Town of Ipswich, MA
Community Resilience Building Workshop

Appendices

Municipal Vulnerability Preparedness Workshop
Town of Ipswich, MA

Tuesday, February 5, 2019, 8:00am–3:00pm
Ipswich Town Hall
AGENDA

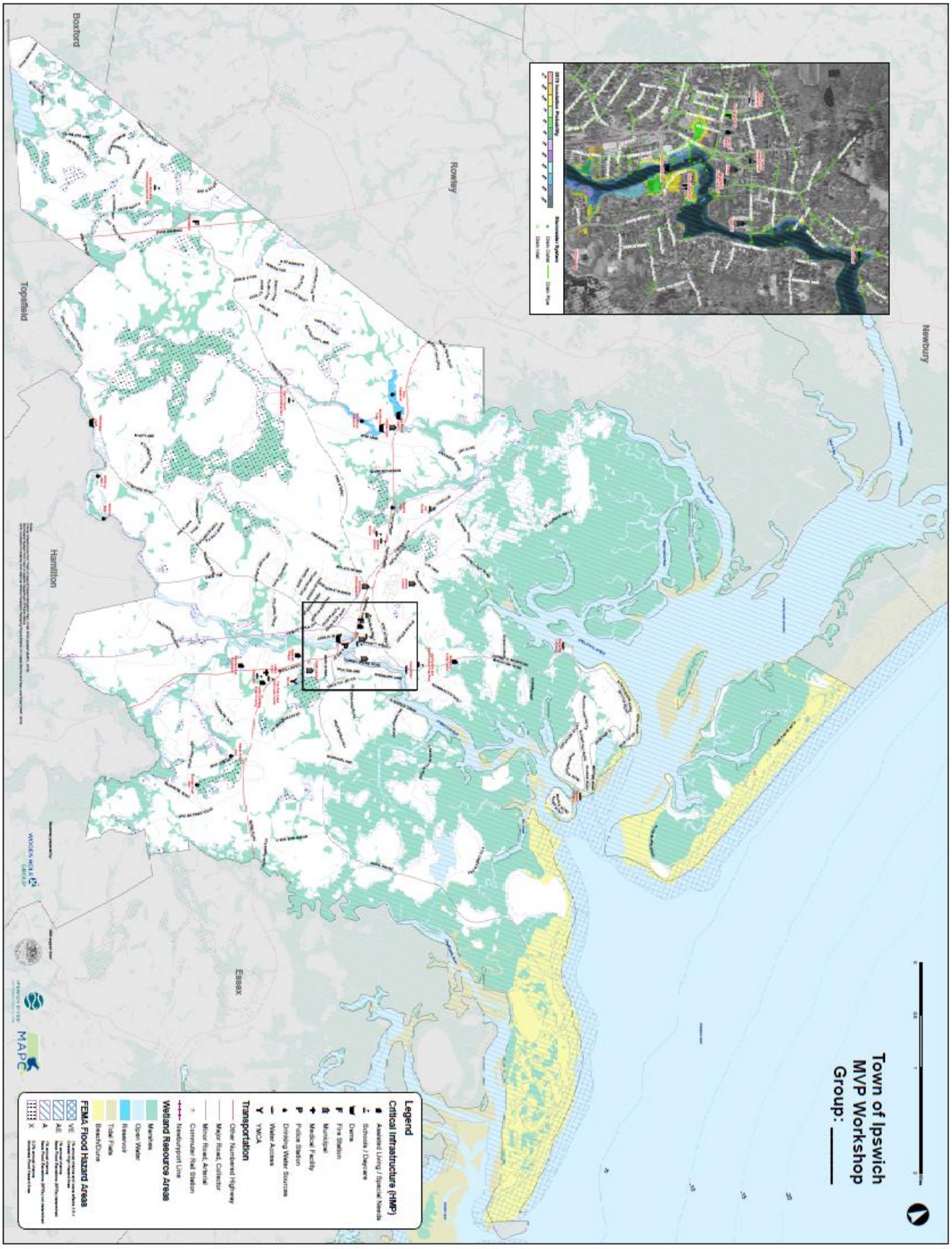
The Massachusetts **Municipal Vulnerability Preparedness Program** provides support for cities and towns in Massachusetts to plan for climate resiliency and prepare immediate action steps.

TIME	ACTIVITIES	WHO
8:00 AM	Registration and Refreshments	
8:30 AM	Welcome	Anthony Marino Ethan Parsons
8:35 AM	Overview of the Workshop Introductions	Kristen Grubbs All
9:00 AM	Presentation on Science, Resources, & Previous Planning Confirm Major Hazards	K. Grubbs
9:30 AM	Instructions for Small Group Work	
9:40 AM	Small Group Exercise #1: Review & Discuss Vulnerabilities & Strengths of Features (Infrastructure, Society, & Environment)	Small groups & facilitators
10:40 AM	10 MINUTE STRETCH	
10:50 AM	Small Group Exercise #2: Identify Actions to Address Vulnerabilities or Protect Strengths	Small groups & facilitators
11:50 AM	Small Group Exercise #3: Determine Priority (Hi, M, Lo) and Urgency (short/long-term) of Actions; Discuss & Identify Top 3 Priority Actions	Small groups & facilitators
12:00 PM	LUNCH	
12:45 PM	Small Groups Reconvene & Prepare to Report Out Write Top Priority Actions on Cards	Small groups & facilitators
1:00 PM	Small Group Report Outs: Sharing Top Priorities	Adam Whelchel Spokespersons & large group
1:30 PM	Large Group Activity & Discussion Determine Overall Priority Actions (sticky dot activity) Collectively discuss identified opportunities to reduce current and future hazard risks and improve resilience.	A. Whelchel & facilitators
2:30 PM	Closing Remarks & Next Steps How will Ipswich use the recommendations/outcomes from the MVP workshop?	K. Grubbs E. Parsons
3:00 PM	Adjourn	

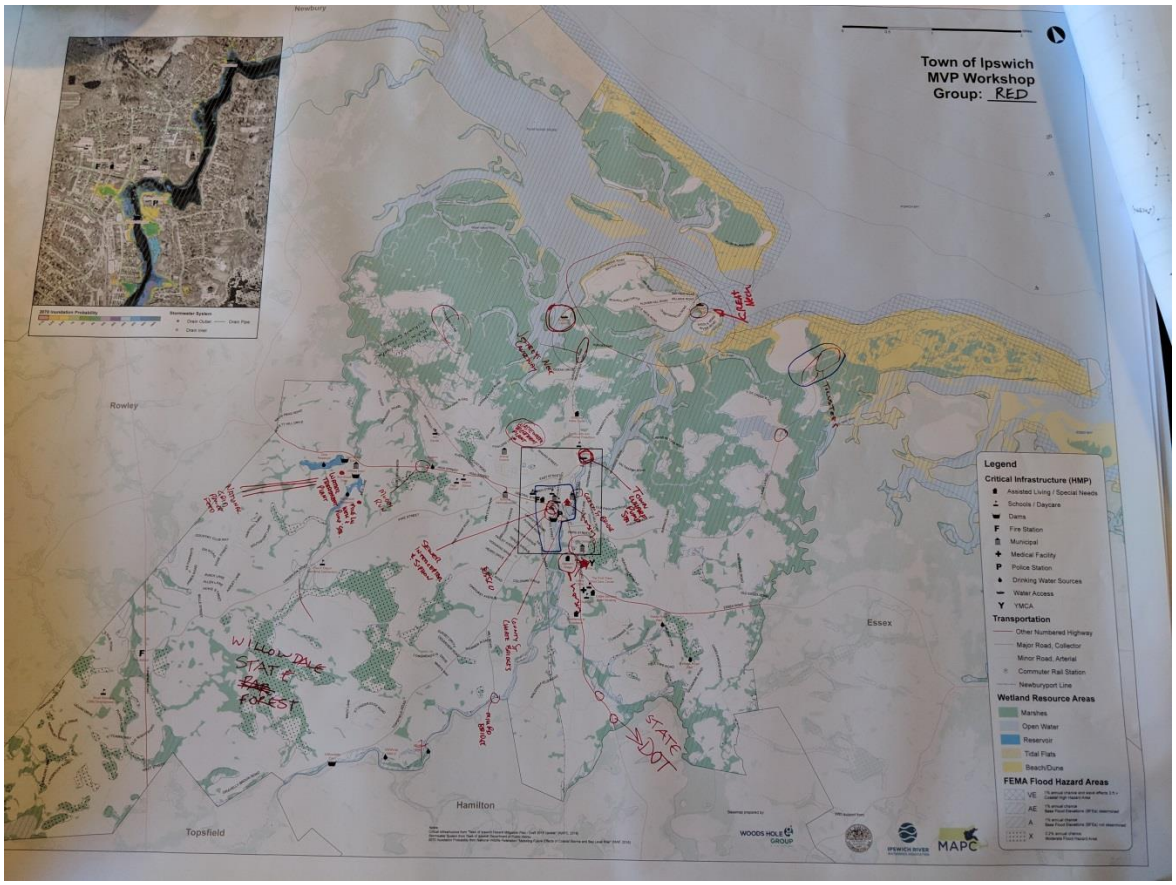
For more information about the Ipswich MVP Workshop, please contact Kristen Grubbs, Environmental Planner, Ipswich River Watershed Association (kgrubbs@ipswichriver.org, 978-412-8200)

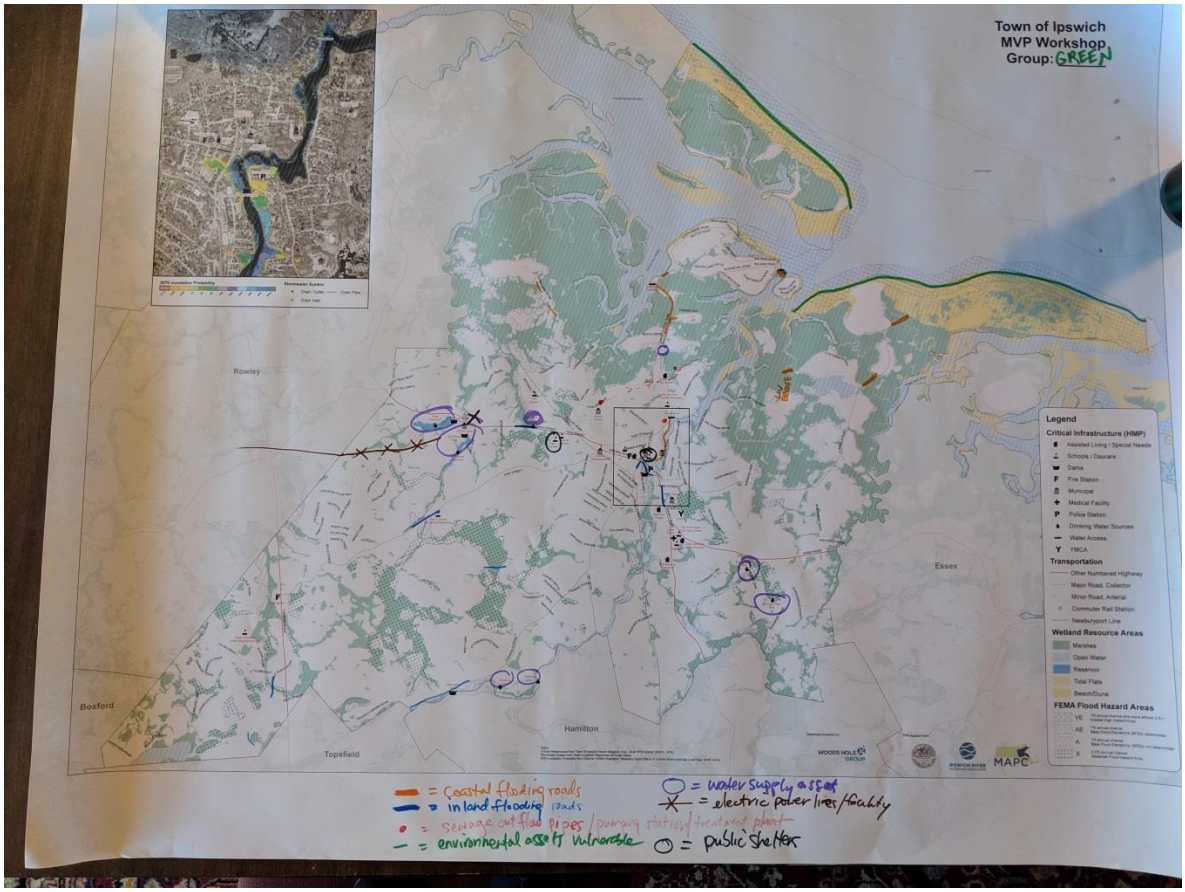
IPSWICH RIVER WATERSHED ASSOCIATION

Appendix A: CRB Workshop Agenda



Appendix B: Base Map





Appendix C: Participatory Table Maps

Box 4.1-1. Regional Adaptation Strategies & Recommendations for the Great Marsh Region

Best Practices *(see also page 126-130)*

- Establish and maintain a permanent Municipal Resiliency Task Force or committee
- Set clear goals for addressing existing and projected vulnerability
- Collaborate across municipal departments
- Collaborate across municipal boundaries
- Protect and enhance biodiversity
- Reduce non-climate stressors
- Evaluate effectiveness of adaptation strategies at regular intervals
- Monitor coastal hazards and maintain strong research initiatives
- Promote economic diversity
- Incorporate climate change adaptation planning and climate projections into all relevant local and regional plans as well as capital investment projects

Natural and Nature-Based Strategies *(see also page 130-137)*

- Ensure and restore connectivity of river and coastal systems
- Use living shorelines to stabilize shoreline edges, where appropriate
- Explore construction of offshore shellfish reefs and beds to attenuate wave energy, reduce erosion, and improve water quality
- Protect and restore barrier beaches and dunes through renourishment and revegetation
- Explore opportunities to beneficially reuse dredged material
- Restore sub-aquatic vegetation
- Restore degraded salt marshes
- Facilitate marsh migration
- Enhance land conservation efforts

Gray Infrastructure and Retrofits *(see also page 138-139)*

- Remove unnecessary dams
- Upgrade road-stream crossings
- Retrofit buildings to be more flood resilient
- Elevate roadways to prevent nuisance flooding and to withstand projected sea level rise
- Pursue retrofits and planning for Massachusetts Bay Transportation Authority (MBTA) railroad

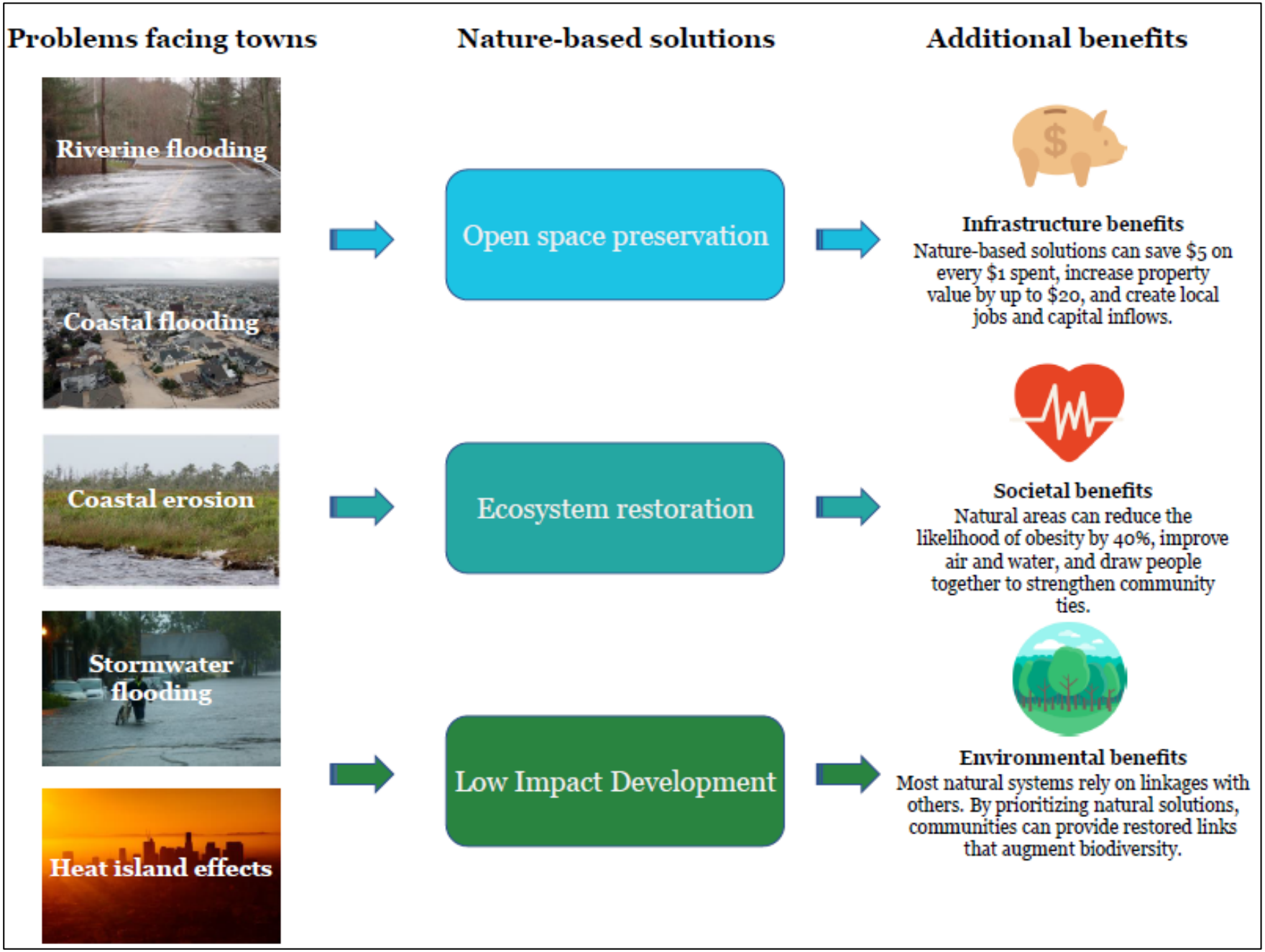
Land-use Planning and Policy *(see also page 140-144)*

- Update municipal policies
- Prioritize low-impact development (LID) practices
- Revise local wetlands protection bylaws and regulations
- Move development away from the coast and from wetlands
- Create "freeboard incentive" for residential and commercial buildings
- Use transferable development credits (TDCs) to reduce risky coastal development
- Institute comprehensive water resources management, including strategies for stormwater, waste water, and public drinking water

Outreach and Engagement *(see also page 144-146)*

- Develop municipal strategies for enhanced outreach and education
- Strengthen existing regional outreach and education programs
- Support and develop opportunities for citizen science

Appendix D: Great Marsh Coastal Adaptation Plan – Regional Strategies


Problems facing towns
Nature-based solutions
Additional benefits
Riverine flooding
Coastal flooding
Coastal erosion
Stormwater flooding
Heat island effects
Open space preservation
Ecosystem restoration
Low Impact Development
Infrastructure benefits
Nature-based solutions can save $5 on every $1 spent, increase property value by up to $20, and create local jobs and capital inflows.
Societal benefits
Natural areas can reduce the likelihood of obesity by 40%, improve air and water, and draw people together to strengthen community ties.
Environmental benefits
Most natural systems rely on linkages with others. By prioritizing natural solutions, communities can provide restored links that augment biodiversity.

