



# Public Information Meeting

## Willow Brook Flood Mitigation Study



Town of East Hartford, Connecticut | November 19, 2015

# Project Partners



Department of  
**ENERGY & ENVIRONMENTAL PROTECTION**

*State of Connecticut Funding Provided for Capital Improvements for Flood and Erosion Control, Administered by the Connecticut Department of Energy and Environmental Protection.*



**Town of East Hartford**



**MILONE & MACBROOM**

# Purpose of Tonight's Meeting

- Provide an Update on the Willow Brook Flood Mitigation Study Area
- Recap the analysis performed
- Present Potential Alternatives Analysis & Findings
- Answer Any Questions

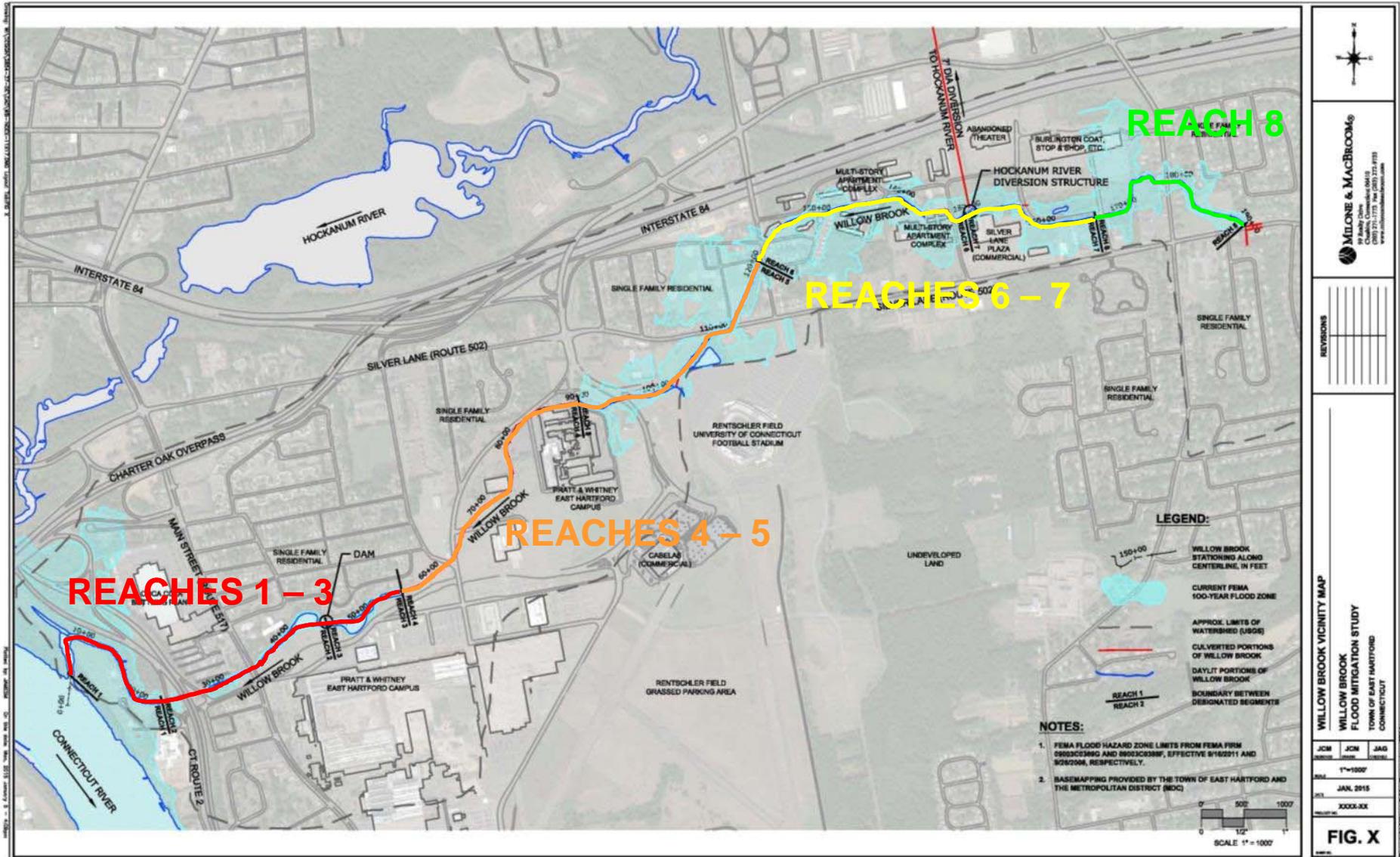


# Project Goals

- Assess Willow Brook and its Contributing Watershed
- Identify Existing Riverine Flooding Issues & Deficiencies
- Identify and Evaluate Potential Solutions to Flooding
- Develop a Master Plan of Improvements
- Minimize Number of Land Owners Subject to Flooding and Flood Insurance



# Willow Brook Project Study Corridor



# Review of Work Completed to Date

1. Data Collection
2. Hydrologic Assessment
3. Hydraulic Assessment
4. Potential Alternatives

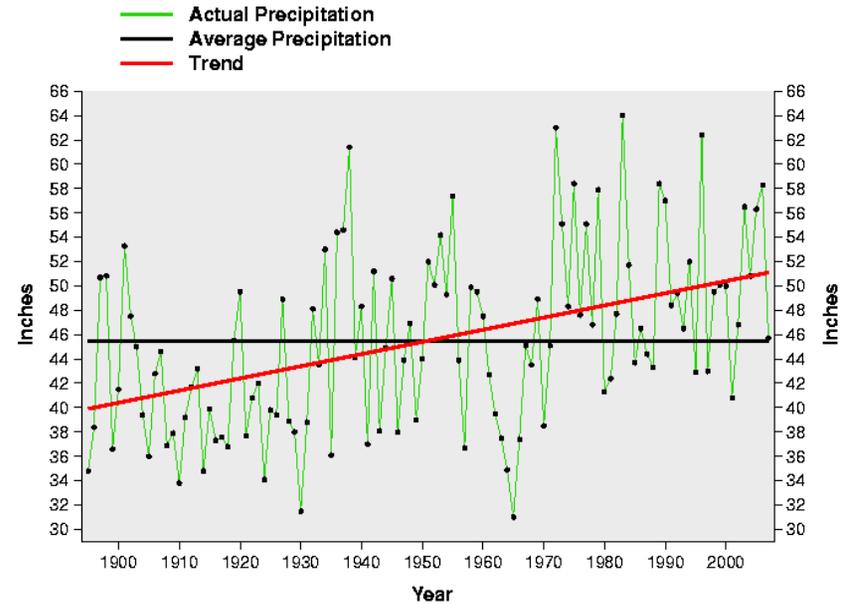
# Data Collection Efforts

- Bridge & Culvert Inventory – Many changes from the original FEMA analysis were identified
- Stormwater Outfall Inventory
- Watershed Composition - Land Use, Geology, Natural Resources
- Topographic Survey
- Field Assessment of Watershed and Stream Corridor, Geomorphic Assessment
- CCTV Survey
- Flood Events and Rainfall History

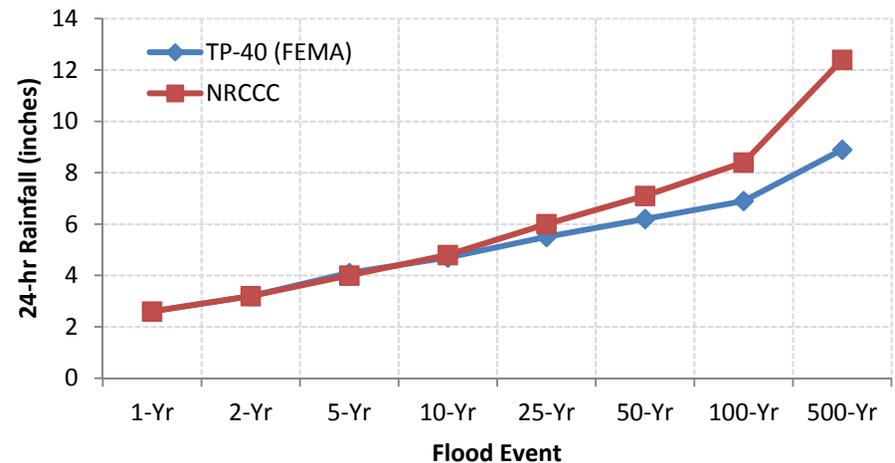


# Hydrologic Assessment

- Differences Between FEMA Data and Present Day Rainfall Data
- Changes in Rainfall Volume and Intensity
- Changes in Land Use

