

# *Committee Meeting*

of

## SENATE BUDGET AND APPROPRIATIONS COMMITTEE

*"The Committee will hear testimony from invited witnesses on issues surrounding coastal planning and rebuilding in the aftermath of Hurricane Sandy"*

**LOCATION:** Toms River Municipal Complex  
33 Washington Street  
Toms River, New Jersey

**DATE:** 10:00 a.m.  
February 11, 2013

### **MEMBERS OF COMMITTEE PRESENT:**

Senator Paul A. Sarlo, Chair  
Senator Linda R. Greenstein  
Senator M. Teresa Ruiz  
Senator Bob Smith  
Senator Jennifer Beck  
Senator Anthony R. Bucco  
Senator Kevin J. O'Toole  
Senator Samuel D. Thompson



### **ALSO PRESENT:**

Catherine Z. Brennan  
*Office of Legislative Services*  
*Committee Aide*

George J. LeBlanc  
*Senate Majority*  
*Committee Aide*

Christopher Emigholz  
*Senate Republican*  
*Committee Aide*

***Meeting Recorded and Transcribed by***  
The Office of Legislative Services, Public Information Office,  
Hearing Unit, State House Annex, PO 068, Trenton, New Jersey

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**SENATOR PAUL A. SARLO (Chair):** Good morning, everybody. Welcome to the February 11 Senate Budget and Appropriations Committee meeting, being held in Toms River, New Jersey, at the Municipal Complex.

May we have a roll call, please?

**MS. BRENNAN (Committee Aide):** Senator Beck.

**SENATOR BECK:** Here.

**MS. BRENNAN:** Senator Thompson.

**SENATOR THOMPSON:** Here.

**MS. BRENNAN:** Senator O'Toole.

**SENATOR O'TOOLE:** Here.

**MS. BRENNAN:** Senator Bucco.

**SENATOR BUCCO:** Here.

**MS. BRENNAN:** Senator Sarlo.

**SENATOR SARLO:** Here.

**MS. BRENNAN:** Senator Greenstein.

**SENATOR GREENSTEIN:** Here.

**MS. BRENNAN:** Senator Ruiz.

**SENATOR RUIZ:** Here.

**MS. BRENNAN:** Senator Smith.

**SENATOR SMITH:** Here.

**MS. BRENNAN:** You have eight members present.

**SENATOR SARLO:** Thank you.

Let me just begin by thanking the members of the Committee and our staffs for all the work they've put in, in organizing this hearing and all the hearings that we've done outside of Trenton. This is the second time

that we are here in Toms River. Our first legislative hearing on the hurricane and the response to it -- our first one was here in Toms River, and it's amazing the progress that we've made here in Toms River and in other coastal communities, as well as other communities around the state. But we all know there's a long way to go.

I'm proud of how we've conducted ourselves in these hearings. We've done this on a very bipartisan basis. We recognize that the Executive Branch has taken the lead on this rebuild effort, but it's important that the Legislative Branch-- We play an important role, especially when it comes to certain aspects of funding and legislation. So as a coequal branch of government we want to make sure that we are prepared when needed to act.

I'm a little disappointed; I'm just going to mention it. I mean, a few of our key cabinet members who have been great with us -- Commissioner of DEP, Bob Martin, and the DCA Commissioner, Richard Constable -- were supposed to be with us, but due to a conflict they had to cancel. I understand that; I respect their decision. I'm not sure if they were told to cancel or not, but, regardless, we want an opportunity to meet with them. I don't want to take away from the importance of what our role here is -- working and supporting the Executive Branch and the Governor on rebuilding New Jersey and rebuilding our coastline.

So with that being said, I thank the members.

I want to turn it over to them, to let them open up and share a few words -- our great Mayor here in Toms River, Tom Kelaher. Mr. Kelaher, you may have a seat -- please have a seat.

**MAYOR THOMAS F. KELAHER:** (off mike) I just want to take a couple of minutes, and I can do it from standing right here.

**SENATOR SARLO:** Whatever it is-- This is your Borough Hall; you can do whatever you want. You can stand on the table. (laughter)

**UNIDENTIFIED MEMBER OF AUDIENCE:** (Indiscernible) microphones. This is where the mikes are.

**MAYOR KELAHER:** All right, all right, okay.

I just really want to take this opportunity to welcome all of you here, and to thank you for coming and discussing the budget and to get firsthand information about the local problems that we have here. As you all know, you don't need me to tell you we took a tremendous hit in this Hurricane Sandy and we've got at least 10,000 homes that are impacted -- either on the barrier island or in the low-lying areas along here -- that are either flooded or knocked over or destroyed. And nobody in those areas escaped any damage.

As far as the budget is concerned, that's going to be a real crisis for us, going forward. We were already estimating that we're going to see a loss of 20 to 25 percent of our tax ratable base without any diminution in our expenses. You know, Toms River school system has 18 schools in the system. We're not going to see any reduction in our police or our public works efforts. So it's going to be a real challenge and I just ask that -- any help that you can give us would be greatly appreciated.

**SENATOR SARLO:** Mayor, you just raised, actually, a very good point that we all kind of take for granted. If Toms River was to lose 25 percent of your tax base, of course it impacts your municipal budget. But we all forget 66 percent of your tax bill is your schools, which will have

a major-- That loss of ratable will have a major impact on your school budget. How many children--

MAYOR KELAHER: Seventeen thousand.

SENATOR SARLO: Seventeen thousand children in Toms River.

MAYOR KELAHER: Three high schools, three intermediate schools, and the balance of the 18 schools are elementary.

SENATOR SARLO: That is-- We all take for granted-- We all know it's getting back to the municipal budget, because we all deal with the mayors. We don't really, sometimes, deal with the school boards. We deal with the mayors and we hear from you. But it is going to have a major impact.

How many folks do you believe in Toms River are still out of their homes, roughly?

MAYOR KELAHER: Well, it's a hard figure, but just let me say this. We were just able, a week ago today, to do what we call *repopulate* two-thirds of Ortley Beach. And that's because we could certify to the State OEM that all four utilities were in place. There a couple thousand residences and homes in that area that were impacted. And I think our police Chief did a survey the other day and there are only 100 people back in there. Because even though we said you could repopulate and utilities are available, people's homes are still trashed, their furniture was destroyed, their appliances were destroyed. So even though we said, "Yes, you're welcome to move back in," that varies and depends on everybody else.

The northern beaches -- you know, the main beaches that you would recognize, Chadwick Beach, and Normandy Beach, and Monterrey

Beach, and all of them -- we were able to repopulate that area about two or three weeks ago. It all runs together in my head. And there are 4,000 homes up there, and our Chief went over that first morning and could only count 30 people who were back in because-- And I've been back and forth, up and down these streets and it's just pathetic. Everything everybody owned was out at the curb. And we had to pick up all of that trash. And the rebuilding and the reoccupation are going to depend on whether the people had insurance, whether they have any money. I just talked to a lady at church about a week ago; she lived in Green Island, a low-lying area of our Silverton section. The bay came right through her house -- a single, one-story on a slab. The lady is in her 70s, no insurance because she couldn't afford it. Her car was totaled. Everything she owned in the house wound up at the curb. She has no money to fix the house, and she said, "Even if I could fix the house, I have to buy all new furniture, all new appliances." Her daughter lives out-of-state, and the daughter said, "Mom, come down and live with us." And I said, "What about your house?" She said, "I'm just going to leave it there. There is nothing else I can do about it." And I am afraid that that's the scenario that we're going to see repeated. I don't like to see it, but I think even the *Star-Ledger* had a front page story this morning about people just putting their homes up for sale and leaving. So it's a challenge.

You know, in the beginning we used a race term like we were in a sprint to try to get things done. Now I think we're in a long-range, cross-country marathon. It's not going to go away for a while. It's going to take a while. It's going to be a real problem.



SENATOR SARLO: And I will say this, and I mean this sincerely, to the members of the Committee. I actually have been very involved with Toms River, and I actually, for full disclosure-- Because I have a house on the barrier island in Toms River. And in Toms River there are 16 private beach associations, actually. And what's quite amazing is every one of them has their own little political structure and organization. And I really have to credit the Mayor, his Borough Attorney who we're going to hear from shortly, his Borough engineer; his Police Chief, Michael Mastronardy. Although maybe not everybody in these private beach associations agree with everything they're trying to attempt, whether it's the dune protection, of course, number one; and then dealing with these complicated flood maps and these articles in every paper, "New maps complicate flood victims' plans--" A lot of things are Federal or State regulations. I really-- Mayor and your staff, you've done an amazing job of being responsive and answering the best you can. They may not all agree with you, but at least you opened the doors--

MAYOR KELAHER: That's part of the problem -- you don't know all the answers.

SENATOR SARLO: Well, at least you've opened the doors and allowed them to come here and begin the process of talking about it. So I really can't commend yourself and all of your staff enough for what you've done to try to help. There are a lot of answers that are still out there; it's very complicated.

MAYOR KELAHER: Yes.

SENATOR SARLO: But one thing you have done, you've opened your doors. You've allowed all of these little political structures to

come in and meet with you, agree to disagree. But at least the dialogue is ongoing.

MAYOR KELAHER: True; we're trying.

SENATOR SARLO: So I commend you for that, Mayor.

MAYOR KELAHER: Senator, thank you; and welcome once again, everybody. Thank you.

SENATOR SARLO: The first person we're going to hear testimony from is Kenneth Fitzsimmons, Special Attorney to Toms River -- Borough Attorney to Toms River. And his focus is going to be to talk about dunes, reconstruction of dunes; before people build their homes, what the Township is doing, interaction with the Army Corps of Engineers, and the like.

Please have a seat, Mr. Fitzsimmons.

**K E N N E T H   B .   F I T Z S I M M O N S ,   E S Q .:** Good morning, ladies and gentlemen.

SENATOR SARLO: We'll leave it up to you, sir, to say a few words -- what you've been up to and what kind of help or guidance you may need from us, and we'll go from there.

MR. FITZSIMMONS: Due to reconstruction, the Township owns approximately one-half of the beaches on the Atlantic Ocean. We implemented emergency contracts to restore the dunes in front of the Township-owned property. That contract was approximately \$2 million. During the time we were restoring our beaches we had contact from many of the private associations and they asked if we would construct the dunes in front of their property. If we did, we could only do so with FEMA reimbursement. The FEMA reimbursement percentage is 75 percent for

that project. To undertake that contract it would be about a \$2.5 million commitment, and although FEMA indicates that it will reimburse, there is no promise it will reimburse. So it's a large undertaking.

The only way we could justify expending public funds on private beaches was to obtain a perpetual public access easement. It was my opinion as Township Attorney that that would justify our expenditure if we had the right to go under those beaches and create dunes according to the FEMA regulations. FEMA would reimburse only for the height of the dune and the width of the dune that was in place prior to October 28.

I prepared an easement and we put it out on our website. It was a very generic easement, simply giving perpetual public access to maintain the dune system. We sent that document to each of the private associations; I believe there are 16, and there are about 30 private property owners -- individuals. That document was sent to them with a cover letter on two occasions -- one by regular mail, the second by certified mail -- because some people claimed they didn't receive the original mailing. We also published that on our website.

One property owner, a condominium association, came in immediately and said, "We'll sign the document." They did, in fact, sign it and returned it to us. Many others had questions. But there was a general reluctance to give up a private property right. New Jersey is very focused on private property. You know the number of municipalities we have. We're very subject to local regulations. We met with a number of people. Several attorneys I met with who represented, collectively, six homeowners associations wanted some changes. We discussed the changes and we indicated that perhaps they would commit that to writing and give that

back to us. In the interim we had contact from representatives of the NJDEP and they tried to persuade us, and did successfully persuade us, that the better approach would be to use their document which had been approved by the Army Corps of Engineers. That made a lot of sense, because what they were saying is if you want to have a short-term fix by the Township, you can do so. But in the long term we all agree it would be an Army Corps of Engineer project that would solve the problem. So we converted to sending out the Army Corps/DEP document. There was a lot of resistance to that. That's an 8- or 9-page document. People wanted to negotiate the terms. One of the things that we found better about using that document is if the NJDEP was saying "this is the document," then we can say, "There are no negotiations. This is the document you have to sign. It's been approved at the State level and it's been approved at the Federal level. It just makes sense to go forward and use this document." But to date I only have one signed easement in place -- with a tremendous amount of dialogue.

SENATOR SARLO: Mr. Fitzsimmons, we've had some discussions. I have spoken with him previously about this. And just for the Committee's sake, many of the private beach associations that we spoke about earlier have funded the temporary fixes. They put their dunes back to their original conditions. Many of them have CAFRA permits; they've put it back to their CAFRA permits. That doesn't necessarily mean that they are Army Corps of Engineered dunes, correct?

MR. FITZSIMMONS: That's correct.

SENATOR SARLO: But many of them have put back what they had originally. They've paid for it privately with their own private

dollars. So really the next-- If they've done that, they've put themselves back, or even better than they were previously. The next big movement will be with the Army Corps of Engineers and the Federal dollars that are looming. Toms River -- no municipality -- Brick Township, nobody can move forward. The Army Corps won't move forward, I think, until they have easements -- agreements with every one of these private beach associations and every municipality. Are we correct in saying that?

MR. FITZSIMMONS: You're absolutely correct.

We have no objection to the associations going forward and doing the dune restoration themselves. We simply agreed that we would spend public money and apply for reimbursement if they would cooperate with us. I commend the associations that did that because if you look at the last storm over the weekend, the dune system did protect. Where there were gaps in private properties, there was a breach.

SENATOR SARLO: And I think many of them have done it themselves and they've footed the bills themselves. But the big question is the next step: How do we widen our beaches and protect our communities from the next surge? Not the nor'easter that we just got this winter, but the next major surge. We're going to hear, probably, from some experts here today who are going to tell us that it could happen next year, for all we know.

MR. FITZSIMMONS: I don't know that any municipality is capable of achieving the next step -- by getting the easements. Mantoloking Borough has worked very hard. Their mayor has personally contacted people. And his degree of success, it is my understanding, is about 50 percent. And 50 percent won't do it.

I envision there's going to have to be some State legislation that is going to require the dunes to be built, or require at least oceanfront property owners to give an easement. And I know they'll be a compensation issue, but perhaps if it's done on a public safety basis the compensation issue can be avoided.

You're all familiar with the Long Beach Township case. There was a lawsuit down there that resulted in a \$350,000 reward against the Township. And Long Beach Township and Toms River and every other community just can't afford to pay a tremendous amount of money to get an easement to protect the property that's giving the easement. It's upside down. It doesn't make sense.

SENATOR SARLO: Senator Smith, our Chairman of our Environment Committee.

SENATOR SMITH: A couple of questions for you. And I think you alluded to it, but I just want to make sure I understand. Are you suggesting, when you said State legislation, that there should be the tool in the toolbox to allow for condemnation of these easements, either by State government or local government?

MR. FITZSIMMONS: No, I think the condemnation tool is there now. It's simply not an affordable option for municipalities.

SENATOR SMITH: Okay. And it's not affordable because of the Karan case -- the one that you referred to, the \$350,000 award?

MR. FITZSIMMONS: Correct.

SENATOR SMITH: All right. If that case is allowed to stand in its current form, would that pretty much end the ability of the State of New Jersey to build dunes in this state?

MR. FITZSIMMONS: I don't know. I would have to read that decision after it's decided by the Supreme Court. But if it comes down in the same fashion as the Appellate Division, yes, it probably would totally impede your ability to--

SENATOR SMITH: Right. Any property owner who had a "view" would be a fool to say, "Yes, we're going to waive any compensation." Why not get their windfall and ask for compensation for the loss of their view. And, as a result, if any of these property owners -- or series of property owners -- ask for compensation for the view, the cost would be beyond the pale.

MR. FITZSIMMONS: Pragmatically, that's correct.

SENATOR SMITH: Okay. A related question: You mentioned money, money, money in various parts of your testimony. Do municipalities that have been adversely impacted by Hurricane Sandy need some type of cap relief for Sandy-related expenses?

MR. FITZSIMMONS: Yes. There is no way that any municipality that borders the Atlantic Ocean can afford or sustain the damage that was inflicted without some relief.

SENATOR SMITH: Okay. Then lastly, in Toms River what has your municipality decided with regards to the planning and the zoning issues related to rebuilding? But specifically, we now have these advisory base flood elevations from FEMA which may require homes to be built zero to 12 feet higher than they are now. They have to be raised up. If a homeowner in Toms River wishes to do that, and they had a two-story home, you have a certain building height permitted under your zoning.

Can they automatically rebuild, or do they have to go to the planning or zoning board for a bulk variance or use variance?

MR. FITZSIMMONS: As we speak, they cannot automatically build. However, we are drafting an ordinance -- and we expect that to be offered at our February 26 meeting and implemented on March 12 -- that will allow the property owner to increase over the 35-foot height limitation for the old regulation versus the new advisory regulations. So if the differential is 4 feet, then they can go 35 feet plus 4.

SENATOR SMITH: Will they be required to go to a planning or zoning board even though that's now--

MR. FITZSIMMONS: That would avoid the planning or zoning board appearance.

SENATOR SMITH: It would be an automatic.

MR. FITZSIMMONS: We also have a policy saying that you can rebuild what you had before -- one story, two story, three story -- exactly in place, even though you might have encroachments into the required side yard setback or front yard setback area. We're not requiring the homeowner to return for a variance to do that.

SENATOR SMITH: Or lot coverage?

MR. FITZSIMMONS: Or lot coverage, as long as you're not increasing the size of the home.

SENATOR SMITH: Right. Now it seems to me that Toms River is doing all it can to assist homeowners in getting the rebuild underway. Should the State of New Jersey consider having uniform legislation so that every town is as progressive as you are? In other words, saying that any rebuild that meets FEMA is an automatic? If there's a lot



or a bulk variance, it's an automatic? And you don't have to go to a planning or zoning board to get the approval. You think that would be helpful?

MR. FITZSIMMONS: I think there's always a benefit to uniformity like that. We can do it on our own; I know Manasquan recently enacted an ordinance to do essentially that. A lot of the communities are addressing it.

SENATOR SMITH: Great. Thank you.

SENATOR SARLO: Senator Smith, you raise a good question. It's more about money than view. It's more about money than view these days. Maybe for some of the private establishments along the beachfronts, I think it's about view. But from the money perspective, these private beach associations -- I believe their concern would be they have to maintain, secure them, provide lifeguard services, provide liability insurance on a seasonal basis. If they sign the easement then it generates who can come on, who cannot come on, the public access, and who's paying for it. I think that sort-- Is that sort of the big issue? It's not so much the view, it's about they're privately paying this out of their own pocket and if they sign the easement-- They're not in the business of -- as much as they maybe would like to be -- they're paying out of their pocket for the maintenance, security, safety, insurance, and the like. But once they sign the long-term easement with the Army Corps of Engineers-- Forget the temporary fix for a minute; a lot of that's happening. But the long-term Army Corps of Engineers easement, what does that do to charging access and the like?

MR. FITZSIMMONS: That is a concern that is often voiced. But our response to that is we are not trying to interfere with your

collection of beach badge fees, so that you can maintain all those services that you just mentioned to have a safe and healthy beach.

SENATOR SARLO: But legally it's not---

MR. FITZSIMMONS: Legally they would have to make available beach badges at a competitive rate to the public. They can't have it both ways. As a practical matter, at least in Toms River, access to the beach is really regulated by parking. And all of the communities on the barrier island have little or no public parking facilities. So then we don't envision a substantial increase in people coming to the beach because now you have "public access." In fact, virtually all of those associations sell badges to the public. They did last year and they'll continue this year. And that's a regulation; that's a condition of a CAFRA permit -- to make those badges available.

SENATOR SARLO: Yes.

MR. FITZSIMMONS: To make those badges available. And that's a good thing for CAFRA to insist on.

SENATOR SARLO: Any private beach association that has a CAFRA permit in place must make available a daily badge which is equal to -- some of them are expensive because people shell out a lot of money -- but must be equal to what the homeowner pays for the services for that private beach. So anybody that has a CAFRA permit is way ahead of the curve.

MR. FITZSIMMONS: Correct.

SENATOR SARLO: Senator Beck, then Senator Thompson. I'm sorry, you don't have anything?

SENATOR BECK: No.

SENATOR SARLO: Okay, I thought you did. I'm sorry.

Senator Thompson, from Middlesex.

SENATOR THOMPSON: The requirement for access -- I believe that's a Federal requirement. Is there also a State requirement -- both of them have it in order to expend public funds?

MR. FITZSIMMONS: It's a Federal requirement to have the Army Corps participate in the project, Senator. When the CAFRA permits are issued, DEP wants public access. We also need public access because I cannot give my Township an opinion that it's proper to spend public funds on a privately owned piece of property unless there's some public interest in that property. And the perpetual easement would create that interest that, in my opinion, would allow the expenditure of funds to assist these groups in replacing the dunes.

SENATOR THOMPSON: Well, you see, the thing about it is when you say a public interest in that property, when we talk about the dunes we're not necessarily just talking about that property. That property might be right on the beach, but we're also concerned about the property behind that one and so on, because the flooding goes on back. We're trying to-- Thus people who live on the streets behind that are complaining because the people in front of them won't give permission, so we get flooded and we get wiped out, and etc. So if you're building the dunes, you're not just protecting that property but you're protecting all the properties behind it. And that's a public interest.

MR. FITZSIMMONS: You're protecting the entire barrier island.

SENATOR THOMPSON: So there's a public interest there. You're not just protecting one -- doing something for that homeowner,

you're doing something for all the homes behind it, which is a public interest. So I could see using that as a justification for saying, yes, the public interest is served even though we're taking care of that person. I agree with the Chair that I think that the primary objection today is more so related to the public access portion than the obstruction of view -- after what's happened here. I think we ought to take a look to see if there is something we can do in modifying that section to prevent more utilization of public funds in some of these instances. I mean, we talk about associations; it's one thing if you've got a commercial thing that has a beach out there, but if somebody has a private home there, you're talking about their yard. And I don't know how many people would like people just wandering willy nilly through their yard and I can see why they object to it. But I think that's something we should look at and make some modification on those rulings.

SENATOR SARLO: I was just talking to our staff here, and one of the issues, if the Legislature and the Governor were to act on legislation requiring municipalities and beach associations to sign in order for the Army Corps of Engineers to act -- there are constitutional issues associated with that, because it is the taking of one's land. And they need to be compensated accordingly. Even though it's a temporary easement, there are some constitutional issues associated with that. Am I correct in that?

MR. FITZSIMMONS: You are correct. There is a case pending before our Supreme Court and the 3rd District Federal Court. We're hoping after Sandy some of those philosophies may shift, but there's no guarantee.

SENATOR THOMPSON: Now, of course when we talk about this taking, I think we do have the ability to take for the public good already. But based upon the amount of money they set for that one property that's in the courts right now, if we have to pay for all that -- my God, what the cost would be -- just out of sight.

SENATOR SARLO: Last question: From Toms Rivers' perspective, what do you think is more of a pressing issue? It appears-- Are the flood elevation maps more pressing than the getting easements on these dunes with the Army Corps? What do you think is more pressing, or are they about equal right now as you focus on the rebuilding?

MR. FITZSIMMONS: I think your statement that they're about equal is correct.

SENATOR SARLO: Well, Mr. Fitzsimmons, thank you. Thank you for the work that you do. Oh, I'm sorry, Senator Greenstein. I apologize.

SENATOR GREENSTEIN: Hi. I just wanted to ask this. You've somewhat answered it, but in terms of your understanding of the FEMA rules, what would it take for them to work with you on the dunes? What are they looking for to reimburse?

MR. FITZSIMMONS: They are simply looking for us to give proof that we have reconstructed the dune; it's in the same place, the same height, and the width. And then they'll go for the 75 percent reimbursement. They actually have not been very difficult to work with on that issue.

SENATOR GREENSTEIN: Okay. I just wanted to make sure that was not the barrier, in a sense.

Okay, thank you.

SENATOR SARLO: Mr. Fitzsimmons, as you go through this process working with the Township officials here, if there is anything you think, legislatively, that needs to be done that we should be working with the Administration on, please feel free to reach out to me or any member of this Committee. As you go through this process, if there's something that's glaring that could be changed and it could be done legislatively -- please, please let us know.

MR. FITZSIMMONS: We will take advantage of that offer, sir.

SENATOR SARLO: Thank you, sir.

MR. FITZSIMMONS: Thank you.

SENATOR SARLO: Lieutenant Colonel John Becking and Keith Watson, United States Army Corps of Engineers. You are the fine gentlemen with this big document that everybody's--

Good morning. Thank you for responding.

**LIEUTENANT COLONEL JOHN C. BECKING:**  
No worries.

If I could start with an opening statement, then I'll be happy to answer your questions as best I'm able. But I do want to thank you, ladies and gentlemen, for giving us a chance to come here and speak to you about what the U.S. Army Corps of Engineers has done through response and recovery efforts for Hurricane Sandy.

We're currently positioned to continue helping the State of New Jersey and the region maintain the extraordinary and heroic efforts to recover from that terrible storm.

The response to the storm was truly a joint effort from the start, as you know. Our President, your Governor, my Commander -- leadership at the highest levels set an example of cooperation, decisiveness, and urgency that inspired us all, down to those operating the bulldozers, pumps, and generators -- the boots on the ground, as we call it in the military.

The Army Corps of Philadelphia District responded in many ways to the storm -- some of them even before the storm had passed, really -- such as mobilizing hundreds of generators in the earliest hours. All told, the Philadelphia District of the U.S. Army Corps of Engineers executed 27 task orders from the Federal Emergency Management Administration -- FEMA -- for a total of \$63 million.

Two further examples that illustrate how cooperation and hard work paid off are the breach of Mantoloking and the flooding at the Passaic Valley Sewage Commission's treatment plant in Newark. Looking at Mantoloking, it was really, literally, cut in half by the storm surge. Summoned to the scene by FEMA, engineers from the Philadelphia District assessed the damage, developed a plan to fill the breach, and had a contractor onsite and working three days later. Through the efforts and cooperation of the New Jersey Department of Transportation the job was made a great deal easier. When the Army Corps of Engineers arrived, your heavy machine operators from New Jersey were already onsite pushing sand into the breach, cutting the inlet off at the ocean side so that we could fill the beach behind it and build a new beach on top of their work.

Failure was not an option at the sewage treatment plant in Newark. Sandy pushed a wall of water up Newark Bay and inundated that

very sprawling plant in over 4 feet of water. So when you add it up that's 152 acres that were completely underwater. But more significantly, the tunnels beneath the plant -- and some of those could be even as long as a mile -- that hold the pumps, and the pipes, and electrical equipment that support the operation above ground that you see were flooded as well.

The plant had to be dewatered, the pumps dried, and the centrifuge systems repaired. Again, the mission was accomplished through collaboration and cooperation at every level of government: the Army Corps of Engineers, the State Department of Environmental Protection, and actually the PVSC itself.

Looking ahead we anticipate more of that kind of cooperation as we tackle more and more permanent solutions to some of the problems New Jersey now faces. Coastal protection is very high on that list. We've heard positive feedback from countless owners, business owners, and elected officials throughout New Jersey. Without the previously constructed projects the damages would have been much worse in many communities.

Our formal partnership with the State of New Jersey, and specifically the New Jersey Department of Environmental Protection, dates back to the late 1980s and makes these projects possible. We started with Cape May and Ocean City, but the program has evolved and grown over the years. The Army Corps of Engineers has built dune and berm systems that are approximately 50 of the 98 miles of developed coastline in New Jersey. These projects not only provide a level of risk reduction but enhanced natural coastal eco systems such as our project in Lower Cape May Meadows.



Additional stretches of the coastline have congressionally authorized projects but have not yet been built. These coastal storm damage protection projects also help to mitigate damage to homes, businesses, infrastructures, and various utilities. These projects are designed to be effective during storms of varying intensities and durations, but during a massive storm like Sandy the difference between areas with the project and without a project is very apparent.

Soon after the storm passed and conditions allowed a safe access, teams were dispatched to survey all our projects and assess the sand loss. From there we began working through the process to be able to repair the projects and bring them back to their pre-storm conditions. The recently enacted Supplemental Appropriations Act also included funds for projects to be restored back to their authorized design profiles. This is all done under our Flood Control and Coastal Emergencies Program -- you might have heard that called FCCE. We compile reports on each project, and quantify the daily damages and sand losses.

Our teams worked quickly to complete the reports and our higher headquarters approved six of them in New Jersey. Those are Long Beach Island, Brigantine Island, Absecon Island, Ocean City, Seven Mile Island, and Cape May. We're already dredging and pumping sand at Seven Mile Island and Brigantine, and we'll soon begin in Ocean City. We have also begun engineering design efforts for the other projects. Once designs are complete the contracting process will begin.

