UPPER NEMASKET RIVER

ENHANCEMENT PLAN

JUNE 28th, PUBLIC MEETING

WE ARE HERE!

PUBLIC MEETING 1:
Discuss the vision for river to help develop and refine project objectives.

PUBLIC MEETING 2:
Discuss project objectives and alternative packages

PUBLIC MEETING 3:
Evaluate how well the different alternative packages meet the project objectives

AGENDA

- Introduction Presentation - (40 minutes)
- Break out groups:
  - Introductions (5 min)
  - Discussion of alternative packages + summary table (30 min)
- Report out (10 min)
- Wrap up/next steps (5 min)

RESPECT

- Please respect the viewpoints of others.
- During small group discussion let one person speak at a time and try not to interrupt.
- We are not here to advocate for any one alternative or solution - We are here to explore how a range of alternatives can meet the goals for the future of the Upper Nemasket River

INTRODUCTION TO PROJECT TEAM

Bill Napolitano
Environmental
Program Director

SRPEDD

Helen Zincavage
Environmental
Program

SRPEDD

Danica Warns
Climate Resilience
Coordinator

SRPEDD

Marea Gabriel
Conservation Projects
Manager

The Nature Conservancy

Neal Price
Associate Principal,
Senior Hydrogeologist

HORSLEY WITTEN GROUP
Sustainable Environmental Solutions

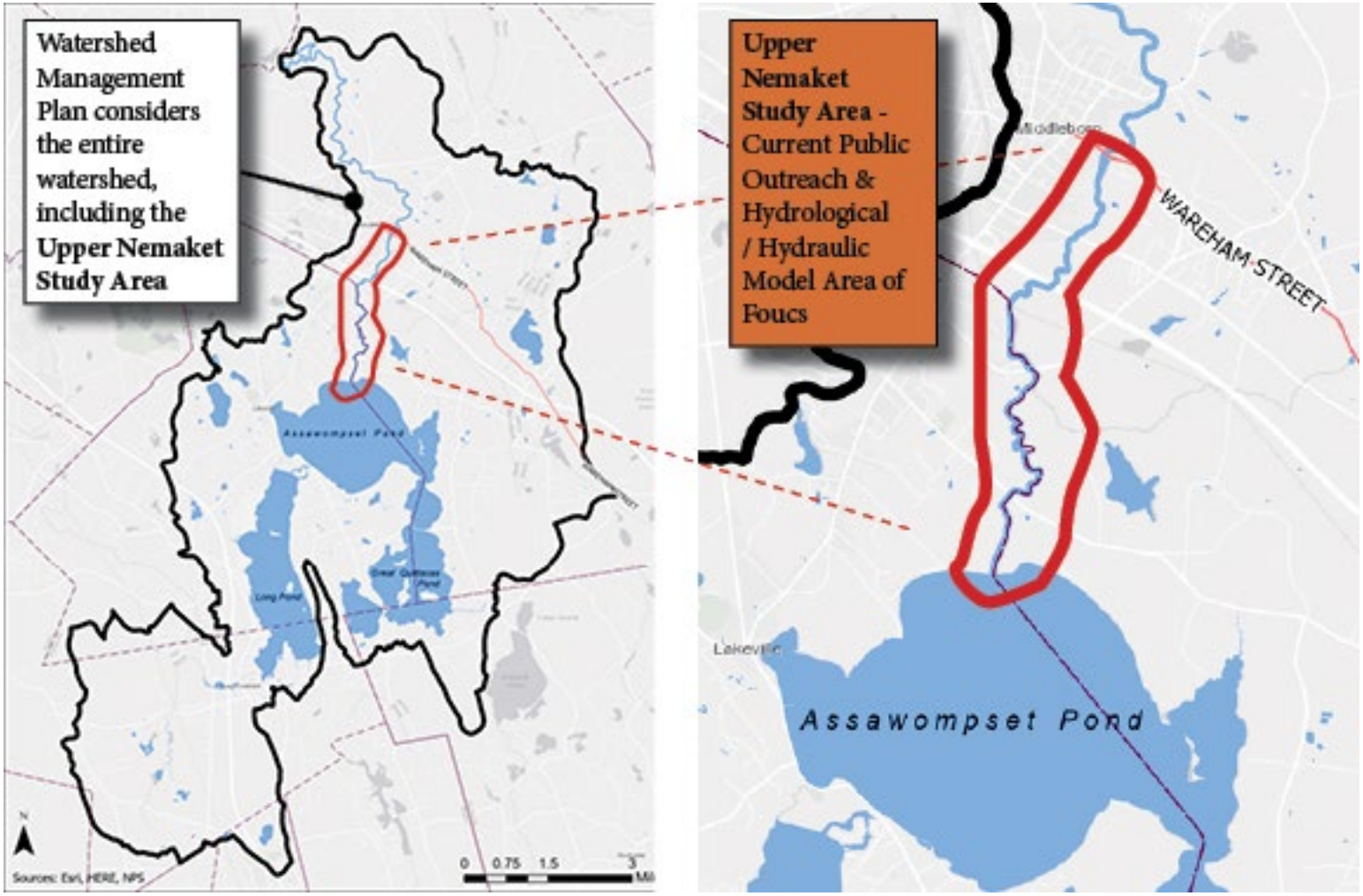
Emily Vogler
Commonplace
Landscape and Planning
RISD

Eric Walberg, AICP
Climate Services

STEERING COMMITTEE

- **Nancy Yeatts -** Town of Lakeville, Environmental Manager of the APC
- **Tom Barron -** Herring Commission
- **Trish Cassady -** Town of Middleborough, Cons. Agent
- **Lia Fabian -**Town of Lakeville, Selectman
- **Mike Arruda -** City of Taunton, Water Supervisor
- **Ymane Galotti -** NB water supply - director
- **Patti Kellogg -**MASS DEP
- **Chris Peck -** Middleborough, Director of Public Works
- **Martha Schroeder -** Lakeville Open Space Recreation Committee
- **Monica Bently-** TRWA, Wild and Scenic Taunton River Stewardship Council (NPS), Chair of the W & S Council's River Access Committee
- **James (Jim) Turek-** NOAA, Restoration Ecologist
- **Brad Chase -** MA DMF, Diadromous Fisheries Project Leader
- **Nathan Demers-** Town of Middleborough, Selectmen
- **Roger Desrosiers (Gray Fox) -** Dighton Intertribal Indian Council
- **Donna Desrosiers (Spirit Fox) -** Dighton Intertribal Indian Council

APC WATERSHED MANAGEMENT PLAN vs. UPPER NEMASKET RIVER ENHANCEMENT PLAN



TIME FRAME OF CHANGES:
PARALLEL IMMEDIATE + LONG TERM PROCESSES

IMMEDIATE ACTIONABLE ITEMS

Remove Weeds from Long Pond and Nemasket River- Summer 2022 + 2023. Funding in place to support.

Address Sedimentation with a 5 year emergency permit- Working on permit for August ConCom Meeting

LONG-TERM PLANNING

Upper Nemasket River Enhancement Plan +
Apc Watershed Management Plan

BALANCING MULTIPLE PROJECT OBJECTIVES

Developed at Previous Public Meetings

ECOLOGICAL OBJECTIVES

- Improve fish passage
- Improve water quality
- Improve riparian and aquatic habitat
- Improve low flow aquatic connectivity

INFRASTRUCTURAL OBJECTIVES

- Minimize flood damage to infrastructure and property upstream of APC Dam
- Minimize flood damage to infrastructure and property downstream of APC Dam
- Improve ability to manage water levels in pond to help ensure water supplies
- Reduce ongoing maintenance by working with river morphology

SOCIAL OBJECTIVES

- Maximize quality and quantity of recreation on the river
- Minimize cost

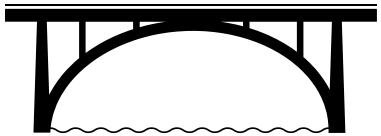
UPPER NEMASKET RIVER ENHANCEMENT PLAN GUIDING PRINCIPLES

- Take a holistic approach to the river
- Work with river morphology to reduce need for ongoing maintenance
- Where possible, work towards multi-functional solutions
- Anticipate a future climate with more severe flooding and more severe droughts
- Expand the way we think of the river - understand the whole watershed as a gradient of moisture where water can be held and stored in wetlands and infiltrated to help reduce flooding and to recharge river during low flow conditions

ALTERNATIVE PACKAGES

PACKAGES MADE UP OF 3 DIFFERENT ELEMENTS

DAMS



BRIDGES

RIVER CHANNEL

LIST OF ALTERNATIVES:

ASSAWOMPSET POND DAM

1. Do nothing
2. Replace/Modify dam
4. Restore hydrological connection to wetlands through berm
5. Sediment trap

RIVER CHANNEL

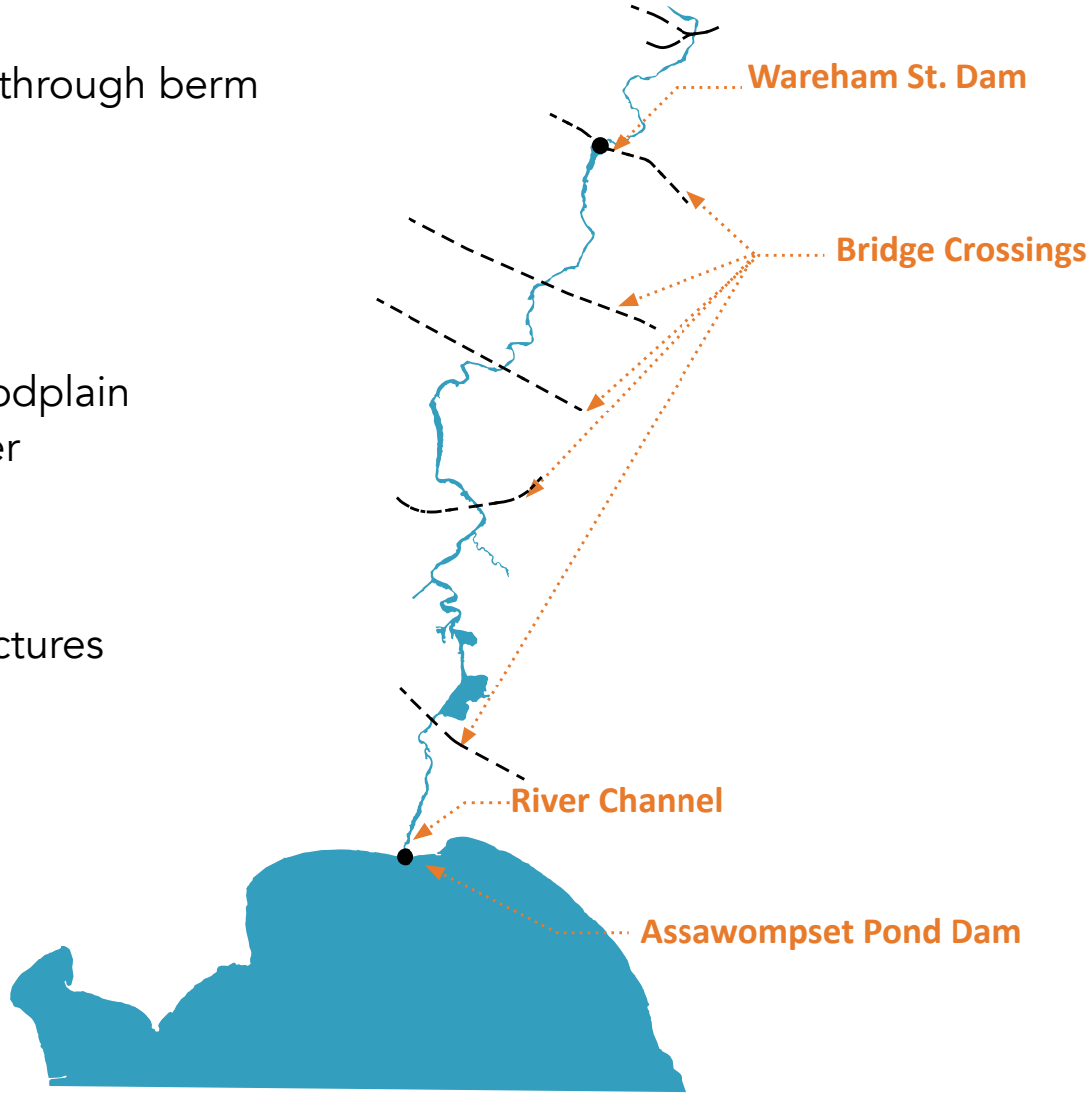
1. Do nothing
2. Dredge channel
3. Reconnect river to adjacent wetlands and floodplain
4. Redesign river channel - Narrower and deeper

