MAPC/NORTH SHORE WATER RESILIENCE TASK FORCE

HAMILTON WMA STUDY FINAL REPORT PRESENTATION

Regional Evaluation to Improve Water Supply Resiliency within the Lower Ipswich River Watershed

MAPC STUDY OVERVIEW

Assessment of the Water Security and Resilience Needs and Opportunities in the Ipswich River Watershed

Date: 03/28/23

MAPC/NORTH SHORE WATER RESILIENCE TASK FORCE

AGENDA

HAMILTON WMA FINAL STUDY OVERVIEW
TASKS 1 THRU 6
Q & A

MAPC STUDY OVERVIEW
TASKS 1 THRU 7
Q&A

HAMILTON WMA FINAL STUDY OVERVIEW

- Five (5) partnering communities participated in the study along with the SBWSB
  - ❖ Wenham, Ipswich, Essex, Manchester & Topsfield
  - ❖ Senator Tarr's North Shore Task Force also played a role
- Study Goals
  - ❖ Evaluate alternative supply sources and/or possible WMA surplus withdrawals available to Hamilton and the partnering water systems
  - ❖ Identify impacts from sharing alternate/surplus supply with respect to WMA permitting, water quality, system operations & infrastructure

HAMILTON WMA FINAL STUDY OVERVIEW

- Six (6) Separate Tasks
  - ❖ Task 1 – Team Meetings/Project Management
  - ❖ Task 2 – Data Collection
  - ❖ Task 3 - Assessment of Future Water Supply Connection with SBWSB; Technical Memorandum
  - ❖ Task 4 - Assessment of New Interconnection w/ Manchester (Partial Regionalization); Technical Memorandum
  - ❖ Task 5 - Feasibility of Sharing Current/Future Water Supplies on a Mutual Aid Basis; Technical Memorandum
  - ❖ Task 6 – Reporting (Draft and Final Reports)

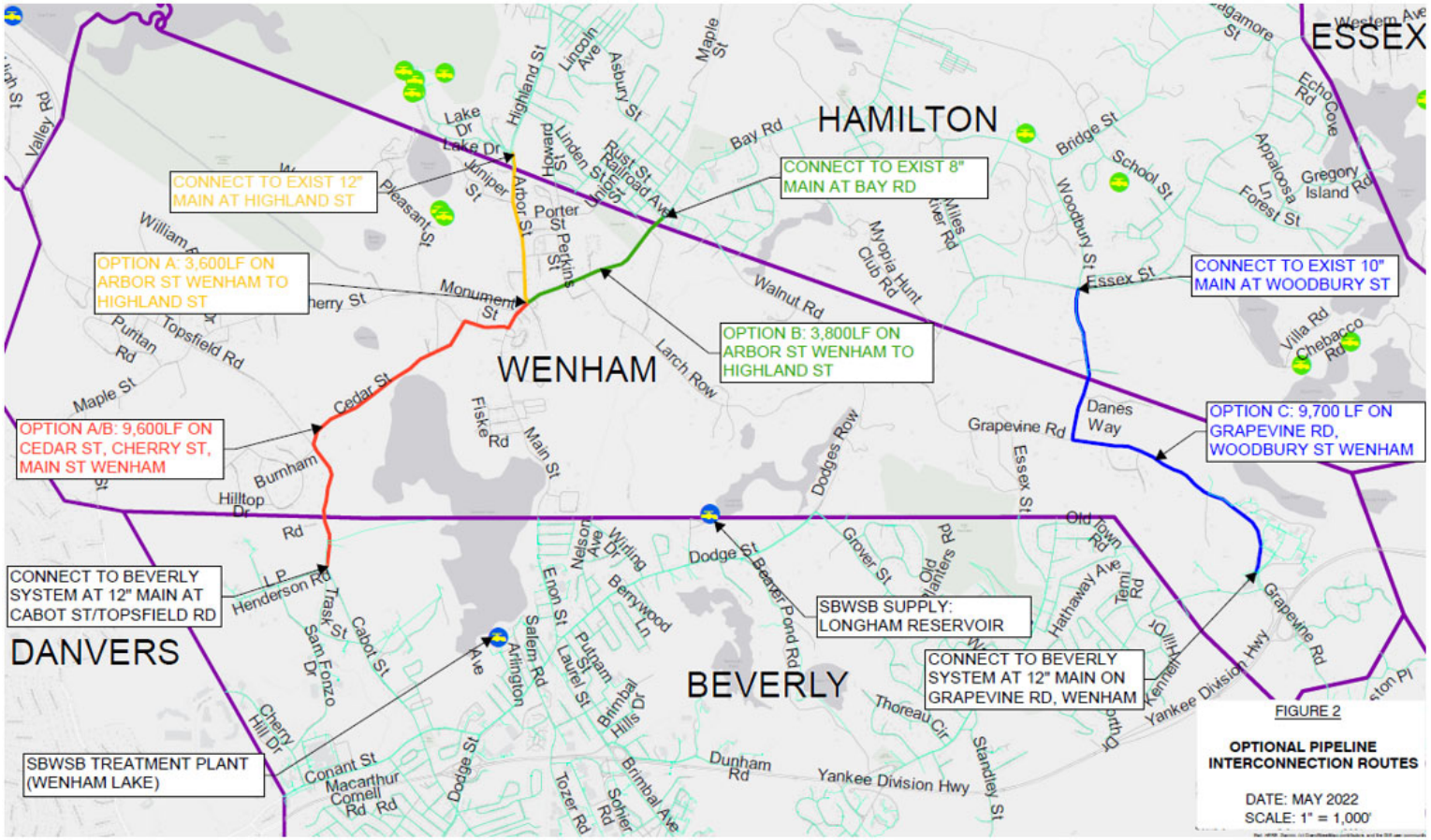
HAMILTON WMA FINAL STUDY OVERVIEW

- Task 3 – Future Water Supply Connection w/ SBWSB:
  - ❖ Review of SBWSB Water Supply System
  - ❖ Evaluation of Optional Pipeline Routes for New Interconnection
  - ❖ Review of Water Supply Permitting Considerations
  - ❖ Review of SBWSB Authorized Withdrawals versus Water Needs
  - ❖ Review of Water Quality Impacts from Blending Sources
  - ❖ Identify Infrastructure Upgrades to Supply Partnering Water Systems
- No direct connection w/ SBWSB
- New pipeline required to connect Hamilton to SBWSB

HAMILTON WMA FINAL STUDY OVERVIEW - Task 3 Cont'd

- Evaluated 3 Pipeline Options:
  - ❖ Option A – New 12-inch DI main from Cabot Street in Beverly up to Topsfield Road, Cedar Street, Cherry Street, Main Street and Arbor Street in Wenham to Highland Street in Hamilton ***(approx. 12,900 feet)***
  - ❖ Option B – New 12-inch DI main from Cabot Street in Beverly up to Topsfield Road, Cedar Street, Cherry Street and Main Street in Wenham to Bay Road in Hamilton ***(approx. 13,500 feet)***
  - ❖ Option C - New 12-inch DI main from Grapevine Road in Wenham up to Rubbly Road (Rte. 22) in Wenham to Woodbury Street in Hamilton ***(approx. 7,600 feet)***