While this program enables us to restore existing projects, there is work to be done along other stretches of the coastline without a constricted dune and berm. This will take a cooperative effort between

Federal, State, and local governments and community residents. Our efforts will be to prioritize repairs to existing projects on the beaches of New Jersey. We recognize stretches of the coastline are vulnerable given the extent of the erosion to many of our projects. Moving forward, we will continue to work closely with our partner, the New Jersey DEP, to repair, renourish, and build projects to help protect the communities and the shore.

SENATOR SARLO: Where does the Army Corps of Engineers stand today with plans from the Point Pleasant area down to the Barnegat Inlet, along the northern barrier island? Where does the Army Corps of Engineers stand with the actual engineering plans? Are they prepared, are they ready to go? Just kind of give us a snapshot of what is the status.

COLONEL BECKING: Most of the area that you're describing now is what we would call in the-- It's been authorized by Congress but the project has not yet been constructed. And so some of that engineering work has been done and some of that still remains to be completed before the project can go to construction. So there isn't what we would call an active project, in that it has been authorized by Congress, but, again, to date no actual pumping of sand or putting sand on the beach has occurred -- if that answers your question.

SENATOR SARLO: And of course it would need to be facilitated by the signing of easements as well, correct?

COLONEL BECKING: There are, throughout New Jersey, various places where real estate easements are an issue before construction of authorized projects could proceed.

SENATOR SARLO: How long would it take for that stretch of the northern barrier island, if everything was to fall into place -- the design is done, easements are signed -- how long would it actually take for the Army Corps of Engineers to facilitate that construction?

COLONEL BECKING: That's a harder question to answer than you would expect.

It would take a while. We will not be able to begin construction until after we receive the funds from Congress. And that won't be, at the very least, until after May 1. We would then have to proceed and do some engineering work; and then assuming that real estate issues were not an issue, and that the agreement that we have to have in place with our partner -- in this case, New Jersey DEP -- is already in place, then we would be able to proceed, as I said, to the contracting process. There could be potentially some issues with the capacity of the industry, and so that may have impacts; because obviously this storm has affected most of the Northeast and so there would be a lot of communities asking the exact same question you just did. And so that would play into it, too.

So I think the answer to your question is a complex one to answer and all those factors have to weigh in.

SENATOR SARLO: But essentially, the Army Corps of Engineers' position is, "We'll fund this; we'll design it; we'll come in and build it. We'll pump the sand, widen the beaches, construct these dunes, engineer dunes," but you are not just about height, but volume, correct? "We'll do all this, but you need to get all your legal -- all your real estate easements and all your agreements in place, otherwise we don't have the mission to come in and start this work." Am I correct in that?

COLONEL BECKING: Yes, I would say we do have the mission. Congress has authorized that project to proceed. However, there are things that must be in place before that construction could begin -- some of which you just pointed out there. So -- yes.

SENATOR SARLO: Realistically, that could take two to three years before all of these-- It could even be longer by the time all of these easements, issues, and access issues, and all the agreements are worked out between all the parties. I mean, have you seen that in other parts of the-- Has the Army Corps of Engineers seen that in other parts of the country?

COLONEL BECKING: There have been-- Yes, there are problems, and we have to be concerned about peoples' property rights and obtaining real estate easements in a lot of our coastal projects -- yes.

SENATOR SARLO: Okay. So you actually-- So some of these municipalities, whether it's Toms River-- What they tried to do -- through the public funding, through FEMA reimbursement -- or what some of these private beach associations we heard-- Sort of a smart move as an interim measure, not sitting around waiting for the Army Corps of Engineers. It was actually to protect them from these storms that were kind of getting -- these nor'easters that we were getting that we just had this weekend. It was a smart move on their part, am I correct? Is that a correct assumption -- to protect themselves temporarily?

COLONEL BECKING: We realize that a lot of the communities are vulnerable. We just-- Immediately after the storm we worked with FEMA to provide some sand to various communities throughout the New Jersey area -- to provide some of that immediate

protection. And we realize that some communities are going to have to take action while they wait for other things to work out.

SENATOR SARLO: What's the status of the dunes on the southern portion -- the southern barrier island, down by Long Beach Island? What is the status there? Is the Army Corps of Engineers work still ongoing? Are there still access issues?

COLONEL BECKING: We have projects down there as well.

Keith can answer that one a little more--

**K E I T H   D.   W A T S O N:** That project has been in construction. We've constructed Harvey Cedars, the Surf City area, and in Long Beach Township what is known as Brant Beach. All those areas have obtained all their easements. And when we were appropriated, the funds were enough to complete the areas that -- the easements were already obtained. There are still issues outstanding. The one case from Harvey Cedars where the town-- I want everyone to know that the Corps doesn't get the easements -- that's the responsibility of the non-Federal sponsor. In this case, that's the New Jersey Department of Environment Protection who, in turn, goes to the township or borough or municipality that the project will end up in. They are actually getting the easements. So the case that was spoken about earlier -- the Karan case -- was actually Harvey Cedars -- the Borough of Harvey Cedars is the entity that's doing the litigation and taking it to the Supreme Court.

But the easements are needed before we can move further. There are areas of Long Beach Township that the mayors have obtained a majority of the easements that we'll be able to work in.

SENATOR SARLO: Senator Smith.

SENATOR SMITH: What is the unappropriated cost for completing your plan for the New Jersey shore? I understand that you have appropriations for some of the towns on LBI or on the coast that you just described. But if you could build what you proposed for the Jersey Shore, what is the cost?

SENATOR SARLO: Are you talking the northern barrier island?

SENATOR SMITH: I'm talking about the Jersey Coast -- the whole thing. What is the whole banana here?

COLONEL BECKING: Sir, if you are considering those projects which Congress has authorized but which previously had not been appropriated -- if that's what I think you're asking, Senator -- our math comes up to about \$280 million -- and that's in 2012 dollars. And that's based off of the amounts that Congress authorized at the time of the authorization, which may have been a little bit older; we've adjusted those up to 2012 dollars.

SENATOR SMITH: Right. Again, so I'm clear on the costs: Congress authorized these new projects before Sandy, correct?

COLONEL BECKING: Yes.

SENATOR SMITH: Okay. Is your plan for the Jersey Shore-- If you could build what you think is necessary to make it safe for property owners and individuals -- what's in effect -- what would be the difference in cost? Because I imagine those plans are going to change after Sandy.

COLONEL BECKING: The amount that Congress authorized is that number that I just gave you -- the \$280 million. So that's the amount they authorized. We're still going through and putting together

the adjustments to those numbers based on any damages that may have occurred as a result of Sandy.

SENATOR SMITH: Correct. Those are only the projects that you knew about pre-Sandy. Would the Army Corps be recommending an expansion of the projects on the Jersey Shore to protect both life and property? Is that in the works?

COLONEL BECKING: I understand your question now. The law that the President has now signed into being is that we have received funding to conduct a study to look at those kinds of things that you're asking -- what other kinds of things need to be done to address flooding and coastal protection.

SENATOR SMITH: All right. So we're not going to know that answer for a while until you get your studies done.

COLONEL BECKING: That study would last probably about two years, is what the legislation says.

SENATOR SMITH: Okay. Colonel, were you involved in Katrina?

COLONEL BECKING: Me personally? No.

SENATOR SMITH: Okay. Was your colleague?

MR. WATSON: No, sir.

SENATOR SMITH: All right. Hopefully you talked to other members of the Army Corps just to try and help us. Within the Army Corps, when you look back on the Katrina experience, what was the best thing that was done for the future to prevent problems? And what was probably the least smart thing that was done as a result of Katrina? We would like to learn from their mistakes and their successes -- if you know.

COLONEL BECKING: Yes, I feel pretty out of place to answer your question. I can say that it was like the situation that we have here with Sandy. There was -- a lot of what was already planned for, in particular the City of New Orleans, was already an authorized project with the U.S. Army Corps of Engineers. And the Administration was able to come forward and, working with Congress, find solutions to fund those and execute those projects. And I think one highlight of the U.S. Army Corps of Engineers is how quickly they actually went to work and actually got those projects into construction and executed them. Some of that construction is still ongoing. I was just there in October and viewed some of it, and there is still construction ongoing there, believe it or not, in response to Katrina in the New Orleans area.

But in the broader sense I think that's, from my viewpoint, the best I could do to answer your question.

SENATOR SMITH: Okay. There are two models that are out there on the public table with regard to the acquisition of lands. I'm not sure one-- One is the Cuomo plan and one is the Christie plan. And I don't know how closely you read your *New York Times*, but as I understand the Cuomo plan, the plan is to put aside a pot of money for the acquisition of shore flood-prone property. That the Cuomo plan would say buy individual homes if you can or buy whole blocks if you can. And for property that's really hazardous flooding areas, even if they weren't hurt by Sandy, to consider purchasing them. And there are incentives. If you're in a really hazardous area there's a 10 percent above the market price; if you can get a whole block together there's a 5 percent incentive to do that. As I understand what Governor Christie has proposed, he's saying he wants to



buy out zones; in other words, if you can get a block of properties where all the property owners agree, let's buy if it's in harm's way.

From the Army Corps' perspective, is either of those proposals better or worse in terms of future protection of life and property?

And by the way, I'm not asking you to criticize; both Governors are trying to deal with a tough issue. But in terms of the science of it, in terms of what's best for protection of property, what's the best way to go?

COLONEL BECKING: I can appreciate that there's -- and I think everyone in my organization appreciates that there's a lot of very difficult question revolving around real estate. And you, ladies and gentlemen, just heard some of that discussed. And so, regardless, I don't think I can offer any advice or a viewpoint on either one of those Governors' plans.

What I can say is that the U.S. Army Corps of Engineers previously has worked, and we have examples, on the New Jersey coast where we have not had real estate easements signed in some areas; and so those were portions of projects that we had to forgo building, but we continued with building the remainder of the project in areas where we did have real estate easements.

SENATOR SMITH: Is that effective?

COLONEL BECKING: It's not as effective as having the entire project complete. You can imagine, if you're built at the end of a wall the water can go around the end of a wall, if you want to think of it in very simple terms. And so if you're the last person at the end of that wall that might be a little difficult for you. But it does present opportunities to provide protection to other people that do have the real estate easements in

place. I think we have examples of where on the New Jersey coast we've worked with communities and tried to make that -- build as much of the projects as we can based on what real estate is available and other things that come into the project.

SENATOR SARLO: I want to turn it over to Senator Greenstein, but quite frankly, I mean, just hearing what you're saying and the timeline, Congress has appropriated this money, there's been a mandate from the Congress and the President, both Governors have done a great job of seeking the money. But let's not kid ourselves. The people who are living in Seaside Heights, Lavallette, Toms River, Brick Township -- all the way up and down the coast -- and borough officials-- Nobody should think this Army Corps of Engineers permit -- this widening and dune reconstruction -- is going to happen overnight. It's going to take years, quite frankly, by the time all the legal wrangling is completed. And whether or not the Legislature and the Governor have the political will to do so-- Let's not kid ourselves, this is not-- The Township officials and residents, we are not going to see Army Corps of Engineers dunes. It's no fault of the Army Corps of Engineers. You have Federal monies and a Federal mandate. It's going to take some strong political will and it's going to take some time to have this accomplished, and it's going to take a couple of years, quite frankly. That's the way I see it.

Senator Greenstein.

SENATOR GREENSTEIN: Thank you, thank you very much.

I have a couple of questions. The concept of the 100-year storm that we've always heard. When people talk about it -- lay people -- they say, "Well, I'm sure that's being reevaluated." Now, I believe that

concept comes from the Army Corps. Is it being looked at again in light of Katrina and Sandy and all the other storms? Is it being reevaluated so that we can plan better for future storms?

COLONEL BECKING: In short, yes. The *100-year storm* is not our term.

SENATOR GREENSTEIN: Oh, it isn't? I thought it was.

COLONEL BECKING: It's a convenient term to talk about, but that's not the term that we would choose.

SENATOR GREENSTEIN: Where does it come from, do you know?

COLONEL BECKING: I don't know. I couldn't tell you.

SENATOR GREENSTEIN: Oh.

COLONEL BECKING: But it's got quite good legs, though, doesn't it? It keeps going.

SENATOR GREENSTEIN: I always thought it was the Corps.

COLONEL BECKING: Sorry, sorry to disappoint you.  
(laughter)

But regardless, yes, I understand your question. And we are considering that. We have-- For years now have had within our models and our thinking the fact that we will have sea level rise, and we've been taking that into consideration. What we are doing now is going back and reexamining whether that level of sea level rise -- the rate of that sea level rise is accurate. And that is, yes, something that we're looking at now.

SENATOR GREENSTEIN: Thank you.

And then, another question: This is very specific, and I don't know if either of you are familiar with it. Sort of a friend of a friend who

owns property in south Ocean City contacted me. And it seems that -- and I'm just trying to use this as a case study to understand your process -- the impression I get is that they've been doing a lot of work in north Ocean City; that there are contracts in place and appropriations, and the Corps is involved. And south Ocean City was trying to figure out how they could get involved. Their local officials are supposedly supportive of it; I've talked to DEP. Say that there is a section of a town that's not getting the dunes, but other parts of the town are. How could this other section of town become part of the process? Is it too late at the moment for an appropriation, or is there a way they can get into the process?

COLONEL BECKING: Ma'am, if I'm thinking of the right area that you're describing, that is part of a project that's already authorized. It just hasn't necessarily been appropriated.

SENATOR GREENSTEIN: Really? That's interesting. Because they don't know that. They weren't aware of that. Maybe I can talk to you further, because it is a very specific issue and I've been trying to get information on it and I haven't been able to. So if it's authorized, that would be good news.

Say it's authorized, what would be the next step to-- Is there anything the town can do to push for an appropriation? Can anyone do anything to make that happen?

COLONEL BECKING: I would say not at that level. I think this supplemental bill that has been passed and signed by the President should ideally address the appropriation. Once we submit our report on March 1 and May 1 to Congress, and we get their feedback and they release

the funds to us, then we would be certain about the appropriation for those projects.

SENATOR GREENSTEIN: Okay.

COLONEL BECKING: In general terms, for the coast of New Jersey, we have only one small portion down in the southern part of New Jersey by Hereford Inlet -- by the Wildwoods, you would call it -- that is still under study. The rest of it is all either projects that we have already begun construction on, or projects that are already authorized by Congress--

SENATOR GREENSTEIN: Okay.

COLONEL BECKING: --and are just awaiting appropriations. So there is only one small portion that does not yet have an authorized project for the State of New Jersey.

SENATOR GREENSTEIN: And that's in the south, you were saying?

COLONEL BECKING: Yes, in what you would call the Wildwoods -- Hereford Inlet is the name we've given the project portion of it.

SENATOR GREENSTEIN: Okay, thank you.

SENATOR SARLO: But in order for these projects to be successful, you have to do-- You can't do it piecemeal in order for these projects to be successful, and for the Army Corps they need to be done in larger sections.

COLONEL BECKING: As I said, yes, sir, we've done sections of projects. And so I guess you're getting into how small is a small section versus a large section.

SENATOR SARLO: Yes, exactly.

COLONEL BECKING: And you could debate that for quite--

SENATOR SARLO: You could debate that for a long time.

Senator Beck, followed by Senator Bucco, then Senator Thompson -- you have a question?

SENATOR BECK: Thank you for your time this morning. It's very helpful for us to hear from you.

I represent Monmouth County -- a good portion of it. And two quick questions; the first is about Ocean Grove -- the Ocean Grove Camp Meeting Association, who you may be familiar with. I know the Army Corps has worked with them on beach replenishment projects in the past -- actually owns the boardwalk, the beach, and 2,000 feet into the water. But they are very interested in starting the beach replenishment and dune rebuilding process because, frankly, the work they had done with you in the past preserved the residences along that Ocean Avenue Drive. So they're anxious to rebuild. Last week FEMA announced that at this moment they are not going to fund the reconstruction of the boardwalk. And obviously we're appealing that. But I am wondering whether or not you can begin working with the Ocean Grove folks on the dune issue and the beach replenishment issue while we're still sorting out the boardwalk piece. Because I think the residents there truly believe that they were spared because of the excellent work that they had done with you in the past. And they are anxious to go back and rebuild whatever needs to be rebuilt. But I was not clear if the boardwalk reconstruction has to be tied in with the work that you would do, in terms of dunes and beach replenishment.

COLONEL BECKING: Ma'am, in full disclosure, that area is technically outside of my District for the Philadelphia District. But

regardless, I am slightly familiar with that area; I've spent a lot of time since Hurricane Sandy up in that part of the state. So I'm not as familiar with that area. However, in general terms, the boardwalks, for example, are not something that we as much concern ourselves with. It is not something that we-- We obviously cannot provide construction support and funding for that. But I'm willing to bet that the New York District of the U.S. Army Corps of Engineers, who is responsible for that area up there, would be happy to have the discussions with local people there about how their projects could proceed and any interactions that there might be between things like a boardwalk and the coastal protection system, and be able to enter into conversations about how those projects might proceed.

SENATOR BECK: Maybe before you leave, if I could get some contact information from you to pass on to the folks at the Ocean Grove Camp Meeting Association. That would be really helpful.

And the other question I have, which is also-- Since I know Monmouth County is out of your region this is somewhat theoretical, but we had a little different situation in Manasquan where Manasquan did take care of their own dunes. But the way they were constructed they were very high, with paths between them. And, as a result, the sand, when the water came in -- when the ocean came in and the surge came, took the tops off the dunes and rammed them into the households that were along the ocean area. And so some have said that the engineering, because it didn't necessarily go through the Army Corps, was not in keeping with some of the other -- with some of your standards. And so in situations like that, do you sort of take the approach that you'll do extra outreach to kind of bring these folks in and maybe give them guidance as to what works and what

doesn't? I'd be surprised if they haven't reached out to you on their own already. But this was just sort of an interesting example where I think the community really believed that they had protected themselves, but maybe because the construction of the actual dune wasn't engineered maybe with certain standards it didn't actually work the way that they had hoped.

COLONEL BECKING: Ma'am, yes. We are pretty particular about how we engineer the beaches. I'm not a coastal engineer myself, and so I was really surprised to learn all the engineering that does go into it. I mean, you would think -- as a normal lay person you would think, "Oh, I'm just piling up sand." And nothing could be further from the truth. It truly is an engineered structure, and each element of it has a design purpose to really achieve the kind of protection that communities are hoping to see.

That being said, various communities throughout New Jersey have taken measures in the absence of a U.S. Army Corps of Engineers project with varying degrees of success. Some have been quite good; others not as good. So we have, on occasion, provided advice to folks on, "If I was going to do this, this is how I might do that." And we're happy to have the conversations with folks.

I'll turn it over to Keith, because if someone was getting phone calls in the middle of the night about how do I protect my dune, it actually would have been this gentleman right here. And I don't know if he has been contacted by Manasquan.

MR. WATKINS: I haven't been contacted directly by Manasquan, but many of the communities in our District, from the Manasquan Inlet south; we control the actual inlet and south around Cape May and up the Delaware Bay. The size and engineering of dunes goes into



the economics. So it's sort of a level of protection question: What's the level of protection you want to build? Our projects look at a 50-year, and it gets very complicated, as the Commander said. So the project we had for the Manasquan reach, for instance: We look at a suite of storms over 50 years -- what could possibly occur, the largest storms ever -- and then we run that over that period of time and see what could occur, what damages occur. Our projects don't protect to a level, per se. They actually reduce damages over that period of 50 years, which is our economic analysis period. After every 50 years we have to reanalyze this to see if it's doing as predicted. So we're actually putting a project out there, and the size of it is predicated on the damages we prevent that would have otherwise happened over that 50-year period. And it's a risk and uncertainty type of analysis that goes into that.

SENATOR BECK: I'm not going to use my microphone because it's incredibly annoying. (laughter)

I just have one final question, which is: When you look at Monmouth County and Sandy Hook, and then the area to the north of that -- which is the Borough of Highlands, Port Monmouth, Belford, Keyport, Keansburg, Union Beach -- many, many of those municipalities have a good portion, in some cases all of their town, in a flood zone. I mean, in Highlands, nine blocks back is still either an A or a V zone. And so I think the mayors are trying to figure out how will they elevate an entire business community. Or Sea Bright. Or how will they get every resident, when you're talking about 1,250 homes in a nine-block area, to elevate? I mean, one mayor even suggested just raising the whole town, which I'm not sure how you would do that from an engineering perspective. But I think there's

a real sense that we've built out this municipality in a place that's really prone to flooding, and I'm not sure even with the additional Federal dollars if we can raise an entire town.

And so how is the Army Corps approaching this, particularly when you look at Union Beach, which has 1,700 homes that took water all the way to Highway 36. How will you, from an engineering perspective, protect that municipality? Or are you in conversations with them about different structures that they can put in place, beyond just elevating residences, that can help them out?

COLONEL BECKING: Yes, it's a very difficult challenge. And it is one that in this legislation we've received an appropriation to do a study that should look at the kinds of questions that you're raising.

I can't tell you right now; I'm not familiar enough with the situation to tell you exactly how you would address that. But yes, there are probably many different solutions that would have varying degrees of success. But either way it's a real challenge.

Now, the thing I would say, just in reference though, ma'am, is even in those areas where we have built a U.S. Army Corps of Engineers dune system in a coastal area, it is only a risk reduction measure. It's not a magic bullet that will protect everyone from flooding in their homes. And really, the dune systems that we construct are primarily -- their first purpose is to prevent damage from a surge -- from waves crashing in on something like that.

There is, very oftentimes, an added benefit of reducing the risk from flooding which -- as you were just describing. But the primary purpose is to reduce the risk of the waves crashing into your home and completely

destroying your home. But there is a residual risk of flooding that can still occur for lots of different reasons.

So even with the coastal system that we've constructed elsewhere, there is still some of that flooding risk out there that communities such as you described can still face, even with some of the systems that we've built elsewhere.

SENATOR BECK: Okay. Thank you for your time.

MR. WATKINS: May I add one thing to that?

SENATOR BECK: Sure.

MR. WATKINS: So our projects are mainly on the coast right now -- the dunes -- but they also reduce the risk of flooding and super elevated flooding from breaches and washovers that occur from the oceanfront. The primary beneficiaries who get a special benefit on that are the oceanfront homeowners. They will be the first ones, and they are much more likely to lose use of their home, and have their homes condemned and wiped out than the rest of the community. However, that dune does provide a residual protection to the back bays. So when you say the super elevated waters that came back through Mantoloking, we can track that back to when the breach occurred -- looking into all the tidal gauges there. So the town does get the risk of residual flooding reduced, because you're not having the ocean waves and the ocean surge come right over. But the primary-- The most risk are the oceanfront homeowners. And they are garnering a special benefit from our projects that, I believe, was illustrated when you look at areas like Long Beach Island where you had a project with a large Federal dune right next door to a community that didn't. Most of the oceanfront homeowners are gone; their homes are condemned or

unlivable -- many of them. Whereas the areas that had the dunes still had some back bay flooding. Some people still got flooded but the oceanfront and the beach block were all intact. So that's a big benefit.

SENATOR BECK: I understand that the Army Corps undertook an analysis of the entire Jersey coastline to evaluate what worked and what didn't work. Is that publicly available and can be shared with this Committee?

COLONEL BECKING: You're saying after Hurricane Sandy, ma'am?

SENATOR BECK: I understand that the Army Corps of Engineers was deployed right after Hurricane Sandy to go, literally, municipality by municipality on the coast and take a look at what worked, what didn't work, and sort of put together a comprehensive report about the Jersey coastline. And I've been told that a couple of different times -- that that kind of analysis was being done by the Army Corps. I'm just wondering if it is available to us as we are out talking to residents and constituents and, I think to some degree, trying to persuade people that they want to embrace dunes and mitigation efforts. It certainly would be helpful.

COLONEL BECKING: Yes, ma'am, I understand. And I think we would look forward in providing that. I'm not aware yet that we've completed such a report; however, we are required by law to provide that by this legislation that just passed and has been signed. But I'm not aware that we had that compiled right now in one convenient report for the entire coast of New Jersey. But I trust that it would be made available when we complete that.

SENATOR BECK: Thank you. Thanks for your time.

SENATOR SARLO: Senator Bucco, you have a question?

SENATOR BUCCO: Yes, thank you. Mr. Chairman.

Good morning, Colonel. Thank you for coming. Your testimony has been very informative.

I just have several questions for you. One of them is: With the working relationship with our government, especially DEP, have you been finding the cooperation that you needed or is there something that we can do to help, or change, or whatever?

COLONEL BECKING: No, I'd say working with Commissioner Martin and the rest of his staff at DEP has been great. They're a great group of civil servants that you have going on there in New Jersey and we appreciate all their support -- prior to the storm and after.

SENATOR BUCCO: We appreciate that, because we are concerned about making sure that our shore area is rebuilt as quickly as possible. If there is anything we can do to help to expedite any of the problems, we would-- As the Chairman had said, don't hesitate to come to us also, as he told the attorney before you testifying.

But with the designation of the FEMA report that came out with the designation of the properties and the level of homes that had to be raised -- and we understand some of them are up as high as 12 feet -- that's a story and a half -- it seems quite extensive. But my question then is: With the building of the dunes, does this change designation on some of these properties?

COLONEL BECKING: Sir, I understand your question. And we don't get involved heavily with FEMA's maps and your determination of flood zones. That's something that FEMA handles.

SENATOR BUCCO: Why? Why don't we get involved with FEMA? It's a government agency, we're a government agency.

COLONEL BECKING: As I understand it, sir -- and I'm pretty new to the Corps of Engineers -- but I'm pretty sure that's not one of our missions. We get directed what our missions are by Congress, and I'm pretty sure that's not one of our missions.

SENATOR BUCCO: How does FEMA designate these areas then -- by what studies? Do you have any knowledge of that?

COLONEL BECKING: I don't have direct knowledge. I would suspect they do engineering studies to develop those. But I'm not intimately familiar with that.

SENATOR BUCCO: Maybe the left hand and the right hand should be talking together to try and come up with a designation. Because I understand some of these designations -- there are discrepancies in some of these designations, and our concern is what the homeowner -- the property owners are going to be doing with-- Whether they're going to raise up these properties to 12 feet, or possibly even walk away from their properties if their mortgage is upside down or if they don't have a mortgage and they can't afford to raise their properties. So it's a concern to all of the towns along this area, and it's a concern to us in the Legislature, of having the towns lose additional ratables, as we heard this morning.

Okay, but just to pick up on Senator Smith's question about the buyouts. Would it be prudent for us to go ahead with the buyouts as

quickly as possible for the people who do want to sell out in the areas that are designated, and then look to building the dunes? Or are the dunes first, and then the buyouts next?

COLONEL BECKING: Sir, I understand your question, but I think from the U.S. Army Corps of Engineers' point of view, we just have to have the real estate easements in place to be able to proceed with the coastal protection works that we've been authorized to construct. The sequence that you're describing, I don't know if I could provide you advice on that.

SENATOR BUCCO: Well, then, Mr. Chairman, I think that we should also look at that scenario of the buyouts maybe preceding even the dunes. Because that could happen a lot quicker than trying to get the permitting and all to try and rebuild the dunes over several years.

Thank you, Colonel. Thank you, Mr. Chairman.

SENATOR SARLO: And just for everybody's sake, the Federal Emergency Management Agency is responsible for updating these maps. The remapping process is ongoing, and it was not originally due to be released until the summer of 2013; but FEMA, at the urging of Congress or the Governor, released the maps early for 194 New Jersey coastal communities. And then the Governor, through executive order in January of this year, signed an emergency regulations to adopt FEMA's proposed advisory base flood elevation maps, even though they have not yet been promulgated by FEMA. So really it's FEMA working with our Administration; the Army Corps of Engineers really has nothing to do with that. As part of the executive order, the Administration did say if the maps were to change they would also change their executive order as well. That is

a whole-- FEMA, for the rebuild for certain homes, is a whole different topic. We've invited FEMA here today; they did not have the proper authorization from the Administration to be here. So we were unable to get them today.

SENATOR BUCCO: Which Administration?

SENATOR SARLO: The Executive Branch.

SENATOR BUCCO: I didn't know that FEMA has reporting duties to the--

SENATOR SARLO: They are here, literally, as a guest of the State of New Jersey.

SENATOR BUCCO: Yes, okay.

SENATOR SARLO: Senator Ruiz, and then Senator Thompson -- I'm sorry.

SENATOR RUIZ: Thank you, Chairman, and thank you for your testimony today, and the work that you have done and will continue to do along our coastline.

I want to thank Chief Mastronardy for taking me out this morning. I wasn't available to attend the tour earlier. During excavation a lot of the debris has been cleaned up. It's clear that the devastation is still really severe along our coastline.

