# Falls Bridge Advisory Committee

## Meeting #11

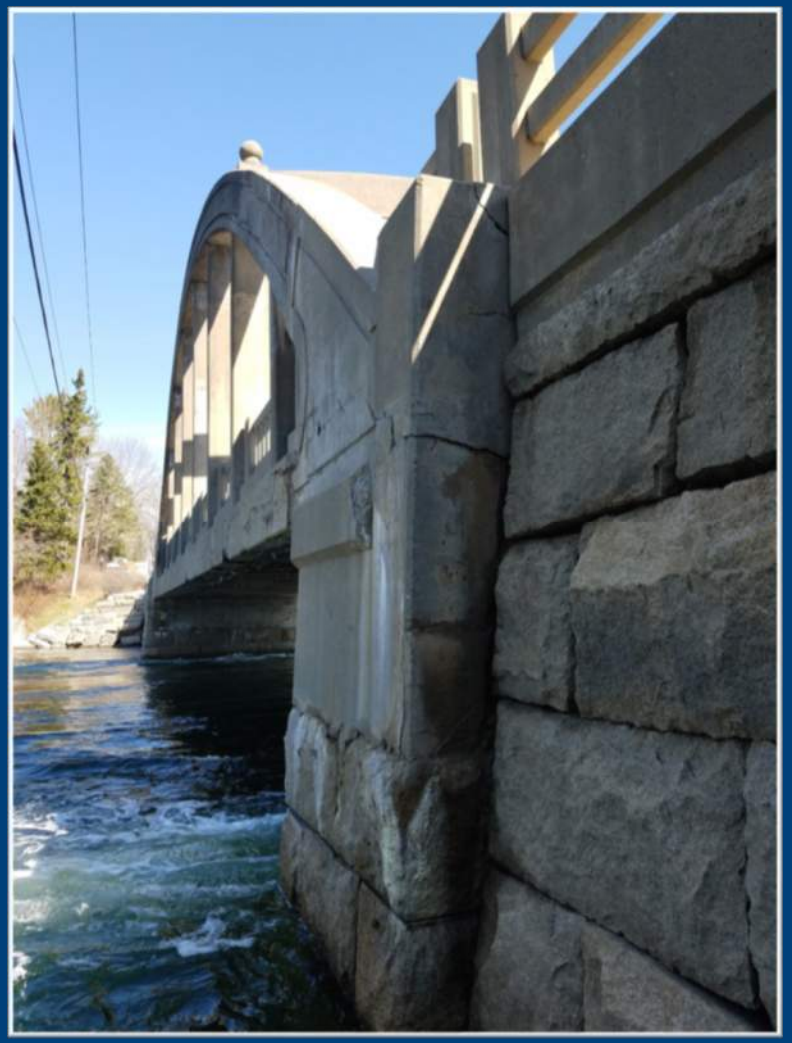
## Replacement of Existing Bridge


*Integrity - Competence - Service*

MaineDOT

# Meeting Agenda

- Bridge Replacement
  - Purpose & Need / Design Criteria
  - Substructure Alternatives
  - Superstructure Alternatives
  - Initial Constructability Assessment
- Bridge Rehabilitation Next Steps
- Alternate Route Concept
- Discussion



# Replacement Strategy

## Purpose & Need Statement

**Project:** Blue Hill, Falls Bridge #5038 (WIN 17712.00)

**Purpose:**

The purpose of the project is to address the structural deficiency of the Falls Bridge and improve public safety within the project limits in a cost effective manner. A successful project will provide a bridge capable of carrying all legal loads, will not require additional capital improvements for at least 25 years, will achieve a minimum remaining service life of at least 50 years, and improve site safety.

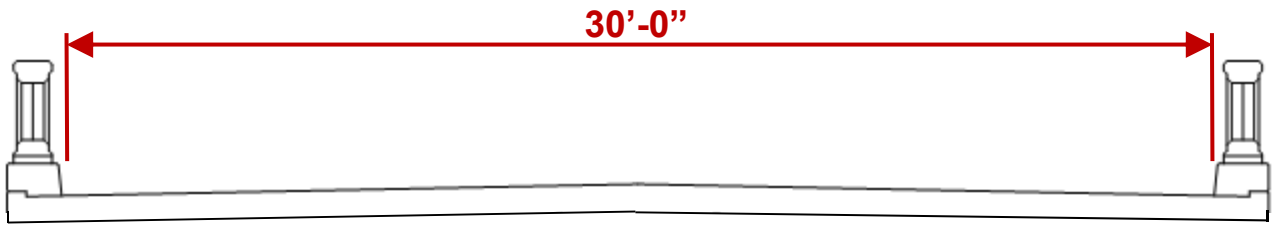
**Need:**

The rating condition of the bridge elements are: 5 (fair) for the concrete superstructure, 4 (poor) for the stacked stone substructure, and 4 (poor) for the concrete deck. Further deterioration of the bridge elements may require a load posting. The bridge spans over a reversing falls that is a popular recreation area; however; the bridge and roadway do not meet geometric design standards which create safety concerns.

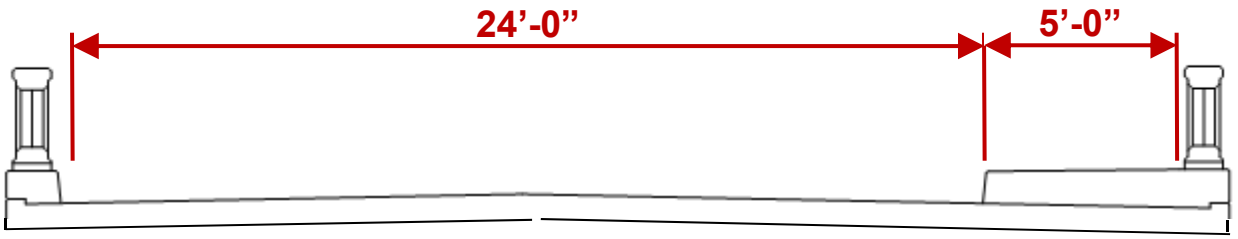
# Replacement Strategy

## Design Criteria

- 100 Year Service Life, Modern Design Loads
- Modern Typical Section




**TYPICAL SECTION WITH WIDE SHOULDERS**




**TYPICAL SECTION WITH SIDEWALK**

# Replacement Strategy

## Approach to Evaluating Replacement

- Steps 1 & 2: Identify, assess & short list initial options
  - Abutments & Retaining Walls
    - Widen approach to accommodate typical section.
    - Remove eroded fill within approaches, replace with concrete fill
  - Superstructure
    - Assess conventional girder alternatives
    - Assess tied arch alternatives
- Step 3: Assess constructability, schedule, impacts, longevity & cost
- Step 4: Identify most suitable replacement strategy