HAMILTON WMA FINAL STUDY OVERVIEW - Task 3 Cont'd



HAMILTON WMA FINAL STUDY OVERVIEW - Task 3 Cont'd

- Conducted hydraulic analyses to determine supply rates & system impacts for following operational scenarios:
  - ❖ Scenario #1: Current system conditions with SBWSB supplementing Hamilton's Supply
  - ❖ Scenario #2: Full supply from SBWSB w/ Hamilton's supply off-line
- Based on system gradients, new PRV will be needed at interconnection with SBWSB **(239' vs 210')**
- For Scenario #1, flow rates up to 300 gpm can be delivered for pipeline Options A and B, with only 200 gpm for Option C

HAMILTON WMA FINAL STUDY OVERVIEW - Task 3 Cont'd

- For Scenario #2, supply rates up to 600 gpm can be delivered for all three pipeline options
- Under Scenario #2 w/ full supply from SBWSB, Option C resulted in reducing available fire protection w/ Hamilton
  - ❖ Additional system improvements will be needed to maintain adequate fire protection
- For Scenario #2, a new 1.5 MGD pump station would be needed to fully meet Hamilton's future supply needs

HAMILTON WMA FINAL STUDY OVERVIEW - Task 3 Cont'd

Table 2.2 Cost Summary - Pipeline Interconnection Options

Item			Total Cost[1]
Option A – 12,900' of New 12" main w/ New Revenue Meter/Backflow Preventer			
Scenario #1: Additional SBWSB Supply, Current Existing Conditions w/ New PRV			$7,004,250
Scenario #2: Full SBWSB Supply, Finish Water Pumps Off-line, New 1.5 MGD Booster Pump Station			$7,637,500
Option B – 13,500' of New 12" main w/ New Revenue Meter/Backflow Preventer			
Scenario #1: Additional SBWSB Supply, Current Existing Conditions w/ New PRV			$7,296,250
Scenario #2: Full SBWSB Supply, Finish Water Pumps Off-line, New 1.5 MGD Booster Pump Station			$7,869,000
Option C – 9,600' of New 12" main w/ New Revenue Meter/Backflow Preventer[2]			
Scenario #1: Additional SBWSB Supply, Current Existing Conditions w/ New PRV			$5,395,000
Scenario #2: Full SBWSB Supply, Finish Water Pumps Off-line, New 1.5 MGD Booster Pump Station			$6,028,750

1. Costs do not include land acquisition, right-of-way procurement and legal fees.
2. Costs for Option C include the additional 2,000 feet of new 12" main as recommended in the Task 3 technical Memorandum.

HAMILTON WMA FINAL STUDY OVERVIEW - Task 3 Cont'd

- Option A was recommended as the preferred pipeline option with Option B as an alternate
- Both options can provide up to 300 gpm of gravity flow to supplement Hamilton's existing system and fully supply Hamilton with minimal impact to current operations
- Need to conduct additional investigation to determine most cost-effective pipeline option to construct and possible impacts to SBWSB's system

HAMILTON WMA FINAL STUDY OVERVIEW - Task 3 Cont'd

- SBWSB Water Supply Assessment:
  - ❖ Has registered WMA withdrawal of 10.17 MGD from Ipswich River Basin w/ additional permitted withdrawal of 2.27 MGD **(includes 3 surface water supplies w/ diversion from Ipswich River)**
  - ❖ Current Average Day Demands (ADD) and Maximum Day Demands (MDD) are 8.19 MGD & 16.0 MGD
  - ❖ Future ADD and MDD are estimated to be 9.5 MGD & 17.1 MGD
  - ❖ Estimated future surplus of 0.67 MGD based on WMA registered allocations (10.17 MGD – 9.5 MGD)
  - ❖ Estimated future surplus of 2.94 MGD based on WMA registered & permitted allocations (12.44 MGD – 9.5 MGD)

HAMILTON WMA FINAL STUDY OVERVIEW - Task 3 Cont'd

- Hamilton & Partnering Water System Supply Needs:
  - Hamilton's future ADD & MDD = 0.67 MGD & 1.01 MGD
  - Ipswich's future ADD & MDD = 1.39 MGD & 4.17 MGD
  - Essex's future ADD & MDD = 0.260 MGD & 0.421 MGD
  - Wenham's future ADD & MDD = 0.28 MGD & 0.50 MGD
  - Topsfield's future ADD & MDD = 0.43 MGD & 0.90 MGD
  - Manchester's future ADD & MDD = 0.62 MGD & 2.03 MGD
- Combined Future Supply Needs:
  - ADD = 3.65 MGD; MDD = 9.03 MGD

HAMILTON WMA FINAL STUDY OVERVIEW - Task 3 Cont'd

- Estimated future SBWSB surplus of 2.94 MGD w/ permitted WMA withdrawals activated could supply 80% of partnering water systems' needs
- Surplus could fully meet Hamilton's future water needs with 2.2 MGD available to supplement other partnering systems
- SBWSB have never activated their permitted allocation
- Activation would trigger regulatory conditions and requirements to be imposed on SBWSB by MassDEP
- Further discussions w/ MassDEP & SBWSB needed

HAMILTON WMA FINAL STUDY OVERVIEW - Task 3 Cont'd

- SBWSB Production Capacity Limited by Plant Operations:
  - ❖ Maximum production capacity is currently 16 MGD **(plant originally designed for 24 MGD)**
  - ❖ SBWSB's current MDD = 16.0 MGD w/ Future MDD = 17.1 MGD
  - ❖ No supply surplus available during these high demand periods
- SBWSB cannot supply Hamilton & partnering systems on a permanent/regional basis due to current plant limitations
- Could supplement Hamilton & others during normal demand periods

HAMILTON WMA FINAL STUDY OVERVIEW - Task 3 Cont'd

- SBWSB plans to complete $50M of plant upgrades over next 10 years to increase capacity back to its original 24 MGD
- These upgrades could allow SBWSB to fully supply Hamilton & most of the other partnering systems on a regional basis
- SBWSB's existing Charter allows them to sell water to the Towns of Wenham and Hamilton along with Salem and Beverly.
- New legislation would be needed to allow SBWSB to supply Ipswich, Essex, Manchester and Topsfield.

