

STATE OF CONNECTICUT

CONNECTICUT SITING COUNCIL

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DATE: December 22, 2017

TO: Parties & Intervenors

FROM: Melanie A. Bachman, Executive Director *MAB*

RE: **DOCKET NO. 461A** - Eversource Energy Certificate of Environmental Compatibility and Public Need for the construction, maintenance, and operation of a 115-kilovolt (kV) bulk substation located at 290 Railroad Avenue, Greenwich, Connecticut, and two 115-kV transmission circuits extending between the proposed substation and the existing Cos Cob Substation, Greenwich, Connecticut, and related substation improvements.

During a public meeting of the Connecticut Siting Council (Council) held on December 21, 2017, the Council denied the Town of Greenwich's (Town) November 29, 2017 Petition for Reconsideration, pursuant to the provisions of Connecticut General Statutes §4-181a(a), of the Council's November 14, 2017 final decision to grant a Certificate of Environmental Compatibility and Public Need to Eversource Energy for the above-referenced electric substation and electric transmission line facilities located in the Town of Greenwich on the following bases:

1. No statute requires the Connecticut Institute for Resilience and Climate Adaptation (CIRCA) Presentation sea level rise scenarios to be applied;
2. 290 Railroad Avenue is **not in a FEMA flood zone**; and
3. Reconsideration of an open-air substation is not required under Connecticut General Statutes §4-181a(a) because the CIRCA findings do not materially affect the case, the final decision does not contain errors of fact or law, and the Town has not shown any good cause for reconsideration.

Enclosed is a copy of the staff report, dated December 21, 2017.

MAB/RDM/laf

Enclosure: Staff Report, dated December 21, 2017



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Affirmative Action / Equal Opportunity Employer



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DATE: December 21, 2017

TO: Council Members

FROM: Melanie A. Bachman, Executive Director *MAB*

RE: **DOCKET NO. 461A** - Eversource Energy Certificate of Environmental Compatibility and Public Need for the construction, maintenance, and operation of a 115-kilovolt (kV) bulk substation located at 290 Railroad Avenue, Greenwich, Connecticut, and two 115-kV transmission circuits extending between the proposed substation and the existing Cos Cob Substation, Greenwich, Connecticut, and related substation improvements. Reopening of this docket based on changed conditions pursuant to Connecticut General Statutes §4-181a(b). **Staff Report - Town of Greenwich Petition for Reconsideration.**

On November 29, 2017, pursuant to the provisions of Connecticut General Statutes (CGS) §4-181a(a), the Town of Greenwich (Town) filed a Petition for Reconsideration (Petition) of the Connecticut Siting Council's (Council) November 14, 2017 final decision to grant a Certificate of Environmental Compatibility and Public Need (Certificate) to Eversource Energy for the above-referenced electric substation and electric transmission line facilities located in the Town. In its Petition, the Town contends that the Council's final decision should be reconsidered based on an October 19, 2017 PowerPoint presentation relative to updated sea level rise scenarios developed by the Connecticut Institute for Resilience and Climate Adaptation (CIRCA Presentation).¹ On the basis of the CIRCA Presentation, the Town requests that the Council's final decision be reopened and modified to require a "fully-enclosed" substation at 281 Railroad Avenue.

The evidentiary record closed on September 5, 2017.² A final decision was rendered on November 14, 2017. Under CGS §4-181a(a), a party in a contested case may, within fifteen days after mailing of the final decision, file with the agency a petition for reconsideration of the decision on the ground that: (A) an error of fact or law should be corrected; (B) new evidence has been discovered which materially affects the merits of the case and which for good reasons was not presented in the agency proceeding; or (C) other good cause for reconsideration has been shown. Within 25 days of the filing of the petition for reconsideration, the agency shall decide whether to reconsider the final decision. The failure of the agency to make that determination within 25 days of such filing shall constitute a denial of the petition.

On November 30, 2017, the Council requested parties and intervenors to submit written comments with respect to whether the Petition should be granted or denied by December 13, 2017. On November 30, 2017, Meg Glass submitted comments requesting reconsideration of the decision. On December 6, 2017, Field Point Estate Townhouses, LLC, Bella Nonna Restaurant & Pizzeria, and Cecilia Morgan submitted comments requesting reconsideration of the decision. On December 11, 2017, Richard Granoff submitted comments requesting reconsideration of the decision and offered architectural consultation on the aesthetic

¹ Town Petition, Schedule 1, CIRCA Presentation, entitled, "Coastal Flood Risk in Connecticut."

² The public comment record closed on October 5, 2017.

design of the substation.³ On December 11, 2017, Parker Stacy submitted comments requesting reconsideration of the decision. On December 13, 2017 Eversource submitted comments requesting the Town's Petition be denied.

The Town's Petition claims that: (1) the CIRCA sea level rise projections must be considered to make a finding that the project is consistent with Connecticut's environmental laws; (2) sea level rise creates a risk of flooding at any substation built at 290 Railroad Avenue; and (3) reconsideration of an open-air substation at 290 Railroad Avenue is required.

I. No statute requires the CIRCA Presentation sea level rise projections to be applied.

The Center for Energy and Environmental Law PowerPoint Presentation (CEEL Presentation) attached to the Town's Petition as Schedule 3 clearly indicates that no statute requires CIRCA sea level rise projections to be applied.⁴ On page 3 of its Petition, the Town argues that "the CIRCA Report's updated sea level rise scenarios and planning recommendations must be considered by the Council in order to make a finding that the substation is consistent with Connecticut's environmental laws." This is inaccurate. The Town neglects to acknowledge the following record items that were considered by the Council in its finding and determination that the substation is consistent with Connecticut's environmental laws, which include, but are not limited to:

Presidential Proclamation No. 8460 – Critical Infrastructure Month;⁵
Presidential Executive Order No. 13636, Improving Critical Infrastructure Cybersecurity;⁶
North American Electric Reliability Corporation: Critical Infrastructure Protection;⁷
Conservation and Development Policies Plan for Connecticut;⁸
Final Report of the Two Storm Panel;⁹
Connecticut's Climate Change Preparedness Plan;¹⁰
Institute of Electrical and Electronics Engineers Standard 1127;¹¹ and
The National Electrical Safety Code.¹²

The CIRCA Presentation sea level rise projections are based on the sea level change scenarios published by the National Oceanic and Atmospheric Association (NOAA). In its Petition, the Town references state statutes that require consideration of published sea level change scenarios including, but not limited to, the Plan for Conservation and Development Policies Plan for Connecticut (CPOCD) and the Connecticut Coastal Management Act (CCMA).¹³ However, the current CPOCD is in the record and compliance with the CCMA is discussed in Findings of Fact (FOF) ¶¶408-418 of Docket 461 and FOF ¶¶265-276 of Docket 461A.

Among other items in the record, the North American Electric Reliability Corporation (NERC), the Institute of Electrical and Electronics Engineers and the National Electrical Safety Code establish standards for the design, construction and operation of safe and reliable electric substation facilities. Connecticut's Climate

³ 330 Railroad Avenue was an alternative site considered in Docket 461. It is located within the 500-year flood elevation. Docket 461, Findings of Fact ¶¶260-262.

⁴ Town Petition, Schedule 3, CEEL Presentation, Slide 13.

⁵ Council Administrative Notice Item No. 3.

⁶ Council Administrative Notice Item No. 4.

⁷ Council Administrative Notice Item No. 8.

⁸ Council Administrative Notice Item No. 61.

⁹ Council Administrative Notice Item No. 62.

¹⁰ Council Administrative Notice Item No. 65.

¹¹ Council Administrative Notice Item No. 68.

¹² Council Administrative Notice Item No. 70.

¹³ The Town also references the development of the state Long Island Sound Blue Plan (LISBP), yet fails to acknowledge that the Council is a member of the LISBP Advisory Committee.

Change Preparedness Plan recognizes rising sea-surface temperatures and sea levels, and recommends assessment of future flooding risks to infrastructure, including public health and safety. The Two Storm Panel Report dedicates an entire chapter to – “Assessing Risk: The Impact of Climate Change, The Rise of Sea Levels.” Therein, concerns and recommendations about the need to protect critical infrastructure along the coast and adjacent to rivers from the impact of climate change on the rise of sea levels are discussed and presented. Unlike the CIRCA Presentation, the recommendations in the Two Storm Panel Report have been codified in statute. No statute requires the CIRCA Presentation sea level rise projections to be applied.

II. 290 Railroad Avenue is not in a FEMA flood zone.

Footnote 1 on page 5 of the Petition alleges that the Council’s FOF ¶422 in the Docket 461 final decision - “[t]he southern portion of the site is 10 feet from the edge of a designated 500-year flood zone associated with Horseneck Brook” - was corrected in the Town’s July 18, 2017 Pre-Filed Testimony (PFT) in Docket 461A. On page 27 of the PFT, Town witnesses testify, “... 290 Railroad Avenue is at a higher elevation than Horseneck Brook, which is less than 100 feet from the edge of the property. Horseneck Brook flows directly into Long Island Sound. *Indeed, 290 Railroad Avenue is in a FEMA flood zone.*”¹⁴ There is no support in the record for this statement.

On page I-20 of Eversource’s Docket 461 application, a copy of which is attached as Exhibit A, Eversource submitted an Environmental Resources Map that was developed using the National Geodetic Vertical Datum of 1929 and FEMA Map Panel No. 09001C 0494G, revised July 8, 2013, which depicts the 290 Railroad Avenue property not located within either the 100-year or 500-year flood zones established by FEMA.¹⁵ Furthermore, based on information on Worst Case Hurricane Surge Inundation data developed by the National Hurricane Center using the Sea Lake and Overland Surge from Hurricanes Model (SLOSH), no portions of 290 Railroad Avenue are within Category 1, 2, 3, or 4 areas.¹⁶ Therefore, according to the FEMA and SLOSH maps, the Council’s FOF ¶422 in the Docket 461 final decision is in fact accurate and it is the Town’s PFT that is in fact inaccurate. 290 Railroad Avenue is not in a FEMA flood zone.

III. Reconsideration of an open-air substation at 290 Railroad Avenue is not required under Connecticut General Statutes §4-181a(a).

The Town contends that reconsideration of an open-air substation at 290 Railroad Avenue is required under CGS §4-181a(a) on three grounds as follows:

a. The CIRCA Presentation findings materially affect the merits of the case.

As indicated in Section I above, no statute requires the CIRCA Presentation sea level rise projections to be applied. The claims in the Town’s Supplemental Testimony that there is a risk of constructing an open-air substation in a FEMA flood zone,¹⁷ it would be far more susceptible to flood damage than if it is “fully-enclosed,”¹⁸ and merely building a perimeter fence around an open-air substation

¹⁴ Emphasis added. On page 28 of its July 18, 2017 PFT, the Town specifically refers to the same indoor substation in Avalon, NJ that is referenced in the Town’s Petition and Schedule 4 attached thereto.

