

# Horseshoe Falls Dam Fish Passage Project

Public Informational Meeting  
Richmond/Charlestown, RI



Wood-Pawcatuck Watershed Association



September 21, 2010



**FUSS & O'NEILL**  
*Disciplines to Deliver*

# Agenda

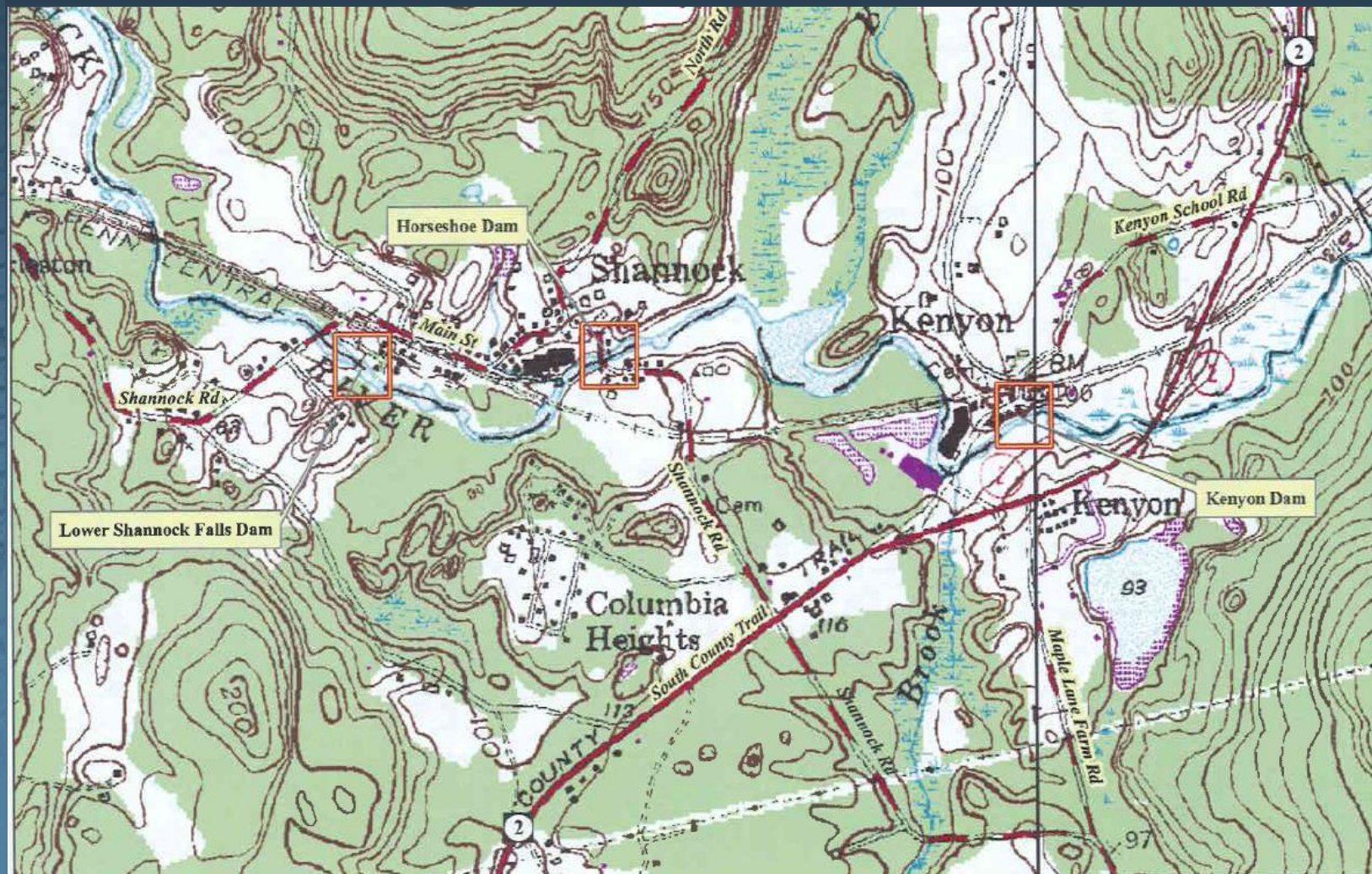
## Horseshoe Falls Dam Fish Passage

- Introduction
- Project Background
- Project Description
  - *Site Description*
  - *Previous Dam Assessments and Current Condition*
  - *Feasibility Study Alternatives Evaluations*
  - *Fish Passage Target Species*
  - *Fish Passage Design Alternatives*
  - *Final Design and Construction Sequence*
- Questions and Discussion



# Site Description

## Horseshoe Falls Dam Fish Passage



USGS Site Location Map

# Site Description

## Horseshoe Falls Dam Fish Passage

### Wood Pawcatuck Watershed Association Fish Passage Projects

- Lower Shannock Falls Dam Removal and Fish Passage – Completed 2010
- Horseshoe Falls Dam Fish Passage – Permitting Completed, Design 70% Complete
- Kenyon Mills Fish Passage – Design 20% Complete, Permitting Underway



# Site Description

## Horseshoe Falls Dam Fish Passage

### Richmond

- 1759 - Saw & Grist Mills (Jeffrey Wilcox)
- 1771 - Bought by Clarke Family, Added a Woolen Mill
- 1848 - Added additional Stone Cotton Mill, Five Mill Houses and Store (Clarke Family)
- 1925 - Horseshoe Dam Spillway Raised, Original Waterwheel Replaced with Hydroelectric Turbine
- 1964 - Mill Closed, 1972 Clark Family Sold Mill Holdings

