U.S. DEPARTMENT OF COMMERCE

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NATIONAL OCEANIC AND
ATMOSPHERIC ADMINISTRATION (NOAA)
HYDROGRAPHIC SERVICES REVIEW PANEL

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PUBLIC MEETING

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THURSDAY, APRIL 9, 2015

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The Hydrographic Services Review Panel met in the Long Beach Hilton International Conference Room, 701 West Ocean Boulevard, Long Beach, California, at 8:30 a.m., Scott Perkins, Chair, presiding.

MEMBERS PRESENT
SCOTT R. PERKINS, HSRP Chair
WILLIAM HANSON, Vice Chair
ANDY ARMSTRONG*
LARRY ATKINSON
RADM KENNETH BARBOR
JULIANA BLACKWELL*
DR. LAWSON W. BRIGHAM
RADM EVELYN FIELDS
EDWARD J. KELLY
DR. FRANK KUDRNA
DR. GARY JEFFRESS
CAROL LOCKHART
DR. DAVID MAUNE
JOYCE E. MILLER
CPTN. SALVATORE RASSELLO
SUSAN SHINGLEDECKER

* Non-voting members

ALSO PRESENT

REAR ADMIRAL GERD F. GLANG, HSRP Designated Federal Official
MICHAEL ASLAKSEN, Chief, Remote Sensing Division, National Geodetic Survey, NOAA
CAPTAIN (sel) RICHARD BRENNAN, Chief, Coast Survey Development Laboratory, NOAA
DANA CACCAMISE, Pacific Southwest Regional Advisor, National Geodetic Survey, NOAA
CHRISTOPHER CANNON, Director, Environmental Management, Port of Los Angeles
RUSSELL CALLENDER, Ph.D., Deputy Assistant Administrator, National Ocean Service, NOAA
ASHLEY CHAPPELL, IOCM Coordinator, Office of Coast Survey, NOAA
TOM CULLEN, Administrator, State of California, Office of Spill Prevention
JEFF FERGUSON, California Navigation Manager, Office of Coast Survey, NOAA
JIM HAUSSENER, Executive Director, California Marine Affairs and Navigation Conference
TIFFANY HOUSE, Project Analyst, Remote Sensing Division, National Geodetic Survey, NOAA
DAVID KENNEDY, NOAA Arctic Policy Advisor, Office of the Undersecretary
BRANDON LINK, United States Coast Guard
AUDRA LUSCHER-AISSAOUI, Resilience Program Manager, Center for Operational Oceanographic Products and Services
LYNNE MERSFELDER-LEWIS, HSRP Coordinator
RUSSELL PROCTOR, Chief, Navigation Services Division, Office of Coast Survey, NOAA
PETER STONE, Technical Director, Center for Operational Oceanographic Products and Services
JOHN Z. STRONG, Vice President, Jacobsen Pilot Service
BIANCA TERRY, Office of Assistant Administrator, National Ocean Service, NOAA
JULIE THOMAS, Program Manager and Principal Investigator, Coastal Data Information Program

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P-R-O-C-E-E-D-I-N-G-S

8:35 a.m.

CHAIR PERKINS: Good morning. Welcome to day two of the 29th meeting of the Hydrographic Services Review Panel. We had an interesting day yesterday. Outstanding presentations. Graciously, we had the honor of having Representative Lowenthal from the 47th Congressional District of California address us yesterday morning. Distinguished panelists.

Wonderful field trip to the Marine Exchange yesterday afternoon and got a look at the complexity of the amount of vessel traffic coming into the Ports of Long Beach and LA, and then a waterside tour of these port facility. About half a dozen tanker ships at anchorage awaiting their approaching. Another dozen ships in the process of loading and unloading and shifting. A wonderful first-hand look at both the complexity and the size of the port facility here.

We have a full day in front of us

again here this morning, and just a small recap.

Admiral, do you need to do a safety briefing again?

RADM. GLANG: Sure. Good morning. I'm Gerd Gland, the designated federal officer. This only applies to those folks in the room and not online. But should we need to leave the room, just go out the door and follow the main hallway out to your right, down the escalator and out.

There are other exits that are marked should we need to find another way out, and of course the facilities are just outside the hall here And thank you for your attention.

CHAIR PERKINS: Yesterday we did a brief introduction of the panelists at the table, but due to the time limitations we didn't have an opportunity for the support people here with us to do an introduction. So if we could do a brief introduction -- if you could do self-introductions for the non-Panel members that are here in support of the HSRP.

MS. LUSCHER-AISSAOUI: Good morning. My name is Audra Luscher-Aissaoui. I'm with NOAA's CO-OPS and I'll be presenting a little bit more on resilience today.

MS. CHAPPELL: Good morning. Ashley Chappell, NOAA Integrated Ocean and Coastal Mapping and Office of Coast Survey, and I'll be talking about Arctic and resilience today.

MR. ASLAKSEN: Morning. Mike Aslaksen with the National Geodetic Survey. I'm Chief of the Remote Sensing Division and I'll be talking about NOAA operations supporting resiliency.

MR. FERGUSON: I'm Jeff Ferguson. I'm Coast Survey's California Navigation Manager.

DR. CACCAMISE: I'm Dana Caccamise, a Pacific Southwest Regional Advisor for the National Geodetic Survey.

MR. PROCTOR: Good morning. I'm Russ Proctor. I'm with the Office of Coast Survey and also serve as Admiral Glang's alternate DFO.

MS. MERSFELDER-LEWIS: I'm Lynne Mersfelder-Lewis and I am the program manager for the HSRP.

MS. TERRY: I'm Bianca Terry. I'm with the Ocean Service and I'm Dr. Callender's staffer.

LCDR. LINK: Good morning. Brandon Link with the United States Coast Guard here at Sector Los Angeles/Long Beach and here representing Captain Williams.

CHAIR PERKINS: Great. Thank you. A couple panel business items before we get into our presentations this morning.

So the Panel had a working group tasked with reviewing the charter. The charter of the HSRP is required to be renewed every two years. That working group prepared a draft. That draft has been circulated to all of the Panel members, and at this point it would be appropriate for us to see if there's any discussion on that draft charter as presented. And then following that discussion we would take a simple voice vote to approve it as prepared and submitted.

So discussion on the prepared draft charter? Dr. Kudrna.

MEMBER KUDRNA: In reviewing the document and in discussions, the issue came up regarding subcommittees or working groups and our ability to use outside individuals to provide information to us.

And it was clarified by NOAA that we are allowed to solicit information from outside individuals, but based on the statute we could not have them as sitting and voting members of those committees. But our working committees or subcommittees do have the ability to consult with and obtain information from outside members. So I wanted to clarify that to the Panel.

CHAIR PERKINS: Great. Thank you for clarifying that, Frank.

So with that, I'll ask for a simple voice vote. All in favor of presenting the charter as you've received it, say aye?

(Chorus of aye.)

CHAIR PERKINS: Any opposed?

(No audible response.)

CHAIR PERKINS: Great. Thank you.

One other housekeeping issue that we need to deal with. After the Charleston meeting the official meeting minutes were produced and there were some omissions in those minutes. So I conducted --- as the Chair conducted the review of the meeting minutes, and there were some omissions that I didn't catch. So amended minutes of the Charleston meeting have been prepared. They have all been sent to you for your review.

So in similar fashion the action before us would be to adopt those amended minutes from the Charleston meeting. So I'm going to ask are there any comments or any additional clarifications or corrections beyond the amendment to the Charleston minutes?

(No audible response.)

CHAIR PERKINS: Okay. Hearing none, I'm going to ask for a simple voice vote accepting the amended Charleston minutes as you've received them. So all in favor of accepting those minutes, say aye?

(Chorus of aye.)

CHAIR PERKINS: Any opposed?

(No audible response)

CHAIR PERKINS: Great. I think that concludes our business matters. And now we can get to more important things, which is our Panel presentation.

So with that, our first speaker is Captain Richard Brennan, the Chief of the Coast Survey Development Laboratory. And, captain?

CAPT. BRENNAN: I'm going to just come over here so I can see what I'm doing a little better. Let me start off with my presentation first.

CHAIR PERKINS: While we take just a minute to get the audio-visual rolling, this gives us an opportunity to review the six questions that Dr. Callender put in front of us.

The first of those being how does coastal intelligence, the foundational observations, models and mapping make coastal resilience better?

The second being how do we leverage the National Ocean Service foundational data moving forward?

DR. CALLENDER: That second question is really focused on the resiliency issue as well.

CHAIR PERKINS: Yes. Great. In the context of how it can complement the resilience challenge facing the nation.

What criteria should we consider in determining national charting priorities and balancing the needs of maritime users with the needs of coastal bathymetry?

That one I think really hit home after our time on the water yesterday. And this Panel, since I've been on it, we've had the opportunity to see the Port of Anchorage, the facilities in Norfolk and Charleston and New Orleans. And now we've come here I guess to see the big dog in the fight, the Port of LA and Long Beach.

We've heard about the critical challenges facing each one of those facilities and the challenges facing each one of them are unique and different tied to their geographies, but just the sheer size and complexity of what we saw yesterday is -- it makes prioritizing -- the challenge in front of us to prioritize these missions I think is really going to be exciting and a difficult challenge for us.

What are the ways in which navigation, observations and positioning programs are good at engaging stakeholders and how can NOAA better connect and strengthen our relationship with these stakeholders?

We heard from one of those stakeholders yesterday afternoon during the public comment period on the challenge facing GPS continuity and eLORAN. So that ties in very closely to question 5.

And what are the criteria we need to consider in selecting the next 20 ports for precise navigation and how should we prioritize them?

I'm not sure I know what precise navigation means, but I'm going to learn a lot more about it in the presentation before us today.

DR. CALLENDER: Scott, you actually skipped number four, which is the criteria about determining charting priorities in the Arctic and how do we prioritize that work versus -- not versus, but in light of the other priorities in the lower U.S.?

MEMBER BRIGHAM: May I comment? The United States is the chair of the Arctic Council and the State Department has campaigned internally to remind all Americans that in fact we are an Arctic country.

So it's a great focus in the next couple years, even more than normal, on trying to educate the American public in Peoria, wherever, on this topic. So it's also an opportunity for even us to engage more on explaining why Arctic is important for national security and economic reasons.

CHAIR PERKINS: Thank you, Lawson.

Yes, Susan?

MEMBER SHINGLEDECKER: I just had a quick question. When trying to provide input on these questions regarding prioritization, I personally am not currently aware of how the areas that are currently charted are prioritized within NOAA. So if there's any way we could get a little more information on that, that might help inform our answers here. Maybe I'm the only one who doesn't know it.

MEMBER MILLER: I believe there's a lot of information on the Survey website.

RADM. GLANG: Gerd Glang, Director of Coast Survey. So that's a great question. We do have material on that and we can review that this afternoon during the breakout sessions, and then Panel members can also dig in a little bit deeper on that. Perhaps as part of the working group work we can walk you through that process in a little bit more detail, but we do have a documented methodology.

MEMBER SHINGLEDECKER: Thanks.

CHAIR PERKINS: I skipped over Captain Brennan's bio, so just give me a second here.

Captain Brennan served with the NOAA Office Corps for 20 years sailing on nearly every hydrographic ship in the modern NOAA fleet. He's conducted surveys throughout the U.S. waters in the Gulf of Mexico and the Caribbean, to the Gulf of Maine and from the Oregon Coast to the Arctic Ocean. Captain Brennan's most recent sea assignment was the commanding officer of the NOAA Ship Rainier serving in Alaska waters.

And I think we're getting very close to having our audio-visual resolved, and Captain Brennan is approaching the podium.

CAPT. BRENNAN: Okay. Take two. So I apologize. Part of the reason that we got a little bit sideways here is I really wanted to show you a live demonstration, and that's always a little dangerous when you're doing it in front of an audience. So I accepted the risk on that and I'll deal with the consequences, I guess.

So ultimately, as Scott mentioned, I wanted to talk about precision navigation, and certainly that's a term of art that's been developed. I think certainly everybody understands that at some level, or they think that they understand what it is. And so I want to, at least for the context of this presentation, talk about that. But first, I want to at least step us down through that.

So NOAA's focus is on providing timely and accurate environmental intelligence to the maritime community and delivering that data to the location where the decision is made. So environmental intelligence is a broad term and again another term of art, but I think for us, what we're talking about here is in precise navigation is the ability to navigate where sea room is limited in four dimensions: X, Y, Z and time, and with statistical certainty. And we'll talk a little bit more about what that statistical certainty is today, but ultimately I wanted to cast that out as far as what precision navigation is.

So --- but I think we've seen what the challenges are here at Long Beach, but I wanted to at least take it a little bit more broadly first because precision navigation means different things in different ports. So it's not going to look the same in every port that you go to.

So for instance, this is an ore carrier in the Great Lakes entering the locks. And you can see by the minimal clearance that they have on either side that the challenges that they have here are not in the vertical, at least not in this navigational instance. It's in the horizontal, right? And so, how are they coming in?

And so the things that affect that, the environmental conditions, the environmental intelligence that they're going to be pulling on to make their decisions as they bring that ship into that lock are going to be different than perhaps this ship that's passing under the Verrazano Bridge and it has an air draft restriction. And so, it has a very tight tolerance as it goes under that bridge.

That's different than if you're in the Houston Ship Channel and you're doing the Texas Chicken, for anybody who's familiar with that. So you have bow cushion and stern suction issues when those things pass. And so literally the ships have to steer into each other for a brief moment in time as they pass each other, or else they'll literally be forced apart and collide because of the pressure bulbs that are formed at the bow of each of those respective vessels.

And then looking at that here in Long Beach, and quite literally across all of our ports, is the increase in draft that we have. So all of our vessels are getting bigger, wider, deeper, as we know, and so the issue is how do we deal with that?

So when we start talking about precision navigation, there are a number of elements that feed into that. And so, in this graphic on the left-hand side I'm talking about forecasts and models. On the right-hand side I'm talking about direct observations. And then in the center, just because I'm a hydrographer, I've got gridded bathymetry. That's the center of my world, so that's where I put it here.

(Laughter.)

CAPT. BRENNAN: But, so when we talk about that, we've got water level forecasts, wind forecasts, wave forecasts, salinity forecasts, and salinity is one that can be frequently lost in the shuffle.

But in talking with pilots in Charleston during our last visit there, one of the things that they said was that salinity was an issue because when they were calculating their air drafts, they thought that the water would become much more fresh sooner than it did. And that salinity didn't change until after they got through the bridge. So there was a very tense moment as they passed under that bridge and had significantly less air draft than they had hoped for, right?

So again, the different navigational theaters are going to bring different things to the table on that as far as what's needed.

Current forecasts. Looking at that image from the Great Lakes, currents are a big issue, cross-currents and what the outflow is from the locks. Those are big factors when they're bringing those ships into the locks. And then you have the observations that mirror those on the other side. And we'll talk about each of those independently.

So I think for some of you you may have heard this story, but this is the story that we have gotten from the Port of Long Beach here. And ultimately, as they were -- and Captain Strong will talk to you more about this shortly, but as they were bringing the large crude carriers in, they realized that one degree of pitch ends up equating to --- for a 1,000-foot long vessel, if you just do the basic math on that, that's about a 10-foot change in draft as that vessel oscillates through that vertical motion. And you realize very quickly that given a certain sea state that's going to induce that sort of motion, the static draft doesn't begin to nearly tell you the full equation on that.

So ultimately they've embarked on a journey with a vendor named PROTIDE. And I'd like to thank Karsten for changing his life plans here to make it all the way across the ocean to be with us today and to have meetings with us earlier this week with the Port of Long Beach.

But basically PROTIDE is taking all of that data and synthesizing that into a solution that allows those vessels to come in and navigate in a precision navigation fashion where they're operating in very close proximity to whatever their danger is.

And so, in this case what are we talking about here for the Port of Long Beach? Specifically what we're talking about water level forecasts, wave forecasts. We've got the bathymetry in there, and then we've also got wave observations and water level observations. And we'll see how each of those things work with each other as I proceed on.

But this is the output that PROTIDE puts out, and it's a report by vessel. The key thing that we had before is as you looked at that pinwheel diagram that I had, basically all those data feeds are data feeds that NOAA provides and that are in NOAA data tanks.

The one thing that we don't provide, however, is something that is intrinsic to each of the ships, and that's the ship's independent motions. And part of the service that Karsten and PROTIDE provide is that analysis of the ship motion. And so, it couples that with all the environmental observations and ultimately comes up with a statistical probability of grounding on that, and hopefully a statistically diminishingly low probability of grounding.

And that's what each port ultimately determines as far as what is an acceptable risk that they're going to do. But in most cases it's at the 0.018 level, I think, depending on where it's at. I think there's this 0.017 percent of grounding, which I think is deemed to be statistically low.

And so, if we come into that, you can see here's the 0.017 percent probability of grounding in the under-keel clearances. So for somebody as a surveyor who deals with measurements and uncertainties in all of our measurements, this is music to my ears to see that.

That those uncertainties which we work very hard in addition to just the soundings, but to quantify those uncertainties with our soundings and all of our scientific measurements this is what you want, right? This is why we have worked so hard over the last 10 years to assign uncertainties with all of our measurements, because when it comes into this, it should make Karsten's job very easy as he pulls that together to make a statistical value for our mariners.

And so this is ultimately the money graph for the port, is when can I bring that ship in? And Karsten, speak out if I'm butchering this too badly, but I think ultimately the white space here is the time where that's at. And so, you see time across the top. The vertical axes are station marks along the channel coming in. I believe 10 is offshore at the buoy and zero is at Pier 121.

And so, ultimately this would be the time at which it would be considered safe and you would achieve that statistical probability for bringing the ship in and not grounding. And so, you can see that this whole area is where that would be. And that's the tool that the port would be using to say, okay, that's when we're going to target our ship transits for that moment in time.

As we talked about though, vessel motion is a big issue, and this whole thing that Karsten has put together and PROTIDE has designed to do is a model. And so, those models have to be validated. And so a lot of what we're working on, both with Karsten and all the partners in this, are validating those models. And I don't want to steal too much of Julie's thunder, because she'll be talking about that as well, but this was some work that we did.

Just about two weeks ago, we sent one of our survey technicians out with two GPS receivers and we put a dual-frequency GPS receiver on the bow of the ATC Legend just before it left Valdez on its way here to Long Beach and we put a GPS receiver on the stern.

So we had two measurements. And ultimately this is the result of that. And I was certainly surprised at it. Captain McCoughey, who had been the captain on that ship, said, oh, no, no, it definitely moves that much.

But if you look at, it you can see here it wasn't all this much, but in some cases that vessel was moving up and down peak to trough by four meters. That's meters, not feet.

Meters.

So there was concern that -- certainly hypothesis that, well, geez, that can't move that much. And even the crew on the ship said, oh, no, the weather moves around us, the ship doesn't experience weather, which in hindsight is kind of funny. But certainly the measurements that we took bore that out. So it is a critical measurement that needs to be had on that.

The other value that is critical to this obviously, what makes the ship move up and down are the waves. And so, National Weather Service at Oxnard, the local forecast office, has put together a model that they released just a month or so ago, and that will be providing valuable input to the PROTIDE model so that they can do that. And so, those forecasts will be helping to guide those calculations.

But the model is really just a quaint set of calculations if it's not correct, right? So the validation of that model is what's critical. And this is the CDIP buoy. I don't know if it's the exact CDIP buoy, but it's a picture of a CDIP buoy getting deployed.

And so, this is the thing that provides the validation for that to see is that model really correct and is it providing that data with a statistical certainty that we need to bring a thousand-foot ship loaded with over a million gallons of crude into a port? So that's the other critical thing is making sure that those models are working correctly.

So there's a very nice partnership here I think between NOAA and academia and the private industry to work together to solve that problem, and certainly this is a shining example of that in my eyes.

Water levels is the other thing that I think you can't get around. And so, this was from the PROTIDE report that came out for Long Beach, and it just shows that 40 percent of the water levels here in Long Beach are greater than one meter. So if you don't account for that, you're missing that window of opportunity to actually load according to the tide.

And so, that's a valuable asset if we're really trying to pinch out inches of draft out of each transit of a vessel, because as we know, every inch of draft has absolute financial implications to the port and the products that they're able to bring in. So I think if we talk about economic resiliency in the ports, this certainly is an enabler for that economic vitality and resilience.

When you start talking about water levels though, observations are not good enough, because observations are telling you what's happening right now. So you really need the models to tell you what's going to be happening in the future based on current observations and based on all the other driving factors.

So this is a graph that Peter Stone gave me for the Port of Baltimore. And you can see the blue line is the astronomical observations -- or I'm sorry, the astronomical predictions. But you can see that before we had almost a foot higher at one point based on the storm that moved through. This was February of this year in Baltimore. And then we had a departure where the water levels actually got almost three below what those predictions were there in the Port of Baltimore.

So if you were just purely operating on the predictive water levels, you would have been way off in that arena. So having those predictions and knowing that based on all the driving conditions, particularly weather and wind here in Upper Chesapeake, you would have only had part of the equation.

Weather is also a big one in being able to more effectively get our weather out there to the mariners so that you can actually overlay these things in your ECDIS system on board or the computer system, the port management system back on the beach. You can start overlaying all of this data in a GIS-type fashion so that you can make better, well-informed decisions.

So getting our NOAA data in a format that's easily ingestible in a machine-to-machine format is really where this project seeks to take us.

So NOAA's commitment for the Port of Long Beach specifically is to create the 500-meter resolution Nearshore Wave Prediction System. That's currently out and in validation right now. We really need a year to get a full cycle, a full weather cycle for that -- to validate that. And so, that's currently underway.

We're going to operationalize a high-resolution bathymetric database for the surveys that were acquired by Fairweather here and keep those running for the next five years. And so, we've already -- as soon as we had gotten that, we had a winter storm here. The Corps of Engineers went out and resurveyed it and now we've got new data to add to that. And so, ultimately every time a new survey occurs, whether it's from the port or from the Corps of

Engineers, we'd like to be able to add that into that database, create new products and provide them back out.

We've provided prototype high-resolution bathymetry -- and I'll show you a couple of examples of that here in just a second, and the visualization tool to hopefully show how this data, when it's properly enabled, can help the mariner and shoreside support make those decisions that they need to make.

So these are a 102, plus or minus, grids that we've created. So each one of these cells is a small ENC cell. So for anybody who's unfamiliar with the whole ENC data format, they try and keep you to a five megabyte limit. So we've had to make these high-resolution cells fairly small to keep them under that five megabyte limit because we've got a fairly high-density set of soundings in there along with a high-density set of contours.

So anyways, we've made these and they literally were rolling off the presses at the end of last week just for this week's events. And so we plan to provide those to the port here this week, so that they can begin to use those and put them in their portable pilot units.

This is a close-up view of just one of those. This was during our test and evaluation of that. You may not be able to tell, but the green one on the left-hand side is a 20-meter resolution sounding set. So each one of those -- if you look at each one of those little dots, that's a sounding and those soundings, if you were to measure around, the next closest one is going to be 20 meters away. That was considered to be a little too close, so we went back and put them at 25 meters.

So this is ultimately the density of the product that you're seeing there is a 25-meter sounding spacing and half-meter contour interval. And so, that's what is in each of these overlays, along with the updated -- the new ENC that will be released as well.

So let me just tempt the fates here on

that and see if I can actually do this demonstration here. So this is a prototype that we put together in the Coast Survey Development Lab.

And ultimately the issue that we've seen as we've traveled around and talked with mariners is that we say, well, if you apply tides and you have high-resolution bathymetry, you can cut contours wherever you want that tell you if you've got a 40-foot or a 60-foot draft ship, where you can go. And we basically get a blank look back, because I don't think they understand what high resolution really means. So we're not talking about 25-meter density soundings. We're talking about half-meter resolution soundings. So one sounding on the sea floor every half-meter or every one meter.

So ultimately what we have here --- this is one sounding every two meters, so a two-meter resolution grid. And ultimately we've applied tides to that.

So we're currently at the present time

-- so this taking real time water level values from the NWLON Tide Station in Long Beach. And if I bring it over here --- hopefully I still have my Internet connection, I can also come in and -- since we're in the U.S., I'll put it in feet.

Can you type in 72 for me there? And enter. See if it does that. Ah, I've lost my Internet connection. Like I said, this is the danger of a live presentation.

Okay. So ultimately I -- there we go. So 72 feet, you can see red is bad, green is good.

(Laughter.)

CAPT. BRENNAN: And so, you can see if you were a 72-foot draft vessel coming in right now, this is -- anywhere where it's red is where you would not want to take that vessel. And you can even see here in the channel that there are some areas where you're going to be really close to the seafloor.

So where the red -- the interface

between the red and the orange is pretty much right at 72 feet, and the orange envelope is 72 feet to 73 feet, I believe. And then it goes in I believe one-foot increments from there. So you really have fairly low values below that.

And ultimately what you can do as well is you can -- this tide slider here allows you to go from the actual values, what you're receiving right now, to the predicted values and go forward in time.

So this is something that we did with just a couple weeks of work, basically taking data out of NOAA's data tanks and just synthesizing it into a view like this, and it's one that I hope will be valuable.

So in the future what we'd like to be able to do is we're going to be adding in the results of the wave models so that you can see the wave model results right on top of that. We'd like to be able to get AIS in there so that you can actually see vessels and where they're at in that.

You can also click on this and you should be able to get the value of any sounding at any point in the area of navigation, assuming that your Internet is working. Clearly you don't have -- well, you may or may not have Internet at sea, that can be a challenge.

So this is ultimately the tool that we're creating to share with mariners kind of our idea on what we think the future looks like and what's possible when you start synthesizing all of these tools together into one thing.

So anyhow, let me take us back to the presentation here. So the intended outcomes, as I stated, was to gain experience maintaining the gridded bathy database. So this is a new thing for us. This is not something that we're familiar with.

We've been dealing with gridded bathymetry for 12 years or more now, so that's not it. But I mean, managing this is in a rapid fashion where we can add new data to it, update the skin of the earth representation of the seafloor and produce new products from that rapidly is where we're at.

And so, we're hoping to learn information from that and then be able to parlay that to other ports using tools, like the one that I just showed you, to educate mariners and let them know what the realm of the possible even is. As well as to provide other vendors who are trying to enable their precision navigation tools with NOAA data, and then to also encourage the use of the S-100 standards that are currently out there.

So for anybody who's not an IHO wonk, that's the next greatest thing that's coming out as far as data standards go. That should enable a much richer set of data to be brought to bear on the bridge of a ship. So that will include gridded data, model data in a much better rendering capability because it will have some cartographic elements to that.

So what I wanted to leave you with today is some questions. So thinking with the end in mind, where is it that we might want to go? And so, hopefully this will get you primed for some of our breakout sessions. But where might we go with high-resolution or high-accuracy GPS, particularly in the vertical?

So if you have a ship that is able to navigate and its GPSes that it's receiving is accurate to, let's say better than 10 centimeters in the vertical, what does that mean for you? And particularly if we start providing data that is relative -- all that gridded data -- currently it's relative to mean low or low sea level, but what if it were relative to the ellipsoid? So now everybody -- instead of navigating on a tidal datum, you're navigating on a geodetic datum. So I mean, ultimately that's what we're talking about if we're going to get to the level of accuracy that I think that our ports are demanding now, that's certainly -- to me that's one of the most obvious things.

The other thing is we've got a lot of data, as I showed, in our data tanks. So ultimately how do we turn that data into information, that information into knowledge, and then ultimately with some experience and some use of that knowledge that we can turn that into wisdom for making better decisions again, and that becomes a self-fulfilling loop there on how we do that.

Ultimately how do we provide 24/7 support to these ports? Because they want to operate 24/7. They want to bring ships in and out of the harbor 24/7. So how do we press our data into the service of helping that port meet that need?

And then how do our products need to change enable to support that? So will the same old cartography and the same old products that we create -- is that really where it's at and how do we need to change those products to support that navigational paradigm shift that's currently underway? So that's the questions that hopefully we'll have a chance to talk a little bit more about later, but I think that's all I've got.

And with all my technical challenges, I've eaten up my time and some of my colleagues', so I'll let you change it from there.

CHAIR PERKINS: Thank you, Captain Brennan.

(Applause.)

CHAIR PERKINS: So we'll do all three presentations and then we'll pose our questions to the Panel collectively at the end.

So our next presentation will be from Ms. Julie Thomas. Julie is the program manager and principal investigator at the Coastal Data Information Program, CDIP. So Julie Thomas has worked for over 38 years at the Scripps Institution on Oceanography in La Jolla, California. She's served as the program manager and principal investigator of the CDIP Program since 2001.

So, Julie, welcome, and we're glad to have you here this morning.

MS. THOMAS: Thank you very much, Scott, and thank you for inviting me to the HSRP.

And I'm also director of the Southern California Ocean Observing System, so IOOS; I think most of you are familiar with that program. And I'd just like to say that this has just been a very exciting project to work on with the Port of Long Beach.

And let's see. I have control here. Okay. Oh, where is it? Here we're going. Yes? Where is the computer? Are you controlling?

Okay. So, I wasn't exactly sure, but my first few slides are very broad. I wanted to specifically talk about two programs that I am involved with. And this one is the SCCOOS here, which is one of the regions of IOOS. I'm sure most of you know there's 11 different ocean observing regions within the U.S., and we all have our own observations. We are very heavy advocates for sustained observations, and that's really through SCCOOS what we try to maintain.

So we have HF Radar; we have Blighters; we have shore stations where we measure things; we have part of the leverage programs are through the CDIP Wave Network. And these are just a whole combination of different observations that we have.

Okay. You've got it? Thank you.

So I just put the HF Radar up there because this was such a state investment. In case you don't know, in 2004 the State of California put $21 million into HF Radar within the state. And that's primarily because of course we have the potential for oil spills offshore and people like Tom Cullen, in the back who's with OSPR, are big advocates for these systems, and these data do go right into the NOAA NO model. We work very close with NOAA and OSPR within the state.

And the other program I wanted to talk about was mostly the Army Corps cooperative agreement between the Army Corps of Engineers and the State of California who funds this program called CDIP, Coastal Data Information Program, based at La Jolla Scripps. And this has been in existence since 1975. I really want to commend the Army Corps here because we have managed to have sustained funding for this program since 1975. And we now have a network of 62 buoys throughout the coastal U.S., including Alaska, including the Caribbean and the South Pacific.

We don't do the field portion for all of them because we have many partners -- for instance, at University of Hawaii -- which take care of the field operations, but all of the data processing handling, the real time information -- these go from the buoy itself up to the satellite Iridium to the DoD gateway because of the Army Corps funding on Honolulu, back to Scripps, out to National Buoy Data Center, all in about two-and-a-half minutes. And they update every half hour. We get that data to NDBC, then it is wonderful because of course the partnership with NOAA goes right out on AWIPS to the National Weather Service office. It goes to CO-OPS to the port system.