¹⁵ Council Administrative Notice Item No. 43, Docket 461, Application p. I-19-I-20; The 2012 Biggert-Waters Flood Insurance Reform Act granted FEMA direct statutory authority to map future conditions resulting from sea level rise.

¹⁶ Council Administrative Notice Item No. 43, Docket 461, Application pp. I-19-I-20.

¹⁷ **Coastal Area Resources:** Docket 461, FOF ¶408-418; Docket 461A, FOF ¶265-276; **Flood Zones:** Docket 461, FOF ¶256-261; Docket 461A, FOF ¶422-423.

¹⁸ The substation would not be “fully-enclosed.” Docket 461A, FOF ¶183 (Two 60 MVA 115-kV/13.2-kV transformers would be installed in the central portion of the structure and would not be covered by a roof. The roof opening above the transformers would measure approximately 80 feet by 40 feet.); Docket 461A, FOF ¶191 (No perimeter fence

will do little to avoid the risk of damage to the equipment within the substation if flooding occurs,¹⁹ were fully addressed during the proceedings held on this matter. Furthermore, the sea level change scenarios published by NOAA and relied upon in the Council's final decision form the basis of the CIRCA Presentation sea level rise projections and the design standards employed by Eversource are consistent with the CIRCA Presentation sea level rise projections. Therefore, the CIRCA Presentation findings do not materially affect the merits of the case.

b. The final decision contains errors of fact and law relating to the hazards posed by siting an open-air substation at 290 Railroad Avenue.

i. The final decision fails to make a finding that an open-air substation at 290 Railroad Avenue is consistent with public health and safety.

In Docket 461 and Docket 461A, the Council's final decisions each include over a dozen findings on Public Health and Safety.²⁰ In those findings, the Council cites to a Presidential Proclamation and a Presidential Executive Order relative to the resilience and security of critical infrastructure, which resulted in the development of a National Infrastructure Protection Plan that recommended drawing upon the expertise of NERC.²¹ NERC developed a standard to address threats and vulnerabilities to the physical security of critical infrastructure and requires systems and contingency plans for unplanned events, including, but not limited to, natural disasters.²² Furthermore, Docket No. 461A FOF ¶323 specifically states, "There are no standards or safety codes that would prevent an open-air substation from being constructed at 290 Railroad Avenue, adjacent to the AIRGAS commercial property." Therefore, the final decision does make a finding that an open-air substation at 290 Railroad Avenue is consistent with public health and safety.

ii. The final decision fails to consider the adverse environmental effect of rising sea levels.

In Docket 461 and Docket 461A, the Council's final decisions each include over a dozen findings on Water Resources, including, but not limited to, Coastal Area Resources, Inland Wetlands and Watercourses, Flood Hazard Areas and Groundwater. Furthermore, the Town neglects to acknowledge that during the Docket 461 hearing held on December 1, 2015, Christine Edwards, a Greenwich resident, an intervenor in this matter and a local realtor, cross examined Eversource on the accuracy of the FEMA 500-year floodplain maps in relation to "everything from sea rise to land shrinkage."²³ As evidenced by the Environmental Resources Map attached as Exhibit A, Docket 461 FOF ¶422 and Docket 461A FOF ¶256, 290 Railroad Avenue is not within a 100-year or 500-year flood zone nor is it within a Hurricane Surge Inundation Area. Also, Docket 461 FOF ¶214 and Docket 461A FOF ¶164 identify 290 Railroad Avenue at approximately *40 feet above mean sea level*. The findings accurately identify that "the southern portion of the site is 10 feet from the edge of a designated 500-year flood zone associated with Horseneck Brook."

around the substation building is proposed.); Docket 461A, FOF ¶197 (The new Greenwich substation is a distribution asset and as such, the cost would have to be borne 100% by Connecticut ratepayers. The indoor substation design would cost approximately \$1.2 million more than an open-air design with a perimeter brick wall.)

¹⁹ **Coastal Area Resources:** Docket 461, FOF ¶408-418; Docket 461A, FOF ¶265-276; **Flood Zones:** Docket 461, FOF ¶256-261; Docket 461A, FOF ¶422-423. See also Docket 461A FOF ¶183, 191 and 197.

²⁰ Docket 461, FOF ¶347-367; Docket 461A, FOF ¶315-327.

²¹ Council Administrative Notice Item Nos. 3 and 4.

²² Council Administrative Notice Item No. 8.

²³ Docket 461, December 1, 2015 Transcript, pp. 117-120.

In its Supplemental Testimony attached to the Petition as Exhibit A, the Town references the CEEL recommendation to increase building elevation requirements to “add *at least* two feet of freeboard above ASCE 24-14 requirements.”²⁴ The CEEL Presentation depicts current Floodplain Elevation Requirements for Residential Buildings in A/AE Flood Zones in Greenwich to be “100-year Base Flood Elevation + 1 foot.”²⁵ According to the evidentiary record, Eversource uses the base flood elevation dictated by the 500-year flood elevation for a Category 3 storm surge, then adds “a design basis on top of that of 1 foot + 1 foot,” which is equivalent to 2 feet above the 500-year flood elevation.²⁶ Therefore, the final decision does consider the adverse environmental effect of rising sea levels.

iii. The final decision fails to comply with the Coastal Management Act.

In Docket 461 and Docket 461A, the Council’s final decisions each include an entire section of findings on Coastal Resources.²⁷ Docket 461A FOF ¶265 states, “The Project is located within the coastal resource boundary, as defined by the [CCMA]. The goals and policies of the act are to “ensure that the development, preservation or use of the land and water resources of the coastal area proceeds in a manner consistent with the rights of private property owners and the capability of the land and water resources to support development, preservation or use without significantly disrupting either the natural environment or sound economic growth.” Docket 461A FOF ¶266 states, “None of the coastal resources identified by the CCMA would be adversely affected by construction or operation of the Project.” The remainder of the findings in the section discuss how the Project is consistent with the goals and policies of the CCMA. Therefore, the final decision complies with the CCMA.

c. The final decision should be reconsidered because the Town has shown good cause as a matter of law.

As indicated in Section I above, no statute requires the CIRCA Presentation sea level rise projections to be applied. As indicated in Section II above, 290 Railroad Avenue is not in a FEMA flood zone. As indicated in this section, reconsideration of an open-air substation at 290 Railroad Avenue is not required under CGS §4-181a(a) because (1) the CIRCA Presentation findings do not materially affect the merits of the case; and (2) the final decision makes findings that are consistent with public health and safety, considers the adverse environmental effect of rising sea levels and complies with the CCMA. Yet, the Town believes it has shown good cause for reconsideration.

In a March 28, 2017 article in Connecticut Magazine entitled, “Connecticut’s Rising Seas: Are Towns and Cities Ready?,” a copy of which is attached as Exhibit B, Town witness, Denise Savageau states, “The result of rising sea levels is already visible in Greenwich, as the Town has begun to see regular flooding in places where, in the past, flooding was rare... The most at risk section of town is Old Greenwich...”²⁸ The evidentiary record closed 6 months after publication of the article. Savageau continues, “All new Greenwich homes, or homes undergoing major renovation, must be elevated in accordance with FEMA maps and guidelines, plus Greenwich requires homeowners to elevate one additional foot beyond what FEMA recommends.”²⁹ As stated earlier, Slide 28 of the CEEL Presentation depicts Greenwich using the base flood elevation dictated by the 100-year flood

²⁴ Town Petition, Exhibit A, Supplemental Testimony, p. 5; Town Petition, Schedule 3, CEEL Presentation, Slide 30 (ASCE 24-14 = American Society of Civil Engineers consensus standard “Flood Resistant Design and Construction.”)

²⁵ Town Petition, Schedule 3, CEEL Presentation, Slide 28.

²⁶ Docket 461, October 6, 2015 Transcript, pp. 47-49; Docket 461A, July 25, 2017 Transcript, pp. 145-146.

²⁷ Docket 461, FOF ¶408-418; Docket 461A, FOF ¶265-276.

²⁸ Connecticut Magazine, March 28, 2017 at page 3 and 5.

²⁹ Connecticut Magazine, March 28, 2017 at page 5.

elevation +1 foot. Also as stated earlier, Eversource uses the base flood elevation dictated by the 500-year flood elevation for a Category 3 storm surge, then adds “a design basis on top of that of 1 foot +1 foot,” which is equivalent to 2 feet above the 500-year flood elevation.³⁰ Evidently, Eversource uses a higher standard than the Town.

Projected sea level rise is not new information that warrants reconsideration of the final decision. Neither is the Peermont substation in Avalon, New Jersey. On pages 27-28 of the Town’s July 18, 2017 PFT, the Town specifically refers to Atlantic City Electric’s Peermont substation in Avalon. This is not new information. Slides 13-15 of Schedule 4 attached to the Petition specifically depict upgrades to the existing enclosed substation located on a barrier island *less than 10 feet above mean sea level*.³¹ In the 2013 PowerPoint presentation, Pepco Holdings, Inc. generally describes its approach to substation storm surge prevention to include: installing new equipment at a higher elevation; elevating switchgear, transformers and control houses; installing GIS equipment; installing protective walls; and weather proofed enclosure/buildings for substation switchgear and controls.³² Eversource’s approach to substation storm surge prevention was discussed in the records of Docket 461 and Docket 461A and the topics of climate change resiliency,³³ storm hardening,³⁴ and flood hazards³⁵ were fully addressed. For all of the reasons described above, the Town has failed to show good cause as a matter of law for reconsideration of the final decision.

IV. CONCLUSION

On November 14, 2017, the Council granted Eversource a Certificate to construct, maintain and operate an electric substation facility at 290 Railroad Avenue. Condition No. 3 of the Council’s Decision and Order requires Eversource to submit a Development and Management (D&M) Plan specific to the proposed substation facility that is to be served on the Town for comment, and submitted to and approved by the Council prior to the commencement of facility construction. D&M Plans are subject to Regulations of Connecticut State Agencies §16-50j-60 to 16-50j-62. Those regulations include, but are not limited to, requirements for the submission of maps and supporting documents related to sensitive areas and conditions within and adjoining the site, such as wetland and watercourse areas and any locations where construction may create drainage problems, areas of high erosion potential and significant environmental features, as well as requirements for the submission of plans for modification, restoration and rehabilitation of surface, drainage and other hydrologic features. Certainly, Eversource has an interest in protecting its assets from flood hazards and it is required by the Council’s November 14, 2017 final decision to demonstrate how it will protect its substation from flood hazards in the D&M Plan for the approved facility.

Therefore, staff recommends the Town’s November 29, 2017 Petition for Reconsideration be denied.

