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TRANSCRIPT:
[Captioner standing by] [Captioner standing by]
>> That is me Sean Duffy I represent the Mississippi river navigation industry. I am continually struck by the challenges that we see in our coastal areas. I think no matter where you are if the water is rising you have some of the same challenges. And yesterday was interesting. I will note that I took a picture, I will have to confirm the type of silt. It was told on reserve that there are less than 400 of them in the world. Who is pretty neat. I was happy to be able to track it out. Thank you.
>> Thanks Sean, Nicole?
>> Nicole: I am the scientist or directive the American sure a peach preservation Association. A base in South Carolina. Charleston area. On the screen I when I was introducing myself before, my other affiliations are up there too. Which include executive director in the South Carolina beach Advocate which is sort of the local and state version of a as EPA. So that is my company. Thanks for everything and looking forward to today.
>> Mexico Lindsay?
>> Lindsay: Yes, I would like to check the screen here. Previously that but now I am an independent consultant. I think if there is a local guy it is great to be back. I think it was 70 is small is beautiful. Small and local is beautiful I had to translate in. And take a picture of it is important I look forward to that thank you.
>> Dave?
>> Dave: I am Dave from the engineers. I heard people talking last night and this morning about they have some ideas for some issue papers, so that

causes my ears to perk up and smiled so thank you all and I would be talking more about that later today.
>> Thank you Dave, Ann.
>> Ann:
>> Wrote that is right she actually had a call and she will join us in a little bit. Ed?
>> Ed: Hi I am Ed Sodi, I am a recently retired regional director for the Americas food grow, I am the current chairman of the circuit Pacific Council of energy and mining. I am sorry I missed the afternoon trip. But I was able to go speak at the school of Ocean and Earth science and technology at the University of Hawaii which is where I went to grad school. This is where I learned geophysics. I believed everybody about all of the great things that are going on. In the range of figure six in hydrograph he and all. And I was quite surprised about the number of questions that they want to learn about data sharing and access to data and all of that. I told them to tune in this afternoon. Thanks.
>> Great thank you let's see we have Nathan.
>> Nathan: Yes Nathan Wardwell managing partner JOA survey. Small business based in Alaska. Yeah, just thinking about it more this morning. And how many different regions of the country we hear about common challenges and supporting those regions. And how big of a role the fundamental programs that NOAA provides and plates in that realm. And just trying to consider how the HSRP can further support that.
>> Great thank you Nathan, and we have two of our members. Ann is on the phone and Gary, Gary are you there?
>> Gary: Yes, I am here good afternoon everyone. Gary Thompson I work for North Carolina management and I am the chief of the North Carolina geo-delegate survey. I have a couple of recommendations for two more issue papers.
>> Look at that.
>> Thank you.
>> Moving along here, all right good Ann Kenner

>> Ann: Seabreeze books and charts involved with small boats particularly interested in yesterday's discussion about the issue of getting the charts out there and getting the data into the charts that are available. And then making people aware of the fact that there are updates, there is additional information available. I look forward to poking into that possibly as an issue paper.
>> Thank you Ann, let's see let's go to Andy. Yes.
>> Andy: I am Andy Armstrong I am the NOAA University of New Hampshire joint Center in Durham New Hampshire. So I was I thought the panel yesterday was fascinating and I was impressed at the at the importance of all of the hydrographic services and data sets being delivered. To the users here and particularly the fact that the the need for these data sets now the panel can focus on the ways as quickly as possible thanks.
>> Larry: I am the UNH coordinator of the joint hydrographic center. I will look up at the picture and I had the same affiliations but much greater here. We will have to see we if we can update that photo. No I thought yesterday was fascinating in many ways too I think it is critical that we are constantly reminded from the users and their needs we can never hear enough of that. And that is critical and I think would really show an example certainly the impression that we got it is working. And everybody is benefiting and that is the key to the successful partnership.
>> Great thank you Larry. Let's go to Rich.
>> Rich: Good morning everyone director for Center for operational oceanographic products and services. I just really enjoyed, I have enjoyed all of the sessions. Typically the one yesterday morning and I and so I am looking forward to today. There is a lot of new great thanks thank you.
>> Great, Juliana Blackwell are you on?
>> Giuliana: I am hello everyone, I am sorry I missed a site visit yesterday. I am the director of the national Geo delegate survey. I want to say I was able to listen and the marine navigation panel

yesterday. I thought everybody did a terrific job and we always learn a lot when we hear such smart people talking about important things thanks everybody
>> Thank you Juliana might you want to say something.
>> Mike: [Away from mic]
>> Great thank you.
>> Paul: Yes, I was unable to join the panel in the morning up to join at the reserve and I think it was a great opportunity to see things on the ground. Each of our reserves are quite different and unique. This one has unique features with agricultural being a part of it and this one going back hundreds of years so I enjoyed it.
>> Great thank you and then?
>> Ann, and Evans, the director of NOAA office of Company survey and the designation official of the HSRP. I thought yesterday's panel discussion was outstanding as I mentioned yesterday afternoon. From the fact that we also really got into a robust discussion, after the. And with the panel. It was excellent. I think the, what I take away from that discussion is, how do we optimize use of our waterway? And, we think a lot about the decision tree navigation program within my office but it goes beyond that. The reality is, you know, we are spending we as the federal government is spending billions and billions of dollars on dredging and in the port improvement projects. And just as important as the infrastructure associated with precision Marine navigation that is just much part of the infrastructure as the dredging. And it is pennies on the dollar. To produce those products. But they are essential for getting maximum return on this huge investment that we are getting and we saw that in the discussion essay. I definitely took to heart the comments of the need to get the data in the user's hands as quickly as possible. One of my predecessors in this role was fond of Saint don't let perfect get in the way of good enough. And I am certainly not suggesting that we should cut corners.

