


2011

## A Financial Impact Assessment of LD 1725: Stream Crossings Presentation

New England Environmental Finance Center

Follow this and additional works at: <https://digitalcommons.usm.maine.edu/economicsfinance>

 Part of the [Architectural Engineering Commons](#), [Civil Engineering Commons](#), [Climate Commons](#), [Environmental Design Commons](#), [Environmental Engineering Commons](#), [Environmental Indicators and Impact Assessment Commons](#), [Finance and Financial Management Commons](#), [Fresh Water Studies Commons](#), [Hydraulic Engineering Commons](#), [Hydrology Commons](#), [Risk Analysis Commons](#), [Sustainability Commons](#), [Urban, Community and Regional Planning Commons](#), and the [Water Resource Management Commons](#)

---

### Recommended Citation

New England Environmental Finance Center, "A Financial Impact Assessment of LD 1725: Stream Crossings Presentation" (2011). *Economics and Finance*. 4.  
<https://digitalcommons.usm.maine.edu/economicsfinance/4>

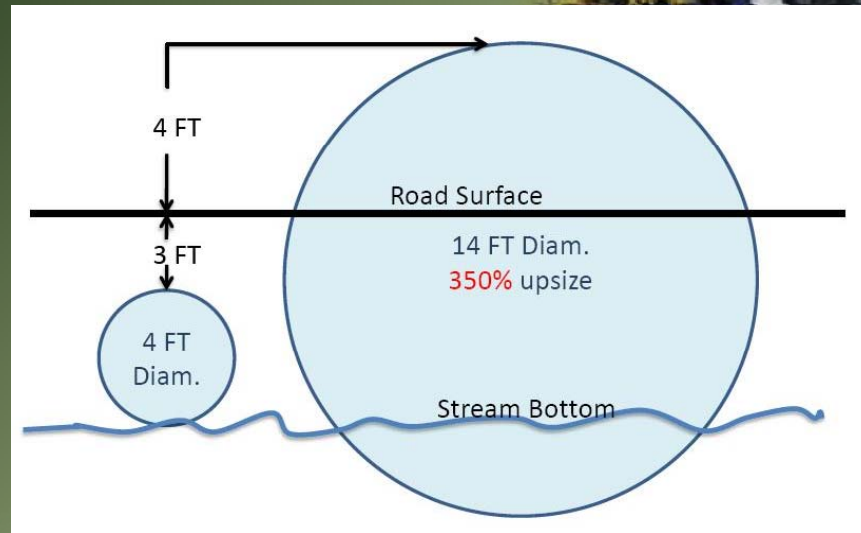
This Article is brought to you for free and open access by the New England Environmental Finance Center (NEEFC) at USM Digital Commons. It has been accepted for inclusion in Economics and Finance by an authorized administrator of USM Digital Commons. For more information, please contact [jessica.c.hovey@maine.edu](mailto:jessica.c.hovey@maine.edu).

# A Financial Impact Assessment of LD 1725: Stream Crossings

Prepared by: The New England Environmental Finance Center

For the Maine Department of Transportation Office of Environmental Planning

Edmund S. Muskie School of Public Service\* University of Southern Maine  
34 Bedford Street, P.O. Box 9300  
Portland, Maine 04104-9300



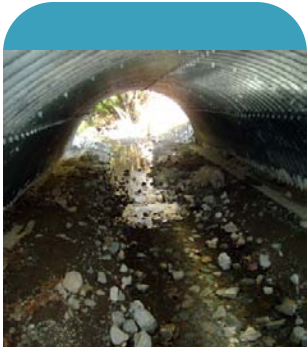
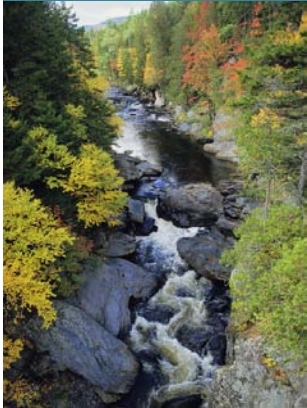
*How much to upsized? Should we?*

# OVERVIEW

Provide a non-partisan comprehensive report on the financial impact of stream crossing replacements under LD 1725.

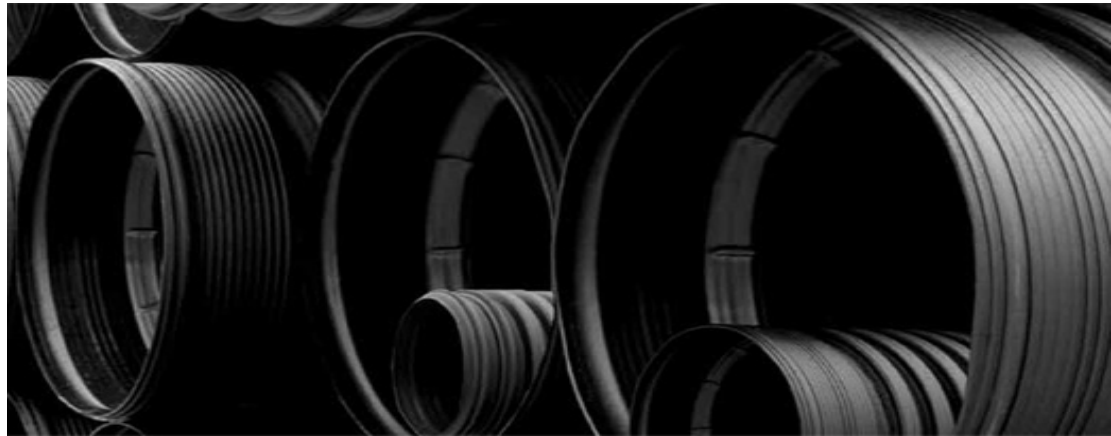
## KEY ELEMENTS:

1. Evaluation of currently manufactured crossing infrastructure
2. Construction Cost Estimates – typical replacement scenarios
3. Data Collection – stream crossing inventory
4. Evaluation of Current Replacement Practices
5. Raw Material Costs
6. Permitting Costs
7. Potential benefits achieved by compliance with proposed rules
8. Summary

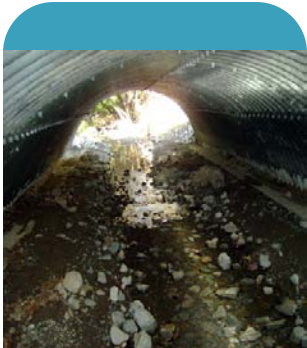
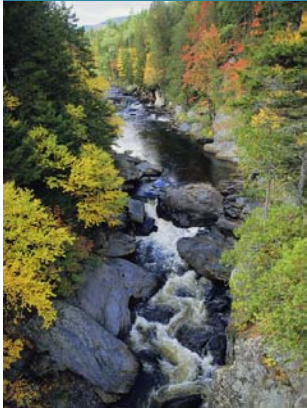


# Crossing Infrastructure

## High Density Polyethylene (HDPE)



- Extremely resistant to corrosion, as well as abrasion, gouging and scratching.
- Is expected to significantly exceed 100 years' design service life.
- Is lightweight and easy to install – does not require special tools or specific skills and training.
- Smooth bore - corrugated only on exterior for strength.