# Site Description

## Horseshoe Falls Dam Fish Passage

### Charlestown

- 1845 – Linen and Wool Goods Factory (Knowles Family)
- 1848 Bought by Samuel A. Hoxie, Converted to Cotton Mill
- Mill Burned in 1856

# Site Description

## Horseshoe Falls Dam Fish Passage

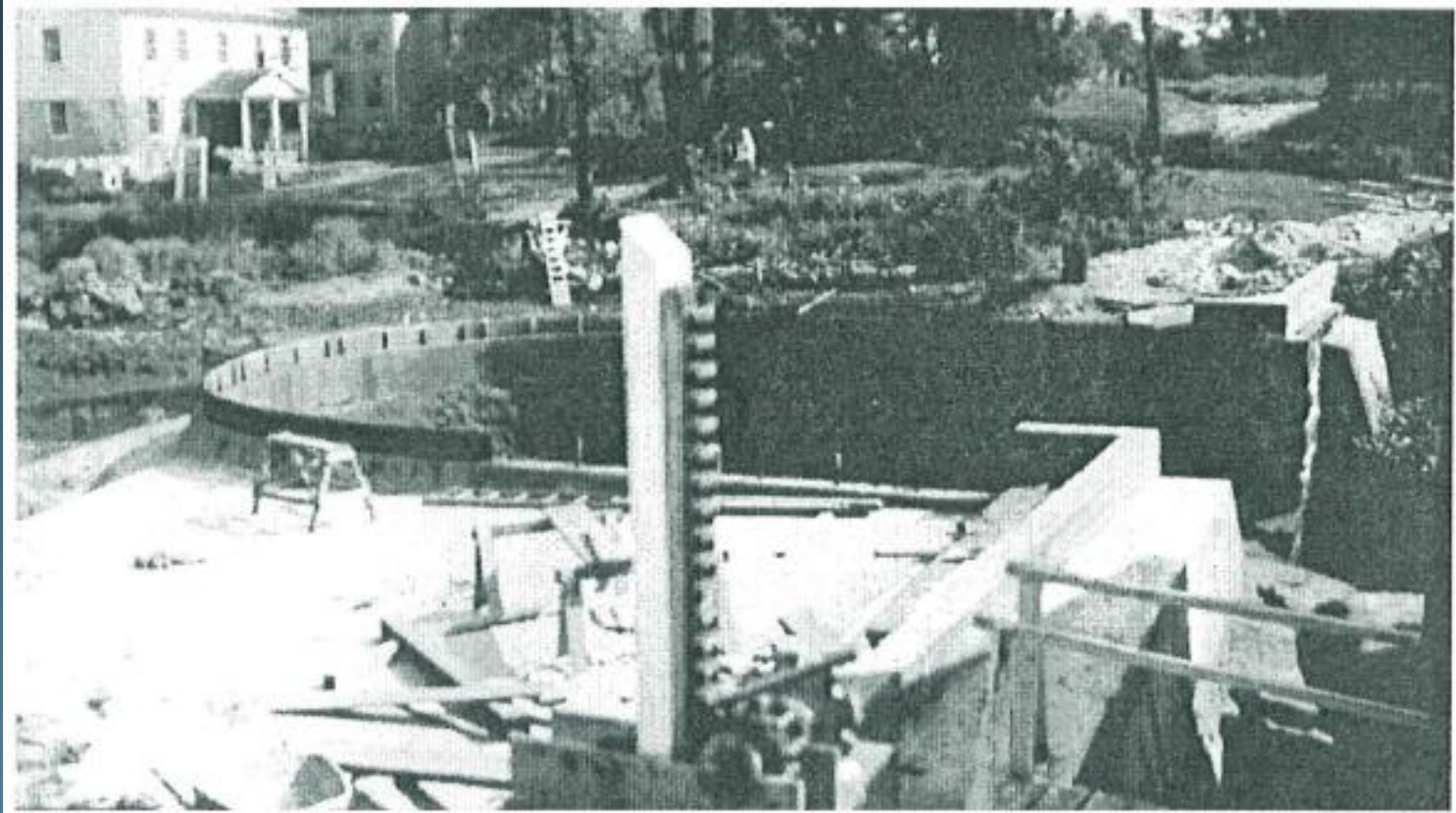


Figure 5-12. Ca. 1942 aerial photograph of Upper Shannock Falls village (source: [www.driftways.com](http://www.driftways.com)).