BRIDGE CROSSINGS

1. Do nothing
2. Evaluate replacement/removal of bridge structures

WAREHAM STREET DAM

1. Do nothing
2. Remove dam



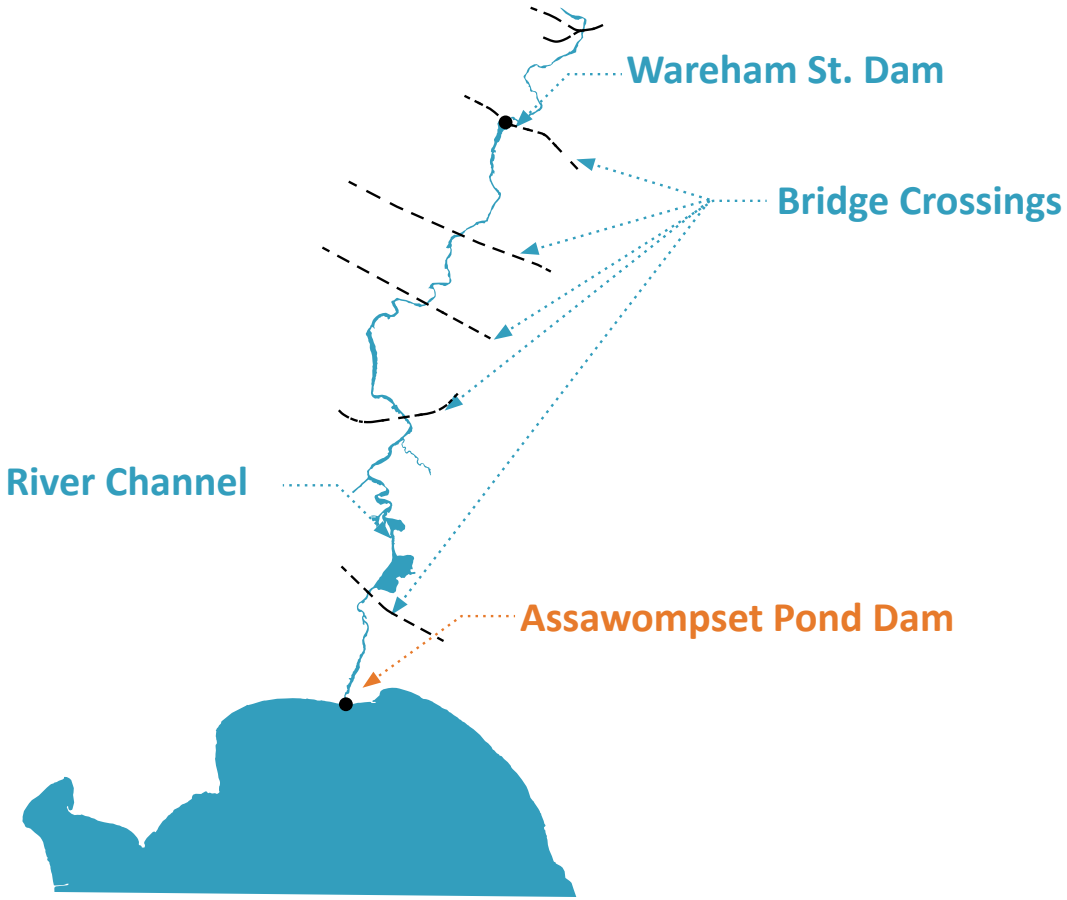
HYDROLOGIC AND HYDRAULIC MODELING

Modelling Approach

1. Run Bridge Modification, Wareham St. Dam removal, and channel modification scenarios individually

2. Combine most effective river restoration scenarios as “hybrid” models

3. Separately evaluate Assawompset Pond Dam replacement scenarios.
    - River restoration scenarios inform the “tailwater” conditions at the dam



Upper River Corridor HEC-RAS Model

- Focus on Upper Nemasket from AWP down to Route 105 Middleboro

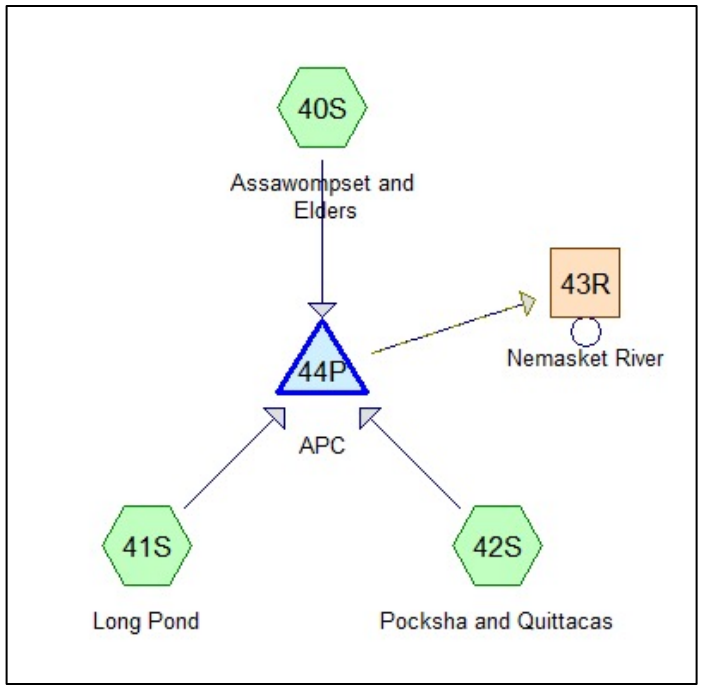
- Used to evaluate potential alterations to river corridor (e.g., dams, bridges, channel modification, dredging, floodplain changes)

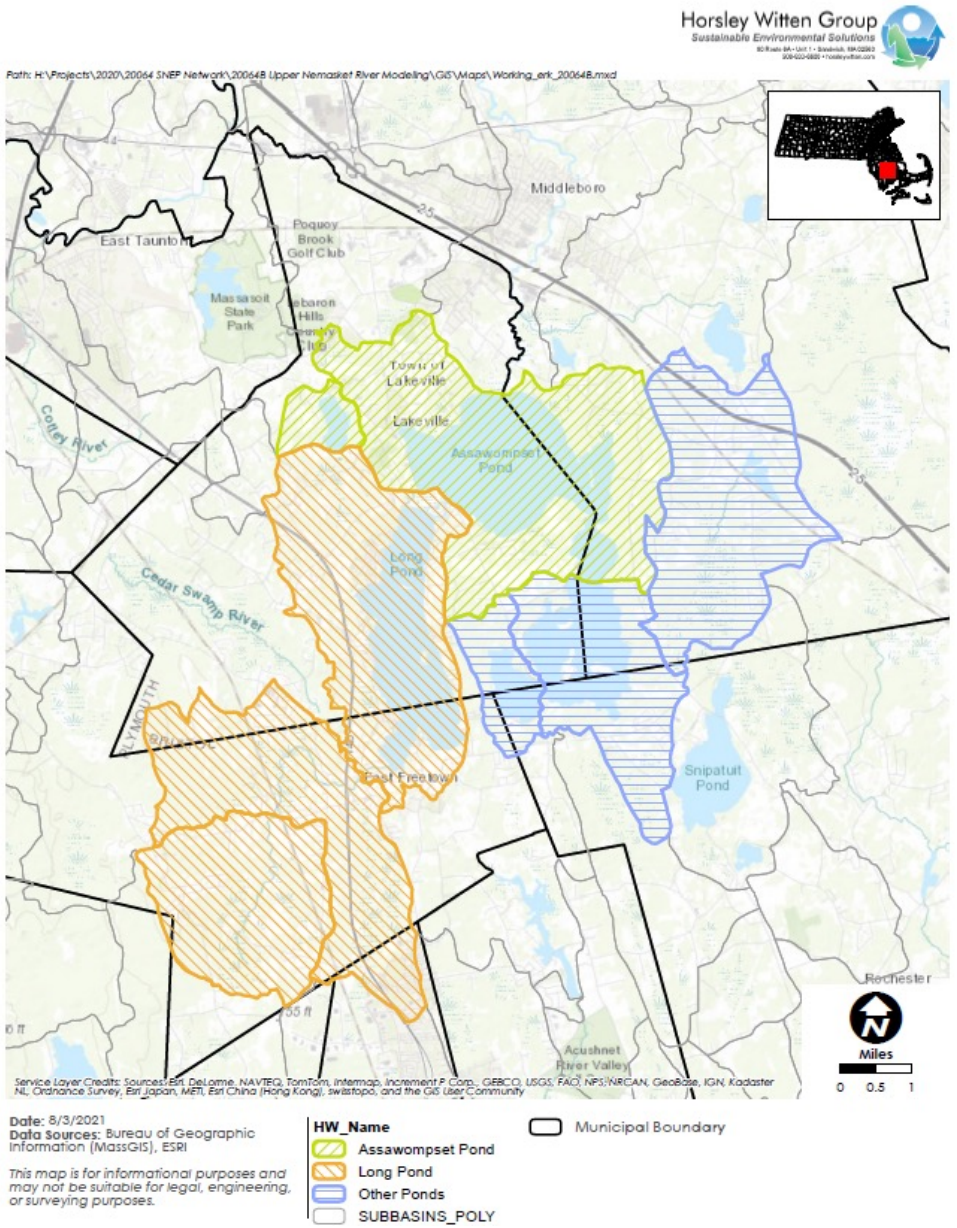
- Added 14 new transects, with focus on:
  - Assawompset Pond Dam
  - Wareham Street Dam
  - MBTA Bridge
  - Old Bridge Street/Bridge Street Bridges
  - Vaughan Street Bridge

- Updated FEMA topography and geometry of dams and road crossings

Developing HydroCAD Model for the APC

- Created separate HydroCAD model to evaluate Assawompset Pond Dam
- Watershed area, land use, and rain depths are main inputs
- Tailwater beneath APC dam defined by HEC-RAS model simulations.





1.
RIVER CHANNEL PACKAGES

THERE ARE SERIOUS ISSUES ON THE RIVER

FLOODING

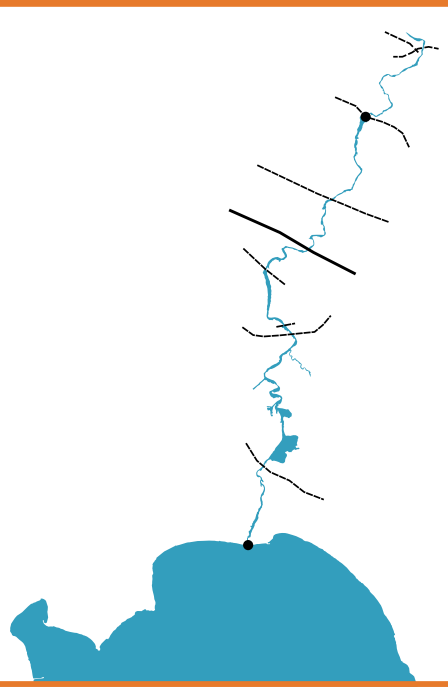
LOW FLOW

FISH PASSAGE

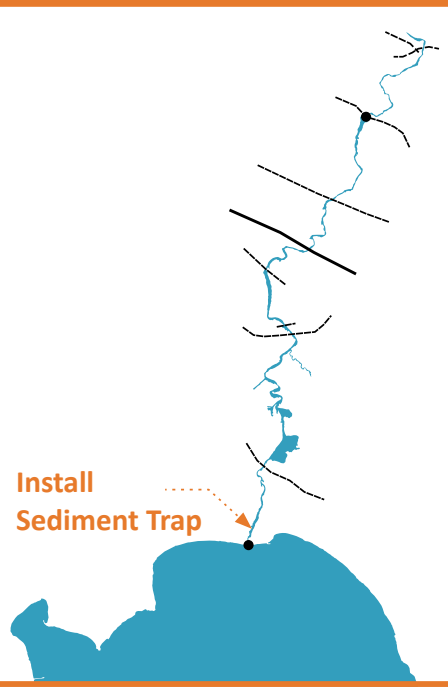
WATER QUALITY

- MASS DEP recently added the upper Nemasket River to the Impaired Water list for not supporting the Aquatic Life Use due to low dissolved oxygen, high temperatures, and aquatic toxicity

