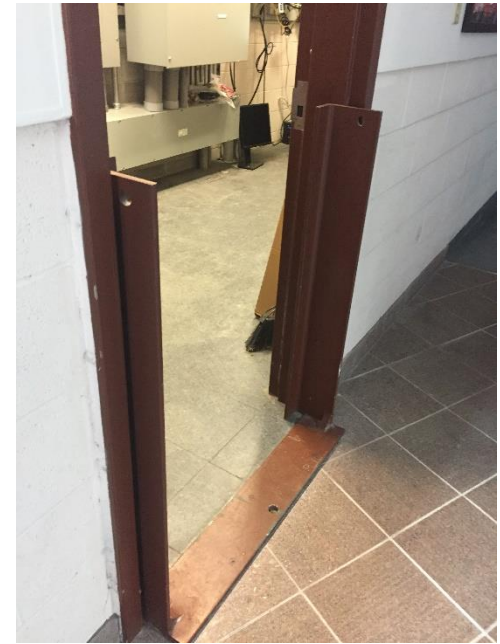


CRITICAL FACILITIES ASSESSMENT FOR SCCOG COMMUNITIES



SCCOG

Southeastern Connecticut Council of Governments

Southeastern Connecticut Council of Governments
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CONNECTICUT INSTITUTE FOR RESILIENCE
AND CLIMATE ADAPTATION

Presented by: David Murphy, P.E., CFM, Milone & MacBroom, Inc.
September 29, 2017



Agenda

- **Project Background**
- **Critical Facilities Included**
- **Key Questions**
- **Design Criteria**
- **Flood-Related Findings and Recommendations for Each Facility**
- **Wind-Related Findings and Recommendations**
- **Snow-Related Findings and Recommendations**
- **Key Conclusions**
- **Next Steps**

Project Background

- Southeastern Connecticut Hazard Mitigation Plan (2012) recommends conducting an assessment of critical facility vulnerabilities and risks
- SCCOG received a grant from the Connecticut Institute for Resilience and Climate Adaptation (CIRCA) for this assessment
- Project will help advance resilience of critical facilities
- Project will demonstrate progress in the HMP Update (under review with DEMHS)



Critical Facilities Included

Which Critical Facilities are Included?

Municipality	Facility	Address	FEMA Zone	Adjacent Zone
Stonington Borough	Fire House and EOC	100 Main St	AE	VE-14
	Borough Hall and Public Works	26 Church St	AE	500-yr
Stonington Town	Old Mystic FD	21 North Stonington Rd	500-yr	AE
	Quiambaug FD	50 Old Stonington Rd	AE	X
	Mystic FD	34 Broadway	AE	X
Groton Town	GLP Police and Fire	5 Atlantic Ave	AE	X
	Town Hall	45 Fort Hill Road	X	500-yr
Groton City	Municipal Building	295 Meridian St	X	500-yr
	Public Works	295 Meridian St	500-yr	X
New London	Fire HQ and EOC	289 Bank St	500-yr	AE/VE
Waterford	Quaker Hill Fire Co.	17 Old Colchester Rd	500-yr	AE
Montville	Chesterfield Fire Co.	1606 Hartford New London Tpke	X	AE
Norwich	Yantic Fire Co. No. 1	151 Yantic Rd	AE	Floodway
	Occum FD	44 Taftville Occum Rd	AE	500-yr
	Public Works	50 Clinton Ave	500-yr	AE
Preston	Public Works	423 Route 2	X	A
Sprague	Town Hall	1 Main St	AE	Floodway
	Public Works	1 Main St	AE	Floodway

Key Questions

- Has the facility experienced a flood?
- Is the facility in the 1% annual chance flood zone (Special Flood Hazard Area) or the 0.2% annual chance flood zone?
- Is the facility's lowest floor below or above the base flood elevation?
- Is the facility's lowest floor below or above the future high tide level?
- Does the use pose challenges? For example, fire station garage doors and emergency access cannot be blocked.
- Are there any situations where a flood wall is advisable?
- What about other circumstances?

Design Criteria

- Existing FEMA BFE (1% annual chance) and 0.2% annual chance flood elevations
- For coastal properties, the MHW and SLR projections
- The State's requirement that critical facilities be constructed per the 0.2% annual chance flood elevation when State authorizations are needed or State funding is used
- Federal Flood Risk Management Standard and local adopted versions such as NYC and NY & NJ Port Authority that are forward-looking relative to climate change
- Connecticut Building Code snow loads (30 psf) and assumption that heavy snow risks could increase with climate change
- Connecticut Building Code wind speeds (varies by town) and assumption that wind risks could increase with climate change
- Design wind speeds for critical facilities that exceed building codes (160 mph)

Flood-Related Findings and Recommendations

- Recommendations are generally divided into short-term and long-term
- In a limited number of cases, alternate options are provided if appropriate
- Options include wet floodproofing, dry floodproofing, elevating utilities, elevating interior floors, elevating buildings, flood barriers at openings, and flood walls

Current

Single Family Home



Please Place a Green Sticker on Your Favorite Option

Mixed-Use



Please Place a Green Sticker on Your Favorite Option

Condominiums



Please Place a Green Sticker on Your Favorite Option

High-Rise / Large Building



Please Place a Green Sticker on Your Favorite Option

Strip Mall



Please Place a Green Sticker on Your Favorite Option

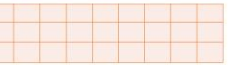
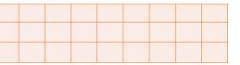
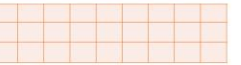
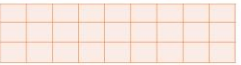
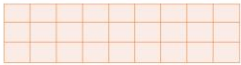
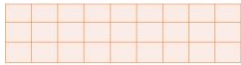
Restaurant



Please Place a Green Sticker on Your Favorite Option

Retreat

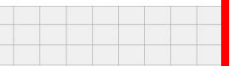
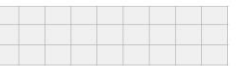
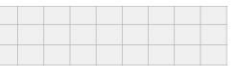
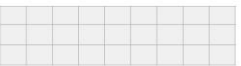
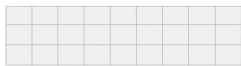
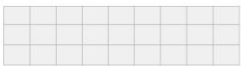
Purchase Property from Owners and convert to Public Open Space



Elevate

Raise Structure above Flood Levels on Columns or Fill

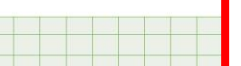
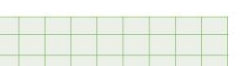
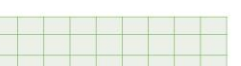
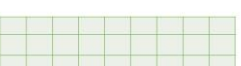
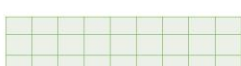
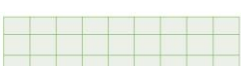
*Note: Residential Space may be Elevated while Commercial Use Remains Below Flood Levels (see Option B)



Floodproof

Retrofit Structure to Prevent Floodwaters from Causing Damage

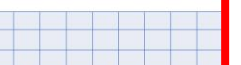
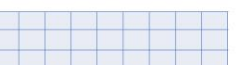
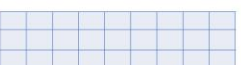
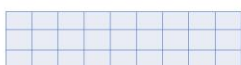
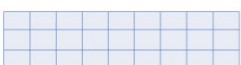
*Note: does not decrease Flood Insurance Rates