Sample Guide to Climate Adaptation Strategies

What are Your Project Goals?

Flood Protection · Water Quality · Habitat Restoration · Wave Attenuation · Erosion Control · Scenic/Recreational Value

Natural Solutions

Remove Invasives

Advantages:
- Supports marsh ecosystem health & function. A healthy marsh provides storm protection, erosion control, and supports wildlife habitat.

Disadvantages
- May not be ecologically appropriate
- Requires maintenance

Vegetated Shoreline

Advantages:
- Provides shoreline stability, reduces erosion, and buffers upland areas from small waves.

Disadvantages:
- Limited flood protection depending on site features
- Plant growth not guaranteed

Land Acquisition

Advantages:
- Strategic protection of land adjacent to salt marshes can help facilitate marsh migration and reduce damage from flooding.

Disadvantages:
- Can be expensive
- Not always politically expedient

Nature-Based & Hybrid Strategies

Shellfish Reef

Advantages:
- Offshore living structures that enhance water quality, reduce erosion, and act as a submerged breakwater to reduce wave energy.

Disadvantages:
- Overtopped by major storms
- Easily damaged by debris and ice

Edging/Sills

Advantages:
- Natural vegetation combined with engineered structures parallel to coastline; reduces erosion and wave energy, and enhances wildlife habitat

Disadvantages:
- Limited storm surge reduction
- Requires more land area to implement

Thin-layer Deposition

Advantages:
- Raises the marsh platform by spraying sediment onto the marsh surface; mostly applied in sediment starved environments

Disadvantages:
- Impacts not fully understood
- Unknown utility in marshes that aren't highly degraded

Gray Infrastructure

Revetment

Advantages:
- Rocks or other material placed on a sloping shoreline to stabilize the shore and to mitigate wave energy.

Disadvantages:
- No major flood protection
- Prevents upland sediment transport to estuarine habitats

Bulkhead

Advantages:
- Vertical wall suitable in high-energy settings; stabilizes shoreline and reduces flooding.

Disadvantages:
- Can erode adjacent areas
- Prevents upland sediment transport to estuarine habitats

Road Flood Barriers

Advantages:
- Various designs exist, but all are meant to prevent flood waters from entering the roadway.

Disadvantages:
- Short-term/temporary solution
- Limited/no co-benefits

Policy Strategies

Zoning

Advantages:
- Utilizes zoning overlays to limit development in flood-prone areas (legal precedent exists in MA).

Disadvantages:
- Can impact property tax base
- May lead to legal challenges

Climate-smart Development

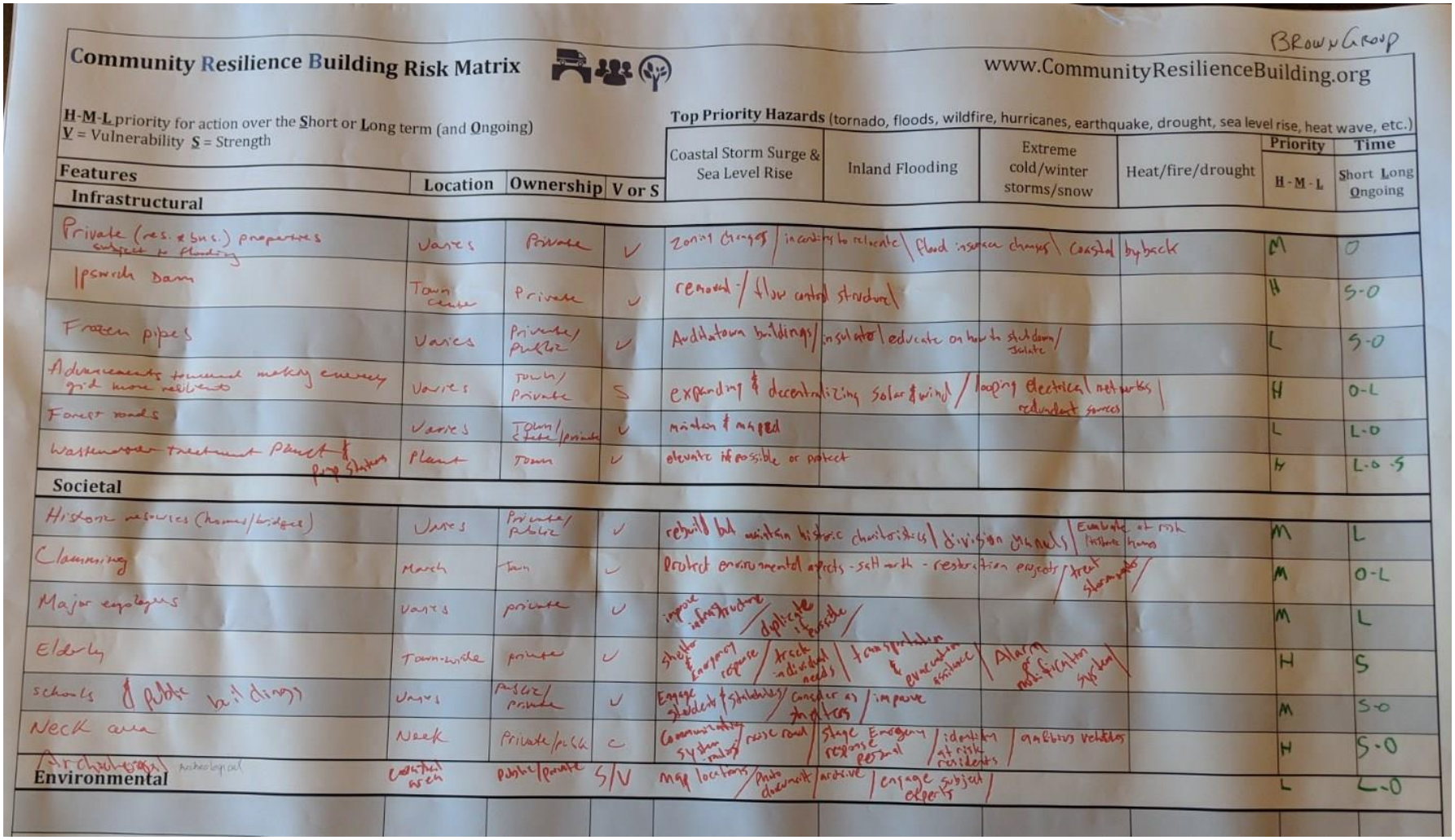
Advantages:
- Requires SLR to be considered in development proposals. Promotes open spaces to increase flood resiliency.

Disadvantages:
- Creates additional work for developers up front
- Doesn't require action

Transferable Development Credits

Advantages:
- Market-based approach (with existing MA guidelines) that incentivizes development away from flood prone areas.

Disadvantages:
- Can be costly and complex to implement
- Requires calibrated market



Brown Group

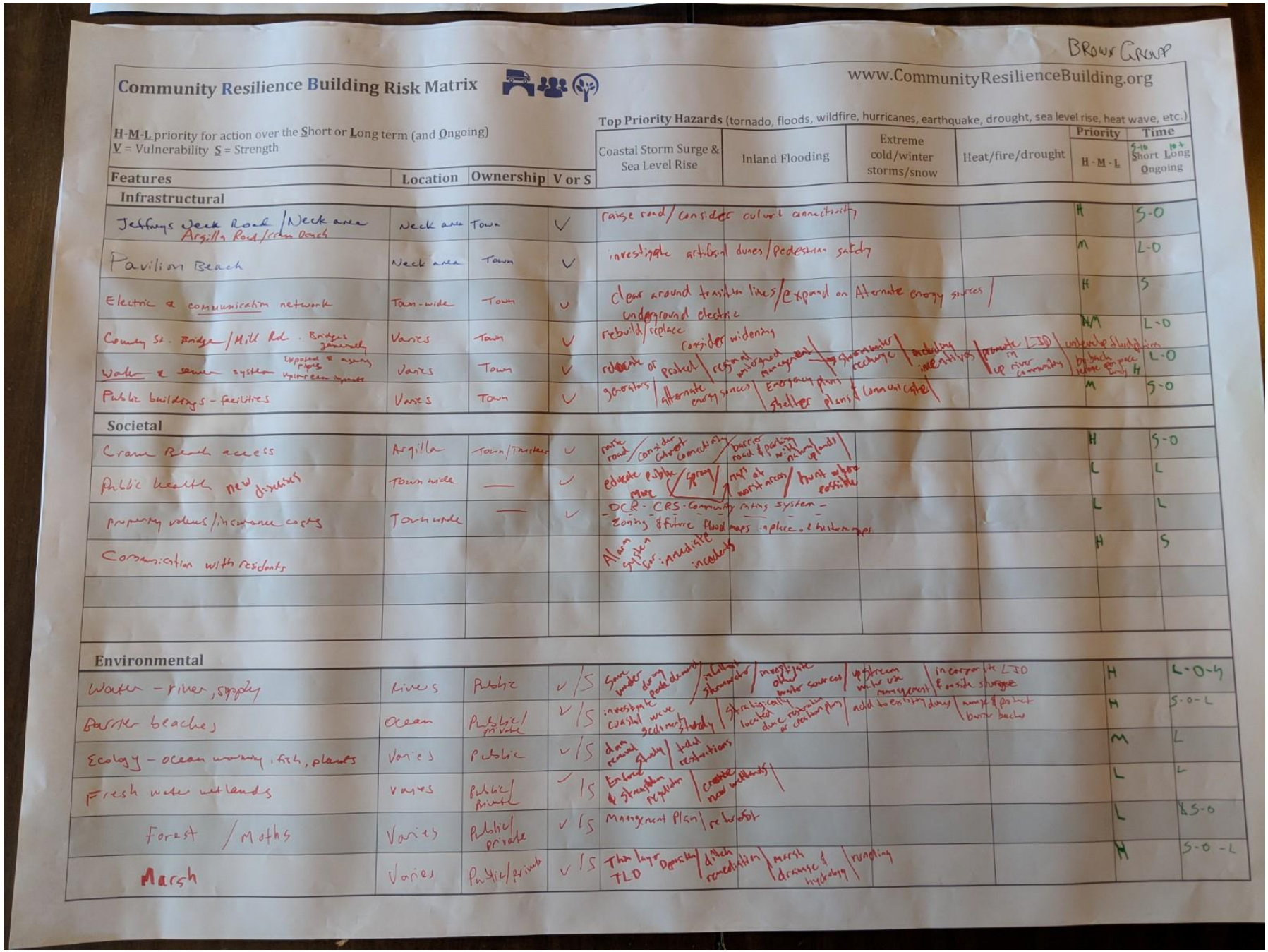
Community Resilience Building Risk Matrix

www.CommunityResilienceBuilding.org

H-M-L priority for action over the **S**hort or **L**ong term (and **O**ngoing)
V = Vulnerability **S** = Strength

Top Priority Hazards (tornado, floods, wildfire, hurricanes, earthquake, drought, sea level rise, heat wave, etc.)

Features	Location	Ownership	V or S	Coastal Storm Surge & Sea Level Rise	Inland Flooding	Extreme cold/winter storms/snow	Heat/fire/drought	Priority H-M-L	Time Short Long Ongoing
Infrastructural									
Private (res. & bus.) properties subject to flooding	Varies	Private	V	Zoning changes / incentives to relocate	Flood insurance changes	Coastal buyback		M	O
Ipswich Dam	Town Center	Private	V	removal / flow control structure				H	S-O
Frozen pipes	Varies	Private/ Public	V	Audit town buildings / insulate / educate on how to shutdown/ isolate				L	S-O
Advancements to manual meter energy grid more resilient to	Varies	Town/ Private	S	expanding & decentralizing Solar & wind / looping electrical / net meters / redundant sources				H	O-L
Forest roads	Varies	Town/ State/ private	V	maintain & mapped				L	L-O
Wastewater treatment Plants & Pump Stations	Plants	Town	V	elevate if possible or protect				H	L-O-S
Societal									
Historic resources (homes/bridges)	Varies	Private/ Public	V	rebuild but maintain historic characteristics / diversion channels / Evaluate at risk historic homes				M	L
Clamming	Marsh	Town	V	Protect environmental aspects - salt marsh - restoration projects / treat stormwater				M	O-L
Major employers	Varies	private	V	improve infrastructure / duplicate if possible /				M	L
Elderly	Town-wide	private	V	shelter & emergency response / track individual needs / transportation & evacuation assistance / Alarm or notification system				H	S
schools & public buildings	Varies	Public/ Private	V	Engage students / Stakeholders / Consider as shelters / improve				M	S-O
Neck area	Neck	Private/public	V	Communication system redesign / rescue route / Stage Emergency response personal / identify at risk residents / mobilize vehicles				H	S-O
Archeological	coastal area	Public/ Private	S/V	map locations / Photo document / archive / engage subject experts				L	L-O
Environmental									



BROWN GROUP

Community Resilience Building Risk Matrix

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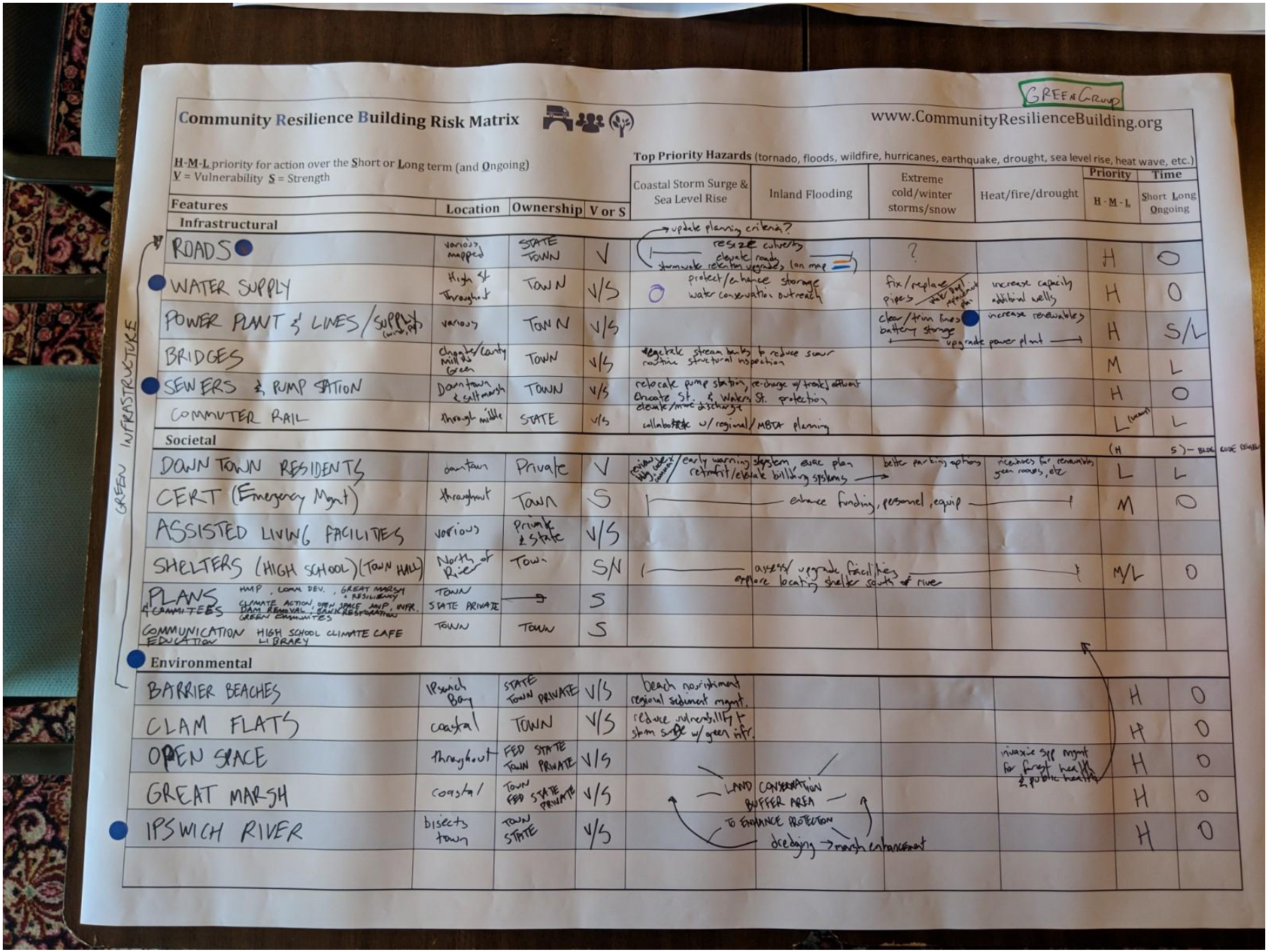
H-M-L priority for action over the Short or Long term (and Ongoing)
V = Vulnerability S = Strength

Top Priority Hazards (tornado, floods, wildfire, hurricanes, earthquake, drought, sea level rise, heat wave, etc.)