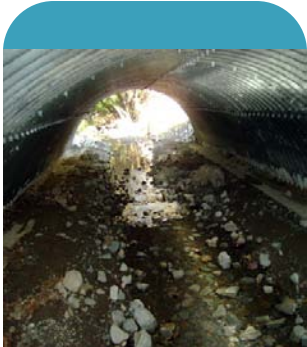
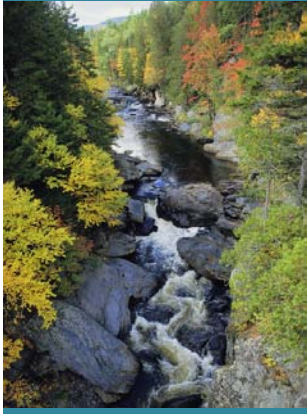


# Crossing Infrastructure

## Corrugated Metal Pipe (CMP)



- Available in a wide range of materials, coatings, diameters and thicknesses.
- New technology in metallurgy has significantly increased corrosion resistance with manufacturers claiming service lifespan of 75 years depending upon environmental factors.
- Per-foot weight can be 2-3 times greater than HDPE pipe – installation requires special tools and heavy equipment.
- Per-foot price can be 2-3 times greater than HDPE pipe.



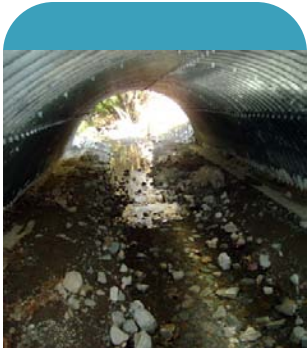
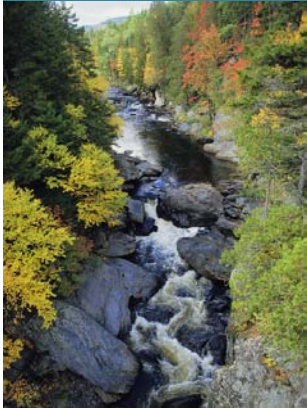


# Crossing Infrastructure

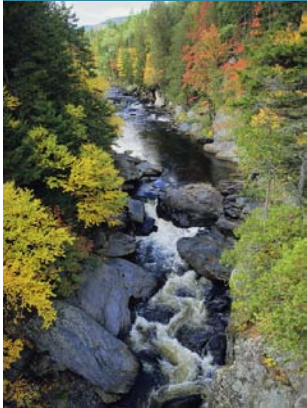
## Structural Plate or Multi-Plate Structure



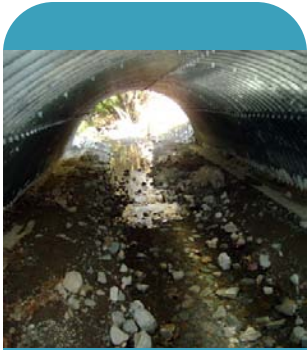
- Constructed of similar materials to CMP with same predicted service lifespan (75 years). Price varies widely.
- Some assembly required...labor and time intensive.
- Available in a wide variety of shapes, lengths and spans (up to 35 feet wide).
- Bottomless applications require construction of footing/foundation which often necessitates engineering.



# Crossing Infrastructure



## Precast Concrete Box Culvert



- High strength precast concrete structure with a design service life of 100+ years.
- Heavy sections require crane to install and results in slow installation process.
- Available as a 3-sided bottomless application which requires construction of footing/foundation.
- Requires some level of engineering and surveying.

# Replacement Costs

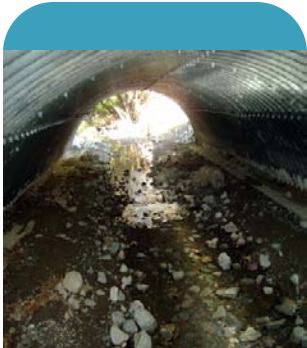
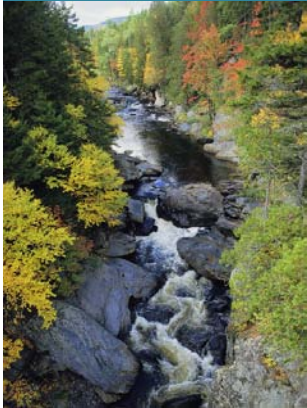
## Scenario based construction estimate

### ASSUMPTIONS:

- Moderately traffic 2-lane paved road in a low-density suburban/semi-rural setting.
- No engineering or shoring requirements.
- No existing underground utilities or other complications.
- Replacement pipe would not require additional fill or roadway modification to achieve depth of cover.
- No channel modification or installation of headwall appurtenances.
- Constructed within existing right-of-way.

### EXCEPTIONS:

- No typical scenario in Maine or other states.
- Small changes in variable quantities can trigger huge escalation of costs.
- There are almost always complications!
- Replacement costs can double or triple depending upon location: rural Maine vs I-295 vs Portland Metro area.
- Not measuring +/- economic impact of crossing replacement.





# Scenario #1a

Bankfull width = 6.75 feet : 1.2X Bankfull = 8 feet

## In-Kind replacement

- 30" metal culvert (CMP) to be replaced with 30" HDPE pipe

Item	Description	QTY	Unit	Unit \$	Total \$
1	Traffic Control	1	LS	\$ 500.00	\$ 500.00
2	Erosion Control	1	LS	\$ 500.00	\$ 500.00
3	RipRap	20	SY	\$ 40.00	\$ 800.00
4	Remove & Reset Guardrail	100	LF	\$ 30.00	\$ 3,000.00
5	Remove Pavement	45	SY	\$ 5.00	\$ 225.00
6	Dam/Diversion of Stream	1	LS	\$ 500.00	\$ 500.00
7	Excavation of Channel & Removal of Existing Pipe	95	CY	\$ 15.00	\$ 1,425.00
8	Pipe Bedding	20	CY	\$ 20.00	\$ 400.00
9	Structural Backfill/Gravel Base	70	TN	\$ 18.00	\$ 1,260.00
10	30" HDPE Smoothbore Culvert	50	LF	\$ 35.00	\$ 1,750.00
11	Hot Mix Asphalt Pavement	15	TN	\$ 175.00	\$ 2,625.00
12	Mobilization & Miscellaneous Cleanup	1	LS	\$ 500.00	\$ 500.00
				\$ -	\$ -

Note: Work would likely be conducted by town crews and could be completed in one day during the summer construction season.

Project Total \$ 13,485.00  
\$/LF \$ 269.70

# Scenario #1b

Bankfull width = 6.75 feet : 1.2X Bankfull = 8 feet

Upsize existing 30" pipe to meet the 1.2X bankfull requirement.