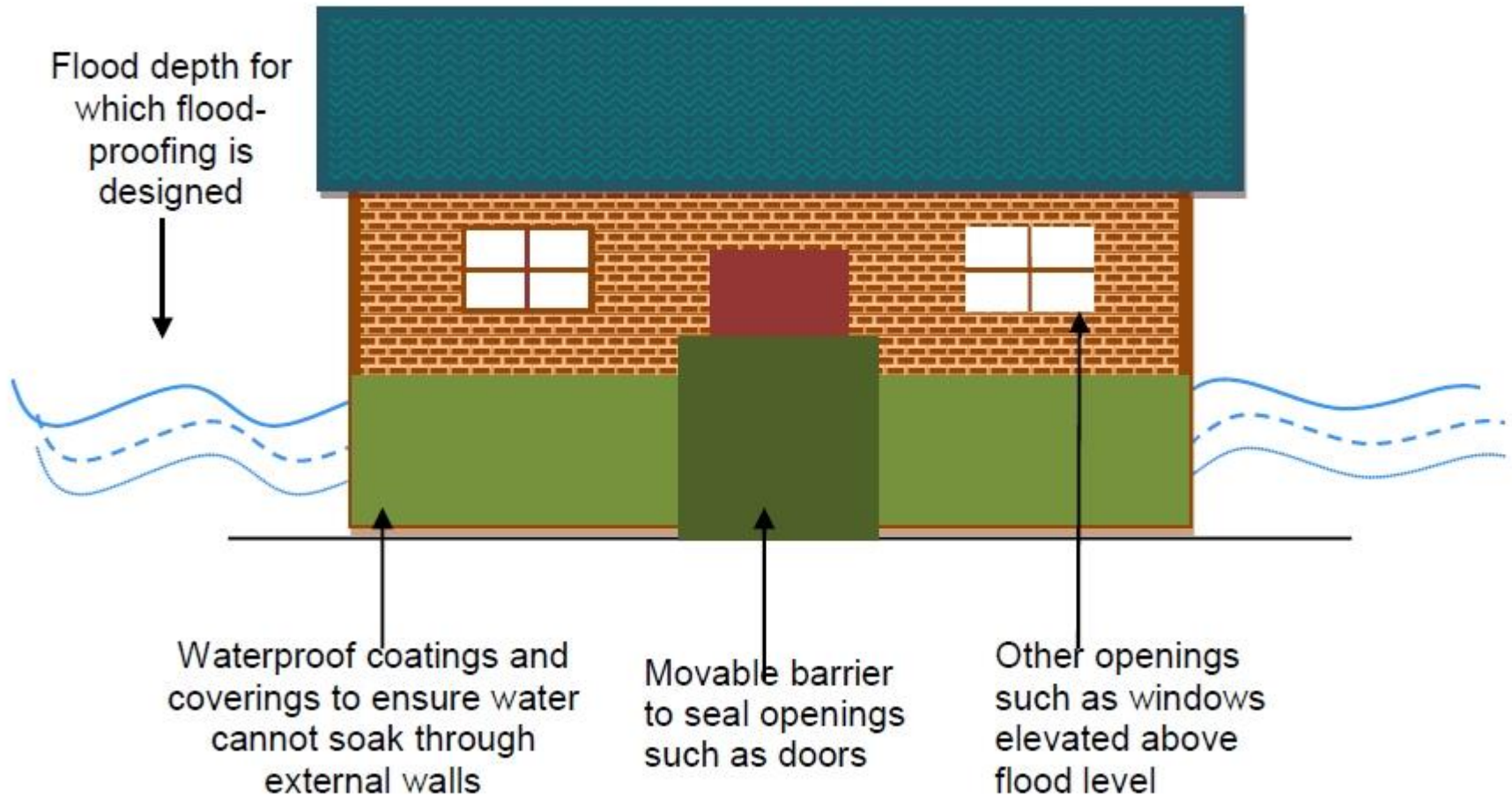
Floodwall

Construct Permanent or Temporary Barrier around Structure

*Note: does not decrease Flood Insurance Rates

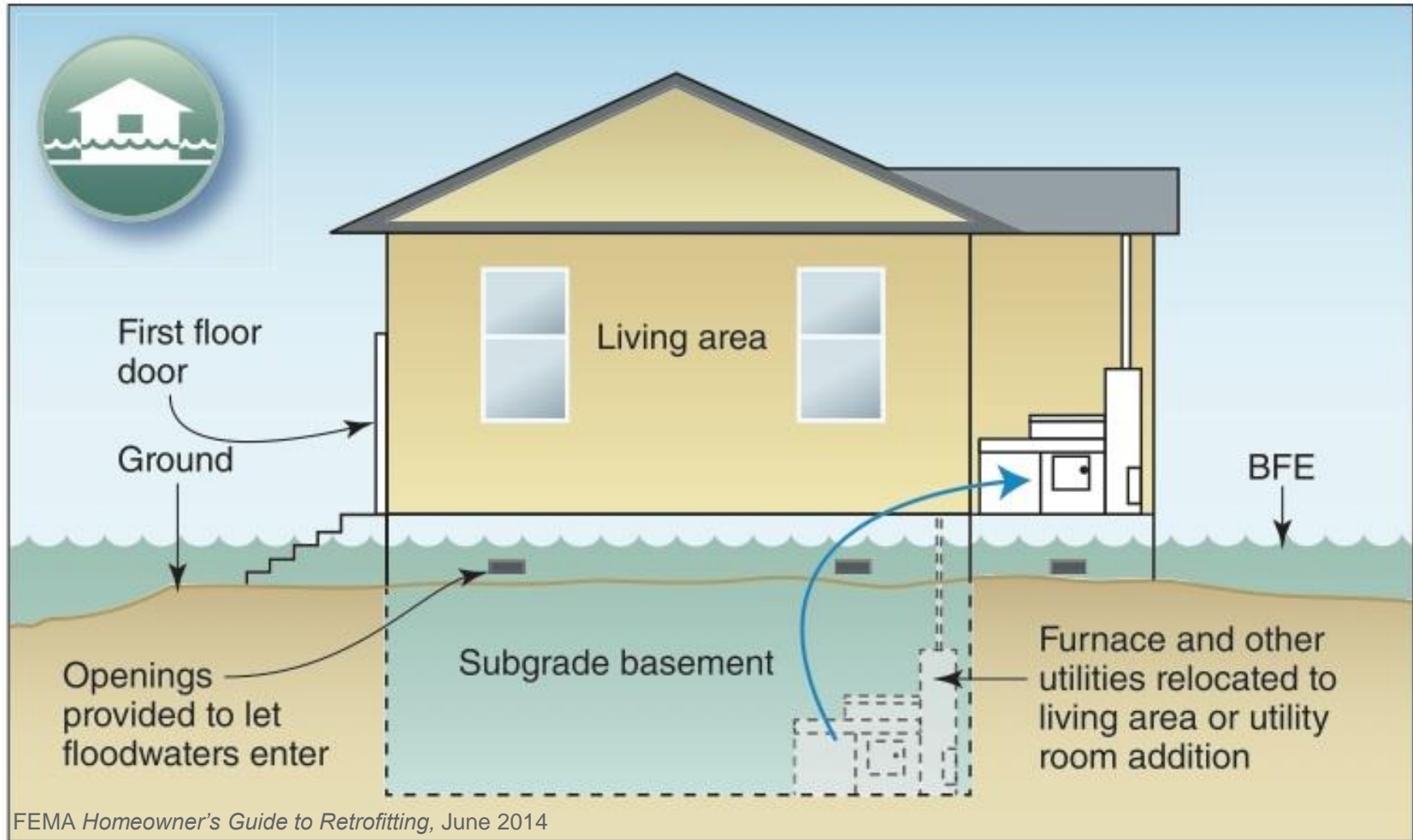


Dry Floodproofing



Source: Linham and Nicholls, 2010

Wet Floodproofing

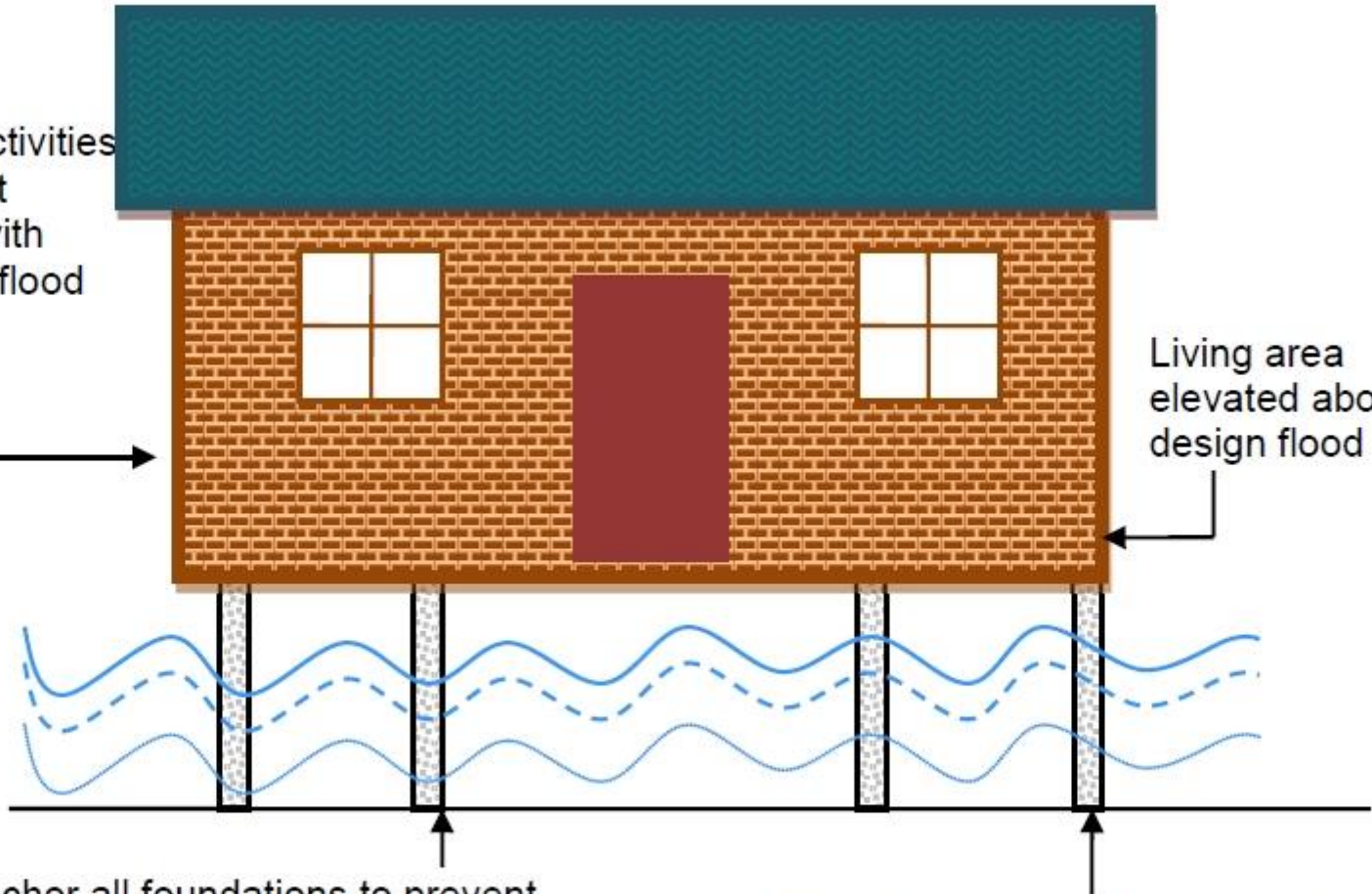


Elevate Building

Elevate all activities which are not compatible with water above flood elevation



Living area elevated above design flood



Properly anchor all foundations to prevent flood water washing them out and also to avoid floatation of the structure if the flood waters get too high

Provide openings or break-away wall sections to allow free passage of water

Elevate Utilities



Barriers at Openings



© North News & Pictures Ltd

Flood Walls (not for FEMA map revisions)



Miami Beach Sidewalk

Binghamton Hospital

Floodable First Floor



Floodable First Floor