But I think that we need to continue to find a way and find ways to get our data out to our users in a fit for purpose format in a timely as fashion as possible and we look for ways to reduce the friction and increase the fidelity of our workflow. And it was Qassim who had the implications of AI in this field. And it was something that we are pursuing as well. I would love to hear ideas of how that might fit? So yeah, excellent panel yesterday and an excellent discussion. Very much aligned with what we are thinking about, but we are smarter on this for the benefit of all of your ideas in that input. Lastly I would just say I also found the visit to the reserve inspiring. For those who haven't spent much time at the sites. I would say they are all like that. They are very local. And they address local issues and requirements, but I haven't one where I have not walked away and thinking that much of the same thing that we all came with yesterday. How inspiring that is and what a great example it is of action at a local level to make things better. And of course the party last night was lots of fun felt so thank you to those who organized that that is it for me thank you.

>> Thanks Ben, we have just one minute, so I just want to say I would focus to the piano that we include a bullet in our letter of recommendation on dater delivery. Promote data delivery to their users as quickly as possible. That would be one of the recommendations that I would propose that we include. We want to make sure they are all here. Mike, could you take a minute and just make a statement about the GPS interference? Gary I do not know if you are still online? Are you still there Gary?

>> Yes, I am still here.

>>

>> Julie: Thank you for sending out the paper on GPS interference and Juliana also sent one after that. And Mike A, are you ready Mike to make a statement? I thought we were just kind of closing the loop on that while we have a minute here.

>> Mike: It might be more appropriate if Juliana is on. The good news is they have basically suspended the plans to build the site in order to do more negotiation. But I know Juliana was attending it as recent as last week.
>> Julie: Juliana do you want to say anything further on that?
>> Juliana: I just want to let folks know that the federal agencies both on the civilian and the defense side working closely to gather on this issue and the concerns about potential interference. And we were happy to see the results of the National Academy study that came out. And we are also preparing for any kind of potential rollout if there is one by legato. Currently they are not planning on doing anything. They have not rescinded their operation so we are just standing by to see what happens next and hope that there is a positive resolution for all thank you.
>> Julie: Great thanks, Lynn, just remind me that people might actually not know what the issue was? Mike do you want to give a couple sentences?
>> Mike: Juliana might be the expert here, the company trying to terrestrial systems in order for Internet and satellite systems that have the same frequency or conflict of frequency with GPS. So there could be lots of impacts from navigation, as it can match from there. But again Juliana is more the expert on this Tammy.
>> Julie: All right, Juliana?
>> Juliana: Mike was right on with his comments. The potential to interference, what affect high performing geodetic type receivers especially those that are not the most modern. Some are come up many of them that are still out in the field operating correctly and appropriately roll it out could be interfered with 32 transmissions were in the vicinity. So this is a big concern for anybody who is doing a high accuracy type of positioning or managing real-time networks et cetera providing those types of accurate information for other types of real-time work. Their concern and I'm not really

sure were all of this would occur. So I'm trying to make sure that we are working as closely as possible to communicate the potential interference and impact to the U.S.
>> Julie: Thank you and just to wrap it up Gary, do you have any comment on this?
>> Gary: Mike and Juliana covered all of the items. I encourage everyone that has not read the report to read that report.
>> Julie: All right great and Qassim do have a common question Qassim
>> Qassim: We've had this a few years ago and it was almost similar things. They are going to take over the GPS frequency and so but we killed it. There is a lot of lobbying and disarray at the time my suggestion to Juliana if we have leverage on it why don't we make it a law? Why don't we lobby Congress to protect and preserve that frequency range just for GPS because it is every five years won of these communication companies and Internet, and cellular, they want to take over it. It is just very risky if we leave it open. That is my suggestion. Thank you
>> We will follow up on that and
>> Julie: We will follow up on that topic Juliana off-line. We are going to ahead and take a couple of minutes for the piano to reconvene up here at the table. And so, HSRP is on break for 2 minutes. [Captioner standing by]
>> Julie: Thank you for reconvening, what we are excited this morning we have a double session, coastal resilience is sea level the role of Pacific Ohana keeping your feet dry on the shoreline. An OS and nose flooding sea level data products and services. So we have this wonderful panel here. As you know we heard that from Paul and Ben this morning. They have been saying that coastal resilience in flooding is one of NOAA's top priorities. We feel really fortunate that that has been a tremendous issue within the Hawaii in the Pacific Islands. And we feel very fortunate to actually this panel was believe it or not, we

contacted the MP for covid-19, when we thought we were coming to Hawaii. And they had been on standby Saints covid-19. For two and a half years or so. And so, we are so fortunate to get them all back here now. It is wonderful. And I am very fortunate to have I Melissa Iawamoto.. Melissa: Thanks everyone we been winning two years to hear from then I will not say much. One of the real reasons I'm looking forward to it is because I think it will be a really important way to highlight, a lot of the issues and the impacts of storms, sea level rise, flooding, both in short-term and long-term in the Pacific Islands. And, I think you will see a nice showcase as well of how NOAA data issues and how it is levers and built upon to help serve the truly wide a range of stakeholders, partners and users. Well be on the reach of this room. So with that I would turn it back to Julie and thank you again.
>> Julie: Great, thank you Melissa Melissa and I used to work together when I was the director. So it is great to see her again. Paul, we are very fortunate to have Paul Scholtz with us today. So Paul, I think this is a topic near and dear to your heart too. So I know you like to see if you words.
>> Paul: Thanks Julie, thank you Julia Melissa for organizing this session, I did not realize it was three years and coming. I will shorten my remarks real-time. Because I am very interested in the topic, it is a very high priority for NOAA and NOS I actually spent 14 years working on the issue of total water level before getting into the current role that I am working on. The theme of this session, I would use is addressing flooding in sea level rise. I think it is absolutely essential in the challenges that we face in this area are too complex and long. The panel is a great model for what we need to be able to address in his collaborative partnerships, that we will come out of these issues and address climate change and coastal resilience in the face of sea level rise et cetera. The application of our science through partnerships is how we can work together and how we can actually