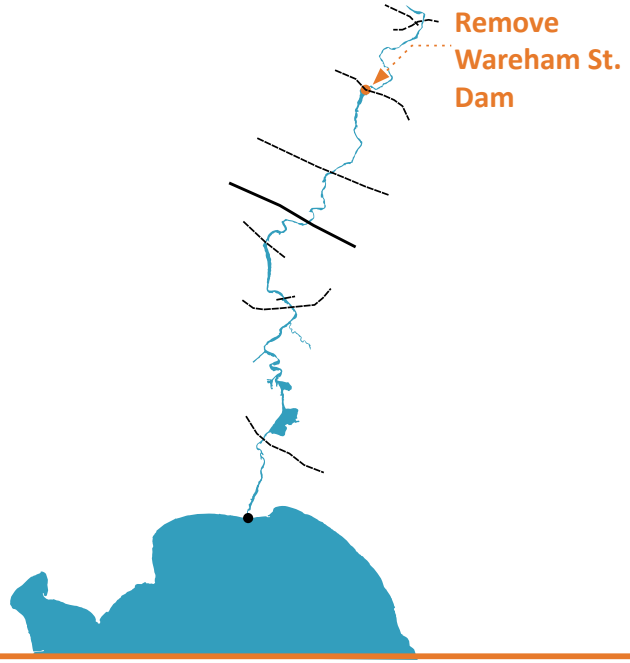
ALTERNATIVE 1: DO NOTHING



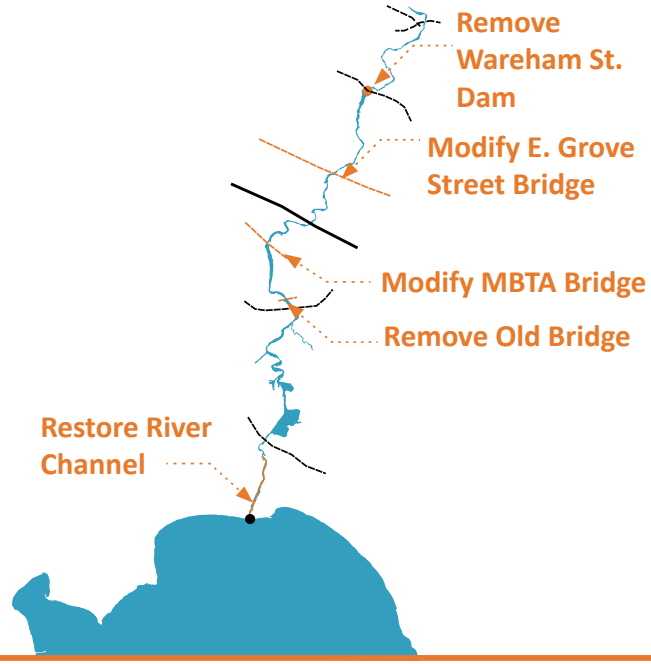
ALTERNATIVE 2: SEDIMENT TRAP



ALTERNATIVE 3: REMOVE WAREHAM ST. DAM



ALTERNATIVE 4: FULL RIVER RESTORATION



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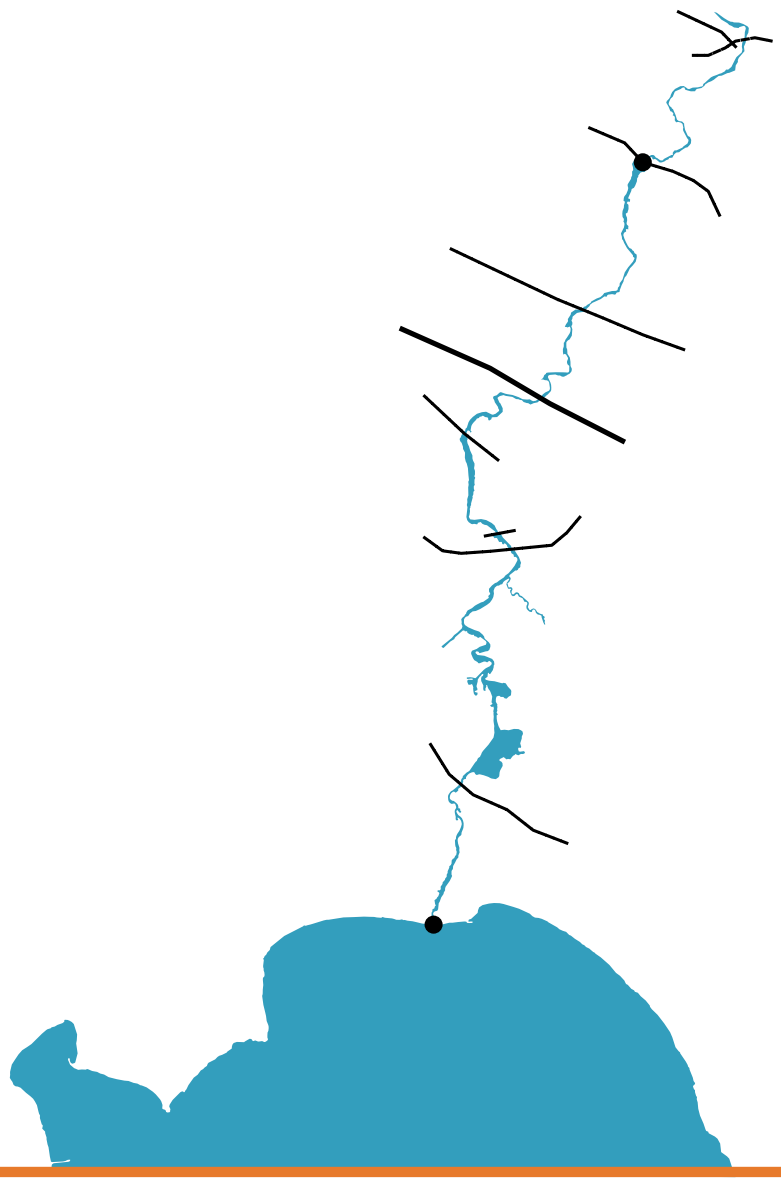
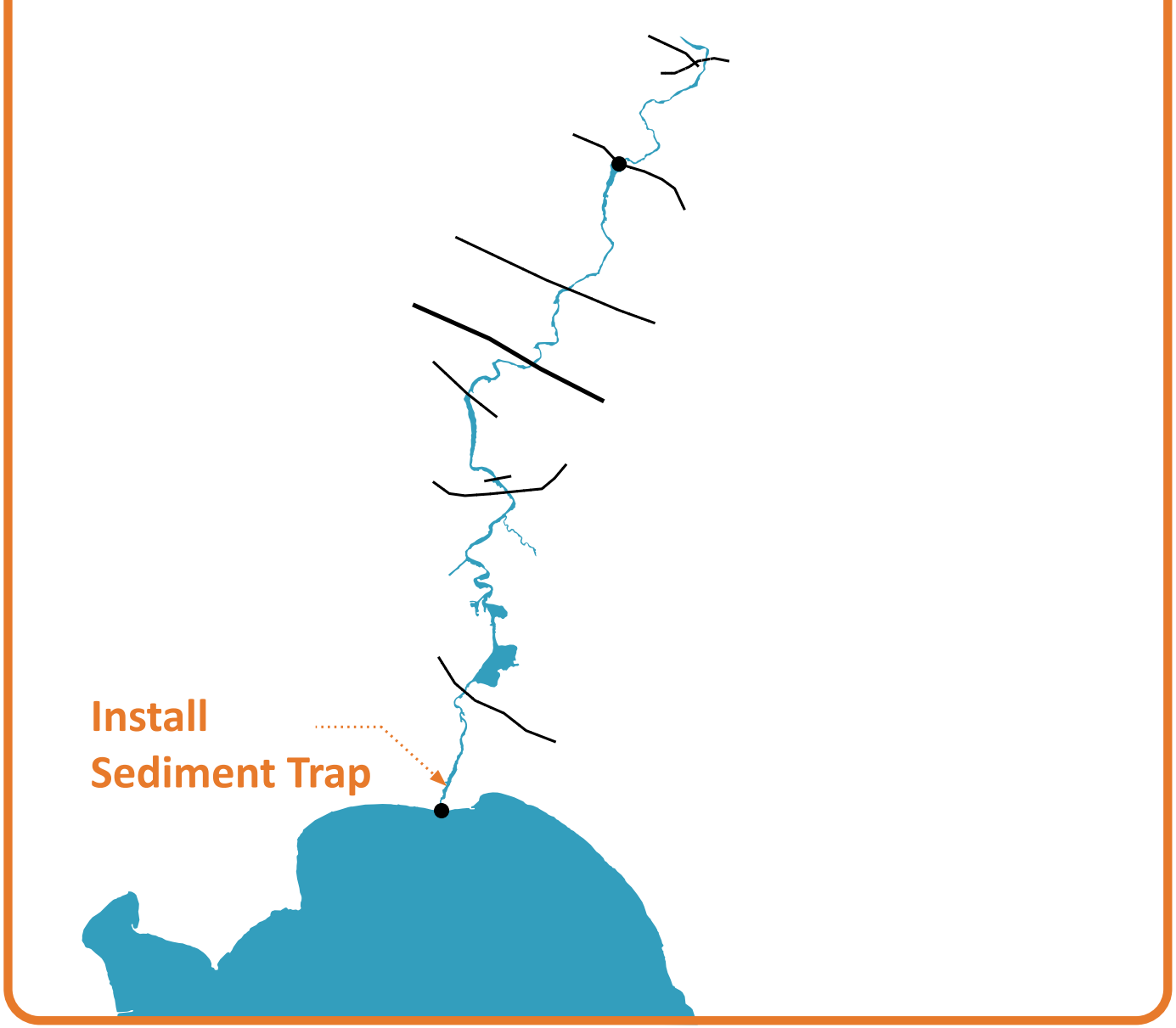
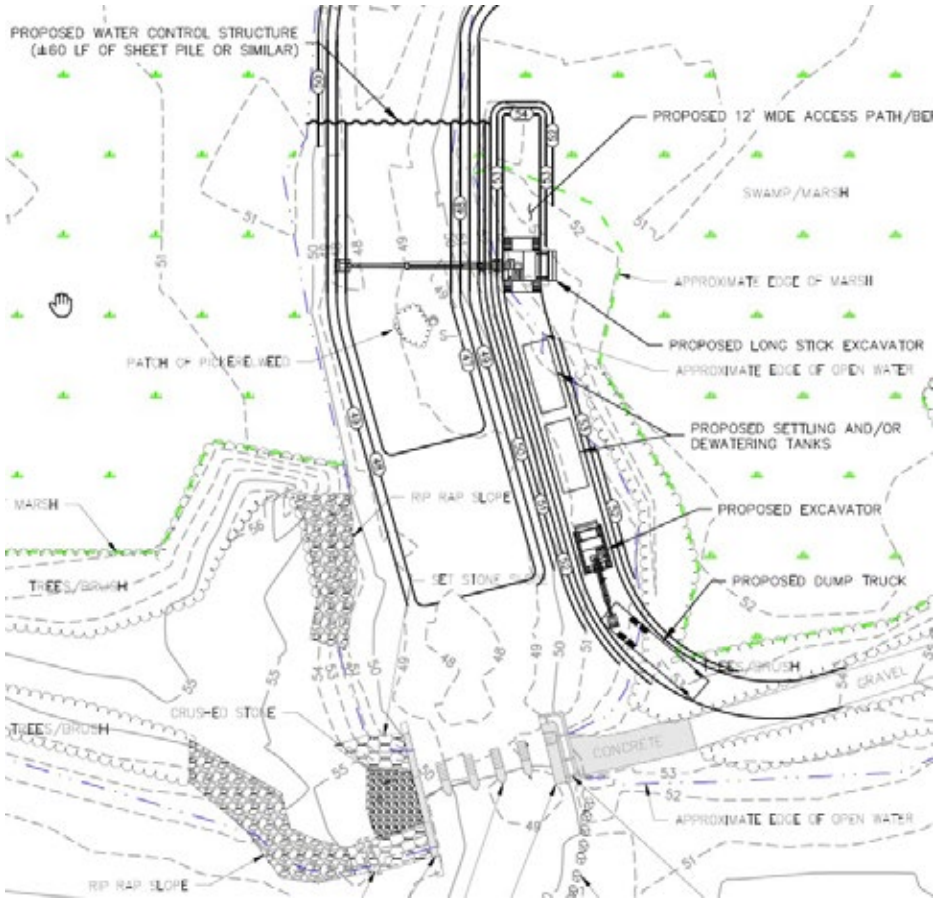


ALTERNATIVE 2: SEDIMENT TRAP

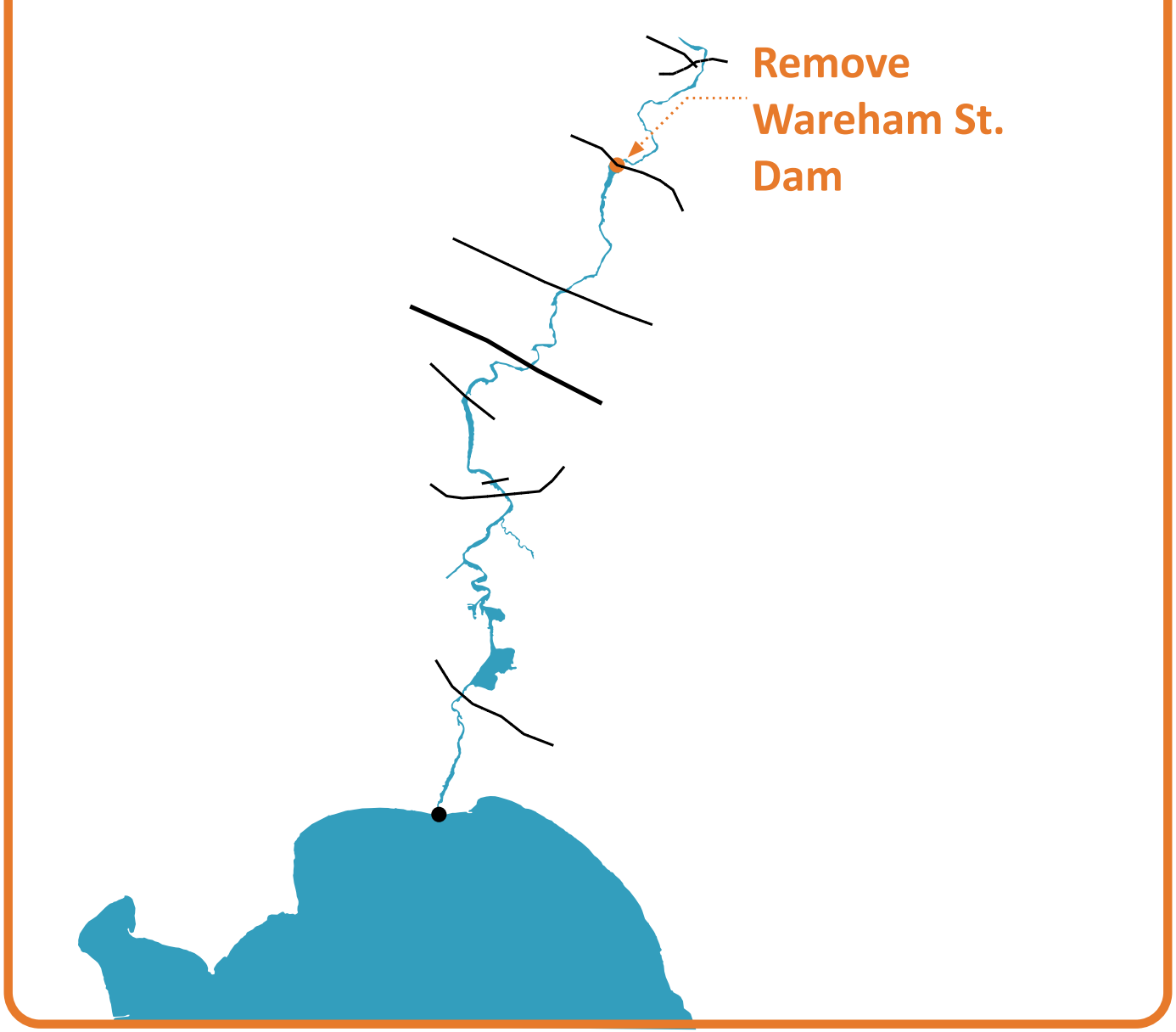


Sediment Trap and Dredge – Outback Engineering Plan

- Expected to capture suspended sand that is carried in the river during modeled flow events
- Simulated to produce flow velocities suitable for settling of silt and fine sand.
- More effective at lower flow rates.
- Sediment input supply uncertain so time required to fill trap uncertain