Features	Location	Ownership	V or S	Coastal Storm Surge & Sea Level Rise	Inland Flooding	Extreme cold/winter storms/snow	Heat/fire/drought	Priority H-M-L	Time 5-10 Short 10+ Long Ongoing
Infrastructural									
Jetfrys Neck Road / Neck area Argilla Road / Cedar Beach	Neck area	Town	V	raise road / consider culvert connectivity				H	S-O
Pavilion Beach	Neck area	Town	V	investigate artificial dunes / Pedestrian safety				M	L-O
Electric & communication network	Town-wide	Town	V	clear around transition lines / expand on Alternate energy sources / underground electric				H	S
County St. Bridge / Mill Rd. Bridges generally	Varies	Town	V	rebuild / replace consider widening				H/M	L-O
Water & sewer system Exposed & aging pipes upstream upgrades	Varies	Town	V	relocate or protect / regional watershed management / stormwater recharge / retaining infiltration / promote LID in up river communities / underside flood plain by back volume emergency H				H	L-O
Public buildings - facilities	Varies	Town	V	generators / alternate energy sources / Emergency plans / shelter plans / communication				M	S-O
Societal									
Cranberry Beach access	Argilla	Town/Trustees	V	route road / consider Culvert Connectivity / Barrier road & parking with natural uplands				H	S-O
Public health new diseases	Town wide	—	V	educate public / spray / trap at worst areas / hunt where possible move				L	L
property values / insurance costs	Town wide	—	V	-DCR - CRS - Community rating system - Zoning & future flood maps - replace & relocate				L	L
Communication with residents				Alarm system for immediate incidents				H	S
Environmental									
Water - river, supply	Rivers	Public	V/S	Sewer under during peak demand / inflow / stormwater / investigate other water sources / upstream water use management / in concert for LID & onsite storage				H	L-O-S
Barrier beaches	Ocean	Public/ private	V/S	investigate coastal wave sediment study / strategically located dune restoration or creation plans / add to existing dunes / manage & protect barrier beaches				H	S-O-L
Ecology - ocean warming, fish, plants	Varies	Public	V/S	clam removal study / oyster restorations				M	L
Fresh water wetlands	Varies	Public/ Private	V/S	Enforce & strengthen regulation / create new wetlands				L	L
Forest / Moths	Varies	Public/ private	V/S	Management Plan / reforest				L	LS-O
Marsh	Varies	Public/private	V/S	Thin layer TLD / Deposits / ditch remediation / marsh drainage & hydrology / ranging				M	S-O-L



GREEN GROUP

Community Resilience Building Risk Matrix www.CommunityResilienceBuilding.org

H-M-L priority for action over the Short or Long term (and Ongoing)
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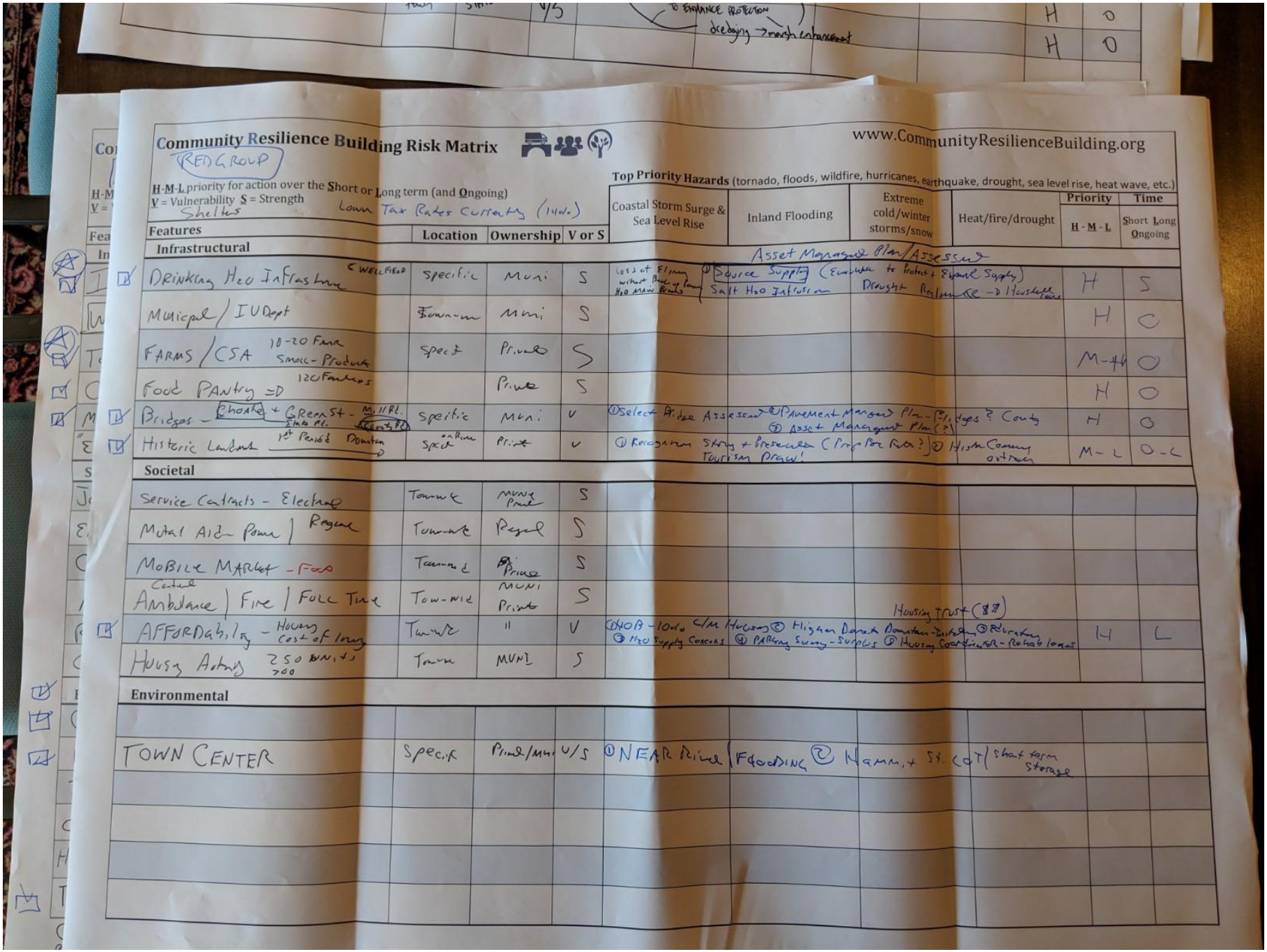
Top Priority Hazards (tornado, floods, wildfire, hurricanes, earthquake, drought, sea level rise, heat wave, etc.)

Features	Location	Ownership	V or S	Coastal Storm Surge & Sea Level Rise	Inland Flooding	Extreme cold/winter storms/snow	Heat/fire/drought	Priority H-M-L	Time Short Long Ongoing
Infrastructural									
ROADS	various mapped	STATE TOWN	V	update planning criteria? resize culverts, elevate roads, stormwater retention upgrades (on map)		?		H	O
WATER SUPPLY	High St Throughout	TOWN	V/S	protect/enhance storage water conservation outreach		fix/replace pipes (early detection)	increase capacity additional wells	H	O
POWER PLANT & LINES/SUPPLY (various)	various	TOWN	V/S			clear/trim lines battery storage ← upgrade power plant →	increase renewables	H	S/L
BRIDGES	Choate/County Mills Green	TOWN	V/S	vegetate stream banks to reduce scour routine structural inspection				M	L
SEWERS & PUMP STATION	Downtown & saltmarsh	TOWN	V/S	relocate pump station, re-charge w/ treated effluent Choate St. & Waters St. protection elevate/move discharge				H	O
COMMUTER RAIL	through middle	STATE	V/S	collaborate w/ regional/MBTA planning				L (vulnerable)	L
Societal								(H M S) – BLDG CODE REVIEW	
DOWN TOWN RESIDENTS	downtown	Private	V	revised bldg. codes / early warning system, evac plan retrofit/elevate building systems →		better parking options	incentives for renewables, green roofs, etc	L	L
CERT (Emergency Mgmt)	throughout	TOWN	S	← enhance funding, personel, equip →				M	O
ASSISTED LIVING FACILITIES	various	private & state	V/S						
SHELTERS (HIGH SCHOOL)(TOWN HALL)	North of River	TOWN	S/N	← assess/ upgrade facilities explore locating shelter south of river →				M/L	O
PLANS & COMMITTEES: HMP, COMM DEV., GREAT MARSH RESILIENCY, CLIMATE ACTION, OPEN SPACE, MVP, INFR., DAM REMOVAL, BANK RESTORATION, GREEN COMMUNITIES	TOWN STATE PRIVATE	→	S						
COMMUNICATION EDUCATION: HIGH SCHOOL CLIMATE CAFE, LIBRARY	TOWN	TOWN	S						
Environmental									
BARRIER BEACHES	Ipswich Bay	STATE TOWN PRIVATE	V/S	beach nourishment regional sediment mgmt.				H	O
CLAM FLATS	coastal	TOWN	V/S	reduce nutrients, IIP & storm surge w/ green infr.				H	O
OPEN SPACE	throughout	FED STATE TOWN PRIVATE	V/S				invasive spp mgmt for forest health & public health	H	O
GREAT MARSH	coastal	TOWN FED STATE PRIVATE	V/S	LAND CONSERVATION BUFFER AREA TO ENHANCE PROTECTION dredging → marsh enhancement				H	O
IPSWICH RIVER	bisects town	TOWN STATE	V/S					H	O

GREEN INFRASTRUCTURE



Community Resilience Building Risk Matrix

(RED GROUP)

www.CommunityResilienceBuilding.org

H-M-L priority for action over the Short or Long term (and Ongoing)
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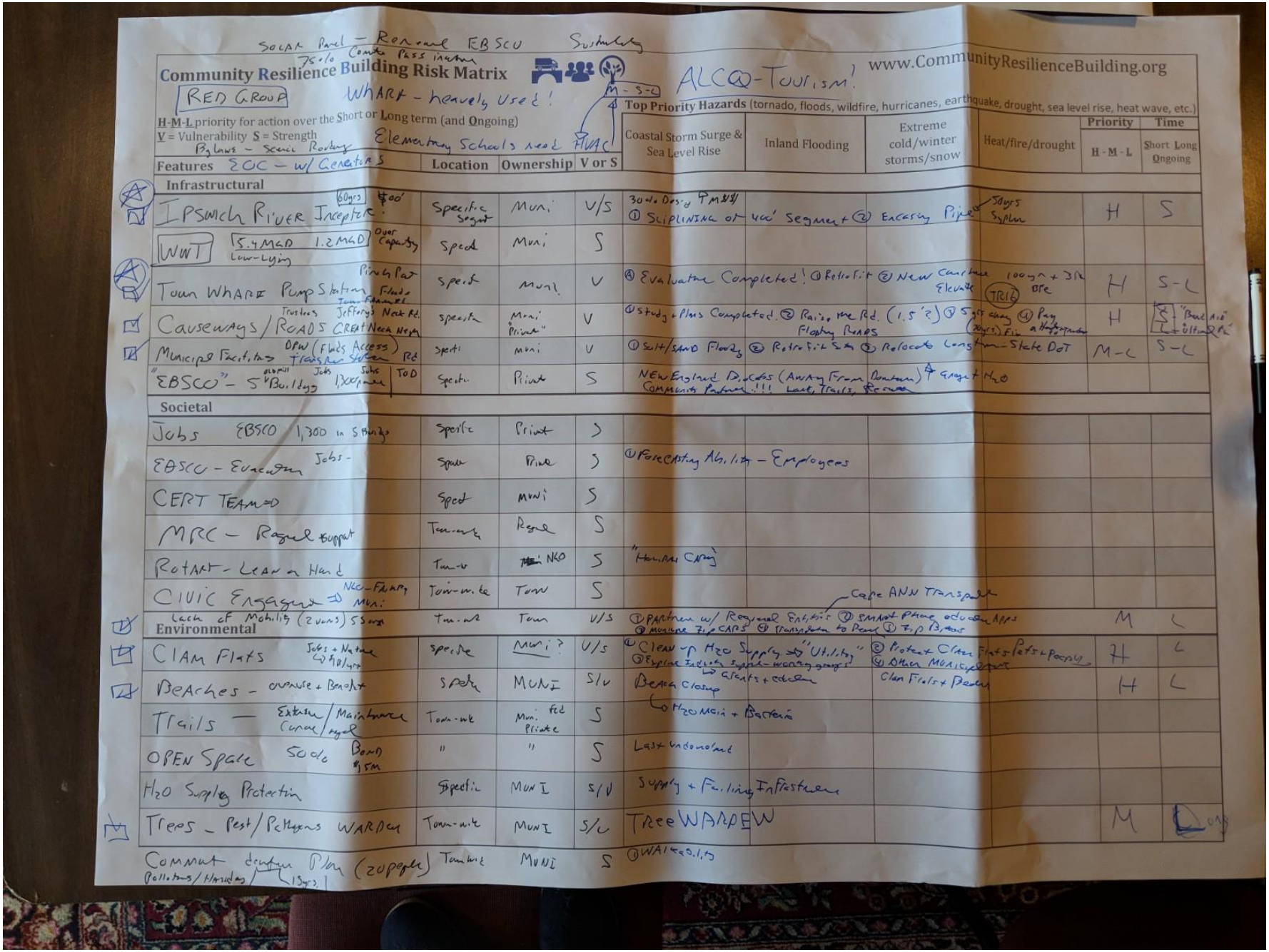
Shelters — Town Tax Rates Currently (14th)

Features	Location	Ownership	V or S	Top Priority Hazards (tornado, floods, wildfire, hurricanes, earthquake, drought, sea level rise, heat wave, etc.): Coastal Storm Surge & Sea Level Rise	Inland Flooding	Extreme cold/winter storms/snow	Heat/fire/drought	Priority H-M-L	Time Short Long Ongoing
Infrastructural									
DRINKING H2O INFRASTRUCTURE (WELLFIELD)	Specific	Muni	S	Loss of Elmm without Back-up Power H2O MAIN Breaks	① Source Supply (Evaluate to Protect + Expand Supply) Salt H2O Intrusion	Drought Resilience → ① Housekeeping		H	S
Municipal / IT Dept	Townwide	Muni	S					H	C
FARMS / CSA (10-20 Farm Small-Producer)	Specific	Private	S					M-H	O
Food PANTRY → (12 Farmers)		Private	S					H	O
Bridges – Choate + Green St – Mill Pl. Essex Pl. Liberty Pl.	Specific	Muni	V	① Select Bridge Assessment ② Pavement Management Plan (?) Hoges ? County ③ Asset Management Plan (?)				H	O
Historic Landmark – 1st Period Downtown	Specific on River	Private	V	① Recognition Story + Preservation (Prop Box Rock?) ② Historic Commission Outreach Tourism Draw!				M-L	O-L
Societal									
Service Contracts – Electrical	Townwide	Muni + Private	S						
Mutual Aid – Power (Regional)	Townwide	Regional	S						
MOBILE MARKET – FOOD	Townwide	Private	S						
Ambulance (Central) / FIRE / FULL TIME	Town-Wide	MUNI Private	S						
AFFORDABILITY – Housing Cost of Living	Townwide	"	V	① NOB – 10+0 C/M Housing ② Higher Density Downtown-Infill ③ Elevation ③ H2O Supply Concerns ④ PARKING Survey – Surplus ⑤ Housing Coordinator – Rehabilitation				H	L
HOUSING AUTHORITY 250 UNITS 700	Townwide	MUNI	S						
Environmental									
TOWN CENTER	Specific	Private/Muni	U/S	① NEAR River/Flooding ② Hamm, St. Cat/ Short term Storage					

Asset Management Plan/Assessment

Housing Trust ($$)