HAMILTON WMA FINAL STUDY OVERVIEW - Task 3 Cont'd

- Review of Finish Water Quality:
  - ❖ SBWSB - Disinfection w/ sodium hypochlorite, fluoridation w/ hydrofluorosilicic acid, pH adjustment w/ quick lime, ortho/polyphosphate blend for corrosion control.
  - ❖ Hamilton – Disinfection w/sodium hypochlorite, fluoridation w/ sodium fluoride, poly/orthophosphate blend for corrosion control, and potassium hydroxide for pH adjustment (School Street only)
  - ❖ Compatible with respect to pH, free chlorine, total phosphate, TTHMs, HAA5s and PFAS levels.
  - ❖ Partnering Water Systems – All compatible with respect to pH, free chlorine, total phosphate, TTHMs & HAA5s except Essex.

HAMILTON WMA FINAL STUDY OVERVIEW - Task 3 Cont'd

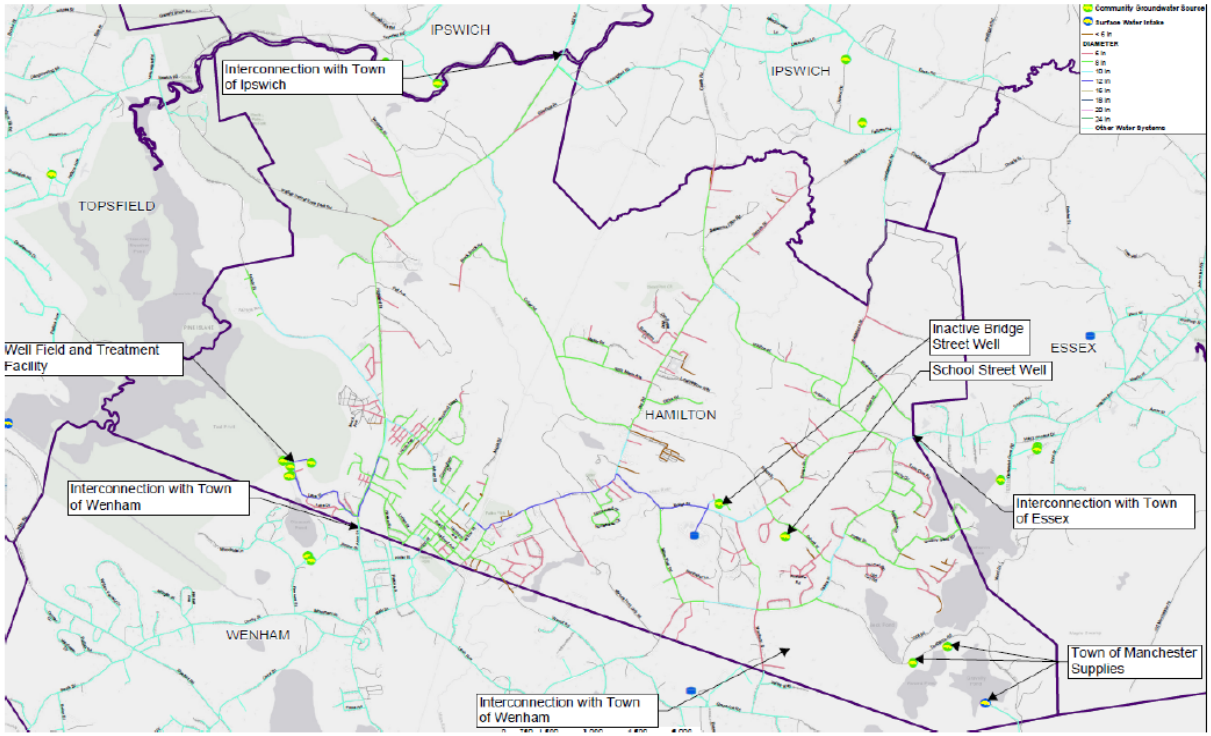
Table 2.3 Finish Water Quality Summary

Parameter	SBWSB	Hamilton	Manchester	Essex	Ipswich	Topsfield	Wenham
pH	7.0 - 7.3	7.2 - 7.4	7.1 - 7.8	7.3 - 7.5	6.5 - 8.0	7.5	Unknown(2)
Chlorine (ppm)	0.57	0.50 - 0.75	0.80 - 1.40	0.53 - 0.59	0.25 - 0.89	0.22 - 0.34	0.3 - 0.88
Phosphate (ppm)	0.45 – 0.90	0.4 – 0.5	0.3 - 1.6	N/A(1)	0.5 - 0.80	Unknown(2)	Unknown(2)
TTHMs (ppb)	25 – 87	47 – 83	36 – 52	37 – 40	20 - 68	18 – 38	15.7
HAAs (ppb)	17 – 54	0 - 46	11 – 19	6 - 9	4.9 -35	ND - 4.5	4.4
PFAS6 (ppt)	2.4 - 4.9	4.9 – 13.0	7.3 - 18.9	<1.9	ND - 23.3	10-23	Unknown(2)

- Only possible concern with blending/sharing supplies is PFAS

HAMILTON WMA FINAL STUDY OVERVIEW - Task 3 Cont'd

- Existing connections w/ Essex, Ipswich and Wenham:
  - Wenham: 8" @ Highland St & 6" @ Woodbury St
  - Ipswich: 6" @ Waldingfield Rd
  - Essex: 4" & 2"@ Essex St
- No interconnections with Topsfield or Manchester



View of Hamilton Water System w/ Existing Interconnections

HAMILTON WMA FINAL STUDY OVERVIEW - Task 3 Cont'd

- Based on System Gradients:
  - ❖ Supply between Hamilton, Ipswich & Wenham can be delivered via gravity thru ex. interconnections (150 gpm to 200 gpm)
  - ❖ Supply between Hamilton and Essex will need a booster pump station (350 gpm) w/ new 8" interconnection
  - ❖ Above connections to be equipped w/ new revenue meters & possibly BPVs
  - ❖ Future connections w/ Topsfield & Manchester will need combination of booster pumps & PRVs along w/ new pipeline

Table 2.4 Existing System Gradients

Community Water System	Hydraulic Gradient (feet)
Hamilton	210
Manchester	273
Ipswich	210(1)
Topsfield	260
Essex	217.7
Wenham	211