succeed in providing these benefits and. As we discussed on Tuesday, partnerships and the Pacific are particularly important given the amount of knowledge shared through tradition and culture. We have learned a lot about that at the reserve yesterday. The type of information sharing helps us and form and apply science in ways that are ecologically sound and respectful to the community. I just want to quickly highlight for recent efforts from the various offices that are represented here. OCS blue topo webpage has been providing web information and access to the best available packing data. The team at NGS has been hard at work at modernizing the national spatial reference system to improve accessibility of the data to people of all different levels of status and economic status in our nation. And the recently tran one with technical papers released the sea level rise technical report and you will hear some of that today. EdIT is a team of extension agents from NOAA's office of oceanic and atmospheric sea grant. They helped develop an application guide, so resource managers on the ground can actually take the information and change the way they think about and deal with decisions in their states and locations. Last, there is a new report that they are working on through the NOAA water initiative specifically on coastal filing in the face of climate change understanding the constituent needs and the needs assessment by holding a series of workshops, virtual workshops, because they were occurring during 21 and 22. To try to gather the information from five different categories, planners, transportation and navigation, realtors, and insurers is Health and Human Services and natural resource use and floodplain management. There was over 200 participants across all of the sections that actually participated in the activity. I want to thank the people for joining us today and sharing stories and experience and thoughts on these topics. This is critical as we move forward. And I also really want to and I hope that we have the time

to have a robust discussion and it will lead us towards recommendations and things that we can follow up with and tran one. We value the opportunity to meet and discuss these developments from your perspective. Especially given it is been three years incoming with that, back to you Julie.
>> Julie: Thank you very much Paul. And yeah, it is exciting to finally get started here. Because it is a double session I will just explain, we have the first three people Anna, Chip, and Jessica to go first. And then we actually have a break. So you don't have to sit through all of these pictures without having a break in there. And Melissa is actually going to introduce this book is for so thank you very much.
>> Melissa: First we have the pleasure of hearing from Annalise Keeney.
>> Annalise: I am with the Center for operation oceanographic product and service at thank you for having me here today it is quite an honor. Today I will be going over some of our efforts to better understand coastal inundation and climate timescales in that over the next five years. With that I will begin with the challenges. Coastal inundation is a risk that we are representatives on a regular basis that is becoming even more a part of daily lives skews me sure. At the moment there is no all-encompassing cool or suite of products and data that is easily accessible and understandable that allows us to be able to understand and mitigate the impacts of sea level rise and coastal inundation, with all of its positive effects. So, we are trying to connect the geographic continue up with what we produce for products in a variety of timescales. Right now we real-time monitoring through quick look and coastal innovation products. We also have seasonal outbursts and bulletins to better understand what regional of the country are going to experience high-tech flooding and what range of time. We also provide our annual Outlook that addresses what we have been able to see over the last meteorological year. If you're just what we

are expected to see for high tide fighting over the next year. And actually provide a better outlook for the future of to the year 2050. We are starting to move and what we need to address for the centennial predictions. However the outlier is that all of these are connected to our national water level observation network. And we need to fill the space between those gaps right now. And so the white paper that was provided, and the material ahead of time it summarizes tran once a process of integrating all of this authoritative data and making it accessible for providing tools based on that. And the timeframe that is helpful for everyone and encompasses all of the United States is specifically the Pacific Islands as we move forward. Provision number three of this paper is the elements that applies to us most robustly. We need to be able to create resilient infrastructure so we can mitigate the impacts of climate change and predict sea level rise anomalies. Not only at you know a shorter-term but also through protections and further into the future. So, this site is a really great summary of what we are providing. You will see that with the white arrows. And that what we planned to do to the funding that will receive to the bipartisan infrastructure law, it is also I believe that is what changed as I IJ a. Infrastructure jobs act. I like this graphic in particular it shows how important it is to understand her cervical observations before we move forward in being able to predict those between the observations. So I will go into super detail about this, but this information is here kind of helps to outline the baseline climatology's are and what we paid to do through this reanalysis of historical information. We are taking 40 years of data and we want to be able to understand the information to provide observations and information between our observations. That is going to become in the form of a 500-meter grid. So you can each aspect of the coastline will have information. This is a great summary. What we are capable of now, there are

areas in blue show we robust service and with the services are so slightly limited? But the area is highlighted in white are examples of where our gaps up with the funding that we will be getting, it all turns blue. So that means that we will be able to provide products and services and tools based on that authoritative information. So I love this graphic too. I'm a huge fan of pictures you will see many as we go through. This is a snapshot of our prioritization dashboard. The areas improved you know where we currently have observations through the network or we have had short terms installations are seasonal installations for data protection. Those areas highlighted in orange, show where we still have gaps in our observations and what we are trying to provide, and this too is great, because it helps us understand each level of how we are providing observations or tools or a product and on how we prioritize making data available between those areas that are not highlighted in blue. All of that will contribute to the fifth national climate assessment. You see the spot on the bottom a couple more times. This is how we are to apply our enhancements. The image up in the top is snapshot of the improvement methodology based on the seal arise that report the interagency sea level to report that we were published in February. And just how we plan to actually use that information, so we can hone in on where we are expecting to see high-tech flooding, not just on a daily basis but evenly hopefully down to the hour. The image at the bottom you'll see a couple more times at which I will go into detail that gives you an understanding of how just broad reaching will be able to provide. It all starts with power of observation. So I am the owner for co-ops. This is an image we have moved into the geospatial category now. We have over 200 stations in the network but 97 of them are long-term. And they are used to calculate the high tide fighting outlets are going to be. Each of those represent those dots. This part is how we fine-tuned what observations and what