Appendix E: Small Group Matrix: Red Group



Solar Panel – Removal EBSCO Sustainability
75% Compact Pass Inactive

Community Resilience Building Risk Matrix

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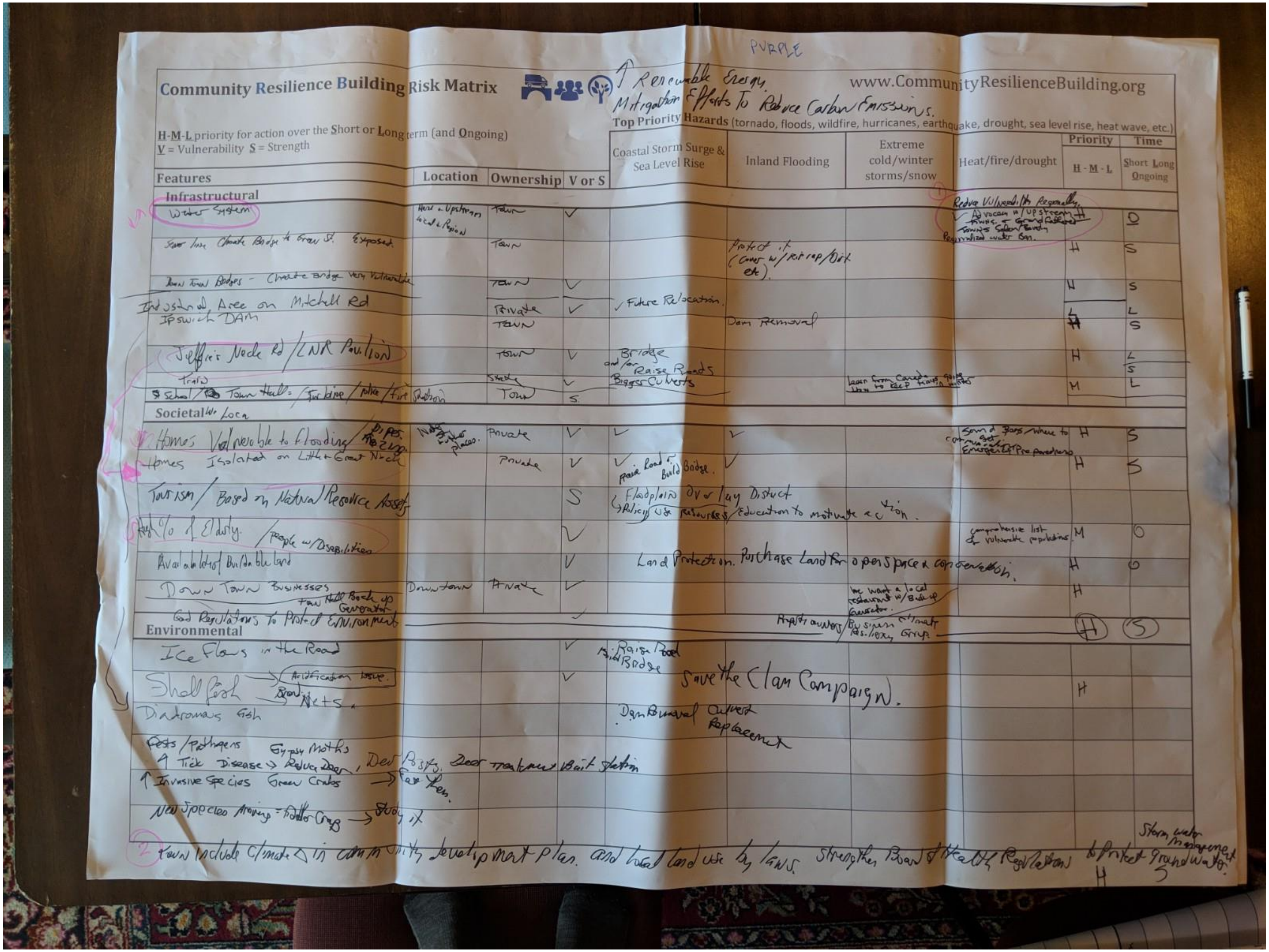
RED GROUP — WHARF – heavily used! — H-M-L — ALCO-Tourism!

H-M-L priority for action over the Short or Long term (and Ongoing)
V = Vulnerability S = Strength
By laws – Scenic Roads — Elementary Schools need HVAC

Top Priority Hazards (tornado, floods, wildfire, hurricanes, earthquake, drought, sea level rise, heat wave, etc.)

Features	Location	Ownership	V or S	Coastal Storm Surge & Sea Level Rise	Inland Flooding	Extreme cold/winter storms/snow	Heat/fire/drought	Priority H-M-L	Time Short Long Ongoing
Infrastructural									
IPSWICH RIVER Incepter (60yrs $400' 5.4MGD 1.2MGD Over Capacity Low-Lying)	Specific Segment	Muni	V/S	30yr Design PMMS ① Slipline of 400' segment ② Encasing Pipe			50yrs System	H	S
WWT	Spread	Muni	S						
Town WHARF Pump Station (Pinch Pt Flood Inundated)	Specific	Muni	V	④ Evaluation Completed! ① Retrofit ② New Carline Elevate (TRIF) 100yr + 3ft Dfe				H	S-L
Causeways / ROADS (Trustees Jeffery's Neck Rd. CRFAT Neck Neck)	Specific	Muni "Private"	V	① Study + Plans Completed. ② Raise the Rd. (1.5'?) ③ Signage ④ Pay (20yrs) File Floating ROADS				H	S L "Beach Access" + Ultimate Risk
Municipal Facilities (DPW (Flds Access) Transfer Station Rd)	Specific	Muni	V	① Salt/SAND Floods ② Retrofit Site ③ Relocate Long term – State DoT				M-L	S-L
"EBSCO" – 5 "Buildings (Landfill Jobs 1,300 employees)	TOD	Specific	S	NEW England Biolabs (Away From Downtown) + Groundwater Community Partner!!! Land, Trails, Revenue					
Societal									
Jobs EBSCO 1,300 in 5 Buildings		Specific	Private	S					
EBSCO – Evacuation Jobs –		Specific	Private	S	① Forecasting Abilities – Employees				
CERT TEAM		Specific	Muni	S					
MRC – Regional support		Town-wide	Regional	S					
ROTARY – LEAN on Hand		Town-wide	~~Muni~~ NKO	S	"Human Capital"				
CIVIC Engagement ⇒ NKC – Filling Muni		Town-wide	Town	S					
Lack of Mobility (2 vans) 55 and		Town-wide	Town	V/S	① Partner w/ Regional Entities ② SMART Phone education Apps ③ Increase Zip CARS ④ Transportation to Penn ⑤ Zip Buses (Cape ANN Transport)			M	L
Environmental									
CLAM FLATS (Jobs + Nature ↳ $10/year)	Specific	Muni?	V/S	① Clean up H2O Supply ⇒ "Utility" ② Protect Clean Flats + Pests + Parasites ③ Explore Industry Septic-wasting groups ↳ Grants + education ④ Other MOA/Cyanobacteria			Clam Flats + Beaches	H	L
BEACHES – overuse + Beach	Specific	MUNI	S/V	Beach Closing ↳ H2O Algae + Bacteria				H	L
TRAILS – Extreme Erosion / Maintenance	Town-wide	Muni. Fed Private	S						
OPEN Space 50% Board $15M	"	"	S	Land Encroachment					
H_2O Supply Protection	Specific	MUNI	S/V	Supply + Failing Infrastructure					
Trees – Pest/Pathogens WARMER	Town-wide	MUNI	S/V	TreeWARPED				M	Long
Comprehensive Plan (zoning) (Pollutions/Hazards / 15yrs)	Town-wide	MUNI	S	① WATER Quality					



PURPLE

Community Resilience Building Risk Matrix

www.CommunityResilienceBuilding.org

↑ Renewable Energy, Mitigation Efforts To Reduce Carbon Emissions.

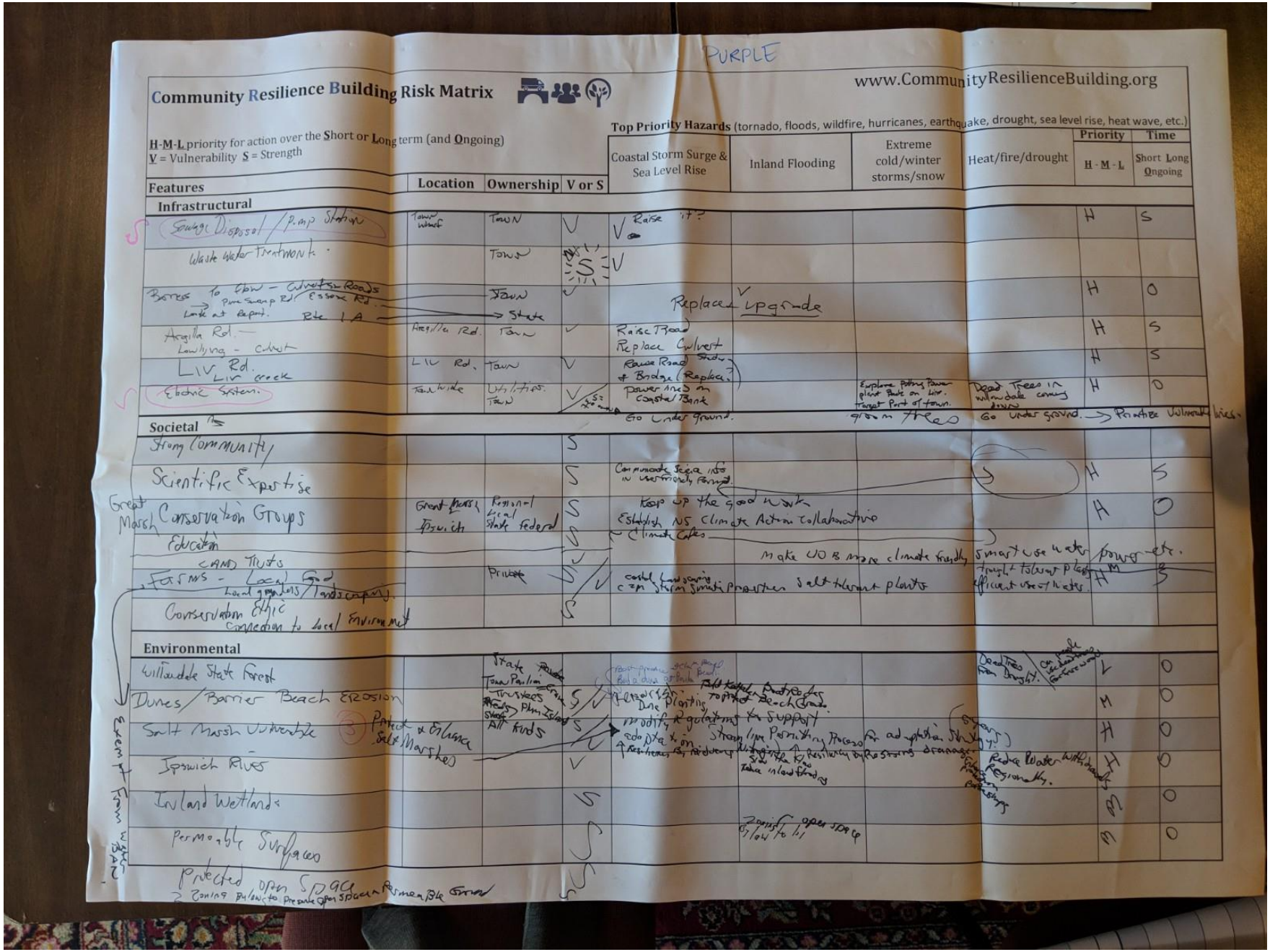
Top Priority Hazards (tornado, floods, wildfire, hurricanes, earthquake, drought, sea level rise, heat wave, etc.)

H-M-L priority for action over the Short or Long term (and Ongoing)
V = Vulnerability S = Strength

Features	Location	Ownership	V or S	Coastal Storm Surge & Sea Level Rise	Inland Flooding	Extreme cold/winter storms/snow	Heat/fire/drought	Priority H-M-L	Time Short Long Ongoing
Infrastructural									
Water System	Here & Upstream Local & Region	Town	✓				① Reduce Vulnerability Regionally. ✓ Advocacy w/ upstream towns. + Grandfathered towns Safe Yield Regionalized water Gov.	H	O
Sewer line Choate Bridge to Green St. Exposed.		Town			Protect it (Cover w/ Rip rap/Dirt etc).			H	S
Down Town Bridges - Choate Bridge very vulnerable		TOWN	✓					H	S
Industrial Area on Mitchell Rd		Private	✓	✓ Future Relocation.				L	L
Ipswich DAM		TOWN			Dam Removal			H	S
Jeffrey's Neck Rd / LNR Pavilion		Town	V	Bridge and/or Raise Roads				H	L
Train		State	✓	Bigger Culverts		Learn from Canada how to keep trains going in winter			S
School / Town Hall = / Turbine / police / fire Station		Town	S.					M	L
Societal w/ Loca									
Homes Vulnerable to flooding / Pipes freezing	Notify [illegible] places.	Private	V	✓	✓		Sound Bars / where to get communication Emergency Preparedness	H	S
Homes Isolated on Little + Great Neck		Private	V	✓ Raise Road or Build Bridge.	✓			H	S
Tourism / Based on Natural Resource Assets			S	Floodplain Overlay District ↳ Policy use Resources / Education to motivate action.					
High % of Elderly / People w/ Disabilities			V				comprehensive list of vulnerable populations	M	O
Availability of Buildable land			V	Land Protection. Purchase Land for open space & conservation.				H	O
Down Town Businesses Town Hall Back up Generator	Downtown	Private	✓			We want a local restaurant w/ Backup Generator.		H	
Good Regulations to Protect Environment			✓	Property owners / Business Climate Resiliency Group				H	S
Environmental									
Ice Flows in the Road			✓	Raise Road And Bridge					
Shellfish → Acidification Issue. → Brand Nets.			✓	Save the Clam Campaign.				H	
Diadromous Fish				Dam Removal Culvert Replacement					
Pests / Pathogens Gypsy Moths ↑ Tick Disease → Reduce Deer, Deer Posts, Deer treatment Bait station									
↑ Invasive Species Green Crabs → Eat them.									
New Species Arriving = Fiddler Crabs → Study it									

② Town include Climate Δ in community development plan. and local land use by laws. Strengthen Board of Health Regulations to Protect groundwater. Storm water management H S

Appendix E: Small Group Matrix: Purple Group



PURPLE

Community Resilience Building Risk Matrix www.CommunityResilienceBuilding.org

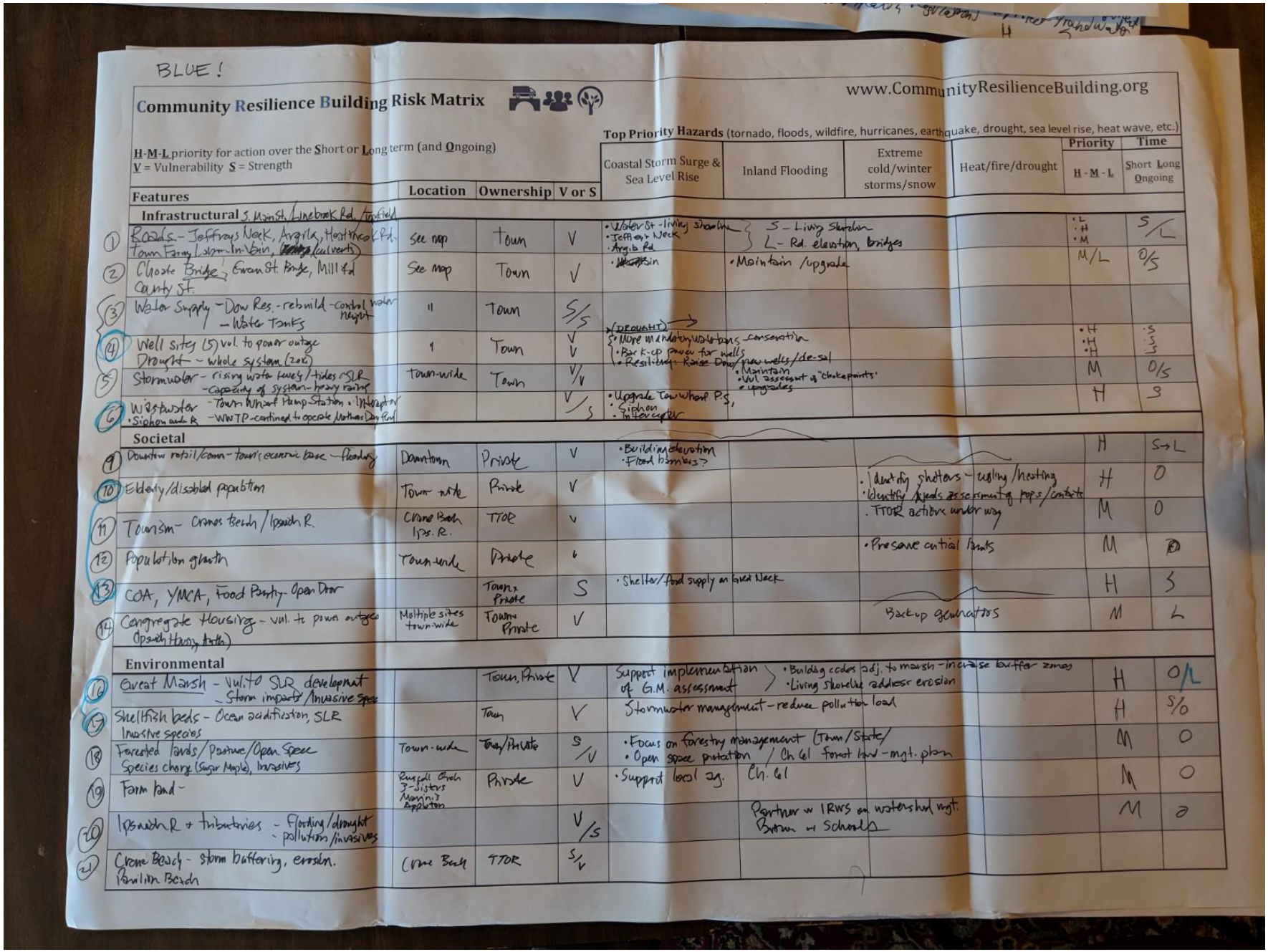
H-M-L priority for action over the Short or Long term (and Ongoing)
V = Vulnerability S = Strength

Top Priority Hazards (tornado, floods, wildfire, hurricanes, earthquake, drought, sea level rise, heat wave, etc.)

