIGH	2								
909	WEARE	Center Rd	unk	NH DOT	MODERATE	MODERATE	HIGH	HIGH	HIGH	HIGH	2								
908	WEARE	N John Stark Highway	Breed Brook	NH DOT	HIGH	MODERATE	HIGH	HIGH	HIGH	HIGH	2								
937	WEARE	River Rd	Piscataquog		HIGH	HIGH	MODERATE	HIGH	HIGH	HIGH	3								
5224	WEARE	Forest Rd	Meadow Brook		MODERATE	HIGH	HIGH	MODERATE	HIGH	LOW	4								
921	WEARE	reservoir rd	unk	Municipal	MODERATE	HIGH	HIGH	MODERATE	HIGH	LOW	4								
1095	WEARE	rt 114	unk	NH DOT	LOW	LOW	HIGH	HIGH	HIGH	HIGH	5								
1112	WEARE	Deering Center Road	Peacock Brook	NH DOT	LOW	LOW	HIGH	HIGH	HIGH	MODERATE	5								
901	WEARE	Duck Pond Rd	Breed Brook	Municipal	MODERATE	LOW	HIGH	HIGH	HIGH	MODERATE	5								
927	WEARE	concord stage rd	unk	NH DOT	HIGH	HIGH	LOW	HIGH	HIGH	MODERATE	6								
903	WEARE	Flanders Memorial Hwy	Breed Brook		HIGH	HIGH	LOW	HIGH	HIGH	LOW	6								
932	WEARE	river rd	Piscataquog		HIGH	MODERATE	MODERATE	HIGH	HIGH	HIGH	7								
5188	WEARE	Driveway mailbox 495 off Rt	Meadow Brook	Private	MODERATE	MODERATE	MODERATE	HIGH	HIGH	MODERATE	7								
1110	WEARE	Deering Center Rd	Peacock Brook	NH DOT	MODERATE	MODERATE	MODERATE	HIGH	HIGH	MODERATE	7								
906	WEARE	East Rd	Breed Brook		MODERATE	MODERATE	HIGH	MODERATE	HIGH	MODERATE	8								
897	WEARE	Mt William Pond Rd	Breed Brook		HIGH	MODERATE	HIGH	MODERATE	HIGH	LOW	8								
1102	WEARE	twin bridge rd	otter brook		LOW	LOW	HIGH	MODERATE	HIGH	HIGH	9								
929	WEARE	Peaslee	Piscataquog		MODERATE	LOW	HIGH	MODERATE	HIGH	MODERATE	9								
924	WEARE	Center Brook	Piscataquog		MODERATE	LOW	HIGH	MODERATE	HIGH	MODERATE	9								
907	WEARE	East	Breed Brook		HIGH	Unable to Score	HIGH	HIGH	HIGH	MODERATE	10								
900	WEARE	S John Stark Hwy	Breed Brook	NH DOT		Unable to Score	HIGH	HIGH	HIGH	MODERATE	10								
1101	WEARE	rte 114	otter brook	NH DOT	MODERATE	Unable to Score	HIGH	HIGH	HIGH	LOW	10								
904	WEARE	Flanders Memorial Hwy	Breed Brook		MODERATE	Unable to Score	HIGH	HIGH	HIGH	LOW	10								
5213	WEARE	Old Francestown Rd.	Peacock Brook		LOW	HIGH	HIGH	LOW	MODERATE	HIGH	14								
5247	WEARE	Peacock Hill Rd.	Peacock Brook		HIGH	HIGH	HIGH	LOW	MODERATE	HIGH	14								
1290	WEARE	Winslow Rd	Piscataquog		HIGH	HIGH	HIGH	LOW	MODERATE	MODERATE	14								
1089	WEARE	MapleWold	Meadow Brook		LOW	HIGH	HIGH	LOW	MODERATE	MODERATE	14								
933	WEARE	East Weare Rd	Piscataquog		LOW	HIGH	HIGH	LOW	MODERATE	MODERATE	14								
1253	WEARE	Colby	Huse Brook		HIGH	HIGH	HIGH	LOW	MODERATE	LOW	14								
1098	WEARE	Melvin Valley Rd	otter brook		MODERATE	HIGH	HIGH	LOW	MODERATE	LOW	14								
1091	WEARE	Maplewold Road	Meadow Brook		LOW	HIGH	HIGH	LOW	MODERATE	LOW	14								
936	WEARE	River rd	Piscataquog		HIGH	LOW	MODERATE	HIGH	MODERATE	HIGH	15								
1073	WEARE	Oak Hill Rd	Hillside Brook		HIGH	LOW	MODERATE	HIGH	MODERATE	HIGH	15								
920	WEARE	rte 114	Piscataquog Trib	NH DOT	HIGH	LOW	MODERATE	HIGH	MODERATE	HIGH	15								
1259	WEARE	River Rd/Clough Park Rd	Piscataquog		MODERATE	MODERATE	LOW	HIGH	MODERATE	HIGH	16								
899	WEARE	Pond View	Breed Brook		HIGH	MODERATE	LOW	HIGH	MODERATE	LOW	16								
898	WEARE	Mt. William Pond Rd	Breed Brook		MODERATE	MODERATE	MODERATE	MODERATE	MODERATE	MODERATE	18								
5182	WEARE	Irving Rd (Reach 5, Culvert 2	Meadow Brook		MODERATE	MODERATE	MODERATE	MODERATE	MODERATE	LOW	18								
902	WEARE	Duck Pond	Breed Brook		HIGH	HIGH	LOW	MODERATE	MODERATE	MODERATE	19								
5214	WEARE	Lull Road	Peacock Brook		MODERATE	MODERATE	HIGH	LOW	MODERATE	HIGH	20								
1291	WEARE	page hill rd	Piscataquog		MODERATE	MODERATE	HIGH	LOW	MODERATE	MODERATE	20								
1097	WEARE	Bart Clough Rd	Otter Brook		LOW	MODERATE	HIGH	LOW	MODERATE	MODERATE	20								
1067	WEARE	Poor Farm Rd	Currier Brook		MODERATE	MODERATE	HIGH	LOW	MODERATE	MODERATE	20								
1066	WEARE	Poor Farm Rd	Currier Brook		MODERATE	MODERATE	HIGH	LOW	MODERATE	MODERATE	20								
1255	WEARE	Clough Park Rd	Piscataquog		MODERATE	HIGH	MODERATE	LOW	MODERATE	HIGH	21								
1092	WEARE	Mount Dearborn Road	Meadow Brook		LOW	HIGH	MODERATE	LOW	MODERATE	HIGH	21								
915	WEARE	Craney Hill Road	Piscataquog		HIGH	HIGH	MODERATE	LOW	MODERATE	MODERATE	21								
5284	WEARE	Mt. Dearborn Rd	Peacock Brook	Municipal	LOW	HIGH	MODERATE	LOW	MODERATE	LOW	21								
5241	WEARE	Rt 149	Peacock Brook	NH DOT	LOW	HIGH	MODERATE	LOW	MODERATE	LOW	21								
1096	WEARE	gould rd	Meadow Brook		MODERATE	HIGH	MODERATE	LOW	MODERATE	LOW	21								