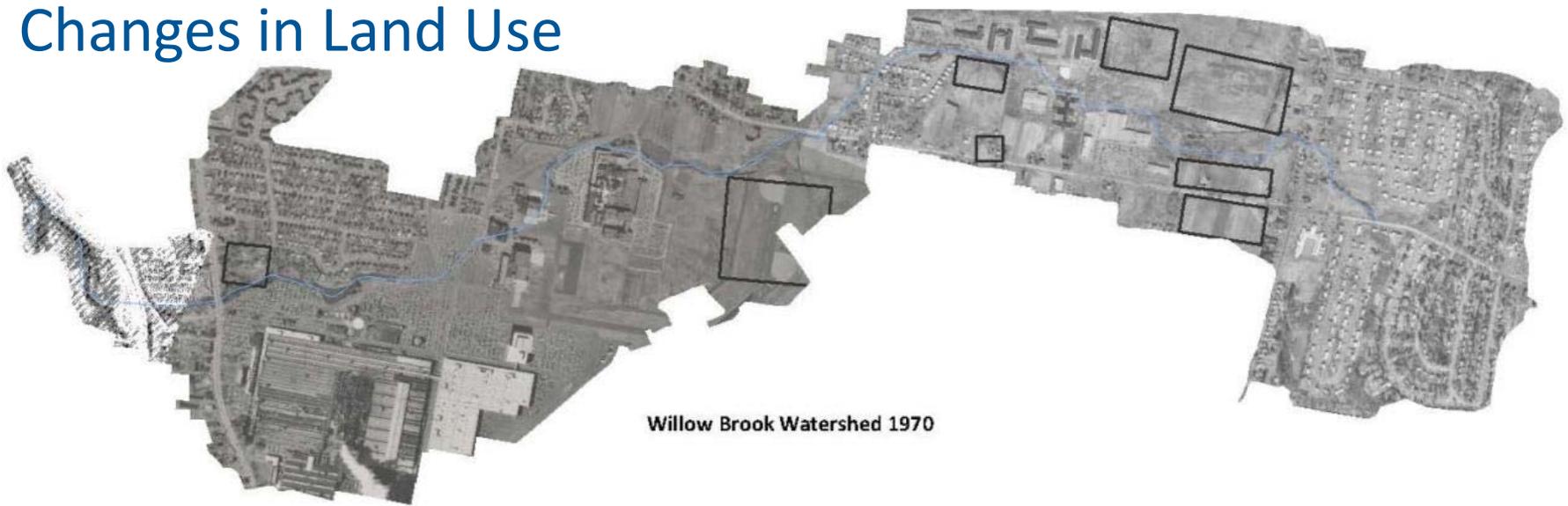


Source: NOAA, National Climatological Data Center



# Hydrologic Assessment

## Changes in Land Use



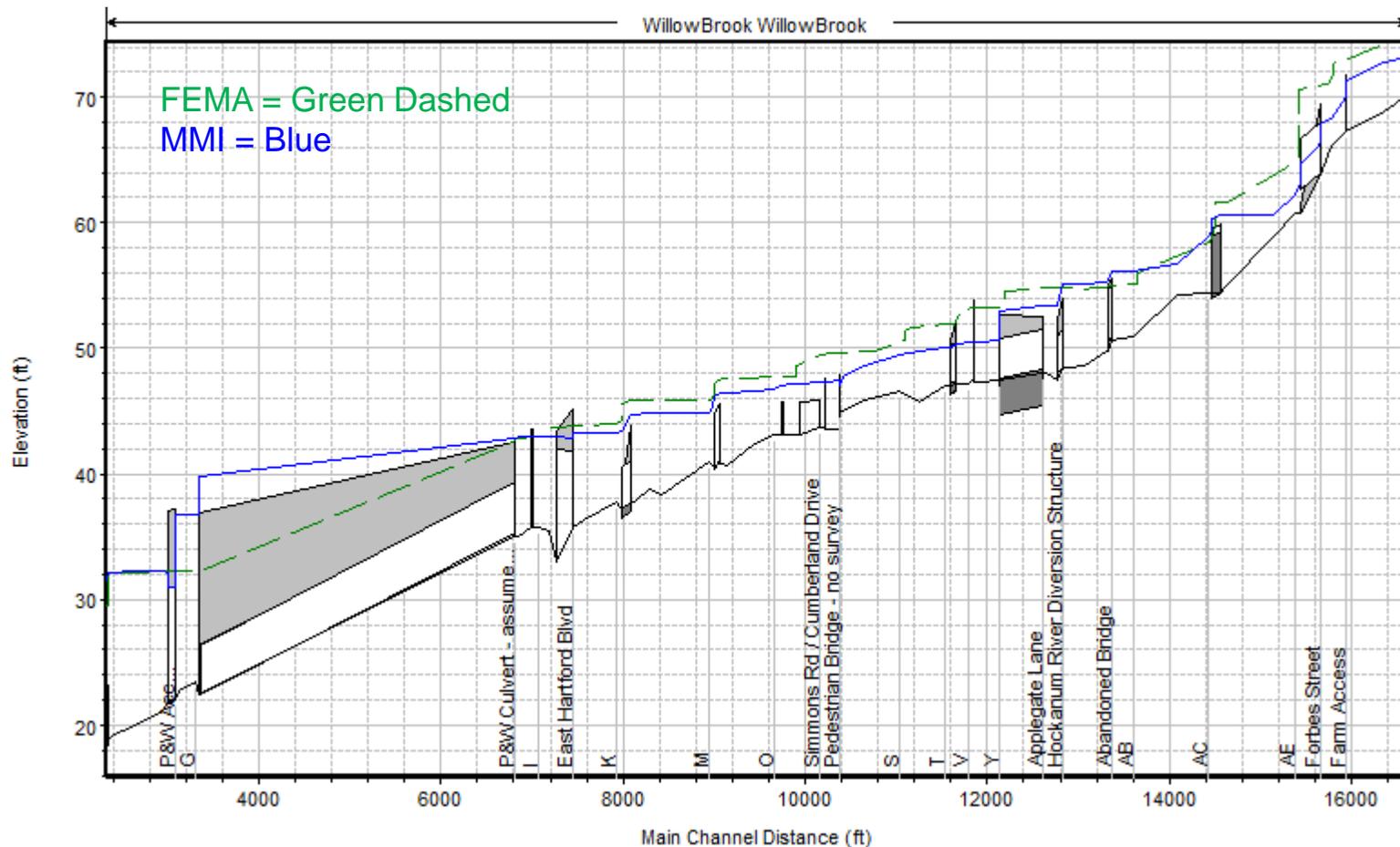
Willow Brook Watershed 1970



Willow Brook Watershed 2012

# Hydraulic Assessment

## Assessment of Floodplain compared with FEMA



# The Costs of Floodplain Development

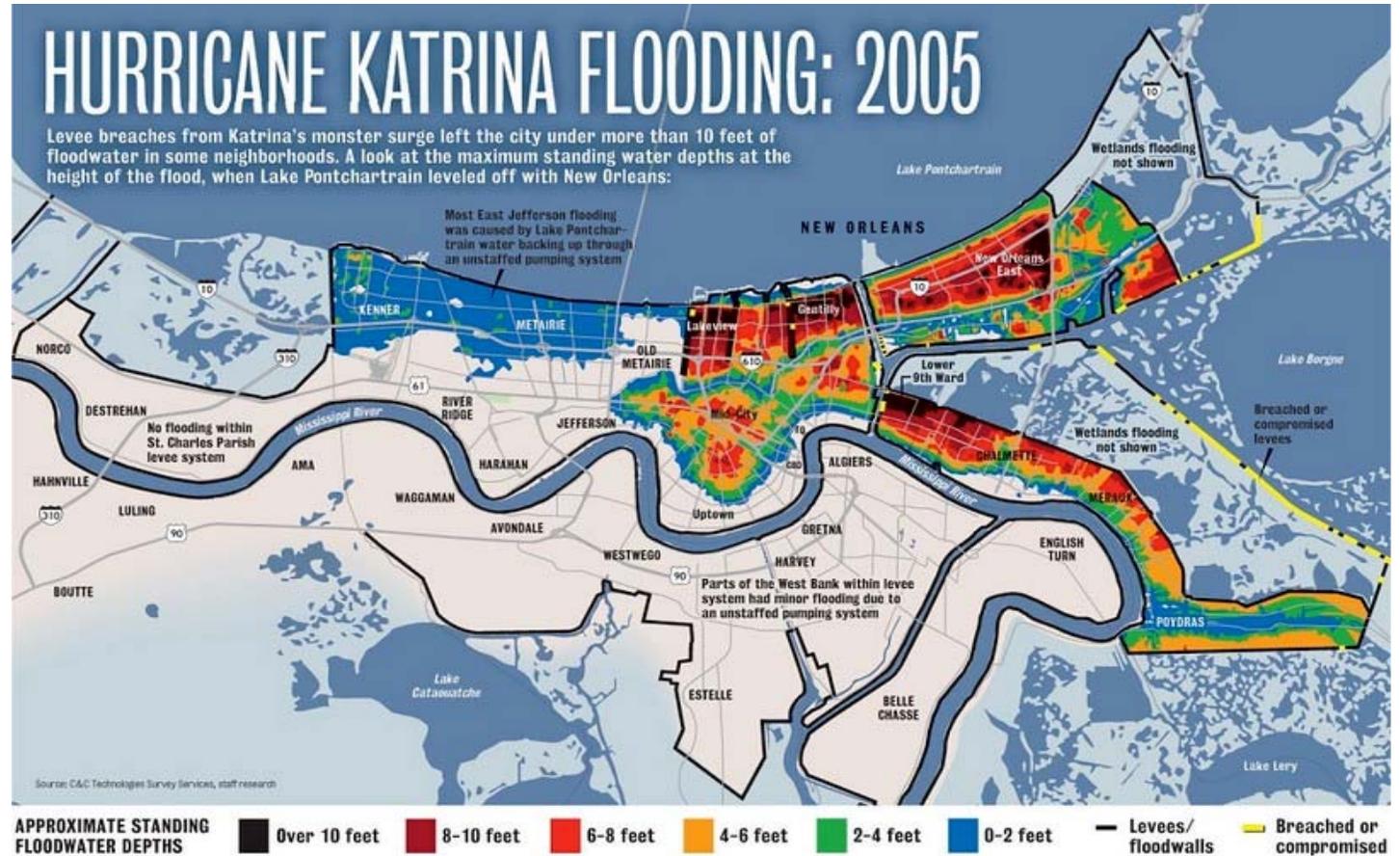
- Accurate Flood Insurance Rate Mapping (FIRM) depicting real-life flooding characteristics is important.
- If a structure is flood prone but not mapped: structure vulnerable during a flood but owner unaware of flood risk or of insurance benefits.
- If a structure is mapped but not flood prone: owner is required to purchase flood insurance, but may not require it.

# Katrina - Aug. 23 – 31, 2005

The costliest disaster in the history of the global insurance industry.

Private insurance: companies paid \$41.1 billion

The National Flood Insurance Program paid \$16.3 billion.



# Irene - Aug. 20, 2011

- Hurricane Irene – Most Costly Category 1 Storm to Date
- \$15.8 Billion in Damages



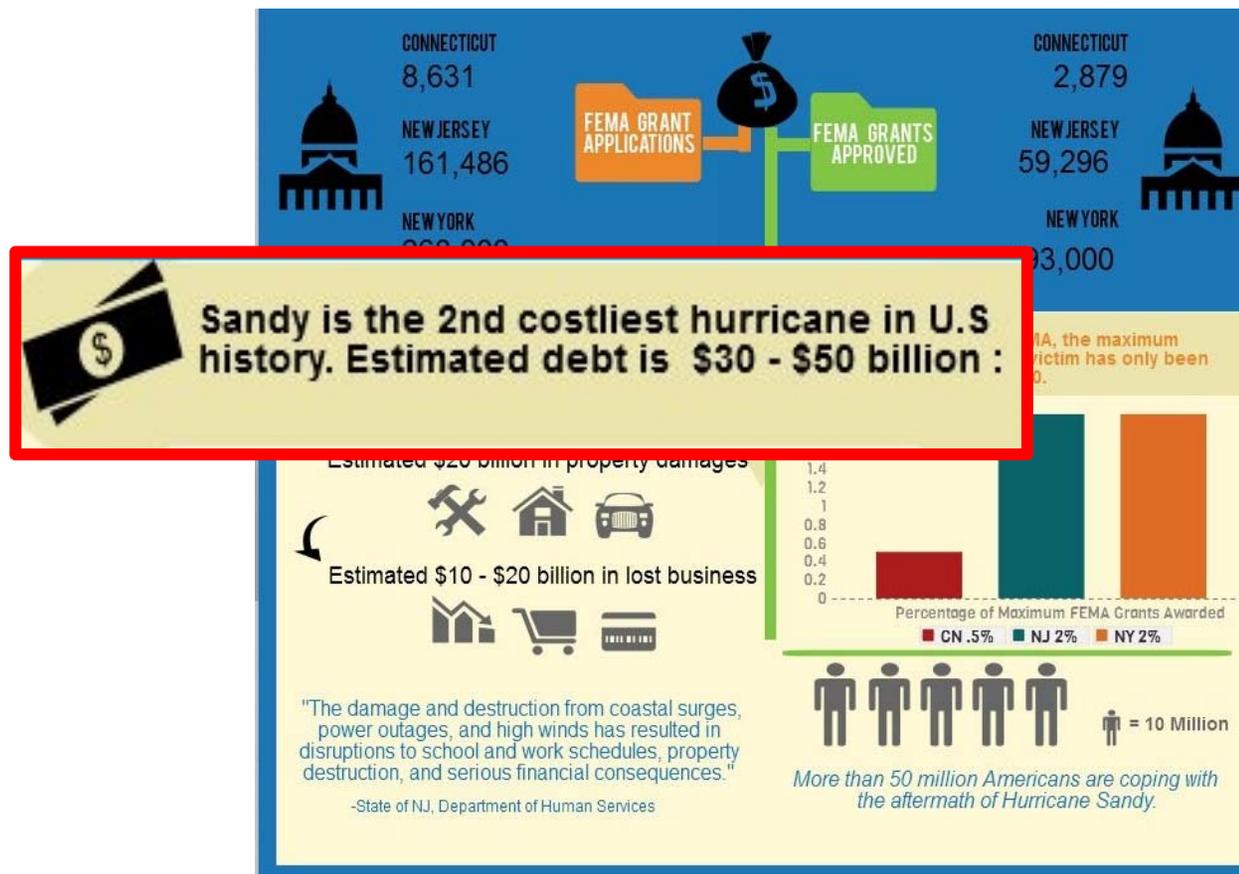
Highway 12, Rodanthe, North Carolina



Main Street, Margaretville, New York

# Sandy - Oct. 22, 2012

## Hurricane "Super Storm" Sandy



Compiled from publically available data, courtesy of <https://raidersofthelostarchitecture.wordpress.com/>

# Boulder, CO Rain - Sept. 16, 2013

**8 DAYS OF RAIN**  
1 YEAR'S WORTH OF WATER

All 15 major creeks and 23 irrigation ditches flooded and overwhelmed city storm drainage and sanitary sewer systems.



Disaster  
Assistance  
Center

Open for just over a month and served: **• 2773 individuals**  
**• 1194 households**

## DAMAGE TO BUILDINGS



PRIVATE PROPERTY DAMAGES

**\$300** MILLION



MUNICIPAL PROPERTY DAMAGES

**\$27** MILLION

## PURSUE & FOCUS RESOURCES

**335 City Projects**

Flood-related projects planned, underway or completed.

**\$27.3 million**

Estimated total cost for City of Boulder flood recovery.

**\$14.4 million**

Potential reimbursement from state and federal agencies.



"Our focus hasn't been on large engineering solutions, but more on good land-use planning and stewardship of the natural enshrinement."

- David Driskell  
City of Boulder Executive  
Director for Community  
Planning & Sustainability.

Courtesy of <http://www.bouldercolorado.gov>

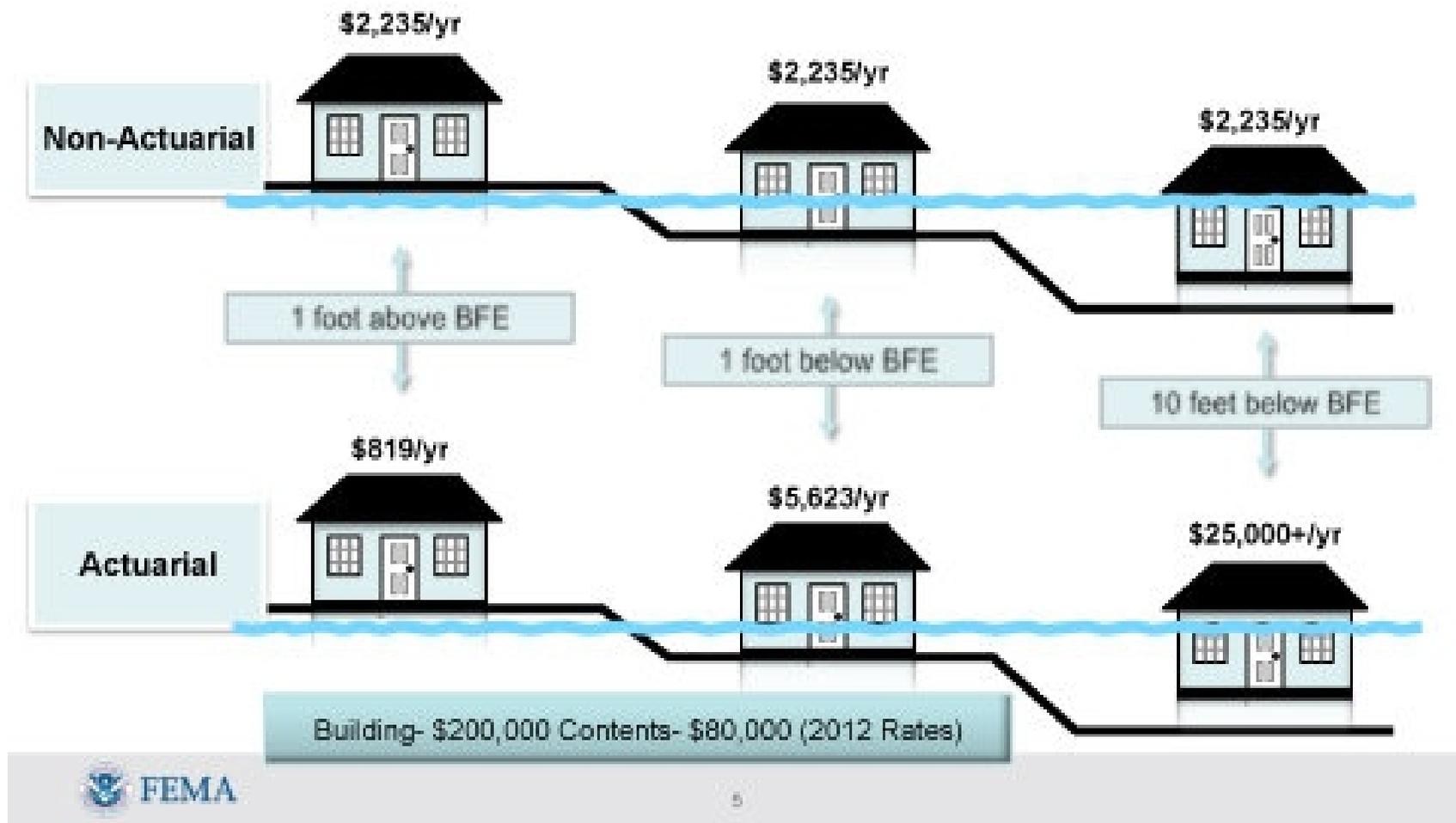
# The National Flood Insurance Program

- The NFIP
- The Biggert Waters Act (2012), “Actuarial Rates” and the end of subsidies
- Full-risk rates will be phased in over five years at 20% increases per year.
- LOMR – Letter of Map Revision. Eliminate properties from within the designated floodplain boundary.
- Update the Flood Insurance Rate Mapping (FIRM), to reflect actual flooding conditions.