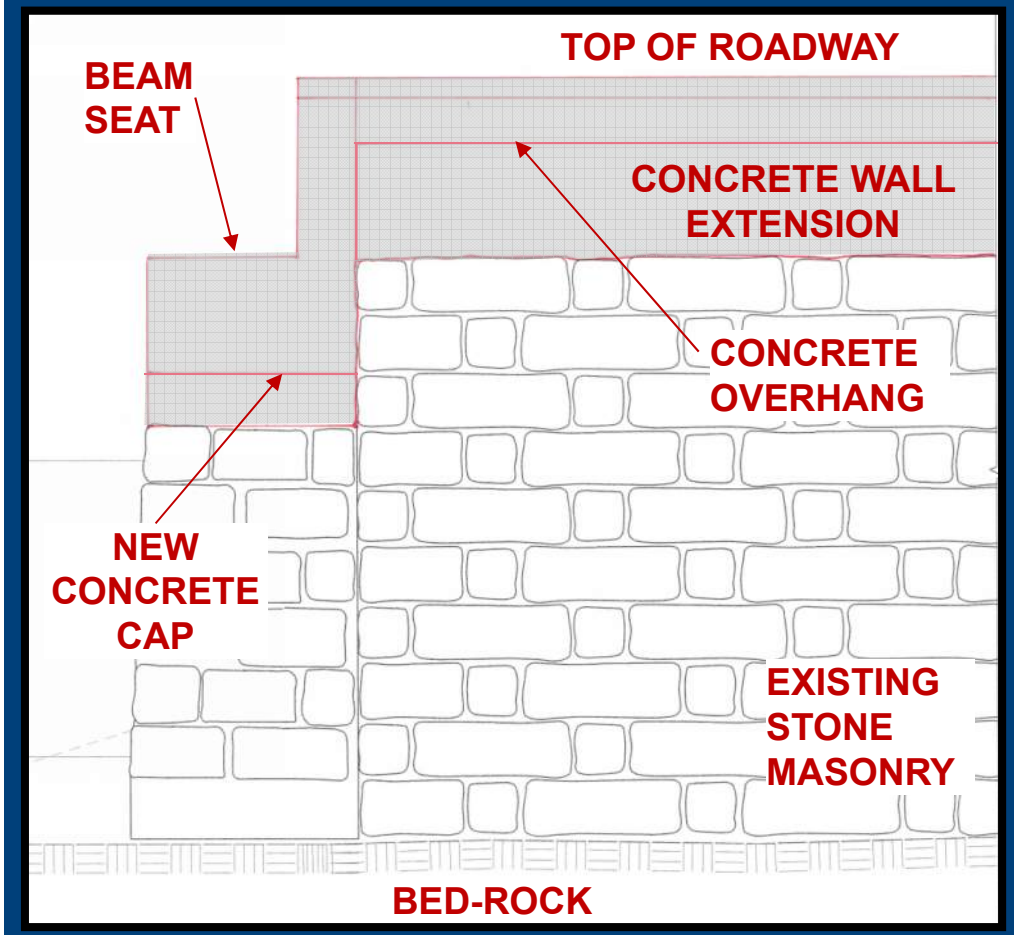
# Replacement Strategy - Substructure

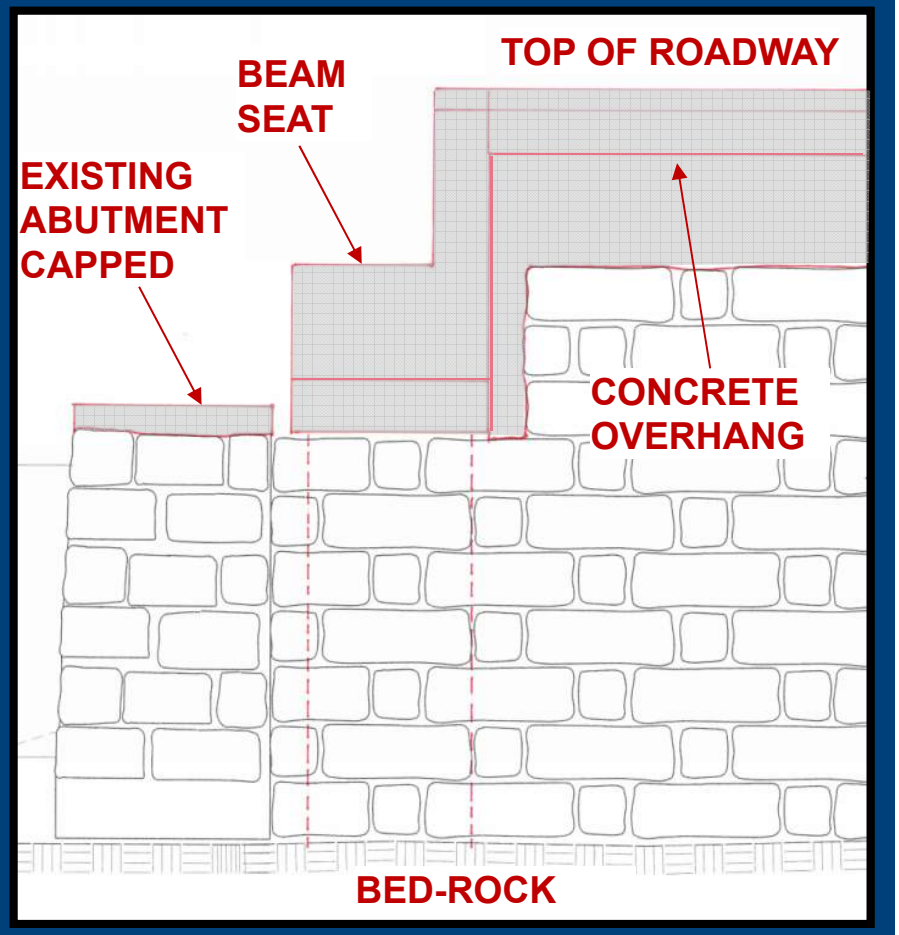
## Abutments

# Replacement Strategy - Substructure

## Abutments

- Two foundation options for new superstructure, decision driven by cost

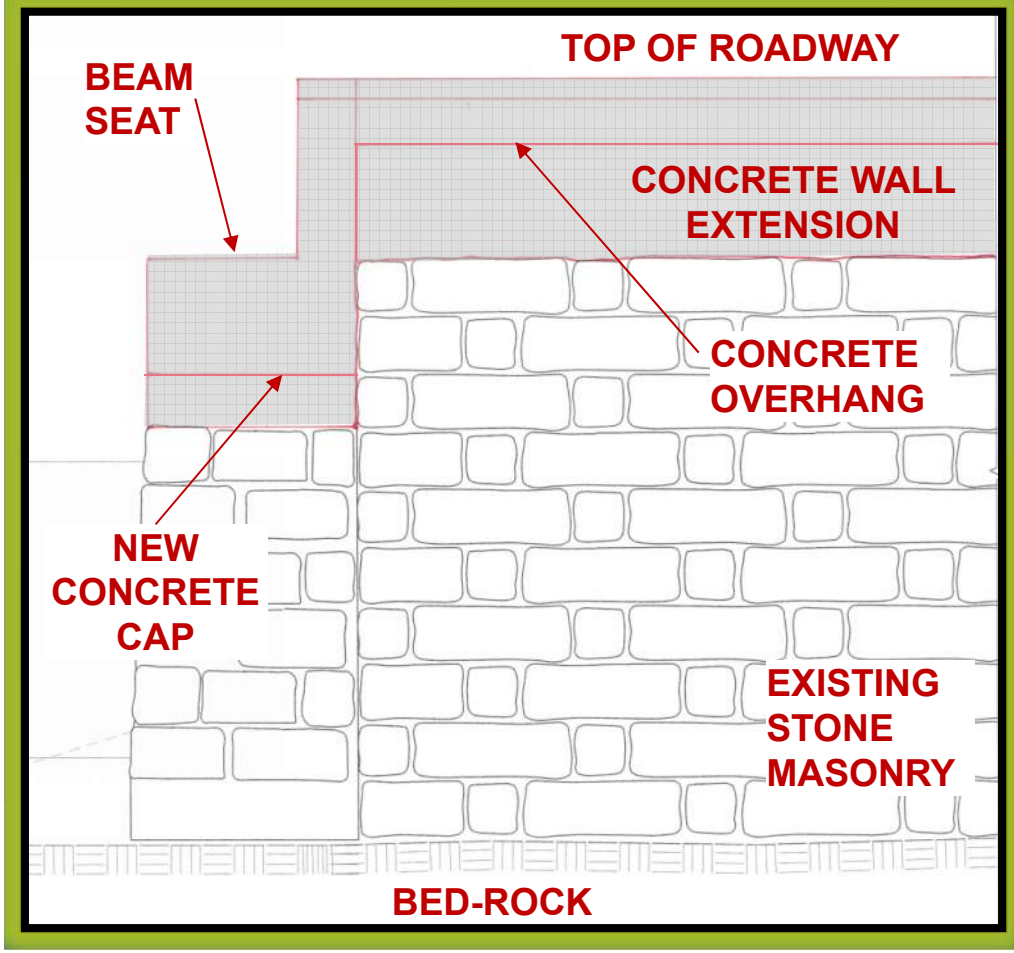


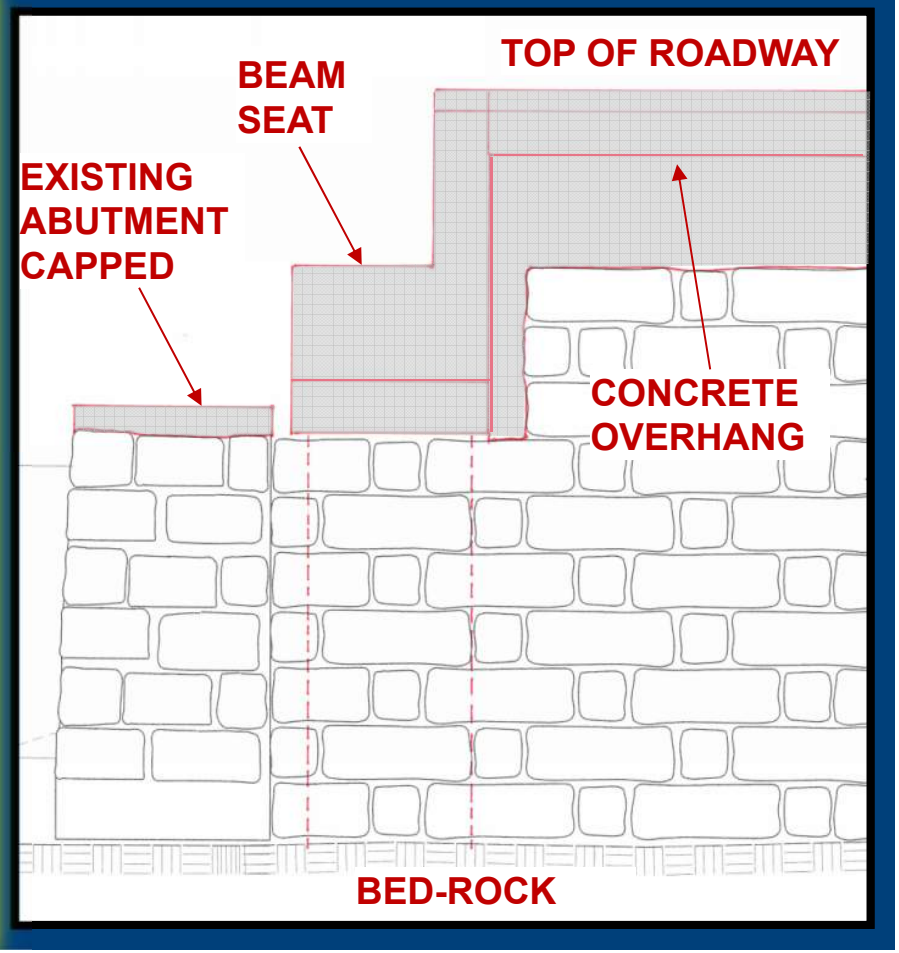



# Replacement Strategy - Substructure

## Abutments

- Two foundation options, decision driven by engineering need & cost

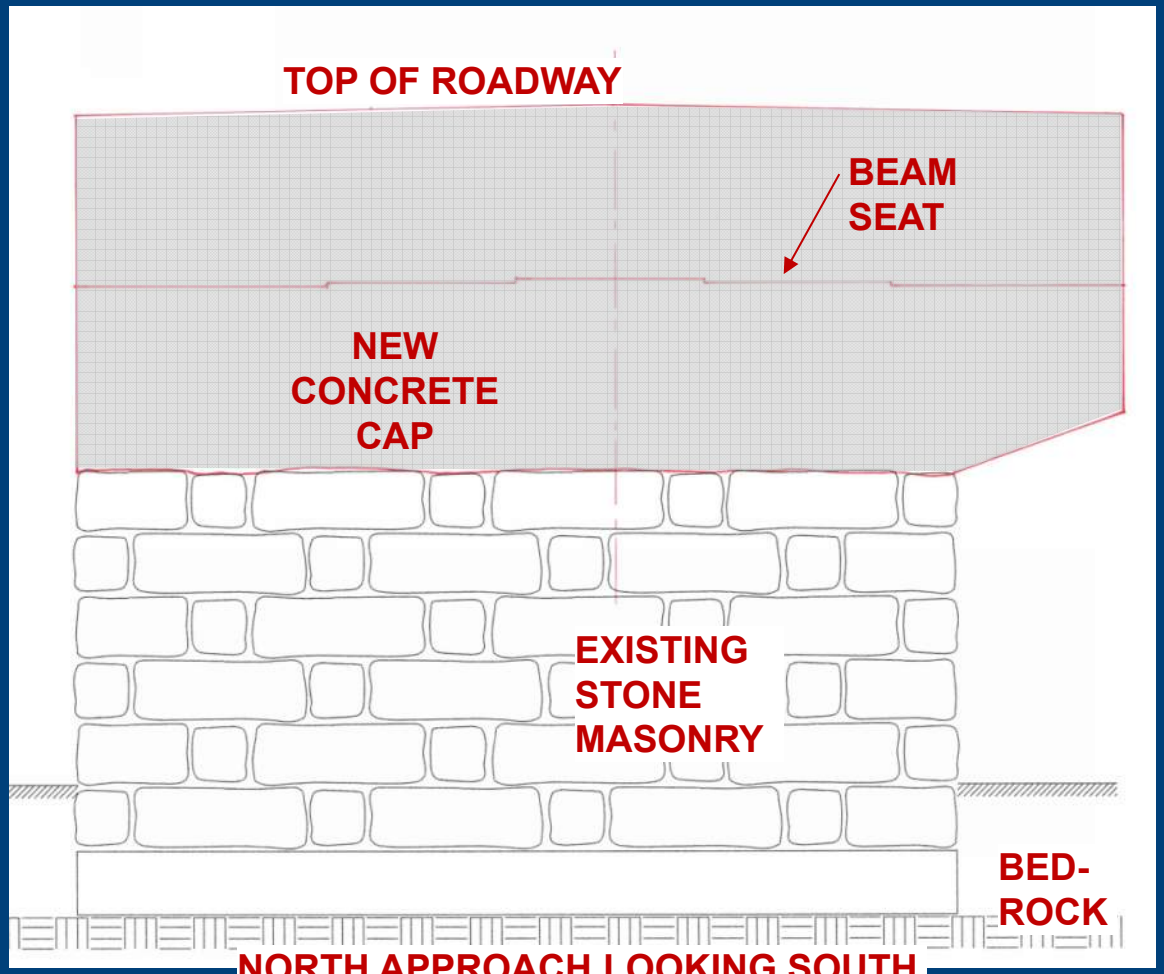


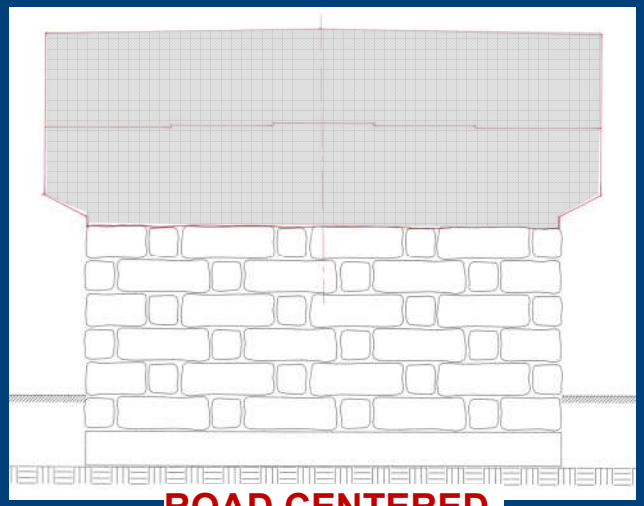



# Replacement Strategy - Substructure

## Abutments

- Configuration driven by cost and impacts

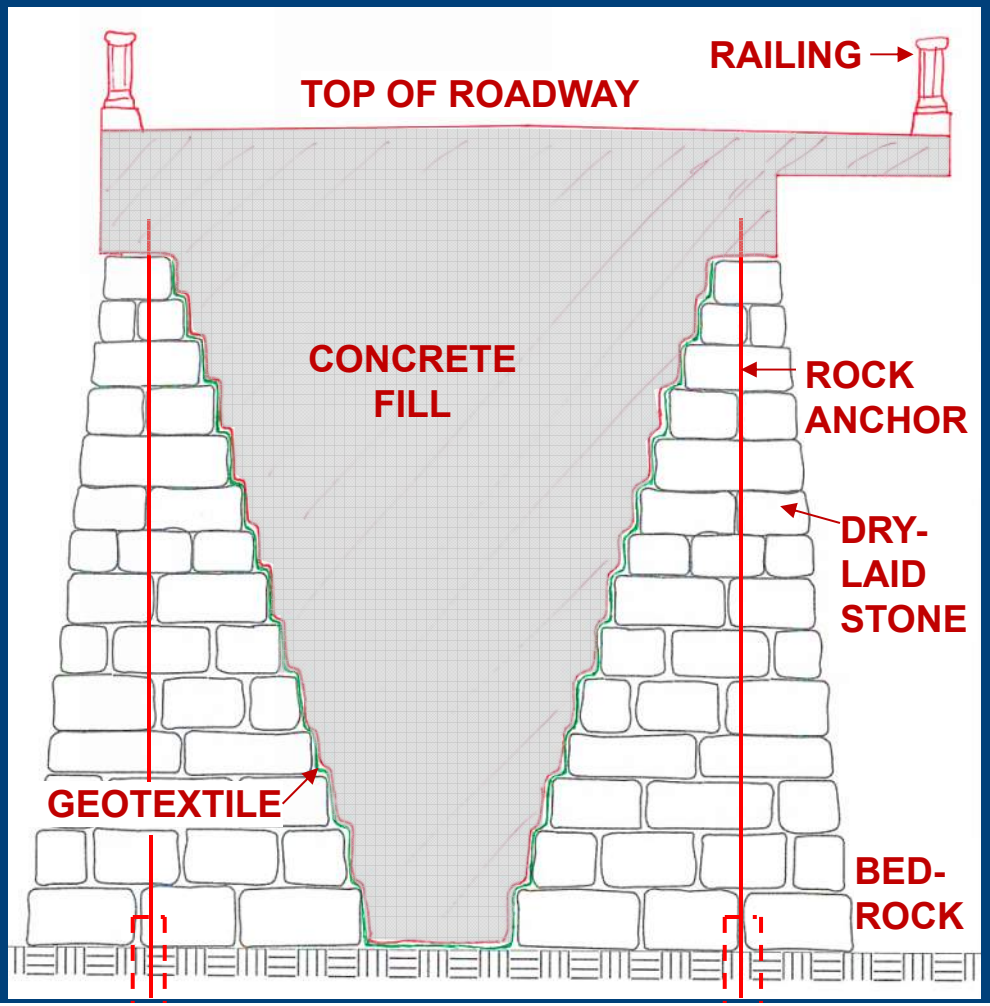


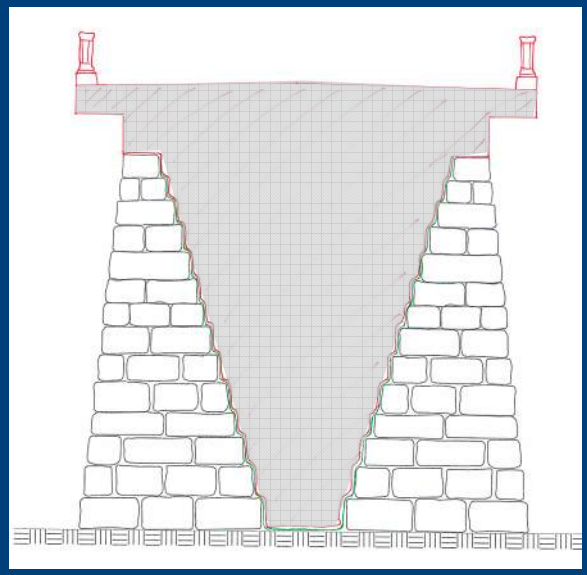