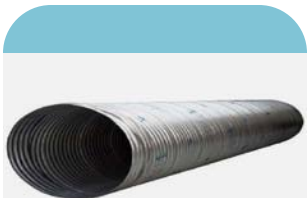
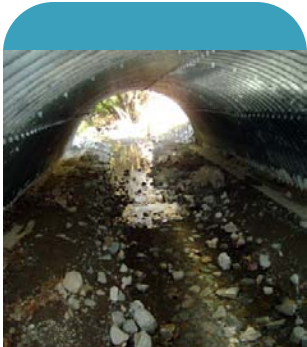
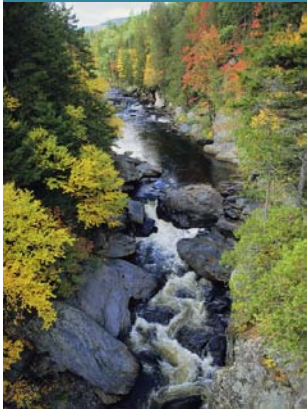
- Installation of 96" x 65" elliptical metal culvert (CMP)

Item	Description	QTY	Unit	Unit \$	Total \$
1	Traffic Control	1	LS	\$ 1,250.00	\$ 1,250.00
2	Erosion Control	1	LS	\$ 750.00	\$ 750.00
3	RipRap	30	SY	\$ 40.00	\$ 1,200.00
4	Remove & Reset Guardrail	100	LF	\$ 30.00	\$ 3,000.00
5	Remove Pavement	225	SY	\$ 5.00	\$ 1,125.00
6	Dam/Diversion of Stream	1	LS	\$ 1,750.00	\$ 1,750.00
7	Excavation of Channel & Removal of Existing Pipe	135	CY	\$ 15.00	\$ 2,025.00
8	Pipe Bedding	35	CY	\$ 30.00	\$ 1,050.00
9	Structural Backfill/Gravel Base	190	TN	\$ 18.00	\$ 3,420.00
10	95" x 67" CMP Galvanized Arch (Elliptical) culvert	60	LF	\$ 120.00	\$ 7,200.00
11	Hot Mix Asphalt Pavement	55	TN	\$ 175.00	\$ 9,625.00
12	Mobilization & Miscellaneous Cleanup	1	LS	\$ 1,000.00	\$ 1,000.00
					\$

Notes: Due to the scope and scale of this replacement, most Maine towns would likely seek the services of a contractor which would incur additional costs associated with bid advertisement, project inspection and contract administration. These additional costs are highly variable from town-to-town and have not been included in the cost calculations above.

**Project Total \$ 33,395.00**  
**\$/LF \$ 667.90**

**250% cost  
increase**

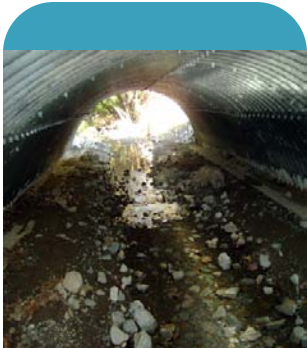
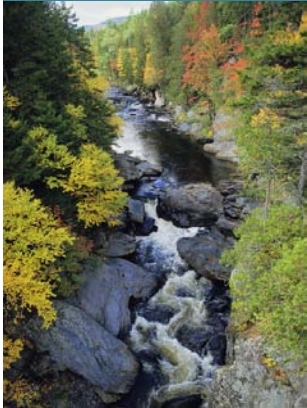


# Scenario #2a

Bankfull width = 10 feet : 1.2X Bankfull = 12 feet

In-Kind replacement

- 48" metal culvert (CMP) to be replaced with 48" CMP



Item	Description	QTY	Unit	Unit \$	Total \$
1	Traffic Control	1	LS	\$ 1,000.00	\$ 1,000.00
2	Erosion Control	1	LS	\$ 500.00	\$ 500.00
3	RipRap	20	SY	\$ 40.00	\$ 800.00
4	Remove & Reset Guardrail	80	LF	\$ 30.00	\$ 2,400.00
5	Remove Pavement	75	SY	\$ 5.00	\$ 375.00
6	Dam/Diversion of Stream	1	LS	\$ 750.00	\$ 750.00
7	Excavation/Removal of Existing Pipe	125	CY	\$ 15.00	\$ 1,875.00
8	Pipe Bedding	45	CY	\$ 20.00	\$ 900.00
9	Structural Backfill/Gravel Base	100	TN	\$ 18.00	\$ 1,800.00
10	48" CMP Culvert - Galvanized Metal	50	LF	\$ 75.00	\$ 3,750.00
11	Hot Mix Asphalt Pavement	20	TN	\$ 175.00	\$ 3,500.00
12	Mobilization & Miscellaneous Cleanup	1	LS	\$ 1,000.00	\$ 1,000.00
				\$ -	\$ -
				\$ -	\$ -
				\$ -	\$ -
Note:				<b>Project Total</b>	<b>\$ 18,650.00</b>
				<b>\$/LF</b>	<b>\$ 373.00</b>

# Scenario #2b

Bankfull width = 10 feet : 1.2X Bankfull = 12 feet

Upsize existing 4 ft. pipe to meet the 1.2X bankfull requirement

- Installation of 12'W x 6'H bottomless metal arch culvert

Item	Description	QTY	Unit	Unit \$	Total \$
1	Traffic Control	1	LS	\$ 2,500.00	\$ 2,500.00
2	Erosion Control	1	LS	\$ 1,000.00	\$ 1,000.00
3	RipRap	30	SY	\$ 40.00	\$ 1,200.00
4	Remove & Reset Guardrail	80	LF	\$ 30.00	\$ 2,400.00
5	Remove Pavement	80	SY	\$ 5.00	\$ 400.00
6	Dam/Diversion of Stream	1	LS	\$ 1,750.00	\$ 1,750.00
7	Excavation/Removal of Existing Pipe	275	CY	\$ 15.00	\$ 4,125.00
8	Footings	100	LF	\$ 115.00	\$ 11,500.00
9	Structural Backfill/Gravel Base	195	TN	\$ 18.00	\$ 3,510.00
10	12' W x 6' H CMP Arch Culvert	50	LF	\$ 250.00	\$ 12,500.00
11	Hot Mix Asphalt Pavement	25	TN	\$ 175.00	\$ 4,375.00
12	Labor & Equipment to Assemble Plates	1	LS	\$ 2,000.00	\$ 2,000.00
13	Mobilization & Miscellaneous Cleanup	1	LS	\$ 500.00	\$ 500.00
					\$ -
					\$ -
Notes: Traffic Control increases due to longer closure of the road				<b>Project Total</b>	<b>\$ 47,760.00</b>
				<b>\$/LF</b>	<b>\$ 955.20</b>

**250% cost  
increase**



# Scenario #3a

Bankfull width = 14 feet : 1.2X Bankfull = 16.8 feet

## In-Kind replacement

- 72" metal culvert (CMP) to be replaced with 72" CMP

Item	Description	QTY	Unit	Unit \$	Total \$
1	Traffic Control	1	LS	\$ 2,000.00	\$ 2,000.00
2	Erosion Control	1	LS	\$ 1,000.00	\$ 1,000.00
3	RipRap	25	SY	\$ 40.00	\$ 1,000.00
4	Remove & Reset Guardrail	90	LF	\$ 30.00	\$ 2,700.00
5	Remove Pavement	115	SY	\$ 5.00	\$ 575.00
6	Dam/Diversion of Stream	1	LS	\$ 1,000.00	\$ 1,000.00
7	Excavation/Removal of Existing Pipe	400	CY	\$ 15.00	\$ 6,000.00
8	Pipe Bedding	45	CY	\$ 30.00	\$ 1,350.00
9	Structural Backfill/Gravel Base	450	TN	\$ 18.00	\$ 8,100.00
10	72" CMP Culvert - Galvanized Metal	50	LF	\$ 105.00	\$ 5,250.00
11	Hot Mix Asphalt Pavement	35	TN	\$ 175.00	\$ 6,125.00
12	Mobilization & Miscellaneous Cleanup	1	LS	\$ 500.00	\$ 500.00
				\$ -	\$ -
				\$ -	\$ -
				\$ -	\$ -
Note:				Project Total	\$ 35,600.00
				\$/LF	\$ 712.00