SADES_ID	Town	Road	Stream	Owner	AOP	GC	STR	C	R	Data Score	Risk Level	Red Listed	Town CIP	10-year Road Plan	Structural Reinspection	Replaced with	Replacement date	Replacement cost	Local ID
1107	WEARE	Shady Hill Road	Peacock Brook		LOW	LOW	MODERATE	MODERATE	MODERATE	HIGH	22								
923	WEARE	Center Rd	Piscataquog	NH DOT		Unable to Score	MODERATE	MODERATE	MODERATE	LOW	24								
1254	WEARE	Colby	Huse Brook		HIGH	Unable to Score	HIGH	LOW	MODERATE	LOW	25								
1108	WEARE	Hodgdon Road	Peacock Brook		LOW	Unable to Score	HIGH	LOW	MODERATE	LOW	25								
1106	WEARE	Shady Hill Rd	Peacock Brook		MODERATE	Unable to Score	HIGH	LOW	MODERATE	LOW	25								
1105	WEARE	Shady Hill Rd	Peacock Brook		MODERATE	Unable to Score	HIGH	LOW	MODERATE	LOW	25								
1081	WEARE	Twin Bridge Rd	Piscataquog		LOW	Unable to Score	HIGH	LOW	MODERATE	LOW	25								
1103	WEARE	twin bridge rd	otter brook		MODERATE	LOW	HIGH	LOW	LOW	HIGH	28								
1292	WEARE	Waterman Rd	Piscataquog		MODERATE	LOW	HIGH	LOW	LOW	MODERATE	28								
1258	WEARE	Chuck	Piscataquog		HIGH	LOW	HIGH	LOW	LOW	MODERATE	28								
1256	WEARE	High Rock Rd	Piscataquog		LOW	LOW	HIGH	LOW	LOW	MODERATE	28								
1115	WEARE	Maplewold Rd	Peacock Brook		LOW	LOW	HIGH	LOW	LOW	MODERATE	28								
917	WEARE	Quaker	Piscataquog		HIGH	LOW	HIGH	LOW	LOW	MODERATE	28								
910	WEARE	Sewell-Hoyt	Choate Brook		MODERATE	LOW	HIGH	LOW	LOW	MODERATE	28								
869	WEARE	Huntington Hill	Piscataquog		HIGH	LOW	HIGH	LOW	LOW	MODERATE	28								
5215	WEARE	Hodgdon Rd.	Peacock Brook		LOW	LOW	HIGH	LOW	LOW	LOW	28								
5246	WEARE	Hodgdon Rd.	Peacock Brook		MODERATE	HIGH	LOW	LOW	LOW	LOW	29								
1113	WEARE	Mt Dearborn Road	Peacock Brook		MODERATE	HIGH	LOW	LOW	LOW	LOW	29								
896	WEARE	PondView Rd	Breed Brook		HIGH	HIGH	LOW	LOW	LOW	LOW	29								
1109	WEARE	Hodgdon Rd	Peacock brook		HIGH	MODERATE	MODERATE	LOW	LOW	MODERATE	31								
914	WEARE	E Shore Rd	Piscataquog		MODERATE	MODERATE	MODERATE	LOW	LOW	LOW	31								
912	WEARE	Craney Hill rd	Piscataquog		HIGH	MODERATE	MODERATE	LOW	LOW	LOW	31								
5274	WEARE	East Shore DR	Piscataquog Trib		MODERATE	LOW	MODERATE	LOW	LOW	MODERATE	32								
1257	WEARE	High Rock Rd	Piscataquog		LOW	LOW	MODERATE	LOW	LOW	MODERATE	32								
1100	WEARE	Colby Rd	Otter Brook		MODERATE	MODERATE	LOW	LOW	LOW	MODERATE	33								
1090	WEARE	Maplewold Road	Meadow Brook		LOW	MODERATE	LOW	LOW	LOW	MODERATE	33								
931	WEARE	Peaslee Hill rd	Piscataquog		HIGH	MODERATE	LOW	LOW	LOW	MODERATE	33								
5183	WEARE	Bogue Road	Buxton Brook		MODERATE	MODERATE	LOW	LOW	LOW	LOW	33								
939	WEARE	rte 77	Stark Brook	NH DOT	HIGH	LOW	LOW	HIGH	LOW	HIGH	34								
5223	WEARE	Route 77 (Reach 1C)	Meadow Brook	NH DOT	MODERATE	LOW	LOW	HIGH	LOW	MODERATE	34								
1099	WEARE	barnard hill rd	otter brook		HIGH	LOW	LOW	LOW	LOW	MODERATE	36								

APPENDIX H

OTHER TOWNS WITH FEW ASSESSED CULVERTS IN THE WATERSHED

Select Town: Bedford

SADES_ID	Town	Road	Stream	Owner	AOP	GC	STR	C	R	Data Score	Risk Level	Red Listed	Town CIP	10-year Road Plan	Structural Reinspection	Replaced with	Replacement date	Replacement cost	Local ID
988	BEDFORD	Pulpit	Bog Brook		MODERATE	HIGH	MODERATE	LOW	MODERATE	MODERATE	21								
989	BEDFORD	Pulpit	Bog Brook		MODERATE	LOW	LOW	LOW	LOW	MODERATE	36								