And as we sit here discussing about the rebuilding of dunes, it was evident to me -- and I am not an engineer -- but associations that have the ability to vote as to whether they want to have these dunes built to the specs of the Army Corps of Engineers also have an impact on the communities behind them. And I think that that's something for all of us to take into consideration, when we're thinking long-term, in specific areas



that had devastation outside of association areas -- that have the right to vote as to what they want their shorelines to look like, but not recognizing the impacts of, when waters come out, what other communities have to deal with.

So not a direct question, but just-- Senator Thompson, I think you alluded to some of that earlier in your remarks. And I think it's something we have to be poised to deal with.

SENATOR SARLO: Senator Thompson.

SENATOR THOMPSON: One further comment on that part there.

Again, when earlier you were talking about that, they were saying the public spends public money for personal property improvements, etc. I don't see that they're spending in this case any different than when they take personal property to flatten a roadway. Thus, they're not doing that for the owner's personal property to benefit them, they're doing it to benefit the general public. Well, here if you were taking part of their beach to benefit the people who live behind them, it's the same thing. You're benefitting more than just a personal, private owner.

But I did want to comment on the question raised earlier by Senator Smith relative to the Cuomo buyout proposal versus the Christie buyout proposal. And as he said, Cuomo had proposed that they buy out any willing seller, as opposed to the Christie proposal which is to buy communities out rather than individuals. I think the Governor, in taking that approach, is recognizing there will only be limited dollars available for buyouts. There will not be adequate dollars to buy from everybody who wants to sell their homes because they were flooded. And his thoughts are,

“If we buy a community out, we have solved a problem in that area.” Well, if you buy a home here and a home there, well, that homeowner is happy but you have the same problem in that area next year the next time the next flood comes, or whatever.

So by buying out an entire neighborhood you’ve eliminated a problem area. Buying a sporadic home here or there, you still have the problems out there in that area. You’ve not solved anybody’s problem. So I think that’s why he is recommending that approach versus the Cuomo approach.

SENATOR SARLO: Is that a question, or--

SENATOR THOMPSON: That was just a statement.

SENATOR SARLO: Okay, a statement. Okay, that’s what I thought.

Any other further questions? (no response)

Well, Colonel, we appreciate the Army Corps of Engineers’ efforts to support us. We know you have the mandate and the appropriation, but there is a lot of work to be done, I guess, before we will see Army Corps of Engineer projects, especially along the northern barrier islands.

So thank you; thank you for being here.

COLONEL BECKING: Thank you very much, ladies and gentlemen.

SENATOR SARLO: Dr. Anthony Broccoli from Rutgers University. I know you’re under a quick time frame, so we’ll get you out of here.

And then we're going to be followed by two experts on dunes -- the design of dunes -- Dr. Jon Miller of Stevens and Dr. Stu Ferrell of Stockton. Dr. Broccoli is just going to talk a little bit about the surge and the climate change.

**ANTHONY J. BROCCOLI, Ph. D:** Thank you very much. I appreciate the opportunity to speak with you this morning.

I'm going to focus on how we plan for future weather extremes in coastal New Jersey. Hurricane Sandy is certainly an example of a weather event that was highly unusual. Even though we've had a lot of extreme weather events recently, the devastation caused by Sandy certainly puts it in first place among the most impactful weather events that we've had, not only in recent years but for many decades.

Hurricane Sandy was very unusual. Most of the tropical storms and hurricanes that effect New Jersey generally are travelling more or less parallel to the East Coast of the United States -- moving to the north or northeast. Hurricane Sandy followed a much more unusual track where it paralleled the coast several hundred miles offshore before making a sharp left turn and moving perpendicular to the coastline.

This put the strong winds on the northern side of Hurricane Sandy along the beaches from Atlantic City north to Long Island and produced hurricane-force winds from the New Jersey coast all the way up through Cape Cod. An impact of those winds was to drive a lot of water onshore. When we talk about the storm surge from Hurricane Sandy we're talking about water levels that were roughly 9 feet higher than they would have been without the storm, in places like Sandy Hook where the tide gauge stopped working at over 13 feet elevation, and in the Battery of

Lower Manhattan where the tide gauge recorded an all-time record of 14 feet.

While this storm surge was very well forecast by the National Weather Service and the various entities responsible for communicating that information, it still had a tremendous impact, as did the very strong winds which produced damage far inland.

So in the several months since Sandy, the questions that I have typically received about the storm are whether or not it is a harbinger of things to come -- in terms of more extreme weather events in the future. To answer that question, I think it's important to start by saying a little bit about what we mean by *normal climate*. Very often I'm asked, "Is there a new normal? Are we seeing something that we haven't seen before?" But the term *normal* itself describes not just what ordinarily happens, but also the range of conditions, including the extremes that can happen at a location. Estimating that full range of conditions that could happen at a location is difficult because we only have weather records that go back for a limited period of time. Here in New Jersey we have pretty good records for, maybe, 100 or 115 years. But when we're talking about truly exceptional events, that makes it very difficult to say what the extremes can be.

What we typically do when estimating the risks from weather and climate extremes is to use a concept called *stationarity*. And stationarity is a term that statisticians use; but basically what it is, is the assumption that the future will be similar to the past, and by looking at what's happened in the past we can estimate the probability of future events.

So the 100-year storm that Senator Greenstein referred to before is really referring to an event that we estimate has a probability of

occurring in any given year of 1 percent. That doesn't mean that such storms will be 100 years apart; just by chance you could get more than one of them in a much shorter period of time. But the idea is that if the future is like the past, then we can estimate the risk by looking at what has happened.

SENATOR SARLO: Dr. Broccoli, I'm going to interrupt for a moment.

DR. BROCCOLI: Sure.

SENATOR SARLO: And maybe you can clarify.

Was this a 100-year storm? Because it really-- Hundred-year storms are based upon precipitation from above. This was-- The damage here was caused by the surge. So was this a 100-year storm?

DR. BROCCOLI: We can use the term *100-year storm*, *100-year surge* -- whatever the case may be -- to refer to many different elements of what a storm does. So in this case, for the areas that we've been talking about today, the damage has come not from precipitation but from surge. We can look at tidal records and estimate how likely it is that an event like this could happen. And our best estimates based on the past history is that Sandy's water levels may have had less than a 1 in 100 chance of happening in a particular year. But as I said, that's based on looking at limited records that only go back, in the case of coastal water levels, maybe 100 years or so. But we can refer to a 100-year storm in terms of storm surge as well as in terms of precipitation.

SENATOR SARLO: Hurricane Irene affected -- I know Senator Bucco's and a lot of other different areas of the state, which was a-- I don't know if that was a 100-year or not, but that was based upon from 10 inches

of rain over a very short period of time. All the towns impacted here, including Little Ferry, Moonachie, Sayreville, and the like, were all impacted by the surge, not from the rain, actually.

DR. BROCCOLI: That's right. The story with Sandy in the areas that were most badly affected was really about surge. The rainfall was relatively light over the northern two-thirds of New Jersey. Extreme southern New Jersey did get 8 to 10 inches of rain, but it happened in places where the soil is sandy and it didn't produce the kind of impacts we saw from Irene.

SENATOR SARLO: Sorry to interrupt you.

DR. BROCCOLI: That's fine.

So the concept of stationarity -- the idea that the future is going to be similar to the past -- may not be a very good assumption, going forward, because the climate has been changing and those changes are expected to continue into the future.

When we talk about climate change, we often use the term *global warming*, which places the focus on temperature. But climate change also impacts sea levels. And we have seen, in New Jersey, a rise in sea level of about 16 inches during the past 100 years. Most of that rise in sea level is occurring because as the climate warms the water in the ocean expands and takes up more space. And, in addition, ice that's present in glaciers in the mountains, and also in places like Greenland and Antarctica, melts adding water to the ocean. And the water added to the ocean has been increasing over the last 20 years or so, based on satellite measurements from Greenland and Antarctica.

The effect of climate change on sea level is very important because it raised the baseline for coastal flooding. If Hurricane Sandy had happened a hundred years ago it would have still been a very strong storm that produced a sizeable storm surge; but that storm surge would have been 16 inches less than it was happening in 2012. And this is important, because projections for sea level rise by the middle of this century in New Jersey are an additional 16 inches or so, and as much as 3 feet by the end of the 21st century. When we consider the future impacts of storms we have to keep in mind that this rising baseline is going to create more vulnerability.

In the late 20th century -- let's say from about 1950 on -- there were six or seven storms that produced levels of flooding at Sandy Hook that if we added 3 feet to them would have been comparable to what happened with Sandy. So in the future, the issue is that our past record of what happened may not be a good guide to what can happen in the future because of this rising baseline for coastal flooding.

There has been some discussion of whether or not climate change is making storms stronger. For hurricanes there is some evidence that a warming climate will make storms stronger, although interestingly, at the same time, they may happen somewhat less frequently. Coastal storms, nor'easters of the kind we had this past weekend -- the science is not available yet to tell us for sure what may happen. This is something that we're studying very closely as a community -- the community of meteorologists and climatologists -- but we're not sure what the future holds in store when it comes to nor'easters. But if we focus on the aspects of climate change that we do understand with high confidence, such as sea

level rise, that still tells us that in preparing for the future we may need to anticipate these serious flooding events happening more frequently than they have in the past.

SENATOR SMITH: Senator Sarlo asked that I proceed with a couple of questions.

If you were projecting 3 feet by the end of this century, you feel pretty confident in that, Doctor?

DR. BROCCOLI: Well, 3 feet is sort of the middle of the range estimate. There's a lot of uncertainty that goes into this, not the least of which is we don't know how much fossil fuels will be consumed during the rest of this century and how much carbon dioxide that we'll put into the atmosphere. The range of expectations is somewhere from, maybe, about 20 inches on the low end to the high 50's on the high end, with 38 inches being the best estimates from my colleagues Ken Miller and Bob Kopp at Rutgers.

SENATOR SMITH: Let me give the opportunity to be the most unpopular person in New Jersey. If that is true, if we are facing a future of, on the average, 3 foot hike in sea level, what is our best policy? Should it be to do the Army Corps' suggestion of dunes? In other words, a barrier to the rising sea level where the impact of the storm is? Or should we really be looking to make our barrier islands just islands with no development on them?

DR. BROCCOLI: As an expert in climate I don't feel especially qualified to answer such a difficult question of policy. But I will say--

SENATOR SMITH: Very smart on your part. (laughter)



DR. BROCCOLI: But what I will say is that it's important to plan for these changes. How we respond to these changes is a matter of public policy. It involves balancing a lot of considerations, including the rights of property owners, the important role that the Jersey Shore plays in tourism. But we need to do that with our eyes open to the changes that may be coming -- so that the plans that we make today take into account the best information we have.

SENATOR SMITH: Okay. Which team are you on in terms of the global climate change? Do you believe that this is part of the natural cycle? Do you believe it's aggravated or stimulated by the carbon dioxide produced by our industrial society? Or do you think it's a combination of both?

DR. BROCCOLI: Well, climate change is always a combination of many things. But because we've known as a scientific community since the 19th century that carbon dioxide has the ability to change the temperature of the earth, and because we know that the amount of carbon dioxide in the atmosphere has risen from about 270 parts per million before the Industrial Revolution to now about 395 parts per million, and the warming that we would expect to accompany that rise in carbon dioxide has, indeed, happened over the course of the last century and especially over the last several decades, there is no doubt in my mind that carbon dioxide emissions are playing an important role in the changes in climate that we've seen and will continue to play an important role in the future.

SENATOR SMITH: What do you think the probability is that we're going to be able to stem the increase in the atmospheric global climate change? Are you an optimist on that or a pessimist?

DR. BROCCOLI: The answer depends on a lot of things. The thing that makes me optimistic is that there is a lot of work underway for many reasons -- climate change is just one of them -- to develop new sources of energy that either don't involve the combustion of fossil fuels, or new technologies that may enable the carbon dioxide to be removed from the waste stream when burning fossil fuels. So I would say that both of those things make me optimistic, that there may ultimately be a reduction in the emissions of carbon dioxide.

The fact that so much of our energy used globally comes from burning fossil fuels means that those changes are not going to happen immediately. And that's why there's also a need to plan for changes in climate that we will see over the decades to come.

SENATOR SMITH: Okay.

Do you own property down the shore?

DR. BROCCOLI: I do; in fact, before I came here this morning I was across the bridge visiting my condo, which I haven't been able to spend any time in for the last four months. That's a small--

SENATOR SMITH: First floor? Second floor?

DR. BROCCOLI: What's that?

SENATOR SMITH: First floor or second floor?

DR. BROCCOLI: First floor unit.

SENATOR SMITH: Okay.

DR. BROCCOLI: The inconvenience we've had is minor compared to the people who have lost their primary homes. And we didn't take water in our living area; instead we took water into the utilities and in the mechanicals, which is why it's not able to be occupied at the moment.

SENATOR SMITH: What's your plan for the future of your property?

DR. BROCCOLI: I'm going to hold onto it. I'm hoping that within a couple of months we'll be back and we'll have our utilities again. But in planning for the future there's a lot of uncertainties: What is it going to cost to insure this property? I certainly wouldn't pass it along to a succeeding generations without making sure that they were aware of the risks that are associated with owning property on the New Jersey coast or on any other coast.

SENATOR SMITH: Thank you, Doctor.

Senator Thompson.

SENATOR THOMPSON: Of course, we're focusing on the impact of the increase of the CO<sup>2</sup> levels in the atmosphere. There are some other significant changes taking place on the earth that I haven't heard of anybody doing any studies on. For example, now we speak of alternative energy sources -- one of those, of course, is increasing use of solar power. So we're putting all these solar panels out there to absorb sun rays and generate electricity, etc. And quite a bit of solar energy is being absorbed that way. Normally this solar energy is absorbed into the earth. That has to have some kind of impact also on what goes on here. But nobody is looking at what will be the possible impact of the fact that we don't get that energy going into the earth that we'd normally get.

Another factor that I wonder about: We've been using an awful lot of petrochemicals -- oil and so on. So vast amounts of oil is being removed from the earth's surface and so on, and then consumed (indiscernible) to CO<sup>2</sup> and etc. What is the consequence of these big deposits that we're removing down there and not replacing; maybe we're putting water in or so on. But these are issues that maybe you ought to have some of your colleagues take a look at and see what are those impacts.

DR. BROCCOLI: There actually has been quite a bit of work that's been done looking at alternative energy and the effects that they can have on weather and climate. This has been most prominent with respect to wind energy -- because if you put up wind turbines, the energy is coming from the wind so you're producing energy by essentially slowing down the wind by having it turn the turbines.

For solar energy, we are lucky in that even with the rapid growth in solar energy, it is still just a miniscule fraction of the earth's surface that's being covered with solar panels. And very often those solar panels are put on buildings or other structures that would be preventing solar radiation from reaching the Earth directly anyway.

But certainly it is wise as we go forward with alternative energy sources to try to see what kind of impacts they may have on the environment, including the climate.

SENATOR THOMPSON: I realize the problem is miniscule but, again, one predicts in the future to make an estimation of what's going to be the outcome of--

DR. BROCCOLI: Right.

SENATOR SARLO: Okay, thank you. Thank you, Dr. Broccoli.

DR. BROCCOLI: Thank you.

SENATOR SARLO: I'm assuming we're going to be seeing more and more storms, unfortunately, over the years.

Dr. Jon Miller, Stevens; Dr. Stu Farrell, Stockton College. We will take-- Come on up.

**J O N K. M I L L E R, Ph. D.:** Well, thank you very much. Thank you for the opportunity to come and speak to you today about a topic that's certainly going to shape the future of the Jersey shoreline for the coming century.

Just to kind of orient you: What you have before you-- We were kind of under the impression you might have PowerPoint facilities, so you'll see some slides. You'll also see some written testimony that I prepared. I'm not going to read directly from it--

SENATOR SARLO: Please.

DR. MILLER: --because of time issues. So what I'm going to try to do is just highlight some of the most important things that I have there.

First of all, just a little background about myself: I'm a coastal engineer, so what I do kind of bridges the gap between some of the stuff you've heard already -- Dr. Broccoli, the Corps of Engineers, and what Stu Farrell were talking about. We basically look at buildings, we design things along the beach -- things for shore protection, whether it be seawalls, beach nourishments, sand dunes, things like that. So we get involved with all of that.

My objective here today is to talk a little bit about what I call *rehabilitating* the New Jersey shoreline. I think the term rebuilding is bad because it implies that we're just going to put back what was there. And I think that that's not something that we want to do. We want to take into consideration what we've learned about the coast -- what we can do to improve things and what we can do to make the communities more hazard resilient and more sustainable for the future, moving forward.

One of the first things that I wanted to do is to bring out a little bit of background about beaches and coastal changes. It's actually on the 4th page, for those of you trying frantically to keep up. One of the things to keep in mind is that the coastline -- beaches themselves -- are what we call *dynamic* landscapes, being that they're constantly in a state of flux. Left to their own natural processes-- The thing that you see there is an illustration of Sandy Hook. Sandy Hook, at times, was an island; it broke off then reattached. It's one of the more dramatic illustrations of what the natural coastline wants to do.

Obviously we've developed a lot of our coastline so we can't allow things like that to happen anymore. A great example is the breach in Mantoloking; again, a completely natural process but we can't have that happen where we have development. So we have to kind of take a look at what we can do to prevent these types of things from happening and live more sustainably along the coastline.

SENATOR SARLO: Let me ask you, real quick.

The breach at Mantoloking -- is it just because it was a narrow strip of land there, or did it have something to do with where the storm -- the impact of the storm -- did the storm hit that area more severely, the eye

of the storm? We know the eye of the storm hit Atlantic City, but the waves of bands around the northerly end -- was there a greater impact at that specific location?

DR. MILLER: It's due to a combination of factors. Particularly, Sandy was a little bit abnormal in how spread out the wind field was where the major surge was. So the areas of northern Ocean County got impacted most dramatically.

Naturally what happens is the sand on the beach kind of moves around and it generally moves in one direction or the other -- either north or south. And as it moves in that direction, typically what would happen is the barrier island would start to thin out a little bit in certain sections. What we typically see when we have breaches is that a storm surge comes in, raises the water level in the bay and, essentially, there is just a weak point -- a narrow point -- that is a hydraulically more efficient way for water to get back out and it just blows through. It can blow out in either direction. So it's a combination of a storm surge, the character of the storm, narrow spot, and it even has to do with the different types of soil -- how erodible the different stretches are. In Mantoloking in particular we saw a lot of different scour depressions -- basically just areas where up to 8 to 10 feet of sand were just removed out. And right next to that there were areas that were not impacted at all. It has to do the material, and how erodible it is, and how it responds--

SENATOR SARLO: Do you think the breach actually occurred from the water trying to get back out, or the breach occurred from the surge?

DR. MILLER: It can occur in both directions. A lot of times what will happen is the water will come up over the dunes and wash across the island; and then when the water goes back down in the ocean, now that water is stuck and it looks for a way out. So it can happen in both directions.

A little bit of this is touched on in the 5th slide -- it's the Sediment Budget. I thought it was appropriate given the Committee that we're before here today. Basically, beaches operate just like a checking account. If you've got more that goes out than comes in, you've got a problem. And that's the way that beaches operate. If you've got more sand that leaves the system than comes in, you're going to tend to have an erosion problem. Now, that erosion problem can happen over time, through long-term processes; it can happen on a seasonal basis; it can happen very dramatically like we saw in Sandy. Just like in your checking account, perhaps. If we get that dramatic withdrawal, if we get something like Sandy that causes a lot more to go out than comes in, you feel it a lot more. And that's kind of what happened with Sandy. We felt the impact very dramatically.

But basically all the time subtle changes are happening -- things like Sandy Hook actually elongating. We just don't tend to notice those as much as we notice something like Sandy.

One of the problems with these very dramatic events is that unlike long-term changes, where we have an ability to respond kind of slowly over time, when they occur so rapidly we don't have that ability to respond. And usually the rapid changes are also the ones that are the most significant in terms of removing sand from the system permanently. In the



case of Sandy, a lot of the sand was moved over the barrier island and deposited into Barnegat Bay. A lot of the sand is put into the streets, into people's houses. A lot of the sand-- Some of the sand is actually moved far offshore where it's not coming back. So without help, without assistance, that sand is not going to make it back to the beaches. Now, communities do a great job; I know in Toms River here they've been doing a great job trying to recycle the sand and get it back onto the beaches as fast as possible. And that's great. But there is still the sand that ended up in the Bay and some of it may have ended up offshore that is basically gone from the system. So now we're faced with the challenge of replacing that, and that's part of what the Corps of Engineers was talking about with the beach nourishment projects.

The 7<sup>th</sup> page has just some dramatic storms. Sandy was not the first and will not be the last storm that has hit the New Jersey coastline. There are some dramatic storms of the 20th century listed on that page. The ones that are highlighted kind of illustrate some of the responses that we've had as a State to storms that, I think, have been fairly successful in the past. Prior to Sandy, the 1962 storm was probably the worst in terms of impact in our history. During the 1962 storm a lot of the southern New Jersey coast was impacted; a lot of the homes had the same types of damage -- lifted up off their foundations, just wiped clean -- similar to what we saw in places like Ortley Beach and Mantoloking during Sandy. After that storm, a lot of the rebuilt houses were built on more solid foundations using pilings and things like that. In part that is what limited the amount of damage that we saw to the southern part of the state. Part of it had to do with the storm being more concentrated up here, but part also had to do

with the fact that houses down there were rebuilt after the 1962 storm and were to a higher standard.

The 1984 nor'easter-- After that, the State of New Jersey supported the New Jersey Beach Profile Network, which Stu Farrell, I'm sure, will talk a little bit about. Basically, it provided annual monitoring of the beaches in New Jersey so we know what condition they're in on a year-to-year basis.

After the 1991 and 1992 storms, the State of New Jersey responded by establishing the Shore Protection Fund, which some of you are very familiar with. That fund has been instrumental in providing protection to a lot of the areas that were lesser impacted by the storm. I'll talk a little bit more about that later on.

And the Hurricane Sandy chapter -- that's kind of what we're trying to discuss here today, and figure out what kind of a response we're going to have, and how that will play out in the future and hopefully make us more resilient.

Structural responses. We've done everything in New Jersey; we've built groins, and jetties, and breakwaters, seawalls, bulkheads -- you name it, we've tried it. I think something that we have-- I think something that we need to keep in mind, moving forward, is the approach that we're going to use is not necessarily one or the other of these. I'm not going to say, "Build a groin everywhere, build a wall everywhere, build a beach everywhere." I think we have to think about the specific processes occurring at a site, and use the best science and engineering to design a project that's going to provide the most protection to the area that we're

looking at. I think it will incorporate some, if not all, of these in different locations.

One thing that is kind of missing a little bit is innovation -- it's something that we, as engineers, relish -- the ability to innovate and to find solutions to problems. I think there are opportunities for innovative solutions for protecting shorelines that have not necessarily been implemented in the past. The state of Florida has a program, the Innovative Erosion Control program. It's not experimentation, but it's trying something that coastal scientists and engineers believe there's a reasonable chance of success -- even if it hasn't been tried before. And I think we need to encourage that if we're going to find solutions that are sustainable for the future.

Living shorelines. That's kind of the next -- and one of the things that we've been involved in. On Bayshore communities it involves using elements that create habitat as well as provide some protection. They've been used extensively in Maryland, North Carolina, and Virginia. We're starting to use them in New Jersey, and I think that moving forward that's something that we're going to need to take a closer look at. And the DEP actually has been involved in trying to speed the approval process -- the permitting process -- to get these projects built and move them forward. So that's a positive step.

Beaches and dunes. The beach nourishment projects -- what they do is they put sand back on the beach. The erosion is caused by the fact that there is not enough sand, so we put sand back onto the beach. The important thing to kind of consider is that just putting it back on the beach doesn't solve the erosion problem. If the beaches were eroding prior

to the beach nourishment, they're going to continue to erode. It's kind of like if you're checking account is eroding over time; if you get a big influx of cash, if you don't do things to address the issues or problems, eventually that cash is going to run out and you're going to need another influx of cash. That's basically what a beach nourishment is. The Corps of Engineers' projects all have renourishment intervals and they take that into account when they design them -- when they do their cost-benefit analysis. So the idea is they build these projects; they know they're going to have to go back and renourish them, typically anywhere from three and seven years after they're constructed. And that's something, again, that's been taken into account when they're designed and have done their cost-benefit ratios.

There is a little bit of information about how much beach nourishments cost and how much sand we're talking about. It's a lot of sand and beach nourishment projects do tend to be expensive. Mobilization costs are typically between \$2 million and \$5 million, depending on where the dredge is at any given time -- the process it takes to get it up here. And then it's \$5 and \$15 per cubic yard for a project. So for a very small beach nourishment project, you can do it for about \$5 million -- which is expensive. Generally, the rule of thumb -- I think somebody asked this previously -- the general rule of thumb is the longer a project is, the longer it lasts. And it's not a one-to-one relationship; basically, if you double the length of a project, the length of a shoreline that's protected, the sand lasts four times as long. That's just a-- It's based on engineering guidance; that's based on an analysis done of beach nourishment projects in the past. So when we kind of split up these projects and do them piece by

piece, they don't last as long as they would and won't be as effective as they would be if we nourished big sections all at once.

Natural sand dunes. One of the big issues I know is people don't want their views blocked. I think we've done a bad job in the past of relaying what is the height of a sand dune, versus the elevation of a sand dune. Most of the Corps of Engineers' projects have dunes with an elevation of 22 to 24 feet, which sounds very imposing. But that elevation is basically measured from the waterline. So if you're standing on the beach, or you're standing on your back deck, or you're standing on the boardwalk it's not 22 feet above that level; it's 22 feet above the water. So if you're standing on your deck or the beach, more typically the dune is 6 to 15 feet tall. Which is still, certainly, tall enough to block some views but it's not nearly as dramatic as saying it's 22 feet. So I think we need to keep that in mind.

Protective capacity of dunes. FEMA has this so-called *540 rule* which says that basically you need 540 cubic feet per foot of beach as the volume of sand that's required to qualify, under FEMA regs, as a storm surge and wave barrier. And that's a lot of sand. The little sketch there kind of shows how it's measured. It's in the primary frontal dune, so it's not even the entire dune.

Prior to Sandy occurring, many New Jersey dunes did not meet this requirement; I would say most did not meet this requirement. One thing that's going to be interesting to consider also with the new maps that come out -- if the flood elevation, the base flood elevation, the 100-year elevation is elevated or raised, less of that dune will count because basically

the bottom part that you count is higher now. So that's something that may come through with these flood elevations.

The Shore Protection Fund. I had mentioned it before-- Again, the Shore Protection Fund was set up in 1994 after the major nor'easters in 1991 and 1992. It was originally set at \$15 million. It has since been increased to \$25 million in 1999, but it's been essentially flat since then. That fund has been instrumental in most-- In the sections of New Jersey that have been nourished, that the Corps of Engineers has participated in, that fund has helped fund the local share or the State's share. Those projects are basically funded as 65 percent cost to the Federal government, 35 percent to the State. The State then splits that 35 percent between the local municipality and the State itself. The municipalities end up paying about 9 cents for every dollar of a beach nourishment project. It's not just beach nourishment projects. They fund structural stabilization as well. It doesn't just fund ocean coastlines, it funds bayshore stabilization projects as well. That money has been essential in helping to protect the New Jersey coast.

And then there are just a few examples that I wanted to show of what we would consider good coastal engineering practice. The first one -- it's on page 15, again, if you're following along -- it's a picture of Ortley Beach. I believe you have color copies. The little dots on the aerial photograph represent FEMA damage assessments: basically, the darker the dot, the more significant the damage. I believe red is structures that are completely removed. And you'll see there's a cluster of them right there in Ortley Beach.

So one of the questions is, “Why Ortley Beach? Why did this happen?” Then if you look to the left there is a series of lines or plots. They are beach profiles which were taken from the work that Stockton does through the New Jersey Beach Profile Network. I’m sure he’ll talk more about it. But basically you can see the dune -- the size of the dune -- in Ortley Beach, which is obviously the small one. And then the two neighboring towns to the south -- the Seaside Park profile and the Midway Beach profile. And that just gives you an idea, even though there was “a dune” at Ortley Beach -- a mound of sand -- you can see how it paled in comparison to the size of the dunes in the other communities that, for the most part -- again if you look at the dots, if you believe the dots -- most of the southern part of the-- From basically the bridge down south it’s kind of in the unimpacted zone. So the beaches and dunes in that area certainly provided a significant protective benefit to those communities.

The next page just kind of shows the before and after, again from the work that Stu Farrell has done. Basically you see the entire dune chopped off in Ortley Beach -- completely removed. Then you look at Seaside Park and you see that there is still a significant chunk of that dune that was remaining. So not only were those homes protected but there’s still some residual left in that dune.

And the bottom is, of course, just an aerial photograph illustrating the damage in Ortley Beach -- and that wasn’t the worst one that I picked. I tried to be on the up and up and take that picture from the location where the beach profile was. I could have gone north or south and it would have been even more dramatic.