³⁰ Docket 461, October 6, 2015 Transcript, pp. 47-49; Docket 461A, July 25, 2017 Transcript, pp. 145-146.

³¹ Town Petition, Schedule 4. Peermont substation is an upgraded “enclosed” substation, not a new substation.

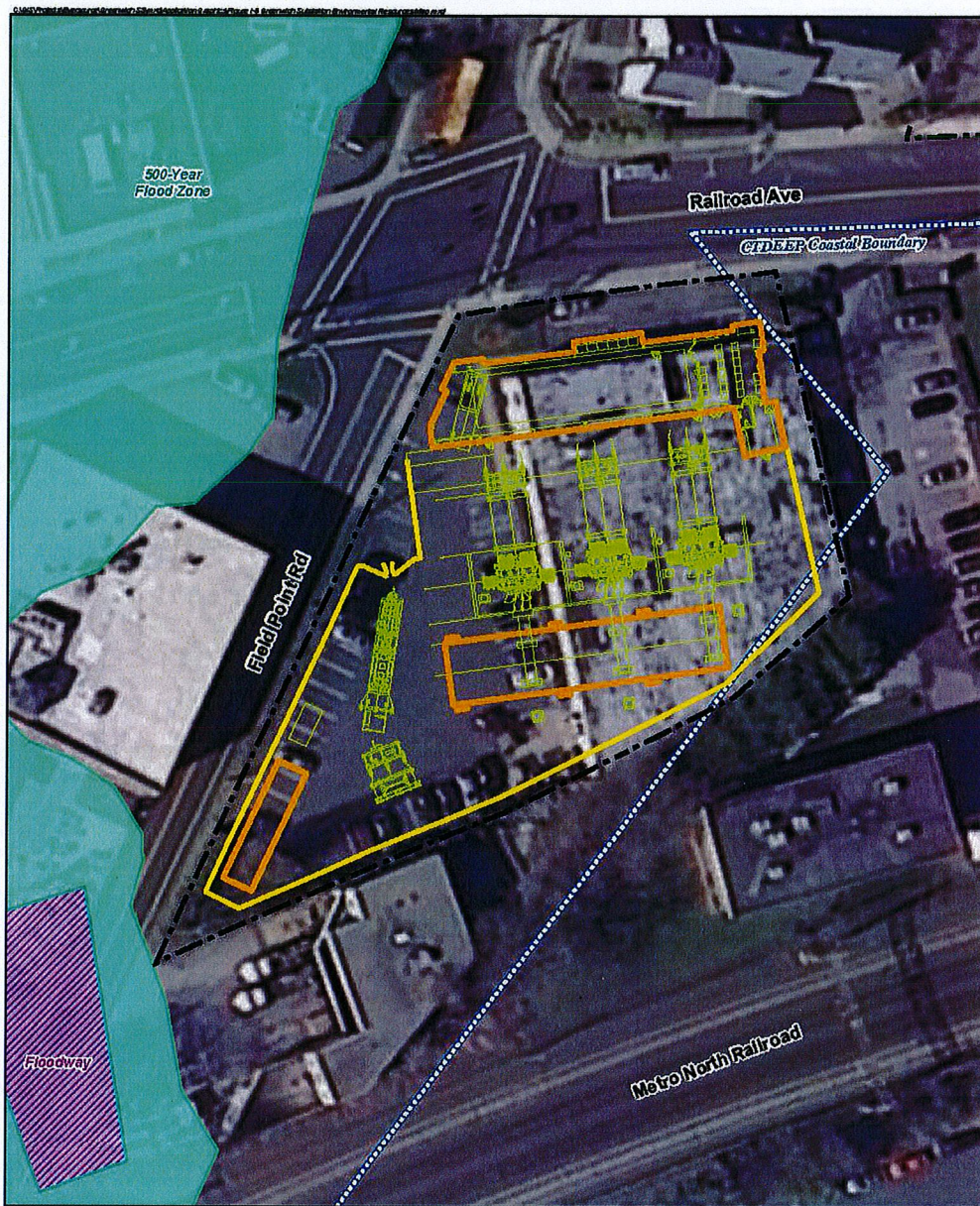
³² Town Petition, Schedule 4, Slide 12.

³³ Docket 461, October 6, 2015 Transcript, p. 269; December 1, 2015 Transcript, p. 67; January 12, 2016 Transcript, p. 19; February 23, 2016 transcript, p. 69.

³⁴ Docket 461, February 23, 2016 Transcript, p. 65; March 10, 2016 Transcript, p. 76; Docket 461A, August 29, 2017 Transcript, pp. 82-83, 223-224.

³⁵ Docket 461, December 1, 2015 Transcript, pp. 117-120; Docket 461A, July 25, 2017 Transcript, pp. 145-152.

Figure I-5 Greenwich Substation Environmental Resources Map



- Legend**
- Subject Property Boundary
 - CTDEEP Coastal Boundary
 - Proposed Building/Enclosure
 - FEMA Flood Zones
 - Proposed Fence
 - 100-Year Flood Zone*
 - Proposed Equipment
 - 500-Year Flood Zone
 - Floodway

Icons in shaded area
Base Map: 2012 Aerial Photograph (CTECO)
Map Scale: 1 inch = 50 feet
Map Date: June 2015



Figure I-5 Greenwich Substation Environmental Resources Map

Greenwich Substation
290 Railroad Avenue
Greenwich, Connecticut



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EXHIBIT B

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http://www.connecticutmag.com/health-and-science/connecticut-s-rising-seas-are-towns-and-cities-ready/article_e97a46de-0a74-11e7-a2f8-172f13eccc2.html

EDITOR'S PICK

FEATURED

Connecticut's Rising Seas: Are Towns and Cities Ready?

Erik Ofgang, Michael Lee-Murphy, Albie Yuravich Mar 28, 2017



Waves batter homes along Cosey Beach Avenue in East Haven as the storm surge from Hurricane Irene arrives on Aug. 28, 2011. This photo was taken two hours before high tide.

Peter Casolino

The state is working to determine just how quickly its waters are rising. Meanwhile, our survey of coastal cities and towns (scroll down to see our town-by-town list) shows that some already have plans in place to deal with loss of shoreline and more intense storms. Other municipalities are scrambling to catch up.

Click on a name to go directly to the entry for that town: Greenwich | Stamford | Darien | Norwalk | Westport | Fairfield | Bridgeport | Stratford | Milford | West Haven | New Haven | East Haven | Branford | Guilford | Madison | Clinton | Westbrook | Essex | Old Saybrook | Lyme | Old Lyme | East Lyme | Waterford | Montville | Norwich | New London | Ledyard | Groton | Stonington

Introduction by Erik Ofgang | Survey reporting by Erik Ofgang, Anna Bisaro, Michael Lee-Murphy, Sam Norton, Kathleen Schassler and Albert Yuravich

Connecticut's coastline is changing. The Nature Conservancy estimates the state will lose 24,000 acres of land to sea-level rise by 2080, and in terms of insured assets, Connecticut will be more impacted than every other state except Florida.

The waters of Long Island Sound are rising. Projections range from about a foot to more than six feet by the end of the century. At the same time, the state's landmass has been gradually lowering since the retreat of the ice sheet in the last Ice Age. The result is an advancing sealine that outpaces the national average and will likely cause increased flooding in the short term, and ultimately could reshape shoreline communities and the state's economy.

"Just as waters of the oceans of the world are at higher levels, we're seeing on the Sound rising waters and warming waters and changing fish species. There are more warmer-water fish and less colder-water fish," says Dennis Schain, spokesman for the state Department of Energy and Environmental Protection. "Like many climate issues, changes along our coastline are going to be gradual. It's not something where you're going to wake up and see necessarily a profound difference from one day to the next, but gradually increasing water levels will change the coastline, will change flooding patterns, and storm-surge patterns, making them more severe. We are working to minimize disruption on our shoreline by trying to protect valuable resources and properties with sound, environmentally sustainable strategies."

The Connecticut Institute for Resilience and Climate Adaptation (CIRCA) was formed in 2014 to better help the state study and adjust to the rising sea level and other environmental issues at the local level.

According to DEEP, Connecticut's shoreline is rising by 2.58 millimeters a year, but many expect that rate to increase, though the rate at which it will increase is unclear. "We understand that sea-level rise is happening, we understand that more will happen in the future, it's just a question of how much and how fast," says Rebecca A. French, director of community engagement at CIRCA, which is based out of the University of Connecticut's Avery Point campus.

CIRCA stresses that the issues caused by rising sea levels are not decades away, French says. In fact, they are already occurring. "A larger area was impacted by the storm surge from Sandy because of the sea-level rise that we've already experienced, but Sandy could have been much worse because we didn't get much rain," French says. "If we experience the same conditions of Sandy in the year 2050, it would be even worse; a larger area would be impacted by flooding."

Shoreline communities have learned this the hard way as severe weather events like Superstorm Sandy have served as a powerful, expensive and, in some cases, terrifying reminder of how vulnerable some coastal communities are to flooding. While towns on Connecticut's coast have some form of resiliency plan in place, or are in the process of creating one, many strategies for preparing for sea-level rise are hampered by a lack of staff resources and funding.

Denise Savageau, the director of Greenwich's Conservation Commission, says the result of rising sea levels is already visible in Greenwich, as the town has begun to see regular flooding in places where, in the past, flooding was rare. Greenwich, like other coastal communities in Connecticut, faces a unique set of obstacles when it comes to rising sea levels, says Savageau. "There's not one solution for every town. It depends on the land pattern and development pattern in every town," she says.

CIRCA researchers are working to determine how these local variables and local topography will impact sea-level rise in Connecticut. Ultimately the organization hopes to arm municipalities with very specific data as they prepare for changing sea levels. "Our goal is to provide communities with information at the scale that they're making decisions," French says. "When you're a municipal leader, you want to know things like how high does Route 146 in Branford and Guilford need to be. There are some parts of Route 146 that flood every day at high tide right now. With sea-level rise, it could be flooded all the time. So, maybe it's too expensive to elevate it to the point where it will never be flooded, but we can handle it flooding once a month, or a couple of times a year. So, how high should we elevate it? And that's very specific information."

In addition, French says it's important that residents who don't live on the coast realize the state as a whole will be impacted. "The upland communities don't have much of an appreciation for how an economic devastation from a hurricane, that might have a greater impact on the coastal areas, [also] impacts the whole state," she says. "As taxpayers we do pay when there's damage at the shoreline."