Select Town: Greenfield

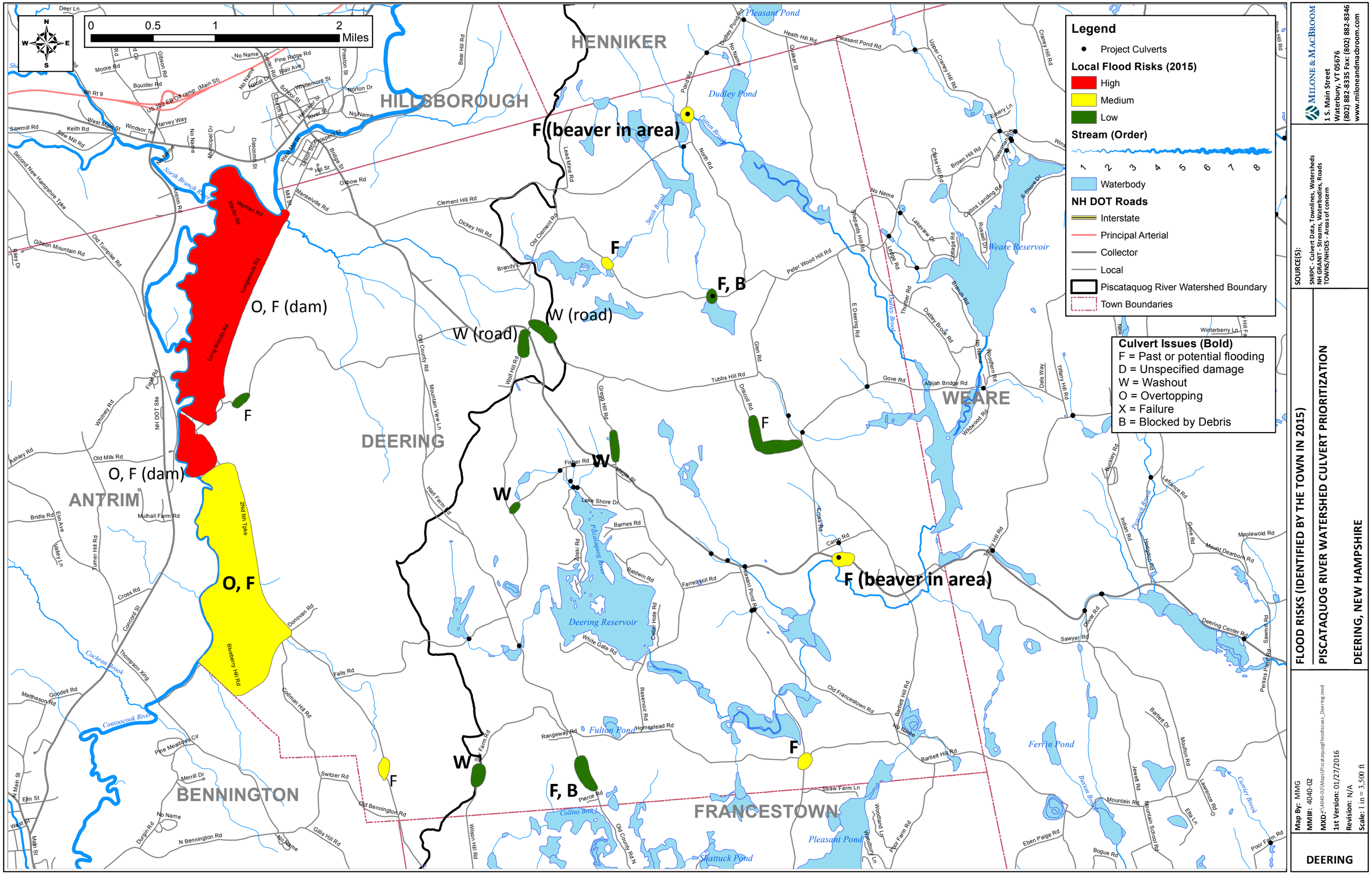
SADES_ID	Town	Road	Stream	Owner	AOP	GC	STR	C	R	Data Score	Risk Level	Red Listed	Town CIP	10-year Road Plan	Structural Reinspection	Replaced with	Replacement date	Replacement cost	Local ID
1169	GREENFIELD	Francestown Road, Rte 136	Rand Brook	NH DOT	HIGH	LOW	MODERATE	HIGH	MODERATE	HIGH	15								
1171	GREENFIELD	East rd	Rand Brook		HIGH	MODERATE	HIGH	LOW	MODERATE	MODERATE	20								
5273	GREENFIELD	Greenfield Rd	Rand Brook		HIGH	LOW	HIGH	LOW	LOW	MODERATE	28								

Select Town: Manchester

SADES_ID	Town	Road	Stream	Owner	AOP	GC	STR	C	R	Data Score	Risk Level	Red Listed	Town CIP	10-year Road Plan	Structural Reinspection	Replaced with	Replacement date	Replacement cost	Local ID
1058	MANCHESTER	Rockland	Rockland Creek			HIGH	HIGH	HIGH	HIGH	LOW	1								

APPENDIX I

LOCAL FLOOD RISK INFORMATION IN THE PISCATAQUOG RIVER WATERSHED



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15 Main Street
Waterbury, VT 05676
(802) 882-8335 Fax: (802) 882-8346
www.miloneandmacbroom.com

SOURCE(S):
SNRPC - Culvert Data, Townlines, Watersheds
NH GRANIT - Streams, Waterbodies, Roads
TOWNS/NHDES - Areas of concern

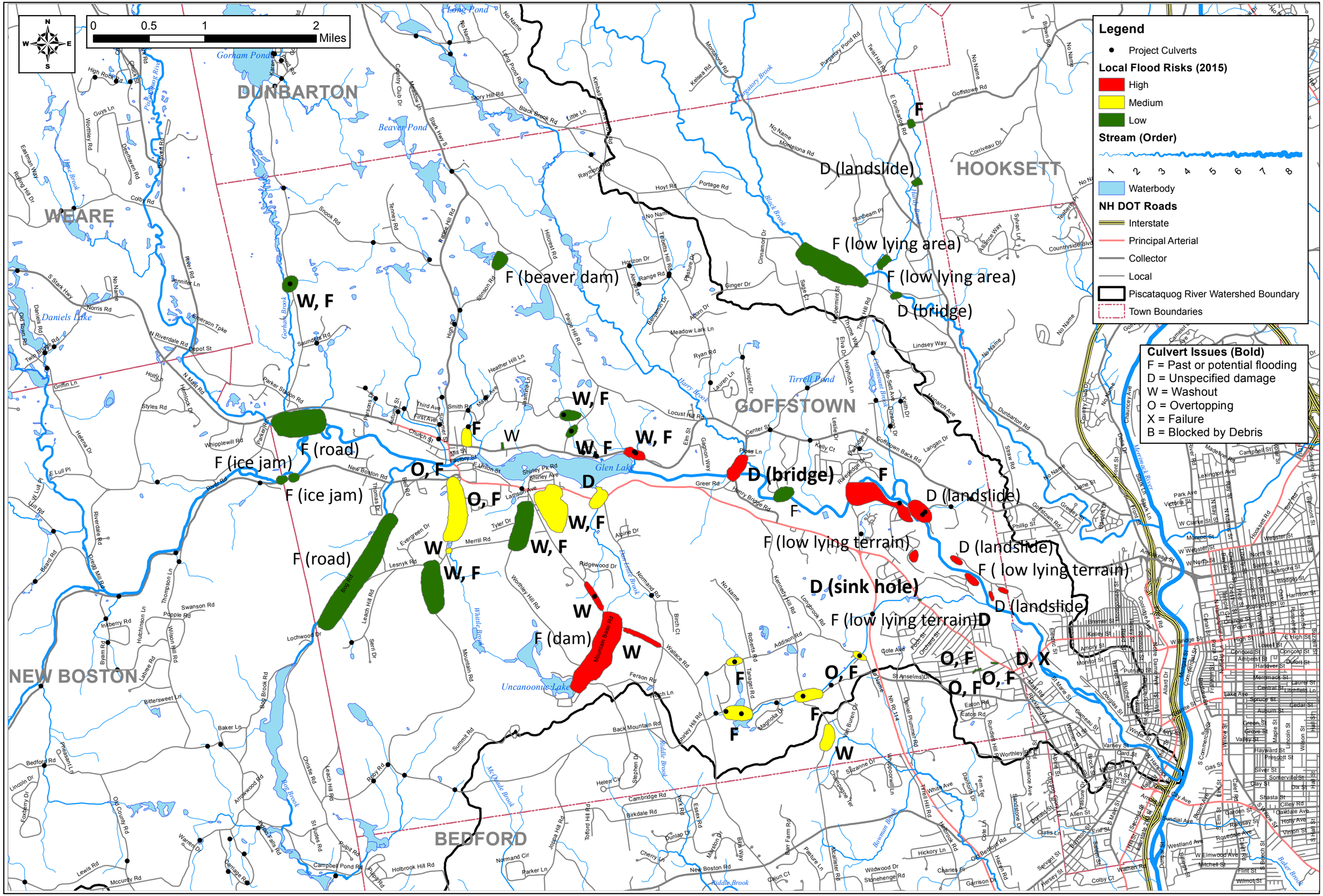
FLOOD RISKS (IDENTIFIED BY THE TOWN IN 2015)