Photo: Designs Northwest Architects

Emergency Preparedness

Always recommended, but not part of this study. This is not a long term method of adapting.



The Daily Signal

Not Feasible for a Critical Facility



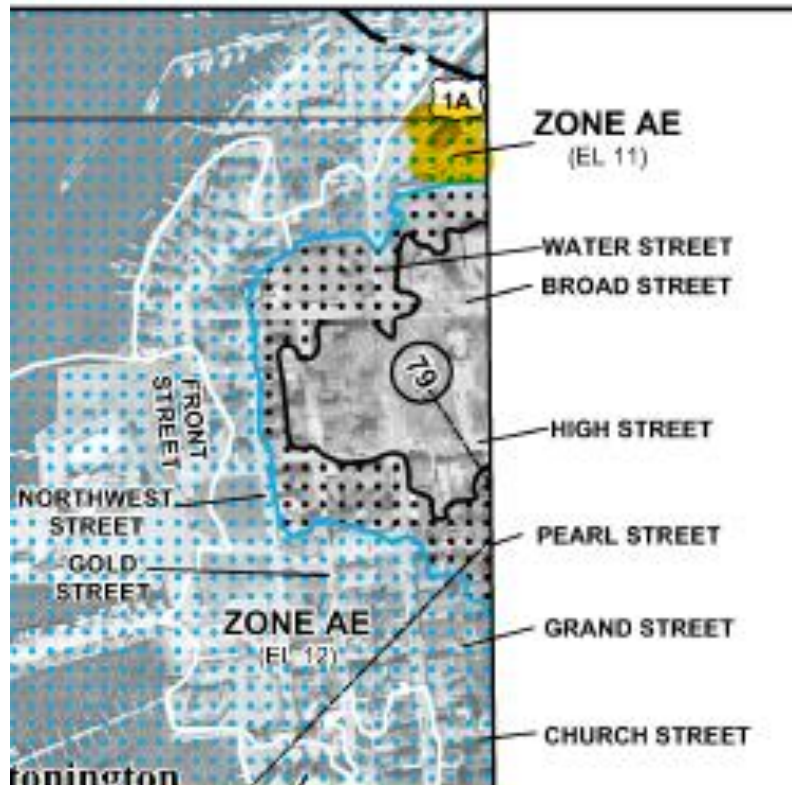
Flood-Related Findings and Recommendations

Acronym Key

BFE	0.2% WSE	LAG	FFE	NFE	Utility
Base Flood Elevation (1% annual chance WSE)	Flood elevation for the 500-year flood	Lowest Adjacent Grade	First floor elevation (not always the lowest occupied floor)	Next floor elevation (this may be the occupied floor, or what we call the “first floor”)	Elevation of lowest utility (sometimes the same as the FFE)

Stonington Borough

Borough Fire Department

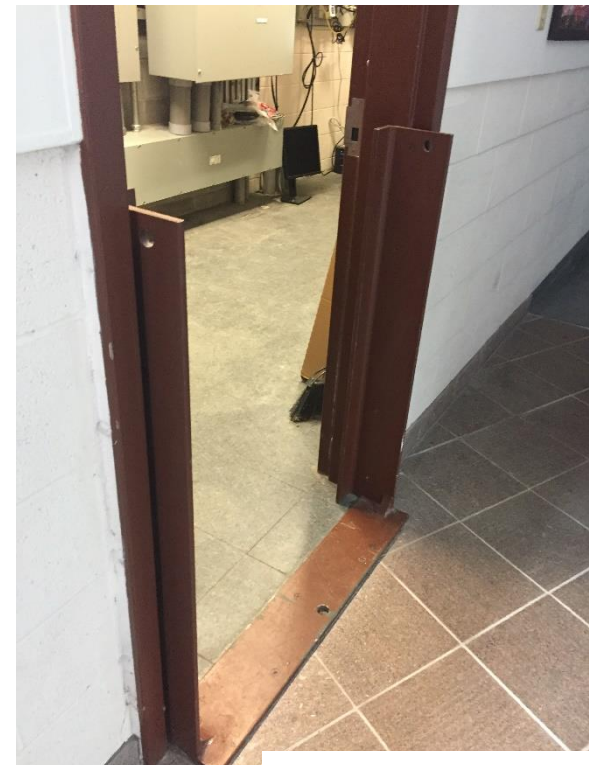


Stonington Borough

Borough Fire Department

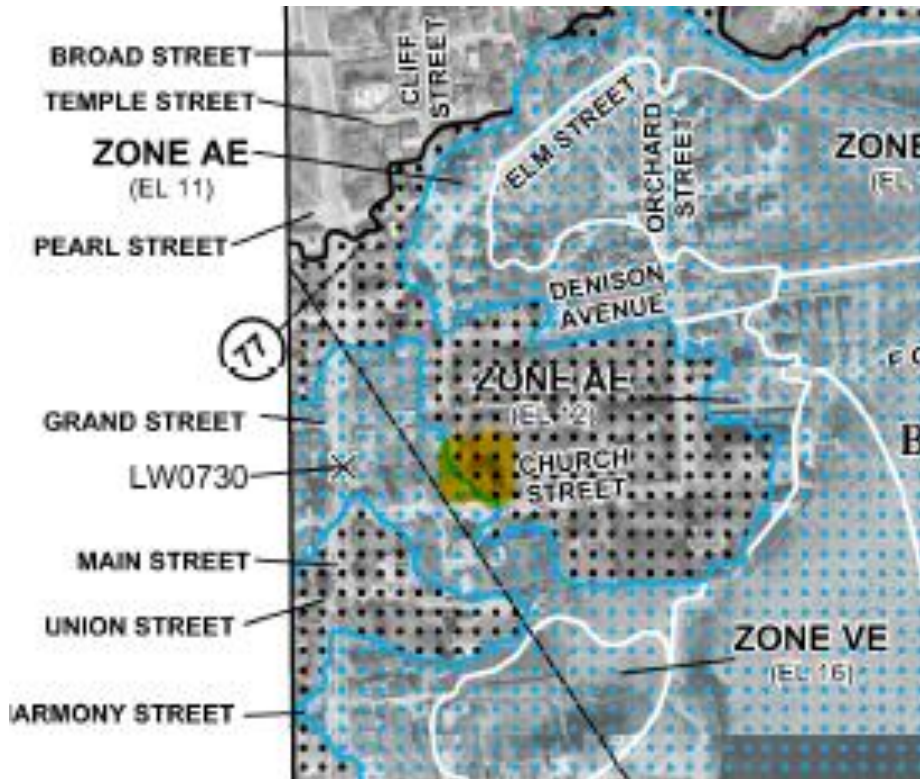
BFE	LAG	FFE	NFE	Utility
11	8.34	8.78	24.98	4.78