And a lot of people don't know that actually it is the Army Corps that funds this inter-network of buoys within our coastal U.S. They get assigned a NOAA ID very quickly on at NDBC. So this becomes part of the NOAA network, but actually I like to just highlight the Army Corps here because they are a big partner in this.

So we're going to start drilling down now to this area. And I wanted to just spend the next few slides talking about kind of the complexities for working within Southern California. I get a lot of comments from people, "Oh, the waves are benign in Southern California. You don't have any problems. And what's the big deal?" Et cetera. But when you look at the islands offshore, when you look at some of this charting that has been done through Coast Survey and realize what type of bathymetry we have between Catalina Island and the port, there's canyons. There's a deepwater canyon there. And there's an awful lot of wave refraction, diffraction, a lot of processes, nearshore processes here, wave processes that are going on.

So we put out -- the San Pedro buoy actually went out -- do I have a pointer? Maybe? Yes, right here. In the separation zone for the northbound shipping lane is the San Pedro buoy. And that one was actually deployed in year 2000, once again funded by the Army Corps and the State of California. And the directional spectrum on the left shows predominantly where the waves are coming from. So this is all the records, every half hour since year 2000. That's what is showing on the left here. So you can see that most of them is this westerly storms or waves that are coming in, but then we get the south and a little bit that trickles in from these different directions.

This is during a southern swell. This was actually when the breakwater was breached, and as you've heard, we lost some of the -- the actual boulders were displaced at that time. And that was kind of coming out of the south-southeast there a little bit, but it really depends on the swell as it approaches, like what is going to happen to the entrance as these ships are coming into the port.

Go ahead. So I wanted to just throw this one out. These are just several shots to give you the idea of this complexity for this region. And I thought this one was interesting for today because I believe it was July 24th, 2009 when the HSRP was meeting in Long Beach and I was actually talking with Jacobsen Pilots at the meeting and talking about the importance of wave data. And during the break, someone came up to me and said, "Oh, my gosh, Julie, did you realize about this big storm coming in from the south?" And I go, "Really?" Like I haven't even heard it.

And I looked. Because I actually -- we send messages out to Jacobsen Pilots. We have been doing this for quite a few years. Look at what the models are saying, look at what the waves are saying, and kind of give them a three-day heads up if we see on our records that the waves are going to be above a certain threshold where they might be concerned about it bringing in the ships. And I hadn't been getting the messages. And I thought, oh, my gosh, I have to call the lab, find out what's happening. We're getting big storms. I have no message on my iPhone, computer. And so I called and they said, "No, actually it's working right."

And you can just go on to the next one here because I think you can see it a bit better. This is what's happening, is that these high-resolution Datawell buoys, which thank you very much, Rick, for showing picture of it -- they are very, very accurate in measuring the wave direction and wave heights. And actually, to come into the port right there, it wasn't going to get the full force of the storm because it was blocked a little bit by San Clemente Island and Catalina coming in.

And there was actually a surfer, a bodysurfer that was killed up-coast at Redondo Beach that day. Waves were big; they were breaking at 20 foot at the entrance there. And yet coming into the port, even though I believe you had some harbor damage, they could keep the traffic coming in because actually right there at the port, it was not getting the larger part of the wave.

And so, I'd just like to show this because to me that really does show the complexities. It's important economically to keep the traffic going, right, to keep the vessels coming in. You don't want to over-predict; you don't want to call that there's big waves and all of a sudden close all the traffic to the port when, in reality, because of blocking San Clemente and Catalina, maybe that channel can stay open and vessels can keep coming in. So this is to me kind of an example of why it's important to have good wave data and good forecasts, good models at this particular area. We don't want to have them hit the bottom, but on the other hand, you want to keep the traffic going when you can.

Okay. So this is kind of my pull for

why we really need to validate models as we go into this project with the Port of Long Beach and under-keel clearance.

Go ahead. So I think you've probably seen this, but they have had some close calls. And, John, you can probably talk to this better than I can, but from what I understand, there have been instances where -- I think in this case the vessel actually rolled and came very close to the bottom -- closer than that 10 percent, definitely. So we know that there are instances where ships are in a vulnerable situation right now.

So what we did so far with this is, as Rick had said, is that -- this is -- oops. No. Back. Back one. Oops. Just go back one. Sorry. This is the San Pedro buoy; it's been there since 2000. In September, we deployed San Pedro south buoy; Captain Kip Louttit was on board from the Marine Exchange. Thank you, Kip. And we managed to put this buoy in here.

So now we have really good

observations, good measurements for both of those slices of waves coming in from the west, from the south, from the north coming up here. We can get them. And as you've heard, the National Weather Service is developing this ocean forecast system, a high-resolution model for this area. In the meantime, we're actually sending to Karsten -- thank you, Karsten, for coming -- to PROTIDE, the CDIP model that we have run in house. We actually have a model that was developed since 1985, a wave model that we've been using. And those are examples of what you've been seeing. That's actually our own CDIP model, and we're actually feeding that to Karsten right now.

There's two data points. One here. We call it our SP021; that's our spectral value, and Spectral Value 020 at Location 20. So this is the channel coming in here. And both of those values are being fed into PROTIDE right now as a temporary measure until the National Weather Service is up and ready to go operational.

Okay. So I mentioned that we are

sending messages to Jacobsens right now. This is an example. This is Wavewatch 3. For those of you that know, that's the model, which has been running out of NCEP for quite some time. And like I said, this is a difficult area to actually model. And they have never had the chance to really validate or bring that model inshore. It usually stops further off in deep water.

What we've done before in working with NCEP is each one of our Datawell buoys -- so from the map where you saw the 62 buoys -- NCEP has actually put in that point at that latitude-longitude of the buoy as a model point within Wavewatch 3, so we can do a comparison of Wavewatch 3 right at that location on all of our buoys.

So for this particular one, when we see this type of thing happening, the model is predicting something, but then we see at least a foot difference in what is going on. And we actually do send this data -- this is what is an example of what Jacobsen Pilots would get then.

And we just have that automated. We look for our thresholds above a certain wave height and the longer period waves. I think anything over 10 or 12 seconds is when they're interested.

Okay. So this is a website that we've kind of thrown together just very much like Coast Survey did, but it's not quite as sophisticated. This is actually a display at the Marine Exchange. I don't know if you saw it yesterday or not, but there's a lot of stuff on here. This is San Pedro buoy this side; this is San Pedro south this side. This is the CDIP wave model. What's happening, this model updates hourly. And this I think is just really helpful; it shows the spread of the direction of the wave and energy that's coming in.

Go ahead. So this is really my last slide. I just wanted to acknowledge that -- and it's been mentioned before -- but this has been really a nice partnership. Just looking around the room with the end user, the industry partners, the Marine Exchange. Tesoro is here, PROTIDE, Jacobsen Pilots. I think that as really working with federal agencies, both NOAA and the Army Corps and the State of California, it's really nice to see all of this partnership coming together. And I think this is a good example of that. So thank you very much.

(Applause.)

CHAIR PERKINS: Great. Thank you, Julie.

The last speaker on this panel is Captain John Strong, Vice-President of Jacobsen Pilots. Since 1922, Jacobsen Pilots has been keeping vessel traffic flowing and safety and smoothly through the Port of Long Beach. In addition, the company serves the U.S. Navy as their contract pilots for the Naval Weapons Station Seal Beach. Captain Strong became a Jacobsen Pilot in 1982. He was appointed vice-president in 1997. He is a graduate of the California Maritime Academy. As chairman of the Los Angeles/Long Beach Harbor Safety Committee, he also serves on the Executive Steering

Committee for the Central California Area Maritime Security Council, representing the wet side of the table.

So, welcome.

CAPT. STRONG: Thank you. Well, let's see, Rick did the first half of my presentation and Julie did the second half --

(Laughter.)

CAPT. STRONG: -- so I'm just going to stand up here. I'll give some sea stories as we go.

(Laughter.)

CAPT. STRONG: You've seen this ship a lot, Genmar Vision, the Stena Vision, same ship. This is a great example of the size ships that now can come in fully loaded into the Port of Long Beach. The ship is 1,100 feet long, 230 feet wide and has a maximum draft of 63 feet. We can actually bring ships in up to 65 feet now. That's 312,000 dead weight tons of cargo that this ship carries. This has been a slow evolution over the years. As the dredging continues, the ships get bigger. The terminals are able to handle these ships. And this is the challenge that's been going for us as pilots, as to slowly evolve and do larger and larger ships.

The way it works or has worked up to now -- now, I'm an old school guy. I'm kind of a look out the window, gut feeling, does it feel good or not, should I go? And over the years, having piloted for 33 years, more and more tools have become available to us. And up until -- well, even today that ship comes in, approaches from sea, we have a weather event going on, really the control we have over it now is the pilot and master look at it, they kind of sense, well, are we pitching one degree? I don't know. What do you think? Are we pitching one degree? How do you measure one degree of pitch?

And I became very concerned about this when the whole responsibility of whether to attempt a transit with the ships of this size coming into the Port of Long Beach rested solely on two guys out there talking amongst themselves with very limited data input. I expressed my concern at a Harbor Safety Committee meeting and the Coast Guard's ears poked -- I remember Captain Jenkins was here at the time. We had just dredged, so we could take into 65 feet. We were shooting for 69 feet actually, and that's what we felt we could do at the time. And I remember his ears perking up and said, you know what, I think we'll just freeze this at 65 feet for now until we can get a better handle on what we're doing here and get some more information.

We can go to the next slide. Parallel to this, we've had the rise in the size of the just astronomical increase in size of container ships. And that wasn't a big deal for us. We never ever thought that air draft would be an issue coming into the inner harbor. Then all of a sudden they just kept building the ships bigger and bigger. And again, the question that came to the pilots is: How big a ship can you put in that little hole back there in the inner harbor? And again, it was one of those deals that we said, "Well, I don't know, what do you think? Let's try." Are we going to keep getting bigger and bigger until we have an accident? And I said, "We got to come up with some sort of guidelines on how big is too big."

The air draft, the air gap on that ship really started us thinking on the importance of tides. Up to this point, before that ship -- that's the MSC Texas. Let's see, it came in 2004, I think it was. And up until that point when we had an issue with air draft, we knew that the bridge was 155 feet above the water at mean high water, and as long as the ship had an air draft -- if the ship even calculated the air draft -- less than 155 feet, we could go. And we're talking an inch less, two inches less, whatever.

And I'll never forget one day I'm driving into work -- and this was before these 8,000 TEUs started coming into the inner harbor -- and I was coming in to check on the boys on the weekend, and I'm listening to the radio and it says, oh, because -- there was an El Niño event in the 1990s sometime -- and said, "Geez, isn't that weird?" -- because we'd been going off predicted tides. The LA Tide Station has a long history of being very precise on the tides in this port.

And the radio announcer says, "Well, geez, we got a two-foot higher than expected tide today because of El Niño." And we had a ship coming in. I'm coming down Ocean Boulevard. I can see the ship approaching the bridge and I go, "Oh, God." And I knew we were only within a couple feet of clearance at that point. I kept driving; I drove right over that bridge and stopped on the other side and got out of my car and watched that ship go underneath the bridge. I thought if it hits, I might as well be the witness to it because I'm going to be in talking to the Coast Guard about it.

(Laughter.)

CAPT. STRONG: Luckily it cleared. At that point that's when we said, "Okay, we got to have a safety limit here for the ships coming in underneath here." We went to the port. We said, "We need to have some sort of way of getting some real time information and not just work off the predicted data." We got a direct link to the LA Tide Station at the point. We started the discussions about, "Oh, is there technology out there that can actually measure the height from the bridge down to the water?"

We started finding out that there was. There's different types. There was radars; there was lasers; there was all this stuff. And it like started that discussion, started pulling through the port. We were reaching out to NOAA and anybody we could find to find out what was out there that could help us. And so, we were doing the shotgun approach on let's wait until a close call and then go out and find out what's out there that can help us prevent an accident from happening. That process started the discussion amongst us as a pilot group working with the port on getting a little more -- taking more advantage of the available data out there and what people are assembling it for.

We can go to the next slide. Going back to the container ships again, we started at that stage. In 1996 we went out and contracted with a company -- at the time it was named AIRINC -- that did some of the navigational protocols for the airline industry. They were formed during World War II to standardize the navigation procedures and everything for the airlines. We hired a consultant to go out and see what was on there, what off-the-shelf navigational aids or instruments were out there that we could maybe develop our own.

We found AIRINC. We started working with them, and we started a discussion. We're a private company with another private company in saying, "This is our problem. How do we solve it?" They would go out and find out what the technology was out there and started developing our own carry-aboard pilot unit. It's gotten down to a little bit smaller, but it was pretty clanky at first. All hard-wired together. We've gone wireless; we've got shoreside stations and sensors and all that kind of stuff. But it was one company hiring one consultant and working on our own trying to figure out what was out there.

Then working with the ports, we've been educating ourselves on, well, the ports are taking soundings, but how often are they taking soundings? NOAA gets soundings. They upgrade their charts, but how accurate are they? We had no concept of the detail that was going in, so we were floundering around out there.

So that evolved into we got the air gap sensor on the bridge; it helps us with the real time distance on the bridge to the water. And we also have that horizontal factor that Captain Brennan was talking about, where we're taking wider and wider ships back in the channel. Well, you have captains coming in. They look at the channel. The channel is this wide. Look at all that blue water. Well, the channel is shaped like a V. So the deeper the ship is, the narrower the channel is, right? And we have ships coming back in there that are 1,150 feet long, so up-path you have to stay pretty much in the axis of the channel or your stern will hit one side and your bow will hit the other. And we have to be able to see how much channel do we have underneath the water that you can't see?

So we started with the port taking soundings and getting sounding points and putting them into our own navigation units that we could draw up pretty much like -- I mean, that model you showed, that's our dream model. You got everything. But we were limited that -- that takes a lot of data and the computer to process that, keeping a smooth picture of the ship moving through there, we were limited to doing just sections at a time as we were going through very clunky, working up through that technology.

But that allowed us -- when the port came to us and said, "How big a ship can you take down this narrow channel?" And we went through the process, that CNN test, like, "So, Captain

Strong, what were you thinking when you ran that ship aground in the back channel, you know?"

(Laughter.)

CAPT. STRONG: Going through that and saying at least we surveyed the channel and made sure there's no -- we did find a bunch of old boulders and concrete blocks and stuff that were left over from the old pontoon bridge; even the Spruce Goose used to be moored there. There was some debris from that. Surveyed all that. Got the latest soundings. Put it into our PilotMate. Had a meeting with the Coast Guard. Brought them in and said, "We'll try it."

And so we did. And we've since -- that was 140-foot beam back then. And just last week I took a ship -- it was a one-time deal -- kind of went through the same process of 158 feet beam. So utilizing the inner harbor so much greater now than we used to, due to the technology that's available to us.

Next slide. Now getting back to the VLCCs and the ULCCs, like I started, this is -- I thought I better get a BP ship or something in here, Rob, just one of your customers. This is an 1,100-foot ship, 190-foot beam; it's got a maximum shaft of 73.9 feet -- that's 306,000 tons dead weight. Well, this is a ship that wants to come into Long Beach Berth 121, which is the deepest tanker terminal in the lower 48 states. And we're shooting -- our goal is to go to 69 feet, because that goes back historically on how these things work. When Arco had 121 channel -- let's see.

Next slide. I'm kind of bouncing around; we can go to the next slide. When Arco had that terminal, their deepest ships at that time were 69 feet deep. And they came to the port and said, "We want to bring in our ships fully loaded. How deep a channel do we need?" They come to the pilot. So, how deep a channel do you need to bring in a 69-foot draft ship? And, well, 10 percent sounds pretty good. Let's say 10 percent under-keel clearance and let's go from there. And so, 69 feet or 7 feet. Say, oh, that's 76 feet. That's how we came up with 76 feet on that channel. I mean, just a wild-ass guess by the pilots on 10 percent under-keel clearance. The port said yes. They started dredging; we dredged it down to 76 feet.

In the meantime, Exxon-Valdez happened. The tankers went from single-hull to double-hull. The same size tanker all of a sudden became a lot deeper, and now we still can't get a fully loaded ship in there with a 10 percent under-keel clearance.

But once we finally got all the dredging done and said, "Okay, our customers, the oil companies are ready; let's bring it in at 69 feet." And it's all of a sudden we're saying, "Oh, my God." We had to go back. Our tug escort regulations, our matrix on how heavy a ship we could bring in, are all based on displacement tonnage for how much tug power we need -- didn't even go up that high. So we had to go into the process with the state and refigure the matrix on escort tug strength and all that. And we got that done. And that's when I had the conversation thinking I know we said we could go in 69 feet, but I'm older and wiser now, and I'm not feeling so good about that and worried about the movements of the ships and those kind of things.

So here we are now. We can go to the next slide. Everyone's seen that; that was the reason.

We can go to the next one. Now we need to figure out: How deep can we go into Long Beach 121 and under what conditions? Like I said, the model now is the pilot and the master get out there, they look at the conditions and they eyeball it and they think, "Well, I feel good about it. Let's go. I don't feel good about it." It only takes one person to say, "No, we're not going to go. We're going to go out an anchor outside." Of course, when a terminal is waiting for a million gallons of oil to come to it and the ship says, "Ah, never mind; we'll wait for the weather to get better," that's a huge expenses. And I've learned from long experience that if you're going to disappoint somebody, disappoint them as far in advance as you can. Give them time to get used to it.

But how can we make a prediction on whether we can go or no-go in advance and take it -- don't put that responsibility on two guys sitting out in the middle of the ocean trying to eyeball how a ship's moving around and they're five miles offshore coming in. Who knows what it's going to be like when we get to the gate?

Julie mentioned about a ship rolling and touching. That was the Arco Alaska, and that was back in like '85 or something, 1985. That was before the channel was dredged, where it was a 59-foot channel. And that ship rolled right at the breakwater entrance and it was during a -- it was west swell coming in. And nobody expected to roll. We all at the time -- we thought, well, that's a double-bottom ship. There's a stability thing in there. Maybe it rolled. It touched. Didn't breach the hull or anything. But it was one of those things that made everybody stand up and take notice. So we got to get beyond the eyeball judgment of the pilot and the master. And this is a process that we're working on now.

Real quick, on the PROTIDE thing, Karsten, you got to thank me for bringing you over here, because I've been worried about these deep-draft tankers. In Rotterdam, they have a 76-foot deep channel, very similar to Long Beach. They board 15 miles out. These ships come in at 72, 73, 74-foot of draft. And I took a trip over to Rotterdam, rode with the pilots, looked at their pilot system and talked about -- I remember talking to a pilot and saying, "God, how do you guys figure out when you're going to go or not?" And he pulled out this sheet of paper. "We got this. They tell us." And I said, "Well, what happens if it's wrong?" And he says, "Well, no, it's not wrong. The port tells us to go and we go. That takes all the responsibility off the pilot."

Well, that's how we got introduced to

PROTIDE and started that conversation with him and said, "Well, what do we need to develop a system like this?" And all this stuff, NOAA, Julie and everybody's been working in the background, Army Corps of Engineers. Well, we're just a little company out here on the West Coast doing it by ourselves and not realizing what assets are out there. And that was the beautiful thing about -- NOAA jumped all over this with this Harbor Safety Committee. The NOAA representative -- at the time, Gerry Wheaton -- now Jeff Ferguson is on there, has been putting us in touch with the right people to get the right things down.

We can go to the next slide. But as an example of the gaps here, this -- before I did this, just last week I went on our PilotMate system. I said I'm going to -- because I knew we supposedly had the data of all the soundings outside the breakwater. They had given them to our tech guy that does our PilotMate system. And I set up -- this is a 69-foot -- I put in a 69-

foot draft of the ship, with a 10 percent under-keel clearance -- or a 65-foot with a 10 percent under-keel clearance -- to show me where the shallow areas were, and this is what came up.

We have missed all that data to the east. And that's not NOAA's fault; that's our fault. Somehow we didn't know the right questions to ask, or I didn't communicate to my tech guy the questions to ask, because that communication chain had kind of broken down. And it's groups like this and these kind of get togethers that help operation guys like me that don't really understand the science. I only know I want the end result and know the end result I need, but to help fill in those blanks. And just that alone has just been huge for you guys coming out here this time.

Okay. We can go to the next one. Yeah, PROTIDE, blah, blah, blah.

(Laughter.)

CAPT. STRONG: Going to be great. But the one thing with PROTIDE is that, again, learning as an operations guy, it sounds easy. I mean, I had my computer guy tell me, "With enough time and money we can do anything." But with PROTIDE we need the data to come in. And getting that data is really tough, especially when you're talking as a private company or something going out and trying to do it yourself. And we've been introduced to Julie; she's been helping us with the wave models, and then with NOAA and all the support that we're getting from this group here and with industry.

See, it's all economically-driven, too. Because without the Army Corps -- we first came and four or five of us sat down to talk about this and the first question is, "Okay, well, where are we going to get the money?" We got the state to come up just for the feasibility study to see if it was even possible. So, okay, "Well who's going to chip in to fly Karsten out here to talk to us?" But we had the state chip in some, the ports chipped in some, and the oil companies chipped in a lot. And Rob went out and knocked on a lot of doors and got a lot of funding to get this thing off the ground. And then with that and getting the federal side of it in has just -- this thing has just taken off. It's been huge.

Next slide. But I'll tell you what, this is the next challenge. And that's a great picture. I saw Julie used it, too. But this is like a 14,000 TEU going into Pier J South, which is right north of the opening to the Long Beach breakwater. That ship right there has only three feet of under-keel clearance; that's all we're requiring now.

And this is not necessarily a long period swell concern of mine; it's a southern storm concern of mine, because when you turn around, that ship's 158 feet wide, it's not going to take much roll to touch the bottom. And it hasn't happened yet, but when it does -- or if it does -- it's going to be a big deal, because when the Panama Canal opens -- this is just a prediction -- all these ports on the East Coast are trying to get more water to get these ships in there, that pitch and roll thing for them, it's going to be huge for all the ports, I think, on the East Coast with the big container ships coming in.

And you know what, these ships, when they come in, they're very tender because they don't want to be stiff. They need to be very tender so that they don't flip the containers off. So they have as small a GM as possible, and they roll real slow and real long. So you heard it here first. And that's the next stage.

We can go to the next slide. This is the hugest thing of the deal is the partnership, and we all talked about it. And inside the breakwater stuff, it just gets more and more complex. And I understand inside the breakwater, making predictions is a Herculean task. And we've already started the initial discussions with it. It's going to be very expensive and to get the data, but I hope after we prove the PROTIDE system for us outside the breakwater and we concentrate on the tanker companies helping fund it and get it off the ground -- my goal as the next stage is we start pulling in the container ship companies and we start working inside the breakwater and take care of those guys in there. That's all I have. Thanks.

(Applause.)

CHAIR PERKINS: Thank you, Captain Strong.

Who would like to go first for questions for the panelists? Dr. Miller?

MEMBER MILLER: Joyce Miller. The PORTS system, we've heard it many other places, is very differently funded in different harbors around the country. What are the plans for this system in terms of sustainable funding for the Port of Long Beach, whoever?

CAPT. STRONG: From a pilot's perspective this is all customer-driven, because we don't get any funding down here in the Port of LA and Long Beach for our port system. And like I think San Francisco gets some sort of funding up there from the state. But the pilot's saying, "If you want us to take this size of ship to this berth, this is the information we need." PORTS provides that information. So the Port of Long Beach is more than happy to help fund the PORT System. And above and beyond that, in the future as they build things, they build them to the PORTS standard, their surveying equipment and all that kind of stuff so they can help, I believe, they can help get the data to the Government as well for sure.

MEMBER MILLER: So this new system will be funded probably in the same manner that the --

CAPT. STRONG: Well, it's a partnership. We're going to go to the oil companies and whatever. Or everything stops and the big ships don't come in.

CHAIR PERKINS: Dr. Kudrna?

MEMBER KUDRNA: We toured the port yesterday and I guess those from other parts of the country, we're surprised that there's still ships under anchor backlogged from the strike. Obviously there are economic consequences to that. Is that purely a labor issue or could some technology improve the ability to clear that system up?

CAPT. STRONG: I think it's a labor issue. I don't think there's anything technology could do. I think one thing though that is surprising to people is you keep seeing the labor issues have been resolved evidently, but there's still a lot of backlog anchored out there. A lot of those -- and Kip can probably address it -- are new arrivals, because they've been drifting out at sea in the -- out of the air quality zone so they can burn the dirtier fuel. And as their times come up, then they come into anchor. So they've been out there for a long time, a lot of them.

CHAIR PERKINS: Yes, I'll go one. Captain Brennan, would the one-meter grid density, would the new high-resolution data set -- and not being familiar with the movement, the shoaling and the movement of the bottom in this region -- at what frequency are you going to have to go out and resurvey this area to have an accurate data set that will support the use of this new precision PROTIDE and approach?

CAPT. BRENNAN: Well, I think that our hope is that at least beginning to monitor it at that level is what it's going to take. And so, certainly for the channel that's not within NOAA's jurisdiction; that's a Corps of Engineers -- a federally-maintained channel -- so they would be doing that. But I think as we start to navigate more closely to the bottom, I think that it's going to bring that certainly into sharper focus, or it should drive that into sharper focus as to what is that resurvey frequency? So that's a question that I don't think that we know right now.

I mean, to the benefit of the Long Beach and LA Ports, I think geologically there's not a lot of sedimentation and dredging, at least as I've been told, is not routinely needed like it would be in the Gulf Coast or on some of our East Coast ports, but I think that, you know, that may change as things get tighter. So I'd have to let Captain Strong answer some of those questions.

CAPT. STRONG: Are we talking about how accurate the soundings are?

CHAIR PERKINS: Not about how accurate they are, but how often -- if it's the Army Corps' burden to provide a timely and accurate data set at a one-meter resolution in order for this solution of precise navigation to work, is that a feasible expectation? And I don't know if we have anybody from the Army Corps here today, that I guess sitting here I'm like, "How do you keep an accurate enough data set temporally current enough for this system to be reliable and provide safe, precise navigation?"

And maybe this geography on the ocean bottom doesn't move and sedimentation isn't the concern, but looking at the -- it's compelling, right, very compelling and that's citing application of technology to get the ships in and out at a tighter frequency. But what are we going to do with this system in Charleston, where we just met, where the sedimentation and the shoaling -- are we going to have to resurvey every day? That's the nature of the question I'm trying to ask.

CAPT. STRONG: One of the phenomenon that's happened with the advanced technology of taking bottom surveys is you see every nook and cranny. And every time I take a ship into the dock, I'm going to change the contour of the bottom just by virtue of popping 100,000 horsepower engine dead slow ahead for five seconds. I'm going to take this pile of mud here and I'm going to put it over there, and you're going to be able to see it. And in the old days, I mean -- I think in Houston they still do it -- moving a little bit of mud around is not a big deal with a ship. If it's not hard, it's soft.

So when you start getting too detailed -- I almost wish we could make the soundings more coarse, plus or minus a foot or something, because the way contracts and stuff are made with terminals, with the port on how deep a ship, am I allowed to get into your berth, and you have 18 inches under-keel clearance, well, if you have a six-inch swing, all of a sudden you can't get that ship in there anymore and it's a big hoopla going on. And I think there's -- the threat is not as big as the consequences of not knowing that. You know, the ignorance is bliss thing?

But like you said, yes, if you want to be that precise, you would have to survey every day.

CHAIR PERKINS: To those in the survey business, that's great news.

(Laughter.)

Gary?

MEMBER JEFFRESS: Well, it seems to me that the pilots -- you're going out in vessels every day. Why not put hydrographic instrumentation on the pilot boats so that you can actually change it, get the data and see the change on a daily basis?

I'm going to ask this to Andy. Andy, is there technology to do that?

MEMBER ARMSTRONG: I may get in trouble here.

(Laughter.)

MEMBER ARMSTRONG: Certainly it's not a technology issue, but it's a process issue and an expertise issue and a personnel issue in terms of installing and maintaining the equipment, processing the data, keeping track of all the corrections, getting that through the system. So I say the technology exists, but the process is a challenge for something like that.

CHAIR PERKINS: Carol?

MEMBER LOCKHART: Yes, I actually was going to ask this the same question as you, Scott, so I'm glad you asked it. I have a slight follow-up to that, and that is if you get these updated data sets, whether it be from the Army Corps of Engineers, whether it be from yourselves -- you talked about rapidly updating the database and I'm wondering if you have a goal in mind for what's meant by "rapidly?"

I know certainly when they do this at Rotterdam, they go out and they survey very regularly and they're updating I think almost overnight those ENCs. Is that the kind of goal you have in mind for precision navigation? And I guess I'm asking in the context not only of Long Beach, but we've been asked to consider other ports that this might be of interest to for the U.S. That's one of the questions we've been asked, so I'm wondering if you could comment on that?

CAPT. BRENNAN: I'm looking at the admiral here because talking about dangerous waters, certainly overnight would be great. I mean, I think what the Port of Rotterdam does is absolutely the gold standard, but they control everything, and they're delightfully small. Right? So I think the challenges there are very well contained. They have dominion over the data and the products that they create and everything.

So, but it does show the art of the possible there. And so that's certainly the goal.

I was intentionally vague as far as doing it rapidly and what that meant, but I mean I think we would like to say -- I mean, if we could get that data and prioritize it and turn it around, at least initially I think in two weeks, we think that that's probably doable right now, I mean, assuming that that was a priority and it would supplant other things in that.

But we don't know right now, and that's the point. And that's the whole reason why we're doing that is we don't know what we don't know. And so we need to begin to understand, okay, well, what does that take? How quickly can it drop in? And so there's a whole host of issues. There's data format issues. Is the Army Corps actually logging and calculating their uncertainty? And if they're not, well, then what do you do? I mean, you know what that means to your calculation of your gridded data. And so if there's no uncertainty to it, well, how do you prioritize it with everything else that's in your database?

So those are the questions that we're hoping to understand better as we go through this process, is what does that mean? Technologically it sounds easy enough, but in practice it's an entirely different thing.

CHAIR PERKINS: Captain Rassello?

MEMBER RASSELLO: Hi, my name is Captain Rassello. I'm from Carnival Cruise Line. I have a question regarding the assessing report in regards of the under-keel clearance. You feel comfortable with 10 percent under the keel with the 65-foot deep draft vessel, right?

CAPT. STRONG: No. No.

(Laughter.)

MEMBER RASSELLO: Well, my question is we assess our under-keel safety clearance about 20 percent just to be say conservative due to the height of our vessel to the wind effect to the side list. So how this would be communicated with the end user, let's say the shipping industry, if a port is doable for certain draft? In the planning stage, I mean. When I try to plan my itinerary, they ask me can this ship go to Long Beach? So I have to have a good assessment based on the data you provide and decide if 10 or 15 or 17 or 20 percent would be enough. So I noticed that you use 10 percent. Is this base on static draft or dynamic draft?