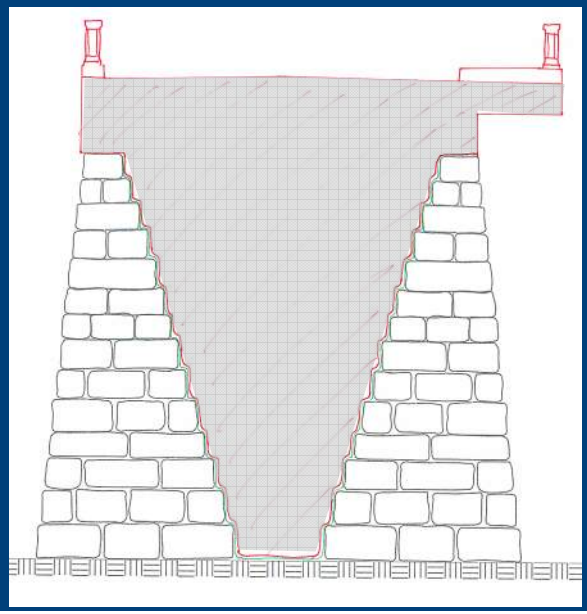

# Replacement Strategy - Substructure

## Abutment Retaining Walls

- Configuration driven by cost and impacts





# Replacement Strategy - Substructure

# Replacement Strategy

## Approach to Evaluating Replacement

- Steps 1 & 2: Identify, assess & short list initial options
  - Abutments & Retaining Walls
    - Widen approach to accommodate typical section. ✓Complete
    - Remove eroded fill within approaches, replace with concrete fill
  - Superstructure
    - Assess conventional girder alternatives
    - Assess tied arch alternatives
- Step 3: Assess constructability, schedule, impacts, longevity & cost
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# Replacement Strategy - Superstructure