- Floodproofing already present
- Short-Term: No action needed
- Long-Term: Increase height of interior dry floodproofing



Stonington Borough

Borough Hall

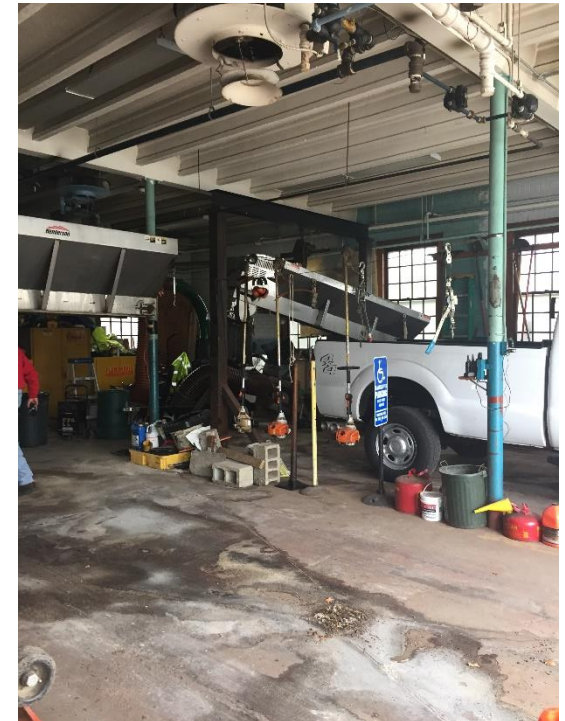


Stonington Borough

Borough Hall

BFE	LAG	FFE	NFE	Utility
12	8.77	8.52	11.70	8.97

- Floodproofing not present
- Short-Term: Dry floodproof the utility room
- Long-Term: Wet floodproof the remaining lower areas such as the garage bays



Town of Stonington

Old Mystic Fire Department

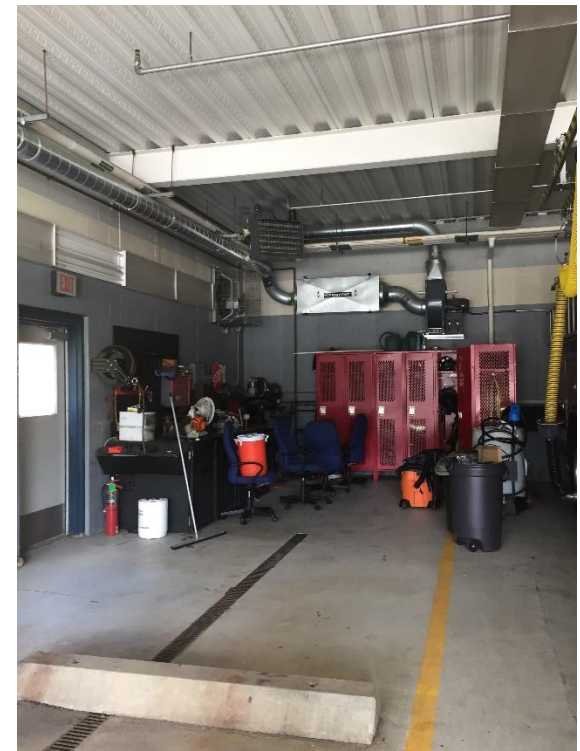


Town of Stonington

Old Mystic Fire Department

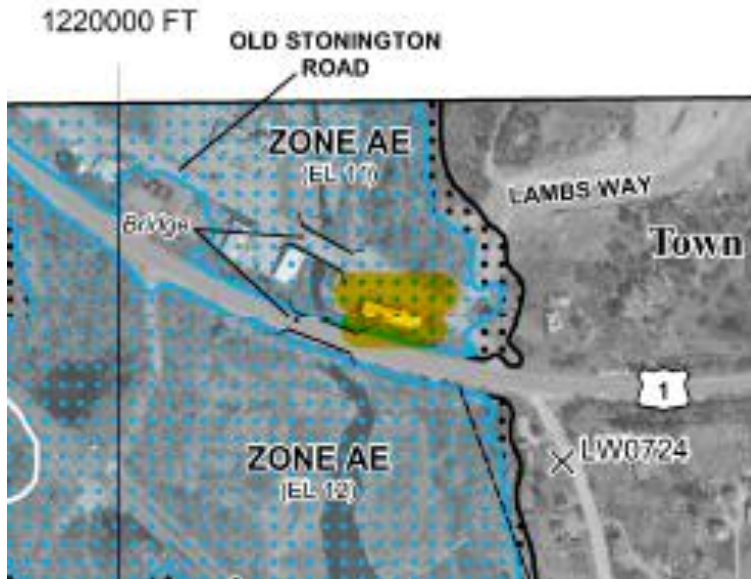
BFE	LAG	FFE	NFE	Utility
13	16.87	16.85	30.66	16.85

- Property at risk of riverine and coastal floods
- Floodproofing not present
- Short-Term: No action needed
- Long-Term: Wet and dry floodproofing or low berm or flood wall



Town of Stonington

Quiambaug Fire Department

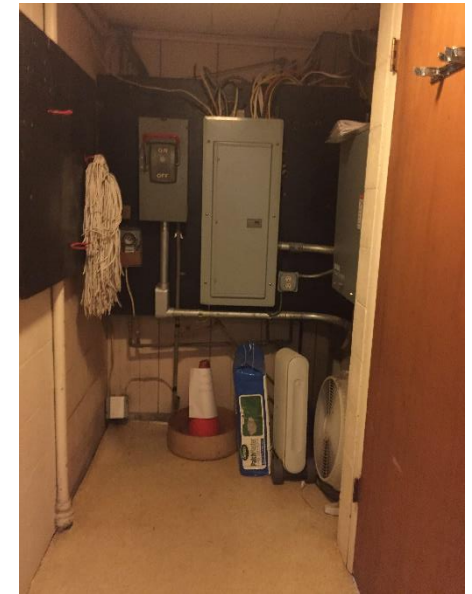


Town of Stonington

Quiambaug Fire Department

BFE	LAG	FFE	NFE	Utility
11	3.32	6.97	none	6.97

- Current MHW is 0.84'
- Coastal Jurisdiction Line is 2.0'
- Future daily high tide is 2'-5'
- Floodproofing not present
- Short-Term: Wet and dry floodproofing
- Long-Term: Relocate facility



Town of Stonington

Mystic Fire Department



Town of Stonington

Mystic Fire Department

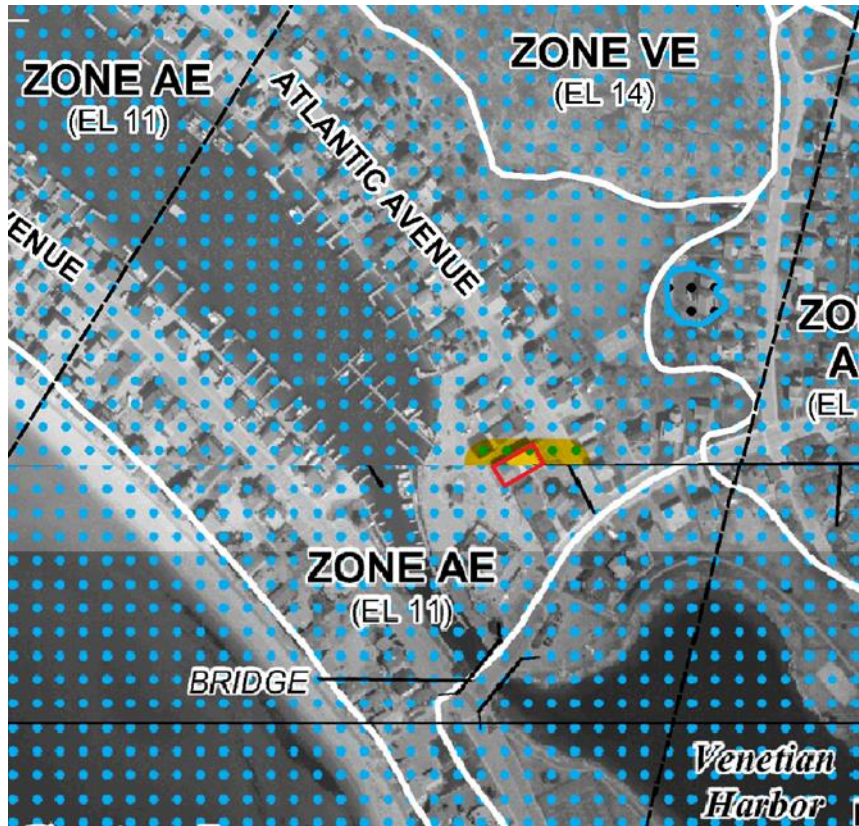
BFE	LAG	FFE	NFE	Utility
11	7.96	8.62	9.73	9.73