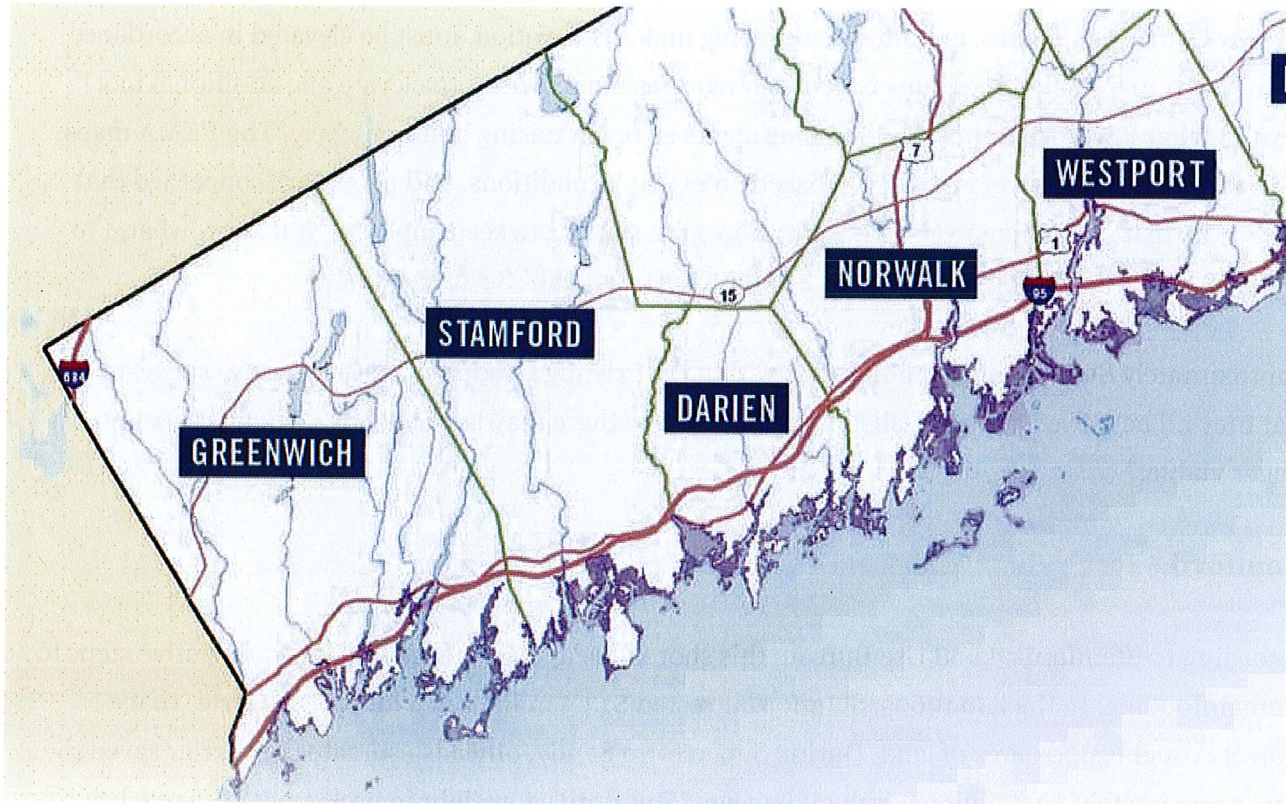
Schain says that as municipalities and the state ramp up efforts to combat rising seas, projections about the future sea level will be key. "You don't want to build new roads, new treatment plants, new parks without understanding the dynamics and what the shoreline of the future might look like," he says. He adds that Connecticut is also trying to "reduce carbon emissions to slow the pace of climate change [while] hoping that there's some national policy and international efforts in support of that. While we want to do our fair share and more in Connecticut, we can't stop climate change on our own. It needs a larger effort."

How are towns preparing?

Connecticut Magazine and the *New Haven Register* asked officials from every coastal town how they are preparing for sea-level rise. Their responses follow.

Note: Coastal map and town-specific maps on each page show six feet of sea-level rise (in purple).

Map source: State Department of Energy and Environmental Protection
(ctecoapp1.uconn.edu/ctcoastalhazards/)



Purple areas show six feet of sea-level rise.

Map source: State Department of Energy and Environmental protection (ctecoapp1.uconn.edu/ctcoastalhazards)

Greenwich

The town is already seeing the effects of sea-level rise, says Denise Savageau, director of Greenwich's Conservation Commission. "Now we have flooding on a monthly basis [in places] where we never had flooding before," she says, adding that the parking lot at Greenwich Point Park "floods during the full-moon high tide now where it didn't previously." The most at-risk section of town is Old Greenwich, which encompasses Greenwich Point Park. Because the park was long ago designated as open space, fewer homes will be affected by the rising seas than would have been otherwise, says Savageau. But, she adds Greenwich Point Park needs to be preserved because "it creates a barrier from wave action for where our residential community is."

Part of the town's sewer system is vulnerable to flooding. "Like most municipalities on the shoreline, the sewage treatment plant is in the flood zone," Savageau says.

Greenwich is working to get better data on sea-level projections, to better plan and budget for the future, Savageau says.

All new Greenwich homes, or homes undergoing major renovation, must be elevated in accordance with FEMA maps guidelines, plus Greenwich requires homeowners to elevate one additional foot beyond what FEMA recommends. Some residents are even raising homes higher. “The FEMA maps are not based on sea-level rise, they’re based on existing conditions, and people are concerned that the FEMA maps are going to change again. So you’re starting to see people go, ‘you know what, I’m going to go a little bit higher than what FEMA maps [require],” Savageau says.

Approximately 800 Greenwich homes are within the existing floodplain. Savageau says suggestions that they all be moved are not realistic, but “eventually there may be some homes that are just no longer viable.”

Stamford

According to Stamford’s Land Use Bureau, this shoreline city has long been taking preventive steps to combat flooding. In the late 1960s, Stamford invested \$14.5 million in a hurricane barrier that protects roughly 600 acres of land. During Superstorm Sandy, officials estimate the barrier saved the city approximately \$25 million worth of damage. “Stamford’s foresight in protecting its assets has attracted many diverse businesses including international and national headquarters of Fortune 500 companies, a top-ranked hospital, and many leading financial institutions,” says Thomas Madden, Stamford’s director of Economic Development.

The Nature Conservancy assisted Stamford and other southwestern Connecticut municipalities in preparing a hazard-mitigation plan for 2016 to 2021, which the city has formally adopted. In addition, the Nature Conservancy prepared a Salt Marsh Advancement Zone Assessment of Stamford in 2014. Both documents have served as a basis in coastal-resilience grant applications. The hazard-mitigation plan includes a host of recommendations for the city including a recommendation that Stamford “encourage the preservation of undeveloped lands within the 100-year flood zone with the use of open space purchase, donation or conservation easement,” a strategy Stamford has vowed to implement. In addition, the plan recommended that Stamford “refine and provide usable sewer and drainage system maps to EOC [Emergency Operations Center] and emergency responders,” a process that is in progress.

Darien

Darien's first selectman, Jayme Stevenson, says the "Emergency Management Department and Land Use boards keep abreast of all information on the issue of sea-level rise." She adds, "To date, we have no planned projects in Darien to specifically address sea-level rise. Our actions are limited to protecting our environmentally sensitive coastline by limiting development and where development is allowed, following all FEMA guidelines for building elevation.

"Our zoning guidelines require that all new construction within the flood zone have finished floors of at least one foot above the base flood elevation (1 foot freeboard). The challenge arises when FEMA changes these base flood elevations, which they did recently, making homes that were compliant out of compliance. National Flood Insurance program (NFIP) standards do not require the 1-foot freeboard and many communities do not apply this standard. Darien is a participant in the FEMA NFIP."

Norwalk

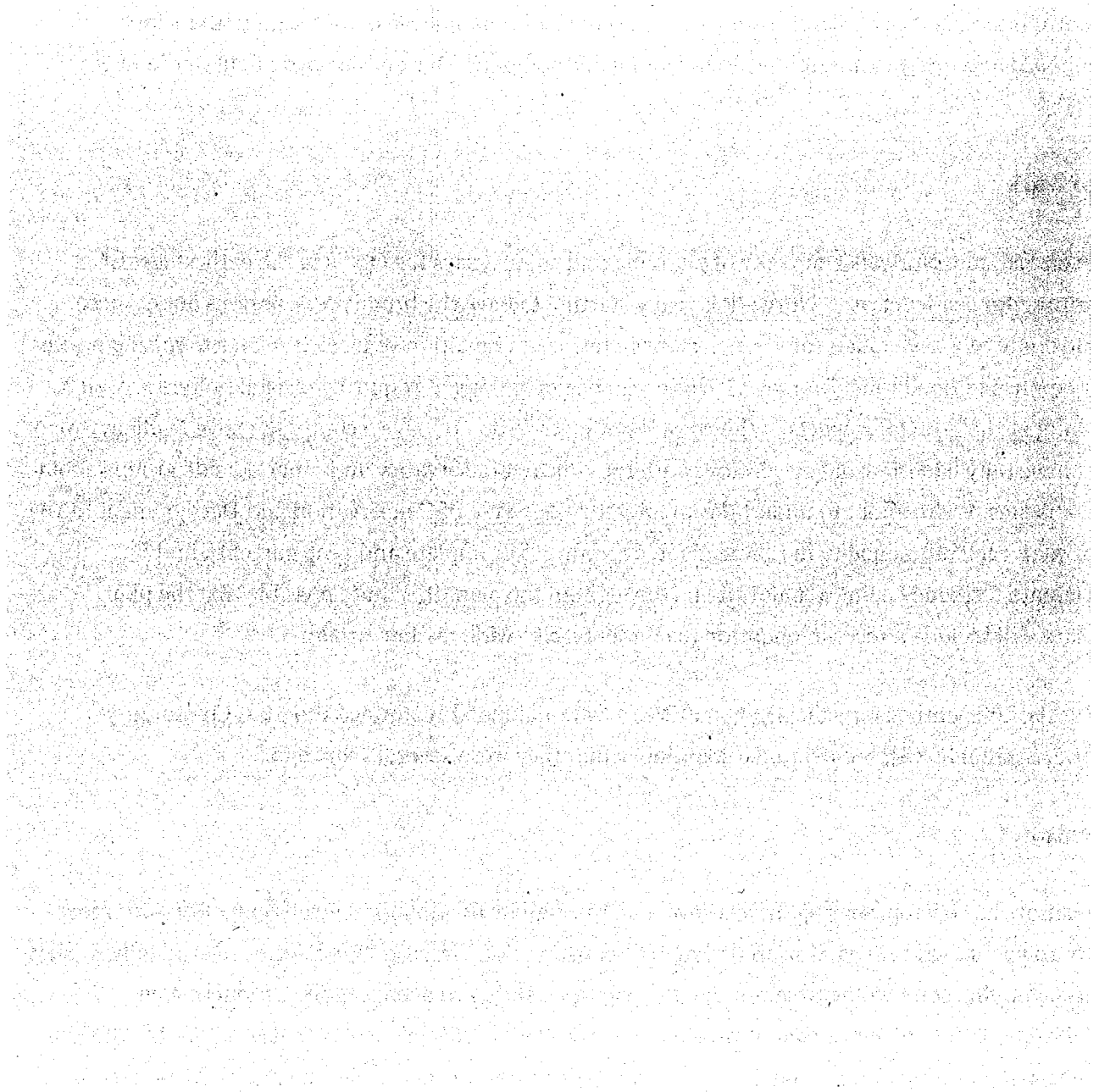
Steven Kleppin, Norwalk's director of planning and zoning, says his city is in the early stages of planning for sea-level rise. "Norwalk is really starting to have the broader discussions about these issues now. We have taken some small steps in terms of regulation relief as it relates to raising houses in response to flood relief," he says. "We've also began looking at requiring coastal buffers as well as looking at the broader impacts of the coastal buffers. We do not have a comprehensive resiliency plan and have only had informal discussions with the Nature Conservancy and other outside groups about these issues. We're about to undertake an update of our Plan of Conservation and Development [a 10-year plan each municipality in Connecticut is required to complete and keep current], and I anticipate resiliency being a major theme throughout the plan. It is quite possible that the plan update will include a recommendation to conduct a city-wide resiliency plan."