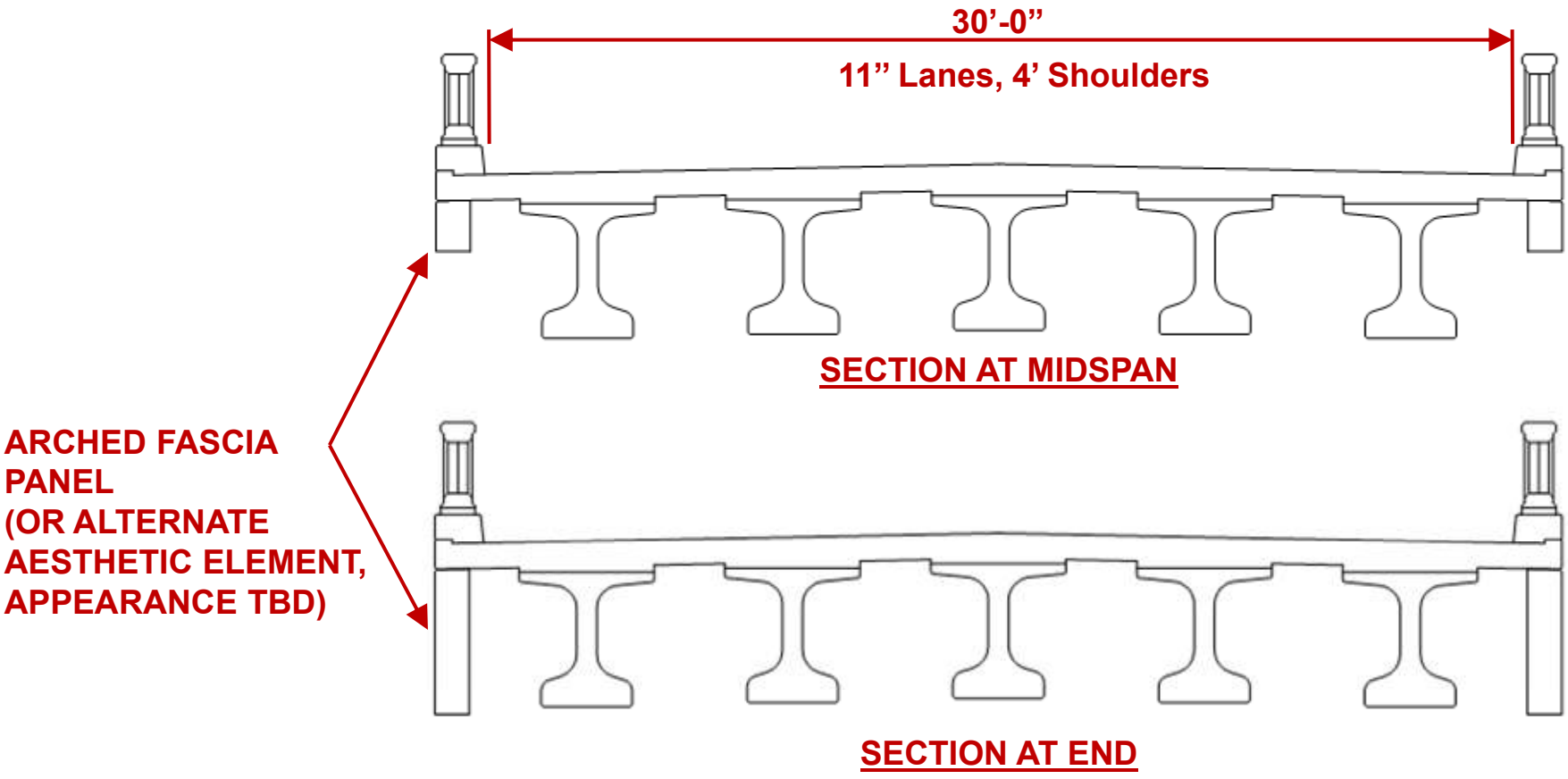
## Girder and Tied Arch options considered

- Both designed to provide a 100-year service life
- Both options feature a 100 to 120 foot-long bridge
- Both options can accommodate sea level rise

# Replacement Strategy - Superstructure

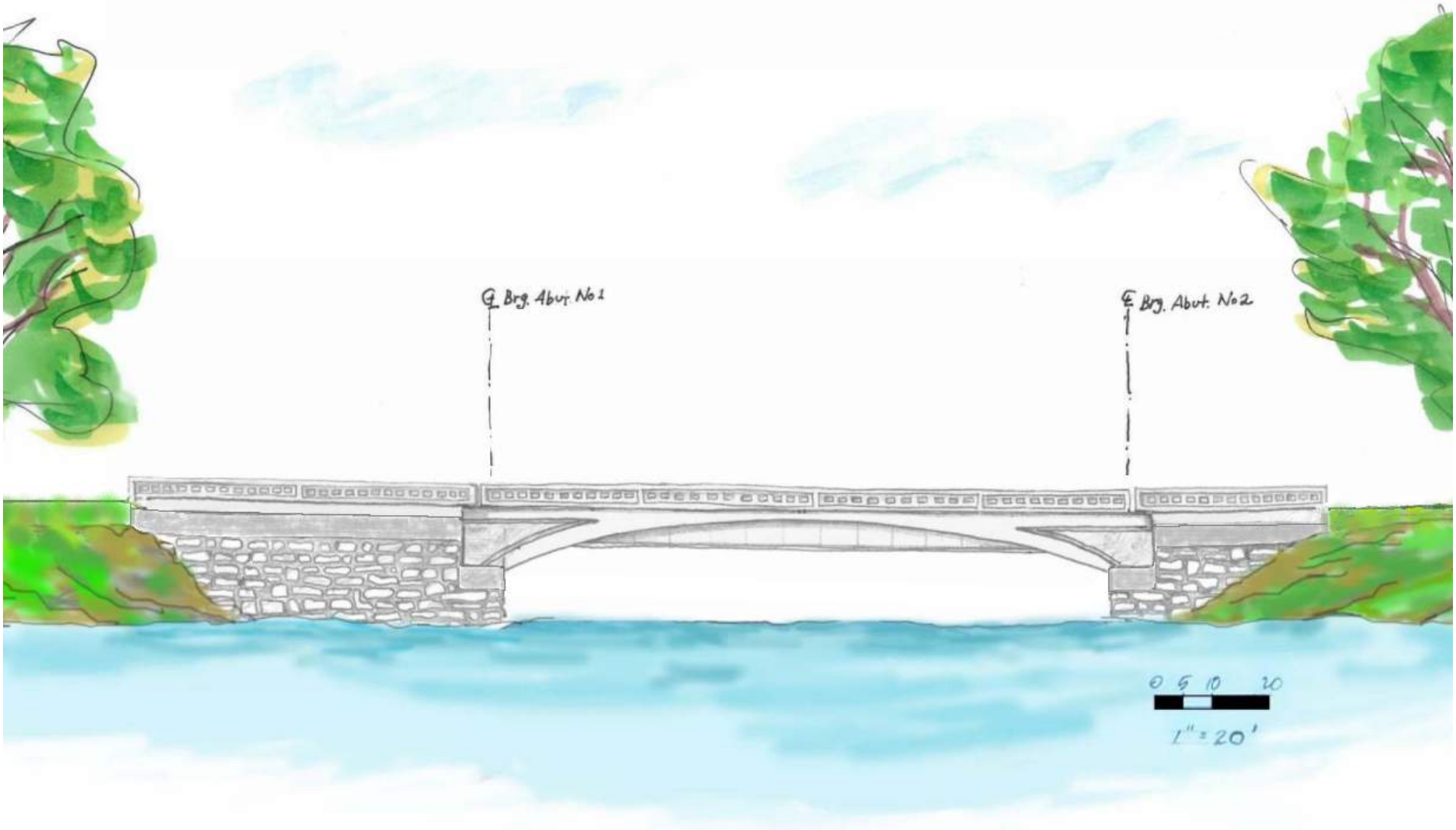
## Conventional Girder - Typical Section w/o Sidewalk