ALTERNATIVE 3: REMOVE WAREHAM ST. DAM

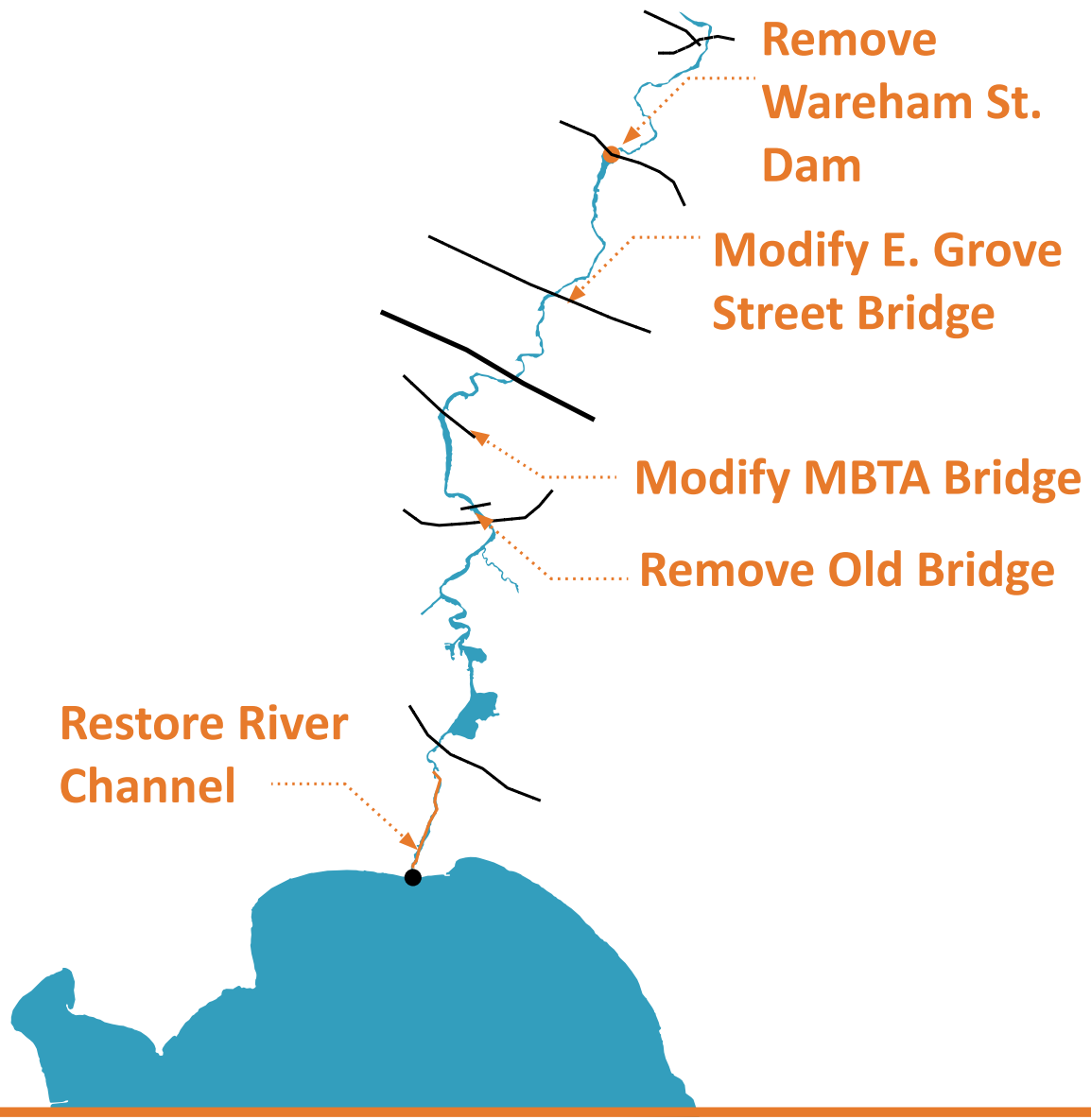


Removal Of Wareham St Dam and Weir

Hopewell Mills Dam Removal- Mill River, Taunton

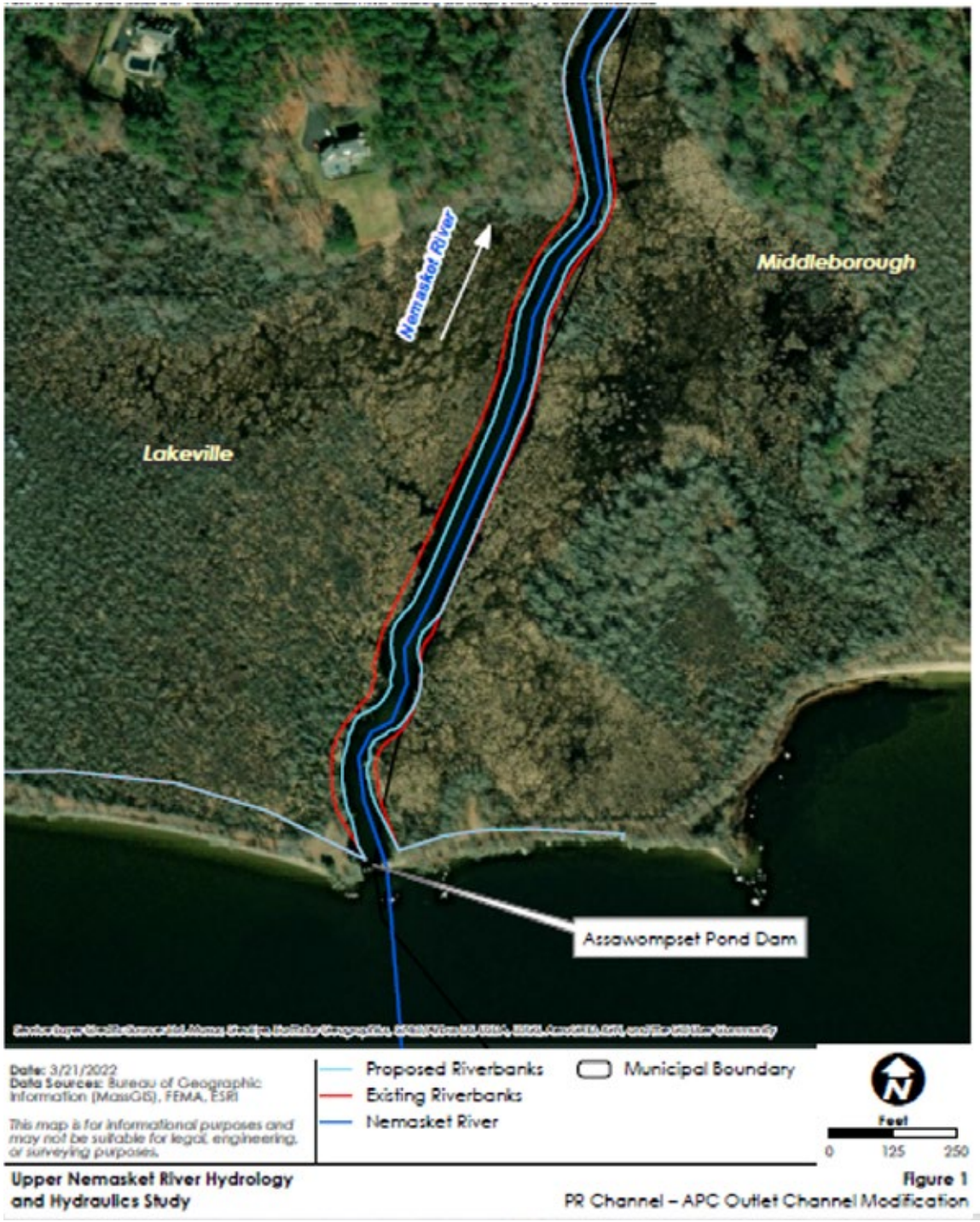
Massachusetts Department of Fish and Game
Division of Ecological Restoration
Invested in Nature and Community

ALTERNATIVE 4: FULL RIVER RESTORATION



Channel Restoration

- Channel narrowed from current approximately 100’ width down to 54’ bankfull width
- Velocity in channel increase, reducing sediment buildup
- Reconnection of channel downstream of APC dam to adjacent floodplain

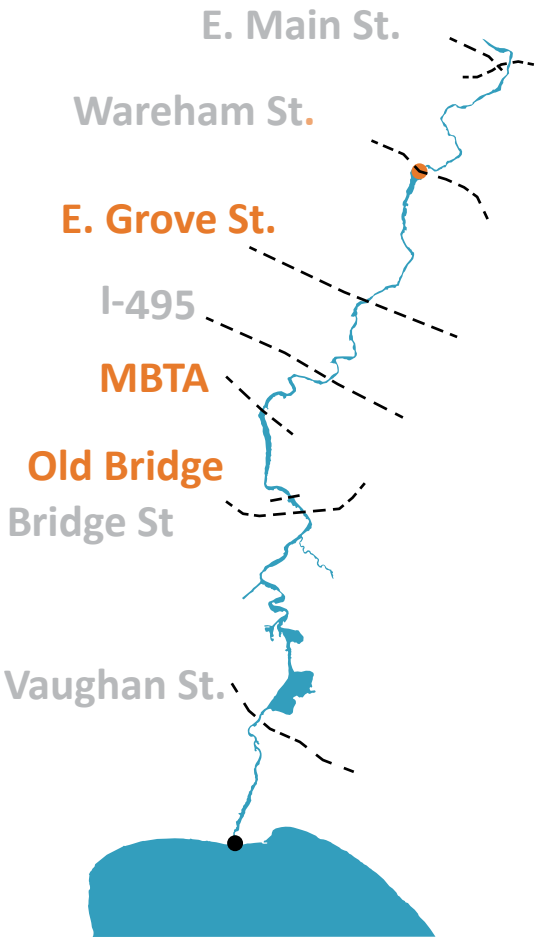


BRIDGE CROSSINGS

- Bridge crossings are places along the river where the flow is pinched which can lead to flooding and sedimentation

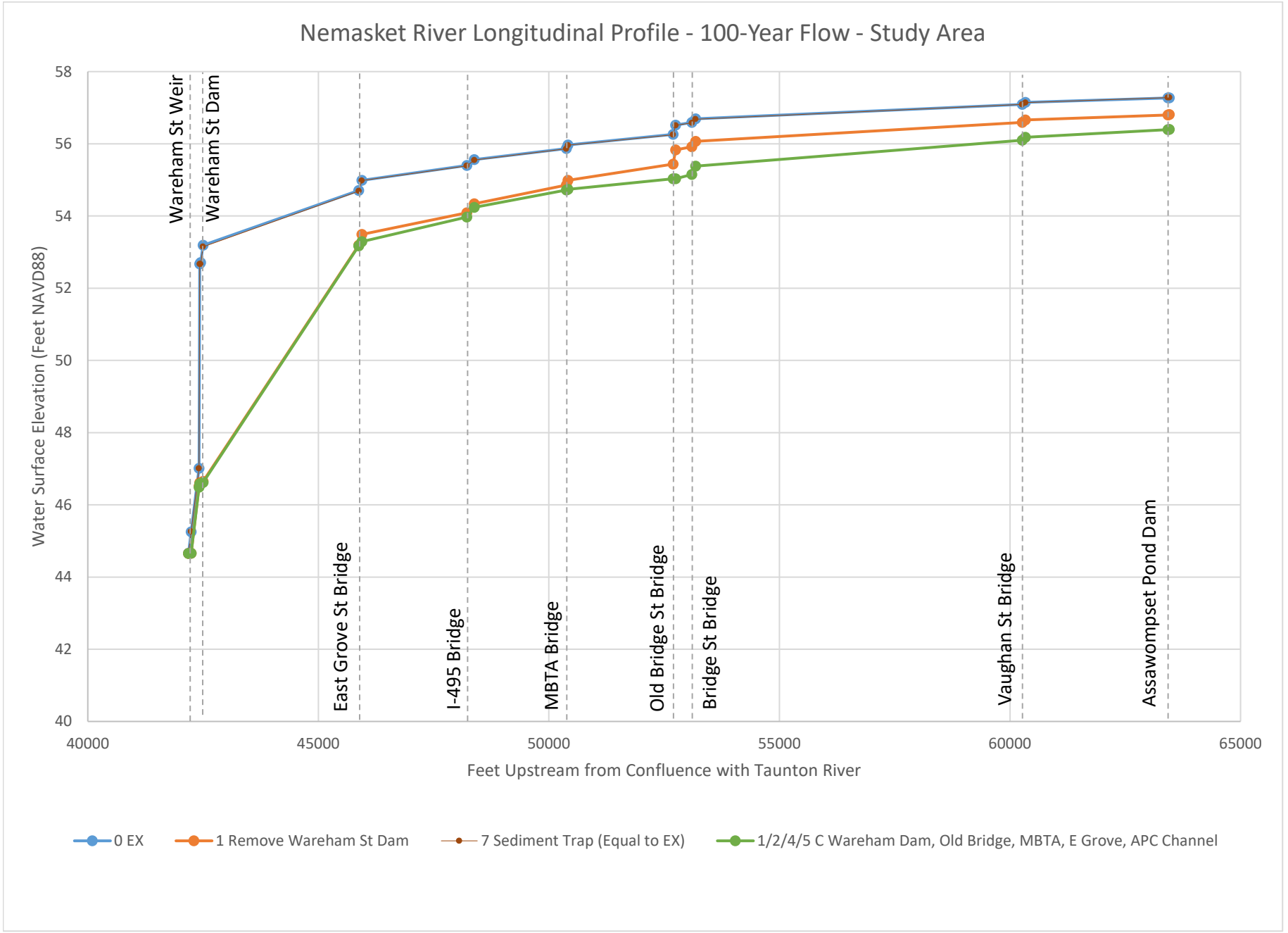
- The goal with bridge modification is to widen the opening (span) below the bridge to allow for the river to flow through with less restrictions