1. Main pressure zone gradient as maintained by Tower Hill Tank.

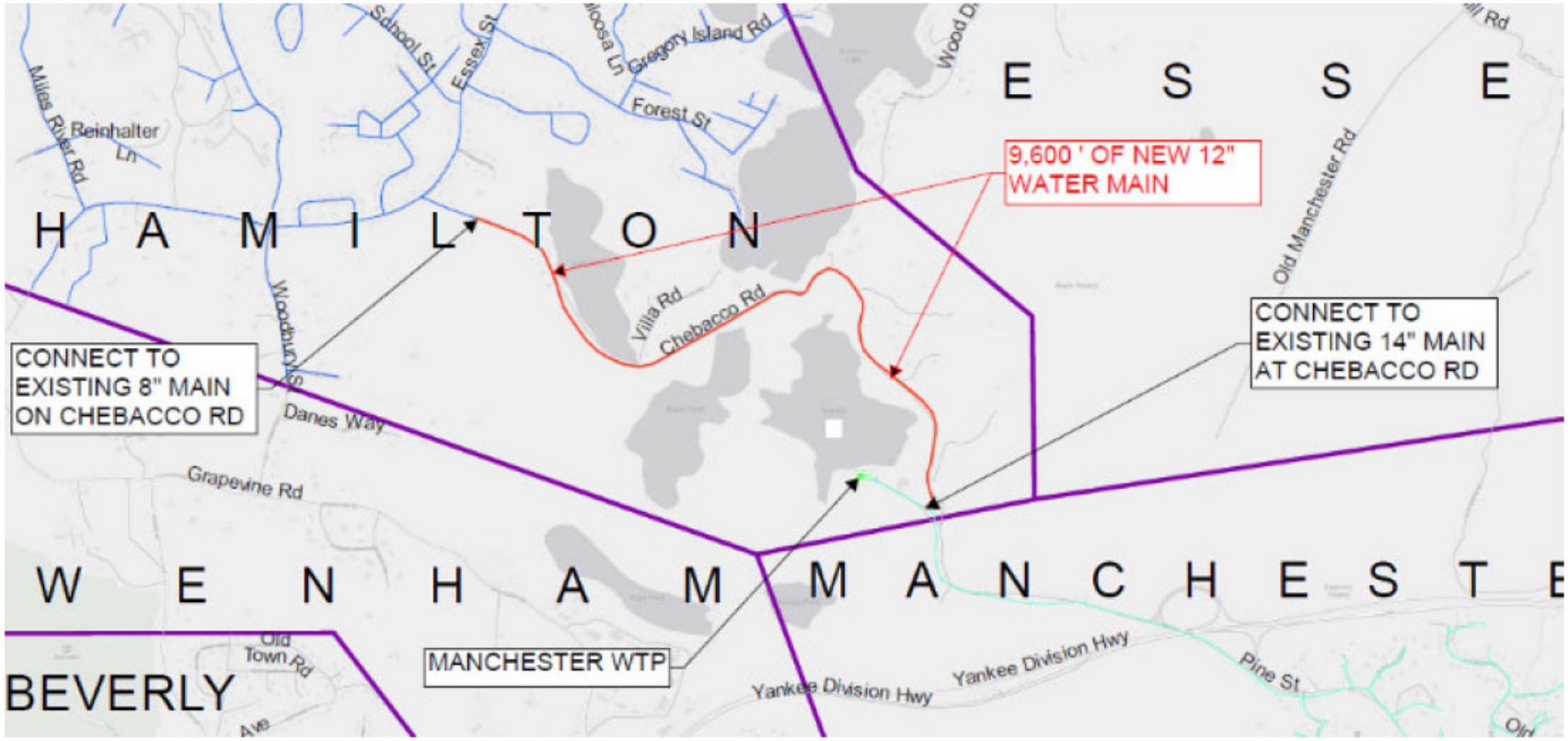
HAMILTON WMA FINAL STUDY OVERVIEW

- Task 4 – New Interconnection w/ Manchester:
  - ❖ Review of Manchester's Water Supply System
  - ❖ Evaluation of Pipeline Route for New Interconnection
  - ❖ Review of Water Supply Availability/Permitting Considerations
  - ❖ Review of Water Quality Impacts from Blending Sources
  - ❖ Identify Infrastructure Upgrades to Supply Partnering Water Systems
- No direct connection w/ Manchester
- New pipeline required to connect Hamilton to Manchester

HAMILTON WMA FINAL STUDY OVERVIEW - Task 4 Cont'd

- New Pipeline w/ Manchester:
  - ❖ Most preferable alignment is along Chebacco Road in Hamilton
  - ❖ New 12-inch DI main to extend from Hamilton's existing 8-inch main in Chebacco Road to Manchester's 14-inch transmission main at their WTF**.(approx. 9,600 *feet)***
  - ❖ New interconnection to be equipped w/ new revenue meter & BFP
  - ❖ Based on Manchester's higher system gradient **(273')**, new PRV will be needed at interconnection to supply Hamilton **(210')**

HAMILTON WMA FINAL STUDY OVERVIEW - Task 4 Cont'd



Partial View of Figure 1- Pipeline Interconnection w/in Chebacco Rd.

HAMILTON WMA FINAL STUDY OVERVIEW - Task 4 Cont'd

- Conducted hydraulic analyses to determine supply rates & system impacts for the following operational scenarios:
  - ❖ Scenario #1: Current system conditions with Additional Supply from Manchester
  - ❖ Scenario #2: Full supply from Manchester w/ Hamilton's supply off-line
- For Scenario #1, supply rates up to 300 gpm can be delivered into Hamilton w/ minimal impact to current operations
- For Scenario #2, maximum supply rate of 800 gpm can be delivered into Hamilton with new PRV set to 235'
  - ❖ Under Scenario #2, Browns Hill Reservoir would no longer function, a new taller tank will need to be constructed

HAMILTON WMA FINAL STUDY OVERVIEW - Task 4 Cont'd

Table 3.2 Cost Summary - Chebacco Road Pipeline Interconnection

Item			Total Cost[1]
Scenario #1: Additional Manchester Supply w/ New PRV, FW Pumps & Browns Hill Tank On-Line			
9,600' of new 12" Main w/ New PRV, Revenue Meter & Backflow Preventer			$5,565,625
Scenario #2: Full Manchester Supply w/ New PRV, FW Pumps & Browns Hill Tank Off-line			
9,600' of new 12" Main w/ New PRV, Revenue Meter & Backflow Preventer			$5,565,625
New 0.80 MG Storage Tank, Demolition of Ex. 0.80 MG Tank & Appurtenances			$4,021,875
Total - Scenario #2			**$9,587,500**

1. Costs do not include land acquisition, right-of-way procurement and legal fees.

HAMILTON WMA FINAL STUDY OVERVIEW - Task 4 Cont'd

- Manchester Water Supply Assessment:
  - ❖ Has a registered WMA withdrawal of 0.72 MGD from North Coastal Basin **(includes surface water & two well sources)**
  - ❖ Has a maximum pump capacity of 4.97 MGD
  - ❖ Current ADD and MDD are 0.628 MGD & 1.403 MGD
  - ❖ Future ADD and MDD are estimated to be 0.62 MGD & 2.03 MGD
  - ❖ Estimated future surplus of 0.10 MGD based on WMA registered allocations (0.72 MGD – 0.62 MGD)
  - ❖ Future surplus could be closer to 0.180 MGD if Manchester's current UAW of 25% can be reduced to 12%

HAMILTON WMA FINAL STUDY OVERVIEW - Task 4 Cont'd

- Potential surplus of 0.180 MGD could allow Hamilton to reduce use of its Idlewood Well #2:
  - ❖ Would improve finish water quality at its treatment plant
  - ❖ Reduce withdrawals from the Ipswich River Basin
- No available surplus to supply other partnering water systems
- To fully supply Hamilton & supplement other partnering water systems, Manchester would need to obtain MassDEP approval to significantly increase its current WMA registered withdrawals