- Precast Concrete Girders – Standardized Shape, 4’ Deep Girders



# Replacement Strategy - Superstructure

## Conventional Girder – Architectural Sketch



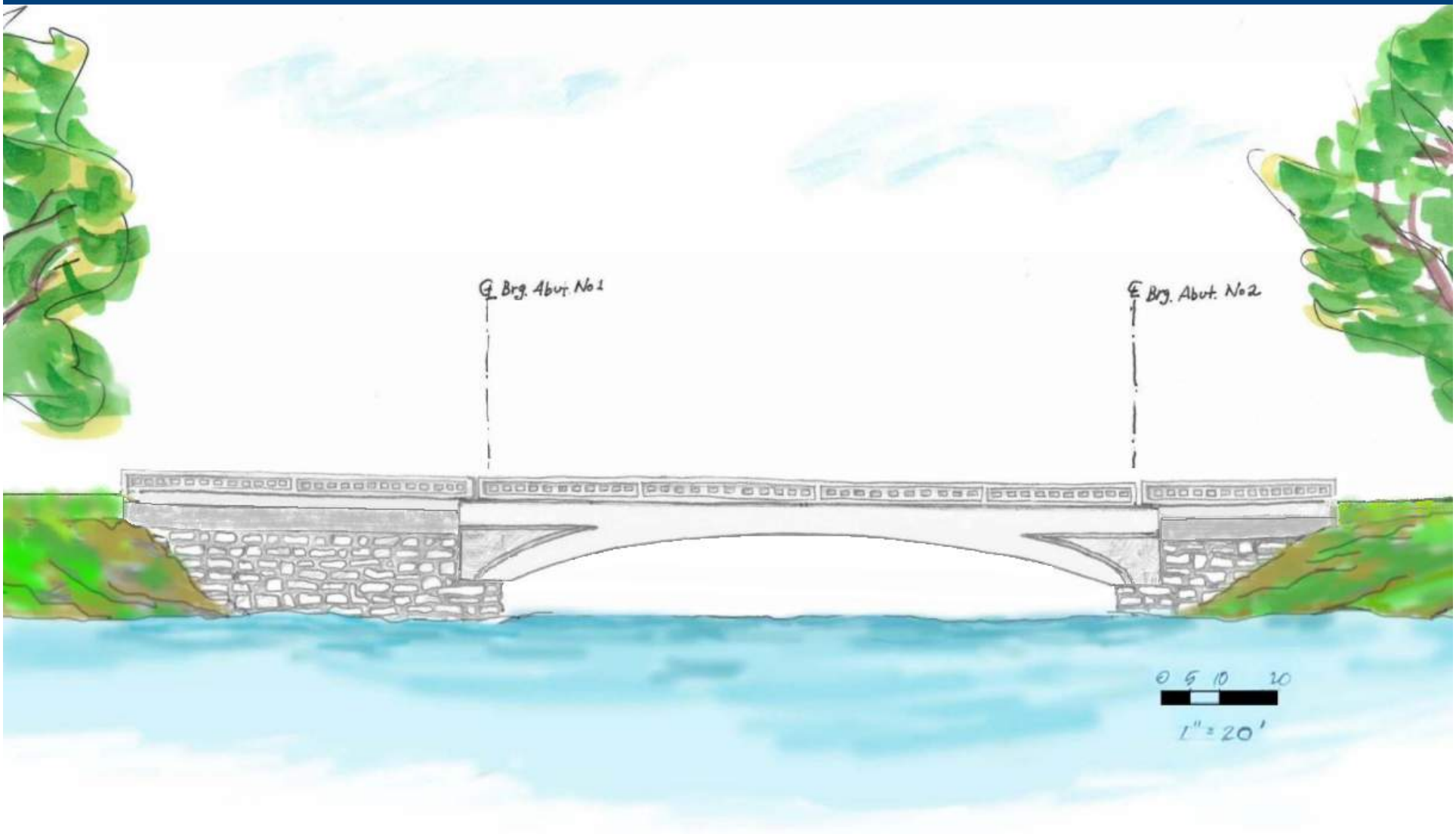
# Replacement Strategy - Superstructure

## Precast Arched Girder

- Precast Arched Girders – Variable Depth, 4’-0” to 7’-0” Deep

# Replacement Strategy - Superstructure

## Precast Arched Girder – Architectural Sketch



# Replacement Strategy - Superstructure

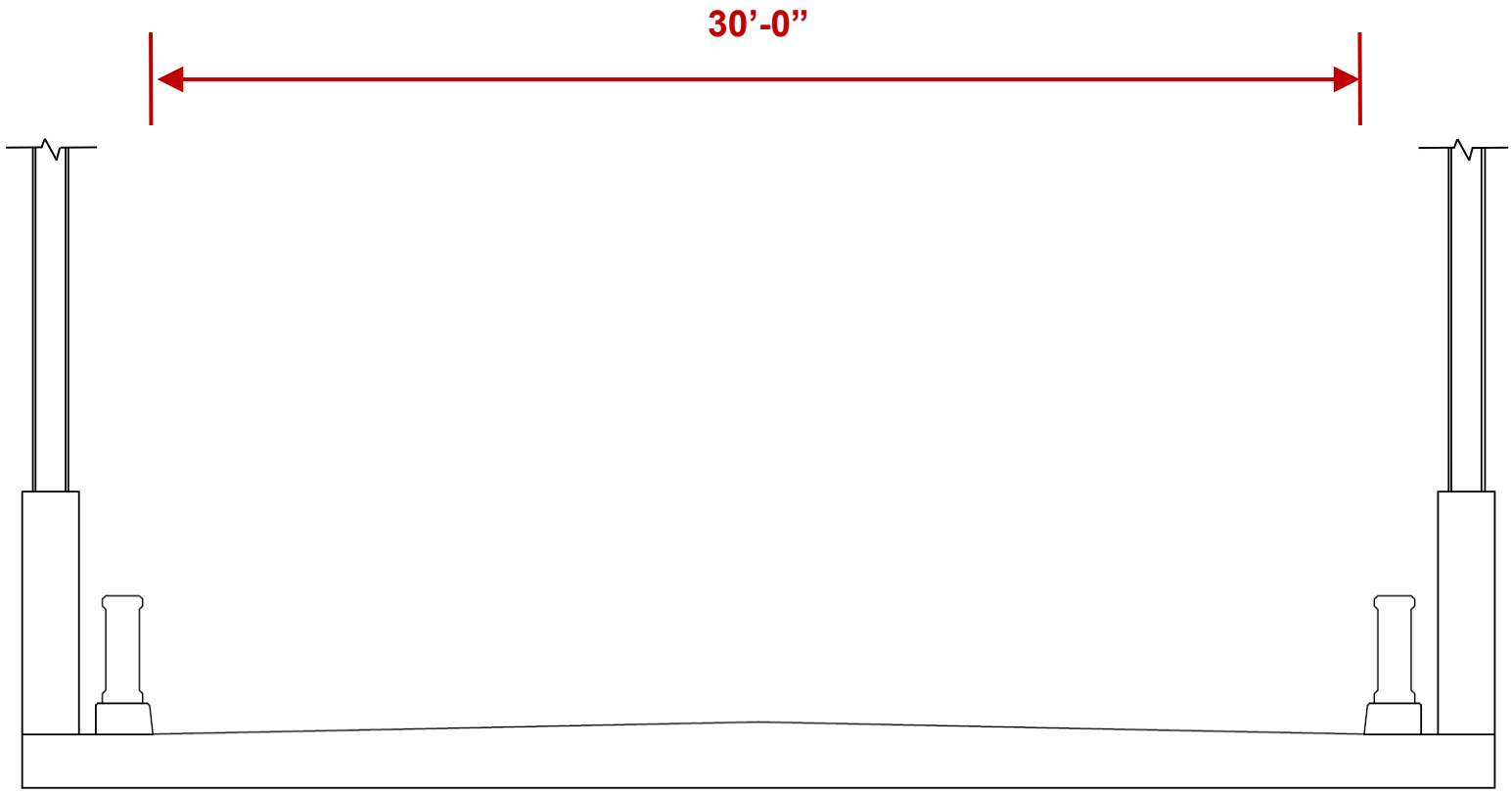
## Tied Arch

- Steel, Precast Concrete, and Cast-in-Place Options Considered

# Replacement Strategy - Superstructure

## Tied Arch - Typical Section with Wide Shoulders

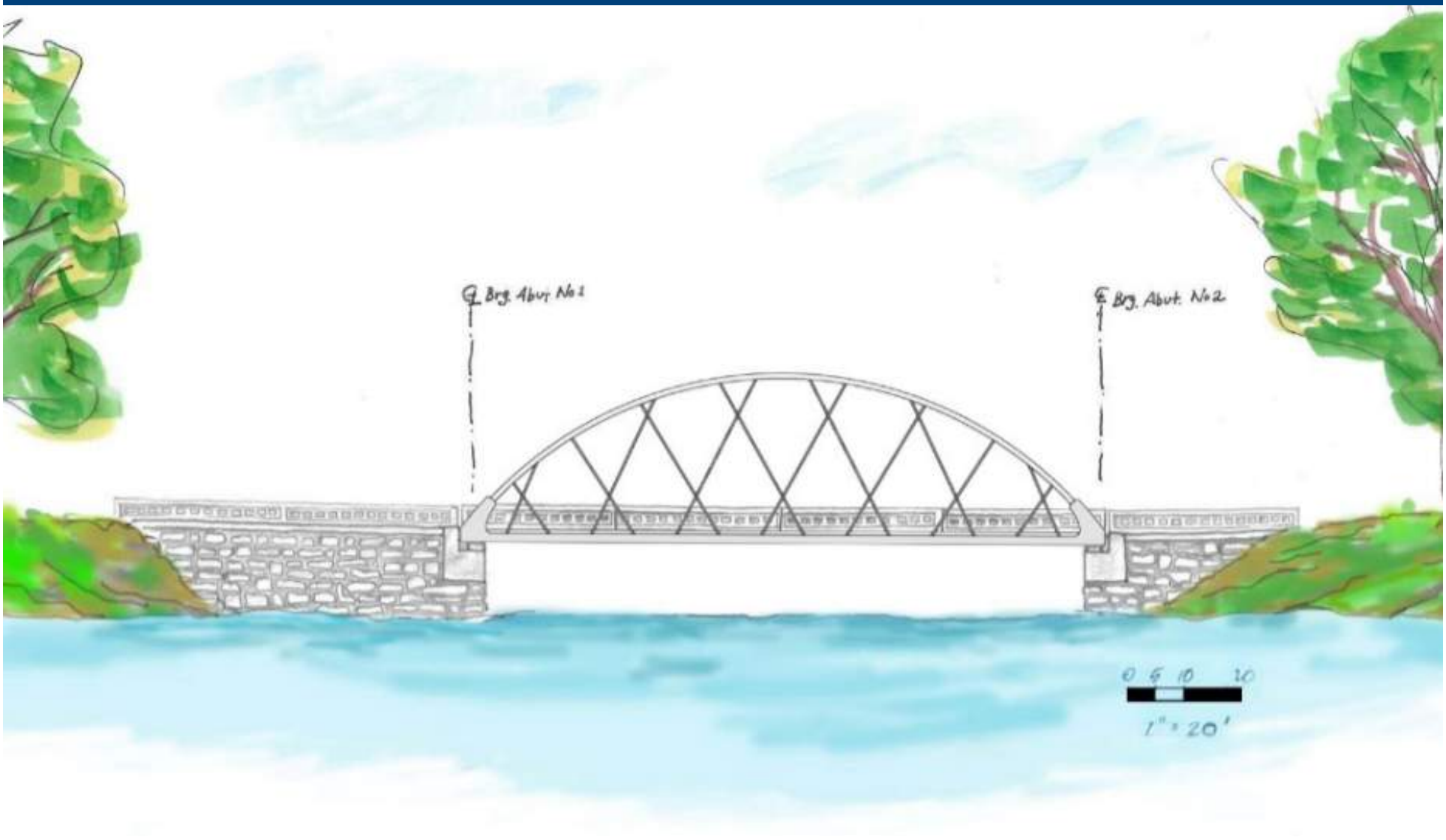
- 11-ft Lanes, 4-ft Shoulders




**TIED-ARCH TYPICAL SECTION**

# Replacement Strategy - Superstructure

## Tied Arch – Architectural Sketch



# Replacement Strategy - Superstructure

## Tied Arch Considerations

- Hanger Configuration: Vertical or Inclined\Network Configuration
  - Network Expected ~ Similar cost, provides engineering benefits
- Tie Girder: Concrete or Steel
  - Concrete Expected ~ Lower cost, simplified construction
- Arch Rib: Steel or Concrete
  - Steel Expected ~ Lower cost, faster construction