our predictions are going to be based on the data that we have been providing or giving to the sea level I start report. And how we are sharing that information. I love this plot because each one of these are available at each of the dosages on the previous image is one of our stations. We are providing information that observed data we provide high water thresholds. Also the specifically calculated minor high tide flooding threshold. And then alongside with the sea level rise of scenarios are going to be. And that is particularly valuable so you can understand all of the aspects that contribute to high tide flooding. We are definitely moving towards I think you know to geospatial information has an advantage over technical publications sometimes. It makes the information more reliable. We are already utilizing this methodology before we were producing tech reports. We use GIS to create the graphics, so why not harness the infrastructure of that? Each of our high tide reps the high tide flooding map Outlook is not only international capabilities but it also is down into regions. So each of those buttons at the top, when you visit the website you will be able to click on each of those regions. Because we are what is happening in Houston is not necessarily up to what is happening in Annapolis. It is broken up by region now, you will see the area in red is the coastal inundation dress rolled based on the layer provided by partners at the office of customer management. It is labeled in med because the minor flooding is actually the most prolific and cause the most damage. Major flooding will definitely be a challenge in the future it is denoted in yellow because it is not as prevalent. We further put that out by providing if progress is sorry impact graphic. Regional summary snapshot. You have information for national outlook but you also get what you expect in the region. We like to bring that information to light. It is exciting. This is an image here. If you click on the image with dense tables or dents information that used to be written

and paragraphs and return it actually a table for each of the stations. And then we supply the impact graphic next to it over on the left use either Bayway of London information and on the right-hand side you look at what the actual impact is based on flooding. This is in Biloxi Mississippi right here. And this is in the wake of a hurricane. So there was definitely lots of flooding. We have gone a step further by providing the digitalization's are going to be like three times through the sea liable rise tech report has methodology spilling out to the year 2100. And we are honing in on that not is what expected but was likely in these areas. This year's each one of these observations and what they are and what inundation and high-tech flooding is expected to look like. Through the years. That is a good understanding of what we are capable of now and this is where we are going to head in the future. We are trying to connect not just the information between observations but also to the suite of products that we currently have. So these plots here on the right are examples of how high-tech flooding information is going to be visualized in our coastal inundation dashboard, and that is a really awesome real-time tool, but we are also creating links to the data we are protecting even in real-time tools. You will see those integrated within the next two months. We are close to the finish line on that. And that we are also working on getting together our seasonal outlook and our seasonal ports and in our annual outlook. So the future those would be integrated in the same kind of really flawless GIS -based infrastructure. And again here is that lovely picture of all of the nodes that I will describe in detail a little bit further but I wanted to touch on this before you before I run out of time this over here this plot this is a part of what we are doing for our 40 year reanalysis and those of the ads and observations and other forms of model information that we are using to better understand where actually does high tide values have been observed. And to pop those over here on this type of

infrastructure each of these green dots is a note. It shows the extent of where we are going to go. So we will provide observations and projections in river areas. And also offshore right here. And the five-year strategy is to be able to do that and provide a resilient infrastructure. Going even further, this image on the right with the heat map is an example of our is a global sea level rise phenomenally model. It is a collaboration with NASA and a few other partners tran ten RR, right now the information is leaked to stations in the national observation network. That we are trying to bring all of those together over the next five years. Yet the hope is that we will be able to find more information to people through high-tech filing outlooks. And they will be used for decision-making so we can you know understand and how to plan for flooding like this. This is an image taken recently in American Samoa by one of our partners. It shows how real high tide flooding actually is. Again, where we want to provide observations. And so with that we cannot do it without stakeholder engagement and we can't do it without being able to fight all of the information in one place. The goal over the next five years is Jacob to do that. I don't know that if there is time for questions but I just wanted to say thank you.
>> Chile: We will hold questions to the very end I think okay thank you.
[APPLAUSE]
thanks so much Anna we have Chip Fletcher who is wearing many hats two of which he puts on today is Professor within the school of Ocean interscience in technology at the University of Hawaii. And as the vice chair for the Honolulu climate change commission thank you chair.
>> Chip: Thanks Melissa thanks everybody. As you know global warming continues. We are watching the oceans of the world absorb heat from the warming air. We are currently on track to warm over 3 degrees Celsius if you look at the actual investments by the world's nations in their fossil

fuel infrastructure and their expansion of agriculture, although the promises under the 2015 Paris agreement at up to putting us on track to 2 degrees Celsius. The actual investments in policies by the nations put us on track to much warmer than that on the order of 3 degrees Celsius. And in a completely separate talk that I would love to give you sometimes 3 degrees Celsius makes one fifth of the land surface unlivable, and it is already set loose sea level rise. Of course exacerbates this problem. And as the air warms, the ocean is attempting to correlate to that air temperature it is absorbing heat from the air. As you know overturning circulation of the ocean takes thousands of years. I was reminded of this two weeks ago. The five Dave Cruise on the Hawaiian ocean time series of gestation Aloha which is north of this island. We sampled that for an half kilometers water dense water that was 400-years-old. And so as the oceans and the surface water absorbency from the atmosphere it will take centuries to millennia of thermal expansion before our oceans are coal abraded to today's woman. Warming is going to continue. So receipt level rise is a permanent human condition at this. All of our coastal management regimes from NOAA down to the counties and municipalities has not been written or produced for that. We are in scramble mode at this point. Trying to readapt our policies or we can figure how we can live safely on the coastline that is moving landlord so this map shows the to the global average. Every summer in the northern hemisphere we watch the headlights scroll across as he weighs and wildfires in intense floods take place, this summer has not been any different. Thermal expansion represents 38% of global sea level rise. Melting of Greenland since 20% of global sea level rise this is data from the grace satellite that measures gravity. Loss of mass from Antarctica at 6% of global sea level rise. And kids especially concerning is the ice streams in West Antarctica. Which may be an a state now of irreversible retreat.