HAMILTON WMA FINAL STUDY OVERVIEW - Task 4 Cont'd

- Water Supply Permitting Considerations:
  - ❖ North Coastal Watershed designated as a Category 4 basin & is already considered depleted
  - ❖ Any effort to increase withdrawals will require additional analysis w/ Manchester having to meet certain minimization requirements with respect to existing & new withdrawals
  - ❖ An Inter-Basin Transfer Act permit would be needed along with the potential for an Environmental Impact Assessment
- Conclusion: Future interconnection w/ Manchester is a short-term solution only, not feasible as a long-term solution

HAMILTON WMA FINAL STUDY OVERVIEW - Task 4 Cont'd

- Review of Finish Water Quality:
  - ❖ From Task 3: Both Manchester & Hamilton maintain similar finished water quality w/ respect to pH, free chlorine and total phosphate residual.
  - ❖ Both Manchester & Hamilton have occasional elevated PFAS levels.
  - ❖ Both systems are compatible, no anticipated issues
  - ❖ From Task 3, partnering water systems also compatible with respect to pH, free chlorine, total phosphate, TTHMs & HAA5s except Essex.
  - ❖ Only possible concern with blending/sharing supplies is PFAS

HAMILTON WMA FINAL STUDY OVERVIEW - Task 4 Cont'd

- Infrastructure Needs to Supply Partnering Systems **(same as in Task 3):**
  - ❖ Supply between Hamilton, Ipswich & Wenham can be delivered via gravity thru ex. interconnections (150 gpm to 200 gpm)
  - ❖ Supply between Hamilton and Essex will need a booster pump station (350 gpm) with new 8-inch interconnection
  - ❖ Above interconnections to be equipped w/ new revenue meters & possibly BPVs if used on a more permanent basis
  - ❖ Future connection w/ Topsfield will need combination of booster pump & PRV along w/ new pipeline

HAMILTON WMA FINAL STUDY OVERVIEW

- Task 5 – Sharing Partnering System Supplies on Mutual Aid Basis:
  - ❖ Review of Existing Water System Infrastructure
  - ❖ Review of Water Supply Availability w/in WMA Allocations
  - ❖ Identify Possible Supply Surplus for Sharing between Systems
  - ❖ Permitting Considerations w/ Sharing Supply
  - ❖ Review of Water Quality Impacts from Sharing Supply
  - ❖ Identify Needed Infrastructure Upgrades w/ Associated Cost to Share Supply Partnering Water Systems
  - ❖ Evaluation of New Pipeline Route & Associated Costs to Connect Topsfield & Hamilton

HAMILTON WMA FINAL STUDY OVERVIEW - Task 5 Cont'd

- Ipswich:
  - Parker River Basin: WMA Allocation = 0.98 MGD **(incl. 2 reservoirs & 2 wells)**
  - Ipswich River Basin: WMA Allocation = 0.20 MGD **(incl. 3 wells)**
  - Total WMA Allocation = 1.18 MGD; Max. Pump Capacity = 3.67 MGD
  - 2020 ADD = 1.009 Current Surplus = +0.171 MGD
- Essex:
  - North Coastal Basin: WMA Allocation = 0.22 **(incl. 3 wells**)
  - Max. Pump Capacity = 1.0 MGD
  - 2020 ADD = 0.201 MGD; Current Surplus = +0.019 MGD
- Wenham:
  - Ipswich River Basin: WMA Allocation = 0.29 **(incl. 2 wells)**
  - Max. Pump Capacity = 1.48 MGD
  - 2021 ADD = 0.26 MGD; Current Surplus = +0.030 MGD

HAMILTON WMA FINAL STUDY OVERVIEW - Task 5 Cont'd

- Topsfield:
  - Ipswich River Basin: WMA Allocation = 0.43 **(incl. 2 wellfields)**
  - Max. Pump Capacity = 1.4 MGD
  - 2021 ADD = 0.393 MGD; Current Surplus = +0.037 MGD
- Hamilton:
  - Ipswich River Basin: WMA Allocation = 1.03 **(incl. 1 wellfield & 1 well**)
  - Max. Pump Capacity = 0.93 MGD
  - 2021 ADD = 0.565 MGD; Current Surplus = +0.315 MGD
- Future Supply Estimates/Impacts **(see Table 4.3)**

HAMILTON WMA FINAL STUDY OVERVIEW - Task 5 Cont'd

Table 4.3 Available Surplus – Average Day & Maximum Day Demands

Year	Maximum Supply Capacity (MGD)	WMA Authorized Withdrawal (MGD)	Average Day Demand (MGD)	Surplus/ Deficit (MGD)	Maximum Day Demand (MGD)	Surplus/ Deficit (MGD)
Ipswich:						
2020	3.67	1.18	1.009	+0.171	1.837	-0.657
2040	3.67	1.18	1.390	-0.210	4.170	-2.99
Essex:						
2020	1.00	0.220	0.201	+0.019	0.435	-0.215
2035	1.00	0.220	0.260	-0.040	0.421	-0.201
Wenham:						
2021	1.48	0.290	0.260	+0.030	0.466	-0.176
2035	1.48	0.290	0.280	+0.010	0.500	-0.220
Topsfield:						
2021	1.40	0.430	0.393	+0.037	0.823	-0.393
2035	1.40	0.430	0.430	0.00	0.900	-0.470
Hamilton:						
2021	0.93	0.880	0.565	+0.315	0.770	+0.110
2035	0.93	0.880	0.671	+0.209	1.006	-0.126

HAMILTON WMA FINAL STUDY OVERVIEW - Task 5 Cont'd

- Water Supply/Surplus Conclusion:
  - ❖ Minimal surplus available to share under current system demands
  - ❖ No surplus available to share under future system demands
  - ❖ Ipswich, Essex, Wenham & Topsfield at or above WMA allocations
- Hamilton:
  - ❖ Has available surplus per WMA Allocation
  - ❖ Limited due to poor water quality
  - ❖ Future MDD exceeds plant capacity
- Could possibly share supply during lower demand periods on emergency basis
- No significant surplus to improve water supply resiliency

HAMILTON WMA FINAL STUDY OVERVIEW - Task 5 Cont'd

- Permitting Considerations for Sharing Supply:
  - ❖ Hamilton, Wenham & Topsfield w/in Ipswich River Basin; Sharing supply between systems to be governed by WMA requirements
  - ❖ Essex & Ipswich w/in Parker, North Coastal & Ipswich; Sharing supply with these systems would also require IBTA permit
  - ❖ Sharing supply between systems w/in same basin limited to existing WMA allocations
  - ❖ Systems can exceed its WMA withdrawals to share with other in-basin systems, receiving systems have to reduce WMA withdrawals by the same amount.