Features	Location	Ownership	V or S	Coastal Storm Surge & Sea Level Rise	Inland Flooding	Extreme cold/winter storms/snow	Heat/fire/drought	Priority H-M-L	Time Short Long Ongoing
Infrastructural									
Sewage Disposal / Pump Station	Town wharf	Town	V	V Raise it?				H	S
Waste Water Treatment		Town	V	V					
Barrier to flow – Culverts, Roads Pine Swamp Rd, Essex Rd. Look at Report. Rte 1A		Town → State	V	Replace V Upgrade				H	O
Argilla Rd. — Low lying – culvert	Argilla Rd.	Town	V	Raise Road Replace Culvert				H	S
LIV Rd. LIV Creek	LIV Rd.	Town	V	Raise Road study of Bridge (Replace?)				H	S
Electric System.	Town wide	Utilities. Town	V	Power lines on Coastal Bank Go Under Ground.		Explore putting Power plant Back on Liv. Target Part of town. Storm Trees	Dead Trees in windstorm causing issues Go Under ground. → Prioritize Vulnerable lines.	H	O
Societal									
Strong Community			S						
Scientific Expertise			S	Communicate Science into in user friendly format.				H	S
Great Marsh Conservation Groups	Great Marsh, Ipswich	Regional Local State Federal	S	Keep up the good work Establish NS Climate Action Collaborative ~ Climate Cafes				H	O
Education			V				Make UOB more climate friendly	Smart use of water, power etc.	
CAMD Trusts							drought tolerant plants		
Farms - Local Food Local growers/Landscapers		Private	V	coastal landscaping can stem storm surges Promotes salt tolerant plants			efficient use of waters	H	S
Conservation Ethic Connection to local Environment			S						
Environmental									
Willowdale State Forest		State Private					Dead Trees from Drought.	L	O
Dunes / Barrier Beach Erosion		Town Parks Trustees Friends Plum Island State All Funds	S	Beach Nourishment Dune planting	Build Kept on Boat Ramps to protect Beach Grass.			M	O
Salt Marsh Unventable (3) Protect & Enhance Salt Marshes			S	Modify & adjustment to support Stormwater Permitting Process for adaptation strategies				H	O
Ipswich River			V	Education & Resiliency by Re-storing drainage Take inland flooding			Reduce Water Withdrawals Regionally.	H	O
Inland Wetlands			S					M	O
Permeable Surfaces			S		Require open space to 1:1			M	O
Protected open Space → Zoning Bylaw to Promote Open Spaces Permeable Surfaces			S						

Exempt from water ban

Appendix E: Small Group Matrix: Purple Group



BLUE!

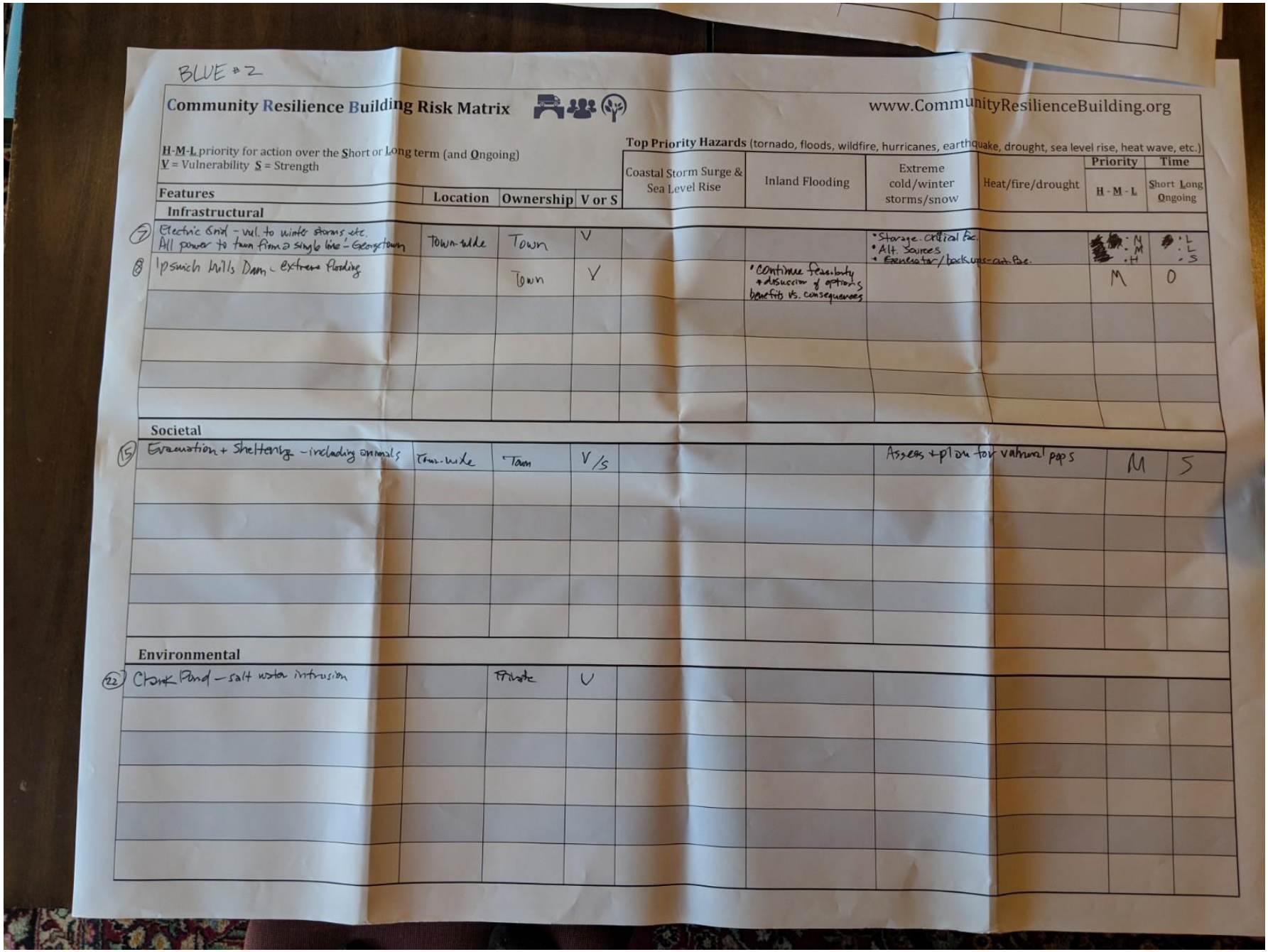
Community Resilience Building Risk Matrix

www.CommunityResilienceBuilding.org

H-M-L priority for action over the Short or Long term (and Ongoing)
V = Vulnerability S = Strength

Top Priority Hazards (tornado, floods, wildfire, hurricanes, earthquake, drought, sea level rise, heat wave, etc.)

Features	Location	Ownership	V or S	Coastal Storm Surge & Sea Level Rise	Inland Flooding	Extreme cold/winter storms/snow	Heat/fire/drought	Priority H-M-L	Time Short Long Ongoing
Infrastructural S. Main St. Linebrook Rd. Topsfield									
1 Roads - Jeffrays Neck, Argilla, Heathcock Rd. Town Farm Lane, Linebrook Rd. (culverts)	See map	Town	V	• Water St - living shoreline • Jeffrey's Neck • Argilla Rd	S - Living Shoreline L - Rd. elevation, bridges			• L • H • M	S/L
2 Choate Bridge, Ewan St. Bridge, Mill Rd County St.	See map	Town	V	• [illegible] in	• Maintain / upgrade			M/L	O/S
3 Water Supply - Dow Res. - rebuild - control water height - Water Tanks	"	Town	S/S						
4 Well sites (5) vol. to power outage Drought - whole system (2016)	"	Town	V V	(DROUGHT) • More monitoring/restrictions, conservation • Back-up power for wells • Resiliency - Raise Dow, new wells/de-sal				• H • H • H	S S S
5 Stormwater - rising water levels / tides / SLR - capacity of system - heavy rains	Town-wide	Town	V/V		• Maintain • Vul. assessment of "choke points" • upgrades			M	O/S
6 Wastewater - Town Wharf Pump Station • Interceptor • Siphon and R - WWTP - continued to operate Nathan Dorman Pond			V/S	• Upgrade Town Wharf PS, • Siphon • Interceptor				H	S
Societal									
9 Downtown retail/comm - town's economic base - flooding	Downtown	Private	V	• Building elevation • Flood barriers?				H	S→L
10 Elderly/disabled population	Town-wide	Private	V				• Identify shelters - cooling/heating • Identify needs assessment of pops/contacts	H	O
11 Tourism - Crane Beach / Ipswich R.	Crane Beach Ipsw. R.	TTOR	V				• TTOR actions under way	M	O
12 Population growth	Town-wide	Private	V				• Preserve critical lands	M	O
13 COA, YMCA, Food Pantry - Open Door		Town, Private	S	• Shelter/food supply on Great Neck				H	S
14 Congregate housing - vul. to power outage (Ipswich Haven, Parkview)	Multiple sites town-wide	Town, Private	V				Backup generators	M	L
Environmental									
15 Great Marsh - Vul. to SLR development - Storm impact / Invasive spec		Town, Private	V	Support implementation of G.M. assessment	• Building codes adj. to marsh - increase buffer zones • Living shoreline address erosion			H	O/L
16 Shellfish beds - Ocean acidification, SLR Invasive species		Town	V	Stormwater management - reduce pollution load				H	S/O
18 Forested lands / Pasture / Open Space Species change (Sugar Maple), invasives	Town-wide	Town/Private	S/V	• Focus on forestry management (Town/State/ • Open space protection / Ch. 61 forest land - mgt. plan				M	O
19 Farm land -	Rustfall Orchard, 3 Sisters Manning's Appleton	Private	V	• Support local ag. Ch. 61				M	O
20 Ipswich R. + tributaries - Flooding/drought - pollution/invasives			V/S		Partner w IRWS on watershed mgt. Brown w Schools			M	O
21 Crane Beach - storm buffering, erosion. Pavilion Beach	Crane Beach	TTOR	S/V						



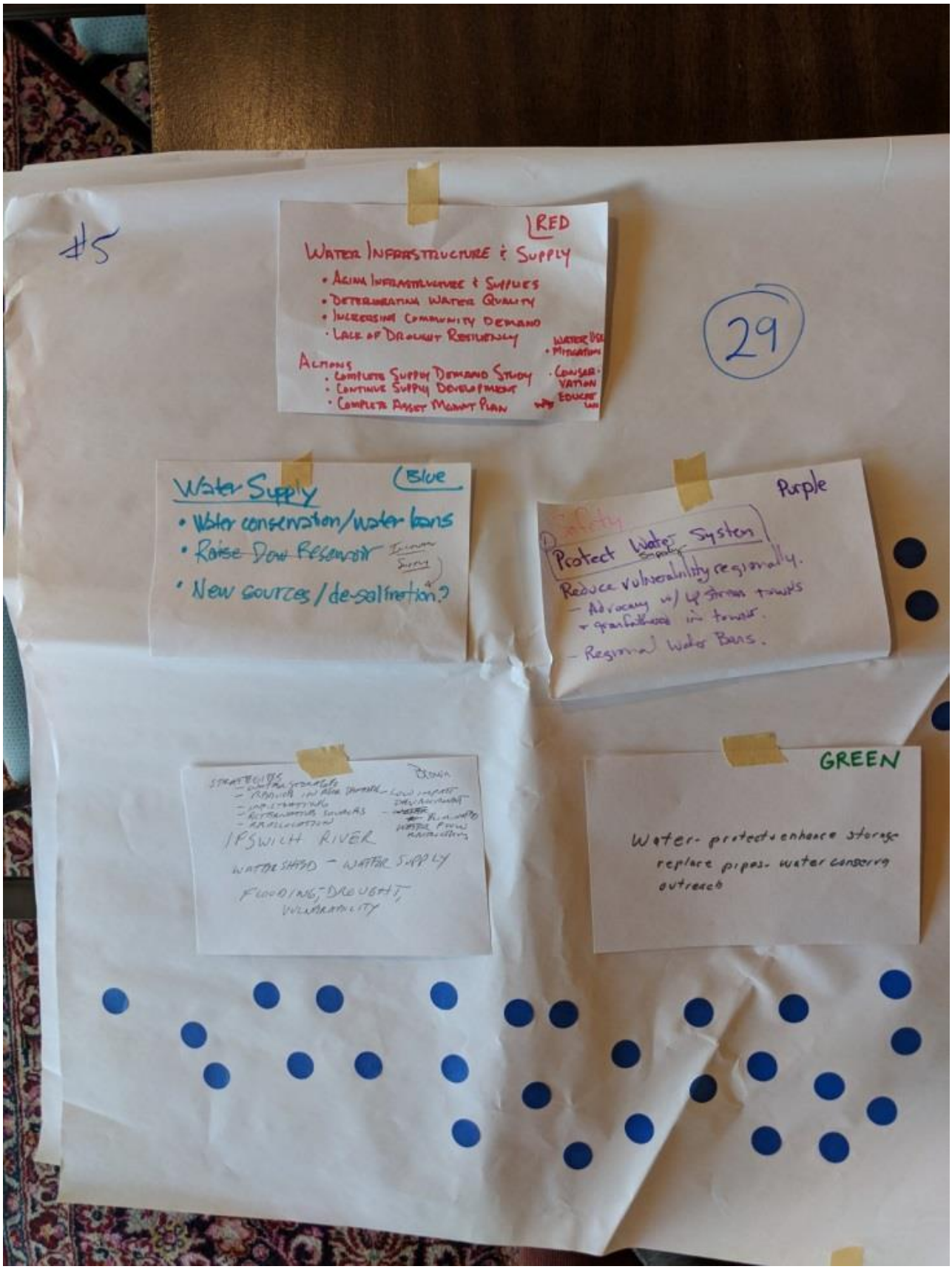
BLUE #2

Community Resilience Building Risk Matrix www.CommunityResilienceBuilding.org

H-M-L priority for action over the Short or Long term (and Ongoing)
V = Vulnerability S = Strength

	Features	Location	Ownership	V or S	Top Priority Hazards (tornado, floods, wildfire, hurricanes, earthquake, drought, sea level rise, heat wave, etc.) Coastal Storm Surge & Sea Level Rise	Inland Flooding	Extreme cold/winter storms/snow	Heat/fire/drought	Priority H-M-L	Time Short Long Ongoing
	Infrastructural									
7	Electric Grid - vul. to winter storms, etc. All power to town from a single line - Georgetown	Town-wide	Town	V			• Storage - critical fac. • Alt. Sources • Generator/backups - crit. fac.		H	L
8	Ipswich Mills Dam - extreme flooding		Town	V		• Continue feasibility + discussion of options benefits vs. consequences			M	O
	Societal									
15	Evacuation + Sheltering - including animals	Town-wide	Town	V/S			Assess + plan for vulnerable pops		M	S
	Environmental									
22	Clark Pond - salt water intrusion		Private	V						

Appendix E: Small Group Matrix: Blue Group



Appendix F: Top Priority Posters with Sticky Dot Votes

#4

GREEN

Environment - shoreup existing natural resources - nourishment - vegetation - areas designated protected reduce

27

Brown

RESTORE/PROTECT BARRIER BEACH & MARSH SYSTEMS

- CONSIDER MARSH/SEDIMENT SUPPLY
- STRATEGICALLY SITING DUNE RESTORATION
- RESTORING MARSH HYDROLOGY THROUGH DITCH REMEDIATION & RUNNELLING
- IMPROVE EXISTING DUNES THIN LAYER DEPOSITION

Blue

Great Marsh/ Shellfish Beds

- Implement GM
- Bldg codes - adjust buffer zones
- Living shoreline
- Stormwater management

3

Purple

Protect the salt marshes.

- Modify state regulations to support adaptation. Stream line permitting process
- ↑ Resiliency by reducing Nitrogen and restoring drainage.
- Land protection to allow salt Marsh migration.