CAPT. STRONG: Well, that was on static draft, but we're talking -- this is the olden days where we didn't know anything. We were guessing that that would be a good figure to start from. There were some studies out there that the ships would not experience conditions that would allow them to pitch or roll, that would exceed 10 percent. But that's when we started getting more and more information. And at that time the information that we got was that it was very unlikely that we would get long period swells in excess of 15 seconds. And it was the 18-second swell that was probably going to cause the problems. So then we think statistically it's not an issue. But as we got more and more data we started finding out that we were getting those swells.

So, and there's also -- captain, there's a big difference between -- when you talk about 20 percent under-keel clearance, I guess you're talking about the approach to the harbor, because they certainly wouldn't get that alongside the berth. But depending on where the berth is and what you're going to experience between the breakwater and the berth -- that's like that picture I showed you of the container ship. This is a gap in our process that needs to be addressed, I think.

MEMBER RASSELLO: Yes.

CAPT. STRONG: And that's a tough one.

MEMBER RASSELLO: Yes, I think it will be good if the NOAA present this as a criteria when we buy a chart, right? And then the chart says, okay, this is the minimum under-keel clearance based on the data we have for this port. So the user will already know that the study has been done according the data provided and not trying to guess himself and then decide with the pilot when the pilot board if they can go or not go, having already a baseline study of -- write it down. Let's say, okay, this is the minimum to accept a ship in this port.

CAPT. STRONG: I think the best answer you're going to get though from anywhere is you're going say under normal conditions these are our limits, but under abnormal conditions it will be greater. And so, I mean, for the long-term planning that's what we always run into is customers asking us, well, how big a ship can I get in here, and I say, well, how often do you want to come in? I can't guarantee that that will be the case every day, but most of the time we can get in.

MEMBER RASSELLO; Yes, but nowadays with increasing of the ship size, we really work on very limited data to play with. Not much room to play with. So we accept some consolations, but at least to approve a port or not I need to have some standards data.

CHAIR PERKINS: So would real time air gap capability from ports in the approaching implementation of autonomous hydrographic survey depth measurement -- are we getting close to needing real time bottom measurement from autonomous systems to complement the real time air gap? Do you see that as in the future, Captain Strong?

CAPT. STRONG: I don't think here in this port. I think ports are subject to shoaling, maybe, but I don't -- having the air gap and that process, that's all we need. Our bottom doesn't change that much. But if you know the air gap, then you're going to know the tide, right, kind of thing.

CHAIR PERKINS: Gary?

MEMBER JEFFRESS: This is a question for Julie. Julie, one of the things the Panel's been discussing several times in the past is how to transfer funds from different federal agencies to do cooperative projects, and particularly the

Corps of Engineers. But I believe you said that your funding goes back to the 1980s with a cooperative arrangement with the Corps. So I was wondering how did you do that and what sort of mechanism is in place to make that happen? And where from the Corps' budget does it come from? Does it come from the district level, the regional level or headquarters?

MS. THOMAS: We've been through an evolution since the 1978 when the Corps funding actually -- we started with Sea Grant funding and then state. Then it became the Army Corps in a cooperative agreement. So we've done a few things. It actually started out -- George Domurat, San Francisco, Army Corps was very instrument. Charlie Chestnut. People that know Corps people. These were all people that founded CDIP. And that was district funding.

But then as we started to expand, particularly out of the State of California, it became obvious that it was too crazy to get district funding from LA, San Francisco, all the different ports, or district offices. So then it became centralized. At that time it was in Washington, D.C. at Fort Belvoir at the Corps headquarters. And then it moved to ERDC. So now all of our Corps funding is actually centralized in ERDC. It's under a CODS president's budget, Coastal Ocean Data Services. And part of that funds the Army Corps.

It used to be -- well, it went from district funding and then it was an earmark for a long time. And then when earmarks kind of went out of style, we worked very hard -- well, people within the Corps worked hard to move it over to the president's budget. And it's actually under -- it used to be in General Investigations, but now it's under the O&M. That's a little bit I think a sore topic with the Corps because it does -- it is part of the dredging budget. And I don't know. That's kind of been out of my purview. But I know it is out of O&M right now and it is a line item through the Corps. And then we also have managed to get a little bit of an add-on through Congressional support, too.

MEMBER JEFFRESS: When you say O&M, that's the O&M from --

MS. THOMAS: Oh, Operations and Maintenance of the Army Corps.

MEMBER JEFFRESS: Yes, but the dredging budget?

MS. THOMAS: Yes.

MEMBER JEFFRESS: Okay.

MS. THOMAS: As far as I understand that. By the time -- like I said, it's all centralized through ERDC right now. But we've also -- there is another piece to the pot, because we've been masters at getting our funding from different federal and state agencies. We did have this cooperative agreement with the State of California. So since 1985 all of the Corps funds were routed through the state, and that was wonderful.

For those of you that know what type of overhead the universities of California have, you can understand why we encourage that. And but we also now have -- just this year we have a cooperative agreement with the Army Corps directly. So it's evolved over the years. It kind of depends on what's happening at the time, but we've been masters at trying to move money back and forth.

We also get Navy funds. A lot of these buoys that were up there are supported through the NAVY, and that's MIPR'ed directly to the Army Corps.

CHAIR PERKINS: Great. We're right at our scheduled time, so we'll conclude this session with a closing comment from Andy.

MEMBER ARMSTRONG: Yes, for Julie. So it seems that institutions like Scripps and like UNH where I work and others have the advantage of a lot of oceanographic and marine geology science and understanding. So in your case it might be wave and current data, and some others it might be regional coastal processes. So it seems to me that there's some potential gain from interaction with the charting agencies and the scientists who kind of understand regionally the things that might affect precise navigation in a particular area. Could you comment on that?

MS. THOMAS: Yes, actually I get the comment often how come these buoys aren't directly under NOAA, and why is the Army Corps interested? And I go back that the reason why this program is actually at Scripps is because the closer to the shoreline you get regional sediment management structure. The Corps is interested. They're responsible for structure design along the shoreline. They're interested in very -- they want to know the thresholds for design. They want to know the sediment budgets.

And we have a really strong team, academic, that dedicate their life to figuring these things out. We spend a lot of time on quality control with these buoys. The Navy uses them for very high proficient precision maneuvers. So the accuracy and the real time quality control on these systems is really what has kept it at Scripps. And I think that people that use the system have realized the academia/federal partnership works really well here.

And to me this is kind of the coastal intelligence that NOAA talks about. I didn't mention that earlier, but I'm very involved with a lot of the quality control efforts and I think that there's this coastal intelligence that goes into coastal resiliency that is very important and programs that come through academia. I'm a big advocate for them because we can be 24/7. We can be operational. We get 99 percent, 100 percent reliability on these buoys with 60 of them out there. So we work very hard for that.

I know you're out of time. I can see Scott ready to go.

CHAIR PERKINS: Well, I completely lost control of the schedule yesterday, so I'm going to try to do better today.

(Laughter.)

CHAIR PERKINS: So thank you very much. Applause for our panel, please?

(Applause.)

CHAIR PERKINS: We have a brief 10-minute break and then we have the Southern California Regional Stakeholders Panel. So, thank you very much.

(Whereupon, the above-entitled matter went off the record at 10:19 a.m. and resumed at 10:40 a.m.)

CHAIR PERKINS: All right. We'd like to get back on track here and reconvene and start our Southern California Stakeholder Regional Panel. And Regional Nav Manager Jeff Ferguson is going to do the panelist introductions for us.

So, Jeff, thank you for that.

MR. FERGUSON: Yes, so, well, I'm going to tap dance for a few minutes while we finalize the IT and do all the introductions now, so when it's time for the next speaker we'll just roll right through.

So I think we got a real good panel today. I'm going to give a brief overview. Again, I'm Jeff Ferguson. I work for Coast

Survey as the California Navigation Manager. I have 25-plus years working with NOAA in various mapping and charting positions. And I've been here on the ground in California since just November replacing Gerry Wheaton who had the job for about a decade. So I'm still coming up to speed on some of the local issues, but I'm the point man out here.

And then next on the panel, we'll listen to Mr. Tom Cullen. He's the administrator for the State of California Office of Spill Prevention and Response, or OSPR. And California is pretty unique in that the state government takes a very active role in the Harbor Safety Committee framework and in maritime safety in general. So it will be interesting to hear from him.

He was appointed by Governor Jerry Brown as the administrator in June 2012. He directs a team of scientists and environmental specialists, game wardens and support personnel in protecting and preserving the 3,400 miles of shoreline and almost 8,000 square miles of state waters from oil and other substances.

Prior to his appointment, Captain Cullen served in the United States Coast Guard for 31 years, including serving as Deputy Commander of Coast Guard Sector San Francisco, where he performed a wide range of federal authorities in the San Francisco Bay Region. He received a bachelor of science in ocean engineering from the Coast Guard Academy and a master of science in industrial administration from Purdue University.

So we're happy you can make it, Captain Cullen.

Then we're going to have Jim Haussener, Executive Director of the California Marine Affairs and Navigation Conference. So we spent a lot of time talking about big ships coming into big ports, but I'm hoping Mr. Haussener will give us a little broader perspective of some of the smaller harbors and other traffic that comes through state waters.

He has over 30 years of experience in the California maritime industry where he has been the harbor master of the Cities of San Leandro and Vallejo, as well as assistant harbor master for Pillar Point Harbor and the harbor patrol officer for the City of San Mateo. Currently he is executive director of the California Marine Affairs and Navigation Conference, or CMANC, the trade association that represents the objectives of California ports, harbors and marinas.

And then finally we have Mr. Christopher Cannon, Director of Environmental Management for the Port of Los Angeles, and he's going to have a -- take us a little different subject matter, talking about hydrography and hydrodynamic models in the Port of LA and how they use that in their environmental programs.

He is again the Director of Environmental Management for the Port of Los Angeles, a position he has held since October of 2010. He is responsible for balancing commerce and growth with ecological sustainability at the nation's busiest container port.

He also spent years as Legislative Assistant for Environmental Policy on the Washington, D.C. staff of U.S. Representative Martin Sabo. He received a bachelor's degree in international relations from Dartmouth College and a law degree from the University of California at Berkeley.

Are you ready?

PARTICIPANT: I think so.

MR. FERGUSON: Prefect timing. All right. Let's see if my clicker works. There we go. So I just did that, so we'll roll right along.

So the Office of Coast Survey has regional navigational managers located around the country, and we're kind of the local representative on the ground to work with the pilots an port authorities and local stakeholders to learn about what they need from NOAA. Although we work for Coast Survey, we take a much broader perspective and represent navigation services as a whole. And basically we have the NOAA logo on our business card, so if anybody comes to us with questions about maritime weather or anything that NOAA does, we certainly try and help them.

And so my territory there is the State of California. Like I said, I've been here since November of last year.

Just to kind of level set us for a second, I wanted to pull up the chart of LA/Long Beach. I know you can't see the interior very well, but I wanted to highlight a couple points here. The green line, I highlighted the breakwater. So the breakwater is, quote, "owned and maintained by the Army Corps of Engineers." So when we had the breach last year over the storm, it was the Corps of Engineers who responded, found the emergency funding and fixed it. And of course they maintain channels and take care of that. And then there's the offshore anchorage which the U.S. Coast Guard defines and the Marine Exchange works with the Coast Guard to assign ships to those anchorages.

Inside the breakwater is then where the port authorities come into play. And so I put a red line there to give the approximate division between the Port of Long Beach and the Port of LA. So to the right or to the east of that red line is the City of Long Beach, the port of Long Beach. Jacobsen Pilots run the ships in and out from there. The Port of Long Beach has a survey department with a land survey team and a hydrographic capacity with a ship and a boat and multi-beam.

To the left is the City of learning outcome, the Port of Long Beach. The LA pilots are actually city employees that work for the port. And the Port of LA also has a survey department with land surveyors, hydrographers, a boat with multi-beam.

So you have basically three different groups doing periodic surveys in this area, four if you count Coast Survey, which I'll talk about in a second.

Most of the port surveyor work is very small and doing specific investigations of the pilots or a tenant has a problem about sand dunes along the wharf and to support the construction projects in the area.

The blue arrows I drew was to show the water in flow into the port. So on the Long Beach side that's the LA River. Calling it a river is pretty generous. It's basically a concrete storm drain and with the lack of rain we get, not much flows out of it. And so they don't have to worry about sediment. On the Long Beach side is the Dominguez Channel, which is even smaller. But again, there's not much sediment flowing into the port. So as we were talking earlier, when they do dredge work, it stays dredged and they worry about prop wash moving some things around, but they don't have to worry about sediment transfer like a lot of ports do.

So the ports and the Corps, like I said, do do hydrographic surveys. The Corps just like they do everywhere, sends that data to Coast Survey so we can update the charts. The ports have sent us data as well that goes on our charts. We still need to kind of reduce the friction points on that flow, and that's something I'll be working on. But we have used their data, but it's something we need to continue to improve. So that's the port.

Coast Survey was here in the fall of '13 with the NOAA ship Fairweather to do a shore-to-shore survey of the area. So again, the port survey teams wouldn't spend any time outside the breakwater, which is technically outside their sphere of influence. Certainly if the pilots found something in the anchorage and they needed something done quickly, they could, but the Fairweather kind of did the offshore and even resurveyed inside the harbor.

The preliminary ENC with all that data is in my hands now, and I've shared it with the stakeholders in the area and the official ENC should hit the street in the next week or two.

And then the raster and POD products will follow a week or two after that.

Here's a graphic showing the AIS data for Southern California. So we're here. All the big traffic that leaves the port is almost equally divided into thirds, where a third of it heads south to the Panama Canal and points south, due west heading out, or northwest through the Santa Barbara Channel traffic separation scheme. You can see a lot of traffic to and from Catalina with all the ferries running back and forth. There's some oil production platforms in the Santa Barbara Channel, so you can see all the traffic support vessels going to and from there.

One thing that happened in 2009, California, being forward-thinking and the environmentalists that they are, they put in the low-sulfur fuel regulations before most people did, and so ships, when they got within 24 miles of the coast had to switch to low-sulfur fuels. So one thing they saw was that the ships would stay out just offshore, that 24-mile limit, until the very last minute and then they could switch fuels and then zoom in.

As of January 1st of this year it's now a federal requirement out to 200 miles. So now when they're 200 miles off, they have to switch. So we're still waiting to see whether that's going to change the traffic patterns and have -- the people are on low-sulfur anyway. Will they be running closer to shore? So it's just something we're monitoring. We haven't seen yet, but it's just something to keep an eye on. We may have bigger vessels staying in closer to shore now because of those regulation changes.

So we talked a little bit about PORTS the last couple days. So this is PORTS as in the Physical Oceanographic Real Time System. It's a public/private kind of partnership where NOAA takes the data stream and then kind of pays for the data ingestion, quality control, archiving and distribution to the public via the Web and other mechanisms. And then on the private side usually a port authority or pilot organization pays for the maintenance of the actual equipment on the ground to collect that data.

So LA has a good one. All of these pins around here are weather wind gauges. So on the Long Beach side Jacobsen Pilots pays to put those in and maintains them and then sends the data to CO-OPS for them to make it publicly available. On the LA side the port for them. The one tide gauge is part of NOAA's national network, so NOAA pays for that gauge and maintains it. There's one air gap sensor on the Long Beach side which I believe the City of Long Beach and the port are paying for. LA is in conversations to get one on the Vincent Thomas Bridge, and that should be in shortly.

So PORTS in LA/Long Beach works very well. There are other ports in California where that private partnership part they're having problems with. Port Hueneme would like to have a PORT System, but they saw the price tag and they can't come up with the money. San Francisco is kind of running on carryover funds and is struggling right now how they're going to come up with the money to pay for their share. So there's different ports. And I'm sure people who have been on the Panel awhile have heard this conversation elsewhere.

So in LA/Long Beach it works really well because the port and the pilot, everybody just stepped up and did it, but there are other ports in California where it's a bigger problem.

In LA/Long Beach the PORTS also has the wave buoys that Julie talked about earlier. One kind of communication problem we have with the public is the San Pedro South buoy was intentionally designed just to be for a special project and here for one year. Now, when you go to the PORTS Web site, it doesn't look any different from any other sensor. So the public sees it, they start using the data. The high-speeds ferries to Catalina have told us that they loved that buoy. They use it every day and they don't know that that's going to go away in a year. So we have a communication problem about how to manage these special project buoys. So we're looking to find ways to fund that longer.

So all the buoys up and down the West Coast -- it's kind of a great cooperative consortium of sources where we have some of Julie's CDIP buoys, we have some NOAA weather buoys. And most of the data goes to NOAA's Buoy Data Center, NBDC. And so the public can go there and see all the data, but again they don't see who controls what buoy. And earlier this year -- this is a status update from just March of this year, in Northern California all the buoys offshore were out of commission. A couple of them were we think snagged by fishermen and ended up on the beach.

But so, the sailors heading up and down the coast want to call ahead and see what the waves and weather is doing and they had this huge blackout of information. So they come to me or to other people in NOAA and say, hey, what's happening with those buoys? And then we have to figure out, okay, well, is that a CDIP buoy, is that a USGS buoy, is that a NOAA buoy and then figure out how we can get it fixed. So at one level it's a great example of different agencies cooperating, but when something bad happens the fingers start flying and we got to figure out how to communicate that better with the public.

Shifting gears a little bit, Dr. Callender is head of NOS, is also in charge of the Office of National Marine Sanctuaries. So California has a pretty robust sanctuary system. The big one Monterey Bay Sanctuary. And then up north we have Gulf of Farallones and Cordell Bank. Just a couple weeks ago NOAA announced that Cordell Bank and Gulf of Farallones is going to basically double in size. Congress has 45 legislative days to veto that, but if they don't, they're going to extend all the way up to Point Arena. And so California will be coastal marine sanctuaries from Port Arena in Northern California all the way down to Central California.

And then down here in Southern

California we have the Channel Islands National Marine Sanctuary. And they're pretty active in working with the local maritime communities. The separation fairways actually run right through the sanctuary because the sanctuary boundary runs pretty far offshore. So yesterday when we were at the Marine Exchange, Kip talked about the speed reduction, Voluntary Speed Reduction Program at 20 and 40 miles. So the marine sanctuary actually, through funding from the Santa Barbara County Air Quality Board, extended that program for ships to stay at 12 knots or less all the way through the Santa Barbara Channel.

So it's an interesting group of people where you had the Air Quality Board on land working with the marine sanctuary offshore who wants to save the whales working with the maritime industry and the ships passing through there. So the funding allowed a ship, that if they stayed at 12 knots through that whole channel, would get a check for 2,500 bucks when they hit port. So again, that funding came from the air quality boards on land and we had a whole bunch of companies enrolled. So it was an interesting program.

And the National Marine Sanctuary's Advisory Counsel has a Marine Shipping Working Group that they just spun up. So again, it's the marine sanctuary working with the shipping lines and the Coast Guard and all the local interests to make sure the traffic around and through the sanctuary is safe for the environment.

And that's where I work up in Santa Barbara. So that's my viewpoint from the California Nav Manager. Are there any quick technical questions, anything I said, or should we flow into the next speaker?

CHAIR PERKINS: Yes, I think if we flow into and then we'll take all the questions at the conclusion.

MR. FERGUSON: Sounds good. So I'll introduce Mr. Tom Cullen, the administrator for State of California OSPR.

(Applause.)

CAPT. CULLEN: Well, good morning, everyone. Thank you, Jeff, and welcome to California.

So how many out there are from outside the state visiting?

(No audible response.)

CAPT. CULLEN: Well, this is what a drought looks like. It's deceiving. It's an extreme drought. Some of you might have been watching the news and saw that the governor announced earlier this week a 25-percent cut, a target for further water reduction usage. And it really underscores the importance of what me and my team try to do in Sacramento, which I'm going to talk with you a little bit this morning, give an overview of how we protect the state surface waters, particularly when in times like this they're becoming more scarce and in need of that protection.

I want to give a couple quick call-outs. Admiral, it's good to see you again.

Thank you for coming and visiting our two Harbor Safety Committees that I went to last year here at LA/Long Beach and then Port Hueneme and showing the importance of those committees.

Great to see Kip Louttit, John Strong, Laura Coverie, a lot of partners, Rob McCoughey, that you heard Julie and others speak about, the partnership that makes California so strong and helping me achieve my goals. It's kind of interesting that 32 years ago I graduated from the Coast Guard Academy with a degree in ocean engineering and it's only now that I'm coming full circle and starting to see some of the benefits of that degree in trying to understand some of the things that you're working on.

So not only do I want to describe a little bit about the Office of Spill Prevention Response, or OSPR from this point forward, and where we came from, but a little bit of a discussion about what you heard about our relationship with the five Harbor Safety Committees in the state.

Next slide, please. So OSPR was created about the same time as the Federal Oil Pollution Act of 1990, OPA-90. We have something similar in California called the -- we call it Lempert-Keene-Seastrand. It's the Oil Pollution and -- Prevention and Response Act of 1990. The result of two big spills that big happened. You're all familiar with the Exxon-Valdez, 750,000 barrels back in March of 1989. And then here down in Southern California in Huntington Beach the following February was the American Trader spill, and that was about 10,000 barrels.

So similar to the federal authority, the state created an entity within the Department of then Fish and Game to basically provide a protective umbrella, which you see in a next slide, to protect the state, provide the best achievable protection. And there's a couple other buzzwords that are in the statute: levering best achievable technology, providing best achievable wildlife care through something that we have called the Oiled Wildlife Care Network.

Many of you that are in the shipping industry are familiar with that in your contingency plans. And ultimately with our response measures providing what is the net environmental benefit to the protection of the habitat and species.

Next slide, please. A little busy slide. I apologize. I hate lots of words on slides, but I want to give just a sense of the various things that go on underneath that protective umbrella of prevention, preparedness response, and then within a response, restoration and recovery.

The big things that I would point out up there among that busy list would be a requirement for oil spill contingency plans through plan holders, shipping companies, anybody that moves, transports, stores oil of any volume in the state. They also every couple of years have to prove their standing through a Certificate of Financial Responsibility, their ability to leverage -- to deploy resources should a spill happen. Also, we conduct many dozens of spill exercises, anything from a national preparedness exercise every three years down to simple unannounced notification drills making sure that people know who to call within a certain time frame should a spill happen.

Next slide, please. So we have about two dozen offices located throughout the state. It's probably important to note that when we were created back in 1990 we were a maritime only, so a coastal tidally-influenced waters organization. And so hence, we're a little bit closer to the shore. We'll talk a bit about how we've expanded beyond that in the recent year.

And then it's not really to see with the color coding along the right-hand chart, which I by the way pulled from a very nice NOAA/University of New Hampshire product called ERMA, which I'll talk a little bit about later -- that shows where we've developed areas contingency plans, basically site protection strategies, sensitive sites, what to do when a certain type of product enters the water. What are the priorities? How do we handle it? What's important to note is that everything east of the coastal region is somewhat exposed. We don't have plans in place yet.

With the expansion statewide; again, I'll give some more details here, we're going to grow our staff from about 250 to 300 people made up of law enforcement wardens, who are usually the first responders to arrive and assess the situation, environmental scientists. We have a specialty -- Captain Jeff Cowan, my representative to the Port Hueneme Harbor Safety Committee back there is one of our oil spill prevention specialists, and OSPS. And then of interest to probably this group here we have a very heavy GIS presence in Sacramento that maintains the different layers in ERMA.

Next slide, please. So the left slide shows that oil can spill anywhere, not just in the marine region. This is a three-year period of reports that were taken by the California Office of Emergency Services. And any given year there might be between 8,000 and 10,000 reports. You can almost pick Interstate 5 going north to south -- and of course there's probably a lot of truck rollovers and things like that.

It's interesting to look at the right hand slide. What you see are some of the more predominant state waterways superimposed with the red lines of being rail. We've heard a lot recently in the news about the crude by rail, the energy renaissance that's happening in this country. So the very high-quality, low-sulfur light crude coming out of the Bakken formation in North Dakota, also the tar sands from Canada, hasn't been coming into California in great volume yet, unlike other parts of the country, but within the next couple of years, based on what we can put together through permit applications for various facilities are near refineries and so forth, we're expecting between 6 and 10 what we call a unit train, the 100-plus car trains, tanker car trains rolling in the state.

And there's about 8,000, more than 8,000 water crossings -- I'm sorry, about 7,000, more than 7,000 crossings of rail over state waters. And that's the kind of perpendicular crossings. That doesn't take into account where the rail is running parallel to water. And oftentimes pipeline enjoys the same right of way that rail does. And so there's 5,000 pipeline crossings of various oil products over water. So it's a big concern because we weren't positioned for the previous 23 years with funding to support and respond to inland spills. If we had a responsible party, we will go and work with them of course. But it presented a concern as oil coming into California shifts from the maritime arrival to other means.

The other thing I wanted to point out, too, is this is not targeting rail. If you look the volumes of oil that's spilling in the interior of the state, 91 percent of it right now by volume is pipeline breaks. So it's a problem.

Next slide, please. So we went to the

administration and the legislature last year and kind of waved the flag and said this energy renaissance is great stuff, but we're exposed and we probably need to do something, restructure the way that we are funded, the way that we're authorized or, if you will, restricted by statute to prepare, protect, prevent and respond to oil spills.

So what happened was we, in concert with the legislature, drafted Senate Bill 861, which basically took the proven maritime program that you saw described in the umbrella slide, and just expanded it to cover all state waters. Instead of charging our small six-and-a-half cent per barrel or 42-gallon fee on oil arriving at marine terminals, we're now assessing that at the refineries. So any oil that arrives at California's refineries, it will be six-and-a-half cents. Or if you reduce to a $4 a gallon of gas, it's about a sixth of a penny. And that tells you the volumes of oil that's coming into California if we can fund a program on a sixth of penny per gallon of gas.

We've been since June of last year developing emergency regulations, which we're hoping to get out here shortly, that will let new perspective plan holders -- so anybody that pumps water out of the ground, pumps water -- pumps oil. I'm thinking produced water, which is a byproduct of the hydraulic fracturing. Puts in the pipeline. We have airports that are out there that are storing and refueling planes. They become new plan holders. And if they're proximate to state surface waters, they have to provide those things we talked about, a contingency plan, a certificate of financial responsibility and participate in drills and exercises with us and other partners like the EPA and Coast Guard, locals, to show that we can respond during a spill.

Next slide, please. On the response side we exercise all the time something called the Incident Command System, which I'm sure many of you are familiar with. It's part of the

National Incidence Management System managed by FEMA. And so you have something called a unified command. And within the unified command there's traditionally three major participants. You have the federal side. And so our big partner there had been the Coast Guard. Now we're starting to work with the EPA more closely on some of the interior events.

The state, my office provides a state on-scene coordinator. You have the responsible party. They're the ones who are going to be coming in and providing the resources, the funding to quickly manage the response. And there's something we learned from the Cosco Busan spill that was of critical importance was the introduction of local governments. So we have a local government on-scene coordinator. Not showing up there in the little triangle, but it's something that we have found is a best practice in a response.

Some of the key roles that our office fills would be like the environmental unit leader, wildlife section chief and something that we call the SCAT Teams, the Shoreline Cleanup Assessment Teams. And this is where we really rely on that really nifty product called ERMA, the Environmental Response Management Application, which you and University of New Hampshire manage for us. And it is a very useful tool.

Next slide, please. So now we're shift a little bit into -- I didn't realize there were animations. I apologize for that. That's what happens when you pirate somebody else's slides.

So another busy one. I apologize. But there is statutory authority for my position, our office to work with the Harbor Safety Committees. We're mandated to have five of them, and we do, in the State of California. And then there's also some pilotage responsibilities, hence our particular interest in some of the products like PORTS that are provided in the harbor complexes.

Next slide, please. So we have five Harbor Safety Committees running north to south: up there in North Country, Humboldt Bay; then the whole big San Francisco region to include Stockton, Sacramento, Suissun Bay; Port Hueneme north of here; Los Angeles/Long Beach; San Diego. I appoint not only the chairman of the committees, but also members from the various industry groups, other groups. They take an oath and they do annual harbor safety plans. And it's just a real example of world class cooperation and protection of the commerce in our ports.

Next slide, please. This shows you the diversity of membership. Jeff, it's great to have you filling those big shoes of Gerry Wheaton. I don't think I attended any Harbor Safety Committee that Gerry was not only in attendance, but stealing the stage and really providing some very valuable insight for many years. And so we're thrilled to have you with us.

At the very bottom, you might not

familiar with those two. That's the California Coastal Commission and the Bay Conservation Development Commission, two also very active interested participants in the Harbor Safety Committees.

Next slide. Just a couple of the qualities of the committees. I just want to point out that three of our Harbor Safety Committees -- well, two Harbor Safety Committees three times have won National Harbor Safety Committee of the Year. John Strong in Los Angeles/Long Beach once and then San Francisco Bay twice.

And one more slide. I asked for some examples of some of the great things that they're doing in each one of the Harbor Safety Committees, and I was so thrilled that our Panel was preceded by that remarkable project right here that's going on in Long Beach. Julie was so kind to host me up at Scripps last month. Had a chance to see the HF tool and talk a little bit more about this great project that Rob McCoughey, Tom Jacobsen, the rest of the team down here has been putting into place. And we're hoping that we're going to take that and cascade it to California's other busy ports. Great example of the synergy, what cooperation can do.

So with that, thank you so much for inviting me to participate with you here today, and I'm looking forward to your questions after the next two panelists.

(Applause.)

MR. HAUSSENER: Okay. Now you can go to sleep because there's no slide show, or you have to stay awake because there's no slide show.

I'm Jim Haussener. I don't know if anybody remembers, I was here in 2008. I'm not sure if any of the Committee members are around from that point. But thank you. I guess I did not upset you enough at that point, or you can't remember exactly what I did or didn't say.

I would like to comment about LA County, and I think it's appropriate you're here in LA County. I don't know if anybody knows that the National Ocean Service road map -- that actually the picture on that is Marina del Rey and the beaches of Marina del Rey as you're going up.

CMANC is a regional port group similar to American Association of Port Authorities. We represent all of the ports and harbors that have navigation projects. So LA/Long Beach up to Crescent City, Noyo, Port San Luis. So large and small. California is unique because we don't have a state port agency. There's nobody in the governor's office or the executive branch at all that has a portfolio that says "ports" on it. There are discrete pieces, such as Tom that's doing certain things, but nobody representing the ports. And so, we go back to Washington and work primarily to get more money to come to California because so much of it's collected here in California.

I do want to make a couple of statistical points. About 40 percent of the maritime trade by dollar goes through California;

the number fluctuates a little bit up and down as we're doing well and doing poorly. Right now we're doing poorly; everybody's heard about some of our congestion problems. This creates about 1.6 million jobs, about $30 billion in personal income and federal tax revenues of various sorts. There's 107 different federal taxes and fees on the maritime industry of about 10 billion bucks a year.