- Plan indicates construction to FFE-11, but that was likely NVGD with prior FEMA map (pre-2010) so building is no longer above the BFE
- Floodproofing not present
- Short-Term: Dry floodproof the utility room
- Long-Term: Wet floodproof the remaining lower areas



Town of Groton

Groton Long Point Police & Fire

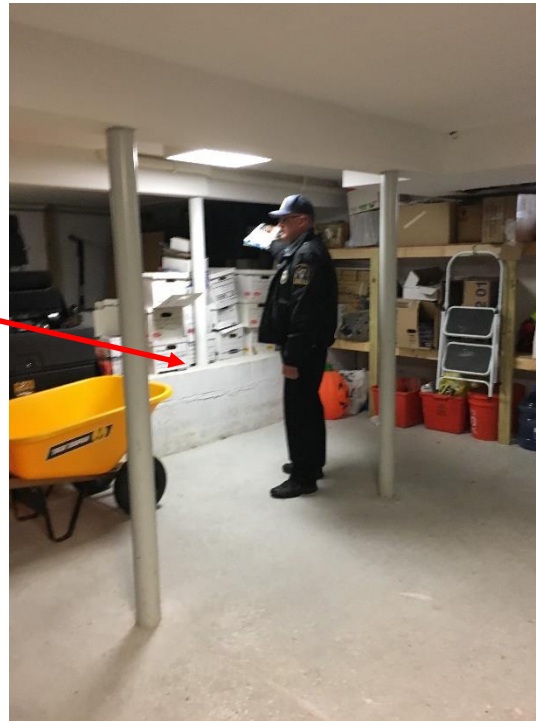


Town of Groton

Groton Long Point Police & Fire

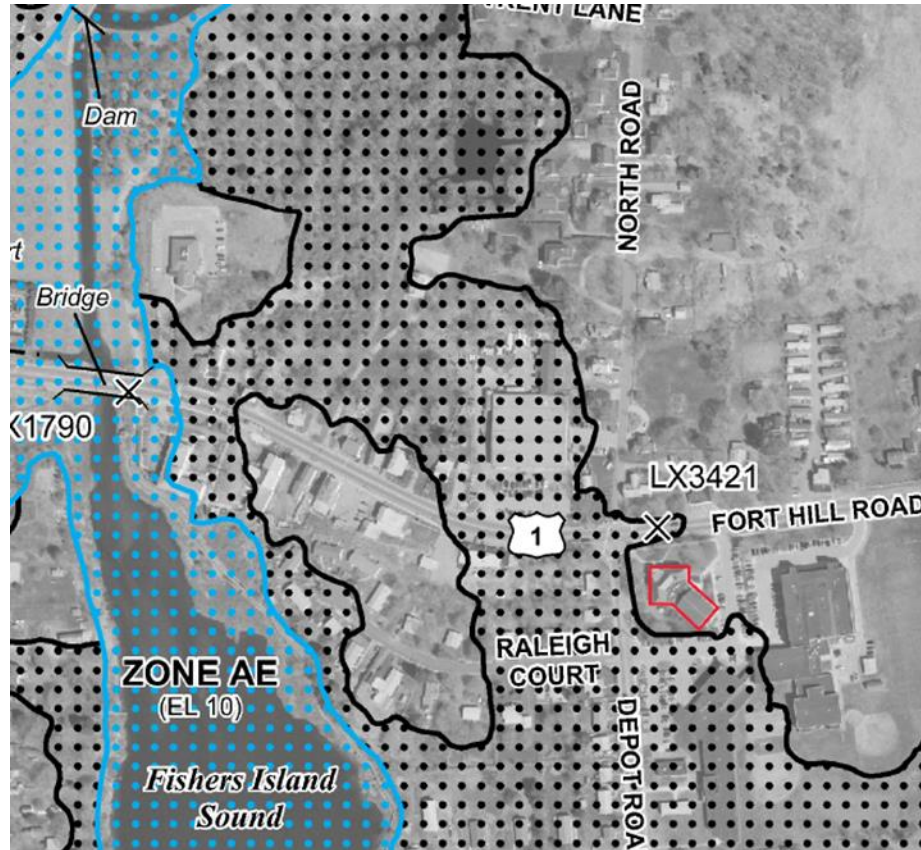
BFE	LAG	FFE	NFE	Utility
11	2.96	4.26	5.75	6.21

- Some floodproofing already present (utility room is elevated)
- Current MHW is 0.84'
- Coastal Jurisdiction Line is 2.0'
- Future daily high tide is 2'-5'
- Short-Term: Additional utility room dry floodproofing and expanded wet floodproofing
- Long-Term: Relocate facility



Town of Groton

Groton Town Hall



Town of Groton

Groton Town Hall

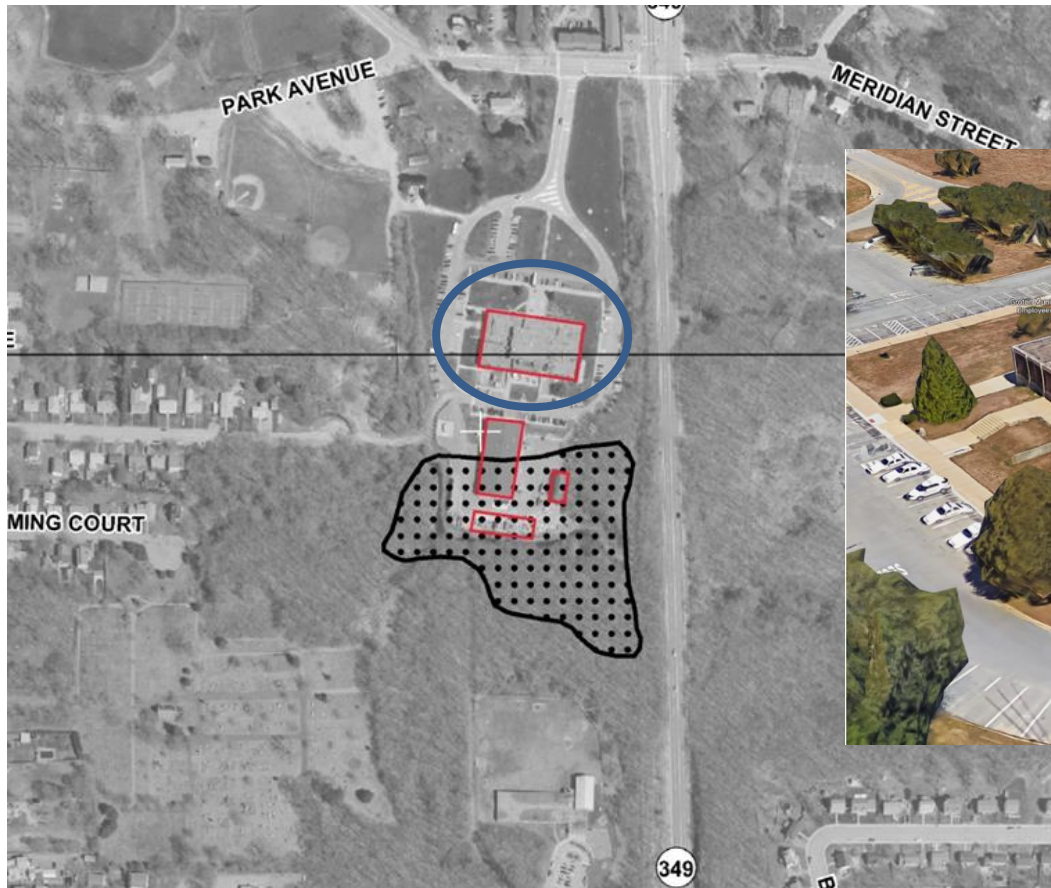
BFE	LAG	FFE	NFE	Utility
10	18.96	12.07	20.62	12.32