# NFIP Rating Examples

## The Impact of the Loss of Subsidies

### Rate comparisons



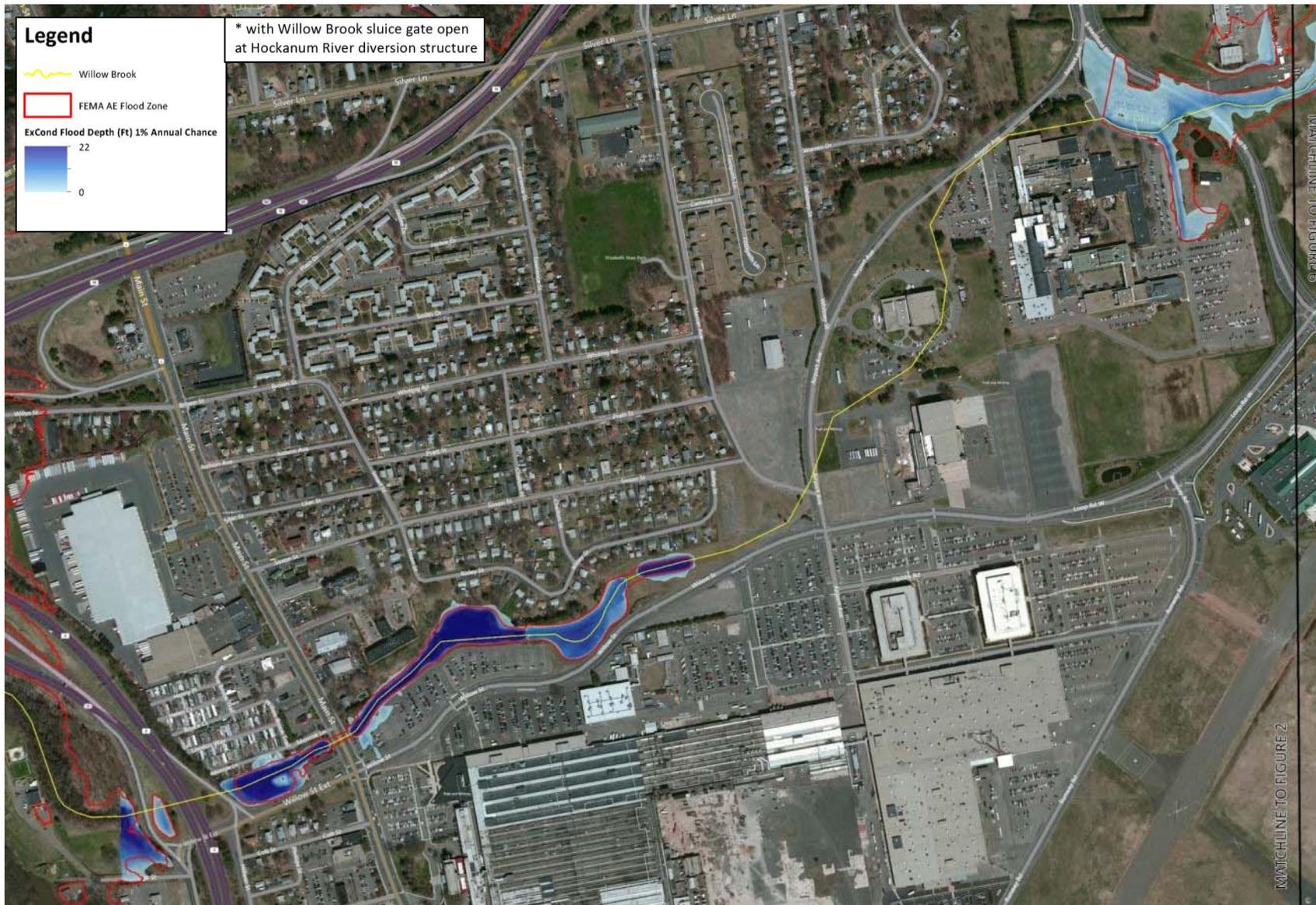
Courtesy of <http://www.fema.gov>

# Potential Alternatives

1. Updated Floodplain Analysis (FEMA LOMR/PMR)  
(funding in place)
2. Sediment and Debris Management
3. Localized Mitigation Alternatives
4. Individual Structure Floodproofing



# Updated Floodplain Analysis



# Potential Alternatives

1. Updated Floodplain Analysis (FEMA LOMR/PMR)  
(funding in place)
2. Sediment and Debris Management
3. Localized Mitigation Alternatives
4. Individual Structure Floodproofing

# Sediment and Debris Management

## Issue:

- Wood, Debris and Trash accumulates in channel. Debris catches more debris, accumulates more with each flood.
- Block flow, cause debris jam
- Promote unwanted vegetative growth

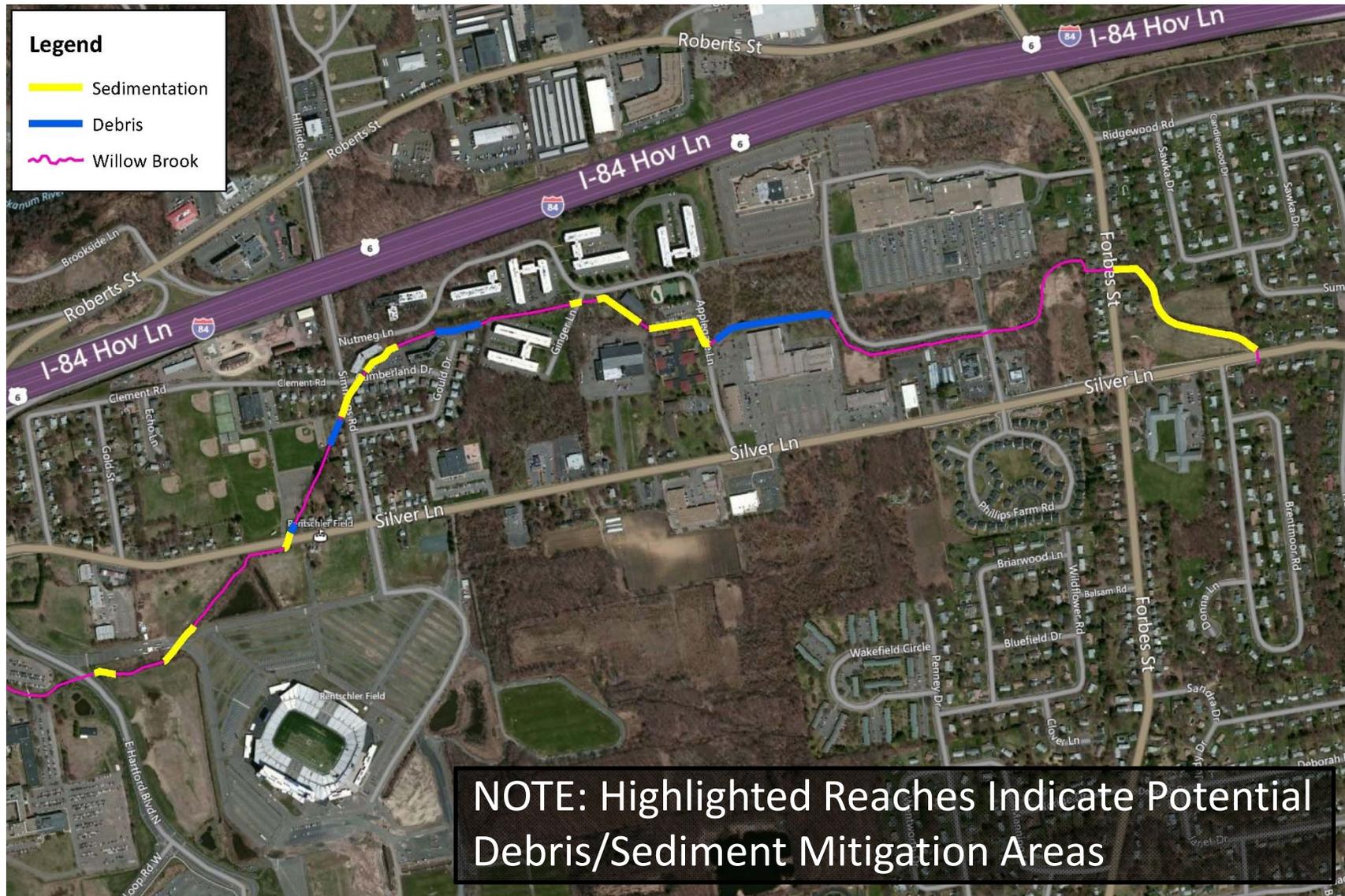


## Mitigation:

- Debris management plan/inspection schedule. Requires public funds to provide labor crews for public land, or property-owner involvement for private land.
- OR, volunteer interest coordinated via a “Brook Cleanup” initiative, which may be a cost efficient way of removing debris in the channel.



# Sediment and Debris Management



# Potential Alternatives

1. Updated Floodplain Analysis (FEMA LOMR/PMR)  
(funding in place)
2. Sediment and Debris Management
3. Localized Mitigation Alternatives
4. Individual Structure Floodproofing

# Localized Mitigation Alternatives

- Conceptual Localized Mitigation Alternatives
- Require More Detailed Analysis and Engineering Prior to Construction
- Require Identification of Funding Sources
- (LOMR Alternative is funded, no funding available for other alternatives presented in this study)

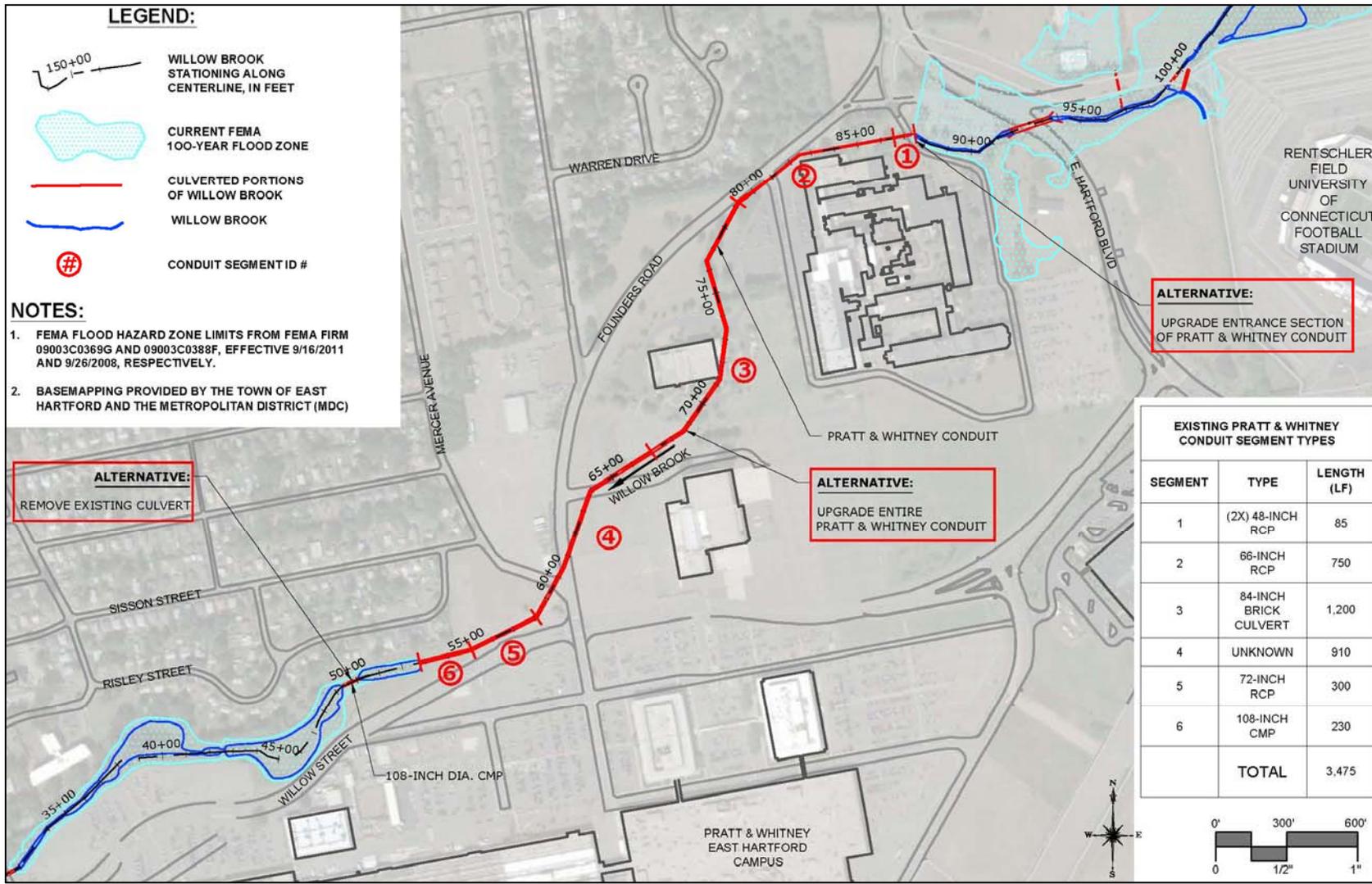
# Localized Mitigation Alternatives

- Area 1 – Willow Street and Founders Road
- Area 2 – Simmons Road and Cumberland Drive Area
- Area 3 – Applegate Lane Area
- Area 4 – Upstream of Applegate Lane
- Area 5 – Downstream of Forbes Street
- Area 6 – Upstream of Forbes Street (DePietro Park)

# Localized Mitigation Alternatives

- Alternatives Include:
  - Area 1 – Willow Street and Founders Road
  - Area 2 – Simmons Road and Cumberland Drive Area
  - Area 3 – Downstream of Applegate Lane
  - Area 4 – Upstream of Applegate Lane
  - Area 5 – Downstream of Forbes Street
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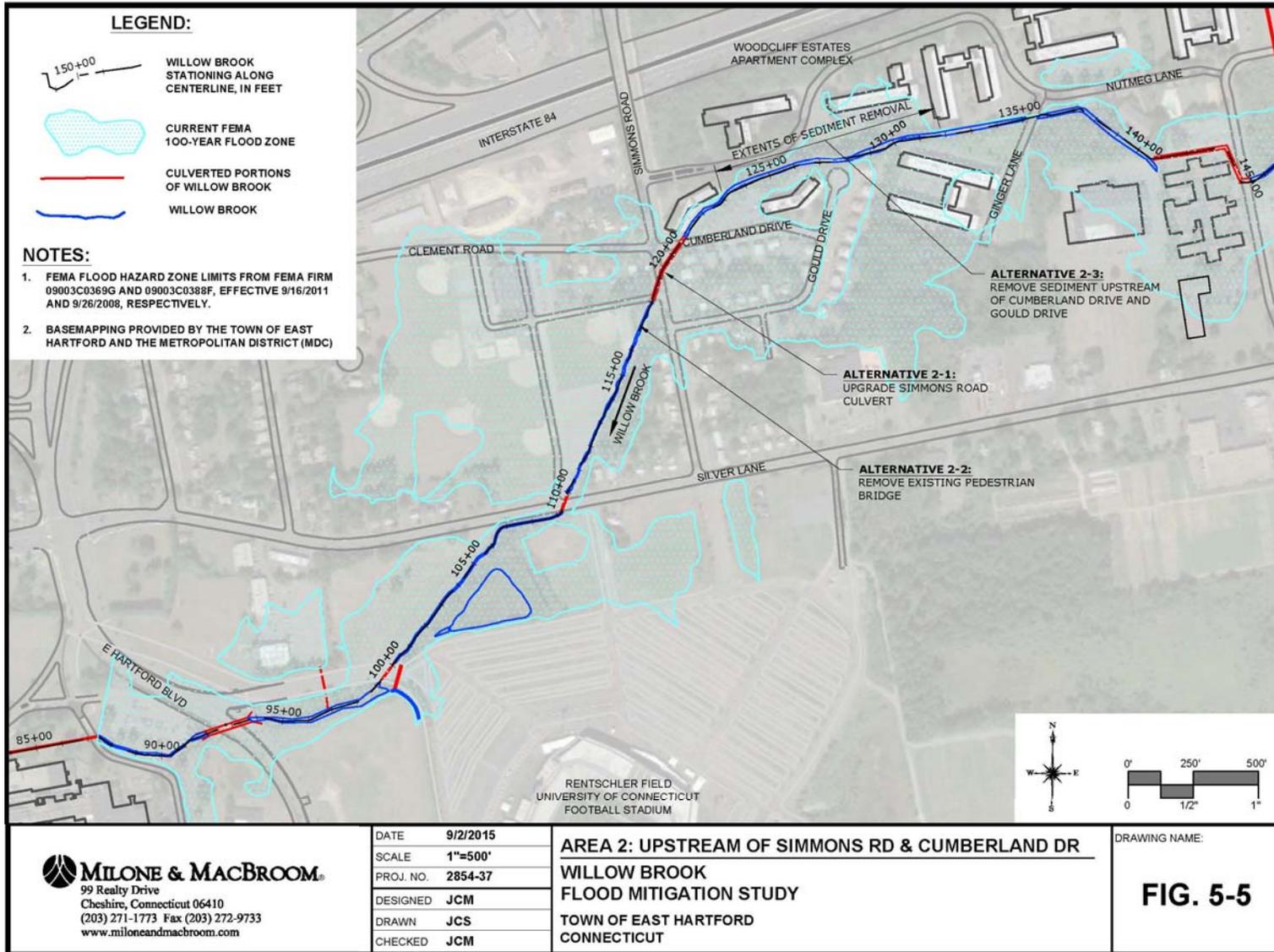
# Willow St and Founders Rd