# Scenario #3b

Bankfull width = 14 feet : 1.2X Bankfull = 16.8 feet

Upsize existing 6 ft. pipe to meet the 1.2X bankfull requirement

- Installation of 16'W x 6'H bottomless metal arch culvert

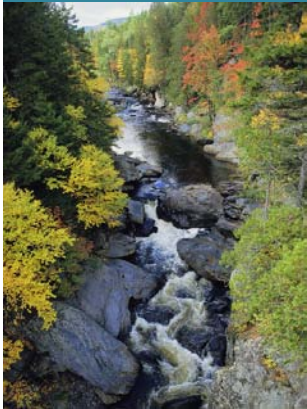
Item	Description	QTY	Unit	Unit \$	Total \$
1	Traffic Control	1	LS	\$ 3,500.00	\$ 3,500.00
2	Erosion Control	1	LS	\$ 1,000.00	\$ 1,000.00
3	RipRap	50	SY	\$ 40.00	\$ 2,000.00
4	Remove & Reset Guardrail	100	LF	\$ 30.00	\$ 3,000.00
5	Remove Pavement	125	SY	\$ 5.00	\$ 625.00
6	Dam/Diversion of Stream	1	LS	\$ 1,750.00	\$ 1,750.00
7	Excavation/Removal of Existing Pipe	250	CY	\$ 15.00	\$ 3,750.00
8	Footings	100	LF	\$ 115.00	\$ 11,500.00
9	Structural Backfill/Gravel Base	350	TN	\$ 18.00	\$ 6,300.00
10	16 W x6' H CMP Arch Culvert	50	LF	\$ 400.00	\$ 20,000.00
11	Hot Mix Asphalt Pavement	40	TN	\$ 175.00	\$ 7,000.00
12	Labor & Equipment to Assemble Culvert	1	LS	\$ 2,000.00	\$ 2,000.00
13	Mobilization & Miscellaneous Cleanup	1	LS	\$ 1,500.00	\$ 1,500.00
					\$ -
					\$ -
Notes: Traffic Control increases due to longer closure of the road				<b>Project Total</b>	<b>\$ 63,925.00</b>
				<b>\$/LF</b>	<b>\$ 1,278.50</b>

**180% cost  
increase**

# SCENARIO PROBLEMS

## Differing site conditions

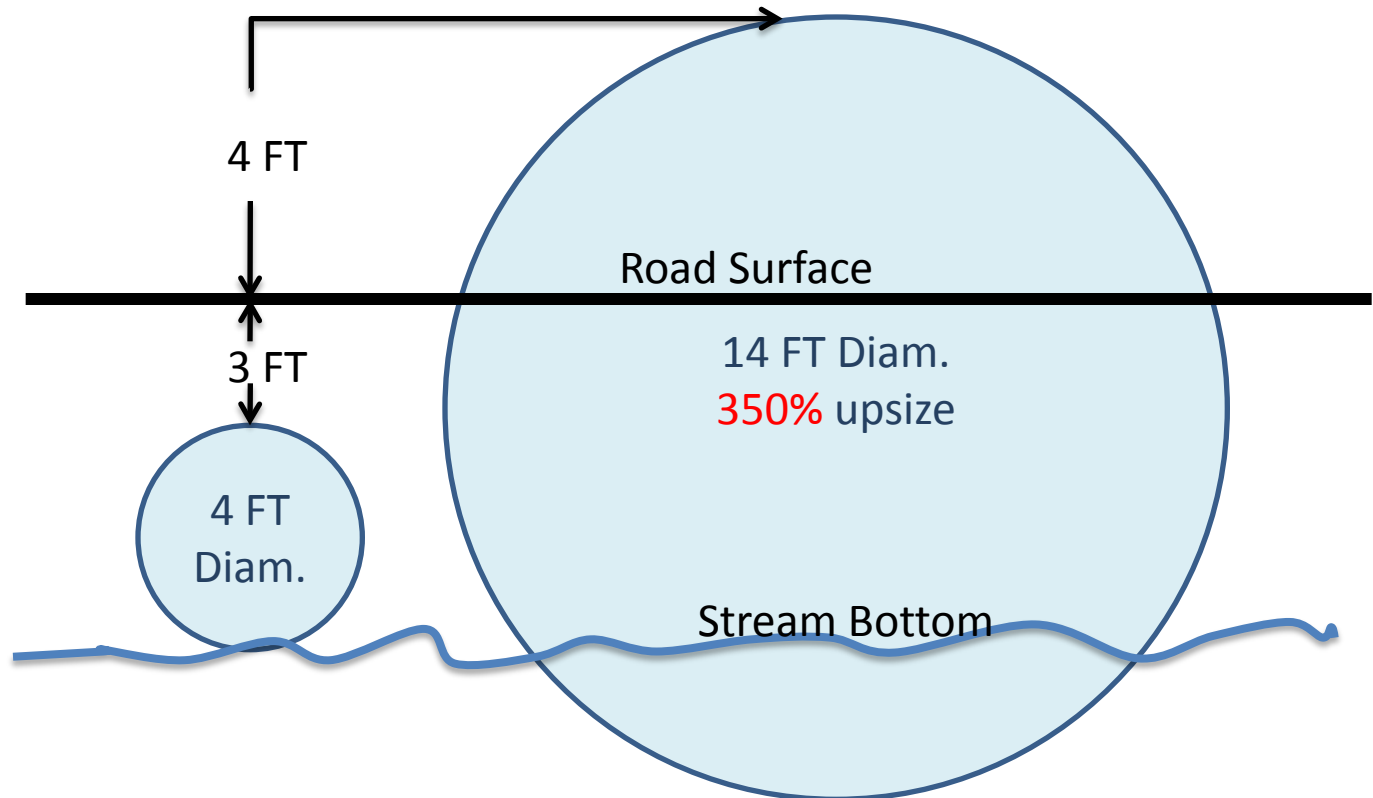
- Utility conflicts
- Lane or road closure restrictions
- High traffic areas
- Deep fill
- Presence of ledge
- Stream Characteristics



# SCENARIO PROBLEMS

## Reengineering as a result of upsizing

- Scope and scale would likely prevent most towns from self-performing the work.