#3

GREEN

#1

Sewers - rehab. pump station
Recharge water - Protect
Choate St + Water St. Lines

(RED)

WASTEWATER INFRASTRUCTURE
- INTERCEPTOR & SIPHON
- TOWN WHARF PUMP STATION

ACTION:
- EVALUATIONS COMPLETE
- COMPLETE DESIGN & PERMITTING
- REHAB AND/OR REPLACE PIPING & PUMP STA.
- COMPLETE ASSET MANAGMT PLAN

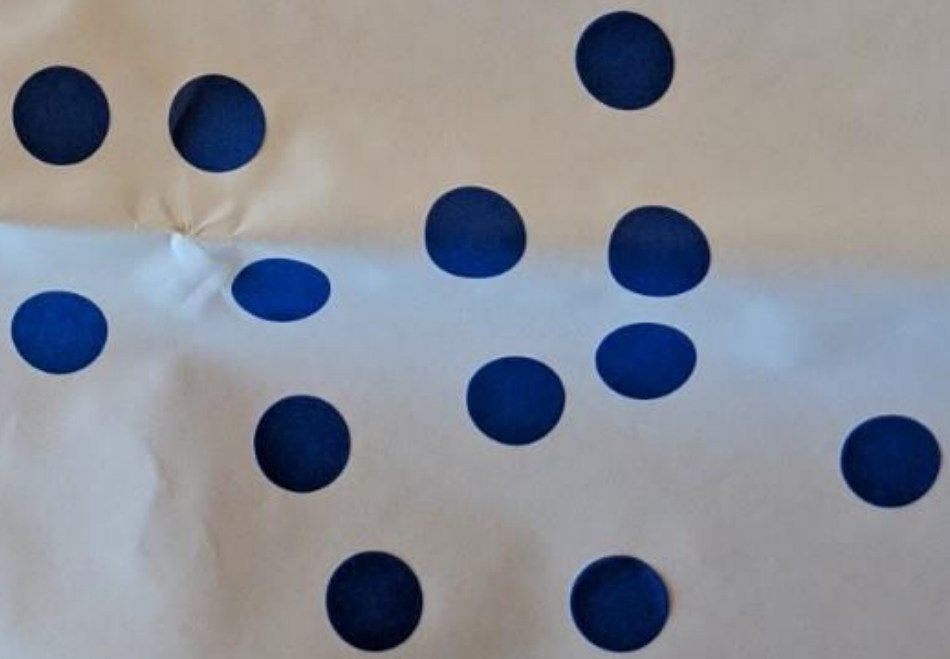
14

Wastewater (Blue

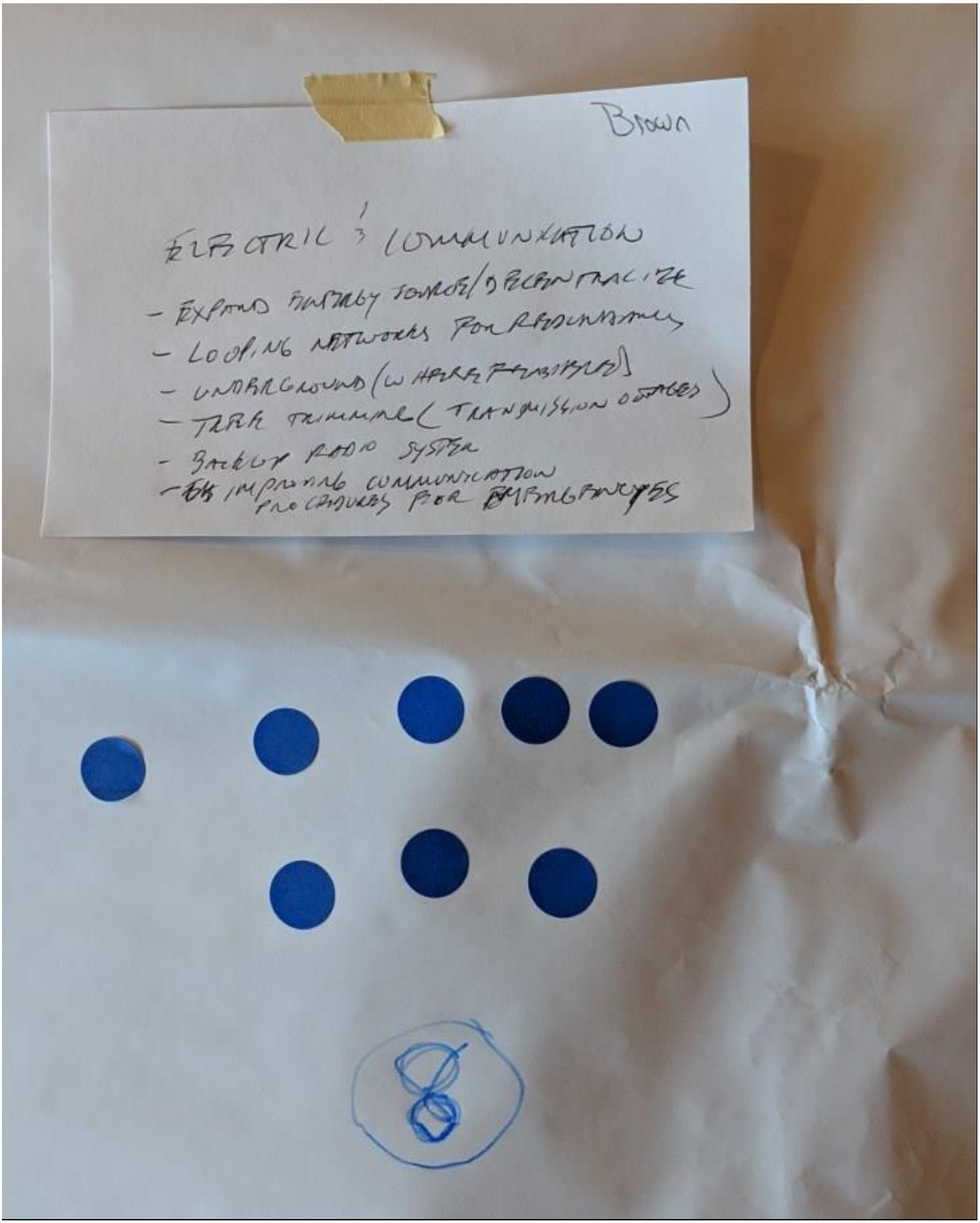
- upgrade Town Wharf pumping
- upgrade Siphon
- upgrade interceptor

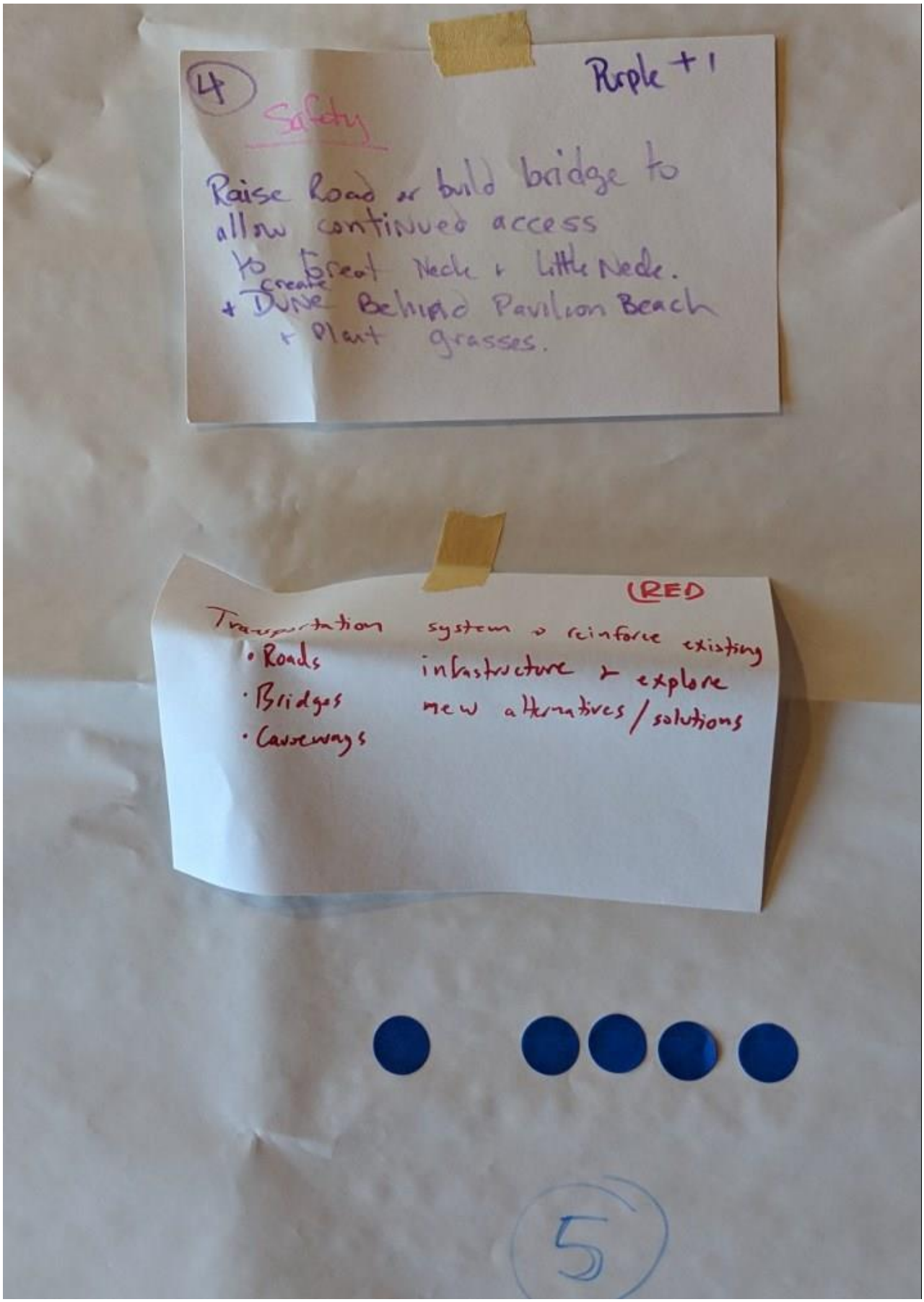
(2) Regulation Changes — Purple

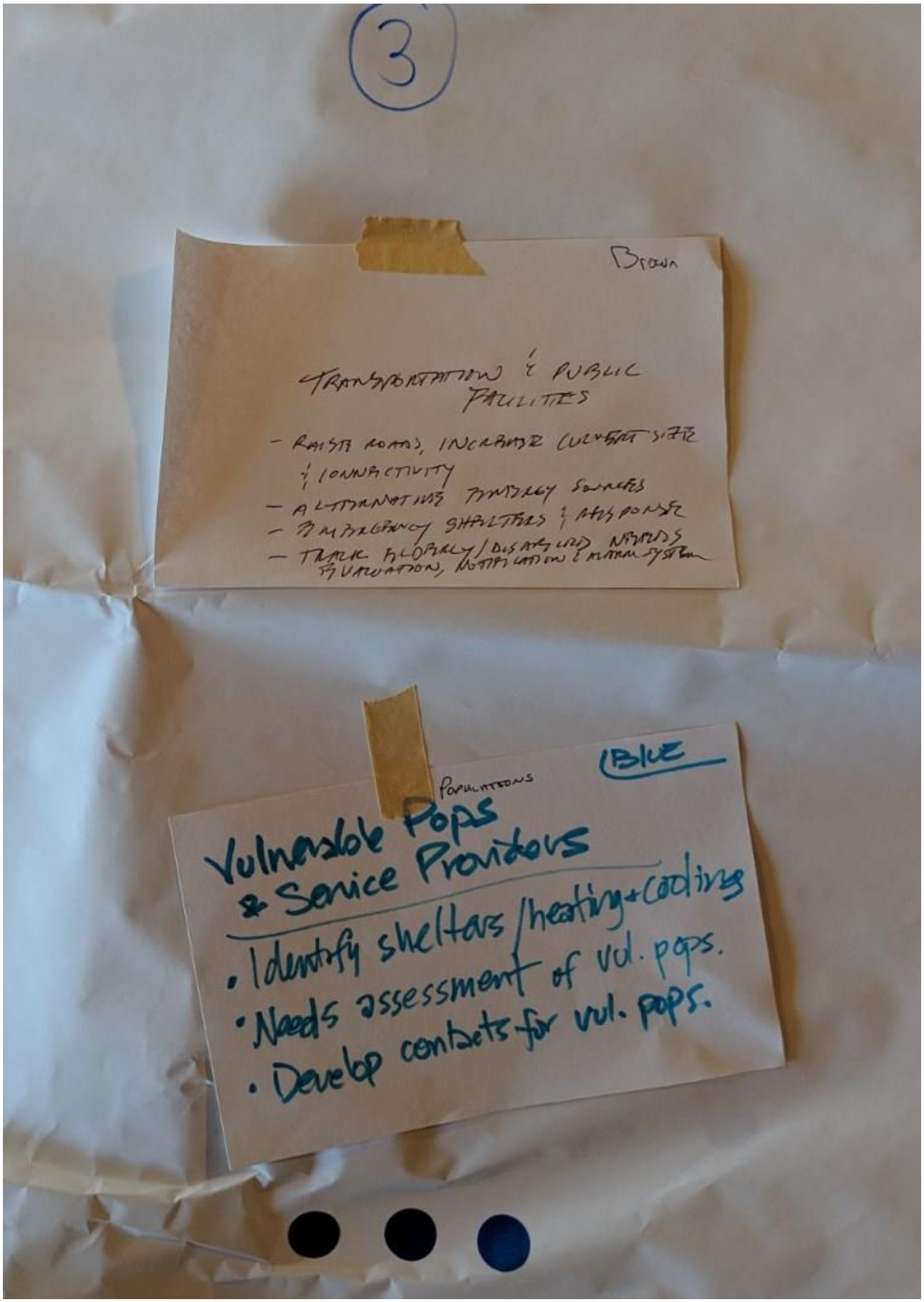
Include climate change and sea level rise considerations in all local regulations, Bylaws + Policies including: zoning, Building, Health, Wetlands stormwater management, Open Space, economic development, climate Action Plan, Community Development Plan, + MVP. Examples include: Add a flood plain overlay district, strengthen the stormwater management Bylaw to address stronger storms.



13


BROWN
ELECTRIC 3 COMMUNICATION
- EXPAND BATTERY POWER/SPECIFY CAPACITY
- LOOPING NETWORKS FOR REDUNDANCY
- UNDERGROUND (WHERE FEASIBLE)
- TREE TRIMMING (TRANSMISSION OUTAGES)
- BACKUP RADIO SYSTEM
- IMPROVING COMMUNICATION PROCEDURES FOR EMERGENCIES


4
Purple +1
Safety
Raise Road or build bridge to allow continued access to Great Neck + Little Neck.
+ Create Dune Behind Pavilion Beach + Plant grasses.
(RED)
Transportation
• Roads
• Bridges
• Causeways
system → reinforce existing infrastructure + explore new alternatives / solutions
5

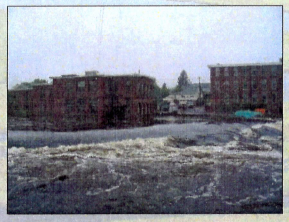

3
Brown
TRANSPORTATION & PUBLIC FACILITIES
- RAISE ROADS, INCREASE CULVERT SIZE & CONNECTIVITY
- ALTERNATIVE ENERGY SOURCES
- EMERGENCY SHELTERS & RESPONSE
- TRACK FLOODS / DISASTERS AND NEEDS EVALUATION, NOTIFICATION & ALARM SYSTEM
BLUE
POPULATIONS
Vulnerable Pops & Service Providers
• Identify shelters/heating+cooling
• Needs assessment of vul. pops.
• Develop contacts for vul. pops.

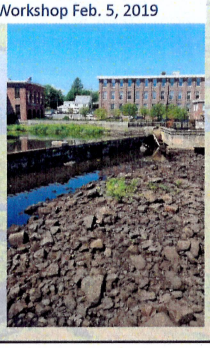
Appendix G:

Presentation Slides from Ipswich CRB Workshop Feb 5. 2019

Municipal Vulnerability Preparedness Program, Town of Ipswich, MA

Community Resiliency Building Workshop Feb. 5, 2019





May, 2006 August, 2016

Ipswich River, at the Ipswich Mills Dam

Ipswich MVP Workshop

February 5, 2019

Thank you to Ethan Parsons, Alicia Geilen, and Lt. Jonathan Hubbard for leading the Ipswich MVP Planning team.

Agenda

8am	Registration
8:30am	Welcome & Intros
9am	Presentation
9:40am	Small Group Work
12 noon	Lunch
12:45pm	Small Groups Reconvene
1pm	Large Group Discussion & Prioritization
3pm	Adjourn

Thank you for being here!

IPSWICH RIVER WATERSHED ASSOCIATION
The Voice of the River

Expectations of Workshop Participants

- *Permission to be active participants*
- *Your ideas & expertise are needed*
- *Respect contributions of others*
- *Be creative and remain optimistic*
- *Stay on task (as defined by your facilitators)*
- *Turn off your cell phone if you can*

Introductions

Your name

Your relationship to Ipswich

One place you want to go where you've never been

Commonwealth of Massachusetts

Executive Office of Energy and Environmental Affairs

Municipal Vulnerability Preparedness Program

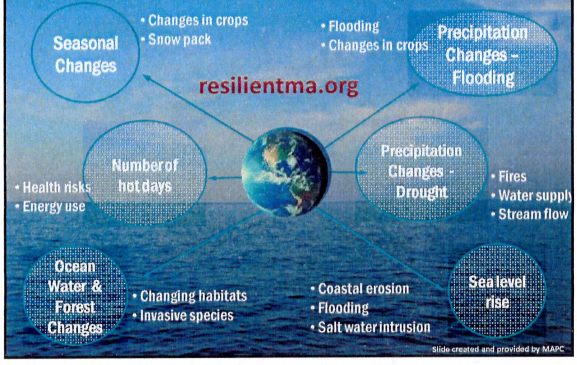
State and local partnership to build resiliency to climate change

1. Engage Community → 2. Identify CC impacts and hazards → 3. Complete assessment of vulnerabilities & strengths → 4. Develop and prioritize actions → 5. Take Action

The Municipal Vulnerability Preparedness (MVP) program helps communities in Massachusetts to:

- Define extreme weather and natural and climate related hazards
- Identify existing and future vulnerabilities and strengths
- Develop and prioritize opportunities to take action to reduce risk and build resilience

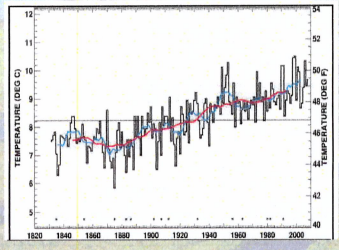
Our warming climate will have multiple impacts...