PISCATAQUOG RIVER WATERSHED CULVERT PRIORITIZATION

DEERING, NEW HAMPSHIRE

Map By: MMG
MMI#: 4040-02
MXD: X:\4040-02\Maps\PiscataquogFloodIssues_Deering.mxd
1st Version: 01/27/2016
Revision: N/A
Scale: 1 in = 3,500 ft

DEERING



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TOWNS/NHDES - Areas of concern

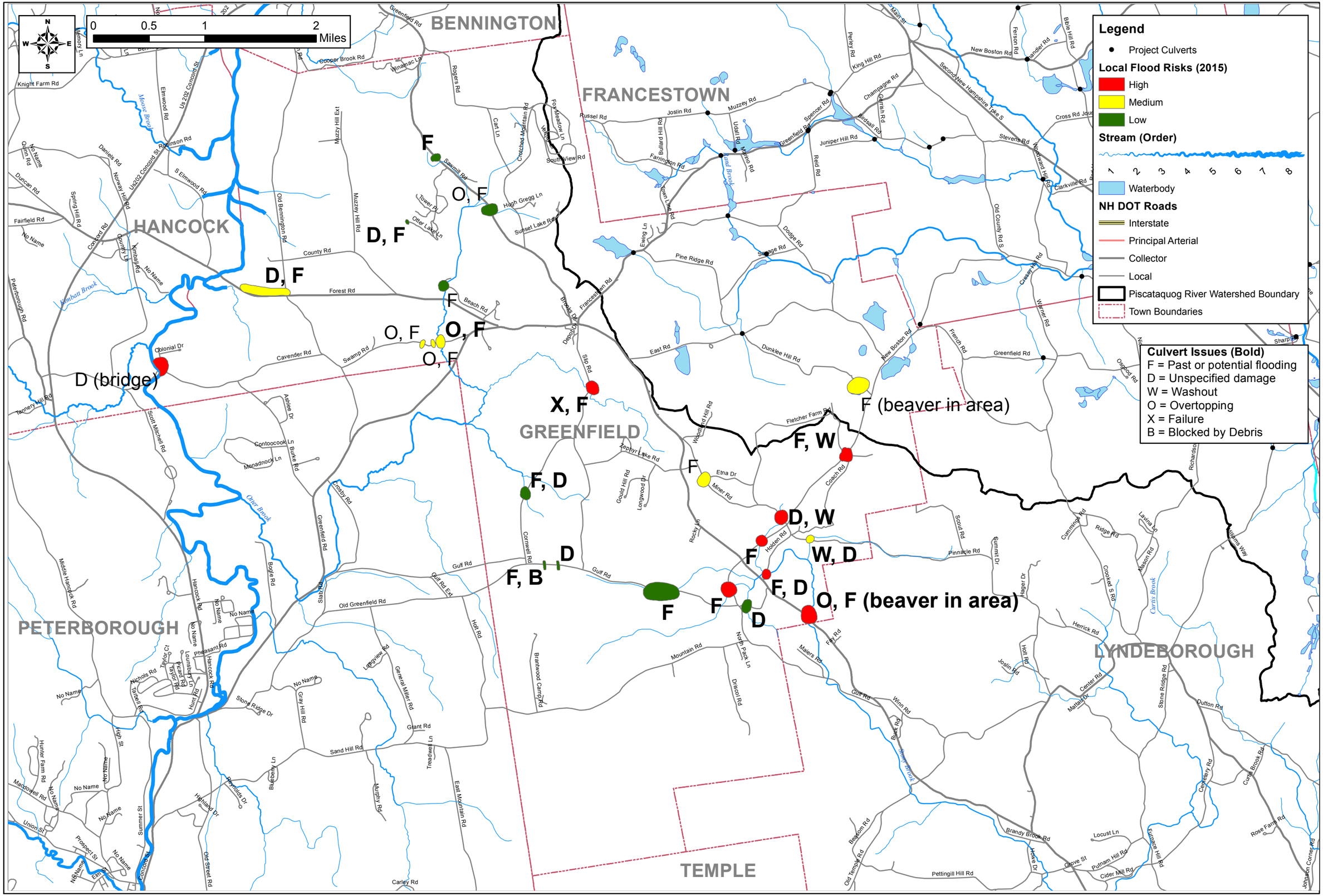
FLOOD RISKS (IDENTIFIED BY THE TOWN IN 2015)

PISCATAQUOG RIVER WATERSHED CULVERT PRIORITIZATION

GOFFSTOWN, NEW HAMPSHIRE

Map By: MMG
MMI#: 4040-02
MXD: X:\4040-02\Maps\Piscataquog_floodIssues_Goffstown.mxd
1st Version: 01/27/2016
Revision: N/A
Scale: 1 in = 4,000 ft

GOFFSTOWN



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TOWNS/NHDES - Areas of concern