We see the glaciers accelerating from flowing ten years ago at a rate of 1-2 climbers per year to now to over 5 kilometers per year into the eminence and see.
And the world's mounting glaciers of the world are all in a state of net loss. They are melting losing eyes, flowing into the ocean, over all of the amount of water coming out from the mounting systems, the mounting glaciers, is roughly equivalent to the amount of water coming off of the Greenland ice sheet. The which represent about one fifth of global sea level rise individually. What many people don't realize is, we actually mitigated global sea level rise during the course of the 20th century by damning the world's major rivers. Sea level rise were slow by reservoir construction around the world and the 20th century net we have now dammed all of the world's major rivers. Every additional drop of ground water that we pull out of the aquifers on the continents and use Aji for irrigation and then delved into the local watershed and it flows into the ocean, represents an additional two sea level rise. Basically groundwater mining represents about 10% of global mean sea level rise. The IPCC reports that came out last year sea level is committed to rise for centuries to millennia due to deep ocean warming and I she melt and will remain elevated for thousands of years. That is a quote. Then they add we have high confidence in this statement. They go onto say that global mean sea level rise from six and a half-10 feet if we warm at 1.5 degrees C. We are currently at 1221.3 degrees. Six and a half to 20 feet at 2 degrees Celsius an unimaginable amount of warming up and do not get this under control and it a season 3 degrees Celsius. 5 degrees Celsius is highly unlikely at this point. We are motivating and organizing around the world to attack this POTUS is not fashionable. Sea level rise is an unstoppable reality. This is the satellite data for the rate of rise three and a half millimeters per year in the last decade it is accelerated to over

4 millimeters per year. Paper came out last year, showing that at the covered rate of acceleration we look at over 70 centimeters by the end of the century. So we have bypassed 2 feet, and we are closing in on 3 feet at current rate of acceleration. That means that these inter- agency planning scenarios, which are a wonderful two and the update came out earlier this year. The low and the intermediate low the global sea level would have to slow down in order for these scenarios to be appropriate. So, I do not recommend using the lower two scenarios for painters. I recommend using the intermediate scenario which is scaled to the Honolulu time gauge takes us to the four fetal levels sea level rise by the end of the century. And the intermediate hi, we have recommended through the Honolulu climate change weep out God's purpose on this and the latest guides paper on sea level rise recommends public infrastructure projects, that are sensitive to loss or sensitive to sea level rise. We recommended. We know that King ties are already arising. That is not exponential rising water is the arrival of King tides that have been decades ago. They are accelerating, they are getting higher we see more King tides especially modeling as showed by the next decade in the 2030s we will see a rapid acceleration of King tied to flooding. And here in Honolulu, we see already storm a train at Desmet backflow. We see the loss of gravity and drainage. That separately I would like to make gravity drainage, the guiding principle for our drainage infrastructure, is gone at high tide. It is already gone. We also have a water table that we can watch go up and die with the tides in ocean. You can predict where the water table is if you look at the open ocean tide. And so this is Waikiki, and at high tide, on the Honolulu time gauge. The water table is 2 feet below the lead service. What is it called when the water table reaches the late service? A wetlands. Wetlands in urban areas are not environments that we know how to deal with. Now let's rain on top of that. Here is

the third most valuable block of retail shopping. Under a storm this past December for where we had onshore winds, record-setting rainfall, it was a king tide, lunar perigee, and we had large waves off shore. So we not only lost drainage, we became the new shoreline. And NOAA jurisdiction is going to be expanding so, high tide, groundwater, and rate these are all elements that need to be modeled in order to understand this problem. Melissa runs Deepak program with the joint project between the states and counties in University and pack IOC which is NOAA funded. We have the high sea level rise viewer. The viewer shows modeling that we have done for non- storm wave run ups. This is typical spell of events that we go surfing for this is not a hurricane storm surge this is a community on the South Shore of this island. At 2 feet of sea level rise this is what the summer swell looks like it at 3 feet this is what it looks like. So there is sort of a tipping.here. Where every year at the wave run up suddenly becomes a dramatic event. We also have coastal erosion, and to be have one dimensional coastal erosion modeling that is available on this website. Now we are taking on two dimensional modeling a model that is developed by the U.S. geological survey. So, we have a new entity at the University of Hawaii the client omit resiliency collaborative. We engage in modeling of several types. Two dimensional coastal erosion modeling. To do dimensional wave run up modeling. Storm drain backflow modeling. And we have to find what is known as a sea level rise exposure area. This has now been accepted and lots of local policies. Yesterday I was testifying before Kawai County Counsel. They just passed a new bill creating a sea level rise exclusion zone National flood insurance program is not acknowledging to reality of sea level rise. The county has taken the wavefront updater and the hydrostatic fighting data and they require that planes that are renovated more than 50% of the value over a decade, must be elevated 1 foot above the combination of hydrostatic and wave flooding.