- Deck System: Concrete or Deck & Floorbeams
  - Concrete Anticipated ~ Lower cost, simplified details

The details of the arch structure will be selected by the Department considering engineering need, cost, impacts, and schedule.

# Replacement Strategy

## Approach to Evaluating Replacement

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✓Complete

  - Superstructure
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✓Complete

- Step 3: Assess constructability, schedule, impacts, longevity & cost
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Preview of Next Meeting

# Replacement Strategy - Constructability

## Existing Bridge Demolition

- Temporary supports required to remove existing bridge
  - Construct widened approaches to accommodate cranes or;
  - Construct temporary trestles west of bridge (similar to rehab).
- Method will be driven by environmental requirements, cost and schedule

# Replacement Strategy - Constructability

## Conventional Girder & Tied Arch Bridge Construction

- Large cranes required to place girders or arch components

# Replacement Strategy - Constructability

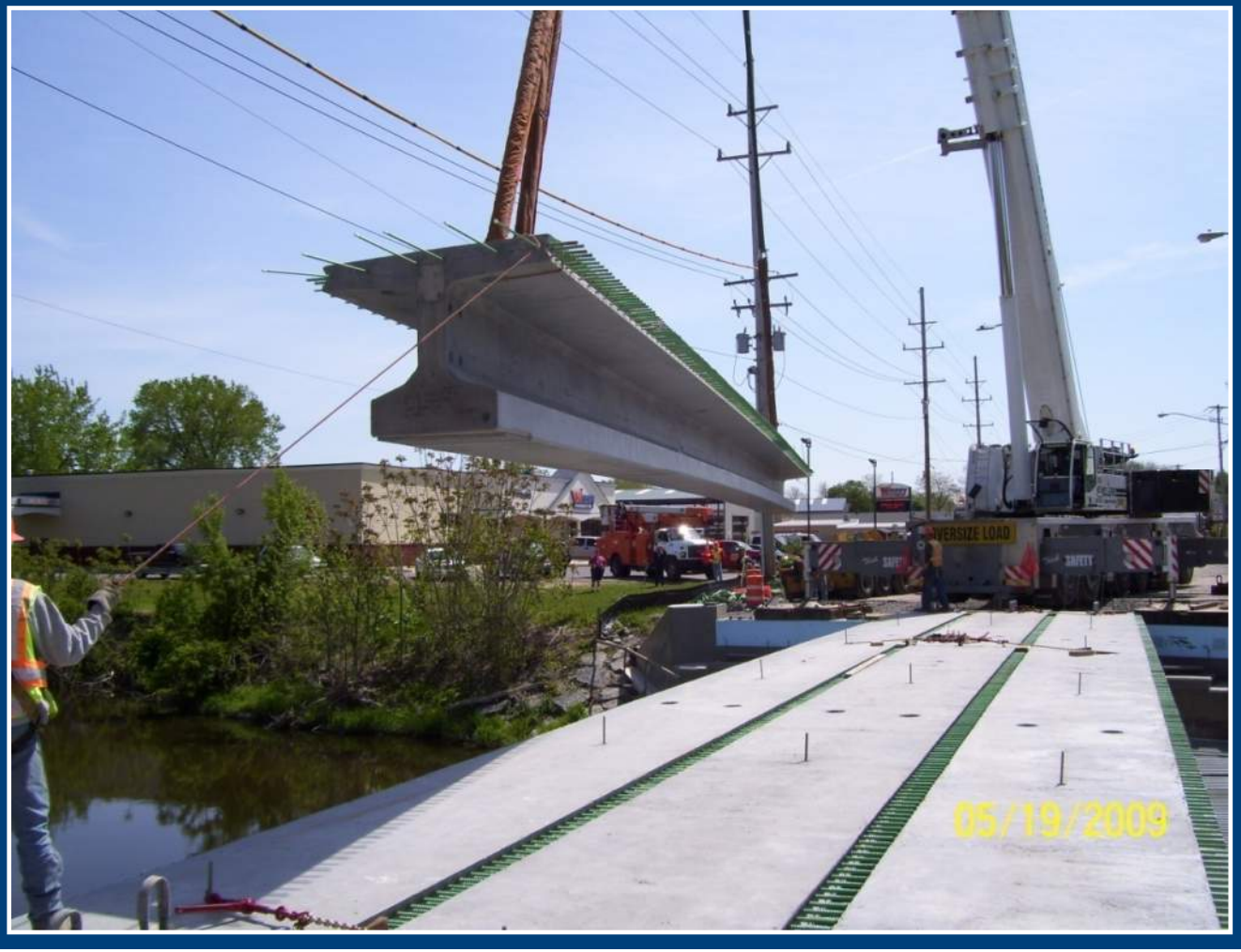
## Accelerated Bridge Construction Techniques