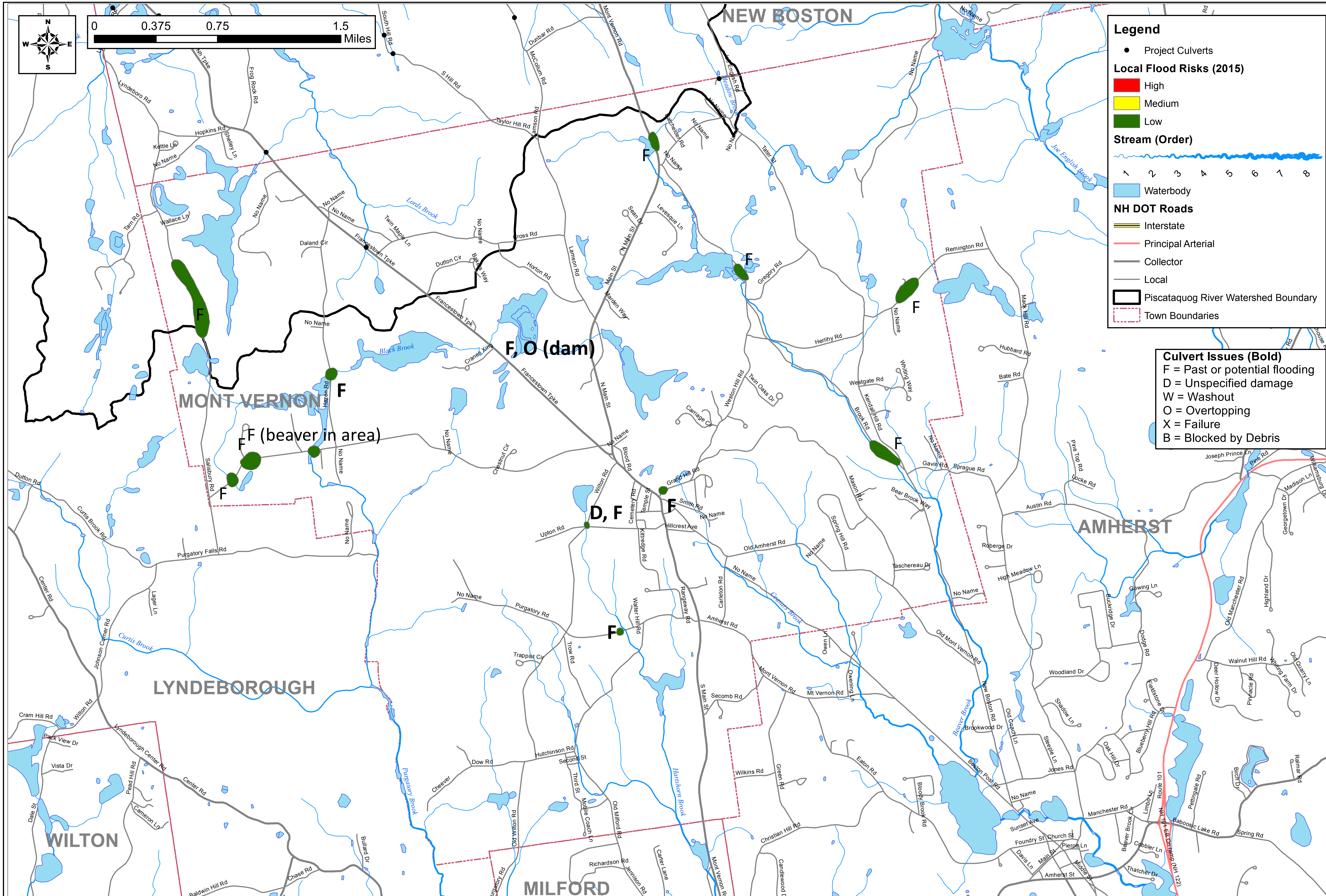
FLOOD RISKS (IDENTIFIED BY THE TOWN IN 2015)

PISCATAQUOG RIVER WATERSHED CULVERT PRIORITIZATION

GREENFIELD, NEW HAMPSHIRE

Map By: MMG
MMI#: 4040-02
MXD: x:\4040-02\Map\Piscataquogfloodissues_Greenfield.mxd
1st Version: 01/27/2016
Revision: N/A
Scale: 1 in = 4,000 ft

GREENFIELD



FLOOD RISKS (IDENTIFIED BY THE TOWN IN 2015)

PISCATAQUOG RIVER WATERSHED CULVERT PRIORITIZATION

MONT VERNON, NEW HAMPSHIRE

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Waterbury, VT 05676
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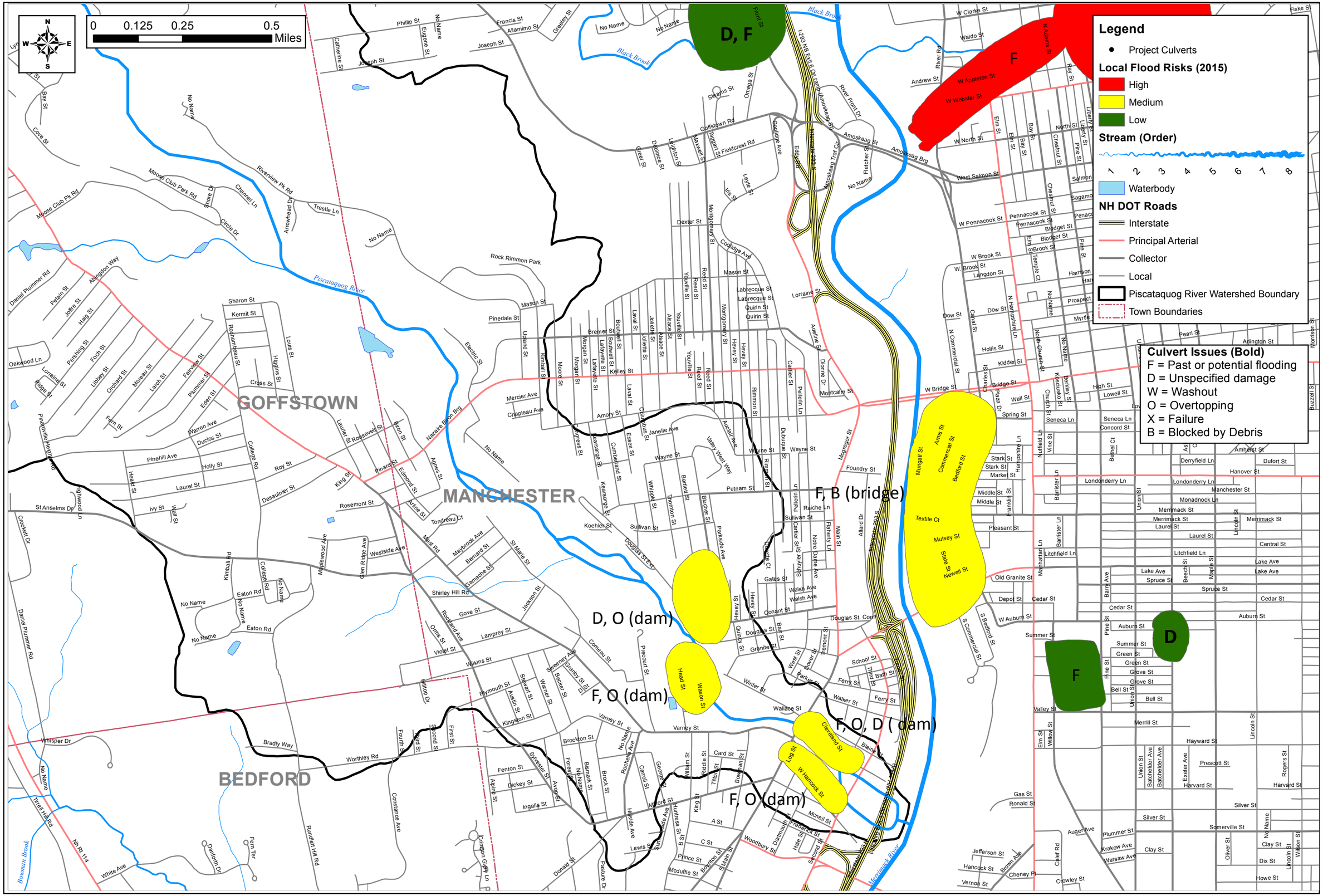
SOURCE(S):
SNRPC - Culvert Data, Townlines, Watersheds
NH GRANIT - Streams, Waterbodies, Roads
TOWNS/NHDES - Areas of concern