The next case is from Mantoloking. You see an aerial photograph before and after Sandy. There is one particular house that's highlighted. One thing that's noticeable about this house is it's not located right up on the beach compared to all the others -- it's actually set back closer to the road. Prior to Hurricane Sandy the dune that was in front of that house was about 150 feet wide. So from the guy's back door out to the toe of the dune or to the beach was a 150-foot wall, which is a pretty significant wide dune. If you turn to the next page basically you see a photograph that I took of that house where you can see a big chunk of the dune kind of remaining in front of his house. You see his house standing there, almost-- I mean, it looks intact. I didn't get a chance to go inside the house; I'm sure there was some flooding damage. But notice that it structurally looks essentially fine. If you look on the right there you'll see, again, the dots from the FEMA damage assessment. The one light-colored dot, the one faded yellow dot that's there -- that's that house. That's the only house on that stretch, either in the first or the second row -- it's not just the first row; it's the first or the second row -- that is kind of unimpacted, and that happened to be the house that was set further back and it had a big dune. So that's kind of a combination of two things that we would like to see: is building further back, but also having a significant sized dune in front of you. Given the idea those houses in that area are about \$4 million to \$6 million apiece -- so the investment in the dune is relatively small.

One thing to keep in mind -- somebody had brought it up before as well -- what happens on the barrier island is not just limited to the barrier island. In the areas of Bay Head, Brick, the northern part of



Barnegat Bay, surge levels were a few feet higher potentially because of the breach that occurred in Mantoloking. So if that beach had been nourished, if the Corps of Engineers' project was in place, if the dune was there, the breach would not have occurred there. And it's not only the homes on Mantoloking that would have benefited, not only those on the oceanfront or the second row, but all those homes in the back bay area also. Basically, once that breach occurs it allows the surge to go in and waves to attack those houses back in that bay area.

Bay Head is another example. Bay Head's seawall protects 75 percent of the town. You can see on the right figure there the tail end of the seawall. You'll notice the picture on the left is, again, those FEMA analyses. The houses that were destroyed were north of the seawall, basically outside of the area where it protected. Also, if you looked at the before and after photographs -- which I didn't have a before here, but -- those houses on the beach were actually built in the dune line. So not only did they have a dune in front of it, they were actually embedded in the dune line, basically. There are dunes on either side and then there's a house in the middle. Interestingly, those houses go back to the 1920s; they've been there as far back as I can see. But those houses-- One of those houses in particular got destroyed -- it got carried and pushed into the house behind it and destroyed that house. So again, illustration, perhaps, of seawalls and dunes.

Monmouth Beach. Monmouth Beach, as I'm sure most of you are familiar, has a massive seawall. It's a huge structure. The picture that I've highlighted there is a house that I find particularly interesting because this guy is behind the seawall. Most people would assume, "I'm behind the

seawall, I don't have anything to worry about, I'm safe. Why would I do anything differently? Why would I take extra measures to build to a more resilient state?" That guy elevated his house; it's on a mound, you'll see. He also has hurricane shutters on all the windows so you can tell he takes storm protection very seriously. Compared to the houses around there -- most of the houses there did not get directly impacted, per se, by waves, but water splashing over the seawall scoured out foundations and things. This guy, with his house on the mound with the hurricane shutters, kind of had these extra layers of protection, and I would be shocked if he even got water. So he didn't just go with the bare minimum and say, "I'm behind a wall, I'm safe." He went and did extra steps. I think we should encourage that.

The next page just kind of shows, on the engineering side of things, construction side-- Basically, the three pictures kind of concentrated on the lefthand side show the way in which some structures were secured to the pilings. Those pictures are from Sea Bright and the beach clubs at Sea Bright. The three on the lefthand side kind of illustrate bad practice. One kind of uses these 1-inch by 1-inch wood strips and a few nails -- 2 or 3 nails -- basically to secure the entire beach club to the foundation. That's insufficient. Those beach clubs got basically tipped over and removed from the foundation. The one kind of in the middle on the bottom is a proper, what we call, *hurricane clip* or *hurricane strip*. What you can see is that they're completely rusted through. Those strips may have been effective when they were originally put on, but because of the rust and the corrosion around the strips, as well as the nails, those weren't sufficient. And we saw a lot of that up and down the coast. And then kind of in the upper right is

an example of a good hurricane strap. That's actually on the boardwalk in Sea Girt -- the part that's still standing. What you'll notice is --- or you may notice is that there's-- Basically, every hole that's available on the strip is being used by the fastener. And in the case of that particular structure, they use screws instead nails, which is generally a more resilient, a more robust way of securing the decking to the substructure. So again, we get to take a look at kind of how we build and how we construct these structures on the coast.

The next picture shows kind of natural protection in Seaside Park. There's a little area, it's a little marshy area. Again, you'll notice that there's kind of that section in the middle where there are all these washed out color dots -- basically, the unimpacted structures. Did that have something to do with that natural area? It's something I'm very interested in; I'm not positive at this point. But that's kind of the concept behind living shorelines approaches -- is it takes nature and it uses that to reduce the waves and the surge and the impacts to those structures.

Buyouts is something that we've talked a little bit about here. I think that buyouts are certainly one of the options that we need to consider. It's not something that we should take off the table. I grew up in Rahway, so the picture you see there is from Rahway. It's an example of a very successful buyout from FEMA's standpoint. A bunch of repetitively flooded properties were bought out, and then during Hurricane Floyd that area flooded once again but there were no properties this time. So it proved effective. The thing that I can remember, though, growing up, there is it was very controversial at the time. One of the issues was the amount of money that they were given would not allow them to buy another house in

Rahway so they had to move. They took so much less money. I think one of the issues with buyouts along the coast is that in certain communities, buyouts-- People get flooded; they want to sell out. They just can't find somebody to buy their house. They would get out if they could. So buyouts are an attractive option. As soon as somebody offers them money, "All right, great, I'll leave." The problem is, along the New Jersey coast there's not that rush to leave. There's always a buyer for those properties; hence, the property values are going to be higher.

SENATOR SARLO: Buyouts are great for communities or inner suburbs that are along rivers and streams that flood. But coastal properties -- clearly, people are buying there for a reason -- to be near the water.

DR. MILLER: And they're willing to accept that risk.

SENATOR SARLO: Exactly.

DR. MILLER: And I think that makes it much more difficult--

SENATOR SARLO: Buyouts, I don't think, are the answer along the Jersey coastline.

DR. MILLER: And I think-- And if it is part of the solution in certain areas, I tend to agree that you need to kind of target it and make sure you don't kind of pockmark communities. One of the fears is that you buy out-- Financially, the properties that will be most easily bought out are the lower-valued properties. Unfortunately, that's also the areas where the fishermen live; it's where the policemen, the firefighters -- the local residents who built the fabric of that community, that's where they live. You don't want to buy them out and then leave just the mansions on the beach.

Just finally, the conclusions: Sandy's not unprecedented; it will happen again. It's a storm that-- We've seen storms like that in the past; we will see more storms like that. I think that we need to consider all the options that we have. We can't just focus in and say, "We're going to just do one thing and that's the only thing; that's the only solution." Different areas, multiple types of solutions might be appropriate. We need to evaluate those. I think wherever possible we need to consider not just a single line of defense -- we need to have kind of a duplication, several lines of defense. This is the kind of approach that the Dutch are taking, very much, with their flood control methods. Don't just build the one wall; build redundancy. So that way if the wall gets over-topped, you're not flooding out entire communities. We need to kind of consider beaches and dunes as kind of the front line of what you take -- try and take care of as much of the storm as possible out in front of it. Structures may be a part of the option, but then on the landward side of the structures we need to consider things like zoning codes, elevating structures, building structures on piles wherever we can, and building more robust structures on the construction practice side.

And with that, I'll be happy to take any questions that anybody may have.

SENATOR SARLO: Dr. Miller, this is a really nice package -- a nice presentation.

I wasn't sure if it was you or Dr. Farrell, somebody presented to many of the committees down here. Was this presentation done before?

DR. MILLER: I'm sure we both have. And I actually did present down here in Toms River to one of the local communities. We've

also done some presentations in Bay Head. One of our funding mechanisms is through the New Jersey Coastal Protection Technical Assistance Service -- it's a mouthful. It's actually funding that comes through the Shore Protection Fund, and through them we work with the DEP and the local municipalities on hazard resilience, storm protection, and provide advice to both the communities and the State.

SENATOR SARLO: You're okay if we share this presentation, then, with the private communities--

DR. MILLER: Sure.

SENATOR SARLO: --or other constituents who are very interested to learn more about dunes? I mean, dunes is--

DR. MILLER: Sure.

SENATOR SARLO: Dunes is not a sexy topic, but it's a-- After the storm we realize it's a necessity.

DR. MILLER: Yes, they're very valuable. I know they're very controversial as well, so the more informed people are, the better.

SENATOR SARLO: Thank you.

Any questions?

SENATOR SMITH: Yes, one quick.

New Jersey was pretty quick to adopt the advisory-based flood elevations put forward by FEMA. In your experience, have these advisory-based flood elevations been 100 percent accurate?

DR. MILLER: The quick answer to that is no. I've been involved with FEMA on part of the technical advisory panels. So when they were redeveloping these flood risk analyses, we were involved throughout that process. What I can tell you is that the new maps were

scheduled to be released this summer and so they were 90 percent of the way down the path when Sandy hit. And Sandy was probably their worst nightmare because in a sense it provided both a ground truthing, but also a way to say this is completely wrong. So with these advisory elevations, what happened was the government had this information -- the latest, most up-to-date analysis. It wasn't complete yet and one of the things that hasn't been completed is the wave modeling. So when people talk about the V zones, they have not completed the wave part of that. So that may be likely to change when the new maps come out.

But the point was, people were going to rebuild as fast as possible. And the government had this information; they wanted to release the best information that they had at the time -- which is what these advisory flood elevations are. They realize, they recognize that they weren't complete, but you didn't want to have a situation where somebody comes back, rebuilds their house to the old flood elevations, and then the government comes in and says, "Aha! Surprise! We just did the remapping. Now you're no longer above the 100-year flood elevation and so now your insurance is going to skyrocket." So this was sort of a-- I know that in releasing these maps, the tendency was to be conservative. Again, they didn't want people to build too low. They said if they're going to build too high or too low, we'd rather have them build them too high because then they're safer, going forward. I've been contacted personally by -- my dentist lives in Mantoloking and he talked to me about his house. And I told him that there is a process. Once the new maps get released later this summer or perhaps in the fall, there's essentially a year, year-and-a-half-long process that FEMA has to go through. There's opportunities for municipalities to

question the new flood elevations. They can go for revisions. There's a whole process before everything kind of becomes finalized. And I imagine, based on some of the feedback I've heard, a lot of communities will go through that process.

SENATOR SARLO: There is a lot of confusion on these new maps and what municipalities -- what homeowners should do; modifications to their homes, rebuilding-- There's just a lot of confusion out there right now.

SENATOR SMITH: Well, there's also a lot of resentment. I have the *Home News Tribune* on February 9 -- Saturday, February 9. I'm now clipping out my newspapers every time there's something in it related to Sandy. This was a homeowner's letter to the editor which I think illustrates some of the frustration with this.

It says-- It's from a Laura Dickinson, Chadwick Island, Toms River. "Governor Christie's adoption of the Federal Emergency Management Agency's advisory base flood elevation maps is going to create a tremendous financial burden on many residents of New Jersey -- my husband and I included. All we hear is 'raise your home higher,' but that is easier said than done. First, where do we get the tens of thousands of dollars to raise our home, which is erroneously designated in a velocity zone? Second, where are all of the qualified contractors going to come from to raise thousands of homes before these maps are adopted by FEMA? Third, how are we supposed to put our homes on piles as the velocity zone designation requires? Move it into the street while the work is being done? Fourth, if we do not have the funds or the contractor with the ability to move our home out of the way, are we just supposed to knock it down and



rebuild and to bleed off our retirement savings? Last, if the options are not feasible, and we are not one of the privileged few to receive a hazard mitigation grant, do we just suck it up and pay \$31,000 a year for flood insurance, or sell our property at a massive financial loss? These maps are severely flawed. My husband and I are permanent residents on Chadwick Island in Ocean County. Our home was never flooded since it was built 40 years ago. The flooding of Chadwick Island was the result of poorly built dunes on the ocean side which caused the Barnegat Bay to flood. We certainly did not experience high velocity wave action as defined in the velocity zone designation; that is what happened on the ocean, not on Chadwick Island.

I hope the Governor takes a hard look at the ramifications of his actions. If these maps are allowed to stand, he can forget about restoring the shore. I for one will be making my own sweatshirt with the new slogan 'Destroy the Shore,' because that is what will happen."

Now, that sounds like a very, very frustrated resident of Toms River. And I don't know what the truth is. I mean, I would assume -- and you know what assuming does -- assume that FEMA would be the expert on this, and they would not have issued those advisories based on elevations willy nilly. But two years from now if there are any significant changes to those advisory base flood elevations, you're going to have a lot of really unhappy people.

DR. MILLER: Yes, and I've actually spoken with some residents from Chadwick Island on the phone. And they've been very proactive in trying to get out in front of the issue. And they're looking at different consulting companies to hire that would be experts in disputing

the maps. And I've advised them that they're only advisory at this point. And they're gung ho about -- they want to get out in front and do something now.

SENATOR SMITH: Yes, but they're more than advisory. Didn't we adopt them as the base flood elevation for the State even though they were only advisory?

DR. MILLER: They're--

SENATOR SARLO: In the executive order?

SENATOR SMITH: Yes.

UNIDENTIFIED MEMBER OF AUDIENCE: (off mike) The DEP adopted emergency rules. They were adopted. (Indiscernible) They are legally enforceable.

SENATOR SMITH: They are legally enforceable, at this point. They're not advisory.

DR. MILLER: I think some of that lies in a kind of disconnect between the FEMA intent in putting out these advisory elevations and how New Jersey has treated them. I know for a fact that FEMA never thought, "All right, well, we're going to put these out and then--"

SENATOR SMITH: Should we as a State have waited a bit?

DR. MILLER: It's a-- Can I plead the Fifth as well and say that's-- (laughter) I'm just a scientist. I'm not smart enough.

SENATOR SMITH: We're giving you the opportunity to be the most unpopular -- or most popular -- guy in the state.

I understand you don't want to take a position.

SENATOR SARLO: No, we respect you on that.

Both you and Dr. Farrell are going to need press secretaries because you guys are quoted in the article in the *Record*, too, today: "New Maps Complicate Victims." So we understand there are issues here. And there is a lot of emotion involved with it. But Senator Smith is absolutely correct. The executive order is clear: It does adopt the advisory flood elevations today. But as you heard from the Toms River Borough Attorney and I think even from other municipal officials, many of the local officials are struggling with how to enforce them or how to apply them.

DR. MILLER: Especially when they disagree with them. I mean, I spoke with the Toms River municipal engineer and he's disputed a couple of the (indiscernible).

SENATOR SARLO: Thank you. Thank you, Dr. Miller.

DR. MILLER: Thank you.

SENATOR SARLO: Dr. Farrell is next. We'll just take this question, then we'll bring up Dr. Farrell.

SENATOR THOMPSON: Thank you.

Of course, now, these are advisory, and you've said that about 90 percent done when they issued the advisories, etc. And, of course, they are subject to change. If you had to conjecture about the changes that may occur, would you say that the changes that may occur in most instances will end up putting homes in a higher classification of risk or tend to put them in a lesser classification of risk? Or is there no way of guessing -- in the most cases?

DR. MILLER: The intent with the advisory elevations was to put them in a higher category of risk; when in doubt to encourage people to build to a higher standard. So my thinking is that once they complete the

wave modeling, and once they complete the final analysis, that we will see that the zones get dropped down -- the risks--

SENATOR THOMPSON: Not where people will be dropped to a lower zone, you're suggesting.

DR. MILLER: Yes.

SENATOR THOMPSON: Okay.

The second thing, again: Now, I am a little confused. The Governor did, by executive order, adopt these as a statewide construction plan, etc. But I think there is some requirement for the municipalities to adopt them too for it to really be in effect. Is that necessary, or what is the situation here?

DR. MILLER: To be honest with you, I'm not really sure about that.

SENATOR THOMPSON: You're not sure? Again, I've seen something that seemed to indicate the towns need to adopt it, as well as the State having adopted it, for it to be totally enforceable. And, of course, I think the Governor's point here in doing this was people right now have no idea what to do. So he's trying to set at least some kind of baseline out there so they have some direction. Because many of them were going to the towns, and the towns said, "Well, we can't give you approval because we have no idea what you have to do." Would you clarify for me-- Now, of course, in order to be able to qualify for flood insurance and so on you have to build to these standards if you have at least 50 percent damage and so on. If you have the 50 percent, are you just denied ability to build if you don't build to these standards? Or is it a case of, "Well, you can go build

without building to those standards, but you can't get any flood insurance. Or, if you do, you're going to pay \$31,000 a year." What's the situation?

DR. MILLER: Well, the insurance rates are generally based upon where you lie with respect to the flood elevation. So for every foot below the flood elevation that you are, you're rates are going to go skyrocket. For every bit above, you'll get--

SENATOR THOMPSON: Well, you're missing my question. My question here is, are you prohibited from rebuilding -- if you had 50 percent or more damage -- if you don't build to these specifications? Or can you go ahead and build, but hey, you've got your problems relative to insurance?

DR. MILLER: I think that that's more of a-- It's not a FEMA decision. FEMA is the one that readjusts the risk and then that risk is taken up by the insurance -- the Federal insurance program.

SENATOR THOMPSON: No, no. You're still missing question here.

Can somebody say, "The heck with what FEMA says. My house was more than 50 percent damaged. I'm going to go rebuild, and I'm not going to build to their specifications." Can they do that if they want to, regardless of what the impact is going to be on the insurance and so on?

SENATOR SMITH: Yes.

SENATOR GREENSTEIN: Do you know the answer to that, Bob?

SENATOR SMITH: I know the answer.

SENATOR GREENSTEIN: Bob knows the answer.

SENATOR SMITH: Sam, I know the answer to that.

SENATOR THOMPSON: Okay.

SENATOR SMITH: All right. The answer is yes.

SENATOR THOMPSON: They can.

SENATOR SMITH: You can rebuild. But you won't get flood insurance, and that's an element of default on your mortgage.

SENATOR THOMPSON: Oh, I realize that. But as I say, they can go ahead and build however they want to.

SENATOR SMITH: But you have to pay your mortgage--

SENATOR THOMPSON: The towns will give them permits to build?

SENATOR SMITH: Yes.

SENATOR THOMPSON: Okay.

SENATOR SMITH: And not only that, a lot of the towns are not even charging building permit fees.

SENATOR THOMPSON: Oh, I realize that.

SENATOR SMITH: But the implications is no flood insurance, and pay your mortgage off because it's an element of default.

SENATOR THOMPSON: So somebody could go out there today and rebuild any way they wanted to without worrying-- I mean, the consequences are going to be there on insurance and everything else. But if you want to go build, you can go build.

SENATOR SMITH: Well--

SENATOR THOMPSON: Any way you want to.

SENATOR SMITH: --yes and no. What the Borough Attorney in Toms River said, they're changing their local planning and zoning laws to make any raising of the building to be a permitted use, no

bulk variances. Any change in coverage or side yard to be automatically approved and you don't have to go through a planning and zoning board. That's what we need to do for all the shore towns so that everybody-- I mean the worst thing that would happen--

SENATOR THOMPSON: Of course, you don't have to go through a CAFRA permit or anything else if you build according to these codes. But if you don't then you may have to go through the--

SENATOR GREENSTEIN: Okay. Thank you for very much.

DR. MILLER: Thank you.

SENATOR GREENSTEIN: Thank you.

The next person is Mr. Stewart Farrell, Director of Coastal Research at Stockton College.

Is that Mister or Doctor?

**S T E W A R T F A R R E L L, Ph.D.:** Doctor.

SENATOR GREENSTEIN: Doctor Farrell.

DR. FARRELL: For better or for worse.

SENATOR GREENSTEIN: Welcome.

DR. FARRELL: Thank you very much for the opportunity to come and speak today.

I tried to condense 41 years of work on New Jersey's coast into two pages -- which I may have successfully done.

The Coastal Center began 30-odd years ago at the request of the Borough of Avalon because their beach was disappearing 20 feet a week, for a total of 475 feet of retreat during the summer for no apparent reason. So we were asked to come in and take a look and see what was going on.

The mention of the Shore Protection Act of 1994 is key critical because that's essentially the partnership developed with the Bureau of Coastal Engineering, under the DEP, to monitor the State of New Jersey -- starting after Hurricane Gloria in 1986 at 105 locations, from basically the Raritan Bay down the oceanfront coast into the Delaware Bay. So we visit these sites individually twice a year; survey from across the dunes, across the beach, and out into water about 16 feet deep to get a picture of what the cross-section looks like. We also evaluate the Corps of Engineers' projects -- take a look at them. They survey them periodically; we try to get there more frequently.

After Sandy we started-- October 31 -- to visit each of these 105 sites as fast as we could; we did so by Thanksgiving. So we have a pretty good idea of what happened, what worked, what didn't. And to take that right to the back page, in bold type, there were four keys to success in the Jersey Coast design and execution -- mostly in the execution, not necessarily the design.

The beach width hasn't been discussed much, but the key ingredient to the failure in Mantoloking was a 35- to 55-foot wide dry beach. That was all the sand that was available. They did the best they could to build dunes with the quantity of material they had available to them. And we've been working with the Borough since the 1991 nor'easter as part of this process. So a wide beach -- by wide I mean 250 feet of dry beach -- seems to make a huge difference even in places without dunes. Witness the area in Point Pleasant Beach near Jenkinson's holdings. The beach is almost 400 feet wide in that location. And the damage, while-- Flooding occurred, over wash did occur; you did not have 15, 20 foot white



water bores crashing into the houses directly. So the dissipative effect of a wide beach at elevation 5 feet above water level -- or 6.75 in the case of the Corps design -- was very instrumental in reducing the wave damage. This was true in the City of Wildwood, which does not have a dune system, and in the City of North Wildwood, which built a dune system to Corps specifications using State funding in 2009. That town suffered minimal damage because the dune absorbed what was left; in fact, the waves added sand to the toe of the dunes in North Wildwood as a result of dissipating their energy on the beach.

Second is the berm elevation. The higher the beach, the more those waves will break. Even though the beaches flooded during the storm event with a 5-, 6-foot storm surge, the beach is underwater because it's -- even still water. Now you throw the waves on top of that. I have been handed a picture of the white water bores in Sea Girt. And, my God, it's impressive. Here's this white water bore with timbers in it coming at you in this photograph and it's at least 15 feet high. The guy had real guts to stand there and take the picture, I'm sure.

But nonetheless, that's what does the damage. It's not the Hawaii 5-0-type wave curling over and coming down. That happens-- You want that to happen as far from the shoreline development as possible so that that white water bore that washes in-- Just if you think in terms of going swimming and the waves are, say, 5 foot high breaking. If the wave breaks right on you, it knocks you flat on your butt -- no doubt about it. But if it breaks and then rolls towards you, it's no big deal. Little kids dive under it; even the little 2-year-old can stand a 6-inch, white water bore. It's

not much of a deal. We scale that up by orders of magnitude and you see the danger that results in having that happen right at your doorstep.

The berm elevation, and then the dune height. These numbers that have been put out there -- 22 feet, 16 feet, 14.75 feet -- all these are actually the result of designing wave runup to reach a particular elevation. These analogies of storms -- a 1-year, a 5-year, a 10-year, 20-year, 50-year, and 100-year storm events -- actually have parameters attached to them of stillwater elevation, wave period, wave height, and duration of the storm. That's all attached to them. And the Army Corps of Engineers two decades ago came up with a linear one-dimensional wave model to erode to an unconsolidated sand shoreline called *S-Beach*. That model actually runs against the shoreline that you're presented with in the computer, and it shows you how it will modify with the storm you predict to impact that beach -- whether it's a 10-year storm, or a 20-year storm. It's just different water elevations and wave heights.

So the dune height that has been derived from these successive studies that have been undertaken, the 14.5-foot dune, or 14.75-foot dune in Atlantic City which just barely kept Sandy at bay was, essentially, for a 20-year or 5 percent likelihood of a storm occurring that year -- 20-year storm event. The 16-foot dune is for the 50-year storm and the 22-foot dune is for the 100-year storm event.

In Long Beach Island they built to the 22-foot elevation, which worked -- emphatically worked.

SENATOR SARLO: But it's not just about the height, right? It's also about the--

DR. FARRELL: It's the width of the beach--

SENATOR SARLO: It's the volume, right?

DR. FARRELL: The volume of sand in the dry beach, and in that dune.

Now, the dune at the base was like 185 feet wide, at the base; rising at a 105 slope to the 22-foot-- And that was 25 feet wide flat. So that kind of situation was what dramatically made the difference. And it was the width of the beach, not just the dune elevation, that made those things as successful as they were.

SENATOR SARLO: And that's why Ortley Beach was hit so -- was so damaged because there was no width. There's no width to the beach.

DR. FARRELL: No width at all; in fact, it was our poster child in our 25-year report for the worst performing beach in New Jersey, in terms of shoreline retreat and narrowness and smallness of the dune. And this had been discussed with the homeowners' folks repeatedly, and what to do about it. And we said you have to push for the Corps project. The Corps project solves your problems almost overnight if you can get it built. And why that particular beach retreated as much as it did -- it lost 63 cubic yards of sand for every foot of shoreline at 8<sup>th</sup> Avenue in Ortley Beach -- kind of has to do with what Dr. Miller was talking -- this kind of undulation effect of the ocean shoreline as some parts of it erode back, some parts of it accrete seaward. And this has been going on for forever, and we first noticed this up at the University of Massachusetts back in the 1960s. A fellow called them *sand waves* or *beach cusps*. Essentially, beaches will erode, erode; and then meanwhile down 1,000, 2,000 feet to the south it is

advancing and accreting. And then this will switch back and forth in a fairly methodical sort of way.

And the final piece of this thing is project maintenance. Project maintenance is key to success -- just like taking care of your car. Avalon has probably done more beach nourishments than any other community in the state. They take it very seriously. They've even funded it by themselves, on occasion, to restore their beach. Because in 1987, I stood under the boardwalk and low tide was washing under the boardwalk in Avalon. And I watched wave runup in April 1987 and splash up against this guy's sliding glass doors. He popped them open in a minute, and I said, "Eighty thousand for it, right now, where she stands." He slammed the door shut.

Well, a couple sold their home for \$68,000 that spring. The guy bought it; did nothing, didn't even paint it -- nothing, zero. The next fall after the first beachfill was put in place with this New Jersey State bond money that was available at the time, he sold it for \$365,000. So that was the value of a beachfill to a property. And these older folks said, "We might lose it all, so let's just get rid of it." And they did, the guy buys it. He turns it around after staying there briefly in the summer for a nice profit -- just because the beach was now 400 feet wider than it had been.

If I may, I happen to have some information on questions that went by. A question about Ocean City's beaches: Ocean City is a bifurcated project. The Army Corps' jurisdiction extends from the inlet down to 34th Street in Ocean City. From 34th Street down to 59th Street is a New Jersey State project -- they are the key lead partner in beach nourishment. They did beach nourishment there in 1995 and they did it again in 2001. And they were preparing to come back again before Sandy

happened. So much of the issues related to the questions that were asked of the Senator about Ocean City, from the folks down the lower -- south Ocean City, as they put it, is the 50s blocks -- was maintenance issues. The beach was narrow, the dune had been already nibbled at by the 2009 storm series plus Hurricane Irene. So that is basically why some failure occurred at that point.

And in Monmouth County project, the Army Corps District in New York, when they first put this project together in the 1990s, dunes were optional. They weren't part of the requirement. Asbury Park never built dunes; neither did Belmar. Ocean Grove chose to let them occur and they basically put sand fences up, put the grass in, and just let nature do its job with this nice, wide beach they had to draw sand supplies from to build the dunes.

The dunes in Spring Lake had existed from my childhood. I used to do that boardwalk on a bicycle in the winter, and the dunes were always between the boardwalk and Ocean Avenue. And the boardwalk was seaward of Ocean Avenue. Well, that's kind of -- the reverse should be the case. The dunes should be in front of the boardwalk. And what happened was the waves came in, up the dune ramp, hit the front of the dunes, went straight up, lifted the boardwalk off of its supports.

So Monmouth County has to reevaluate the dune situation. If the Corps comes back to widen the beach again, are we going to make dunes part of the issue regardless of the impact they may have on views from the Belmar boardwalk, the Asbury Park boardwalk? And do they need to be 22 feet high -- at elevation 22, rather? And the answer is probably not -- with that nice, wide beach you probably can keep them lower.