- Very complex building with various floor elevations, window wells, and many openings
- Floodproofing not present
- Short-Term: No action needed
- Long-Term: Low berm or flood wall may be prudent due to the relatively low flood risk, configuration of site, and complexities of the building



City of Groton

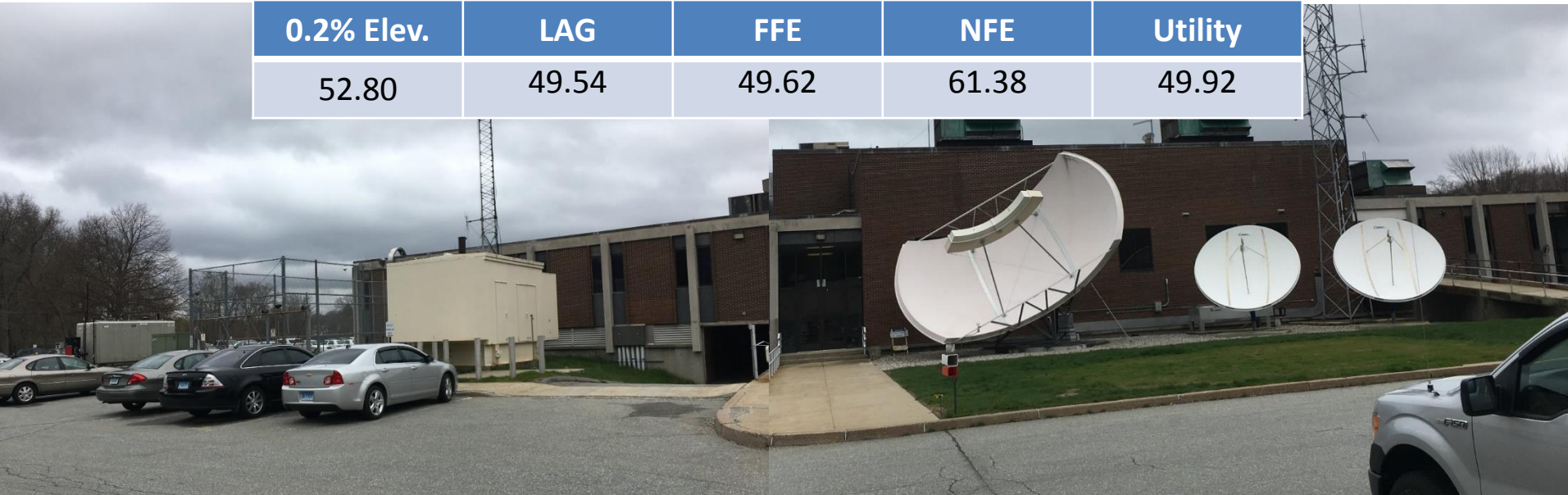
Municipal Building



City of Groton

Municipal Building

0.2% Elev.	LAG	FFE	NFE	Utility
52.80	49.54	49.62	61.38	49.92



- Complex building with various floor elevations and many openings
- 0.2% elevation estimated from FEMA Publication 265
- The grade between the building and the 0.2% risk zone exceeds 52.8', so there is no risk from Birch Plain Creek
- Drainage-related flooding has occurred
- Short-Term: Drainage improvements
- Long-Term: Upgrade drainage as needed to keep up with increasing precipitation intensities



City of Groton

Public Works



City of Groton

Public Works

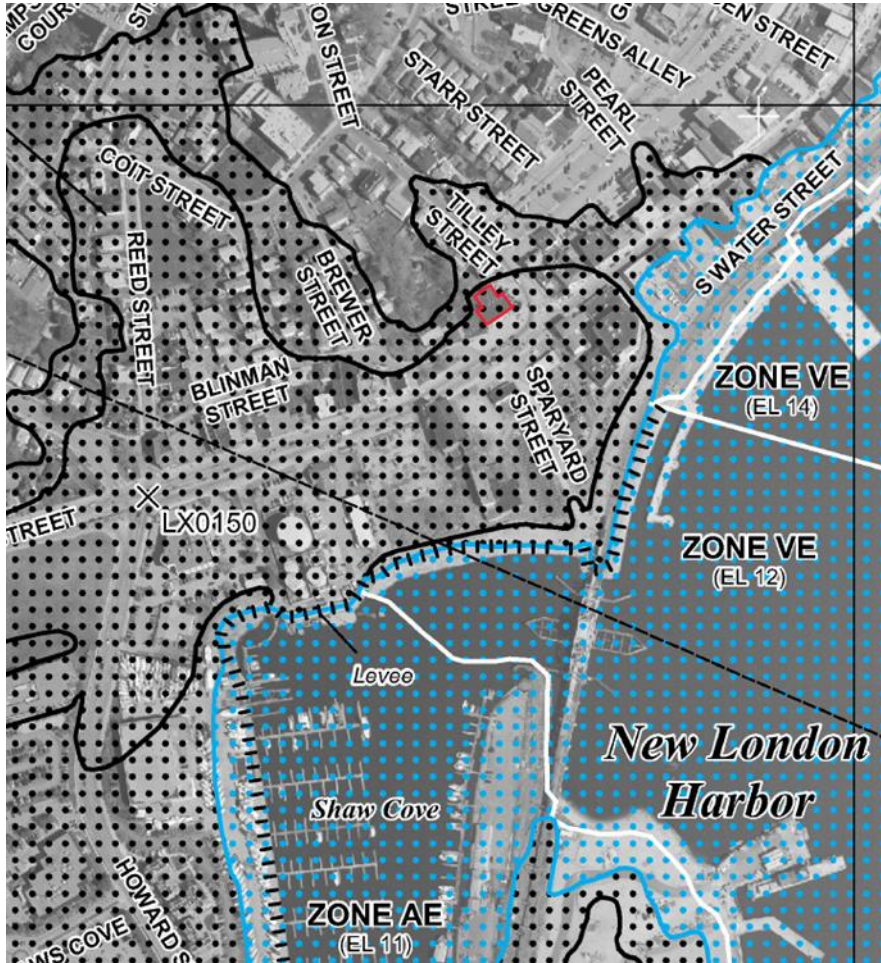
0.2% Elev.	LAG	FFE	NFE	Utility
52.80	--	--	--	--

- Building elevations were not measured (this was a bonus site)
- Floodproofing not present
- Short-Term: Wet and dry floodproofing
- Long-Term: Low berm or flood wall may be prudent due to the relatively low flood risk, configuration of site, and nature of the property use