# Localized Mitigation Alternatives

- Localized Mitigation Alternatives
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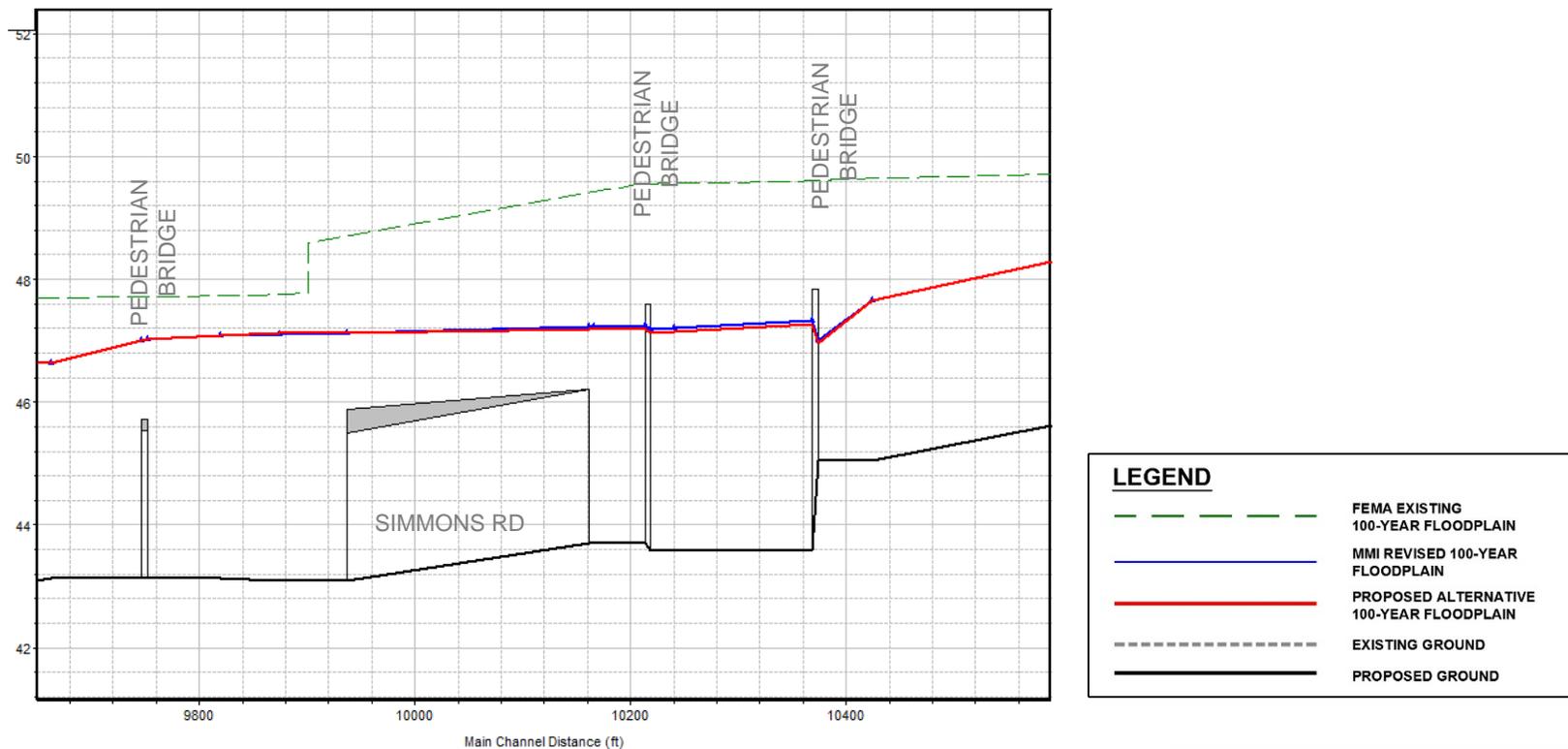
# Simmons Rd and Cumberland Dr



# Simmons Rd and Cumberland Dr

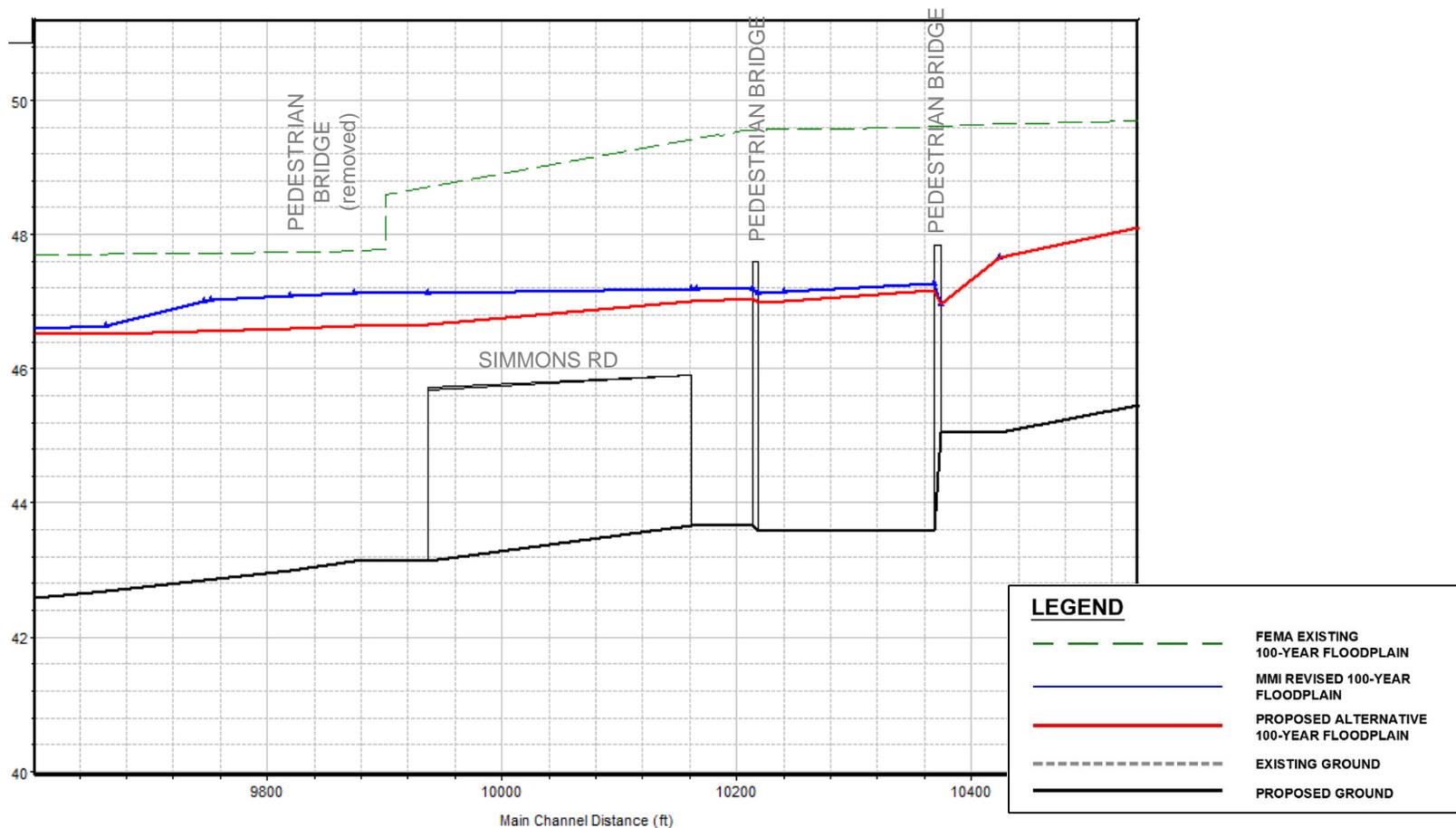
## Alt 2-1: Simmons Road Culvert Replacement PROFILE – Existing vs Proposed Condition, 100-year (1% ACR)

Condition	Width (ft)	Height (ft)	Open Area (sf)
Existing Conditions	10	2	20
Proposed Conditions Trial 1	20	2.5	50
Proposed Conditions Trial 2	30	2.5	75