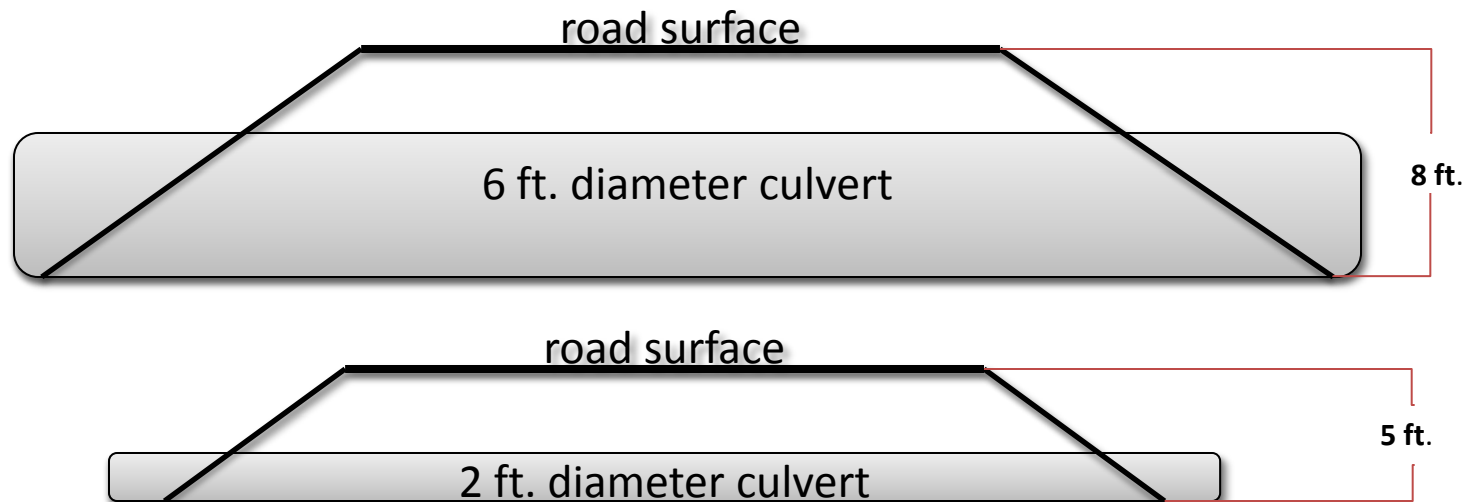


# SCENARIO PROBLEMS

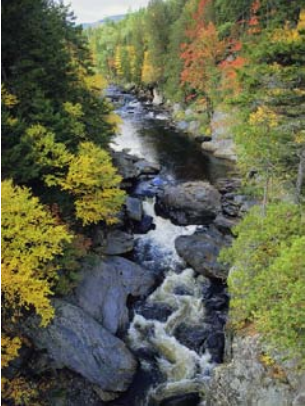
## Maintaining a minimum depth of cover

- May require additional backfill, pavement and guardrail.
- May require additional footage of pipe due to lengthening of slope.

*Example: in the illustration below, increasing the depth of fill from 5 feet to 8 feet would increase the length of the slope on each side of the road by 6 feet assuming the minimum standard slope ratio of 2:1 (L:H).*



# DATA PROBLEMS



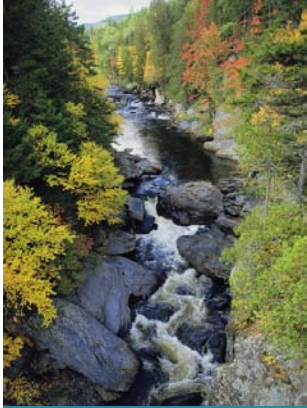
## Unknowns

- How many crossings statewide?
  - How many are bridges?
  - How many are exempt?
- Are replacement culverts currently being upsized to some degree to accommodate observed increase in frequency and intensity of storm events?
- Method used to obtain existing bankfull measurement.
  - data is often not convertible
- Incomplete datasets
  - may not contain enough information to conduct complete analysis.
- Issues with scalability and extrapolation
  - population density
  - watershed size
  - geography



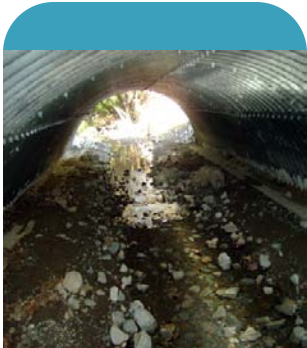


# Data Collection



## KEY ELEMENTS:

1. Total number of stream crossings in the State of Maine
2. Categorical breakdown of crossing infrastructure size (range of span/diameter of culverts, struts, etc.).
3. Standardized bankfull width measurement at crossing location.
4. Relationship between crossing span and bankfull width
5. Age and type of crossing infrastructure - used to determine approximate replacement timeframe.
6. Eligibility of crossing infrastructure for exemption.



# Data Collection

Analysis of stream crossing data from representative samples from which we could draw conclusions about stream crossings on a statewide level.

## What we were looking for....

### *SAMPLE DATA ONLY*

Number of Crossings	Average Span Width (FT)	Average Length (FT)	AVG Upsize % to achieve 1.2x BF
7500	0 - 2	30	350%
6000	2 - 4	35	375%
5000	4 - 6	45	325%
4500	6 - 8	45	300%
4000	8 - 10	55	225%
3500	10 - 12	50	200%
2000	12 - 14	50	175%
7500	> 14	50	150%
<b>40000</b>			



# Data Collection

The collection of stream data in Maine is decentralized.

- Collected by many different groups for many different purposes.
- Significant variation in both quality and type of data collected.

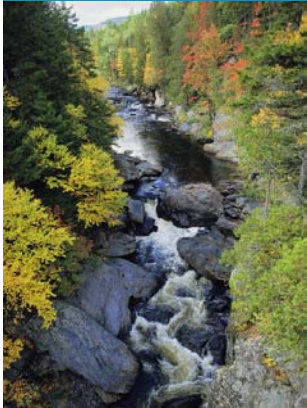
## What we usually found....

Location	Diameter (ft)	Length (ft)	Bankfull (ft)	Culvert type	Multiple	# of Culverts
Rt 35	3	42		CMP	Y	2
44021	2	??	9.5	??	Y	??
	8	??	14	Box	N	
Coffin Brook	??	??	12	Steel	N	

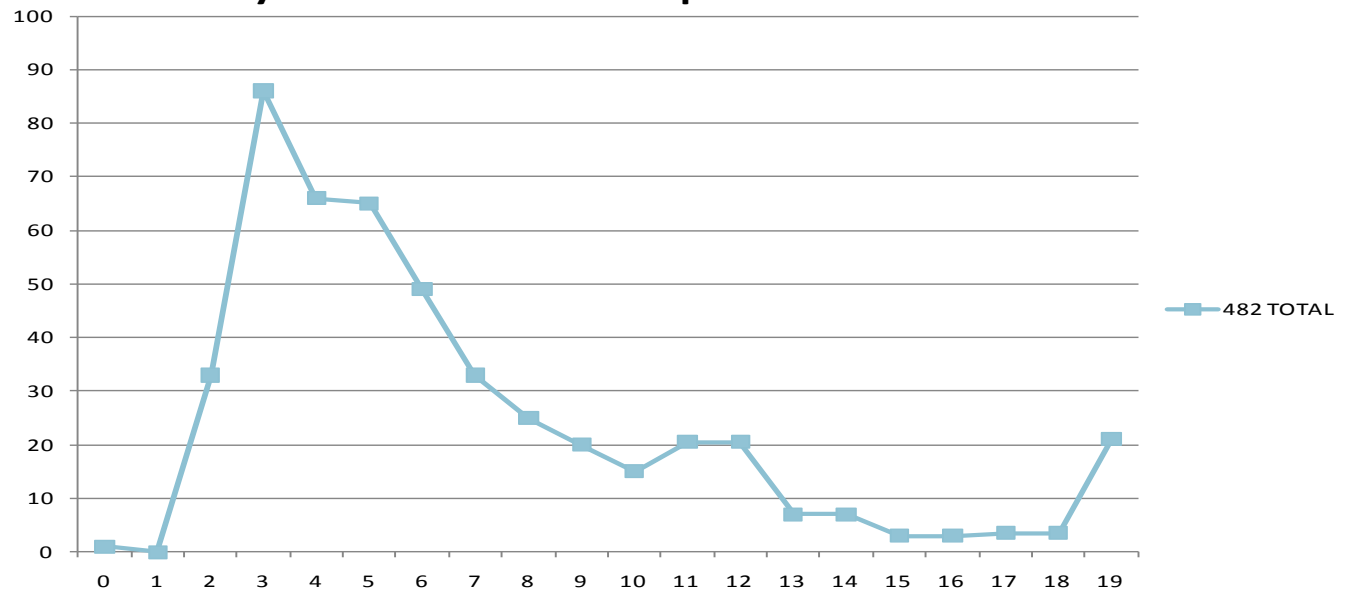
# Data Collection

## Crossing Size: Span or Diameter

- Established statewide average distribution of crossing widths.
- Estimate was derived from analysis of over 2,000 data points from a wide variety of sources.