# Site Description

## Horseshoe Falls Dam Fish Passage



Dam Reconstruction Drawing (1945)



# Site Description

## Horseshoe Falls Dam Fish Passage



Source: Bing Maps; [bing.com](http://bing.com)

## Aerial Site Location Map

# Agenda

## Horseshoe Falls Dam Fish Passage

### Previous Dam Assessments and Current Condition

## Previous Dam Assessments and Current Condition Horseshoe Falls Dam Fish Passage

- 1984 Dam Inspection Report (RIDEM)
  - *Concrete Crest of Spillway in Fair Condition*



## Previous Dam Assessments and Current Condition Horseshoe Falls Dam Fish Passage

- 1993 Raceway Mechanism Failed
  - 1993 - *State Ordered Repairs to Raceway*
  - 1997 - *Plans were submitted and approved, repairs were never made*
  - 1998 & 2000 - *Stop logs placed in headgate*

## Previous Dam Assessments and Current Condition Horseshoe Falls Dam Fish Passage

- Current Dam Inspection



Horseshoe Dam Structural Inspection – February, 2010

## Previous Dam Assessments and Current Condition Horseshoe Falls Dam Fish Passage

- Current Dam Condition
  - *Spillway Remains in FAIR Condition*
    - *Cracks/Leakage in Concrete Apron Behind Spillway*
    - *Voids on Stone Masonry Spillway Face*
  - *Embankment Walls in Fair Condition*
    - *Left Wall to be removed during construction*
  - *Damage/Deficiencies Noted on Raceway Walls*



# Previous Dam Assessments and Current Condition

## Horseshoe Falls Dam Fish Passage

### Current Site Photographs



Horseshoe Dam – June, 2010



# Previous Dam Assessments and Current Condition

## Horseshoe Falls Dam Fish Passage

### Current Site Photographs



Raceway – June, 2010



# Previous Dam Assessments and Current Condition

## Horseshoe Falls Dam Fish Passage

### Current Site Photographs



Left Embankment Wall – February 2010



# Agenda

## Horseshoe Falls Dam Fish Passage

### 2007 Feasibility Study Alternatives Evaluation

# 2007 Feasibility Study Alternatives Evaluation

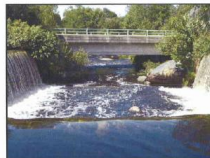
## Horseshoe Falls Dam Fish Passage

### Feasibility Study Alternatives

**TABLE 5-1**  
**Summary of Alternatives Considered**

<i>Upper Shannock Horseshoe Falls Dam</i>	
H-1	No Action
H-2a	High Gradient Riffles at Right Raceway
H-2b	Fish Ladders at Raceway
H-3	Fish Ladder at Left Abutment

SHANNOCK FISH PASSAGE FEASIBILITY STUDY  
PAWCATUCK RIVER  
RICHMOND AND CHARLESTOWN, RHODE ISLAND  
August 10, 2007  
MMI #2989-01



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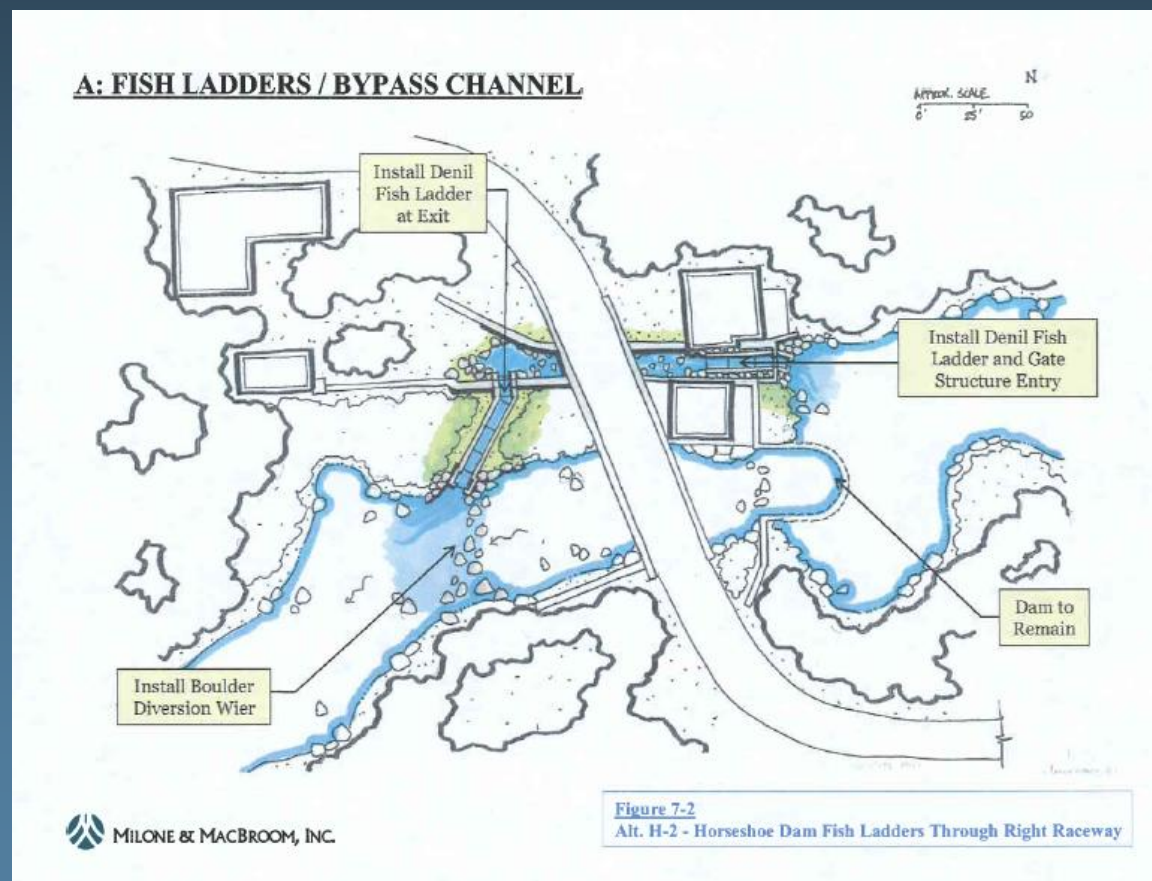
Source: August 2007