- Prefabricated Components – Precast Substructure Components

# Replacement Strategy - Constructability

## Accelerated Bridge Construction Techniques

- Prefabricated Components – Decked Girder Sections



# Replacement Strategy - Constructability

## Accelerated Bridge Construction Techniques

- Prefabricated Components – Deck Panels

# Replacement Strategy - Constructability

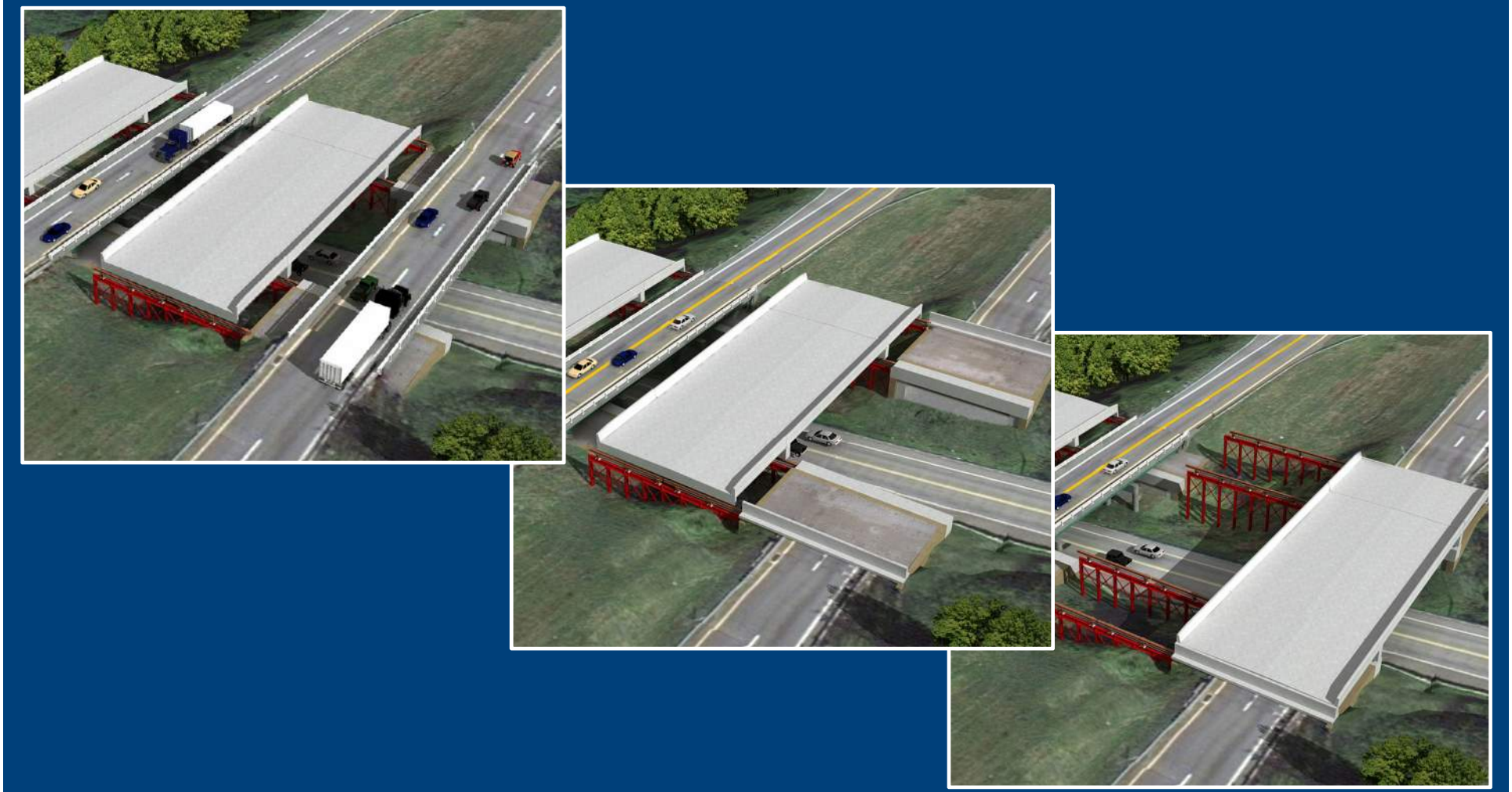
## Accelerated Bridge Construction Techniques

- Prefabricated Components – Off-Site Prefabrication

# Replacement Strategy - Constructability

## Accelerated Bridge Construction Techniques

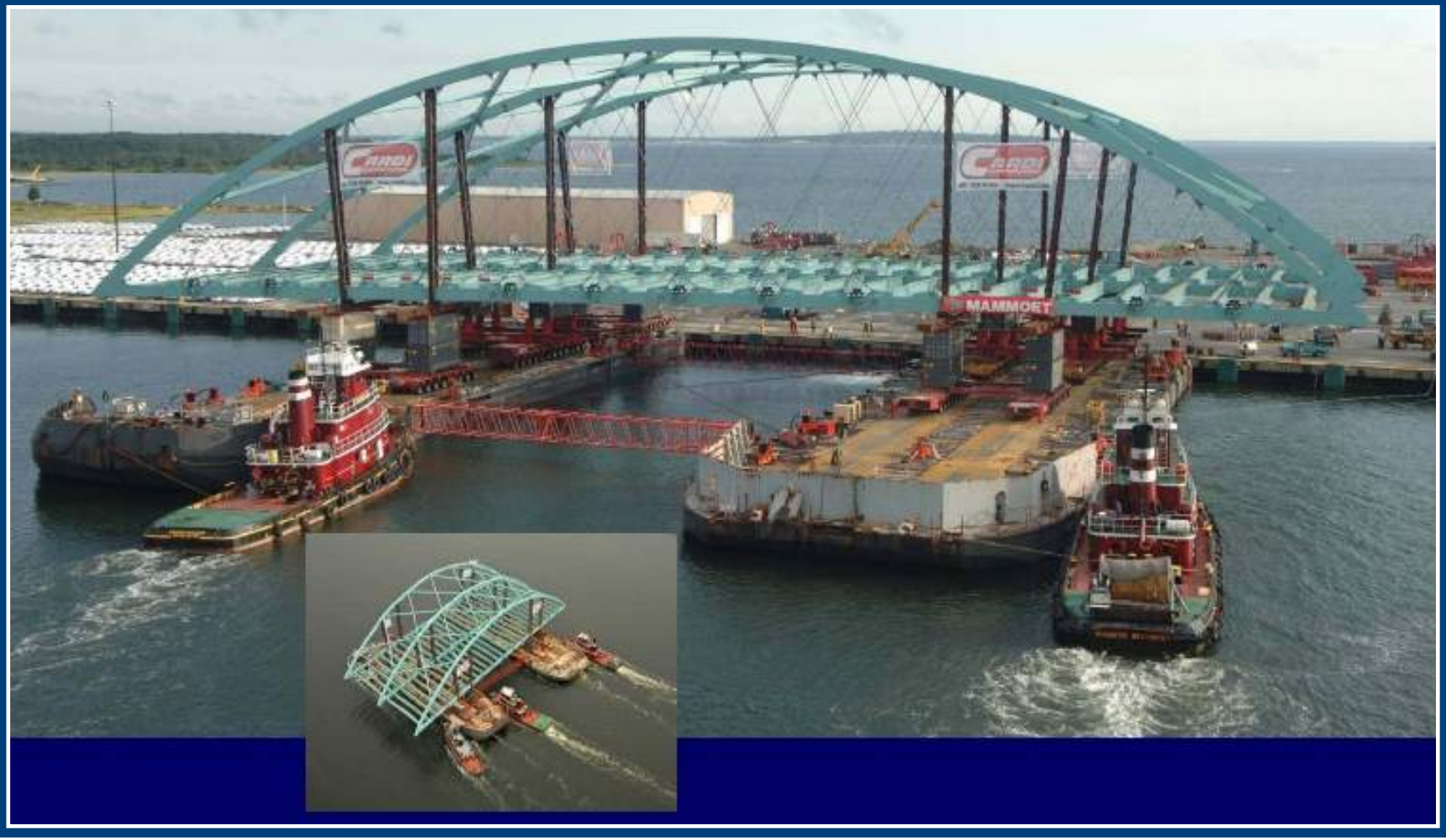
- Bridge Movement Systems – Lateral Slide Techniques



# Replacement Strategy - Constructability

## Accelerated Bridge Construction Techniques

- Bridge Movement Systems – Float-in / Float-out Systems



# Replacement Strategy - Constructability

## Accelerated Bridge Construction Techniques

- Bridge Movement Systems – Incremental Launching

# Replacement Strategy - Constructability

## Accelerated Bridge Construction Techniques

- Presents opportunity to reduce construction schedule
- Results in a cost premium in some cases
  - Large projects with significant repetition:
    - ABC can be less than conventional construction
  - Moderate sized projects with some repetition:
    - 10% and 20% premium
  - Smaller projects:
    - 20% to 30% premium
- Actively evaluating potential ABC opportunities, benefits, and costs as part of the ongoing constructability assessment

# Next Steps

## Approach to Evaluating Replacement

- Steps 1 & 2: Identify, assess & short list initial options
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Evaluation Ongoing