He adds, "Presently, Norwalk is not in FEMA's National Flood Insurance Program Community Rating System [CRS], but my understanding is that they were several years ago."

Westport

"Westport has been preparing for sea-level rise through its floodplain management efforts for more than 20 years," says Alicia Mozian, Westport's conservation director. "We have been gradually raising houses, buying some vulnerable floodplain properties and have been steadily conducting and installing floodplain-improvement projects. We enrolled in CRS in 1994." Mozian adds, "In addition, the Darien Planning and Zoning Commission carefully scrutinizes development within 100 feet of mean high tide."

Westport is part of the same hazard-mitigation plan for 2016 to 2021 that the Nature Conservancy helped prepare for several southwestern Connecticut municipalities. The dozens of recommendations in the plan included advice that Westport “adopt a Natural Hazards Awareness Week complete with public outreach activities focused on flooding and other natural hazards” and “identify properties prone to flooding that may be considered for elevation or acquisition; consider implementing as necessary or as funding becomes available.” The implementation of those recommendations and others have been impeded by lack of staff and funding resources, but Westport is making efforts to ensure they are enacted in the future.



Purple areas show six feet of sea-level rise.

Map source: State Department of Energy and Environmental protection (ctecoapp1.uconn.edu/ctcoastal hazards)

Fairfield

The town of Fairfield is undertaking a project that will protect its most critical facility: the wastewater treatment plant, says Laura Pulie, the town's senior civil engineer. The plan is to "harden" the plant by constructing a flood-control structure around the entire facility. This work will provide protection from coastal storm events and prevent the treatment plant from being inundated with tidal flood waters that would cost hundreds of thousands of dollars to repair. Work is expected to begin by the end of 2017.

In addition to the hardening project, a microgrid, which will provide continuous power from multiple energy sources during power outages, is being designed and will be installed this year. The construction cost for these two projects combined totals over \$5 million. Major funding for these projects is being provided from U.S. Department of Housing and Urban Development's CDBG-DR program, according to Pulie.

Fairfield has also improved its ability to drain floodwater after a coastal storm event by increasing the capacity of existing culverts that will enable a large portion of the floodplain to be emptied of tidal inundations within one day compared to more than a week. This project also received 100 percent HUD funding.

The town is also involved in multiple planning studies funded through HUD's grant program, including constructing a stormwater pump station to quickly remove floodwater from both coastal and rain events. Other studies involve providing resiliency to the downtown area using green infrastructure, providing resiliency for the Riverside Drive neighborhood located from South Benson Marina at Turney Road east to the Shoreham Terrace, and engineered beaches at the town's five public beaches.

Fairfield is also partnering with multiple agencies to develop long-term plans to strengthen coastal resiliency in Fairfield and New Haven counties. These plans may include restoring and/or creating tidal marshes, constructing dunes, providing resilient corridors by elevating certain roads, constructing living shorelines and creating barrier beaches.

Fairfield's coastal flood mitigation plan and other pertinent information is available at fairfieldct.org/feeb.

Bridgeport

Scott Appleby, the city's emergency management director, says Connecticut's largest city has been monitoring sea-level rise for several years. "In this case, sea-level rise or severe coastal flooding has been a target since 2010 due to the devastating effects from that year's nor'easter, 2011 [Hurricane] Irene, and 2012 Superstorm Sandy that showed our city's vulnerabilities along the coastline and in those areas prone to extensive flooding."

Appleby says, "In addition to prevention and preparedness outreach, the city and its Emergency Management Team have worked since 2010 with many local, state and federal governmental agencies, along with nongovernmental agencies, to learn more and prepare more to become a more resilient community. We have also achieved the NOAA National Weather Service Storm-Ready designation for our steps in preparing our community for all types of severe storms that include climate change and sea-level rising. All of this is part of our Ready Bridgeport strategy."

The city worked with the Nature Conservancy in developing a Climate Preparedness Assessment that was conducted in 2012. "Since then we have been working with various universities in assessing vulnerabilities and identifying ways to be better prepared educationally, but also in how to protect our critical infrastructures and our neighborhoods," Appleby says.

All these efforts do not come without a cost, but Appleby says the city is dedicated to preparation. "Infrastructure costs are definitely going to be more than the awarded post-Sandy grant of a little more than \$50 million. However, we will continue to work with the various support agencies guiding us to ensure we reach our resiliency goal and what additional costs or measures we will need to apply for through grants or invest city funding to accomplish."

Appleby says the city's All Hazards Emergency Operations Plan is continually being revised to align with the most recent recommendations the city receives, "especially in the areas of evacuation, sheltering, risk communications, severe storms and flooding. This document is activated before, during and after hazardous threats or emergencies so that the city has a measurable tool to follow as it relates to the protection of life and property."

Stratford

The town of Stratford completed a coastal-resiliency study in December 2016. The study was endorsed by the planning commission and included a range of options for making the shoreline more resilient, including more costly permanent changes, as well as temporary measures that would help accommodate extra floodwaters in case of an emergency, says John Casey, the town engineer. The plan has been sent to the town council for approval, but has not been adopted. Casey says the town prefers a "middle of the road" solution with a mix of more permanent and other temporary measures.

When a plan is approved, the town will look into applying for grant funding from CIRCA, he says. In addition, the Nature Conservancy did a regional study of which Stratford was a part, but there is currently no funding for any follow-up projects from that study.

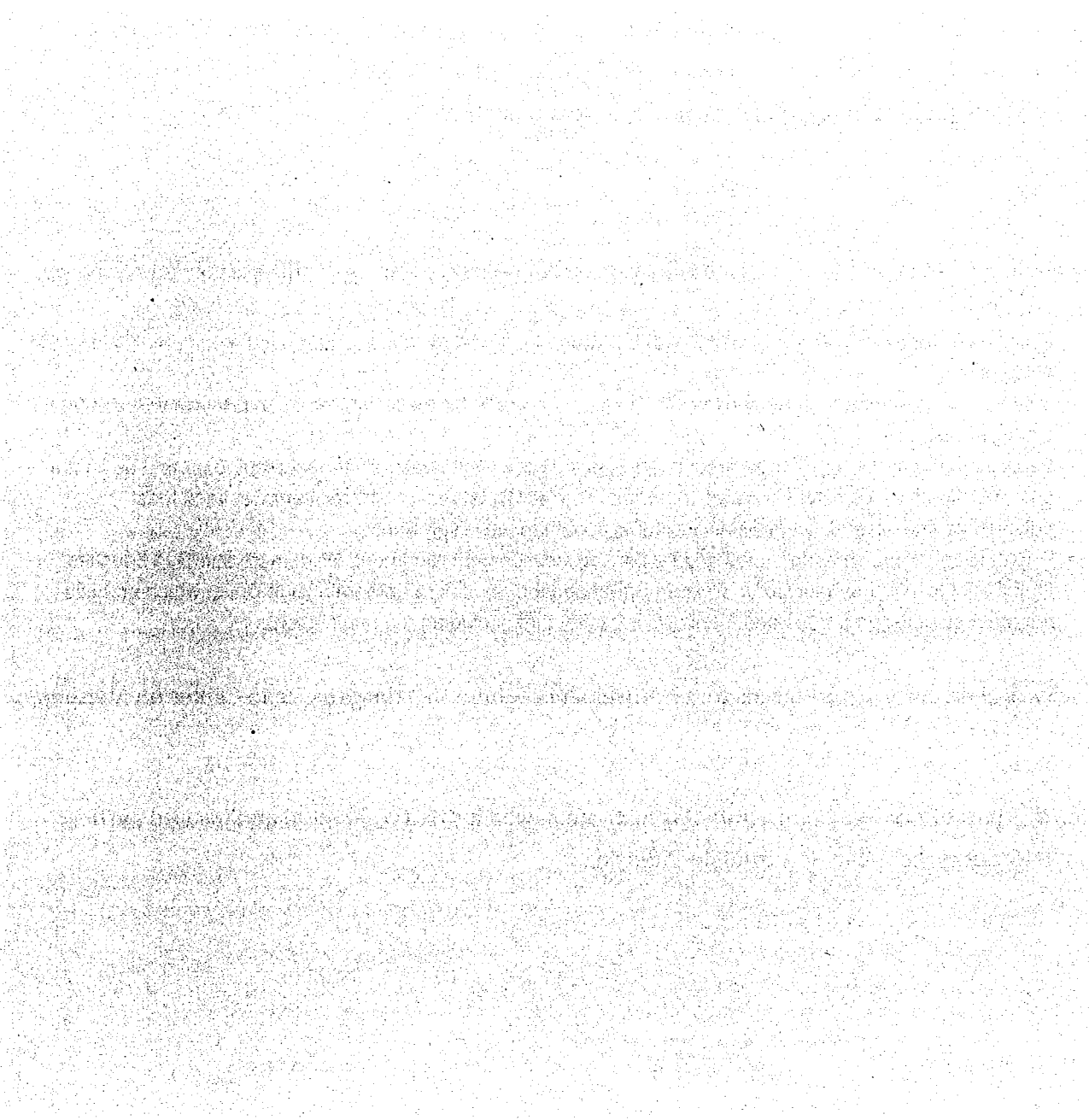
Milford

City engineer Gregory Pidluski says the city is planning several projects to address coastal resiliency:

- Raising the roadway of Milford Point Road (between First and Seaview avenues) and a portion of Beachland Avenue.
- Installing improved storm drainage, including a pump system, for the Point Beach and Bayview Beach (Field Court) areas.
- Installing a perimeter barrier wall around the Beaver Brook wastewater treatment plant to protect against a 500-year flood, at a projected cost of \$2 million. The facility serves 14,000 residents, several local businesses and several city facilities, including Jonathan Law High School.
- Replenishing sand, creating dunes and reinforcing locations at Woodmont, Wildemere and Gulf beaches, Gulf Street to Welchs Point Road, Pelham Street and the revetment at Morningside Drive, which protects private residential properties and municipal infrastructure, including a pump station.