And Atlantic City proved they could do a pretty good job on about a 50-year storm event with 14.75 feet elevation dunes. So the boardwalk in Atlantic City is at elevation 12. So the dunes at elevation 14.75, unless you want to lay on the bench and watch the view, are not particularly difficult.

The problem down there with all the hype that went out in the press is that they used a beach grass type that has a 1-meter growth height which added 3-plus feet to the height of the dune. You couldn't see through the grass, so basically Commissioner Martin said, "Mow the grass; it's probably part of the answer to that situation." So they're very glad they didn't lower the dunes back a year ago.

Mantoloking. We have worked for the Borough of Mantoloking for 20-odd years, starting after the 1991 perfect storm scenario. After Hurricane Irene, in front of Herbert Street where the breach occurred, there was about 15 percent of the existing dune cross-section left standing after Hurricane Irene. The distance from the dune crest to the first properties deck was 15 to 17 feet. That was all that was left. Now, they restored the Hurricane Irene dune losses by pushing sand that accumulated on the beach afterwards back up to restore the dune, but effectively the first high tide of Sandy just erased it completely. So the second high tide went straight through. And the dunes at Herbert Street were wide but only 14 feet high. And so it was rather easy with the wave runup in Long Branch at 24 feet; and in New Jersey's State Park -- Island Beach State Park -- 16.5 feet on the dunes that we actually measured -- GPS, the debris lines -- so we had wave runup that was just going to ride over top of a 14-foot dune.

SENATOR SARLO: Did the surge-- Did the bayside homes get it twice? Bear with me -- so the surge comes up to a level--

DR. FARRELL: Cuts through.

SENATOR SARLO: Cuts through -- right -- comes through. Comes across the Barnegat Bay--

DR. FARRELL: Right.

SENATOR SARLO: --into the mainland.

DR. FARRELL: Right.

SENATOR SARLO: Right? Into the mainland, until it hits an elevation that levels out. Hooper Avenue -- one of these streets back over here-- Hits one of these streets. Now from that velocity there is the reaction backwards. Am I correct?

DR. FARRELL: Most inlets that are cut in barrier islands are actually carved to become navigable inlets by the ebb flow. The flood tide-- The surge comes across everything like a big sheet wash, over everything.

SENATOR SARLO: Goes into the mainland.

DR. FARRELL: Goes into the bays, floods the lagoons. This happened in Pike's Inlet in Great South Bay in Long Island in 1992, that created Pike's Inlet that the Corps actually closed later on to stop the--

SENATOR SARLO: But the houses on the barrier island on the Bay, from talking to those folks, they got it twice. They got it from the surge coming across, but then they got it going back out.

DR. FARRELL: Yes, when the flow came out-- The fact of the matter is, it was basically a Depression-era construction crew that built Highway 35 that saved them from having a navigable inlet to have to close. The big slabs that made up Highway 35 were 8 inches thick, 16 feet wide,

and about 25, 30 feet long. And basically they just sat there on the-- They were undermined and collapsed, but they were like a huge resistance to further downcutting by the tides. So the ebb tide just flowed over it. I've got some of the pictures that were taken that show white water rapids right where Route 35 used to be. And having been there on the ground three days later, stood on these slabs all at funky angles -- but the dotted lines were still painted there. And the fish were swimming around our waders as we were looking at this and saying, "You know, this really saved their day, because these big slabs kept it from becoming a really deep inlet to have to worry about closing that" -- which would be hydrodynamically much more difficult than the major project they undertook anyway.

So there were some plusses and minuses to how things were done. Basically there were three breaches in Mantoloking: one at (indiscernible), one at Herbert Street, and one between Herbert and not at any particular street. We had a profile, and I think it's 1117 Ocean Avenue. There was not even a trace of foundation of the home left -- nothing -- just gone. And so the beach elevation, when I sat there with a GPS -- and this is supposed to start at 15.3 feet elevation, guys? We're standing here at 6. So we lost almost 10 feet vertically where this house used to stand. So in fact this wash-over effect put that sand in the community and into Barnegat Bay.

And finally, the FEMA wave model. The work that I've been involved with, just like Jon -- the base flood elevations, that modeling, is essentially complete and vetted by other-- The group that did the modeling has sent this out to be vetted by others. So the BFEs of 11, 8, 9, 10 have been thoroughly, scientifically verified.



SENATOR SMITH: They are the pre-Sandy--

DR. FARRELL: Yes.

SENATOR SMITH: --elevations?

DR. FARRELL: No, I'm talking about the advisory base flood elevations.

SENATOR SARLO: But they're pre-Sandy.

DR. FARRELL: Yes. Pre-Sandy, but they were vetted.

What hasn't been done -- which has everybody in my neck of the woods down in Cape and Atlantic County all up in arms -- is these kind of art-like drawings of where these coastal A zones are going to be -- where minor wave flooding -- and the V zones have been placed on the Bay side of the barrier islands.

SENATOR SARLO: Can you just define for us the difference between the A zone and the V zone?

DR. FARRELL: The V zone is an elevation achieved by the still water during the flood -- whatever that is. So that would be no waves, no nothing -- that's how deep the water gets. Then on top of that there is at least a 3-foot amplitude wave. It may be bigger, but it's what they define as where will that, at least a 3-foot wave, get to as it comes ashore. And so they've determined the limit of the V zone where the propagation over land of a 3-foot-high wave on top of the still water gets to.

SENATOR SARLO: So the V zone is a much greater--

DR. FARRELL: Way bigger risk.

SENATOR SARLO: Way bigger risk.

DR. FARRELL: Way bigger risk. And then this--

SENATOR SARLO: Is all the barrier island now a V zone?

DR. FARRELL: No, not even in the advisory maps. But a lot of the barrier island-- What has been added -- it has them all completely mashugana -- is the fact that they put a V zone on the Bay side of the barrier islands and on the mainland. So they've said that there will be 3-foot high waves in Barnegat Bay, Lakes Bay, all the rest of the bays down to Cape May, and that this will also generate 3-foot high waves that will impact structures on the land side as well as on the back side of the barrier islands.

SENATOR SMITH: Do you believe that to be scientifically valid?

DR. FARRELL: No.

SENATOR THOMPSON: Because they might as well put them on Raritan Bay.

DR. FARRELL: Well, basically, because I've been there afterward and the houses that were flooded -- no doubt about it, because there was a scum line on the buildings, on the Bay front, right on the Bay front--

SENATOR SMITH: I got the house.

DR. FARRELL: Yes. And there's this scum line on the house. If there were waves, there would be no scum line. These lines were snapped on every house, just like somebody had a chalk line and put this chalk line on each house and said, "Well, look at that. There's where the water came." I kind of said this up at the Commissioner's meeting up in the State House last week, that when the Bay is full, it's because the wind is out of the east, southeast, or northeast, and these Bayside properties are essentially in an offshore wind. The wind's blowing over their heads out

into the Bay. So there are no waves. Yes, I know waves occurred on Barnegat Bay when the water level was 5 feet deeper, because I have contacts in Forked River where the waves hammered their homes on the Forked River frontage there right along the Bay. So yes, maybe there's a validity to what V zones -- those parts.

But the wave modeling hasn't been done. They've said so; not done. They are not satisfied with the--

SENATOR SMITH: So why are we adopting the advisory base flood elevations, and now homeowners in the state are going to spend tens of thousands -- maybe even hundreds of thousands -- of dollars to raise their home if they're not scientifically valid?

DR. FARRELL: Well, they've done the science for inundation. Basically what they did was say, "Okay. Anywhere the water is 4 feet deep or greater during that -- based on that base flood elevation -- so where the water is 4 feet deep you can have 3 foot waves." That was the first cut to this. They have not dealt with obstacles, like rows of houses. You asked the gentleman whether he owned property on the shore. I happen to have three of them, so yes, I'm pretty familiar with the flood zones. The Cape May Point, for example: There is a little island, just standard A zone that the house is in; no problem with that. It's been that way forever. However, now I'm completely surrounded by a wave velocity zone of the intermediate wave height. So this is called the *coastal A zone*, which is: between 3 and 1-foot waves will be in this zone to attack the buildings. And it's like, "How are we going to get waves off of Lily Lake in Cape May Point?" It's about the size of this -- 10 times the size of this building. And so where are the 3-foot waves coming from?

It's basically not done yet. In fact, it was essentially that they pulled the roast beef out of the oven while it was still rare. And somebody likes well done meat and is not going to go for it. The whole thing with the base flood elevations is as good as it's going to get.

SENATOR SMITH: Do you realize how outrageous what you're saying is? No, really. There are going to be tens of thousands of property owners all on the shore that are going to be raising their homes, potentially spending money--

DR. FARRELL: Raising--

SENATOR SMITH: And by the way, not-- Some with good reason to do it.

SENATOR SARLO: Yes.

SENATOR SMITH: But doing it on partial and preliminary information is insane.

DR. FARRELL: I think we have a lot of people who would agree with you, especially down in Cape Atlantic County. Because we have had several meetings where code officials, municipal officials, engineers have all said, "Look. Is this real to expect 3 foot waves in a lagoon that's 900 feet long and 200 feet wide?" No, it's impossible.

But see, they've gone and done one thing. Here's the key ingredient. They said, "A 3-foot wave," and this is an old, 50s-style equation that's empirical, "A wave will break when the water depth is four-thirds the wave height." So when the water depth becomes four-thirds whatever height the wave is, the wave breaks. It's a mechanical problem. Okay, so what do four and three have to do with anything? Well, they have a 3-foot wave; that's why 4 feet of water was chosen to draw the line on

these maps, subject to editing with the obstacles -- which has never been done. That's where it stands.

SENATOR SMITH: Chairman, you now know why FEMA is not at this hearing.

SENATOR SARLO: Yes. (laughter)

DR. FARRELL: I may have said something that I may regret.

SENATOR SARLO: No.

DR. FARRELL: But it's still the truth.

SENATOR SARLO: No, no, no. Clearly-- the advisory flood-base elevation maps are due out a year from now. Clearly there's a lot of confusion. I feel for towns like Toms River and these other towns along the coastline who are trying to implement them. But clearly there's a lot of confusion on this, Senator Smith; you're right. There's a lot of confusion. The towns don't know how to implement them, apply them, or enforce them. And homeowners are in the same predicament.

So FEMA is going to have to play a role, as well as the DEP and the Administration because they've adopted them already. And they've been adopted by executive order. So at this point in time they are the rule of the land. And there is going to be need-- Some rules are going to need to be promulgated quite quickly out of the DEP on how municipalities like Toms River and others could interpret these.

DR. FARRELL: Well, I think the biggest place where changes will occur is in how far into the interior of the barrier island this coastal A zone is allowed to go; and will they demand a bayside barrier island ocean spit, here in northern Ocean County, V zone on the Bay side at all? Is it a valid exercise when you have winds that blow from the ocean to the Bay? If

there are going to be waves on the Bay they're going to be hitting the mainland, not Chadwick Island.

SENATOR SARLO: The dunes are critical here -- there is no doubt about it. These dunes are very critical to protect -- whether it's the barrier island or it's part of the mainland.

DR. FARRELL: Well, we did-- We took a look at the all the dunes in all of New Jersey. We did one of those awful things called an *earmark*, back in 2006, where we were tasked with what's called Lidar data, which is digital elevation mapping of big swaths of the shoreline. We put together-- We defined the dune, the seaward toe, the landward toe of the dune crest, and then we divided the shoreline up into 150-foot segments. So we basically got lot-and-block level analysis of where the dune will fail, when it will fail, and how well it will perform in these FEMA-rated storm levels. And most of northern Ocean County, unfortunately, saw 90 percent dune erosion in a 10-year storm event. And you can see all this on their-- I gave you the website; you can read all about it if you want to.

SENATOR SARLO: Dr. Farrell, thank you for your patience today. Thank you for being with us. And we're going to want to hear from you again -- yourself and Dr. Miller. The both of you have shed a lot of light on this subject matter, and clearly there is a long way to go here. But we appreciate you being here today. And we're going to probably call you back at one point in time, in the future.

DR. FARRELL: Thank you very much. It was a pleasure.

SENATOR THOMPSON: One question, Mr. Chairman.

SENATOR SARLO: Question?

Senator Thompson.

SENATOR THOMPSON: Of course, we're focusing here on the barrier islands and so on, etc.-- In my district we have Laurence Harbor and Cliffwood Beach, which is the Raritan Bay area. And there, I don't think they have dunes or so on.

DR. FARRELL: Cliffwood Beach does have a pretty nice little dune. It's a park.

SENATOR THOMPSON: They do have a dune in Cliffwood Beach?

DR. FARRELL: Yes.

SENATOR THOMPSON: Of course, they got hit pretty hard as it was, so I guess their dune wasn't that good.

DR. FARRELL: Well, it was. It was a bayside dune. They're seldom 20 feet high.

SENATOR THOMPSON: But a number of these areas -- now they are talking about V zones there in Laurence Harbor and Cliffwood Beach.

DR. FARRELL: Yes. Well, the fetch across Raritan Bay is as much as 12 miles from the northeast. So you can generate a 5-foot high wave in a 12-mile fetch with an 80-knot wind. So it's possible to get-- But the real short period waves are just nasty when they're right on your doorstep.

Thank you very much.

SENATOR SARLO: Thank you.

Former DEP Commissioner Mark Mauriello, now in the private sector as a consultant.

So Mark, you've heard a lot here today. Why don't you have an opportunity to kind of, for us -- some of the things that you've hear -- without criticizing any of our speakers-- But some of the questions we've asked, perhaps in your years of experience at the DEP -- fill in some of the blanks here.

**MARK N. MAURIELLO:** I'd be happy to.

As I told you outside, these remarks will stay folded up.

Just a few points on some of the questions. Senator Greenstein asked about this 100-year flood. It's being relooked at all the time. Every time FEMA amends a map you notice the flood hazard areas get more expansive and the heights get higher. So statistically, again, it's all done because it's an insurance program and it's all based on statistical risk. So that's being done continuously.

A few things that are a little bit of a concern. I'm saying this not just as the former DEP guy; I've had a lot of experience at DEP in coastal management. I'm a coastal resident my entire life. And I work very actively with the New Jersey Association for Floodplain Management, which I founded about eight years ago. But the concept of the acquisitions -- it's a little bit of a concern to me to hear that we might wait until we get an entire neighborhood to consider buying vulnerable property, especially at a time when these properties -- many of them have been completely destroyed or damaged to the point of not being habitable. Keep in mind that these homes didn't appear in these hazard zones overnight; they were incrementally built and every time a home gets damaged, someone's life is at risk, someone's business gets disrupted and, ultimately and for the Budget Committee's purpose, the taxpayers are subsidizing that risk. So if



we can incrementally pull people out -- willing sellers; and there are willing sellers there now who you probably wouldn't have heard from, from any other storm. And I know because I've been out there and I've heard from these people. People are looking for government to buy their property. They don't want to be there. I'm not saying everyone, and I'm not saying mandatory. I'm saying for willing sellers who we can compensate and allow them to relocate out, we never have to go in and rescue those folks in a storm. We don't have to subsidize the recovery and the reconstruction with tax dollars. Why wouldn't we want to do that and start incrementally pulling back where we can?

SENATOR SARLO: And you're saying that more for like people in Sayreville and some of these other areas that are prone to flooding, or are you talking about even people on the coastline, along the ocean?

MR. MAURIELLO: I'm saying wherever you have high hazard areas where vulnerable properties exist and willing sellers want out, we should consider getting them out.

SENATOR SARLO: Okay.

SENATOR SMITH: In effect, what you're saying is that between the Cuomo model and the Christie model, the Cuomo model is superior. We should get the properties while we can get them, as opposed to waiting until an entire neighborhood says yes as a group.

MR. MAURIELLO: Exactly. And it's not a Cuomo/Christie-- I've been saying this for 25 years. And we've successfully done this in New Jersey. We've purchased properties in places like Whale Beach and Sea Isle City -- the northern end; it's actually Upper Township. We've used public

funds from the Shore Protection Fund to buy properties so that people didn't put another house in a V zone that we know is going to get damaged, people are going to be at risk, and the taxpayers will ultimately assume the subsidization of that risk.

So I think the idea of the acquisition-- I know some folks say, "We don't want to go willy nilly, a house here or there." Strategically, if you concentrate on the most risky areas -- these V zones -- and you can incrementally pull back a little bit, you then have the opportunity to build the dunes that everyone says are really the most critical protection that we can find along the oceanfront.

There are two ways to get that dune and beach that you want to be there: one is spend hundreds of millions of dollars of public money to put sand in the ocean, trying to get a shoreline to exist where it doesn't want to exist. Or you can incrementally pull back and get that beach and dune to be in those restored areas for the protection of the community. And, unfortunately, we don't look at the long-term costs of these solutions. And if we were really true to ourselves and did a true cost-benefit analysis, it would clearly show that selectively pulling back -- again, not abandoning the island or running everybody out of their homes -- but selective relocation provides areas within which to build dunes and beaches at much less expense to the taxpayer over the long-term.

So I feel very strongly about that as an acquisition issue.

In terms of these advisory base flood elevation data that FEMA put out: We heard testimony a lot about that, and Dr. Farrell talked about the elevations themselves being valid. So in terms of the height, they're valid. The issue of this V zone designation on the back side of the barrier

islands is one that has not been vetted and is not, I would say, ready for prime time. I do disagree a little bit with Dr. Farrell on that. We did observe wave damage on the bay front of the barrier islands. And that was literally from this huge surge of the storm -- when the wind switched, the water got pushed from west to east and actually did damage to structures. Whether those ultimate maps will have smaller V zone areas -- my guess is that they will. I am sure that the ultimate maps will not have these expansive V zones throughout all these back sides like Chadwick Beach Island and many of these other communities.

But the one thing-- And I'm not here to defend FEMA, but in FEMA's defense on this issue, historically FEMA has underestimated the flood hazards in this state, and the result is people build houses that get flooded and get damaged. And, again, the taxpayers are the ones who pay for it -- whether it's disaster assistance, casualty loss deduction -- whatever it is, we're the ones paying for it. So FEMA is trying to be very conservative in putting this data out there and saying, "Look, if you're going to rebuild in the areas we know will be subject to hazards and flooding, you should build them higher and build them stronger." And I can't argue with that -- that philosophy.

Their maps don't factor in future conditions. They don't factor in sea level rise, which we know is real. They don't factor in continuing development in our watersheds that puts more water in our streams and raises the flood heights. So my advice to anyone who has talked to me about should I elevate or not? You should absolutely elevate, and it's not just because you're going to save money on flood insurance. It's so you can

sleep at night when you live in that house, and you're not worried about your house being swept away and your family being threatened by damages.

Another point-- You had asked about suggestions for legislative changes.

SENATOR SARLO: Yes.

MR. MAURIELLO: I feel very strongly-- I've had several conversations with Senator Smith. In terms of the CAFRA statute -- which was enacted in 1973, it was amended in 1993 -- it's a 20-year cycle. Well, guess what? We're another 20 years down the road. Two provisions I think we should seriously consider. One is the elimination of this explicit right to rebuild. Currently under the statute, if your house is destroyed by a storm you can rebuild it -- same place, location, size. And I don't know that that's really in the best interest of everyone when you think of the fact that there's no opportunity to look at whether rebuilding in that exact location is appropriate: is it safe, does it put the homeowner at risk, does it put the taxpayer at risk? That's something I think should be revisited.

The other thing is, we talk about the recalcitrance of these homeowners who won't sign easements for public shore protection projects. And that's outrageous. And I think you have great lawyers at your disposal, there are great lawyers as part of this Committee. But if I could rewrite that statute, I would write a provision that gives the State the opportunity and the direction to condemn easements on all these oceanfront beaches. Condemn those easements and make those areas available for these public projects that protect the entire community. I would argue that these homeowners are causing a nuisance. If I lived behind one of these people,

they're causing a nuisance. They're threatening my home and my family by holding out and not allowing a public project to go through.

SENATOR SARLO: Mark, the beach associations -- whether the towns-- The private beach associations that already have CAFRA permits, they sort of already are complying. They're almost there with the Army Corps of Engineer easements because they already have requirements to allow the public to access their beach. They have to have a daily access plan. They don't have to provide parking or bathroom facilities, but those who have CAFRA permits, they are already sort of close to what the Army Corps of Engineers is looking for. Am I correct in saying that?

MR. MAURIELLO: Not necessarily. I mean, the CAFRA permit just authorizes certain beach work to take place.

SENATOR SARLO: There is an access component in the CAFRA permit.

MR. MAURIELLO: There is. And I wouldn't want to look at how well that's being implemented and enforced, to be quite honest with you.

SENATOR SARLO: Okay.

MR. MAURIELLO: And I sat in the office that was responsible for doing that. I say that seriously.

The thing is that -- and we talked briefly about this earlier, Senator -- before the Corps was in the business of doing these projects, which are very costly, a lot of towns were doing this work based on guidelines that we adopted in the DEP rules 20 years ago. These standards have existed for how big a dune should be, how you build a dune walkover structure so you don't have these gaps in the dune; and it's a little bit of a

concern to me -- and you highlighted it earlier, Senator, when you said, "Are we going to wait for the Corps to come in to northern Ocean County and do this?" Look at the successes we've had in northern Ocean County: Berkeley Township, the Midway Beach section, Seaside Park, a large portion of the Borough of Lavallette.

SENATOR SARLO: Lavallette is a success story.

MR. MAURIELLO: We built those dunes using guidelines that DEP established, and I would hope these towns are running out there today using these established guidelines and successes to rebuild their dunes and not sitting back and waiting for the Federal government to come through and do that. Because, quite frankly, it's not going to provide the protection that they need now. And there are low-cost solutions that we can apply between the setbacks and the dune restoration that really will, over the long term, provide the protection with much less burden on the taxpayers of the state.

SENATOR SARLO: Questions?

Senator Greenstein.

SENATOR GREENSTEIN: Thank you.

Hi, how are you?

I just wanted to ask you: In terms of the, I guess, philosophical statement that homeowners, perhaps, shouldn't have the right to rebuild. What if a homeowner is willing to do it completely at private cost; there's absolutely no public money involved-- if that's even possible. Would you still feel that we should eliminate that right to rebuild?

MR. MAURIELLO: Senator, if I may. I wasn't suggesting that we prohibit them from rebuilding. What I'm saying is that reconstruction

should be regulated pursuant to CAFRA. I mean, the statute was intended and enacted to look at development in those hazardous areas. My point is that it should not be an exempt activity, because the condition of the land may have changed sufficiently that it should require review.

Now, on the other hand, if all homeowners assumed all risk at no cost, you might suggest, "Well, if you want to go it alone, go ahead," but what we see, and what we've seen through these storm damages, houses get damaged, they damage other houses. So unfortunately, we're all in this together and it's hard to really isolate the risk. If we could do that, I would feel much more comfortable about saying, "You want to take the risk, don't ask me to keep paying for it. We'll buy you out once, get you out of there, and that's fine." But to have to pay over and over again for repetitive damage I think is just unfair.

SENATOR GREENSTEIN: And then, the other question I would ask is, the maps that were put forth rather quickly -- obviously because people are in a rush to get some guidance here -- and then the Governor promulgated, I guess, the ordinance to carry it out-- Do you feel that those are going to -- that people should be able to depend on those? I know they said it has the force of law, but it's really a difficult situation because the whole comment period that FEMA would have gone through has not happened yet. Things could change.

MR. MAURIELLO: Right.

SENATOR GREENSTEIN: What should a homeowner do? And I guess that was asked of other earlier speakers.

MR. MAURIELLO: Yes. In the cases where the issue is just elevating the home to a higher elevation, I would tell any homeowner they

should do it. In the case of these new V zones where the requirements don't just involve elevation, they involve new foundation types -- pilings -- that's where it's creating a problem. And that article captured it. It's a cost problem and it's a logistical problem in that there aren't enough contractors who can do the work.

I would hope that people take advantage of funding through their flood insurance. It's called *increased cost of compliance*. Homeowners are eligible for a \$30,000 grant to help with that. I would hope that some of this--

SENATOR SMITH: First home though?

MR. MAURIELLO: What's that?

SENATOR SMITH: Not for a non-primary structure, correct?

MR. MAURIELLO: Correct. I'm sorry -- yes.

Also with this funding, I would hope that funds brought back to the State would go to help people meet those elevation requirements. But, quite frankly, that V zone issue is tough in some of these neighborhoods. I've had a lot of people say, "I'm just going to wait it out. I'm going to wait and see what that map ultimately says."

One point that I'd like to raise, and I haven't gotten clarification on this, but the emergency rule -- the order -- does not mention V zone at all in the order. And I have asked the question now three times and have yet to get an answer as to whether it just requires the elevation standard, or if it also requires this foundation standard in the V zone. And it's an important distinction. Whenever something is missing, I don't assume that someone forgot to include it. So I think it would behoove all of us to get an answer to that from the Department as to whether that



emergency order that was adopted includes a requirement to elevate on pile foundations in these newly mapped V zones. It would have been very easy to refer to the V zone construction standard along with the elevation standard. And it is very clear that elevation standards are part of that.

So I wish I knew the answer to that but, Senator, I think for those folks in the Chadwick Beach Island scenario and some of these back sides of the barrier islands, they may wind up just waiting to see. Because it is a costly thing and, ultimately, if it's not adopted then they would have expended a lot of money for something that really was not necessary.

SENATOR SARLO: And let's not forget we're focusing a lot on the coastal -- the barrier island. But there are areas and properties around the Passaic Valley Sewage Commission that got damaged, and Little Ferry, Moonachie -- a lot of areas -- Middlesex, Sayreville--

MR. MAURIELLO: Right.

SENATOR SARLO: There are a lot of areas that got wiped out, that were heavily damaged by the surge, that are in the same predicament with these flood elevation maps.

MR. MAURIELLO: Right. And those are areas that, quite frankly, don't get enough attention -- Woodbridge, Sayreville, the upper Raritan Bay. And you talk about Newark, Jersey City, Hoboken. The problems are significant up there, and the options are far less in a place like Hoboken than they are in a place like Dover Township, where you have the room to move. You can elevate a home. You're not going to elevate a block of row houses in Hoboken.

SENATOR SARLO: Yes, the quote-- There's a woman here on the front page of the *Record* from Moonachie -- Joanne Van Saders -- who is

still not in her home. Her quote is, “Do my husband and I have to rebuild our home? Do I spend \$100,000 to raise it? Is my flood insurance going to go up \$30,000? Common sense tells me that none of this makes sense at all. I don’t have the money for any of it.”

MR. MAURIELLO: It’s a tough situation. But one thing that it illustrates in that part of the state -- and I know that’s your home turf -- is that reliance on these berms and levees is a little bit foolish. And it’s unfortunate people get this sense of security because they live behind a berm and they think they’re protected.

SENATOR SARLO: Well, I think they’re all realizing that there’s no such thing as an “engineered berm” or dune--

MR. MAURIELLO: Engineered anything.

SENATOR SARLO: There’s nothing.

MR. MAURIELLO: Look at Monmouth Beach and Sea Bright. It’s the most engineered shoreline we have in the state. The seawall-- That beach has been renourished probably 10 times at a cost of many, many millions of dollars. And it probably had the worst damage in Monmouth County. So it’s important to remember that.

SENATOR SARLO: Thank you, Mark, and we look forward to hearing from you more in the future. And thank you for trying to fill some of these gaps. I appreciate it.

MR. MAURIELLO: I appreciate the opportunity.

SENATOR SARLO: Okay, our final two speakers-- I’m just going to have Senator Greenstein chair for a moment here because I have to step out and make a phone call. We’re going to ask Clint Andrews from the Bloustein Center for Green Building to come up; and is Chris Sturm from

New Jersey Future still with us? Okay. Chris, you could come up. And then after-- We'll let Dr. Andrews go first and then (indiscernible).

So, Dr. Andrews, you patiently have waited here. You've heard from folks who've been on the ground -- the folks from Toms River, the folks dealing with the private owners. You've heard from academic experts. You heard from the Army Corps of Engineers. What do you make of all of this? What direction should we be heading in here?

**CLINTON J. ANDREWS, Ph.D.:** Well, I don't presume to give you advice on that. But I do have a couple of thoughts that really draw from my experience as a planning and policy researcher.

And there's some written testimony, which I won't go through except to highlight a couple of issues that have come up when I've talked about, what should planners be doing and what should the planners be asking the State Legislature to do in the short run and in the long run, as we go forward.

And part of this is reminding ourselves that this should all be about the future and not reliving the past. And so what that means is that, in the short run, there is a challenge that our well-meaning regulatory structures have put us into that we need to address. And one example is something that we heard a little bit about already, which is that we end up telling people to elevate their homes but then having height restrictions that limit the ability to do so. There are a number of other things like that hidden in our zoning ordinances that are basically paralyzing anyone's ability to act, because every one of those variances has to go through a local board -- which can't even meet in many cases because people aren't around. And so it feels like there's something that needs to be done to help these

overwhelmed local boards, and State funding to unchoke that process might be worthwhile.