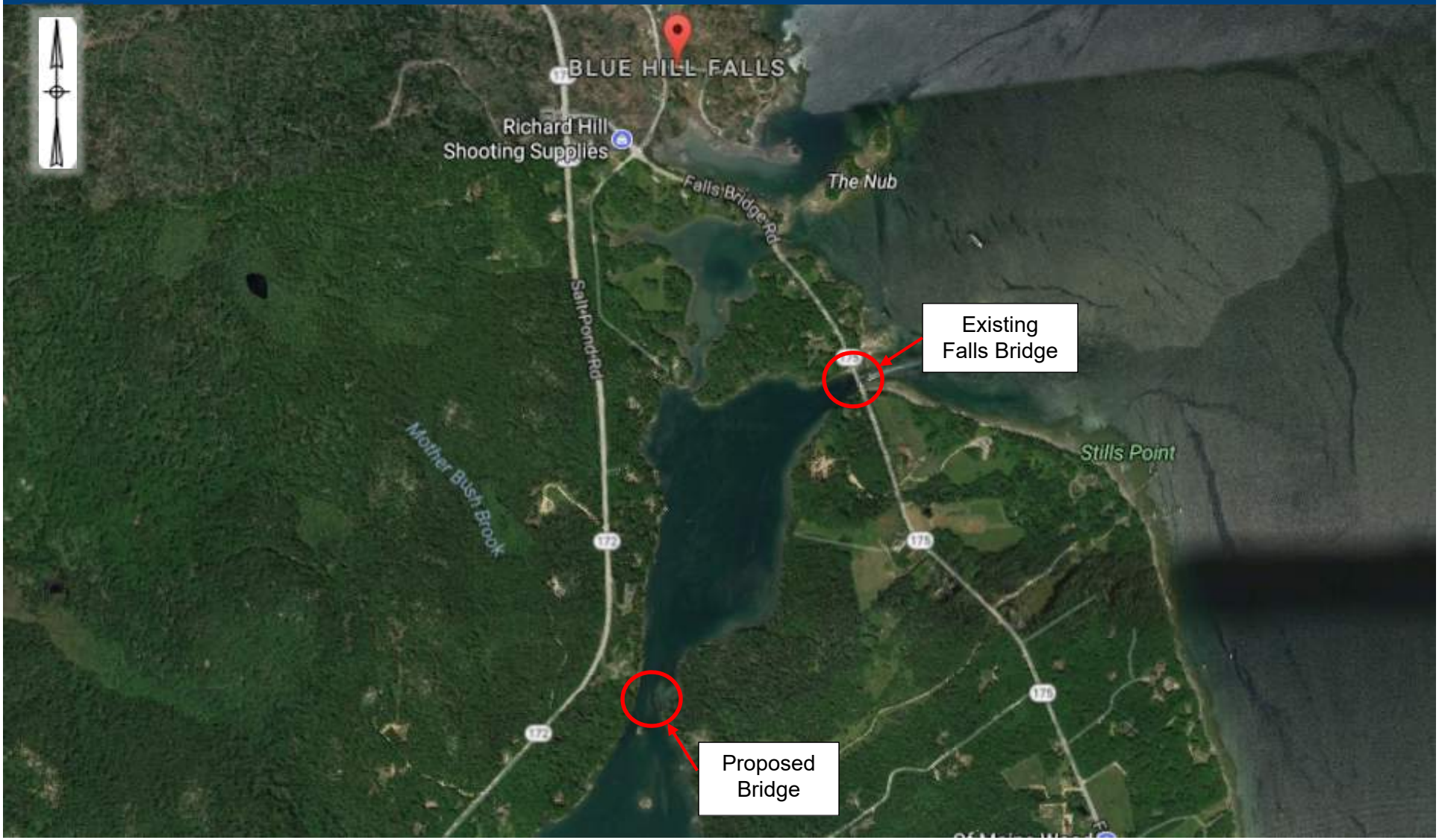
# Alternate Route Concept

## Design Assumptions

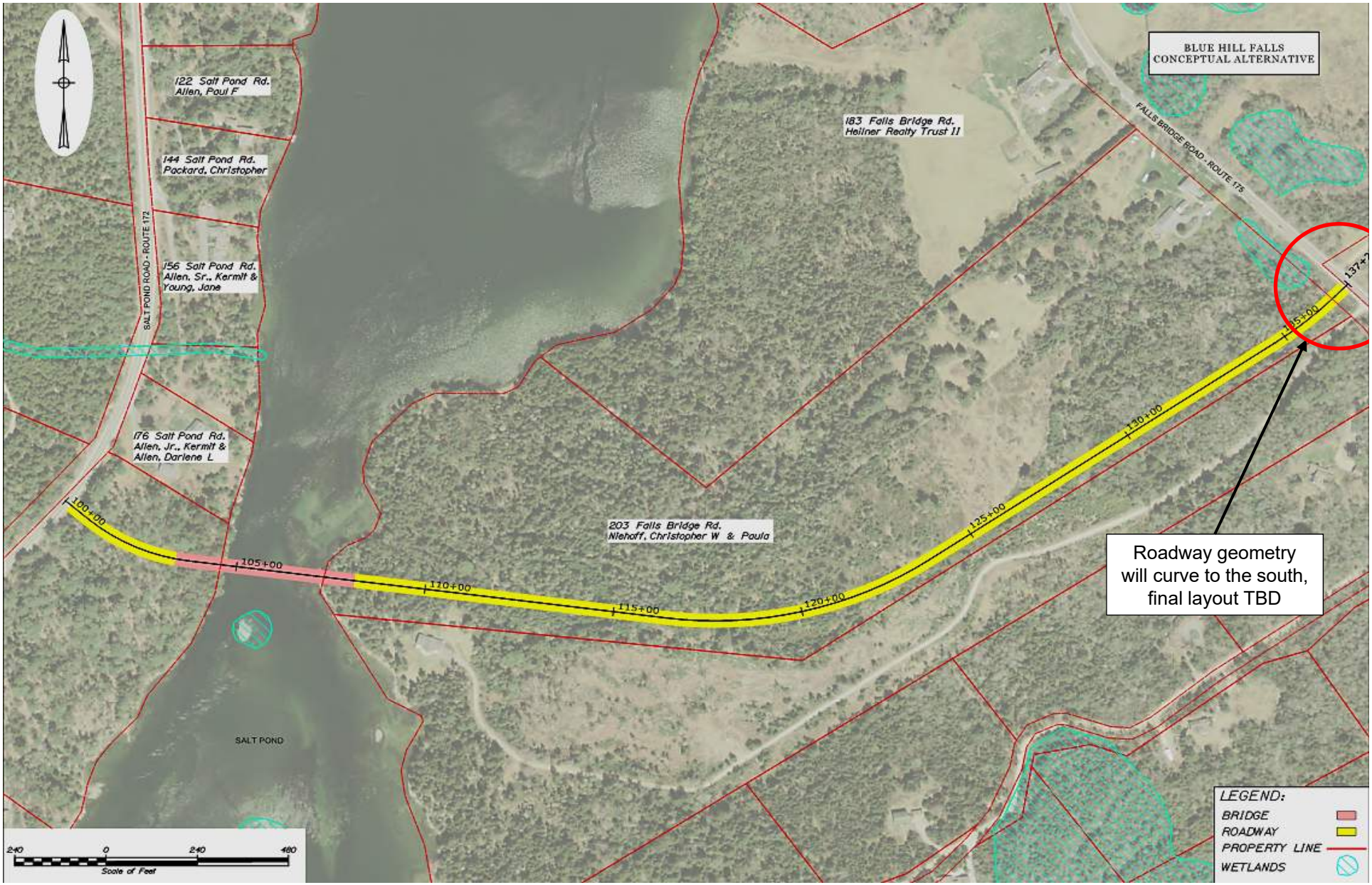
- Horizontal alignment was developed to minimize:
  - Wetland Impacts
  - Property Impacts
  - Embankment construction
  - Bridge length
  - Cost
- Roadway & Bridge Typical Section:
  - 2 - 12 foot lanes with 2 - 4 foot shoulders

# Alternate Route Concept

## Location Map



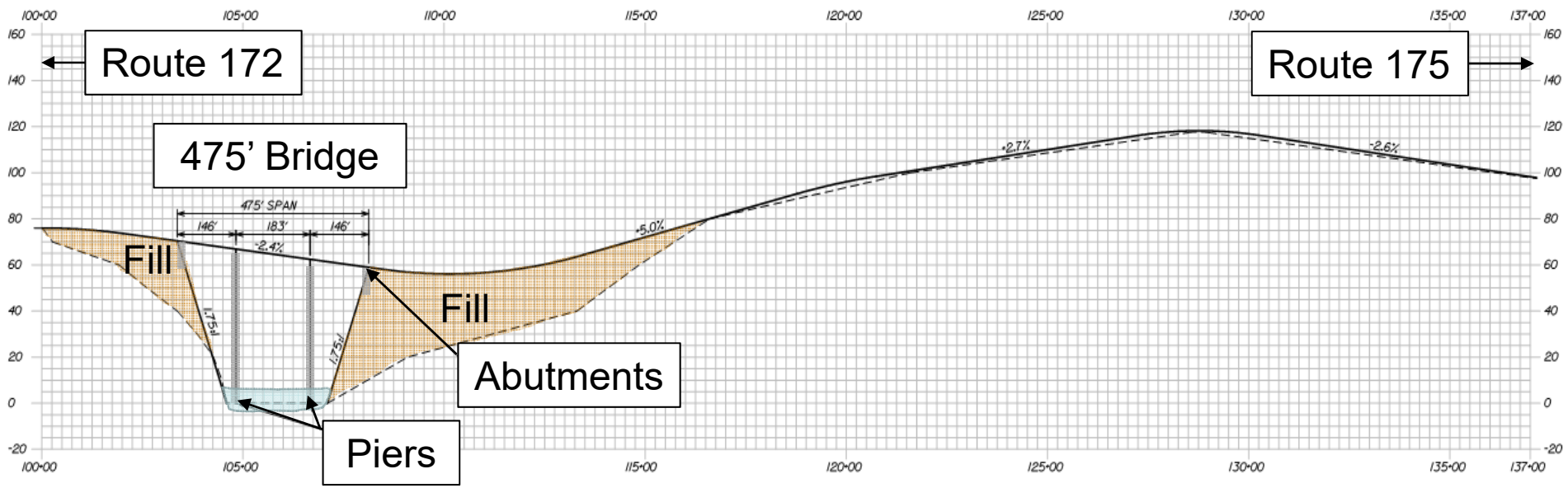
# Alternate Route Concept



# Alternate Route Concept

## Conceptual Roadway Profile

- Generally follows existing grade
- Steep slopes on both sides of Salt Pond
  - Significant embankments needed (up to 60’ tall)
  - Long bridge required (±475’ long)



# Alternate Route Concept

## Many items would require consideration:

- Falls Bridge would be closed to all vehicle traffic.
- Bridge ownership agreement required between MaineDOT and the Town.
- Agreements needed regarding the Falls Bridge:
  - Condition of bridge at time of transfer.
  - Future maintenance will be responsibility of Town.
- Portions of Route 175 would likely become a Town road.
- The small strut/bridge north of the Falls Bridge on Route 175 would likely become a Town-owned structure.
- Additional requirements and considerations likely exist.

# Discussion