	Current Span (ft)	Proposed Span (ft)
E. Grove St.	22′	80′
MBTA	40′	80′
Old Bridge	35′	Remove



EVALUATING THE ALTERNATIVES

FLOODING - Alternatives



FLOODING

Restoration Scenario	Flooded Area (100-year)	Buildings Impacted
Existing Conditions	723 acres	27
Wareham Street Dam Removed	680 acres	23
"Optimal" (Wareham Dam Removed, 3 Bridges Modified, Channel Restored)	653 acres	19

- With Wareham Dam Removed Only…
  - 6% reduction in flooded area
  - 4 buildings no longer in flooded area

- Under Full River Restoration Scenario…
  - 10% reduction in flooded area
  - 8 buildings no longer in flooded area

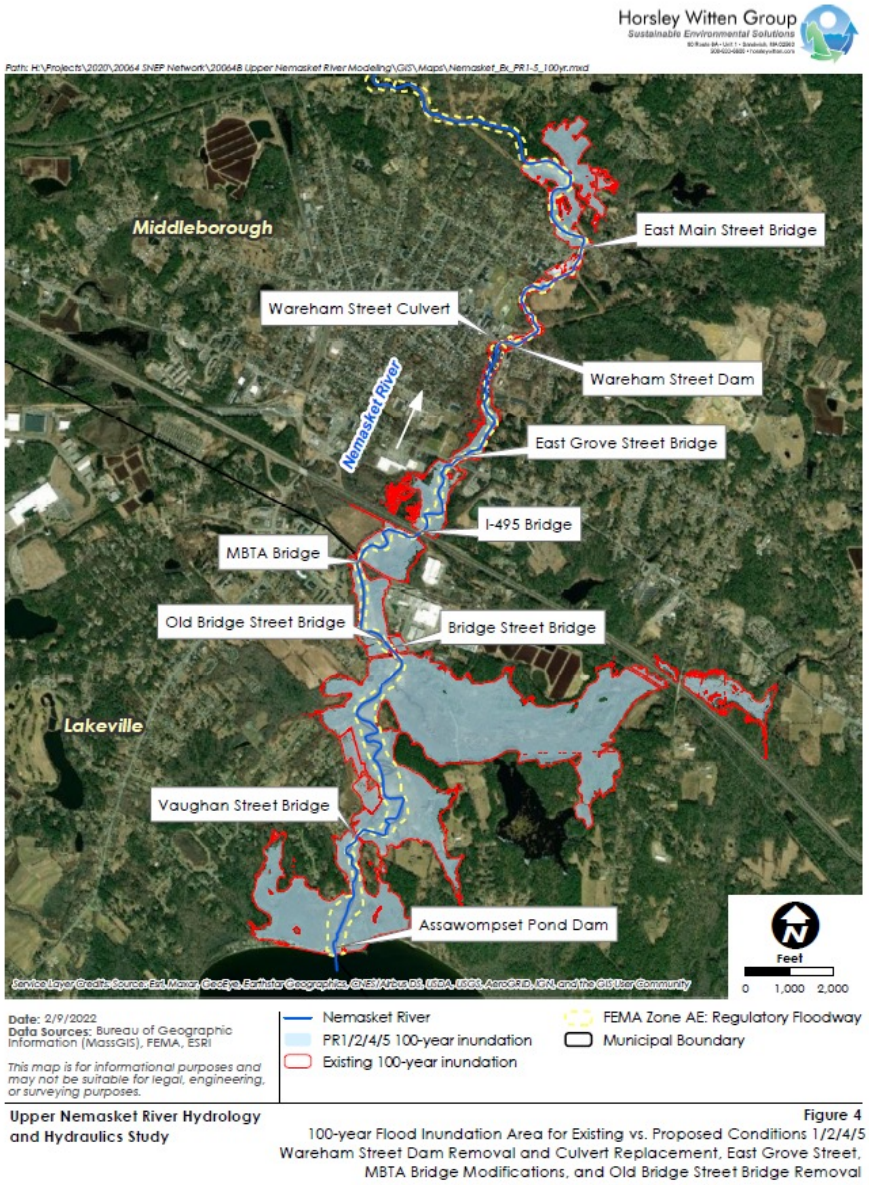


Figure 4
100-year Flood Inundation Area for Existing vs. Proposed Conditions 1/2/4/5 Wareham Street Dam Removal and Culvert Replacement, East Grove Street, MBTA Bridge Modifications, and Old Bridge Street Bridge Removal

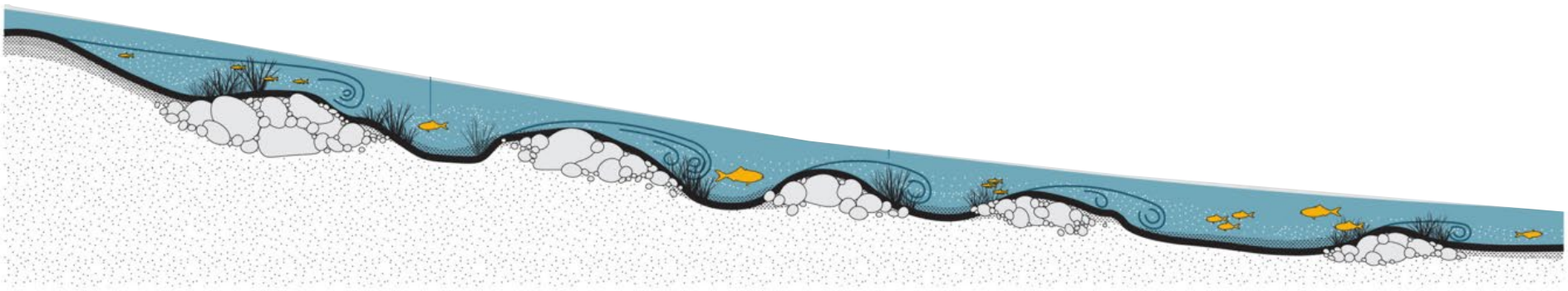
FISH PASSAGE

- Fish passage is evaluated in terms of two criteria:

  1. Are water depths deep enough for fish passage during **low flow conditions?**

  2. Are water velocities low enough for fish swimming upstream during **high flow conditions.**

- Fish species of concern evaluated are blueback and alewife herring.
- Minimum water depth for those species is **0.5 feet** (USFW).
- Maximum burst speed for those species is 3.5 fps (NRCS).

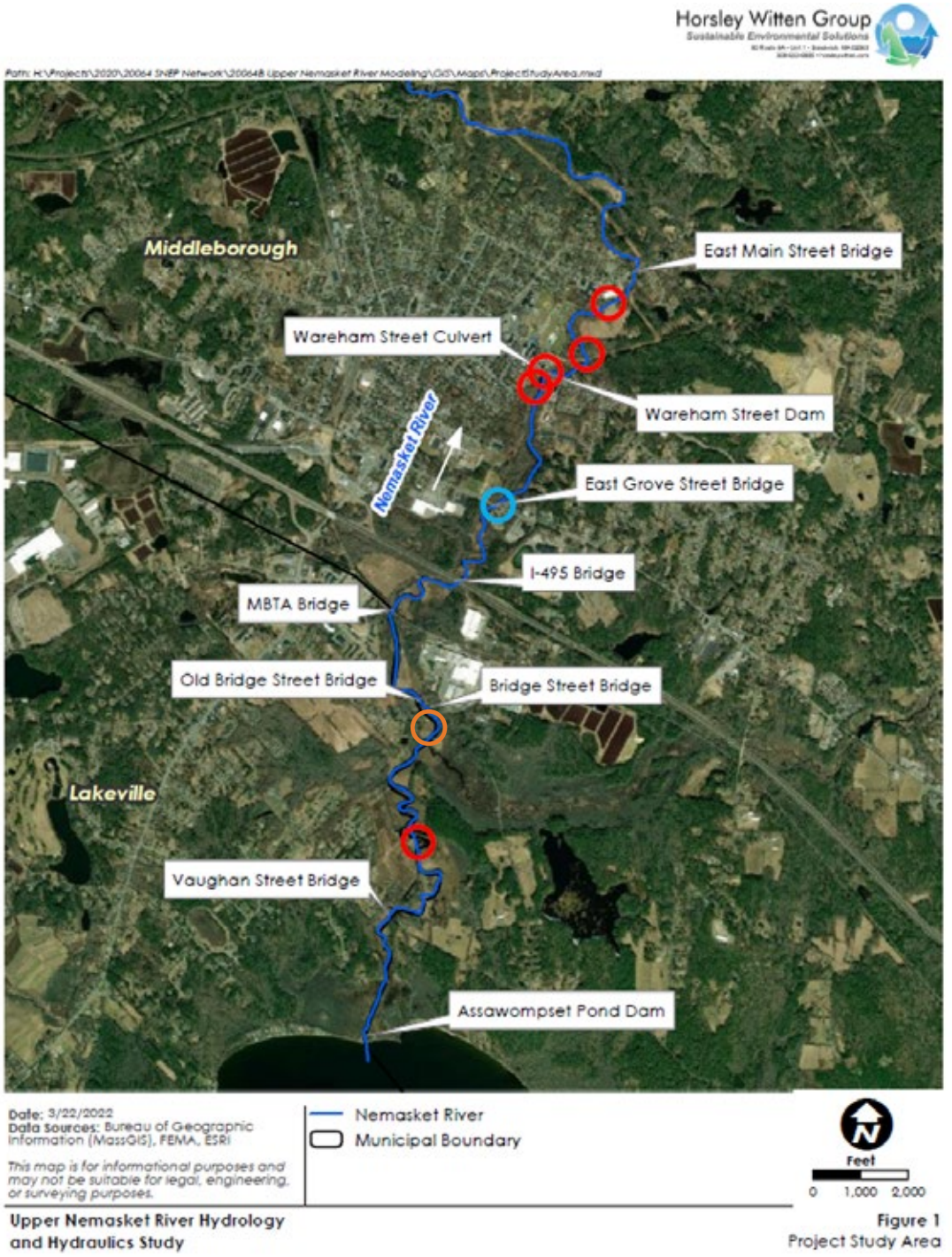


FISH PASSAGE

- Existing barriers to passage
  - Water depths are too shallow for herring during **low flow** at 7 locations circled in **red**
  - Water velocity is not too fast for herring during **high flow** at any location

- Removal of Wareham Street Dam
  - East Grove Street **(blue)** shallow location is removed.
  - Greatly improved passage at Wareham Street