Malone and MacBroom Feasibility Study

# 2007 Feasibility Study Alternatives Evaluation

## Lower Shannock Falls Dam Removal and Fish Passage

### Fish Ladder Through Right Raceway



Source: August 2007

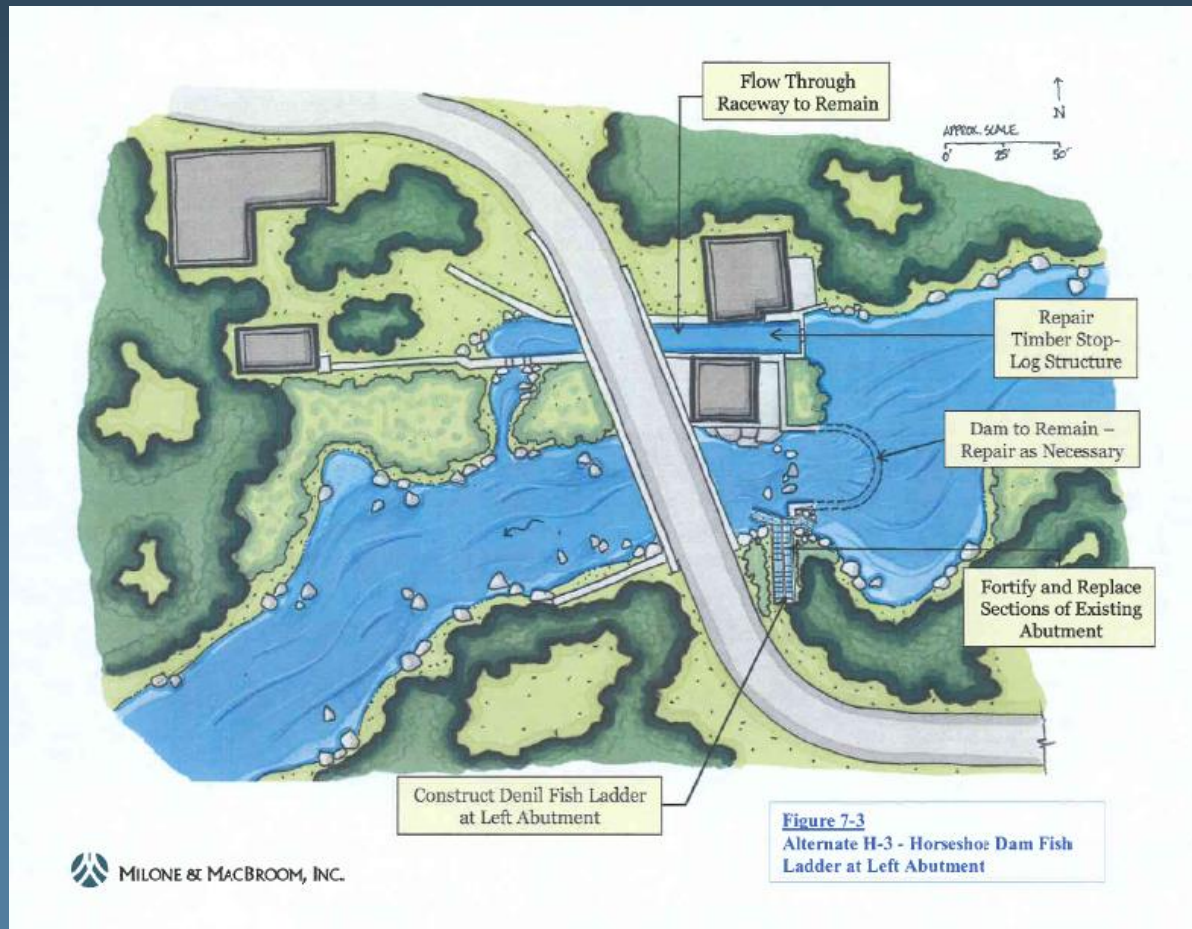
Malone and MacBroom Feasibility Study



# 2007 Feasibility Study Alternatives Evaluation

## Horseshoe Falls Dam Fish Passage

### Fish Ladder At Left Abutment



Source: August 2007

Malone and MacBroom Feasibility Study

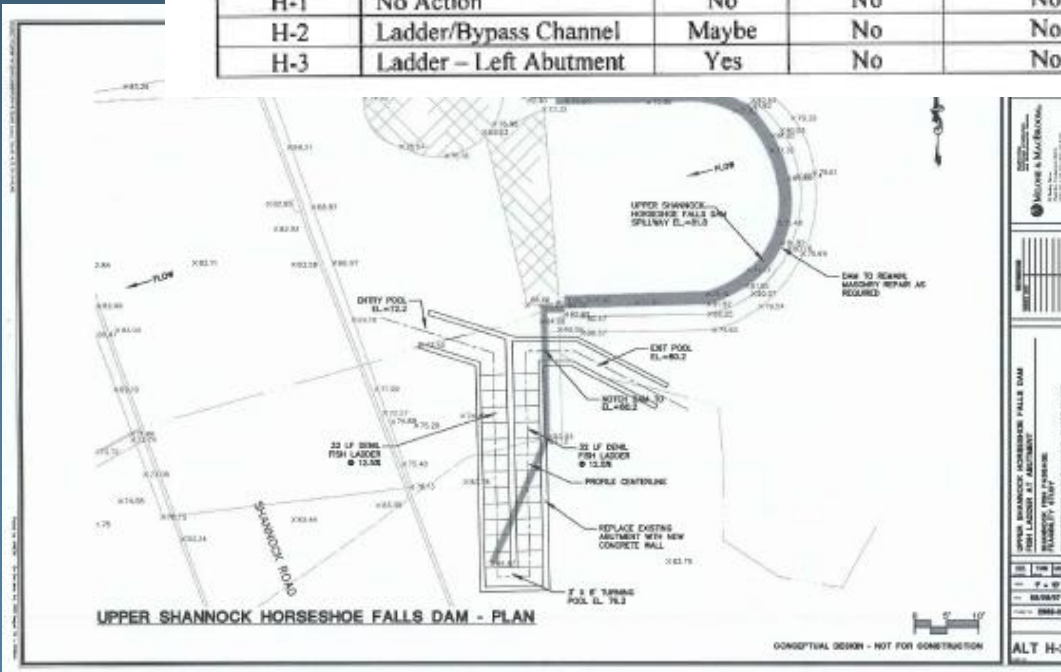
# 2007 Feasibility Study Alternatives Evaluation

## Horseshoe Falls Dam Fish Passage

### Alternatives Evaluation Summary Table

**TABLE 7-2**  
**Summary of Alternatives at Upper Shannock Horseshoe Falls Dam**

<i>Alternative</i>	<i>Description</i>	<i>Achieves Fish Passage?</i>	<i>Improves Habitat Conditions?</i>	<i>Minimizes Long Term Dam Maintenance?</i>	<i>Potential for Impact to Historic Resources?</i>	<i>Prudent and Feasible Alternative?</i>
H-1	No Action	No	No	No	No	No
H-2	Ladder/Bypass Channel	Maybe	No	No	Yes	No
H-3	Ladder – Left Abutment	Yes	No	No	Yes	Yes



Source: August 2007

Malone and MacBroom Feasibility Study



# 2007 Feasibility Study Alternatives Evaluation

## Horseshoe Falls Dam Fish Passage

### Denil Fish Ladder





# Agenda

## Horseshoe Falls Dam Fish Passage

### Fish Passage Target Species

# Fish Passage Target Species

## Horseshoe Falls Dam Fish Passage

- Historic Passage
  - *Atlantic Salmon (possible)*
  - *Salter Brook Trout*
  - *American Shad*
- Alewife
- Blueback Herring
- Rainbow Smelt
- Brown Trout
- Brook Trout
- American Eel