That is the exclusion zone we have coastal setbacks now on my Wii and Kawai based on a reach of shoreline change. It is emplaced by local and state government. With money from the office of Naval research, we will pelt we have is to build a new website mimicking the NOAA sea rise viewer. Using 1 foot increments of sea level rise. Using your inter- agency sea level scenarios to give us a timing perspective. Also including two dimensional coastal rose and groundwater monitoring, storm drain monitoring and modeling and storm surge and compound events. We are using wharf the weather research forecasting model. To start to simulate as a heavy rainfall event. And develop GIS layers were flooding at high tides. I would just end with quick GIS layers that we produce. This is Waikiki in an urban area. You will see groundwater flooding and green. You will see storm drain backflow and blue. You will see hydrostatic shoreline flooding. This is 1 foot of sea level rise you see areas where groundwater flooding has developed. You will see pink dots those individual storm drains that have failed because they are backfilled with saltwater. This is 2 feet of sea level rise. Here is 3 feet of sea level rise. The red lines of blocks of streets where there is a transportation engineering criteria of 6 inches of standing water will create a bow wave on a small vehicle which will backflow into the engine compartment and cause it to stall. Which they assume will close down that venue, that block of roadway. So here is 3 feet of sea level rise. 4 feet is more likely, and we see the expansion in
know what jurisdiction here. 5 feet of sea level rise individual storm drains and single blocks of traffic et cetera. We have a lot of adaptation to do thank you I am sorry I went over time.
[APPLAUSE]
>> Julie: Thanks --
>> Thank you for that talk. Okay we have Jessica from the Army Corps so thanks Jessica.
>> Jessica: Thank you I am a coastal engineer with the U.S. Army Corps of Engineers in here in the

district. I want to think the panel for inviting me too speak today and represent the core. So after those great presentation showing a lot of interesting data, and of course Chip never leaves us feeling too happy. So I will try to improve a little bit here. I will be talking about the corpse of engineers how we Inc. include climate change in our projects, and how NOAA data supports us especially the Pacific Islands. So my outline for this talk today it will be quickly going over some of our projects are civil wars and military presence in the Pacific Islands. If you folks are not familiar, since you are in the area, I will go over briefly our climate change policy and requirements for our projects. And then I will talk about some of the NOAA data that we used to support these efforts and incorporating climate change resiliency into the is infrastructure. And then I will give you the wish list of additional data that we did release. So our projects, the civil wars projects in Hawaii and Guam and American Samoa and the Commonwealth and Northern Mariana silent is the area of responsibility. We have 27 federally maintained deep draft however since mobile helpers within the high watt Hawaii and U.S. Pacific territories. You can see the deep drop harbor all of the major commercial harbors on each island are maintained by the Army Corps of Engineers. We maintain the general navigation features with the Channel and bigger breakwater structures all on the land side infrastructure is meantime by the state of Hawaii. We also have a lot of really important small boat harbors in the Pacific. On the rate you see the small boat harbor, that is one of us morphed for a small boat harbors we have been American Samoa. That is a subsistence harbor. We have several recreational harbors as well. But these are in American Samoa. And some of these far-flung places. This is what the locals there used is offered to transport goods to that island you can see in the background. So folks that live over there there is a small population very underserved population so I

am glad we are talking about those more. They use these as a lifeline to get the goods back and forth and people back and forth. They are really important even though they are small. On the bottom left, we have another small boat harbor and Guam. The Navy maintains the harbor and golfer so we have a small boat harbors. They are used for recreational fishing in those types of things. We also have 14 federal flood control projects which we now control and call them storm and flood retreat flood read. We also have many shore protection projects around the country again which we call coastal storm damage reduction projects. That might be the beach projects that you are familiar with on the East Coast. Here in the Pacific we are smaller scale. But we have some in the Pacific islands and Saipan and it is shown in the bottom right there. We have a lot of projects to maintain. We also have give military construction support in the Pacific our district in Honolulu disc is about 90% military construction. Civil works is a small portion of it different than many other districts that we have on the mainland that you might be familiar with. We do support Army assets in the Pacific so in the top left there you see that we have a tetra pod structure protecting a. At the Army. At the Naval Station and white beach Okinawa. We have the Army rec sector which is on the west side if you have a chance to go out there and check that out while you are here it is really beautiful spot. But we have a shore protection Project there. That protects the small cabins and provides a beach. And then in the bottom, we see Kwajalein we have Army family housing there. And a lot of these military projects are on the coast. It is critical infrastructure that needs to be protected there is sea level rise. We are looking at all of those especially these space Pacific atolls. We do use the NOAA on the Kwajalein to quite a bit. So our climate change regulation policy doors a lot of words on the slide. The big ticket is we have an engineer regulation that requires us to incorporate looking at climate change

and specifically sea level change throughout all of our projects within the core of engineers it is not an option. We look at it and maintenance project. The requirement is we must look at it and we have some technical resources that show us how to comply with that policy. And, this also applies to the inland projects. That is been something that I have been learning about more. Even as we have a flood control project the sea level is rising on the bottom of the flood control project it will reduce the amount of flow that we have to that project we are incorporating those interesting compounding flooding to all of our projects. This is a picture of Hilo breakwater. It is overtopping, that is on the big island. That is just a project that we will be working on coming up soon we are looking to maintain the project and possibly do a repair in the next 5-10 years. In the past, the standard procedure was okay, whatever is broken fix it, return it's what it was. Now, we are looking at can be elevated? Can we adapt it for the increase climate change, and sea level rise that we are seeing that is causing more and more overtopping of that structure and we will eventually impact the navigation in the harbor. So some of the NOAA data that we used to support the climate change analysis there is a lot. These are the tide stations here in Hawaii. We use those quite a bit. The sea level trance of course that are calculated by NOAA, we use those rates at each one of these tide stations to evaluate you know what our sea level change impact is going to be in the various projects. That is a very small clock, but they use the preserved predicted versus observed water level to get the nontitle residual for the project. We look at the extreme water analysis that is provided by NOAA. This is kind of static plop that I was excited to hear about the new stuff and I want to talk to them. Because that is going to be really helpful. These are great, these are usually protected area so we typically add wave set up to these. But it is a good start for a lot of our analysis. We use the