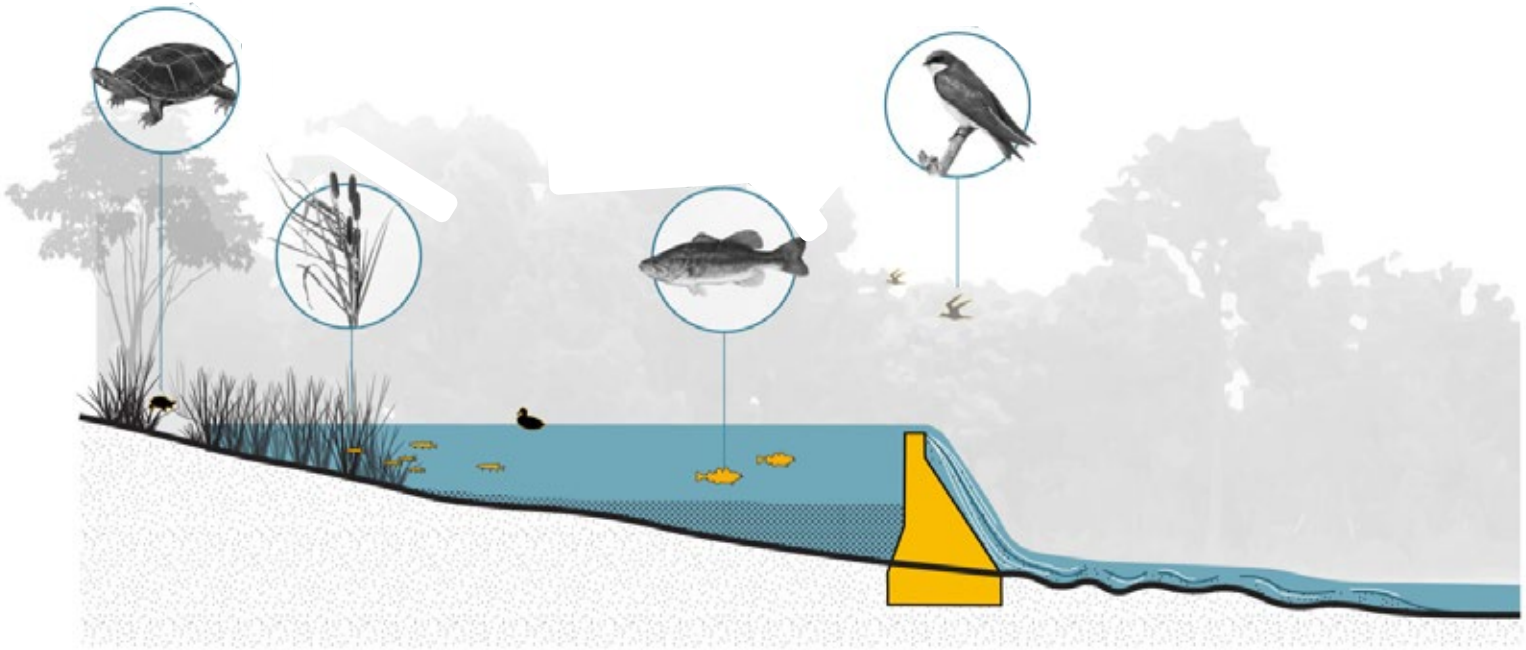
- Full River Restoration Scenario also removes shallow point up-stream of Bridge Street **(Orange)**



Additional Ecological Impacts

EXISTING CONDITIONS - DAMS + OBSTRUCTIONS

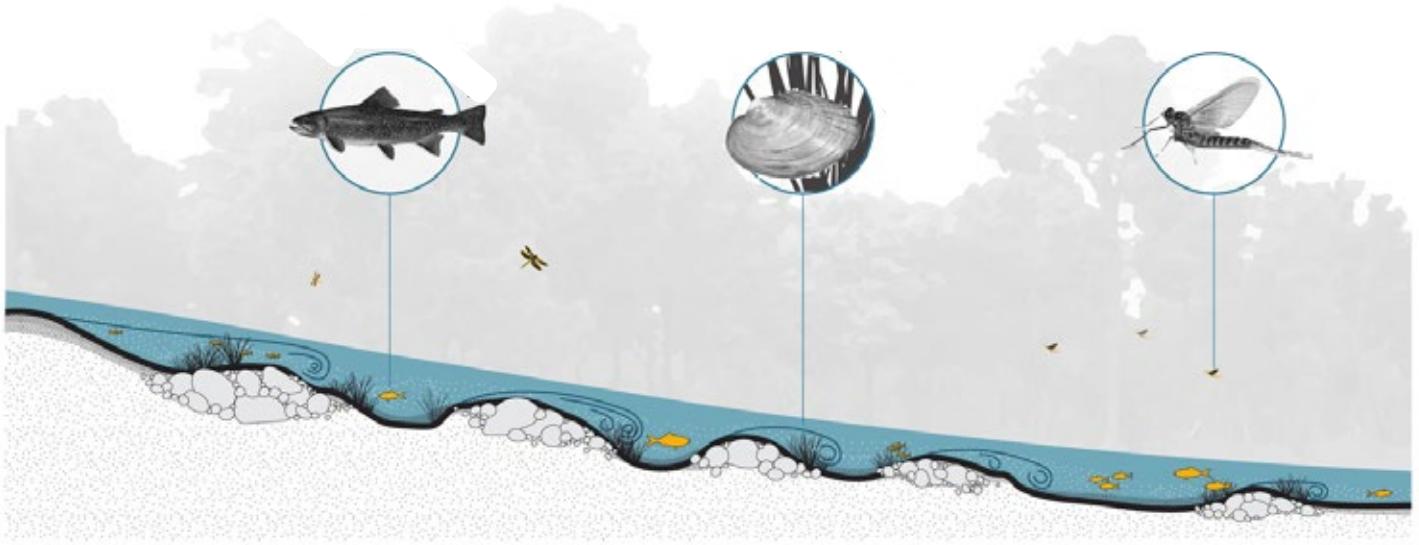
- Increases siltation and turbidity
- Increases water temperatures which hold less dissolved oxygen
- Suitable for some common species, such as mallards, sunfish, and painted and snapping turtles, and some invasive plants tolerant of more degraded conditions.
- Alters substrates, native vegetation, and eliminates riffles, runs, and pools important for some habitat specialists



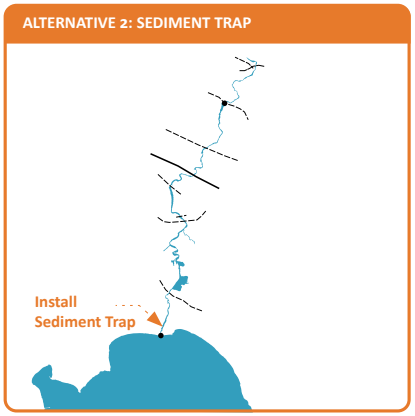
Additional Ecological Impacts

RIVER RESTORATION SCENARIOS

- Allows for unobstructed fish and wildlife passage
- Helps maintain adequate water quantity
- Maintains cooler water temperatures which increases dissolved oxygen levels
- Transports sediments downstream.
- Provides habitat for specialists, such as spawning blueback herring, bridle shiner, and invertebrates associated with good water quality, including freshwater mussels, caddisflies, mayflies, and stoneflies.

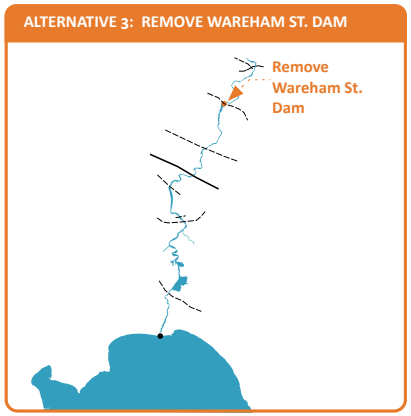


SUMMARY:



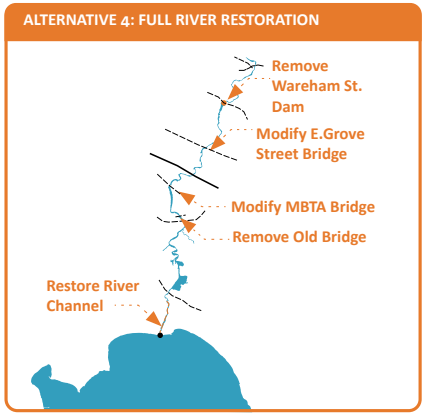
Sediment Trap

- Little impact on flood control/water levels
- Likely difficult to permit
- Impacts on fish passage unclear
- Does not work with river morphology- will require ongoing maintenance



Wareham St. Dam removal

- Reduces flood area
- Increases energy gradient which will lead to less sediment
- Improves fish passage
- Improves water quality and habitat
- Works with river morphology



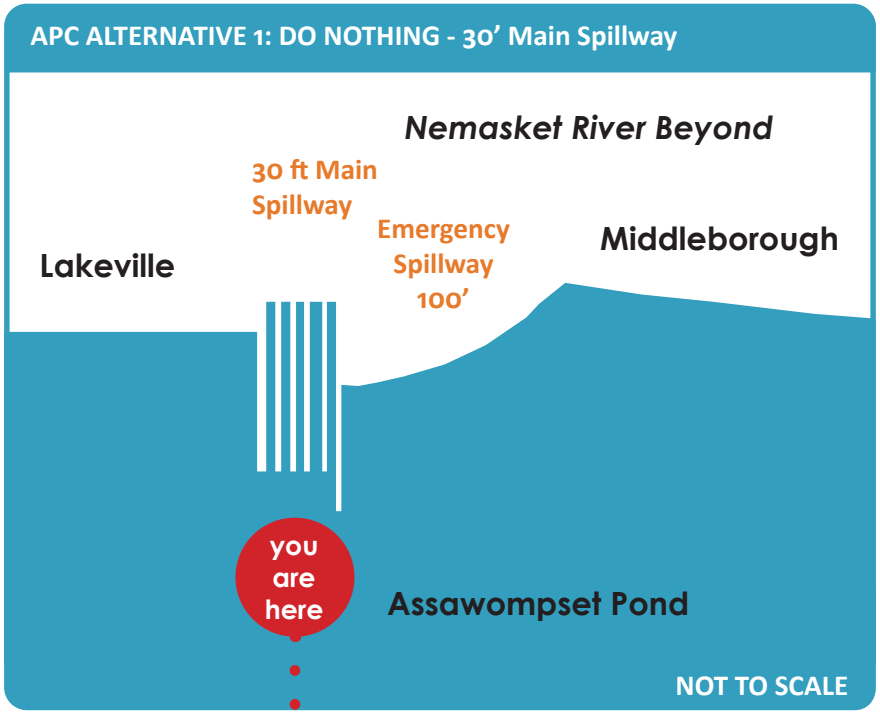
Full River Restoration Package

- Greatest impact on flood reduction
- Greatest increase in energy gradient + reduction in sediment
- Greatest improvement of fish passage
- Greatest improvement of water quality and habitat
- Greatest alignment with river morphology reducing ongoing maintenance

2.
APC DAM ALTERNATIVES

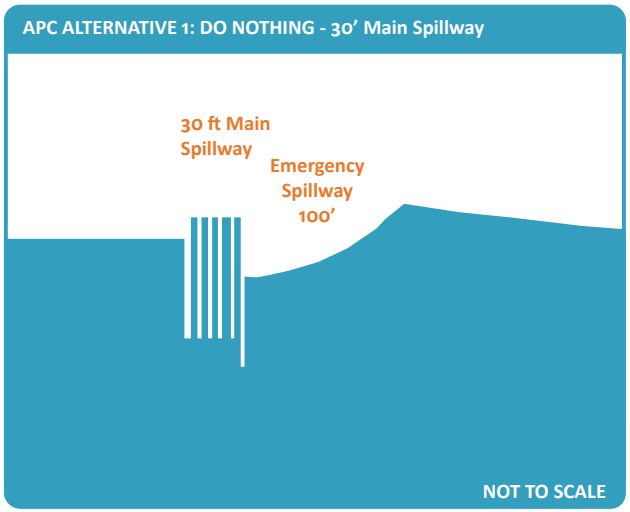
A note on reading the diagrams that follow

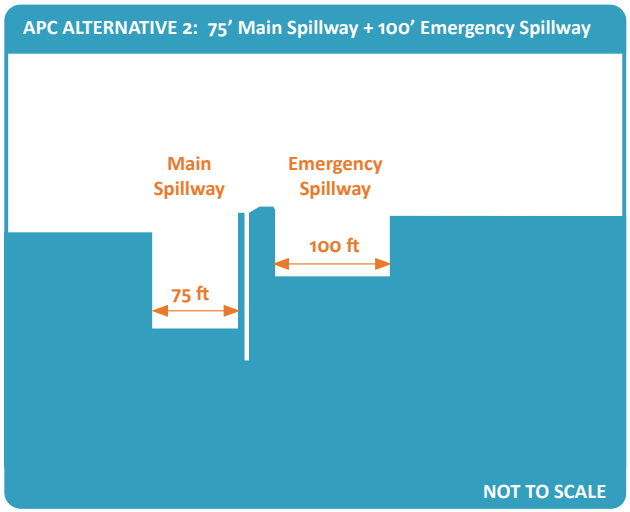
There are diagrams in the slides that follow that look like the blue diagram below. When you look at the diagrams, you are standing in the APC looking downstream toward the Nemasket River, as in the picture below from 2020 (during drought conditions), showing the same vantage point.

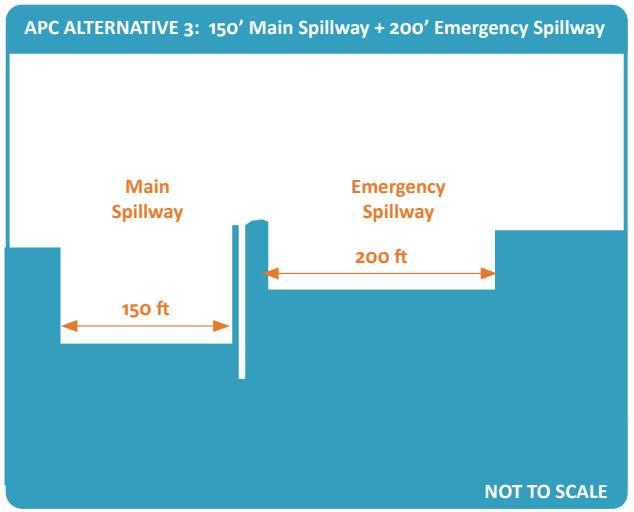


Assawompset Pond Dam Replacement Alternatives

- Minimize flood damage to infrastructure and property upstream of APC
- Improve ability to manage water levels in pond to help ensure water supplies during drought conditions and minimize safety risk to workers
- The ultimate design of the dam will allow for water levels to be raised and lowered in the ponds (similar to how the boards are used now). Therefore, the operation of the dam will determine how much water is kept in the pond vs released downstream.