# Agenda

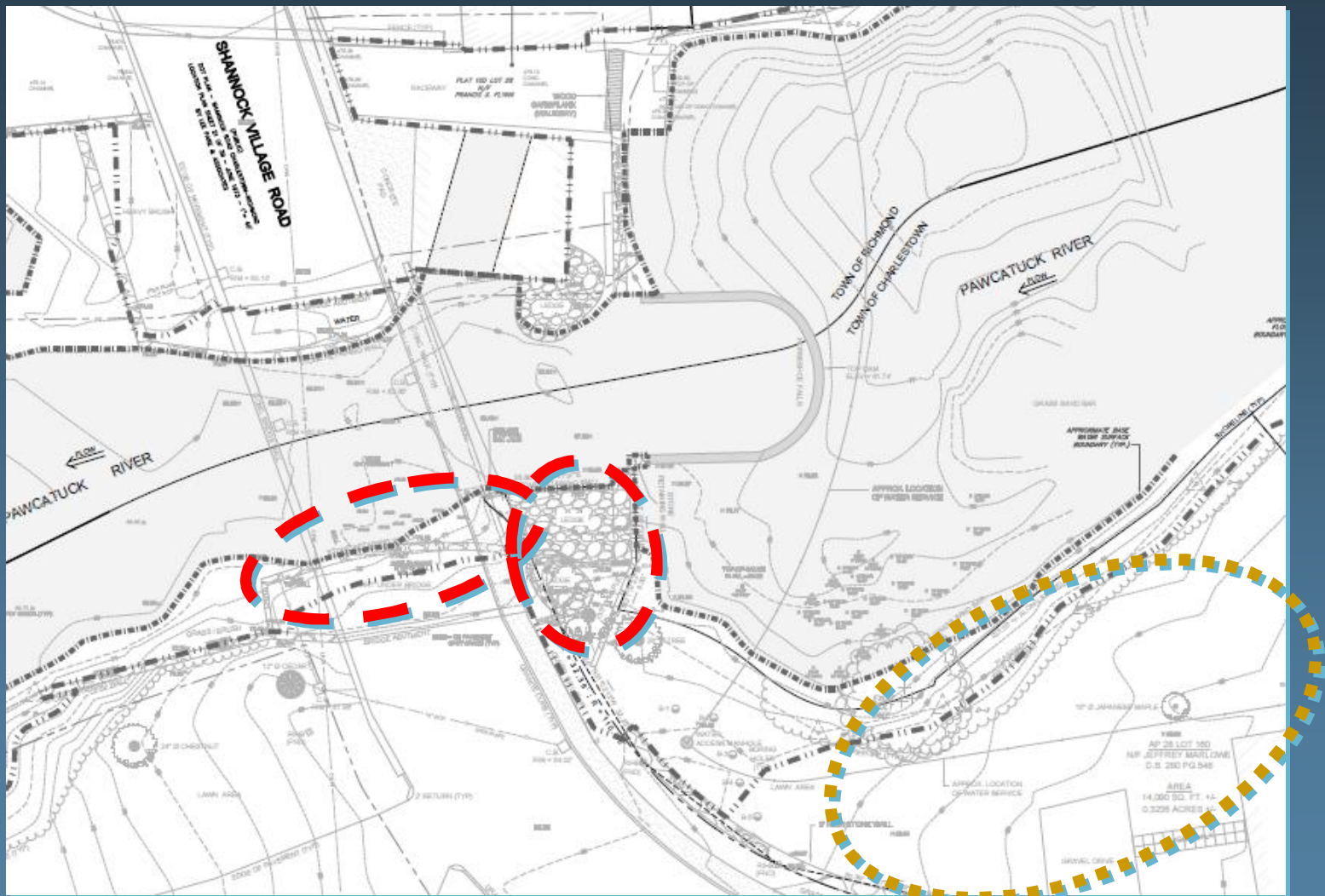
## Horseshoe Falls Dam Fish Passage

### Fish Passage Alternatives



# Fish Passage Alternatives

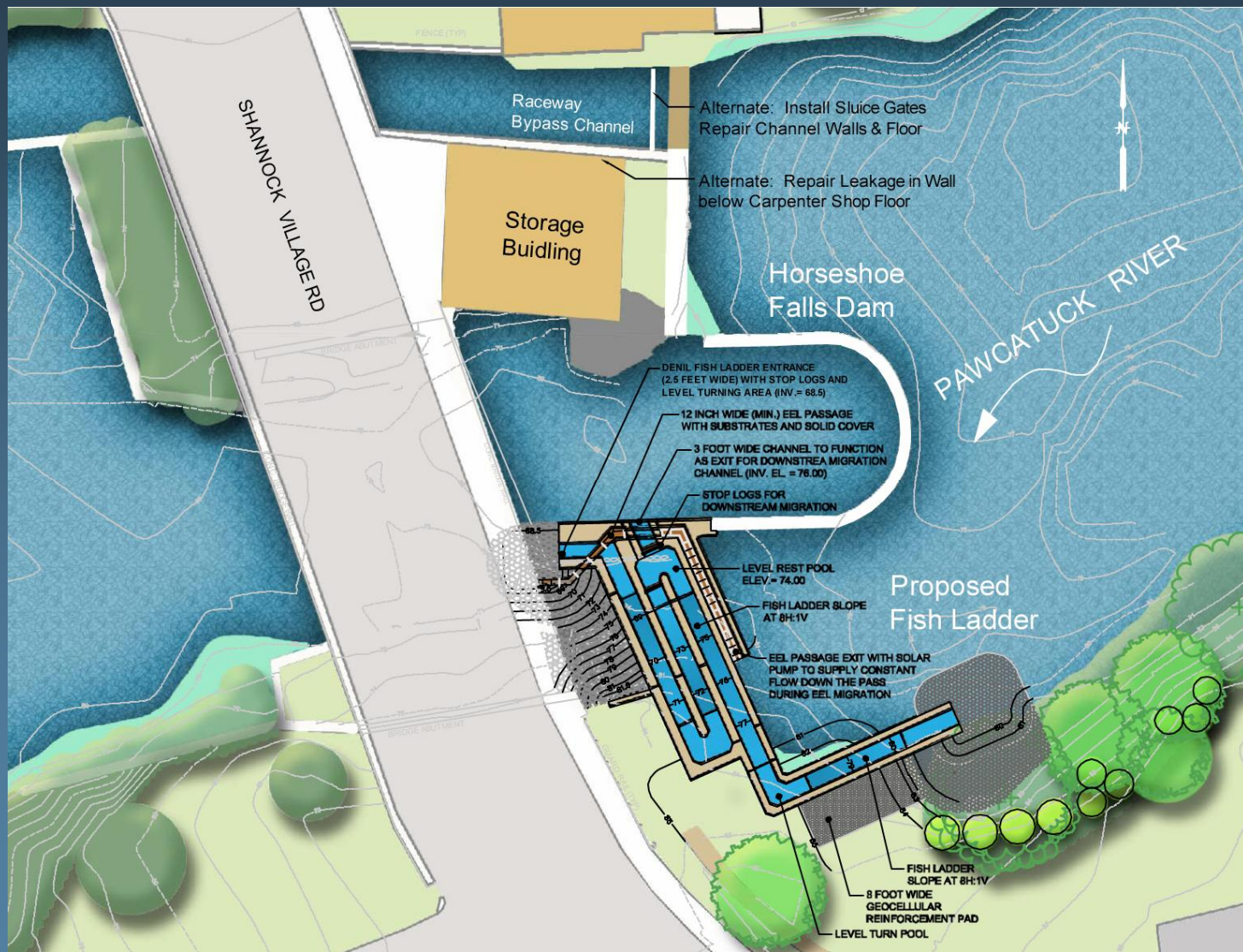
## Horseshoe Falls Dam Fish Passage



Final Design Considerations

# Fish Passage Alternatives

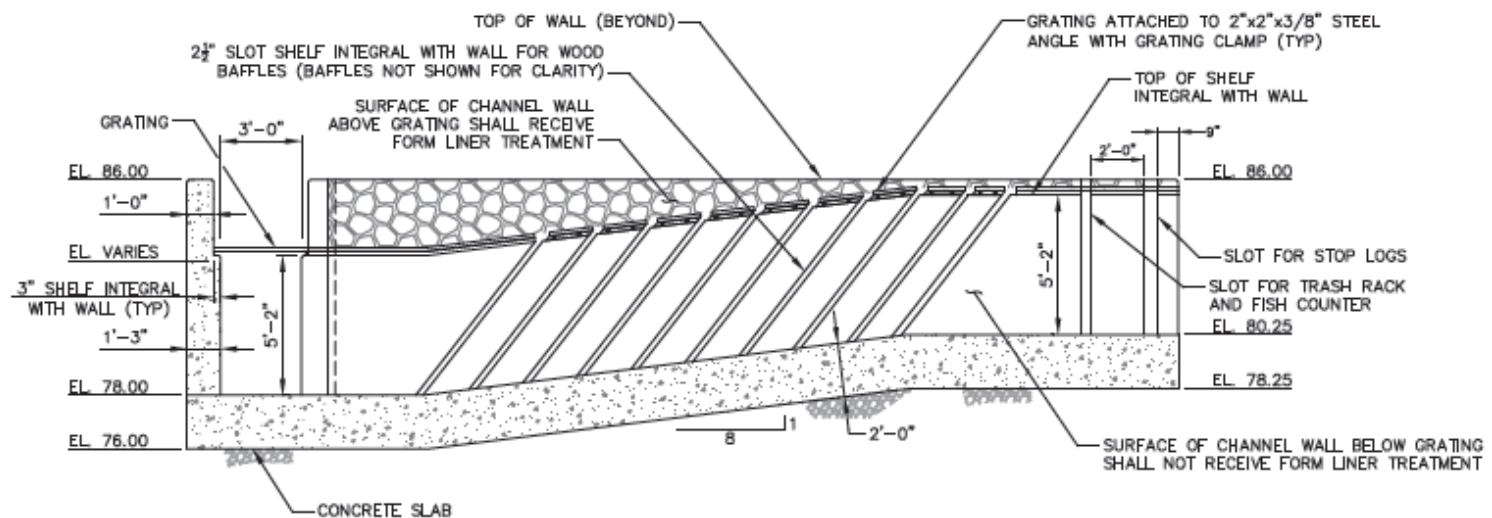
## Horseshoe Falls Dam and Fish Passage





# Final Design and Construction Sequence