There's a related issue which gets into what each profession thinks they own in the regulatory process, and that has to do with measuring: "What is that base flood elevation anyway? How high is my house above the mean water level?" And this is something that, right now, homeowners and towns are required to turn to professional surveyors when, in fact, we have an awful lot of GPS and Lidar data that is widely available, and the GIS professionals could also be doing similar work to expedite another bottleneck.

And then a final short-term thing that I want to mention is that there is an instinct among many of us to rebuild exactly what was there -- to get back to life as it was. And that's clearly not going to work; life is different than it was. And yet communities are having trouble having that conversation. And so I think there could be a role for a State-funded grant program to try to get some visioning activities going within the towns and to have those communities, whose leadership wants to encourage that kind of a discussion, do so.

For the longer run, I'm finding myself in the unpopular position of saying we ought to be listening to FEMA a little bit more. And that comes from first hearing Tony Broccoli describe how relying on the past 50 years isn't a great prediction of what the next 50 years is going to bring; and acknowledging that FEMA regularly updates its maps. This isn't a one-time event. This is something that happens every so often, and we should expect a moving baseline, in other words. And we should be encouraging people to think about not what's the minimum that the map says, but what is a

reasonable expectation for where I should be rebuilding and whether I should be rebuilding.

And this plea for trying to bring the best science and the best engineering to the process does run up against a very powerful political obstacle -- which involves the desire of municipal officials to keep their ratable base and to be able to balance their budgets in the short run. And it's an understandable concern, clearly. But it also should not be overruling the long-term objectives of encouraging people to rebuild in the places where it makes sense and discouraging them in other places.

There's another part of the politics which I think is difficult to talk about and difficult to bear, but undeniable. And that is really that there are some people who are going to be able to afford to rebuild to meet the new standards, and others who will not be able to afford to do that. And over the past couple of hundred years we've gone from having disaster management and response be an entirely local activity, to the case today where State and Federal governments play very big roles. And as part of that we managed to put a few perverse incentives in place that encourage risk taking. And so I think we -- and really you, as legislators -- have that challenge of trying to find that balance of discouraging risk taking without acting in an inhumane way.

Now, this is something that plays out differently in different parts of the Jersey Shore. A lot of the barrier island communities are, in fact, largely seasonal, second homes. And anyone who has a second home probably is not going to be discouraged from getting their oceanfront view if they can afford to rebuild. And we should let them, but just make sure that they don't expect any help.

There are other places, and I see this especially in the Monmouth County bay shore towns, where these are poor communities; they live on thin margins, houses are only there because they were grandfathered in, essentially, and the tax base also depends on them because these are the year-round residents. And basically, from a fiscal impact point of view, a summer home is a great ratable -- lots of revenues, few expenses. In the bay shore communities, those homes bring both revenues and expenses, so in those areas it's actually-- We've been doing some calculations. I've had a group of students working through this for three bay shore communities. We've been seeing that if we go slowly on rebuilding, and allow some buyouts, and discourage rebuilding exactly in harm's way, that municipal revenues decrease but municipal expenditures decrease even more. And so for many of those poorer communities -- the year-round communities -- the fiscal argument, I don't think, really carries weight in the long run.

So those are some observations I have. And my sense is that we need to encourage a little more preparation for what we know is a riskier future on the shore. But that it's going to have to vary a little bit by community. And so that suggests getting the superstructure in place at the State level, and then allowing a lot of autonomy in how it gets carried out.

Why don't I stop there and see if there are any questions.

SENATOR GREENSTEIN: Thank you very much.

Questions? (no response)

Okay, well, thank you. We really appreciate it.

And next is Chris Sturm, New Jersey Future.

**CHRIS STURM:** Yes, hi.

SENATOR GREENSTEIN: Next and last.

MS. STURM: Next and last.

Thank you for inviting New Jersey Future to speak to you today. I passed out my PowerPoint presentation. I'm going to skip over some of the introductory stuff. You've been here a long time.

But I wanted to just, first, point out that there's some great polling that's been done that shows the public is really supportive of thoughtful rebuilding activities -- done by the Monmouth Polling Institute.

I want to highlight two approaches for smart rebuilding that are going to work and make sense over the long run. One, is just looking at opportunities to attach strings to the public spending. Make sure that the right criteria are in place. And the second is to integrate the rebuilding activities with existing government decision making. Because that's going on; that's going to go on in the future. And if you ignore it you're less likely to be successful.

There are some things I think you can poach. New Jersey almost had a new State plan; the Christie Administration proposed a State Strategic Plan that it was going to adopt in November, and at the very last minute pulled it off the agenda because they wanted to make sure it addressed the storm and rebuilding. It's ironic in a way, because now that we're going to be spending these billions of dollars we need a strategic approach and framework more than ever.

But if we can't have the full plan, I think there are some good things in there that the Legislature could promote. One is a set of values -- Garden State values to guide rebuilding, to make sure that what we're getting is equitable for everybody, including the people who can't afford to

rebuild, who Cliff was talking about. That it's more resilient, going forward, in the face of rising of sea levels and extreme weather. And that we're getting the biggest bang for our buck in terms of walkable communities, better transportation, and so forth.

The second thing that the State Strategic Plan proposed was having the State agencies each prepare implementation plans to show how they were going to change their business of regulating, and planning, and spending to reach the goals of the plan. That mandate could be revised to ask the agencies to prepare implementation plans for how they're going to do rebuilding; and they could be presented to the State Planning Commission for public comment. There is not enough public dialogue on shore rebuilding at the State level. And certainly the State Planning Commission is one potential body that could provide for that kind of venue.

At the regional level, Mark Mauriello touched on the opportunity to update the CAFRA statute, which is long overdue. The CAFRA statute created a Shore Protection Fund, and then said those monies had to be spent according to the Shore Protection master plan -- which embodied the latest sciences of 1981 on dune widths and so forth. That plan is over three decades out-of-date. Senator Van Drew has introduced legislation which -- the text isn't released yet, but that would update that plan. That makes sense. We shouldn't be spending all this money without incorporating scientific understanding and a regional look at how to do it best.

There has been talk about a Coastal Commission and what that would offer New Jersey residents. I think it provides a way to bring the best



resources to bear on this region -- which is really unique in New Jersey -- to take the scientific understanding and put it in the format that municipalities can take advantage of. We've got great examples of regional planning in the Pinelands, Highlands, and Meadowlands. Those all try to advance goals set by the Legislature. A Coastal Commission would have different goals: promoting tourism, commercial fishing, as well as resilience and other things. So that's something to look into.

At the county level in New Jersey we have every county just about ready to formally adopt sewer service areas, which provides a great baseline for development. We have 15 counties updating their hazard mitigation plans right now. We have one county which has adopted a new map of growth in preservation areas pursuant to the State Development and Redevelopment Plan, or the new strategic plan. Those things should be integrated. Our hazard mitigation plans need to address where we grow: are we pulling back, are we developing more intensely in good locations, and so forth.

When counties do that work, it really helps their towns that don't have the same staff capacity or GIS sophistication. So it's important that counties do it in an integrated fashion. When we go down to the municipal level, municipalities should really be either required or strongly encouraged, or sort of bribed, I guess, if you will, to update their master plans, to recognize this new reality of rising sea levels and hazards. And to also adopt a hazard mitigation element, especially if they're accepting State and Federal money for rebuilding.

They should be given some funds to make the necessary zoning changes, as well as to update their stormwater management plans. The

world has changed a lot since the mid-2000s when the stormwater management rule was adopted. We know a lot-- We've seen tremendous flooding. We know a lot more about green infrastructure approaches that can complement gray infrastructure at a lower cost. But that costs money, and so towns should be given money to do that as well.

And they should also be funded to update their capital investment plans so that the planning is reflected in the local spending.

There is some other legislation that you have before you that's been introduced that I think can help. This is just sort of a hodgepodge, but a few sort of low-hanging fruit. Redevelopment is a tool that some towns can use to rebuild. But when they do, it raises the specter of eminent domain, which sets everyone's teeth on edge. There's a bill, A3615, which would allow towns to designate what's called a *non-condemnation redevelopment area* where eminent domain is not even an option. And so it makes it easier to move forward with redevelopment without raising local fears.

Senator Smith has introduced legislation that would allow New Jersey to catch up with its neighboring states New York and Pennsylvania in authorizing stormwater utilities so that we can begin to manage our stormwater better to address flooding -- especially our urban areas with combined sewer overflows. Places like Hoboken and Jersey City are really going to suffer economically if they can't have access to these tools. The Governor has not supported it, but we need to find a way to break through that opposition, whether it's through pilots or something else.

And finally, back to the land preservation that Mark Mauriello was talking about. Certainly we need funding for buyouts through Green Acres and Blue Acres programs. There are also planning tools that towns

can use that can allow for preservation without public funding. And a bill, A3761, has been introduced to improve cluster development tools. It's broadly supported by the builders, the League of Municipalities, Farm Bureau, and so forth. I hope you all will support that bill.

Transfer of development rights is a great tool, as you both know. That can be streamlined. And we'd be happy to talk to you about how to do that.

Finally, I just want to make you aware of some resources at New Jersey Future. We are hiring a local recovery manager, in concert with FEMA, to work in a shore community to help them access government funds and figure out how to spend those funds well at the local level. And we're hoping to get some private foundation funding to hire more of those folks.

We also have a number of reports on our website, and we are otherwise interested in supporting you all as you move forward.

Thank you very much.

SENATOR SARLO: Questions?

Bob, I think.

SENATOR SMITH: Just one on the Coastal Commission.

Do you envision a Coastal Commission with land use regulatory powers?

MS. STURM: I mean, in a perfect world, that's what we would have. What would still be a big step forward would be a Coastal Commission that was primarily a resource, that could pull together the research-- You know, how do we build things on stilts and have communities that work, for example? What are the impacts of rising sea

levels on these ABFEs, and what should towns really be planning for? Advising towns on how to deal with the V zones; where do they make sense and where do they need adjustment? So if nothing else, that would be helpful. But we would prefer to see a stronger model.

SENATOR SARLO: With regards to these flood base elevations -- the advisory flood base elevations -- this is sort of new territory here for us, with adopting-- We've adopted them; essentially, they've been adopted via executive order. So they've been adopted. FEMA has yet to issue-- Could FEMA modify these any further? Could you see FEMA modifying these any further, based upon engineering, public outcry? I mean, at this point in time, do they get modified any further?

DR. ANDREWS: I think they should be expected to change them a little bit more in this current round. But then we're going to have another round in a few years, and so this is-- It's their right, and we want them to do it. We want them to tell us where the risks are. And so I'd say of course they're going to be fine-tuning this round over the next year. And my expectation is that the executive order will eventually be displaced by something else that's more formal and/or fully thought through.

SENATOR SARLO: One final question: Other areas have been damaged and ravaged by storms along coastlines. Now, New Jersey's unique: We have 567 municipalities; everybody independently acts as their own little authority and agency and planning agency. In some of these other states was the rebuilding effort -- was it smoother when there was one authority dictating or authorizing how the rebuilding effort should be implemented?

DR. ANDREWS: What I have heard from colleagues in other parts of the country is the answer is no. And it has to do with the fact that even if you have one larger area, you still have the same political battle. You still have the same interests that have to fight it out and figure out who is getting what. Are we rebuilding casinos or housing? Are we protecting this stretch of the Mississippi or that stretch? And so, in that sense, I don't think it's any harder here. What's a little bit more of a challenge is that we've carefully distributed decision making so that we have a lot more coordinating to do. And in a way it's the same challenge that we've seen with land use planning in New Jersey, where we've--

SENATOR SARLO: We have a lot of chiefs.

DR. ANDREWS: Exactly. But realistically, it's a private real estate market and every homeowner is a chief. And so this is a situation where regulation is, at best, kind of a signal of where we see the public interest lying. But, in fact, it plays out homeowner by homeowner by homeowner.

SENATOR SARLO: And I think -- and we said this earlier -- I mean, there are a lot of communities, Bob, that-- There is no focus on a lot of these other communities like Woodbridge and Sayreville and Moonachie. They're sort of getting-- We all focus on the tourism industry, the beaches, the glitter. It's great to talk about the beaches. As I said before, it's sexy to talk about the beaches and the glitter; whereas a lot of these other areas, these towns that were devastated -- you just hope they don't get forgotten in this process.



DR. ANDREWS: Yes.

SENATOR SARLO: Thank you. Thank you for being here and thank you for your patience today.

We are adjourned and we will see everybody back in Trenton.



**(MEETING CONCLUDED)**

## APPENDIX



## Coastal Planning & Rebuilding in the Aftermath of Sandy


***Jon K. Miller, Ph.D.***  
*Research Assistant Professor*  
*Assistant Director NJ CPTAS*  
*NJ Sea Grant Coastal Process Specialist*



Testimony to Senate Budget & Appropriations Committee  
Toms River, NJ– February 11, 2013


Thank you for the opportunity to come talk to you today about an extremely important topic that has the potential to shape the future of New Jersey in the coming century.



**STEVENS**  
INSTITUTE OF TECHNOLOGY


## Background

- 37 year NJ resident
- Coastal Engineer
- Professor
- NJ Sea Grant Coastal Processes Specialist
- Assistant Director NJ Coastal Protection Technical Assistance Service (NJ CPTAS)

DAVIDSON LABORATORY


Testimony to Senate Budget & Appropriations Committee  
Toms River, NJ– February 11, 2013

By the nature of being invited here today, I am aware that some of you already know who I am and what experience and expertise I bring to the table, but for those of you who don't I wanted to provide a little background. I have been a NJ resident for 37 years and have been visiting the Jersey shore consistently over that time. I have been involved in the study and profession of coastal engineering for 17 years. I have a Bachelor of Engineering in civil engineering with a concentration in structures from Stevens and a Masters and PhD in coastal engineering from the University of Florida. I have been a professor of coastal engineering at Stevens for the past 8 years. Through NJ Sea Grant I have been providing education, outreach, and technical guidance to a variety of coastal stakeholders over the last 6 years. One of Sea Grant's national themes and the one I am most intimately involved with is Hazard Resilient Coasts and Economies, a topic which is especially relevant to this hearing. Finally as Assistant Director of the New Jersey Coastal Protection Technical Assistance Service (NJ CPTAS) I have been working with the state and communities along the Jersey shore providing technical assistance on issues related to coastal hazards and shore protection for the past 8 years.

**STEVENS**  
INSTITUTE OF TECHNOLOGY

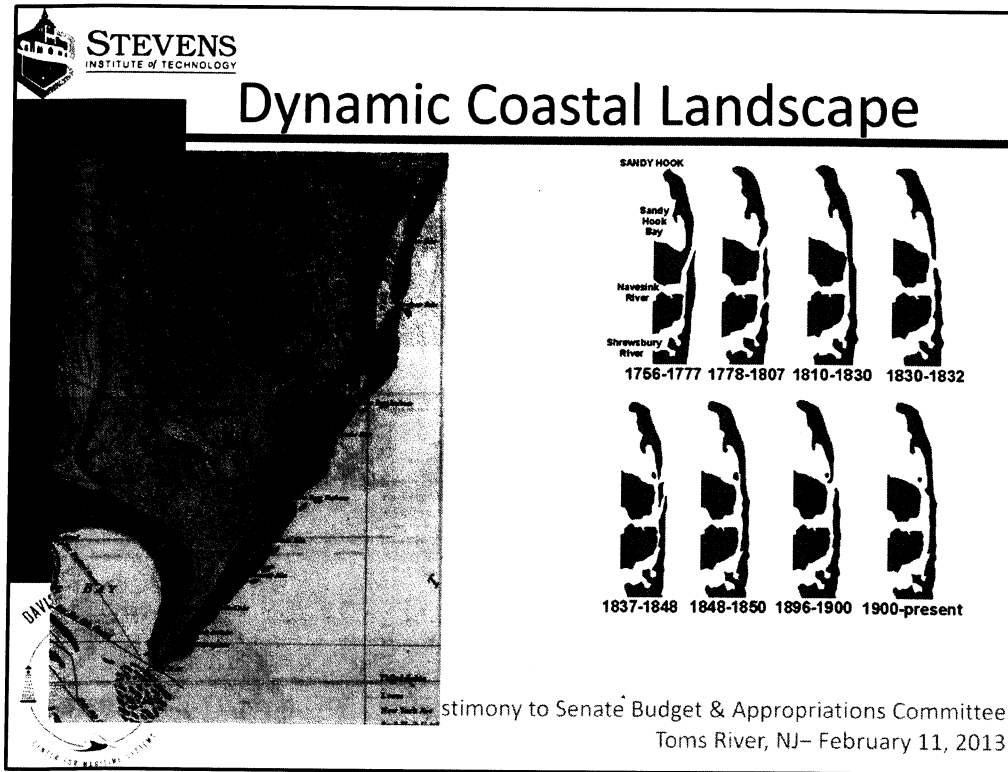
## Objective

- Coasts 101
- Storm Impacts
- Responses
- Examples, good and bad

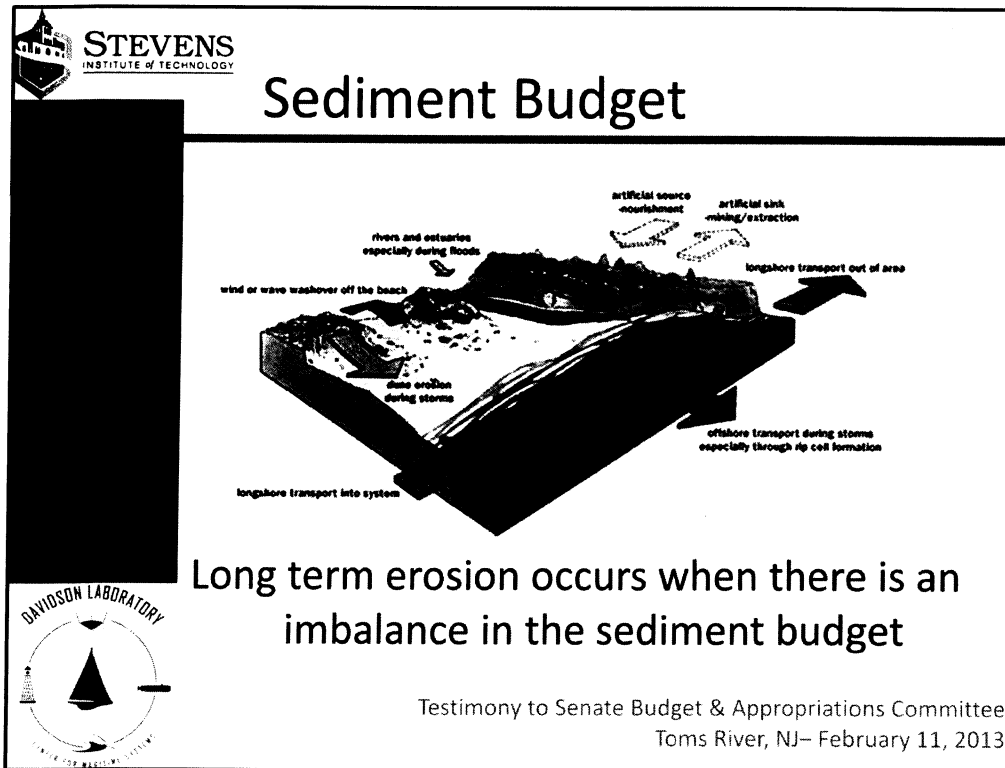
DAVIDSON LABORATORY  
COASTAL & OCEANOGRAPHIC ENGINEERING

Testimony to Senate Budget & Appropriations Committee  
Toms River, NJ– February 11, 2013

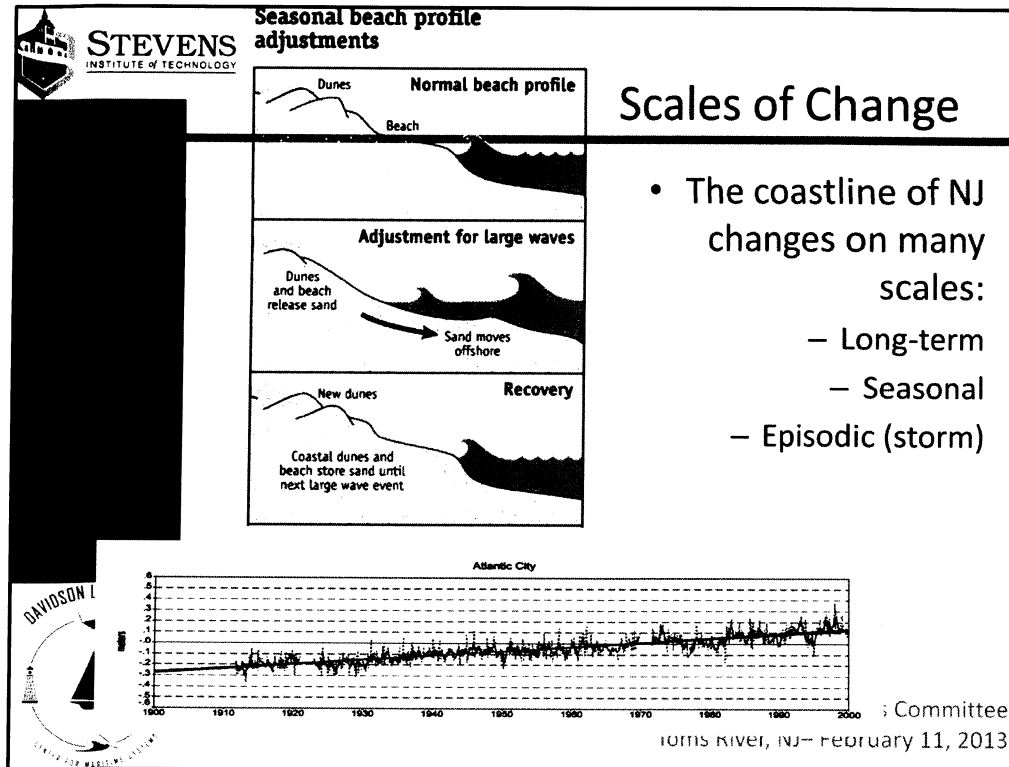
What I hope to relay through my testimony here today and through any follow up questions, is the importance of making sound decisions during the rehabilitation process that will increase the resiliency of the NJ coast to future storms and other hazards. You'll notice that I will purposely try to avoid using the term rebuilding in my testimony, because it implies that we will shortsightedly try to put back what Sandy has taken down. I believe we have a unique but very short lived opportunity to rethink how we rehabilitate the Jersey shore in a way that preserves everything that is special about it, but that takes advantages of opportunities to make it more resilient, and sustainable for our children and grandchildren.




The first thing to keep in mind, is that coasts are dynamic and left to their own, they will change in dramatic ways. These changes can occur slowly over time, or dramatically during storms like Sandy. The breach at Mantoloking is perhaps the most vivid example; however slower less recognizable changes such as the gradual lengthening of Sandy Hook are occurring all of the time.



This slide is perhaps the most simple illustration of why beaches erode. Stable beaches, like a stable checking account, have an equal amount coming in and going out. The sources and sinks vary, but the concept is straightforward. Beaches erode, just like your checking account when more goes out than comes in. This can happen suddenly or slowly over time, although we typically feel it more in both cases when it happens suddenly.





Long term coastal changes typically result from a reduction of sediment supply either from coastal rivers, bluff erosion, or offshore sources. Seasonal changes are generally temporary and are essentially readjustments of the sand to the seasonal difference in wave climate. Episodic changes are the dramatic changes we saw during Sandy, and to a lesser extent during the November 2009 and March 2010 Nor'easters. The problem with these types of changes is that they can remove sand from dunes (nature's piggy bank) that can take years to decades to replace. Even worse, extreme storms like Sandy can permanently remove sand from the system that will never come back naturally. Some of this sand ends up in the street and people's houses and can be put back by mechanical means, some ends up in the back bay, and some is removed far enough offshore that it is lost forever. Estimates in Mantoloking by Stockton and Monmouth Beach by Stevens show losses of 500,000cy from the dry (above water) beach. Together this amount of sand would fill MetLife stadium about half way.

**STEVENS**  
INSTITUTE OF TECHNOLOGY

## Dramatic Storms in the 20<sup>th</sup> and 21<sup>st</sup> Centuries

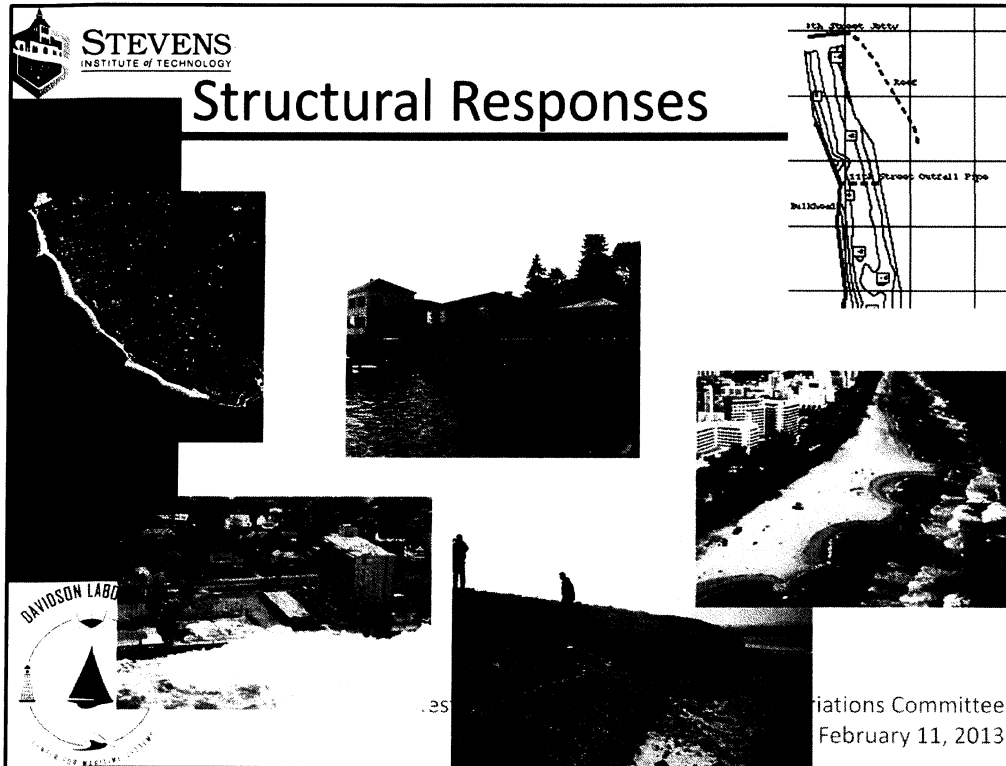
- Hurricane of 1944
- 1950 Nor'easter
- Hurricane Donna 1960
- 1962 Nor'easter**
- Hurricane Bell 1976
- 1984 Nor'easter**
- Hurricane Gloria 1985
- October 31, 1991**
- January 4-5, 1992**
- December 10-14, 1992
- March 13-14, 1993
- Veteran's Day Storm 2009
- Hurricane Irene 2011
- Hurricane Sandy 2012**




DAVIDSON LABORATORY

Ben Keiser, NJ DEP  
Testimony to Senate Budget & Appropriations Committee  
Toms River, NJ- February 11, 2013

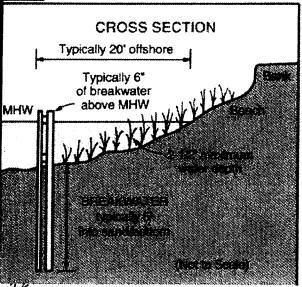
Sandy is not the first, nor will she be the last storm to significantly impact the NJ coast. Early on, less coastal development meant relatively lesser impacts. Specific storms are highlighted to emphasize some of the State's responses, which have helped reduce our vulnerability. After the 1962 storm, many structures south of LBI were rebuilt to more modern design standards which include more storm resistant pile foundations. After storms in 1984 & 1985, the NJ Beach Profile Network (NJBPN) was established. The NJBPN is housed at Stockton College and provides seasonal monitoring of NJ's beaches at 105 locations. After the two major Nor'easters in 1991 & 1992, the NJ State Legislature established the Shore Protection Fund which was integral in providing storm protection to many areas of the NJ coast that fared well during Sandy. How we respond to Hurricane Sandy is the chapter that is currently being written, in part here today.