HAMILTON WMA FINAL STUDY OVERVIEW - Task 5 Cont'd

- Review of Finish Water Quality:
  - ❖ From Task 3:
    - ➢ Partnering water systems compatible with respect to pH, free chlorine, total phosphate, TTHMs & HAA5s except Essex.
    - ➢ Some have seen occasional elevated PFAS levels as Hamilton.
  - ❖ Only possible concern with blending/sharing supplies is PFAS
  - ❖ Need to review further w/ MassDEP

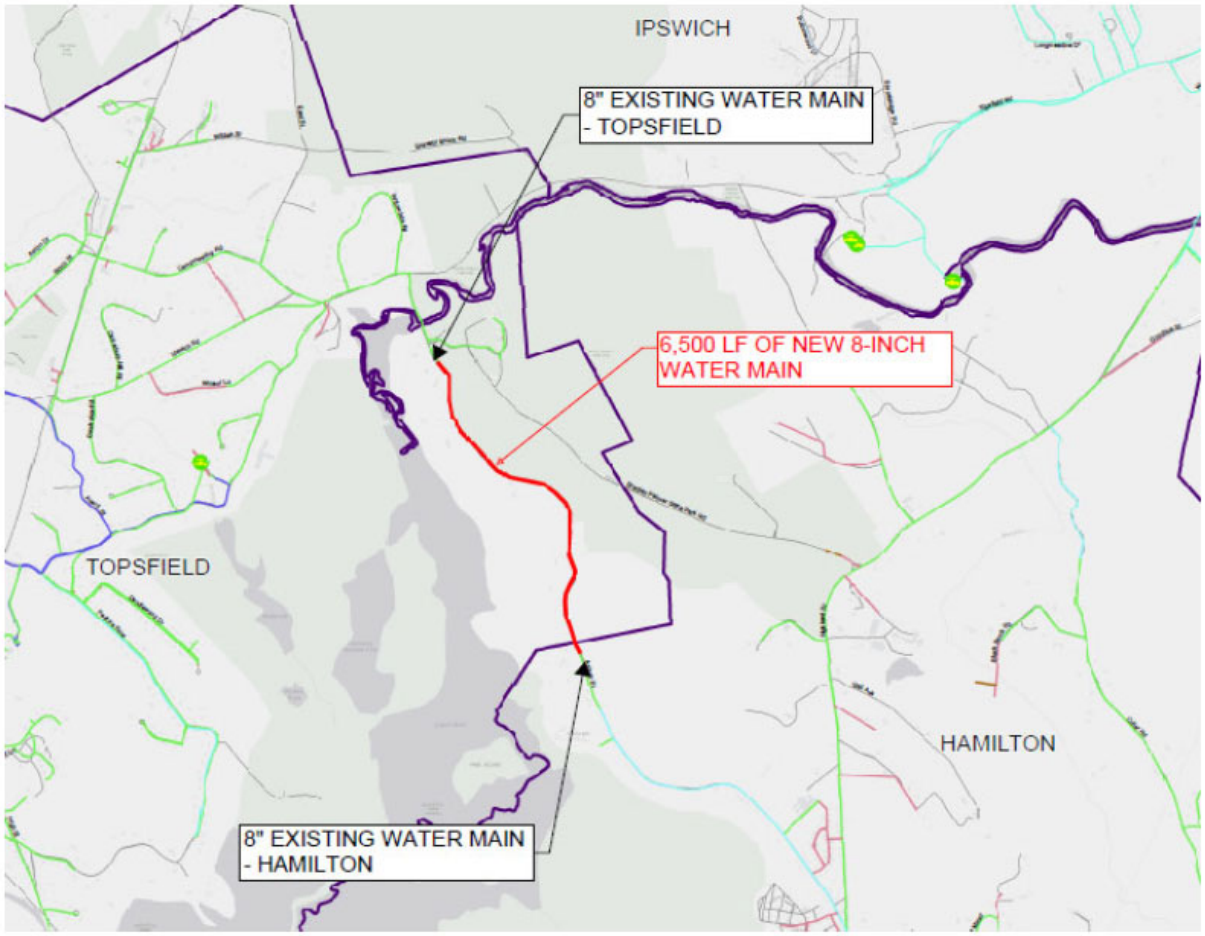
HAMILTON WMA FINAL STUDY OVERVIEW - Task 5 Cont'd

- Infrastructure Needs to Supply Partnering Systems **(same as in Task 3):**
  - ❖ Supply between Hamilton, Ipswich & Wenham can be delivered via gravity thru ex. interconnections (150 gpm to 200 gpm)
  - ❖ Supply between Hamilton and Essex will need a booster pump station (350 gpm) with new 8-inch interconnection
  - ❖ Above interconnections to be equipped w/ new revenue meters & possibly BPVs if used on a more permanent basis
  - ❖ Future connection w/ Topsfield will need combination of booster pump & PRV along w/ new pipeline

HAMILTON WMA FINAL STUDY OVERVIEW - Task 5 Cont'd

- New Pipeline w/ Topsfield:
  - ❖ Asbury Street identified as most favorable alignment to connect systems
  - ❖ New 8-inch DI main to extend from Hamilton's existing 8-inch main in Asbury Street to Topsfield existing 8-inch main in Asbury Street (**approx. 6,500 *feet)***
  - ❖ New interconnection to be equipped w/ new revenue meter & possibly BFP
  - ❖ Based on Topsfield's higher system gradient **(260')**, new PRV will be needed at interconnection to supply Hamilton **(210')**
  - ❖ Conversely, new booster pump station will be needed for Hamilton to supply Topsfield

HAMILTON WMA FINAL STUDY OVERVIEW - Task 5 Cont'd



Partial View of Figure 6- Hamilton/Topsfield Potential Interconnection

HAMILTON WMA FINAL STUDY OVERVIEW - Task 5 Cont'd

- From Hydraulic Analyses Conducted:
  - ❖ New PRV to be set between 208' and 212'
  - ❖ Will deliver supply rates of 200 gpm to 300 gpm into Hamilton w/ minimal impact to current operations
  - ❖ New booster pump station to be rated for 350 gpm at a total dynamic head (TDH) of about 80'.