## Horseshoe Falls Dam Fish Passage



(D) SECTION THRU FISH LADDER  
SCALE: 1/4" = 1'-0"

Fish Ladder

Final Design Alternative – Fish Ladder at Left Abutment



# Agenda

## Horseshoe Falls Dam Fish Passage

### Final Design and Construction Sequence

# Final Design and Construction Sequence

## Horseshoe Falls Dam Fish Passage

### Proposed Temporary Site Modifications

- *Construction Entrances*
- *Perimeter Erosion and Sedimentation Controls*
- *Temporary Cofferdam Next to Existing Dam*
- *Open Raceway*
- *In-Channel Access and Work Areas*
  - *Heavy Equipment in River*
- *Expected 120 Day Construction Period*
  - *Potential Lane Closures, Sidewalk Remains Open*

# Final Design and Construction Sequence

## Horseshoe Falls Dam Fish Passage

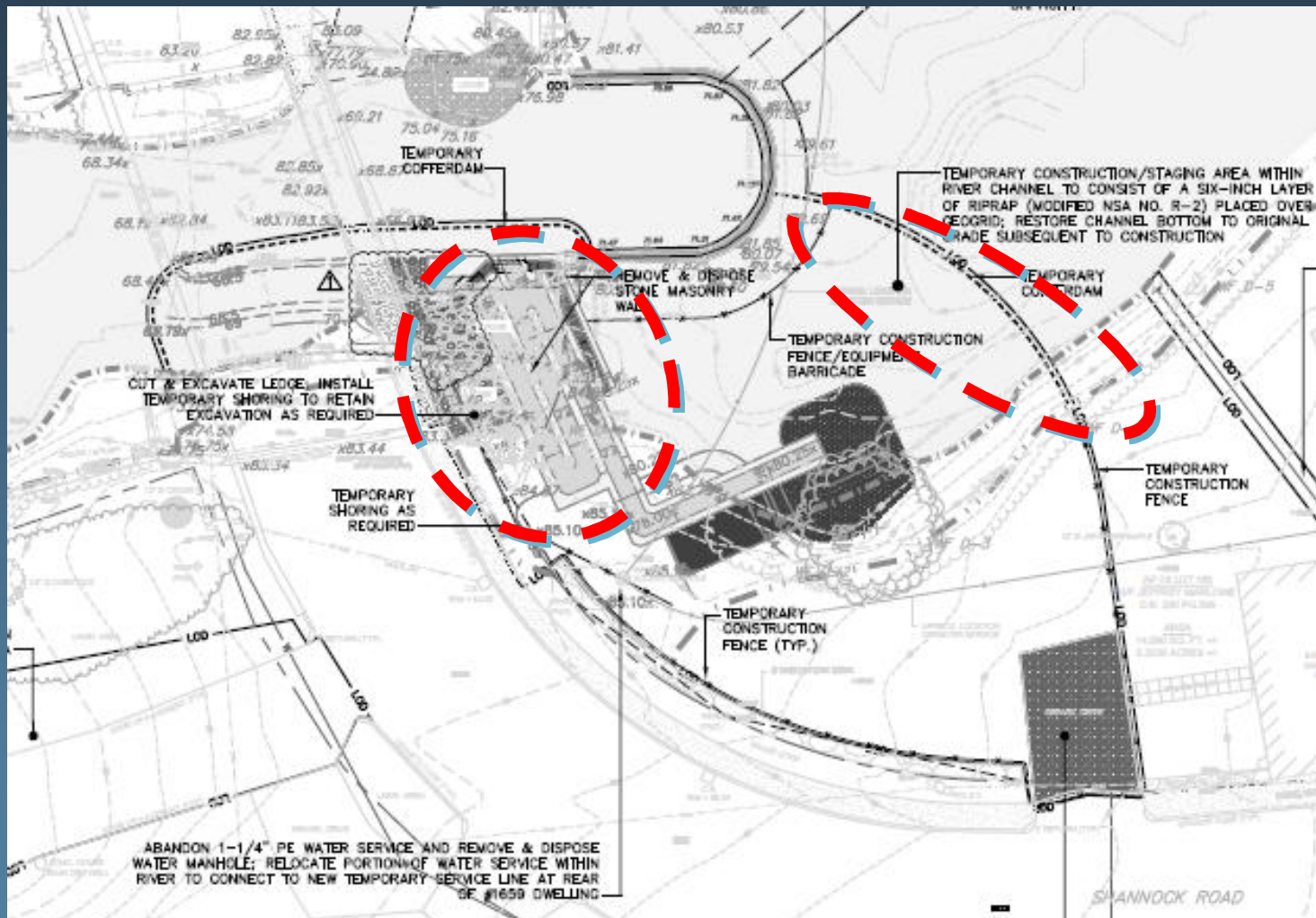
### Proposed Permanent Site Modifications