On the recreational boating side -- and I was asked to talk a little bit about that -- there's about an $8½ billion economic impact in California alone. Over 800,000 registered boats. That doesn't include the documented boats such as the one I have here in California. About 3,000 boating industries and 70,000 folks working in that.

Commercial fishing, which is a very important component, especially for our North Coast, about $250 million worth of fish landings per year.

I'm going to veer a little bit off of

some of my notes as I took on the plane as I was coming down here this morning. I want to talk a little bit about supply chain briefly for a second. California ports are investing heavily into their infrastructure inside the gate. Hundreds of millions to billions of dollars per year. When I was here in 2008, I told you that they had a debt load of $3.5 billion at that point because of all the infrastructure they were putting in. Nationwide California ports are putting about $2 billion a year into the infrastructure.

What we've discovered is we got great infrastructure. We don't have the processes or the innovations in order to make the supply chain work very well. Somewhat similar to the same questions you've been talking earlier today about what sort of innovations do we need in order to make these processes work faster, smoother and get them to the end product. So you're talking about data. We're talking about goods movement to a certain extent.

Costs are a driver. California, we've got an excellent environmental record. The SCCOOS was mentioned earlier. Some of the other things we're doing. We have the highest cost per container of any other place you can bring a container in to North America. So what we need to do in order to drive that cost per container down, more containers. And so, we certainly are working on that.

I want to let you -- some statistics here again. From 2006 to 2013 container growth in the United States grew by less than a half-percent. Container growth in Canada grew by 25 percent. Container growth in Mexico, 80 percent. Mexico is not part of the low-sulfur ecosystem. Canada and the United States are, but not the Mexicans. That may have an impact on some environmental stuff as we move forward.

What we need in terms of supply chain is partnership and collaboration to achieve the high environmental standards while increasing the container throughput that I mentioned a little bit earlier.

So off that soap box; now onto my survey soap box. And this is somewhat the same sort of stuff I talked to you about before. And I work a lot with the Corps on dredging. And Mr. Hanson is one of those guys who dredge. And I tell the Corps there's no point in dredging because until you post the surveys, it's like you didn't dredge the channel at all. And then we get into how deep is the channel? Where is the bottom? When I was in Vallejo the Navy was paying Scripps to determine where the bottom was because the bottom was actually scrubbing the bottom paint off of the Ohio-class nuclear submarines. And because the density was variable and where actually is the bottom? We need to work on that a little bit.

So some of the things I talked about a little bit back at that point is do we need the highest standard? Do we need a NOAA standard? Do we need to talk a little bit about risk? The earlier panel talked a little bit about risk.

Should we be taking a look at some of the risk factors that go into that? Do we need to get down to a hundredth of tenth of an inch when we have an error factor of six inches, or do we round to the nearest foot? Are we making this thing so complex that our costs are going up so the amount of surveys we can do across the entire United States are going down? Is a confidence factor of 95 percent better than a confidence factor of zero?

I will say, since 2008 to today, the number of high-priority places in California that need to be surveyed has dropped down to I think just off of Port San Luis, looking at the latest on your Web site. Back then it included Port Hueneme, San Francisco Bay and I think a little bit off Huntington Beach down here. So there is progress being made in California, but I think we need collectively to take a look and see exactly what do we need to do in order to deal with the risk as we move forward?

The other -- and I'll just mention --

I'm going to mention a little bit later crowdsourced data. One of the things is I think NOAA can work on the QA/QC stuff, and let's start taking a look and seeing if we can't get more crowdsourced data out there and available to folks. And I'll talk about that as we move forward.

So I want to encourage NOAA to develop standards so that data sets are comparable and compatible. You heard that just a little bit before the break. We don't believe that all data has to be the highest standard; it's more important to make certain that the appropriate QA/QC is working right. Jeff talked a little bit about the friction between the port surveys going over to NOAA. And I recall it used to be that the LA stuff in particular went directly over to NOAA and there wasn't any problems. And it got almost integrated directly at that point into the NOAA system.

So we encourage a stronger determination about bang for the buck. Just as channels are not dredged annually, perhaps data integration provided by other private or federal partners may be better, which could then allow us to have increased investment in things like ports, IOOS, or even updating in the Coast Pilot, which I love to read as I go up and down the coast and say, "Oh, that bluff is that, or that freeway bridge is there."

Switching hats. I'm a recreational boater; I've been doing it in California since the '60s. Last time I was here I told you that I own every chart from Alaska down to Mexico and left them all at home and used a boating Yellow Page book in order to go from San Francisco down to San Diego. So I'm not sure I'm the right guy. I basically tell people, "When you go south, keep the coast on your left; when you go north, keep the coast on your right."

(Laughter.)

MR. HAUSSENER: Because I actually predate LORAN. So people are complaining about the lost of LORAN and I go, "Wow, I remember back when we didn't have LORAN to start with."

As we move forward, I want to compliment a little bit a couple of things that are happening. Your upcoming Chart Tile Service and the Offline Tile Service 5.0 sounds like a great thing. Looking forward to it coming out. Hopefully you folks are apprised what's happening there. I understand there was a presentation at the Miami Boat Show. And I missed that, but certainly want to make sure that happens and moves forward.

One of the things we talked a little bit about is Internet connectivity. Getting faster speed so you can get those charts downloaded to your iPad certainly works. Doesn't do you any good to discover all of a sudden you're out of cell phone range and you no longer have that connectivity for those charts.

I do want to give a shout out at the same time to the pocket charts. I don't know if everybody's got one of those; I carry them in my sea bag for San Francisco Bay because I go sailing on a lot of other people's boats. I don't know whether they got charts or what they got, but those pocket charts are great. I also own a personal water craft. They're in that as well. So please keep that sort of stuff going.

The PDF print on your own is nice, but then you get a half a dozen 8½ by 11 inches of paper that you're trying to squeeze into something.

I understand you're working on tide and current projections for a given latitude/longitude rather than a reference point. And certainly we'd like to see that move forward and get that data out to people so we can use it, so we don't have to go, "Well, I'm here at the San Leandro Marina and do I need to use the data point of Robert's Landing, which is two or three miles south? Can I just say I'm here at the marina and give it the lat/lon and there I go forward?"

Julie talked about high-frequency radar; I'm a big believer in it. I have a trawler. I don't go very fast going uphill. Coming back down the coast I make another knot or two coming down. So as an example, yesterday I was taking a look at it and off of Port San Luis, which is just below Morro Bay, past Point Conception, you're heading north, life is good, there is half-knot current, surface current going directly south. So if I'm only doing five or six knots going north, it's nice to know that's going there and I can work my way and plan and integrate to go around that. So I certainly want to include that.

I talked a little bit about the data repository and the crowdsourcing stuff; I think that's something, again from a recreational boater, we'd like to see NOAA do.

The Coastal Buoy Network, Jeff talked a little bit about it; Julie talked a little bit about it. It's getting a lot of focus because a lot of the buoys went out. Well, the buoys are important. I'll sit down there in Santa Barbara waiting to go around Point Conception to the point where the harbor master throws you out because you've exceeded your 14 days while you're waiting. So then you got to go down coast to Ventura, which makes it a longer trip to go back north because you're waiting for that point where the sea and swell and period all work out. Nothing like a 14-foot sea in an eight-second period. You don't go.

So that's real crucial to going up and down the California coast, primarily because we don't have an intercostal waterway. We don't have harbors of refuge very close together. If you think about it, Crescent City, Humboldt Bay, Noyo, Bodega Bay, that's all north of San Francisco. That's it in a 400-mile stretch of the coast. And you can't even get into some of those. Humboldt Bay, which is a 45-foot channel, it breaks. And it filled up with 10 feet of sediment in a one-week period about a month ago because of a storm. So we've got some issues.

So the Coastal Buoy Network is important. One of the things we want to make sure is that we don't lose focus of that again. Get them all fixed again. Problem solved. Go away. But we want to make sure that somebody is paying attention and we keep it all working together.

One of the other things, NOAA was part of a listening session with the Coast Guard and the Corps on electronic stuff. And one of the things I suggested was a dashboard. It would be really nice having high-frequency radar, some of the wind stuff out of Weather Service, some of the buoy data that I can put all onto my iPad so I've got the tools that I want and the tools I need and pick and select depending on where you are. If I'm racing a sailboat, I got certain things I want to see. If I'm cruising in my trawler, I got a few other things I want to take a look at. Need to work on that a little bit.

Although not part of your purview, certainly let your folks over at the National Weather Service start working this way as well. We're going from a static to dynamic and certainly want to make sure that they keep up with that. And I'm willing to bet as we move down the road that at some point in that dashboard we're going to integrate the weather stuff. And you heard this earlier about integrating the National Weather Service wind stuff directly onto the charts with the AIS and put it all together. Might make it a little bit too blurry and you'll have to pull certain things out so that you lose sight of what's important to you in that critical area. But being able to combine all that, from a boater perspective, is a great idea.

One of the things not in here, and I'm a little concerned about -- my father and I own a boat and we have a professional captain. I think he spends too much of his time with his head in the laptop and not enough time with his head out the window. And I see that in reading Professional Mariner or other things that's becoming a concern. And that worries me a little bit and I think that's one of the things that we in the profession ought to be worried about. How do we work this? And I've heard from some pilots as well about how they used to do it guessing by golly and now everybody's technical and we all got our little iPad, iPhone, whatever and spending too much time here, not enough time looking out the window.

Switching topics. Coastal communities. We need a basic framework from NOAA on both your resilience and your intelligence. Preparedness is definitely the watch word going on. The State of California is providing grants to local communities right now. Different things are: assess the vulnerability of beaches to sea level rise and plan for their protection; assess vulnerability of shoreline to expected effects of climate change and identify adaptation strategies; conduct a cost-benefit analysis of strategies for adopting to sea level rise and help the city develop plans for improved resiliency. Those are sentences out of four different grants that got approved back in

November. NOAA should be a partner in all four of those, and we need to make sure you are.

It's real easy for some person to come along, and there are consultants that will do that, and they'll say, "Oh, that's below grade. That's going to be below sea level." Well, except that's not necessarily what's going to happen because there are some levies or a railroad or something that's not going to allow that area to get inundated. And we need to be intelligent about how we're making those decisions so the communities who have limited dollars, limited resources can invest appropriately to protect and adapt their communities. And hopefully want to make sure you're part of that.

VICE-CHAIR HANSON: Jim, on that thought, how much money is the state putting into this?

MR. HAUSSENER: This last grant was -- the State Coastal Conservancy is $1.6 million. The Coastal Commission has done 2 million.

Coastal Conservancy the previous year I think did another million, million-and-a-half. And the grants run anywhere from -- I think LA County got $70,000. The Nature Research -- National Research, whatever -- the Nature Conservancy got 150,000. So we're seeing more and more of it.

The other thing that's been mandated is for all those who are tideland trust partners, which is all the ports and harbors, and some other areas, we have to provide a report to the State Land Commission by 2019 on how we're going to adapt to sea level rise. So again, one of the things, I was talking to an agency person who was trying to push us along and make us do that faster, is I said, "We don't even know what's the outcome of the grants and the studies you're doing now to learn what are the best practices and where we should be putting your time." As well as out State Coastal Commission, the Coastal Zone Management Firm, they came out with some guidelines for sea level rise. All sorts of comments. I think they got over 800 comments.

We haven't seen the draft guidelines come back.

And so, you're telling us we need to develop plans. You got guidelines that are behind the curtain and we don't know exactly how some of the short-term plans are being developed. And we need to work that one through so we can say, "Hey, here are some great ideas, guys. Go forth and see if this applies to your community."

CHAIR PERKINS: John, can I interrupt for just a second?

MR. HAUSSENER: Yes, sir.

CHAIR PERKINS: Dr. Callender is on a schedule and has to depart, so I just wanted to take a minute to ask if you have any remarks you'd like to make before you have to leave.

DR. CALLENDER: I really didn't want to interrupt you. Sorry about that.

CHAIR PERKINS: That's all right.

DR. CALLENDER: So, no, I apologize that I have to leave; I have an appointment at 3:00 in Santa Barbara, and I'm a little bit concerned about driving through LA to get there.

But I do want to thank the Panel, frankly, for the engagement so far. I'm seeing a lot of progress in terms of what we're doing and how we're doing it. I'm really looking forward to the report. And I'm not kidding about calling Gerd on Saturday to bother him and see how it came out at the end of the meeting. So I want to just thank you for all of your efforts and your engagement. Sorry about the interruption.

MR. HAUSSENER: That's all right. Thank you, sir. Have a good drive. Good luck.

Later today you're going to have panels on coastal resilience, coastal intelligent, different rooms. Hope that doesn't mean you work for different masters. And it's got to be combined here at some point as we move forward.

National Response Teams. This is important to California. We do get hit with tsunamis. We've had a couple of them in the last decade. The last one was site-specific and only damaged -- actually "damage" is a polite word --

wiped out Crescent City and significant damage to Santa Cruz. When it was all said and done, because it was just those two harbors, we didn't have a lot of public damage that was done, and it took almost 30 days to assess there was enough damage to get FEMA to come in.

But if we have, similar to the Chilean tsunami, statewide damage, which we do have based upon the current, the direction of the currents moving -- and Julie showed you a little bit of what happens in terms of those shadows. If the storm comes the wrong way, the breakwater at Long Beach gets wiped out. Some comes a different way, the breakwater at Redondo Beach gets wiped out. We've experienced both of those in the last 20 years.

We could have a tsunami that does significant damage to every coastal harbor in California. Your Team 6 isn't going to be able to get out there and do the job. You need to work with some partners and develop QA/QC: the Corps, fishing groups, dredging contractors, so they can get out and get those channels open again. Because in some of those communities, that may be the only way to get stuff in and out. Humboldt Bay and the North Coast, all their fuel comes in by barge. They have about 11 days-type deal. So that gets wiped out and we wait those 11 days because you're going to say, well, San Francisco Bar is more important than Humboldt Bay. Yes, however, they're not going to be able to get any fuel in. What does that community do?

So need to figure out how to take more people working so that you're the professional first responders, but you've got a volunteer backup group that's already trained. It's somewhat like the oil spill and birds. You have to have your HAZWOPER certificate before you can go and clean a bird, and there are hundreds, thousands of folks in California who've gone to the training program. So they got a certificate so when they're called up, they're ready.

About 10 years ago, you worked on the Coastal Storms Program for Southern California to improve prediction of, preparation for and recovery from coastal storms. About a five-year effort. Lots of great things. I called around to some coastal managers and said, "Hey, what do you think about this?" "Oh, not sure. I'm not sure I ever heard of that." So it gets to one of the things of you might have done great work, but unless somebody is taking it to the folks today, that stuff may not be relevant to people and people may not be aware of it. So need to work on that a little bit as to how to make sure that the targeted audience stays moving ahead.

Now a soap box. Would not be Jim Haussener without complaining about the National Marine Sanctuary Program.

(Laughter.)

MR. HAUSSENER: My organization is actually on record being opposed to any new sanctuaries or any expanded sanctuaries because we've got a variety of issues with them.

A personal one. I own a kayak; I go to my local lake to throw the kayak in the water.

I got to pay a launch fee, $4 inspection fee. If the inspector is not there, I can't put my kayak in the water, looking for Coagula mussels or whatever in my kayak that's dry as it goes from my garage to the lake back to my house.

I own a trawler in San Francisco Bay; I can't get out of San Francisco Bay into the ocean without going through a National Marine Sanctuary. National Marine Sanctuaries have the right to oversee vessels and restrict vessels and prevent vessels from going through sanctuaries. That's codified in law; they enforce it against personal watercraft currently. Court case is upheld that NOAA does have that authority. So I can see the day -- and I'm paranoid, I'll admit that -- where in order to leave San Francisco Bay, I'll have to pull my boat of the water, have it inspected and certified and all that that I'm not carrying any whole growth, no copper bottom paint, no anti-fouling or fouling materials in the sea chest, etcetera. So that's part of it.

Sediment management is an important

part of California. The Monterey Sanctuary in its designation document says no dredging, no dredge disposal and that sort of stuff. If you want to take dredge material dredged out of the ocean's sand, put it on a beach just below the Half Moon Bay breakwater, in order to protect the shoreline there, which is eroding away and the highway is eroding way, you can't do it because the sanctuary has a document that says, "Can't be done." Even if the sanctuary manager wants to do it, he or she is not allowed to do it based on their designation document. So we need to work on that one a little bit.

Fisheries. The sanctuary folks every so often want to indirectly or directly take over fisheries from the National Marine Fishery Service. And that has some of my coastal communities very upset.

The other, Jeff had that neat little slide up there, and you saw how the sanctuaries are expanding north. There is actually a proposal that NOAA shot down that will probably come back to put a sanctuary Central Coast South. Well, how much sanctuary do we need along California? Is the entire State of California that great of a resource? Do we need to have those extra regulations and that sort of stuff?

I know that's not necessarily in your purview, but it's one of those things that I need to throw out there from time to time. Thank you very much for your time.

(Applause.)

MR. CANNON: Good morning. I guess it's still morning. Good morning. Thank you for inviting Port of Los Angeles here and we're excited actually to come and talk to you today. We always talk about hydrographic data when it comes to navigation and safety, but I want to give a little different spin on it today and give you a sense of how we use hydrographic data in the environmental world.

But first, just a little bit of an update. You heard Jim talk about congestion, and I guess others have referred to it. We're digging out, and those of you, even if you're not here from California, you've sure read about all the terrible congestion problems that we've had here. And I'm happy to say that it's actually -- we're digging ourselves out a lot faster than we thought. We had at one time almost 30 ships at anchor between the Ports of Los Angeles and Long Beach -- actually got up to closer to 40 at one point -- waiting outside of the breakwater to come in and unload at the height of the labor negotiations. This Monday there were two.

So we've been able to dig ourselves out. There's less than five now I think today. And while we've got another 20 that are on their way, they were slow steaming because there was a whole bunch of anchored ships. And so, there were others on their way that just kind of slowed down. And so now they've kind of sped back up and are coming at the normal rate. But the point is: We're actually making very good progress and pleased to say that the process of digging ourselves out of the terrible backlog of congestion is going well.

And that leads me to one other thing. This has led to increased focus on something that has already been a very high priority for us, and that's supply chain and goods movement efficiency. And I think Mike Christensen was here this morning and he's doing that very thing now with the Port of Long Beach. And there are several of us from the Port of Los Angeles who are equally interested in that. And the basic idea is if you can move the goods faster and more efficiently, you help the cargo owners. And you also, from my perspective, reduce the environmental impacts. So all of it works out well.

So, let's see. I want to make sure I work this right. I just push this? Good.

Okay. So hydrographic data is something that all of us who have any experience with marine science are familiar with. It's typically involved with safety and navigation, bathymetry and certainly understanding what's going on near the ports and so forth for purposes of understanding how to move in and out. And this has been particularly important for us to follow over the years, and certainly is important for our port.

But the environmental uses are becoming more and more important. Particularly water and sediment quality regulations are driving this, but also just environmental planning. What hydrographic data does is, essentially for the environmental world, it allows us to plan for sustainable management of coastal zones. Essentially, it allows us to create a marine and hydrographic data conceptual plan.

We can incorporate marine-related topographical features, shallow water features and habitat, key marine vegetation, fresh water outlets and outfalls, and even coastal flood plains. And this allows us to keep track of things like pollution and various other kinds of things that are introduced into the marine environment. And all of this -- using tides, currents and all sorts of things -- are extremely important to us, and that sort of conceptual model is very valuable for us to manage the coastal zone.

The other thing and the thing I want to talk about today is something called TMDLs. And it stands for total maximum daily load. The regulations essentially -- to put it into simple terms -- it's the maximum amount of a contaminant that the water column can take before you exceed water quality standards. So that's a TMDL. And so, they rate it for the water. And then also there's a TMDL for the sediment that relates to what is put into the water.

And so, for us this is particularly important because at the Port of Los Angeles and the Port of Long Beach, as you know, the ports have been around for over 100 years. And so, we end up having a great deal of legacy contamination in the sediments, going back literally over 100 years. Interesting little bit of interesting tidbit: In the 1920s the Port of Los Angeles was the largest exporter of oil in the world, if you can imagine that. And so, it gives you an idea. And then of course there was a lot of ship building that occurred, World I and especially World War II, and then industrial areas that were developed in the area here in Southern California since then.

Two big things ended up being major contaminants that ended up in the sediments. One is DDT, which as you know is something that was used for -- to -- thank you. Pesticide. And then the other is PCBs, which was part of cooling in industrial equipment. It was on ships and all sorts of equipment that is used in the industrial area. So these two things end up being present in our soils.

And as a result of the presence of DDT and PCBs, we have this TMDL, which has been given to us, which is an extremely low standard that the Agency set. They basically just took screening levels and said, "Well, you know what, if you exceed the screening level, you got to get rid of it all." And our response was, "Well, wait a minute, it's not really impacting anything." And they said, "Too bad. You got to get rid of it all."

Well, the solution would be to essentially dredge the entire part of Los Angeles and Long Beach Harbor literally down to bedrock. We're talking about a billion dollars or more to do this. So obviously not something we could do. So we have a good relationship with the agencies, and we were able to convince them to let us work with them to build a model to try and understand better how all the sediments and marine life interact and the potential impact it can have on water quality.

So this is where we began to use hydrographic data. What we did was looked at all of the different land forms; we looked at the bathymetry; we looked at the inflow of particular channels. The Dominguez Channel was mentioned earlier; that's the one that unfortunately is the source of a lot of the DDT and PCBs that are just kind of washed down from industrial areas in the southern part of Los Angeles, as well as other areas, the Palos Verde Shelf, which is outside of the port, but also is a place where there was an awful lot of contamination that's present. We have of course our own channel in berth-deepening activities. There are shallow water habitats that we've had to construct for purposes of developing mitigation credits, and we even have a sediment storage site, where we've had to store sediments.

And so, all of these things were built in to our model. And it was very interesting. The model -- and here's kind of way to look at it. There at the bottom is kind of -- it's hard to understand, but what that is is a 3-D model. This is the Long Beach. This is LA, the blue in this model here, which extends past the breakwater. Each of these cells is an independent cell. There are five of them going down to the ocean floor. And it's five cells even if it's -- whether it's 20 feet deep or 80 feet deep, there's still five cells. So the cells are a different size. But each cell is designed to operate independently.

And it includes water quality data, everything from currents, erosion, shear stress. We look at the bottom bed consolidation; we look at the movement of the marine life through each of the cells, as well as currents. And the idea is to figure out if and how sediments move through the harbor and also the extent to which these sediments -- the contaminated sediments -- impact and bioaccumulate in marine life, and in particular fish.

And one of the interesting things is not just the sediment impact to the fish in the benthic community, which is of course in the sediments, but actually there is a little bit of contamination in the water. It's not a high amount of contamination, but it's the DDT and PCBs. And so, the fish of course intake an awful lot of water as part of their existence. And so, one of the things that we're studying is how that affects their tissues and if in fact that is coming from our area, or of course whether the fish -- they obviously don't hang out just in the harbor. They go out and move along into the ocean, and so tracking their directions. We've actually tagged some of the fish and we track where they move in an effort to understand this. But this hydrodynamic model has helped us, and it's the data that we talk about here that's particularly important, the hydrographic data.

So it's a 3-D model. And as I said, I wanted to share with you how this essentially conceptual model at the Port of Los Angeles is used to help us work with the regulators. And it's something that has not been done by any of the regulators. And so they're quite interested in this model as well. And it's something that they now want us to help them use as they make decisions about TMDLs and water quality. There is a reopener that's built into the regulation that occurs in 2016, which allows us to go back and based on the results of our hydrodynamic modeling and testing to adjust the TMDL regulations.

But it's super cool stuff. All of our people are really fascinated by it. And the regulators themselves are excited to work with us on this stuff. And so, it's kind of cutting edge stuff. One of the nice things about working in the Environmental Management Division, or being the director, as I am, is we do an awful lot of cutting edge stuff at the Port of Los Angeles/Long Beach. And this is an example of something that's never been done, so it's really very interesting.

So just to kind of summarize the ideas here, hydrodynamic and sediment transport modeling is going to be as good as the data that we input. And so, the kinds of science and the work that this group talks about, and the people who are participating -- that you do is critical and we support it. And we also make great use of it. Obviously the better the model, the better prediction of sediment transport, which for us is critical and could help us avoid nearly a billion dollars in costs and regulators. And it's also quite frankly allowed us to develop a great ongoing relationship with our regulators because of doing something that really hasn't ever been done here at the port.

So with that, I'd like to say thank you. And if you have any comments or questions, I'll be happy to take them.

CHAIR PERKINS: Great. Thank you, Mr. Cannon.

(Applause.)

CHAIR PERKINS: Well, that was a lot of information, so I'm sure the Panel has questions. But, Mr. Cannon, where are you getting your benthic data from?

MR. CANNON: We do a lot of sampling. We actually sample the sediments and analyze them, so we've got a team that does that. So that's where the benthic data is coming from; it's sampling and analysis.

CHAIR PERKINS: Great. Thank you. Dr. Maune?

MEMBER MAUNE: Mr. Cannon, you mentioned mitigation credits. Can you give us some clarification of what you're referring to there?

MR. CANNON: Sure. Whenever you impact marine habitat as a port -- in other words, if you remove it from the ocean -- you have to pay it back. And so, it's either one to one, or half to one, or one-and-a-half to one, depending upon the value of the habitat.

I'll give you an example that's real easy. You've seen pictures of the Port of Los Angeles. In fact, if you could go back to my presentation, I can point to it. Pier 400 is a manmade island; it was built in the 1990s. It was the largest public works project in the United States. Go to the last slide. There. It's in the back. It's here. That's Pier 400; that's completely manmade. It didn't exist. And so by adding Pier 400, we took away all of the marine habitat that existed in its place. And in order to do that, you have to pay it back. And it's an acre for acre, either one acre or half an acre or one-and-a-half acres.

And so we had to create new marine habitat in other locations, enhanced marine habitat. This was done under the auspices of the State Fish and Game, which is now Fish and Wildlife, as well as the National Marine Fisheries and other agencies that had oversight. And so, it's a very important thing. We continue to do it. We're going to do this area over here is now going to start to be filled in. And so, we're taking away habitat there. And so once you take away that water -- and of course the agencies define "habitat" as any water regardless of the quality of it. And once you take away habitat, you have to replace it. And so, that's what the concept of a marine credit is.

CHAIR PERKINS: Jim, you brought up crowdsourcing, and this Panel has spoken to crowdsourcing going all the way back to when the

Panel met up in Anchorage, Alaska, and we used the phrase "a frontier mapping strategy that utilized crowdsourcing," or that "could look at crowdsourcing." So do you have an example of how crowdsourcing has been used effectively that you can share with us?

MR. HAUSSENER: Yes, one of the -- I'm not sure if it's Raymarine. One of the big fathometer companies actually is now putting that together for their customers. So they tie in the chart plotter, the fathometer, the GPS all into one unit, and the data goes back to their headquarters, which then they use to update their own charts back to their same people. And I can't remember which company it is; I think it's Raymarine. One of the boat shows I've been at I looked at it. It's very interesting in my mind because frankly the boaters are moving back and forth through a lot of areas and you can pick up an anomaly that way, but you cover much more if you take a look and you saw the AIS with all the high-speed ferries, as an example.

Could you then put that in there and pick up some of their routes? San Francisco Bay, we have the bar pilots going in and out of the bar every day multiple times. Can you pick it up off of them and that way you get to know that you're getting more and more of the channel. You don't have to have your own vessel go out to the triple beam, take the time to get the results, analyze and post it.

So, yes, the individual chart plotter companies are doing it themselves and including that into their program.

CHAIR PERKINS: Susan?

MEMBER SHINGLEDECKER: Jim, I just wanted to thank you for providing such a great recreational boater perspective; I love passionate recreational boaters.

I just wanted to kind of reemphasize the point he made about the importance of the buoy network on the West Coast for recreational boaters. We see this with the absence and the wide spread between those ports of safe refuge along the West Coast. We see it with our beacon rental program in terms of there just really aren't that many places to tuck in. And so I thought that was a great point you made about how, especially on the West Coast, boaters really rely on that buoy data when they're making their decisions because there just isn't as much room for error as there might be in other parts of the country. So thank you for that.

VICE-CHAIR HANSON: I have a question for several of the panelists. First off, Chris, thanks for that presentation. And also the mitigation stuff is not new; it's actually LA/Long Beach has been a leader in doing that for many, many years. We go back to the original deepening in 1980; we actually had a shallow water habitat as part of that construction as well, followed by the Batiquitos Lagoon work also that really was a primer for all the expansion at the Port of LA/Long Beach. So that's good stuff.

MR. CANNON: You no doubt worked with Ralph Appy, I suspect.

VICE-CHAIR HANSON: Yes.

MR. CANNON: My predecessor.

VICE-CHAIR HANSON: Even before that.

CHAIR PERKINS: He's really old.

VICE-CHAIR HANSON: Yes.

(Laughter.)

VICE-CHAIR HANSON: So but I want to ask the other two panelists a question, and it has more to do with -- we talked yesterday about outreach, and NOAA talked more about what we do, how we do it, and trying to build support, of course, but also bringing in where we need to go for the future.

One of the things we focused on yesterday is at the state level. We do a lot of outreach at the federal level, a lot of partnerships with other agencies, but engaging at the states where the local users are, where there's economic benefit, jobs and all that's part of it, the challenge has been getting the governors to engage in coastal issues through their budget.

Can you talk a little bit about say California's budget for coastal issues and maybe the long-term outlook as well? And I think it would probably be best to start with Jim because he's going to be the least political. I know, Captain Cullen, you'll be the insightful, but let's see what you guys have to say about that, please.

MR. HAUSSENER: Well, let me back up to the first part where you talked about outreach. And Jeff has got the unenviable job of following Gerry Wheaton. If there were three people gathered along the coast of California, one of them was probably Gerry. So I don't know how he's going to do that.

But it's going to take more than what they're doing to get to the people. There's 35 million of us here in California. The folks that go to the Harbor Safety Committee meetings from the individual ports are probably the wharfinger. The wharfinger guys don't necessarily communicate with the environmental folks, don't necessarily communicate with the engineering people. The ports have pretty big organizations and stovepipe, and so need to do more than Harbor Safety Committee stuff.

Becky Smyth is a person who I enjoy working with; she's one of your resource folks out here based in Oakland. She does a great outreach with the scientists and with the various agency folks, but again not much with the rank and file, the folks who are along the waterfront using the waterfront. So I don't know how you're going to get around that in order to expand the world that you communicate with.

To the other part, the State of California and its maritime budget sucks, I guess is the simplest word. For years -- decades -- you know, back in 1987 the Water Resources Act said the local ports had to cost-share those federal projects. In California the ports themselves have picked up that cost-share.

We've gotten legislation introduced into the legislature. Actually had Congressman

Lowenthal -- he carried some stuff for us back in the '90s in order to get the state to pick up one-half of the local cost-share. State governor vetoed one and blue-penciled -- which means he allowed the other bill to go through, but he penciled all the money out of it to move forward.