Slide created and provided by MAPC

Temperature change: observed

For the Northeast United States: average temperature increased by almost 2 degrees, between 1895 and 2011 (US National Climate Assessment 2014)



Blue Hill Observatory (near Boston) Annual Temperature, 1831-2008

Source: Michael J. Iacono (from MA Climate Change Adaptation Report 2011)

Temperature change: predicted

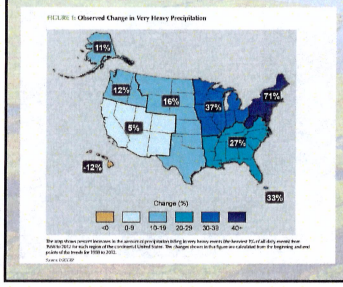
Projected Temperatures
Ipswich Watershed

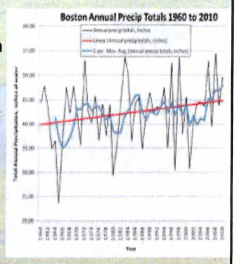
Temperature F°	Observed Baseline 1971-2000	Predicted 2050s	Predicted 2090s
Average annual temperature	49.48°F	52.22-55.69°F	53.07-60.24°F
Days over 90 ° (days/year)	6.88 days	8 to 30 more days, so a total of approx. 15-37 days	11 to 55 more days, so a total of approx.18-65 days

www.mass.gov/service-details/climate-change-in-massachusetts-and-its-impacts

Precipitation change: observed

For the Northeast United States:
71% increase in heavy precipitation from 1958 – 2012.
Source: US National Climate Assessment 2014





For Boston area:
10% increase in annual precipitation over the past 50 years

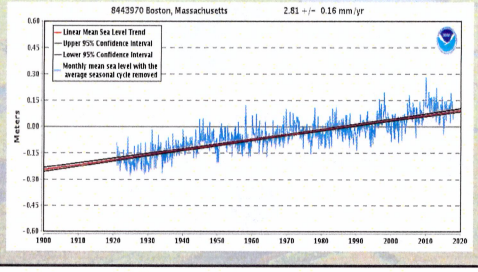
Precipitation change: predicted
Ipswich Watershed

Parameter	Current Conditions (1971-2000)	Predicted Change by 2050		Predicted Change by 2100	
		Low	High	Low	High
Annual Precipitation (inches)	45.59	+0.04	+5.35	+0.73	+7.0
Annual Consecutive Dry Days	16.69	+0.05	+2.50	+0.15	+3.09

www.mass.gov/service-details/climate-change-in-massachusetts-and-its-impacts

Sea level rise: observed

- Boston tide station
- Records from 1921-2016
- Equivalent to 11 inches in 100 years



Sea level rise: projected (Greater Boston Harbor)

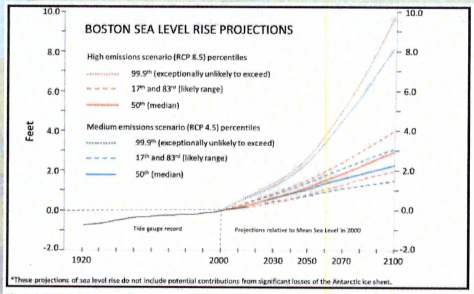
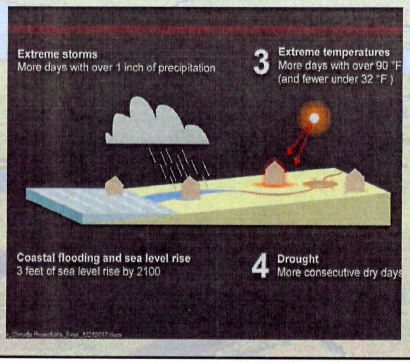
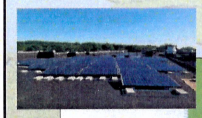


Figure 1: Sea level rise projections at the Boston tide gauge. Projection curves are given for the medium (RCP 4.5) and high (RCP 8.5) emissions scenarios, at multiple levels of likelihood, in feet relative to mean sea level in 2000. These projections of sea level rise do not include potential contributions from significant losses of the Antarctic ice sheet.

In summary, changes to our region include....



Prior Planning Efforts:
Climate Action Plan 2011, Updated 2017

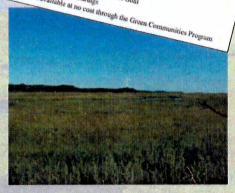


II. Key Recommendations to Undertake in FY 2018 and New Recommendations from the Climate Action Plan: 2017 Update

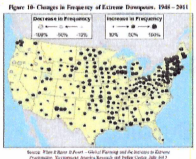
Key Recommendations for FY 2018

1. Include Energy Conservation Metrics in Department Staff Performance Plans
2. Hire an Energy Conservation Education Coordinator
3. Establish an Interdepartmental Energy Team
4. Establish a Climate Action Commission for the Town
5. Implement a Municipal Energy/GHG Emissions Reduction Goal
6. Perform Energy Audits for all Municipal Buildings
7. Adopt the energy tracking tool available at no cost through the Green Communities Program

Climate Action Plan
Ipswich, Massachusetts



Hazard Mitigation Planning
December, 2018



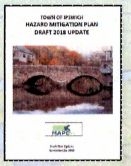
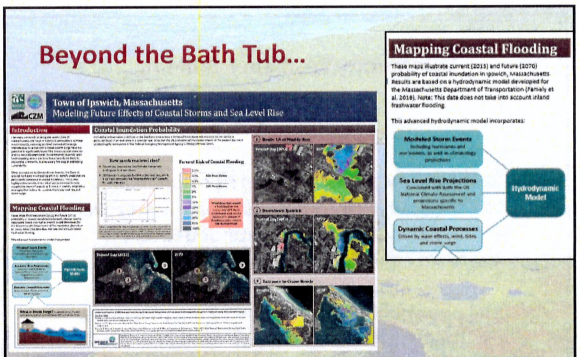


Table 5 - Hazard Risks Summary

Hazard	Frequency		Severity	
	Massachusetts	Ipswich	Massachusetts	Ipswich
Flooding	High	High	Serious	Serious
Dam failures	Very Low	Very Low	Extensive	Serious
Hurricane/Tropical Storms	Medium	Medium	Serious	Serious
Tornadoes	Medium	Very Low	Serious	Serious
Thunderstorms	High	High	Minor	Minor
Nor'easter	High	High	Minor	Minor
Winter-Blizzard/Snow	High	High	Minor	Minor
Winter-Ice Storms	Medium	Medium	Minor	Minor
Earthquakes	Very Low	Very Low	Serious	Serious
Landslides	Low	Very Low	Minor	Minor
Brush fires	Medium	High	Minor	Minor
Extreme Temperatures	Medium	Medium	Minor	Minor
Drought	Low	Low	Minor	Minor
Coastal Hazards	High	High	Serious	Serious
Tsunami	Very Low	Extensive	Extensive	Extensive

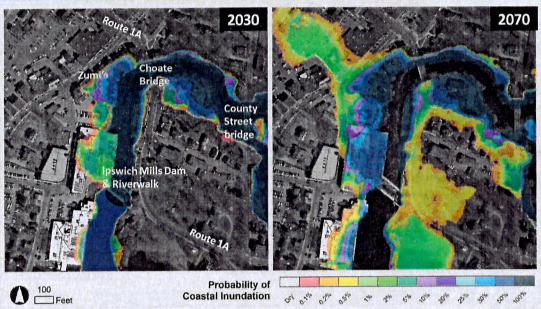
Great Marsh Coastal Resiliency Planning
December, 2017

Beyond the Bath Tub…



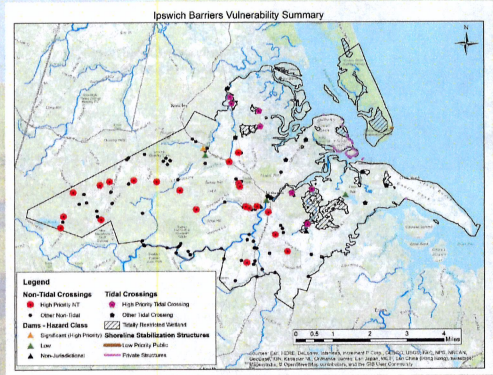
Woods Hole Group assessment of coastal storms and sea level rise for the Great Marsh

GIS-Based Vulnerability Assessments – including socioeconomic impacts - Downtown Ipswich & other important locations



Percent risk of flooding at least once in the calendar year 2030 and 2070

Previous Planning: Assessment of Barriers to Flow



Today's Planning

Community Resilience Building
WORKSHOP GUIDE

www.CommunityResilienceBuilding.org

Community Resilience Building...

What is "resilience"?

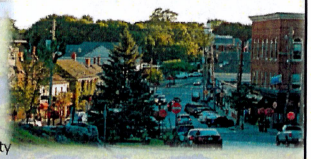
Community Resilience Building...

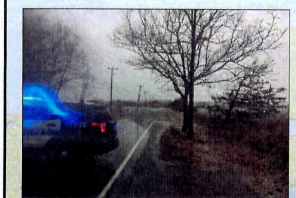
Resilience is...

The ability of a system and its components
to anticipate, absorb, accommodate, or recover
from the effects of a hazardous event
in a timely and efficient manner,
including through ensuring
the preservation, restoration, or improvement
of its essential basic structures and functions.

Ipswich

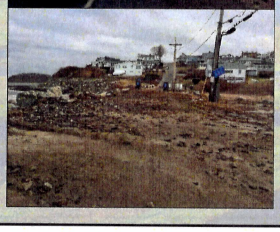
- 33 sq. miles, 21% of the town's land area is the Great Marsh
- 13,175 residents
- Dense downtown along the banks of the Ipswich River
- The Great Marsh, including Crane Beach, dunes, marshes, the Ipswich River, and the estuary, are important community resources for recreation, tourism, the overall economy
- These natural resources also serve to buffer and protect our infrastructure





Jeffrey's Neck Road, Ipswich
03/02/2018 | 11:15 am

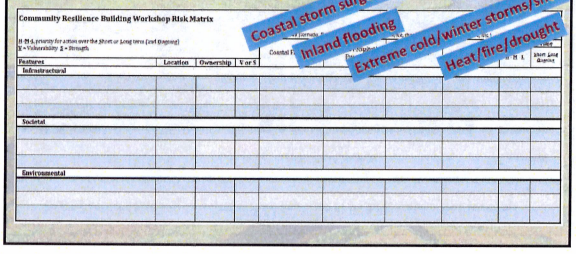
Ipswich is seeing the impacts of extreme weather and of climate change.

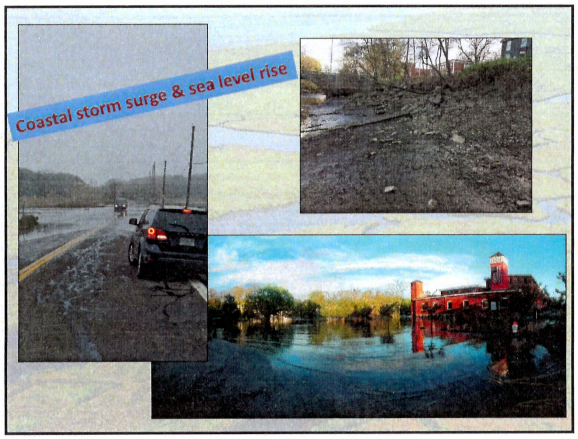


Pavilion Beach, Ipswich
03/03/2018 | 4:43 pm

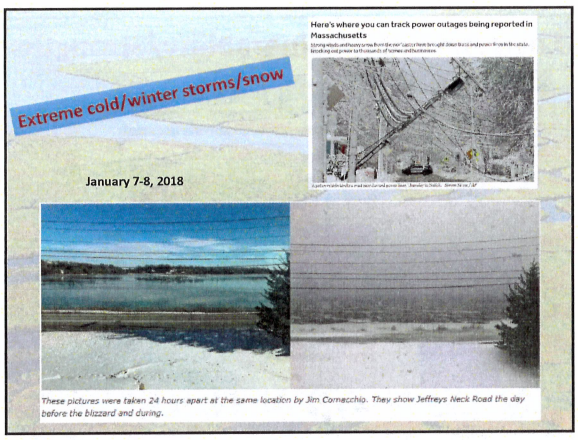
Community Resilience Building Workshop Matrix

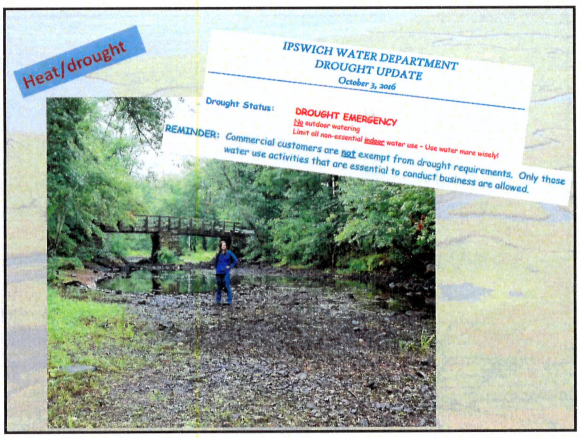
Step 1: What are our Top Hazards?

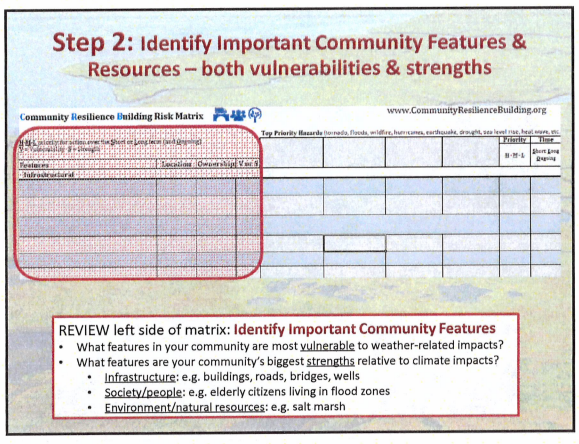


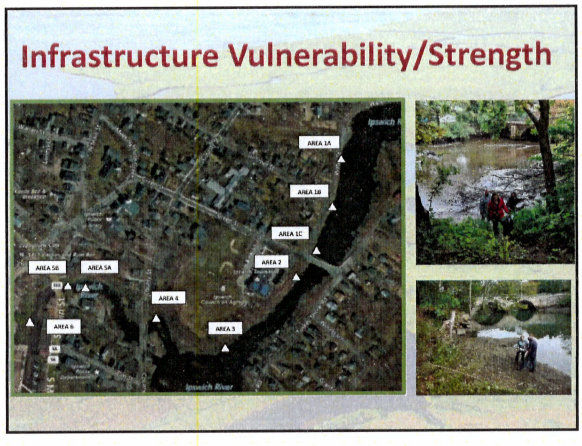

Coastal storm surge & sea level rise


Inland flooding


Extreme cold/winter storms/snow
Here's where you can track power outages being reported in Massachusetts
January 7-8, 2018
These pictures were taken 24 hours apart at the same location by Jim Comacchio. They show Jeffreys Neck Road the day before the blizzard and during.


Heat/drought
IPSWICH WATER DEPARTMENT
DROUGHT UPDATE
October 31, 2016
Drought Status:
DROUGHT EMERGENCY
No outdoor watering
Limit all non-essential indoor water use - Use water more wisely!
REMINDER: Commercial customers are not exempt from drought requirements. Only those water use activities that are essential to conduct business are allowed.


Step 2: Identify Important Community Features & Resources – both vulnerabilities & strengths
Community Resilience Building Risk Matrix
www.CommunityResilienceBuilding.org
Top Priority Hazards
Priority
Time
Features
Infrastructural
REVIEW left side of matrix: Identify Important Community Features
What features in your community are most vulnerable to weather-related impacts?
What features are your community's biggest strengths relative to climate impacts?
Infrastructure: e.g. buildings, roads, bridges, wells
Society/people: e.g. elderly citizens living in flood zones
Environment/natural resources: e.g. salt marsh


Infrastructure Vulnerability/Strength
AREA 1A
AREA 1B
AREA 1C
AREA 2
AREA 3
AREA 4
AREA 5A
AREA 5B
AREA 6
Ipswich River

Infrastructure

- **What infrastructure/facilities are exposed?**
  - *Wastewater treatment plant, elderly housing, schools, hazardous materials, etc…*
- **What makes this infrastructure vulnerable?**
  - *Location, age, building codes, type of housing, etc…*
- **Consequences of this infrastructure vulnerability?**
  - *E.g. lack of access to critical facilities – urgent care, pharmacies*

***POSSIBLE ACTIONS*: What can be done?**
- *Assess housing in vulnerable areas?*
- *Prioritize future development in lower-risk areas?*
- *Integrate risks into capital improvement plans?*

Societal Vulnerability/Strengths

POPULATION CHARACTERISTICS	BETTER / WORSE STATE RATE[1]	COMMUNITY ESTIMATE	STATE ESTIMATE
Total population all ages		13,682	6,742,143
Population 60 years or older as % of total population		28.3%	21.2%
Total population 60 years or older		3,877	1,428,144
Population 65 years or older as % of total population		20.9%	15.1%
Total population 65 years or older		2,866	1,016,679
% of 65+ population living alone		26.9%	30.2%
% 75-84 years		27.8%	29.4%
% 85 years or older		16.3%	15.2%

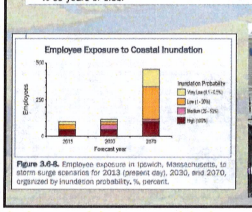
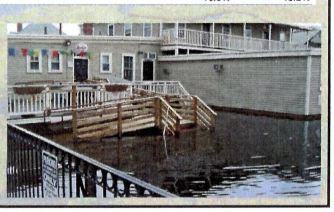


Figure 3.6-6. Employee exposure in Ipswich, Massachusetts, to storm surge scenarios for 2013 (present day), 2030, and 2070, organized by inundation probability, %, percent.