- *Bedrock Removal*
  - *Area Between Bridge and Left Embankment*
  - *Heavy Equipment/Potential Blasting*
- *Fish Ladder*
  - *Area Between Bridge and Left Embankment*
  - *Limited Riverbed Grading Under Bridge*



# Final Design and Construction Sequence

## Horseshoe Falls Dam Fish Passage

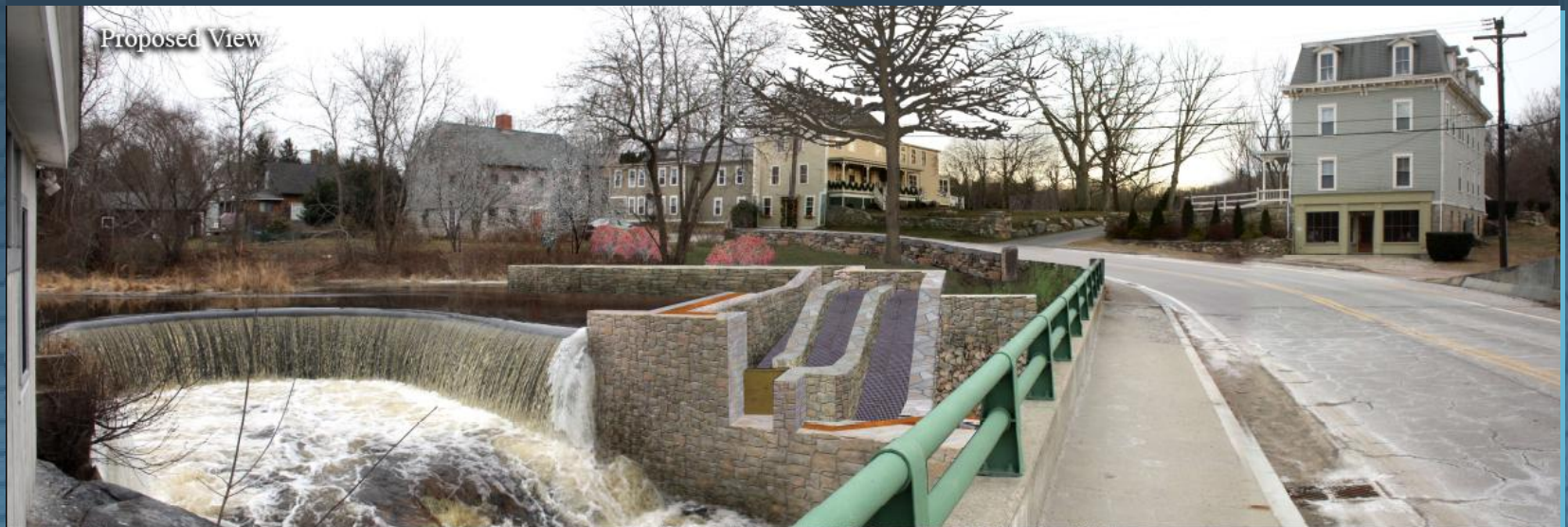


## Construction Activities and Sequence



# Final Design and Construction Sequence

## Horseshoe Falls Dam Fish Passage



Conceptual View Across Channel  
WPWA Horseshoe Falls Dam Fish Ladder



# Final Design and Construction Sequence

## Horseshoe Falls Dam Fish Passage





# Final Design and Construction Sequence

## Horseshoe Falls Dam Fish Passage





# Final Design and Construction Sequence

## Horseshoe Falls Dam Fish Passage



# Agenda

Horseshoe Falls Dam Fish Passage

Questions and Discussion