It was not up until the Hamilton Wetland Restoration Project which took dredge material from the Port of Oakland and placed it over the old Army Air Station so that the local residents didn't have to worry about an airport being built right next to them -- to create wetlands that the state actually pumped in money through the Coastal Conservancy, who was a local sponsor for that piece of creating those wetlands. And they then argue that, well, that's our investment into the port system in California.

One of the things that -- and don't necessarily want to beat up on Tom. Tom has growing responsibilities and a limited budget. And one of the things he's looking at is why am I the guy who's being looked at with the deep pockets to pay for the maintenance supports?

Similarly, I'm a recreational boater and have had lots of ski boats, along with a Jet Ski. My gasoline tax is collected by the state and is supposed to come back to boating. Unfortunately, the state's figured out a way to take that gas tax to the tune of about 35 million bucks a year and catch it before it gets to boaters at all and disappears in the general fund. And so it is a concern as to how do we get folks to work on that?

The West Coast governors out here have an Ocean Program. They haven't necessarily funded it. I've chaired their Sediment Task Force. They decided that sediment was not sexy enough compared to marine debris, tsunami stuff and data. So they eliminated the Sediment Task Force.

When it comes time for implementing the Regional Sediment Management Plans that Julie talked about that the Corps does with the local sponsors, we've now got a half a dozen of these plans that are on the shelf and no money coming from the state to put it together.

The current governor certainly understands waterfronts. The mayor of Oakland lives on Jack London Square. Used to take his dog down on a real regular basis. The previous governor, he didn't discover we had ports in California until he went to China and the Chinese beat up on him as to why we weren't doing enough in the port community.

So we have seen stuff. And Chris may talk a little bit about it in terms of some bond money for a little bit of goods movement overall, as well as for clean trucks. Due to the regulations we've imposed on the truckers, we have the cleanest trucks in the nation. We have guys who own trucking businesses here that have opened up trucking businesses on the East Coast and moved their trucks, their 2007 trucks from California to Virginia because they can't operate them here in California anymore, but certainly can operate them on the East Coast.

And as a result of that, we've seen air pollution around the ports -- and again, Chris can talk briefly -- 80 percent in terms of particulate matter, in terms of SOx and other pollutants from the port community due to the regulations, due to the ports kicking in money and due to the state through the bonds providing some money.

Tom?

CAPT. CULLEN: I'm so glad to be sitting next to you, Jim, because --

(Laughter.)

CAPT. CULLEN: -- you don't have to sugarcoat anything.

Wow. We've been so incredibly busy with my office this past year as we have to, I admit, turn our focus a little bit toward the inland, as you saw with some of my slides. The big gaps, the vulnerabilities that we have.

That said, I haven't seen anything at all, certainly within my department of Fish and

Wildlife, of any of a reduction of an emphasis on the coast. We have, as I mentioned, BCDC California Coastal Commission, which I think would be better entities to address your question about coastal issues.

We have a separate fund for cost damages recovered from spills. Well, you know about Cosco-Busan, Dubai Star, other big events. We put that money back into restoration, wetlands projects.

One of the things that's going to be a priority for me, for other state agencies in the couple of years to come is going to be the tremendous abandoned and derelict vessel threat that we have, perhaps tens of thousands of these environmental time bombs, if you will, because we don't know what's on them, whether it's any type of an oil product or a heavy metal and batteries or something like that. And we're going to need some emphasis, some help in the legislature and the administration and across a broad spectrum of agency jurisdictions to try to look at that.

So I know I'm being a little bit, somewhat evasive, and it's really more because I just don't know the broader perspective of what is being done at the state level and within my Oil Protection Program.

CHAIR PERKINS: Great. Thank you. We're at 12:05, so we're a little bit into our lunch hour. So please join me in thanking our panelists.

(Applause.)

CHAIR PERKINS: So we have 55 minutes on the schedule here for a lunch break, an administrative session for the panelists, and then we'll have a presentation from the Emerging Arctic Working Group followed by a presentation from the IOCM and the National Coastal Mapping Strategy. And then that will lead us into our breakout sessions this afternoon.

So thank you again.

(Whereupon, the above-entitled matter went off the record at 12:06 p.m. to resume at 1:00 p.m. this same day.)

A-F-T-E-R-N-O-O-N S-E-S-S-I-O-N

(1:02 p.m.)

CHAIR PERKINS: Great. I hope everyone had an enjoyable lunch and we will reconvene the 29th meeting of the Hydrographic Services Review Panel, Day 2, afternoon session with an Emerging Arctic Priorities Working Group panel discussion.

That includes Ashley Chappell from the IOCM. She's our Arctic navigation lead at OCS. Dr. Lawson Brigham, the chair of the HSRP's Emerging Arctic Priorities Working Group and professor emeritus from UAF. And Mr. David Kennedy, NOAA Arctic policy advisor, Office of the Under Secretary who is joining us virtually through the telephone bridge. So with that, Ashley, I think you're first on the list.

MS. CHAPPELL: Actually, I think David --

CHAIR PERKINS: Mr. Kennedy are you on the line?

MR. KENNEDY: Yes, I am.

Can you hear me?

CHAIR PERKINS: I think we hear you. Okay. Great. On the line with us virtually is Mr. David Kennedy. He was the assistant administrator of NOAA's National Ocean Service.

And in that role, he has spoken with the HSRP many times before. So, David, welcome back and thank you for joining us.

MR. KENNEDY: Can you hear me okay?

RADM GLANG: It sounds like you're calling from the bottom of a glacier.

MR. KENNEDY: Can you hear me at all?

MS. CHAPPELL: Dave, we can hear you, but you're like in a can. Just a minute while we try and work it out here.

Can you see your slides?

MR. KENNEDY: Yes, I can.

MS. CHAPPELL: Okay. Hang on a second while we --

(Pause.)

MS. CHAPPELL: Can you say something again, Dave?

MR. KENNEDY: Testing one, two, three, four, five.

Did that work?

MS. CHAPPELL: No, it still -- it sounds worse. Are you on a Polycom, or are you on the phone? Sorry, I didn't get any of that.

MR. KENNEDY: Can you hear me?

MS. CHAPPELL: Yeah, we can hear you, Dave. Still kind of muddy. Can you hang up and call back, please?

(Pause.)

CHAIR PERKINS: Ashley, do we want to take presentations out of order while we work through the audio?

MS. CHAPPELL: Lawson --

MEMBER BRIGHAM: Sure.

MS. CHAPPELL: -- do you want to start?

CHAIR PERKINS: Okay. Standing by while we try to resolve audio here. So, those of you that are online, our apologies, but we are doing our best here to try and provide both audio and visual.

(Pause.)

MR. KENNEDY: All right. Sorry for all the confusion and delay here.

So, I'm assuming Ashley introduced me, David Kennedy, I've got a title slide there, for the administrator Kathy Sullivan and talk about what's going on in the Arctic.

I started about May of last year working on Arctic issues before I retired, but I'm now back in a position just working on the Arctic.

And in the last year there's been a tremendous amount of activity around the Arctic. And that activity doesn't even begin to address the fact that the Arctic is warming faster than anyplace else in the world right now.

There is sea ice loss and many, many dramatic changes that are creating kind of a whole new environment there that is setting off a number of discussions, debates, executive orders, Arctic councils and you name it.

I'll talk about some of those at the end of this presentation, but NOAA has been active and involved in the Arctic for a long time and we have significant investments and we have had.

We've had a National Strategy, a NOAA Arctic strategy for some time, but as the National Strategy began to be developed just as I was coming onboard last year, NOAA developed an implementation plan.

So, I'm going to very quickly -- and I know we're already behind time. So, I'm going to go through these very quickly, but what I want to show here; one, is the breadth and depth of the involvement of NOAA, but; two, how we and what we are doing within NOAA matches up with the National Strategy.

So, next slide if you're not there. So, what you see on this next slide is basically the National Strategy on the left hand side.

There's three lines of effort, as they're called, from security to stewardship to international.

And what we have done is taken the NOAA strategy and aligned our goals and objectives with that strategy.

So, basically you'll see then for each of the three lines of effort where NOAA and its goals are aligned.

So, as you'll also see here, stewardship is primarily of the three national lines of effort where the majority of NOAA's work is.

Some of the categorization that we've done here is a little bit random and you can put some of what we do where we have stewardship in security or international and vice versa. So, we've done the best we can.

Next slide, please. So, as we have put together our strategy and tried to align it, we've done a couple of different cuts at looking at how NOAA is invested.

So, in this first slide you'll see on the outer ring again the lines of effort, the

National Strategy. And then kind of by major category where that effort falls within the lines of effort.

And, again, you see that the majority of our effort is really in stewardship and management, in part, because of the definition of the Arctic.

The Arctic, the formal Arctic definition actually is a line that runs through the Aleutian Islands and then north.

So, when you think of the Arctic, quite often you think of the Beaufort and Chukchi Seas, but in this case the Bering Sea is included. And NOAA for a long time has had a significant investment in fishery and Bering Sea fisheries.

Those are huge fisheries and National Marine Fisheries Service has been there doing fish surveys and a variety of other things for a long time. So, that skewed some of these numbers a little bit.

Next slide, please. So, we've taken

another cut in this next slide by geography of where our investments lie. And it gets a little bit more balanced, but, again, you still see that the Bering Sea and the large marine ecosystems of the Bering Sea are where a lot of our investment is as I was speaking to before. Lesser amounts in then the other divisions of the Arctic.

Next slide, please. So, just quickly we really covered this in the first slide. And in the interest of time and maybe to allow you questions, I'm going to go through these next ones very quickly. But, again, it kind of reinforces the National Strategy and then where NOAA falls underneath.

Under security there is a term that's used a lot right now called "the domain awareness." A significant amount of interest within security of domain awareness.

The Arctic is a big place. We're not well structured. We don't have infrastructure. We don't have maybe as much monitoring and intelligence ability as we would like and one of the things that NOAA has been doing is kind of saying that we are part of the environmental domain awareness.

So, we're the backbone of that, a lot of the environmental data that is used for some of that domain awareness discussion.

Next slide. Again, I'm not going to spend any time here. I've already talked about the fact that stewardship is where an awful lot of our activity lies.

And you can see under pursue responsible region stewardship a variety of things. We kind of give you a better flavor of the investments that we're making under stewardship.

Next slide, please. And then under international, it's amazing the number of issues that we have in the Arctic here that are picked up and have been issues probably longer than they have for us in other Arctic nations.

And we're involved and you see the blend of acronyms here. Everything imaginable.

Both national and international and intergovernmental organization seems to have some role or responsibility in the Arctic.

One of the interesting side effects that we're beginning to discuss and talk about a lot more is that the Arctic is kind of something that's put up on the shelf by much of the lower 48 as an issue that they don't really need to be too interested in.

But what we are doing more and more is seeing that a good deal of the change in the Arctic has a potential to have significant effects in the lower 48 in a variety of different ways.

And so, there's a big move afoot to try and get the lower 48 more engaged, interested and aware of how significant the Arctic and its issues are to the rest of the nation.

Next slide. One of the things that we did -- that I was asked to do by Dr. Sullivan when I came on is we have $125 million investment in the Arctic right now. And that covers a lot of territory. We have six goals. All sorts of different objectives underneath that.

And what Dr. Sullivan wanted was for us to take a suite of things within our strategic plan and try and come up with a couple or three areas that we might highlight and really pursue because they met a variety of criteria.

So, we put a workshop together which we held in January in Seattle. And basically what we did was say, okay, what are the main drivers in the Arctic right now?

And so, when you see the identified focused themes at the top of the next slide -- did I ask you to go there? If not, this is the one that says NOAA Arctic Team Retreat, January 2015.

You'll see that we identified three what we felt were significant drivers for change in the Arctic and issues that were really kind of national, international issues.

And what we did was say within those three significant drivers, what is it that NOAA does that probably is mainstream to either helping advise, provide information or provide help with decisions on each of the three; energy, transportation and climate.

And we actually then over a two, two-and-a-half-day workshop took everything that was in our strategic plan and came up with three areas that we have gotten back down to Dr. Sullivan and said, with everything we do, here's the three things that we're going to kind of highlight. Here's the three things that we're going to look at from potentially budget initiative. And three things that, Dr. Sullivan, as you talk about Arctic, we'd like to make sure that you stress that are really important issues that NOAA is stepping out on.

And so, you see improve weather and sea ice forecasting. Again, that gets into that environmental domain awareness arena, but kind of a backbone baseline for so many things that go on in the Arctic in certainly decisions that are made.

The improve understanding of climate impacts on biological resources, that kind of draws in a good deal of immense work.

As most of you or some of you know, as the climate changes, the ice leaves, the temperatures warm. We're seeing migration of species. We're looking at habitats and ecosystems that we did not understand and have not studied nearly as well as we wanted to before and now they're in a state of flux and change.

And so, how, as the climate changes, are we to keep up with understanding those changes as they relate to all the biological ecosystems from marine mammals to you name it. And so, a major issue.

And it, too, affects so many decisions whether it's energy exploration, shipping, you name it.

And then finally navigation services. You folks there, probably this is the one you want to key in on. But in all of the meetings that I go to about major issues in the Arctic, there's always a discussion about how shipping is going to continue to increase, how it's going to become a significant economic driver and it's also going to become a significant threat for a variety of reasons, but always at the center of those discussions is many parts of the Arctic haven't been charted since the early days.

As we have more and more ship traffic, we've got to do something to better understand, keep ships from running aground or into each other and have reliable routes that we can use to get through the Bering Straits and up into the Arctic.

So, those are the three areas we've highlighted. There's a whole series of subtext under each of those, but that's kind of where we now are saying of everything that we do, these are the two or three things we really want to make sure that we highlight and focus on.

Next slide, please. So, finally I mentioned that there is all sorts of new interest in the Arctic. And since I have come on board we have a National Strategy, we have a National Implementation Plan, we have an Executive Order, we have an Executive Arctic Team, we have Arctic Council Chairmanship with a whole suite of priorities that the United States has moved forward as I take over the chairmanship.

And as you look at this sheet, this is just to show you some of the day-to-day things that we're involved with here and that we reach out to the rest of NOAA to help engage and play in a variety of committees, reports, data calls.

But what I have seen in the time that I've been here is the interest just is exponentially growing on the Arctic and everything about it.

NOAA is a center line player and what we're trying to do right now is make sure that we stay right in the middle of all the play and to the world make known that NOAA needs to be at the table and that we bring an awful lot that's of value to figuring out what the Arctic is all about.

With that, I'll stop. And I don't know, Ashley, if you have any idea of questions or thoughts on that, but that's it for me and thank you for your time. Sorry we got off to such a slow start.

CHAIR PERKINS: I would say while we have the line working and audio, let's utilize that to our advantage and put our questions to David while we have him.

Dr. Maune.

MEMBER MAUNE: Sir, you mentioned improve understanding of climate impacts on biological resources.

Are you talking offshore, or the land areas?

MR. KENNEDY: It's similar in both, but really this is an offshore focus. This is the coastal and ocean focus.

MEMBER MAUNE: Okay.

MS. CHAPPELL: Any other questions for Dave?

(No audible response.)

MS. CHAPPELL: All right, Dave. Thank you so much. I think if you don't mind staying on the line, we'll have you on there in case of follow-up questions later.

Is that all right?

MR. KENNEDY: Okay. Fine.

MS. CHAPPELL: Thank you.

CHAIR PERKINS: Thank you, Mr. Kennedy.

Lawson.

MEMBER BRIGHAM: Lawson Brigham, University of Alaska, Fairbanks. Not emeritus just yet. So, still hanging in there.

(Laughter.)

MEMBER BRIGHAM: I'm chair of the HSRP Emerging Arctic Priorities Working Group. We've been around for a couple years dealing with some practical issues of employment of Coast Guard vessels and emerging assets in the United States.

I have a presentation and some slides. I would mention, though, that you may get the wrong impression. And I'll bang on my soapbox since I'm a member here. I can present you an overview.

The United States is the largest Arctic research and Antarctic research budget of any country perhaps by ten.

United States operates nuclear icebreakers in the Arctic Ocean, has domain and control, I would say, of the Arctic Ocean.

The United States has a Presidential Commission. The United States has large fisheries well managed, well surveyed. I could go on in a long list.

You hear all the time that the United States is a piker in the Arctic. In fact, we probably are the most advanced Arctic nation.

We have the most advanced military for cold regions fighting, both bases in Alaska. We have missiles in the ground and there's a long list of things you don't hear about.

What is lacking in all of this, development of the Alaska coastline and the natural resources of Alaska and the infrastructure to support that.

That's what all this hue and cry is about. Where is the money from the federal government, from my perspective, to support that?

Money from the federal government is on all of these other things that make the United States, I would argue, the leading Arctic country. Not Russia, not Norway or whatever. So, that's my perspective as a member of this panel to tell you that there are different perspectives here.

The emerging Arctic you see in the pictures, I think Captain Rassello would be interested in the ship on the lower right, is the only non-icebreaking ship in the images there.

All these are world-class ships in Russia, Russian nuclear icebreaker, Canadian icebreaking Fednav ship, but the interloper in the polar regions is the cruise ships both north and south.

And how the international or global maritime enterprise handles that and IMO handles that and many of these ships of course carry American passengers and how the Coast Guard handles that, the safety network or the lack of safety network.

Next slide. But I want to go back to this National Strategy that David talked about. And since I participated in some input into this, this line of effort which speaks to Arctic stewardship did address and singled out the only infrastructure issue that's addressed in the National Strategy and is called charting the Arctic. So, to my mind for our group and our argument, it is the highest priority.

I see ice forecasts, all kinds of stuff that I enjoy and important investments, but this, to me, is NOAA's highest priority because it relates to the highest priority in the National Strategy, my sense.

And when we run our workshop and working group, maybe we'll come to this conclusion. And so, you can see what it talks about. Charting.

The reason it's there, the Coast Guard officer who is at the National Security Council that wrote this document for the president, lots of input from agencies, lots of input from other stakeholders, I was one of the stakeholders, and they asked us what the infrastructure missing was.

We all said, all of us mariners said hydrography and charting first order. Highest order of issue. For safety, network and whatever, that's the highest order thing.

Don't need icebreakers. Don't need survey ships -- well, we need survey ships to do the surveying, but there are lots of infrastructure that's needed, but primary is charting America's Arctic.

Next slide. And so, in January 2014 this implementation plan was developed interagency. A look, again, headed by the National Security Council and the folks in the White House, but they -- who's got the lead in all of these themes and all of these important lines of importance?

And so, of course you have the lead in NOAA, but supporting a whole range of organizations, but I thought what is interesting are all the bullets that are teased out.

And like the one complete acquisition of U.S. Arctic -- let me go back.

The National Strategy wasn't precise enough. Didn't need to be, but this is the implementation plan. So, what do we need?

We certainly need a lot of elevation data and geoid model development. And we need water level gauge and we need all of this stuff besides the charting to -- and then what was very interesting in it, the implementation plan teased out these percentage, asked for what are these percentage increases and what's to be charted and what's the potential of deep draft port? How much do we need to survey to these, whatever these ports might be? So, anyway, I think there's more precision in the implementation plan.

Next slide. And then this is my cartoon, but over many years of working on these issues it's very interesting at the beginning of the 21st century that the whole of the Arctic has been traversed by surface ships in the summertime.

The map would have no traversing of the Arctic Ocean in the wintertime. A few ships to Svalbard and Greenland. A few ships into the western part of the northern sea route in the Russian Arctic, but we see lots of different sectors, lots of exploration.

The exploration is really related to the adjudication of the claims beyond 200 nautical miles in the Arctic Ocean by the Arctic coastal states, Arctic Ocean coastal states.

So, there have been actually a lot of ships in the Arctic Ocean doing all sorts of activities. Cruise ships in the summer, et cetera.

Next slide. I did mention at lunch this IMO Polar Code. The International Maritime

Organization in London has for now more than two decades, approaching a quarter of a century, developed a mandatory polar code to be rolled out to the world in May to be mandatory by 1 January 2017.

So, the United States being an Arctic country and polar interest and a maritime state will be implementing through the Coast Guard, Code of Federal Regulations, a Polar Code for the U.S. maritime Arctic.

United States is one of the few countries that doesn't have any special Arctic-specific rules and regulations for its Arctic. We will have with this international mandatory polar code.

The next slide. This is the area of the application of the code. And in the Bering Sea, the southern -- the northern area or southern area of the Polar Code application is 60 north. So, that's been maintained since the evolution of the code.

And then you can see there's a zigzag

pattern across the North Atlantic to take into account the North Atlantic drift and the Gulf Stream and the warming of that part of the world. And so, it isn't as easy as applying the Polar Code to the Antarctic which is 60 south all the way around the continent.

Next slide. This Polar Code will even impact -- although it doesn't apply to government ships, in the longer haul government vessels will have to comply or be advised to comply with the Polar code in the future.

SOLAS is the Safety of Life at Sea convention. STCW is the Standards of Training, Certification and Watchkeeping conventions and the IMO, all agreed to by the United States and the other maritime states.

We're amending SOLAS and STCW and IMO, improving the structural standards of ships operating in polar regions, more safety gear apply to polar regions. Training and expertise in the pilot house is probably the number one -- the human dimensions are the number one issue.

All ships sailing in the polar regions, both north and south, will be required to have a polar ship certificate issued by the coastal state or, in fact, the classification society.

And each ship, individual ship, ship special will be required to have a polar waters operational manual.

Next. On the environmental side, MARPOL, the Maritime Pollution convention, will -- we are amending in the IMO Polar Code these annexes, zero discharge of oil, that makes some sense, noxious liquids, sewage and garbage, but not all issues in the environment are covered like black carbon, the ballast water issues are handled in another convention.

But nonetheless this polar code is a seminal new regime for the Arctic which is applied. And so, the IMO is not necessarily ahead of the game, but at least keeping up with the flow of the traffic.

Next. I've handed out to you all a

couple copies of a recent report that gives an Alaskan perspective on the new maritime Arctic.

In the very recent beginning of the year, we had an international workshop with Norwegians and Russian involvement in Anchorage. And then the sections of the report about sea ice and whatever, I'll show you a couple findings in a second here.

Next slide. Sorry for all the words, but what we found in this couple-year study is that its natural resource development is the primary driver of marine transportation not only in Alaska, but throughout the whole of the Arctic.

This is consistent with the Arctic Council's Arctic Marine Shipping Assessment, this AMSA.

The shipping routes in the Arctic as we heard in New York, the great presentation by the silk maritime highway we heard about, the Arctic routes are supplemental to whatever routes we have today. They are unlikely, highly unlikely to revolutionize global trade.

The whole application of the Arctic is taking natural resources out of the Arctic to global markets however the commodities go in the next decades ahead.

So, all the shipping, bulk carriers, LNG carriers, oil tankers, that's what we see, which in many respects might be more higher risk vessels than the container ships, but we're not going to retool and rejig the container vessels.

As Steve Carmel always told us, that's not his business in the Arctic, but there are great opportunities. And the great opportunities are for economic development of the Arctic and taking the resources to the world.

There is a relationship of the National Strategy to the AMSA and the recommendations. I've told you about the IMO Polar Code.

And I mentioned earlier today that minimum extent of sea ice -- the maximum extent of sea ice in the winter in the Bering Sea hasn't really changed for five decades.

The next slide. But the minimum in the summertime is reaching out into the central Arctic Ocean. So, it's likely that there will be longer seasons of navigation in the autumn and in the fall, but not in the spring.

Highly seasonable marine traffic, and I'll show you a slide here in a second, but really it's offshore hydrocarbon development that is the driver of the United States maritime Arctic in the future, marine operations.

There are plausible looks at this development. Could be a hundred support vessels, eight platforms in the Chukchi Sea if they find oil by 2025. And so, that's the traffic we're talking about. And of course the final point is hugely important.

Next slide. That's the traffic for the United States maritime Arctic in 2013. It's identical for the last decade and a half back. And even for 2014 and 2015.

No traffic in the United States

maritime Arctic. No traffic in the Russian Arctic. No traffic in the Canadian Arctic. There's no traffic in this part of the world in the wintertime.

Next slide. But in the summer, in this case June, late May, June through November, all kinds of traffic. Tankers into -- cargo ships into the Red Dog Mine, which is on the coast of the Chukchi Sea.

You can see most of the traffic on the United States side is tugs and barges, towing and supporting coastal communities, but that traffic will also be with offshore development, supporting the offshore oil and gas industry.

On the Russian side, though, we see along the northern sea route on the left, tankers, cargo ships, larger vessels which are using the northern sea route in the summertime as a supplemental trade route.

Next slide. A couple more findings. Arctic port, number of studies looked at, we looked at them in our working group, point all to

Nome as the real port of opportunity, but no port should be built in Alaska, I would say, a member of the study groups, unless it's tied to Arctic natural resource development and the development of Arctic -- Alaska's offshore and onshore resources to export out of whatever this port is to global markets.

The port is not the Port of Newark or the Port of LA or Long Beach or I hear people speculating about having a container port in Adak. I mean, that's the relationship for the port and the development whether it be public/private partnerships, international investment is related to shipping Alaska's Arctic natural resources to global markets in this century.

Seasonal increase along the northern sea route and the Russian Arctic clearly will happen in the decade ahead, but there are no indicators that the northwest passage has any viability as a global trade route in the decades ahead.

What has viability is, again, the carriage of natural resources in the Canadian Arctic out of that area of the world to global markets.

And then finally, the infrastructure needs, as I have mentioned many times, are huge in the United States maritime Arctic. Observing networks, domain awareness, enhancement, deepwater port, lack of SAR and environmental response, coastal icebreaking capability and maybe some defined Arctic corridors, transportation corridors which relate to our hydrographic needs.

One more slide and I'll finish. This report which I've, I think, briefed several times at the HSRP, is still a seminal report of the Arctic Council.

And the Arctic Council and the Arctic states are still working down the 17 major recommendations from this report.

And of course the United States approved this -- agreed to this report, negotiated consensus recommendations. And so, we have a baseline international report which the United States has been using for -- one more slide -- to speak to these issues; maritime infrastructure, safety issues at IMO, and then the general issues of protecting people in the place, which are a full range of issues. And I'll end there. Thank you.

MS. CHAPPELL: Lawson, do you want to take questions now?

MR. BRIGHAM: Sure. Yeah, I mean, we'll use a lot of this information for our working group discussions and try to answer these very specific questions that the admiral has passed to us.

CHAIR PERKINS: Great. Thank you, Lawson.

(Pause.)

MS. CHAPPELL: Admiral Glang.

RADM GLANG: It's working. I can operate the clicker. All right. Good afternoon. I'm Gerd Glang, Director for the Office of Coast

Survey.

This presentation I think, Dave, you've seen in an earlier version. It was presented at the U.S. Hydrographic conference last month at National Harbor by our team of authors, which was a combination from NOAA Office of Coast Survey, as well as the Canadian Hydrographic Service.

So, this paper is about coming up with a risk-based methodology to assess the adequacy of our charts in the Arctic region.

A little bit of background. Under the International Hydrographic Organization we have regional bodies. The newest of those is the Arctic Regional Hydrographic Commission.

The ARHC, as I'll call them, consists of the five primary Arctic nations; Russia, U.S., Canada, Denmark and Norway. We have two observer members; Iceland and Finland.

And so, part of our strategy of getting the ARHC to -- keep in mind this is an international collaboration of -- having the ARHC and our collaboration of the five nations be productive was to engage the Arctic Council recognizing that the last two years Canada has chaired the Arctic Council, that in the coming year the U.S. will take on the chair of the Arctic Council.

We want the Arctic Council to recognize the IHO as the competent body for all issues that have to do with hydrography and charting and safe navigation of the Arctic.

So, we've worked through especially here in the U.S. our connections with PAME, which is a standing working group under the Arctic Council. PAME is the Protection of the Arctic Marine Environment.

As Kennedy mentioned earlier, for the purpose of our study we also used the U.S. Arctic Research and Policy Act boundaries which extends down to the Aleutians. And so, you can see it's kind of a modified circle there.

And so, the question is, isn't the Arctic already charted? So, most of us here are aware that, okay, so maybe if you look on the left in the small scale, we do seem to have plenty of charts for most navigational circumstances. The problem is they're very small scale. So, they cover a very large area.

And on the right, though, you can see a much reduced set of large scale or charts that only focus in on a very small area. And those are sort of in the coastal and harbor scale charts.

So, not a whole lot in the large scale portfolio, but the second question isn't necessarily how well or how many charts there are or how much chart coverage do we have. It's really what's inside the chart, the information that counts. And that's what we're trying to get at in this study.

So, this methodology -- and, again, keep in mind this was a collaboration of primarily the four members of the ARHC.

We're not able to get a lot of input from Russia, and that's something we continue to work on, but it's basically a five-step process. So, first we're going to look at -- this is the word chart. It's easier than the next chart.

So, we want to look at what's our confidence of our present hydrographic holdings? We're going to separate the ocean into general bands of depth. And we'll factor in something -- some general notion about complexity. Then we'll do a little GIS analysis to develop where we have concerns, and then we also brought in historic traffic patterns. That's the beauty of having AIS data and doing this kind of analysis in the GIS.

And then we'll do some statistics and I'll show you how that's guiding through the United States our decisions on where we're going to survey.

So, here's the eye chart. This is the -- you know, we've got engineers doing this stuff. So, here's a beautiful flow chart they're very proud of.

There's a companion paper to this

presentation that walks you through this, but let me start with the base data that we assumed was available.

You'll see that around the U.S. and Canada and Greenland and Norway this white cross-hatched area, and that represents in a GIS space the hydrographic data holding, but then you'll also see underneath it a base layer of a gridded model of the seafloor.

And that data comes to us from the GBCO effort, which is the General Bathymetric Chart of the Oceans. Specifically their effort for the International Bathymetric Chart of the Arctic Ocean.

So, that's a generalized bathymetry model which is of tremendous value in the science community, but what we're using it here for is to provide us a little bit more information about what the depths of the water are, the bathymetry in places where maybe we don't have hydrographic data.

One of the shortcomings of the

bathymetric data set is it's not going to get you right up to the shoreline. That wasn't its intent. So, there is a bit of ambiguity in the nearshore regions, but we do have in many places hydrographic data.

So just a little bit note about how we define our confidence in our hydrographic data and the short story is this has to do with the technology. If it was older data acquired with single-beam technology or there's also a positioning equipment factor in here, then we're going to just put it into a different -- a lower category of confidence. If it's a modern, multibeam sonar kind of a survey with GPS control, we'll categorize it as higher confidence.

And then on the far right there's a category you don't see in the lower 48, which is unassessed.

So, here's the geospatial display of how that confidence of hydrographic data looks for the U.S. So we've zoomed in. There's a green postage stamp towards the left you'll see next to the Diomedes, and that's the product of recent surveys by NOAA.