Map By: MMG
MMI#: 4040-02
MXD: Y:\4040-02\Maps\PiscataquogFloodissues_MtVernon.mxd
1st Version: 01/27/2016
Revision: N/A
Scale: 1 in = 2,750 ft

MONT VERNON



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SOURCE(S):
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NH GRANIT - Streams, Waterbodies, Roads
TOWNS/NHDES - Areas of concern

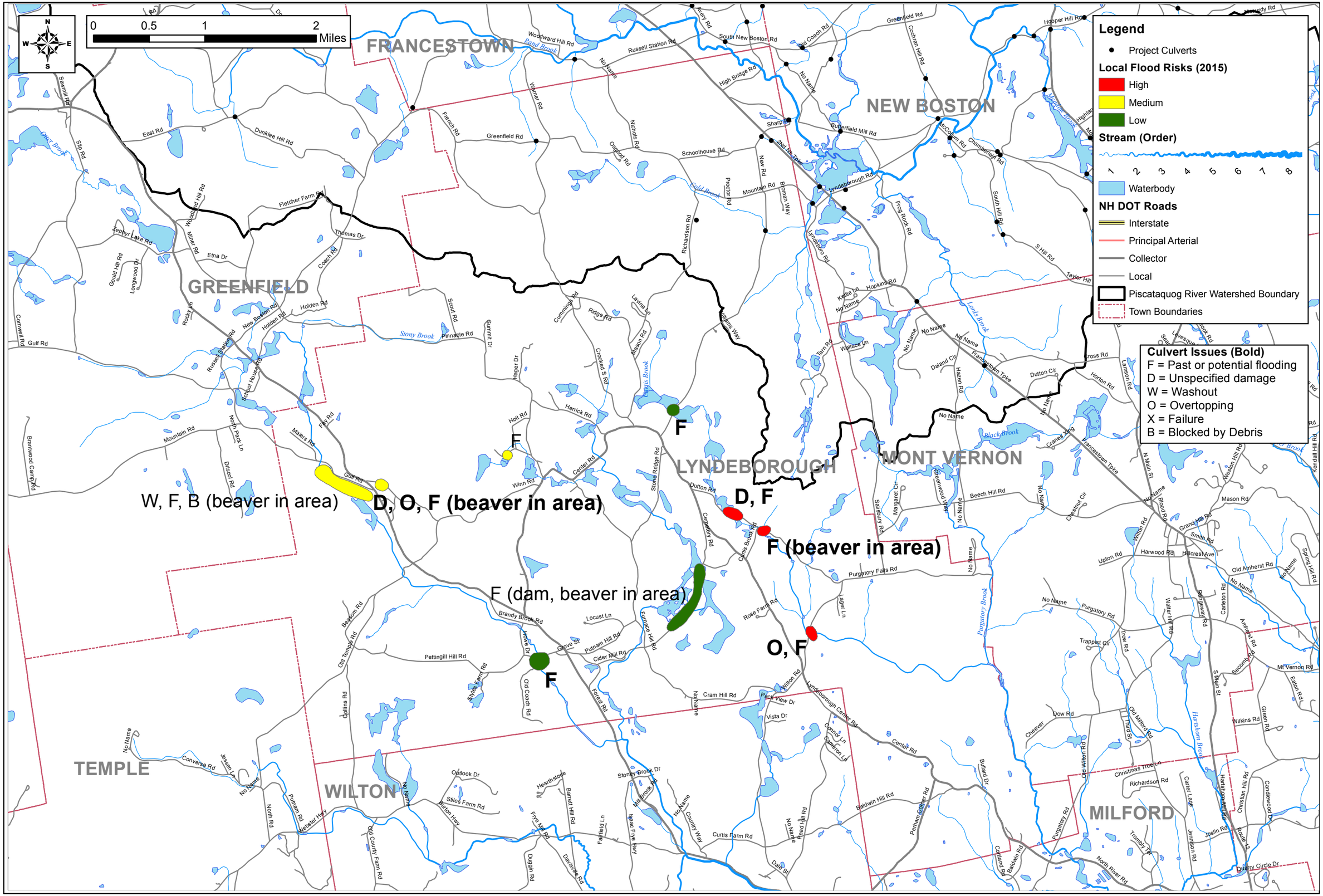
FLOOD RISKS (IDENTIFIED BY THE TOWN IN 2015)

PISCATAQUOG RIVER WATERSHED CULVERT PRIORITIZATION

MANCHESTER, NEW HAMPSHIRE

Map By: MMG
MMI#: 4040-02
MXD: X:\4040-02\Maps\PiscataquogFloodIssues_Manchester.mxd
1st Version: 01/27/2016
Revision: N/A
Scale: 1 in = 1,250 ft

MANCHESTER



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NH GRANIT - Streams, Waterbodies, Roads
TOWNS/NHDES - Areas of concern