The city is also reviewing proposals for improvements behind the Margaret Egan Center on Matthews Street.

Milford is part of FEMA's Community Rating System, which saves residential and insured parties about \$160,000 each year, according to Pidluski.



Purple areas show six feet of sea-level rise.

Map source: State Department of Energy and Environmental protection (ctecoapp1.uconn.edu/ctcoastal hazards)

West Haven

This spring, the city is reviewing a coastal-resilience plan being developed with the assistance of consultant Milone & MacBroom. The city will then determine an implementation strategy for coastal resilience, according to David Killeen, assistant city planner. In addition, West Haven is involved in a study to assess the feasibility of replacing the outfall pipe from the wastewater treatment plant into New Haven Harbor because the pipe is exposed at low tide, creating the possibility of damage to the

pipe and also the risk that there may be increased pollution. Lastly, the city is working on a plan that would raise Beach Street by five feet, which would move the road out of the flood zone and allow city officials to have access to the Water Pollution Control Plant during flood events, Killeen says.

West Haven has worked with Natural Resources Conservation Services to purchase shoreline homes damaged by Sandy and demolish them. Though the city is not currently using any CIRCA funding, grant writer Eileen Krugel says West Haven is in regular contact with CIRCA about future grant opportunities. But there are plans to work with CIRCA on projects that would use dredged material to construct sand dunes, restore beaches and create other resiliency features along the coast, according to Mark Paine, assistant to the commissioner.

New Haven

New Haven is taking a green-first approach to coastal resiliency, saving money and providing green-infrastructure jobs in the city, says Giovanni Zinn, city engineer.

After using Community Development Block Grant Program funds from the U.S. Department of Housing and Urban Development to complete a mathematical model of the downtown stormwater system, the city decided one of the best ways to make the system more resilient to an increase in the intensity of precipitation — another predicted side effect of climate change — was to put in bioswales. Approximately 200 roadside bioswales are being constructed throughout the city. Bioswales look like roadside gardens and serve as natural filters for stormwater runoff. Zinn says more pumps may eventually be required to cope with the need for increased capacity of the drainage system.

Another focus is creating living shorelines, Zinn says, using natural structures such as plants, sand and limited use of rock as a way to protect the city. Targeted areas include Long Wharf Drive, East Shore Park and Morris Cove.

The city is working with nonprofits like the Urban Resources Initiative and Save the Sound in completing these projects, and has been partnering with DEEP, Zinn says. DEEP has helped the city do a resiliency study of the Mill River.

East Haven

Unlike Waterford, East Haven, which has 2.4 miles of coastline, has been accepted into FEMA's National Flood Insurance Program, says Town Engineer Kevin White.

For the past 12 months, East Haven has worked with the Nature Conservancy to identify roadways in exposed areas to elevate. "Right now, it is still a concept," White says. "There is no funding in place. We are aware of what is going on, but it comes down to dollars and cents."

After Irene and Sandy, residents near the shore started to raise their houses, White says. Now, between 75 percent and 80 percent of coastline property owners have elevated their buildings above the projected sea-level rise or are in the process of doing it.

East Haven has not yet adopted an official coastal-resilience plan, White says.

Branford

Branford partnered with other nearby coastal towns to secure a Community Development Block Disaster Recovery grant to create a coastal-resilience plan for each of the municipalities, says Janice Plaziak, Branford's town engineer. Branford adopted its plan in June.

Branford's plan helped pinpoint specific locations that can adapt to changing conditions or, at the very least, prepare for future events similar to Sandy.

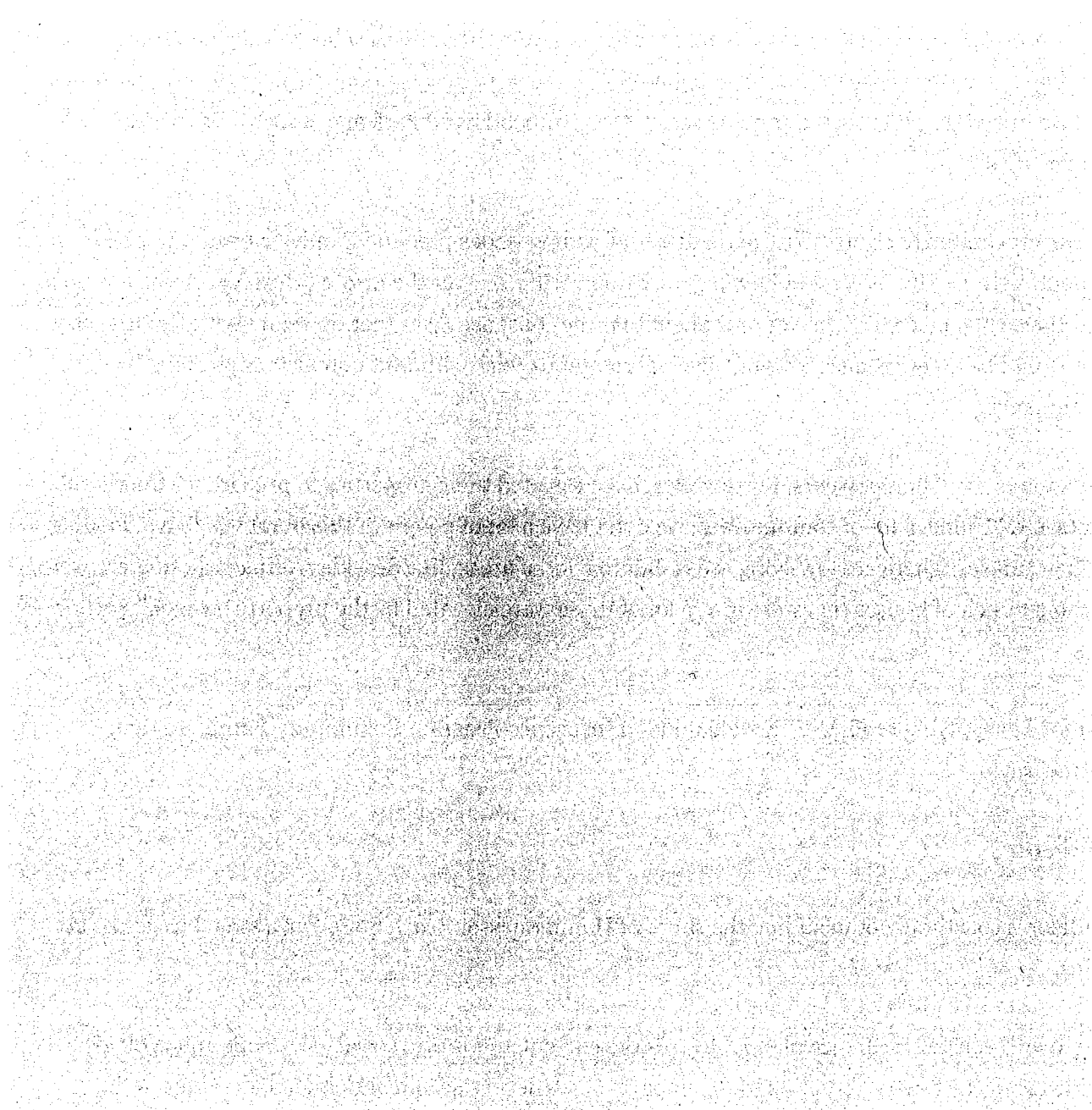
Neighborhoods such as Pine Orchard, Stony Creek and Branford's downtown near Meadow Street were identified as locations that have had consistent flooding issues, not only during natural disasters such as Irene and Sandy, but also during high tides, Plaziak says.

Branford is also partnering with Guilford on a Regional Council of Governments study on Route 146, a state road that runs through both shoreline towns, to identify which areas are subject to flooding on a regular basis, Plaziak says. This study will help identify potential resilience projects the state Department of Transportation can undertake to address the flooding issues.

"From my perspective as a town engineer, things are changing," Plaziak says. "You see that high tide is now reaching the sea walls. Roads consistently being flooded that maybe would only flood during storm events are now flooding during the spring and fall high tide."

Branford was also awarded a FEMA hazard-mitigation grant to implement measures that better protect shoreline-exposed roadways. The project cost, including construction, totals \$1.2 million, Plaziak says. The town is slated to start the first phase of the project, engineering.

Branford has not applied to FEMA's National Flood Insurance Program Community Rating System.



Purple areas show six feet of sea-level rise.

Map source: State Department of Energy and Environmental protection (ctecoapp1.uconn.edu/ctcoastal hazards)

Guilford

To ensure Guilford residents are protected from sea-level rise during regular storms, Town Engineer Jim Portley says his department has worked to elevate roads that are most prone to flooding. In years past, Portley says Old Quarry and Chaffinch Island roads were raised to increase residents' access to their homes during regular storms, not just natural disasters like Sandy or Irene. Last year, Tuttle Point Road was also elevated, Portley says.

“We raised (Old Quarry Road) two feet at the highest point because they historically had some flooding there. We elevated Chaffinch Island Road. We were lucky enough to get a grant from FEMA and we raised that four feet to provide access to Chaffinch Island Park and Brown’s Boatyard,” Portley says.

However, Guilford’s efforts to raise roads with flooding issues predates Sandy or Irene. “It is so difficult because the forecast of how high the water will rise over the next 25 to 50 years, the forecasts are all over the place. If there was a thought that the consensus was that the water will rise three feet, that would be great because it would give us a target to work with. But nobody has given us that,” Portley says.

But a majority of homeowners, Portley says, have elevated their properties to prepare for the rise in sea levels. “Unlike a lot of communities, we don’t have a lot of people at this point who have flooding in their houses. There are low-lying areas. But in a lot of areas, like Seaside Avenue, where there were a whole bunch of houses that were low, a lot of those were elevated by the property owners,” Portley says.

Guilford is applying to FEMA’s National Flood Insurance Program Community Rating System, Portley says.

Madison

Madison’s coastline, not including the shore of Hammonasset Beach State Park, stretches across six miles.

The town’s coastal-resilience plan addresses the current and future social, economic and ecological resilience of the town’s shoreline to the impacts of sea-level rise and anticipated increases in the frequency and severity of storm surge, coastal flooding and erosion.