And then if you follow the gray embayment center right, that's Kotzebue Sound, and you'll see a big green swath in there. And that's the NOAA ship Fairweather survey data from 2012.

So we looked at the confidence or the age of our data and we binned it into four categories: high, medium, low and unassessed.

So I want you to take note of in particular the gray area around Kotzebue Sound. And you can also look at the Bering Straits there where that green postage stamp is and the Diomedes and Point Barrow because we're going to -- as we walk through this analysis, you'll see how this evolves.

PARTICIPANT: Can you point to Kotzebue, please?

RADM GLANG: Oh, sure.

PARTICIPANT: For those of us without

geography.

RADM GLANG: In here.

PARTICIPANT: Great. Thank you.

RADM GLANG: So, that's that green piece where the approach is to Kotzebue. There's the Diomedes. I tried to verbalize this because I don't have a remote pointer.

MEMBER ATKINSON: Excuse me. Is Nome on there?

RADM GLANG: Nome is -- is it still on here, or is it below here? Down here, Lawson, right? Nome.

MEMBER BRIGHAM: Right in there.

RADM GLANG: Right in there. It's been a few years since I've been there.

MEMBER BRIGHAM: Southern tip of the peninsula.

RADM GLANG: All right. So the second step is --- if you'll recall that cross-hatched area were the areas of our --- of each member state's hydrographic data holdings and these also --- the boundaries of which corresponded to our respective member state's territorial regions.

We tried to stay out of the ambiguities of coastal state --- of member state boundaries, but we just did a real simple check. Where do we think the seafloor is simple? And it's a very generalized -- I'm using air quotes -- description, and where is it more complex?

And so our hydrographers from each of the member states sort of did a quick, well, it's, you know, based on the geology and what we know from our surveys in these areas, we're going to call this place complex. And based on what we know -- for instance, of Bering Strait, we'll just classify that as simple seafloor. So, very, very simple. Didn't want to make it too complicated initially.

So here we have taken the depth and the seafloor complexity and just separated it into three color bands very simply, and you can see the criteria that we used for the U.S. I think some of the other countries did not use the 20 meter margin. I think they went straight to the 50 meter margin. They were more conservative.

So then you intersect your confidence in your hydrographic data with those three depth bands and we generate five areas of concern or five levels of concern.

So I ask you to remember Kotzebue Sound, which was unassessed, but it's also shallow. And therefore, in this scheme comes up as an area of highest concern.

And then we've got areas over here in Bering Strait where it's somewhat deeper. Even though the data is older or we have less confidence in it, we have less concern because it is slightly deeper based on the 20, 50, 100 meter banding.

So that's just a real simple intersection you can do in a GIS query. Shown thusly -- we had a mathematician do this. So you can see how the intersection of confidence with depths gives us this color code, and then you generate these -- start generating these complex matrix tables of colors. So green is good. Red is not so good.

So, the next step is to actually -- I think I'm going the right way here -- actually incorporate some vessel traffic. So, this is Step 4. And, again, what we're looking for is to inform us where do we need to survey next? What should our priorities be?

And the AIS data we used was for the year -- mid-2012 to 2013, I think. It's like one year's worth of data, but what's interesting to note is you see these tracklines going down into these unassessed areas. This wouldn't otherwise have appeared as a priority for us to survey.

Lots of traffic up through the Bering Strait with, you know, sort of mixed confidence in there, but we -- you can go one step further now and stencil it out and say, what is the confidence of the survey data where these vessels have actually navigated. And now, we can start seeing that the actual percentage areas for low and none for where they're traveling starts to become more of a concern.

Here's the polar view looking down. So you can kind of see the aggregate of all the four member states for whom we had -- we chose to use their data, and here's with the tracklines sort of stenciled out.

And then we start doing some analyses and looking at Arctic-wide metrics. I'm not going to go into the numbers a whole lot, but you'll see Arctic-wide 80 percent of the area we would regard as either medium to unassessed confidence.

And then if you -- so, 20 percent is probably okay, but really maybe it's better to look at where are these vessels actually operating, where their tracklines are?

Well, it looks like 23 percent of the vessel tracklines for that period are actually operating in areas where we have medium to unassessed confidence levels in the chart data. 77 percent seems to be we have higher confidence.

So we're making some assumptions here,

but the first is that where we do have data, hydrographic offices seem to have been informed by where the vessels are going. The second is that vessels are not navigating where their confidence is higher in bathymetry. I think those are a bit optimistic, those conclusions.

So let's focus in on just the United States, kind of zip through this.

So it would appear that about 80 percent of the vessel traffic in that AIS data batch was operating in areas where we had high to low confidence. Only 20 percent was occurring in areas that were of medium to low and unassessed confidence.

So there are more statistics in here. I don't have a lot of time. Like I said, there is a paper, high confidence analysis. So, we can use as the target where we want to survey based on vessel traffic, how the area is used.

And so here you see for 2015 this is how we developed our survey priorities, and if you look at our survey plan were we to actually get our full survey season underway, you'd see we have Priority Number 1 is Kotzebue Sound. I think Number 2 is Point Hope, and Number 3 was Port Clarence. Just for this year, that has to do with the availability of the ships.

And in our survey plan, you'll actually see that we're going to have both the Rainier and the Fairweather operate here in Kotzebue Sound. We have a contractor that's going to do some work up here off of Cape Prince of Wales. And then the Rainier, if they have time, will be operating at Point Hope. And the Fairweather is assigned Port Clarence.

Yes, sir, Lawson.

MEMBER BRIGHAM: Yes, you can see Nome is right to south of the word Legend, all those blue lines into that point.

RADM GLANG: Oh, there it is.

MEMBER BRIGHAM: And that whole area is surrounded by red.

RADM GLANG: So --

MEMBER BRIGHAM: So, I'm just saying

low -- that is the place where we might have a deport -- a port in the future. And so, that might get attention in the decade ahead.

RADM GLANG: Yes, I don't have a zoom in. Actually, I had them go back and look at this when it was announced that Nome was a port of interest. And we have two surveys for the approaches -- the immediate approaches to Nome that are from 2005 and 2006.

So, we're not at a -- it's not unassessed or unsurveyed, just that this scale of what we're looking at, it's not going to show up.

MEMBER BRIGHAM: Could I mention one more thing?

RADM GLANG: Sure.

MEMBER BRIGHAM: That surveyed in 2012, that box there.

RADM GLANG: Yes.

MEMBER BRIGHAM: That's the Red Dog Mine complex where international vessels come into offshore and load zinc and take it to global markets.

And so all the blue lines from the Bering Strait into that box there, surveyed in 2012, across that part of Kotzebue Sound is all --- looks gray to me and not red, so that the transit areas of all the international ships are crossing areas of what I interpret as somewhat lower confidence even though it's not a -- it's a simple seabed continental shelf.

RADM GLANG: So let's talk about the one other piece --- yes, there we go. The transit corridor.

So this is the transit corridor that's under -- through the Federal Register notice process, that Coast Guard has published for public comment. Those are the words I was looking for.

And we have worked with the Coast Guard generating graphical images for them to communicate, but what we've -- what we're doing now is teaming with the Coast Guard and we've planned out -- to start addressing the adequacy of the charts in this transit corridor, is we've developed this network of tracklines.

So that the vessels, the Rainier, the Fairweather and the Coast Guard Cutter Healy as they transit to and from their operating grounds up north, are assigned these lines so that they can acquire bathymetry along their trackline. All the vessels have the systems to do this.

We're relaxing our standards here. It's trackline bathymetry. It's not hydrographic surveying, but we've done this before. It's better than reconnaissance. It's not quite fully controlled hydrography, but we think that will be really valuable for helping us assess the adequacy of the charts.

And as Lawson mentioned, we do regard this as simple in the sort of bottom topography sense. But if we find something, we certainly have the ability to swing back and further develop it, but this will be a way to get a quick assessment in the shortest amount of time on that route.

And I should emphasize that this is

sort of a -- one of our developing Integrated Ocean Coastal Mapping success stories. So we're really pleased. The key there is good communications. Good partnerships, and we have a longstanding relationship with the Coast Guard up there.

So just a couple of caveats. I'll let you read those. AIS is just for one year and -- right, so we're looking at past navigation trends.

So if there's a new area of interest or a new place where resource extraction takes place -- and Canada, as an example, is looking ahead for where that might happen. Then your requirements are going to change.

But the beauty is we've put this all into a GIS, so we can make it as complicated as we want. We can add more bands of depths and bands of complexities. We can put in resurvey requirements for places where we know there's active shoaling and sedimentation going on. So having it all started in a GIS allows us to go back and repeat the methodology.

And I think that's it. That concludes this part of the --

MEMBER BRIGHAM: I should say that the Alaska Marine Exchange --- like we saw with the Marine Exchange is about -- I'm on the board. So I know quite a bit about it.

It's a hundred transponders that are spread around the coast from St. Lawrence Island all the way up to Barrow and around the whole of Alaska, even the panhandle. And so, we have AIS receivers there.

Have very, very good maritime domain awareness at least for commercial ships and ships that are required by AIAA motor carry AIS. So it's good traffic coverage. Not lots of ships like here in LA, but enough.

RADM GLANG: Dr. Miller.

MEMBER MILLER: Just a quick question. What's the traffic into Kotzebue Sound? I mean, what's there?

MEMBER BRIGHAM: Well, a couple

tankers to support the community --

MEMBER MILLER: Okay.

MEMBER BRIGHAM: -- in the summertime.

MEMBER MILLER: Okay.

MEMBER BRIGHAM: It's not large traffic.

MEMBER MILLER: All right.

MEMBER BRIGHAM: But larger ships.

CHAIR PERKINS: So the trackline surveys that are being collected, what would it take to get trackline data on more of those vessels that we're tracking the AIS on? How do we formulate a cooperative trackline survey collection program from all of those vehicles in transit?

RADM GLANG: The short answer is resources. You know, we're leveraging the systems that exist on the Rainier and Fairweather, obviously with an experienced body of survey technicians and hydrographers who can operate those systems and pay attention to collecting the data through any standard.

On the Healy, there is -- it's a much smaller body of expertise, but they're willing to collect the data. The other thing is the systems are multibeam systems. So they actually cover a wider swath.

So, there are -- if you could ask other vessels of opportunity to log the data, what would be involved? It's really building the relationships, doing some systems checkout, finding somebody who's willing to do this.

So maybe, Ashley, you want to take a crack at this because I know we're sort of gradually getting there, but we've got a long way to go. You can't just pick up the phone and say to the Kirby tug that's going up to Nome, hey, turn on your echosound, or log the data. It's just not that easy. It's the back-end piece.

MS. CHAPPELL: So this kind of picks up on the crowdsourcing discussion you had earlier, and we do have some things in the hopper that we're looking forward to developing further.

Like we're using the Arctic as our

demonstration project for a trackline selection tool. An online way for potential partners to tell us about themselves and tell us where they're going. Perhaps indicate, you know, their route and what their capacity is for survey whether it's -- you know, whatever it is, single beam, that sort of thing. That hasn't been developed yet. It's still in the idea stage, but it will be worked on this summer.

The idea is as we build our trusted partner relationships, we are finding out about people/companies that are interested in doing this with us and then sort of determining what level of support they would need in order to share that information with us.

CHAIR PERKINS: Admiral Barbor.

MEMBER BARBOR: Yes, are those tracklines ellipsoidal referenced, or water level referenced?

RADM GLANG: For the trackline plan that I showed for the Bering Straits, that's just regular waterline reference. It's just straight-up, old school, you know, bathymetric tracklines.

CHAIR PERKINS: Okay. We have a question from an online participant.

DR. MAYER: Hello. This is Larry up in New Hampshire, and I think this has been a wonderful study. I think it will be very helpful in determining the highest priority survey areas.

What I have been concerned about, particularly in the Arctic --- and it's something that Admiral Glang mentioned at the very last end of it are the temporal changes.

I think about our visits to Barrow annually and watching the coastline absolutely change, including the roads, wondering what's happening offshore. And I wonder how we try to capture those temporal changes.

And I am concerned that we -- by just calling the seafloors simple, we may be ignoring some areas that may actually be simple one time, but not so simple the next.

RADM GLANG: Hi, Larry. It's Gerd.

So one idea I had is I've asked as the

two ships go work Kotzebue Sound, that they go do reconnaissance work -- do some reconnaissance lines back over the work they did in 2012. So, I -- and then I've also asked them to do the same thing when they get to Nome. There's some imports planned in Nome where we had the 2006 survey.

So places where we have modern coverage, where we can speak to the -- you know, to what went into that survey more better where we have the full bottom coverage.

If we as a practice start doing some target lines of opportunity over that, just to kind of assess the change, I think -- and I was whispering to Andy earlier this morning, you know, we also need to start looking at some of these coastal processes and where this stuff is going to help sort of cue us to where change is happening more rapidly than in other places.

And where that change is happening, we -- and it may also be affecting navigation.

DR. MAYER: Yes, I think that's

absolutely right. And I think we can start putting into the model some effort to predict where the change may be the greatest. It also may be a place for satellite-derived bathymetry once we have a good basis to look for changes.

RADM GLANG: So, I didn't even get into Shachak's work up there. And I think I talked about that in Charleston to this group, but we did use satellite-derived bathymetry for some analysis.

And Shachak wrote that great paper that highlighted the shoal off of Barrow, which by looking at a series of images and using the pseudo-bathymetry, we actually showed it was probably a real shoal.

And in fact, that's one of the reasons that Point Hope survey was assigned was to go do some recon over that shoal and kind of confirm what we saw in the satellite-derived bathymetry, but lots more room for doing more of that, for sure.

DR. MAYER: Okay. Thanks.

MEMBER BRIGHAM: Lawson Brigham again. This is why we should roll the Sikuliaq into this whole process, a new polar research vessel of the United States for UNOLS, has multibeam. Is the most advanced Arctic research vessel on the planet.

We need to roll that in -- that system and UNOLS ship into this program. It shouldn't be parochially used by the nation's science community. It's a more national asset, I would argue.

And so -- it has multibeams. So I think that would be one working group issue to help you, Ashley, maybe on this issue.

MS. CHAPPELL: I think I'd like Andy to comment.

CHAIR PERKINS: This is about the relationship with the Sikuliaq.

MEMBER ARMSTRONG: Yes, Andy Armstrong. We -- at UNH we've been involved in helping the Sikuliaq get the -- their multibeam system commissioned and set up. And so, we do have some interaction with them.

And I think that certainly one of the things we want to pursue is keeping that relationship going so that we can continue to get good data from those good systems that are on board.

RADM GLANG: Can I go back to the crowdsource question?

CHAIR PERKINS: Yes.

RADM GLANG: So, this is Gerd Glang from Coast Survey again. I'd like to go back to the crowdsource question to make it clear where I see Coast Survey's priorities are in enabling crowdsourced or volunteered observed data.

So we've looked at this from different directions sort of at -- earlier Jim Haussener mentioned Reymarine. There are other system providers out there who have created a closed ecosystem for their users, their customers who buy their equipment, to log their own data and then improve their own charts. And you can go out and find any number of vendors that do that.

Rather than us picking out a single vendor, what we're trying to do is approach the vendors in a broader sense and build those relationships.

On the back-end where we are investing time and effort -- and this is NOAA writ large, is developing through the IHO a global crowdsourced bathymetric database. And I think I've mentioned this in Charleston, but we're getting ready to enter Year 2 of that project and they are basically building out the database -- the back-end if you will, to catch and manage crowdsourced bathymetry, volunteered observations for the whole globe.

At the front end, the IHO is working on a pilot project with the Professional Yachting Association to actually enable sort of the rules of behavior -- the cookbook, if you will, of how do you log the data, what kind of metadata do you put into it.

And the next step here will be through a body of the IHO to consider forming a working group to actually bring in members of the industry who do this kind of work, there's different vendors out there, and try and build some international standards on what crowdsourced bathymetry might look like so that we can get it into the archive, kind of put it into this big data bucket. And I really think we got to have a place to put all this kind of crowdsourced data, because every member state needs to decide how they want to use this data for their own.

For NOAA, for Coast Survey, we see volunteered data, crowdsourced bathymetry serving initially two purposes. And the first will be there's probably value in that data -- in fact, we know there is, in helping us inform and assess the adequacy of our charts.

The second path is if you know enough about the crowdsourced data, if you have a network of trusted partners --- sort of trusted volunteers who are providing data. That over time, using concepts of some of the online games where you accumulate points and can be assigned confidence to your data and you get a lot of data for the same place you can use statistics, you may actually be able to take that volunteer data and choose to put it directly onto the chart.

But that really needs to be up to the individual hydrographic office because there may be geographies where you really don't need that information, that volunteered data. There may be other geographies where you have nothing else and really this is better than nothing. And so, you might consider putting it directly to the chart, but that all has to be discovered as we go.

And so I think our initial focus is really on this priority of building the database to at least collect the data and manage it and steward it in an organized fashion.

So that's Coast Survey's position on where we're going with crowdsourced bathymetry.

CHAIR PERKINS: Thank you for that update. That's been a topic of reoccurring interest. So that's very encouraging.

VICE CHAIR HANSON: I just have a few

questions on all the presentations.

First off --- and I'll go ahead and ask these questions, and you guys can respond how you feel, but there's other countries involved in the overall program that you mentioned and I notice their data seems to be all green -- mostly green.

Do their surveys get done by a NOAA-type government agency, or are they done by third party? And I assume we assume that the standards are NOAA standards. So are you comparing apples and apples?

Two, it was great to see plans for this year. Is there any plan scheduling done for subsequent years to get the rest of the data that we'd like to get?

And then third, I notice you have a contract group working this year and I'm curious how the production of the contracting survey group you use compares to the production, i.e., lines run and cost compared to the NOAA vessels.

MS. CHAPPELL: That's a lot.

RADM GLANG: Okay. Thanks, Bill.

(Laughter.)

RADM GLANG: So, I think the first question had to do with your --

VICE CHAIR HANSON: It's almost that time.

RADM GLANG: We've got a ways to go too.

So you were looking at one of the charts and you noticed a lot of green in the other countries.

VICE CHAIR HANSON: Yes, like their surveys were all perfect.

RADM GLANG: So I think what you were looking at was --- those were places where it was deep, and therefore in this scheme where you're using both depth and recency of data, if it's a deeper area based on the IBCAO, the bathymetric data, you have less concerns. So slightly higher confidence. So, I think that was the green you were seeing.

VICE CHAIR HANSON: Okay. And then

the evaluation of high confidence versus low confidence, was that done by each country or by - -- were you guys --

RADM GLANG: We let each country choose how they want to do that.

So I think for the U.S. we use this CATZOC code, which is a number that's actually encoded into the electronic navigation chart. So we've managed to populate all our ENCs with that CATZOC code.

The other countries are not quite there yet. They're still developing their ENCs - - I'm losing track of the question I was answering. Oh, the CATZOC.

So the other countries you saw in that table way up in Slide 8 -- go back to Slide 8. You can see the U.S. and Canada we used CATZOC. Norway and Denmark used their equipment type because they haven't fully populated that CATZOC value in their electronic nautical charts, navigational charts.

Okay. So your second question had to

do with our contractors?

VICE CHAIR HANSON: I was going to save that for last.

RADM GLANG: Save that one for last.

VICE CHAIR HANSON: The second one was really what's planned for 2016-2017.

RADM GLANG: So, the 2015 plan becomes the 2016 plan.

VICE CHAIR HANSON: Okay.

RADM GLANG: Unless we actually get things done this year. Yes, so they are looking ahead. We certainly have other places planned.

Those survey areas we assign are much larger than we anticipate them knocking out in one year. So there are other areas we've got assigned or are planned as we move ahead.

Using this methodology we have not yet developed a new five-year plan, though. We've got enough to keep us busy for three years.

VICE CHAIR HANSON: That's what I was wondering is how this need impacts the other needs you have.

RADM GLANG: So we can identify the survey priorities. It's how much of that survey --- or that area that you need to survey in a particular year. That becomes the balancing act between resources, right?

I can say I need to do the approaches to Kotzebue and Kotzebue Sound, but how much of that I get done in a particular year becomes a fine balancing act of how many days at sea I get assigned and how many contract dollars I want to invest in surveying in the Arctic versus someplace else.

VICE CHAIR HANSON: And so, that plays too, then to the urgency and the need for the data. And that kind of plays into our outreach, you know.

If this has got to get done because we've got a deadline, then that certainly impacts our outreach message as opposed to, well, we'll get to it when we get to it.

RADM GLANG: So, a good segue then --- and we should probably wrap this session up. I don't mean to cut you off, Bill.

VICE CHAIR HANSON: No that's okay.

RADM GLANG: So, in that tasking for the Emerging Arctic Priorities Group, one of the things I'm asking the panel on is for their views on what kind of criteria should we consider for how much I get done in a particular season in the Arctic.

So I'm looking for input. How important is the Arctic? So, you've heard Kennedy say that it's a priority that if we look at our base funds, there are monies being spent in the Arctic, but we know there's not new money coming to this. And so how much do we light our hair on fire for this work in the Arctic?

CHAIR PERKINS: We have an online question. And I know we've run over on this session, but, you know, we've had so little online input I want to allow a little additional time to try and entertain it.

So the question comes from Timothy Smith, and is anyone able to speak about managing the lack of data in bathymetry on the river systems that tug and barge folks use in support of western Alaska, and what are the methods to address the dynamic nature of the river systems and how can it be approached from a charting perspective?

Now the river systems may or may not be the domain of this group. So I'm looking at the panelists for an answer.

RADM GLANG: So I think if it's the Timothy Smith I'm thinking of, he's actually our navigation manager.

And just recently this question came up from a tug operator. And the same operator -- the name of the company escapes me, also came to our Anchorage HSRP meeting, if you will recall, and they were making a pretty strong case -- making their point very strongly that we're not paying attention to charting those rivers which are extremely -- can be extremely tidal and would definitely have very varying bathymetry.

So in the grand scheme of priorities,

that's one of the reasons we have these questions going to the working group.

So there are different places in the Arctic and in western Alaska that are important for different reasons. How do we decide which is more important?

And then I would just also offer that technically those rivers would be a real challenge, because you do need to establish water levels.

I don't know if you want to talk to that, Peter.

MR. STONE: Yes, I believe it was five or six years ago we did the -- you guys did the river up to Bethel, Alaska. And that was a very challenging area to do tides in.

Part of the problem is, is that the tide range is high and there's extensive mudflats. So it was very challenging and kind of gets back into using -- we can't use our traditional water level gauges in those areas. We have to get more expertise in using things like bottom-mounted pressure gauges and the GPS-type buoys in those areas.

CHAIR PERKINS: Lawson.

MEMBER BRIGHAM: Lawson Brigham. Yes, this speaks to resiliency of communities economic well-being, survivability of these communities.

So what's the priority compared to Americans on the beach in communities, coastal communities and offshore development?

CHAIR PERKINS: Great. And, Mr. Smith, thank you for the question. My apology for not recognizing your name. Alaska seems like a long, long time ago after a few full days here in this room.

MS. HOUSE: He also said Admiral Glang is correct in relaying -- throwing out the question for discussion. Vitus Marine was original inquiry.

CHAIR PERKINS: All right. I think we should end this session and try to get our -- onto the next session and our stakeholder panel discussion.

We'll recess for no more than five minutes, please. Thank you.

(Whereupon, the above-entitled matter went off the record at 2:20 p.m. and resumed at 2:30 p.m.)

CHAIR PERKINS: All right. We'll try to get reconvened and begin with our next session on coastal resilience.

MS. CHAPPELL: Okay. So I just thought -- this is Ashley Chappell, Integrated Ocean and Coastal Mapping. I'm just going to provide a little bit of context for this session, this section of the agenda.

We have a focus on coastal resilience and the idea is that this is -- it's not something that this group has talked about a whole lot, I think. And so, it will be a series of presentations that will then lead into the breakout session so that that breakout session on resilience has a little more fodder for discussion.

So, the order we're going to go will

be -- Audra Luscher is going to present first on coastal resilience writ large, and then I will present on where we are on some integrated ocean and coastal mapping developments that relate to coastal resilience, as well as intelligence, but we'll have a resilience focus.

And then Mike Aslaksen will follow me to give an update on where his program is with some operational developments and advances and their relationship to the resilience effort.

So if you think about this session not as strictly an IOCM session, but more a coastal resilience session, I think it will help the breakouts later.

Let me introduce Audra Luscher. She is recently, dare I say, co-opted by CO-OPS. She was with the Office of Coastal Management, which was formerly the Coastal Services Center, if you need all the history on all the acronyms and names. And she will start us off.

So, thank you, Audra, for being here. Enjoy.

MS. LUSCHER-AISSAOUI: Thank you so much for having me here. Again, Audra Luscher with CO-OPS. I want to start with kind of putting some context around how we got to the term resilience in the whole frame of risk management.

I joined in as a coastal manger through North Carolina and Maryland coastal programs. So I was working on the ground with a lot of communities before I joined NOAA.

So I was one of those people that were looking at the navigation portfolio and wondering how can I use this to plan for sea level rise. So I've been in that very specific situation.

And so I think we're at the place where now funding streams are opening up for this kind of work. And what I want to try to articulate today and talk about is the connection between foundational information and what it means to apply to coastal intelligence versus coastal resilience.

And what I would like to show is it really isn't that much different. And I want to kind of explain what that means before we get into our breakouts.

So I'd like to talk a little bit more about that definition that Russell Callender brought up and talk about what has happened with the trends in coastal resilience, and then make those connections between resilience and coastal intelligence.

And then finally I just want to kind of tee up a couple opportunities I think that I'd like to kind of put out there for you guys to think about where I see there's a lot of opportunity to grow under the portfolio and advocate for new resources and a new story around foundational information.

So we've heard that resilience is, you know, has the whole spectrum of planning, preparing, the long-term planning perspective. It's about responding to events as well. It really is the whole entire spectrum of disaster management. This is really a feedback loop. This is really, when you think before the storm, all the way during a storm and then back around. It really is a feedback loop.

However, what changed was the whole issue with climate change came into the picture of risk management. And for politicians who don't necessarily like to work around that subject matter, resilience has provided a really great framework to continue to talk about changing conditions, future conditions, without necessarily having to specifically tie it to that concept of climate change.

So when you have things that happen after a storm, that as a hazards manager, when I first came into this, was the ultimate opportunity to start again, to have that window of opportunity. A lot of times we are pushing up against walls when it's not in those what I consider windows of opportunities.

Not that I wish storms to happen, but events do happen and I think you need to be prepared in those windows to be able to advocate to make, not just putting the community back to what it was, but how do you take that step forward in changing the dynamic to make it more resilient for each storm? So, it's this constant loop of making these adaptations through this cycle.

And, you know, we rely on that National Academies' science definition, but I think there's a number of ways -- FEMA defines it in a much different context. And actually in the last few years what happened with Katrina and then what we went through with Sandy, we have a new disaster recovery framework that was rolled out in Sandy.

So things like ecosystems are able to come into the picture in recovery now that wasn't provided in storms past. And so these are some of the things that are allowing us to kind of put that resilience context into the picture of management today, compared to what I would consider risk management ten years ago.

So resilience is dynamic. Your community can change its resiliency through policies, through initiatives, through all sorts of ways and it doesn't have to be a static condition.

And just as we can make it more resilient, things can also happen to make it less resilient. If we take away infrastructure that absorbs water during storm events, we are fundamentally taking away our ability to deal with some of the water load that happens in our communities.

So when we make choices, we have to understand that we're changing that spectra and that dynamic of our resiliency. Now, with that being in mind, how do we know how resilient we are? We're really at that fundamental stage where we don't know how to track resilience in a community, in a port, based on fundamental indicators.

So where we really are with the trends around resilience is how do you set up consistent and fundamental ways to assess where we are in that spectrum to know if we are more socially vulnerable, ecologically vulnerable? Do we have enough funding that allows us to get through a storm if we have, you know, enough of those resources? So you're looking at it through those perspectives. So, indicators are becoming a very, very big part of the management framework within coastal resilience.

I pretty much said a lot of this. So let's talk about the importance of coastal intelligence in the concept of resilience. You know, communities really rely on authoritative and reliable information. They rely on it just like a navigation relies on authoritative information, things that you can have actionable information.

What I would say is different is the time frames in which we make those decisions. Most of the navigation-focused activities are realtime. That same data and that same information is applied, but we have to look at it in different time horizons. So things for future planning may be on a spectrum of ten to 25 years. Same data used in different time horizons.

And so when you're looking at sea level, this is what I would consider the crux of the future change when it comes to what we're dealing with under resilience.

Too much water or too little water is really the fundamental issue that we're going to have to address. Whether it be the drought issue we heard about today, or whether it's too much water during storms, or stormwater infrastructure can't take away water in enough time and so our infrastructure floods.

So you're really dealing with how that change in sea level is interacting with the water levels. And so on those different time horizons we have really been looking at sea level from a very long-term perspective. What is sea level rise going to be in 2100?

I would say a lot of managers can't make realtime decisions -- I mean more authoritative decisions on something that's in such a long-term time horizon.

So things that we've done is changed our analysis with sea level -- instead of looking at long-term means, and changing how we look at it through every tidal cycle, every high tide. And what we've seen is that sea level has fundamentally changed how high our tide is rising near our communities every day.

So you're getting this phenomena -- more understanding about what we call nuisance flooding, recurrent flooding. This has significant impacts on how commerce can go because the roads can get affected on a daily basis, your port infrastructure may be flooding on a more regular basis. All of these things are actually happening on a day-to-day basis instead of this very, very long-term horizon.

So I think it's really important is to know that we have a lot of ability to use the infrastructure we're already collecting from a navigation perspective to put it in the context of resilience and to make that authoritative and I would say decision support for this type of end user.

So from my perspective, I don't think they're competitive at all. I think that coastal resilience isn't -- you can't be resilient unless you're intelligent. If you're not informed and you're not intelligent about your situations, you can't adapt and become more resilient.

And so really coastal resilience is about sitting on the shoulders of coastal intelligence. It's just using that same information in different time horizons and different spectrums along this feedback loop of disaster and putting in future conditions in order to inform a new end user.

So, I feel like when all these new funding streams are kind of hitting right now, we have a really great new story to tell.

This is really still the story about coastal intelligence and we have to weave these stories together so that they don't seem competitive, but we also have to think about, as people who deal with navigation, what does that mean for us as we step into the game of resilience?

We've talked a lot about resilience grants. I do not think that those do not include the navigation community.

If anything, I think that ports should be stepping up just as much as communities should be to be going for these grants and looking at the future condition picture. So, from my perspective I think resilience funding has a place to support this overall navigation group and the marine transportation system as a whole.

So, I just wanted to talk a little bit about, here's a product. When it comes to resilience products, I feel like they're really just a second order product of what was usually, you know, what you may use in navigation is one data point or a data stream and some static plots.

In a resilience perspective, these

things need to be put on a landscape scale. Visualization becomes more important.