HAMILTON WMA FINAL STUDY OVERVIEW - Task 5 Cont'd

Interconnection with Wenham	
New Revenue Meter Vault and appurtenances[2]	$150,000
New Electrical/Control Systems & SCADA upgrades (for meter)	$30,000
Miscellaneous (testing, commissioning, general conditions, etc.)	$20,000
Subtotal	**$200,000**
Engineering and Permitting (30%)	**$60,000**
Subtotal – Engineering and Construction	**$260,000**
25% Contingency	**$65,000**
Total - Interconnection with Wenham	**$325,000**
Interconnection with Ipswich	
New Revenue Meter Vault and appurtenances[2]	$150,000
New Electrical/Control Systems & SCADA upgrades (for meter)	$30,000
Miscellaneous (testing, commissioning, general conditions, etc.)	$20,000
Subtotal	**$200,000**
Engineering and Permitting (30%)	**$60,000**
Subtotal – Engineering and Construction	**$260,000**
25% Contingency	**$65,000**
Total - Interconnection with Ipswich	**$325,000**

HAMILTON WMA FINAL STUDY OVERVIEW - Task 5 Cont'd

Interconnection with Essex	
New 350 gpm Booster Pump Station w/ Above-Grade Structure (incl. Revenue Meter)	$175,000
Site work & connections for new Booster Pump Station and Bypass	$75,000
New Revenue Meter Vault and appurtenances (for gravity flow)	$150,000
New Electrical/Control Systems & SCADA upgrades (for meter)	$30,000
Miscellaneous (testing, commissioning, general conditions, etc.)	$50,000
Subtotal	**$480,000**
Engineering and Permitting (30%)	**$144,000**
Subtotal – Engineering and Construction	**$624,000**
25% Contingency	**$156,000**
Total - Interconnection with Essex	**$780,000**

1. Costs do not include land acquisition, right-of-way procurement and legal fees.
2. Based on using single electromagnetic flow meter for measuring bidirectional flow.

HAMILTON WMA FINAL STUDY OVERVIEW - Task 5 Cont'd

New Topsfield Interconnection w/ New Pipeline, PRV and Booster Pump Station	
6,500' of New 8" Main in Asbury Street from Ex. 8" Main to Ex. 8" Main @ $225/ft	$1,462,500
New Revenue Meter Vault and appurtenances	$150,000
New PRV Vault and appurtenances	$75,000
New electrical/control systems & SCADA upgrades (for meter & PRV)	$40,000
New 350 gpm Booster Pump Station w/ Above-Grade Structure (incl. Revenue Meter)	$175,0000
Site work & connections for new Booster Pump Station and Bypass	$75,000
Site work & connections to ex. 8" main on Asbury Street (Hamilton)	$25,000
Site work & connections to ex. 8" main on Asbury Street (Topsfield)	$25,000
Miscellaneous (testing, commissioning, general conditions, etc.)	$225,000
Subtotal	**$2,252,500**
Engineering and Permitting (30%)	**$675,750**
Subtotal – Engineering and Construction	**$2,928,250**
25% Contingency	**$732,000**
Total - Interconnection with Topsfield	**$3,660,250**

1. Costs do not include land acquisition, right-of-way procurement and legal fees.

HAMILTON WMA FINAL STUDY OVERVIEW

- Task 6 – Future Water Supply Resiliency Summary:
  - ❖ Evaluated alternative sources for Hamilton to address its water supply limitations including SBWSB & Manchester
  - ❖ Identified available surplus between partnering water systems to mitigate short-term supply shortages on a mutual aid basis
  - ❖ Estimated available supply rates that can be delivered to Hamilton & the partnering water systems
  - ❖ Determined infrastructure upgrades needed along with associated costs to supply Hamilton & the partnering water systems
  - ❖ Evaluated water quality & permitting impacts from blending/sharing supplies between partnering water systems

HAMILTON WMA FINAL STUDY OVERVIEW - Task 6 Cont'd

- Conclusions:
  - ❖ SBWSB has limited surplus available under its current WMA registration to supplement Hamilton only.
  - ❖ With activating its WMA permit allocation of 2.27 MGD, SBWSB could have available surplus to fully supply Hamilton & other partnering water systems when its plant has been upgraded back to its original capacity of 24 MGD.
  - ❖ Manchester has limited surplus under its current WMA allocations to supplement Hamilton only and would not be able to fully supply Hamilton in the future
  - ❖ Partnering water systems will have limited to no surplus available to share under current WMA allocations in the future

HAMILTON WMA FINAL STUDY OVERVIEW - Task 6 Cont'd

- Conclusions (cont'd):
  - ❖ Increasing current WMA allocations to meet future supply needs highly unlikely
  - ❖ New interconnection with SBWSB is most feasible as short-term and long-term solution to meet future water supply needs of Hamilton & the partnering water systems.
  - ❖ Option A pipeline is recommended as the most favorable alignment to connect Hamilton to SBWSB.

HAMILTON WMA FINAL STUDY OVERVIEW - Task 6 Cont'd

- Recommendations:
  - ❖ Conduct additional analysis to confirm most cost-effective pipeline for new interconnection with SBWSB **(Option A or Option B)**
  - ❖ Design & construct new pipeline along the finalized alignment to connect Hamilton to SBWSB **(upon agreement w/ SBWSB)**
  - ❖ Upgrade existing interconnections w/ Wenham, Ipswich and Essex for sharing future supply
  - ❖ Future pipeline w/ Topsfield included as long-term solution for Topsfield's and Senator Tarr's Task Force consideration
  - ❖ Additional analyses recommended to determine impacts to Hamilton's and SBWSB's water system from SBWSB supplying the future water needs of Hamilton and the partnering water systems on a permanent/regional basis.

HAMILTON WMA FINAL STUDY OVERVIEW - Task 6 Cont'd

- Recommended system infrastructure improvements prioritized into 3 categories:
  - **Initial (0 to 3 years):** Address Hamilton's current supply issues
  - **Short-Term (3 to 5 years):** Improve ability to share supply w/ partnering water systems
  - **Long-term (5 to 15 years):** Required to have SBWSB fully supply Hamilton & other interested partnering water systems; to be completed in parallel with SBWSB's plant upgrades
  - See Phased Implementation Plan

HAMILTON WMA FINAL STUDY OVERVIEW - Task 6 Cont'd

ITEM			COST[5]
Initial Water Supply Infrastructure Improvements (0 to 3 Years)			
12,900' of new 12" DI main with new PRV, revenue meter, backflow preventer & related appurtenances			$7,004,250
Total – Initial Water Supply Infrastructure Improvements			**$7,004,250**
Short-Term Water Supply Infrastructure Improvements (2 to 5 Years)			
New interconnection with Wenham including new revenue meter & related appurtenances			$325,000
New interconnection with Ipswich including new revenue meter & related appurtenances			$325,000
New interconnection with Essex including new 350 gpm booster station w/ bypass, revenue meters(2) & related appurtenances			$780,000
Subtotal – Short -Term Water Supply Infrastructure Improvements			**$1,430,000**
Inflation Adjustment (10%)			$143,000
Total – Short-Term Water Supply Infrastructure Improvements			**$1,573,000**
Long-Term Water Supply Infrastructure Improvements (5 to 15 Years)			
New 1.5 MGD booster station & appurtenances at SBWSB interconnection			$772,000
6,500 feet of new 8" DI main with new PRV, 350 gpm booster station & bypass, revenue meters(2) & related appurtenances			$3,660,250
Subtotal – Long-Term Water Supply Infrastructure Improvements			**$4,432,250**
Inflation Adjustment (15%)			$664,840
Total – Long-Term Water Supply Infrastructure Improvements			**$5,097,090**