“Madison has participated in a few planning efforts to outline actions that will help us prepare for sea-level rise and its consequences. This includes working with the Nature Conservancy to conduct hazards and community-resilience workshops, preparation of a coastal-resilience plan for the town of Madison with support of a Community Development Block Grant Disaster Recovery, and working with the South Central Regional Council of Governments on the South Central Region Multi-Jurisdiction hazard-mitigation plan,” says David Anderson, Madison’s director of planning and economic development.

Madison has not introduced any new or modified zoning codes for the coastal floodplain, but

Anderson says the town's floodplain regulations are currently undergoing a revision.

Clinton

Several neighborhoods in Clinton are at particular risk of rising sea levels, according to Eric Knapp, the town's zoning enforcement officer. In a pair of neighborhoods located on the coastline, flooding from storm surge is a fairly regular occurrence. These areas of Clinton, particularly along Shore Road and the area around Uncas Road, are sandwiched between Long Island Sound to the south and salt marshes to the north, making them acutely vulnerable to flooding. "Certainly there is a lot of concern regarding what is going to happen," says Knapp. The neighborhoods are only accessible by two roads (Beach Park Road and Causeway), and both are low-lying and susceptible to flooding, which effectively seals off the area during storm conditions. This is the first of two problems associated with this part of town.

The second, Knapp says, is a concern for private homeowners rather than municipal infrastructure. "There's already this, sort of, split between people who have the resources to raise their property to current standards, and people who don't," Knapp says. "You have, side by side, houses that are up on stilts, properly prepared for floods, and houses that are falling down."

Westbrook

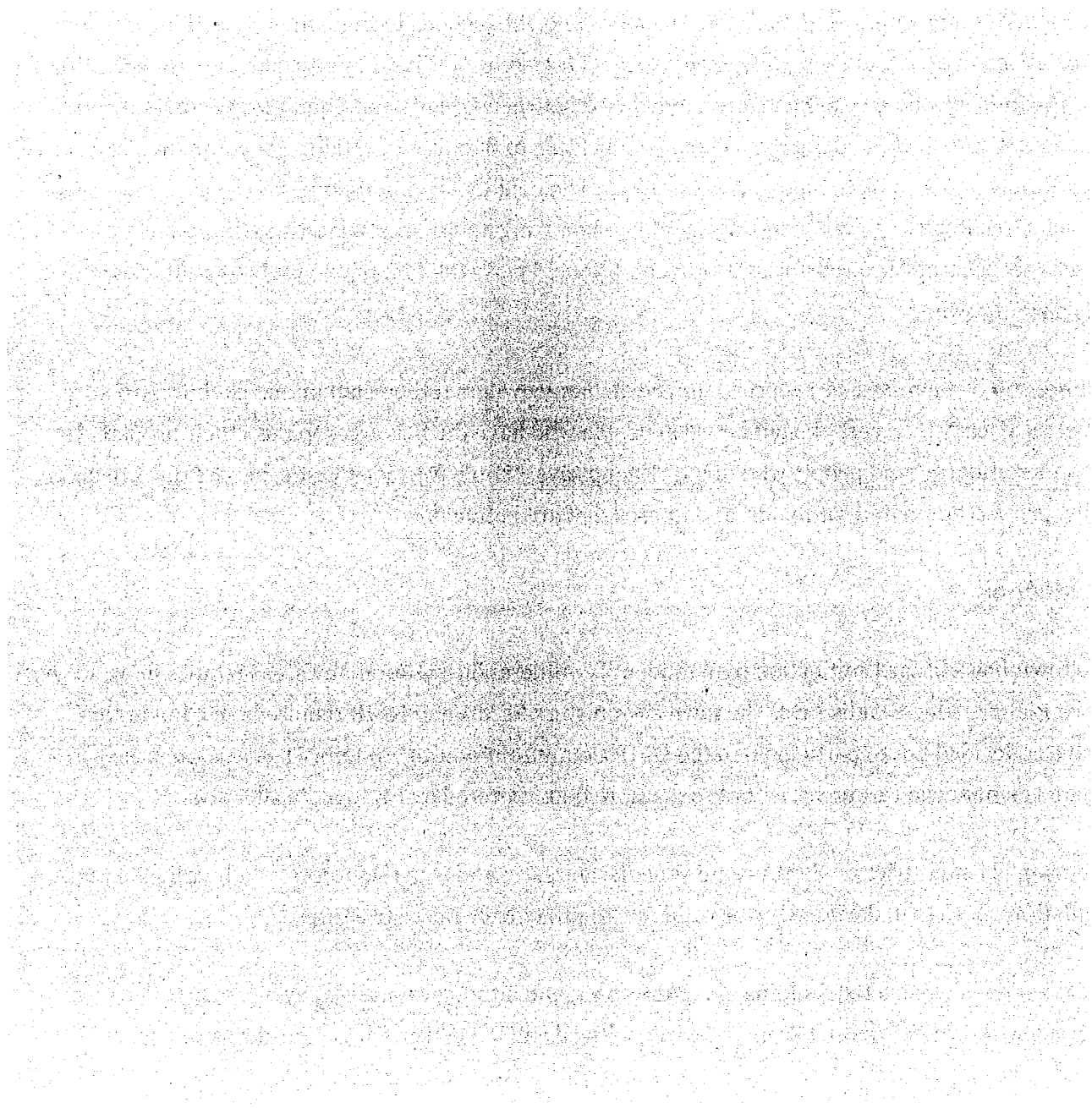
The town has a hazard-mitigation plan to identify vulnerabilities, but many areas require more study, Town Planner Meg Parulis says. The town administers FEMA and NFIP requirements, but at this time has decided not to participate in the NFIP Community Rating System. The decision, based on the town's financial resources, is "not to do more than required by FEMA," Parulis says.

The town is being strict on FEMA requirements, she says, and is in the process of updating its zoning-regulation codes to make it easier for residents to proactively raise structures.

The town hasn't restricted building along the coast, and although some taxpayers come to the town with concerns, there "doesn't seem to be the political will" to make change, Parulis says.

"We want to protect people, but we can't just raise the roads," says Parulis, an advisory board member of Connecticut Institute for Resilience and Climate Adaptation.

The town needs many engineering studies that can help push for wide-scale solutions, and avoid a property-by-property approach to solutions, she says. "When I see something appropriate for Westbrook, we'll proceed accordingly," Parulis says. "If you look at the modeling, the impact [on Westbrook] isn't as bad as it is for Old Saybrook."



Purple areas show six feet of sea-level rise.

Map source: State Department of Energy and Environmental protection (ctecoapp1.uconn.edu/ctcoastal hazards)

Essex

Once covering 25 acres, Thatchbed Island, which sits along the Connecticut River not far from where it empties into the Sound, now covers about eight, says Jeff Going, chairman of the town's Harbor Management Commission. In addition to Thatchbed, several other buffer islands between South Cove and the river have been affected by sea-level rise, he adds.

The commission relies on data provided by the U.S. Army Corps of Engineers, as well as hydrostatic data required to construct boat moorings and other maritime infrastructure, Going says. That data helps inform the commission about water depth in relation to fortification and restoration efforts on Thatchbed Island.

"We're in the initial stage of trying to figure out what funding is available and what actions to take," Going says of opportunities and systems to fortify or restore wetlands. "If we can save what is left of it, or restore sections and habitat eroded away, more interesting systems will come along," he adds.

The mouth of the river has an enormous amount of natural wetlands, a habitat for a diverse variety of wildlife. The wetlands are able to absorb a great deal of water and protect the town when sea levels rise during a hurricane or flood. During a hurricane, as flood levels reach six feet above high tide, that might compare to more than nine feet of water without the added absorbency of marshlands, Going says. "When there is a surge, the wave and wind action has less effect on the mainland," because of the buffer islands, says Going.

"We've seen the high-tide mark come up — nothing dramatic — but we're seeing it on very large rock areas," Going says.

Old Saybrook

When it's high tide during a full moon, with an easterly wind blowing, Old Saybrook First Selectman Carl Fortuna knows which low-lying areas in town are under water. "I know the roads that are nearly impassable" when sea levels rise, he says. Sandy's winds caused water to "pile up" because the tide couldn't flow out to the Sound, a problem that hit Milford and Greenwich especially hard, Fortuna says.

Old Saybrook's ad hoc committees on climate change and sea level are "smack dab in the middle" of a community coastal-resilience study and infrastructure evaluation funded through a Community Development Block Grant.

The town is assessing its changing needs based on rising sea levels and is looking at a spectrum of challenges, including roads and bridges, stormwater, historic and cultural resources, and essential and emergency services, according to Fortuna. Aside from infrastructure challenges, like the possibility of raising roads, the town also considers “the potential of people losing their homes and investments,” he says.

Old Saybrook invested \$6,000 to purchase a tide gauge to monitor sea-level changes through a program of the U.S. Department of Agriculture to accumulate long-term data. The tide-gauge readings are available to the public on the town’s website.

Lyme

By virtue of its location along the east bank of the Connecticut River and a large amount of undeveloped marshland, what coastal area Lyme does have is mostly insulated from rising sea levels. Bernie Gigliotti, Lyme’s zoning enforcement officer, writes that Lyme is “blessed in that roughly two-thirds of that boundary is undeveloped land or salt marsh either under the control of the State of Connecticut, the Nature Conservancy or the Lyme Land Conservation Trust, precluding any future development in those areas.”

Lyme also has very little infrastructure which would need to be updated or repaired to deal with rising sea levels. According to Gigliotti, the vast majority of development in Lyme is outside the area that would be affected by rising sea levels, and as such, there are no existing infrastructure plans or zoning changes. “There are a handful of residences and a small water-dependent commercial area (marinas) that could be affected. Future development in those areas and renovation of existing structures is controlled under the FEMA requirements for floodplain development contained in our zoning regulations,” Gigliotti writes.

Old Lyme

As with many municipalities across the state, Old Lyme is struggling with other important costs, and a state budget that seeks to transfer more liabilities to the municipal level, at the same time as cutting state aid to towns. According to Bonnie Reemsnyder, Old Lyme’s first selectwoman, the list of items from the town’s 2014 natural hazards-mitigation plan has had to take a back seat to more pressing concerns like bridge and dam repairs, given fiscal constraints.