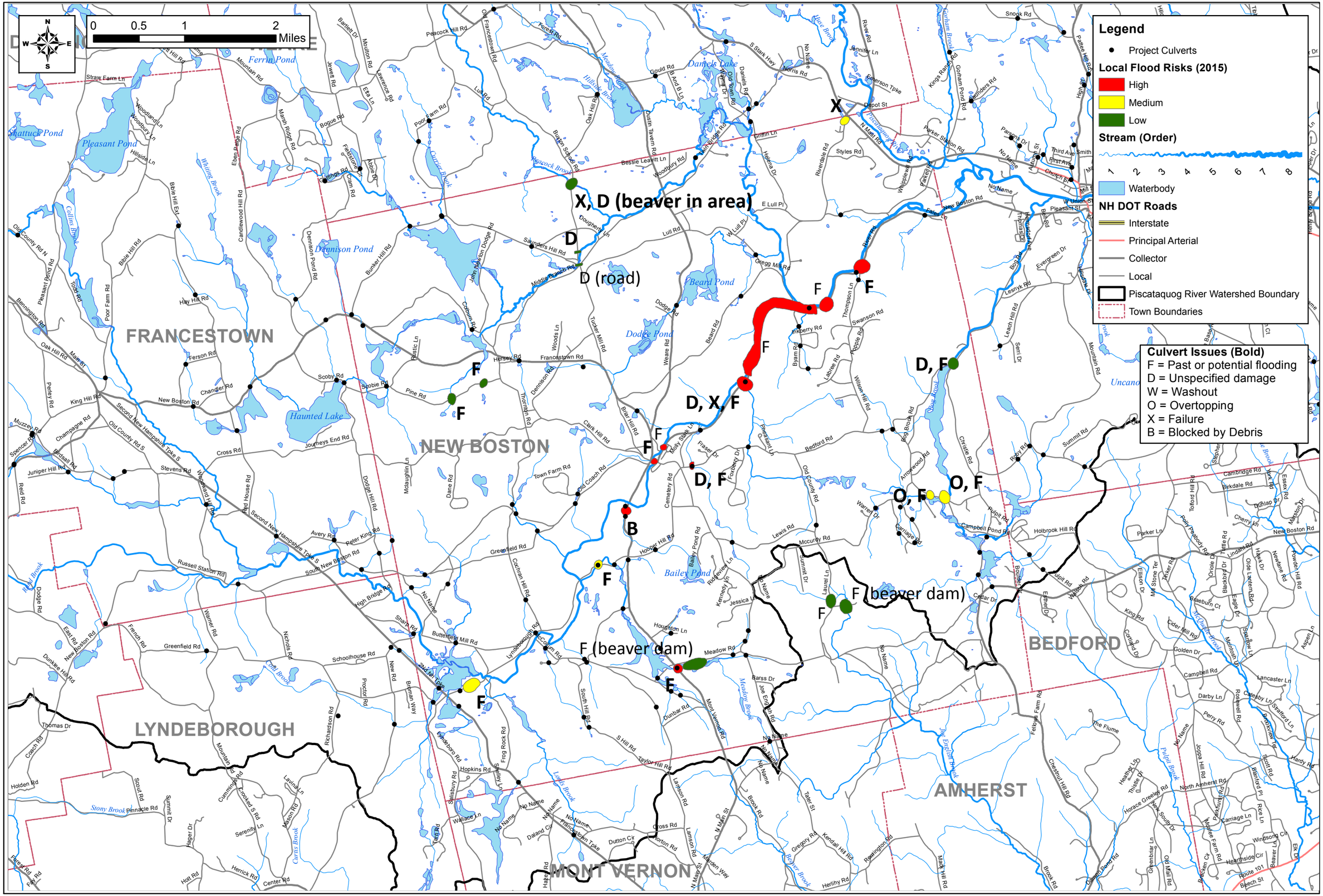
FLOOD RISKS (IDENTIFIED BY THE TOWN IN 2015)

PISCATAQUOG RIVER WATERSHED CULVERT PRIORITIZATION

LYNDEBOROUGH, NEW HAMPSHIRE

Map By: MMG
MMI#: 4040-02
MXD: X:\4040-02\Maps\Piscataquogfloodissues_Lyndeborough.mxd
1st Version: 01/27/2016
Revision: N/A
Scale: 1 in = 4,000 ft

LYNDEBOROUGH



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SOURCE(S):
SNRPC - Culvert Data, Townlines, Watersheds
NH GRANIT - Streams, Waterbodies, Roads
TOWNS/NHDES - Areas of concern

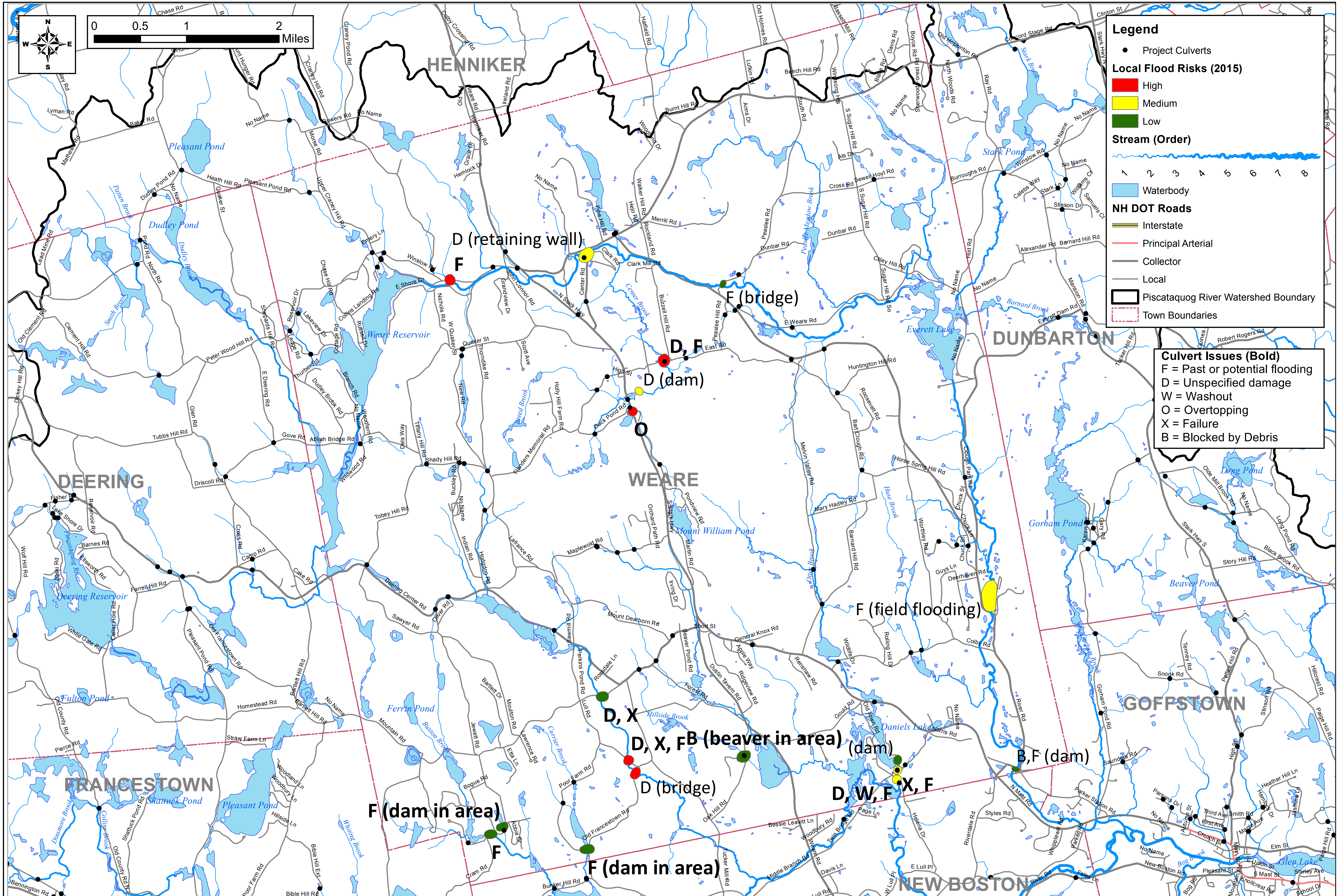
FLOOD RISKS (IDENTIFIED BY THE TOWN IN 2015)

PISCATAQUOG RIVER WATERSHED CULVERT PRIORITIZATION

NEW BOSTON, NEW HAMPSHIRE

Map By: MMG
MMI#: 4040-02
MXD: K:\4040-02\Maps\Piscataquog_culvertissues_NewBoston.mxd
1st Version: 01/27/2016
Revision: N/A
Scale: 1 in = 4,884 ft

NEW BOSTON



FLOOD RISKS (IDENTIFIED BY THE TOWN IN 2015)