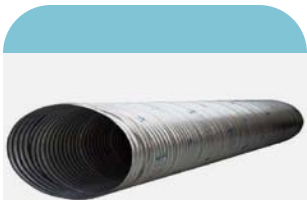
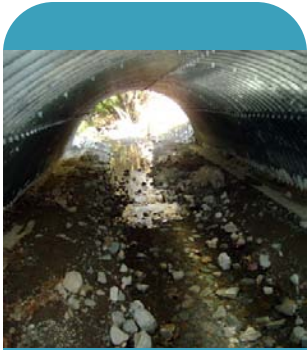
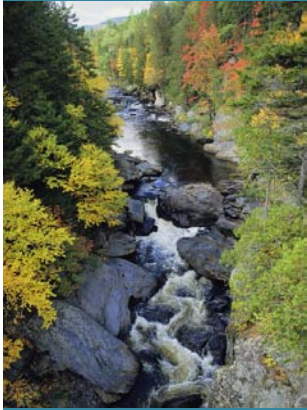
**Sizes Distribution of Culverts  
Royal And Lower Presumpscot Watersheds**



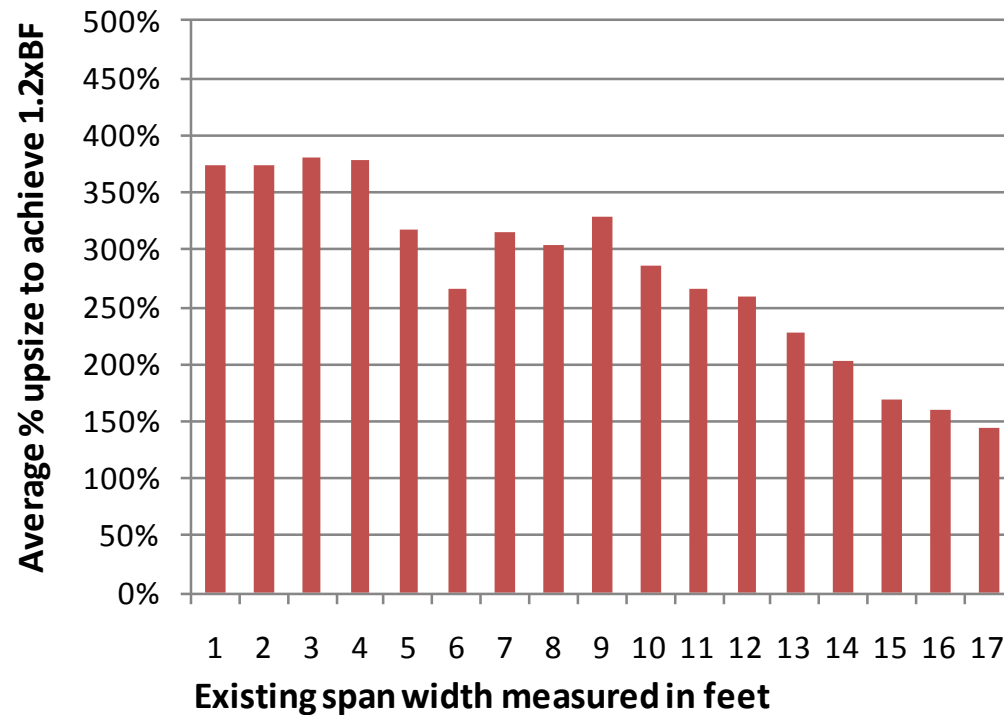
Source: Casco Bay Estuary Partnership 2010

# Data Collection

## Bankfull-to-Span Relationship

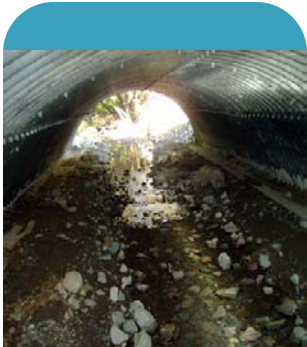
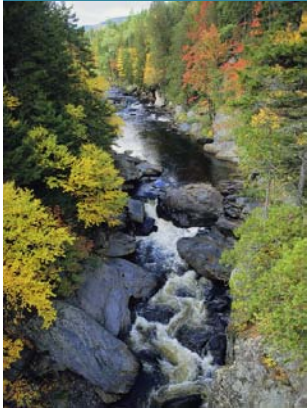


### Average % Upsized Required for 1.2x BF



# Pipe Material Costs

Pipe material costs make are roughly 50% of total project costs

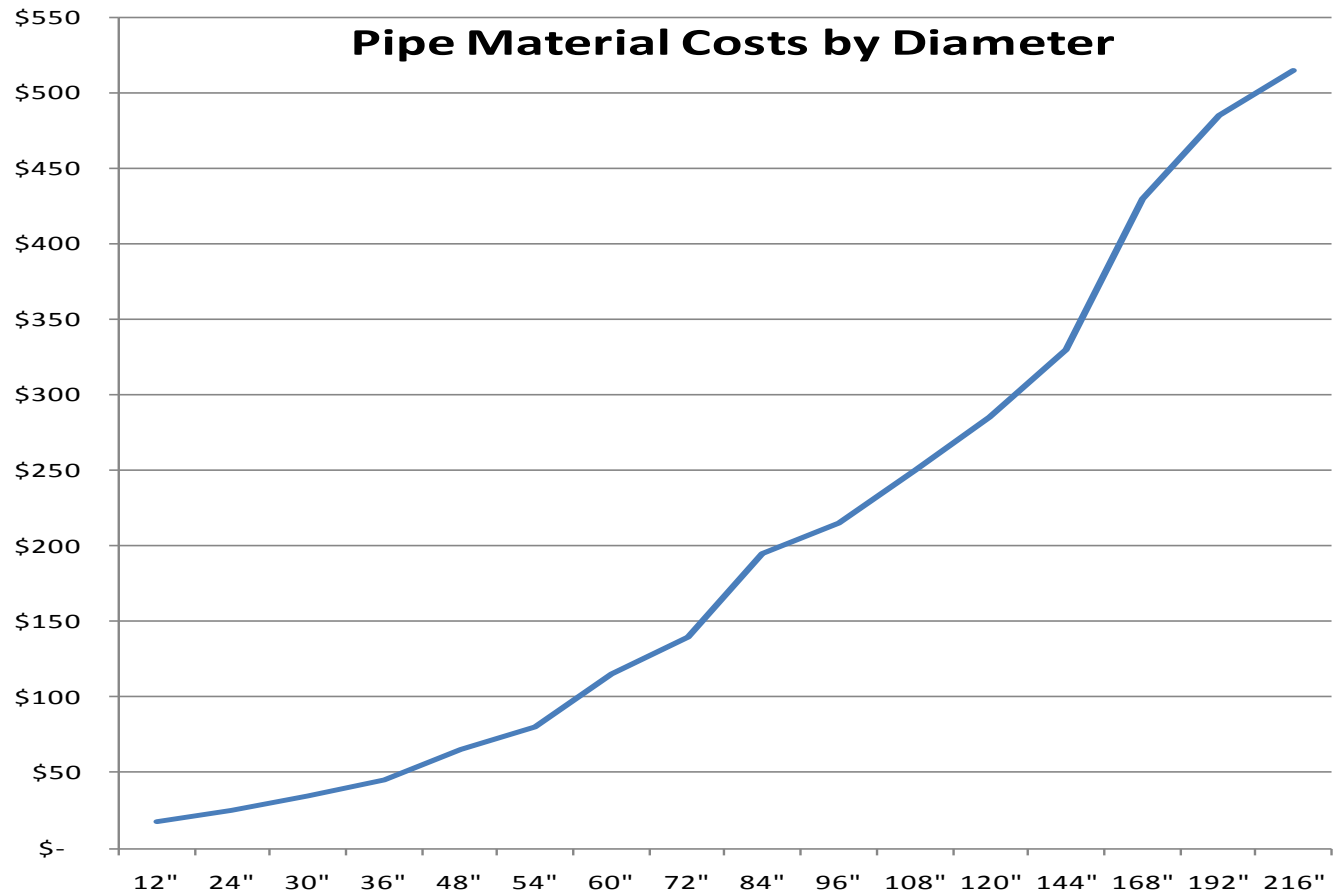
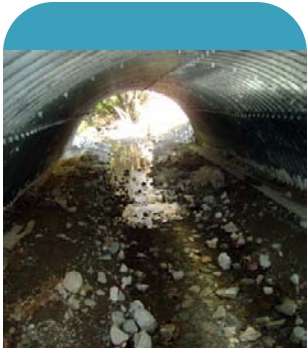
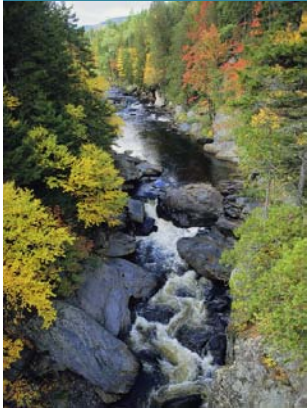