Society

- **Population characteristics in high-risk areas?**
  - *Elderly, low income, special needs, etc…*
- **How will hazards intensify these characteristics?**
  - *Where are areas for improvement in the community?*
- **Strengths of your community?**
  - *Active civic groups, organizations, associations?*

POSSIBLE ACTIONS: What can be done?
- *Improve existing programs (which ones)?*
- *Increase awareness via education/outreach on hazards?*
- *Increase involvement by citizens (on what and with whom)?*

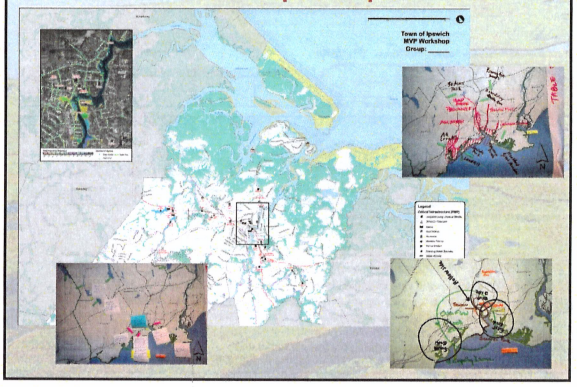
Environmental Vulnerability/Strengths

Environment

- **Natural resources important to your community and where?**
- **Benefits natural resources provide and where?**
  - *Storm buffering, flood protection, erosion control, water quality, recreation, etc.*
- **High risk areas and effects of hazards?**
  - *Impact without and with more natural resources*

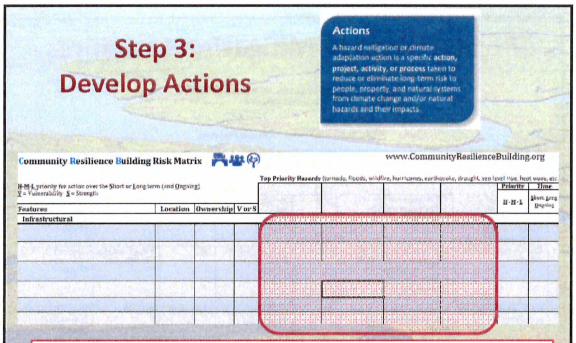
POSSIBLE ACTIONS: What can be done?
- *Conserve land located adjacent to flood zones?*
- *Green infrastructure in neighborhoods?*
- *Decrease impervious cover and encourage low impact development?*

Base Map Example



Step 3: Develop Actions

Actions
A hazard mitigation or climate adaptation action is a specific action, project, activity, or process taken to reduce or eliminate long-term risk to people, property, and natural systems from climate change and/or natural hazards and their impacts.



COMPLETE right side of matrix: **Develop Actions**
1. Develop Actions – How should we reduce vulnerability and/or reinforce strengths?
2. Prioritize – Are actions high, medium, or low priority?
3. Determine Urgency – Are actions ongoing? Or a short-term or long-term step?

Nature-based strategies can complement engineering solutions to benefit our communities.

- Planning and Zoning
- Protect coastal & inland natural habitats
- Restore degraded natural habitats
- Replicate natural systems & cycles in developed areas

Great Marsh Regional Adaptation Strategies

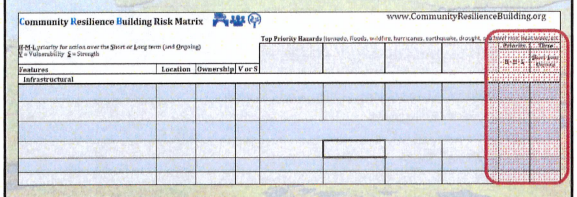
Natural and Nature-Based Strategies *(see also page 130-137)*
- Ensure and restore connectivity of river and coastal systems
- Use living shorelines to stabilize shoreline edges, where appropriate
- Explore construction of offshore shellfish reefs and beds to attenuate wave energy, reduce erosion, and improve water quality
- Protect and restore barrier beaches and dunes through renourishment and revegetation
- Explore opportunities to beneficially reuse dredged material
- Restore sub-aquatic vegetation
- Restore degraded salt marshes
- Facilitate marsh migration
- Enhance land conservation efforts

Outreach and Engagement *(see also page 144-146)*
- Develop municipal strategies for enhanced outreach and education
- Strengthen existing regional outreach and education programs
- Support and develop opportunities for citizen science

Land-use Planning and Policy *(see also page 140-144)*
- Update municipal policies
- Prioritize low-impact development (LID) practices
- Revise local wetlands protection bylaws and regulations
- Move development away from the coast and from wetlands
- Create "freeboard incentive" for residential and commercial buildings
- Use transferable development credits (TDCs) to reduce risky coastal development
- Institute comprehensive water resources management, including strategies for stormwater, waste water, and public drinking water

Gray Infrastructure and Retrofits *(see also page 138-139)*
- Remove unnecessary dams
- Upgrade road-stream crossings
- Retrofit buildings to be more flood resilient
- Elevate roadways to prevent nuisance flooding and to withstand projected sea level rise
- Pursue retrofits and planning for Massachusetts Bay Transportation Authority (MBTA) railroad

Step 4: Developing Priorities



In the last two columns identify the ***Priority*** *of each Action (High, Medium, Low) and the* ***Urgency*** *(ongoing, short-term, long-term).*

4.2-5. TOWN OF IPSWICH: Adaptation Strategies and Recommendations for Selected Areas of Concern

Downtown Ipswich, including Choate Bridge and South Main Street

Location: Downtown along the Ipswich River, Route 133/1A.
Description of hazard: Riverine & coastal flooding; river bank erosion
Consequences of hazard: Includes EBSCO, businesses, housing (Rivercourt)
Existing efforts underway: Town is also studying river bank erosion between Ipswich Mills dam and Town Wharf and prioritizing green solutions.

Short-term Strategies (now-2030)
- ☐ Convene Downtown Ipswich resiliency working group (business owners, town officials, and other partners) to consider long-term flooding risk and impacts. Focus on business owner engagement & education on building retrofits and general principles of resiliency.
- ☐ Encourage landscaping techniques for stormwater mitigation, e.g. rain gardens, pervious walkways & patios, infiltration trenches, and other green infrastructure techniques to reduce flooding.
- ☐ Create, enhance, and protect riparian buffer along the Ipswich River up and downstream of Town center to address current erosion and future climate impacts.

Long-term Strategies (2030-2070)
- ☐ Evaluate feasibility of river flood bypass through Veteran's Green/Elm Street area to accommodate flow from a 500-year flood.
- ☐ Incorporate climate projections, particularly increased freshwater flooding, into long-term infrastructure planning.

Hazard Mitigation Plan Strategies

Updated Mitigation Strategies

FLOOD RELATED HAZARDS
- County Road/Rt. 1A/Heartbreak Road drainage study and upgrades
- Pine Swamp Road–culverts & elevate
- Old Right Road culverts
- Linebrook Road culverts
- Town Farm Road–elevation & culvert
- Sewer Trunk line along Ipswich River & siphon under the river—replace / rehabilitate and armor piping
- Topsfield Road–culvert
- Town-wide—protection & acquisition of open space

DAMS
- Dow Reservoir Dam repairs
- Ipswich Mills Dam complete feasibility study and analyze options for removal

COASTAL HAZARDS
- Elevate 2 sections of Jeffrey's Road
- Elevate section of Argilla Road
- Replace culvert on Labor in Vain Road
- Flood-proof pump station, elevate critical facilities, explore alternative locations
- Crane Beach: Elevate boardwalk, dune protection & nourishment
- Water Street—coastal bank stabilization
- Water Street—elevate homes above BFE

REGULATORY/ADMINISTRATI
- Designate a Flood Plain Manager
- Increase admin. for Wetlands bylaw
- Apply for Community Rating System
- Set up process for elevation certificat

Recommended Mitigation Measures

TOWN OF IPSICH HAZARD MITIGATION PLAN
DRAFT 2018 UPDATE

Table 34: Recommended Mitigation Measures

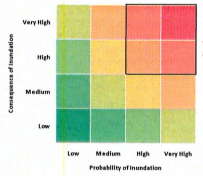
Hazard Category	Mitigation Measure	Priority	Implementation Responsibility	Time Frame	Estimated Cost	Potential Funding Sources
Flooding						
Flooding at 110 -112 County Road/Route 1A, 12-14 Heartbreak Road and southern end of Heartbreak Rd	1) Conduct a drainage study and implement drainage improvements	High	Ipswich Dept. of Public Works and MassDOT	2018-2023	$150,000	Town of Ipswich General Fund; MassDOT; FEMA
Pine Swamp Road and culverts	2) Replace existing 18-inch corrugated culverts with 30-48-inch precast concrete culverts and elevate low section in road.	High	Ipswich Dept. of Public Works	2023	$50,000 culverts $40,000 road	Town of Ipswich General Fund; FEMA
Linebrook Road culverts at Bull Brook	3) Upgrade Linebrook Road culverts – replace at Bull Brook	High	Ipswich Dept. of Public Works	2019-2022	$500,000	Town of Ipswich General Fund; FEMA
Sewer trunk line along the Ipswich River, and siphon under the River	4) Replace/rehabilitate piping, protect by armoring line	High	Ipswich Wastewater Department	2019	$1,000,000	Ipswich Wastewater Enterprise Fund
Topsfield Road culvert at Gravelly Brook	5) Replace culvert with structure based on design that is more resilient to erosion and meets the Mass. Stream	High	Ipswich Dept. of Public Works	2019-2021	$29,000 for 75% design; $400,000 for construction	Town of Ipswich General Fund; Grant from DMF for 75% Design

Vulnerability Assessment & Adaptation Planning

Risk Based Approach and Adaptation Investment Prioritization

- Phase I
  - SLR / Storm Surge Projections
  - Scenario Development
  - Gather asset data
  - Determine Asset Critical Elevations
- Phase II
  - Map Inundation Probability
  - Score Asset Inundation Consequence
  - Vulnerability/Risk Assessment
    - *Risk = Probability * Consequence*
- Phase III
  - Prioritize High Risk Assets
  - Develop Adaptation Strategies for Priority Assets

Rating	Area of Service Loss	Duration of Service Loss	Cost of Damage	Impact on Public Safety & Emergency Services	Impact on Important Economic Activity	Impact on Public Health & Environment
5	Whole Town/City	>30 days	>$50m	Very High	Very High	Very High
4	Multiple Neighborhoods	14-30 days	$5m-$10m	High	High	High
3	Neighborhood	7-14 days	$100k-$5m	Moderate	Moderate	Moderate
2	Locality	1-7 days	$50k-$100k	Low	Low	Low
1	Property	<1 day	<$50k	None	None	None



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Coastal Vulnerability Assessment

FID	Dataset	Property	Name	JN	SC	JN	SC	LV	SC	IC	IM	UP	TOTAL_CON	2070AVG	2030AVG	CV2070AVG	CV2030AVG
37	Infrastruct	Crane Beach	Argilla Road Culvert	0	0	0	0	1	2	5	5	5	44.4	100.0	100.0	4444	4444
82	Infrastruct	Wenham	Wenham Pt. Beach Stairs	0	0	0	0	5	5	4	5	0	42.2	100.0	100.0	4222	4222
90	Infrastruct	World's End	Dunde Meadows Bridge	0	0	0	0	4	5	4	5	5	42.2	100.0	100.0	4222	4222
30	Infrastruct	Crane Beach	Crane-side Ferry Dock	0	0	0	0	2	1	5	5	5	40.0	100.0	99.6	4000	3985
89	Infrastruct	World's End	Dunde Meadows Education Shed	0	0	0	0	4	4	5	5	0	35.6	100.0	100.0	3556	3556
41	Infrastruct	Crane Wildlife Refuge	Choate-side Ferry Dock	0	0	0	0	1	1	4	2	4	35.6	100.0	89.0	3556	3305
0	Infrastruct	Cape Pogo Wildlife Refuge	Dike Bridge	0	0	0	0	5	5	5	5	0	44.4	100.0	70.7	4444	3141
2	Infrastruct	Cape Pogo Wildlife Refuge	Dike Bridge Causeway	0	0	0	0	5	5	5	5	0	44.4	100.0	61.4	4444	2730
38	Infrastruct	Crane Beach	Fox Creek Bridge	0	0	0	0	3	2	0	5	5	33.3	90.0	90.0	2999	2667
40	Infrastruct	Crane Wildlife Refuge	Choate House Culvert	0	0	0	0	0	0	4	2	3	17.8	100.0	100.0	1778	1778
73	Infrastruct	Old Town Hill	Adam's Field Causeway Culvert	0	0	0	0	2	2	0	0	5	15.6	100.0	100.0	1556	1556
74	Infrastruct	Old Town Hill	Newman Road Culvert	0	0	0	0	2	2	0	0	5	15.6	100.0	100.0	1556	1556
75	Infrastruct	Old Town Hill	Newman Road Bridge	0	0	0	0	2	2	0	0	5	15.6	100.0	100.0	1556	1556
76	Infrastruct	Old Town Hill	Hay Street Bridge	0	0	0	0	2	2	0	0	5	15.6	93.4	82.3	1453	1281
70	Infrastruct	North Reservation	Gordon Pond Dam	0	0	1	1	5	1	0	0	0	28.9	81.1	31.1	2342	900
77	Infrastruct	Old Town Hill	Boardwalk	0	0	0	0	2	2	0	0	0	8.9	100.0	100.0	889	889
27	Infrastruct	Conkata Coatue Wildlife Refuge	Conkata Life Saving Cottage	0	0	5	5	1	2	2	0	0	35.6	100.0	26.0	3556	670
54	Infrastruct	Long Point Wildlife Refuge	Off-season Road Culvert	0	0	0	0	5	5	3	2	0	24.4	100.0	20.0	2444	489
34	Infrastruct	Crane Beach	Stone Septic Tank	0	0	0	0	0	0	0	5	4	17.8	100.0	25.0	1778	444
63	Infrastruct	Symon Reserve	Red Brook Aluminum Bridge	0	0	0	0	0	2	0	0	4	4.4	100.0	91.2	444	405
25	Infrastruct	Coolidge Reservation	Coolidge Point Jetty	0	0	0	0	1	1	0	0	0	4.4	100.0	73.4	444	326
91	Infrastruct	World's End	Culvert	0	0	0	0	2	1	1	0	0	13.3	10.0	20.0	133	267
1	Infrastruct	Cape Pogo Wildlife Refuge	Cape Pogo Sand Planks	0	0	0	0	1	2	2	1	0	22.2	46.0	11.8	1021	261
72	Infrastruct	Norton Point Beach	Norton Pt. Air Station	0	0	0	0	5	5	2	5	2	42.2	100.0	5.0	4222	211
97	Infrastruct	World's End	Culvert	0	0	0	0	2	1	1	0	0	13.3	22.5	15.0	300	200

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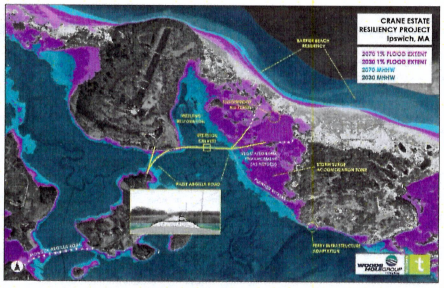
Coastal Vulnerability Assessment



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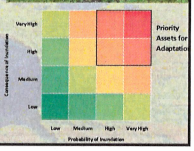
Next Steps … Apply for a MVP Action Grant.

Types of Actions can include:

- ❑ *Detailed Vulnerability & Risk Assessment*
- ❑ *Public Education and Communication*
- ❑ *Local Bylaws, Ordinances, Plans, and other Management Measures*
- ❑ *Redesigns and retrofits*
- ❑ *Nature-Based Storm-Damage Protection, Drought Prevention, Water Quality, and Water Infiltration Techniques*
- ❑ *Nature-Based, Infrastructure and Technology Solutions to Reduce Vulnerability to Extreme Heat and Poor Air Quality, Pests and vector-borne illnesses*
- ❑ *Ecological Restoration and Habitat Management to Increase Resiliency*



February 5th is the start of the Chinese New Year.
Happy Lunar New Year!
2019 is the Year of the Pig.

Pig is the last animal sign of 12 Earthly Branches.
Pig is in the Water group according to Chinese Five Element theory.
Water is related to wisdom.
Pig is connected to river or running water.
Pig has wisdom, initiative and energy.

IPSWICH RIVER WATERSHED ASSOCIATION