interannual and seasonal variation plots that are provided on the train one site that is important in the Pacific. Because as Chip or some of you probably know better than I do, we have and so we have Pacific oscillation we have a lot, the Pacific is a big area, there's a lot of variability in the water levels. Not just with sea level rise but with all of these other be climate impacts. So that variation really allows us to see from year-to-year, you know how much variation we would see in our project in the first year. So that is really helpful. Moving on to NGS. Benchmark elevations and geo- information is a lot of that. We established some of our own bed shots on all of our projects we incorporate that data into the NGS, I can call Ed whenever I have a question about specific data and they will always help me. That is a great resource right there. We use a lot of horizontal vertical transpiration to set all around there. As far as elevation data, this is a great collaboration between NOAA we both collect of lot of line are data it served on digital coast. It makes it accessible for everyone. In 2013 we had a islandwide lidar collection I think you probably heard earlier this week that 2023 we are hoping that will come back and do the islands again. And we can serve that data on the data access which is great. We use a sea level rise viewer. We use a lot of wind and wave data. That's another collaboration between the Army Corps of Engineers and we use wave buoy data for forecast. That the group provides that we are fortunate enough to be on the governing Council so I get to throw and a little bit of my wants and needs every once a year. And we do use this data quite a bit. And that is just a spectral report. We use this data to feed the new churn models that is important information. And the rainfall data also helps inform some of her climate change analysis. So as many people are aware we have sea level rise change calculator. That is publicly available and that is directly from the calculations at each tied station. So that is

always a big help. The weight we do it in the Army Corps of Engineers is we have a 50 year planning horizon as economic planning resin for all of the projects. With this new climate change regulation, we are actually required to look at a 100 year adaptation horizon. That is from the project start date. That's when construction starts. One hundred years from that so we might look into 2125 and days like that. So the sea level rise calculator helps us to do that. And they are telling us you might not build that for the project now, but in 100 years what can it look like? How can you adapt your construction project at that time or as we see how things are going. We also have a tool called sea level tracker that is fed by the NOAA water level data. That plots the sea level curves, also the moving averages of the water levels. This allows us to see what the actual waddle level has been doing and which curve it is tracking now at various moving averages and allows us to get a little more information on which curve we might pick to do the analysis. Wrap up here since I am running out of time. Just an example of some site-specific studies that we have done with climate vulnerability. We did a vulnerability assessment for American Samoa and the invitation structure. A lot of NOAA data was used for that sea level rise viewer predictions, and they are subsiding at an alarming rate after the earthquake. So there sea level rise rate is about three times that is really an area of concern for us. And then just quickly some of the precipitation data. We use the state climate summary to a validate -- evaluate some of my hydraulic projects. And here's the wishes -- wish list of future needs. This is another picture on the right here of American Samoa. This is all a hydrographic NOAA data that we use. We are very excited to hear that there may be an airborne lidar coming to American Samoa. So we can get that last little short piece that has a Cheryl reef environment. That is critical for populating the transformation up to the shoreline with the projects are. Very excited to

hear about that. It would be great to have water level stations in remote locations. We do work in Micronesia, and some of these far-flung pieces that we are trying to reach out. They do not have all of the resources in the very first thing that we look for whether there is title water level when you go up to talk to them and help them it is their project and their resilience. One idea that I have had on the left, you can see this is drone collected beach topography that we took. And I know with the UA as a lot of people chips group and others are taking this drone data and converting it into surface and imagery and elevation data. It is a great resource, we don't have a great way to share it with each other. If there is a way to standardize the data and serve it on a digital coast that would be a great resource. They have my we data that we can access for one of the projects or vice versa I think we would all love to share that. And that enter annual variability across the Pacific is something we are trying to get a handle on for the projects. And incorporated into the project. So with that I will wrap. I just want to say here's to more collaborations between the Army Corps of Engineers and NOAA. This is some of the great ways that we have been collaborating and I think we are always open to more so thank you.
[APPLAUSE]
>> : Thanks Jessica I think will take a break?
>> Julie: Let's go ahead and open it up were ahead of schedule, because we really want to encourage discussion questions here. And I think we have some time. So it may be question specific for Jessica, Chip, and Anna. And then we will still have time for the product panel at the end of the day. Paul would you like to start out and make a comment or two?
>> Sure
>> Paul: Thank you everybody i.e. am thankful for the information is shocking in educational to hear from you on the ascent of the work that you do and the kinds of impacts. This panel, the review panel

is actually charged with providing NOAA with recommendations on things that we can do to move forward. In some of the areas that you talk about. If you had the pen and you were writing a recommendation what would that be? And why?
>> Chip: You will also guess my answer provide additional funding to local researchers. But you know, there are expensive data sets that only a federal agency can support the instrumentation to acquire. And so lidar is one of these. But drone -based lidar is an area where you know and by drone I don't mean military drone, I mean, a drone that is one that you can buy for a few thousand dollars. Currently drone -based lidar, that is both green, and red lasers. In other words topo and Bath fee, I only know one place to get it is are we search group at the University of Colorado. Less I talk to them it was a quarter million dollars. That is an investment area, where we can start to understand sand transportation of RBCs. If we could do repeat survey with right are that local research can launch. Much more monitoring is available, which will feed into our model and give us much more better understanding of how the natural coastal system is responding to sealevel rise and change any and storms and wave energy. If there was more investment in making these tools available at a better price.
>> I will echo as far as what Chip says lidar rater is extreme for us. In this reef environment is important to have short data. It's a pretty good deal the reef does not change very often. So we can kind of go a little further in between without having to re- collect another wish that I would have is as I mentioned, a little more analysis out into the further Pacific Islands. I know that is our reach. It is areas that are underserved. I am excited to see that there will be information to interpret the title data. Where we do have those stations. But even in the further out islands, may be there is one station or maybe there are no stations. So whatever we can do to support the