CULVERT PIPE MATERIAL COSTS ONLY					
Cost/Lineal Foot					
DIAM/SPAN (feet)	CMP Culvert	HDPE Culvert	CMP Elliptical Arch	CMP Bottomless Arch (incl. foundation)	Concrete Box Culvert
2	\$ 22	\$ 22	\$ -	\$ -	\$ -
3	\$ 45	\$ 44	\$ -	\$ -	\$ -
4	\$ 65	\$ 68	\$ -	\$ -	\$ -
5	\$ 115	\$ 93	\$ 120.00	\$ -	\$ 200
6	\$ 138	\$ 92	\$ 150	\$ 182	\$ 250
7	\$ 162	\$ -	\$ 213	\$ 205	\$ 375
8	\$ 210	\$ -	\$ 225	\$ 248	\$ 450
9	\$ 240	\$ -	\$ 267	\$ 260	\$ -
10	\$ 270	\$ -	\$ 299	\$ 291	\$ 760
12	\$ 330	\$ -	\$ -	\$ 327	\$ 900
14	\$ -	\$ -	\$ -	\$ 430	\$ 1,050
16	\$ -	\$ -	\$ -	\$ 481	\$ 1,200
18	\$ -	\$ -	\$ -	\$ 506	\$ 1,450
LEGEND: \$ - (blank) = material not available at this dimension					

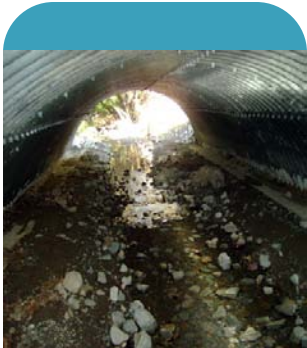
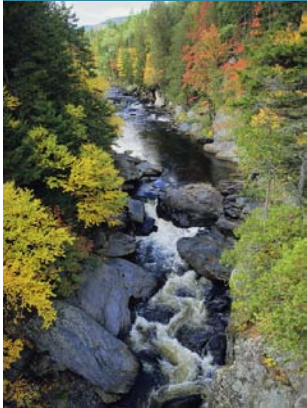


# Pipe Material Costs

Material prices rises exponentially with size increase



# Pipe Material Costs



Maine DOT FY 2010 Culvert Replacement					
Avg Length of 75 FT					
TOTAL #	Length				
100	75				
Structure Size Range Distribution	# of Culverts Statewide	AVG Upsize % to Achive 1.2BF	AVG Δ Material Cost per foot to upgrade per crossing	Total AVG Δ Material Cost to Upgrade per Culvert	Total Statewide AVG Δ Material Cost to Upgrade
0" - 47"	37	350%	\$ 155.00	\$ 11,625.00	\$ 430,125.00
48" - 84"	43	300%	\$ 350.00	\$ 26,250.00	\$ 1,128,750.00
85" - 120"	13	225%	\$ 315.00	\$ 23,625.00	\$ 307,125.00
>120"	7	170%	\$ 550.00	\$ 41,250.00	\$ 288,750.00
			TOTAL AVG MATERIAL COST Δ		\$ 2,154,750.00
Maine DOT FY 2010 Culvert Replacement					
Avg Length of 75 FT					
TOTAL #	Length				
100	75				
Structure Size Range Distribution	# of Culverts Statewide	AVG Upsize % to Achive 1.2BF	AVG Δ Material Cost per foot to upgrade per crossing	Total AVG Δ Material Cost to Upgrade per Culvert	Total Statewide AVG Δ Material Cost to Upgrade
0" - 47"	40	350%	\$ 155.00	\$ 11,625.00	\$ 465,000.00
48" - 84"	20	300%	\$ 350.00	\$ 26,250.00	\$ 525,000.00
85" - 120"	10	225%	\$ 315.00	\$ 23,625.00	\$ 236,250.00
>120"	10	170%	\$ 550.00	\$ 41,250.00	\$ 412,500.00
			TOTAL AVG MATERIAL COST Δ		\$ 1,638,750.00
Maine DOT FY 2010 Culvert Replacement					
Avg Length of 75 FT					
TOTAL #	Length				
100	75				
Structure Size Range Distribution	# of Culverts Statewide	AVG Upsize % to Achive 1.2BF	AVG Δ Material Cost per foot to upgrade per crossing	Total AVG Δ Material Cost to Upgrade per Culvert	Total Statewide AVG Δ Material Cost to Upgrade
0" - 47"	10	350%	\$ 155.00	\$ 11,625.00	\$ 116,250.00
48" - 84"	30	300%	\$ 350.00	\$ 26,250.00	\$ 787,500.00
85" - 120"	30	225%	\$ 315.00	\$ 23,625.00	\$ 708,750.00
>120"	20	170%	\$ 550.00	\$ 41,250.00	\$ 825,000.00
			TOTAL AVG MATERIAL COST Δ		\$ 2,437,500.00

# Pipe Material Costs

Projected Total Statewide Cost Impact for Pipe Material to Achieve 1.2x Bankfull*						
Structure Size Range Distribution	% of Structures Statewide	# of Structures Statewide	AVG Upsize % to Achieve 1.2BF	AVG Δ Material Cost per foot to upgrade per crossing	Total AVG Δ Material Cost to Upgrade 40' L Culvert	Total Statewide AVG Δ Material Cost to Upgrade 40' L Culvert
0" - 47"	37%	11,100	350%	\$155	\$6,200	\$68,820,000
48" - 84"	43%	12,900	300%	\$350	\$14,000	\$180,600,000
85" - 120"	13%	3,900	225%	\$315	\$12,600	\$49,140,000
>120"	7%	2,100	170%	\$550	\$22,000	\$46,200,000
<b>TOTAL AVG MATERIAL COST Δ</b>						<b>\$344,760,000**</b>
* assumes 30,000 culverts statewide with average culvert length of 40 ft.						
** costs are expressed in 2010 dollars using current material prices obtained from regional material vendors.						