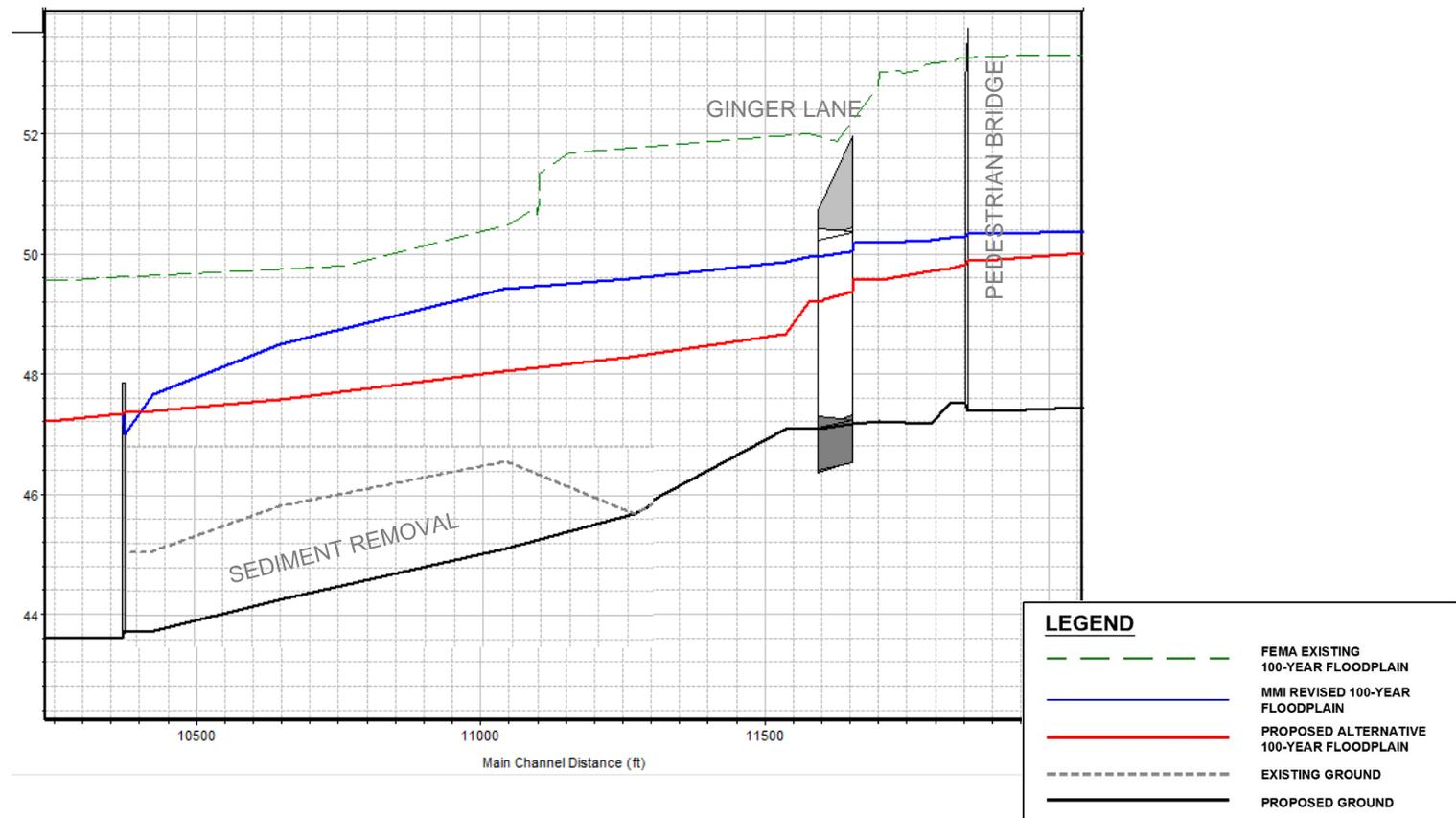
# Simmons Rd and Cumberland Dr

## Alt 2-2: Pedestrian Bridge Removal, and Channel Regrading PROFILE – Existing vs Proposed Condition, 100-year (1% ACR)



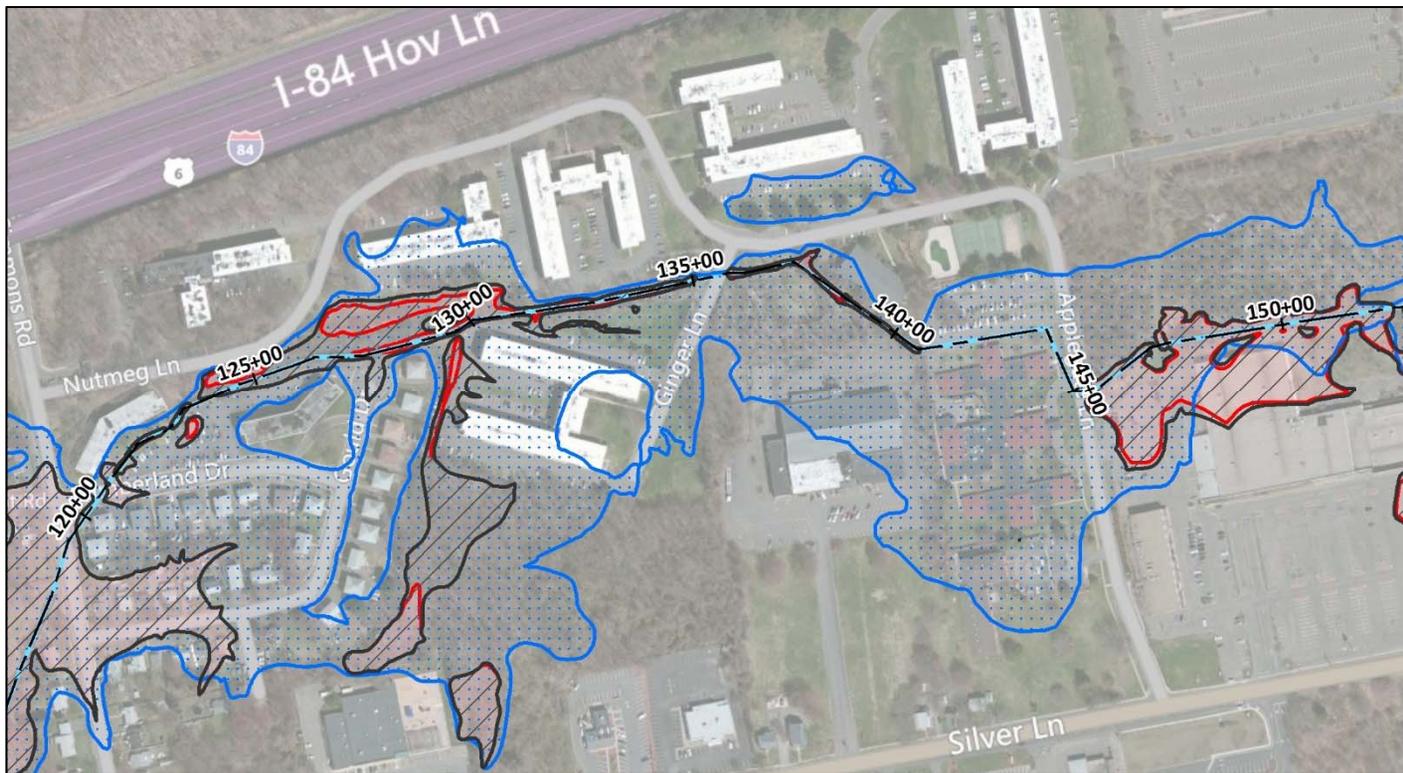
# Simmons Rd and Cumberland Dr

## Alt 2-3: Remove Sediment Upstream of Cumberland Drive PROFILE – Existing vs Proposed Condition, 100-year (1% ACR)



# Simmons Rd and Cumberland Dr

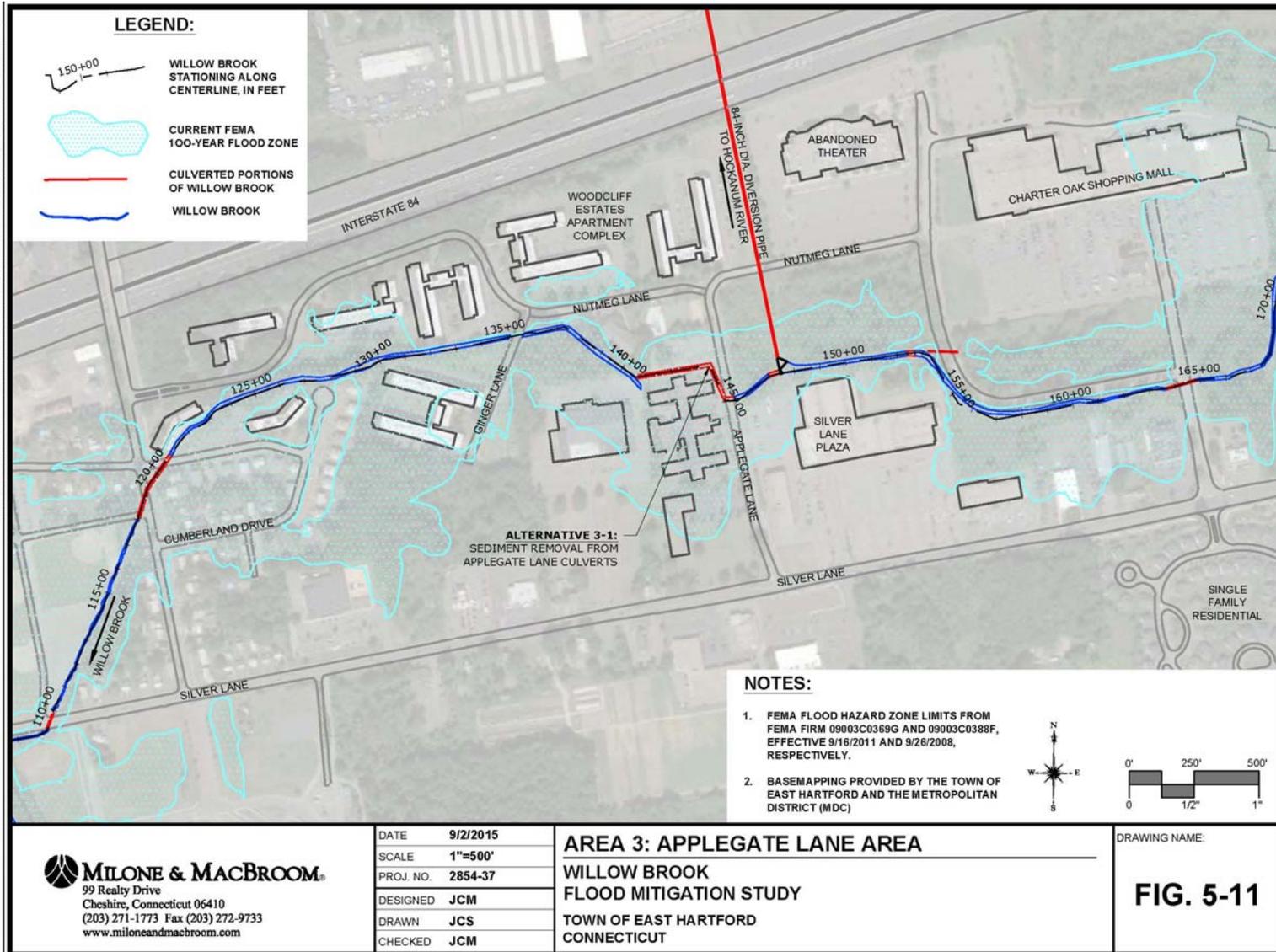
## Alt 2-3: Remove Sediment Upstream of Cumberland Drive Existing vs Proposed Condition, 100-year (1% ACR)



# Localized Mitigation Alternatives

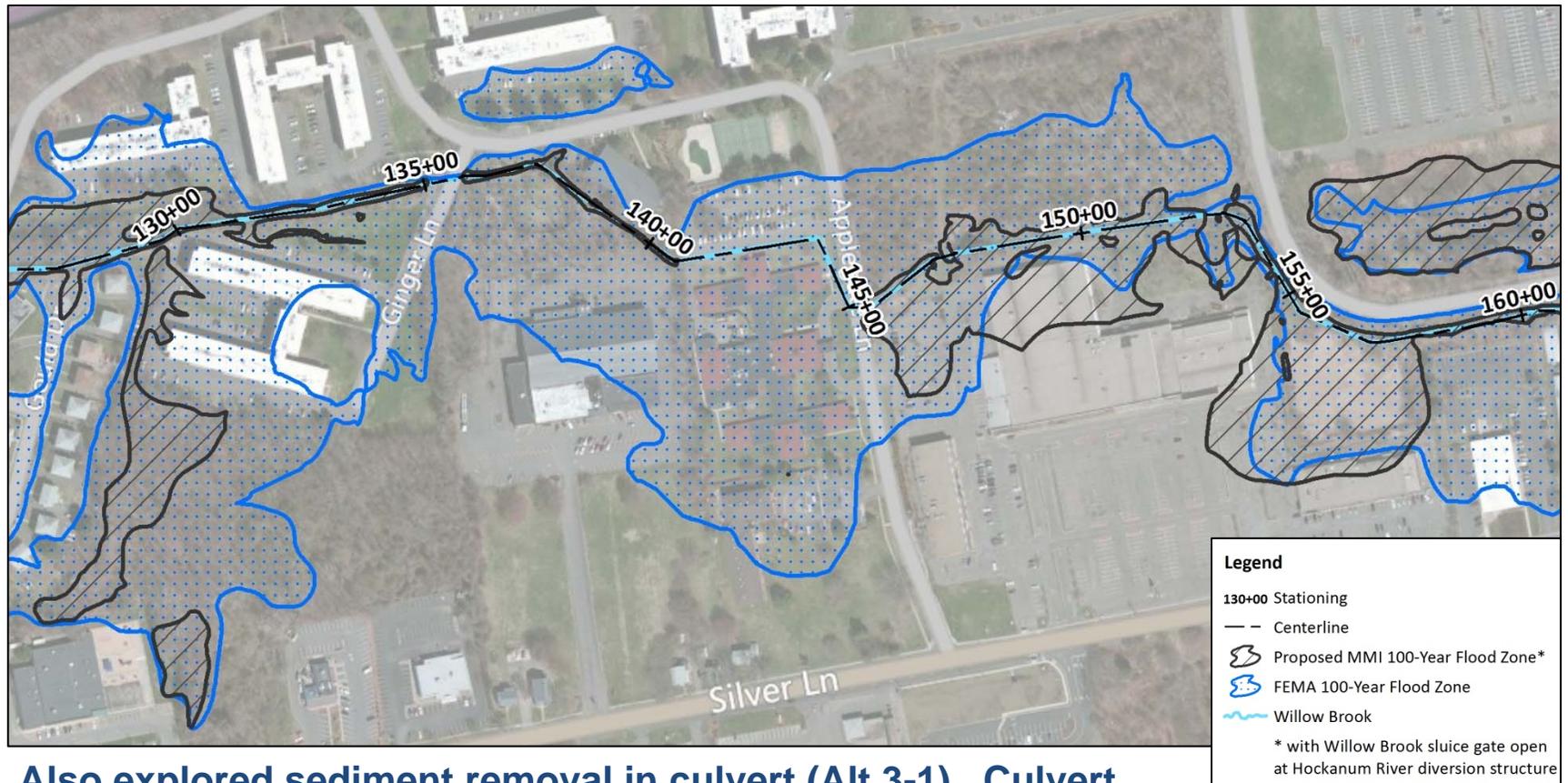
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  - Area 6 – Upstream of Forbes Street (DePietro Park)

# Downstream of Applegate La



# Downstream of Applegate La

Remapped Floodplain, LOMR  
FEMA VS Revised Conditions, 100-Year (1% ACR)

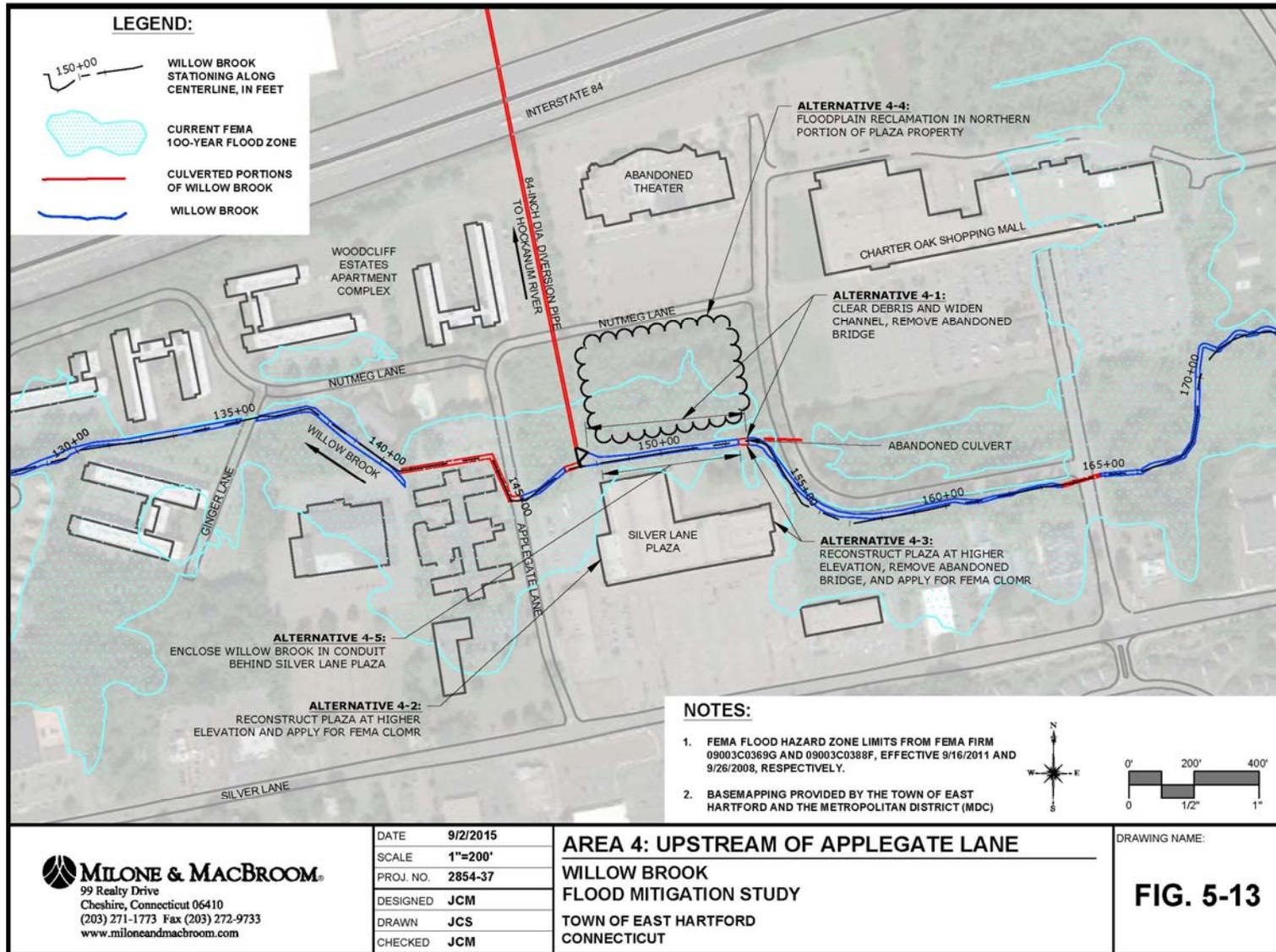


- Also explored sediment removal in culvert (Alt 3-1). Culvert maintenance is recommended in general. Sediment removal in this culvert did not provide significant flooding reduction, but could worsen.