But I'll also say is this is a visualization for lake level. Lake level going up, lake level going down. It's a companion to the sea level rise viewer.

What you'll notice is that those white areas are data gaps. When you start putting navigational -- navigation information into resilience products, it fundamentally highlights those gaps very clearly.

And when you get an end user really relying on this kind of information, what you have is a new group advocating for the same information because they're relying on that and they need those gaps filled.

So, most of this topobathy that was used to make this viewer came from navigation and hydrologic service products, but they were applied to this resilience context.

And so, I say again there's a real story to advocate for more resources for this foundational information to support coastal resilience.

I also think that this is a great opportunity to bring more partners into this picture, because we may not be the only ones that can service those nearshore areas.

I think IOOS has a lot of new methodologies. There are a lot of technologies that can adapt to make partnerships to fill these gaps collectively. So, I think again resilience brings in an ability to kind of leverage and create new opportunities under the navigation portfolio.

So, I say, you know, we probably -- this might fundamentally go against what people think, but really if we didn't put another piece of infrastructure in, another tide gauge, we could still service resilience in a very strong way just by kind of adapting the procedures that we currently have at looking at our current data.

So, right now we have a whole host of information in our ports, that's the ports with the trademark. You have current data. You have water level data. All these are taken on the realtime perspective.

In some respects, they're kind of being left on the cutting room floor for the long-term perspective. Some of these ports have been around for 19 port systems, have been around for 19 years.

That's 19 years of long-term data. That's 19 years that we could be using current information pre- and post-tsunami events just by changing the way we're surveying that data in different cycles.

Instead of going for six-minute data look in doing tides and currents, we could be doing 15-second data in order to pick up that signal after a tsunami event.

So, we really do have large infrastructure investments that if we change the way we analyze it, we could serve that community in a much better way.

I also think we have a lot of

investments in our reference frame. We have information that's telling us where we are.

You heard Juliana talk about, you know, what they are doing to upgrade that reference frame and provide, you know, our positioning information.

But when you combine the cores with the water level, you're looking at land changes. You're looking at that reference system and using it to look and measure that change.

It's incredibly important because actually when we withdraw oil and we withdraw water, we change that subsidence rate. And that's a management decision.

We can very easily change that decision in order to make us less susceptible to coastal flooding, because we can pump water back into our aquifers, we can do a whole host of other things that may happen.

And people have started to do that, because their subsidence rates are going so quickly, are sinking so quickly.

And so, they've either decided not to withdraw from their aquifers anymore, or they do different management activities.

So, again, that reference frame is actually very important in tracking coastal change on land.

So, I think we've heard from already a number of people that talked about, you know, observations are critical to validate models in mapping.

And I don't belabor this point, because I think we've heard that a couple times, but if we don't have the specific information feeding into things that are putting information into a broader geospatial scale and we're not verifying that with observations, you know, we're really discrediting the accuracy of those models and being able to predict change.

And so, I think it's really important that we're continuing to do this process. So, observations and foundational information are incredibly important for geospatial applications as well.

You may have a specific -- this is an NWLON. We're starting to look at change and track it through alert spectrums when it hits a certain threshold so you can start monitoring that change on a daily basis, but you also need to know how that lays out on the land so they can visualize that.

And that's another part of using the observations to depict and visualize change and validate models and mapping products.

And finally I would say the last opportunity is, again, I told you I think ports and navigation communities can advocate for resilience grants.

And I don't think you -- we have to go too far away from the coast to start working in our port systems to look at different ways that they could become more resilient.

Specifically, I think that we don't really have -- we have a lot of products that get ships in and out on time, but we really haven't looked at the intermodal transportation issues that happen with rail and trucking lines.

When you have a disaster, that is the number one thing that really keeps ports offline for a long time is not so much of what's happening in the port; it's what's happening with the infrastructure outside the port.

So, this relationship of really building products that are outlooks for water level that help these industries understand what the change is, understand how to make contingency planning, will ultimately make the people and the places in ports be able to become more resilient in these perspectives.

So, I think things like seasonal outlooks, things that we're talking about how water levels will change and flood roads not even during storm events, we're talking about this nuisance flood issue because how sea level is changing and, you know, people need to know that in a time frame that management decisions can be made in the perspective of a few months or weeks.

So, I just wanted to say this is another opportunity where, you know, I think we could get more engaged in pushing the whole look through an outlook perspective.

So, I will leave it at that and I look forward to the breakout, and I thank you for your time.

(Applause.)

MS. LUSCHER-AISSAOUI: I didn't know if we want to do questions now.

(No questions.)

MS. LUSCHER-AISSAOUI: Okay. Thank you.

MS. CHAPPELL: All right. So, as I said, I'm going to talk with you about where we are on one of our integrated ocean and coastal mapping commitments or one of our projects, and then Mike will wrap up in a bit.

If you jump to the -- actually, I have a slide changer up here. I'm glad to follow Audra, actually, because then I don't have to tell the whole story of resilience as I told

Audra earlier.

What I'm going to be talking with you about is the interagency commitment on a national coastal mapping strategy.

And one of the major reasons behind it and one of the things that all of the different agencies can get around is this concept of resilience.

And so, this slide just is to illustrate that, you know, we are seeing increased frequency/intensity of storms, impacts to our coast, sea level rise, increased commercial traffic, larger ships.

Of course we always talk about those sorts of things. And so, it's just a quick slide to kind of summarize all of that and highlight the areas where we need information, coastal intelligence information for coastal resilience.

And resilience is in all of these different facets that NOAA in particular is focused on; safe and environmentally sound navigation, being a weather-ready nation, community livability, coastal community resilience and resilience to hazards across the board whether it's for communities or economies.

And when you look at all of these things, I don't know what happened to my slide here, but basically the message in this slide is that all of these different -- seemingly different activities really have one underlying piece, which is the need for ocean and coastal mapping data.

That's the bullet there that you can't read. It's the most important one on the slide that says they all need ocean and coastal mapping data.

Just for those of you that are not familiar with how IOCM is structured, first in NOAA, we have 21 NOAA programs that we consider part of our integrated ocean and coastal mapping team. And we get together to talk about data acquisition, data stewardship and maximum use and reuse of data.

At the interagency level, we have very

much the same thing with the agencies that you see here in the list. This was an interagency effort that actually started, I think, in 2009 at least -- actually, predated 2009, because that's our Ocean and Coastal Mapping Integration Act resulting initially from the National Academy of Sciences study Geospatial Framework for the Coastal Zone. So, we've been at this for a while.

We co-chair the IWG-OCM, the Interagency Working Group on Ocean and Coastal Mapping, with USGS and Army Corps. So, NOAA, Army Corps, USGS are the leads of it. And we are charged with facilitating the coordination of ocean and coastal mapping activities to avoid duplication.

This was in 2009. As I said, we were doing this before 2009, but then it got codified in the Ocean and Coastal Mapping Integration Act.

And one of the things that act said to do was develop an annually updated National Ocean and Coastal Mapping plan. Well, that's easier said than done.

Later with the National Ocean Policy, that same charge came to us again in the form of the Ocean Policy Implementation Plan. Kind of called out in more specific detail by saying develop an interagency plan for topographic and bathymetric LIDAR particularly for -- this was in the climate resilience component of the plan and then repeated under the observations, mapping and infrastructure piece of the plan. Kind of the same task.

So, you know, a little bit of redundancy in the plan, but it's kind of like a smack in the head like let's get on with it. We've told you three times to develop an annually updated mapping plan.

And our interagency team of course has been working on this the whole time, struggling with it. How do we do it?

We started with an inventory. We wanted to take an inventory of data. We developed an inventory pilot. That became somewhat obsolete in that, as we were developing it, lots of data portals were sort of proliferating on the landscape and kind of overtook the need for a specific inventory, because there are ways you can find that data.

Formerly named NGDC was getting really good at having bathymetric data and elevation data found.

So, as we took steps to get to this National Ocean and Coastal Mapping plan, we were making progress, but we still didn't have the plan in hand.

So, we got to the point where trying to develop a plan for LIDAR data, for bathymetric data, for the digital imagery that's acquired, for the hyperspectral data that Army Corps collects, you know, there were so many moving pieces in this effort we decided, all right, let's go with something that's really working well and let's focus this first iteration of the plan on elevation data, in particular, LIDAR, topographic and bathymetric LIDAR.

And so, we've got this mapping strategy and work for coastal LIDAR. And we decided we would merge it with an effort I'll talk about in a minute called the 3D elevation program mapping effort, which I believe Larry Sugarbaker, I think, talked to the HSRP, didn't he, in, I think, 2013 about what the 3DEP effort is?

It's an idea, a plan to map the United States, terrestrial United States completely with high-quality LIDAR data in eight to ten years, I think, in order to have really good elevation data for the nation.

So, this 3DEP effort is going on. We're doing our plan and we decided to -- so, we focused initially on coastal LIDAR and we kept sort of bumping into 3DEP, you know. 3DEP is terrestrial topo, topographic LIDAR.

It didn't really make sense to develop our plan kind of in a vacuum with the 3DEP effort. So, we've tried to bring those together with a concept called 3D Nation.

3D Nation -- sorry, I have to go to these different slides to illustrate. 3D Nation is the idea that we would have high-quality elevation data for the entire nation from our mountains to our deepest seas. So, it's blending the whole effort together.

And our interagency working group on ocean and coastal mapping is focused on that coastal zone piece. So, we're looking for a modern, accurate elevation foundation. It's a very high-priority data need.

As you can see here in this slide which illustrates the return on investment, the National Elevation Enhancement Assessment did of the benefits of --

(Comment off mic.)

MS. CHAPPELL: Oh, that's right. I'm sorry. I could ask you to come up and talk about it, but this return on investment, you know, it certainly shows across the nation where the benefit of LIDAR would be, but note the coasts, you know. All of the coasts are in the dark green.

So, we have the -- our coastal mapping strategy focused initially on topographic and bathymetric LIDAR.

I do want to note that when we get to Version 2, because we will get to Version 2, we will be looking at other types of acquisition. In particular, offshore acoustic aerial photography and that sort of thing, but what I'm going to talk about now is strictly LIDAR.

Okay. So, we're building -- in this plan we're building on existing partnerships. We're building on the 3DEP partnership that I already mentioned, but more importantly we're building on the Joint Airborne LIDAR Bathymetry Technical Center of Expertise partnership, which Mike Aslaksen is an important component of.

That's Army Corps, led by Army Corps with NOAA and USGS and NAVO. The JALBTCX partnership has made great advances in coordinating on LIDAR acquisition.

So, this plan tried to take that, the

3DEP effort -- we're really trying to sort of leverage all of the things that are going on in this environment and put them together in an effort to acquire data in this coastal zone, which is just -- I liked Audra's illustration with that lake level viewer showing those data gaps, you know, because that is the zone that we're working on.

So, the plan, it's still in work, but it has five components. The first is kind of our stretch goal. It's really an aspirational effort, an aspirational goal that gives an umbrella that all of the agencies can get behind. Sort of I would call it like a supra mission, you know, a mission above all of our individual mission goals, which is kind of hard to get everyone to get behind, but I'm working on it.

So, that is -- we take the 3DEP idea of mapping the United States in eight years. But when it comes to the codes, we recognize that, you know, mapping the U.S. shoreline completely and accurately and comprehensively in eight years, we have to come back and do that again. So, we need to actually be on a cycle.

That's where we've gone a little bit farther than 3DEP, because 3DEP just says let's do it once and then, you know, we'll think about the next page later, but we're already thinking ahead to these areas are going to come up again and again.

Some of them will have to be done sooner because of hazardous events. Some just have to be built in to be mapped more frequently. Some can wait a while, but that concept of map, repeat, you know, rinse, repeat, recycle, that sort of thing is built into our strategy.

The second element of it that I'll talk about a little bit more is that every year we need to coordinate on mapping data acquisition.

The third is working toward common standards. And I emphasize standards, plural, because there will never be one size that fits all. And I had to realize that.

Fourth is a whole life cycle approach to data meaning, you know, acquiring the data isn't any good if it actually doesn't get out, isn't made available. So, that whole sense of stewardship.

And then the fifth component which is another element where the JALBTCX partnership has been really great and other activities like the Joint Hydrographic Center, this R&D idea, you know, constant refresh of tools and technologies.

So, Component 1 I do need to emphasize that this is aspirational. It is very much something that we could do given a commitment to the concept of 3D Nation, you know, that accurate mapping data set, coastal mapping data set for the nation.

Sufficient resources, I should probably put asterisks around that, highlight, exclamation points.

And a continued effort at coordinating the acquisition strategy among not just the federal, but also our state partners, our private sector partners, academia, you know, the whole suite of entities that are out there mapping, as Audra also said.

So, the Component 1 in our strategy actually builds on what the Army Corps is already doing. And that is that for their sand resource mapping they are getting around the contiguous U.S. and Hawaii on a roughly five-year cycle.

The mapping that they do, the topographic and bathymetric mapping that they do is great. It isn't the total answer, it isn't perfect, but they have a cycle and it means that we can -- when we think about our aspirational strategy, we can leverage what already exists and build on this to get to the concept of cycling around the United States in eight years and then coming back and doing it again.

So, you can see IS would be an initial survey. This is all a nominal schedule, but initial survey and then resurvey.

Everything in the -- below Alaska really maps to what the Army Corps is doing now, their schedule. And then Alaska is factored in, because actually the Army Corps doesn't have any work up there, but NOAA and USGS, for example, do. So, Alaska is sort of laid on over the top, but this whole eight-year concept is there.

Component 2, this is not aspirational. This is actually something we are doing now and we can do better. This is where we coordinate annually on data acquisition. We show each other what our preliminary plans are, not just federal agencies.

Again, this is working with the states and our private sector partners, local, regional, that sort of thing, but getting together at least once a year conscientiously, and then over the course of the year using perhaps some GIS-based tools that we have to coordinate on mapping data acquisition.

We have had one sort of test summit. We had it at the end of the JALBTCX workshop last summer and we will be doing it again this summer.

We will be inviting anybody who cares

to participate. We'll have that invitation extended to anyone who wants to come.

And using SeaSketch, which I think I've demoed to you all before and I'm happy to do it again today, using the SeaSketch tool we will be sharing plans about mapping all with an effort to of course eliminate redundant mapping efforts, streamline what we're doing and just be really smart about where we're spending federal and state dollars on mapping.

This is if you haven't seen it, and some of you may have not, especially our new members, SeaSketch mapping tool was something that we built -- we didn't build it. Something that we employed with the Sandy Recovery effort.

It was kind of a perfect storm, if you will. When we got the Sandy supplemental money, we had recently heard some briefings by Will McClintock of UC Santa Barbara who had developed this SeaSketch tool to demonstrate how marine planning might happen.

His tool used the Channel Islands

National Marine Sanctuary Planning Effort as an example and that's what he demoed to us, but we, as agency partners, had always said, you know, it's really hard to coordinate on mapping data acquisition if you can't see well, see easily where each other are working.

I know I for one have trouble when we sit around the table and just throw out geographic names, you know. I'm a visual person. I have to see it. I have to see where things are overlapping and where they might just be close to each other, that adjacency element.

So, with SeaSketch it just kind of came on the scene at just the right time. It's really easy. We threw our data into it. We used it for Sandy.

We could see where -- not only where the initial sort of big three agencies were going to map: Army Corps, USGS and NOAA, but we could also ask our stakeholders, like the states, where they needed data, what were their priorities for mapping.

And you can do it very quickly. This is kind of -- the idea behind this tool is not beauty. It's quick and dirty. Just get it in there and then let's refine our ideas once it's in there. So, I think it worked really well for that.

And you're probably tired of seeing this example, everybody, but it's a really good illustration of how SeaSketch worked and how it can work in the future.

If you'll look, it's a little hard to see, but this -- these are some blue coastal counties. And up in New Jersey there at Cape May, you see some peach ones. And those are USGS topo-LIDAR mapping plans.

In the red, that's Mike Aslaksen's remote sensing division topobathy acquisition plans. And we can see, you know, just by looking at it, perhaps even by talking about it, but certainly visually on the map that there is a lot of overlap.

And in this particular area, Cape May

and the New Jersey coast, we really want to understand why both agencies needed to map or could not coordinate on mapping and, you know, this helped us have the discussion around what was going on.

I will say that I always want to be sure and say that sometimes it makes perfect sense for two agencies to map in the same area. And that's okay as long as you know why.

And we just wanted to know why and as it happened over the course of the discussion, Mike was able to say that he could cover USGS's area of interest here in New Jersey.

And so, he did that and they were able to take their funds, Sandy recovery money, and move them farther north and acquire another county somewhere else with topo LIDAR that also needed doing, but had fallen off the list.

And then on the Delaware coast there, USGS, I think, was pretty thrilled that they didn't have to fly tide-coordinated data or even entertain the notion, because Mike was acquiring it.

So, you know, that was a savings there, too. Maybe not a huge savings, but certainly a success story with SeaSketch.

Then, later, Army Corps which is really, I think, in the -- I think of all the agencies, Army Corps has been the hardest hit by the travel caps. I don't know. They really have had a hard time going anywhere.

And when they plan their LIDAR acquisitions as they go around the coast, they like to get out into the districts and talk to their districts and the district partners like USGS, NOAA, other agencies, and they could not get out to the West Coast as they planned their West Coast projects.

So, they used the SeaSketch tool through webinars to interact with their districts and their partners and were able to add some mapping efforts, additional areas to their West Coast projects using the tool.

And the really exciting thing about it

is that both the 3DEP program, again topo LIDAR, terrestrial LIDAR nationwide and the IWG-OCM, coastal nearshore and offshore, have agreed to use the SeaSketch mapping tool to do national mapping coordinations. So, everything will be in here. The 3DEP broad area announcement work, the IWG-OCM plans, it will all be in here.

And this is a really good demonstration for what we want to see at the geoplatform, geoplatform.gov, which is where this kind of tool should be and they are working to get it for us. It's just taking a few years.

So, SeaSketch is a temporary demonstration of the functionality we want to have, but it's working out really well. And, again, I'd be happy to show you the actual tool later.

So, just very quickly moving on, on the strategy, common standards. LIDAR quality levels, we're using the same approach that the 3DEP effort has used for topo LIDAR. This is not a final QL chart. We're doing some work to improve what each of the categories is saying and -- but this gives you an idea. We'll have the same sort of quality level balance that the 3DEP effort has.

Data management procedures, you know, this is just that whole life cycle approach. Every -- all the agencies will commit to doing this as they really must, but it's very, very conscious.

And then fifth is that target of research and development. And we have some ideas in the hopper for near-term projects, and then some that go out farther just recognizing that it's smart to leverage each other's capabilities in work that is ongoing.

So, five elements to the strategy. As I said, it's not quite complete. The idea is to put it out for public comment and fortunately or unfortunately, the closer you get to a final draft maybe the more attention people are paying it, which is a good thing, but we're -- so, that's why we still have a little bit of work to do on quality levels and the concept of the eight-year strategy as people are really looking at it.

But we're getting there and I think as we get this plan together, we can say we're getting a step closer to that idea of a 3D Nation that you, I think, will be hearing more about as we go forward.

I do want to say, again, we're not stopping with LIDAR. When we get to Coastal Mapping Strategy Version 2.0, we're going to -- we'll move to the offshore and acoustic technologies and other technologies and hope to emulate successes like what happened out here in California with the California Seafloor Mapping Project.

Those are the kinds of partnership efforts we really want to build on. And it's been alluded to over the past couple of days, but, you know, that partnership came about with the State of California and Fugro and NOAA, Army Corps, USGS played a big part.

And it's really something that we try -- we're trying to copy in other areas. South Carolina, for example, with some of the wind energy work in the State of South Carolina. Long Island Sound. So, these kind of collaborative partnership efforts where all the different partners are getting what they need and contributing pieces and parts to manage the whole.

And I think, yes, I'm going to go into Mike's presentation here. So, I'll end really there on the Coastal Mapping Strategy.

(Applause.)

MR. ASLAKSEN: Thanks, Ash, and thanks, Audra, for teeing me up. Let's see here.

There we go. So, my goal here is to give you an update in the operations within coastal mapping at NOAA.

Really, you know, just to brief you where we are in technology and some complementary technologies we're using.

An update on where the Sandy

supplemental is and delivery of that data. I mean, that's a big deal. It's 2800 square miles of topobathy LIDAR data and imagery and shoreline. About 20 terabytes of data and was about a $10 million investment by Congress to get this work done. And then I'll wrap up with some of our plans both from '14, '15 and '16.

This slide just illustrates the IOCM products produced at NGS. You know, we try to map the ones used many times.

These data streams of course first and foremost is the shoreline for charting production. Orthomosaic imagery, that's our baseline technology. photogrammetry is still the measure in a lot of cases of how we're ensuring that we're meeting the quality for charting standards which then often feeds many other applications.

And then some of the derived products there we have, you know, LIDAR Point Cloud and elevation data, merged topobathy, DEM data set, intensity from the LIDARs.

And then you can actually colorize those point clouds using the imagery for further applications.

So, probably should have done this from the bottom to the top and reversed it, but the takeaway here is the complementary remote sensing technology we're using to derive how we and where and when we fly topobathy LIDAR.

Being an optical system, we need to know where the water clarity is, when and in what time of year.

And so, one of the opportunities we had with Sandy supplemental was to work with our partners at the National Centers for Coastal Ocean Science within NOS who have a harmful algal bloom program, which one of the things they throw out is actually water clarity.

So, we partnered with them to look at the operations during Sandy to provide satellite-derived water clarity products. And then also to look long-term to build climatology of data going back to CWIFs and Lotus some 20 and 30 years back.

Dr. Rick Stumpf is our partner in that. Very well known in the industry and academia for his work. This is -- the goal here is actually to put that out there for both internal and external uses to have an understanding where to fly or when to fly LIDAR.

The middle slide, the satellite-derived bathymetry, again, really, I would say, has blossomed within NOAA especially between us and Coastal Survey as a tool to say where do we need to go and chart, you know.

The mindset of maybe we -- how old data may be, we might be changing to where do we know we have problems, where we have done -- used satellite-derived bathymetry for reconnaissance and we have been very enabled by the access to data, both the Landsat imagery, NGA and digital globe imagery that are at little or no cost to NOAA.

All of this encompassed with, you know, access and ability of GIS to process this data both cleanly and fast.

In the case on the data I'm going to show you, you all know, the Office of Coastal Survey Anthony Klemm basically used Landsat data to look at the issue -- charting issues in the Gulf of Mexico over a few days.

So, and then on top of this is the topobathy LIDAR technology, you know. Colin Cooper at Quantum Spatial coined it right last week as going green, because in that, we're really in the capabilities of what the topo sensors can -- they're IR. We can't see them. Cannot penetrate water. Very high rep rate. Very high density.

That's where we are with these systems and I think NOAA has built a case for the private sector to invest this, in this technology, as well as put this requirement out there to -- even some of our own panel members have invested in this technology. Ms. Lockhart.

And when I show you some of the data examples, I think it's going to be telling of why this is where we want to go, the multi-use of the data and why it really is, as Audra and them have stated, this is the foundation data on which resilience happens.

So, just a little bit on some of the products from the water clarity. Again, Lotus imagery up here, you know. The -- which one is the laser here? This is the laser.

You know, where it's blue in these areas it's showing us that's where we have water clarity. And from that they've been able to build this gridded product of water clarity for operations.

And this is about a day to two latency that we were getting this information, but it was better than going up and flying and looking -- and, again, we're also looking at in situ measurements of other systems out there which you can use, but this is very useful.

And the key research item that we're looking at is how can we pair laser observations against this water clarity product and refine that water clarity product, but just an example of how we use that and partnered with NOS.

Satellite-derived bathymetry, again this is near Tampa Bay. And the idea is, okay, here we have, you know, a pretty high-use inlet just north of Tampa Bay, and where you're seeing, you know, these areas of red are areas of shoaling, you know, on the chart we have looks like some 15 feet there or five feet using these type of technologies to say, hey, this is a place we need to go, you know.

This is of course large interest to the recreational boating community, the modeling community, but, again, some of the places on our charts that we want to update using this technology.

Another example near Jacksonville, north of Jacksonville, Florida, again you can see how the shoals are migrating out of the chart where it is charted now.

And then couple this with things like the AIS tracks. Typically mariners do not want to run aground and often their local knowledge is going to show us where we have problems. And couple this with things like STB to tell us these are areas that we need to go fly LIDAR and/or send vessels.

Another example here with migrating shoal. And again, what are the outcomes of this?

So, what you see here is a current chart of Mason Inlet in North Carolina. Sorry about the vectors there, but that's actually updated shoreline from the Sandy collective topobathy.

And, again, just some of the problems we're trying to resolve with this type of technology. And you're seeing both mean lower level water and mean higher water.

Mean lower level water is one of the toughest things to get that's on the chart. If anybody can state to that, Mr. Perkins has spent many a day watching a clock and the tide gauge for that. But, again, the beauty of this technology and ability to survey at almost any time you can get this type of information.

But, also, how do we enable and increase the efficiencies of our floating assets, our vessels?

And this example, while it didn't come out like we want, we actually planned flight lines ahead of the NOAA ship Thomas Jefferson in an area -- this is Fischer Island Sound near Connecticut and Long Island Sound.

But in these areas here we see these flight lines were littered with rocks, really areas you don't want to send launches in, and I know folks, just from an efficiency standpoint and a safety standpoint, more importantly.

So, the idea is how can we increase the efficiency of the fleet by going ahead of them, collecting topobathy LIDAR, will it work, provide that as a data set for them to then use against their planning.

And then the multi-use of the data, this is pretty telling. This is from Colin Cooper at Quantum Spatial that he presented last week.

But, again, you're looking at ten meter NGDC data sets from 1869 to 2010 and a ten meter down. This is the JALBTCX two meter down from 2010. And this is the LIDAR data collected for the part of the Sandy supplemental.

And you can see, just see the level of detail there that, you know, of course, you know, maybe more data isn't always the best thing if you're getting 40 or 50 points per square meter in some cases we're getting.

But if you look at applications and sea level rise and inundation and what is sea level rise going to do in my backyard, this is a level of data that you're going to want. And this is what the modelers are actually looking for and building models for.

And next, a few examples from Dewberry as far as showing some of the data that processed and just some profiles of what we saw and obtained with a sensor, but to give you the idea, okay, that you can see the structures on the beach here, dew line here and then the water surface and then the bathymetry.

Cape Lookout off, you know, Cape Hatteras. You can see again profiles of the data.

Some of the multi-use especially from the benthic habitat mapping or environmental mapping standpoint, you know. You have the imagery you can see here. Here's the back bay, tidal influence wetlands. You can see areas of overwash here. Really a lot of information just from the image.

Then you couple that with, again, this is what topo LIDAR would give you, but this is what going green gets you.

All right. So, you can see the total seamlessness of this road, the dune and the dune structure, these overwash areas and all this habitat which I'm not the guy to tell you what it is, but folks want this.

I mean, it's an immense data set that I think we're going to find out that was bigger than we ever thought.

Again, here's another graph from Dewberry showing topo only. And then once you go green, you can see this.

And as Dr. Callender showed yesterday, you can see these oyster beds here from an aquaculture site. You can see the structures here where they formerly were. And in a lot of cases they're trying to build up the oyster bed by moving these around, but that level of detail is remarkable.

And, again, just another look at Rich Inlet. And, again, from an application of storm surge, I mean, this is all type of stuff that the modeling community has not seen or had before. And the understanding of how water flows out when inundation comes is something that's critical for them to understand.

So, an update of the delivery of the data. We had some challenges. First and foremost the winter of 2013 and '14 were very challenging that caused us a lot of delays within that.

And then the processing of the data being new sensor technology has taken a little longer than we want. So, we're up to about a five-month delay, but we're confident and work with our partners to get these latest schedules out. And this is what we're looking at as far as delivery basically working from the south, Myrtle Beach, all the way up through Montauk.

In this case, a lot of data has been delivered for South Carolina, North Carolina. You can see a delivery schedule here for -- in April-May for up through Virginia Beach.

Again, this is for -- LAS is the raw Point Cloud forming the LIDAR. A DEM is actually graded into a DEM, a topobathy DEM. So, there's some QA between those two. That's why you see a delay there.

Going up to Cape May, you know, delivery at the end of June. And then the final schedule takes us basically to the middle of August or July when we'll have everything delivered.

Our plans, again, from an imagery standpoint, we're still using imagery quite a bit in a lot of different areas especially in the ports.

These large areas of pink are areas that in which with the Sandy supplemental and the upgrading of our camera systems at least at this point we're planning to fly oblique imagery, georeferenced oblique as a baseline data for hurricane response, as well as coastal managers and especially our partners at the USGS are big users of georeferenced oblique imagery.

And you can see a lot of port areas here and oblique collects here. And you get color codes of the year when this is going to happen.

A lot of the green in this area here has to do with a lot of the marsh area in Louisiana, which we have found to use automatic feature extraction of imagery seems to be the most efficient way to get that shoreline.

Topobathy operations, I highlight these green areas. These were areas highlighted by the work by Anthony Klemm of Coastal Survey, as areas of change using satellite-derived bathymetry. And these have been our ongoing operations in the Florida Keys looking at updating the charts in that area along with the intercoastal waterway and then Puerto Rico.

And, again, this is where the technology works. You can understand water clarity is something we're looking for. But as we get these products for the climatology from Rick Stumpf, we'll ground this out. Just a merge of the two.

Again, the vector data, the shoreline data is all delivered through the north shoreline data explorer.

And the raster data, the imagery, the LIDAR, the DEMs we've partnered with of course and are supporting delivery through the digital coast of our partners at OCM.

So, with that, I'll take questions for

Ashley, Audra or I.

CHAIR PERKINS: Dr. Kudrna.

MEMBER KUDRNA: Very interesting, all presentations. The last meeting we had in Charleston, Margaret Davidson gave us a presentation. Of course the Coastal Service Center has been taking these data and others and putting it to some practical uses of showing municipalities the impact of sea level rise.

In order to fund this and continue to fund it, OMB also wants to know where is the bang for the buck?

And I guess one of my questions, is there any documentation of this information creating behavioral changes for municipalities? Have they set back waste treatment plants? Developments? Roads?

It would be enormously useful if the three agencies collectively provided some economic benefits of the activities that have taken place to help future funding and continuation of the program.

MR. ASLAKSEN: I know Audra can answer this. I know of one example though and some of the forward-looking activities that OCM has done, at least for the Digital Coast in their sea level rise viewer, in that they've opened up that architecture to ingest higher level -- higher resolution data in order to do planning.

I know that the City of New York actually use that tool. I think we were briefed on that at one time as an example of that.

Audra, as far as the economics of it, you probably can answer that better.

MS. LUSCHER-AISSAOUI: Yes. So, I don't know if you guys now that there is a resilience GPRA that is actually tracked through NOAA that actually not only looks at the technical systems and tools that are developed to support resilience, but then it also looks at the long-term change through policy changes. That includes if you change a regulation through CZMA, if you institute a plan, make a number of types of changes within the coastal zone management framework and community.