- Assumes 30,000 replacements
- Assumes 40 foot average length
  - Increasing the estimate for average length will increase total cost:
    - 50 foot average = \$430,950,000
    - 60 foot average = \$517,140,000
    - 75 foot average = \$646,425,000
- An unknown percentage of the crossings in the >120" range may be bridge structures.

# Sample Permitting Costs

## Minor Stream Crossing (NRPA - Permit By Rule)

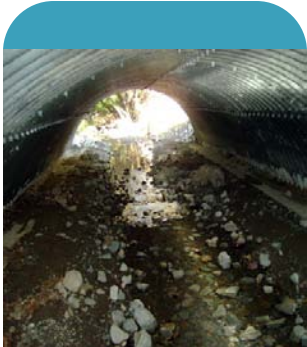
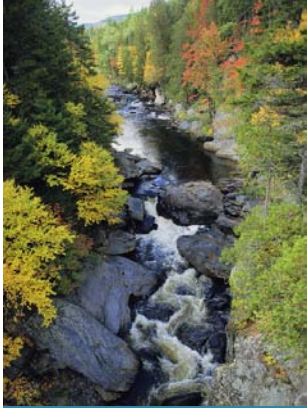
Task	# of FTEs Required	Days Required	Cost/Day	TOTAL
Hydraulic Assessment	1	1	\$900.00	\$900.00
Hydrologic Assessment	1	1	\$900.00	\$900.00
Surveyor	2	1	\$1,000.00	\$2,000.00
Design/Detail	1	1	\$900.00	\$900.00
CAD Drafting	1	2	\$600.00	\$1,200.00
Project Management	1	1	\$900.00	\$900.00
Project Administration	1	0.5	\$450.00	\$225.00
Permit Fee				\$65.00
Reimbursable (mileage, postage, photocopies, etc..)				\$200.00
<b>TOTALS</b>	<b>8</b>	<b>7.5</b>		<b>\$7,290.00</b>

## Major Stream Crossing (NRPA - Individual Permit)

Task	# of FTEs Required	Days Required	Cost/Day	TOTAL
Hydraulic Assessment	1	4	\$900.00	\$3,600.00
Hydrologic Assessment	1	4	\$900.00	\$3,600.00
Geotechnical Investigation	2	1	\$2,000.00	\$4,000.00
Geotechnical Assessment	1	3	\$900.00	\$2,700.00
Structural Assessment	1	2	\$900.00	\$1,800.00
Surveyor	2	3	\$1,000.00	\$6,000.00
Design/Detail	1	4	\$900.00	\$3,600.00
CAD Drafting	1	4	\$600.00	\$2,400.00
Project Management	1	4	\$900.00	\$3,600.00
Project Administration	1	8	\$450.00	\$3,600.00
Construction Document Preparation	1	2	\$900.00	\$1,800.00
Bidding and Construction Administration	1	5	\$900.00	\$4,500.00
Periodic Construction Inspection	1	5	\$900.00	\$4,500.00
Permit Fee				\$267.00
Reimbursable (mileage, postage, photocopies, etc..)				\$1,500.00
<b>TOTALS</b>	<b>15</b>	<b>49</b>		<b>\$47,467.00</b>

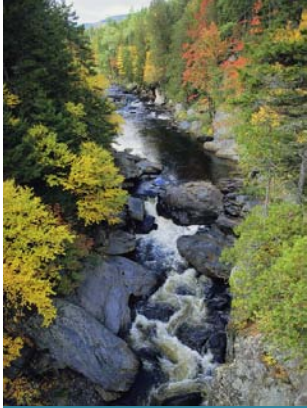


# Potential Benefits

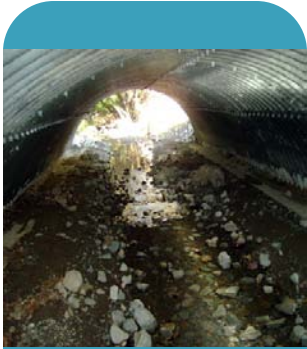


- 1.2x likely exceeds most capacity increase requirements for climate change adaptation.
- The high up-front cost of installing upsized stream crossing infrastructure when amortized over the extended lifespan of the upgraded crossing can potentially offset the costs incurred from the maintenance and shorter replacement cycles required by the undersized culverts.
  - Reduced maintenance due to increased width – diminished risk of plugging.
  - Reduced scouring and storm related damage.
  - Reduced rate of corrosion for metal pipes.
- Possible reduction in vehicle-wildlife collisions.
- Adds value to Maine's natural resource based economy.
  - Sport fishing
  - Commercial Fishing
  - Eco Tourism
  - Canoe/Kayak
- Habitat Creation/Restoration

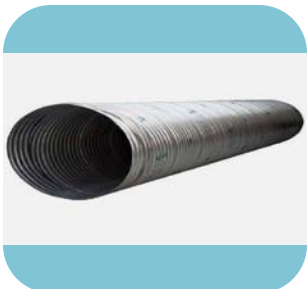
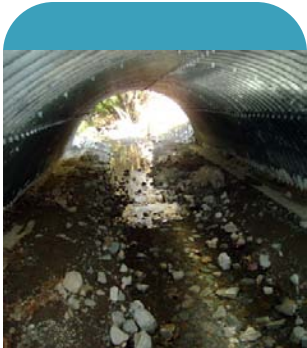
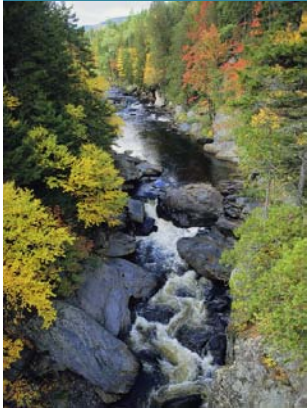
# Potential Adverse Effects



- Unlike segmented culvert which can be installed piece-by-piece , larger multi-plate culverts must be built in place.
  - Can result in lengthy road closures in urban areas.
  - Bypass route(s) can add significant costs.
- May cause municipalities to prioritize replacements based upon costs instead of need or stream value.
  - Could result in high value stream crossing replacements being delayed and replaced under emergency rules.



# Summary



- Decentralized dataset
  - incomplete data from municipalities and agencies
  - not comprehensive e.g. may only contain perennial streams
  - lacked consistent data for crossing material (span, length, etc.)
  - lacked stream characteristic data (BF width, habitat, etc.)
- Limitations of existing data
  - non standardized measurement of bankfull width
  - no data for many regions in the state (lakes region, western foothills, northern)
  - very limited data on the age and condition of existing structure; when will they need to be replaced.
- Towns lack the data and staff time to perform an independent analysis of the potential fiscal impacts from LD1725 and this effectively eliminates their ability to budget and plan.