PISCATAQUOG RIVER WATERSHED CULVERT PRIORITIZATION

WEARE, NEW HAMPSHIRE

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SOURCE(S):
SNRPC - Culvert Data, Townlines, Watersheds
NH GRANIT - Streams, Waterbodies, Roads
TOWNS/NHDES - Areas of concern

Map By: MMG
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MXD: Y:\4040-02\Maps\Piscataquog_culvertissues_Weare.mxd
1st Version: 01/27/2016
Revision: N/A
Scale: 1 in = 4,884 ft

WEARE

APPENDIX J

CONCEPT DESIGNS FOR HIGH PRIORITY CULVERTS IN FRANCESTOWN AND GOFFSTOWN

Dodge Hill Road (SADES ID 803)
Unnamed Tributary to South Branch Piscataquog River
Francestown, New Hampshire

STREAM NAME	Unnamed Trib to South Branch Piscataquog River	ROAD INFORMATION:	NH Tier 5, Paved, two lanes
ROAD NAME	Dodge Hill Road	# OF CULVERTS:	1
TOWN	Francestown, NH	CULVERT SHAPE:	Round
SADES_ID	803	MATERIAL:	Steel-corrugated
LATITUDE:	42.961792	CULVERT LENGTH (FT):	38.5
LONGITUDE:	-71.751541	CULVERT WIDTH (FT):	4.0
RISK	High	CULVERT HEIGHT (FT):	4.0
DATA LEVEL	High	CULVERT SLOPE RELATIVE TO CHANNEL:	Same
GEOMORPHIC COMPATIBLITY ISSUES	Unable to Score	SKEW TO ROAD:	Not Listed
STRUCTURE CONDITION ISSUES	High	BANKFULL WIDTH (FT):	6 to 15
CRITICALITY	High	STRUCTURE WIDTH / BANKFULL WIDTH (%):	38.1
AQUATIC ORGANISM PASSAGE PRIORITY	High	APPROXIMATE FLOOD CAPACITY:	> 100-year flood

Culvert Outlet on West Side of Road:

Culvert Inlet on East Side of Road:

The culvert is located in a wetland setting, with mapped wetlands upstream and downstream. There is a history of washouts and the culvert is severely decayed at each end. The channel bankfull width is in the range of 6 feet to 15 feet wide based on measurements at the site. Hydraulic geometry curves predict a 10-foot wide channel based on the upstream drainage area of approximately 0.6 square miles. The culvert screening data and channel measurements may not accurately reflect field conditions due to the presence of wetlands and possible beaver dams temporarily impounding the channel.

It is recommended that the culvert be replaced with a 10-foot wide by 6-foot tall precast concrete box culvert. The concept design selects a moderate bankfull width of 10 feet to size the culvert. A concrete box culvert has been chosen to accommodate the small amount of cover available over the structure. The proposed structure would be embedded below the existing stream bed to accommodate passage of sediment and debris, and allow for aquatic organisms. The culvert length should be increased to 40 feet to allow reconstruction of the stone headwall. Purchase and installation of this culvert is estimated to cost $100,000. If required, contracting services for design, permitting, bid assistance, and construction oversight assistance are estimated to cost $30,000.

SOURCE(S):

MMI CULVERT SCREEN
BING AERIAL

DODGE HILL ROAD CULVERT (SADES ID 803)
UNNAMED TRIBUTARY TO
SOUTH BRANCH PISCATAQUOG RIVER

LOCATION:

FRANCESTOWN, NH

N

PISCATAQUOG RIVER WATERSHED
CULVERT PRIORITIZATION

MXD: Y:\4040-02\Maps\ConceptDesigns\Francestown_CONCEPT_803.mxd

Map By: JCL
MMI#: 4040-02
Original: 11/30/2016
Revision:
Scale: SEE SCALE BAR

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Stinson Road (SADES ID 4880)
Unnamed Tributary to Harry Brook
Goffstown, New Hampshire

STREAM NAME	Unnamed Trib to Harry Brook	ROAD INFORMATION:	NH Tier 5, Paved, two lanes
ROAD NAME	Stinson Road	# OF CULVERTS:	2
TOWN	Goffstown, NH	CULVERT SHAPE:	Round
SADES_ID	4880	MATERIAL:	Steel-corrugated
LATITUDE:	43.044477	CULVERT LENGTH (FT):	29.0
LONGITUDE:	-71.591272	CULVERT WIDTH (FT):	2.0
RISK	High	CULVERT HEIGHT (FT):	1.5
DATA LEVEL	Low	CULVERT SLOPE RELATIVE TO CHANNEL:	Same
GEOMORPHIC COMPATIBLITY ISSUES	Unable to Score	SKEW TO ROAD:	Water Body Upstream
STRUCTURE CONDITION ISSUES	High	BANKFULL WIDTH (FT):	5 to 8
CRITICALITY	High	STRUCTURE WIDTH / BANKFULL WIDTH (%):	30.8
AQUATIC ORGANISM PASSAGE PRIORITY	Moderate	APPROXIMATE FLOOD CAPACITY:	N/A

Culvert Outlet:

Road Surface and Wetland Area Upstream of Culvert:

The culvert is located in a wetland setting where debris and dams from beavers occasionally clog the culvert. The road is narrow and low in this area and the road is reported to fall apart quickly due to lack of good base material. There is a history of the road being overtopped at this location. The channel bankfull width is in the range of 5 feet to 8 feet based on field measurements. Hydraulic geometry curves predict an 8-foot wide channel based on the upstream drainage area of approximately 0.4 square miles. No bankfull measurements were completed upstream or at a reference location. Immediately upstream of the culvert is a large pond that is mapped as a wetland and controlled by a large beaver dam.

It is recommended that the culvert be replaced with an 8 foot wide by 5 foot tall precast concrete box culvert. When the upstream beaver dam fails, a large amount of water will rush into this culvert. As a conservative approach, the culvert has been sized at the high end of the bankfull width range. A concrete box culvert has been chosen to accommodate the small amount of cover available over the structure. The proposed structure would be embedded below the existing stream bed to accommodate passage of sediment and debris, and support aquatic organism passage. The length of the culvert should be increased to 35 feet to allow for additional shoulder width and stone masonry headwall reconstruction. Purchase and installation of this culvert is estimated to cost $80,000. If required, contracting services for design, permitting, bid assistance, and construction oversight assistance are estimated to cost $20,000.

SOURCE(S):

MMI CULVERT SCREEN
BING AERIAL

STINSON ROAD CULVERT (SADES ID 4880)
UNNAMED TRIBUTARY TO HARRY BROOK

LOCATION:
GOFFSTOWN, NH

N

PISCATAQUOG RIVER WATERSHED
CULVERT PRIORITIZATION

MXD: Y:\4040-02\Maps\ConceptDesigns\Goffstown_CONCEPT_4880.mxd

Map By: JCL
MMI#: 4040-02
Original: 11/30/2016
Revision:
Scale: SEE SCALE BAR

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