So they keep really quite good records and how has that been kind of applied to the bang to the buck, you know? There has been a number of ways that they've been doing some economic assessments, as well as -- so return on investments for both the programs.

And I could, you know, get you some of the recent ones they've done. Billion dollar disasters. Other things that they have applied socioeconomic information to, you know, speak to how the data is influencing decisions in regards to community resilience.

So I'd say also in regards to behavioral change, you know, that's a new focus that we're really trying to address more in NOAA that I didn't really touch on in the resilience perspective, but it's a very important part of that, you know.

Risk communication, we're really starting to understand that. It's the number of ways you can access it that keeps reinforcing.

So if you're seeing data from a navigation perspective, if you're seeing it in a community perspective and they're all kind of saying the same information, that is good risk communication practice and that helps to reinforce.

So the more we kind of have these messages that cycle throughout the perspectives that NOAA supports navigation or communities, helps reinforce how people hear information and they hear it a few different ways.

So I think risk communication is a very important part of, you know, the concept of resilience. So there's a lot of science on that, but I'll point you to some specific return investment-type activities that have been done.

MEMBER KUDRNA: But I guess my question is, is return on investment documented for this by the Agency so you can build the case with OMB?

MS. LUSCHER-AISSAOUI: Sure. Yes, I mean, I wrote the two resilience initiatives that got cycled in. And some of that was both, you know, how much the data costs and how much the infrastructure is influencing the changes, you know, those perspectives.

So yes there has definitely been justifications that have been put into those budget increases that we reflect, and they come back and they ask us those things as well. And so, you know, justifications have been given, you know, for every one dollar you do in pre-disaster planning, you get $4 of savings in the recovery perspective.

So there's been other national academies' assessments too that not just NOAA has done, but other independent research bodies have done as well.

CHAIR PERKINS: Dr. Maune.

MEMBER MAUNE: Ashley referred to the National Enhanced Elevation Assessment, which I was the author of. And that whole study was a return on investment study, but it was based largely on topographic LIDAR.

But even with topographic LIDAR, we

did returns on investment for coastal zone management, for sea level rise, for -- I think we had a little bit on navigation from the different land, air and sea. Rivers and stream management, things like that.

And the return on investment minimally was a $5 return on investment for every $1 spent. Now, I agree that -- and that was the conservative estimate.

We got $1.3 billion per year benefits from the -- what became the 3DEP program. And the 3DEP program is based on Quality Level 2 LIDAR nationwide with Quality Level 5 IFSAR in Alaska. Because Alaska, you just couldn't use LIDAR statewide up there, but that is an example of the kinds of returns on investment you get from LIDAR in general.

And I think if you get five to one return on investment from topo-LIDAR, I bet you get at least that from topo-bathy LIDAR. Probably more.

CHAIR PERKINS: Thanks, Dave.

Mike, can you speak to how far offshore were you able to get good bathymetric data from the airborne bathy LIDAR, you know, either in terms of Secchi depth or water column penetration?

MR. ASLAKSEN: Again, I saw some of the profiles out there about the deepness that we saw. And I want to say out of everything that I've heard from Dewberry and our -- you know, and again not being in the crystal clear waters of the Gulf, you know, in the Keys or in Puerto Rico, I think it was 18 meters we saw off Cape Lookout.

How far off that is really depends on what part of the country, I mean, you're in, but I'm convinced at any one point in time you can find water clarity. It's just, you know, how do we find it efficiently and be able to derive operations?

But the outer coast performance of the sensor, at least the Regal system that we flew probably, you know, isn't what we wanted ultimately, but what was really the eye-opener was how well it performed in the back bays which aren't as critical of a need, whether from navigation, NHPA/SMCA and Coastal Zone Management, but we were able to extract the shorelines, you know, doing low water and high water, which was, again, kind of predominant to chart.

CHAIR PERKINS: Were you able to utilize the work that had been done on the automated shoreline extraction using this data set?

MR. ASLAKSEN: So, we do contour the data. The process is the data is collected on ellipsoid, uses VDatum to get to mean low water reference to zero the lines contoured automatically. And do the same thing for mean high water.

And then the work flow is that those data then are going to go to the contractors to be cleaned and then features added and then brought back for final QC.

CHAIR PERKINS: Great. So those are my lead-ins to the really, really big question.

So historically, you know, you have been contracting out shoreline mapping for near two decades now. And with this implementation of the new topo-bathy LIDAR data set in the shoreline that you've been able to extract on the back bays and on this Sandy supplemental project, how has it changed the cost efficiency of the program compared to the extremely difficult tide-coordinated, black and white, IR aerial photo collects where this program began?

MR. ASLAKSEN: You know, Scott, I don't know if it would be appropriate to give out a cost, but no doubt it does cost more. But the multi-use of that data far outweighs the incremental cost that we receive.

And, in fact, you know, again, your experience with doing VDatum tide-coordinated imagery collection alone, this technology while we have to fly a lot lower, offers us a lot more opportunities to fly and collect data on a day-to-day basis versus waiting for tide windows, sun angle and all these other factors to line up.

So you know, again, with not just producing a shoreline, but also shallow bathymetry for charting, I think that a cost benefit is there.

CHAIR PERKINS: Yes. It's a completely much more robust data set. I just didn't know if you were a one to one or if you were seeing cost savings or cost increase per mile, per chart analysis. It's not a fair question.

MR. ASLAKSEN: Yes, I mean, a couple more years will do it, but at this point in time we're seeing the same level of production per year.

CHAIR PERKINS: I have one more question and then I'll let someone else ask.

The oblique aerial photo program that you showed with the slides of the Gulf Coast and Puerto Rico, so that's going to give you baseline oblique imagery so that you're prepared in the event of another major storm event to do damage assessment, is that correct?

MR. ASLAKSEN: There's multi-use of that data set, but, yes, initially it's a pre-event data set that also -- you know, with the partners at the USGS, the Coastal and Marine Geology folks, they use that to actually -- and they have tools to actually look at dune and dune heights and structures, as well as we've gotten overwhelming positive --- from private users, cities, counties just having that data set and, you know, being able to drag and drop it into Esri and exploit it.

CHAIR PERKINS: Yes, where I'm leading is will you be able to execute post-storm damage assessments in an automated change detection environment using that as your baseline?

MR. ASLAKSEN: I would not say we could do the automatic change detection, but we would provide georeferenced imagery which could be -- that exploitation of the data is not the next step for us.

We feel that we can provide good georeference data for those decision-makers to have that they can bring to a GIS. Those tools are there for them to do the exploitation, which FEMA has done in the past through contracts with folks.

CHAIR PERKINS: Great. Thank you. And I apologize for monopolizing the time.

MR. ASLAKSEN: No, sir. Any time.

CHAIR PERKINS: Joyce.

MEMBER MILLER: A question for Ashley, or a couple questions. I was involved with IOCM way back in early 2002, I believe it was. And there was going to be a database like you've got for the shallow water topo-bathy LIDAR for sonar data. And as far as I know it never materialized, the planning side of it and such. So, what has happened with that?

And you said that acoustic data would be coming into the IOCM framework. When? And what's the funding status for IOCM?

MS. CHAPPELL: Okay. We can start

with that last question first. You know, IOCM is actually not -- we don't have IOCM funding.

With the Sandy supplemental we did get a little bit of funding that we are using for some IOCM demonstrations, which I think are going to pan out as arguing for -- or justifying, you know, spending funds on IOCM projects. But, no, I don't -- we don't have a dedicated funding IOCM stream.

However, the NOAA programs and our partners are certainly committed to IOCM projects when and where they can, and I've been really encouraged by people's interests and willingness to try and accommodate.

Of course, bad budgets always help that. So in a bad budget environment people are more willing to collaborate, but I think even at -- you know, if things become rosier, I think we've got a good enough foundation that we can continue with these partnerships.

I did -- you know, the sonar, the acoustic element, I think we'll start looking at that this fall once we get this first version out. Maybe a little bit later. First of next year, if we have to do any further additional work on this first version, but this first version --- if I didn't say it, I meant to, is really leveraging existing effort of the agencies that are focused on the coastal and nearshore area.

There are not as many agencies that are that easy to wrangle for the offshore work. So we're kind of starting with the low-hanging fruit.

MEMBER MILLER: Is there a length of function?

MS. CHAPPELL: Well, so the SeaSketch tool that I talked about is not just about coastal LIDAR. That's for any kind of mapping effort.

So there is coordination, yes, but in terms of developing a National Coastal Mapping plan that is specific to, you know, the offshore, that's going to be in Version 2. That's the piece that we're waiting -- however, there's already been a lot of really good coordination on hydrographic data acquisition and bathymetry.

CHAIR PERKINS: Dr. Jeffress.

MEMBER JEFFRESS: Ashley, I'm interested in the Coastal Mapping Summit.

MS. CHAPPELL: Okay.

MEMBER JEFFRESS: And the reason I'm interested in this is there's a strange little agency in Texas called the Bureau of Economic Geology, and they're attached to the University of Texas at Austin. And they have a LIDAR mapping systems that are two years old.

One of their functions is to map and monitor coastal erosion in Texas and they fly the Texas coast every year with LIDAR. And so, I was wondering if they're involved in this mapping summit and what sort of standards are set to ingest all this LIDAR data?

MS. CHAPPELL: So that's a good question. The Coastal Mapping Summit and, you know, that idea of partnering, it's really open to any entity. Both to contribute priority areas that people want to have mapped, and to bring in plans.

We're really trying to, you know, kind of pull in whoever is doing any mapping and talk about standards whether it's a QL2, a Quality Level 2, which is the 3DEP goal, for what we will have a matching Quality Level 2 for bathymetry. We'll be pushing those as the most multipurpose use standards and hope that people would use them.

We're going to be developing some tools to help do that, you know, along with the quality levels. The breakdown that you saw there. We hope to include some, you know, draft scope of work, sample templates, scope of works that if a state is contracting for data they might use or --- you know, just to illustrate how we do it, that kind of thing. But the Summit will be open and I hope to reach as many partners as possible.

The state geology programs are of

course very much involved in the 3DEP effort, but we'll be reaching out to them for the coastal zone piece, too.

CHAIR PERKINS: Ashley, do you have the dates of the Coastal Mapping Summit?

MS. CHAPPELL: I don't have the exact date. It's the week of June 15th, and since we're building onto the JALBTCX workshop, I need to talk with Jennifer Wozencraft and finalize which portion of -- what date we are going to have to do this summit piece.

CHAIR PERKINS: Okay. If you can circulate that --

MS. CHAPPELL: Absolutely.

CHAIR PERKINS: -- out to the HSRP members, please?

MS. CHAPPELL: I will.

MR. ASLAKSEN: I've got an update to that. Actually, they're proposing the 16th and 18th in Corvallis, Oregon at the University of Oregon State. And Chris Parrish is going to help organize that.

MS. CHAPPELL: Yes, I just don't know, you know, what part of the agenda from the 16th to 18th will be the Summit. That's what I meant.

CHAIR PERKINS: Okay. That's what I just wanted to verify. When I looked on the JALBTCX website, I thought it said 2014 for Corvallis. So that's why I'm just looking for clarity.

And I'm not sure that the sensor package that Gary is referring to that's in the university system, I believe, is a different sensor than what was used on the Sandy supplemental program. So, just --

MR. ASLAKSEN: Yes, it's the Chiroptera from Leica.

CHAIR PERKINS: So, there may be some differences in the fidelity or the content of those data sets.

MR. ASLAKSEN: Well, we'll tee us Ms. Lockhart who's had the fortunate experience of dealing with both sensors.

CHAIR PERKINS: That's why she's on

this panel.

(Laughter.)

MR. ASLAKSEN: Yes, sir.

MEMBER LOCKHART: Yes, both of those sensors are what I would refer to as new generation sensors.

The Bureau of Economic Geology actually got -- I don't know if it was the first, it may have been the second Chiroptera commercially available. So, they have Chiroptera 1.

The main differences between the Regal and the Chiroptera, the Regal is -- the 820, anyway, that has been used on Sandy supplemental is slightly lower power, but it has a higher pulse repetition frequency. So, it gets more dense data than the Chiroptera, but it typically doesn't see as deeply given water clarity.

And so, they're very similar tools, but they may be used for slightly different purposes because of those differences. That would be the short answer, I guess.

CHAIR PERKINS: It would be interesting for you to present to the panel, maybe through a webinar or something other than in a formal HSRP setting on the comparison of the data sets if that's possible.

MEMBER LOCKHART: Yes, we can certainly do that some time.

CHAIR PERKINS: Great. Thank you.

MS. CHAPPELL: Thanks.

CHAIR PERKINS: All right. So, we have breakout sessions in front of us and a short break, you know, leading into that.

There's a little change in the program for the people on the webinar. The Coastal Intelligence Breakout Session is going to stay in this room, and it stays on the same webinar line.

So, the Coastal Intelligence Breakout Session has asked to stay in this room and will utilize the existing webinar line that you hopefully are already logged into.

So, let's take a short break and --

RADM GLANG: Before we all go adrift

for the break, let's just recap what we want to do with these breakout sessions.

MS. CHAPPELL: Okay. I didn't know I was doing the recap, but I'll do the recap. I can do it. It's fine.

We have -- just like Lawson went through the questions for the Arctic Working Group, we have two sets of questions for what will be a Coastal Intelligence Breakout Session and a Coastal Resilience Breakout Session.

I hope those are in your folders, Lynne. Yes?

MS. MERSFELDER-LEWIS: They are.

CHAIR PERKINS: And are they available for the online participants? Okay. Great. They've been emailed to the online participants?

MS. CHAPPELL: They've been emailed, yes.

MEMBER MILLER: So, there's no Arctic Breakout Session?

MS. CHAPPELL: No, there is no Arctic. You're just going to split into what we hope is two roughly similarly populated breakout sessions. One on resilience, one on intelligence.

I believe the plan was to self-select. And if it looks like one is just completely over --- you know, heavy with people and the other group has two people, maybe we'll come in and pull you out.

CHAIR PERKINS: Right. And just as a point of clarity, the public is invited to participate in the breakout sessions as long -- as well as the online participants, and then we repeat these breakout session tomorrow.

PARTICIPANT: We're not switching.

CHAIR PERKINS: We're not switching?

PARTICIPANT: No.

MS. CHAPPELL: Stay in the same group.

CHAIR PERKINS: Stay in the same groups.

MS. CHAPPELL: Stay in the same groups for tomorrow morning.

CHAIR PERKINS: Okay.

MS. CHAPPELL: Because you might sleep on it and come up with some good ideas.

CHAIR PERKINS: Okay. Great. Great. So, Coastal Intelligence is in this room. Coastal Resiliency will move up to the third floor to the meeting room one floor above here.

MS. CHAPPELL: So the questions -- do you want to run through the questions? Are they pretty self-evident?

RADM GLANG: So, there was a -- I think the intent was to map Dr. Callender's leading questions into each of the breakout sessions if the questions that we have now captured in these one-pagers don't clearly align.

So, that was it.

MS. CHAPPELL: So we have also printed those out and you have those.

We did map into the resilience questions --- his additional thoughts. But when you get into the breakout session -- Rick, you're leading intelligence? And Audra, Mike and I will be in the resilience group, and we'll sort of run through the questions and start thinking.

You know, we're not trying to necessarily get to all of the answers today or additional thoughts today and tomorrow. The idea is to start just brainstorming ideas that can then be used as you meet subsequently in further discussions.

CHAIR PERKINS: All right. Great. Thank you, Ashley, for the recap. I think we're ready to go into the break and then we'll get rolling with the breakout sessions. Thank you.

(Whereupon, the above-entitled matter went off the record at 3:51 p.m. and resumed at 5:33 p.m.)

CHAIR PERKINS: Well, we've had a couple invigorating breakout sessions here this afternoon.

And so, now we will go into the report out from each of the coastal intelligence and the coastal resilience breakout groups. And then we do have a public comment period that we need to attend to as well. So those are the remaining business at hand for today's session.

So coastal intelligence is the shoulders upon which coastal resilience sits, as we so eloquently heard earlier today. So I think coastal intelligence should report out first in that case.

Okay. So, coastal resilience is fundamental and critical to the nation. So, we should perhaps hear about the resilience first.

(Laughter.)

CHAIR PERKINS: And then we'll follow up and put it in context of how intelligent it is.

MS. LUSCHER-AISSAOUI: Okay. There was definitely a theme throughout the conversation that, you know, we can't do this alone. That we really need to integrate across the agencies from our different perspectives and mandates and, you know, really hone in to what NOAA has to offer to those perspectives. And I wholeheartedly agree with that.

There was a number of discussions that

kept going towards applications, visualizations, you know, who is the provider, what should these be?

And, honestly, it came down to partnerships are going to be a very important part of that. Universities that are more agile, that can serve to, you know, meet user's needs. Even ice was brought up in that perspective from an applications perspective as well.

I think we also wrestled with the issue of how much information do you provide to people through these applications? Because if you inundate them with too much information, they don't know what decision to make off of that application or that visualization.

Streams, how do we grapple with this new resilience funding that's coming down that's going to be going to communities? Where do we insert ourselves? How do we make ourselves relevant from a navigational or foundational information to these communities?

If we put out these grants and I feel

like we don't send a strong message that we have this foundational information and we pair our expertise with some of these people who get the grants and make specific call-outs to work on specific issues around our foundational information.

So one suggestion was, how do we consolidate a number of gauges together to make a decision support network on storm surge or sea level rise that's not just NOAA's gauges, but it's a whole host of other gauges? That was brought up by the group.

The whole perspective on sea level and the contribution of land subsidence and how you need to really work at that level that communities understand that change is very important as well. So we definitely reflected on that for a while.

We reflected on incentives. How do we get our information that supports the people that do incentives, like the community through FEMA, the community rating system. How does our information better support those infrastructures that already exist and help people or have people working towards being more resilient through those frameworks?

And we also acknowledged how important those advocates on the ground are. This includes Regional IOOSes, coastal zone managers, people that are working through the Sea Grant Extension. We aren't going to be giving this information directly to the public, but we need those advocates that are working in those regions at the local level that can use this information to better integrate into those management frameworks. So we really touched on that as well.

Ashley, do you have anything?

MS. CHAPPELL: I think the only thing I would add -- Audra covered it all really well. We did a lot of brainstorming.

One other element was that the Navigation Services Program should really take some time, when thinking about coastal resilience, to figure out who our users are in terms of these extended suite of products or just the need for the data and figuring out who we're targeting and then whom we're also targeting for the messaging, you know?

Is it an internal messaging inside of NOAA? Is it external to our users and being clear about what we're messaging and to whom. So I think Audra covered the rest of it really well.

MS. LUSCHER-AISSAOUI: Anything else from the group that was in that discussion that we let out? Anything?

Okay. Well, I just want to thank everybody for their comments and their considerations.

MS. CHAPPELL: And the public participation, too.

MS. LUSCHER-AISSAOUI: Yes.

MS. CHAPPELL: We had four people.

MS. LUSCHER-AISSAOUI: Yes, we had four people outside of our group.

CHAIR PERKINS: Great. Thank you very

much. How is coastal intelligence coming?

(Laughter.)

MEMBER MILLER: Well, I don't have anything to put up. I have to say we were all a bit confused by this layout at the beginning in that everything was about the NOS Roadmap and nobody had the NOS Roadmap. And I think we should have had it well in advance to -- you know, so that we could have been a bit prepared for it.

So -- and in getting started, we were very unclear about exactly what was being asked us in terms of looking at the Roadmap and answering the questions that were on the sheet.

And so eventually with clarification from Admiral Glang and so forth, it became clear that what they wanted to know was, what are the next steps in --- particularly on the first item, which was -- which is the maximized access to highly trafficked and increasingly space-constrained ports by providing ship managers with up-to-date -- up-to-the-minute information to maintain reliable safety margins, that they were looking to -- for criteria by which to select the new ports -- or the new candidates for the precision navigation systems.

This led into talking about a number of the elements that should be considered. There's a large number of them.

Some of them -- the more physical things like population, inundation risk, tidal signature swell, number of large vessels, number of smaller vessels, weather patterns. Things that can be quantified, you know, they're already in matrices.

But there's other things like what partnerships are available in any particular area? What -- how are people willing to partner? Where is there potential funding? Obviously, who needs it most? What places are most at risk?

And Juliana shared with us some of the criteria that she had used in deciding where to go first for GRAV-D, which seemed like very reasonable things to consider.

We also discussed --- because precision navigation is -- it's certainly not PORTS, but there are some common elements. And that the panel has in the past repeatedly, almost every meeting that the panel has had, has recommended that PORTS be funded and that has not happened.

And so, we had quite the discussion and I don't believe we are at complete agreement. And so, how to roll out the precision navigation systems and how to choose the next candidates for it? And frankly, whether it should be funded like PORTS is, or whether an entirely new model should be created for precision navigation?

And that's pretty much as far as we got, except that we -- Dave did discuss that the outcome of C21 was that these seemed fairly reasonable. And that the outcome C13, which CO-OPS is tasked with, doesn't seem to match very well with what CO-OPS actually does.

And I would welcome further comments. I was busy taking notes and not really synthesizing things. So, I apologize that it's -- so I mean, please contribute if you think I missed something.

RADM GLANG: Can I go? The one really useful thing that Ed Kelly pointed out was the Coast Guard's approach.

(Laughter.)

RADM GLANG: It's not just one. One of the things, which Ed pointed out -- I listened to every word Ed said and he held the floor.

No, it has to do with the Coast Guard's -- the Port and Waterways Safety Assessment, which is their risk methodology for assessing the safety of ports and that framework, we went and looked at it here in the margins and that's a really useful approach for -- that we're going to take a look at that. I like that idea of that PAWSA methodology. Very practical.

So I hope that's in your notes because that's very practical. We can crank something out.

MEMBER MILLER: What's the name of it?

RADM GLANG: P-A-W-S-A.

MR. FERGUSON: This is Jeff Ferguson. The LA Long Beach is doing a PAWSA this summer. So I'm going to be participating with that and we can share what -- realtime what's happening in LA Long Beach this summer.

CHAIR PERKINS: Thank you. We are at the time in the agenda for public comment.

So Tiffany, did we receive anything online?

MS. HOUSE: No.

CHAIR PERKINS: Okay. We have no public questions posted online. So, looking at the gallery -- great. All right.

So tomorrow we do reconvene in the morning. We pick up again with these breakout session topics in working towards developing a work plan for responses on coastal intelligence and coastal resilience. So that is the challenge at hand for us tomorrow morning.

There is another public comment period at midday tomorrow 11:45 to 12:00. Then in the afternoon -- that gives us time to do our wrap-up teleconference with Dr. Callender -- oh, he's not calling in. Okay. So, that frees up a little space in the agenda.

Some of us on the panel have travel out of LAX tomorrow evening. So I know Susan and Joyce and myself have --

MEMBER MILLER: Just in case anybody has similar travel plans, I have a flight at 7:10 and I have a shuttle. It's $19 going at 4:10, I think.

So if anybody needs to go to the airport, it's a very reasonable way to do it.

CHAIR PERKINS: Yes, I need that. So I will be riding your coattail.

MEMBER MILLER: Okay, I have the information so talk to me later.

CHAIR PERKINS: Okay. Great. So anyone else that needs to do an early departure before our scheduled adjournment tomorrow? Just the three of us?

Well, Friday night in LA. Traffic

between here and LAX could be challenging.

RADM GLANG: So what's your recommendation there Mr. Chair then? Are we still good with adjourning at 5:00 p.m., or are you asking to move that earlier or --

CHAIR PERKINS: I'm asking to excuse myself. I'm not saying that you need to adjourn early, because we do have a vice chair.

RADM GLANG: So just -- maybe I could just ask who's willing to work here through 5:00 p.m. tomorrow night? All right. Great.

So then my other question is we have a variety of things -- pieces of business that we want to do that we don't want to lose track of. So where do we want to be with those activities at the close of tomorrow's business and we may want to work backwards and look at how we allocate our time.

We had some business questions, I think, on the working group was probably the most pertinent one. We need a good point of departure for these tasks, the work plan, how you want to continue with that. And then we also -- you know, the panel needs to prepare some kind of a report out.

And I think Frank mentioned this early in the process, but as we come across issues during the conversations of the days, to try and summarize those. So if there were any of those issues -- and I think I heard a couple, we want to capture those for the purpose of discussion tomorrow.

So I think we want to work a little bit backwards so that we can sort of define where we're going to end up tomorrow at the close of business and have kind of a measured conclusion.

MEMBER MILLER: I have a couple that I highlighted as we were working through things. I mean, my notes are not complete, guys. Don't count on them.

But Susan made one comment in response to -- my brain is fried. The guy who talks fast.

RADM GLANG: Jim Haussener from CMA?

MEMBER MILLER: Yes, Haussener. About

-- and this is just a local issue that might be good to highlight about the importance of the buoys to the local community.

I don't know if that -- you know, I'll put it in the notes for possibles, but if people have burning issues -- I may have a couple more down here. If people have issues that they thought were brought up that we want to include, please go now.

MEMBER SHINGLEDECKER: I also see that there was a note about the concern about the inability to keep engineers on the ships and how that was impacting the use of resources.

MEMBER MILLER: I have that from yesterday, yes.

CHAIR PERKINS: Okay. So just to recap, we have the ship days and the shortage of engineers. We have engagement and outreach from yesterday. Partnerships in the MOA. And now we've got buoys as a local issue that we want to make sure we capture.

MEMBER MILLER: Just a second. Do you

want to start again, please?

CHAIR PERKINS: Sure.

MEMBER MILLER: I was on the wrong page.

CHAIR PERKINS: Yes.

MEMBER MILLER: Okay. Ship usage I've got.

CHAIR PERKINS: Yes, ship days, shortage of engineers.

MEMBER MILLER: Cooperative agreements I've got.

CHAIR PERKINS: Yes, engagement outreach, cooperative agreements.

MEMBER MILLER: Okay.

CHAIR PERKINS: And then we just mentioned buoys from today.

MEMBER MILLER: Yes. Let me go back to today's notes and see -- do we have a working group -- or do we have an administrative meeting after this, or no?

RADM GLANG: It's an option. So the 6:00 to 6:30 admin session I left as an option thinking that somebody may want to think about how we organize our thoughts for tomorrow, but it's -- I leave it at the discretion of the chair.

I think we're all pretty toasted. So, just --

CHAIR PERKINS: Yes, coming to some clarity on what our working groups are going to be going forward.

MEMBER MILLER: Well, and there's also the issue of our process of --

CHAIR PERKINS: True. We have not -- we have not discussed the HSRP standard operating procedures process document. So that's your homework assignment so we can do that in our morning session over breakfast.

MEMBER MILLER: Procedures and committees. Both.

Scott, what about Dr. Callender's six questions? Should that be in our summary, or is that -- I mean, we need to consider whether that is something for the recommendation letter or if it's something perhaps outside of it?

I don't know if answers to his -- or if that's a working group issue or something. I don't know. I don't think we're going to have definitive answers by the end of tomorrow.

RADM GLANG: So maybe I can help here. The six questions that Dr. Callender pulled out and sort of highlighted in his presentation were meant to flow into the conversations of one or the other, or both, of the breakout sessions.

MEMBER MILLER: Okay.

RADM GLANG: And in some cases they made it, and in some cases they didn't make it.

So part of the tasking for tomorrow as we synthesize a work plan for how the panel would like to respond on some or all of these questions will be to consider it. How do you want to incorporate those, how do you want to assign those or -- you know, you can choose to put them aside because you think it's too complicated or it's not appropriate or -- you don't have to accept all these questions. I think there's plenty of material here.

MEMBER MILLER: Okay. So we need to work with that in the working -- in the breakout session tomorrow morning.

RADM GLANG: In the breakout session, or as a group after we reconvene from the breakout sessions.

MEMBER MILLER: Okay.

MEMBER FIELDS: I think as we think about the recommendation letter, I realize that one of the things that we're going to do is the process on how to get that letter done, but I liked the fact that there were three or four specific recommendations and a cover letter. And I think we should work towards that kind of goal for this letter and not have it, you know, three or four or five pages.

We should just have one or two or three recommendations, four recommendations, but I think it shouldn't be more than a couple of pages.

CHAIR PERKINS: Yes, agreed. And I

believe we put a 150-word target in there. So whatever we decide needs to go into this letter, we are going to try to encapsulate that in 150 words or less and be clear and succinct in that.

MEMBER MILLER: Actually, since we have one that Susan seconded, I mean, we might -- I already wrote up something brief about ship usage just as a draft, you know, that could be used.

We have two others right now. Cooperative agreements, and that's just a check-in really, you know. And then the importance of outreach and engagement.

CHAIR PERKINS: Right. The cooperative agreements, we've already written to that. So I think that's restating the importance of what we've already put in a prior letter.

MEMBER MILLER: Right.

CHAIR PERKINS: So that one I think is a cut and paste job.

MEMBER MILLER: Yes, and then the other one that we have on the table right now is the importance of outreach and education -- or outreach and engagement.

CHAIR PERKINS: Engagement, yes. So do you want to put your draft regarding ship usage and days at sea up on the screen? Do we want to talk about that now while we have a few moments, or -- I'm looking at Susan's body language and that's a big no.

MEMBER MILLER: I think better to do it tomorrow, but I -- what I was thinking was if anyone else -- I don't remember the discussion around the importance of outreach and education, but, you know, if somebody who does think it's important would want to write up, you know, 150 words on it -- or a hundred words if that's the case, then we'd have a second item to consider.

CHAIR PERKINS: I'm looking at Frank, because Frank handed that to me on the --

MEMBER KUDRNA: Maybe less than 150 words, but I'll give it a shot.

CHAIR PERKINS: Okay. Great. Great.

MEMBER MILLER: And then we'd have two written up. And if something else comes up from either the breakout sessions or other discussions --

CHAIR PERKINS: Okay. If you have something drafted, can you email it to --

MEMBER MILLER: I'll have to pull it out of other things that -- this is a mess.

CHAIR PERKINS: Yes, I'll read it while I'm in the shower.

(Laughter.)

CHAIR PERKINS: I think we've exhausted our usefulness for the day.

MEMBER MILLER: Thank you.

CHAIR PERKINS: All right. So with that, we will adjourn. It's been a long day. It's been a fruitful day. So, thank you for your efforts.

(Whereupon, at 5:59 o'clock p.m. Day 2 of the Hydrographic Services Review Panel (HSRP) public meeting was adjourned.)

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C E R T I F I C A T E

This is to certify that the foregoing transcript

In the matter of: Hydrographic Services Review Panel

Before: US DOC/NOAA

Date: 04-09-15

Place: Long Beach, CA

was duly recorded and accurately transcribed under my direction; further, that said transcript is a true and accurate record of the proceedings.

Neal R Gross

Court Reporter