HAMILTON WMA FINAL STUDY OVERVIEW

Questions/Answers

MAPC STUDY OVERVIEW

- Assessment of the Water Security and Resilience Needs and Opportunities in the Ipswich River Watershed
  - ❖ Being administered by the MAPC on behalf of Senator Tarr's North Shore Water Resilience Task Forced
  - ❖ Work being completed with oversight by Task Force Steering Committee
- Study Goal
  - ❖ To evaluate and advance long-term solutions to improve water supply resilience and ecosystem health in the Ipswich River Watershed

MAPC STUDY OVERVIEW

- Seven (7) Separate Tasks
  - ❖ Task 1 – Review & summarize current state of water security and low flow impacts among Ipswich River Basin communities
  - ❖ Task 2 – Consider the water needs of Peabody, Danvers & Middleton in the Hamilton WMA study assessment of SBWSB to address the region's supply needs
  - ❖ Task 3 – Evaluate the feasibility, benefits and costs of new reservoir at the Topsfield site as part of a regional solution.
  - ❖ Task 4 – Identify opportunities & constraints in sharing water between communities assessed in the Danvers and Hamilton WMA grant studies including Task #2

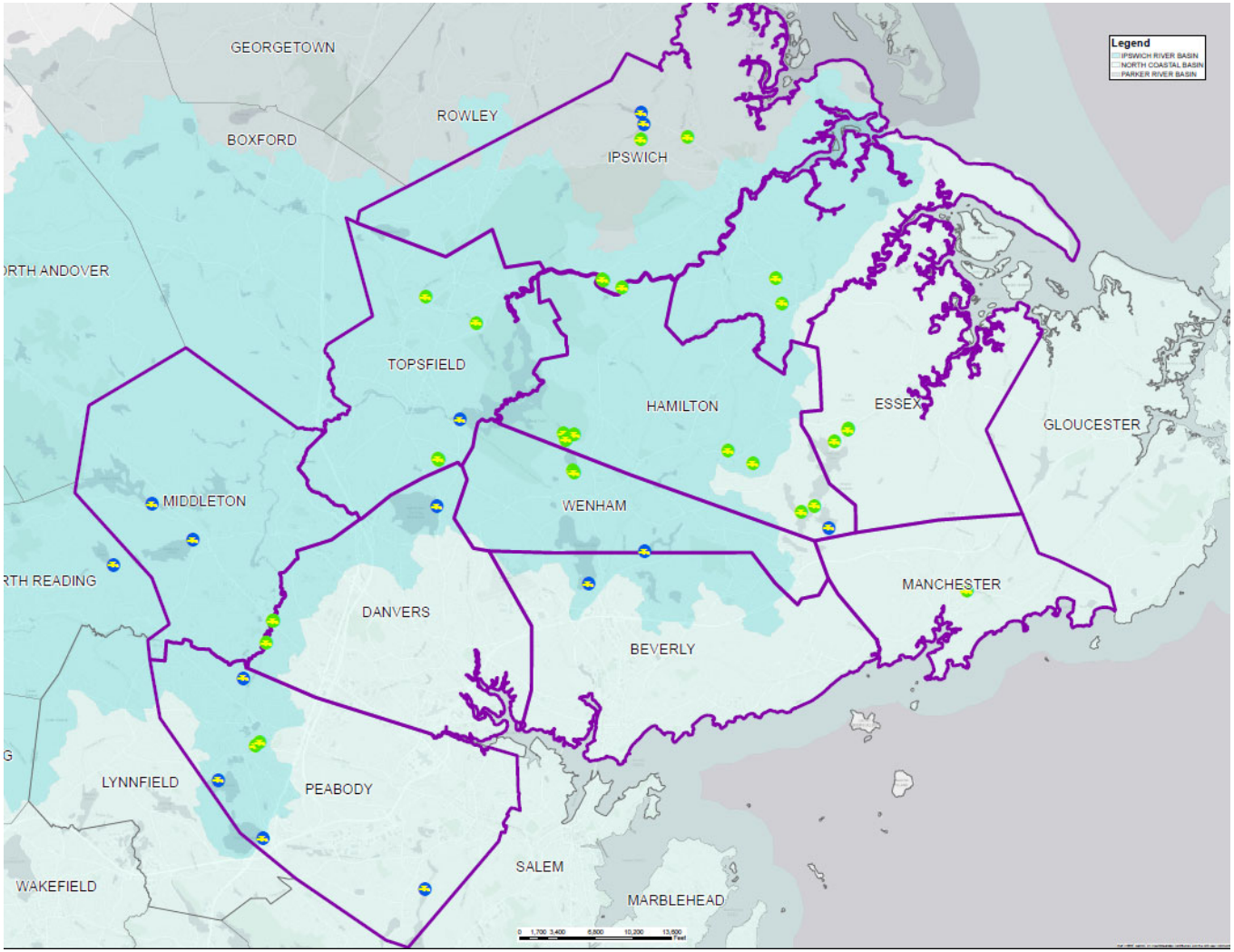
MAPC STUDY OVERVIEW

- Seven (7) Separate Tasks (cont'd)
  - ❖ Task 5 – Present all interconnections to/from/between all Ipswich watershed communities on a map
  - ❖ Task 6 – Identify and incorporate relevant findings from the recent 2022 MWRA study into Tasks 1-5 deliverables as appropriate.
  - ❖ Task 7 – Final report including an executive summary and next-step recommendations to further evaluate water supply options for the Ipswich River watershed region

MAPC STUDY OVERVIEW

- Study NTP: TBD
- Schedule of Deliverables
  - ❖Task 1 – Technical Memorandum *(TBC by March 31, 2023)*
  - ❖Task 2 – Technical Memorandum *(TBC by April 26, 2023)*
  - ❖Task 3 – Technical Memorandum *(TBC by May 17, 2023)*
  - ❖Task 4 – Technical Memorandum *(TBC by June 14, 2023)*
  - ❖Task 5 – Interconnection Map *(TBC by June 21, 2023)*
  - ❖Task 6 – Update Tasks 2-5 per 2022 MWRA study *(TBC by July 21, 2023)*
  - ❖*Task 7* – Draft Report *(TBC by August 10, 2023)* Final Report *(TBC by August 31, 2023)*

MAPC STUDY OVERVIEW



MAPC STUDY OVERVIEW

- Available supply alternatives & strategies to address future supply shortages & reduce Ipswich River Basin withdrawals:
  - ❖ Having SBWSB supplying the future drinking water needs of community water systems on a supplemental or full-time basis;
  - ❖ Constructing a new reservoir in Topsfield to provide a redundant source of supply to assist community water systems within the region to meet future drinking water needs;
  - ❖ Extending the MWRA's water system to provide new source of supply from outside the Basin to meet the future drinking water needs of community water systems;
  - ❖ Sharing available surplus supply among community water systems based on WMA allocations to supplement supply deficits and shortages on a temporary basis.

MAPC STUDY OVERVIEW

Questions/Answers