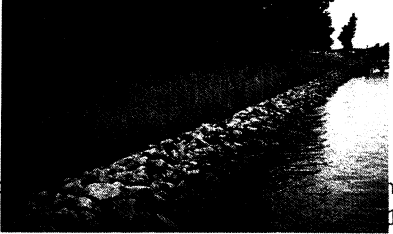




There are many different structural approaches to stabilize eroding shorelines and in NJ we have tried most of them. These range from very traditional to innovative, and I think we need to consider a range of solutions that incorporate many of these alternatives. The truth is that each site is unique, and the solution that works in one location may not in another. In particular I believe we need to find a way to encourage innovation in planning, engineering, and construction, but not experimentation. The State of Florida has a program set up specifically to do this which might serve as a model, should NJ ever consider formally establishing such a program.

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# Natural Approaches “Living Shorelines”



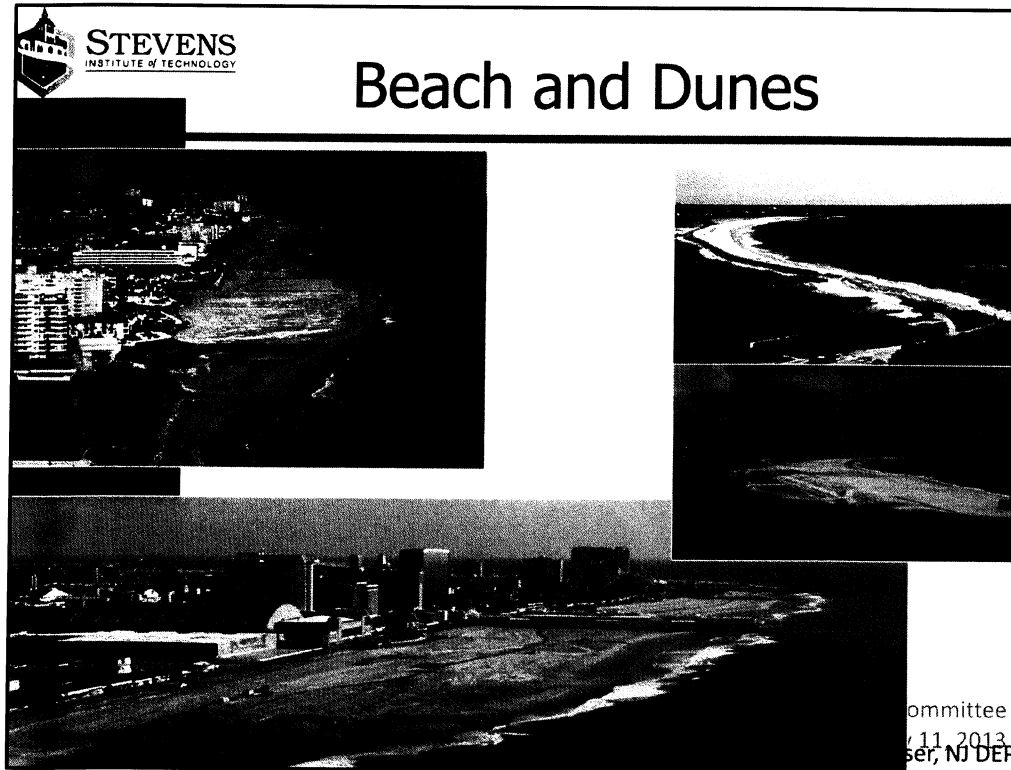


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Testimony to the Committee on Water Resources, January 1, 2013

Natural approaches or so-called “living shorelines” approaches are erosion control measures that seek to work with nature to provide protection, while also providing natural habitat. Living shorelines approaches tend to be most appropriate on lower energy coasts in bay shore and riverine environments and function by reducing the energy impacting the coast from storm surges and waves. North Carolina, Virginia, and Maryland have implemented many projects which have survived significant storms including hurricanes. New Jersey has implemented relatively few living shorelines projects for a variety of reasons; however there are many in the planning stages. Recently the NJ DEP has taken significant steps towards making the permitting process easier for these innovative and potentially very beneficial projects.





Beach nourishment has become one of the preferred methods of shore protection, particularly on ocean fronting coasts. The National Research Council has endorsed this method, which is the only shoreline stabilization approach that adds sand back into the system. Going back to the slide on the sediment budget, beach nourishment is like getting a sudden influx of cash to help stabilize your checking account. In the long run, it doesn't solve the erosion problem, however it temporarily stabilizes the situation. All Corps of Engineers projects include scheduled renourishments (typically every 3-7 years) that are triggered when the beach erodes past a critical point. Most, but not all Corps projects, also include a dune. From an environmental standpoint, beaches & dunes tend to provide better habitat than wood, steel or rock structural alternatives.




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## How Much? & How Much?

- Typically 30-200 yd<sup>3</sup>/lf (>100 ideally)
- Mobilization \$2-\$5 million
- Costs, \$5-\$15/cy typically

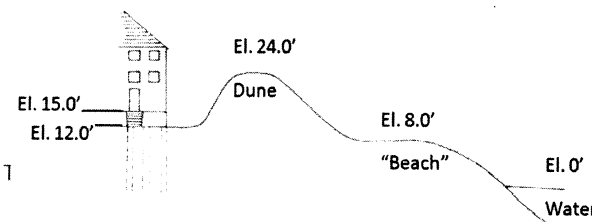
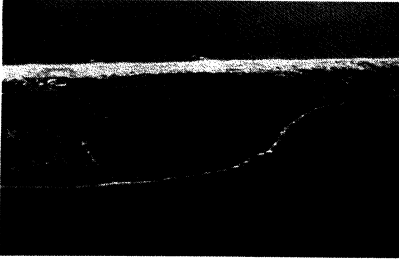



Small beach nourishment projects can be constructed for around \$5 million; however the smaller the project, the shorter it lasts. The general rule of thumb is that if you double the length of shoreline protected, the longevity of the project increases by a factor of four. Ideally large sections of the shoreline are constructed together, and indeed the projects are designed with this in mind. The recent experience at LBI provides an excellent example. While the small sections that were nourished in Surf City and Harvey Cedars proved their worth during Sandy, had the whole island been nourished at once, the sand would have lasted much longer. Building sections of a project is like building a table one leg at a time. Will it stand? Perhaps momentarily, but will it ever be as stable as if it were built with all four legs like it was designed? No.

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## Natural Dunes in New Jersey

- Dunes are typically 6-15 ft high
- Consist of one primary dune and occasionally a back dune
- Width varies but are typically less than 200 ft.



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Natural dunes function as nature's piggy bank. We make deposits today that we ideally won't touch for many years to come. When the rainy day does come however; we crack the piggy bank and hopefully we've been diligent and saved enough. One of the biggest misconceptions about dunes are the typical heights. We've done a bad job in the past talking about the difference between height and elevation. As the sketch shows, dunes typically have elevations of 20+ ft, but elevation is measured from the water, not the beach, or the boardwalk, or someone's patio. Heights are more typically between 6 & 15 ft when measured from one of these reference points. Unfortunately, healthy dunes can only exist with a wide fronting beach. The sand that builds the dunes comes from sand that is blown along the beach. Scraping or lowering the beach to form a dune just makes the base of the dune that much more vulnerable to wave attack and collapse. There are ways in which dunes can be managed however; and many communities use seasonal sand fencing and/or dune planting to try to strengthen their dunes.

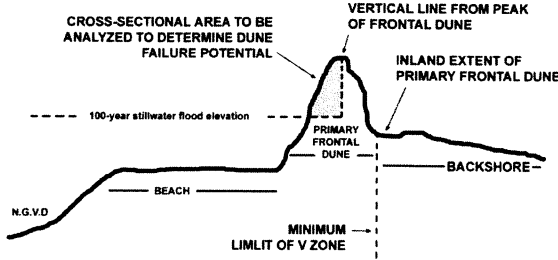


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## Protective Capacity of Dunes


- 540 ft<sup>3</sup>/ft of beach required in frontal dune reservoir above the 100 year base flood elevation (FEMA)

**FEMA 540 RULE**




FACTORS TO BE CONSIDERED IN DETERMINING  
DUNE FAILURE POTENTIAL AND V ZONE MAPPING

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Testimony to Senate Budget & Appropriations Committee  
Toms River, NJ- February 11, 2013

How big does a dune need to be? FEMA has established the so-called 540 rule. The rule states that a dune needs to have 540 ft<sup>3</sup>/ft of sand in the cross-sectional area of the primary frontal dune above the 100 year still water flood elevation in order to be considered an effective barrier to storm surge and wave action. Most NJ dunes failed to meet this requirement prior to Sandy, and post-Sandy even fewer will meet this criteria. In addition FEMA's remapping of coastal flood risk will result in higher base flood elevations reducing the cross-sectional area that counts towards the calculation of the 540 rule.

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## Shore Protection Fund


"To protect existing development and infrastructure from storm surges, sea-level rise and shoreline migration through dune creation and maintenance, beach nourishment projects, and construction and repair of shore protection structures."

**\$25 million dedicated annually**  
*Realty Transfer Tax (N.J.S.A. C.13:19-16.1)*

**Federal Projects** – Studies, Storm Damage Reduction/Shore Protection, Environmental Restoration

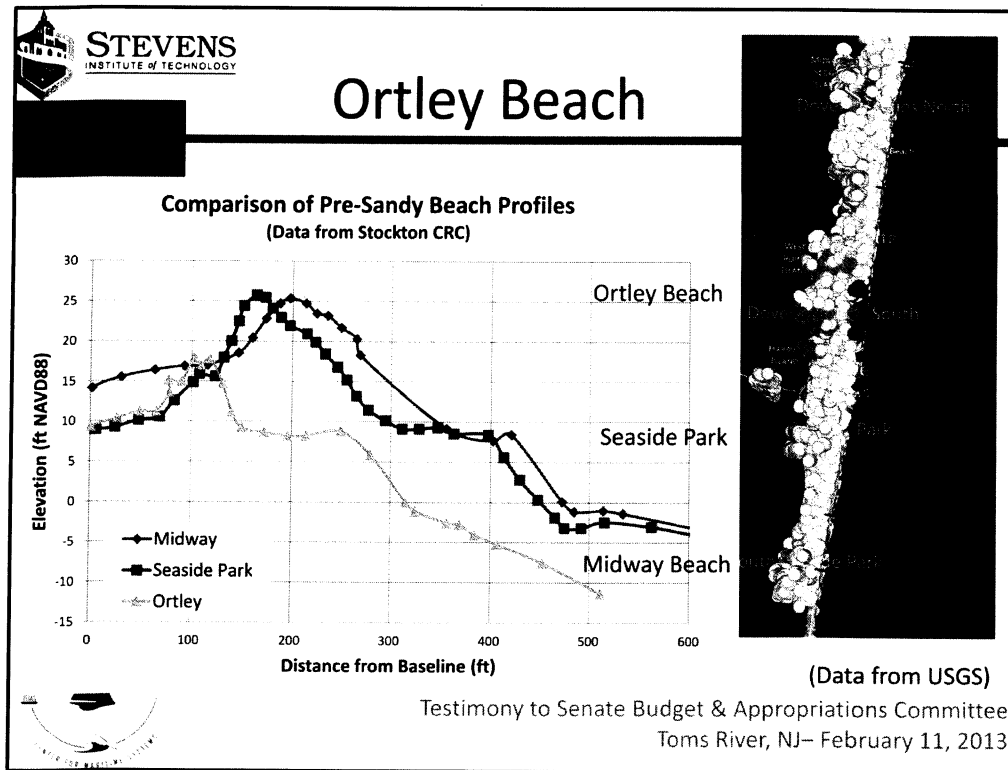
**State Projects** - Storm Damage Reduction/Shore Protection

**Professional and Technical Services** – Stevens, Stockton, Fish and Wildlife, New Jersey Geological Survey

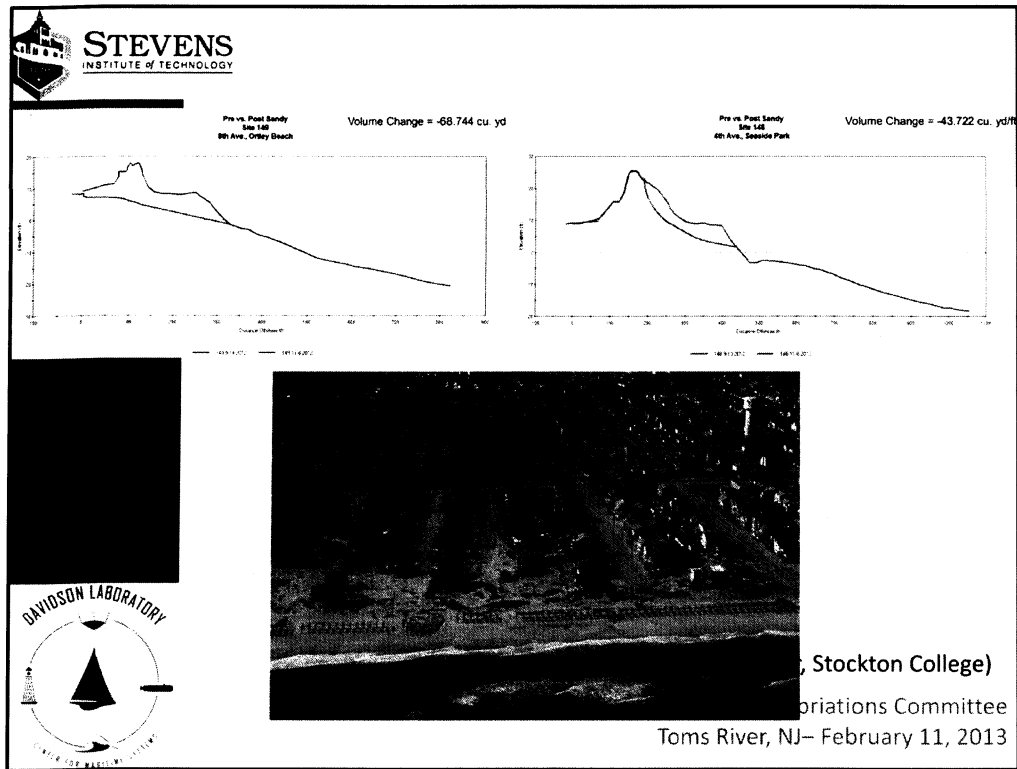
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OF MARINE SCIENCE

Ben Keiser, NJ DEP  
Testimony to Senate Budget & Appropriations Committee  
Toms River, NJ– February 11, 2013

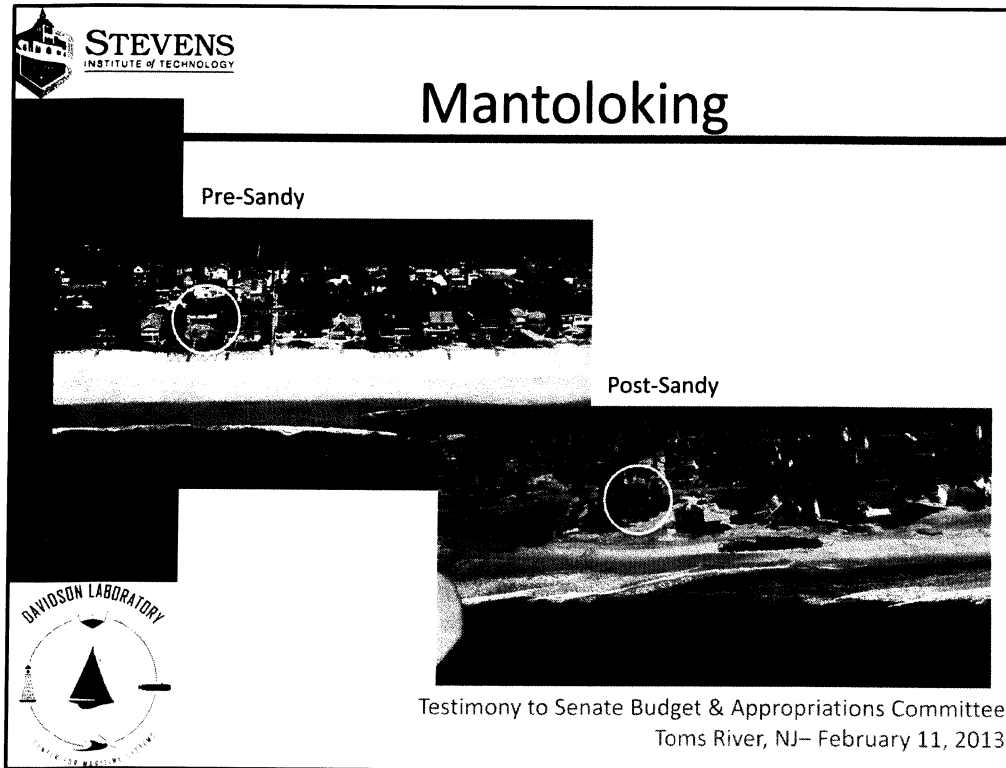
In NJ, we are extremely fortunate to have the aforementioned Shore Protection Fund. The Shore Protection Fund was established in 1994 in response to a series of severe Nor'easters in 1991 and 1992. Originally set at \$15 million, the fund was increased to its current \$25 million in 1999, but has not been increased in over a decade. The Shore Protection Fund is a vital resource that is used to fund a combination of federal and state shore protection projects. These projects include both bay shore as well as ocean front projects and both structural and non-structural options. In particular, the fund has been integral in attracting federal investment in shore protection projects within the state, where the money is used as the 35% match to the 65% federal contribution. While the previous investments made through the Shore Protection Fund largely proved their worth during Hurricane Sandy (and Irene, and the Nov 2009 Nor'easter) in terms of the damage and loss of life prevented, Sandy also exposed the need for greater investment in the future to protect the coast, its residents, its way of life, and its valuable contribution (\$19 billion) to the State's economy.



Now a few examples of what worked and what didn't. Here the figure on the right is a FEMA damage assessment where each dot represents a structure. Red dots are houses that are no longer there, orange dots have moderate damage, yellow dots have minimal damage, and the washed out dots have no impact. Note the cluster of red and orange dots in Ortley Beach. Now look at the beach profiles prior to the storm collected by Stockton on the left. Ortley did have a "dune" prior to the storm, but look at the size in comparison to Seaside Park and Midway Beach. The beach and dune clearly helped protect the communities of Seaside Park and Midway Beach and significantly reduced the impacts of Sandy on its residents.




Just a follow up to the previous slide with Ortley on the left and Seaside Park on the right. In the top pictures you can actually see the before and after Sandy profiles where the Ortley Beach dune was completely removed but the majority of the Seaside Park dune remains. The bottom picture is an aerial view of Ortley Beach taken after Sandy in the vicinity of the location of the beach profile. The picture provides a small indication of the scale of the destruction in Ortley Beach; however some areas of Ortley fared even worse.




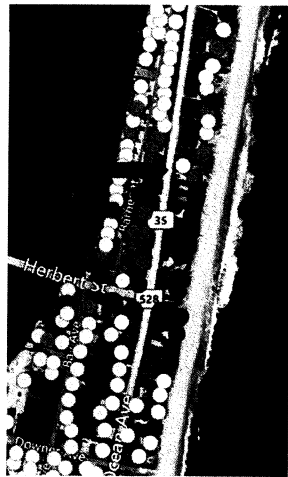
Here we have before and after aerial photographs of a section of the Mantoloking coast near where the breach occurred. In particular focus on the house identified in both pictures. This particular house in Mantoloking benefited from at least two factors which reduced its vulnerability compared to the houses around it. First of all, where every other house is built on the beach and setback from the road, the surviving house is built on the road and setback from the beach. Prior to the storm, the rear of the surviving house was setback 150' or more from the toe of the dune. The second factor protecting the house was the dune itself.




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## Mantoloking, NJ





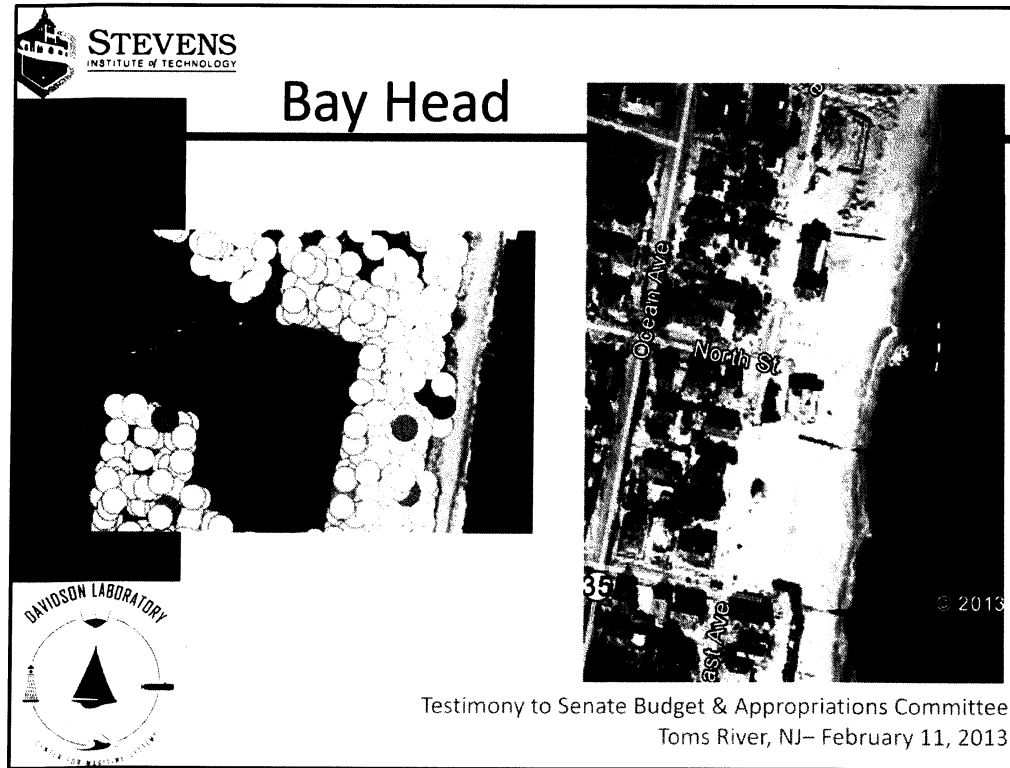


(Data from USGS)


Testimony to Senate Budget & Appropriations Committee  
Toms River, NJ- February 11, 2013

As you can see in the picture, the dune reached as high as the second floor of the house. Sandy carved away a significant portion of the dune, but as you can see in the photograph, the dune did its job. No view from the 1<sup>st</sup> floor, but the house is still standing. To put things in perspective, zillow.com estimates the value of the houses in this area at between \$4 and \$6 million. As indicated by the FEMA damage assessment, this particular house was the only “unimpacted” structure for several blocks in either the first or the second row.


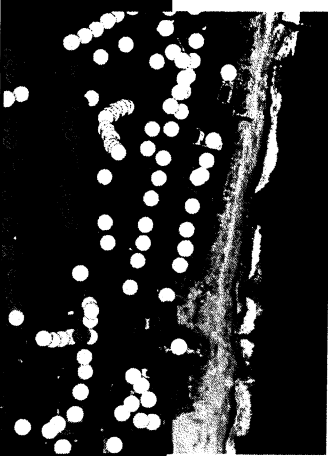
Something else we need to keep in mind. What happens on the barrier islands can have a dramatic impact on the bay shore communities behind them. The opening of breach can dramatically increase water levels and wave exposure to communities not typically prepared for it.




The example shown here is from the north end of Bay Head. The houses that were destroyed during Sandy were located north of the seawall that protects 75% of the town. A before photo of the same area shows that the oceanfront structures are actually embedded within what would be the primary dune. The surviving ocean front houses were built on pile foundations that had up to 6 feet of erosion around them. There are several lessons here. The wall helped. Pile foundations helped. And building in the dune is a bad idea. Interestingly, those oceanfront lots were built prior to 1920 (the oldest aerial I could find).

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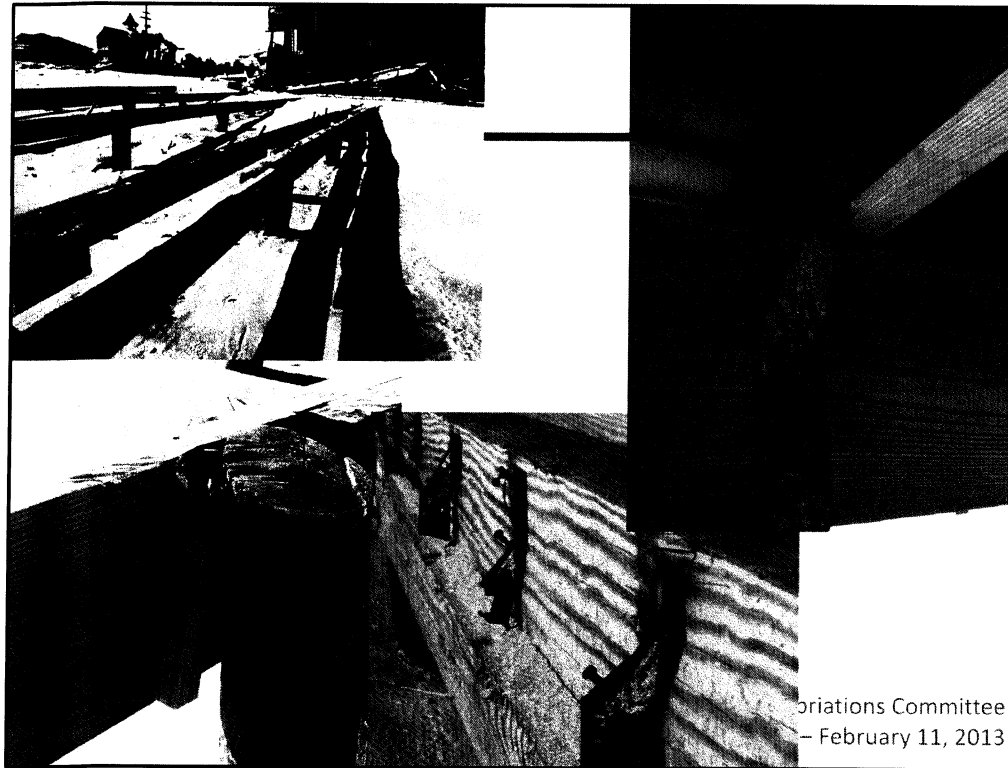
## Monmouth Beach






Testimony to Senate Budget & Appropriations Committee  
Toms River, NJ- February 11, 2013

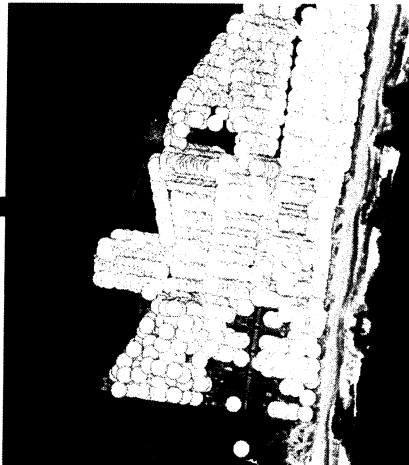
As most of you are aware, a massive seawall protects much of Monmouth Beach and Sea Bright. While few structures protected by the seawall were directly impacted by waves, many experienced flooding or foundation damage due to the scour caused by water spilling over the seawall. The house shown in the picture is notable for several reasons. Based on a visual inspection it appears to have suffered no damage. Notice the hurricane shutters on every window, and the elevated ground on which it sits. Even the majority of the landscaping survived the storm. I like this house because it embodies the philosophy of not relying on a single measure for protection. In spite of the massive seawall which to some provides a false sense of complete security, the owner of the house incorporated several additional measures to increase his hazard resiliency.




Poor coastal construction practices can be blamed for some of the devastation as well. Here we see two examples of inadequate connections between the substructure and the main structure at two beach clubs located seaward of the seawall in Sea Bright. Both were completely destroyed. In the one case 1" x 1" wood strips were used. In the other proper straps were used however both the straps and the nails were completely rusted through. The picture in the upper right shows proper strapping used to secure a section of the boardwalk in Sea Girt that survived Sandy. Not only are the clips and fasteners in good condition, screws were used instead of nails, and every available hole was utilized.

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## Natural protection?