# Localized Mitigation Alternatives

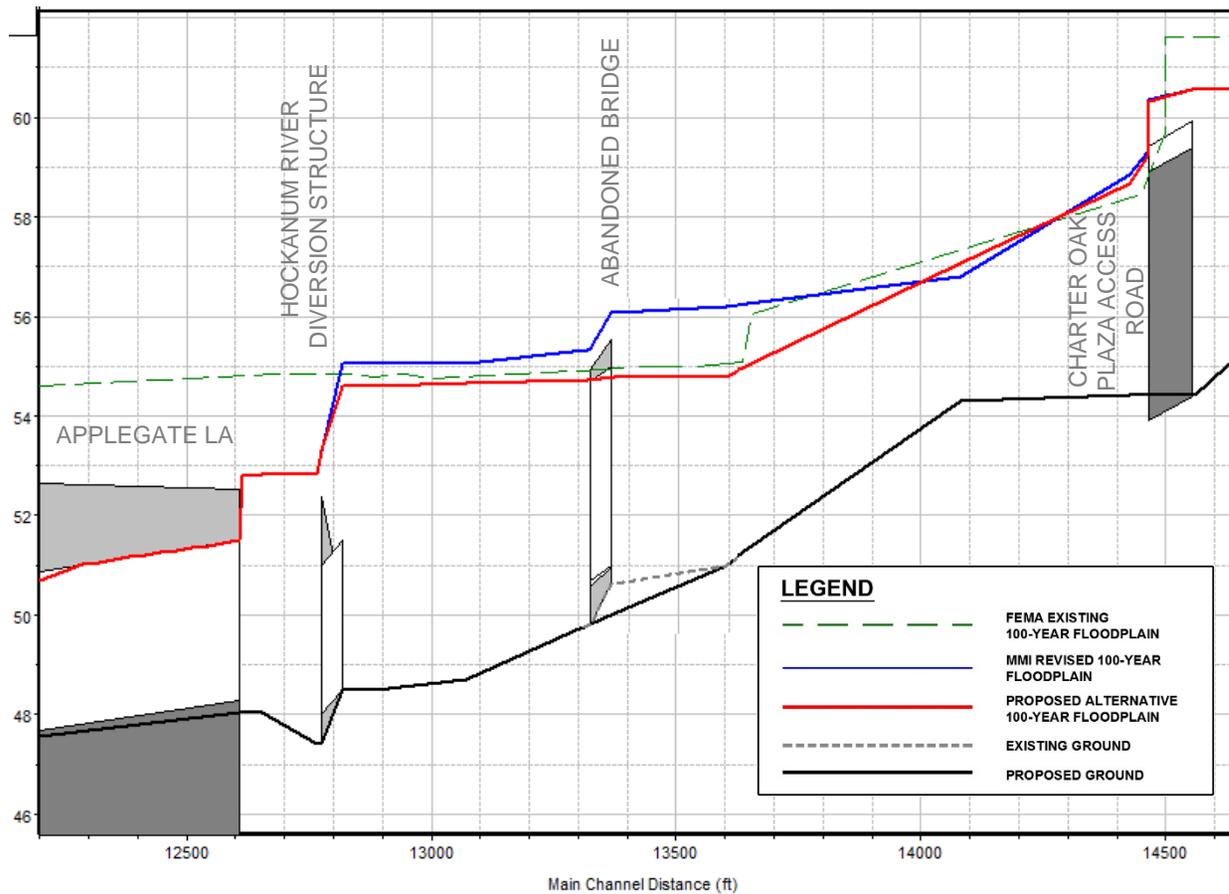
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# Upstream of Applegate La



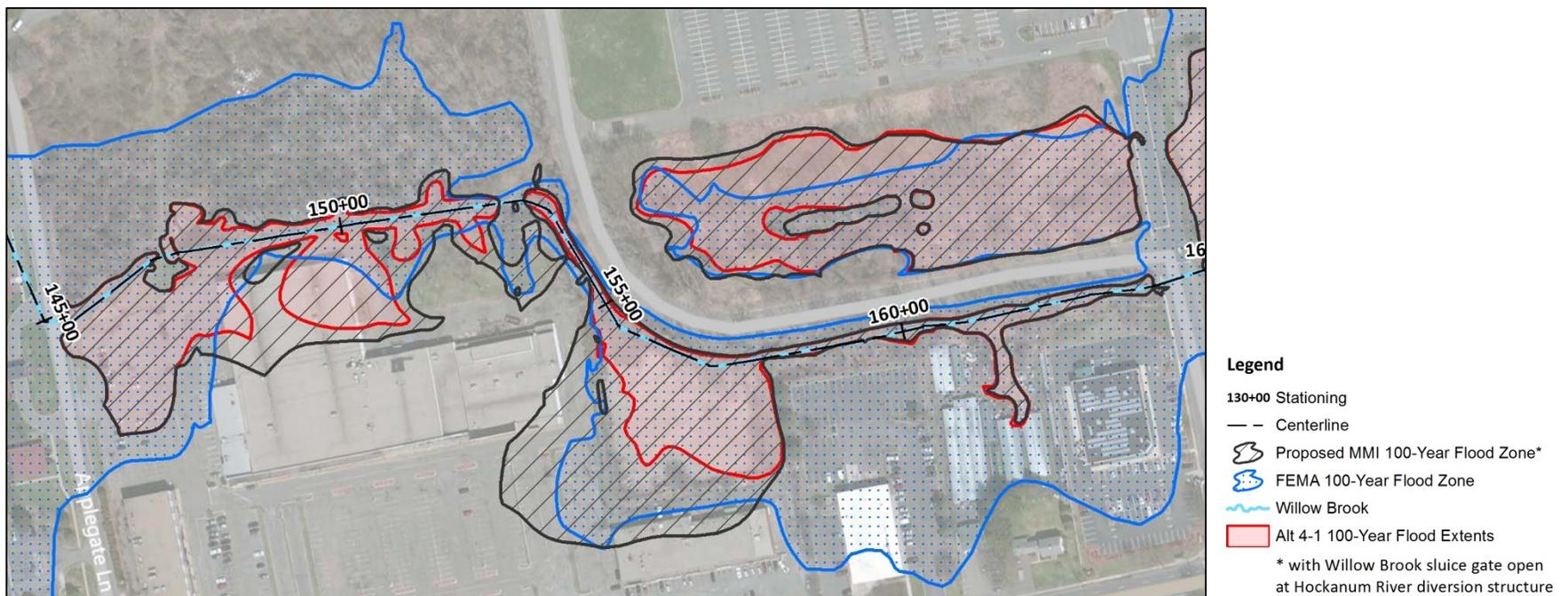
# Upstream of Applegate La

## Alt 4-1: Widened Channel Behind Silver Lane Plaza PROFILE – Existing vs Widened Condition, 100-year (1% ACR) Water Surface



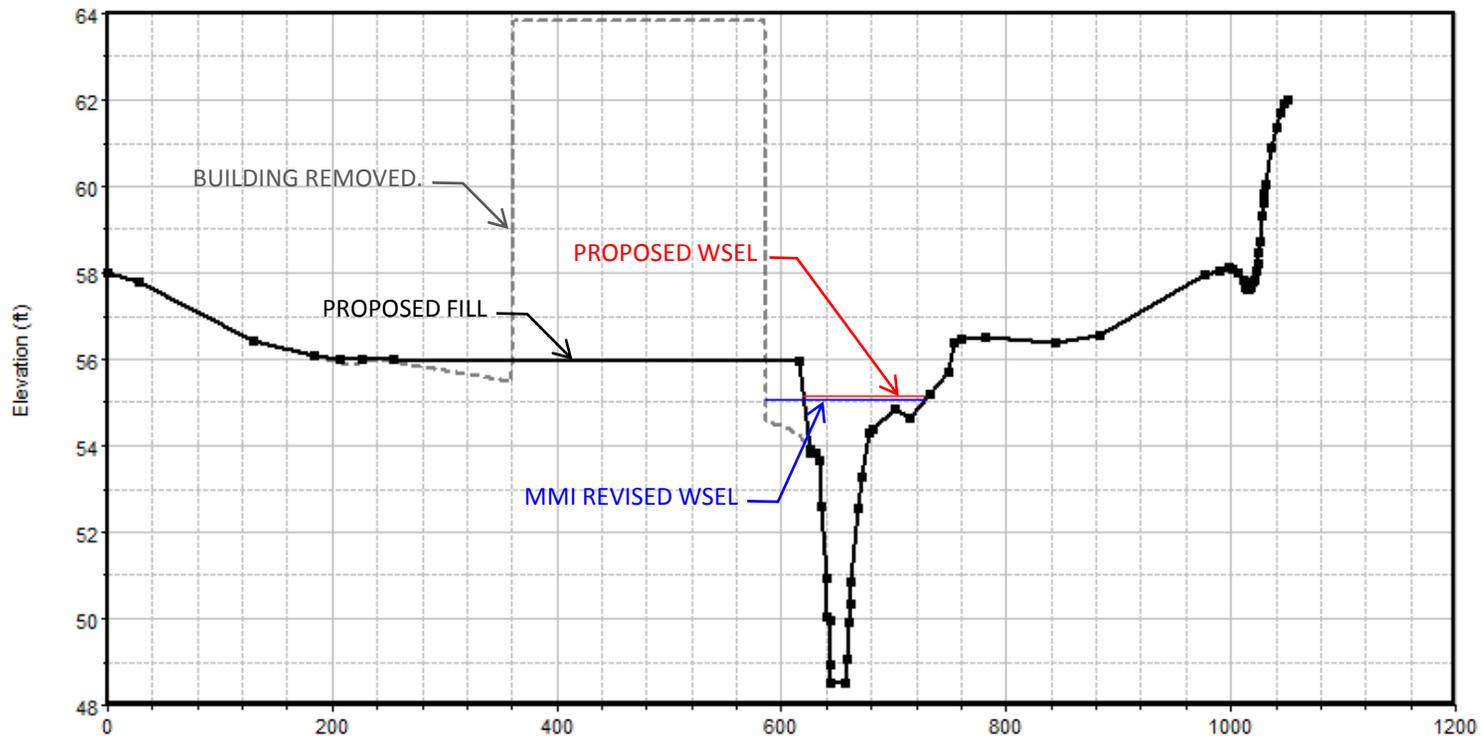
# Upstream of Applegate Ln

## Alt 4-1: Widened Channel Behind Silver Lane Plaza PROFILE – Existing vs Widened Condition, 100-year (1% ACR) Water Surface



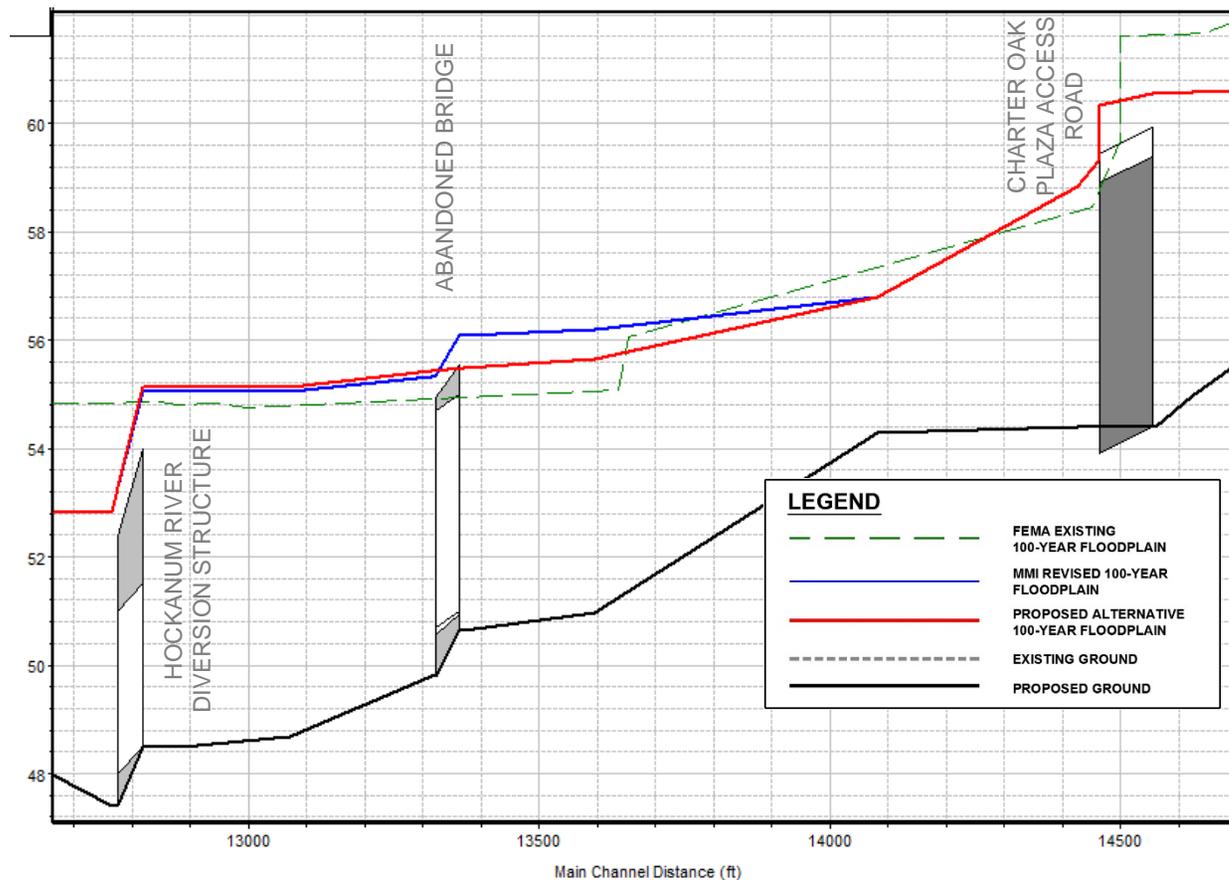
# Upstream of Applegate La

## Alt 4-2: Raise Elevation of Silver Lane Plaza Existing vs Dredged Condition, 100-year (1% ACR) Water Surface



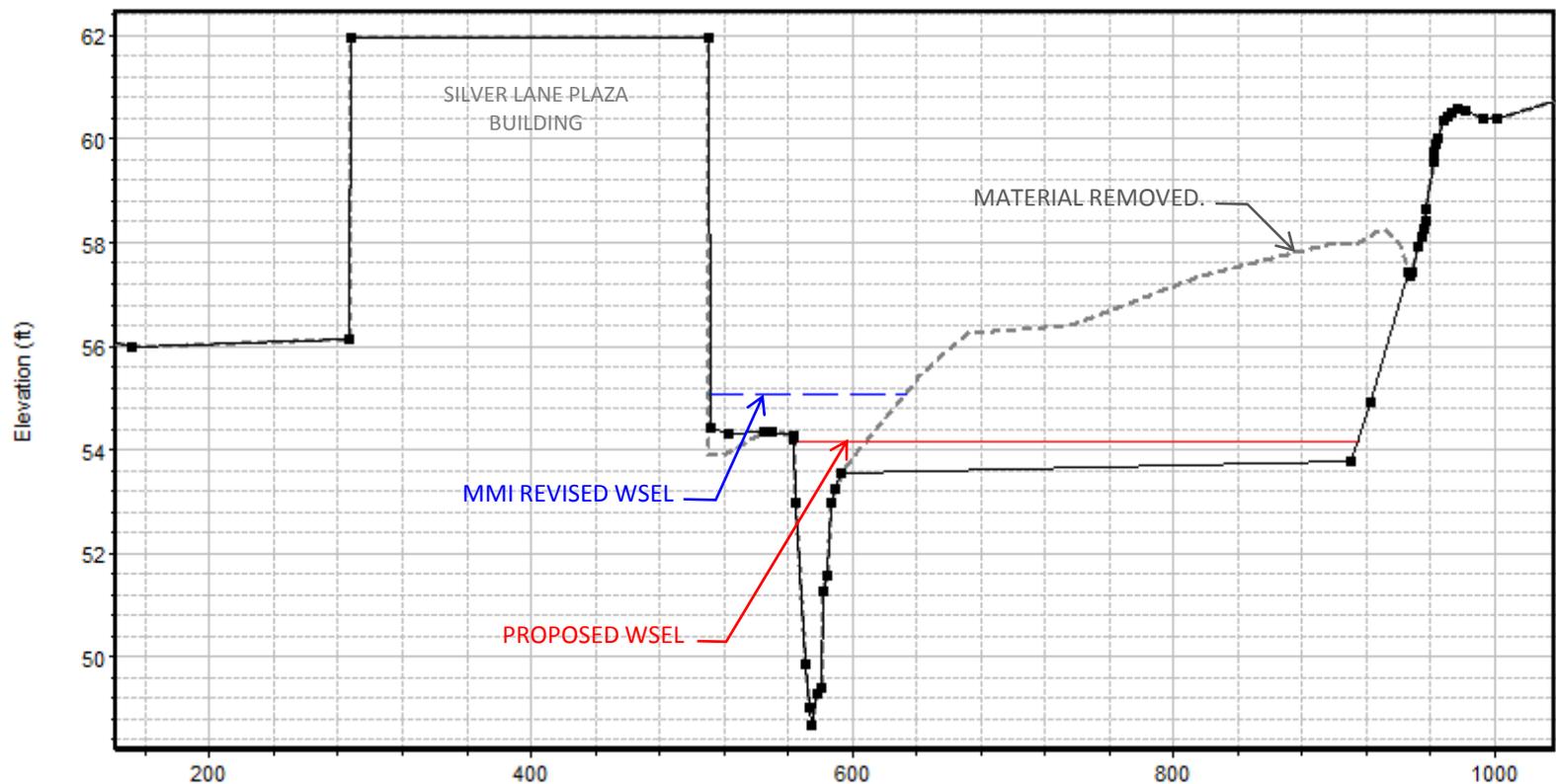
# Upstream of Applegate La

## Alt 4-3: Raise Elevation of Silver Lane Plaza and Remove Abandoned Bridge PROFILE – Existing vs Dredged Condition, 100-year (1% ACR) Water Surface