APC Dam Alternatives – No Alterations in Nemasket

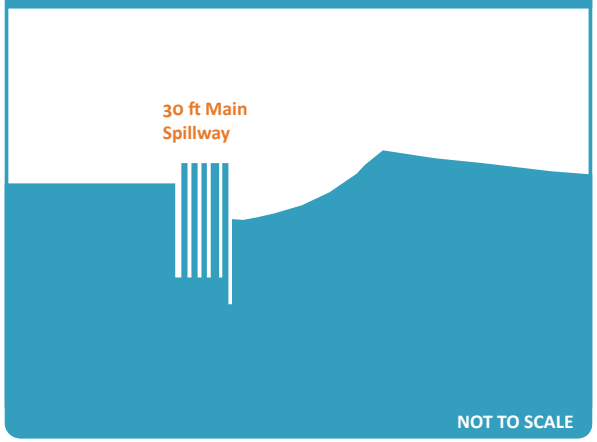
- Pond levels can be curbed up to 0.64 feet by widest dam
- Wider dams can decrease flooded times in the APC from 13 days down to as low as 2.5 days
- Widest dams hold water above lowest target level for 3-4 weeks
    - Assumes no rain

	Peak APC Elevation (NAVD88, ft)		Time to drop from 100-year El to 52.82' (Days)	Time to drop from 52.82' to 51.32' (Days) **
	2- Year	100- Year		
Do Nothing: 30' Main 100'Emergency	54.76	57.27*	12.9	85.3
APC Alternative 2: 75' Main 100'Emergency	54.73	56.93	4.9	30.5
APC Alternative 3: 150' Main 200'Emergency	54.67	56.63	2.4	22.2

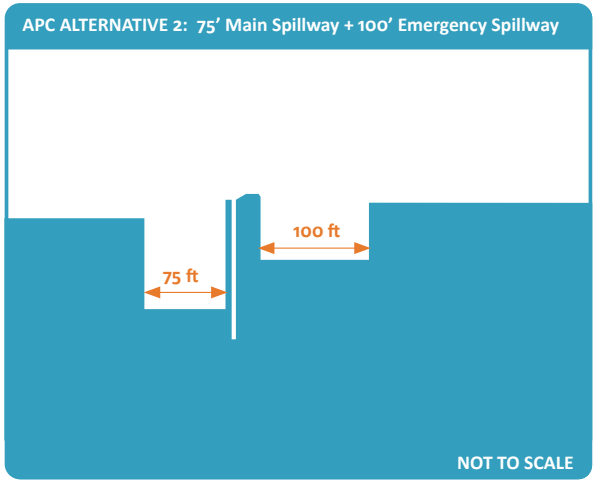
*Blue asterisk indicates water level above FEMA 100-year flood elevation

** In the 52.82 to 51.32 drop time analysis, the main spillway was set at elevation 51.32

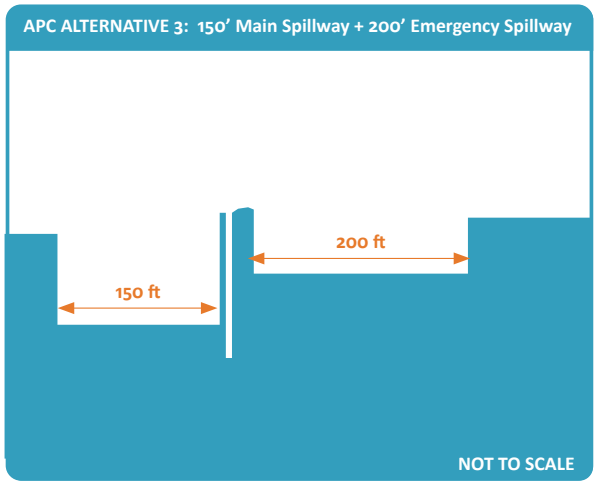
APC ALTERNATIVE 1: DO NOTHING - 30' Main Spillway



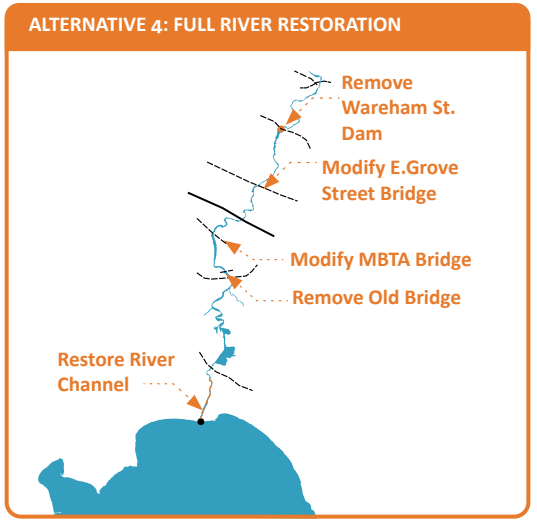
APC ALTERNATIVE 2: 75' Main Spillway + 100' Emergency Spillway



APC ALTERNATIVE 3: 150' Main Spillway + 200' Emergency Spillway



ALTERNATIVE 4: FULL RIVER RESTORATION



APC Dam Alternatives + Full River Restoration

- Little difference in terms of time to drop from peak flood levels or down to minimum target levels
- Significant difference in peak flood elevations in pond
    - 0.9-foot flood reduction even if APC Dam remains unchanged
    - .75 -foot maximum reduction (Alternative 3)

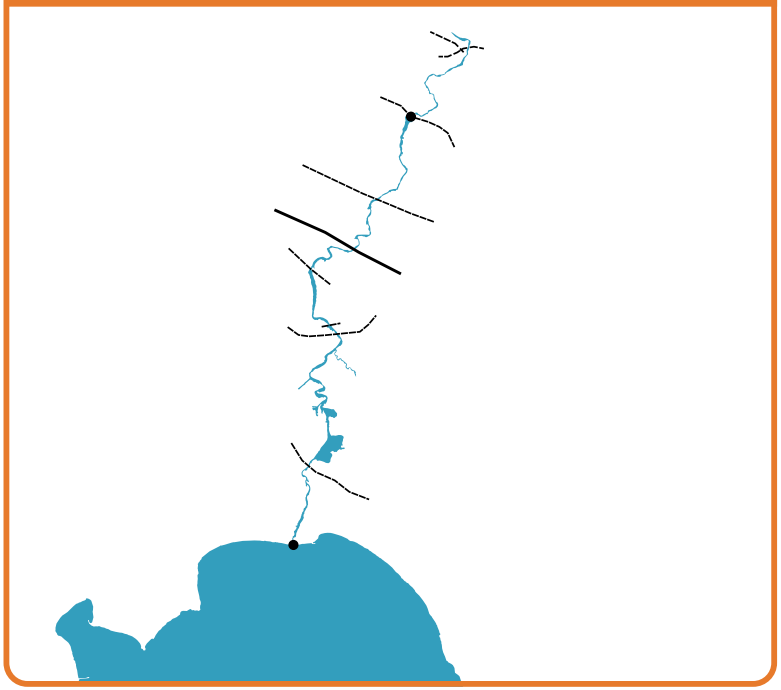
	Peak APC Elevation (NAVD88, ft)		Time to drop from 100-year El to 52.82' (Days)	Time to drop from 52.82' to 51.32' (Days) **
	2- Year	100- Year		
Do Nothing: 30' Main 100'Emergency	54.47 54.76	56.39 57.27*	11.9 12.9	85.3 ← With River Restoration 85.3 ← W/out River Restoration
APC Alternative 2: 75' Main 100'Emergency	54.43 54.73	56.19 56.93	4.5 4.9	29.8 30.5
APC Alternative 3: 150' Main 200'Emergency	54.38 54.67	55.89 56.63	2.2 2.4	21.7 22.2

*Asterisk indicates water level above FEMA 100-year flood elevation

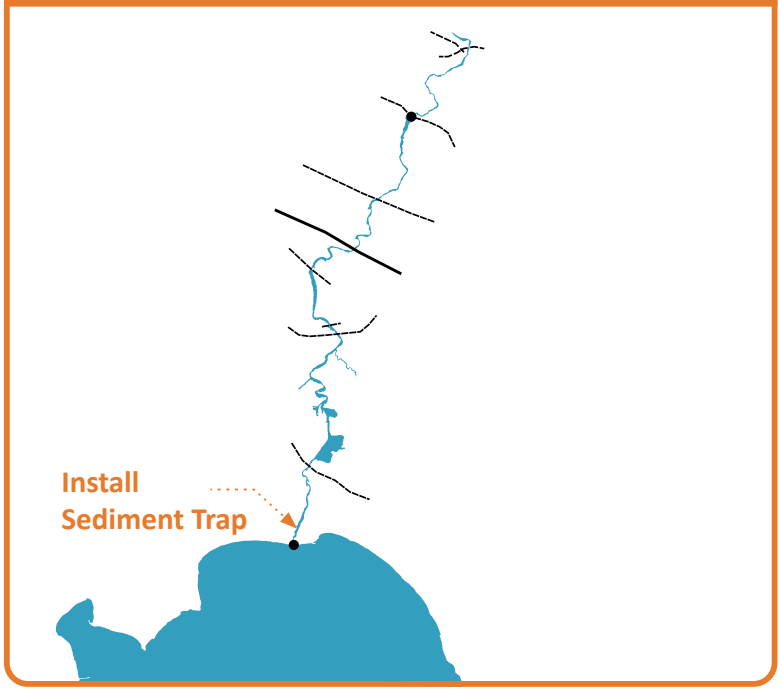
** In the 52.82 to 51.32 drop time analysis, the main spillway was set at elevation 51.32