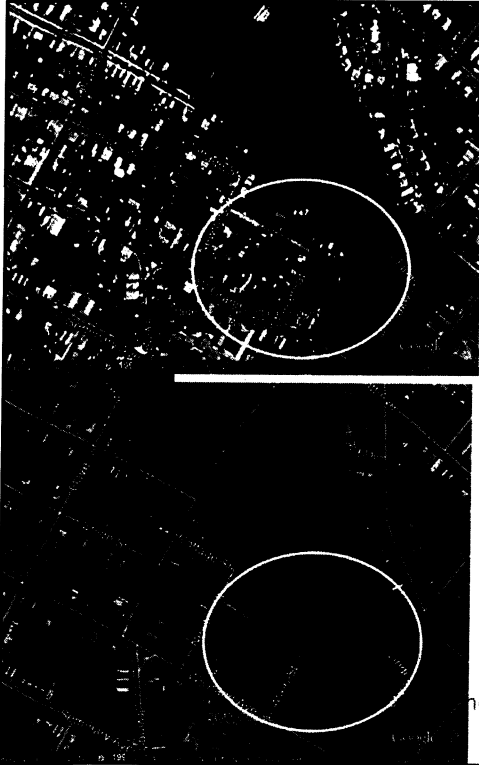


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CENTER FOR MARINE SCIENCE

Testimony to Senate Budget & Appropriations Committee  
Toms River, NJ– February 11, 2013


In this example from Seaside Park, notice the reduction in damage adjacent to the natural area identified in the picture. Conceptually, this is the idea behind the living shorelines approach, utilizing nature to reduce the damage from waves and storm surges. Admittedly, I have not done a detailed analysis of this area; however I am intrigued by what if any role the natural undeveloped area indicated by the arrow played in limiting the damage to the adjacent structures.

# Buyouts




Testimony to Senate Budget & Appropriations Committee  
Toms River, NJ- February 11, 2013

Buyouts should be a part of the solution for repetitive loss properties, but it must be done in a coordinated fashion so as not to leave communities pockmarked. The reality of this solution is that given the property values along the Jersey shore this will be a difficult and expensive proposition. Unlike many inland repetitive loss properties where the owners want to sell, but can't find a buyer due to the very public flooding problems, many buyers are willing to overlook "nuisance" flooding for a chance at owning a piece of NJ shore property. In effect, there is almost always a buyer for shore property. The pictures on this slide are from Rahway where I grew up, and I can remember the controversy the buyouts caused in the community because the families being bought out couldn't find similar properties in Rahway for the price they were being bought out for. Lastly, we need to be careful not to change the character of the Jersey shore through buyouts. If the cheapest properties are targeted, we may force out the fishermen, policemen, fire fighters, that live in these communities year round and help make them what they are.

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## Conclusions

- Sandy not unprecedented
- All options need to be considered
- We can and must engineer a safer and more sustainable coast
- Need to takes a systems approach

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([jmiller@stevens.edu](mailto:jmiller@stevens.edu), 201 216-8591)

Testimony to Senate Budget & Appropriations Committee  
Toms River, NJ– February 11, 2013

Storms like Sandy have occurred in the past and will continue to occur in the future. While there may be some debate about whether or not the frequency of such storms will increase in the future, there are very few people if any arguing that we will have fewer Sandy-type storms in the future. In order to increase our resiliency to future storms like Sandy, we must make smart decisions today during the rehabilitation process. I hesitate to say rebuilding, because simply putting back what was knocked down is insufficient. What we decide today in the wake of Sandy will impact what the Jersey shore looks like a century from now. We must take a multi-faceted systems approach that considers the entire spectrum of techniques for increasing hazard resilience. These approaches include targeted buyouts as Governor Christie has suggested, changes to planning and zoning codes, modification to coastal construction methods, and the consideration of a range of engineering solutions including both traditional and innovative techniques for protecting the coast. Furthermore we need to consider combinations of these approaches so that we are not entirely reliant on a single structure or factor for our safety. Thank you for your time today, and with that I will be glad to take any questions.



## **OBSERVATIONS ON THE IMPACT OF HURRICANE SANDY ON THE ARRAY OF COASTAL NEW JERSEY'S NATURAL AND MAN-MADE SHORE PROTECTION FEATURES**

### **DR. STEWART FARRELL, DIRECTOR RICHARD STOCKTON COASTAL RESEARCH CENTER**

Dr. Farrell studied coastal engineering and coastal processes at the University of Massachusetts, being awarded both a Master's in Geology and a PhD in Sedimentary Geology in 1972.

Dr. Farrell was part of the founding faculty at Stockton College in 1971 and helped develop both the Marine Science and Geology degree programs at the College. His first association with NJ regulatory legislation was an appointment to the Academic Committee tasked with helping the fledgling NJDEP implement the policies to deal with the 1970 Wetlands Act and later the 1972 CAFRA legislation. Many of the early NJDEP employees were graduates from the Stockton marine and environmental science programs.

The Coastal Research Center started with a request from the Borough of Avalon's Environmental Commission to determine why a section of the shoreline was eroding rapidly during the summer without any storm activity.

The NJDEP requested assistance in building a database to document storm and annual changes to the entire NJ coastline in 1986 following Hurricane Gloria damages plus those from a year earlier northeast storm. This was the official start of a 26-year relationship with the Bureau of Coastal Engineering where the CRC has surveyed the dunes, beach and offshore regions at 105 stations from the Raritan Bay, Sandy Hook, south to Cape May Point and up the west shoreline of Cape May County.

In 2008 a 5-year project was started to quantify the erosion and dune breaching potential for the entire oceanfront coastline under a NOAA-guided congressional award of almost \$1 million. This has been named the NJ Dune Vulnerability Analysis and models the ability of the beach/dune system to resist the array of FEMA-generated storms equal to 1-, 2-, 5-, 19-, 20-, 50-, and 100-year theoretical storm events.

### **Hurricane Sandy**

1944, Gloria and Irene were hurricanes with reasonably predictable winds, tides and impacts. The 1962, 1992 and 2009 Northeast storms were easily as damaging as the last 75 years of hurricanes to hit NJ, but are far more difficult to predict, analyze, or quantify. Sandy was the unfortunate combination of both a hurricane and a northeaster that was blocked in its movements to the northeast by a high pressure cell off Greenland. The resulting combination and the forced turn to the northwest produced unexpected destruction to the NJ coast particularly Ocean & Monmouth Counties. While this type of event does occur, it is rare enough that to duplicate it in exactly the same region is very unlikely. In 1991 the "Perfect Storm" was a similar combination of meteorology, but situated east of the Canadian Maritime Provinces. The staff of the CRC commenced surveys and photography of the 105 stations October 31, 2012, continuing until finished prior to Thanksgiving. These studies were compiled into reports submitted to the NJDEP and posted on the site [www.stockton.edu/crc](http://www.stockton.edu/crc) There are six separate reports extending from Union Beach, Monmouth County to Reeds Beach, Cape May County.

- 55% of the developed NJ oceanfront coastline has been modified under either Army Corps or NJ Bureau of Coastal Engineering shore protection projects since 1986.
- 25-years of study has shown that the AVERAGE shoreline position & quantity of sand present on the beaches has increased by a modest amount.
- The RANGE of shoreline changes was pretty huge however: on the plus side, Barnegat Light Borough saw a 2,400-foot shoreline advance due to the re-alignment of the inlet jetty in 1990. The biggest retreat occurred in North Wildwood where 1,057 feet of shoreline retreat occurred between 1986 and 2005. This was noteworthy because almost no one thinks of beach erosion and Wildwood in the same sentence.



- The present effort by the Federal Army Corps commenced in 1989 with a shore protection project for Cape May City, which totally changed the appearance and the economy of that City.
  - Since then projects have been completed in Ocean City, Atlantic City, Brigantine, Avalon, Stone Harbor, Cape May Point, most of Monmouth County, Surf City, Harvey Cedars, and Brant Beach on Long Beach Island.
  - The State of NJ has current projects in North Wildwood, Strathmere in Upper Township, southern Ocean City, and prior to Federal authorization conducted projects in many of the above list of communities since 1983.
  - The Legislation enacted in 1994 creating the stable fund for shore protection was used as financial leverage to generate the highest percentage of a state coastline under Federal jurisdiction for the nation by FAR.
  - 65% of cost is Federal share; 35% is local (of that the State fund pays 75% of the local share with the local community paying 25% of the 35%)
  - This is the only program of coastal storm protection of its kind in the nation.
  - **SANDY'S STORM CONDITIONS**
  - This storm was essentially a 20-year recurrence event in Cape and Atlantic Counties. Dunes at 14 feet elevation withstood the storm preventing overwash into the community.
  - The situation was far more intense in Ocean and Monmouth Counties. Wave run-up on dunes was measured at 10 feet higher at Seven-Presidents Park in Long Branch than in Atlantic City or Avalon. North of the eye's landfall the storm will likely be considered a 100-year event.
  - The high degree of shore protection projects in Cape/Atlantic Counties produced a high level of damage prevention except at a few "hot spots" of erosion (Ocean City).
  - The piecemeal construction of the Federal shore protection project on Long Beach Island provided an unintentional laboratory on the worth and value of its efficacy in protecting property, public and private landward of the segment where the work was completed between 2007 and 2012 and the high loss rates in those sections of coast where it was not.
  - Hard structures parallel to the beach made some difference, but have extreme installation costs.
  - The Dune Vulnerability Model for the 100-year storm event accurately predicted where dunes on the Northern Ocean County shoreline would fail and where they would survive. The CRC will soon acquire pre- and post-Sandy LIDAR\* data so an accurate assessment could be made using the vulnerability model to determine where and how substantial replacement dunes should be.
- \*LIDAR is digital survey data obtained from aircraft that covers the ground in 600 to 900-foot wide swaths with a data point every sq. ft.
- **KEYS TO SUCCESS;**
  - **BEACH WIDTH> A wide beach makes the wave break far from the dune. Massive energy released out to sea as the wave breaks away from the dunes.**
  - **BERM ELEVATION> The 6.75-foot elevation seems to cause the wave to attenuate dramatically before hitting the dune.**
  - **DUNE HEIGHT> At least 16.0 feet up to 22.0 feet depending on wave run-up, which depends on storm intensity and the "still-water elevation" generated by the storm surge. (14.5 feet in Avalon vs. 24.5 feet at 7-Presidents Park).**
  - **PROJECT MAINTENANCE> Damage from waves was zero in Avalon (project just maintained) vs. Real damage in the 50's blocks in Ocean City due to limited maintenance.**

I strongly recommend that the means be found to extend the Federal NJ coastal storm protection program to the remaining 45% of the coastline not currently protected as soon as possible. The sand is available offshore (NJ Geological Survey data), and the Federal design worked in LBI and elsewhere.

The biggest hurdle is the private ownership of real estate to the high tide line in Ocean County where easements must be obtained from each and every owner prior to a Federal project commencing. Yes, Sandy has convinced many holdouts to sign and others may come on board, but there will be those who refuse all encouragements. The answer may have to come in the form of legislation making all NJ beaches public land seaward of the dune crest or conduct eminent domain actions against those who refuse to do something in the best interest of their property and to the benefit of the community at large.

# Issues Surrounding Coastal Planning and Rebuilding in the Aftermath of Sandy

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Presented on February 11, 2013 in Toms River, New Jersey  
before the  
Senate Budget and Appropriations Committee  
New Jersey State Legislature

Invited testimony by  
Clinton J. Andrews, Ph.D.  
Edward J. Bloustein School of Planning and Public Policy  
Rutgers, The State University of New Jersey  
33 Livingston Avenue, New Brunswick, NJ 08901

Thank you for the opportunity to testify on this important matter. The perspective I bring is that of a researcher on planning and policy issues. This includes practical experience in the building industry dating back to the 1970s as well as planning research on Jersey Shore communities before and after Superstorm Sandy. In this testimony I draw in part on research that my students and I completed in May 2012 that we have necessarily revisited following Sandy.<sup>1</sup>

Planning at its best is about the future, bringing foresight to action. At its worst it is a reactionary, regulatory function that gets captured by self-serving interests and constrains initiative. A market economy needs planners when interdependencies, indivisibilities, irreversibilities, or ignorance hinder sound private decision making.<sup>2</sup> Hence planners coordinate investments in buildings and infrastructure, protect public goods like clean water and public safety, help communities avoid mistakes from which they can't recover, and provide information about expected future conditions. Today, we need planning at its best.

It is clear that Shore communities are no strangers to flooding and storm damage. "Here we go again," was the slogan spray-painted on one boarded-up storefront just prior to Superstorm Sandy's arrival.<sup>3</sup> We can trace the terrible impacts of hurricanes and nor'easters on our coastal communities over hundreds of years. We can also see how public policy has evolved in response. Table 1 summarizes storm events and associated responses at the local, state, and federal level. It shows that we have shifted over the past fifty years from viewing disaster response as primarily a local responsibility to the current situation in which state and federal governments play significant roles. I highlight three items:

- Following the 1913-1914 Christmas Storm and January Storms, New Jersey enacted the Waterfront Development Act, requiring permits for development within 100 feet of the 18-year mean high water line.
- Following the 1962 Great Ash Wednesday Northeaster, New Jersey squandered the opportunity to purchase shore front properties with Green Acres funds.
- Following additional disasters, the Federal government in 1968 launched FEMA and the National Flood Insurance Program (NFIP), which provides subsidized coverage for the most vulnerable properties. In 1972 it passed the Coastal Zone Management Act, which led to New Jersey's CAFRA legislation in 1973, which requires environmental impact statements for certain developments within the coastal flood plain, and set maximum pervious coverage limits and minimum vegetative requirements. Each of these laws has been amended over time.

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<sup>1</sup> *Adapting to climate change in coastal Monmouth County*, Spring 2012 Rutgers graduate planning studio report. <http://policy.rutgers.edu/academics/projects/studios/index.php>

<sup>2</sup> Hopkins, L.D. *Urban Development: The Logic of Making Plans*. Island Press. Washington, DC, 2001.

<sup>3</sup> [http://media.nj.com/monmouth\\_impact/photo/11776657-large.jpg](http://media.nj.com/monmouth_impact/photo/11776657-large.jpg)

Thus, a century ago, New Jersey began to regulate coastal land uses to prevent people from building in harm's way. CAFRA and its successors strengthened this theme. However, in recent years, the courts have placed limits on this power and made implementation of local defensive measures more difficult.

The National Flood Insurance Program meanwhile provides information and incentives to encourage private property owners to build in less hazardous locations. Recent updates are driving the program to pursue more actuarially balanced rate schedules.

This mostly sounds like the stuff of good planning. However, recent events have identified several opportunities for improvement, as follows. In the short run:

1. Coordination of individual, municipal, county, state, and federal efforts is critical; now it seems like total chaos. The web is underutilized as a means of communicating with dispersed constituents of flood-ravaged communities.
2. Existing zoning ordinances have become straightjackets and need to be rewritten on a wholesale basis. For example, tens of thousands of properties in dozens of municipalities need height variances to allow structures to be elevated above expected flood levels. Local planning boards are overwhelmed, and state funding to un-choke the process is needed.
3. Professional surveyors have a lock on the authority to provide basic, policy- and investment-relevant basic elevation data. This is an archaic arrangement in an era of ubiquitous GPS and LiDAR data, and that requirement should be relaxed because it has become a severe bottleneck that prevents rebuilding. Until a property owner knows the precise elevation of their structure, they do not know how to rebuild, nor do they know their flood insurance rates.
4. Many communities could benefit from visioning processes that identify and share new ideas. Currently some towns are instead stuck in a "rebuild things exactly as they were" mindset. Whatever else we know, the way things were doesn't work any more. A state-funded grant program might get these visioning efforts going.

For the longer run, five things stand out:

1. The state needs to ensure that communities and property owners pay attention in a timely manner to the best available data on hazards. As regional relative sea levels continue to rise, and as our understanding of what makes structures resilient continues to improve, FEMA will update the flood insurance maps and the NFIP rate sheet. Unpopular as it may be to say it out loud, we must pay attention to FEMA, because their information will help reduce the impacts of future storms.
2. A surprisingly large number of property owners do not have flood insurance, because they have no mortgages and have been willing to gamble that they would not get hit. The local, state, and federal governments need to find humane ways to stop rewarding those gamblers. Wealthier property owners

- can afford to rebuild without subsidies, and government should help those with fewer resources to move to less risky locations.
3. On a related note, this is the time to pursue buyouts of a large number of the properties that are in harm's way. The state missed this opportunity following the "Storm of the Century" in 1962, and it should act decisively this time around.
  4. The Legislature should scrutinize publicly subsidized beach replenishment programs to determine the incidence of costs and benefits. Ideally, those who benefit should pay. Put another way, if the general public of New Jersey is paying, it should fully benefit via enhanced beach access.
  5. Perhaps surprisingly, our estimates of the local fiscal impacts of rebuilding versus more adaptive courses of action suggest that municipal finances may be stronger in the latter case. Revenues may go down, but expenditures will go down even more. Thus, both municipalities and the state should encourage selective demolitions and the creation of buffer zones.

In summary, we need to remove several residual regulatory artifacts that are preventing an effective short-term response to Sandy, and we need to bring the best information to bear in planning our shared future at the Shore. Thank you for your attention.

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## Bio

Clinton J. Andrews is professor of urban planning and policy development, and associate dean for planning and new initiatives at the Edward J. Bloustein School of Planning and Public Policy at Rutgers University in New Brunswick, New Jersey. His research focuses on improving the process and substance of public decision making on energy and environmental issues. Much of his recent work addresses ways to improve the performance of the built environment—how innovative practices diffuse, how actors behave, and how simulation modeling can contribute to better architectural and urban designs. He teaches courses in green building, industrial ecology, environmental planning, energy policy, and quantitative methods. Dr. Andrews was educated at Brown and MIT as an engineer and planner, and holds professional certifications in mechanical engineering, city planning, and green building. Previous experience includes working in the private sector as a design engineer and energy technology assessor, helping to launch an energy policy project at MIT, and helping to found a science policy program at Princeton. At Rutgers, he has launched initiatives in energy policy, green building, and innovation studies. He has published over 90 scholarly and popular articles, and his books include *Humble Analysis: The Practice of Joint fact-Finding*, *Regulating Regional Power Systems*, and *Industrial Ecology and Global Change*.

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Table 1: Selective Chronology of Storm Events Evoking Policy Responses

Storm Event	Local Defensive Responses (ex.)	State Law Enactment	Federal Law Enactment
1757 – barrier island breached	Retreated from Sea Bright		
1890's – barrier island breached	First rock "wall" attempted at Sea Bright cottages rebuilt		
1913-14 – Christmas storms	Railroad retreated inland by a block; cottages abandoned	1914 Waterfront Development Act	
1944 – Great Atlantic storm	Sea Bright sea wall built on former rail right of way		
1962—Nor'easter "Storm of the Century"	Houses elevated	1970 NJ Wetlands Act 1973 CAFRA	1968 NFIA – NFIP and FEMA Established 1972 CZMA & updates
1992—Nor'easter	Middletown Master Plan Adopted 2004	1993 CAFRA update	1994 Reform Act (NFIRA)
1999 – Hurricane Floyd		Beach replenishment (again)	2004 Flood Insurance Reform Act (FIRA) 2005 CZMA updated
2009 – Tropical Storm Ida	Multi-hazard Mitigation Plans		
2011 – Hurricane Irene	NFIP Flood Map acceptances		NFIP reforms
2012 – Superstorm Sandy	?	?	?



## **Better Cluster Development Tools for Municipalities**

*Helping Towns Enhance the Value of Properties and Communities  
At a Lower Cost to Taxpayers*

**THE CHALLENGE:** Municipalities need better tools to put development where it makes the most sense – where it will enhance their communities and where services can be provided in an efficient manner. They also seek affordable ways to create parks and to preserve the open spaces, farmland and historic sites their residents treasure. Existing planning tools, like clustering, can help them reach their objectives at minimal cost to the taxpayer, but these tools need improvement.

**BETTER TOOLS HELP TOWNS, PROPERTY OWNERS, DEVELOPERS AND THE ENVIRONMENT:** When municipalities authorize clustering, developers and landowners can work together to preserve land and build strong neighborhoods; instead of spreading development evenly across a site or sites, they may build it at a higher density on a portion of the site or sites and preserve the remaining land. (See reverse page.) Landowners gain another way to use their development rights, developers can win community support for more marketable projects, and residents gain more parks and open lands. But clustering needs improvement. Noncontiguous clustering, in particular, may be used only in certain specified ways that limit its effectiveness. When municipalities have attempted to use it more broadly, the courts have struck down their ordinances as not being authorized by statute.

**THE PROPOSED LEGISLATION (A3761):** The cluster bill is “permissive”; it improves tools that municipalities may use. It amends the Municipal Land Use Law to update authority for contiguous and noncontiguous clustering and lot-size averaging. (See reverse.) Enhancements for noncontiguous cluster include: empowering municipalities to provide for locations where growth and preservation are desired and allowing development applications either in the conventional form or as a planned development.

### **SUPPORTERS**

American Planning Association/NJ Chapter  
Association of NJ Environmental Commissions  
New Jersey League of Conservation Voters  
New Jersey Audubon  
New Jersey Builders Association  
New Jersey Farm Bureau  
New Jersey Future  
New Jersey Highlands Coalition

New Jersey League of Municipalities  
PlanSmartNJ  
Preservation New Jersey  
Regional Plan Association  
Stony Brook-Millstone Watershed Association



Growth areas are built more densely.



Remaining areas are preserved.

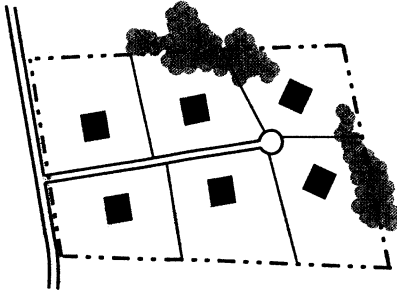
Clustering results in a development project that includes preservation of open space, farmland or historic sites along with a growth area that is developed more intensely.

For more information or to join our growing list of supporters, please visit the New Jersey Future website at <http://njfuture.org> or contact Chris Sturm at 609-393-0008, x114 or [csturm@njfuture.org](mailto:csturm@njfuture.org).

## BACKGROUND: HOW CLUSTERING WORKS

Under the Municipal Land Use Law, municipalities have many options to plan for and regulate development. Shown below are several of the common planning approaches used for residential development in rural and suburban areas. Note that these concepts can also be applied in urban settings.

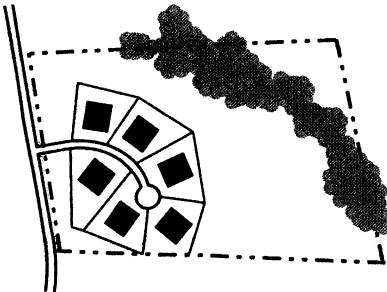
### Conventional Development



Development is allowed across the site, provided lot sizes meet or exceed a minimum size.

This approach is sometimes called "large lot zoning." Municipalities increase lot sizes in the hopes of reducing the impact on things like water resources and the number of school-age children, but the development footprint remains the same and no land is preserved.

### Contiguous Cluster

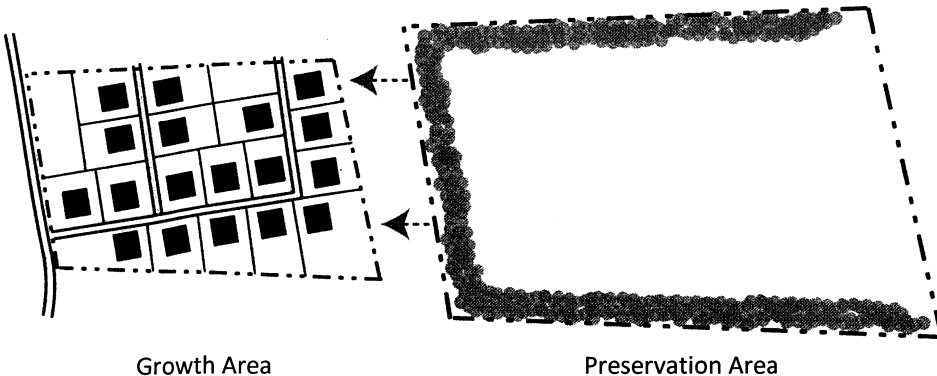


Development is concentrated on a portion of the site, and the rest is preserved as open space or farmland.

Contiguous clustering can be done on a single site or on a set of adjacent sites. Land is preserved without relying on public purchase.

### Noncontiguous Cluster

Two or more non-adjacent parcels are treated as a single site for the purpose of clustering. The growth area is developed more densely, and the preservation area(s) are preserved as open space or farmland without relying on public funds.



Growth Area

Preservation Area

This sketch shows a simple example, where all of the authorized units are built on one site, and the other site is preserved. Other examples can be found on New Jersey Future's [website](#) in [Preserving Land through Compact Growth: Case Studies of Noncontiguous Clustering in New Jersey](#).



## Coastal Planning and Rebuilding

Senate Budget and Appropriations Committee

February 11, 2013

Chris Sturm, New Jersey Future

## NJ Public Supports Thoughtful Rebuilding



December 10<sup>th</sup> Poll shows majority support for:

- Stricter building codes in affected areas (almost 90%)
- Allowing state regulators to determine which coastal areas can be rebuilt (two-thirds)
- Allowing homeowners in high-risk areas to rebuild only if they allow dunes or sea walls (two-thirds)
- Using tax dollars to restore existing wetlands and bays to serve as storm buffers (80%)
- Establishment of a regional entity such as a coastal commission (70%)
- Allowing towns in high-risk areas to impose a short-term moratorium on rebuilding (two-thirds)



## About New Jersey Future

Smart Growth research, policy and advocacy

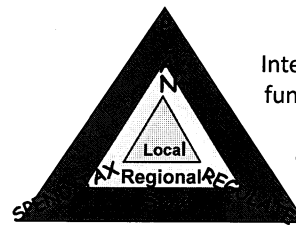


[www.njfuture.org](http://www.njfuture.org)



## Two Approaches to Realizing Smart Rebuilding

Apply guiding principles to public funds



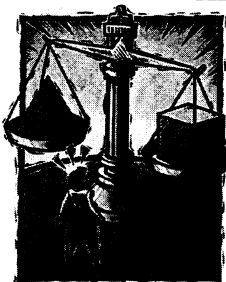
Integrate rebuilding funds with existing government decision-making



## Short and Long-term Actions

### Quickly:

- Get people back in homes
- Shore ready for summer
- Businesses up and running



### Carefully:

- Resilient
- Equitable
- "Smart" for economy, environment & people



## Applying Guiding Principles



- Oversight and transparency are important
- So are better outcomes:
  - Safer, stronger, more resilient in the face of storms and rising sea levels
  - Fair for everyone
  - High-quality livable places
  - More job and business opportunities
  - Better transportation, environment, housing, redevelopment...



### State Level: Borrow from NJ State Strategic Plan

- Framework for Investment: "Garden State Values":
  - Ten goals to guide the state's growth and development
  - Need to add resilience
  - Incorporate into state & federal rebuilding programs
- Require State Agency Rebuilding Plans
  - How are agencies advancing the rebuilding goals?
  - Create opportunity for public comment



### Somerset County "Investment Framework"



- Based on draft State Strategic Plan
- Reflects infrastructure, natural resources
- Supported by all towns
- Need to overlay areas of repetitive loss
- Will drive economic development, infrastructure investments and municipal zoning
- All counties should do...



### Regional-level Opportunities

- CAFRA and implementing regulations
- Shore Protection Master Plan of 1981
- Coastal Commission possibilities
  - Regional analysis
  - Planning resources
    - Supplement ABFEs with mapping of sea level rise
  - Guide regional (CAFRA) regulations



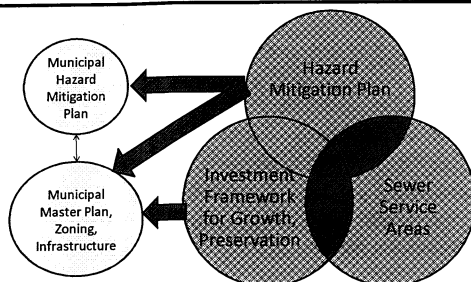
### Municipal-level Opportunities

Fund and reward:

- Municipal master plan update, including Hazard Mitigation Element
- Zoning changes as needed
- Stormwater Plan (green & gray infrastructure)
- Capital Improvement Plan
  - Stormwater
  - Elevate roads and bridges



### County-level Opportunities



### Other Rebuilding Tools

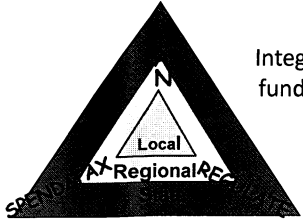
- Noncondemnation Redevelopment Area (A3615)
- Authorization for Stormwater Utilities (A2641/S1557)
- Options for Land Preservation
  - Blue Acres funds for hardest hit areas
  - Improve planning tools: Cluster Development bill (A3761)
  - Streamline Transfer of Development Rights




## Smart Rebuilding

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Apply guiding principles to public funds



Integrate rebuilding funds with existing government activities

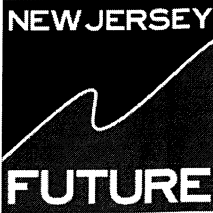



## New Jersey Future Resources

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- Local Recovery Manager position
- Report on Somerset County Investment Framework
- Report on Obstacles to Green Infrastructure
- Case Study Report on Noncontiguous Cluster Developments
- Etc., and stay tuned

[www.njfuture.org](http://www.njfuture.org)



Thank you!

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