# Upstream of Applegate La

## Alt 4-4: Floodplain to be Cleared and Lowered Floodplain Reclamation and Lowering of Grade, 100-year (1% ACR) Water Surface

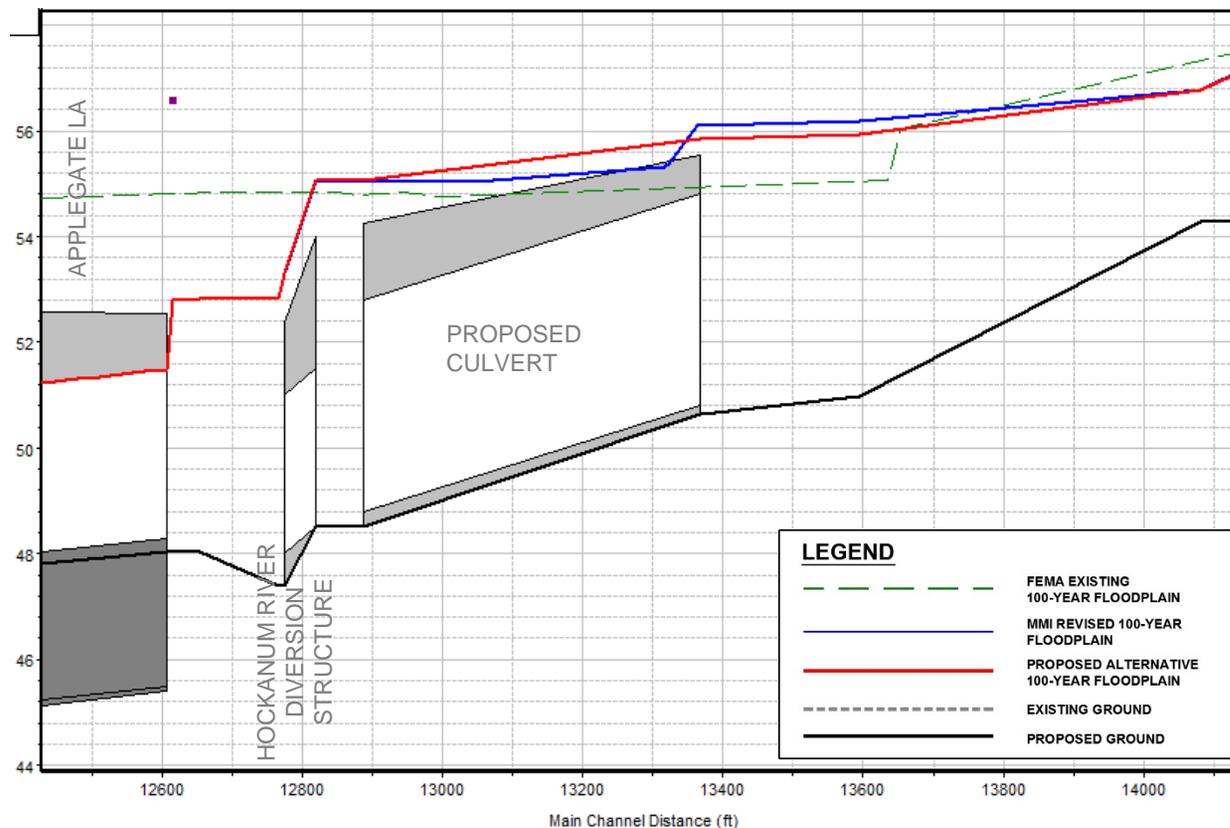


# Upstream of Applegate La

## Alt 4-5: Conduit to Enclose Willow Brook

### PROFILE – Existing vs Proposed Condition, 100-year (1% ACR) Water Surface

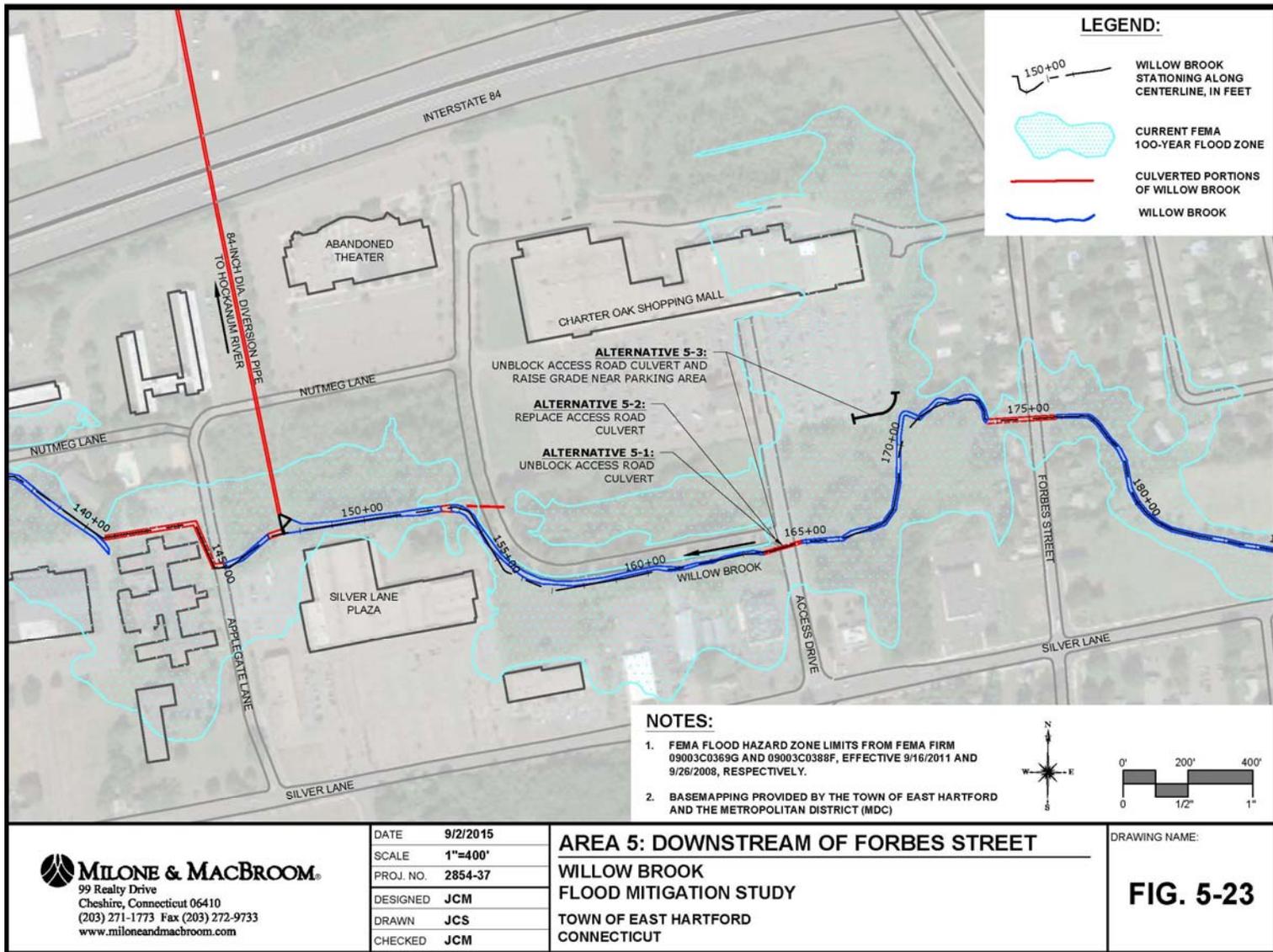
**NOT RECOMMENDED: Culvert overtops due to backwater, and environmental impacts / regulatory challenges**



# Localized Mitigation Alternatives

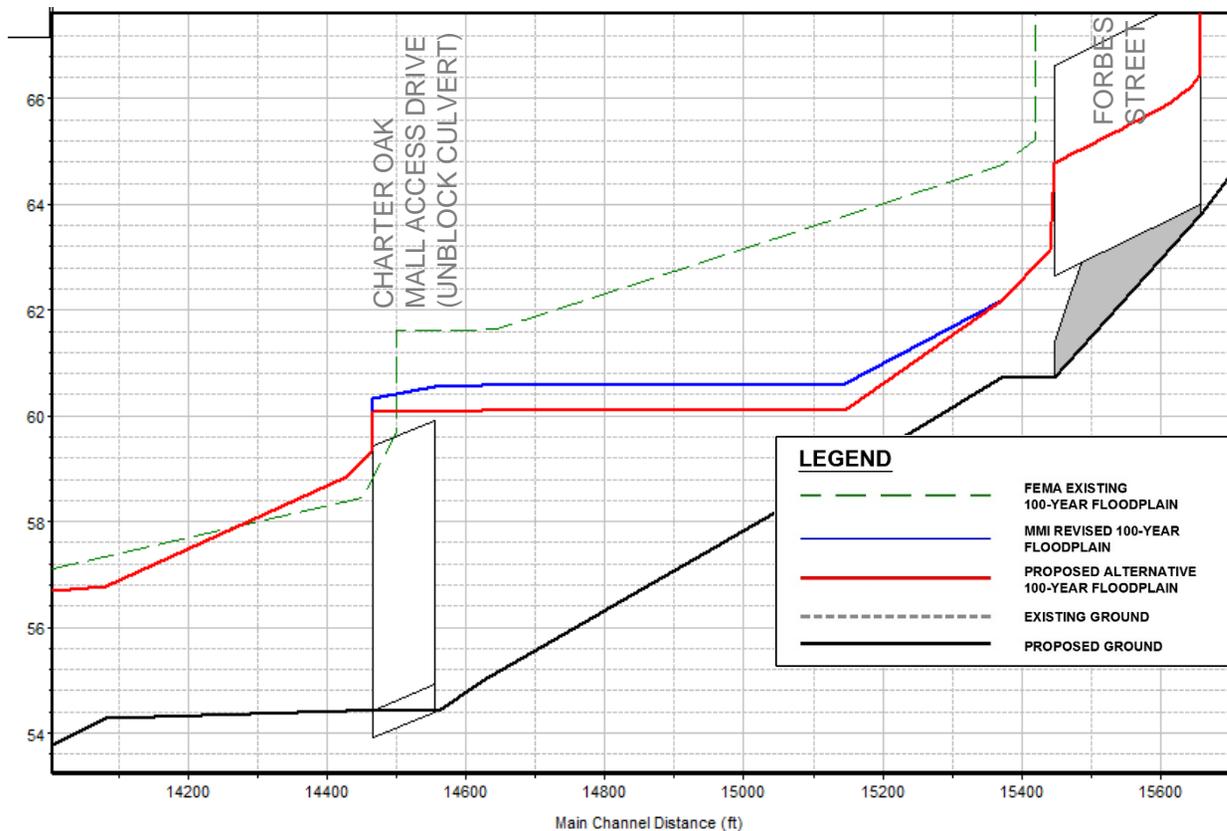
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  - Area 6 – Upstream of Forbes Street (DePietro Park)

# Downstream of Forbes St



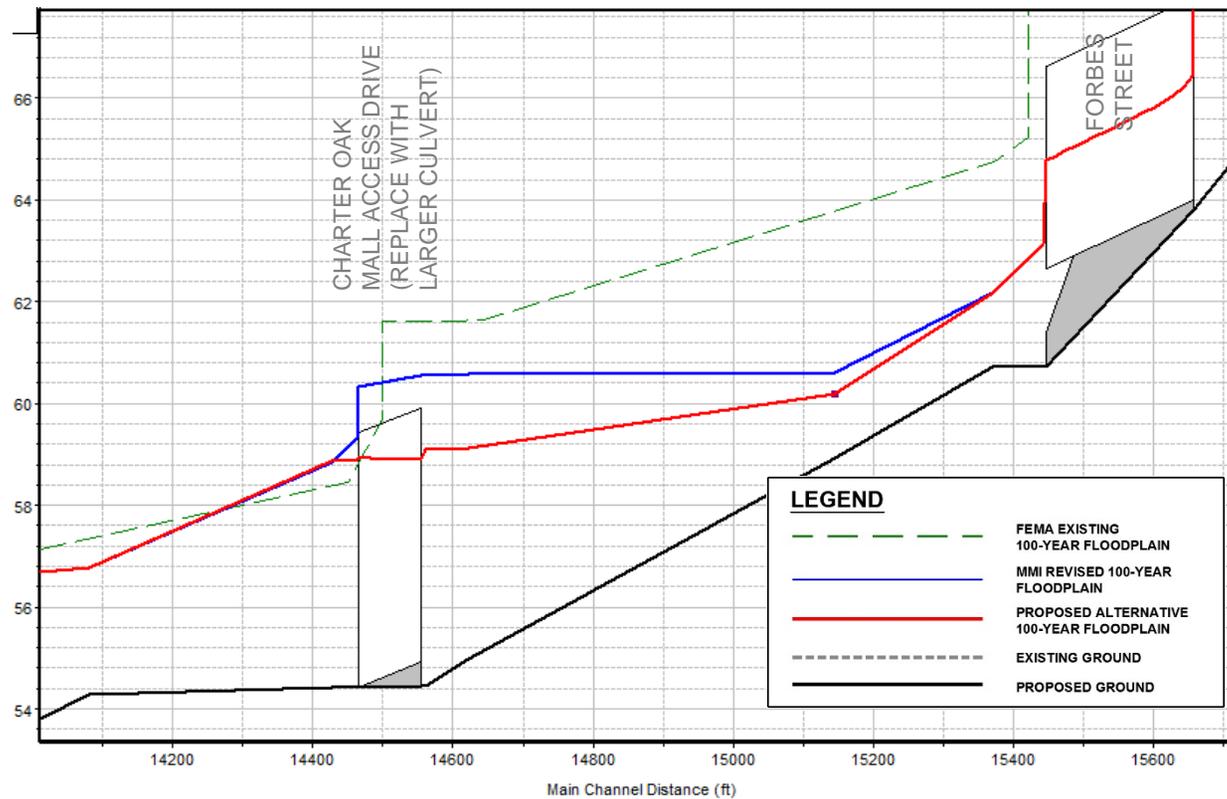
# Downstream of Forbes St

## Alt 5-1: Unblock Culvert Beneath Charter Oak Shopping Center Access Drive PROFILE – Existing vs Proposed Condition, 100-year (1% ACR) Water Surface