City of New London

New London Fire Headquarters

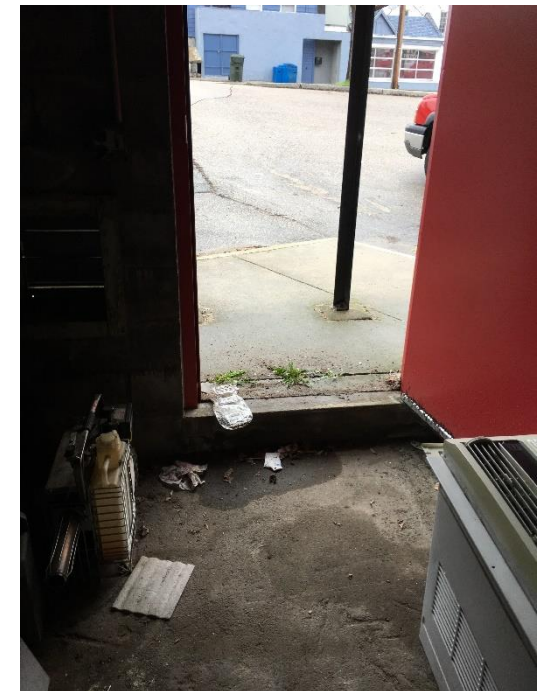


City of New London

New London Fire Headquarters

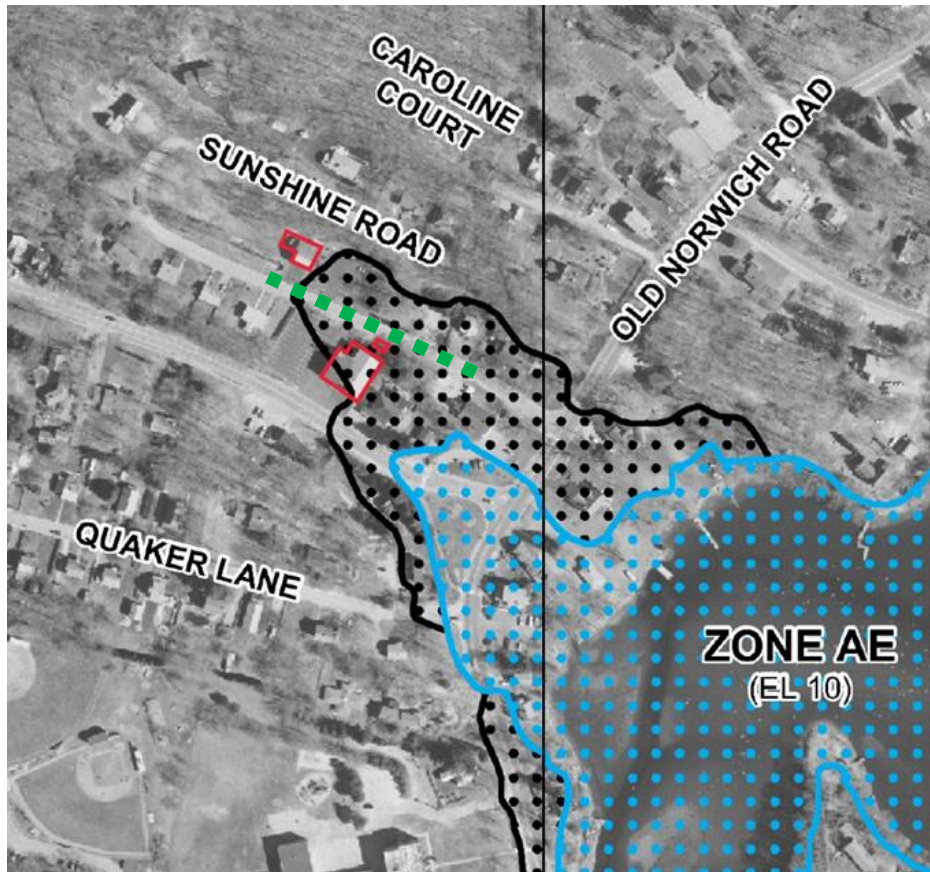
AE/VE	LAG	FFE	NFE	Utility
11/12	6.52	7.22	22.11	7.22

- Property is protected by a flood protection system (levee, berm, or flood wall) at the Thames River and mapped in the 0.2% floodplain
- Floodproofing not present
- Short-Term: Stormwater improvements and backflow prevention; dry floodproof utility room
- Long-Term: Wet floodproof remaining first floor areas



Town of Waterford

Quaker Hill Fire Company



Stream located beneath road in a long culvert



Town of Waterford

Quaker Hill Fire Company

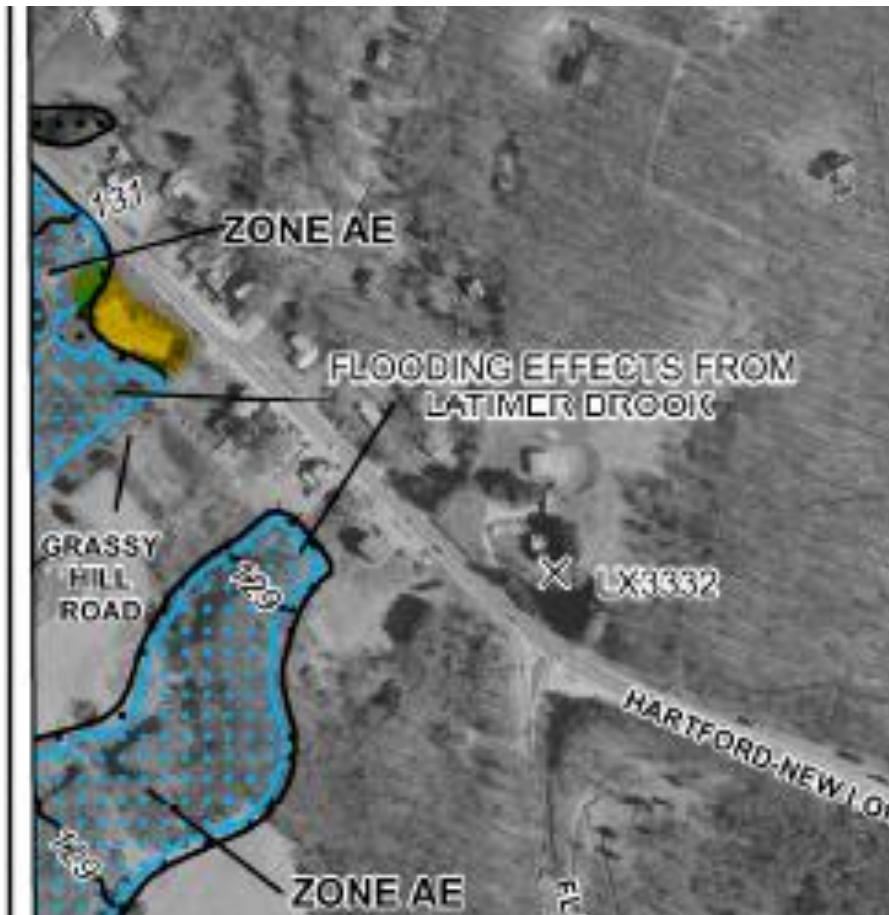
BFE	LAG	FFE	NFE	Utility
10	11.96	11.06	14.44	19.25

- Property at risk of riverine and coastal floods
- Tidal flood waters have reached the property in recent memory, where water levels were approximately ten feet away from the eastern building.
- The secondary garage has undergone flooding originating from the brook overtopping the culvert.
- Short-Term: Wet floodproofing
- Long-Term: Relocate facility (note that the expense of replacing the long culvert beneath the road would be significant)



Town of Montville

Chesterfield Fire Company



Town of Montville

Chesterfield Fire Company

BFE	LAG	FFE	NFE	Utility
131	132.56	134.17	149.80	134.15



- Building is not in SFHA, and FFE is above the 0.2% flood elevation of 132'
- Short-Term & Long -Term: No actions needed

City of Norwich

Norwich Public Works



City of Norwich

Norwich Public Works

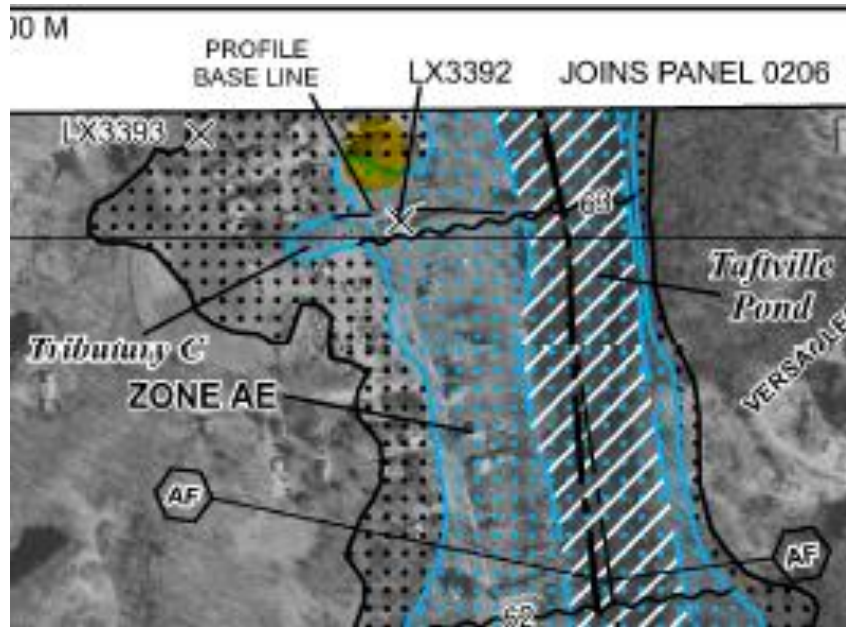
BFE	0.2% WSE	LAG	FFE	NFE	Utility
96	101	98.3	98.8	none	99.9

- Floodproofing not present
- Short-Term: Dry floodproof the utility room
- Long-Term: Wet floodproof all remaining lower areas