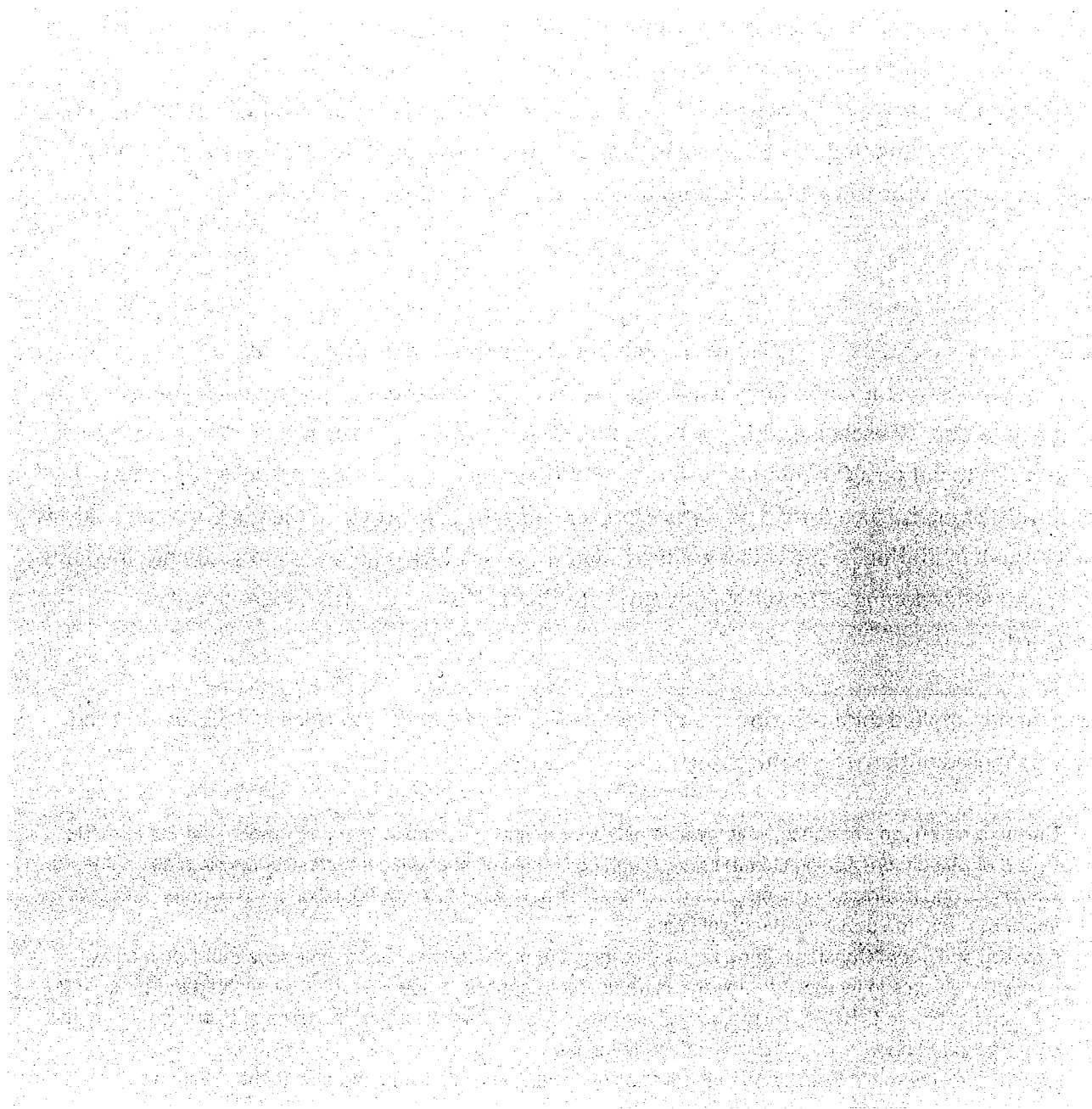
While it has not yet been implemented or initiated, the town is exploring what zoning changes would be required to allow homeowners to construct sea walls on their property, and raise their structures. According to Reemsnyder, there isn't the sense of urgency in the town that would be needed to make swift changes. "I think there's a complacency about it, the further away we get from Storm Sandy," she says. Thus far, the town has not committed any funding to resiliency efforts.

East Lyme

The town has had extensive contact with a number of agencies, and is undertaking several projects aimed at developing the community's resilience to rising sea levels and climate change more broadly. According to Gary Goeschel, East Lyme's planning director, the town has partnered with the Nature Conservancy to put on a Community Resilience Building workshop on April 26 designed to help the community prioritize its efforts. The Nature Conservancy has also provided the town with an analysis of salt-marsh migration, along with a guide to adapting to sea-level rise, a coastal-resilience mapping portal, and is developing a "Lower Niantic River Resilience Vision" for East Lyme as well as Waterford.

The town has applied for a \$50,000 grant from CIRCA. In an email from Goeschel, he lays out the town's proposed initiatives for the grant:

- Create a new flood ordinance, which would establish a Flood Commission, made up of members from the Board of Selectmen, Zoning Commission, Planning Commission and local professionals such as engineers, surveyors and insurance professionals to enforce the new flood-hazard regulations and oversee requests for variances from the those flood regulations.
- Develop and adopt Coastal A-Zone requirements in the proposed new flood ordinance that would allow municipal officials to increase freeboard as needed in response to newer studies by such agencies as NOAA, CT Sea Grant and CIRCA. The project will also identify adequate freeboard requirements and areas in need of increased freeboard in anticipation of sea-level rise.
- Identify projects within East Lyme that advance resiliency, such as living shorelines, the creation of conceptual design and/or construction of structures.
- Update the Geographic Information System (GIS) mapping to incorporate Coastal A-Zones, municipal wastewater infrastructure, CIRCA site suitability for living shorelines data, CIRCA combined impact river flooding and storm-surge data, and CIRCA current and future climate inland flooding data.



Purple areas show six feet of sea-level rise.

Map source: State Department of Energy and Environmental protection (ctecoapp1.uconn.edu/ctcoastal hazards)

Waterford

Even before Irene and Sandy hit the East Coast, Waterford Planning Director Abby Piersall says the town had been taking steps to safeguard residents from rising sea levels. “The town has been more proactive and forward-looking on this issue, looking at the most responsible ways to address this problem head on and not pretend it is not going to happen,” Piersall says.

Not only has the town worked with the Nature Conservancy to conduct a salt marsh-advancement study, but Waterford also partnered with the organization and Clark University in Massachusetts to analyze residents' perceptions of sea-level rise, climate change and their willingness to pay for adaptation measures, Piersall says.

Last year, Waterford received a \$5,800 grant from CIRCA to conduct a vulnerability assessment of its sewer-pump stations that are located in the floodplain. Piersall says this gave the town a base budget for any upgrades or improvement measures needed.

"We are using that information as one small component in a bigger study we are doing now. That one is funded by the CDBG Disaster Relief funds from Sandy and it is about a \$175,000 project," Piersall says. Through this, Piersall says the town has hired a consultant to complete sea-level rise and river-flooding models to identify any risks. "The idea here is that we would be identifying our vulnerable areas to a greater degree and also trying to add in the riverine component so we have a better sense of where our inland issues are," Piersall says.

While Waterford has not adopted a specific coastal-resilience plan, the town has updated its floodplain regulations. The town has not applied to FEMA's National Flood Insurance Program Community Rating System.

Montville

Due to topography, the town has minimal infrastructure and very limited residential development which could be affected by sea level, says Town Planner Marcia Vlaun. Even so, Montville, which lies on the western bank of the Thames River, has adopted all necessary flood-hazard regulations and is in full compliance with FEMA's National Flood Insurance Program, according to Vlaun. Flooding occurs primarily from interior streams and brooks. Infrastructure is being gradually constructed, including the replacement of old, undersized culverts, to address those issues. The town has also been working with the Southeastern Connecticut Council of Governments to update its hazard-mitigation plan, which should be in place this spring.

Norwich

Three rivers — the Yantic, the Shetucket and the Quinebaug — flow into the city's harbor. From there, the Thames River courses south to Long Island Sound. With a great deal of river shoreline, officials "are in the process of evaluating the impact of coastal flooding and will be developing an action plan that addresses the immediate needs for the most severely impacted facilities," says Kenneth Scandariato, the fire chief and emergency management director. Scandariato says the city is looking

at potential economic and environmental impacts, examining, in particular areas, where there are hazardous materials and marina facilities. "It's going to take some time for us to do a complete analysis, but there is a team being assembled, and we're looking at this from a global perspective as well as a local focus with the stakeholders involved," he says.

New London

Though the city does not have a specific plan for coastal management, it does address some flooding and water-management issues with its hazard-mitigation plan, according to City Planner Sybil Tetteh.

Over the past year, the city has partnered with CIRCA, the Nature Conservancy and participated in the 2016 Planning for Historic/Cultural Resources Coastal Resiliency conference, in conjunction with the state Department of Economic and Community Development and the Connecticut Historic Preservation Office. "We don't have a lot of (financial) resources," says Tetteh, adding that the lack of funding prohibits feasibility studies, let alone implementing solutions.

New London has a drainage problem, she says. "When it rains, flooding is expected," says Tetteh, adding that the city's "ecological layout" is a plus, reducing its exposure to sea level "surges."

Future plans are needed to address structures in low-lying areas, such as the city's transportation hub, the main headquarters for the fire department, and Amtrak's rail line, Tetteh says.

New London is part of the Southeastern Connecticut Council on Governments, a public agency that expects to adopt a Regional Plan of Conservation and Development in May. If any money becomes available, New London will accept all financial resources to further resilience efforts, says Tetteh, adding that the city needs to focus on stormwater infrastructure, possible funding for levies or retaining walls, and a cove-restoration project.

Ledyard

A portion of the town, including the village of Gales Ferry, is along the eastern shore of the Thames River. But much of the residential infrastructure that lines the coast is elevated above railroad tracks, says Mayor Michael Finkelstein, who adds there are little to no plans for any building projects along the coast beyond existing structures. Working with the Nature Conservancy, the town is in the process of creating a Southeastern Connecticut Regional Resilience Vision and Guidebook. One focus of the document, which is in its final draft stage, is a look at the threat of storm surge to infrastructure, Finkelstein says.

Groton

The town's Plan of Conservation and Development addresses vulnerable areas and strategies to address sea-level rise, and officials are in the process of updating the hazard-mitigation plan, according to Planning Director Jonathan Reiner. Groton is working with the Nature Conservancy on a mapping tool to identify at-risk areas along the coast, and with the University of Connecticut on a climate-change project to gain a better understanding of increased precipitation rates and their impacts, Reiner says. The Department of Public Works has identified some of its infrastructure that is susceptible to flooding, and is taking steps to address the sites.

Stonington

The town is creating a coastal-resiliency plan, which is expected to be completed by the end of September, according to Town Planner Keith Byrnes. The plan is funded through a \$150,000 grant from the Community Development Block Grant Program. "Planning is especially important in Stonington due to our historic villages, which are directly in the floodplain and subject to sea-level rise," Byrnes says. Stonington was dropped from FEMA's National Flood Insurance Program Community Rating System in the past couple of years, but is hopeful it can rejoin the program later this year, Byrnes says.

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