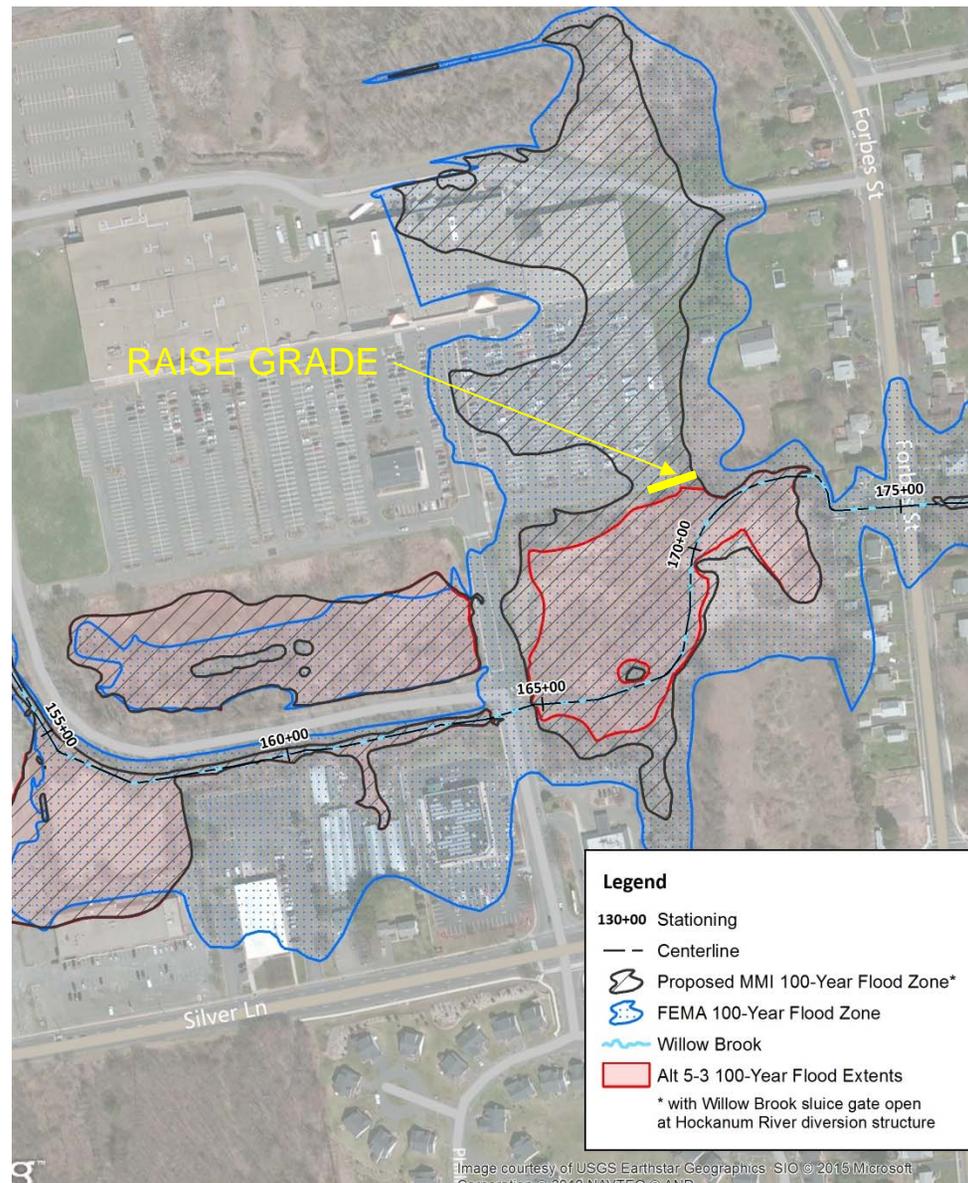
# Downstream of Forbes St

## Alt 5-2: Upgrade Culvert beneath Charter Oak Shopping Center Access Drive PROFILE – Existing vs Proposed Condition, 100-year (1% ACR) Water Surface



# Downstream of Forbes St

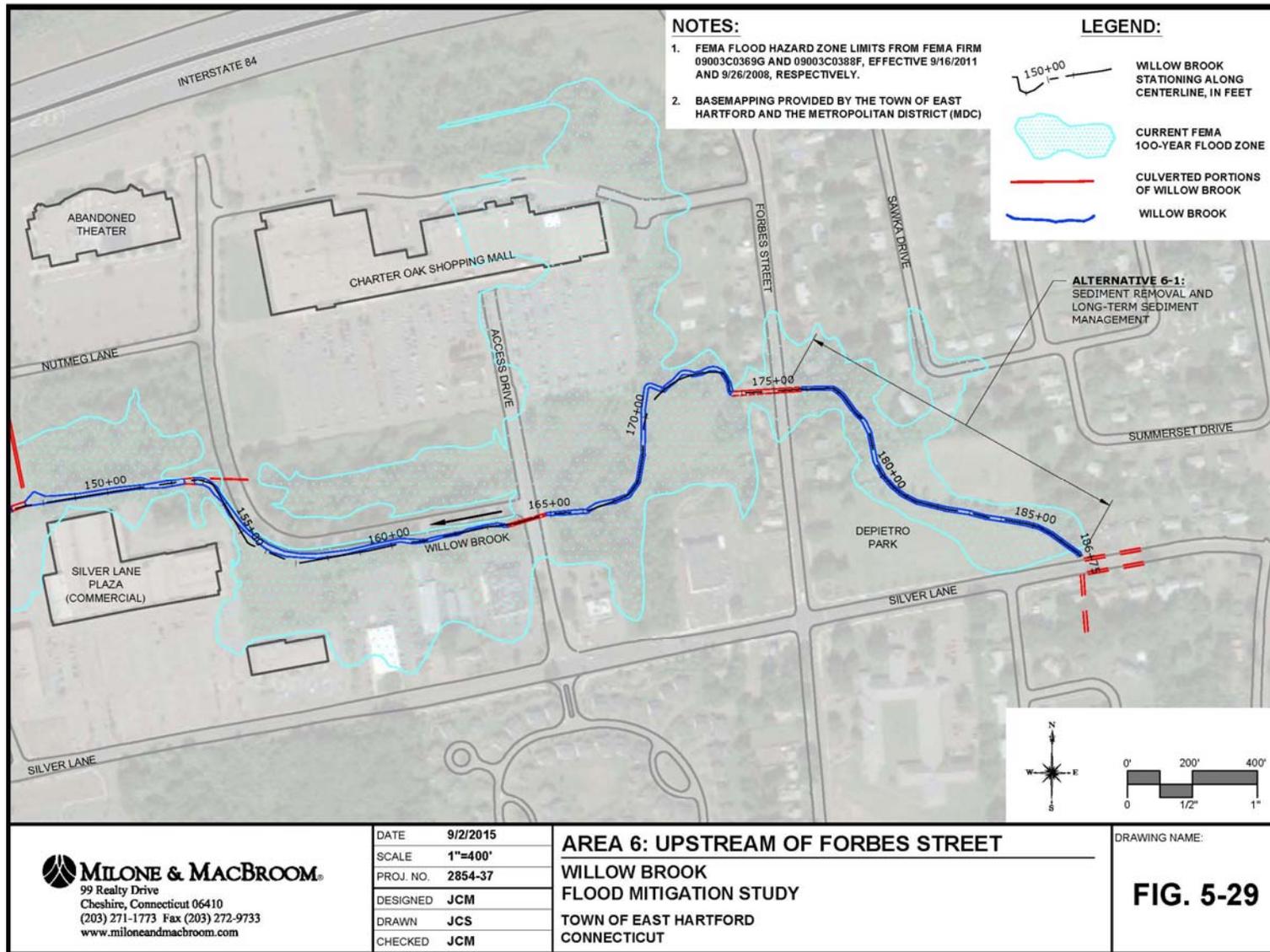
**Alt 5-3: Unblock Culvert Beneath Charter Oak Shopping Center Access Drive and Raise Grade near Parking Area**



# Localized Mitigation Alternatives

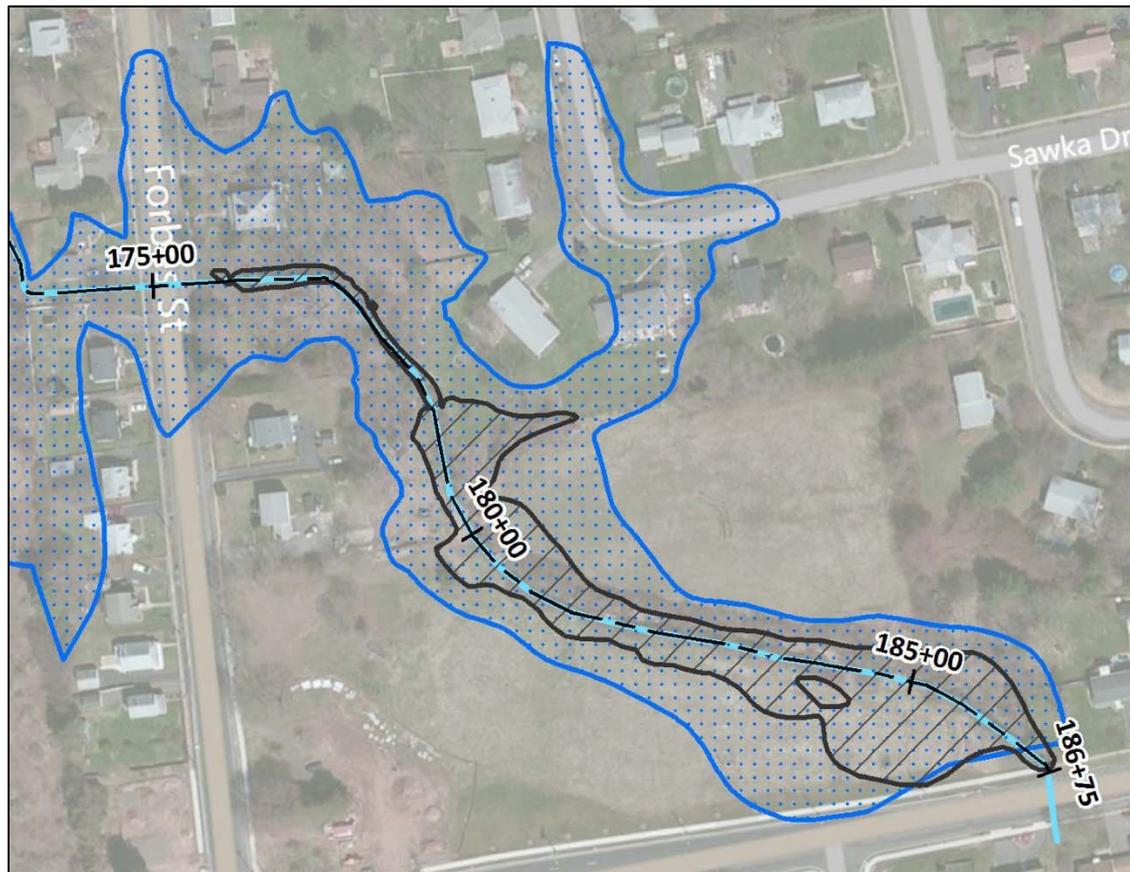
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# Upstream of Forbes St



# Upstream of Forbes St

## Results of LOMR at Area 6 Upstream of Forbes Street



### Legend

- 130+00 Stationing
- Centerline
- Proposed MMI 100-Year Flood Zone\*
- FEMA 100-Year Flood Zone
- Willow Brook

\* with Willow Brook sluice gate open  
at Hockanum River diversion structure

# Summary of Alternatives

Area	No.	Description	Significant Flood Relief?	Recommend Further Consideration?	Property Ownership
Entire Corridor	WS-1	FEMA Map Revision (LOMR)	Yes	Yes	Town
Willow St Area	1-1	Upgrade Entire Pratt & Whitney Conduit	No	No	Private
Willow St Area	1-2	Partial Upgrade of Pratt & Whitney Conduit	No	Maybe: Cost dependent	Private
Simmons Rd Area	2-1	Upgrade Simmons Road Culvert	No	No	Private & Town
Simmons Rd Area	2-2	Remove Pedestrian Bridge and Widen Channel	Yes	Yes	Private & Town
Simmons Rd Area	2-3	Remove Sediment Upstream of Cumberland Drive and Gould Drive	Yes	Maybe: Few properties impacted	Private & Town
Applegate La Area	3-1	Sediment Removal From Applegate Lane Culverts	No	No	Private
U/S of Applegate La	4-1	Deepen and Widen Channel, Remove Abandoned Pedestrian Bridge	No	No	Private
U/S of Applegate La	4-2	Reconstruct Plaza at Higher Elevation & Apply for FEMA LOMR	Yes	Yes	Private
U/S of Applegate La	4-3	Raise Elevation of Plaza & Remove Abandoned Bridge	Yes	Yes	Private
U/S of Applegate La	4-4	Clear Northern Portion of Plaza Property and Lower Grade	Yes	Maybe: Excessively high cost	Private
U/S of Applegate La	4-5	Enclose Willow Brook in Conduit through Length of Property	No	No	Private
D/S of Forbes St	5-1	Unblock Culvert Beneath Access Drive	No	Yes (Inexpensive maintenance)	Private
D/S of Forbes St	5-2	Upgrade Access Road Culvert	Yes	Yes (May have high cost)	Private
U/S Forbes Street	6-1	Sediment Management	N/A	Yes	Private & Town

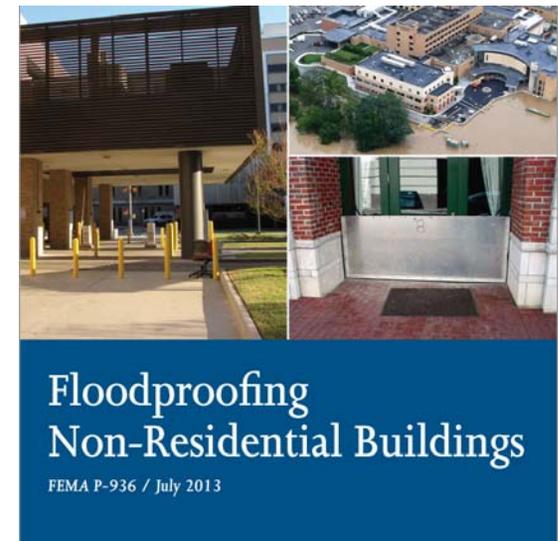
# Localized Mitigation Alternatives

- Updated Floodplain Analysis (FEMA LOMR/PMR)
- Sediment and Debris Management
- Localized Mitigation Alternatives
- **Individual Structure Floodproofing**

# Potential Alternatives – General Strategies

## Potential Improvements at Individual Structures

- Elevate, Relocate, Flood-proof, Levee, Acquisitions
- Do the monetary benefits of retrofitting for flood resiliency outweigh the cost of the construction?
- The FEMA BCA Tool determines the cost effectiveness of proposed mitigation projects submitted for assistance under FEMA's Hazard Mitigation Assistance grant programs.
- May not be viable alternative for all structures, provided for informational purposes only.



Magnitude of Potential Loss (\$)	Probability of Loss		
	Low	Medium	High
Low	Unlikely	Unlikely	Likely
Medium	Unlikely	Likely	Highly Likely
High	Likely	Likely	Highly Likely

Courtesy of FEMA P-936 Manual, <http://www.fema.gov>.

# Next Steps

- Evaluate Potential Funding Sources for Potential Alternatives
- Recommend Town Apply to FEMA for LOMR
- Finalize Study, Issue Report

# Questions, Comments, Thoughts, Input