City of Norwich

Occum Fire Department



City of Norwich

Occum Fire Department

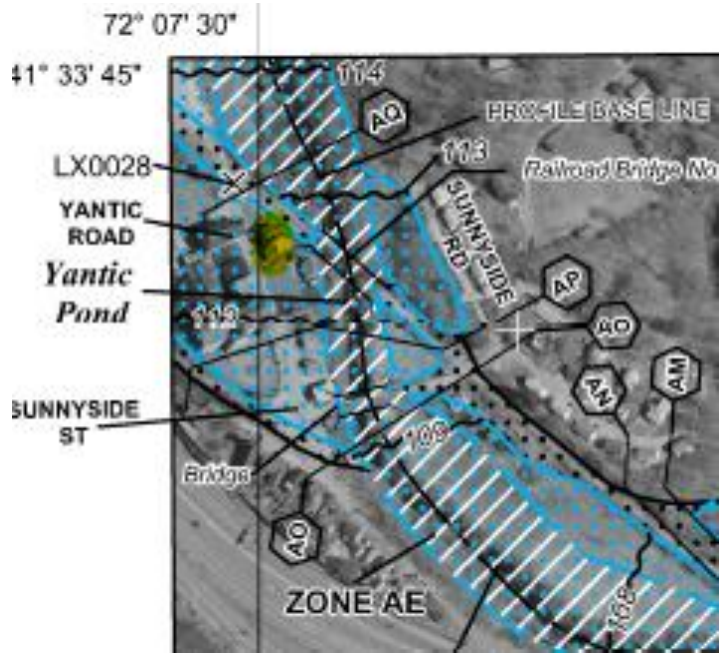
BFE	0.2% WSE	LAG	FFE	NFE	Utility
63.5	67.0	63.6	57.4	64.0	57.5

- Floodproofing not present
- Short-Term: Eliminate basement
- Long-Term: Relocate facility



City of Norwich

Yantic Fire Company No. 1

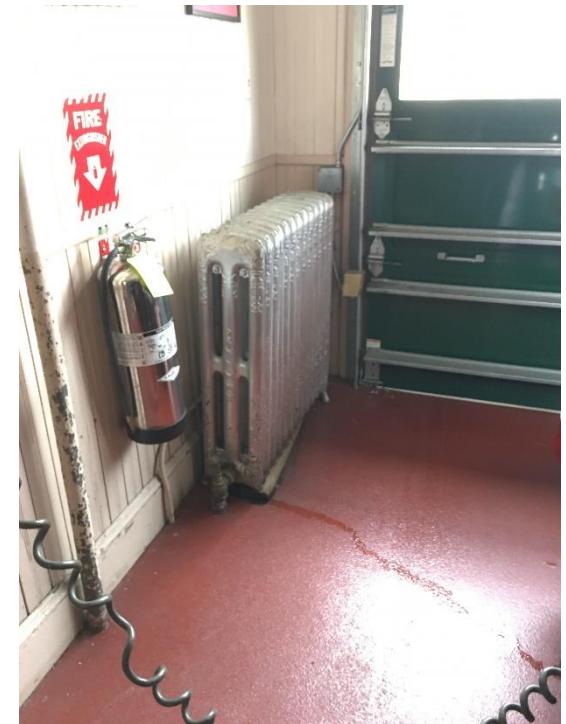


City of Norwich

Yantic Fire Company No. 1

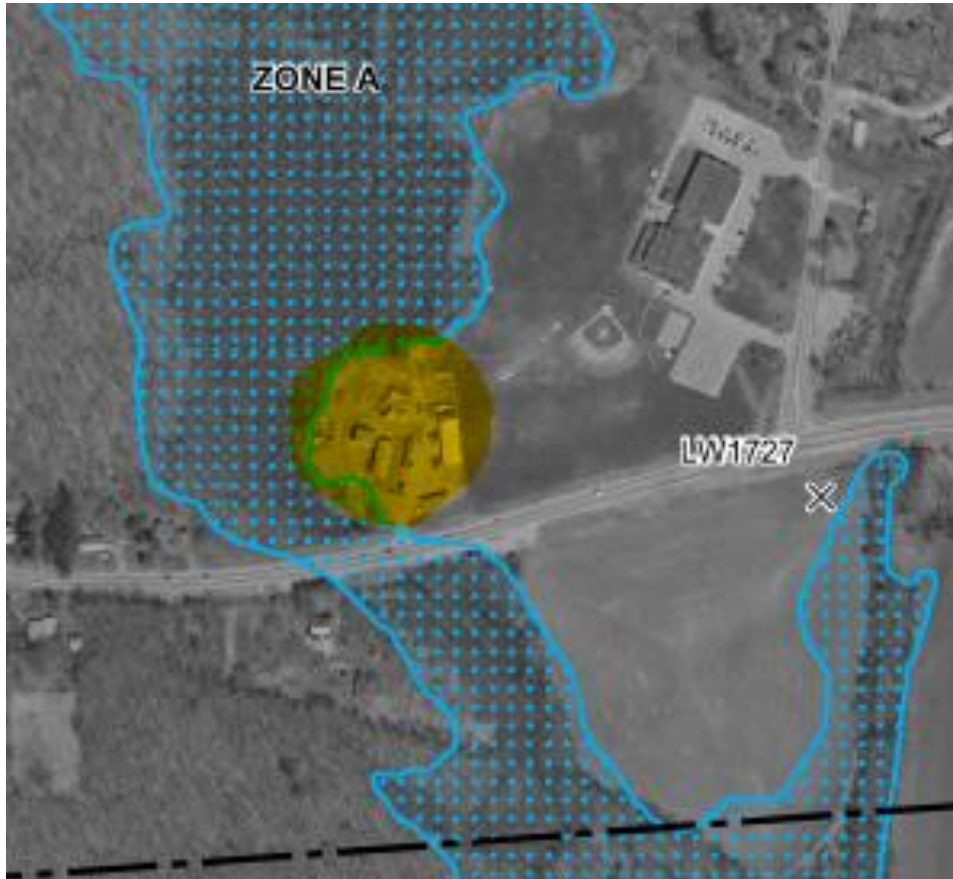
BFE	0.2% WSE	LAG	FFE	NFE	Utility
112.5	120.0	110.77	101.80	111.57	102.40

- Floodproofing not present
- Short-Term: Eliminate basement
- Long-Term: Relocate facility



Town of Preston

Preston Public Works



Town of Preston

Preston Public Works

BFE	LAG	FFE	NFE	Utility
123.0	125.37	125.79	none	126.29

- BFE estimated from FEMA Publication 265
- Floodproofing not present
- Short-Term: No action needed
- Long-Term: Wet and dry floodproofing



Town of Sprague

Town Hall and Public Works



Town of Sprague

Town Hall and Public Works

	BFE	LAG	FFE	NFE	Utility
Town Hall	84	81.79	82.05	~94	80.75
DPW	84	82.19	80.36	89.73	80.75

- Floodproofing not present
- Short-Term: Eliminate utility room basement
- Long-Term: Wet floodproof all remaining lower areas; or construct flood wall along the rear of the property that can extend around to the north side and meet grade without blocking access



Wind-Related Findings and Recommendations

- None of the occupied buildings (buildings occupied by people) appear to have deficient roofs relative to wind
- If a roof is planned for replacement, higher design wind speeds should be considered
- Many of the occupied buildings lack window protection
- Hurricane shutters are recommended where window damage could hinder the ability of the facility to functions
- Small outbuildings, equipment, and vehicles parked outdoors at the three public works facilities are at risk for damage during strong winds and should be secured when storms are forecast



*New London Fire HQ (above) and
Norwich DPW Yard (below)*



Snow-Related Findings and Recommendations

- None of the occupied buildings appear to have deficient roofs relative to snow loads, although many are flat
- Procedures should be developed for removing snow from roofs
- If a roof is planned for replacement, higher design loads should be considered



*Preston DPW (above) and
Norwich DPW (below)*



Key Conclusions

- The elevations of adjacent grade, first floor, second floor, and utilities are critical for characterizing the risks
- Every combination of flood risk and building configuration is unique; there is low potential for “one size fits all” solutions to make sense
- Beware of changing FEMA maps (think of Mystic Fire Company) and go higher when possible
- Make moderate flood mitigation improvements when possible, and make them adaptable when possible
- Local flood damage prevention regulations and the substantial damage/substantial improvement (SD/SI) clause always win; if an improvement meets the SD/SI threshold, then the building must be made NFIP-compliant

Next Steps

- Check Elevation Certificates; if details appear appropriate, we will sign them
- If recommendations are acceptable, add planning-level cost estimates
- Recommendations are in the SCCOG Multi-Jurisdiction Hazard Mitigation Plan; there is time to revise these recommendations if appropriate
- Final materials to SCCOG and facility contacts