BREAK OUT GROUPS ALTERNATIVES + SUMMARY IMPACT TABLES

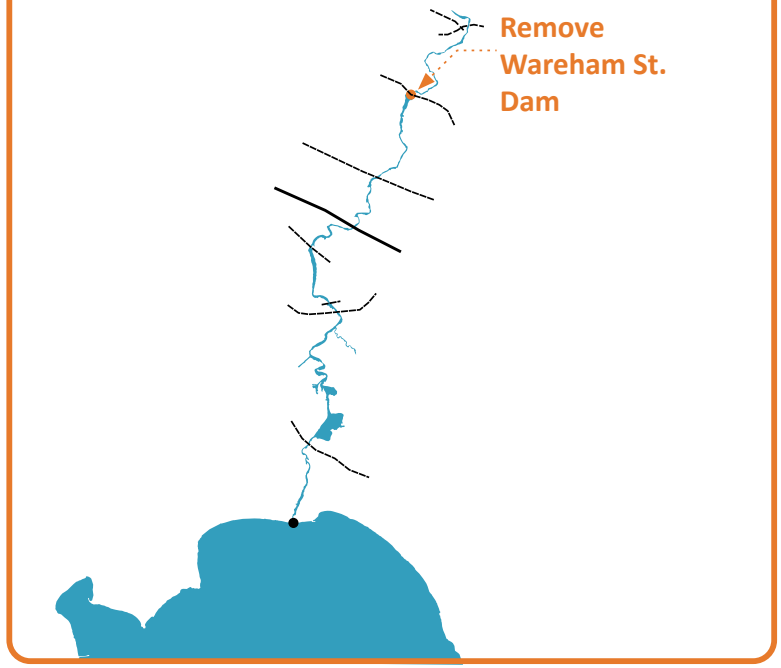
ALTERNATIVE 1: DO NOTHING



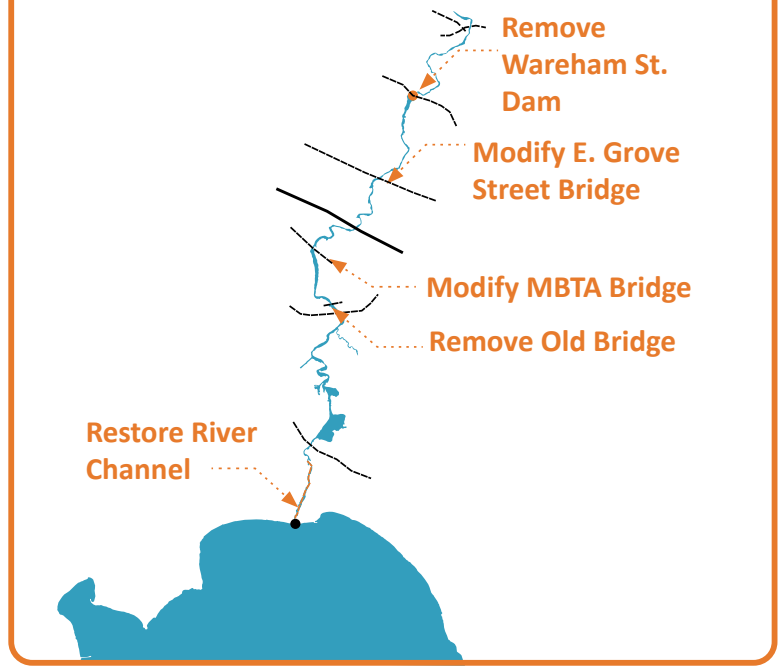
ALTERNATIVE 2: SEDIMENT TRAP



ALTERNATIVE 3: REMOVE WAREHAM ST. DAM



ALTERNATIVE 4: FULL RIVER RESTORATION

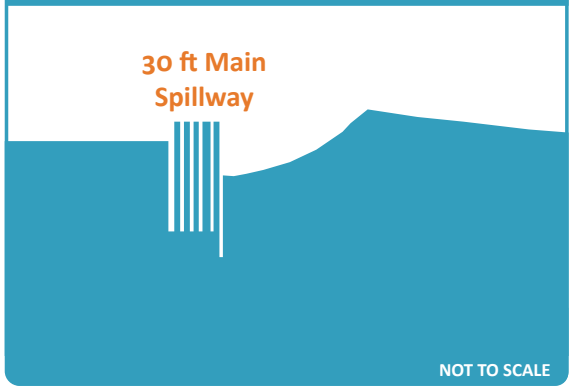


RIVER ALTERNATIVES SUMMARY TABLE

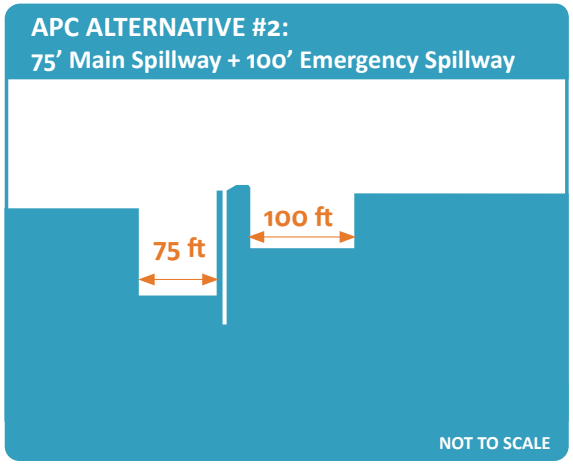
			No Action Alternative	Sediment Trap	Remove Wareham St Dam	Full River Restoration Remove Wareham St Dam Naturalized channel Widen 3 bridges
ECOLOGICAL OBJECTIVES	**Fish Passage up and downstream**		**NO CHANGE**	**MINOR IMPROVEMENT**	**IMPROVED**	**GREATLY IMPROVED**
	Improve Water quality + Habitat		— Disolved Oxygen — Water Temperature — Sediment Transport	— Disolved Oxygen — Water Temperature ↓ Sediment Transport	↑ Disolved Oxygen ↓ Water Temperature ↓ Sediment Transport	↑ Disolved Oxygen ↓ Water Temperature ↓ Sediment Transport
	Improve low-flow aquatic connectivity	Points along river where challenging for Herring to pass	**7** potential low points	**7** potential low points	**5** potential low points	**4** potential low points
INFRASTRUCTURAL AND OPERATIONAL OBJECTIVES	**Minimize flood damage to infrastructure and property downstream of APC.**	Flooded Area (100 Year storm)	**723** Acres	**723** Acres NO Reduction	**680** Acres 6% Reduction	**653** Acres 10% Reduction
		Impacted buildings	**27** Buildings	**27** Buildings	**23** Buildings	**19** Buildings
	Reduce ongoing maintenance by working with river morphology		**Works against river morphology**	**Works against river morphology. Requires ongoing maintenance**	**Works with river morphology**	**Works with river morphology**
	Permitting		**N/A**	**VERY CHALLENGING**	**CHALLENGING**	**CHALLENGING**
RECREATIONAL OBJECTIVES	**Maximize quality and quantity of recreation on the river**	Boating Opportunities	**FLAT WATER RIVER RECREATION** Maintains Existing "flat water" recreation on river + ease of round trips	**FLAT WATER RIVER RECREATION** Maintains Existing "flat water" recreation on river + ease of round trips	**FREE FLOWING RIVER RECREATION** No portage at Wareham st and fewer low flow areas	**FREE FLOWING RIVER RECREATION** No portage at Wareham st and fewer low flow areas
		Expanding fishery habitat diversity				
ECONOMIC OBJECTIVES		Cost	**N/A**	**$**	**$$**	**$$$**
		Availability of Funding	**N/A**	**UNLIKELY**	**LIKELY**	**LIKELY**

GREEN = Preferred
YELLOW = Acceptable
RED = Oppose
You must use at least one green and one yellow sticker

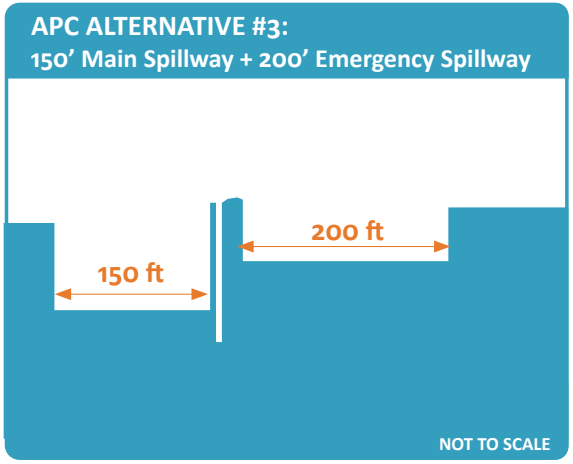
APC ALTERNATIVE #1:
DO NOTHING - 30’ Main Spillway



APC ALTERNATIVE #2:
75’ Main Spillway + 100’ Emergency Spillway

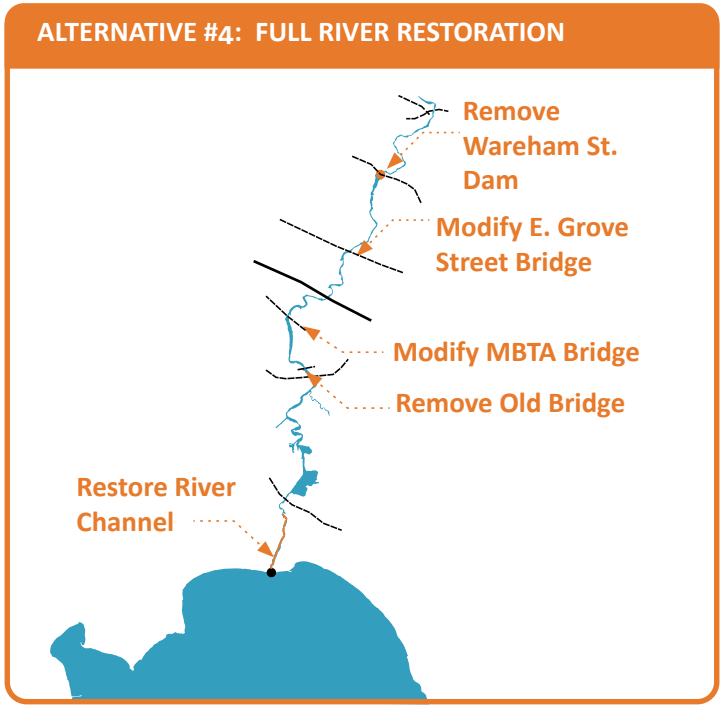


APC ALTERNATIVE #3:
150’ Main Spillway + 200’ Emergency Spillway



+

ALTERNATIVE #4: FULL RIVER RESTORATION



APC DAM ALTERNATIVES SUMMARY TABLE

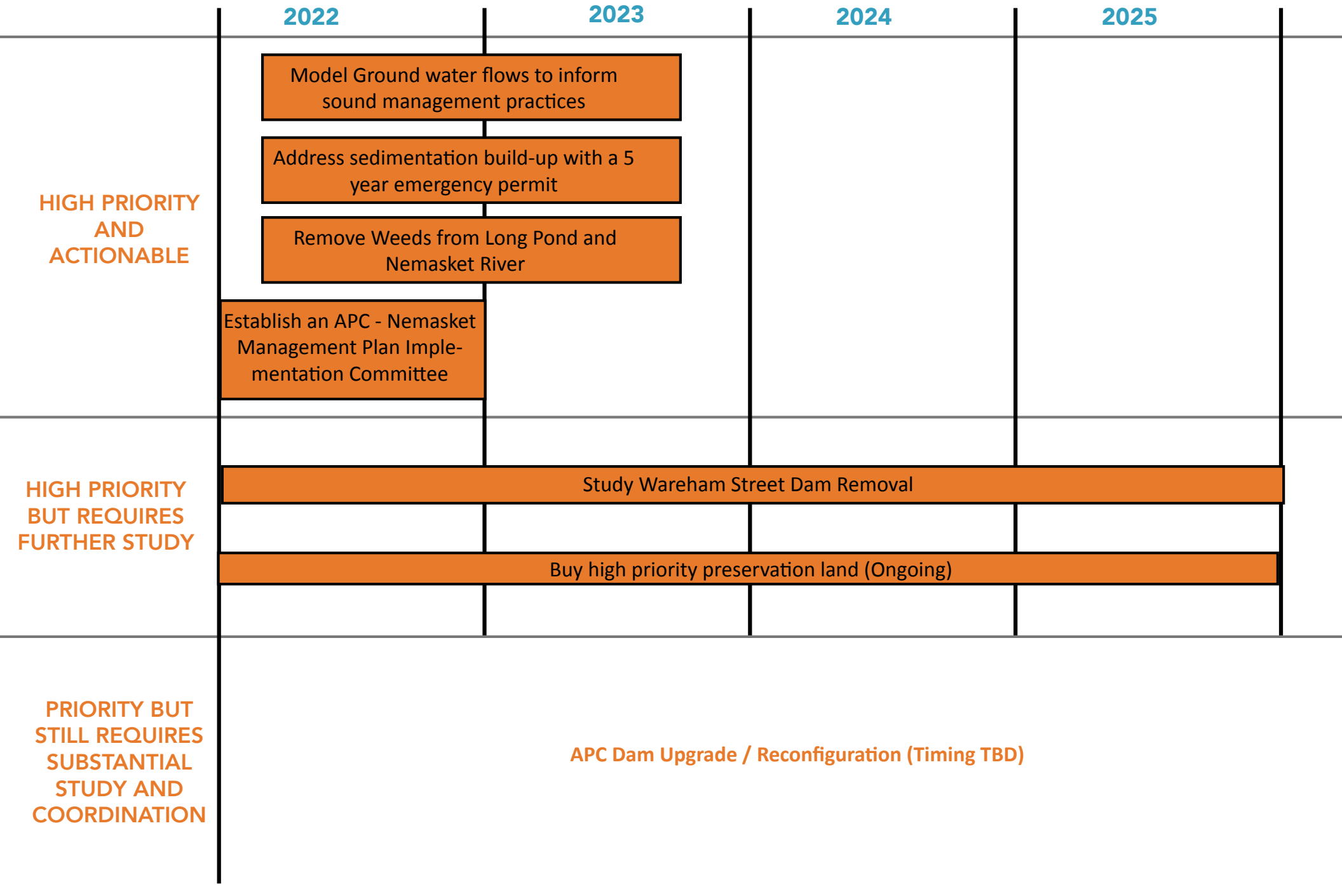
			NO ACTION ALTERNATIVE	NO CHANGES TO RIVER REPLACE APC DAM 75' Main Spillway 100' Emergency Spillway	FULL RIVER RESTORATION + REPLACE APC DAM 75' Main Spillway 100' Emergency Spillway	NO CHANGES TO RIVER REPLACE APC DAM 150' Main Spillway 200' Emergency Spillway	FULL RIVER RESTORATION + REPLACE APC DAM 150' Main Spillway 200' Emergency Spillway
ECOLOGICAL OBJECTIVES	**Fish Passage up and downstream**			**SLIGHTLY IMPROVED**	**GREATLY IMPROVED**	**SLIGHTLY IMPROVED**	**GREATLY IMPROVED**
INFRASTRUCTURAL AND OPERATIONAL OBJECTIVES	**Minimize flood damage to infrastructure and property upstream of APC**	Peak APC elevation (100 Year flood)	57.27	56.93	56.19	56.63	55.89
		Time for water levels to drop from 100-year elevation to 52.82'	13 Days	5 Days	5 Days	2 Days	2 Days
		Time for water levels to drop from 52.82' to 51.32	85 Days	31 Days	30 Days	22 Days	22 Days
	Improve ability to manage water levels in pond to help ensure water supplies during drought conditions and minimize safety risk to workers		**NO**	**YES**	**YES**	**YES**	**YES**
	GREEN = Preferred YELLOW = Acceptable RED = Oppose You must use at least one green and one yellow sticker						

WHERE WE ARE HEADED NEXT ....

NEXT STEPS

1. PROJECT OBJECTIVES
2. DISCUSS ALTERNATIVES
3. RUN H+H MODEL ON ALTERNATIVES
4. SUMMARIZE HOW THE DIFFERENT ALTERNATIVES MEET THE PROJECT OBJECTIVES
5. EVALUATE AND RANK THE ALTERNATIVES — WE ARE HERE
6. REPORT OUT ON PROCESS AND FINDINGS

NEXT STEPS


2022
2023
2024
2025
HIGH PRIORITY AND ACTIONABLE
Model Ground water flows to inform sound management practices
Address sedimentation build-up with a 5 year emergency permit
Remove Weeds from Long Pond and Nemasket River
Establish an APC - Nemasket Management Plan Imple-mentation Committee
HIGH PRIORITY BUT REQUIRES FURTHER STUDY
Study Wareham Street Dam Removal
Buy high priority preservation land (Ongoing)
PRIORITY BUT STILL REQUIRES SUBSTANTIAL STUDY AND COORDINATION
APC Dam Upgrade / Reconfiguration (Timing TBD)

NEXT STEPS:

- Feel free to contact us for more information or to further discuss the project. Please email **apc.nemasket.river@gmail.com**

- Visit the project website for more information about the project or to fill out the survey. **www.srpedd.org/apc-nemasket** (case sensitive).


THANK YOU!