small island countries that are looking for help. They are people on the panel who will agree. They are savvy they know what is going on they are asking for help and we really want to be able to support them it is critical that we have the data to do that.
>> Anna do you want to say something?
>> Anna: I was happy to hear about the integrated model observations along with our integrating models with observation data. I think it is important for serving and creating equity with underserved communities. I wear a GIS hat most of the time anything we could do to support infrastructure for the products that we are developing. That creates a way in a better understanding of the data that we are getting that we are giving to our users.
>> Julie: Okay, right I think Rich wanted to comment on those remote island title stations and infrastructure there.
>> Rich: Sure, all it takes is funding but actually our network in the Pacific has been shrinking because as the military relieves certain islands we already had to shut down a couple of stations because the military is left. I know it goes over to Fish and Wildlife Service. There is no longer access. So we almost had to move awake a couple of times. So we are struggling to maintain what we have right now. So for these other areas, you know and back on the network was full establish I have gray hair and no hair and you probably weren't around that so why things go place where they were, you know I am not sure. But the very small islands don't have the major commercial navigation drivers that help us support those places. Really most of the gauges are in the Pacific are therefore more sea level rise and more for sea level rises than commercial navigation.
>> Julie: Okay, it is nice to have the director of co-op here. Ed?
>> Ed: [Away from mic] the USGS was running them. And that is the reason that I am not there. There is also a network the Australians have a network of

ties stations through these minor islands too. I know they have one and they use the taxation for elevations. I think you H has one. Okay, I think they had a question.
>> Yes a lot of the discussion on sea level rise assume the land is holding still. But a large part of the world where there is water extraction for example, subsidence is as great as sea level rise. So the relative effects of sea level rise is basically double. Is subsidence not a problem in the Pacific islands? I have not hurt anybody mention it.
>> Yes, I would say, and I am not a geologist I will defer to Jim for that. But I know in American Samoa the relative sea level rise rate has increased dramatically since the earthquake that they had in 2009 it is almost 9 millimeters per year whereas here in Hawaii is between two and three I think. So subsidence is a huge area, and this earthquake exposed areas.
>> We have subsidence where there is active volcanoes. So the island of Maui has subsidence and sea level and global global sea level rise. The rate of rise is over 2 millimeters per year. The big island the amount of subsidence and global sea level rise is roughly equivalent as you said. What technology are you using to determine the rate of subsidence?
>> Well there are GPS networks, but mostly it is by inference. Looking at a three and a half millimeters per year trained on the tide gauge. Making assumptions about what sea level is doing. Your residual is due to subsidence. But is not well understood.
>> Is also a technology known as I cannot even say it. That measures the annual rate of subsidence. But it is rather expensive.
>> I did not know if you use the thank you very much.
>> All right Anuj?
>> Anuj: Great presentations by Annalise and Jessica, specifically on capabilities of the core,

and NOAA and the dashboard created. And I really like the Corporation between what agencies are working in the space. What I could make out is you are tracking what is happening, and you are trying to plan something forward 50-100 years to work there. Dr. Chip is protecting academically, as to where this leads to. So we know that society, is facing more challenges than they are predicting. There is more fighting happen there is no more reactionary insurance claims of coastal flooding. More than 50% live within 50 miles of the United States 50% of the population. Why are we not losing some of the projections by the academic, incorporating in your modeling so that 50 years or 20 years from today we don't have that type of claims that we are having today? We have heard already that Florida is having an insurance problem. And that is because we could not predict it accurately. And take me too gauge of actions. Is it an area that we can work to work together to get a better? Thank you so much.
>> I mean, the commercial insurance agency is a hind casting agency they look over trends from the last 305 years and that's what they used to project for next year. But they were also among the first global institutions to acknowledge climate change and sea level rise 20 or 30 years ago along with the military by the way, so commercial insurers have sophisticated levels. But they are fundamentally tied to looking in the recent past. When it comes to sea level rise, you need an act of Congress literally to allow and incorporate sea level rise into the national flood insurance program and that is not happening. I believe there is one year where an FIP did incorporate maybe it is coastal erosion or sea level rise. But is retracted the following year. I led the charge and had to backs up on that. But the insurance industry is often looked at as one of the controlling institutions for managing the coastline but I am not sure that that is going to pan out. Because we have seen withdrawal of commercial insurance for most open ocean coastline.

I live one house back from the beach, and I lost my commercial insurance 15 years ago, because it was a nationwide effort by a very large insurer to pull out of open ocean exposure following hurricane Andrew I think. But real estate prices are going through the roof on the coastline. So I'm not sure the insurance industry is going to be the problem solver here that they thought it would be.
>> Go ahead Jessica.
>> Jessica: I would add for the Army Corps of Engineers we are the end-users of the a lot of this data. Trying to put projects on the ground even once for 50 years. Our policy now is to use what they call actual science. Wait for the scientific community to reach consensus before we implement that into our policy. It is slow, we are not always on the forefront. But I would say that we have pivoted towards making kind of risk informed decision-making where we do look at sensitivity and different sea level rise. We look at the potential risk and if it is critical infrastructure or why are we protecting a product or something that it's not as critical, so we do try to incorporate that whole range and that adaptation horizon even looking at the high and what might it look like in 100 years and we do not have a impact on it right now. We are trying to incorporate that into our process and we think on the longer term.
>> Julie: Okay thank you want to make a comment?
>> I just want to say thank you to our college that I've got to meet yesterday at the University of Hawaii who made it clear that there are other models that we can incorporate to better serve the community's. And I think academics are doing a great job at not only creating these models but understanding the limitations in the computation power that they need to produce them. So I think by working with these partners and that is also no unfunded it will be a valuable way for us to make better connections in the future.
>> Julie: Okay thanks, Qassim and then Larry.
Qassim

>> Qassim: Thank you to the three of you. Great foundation definitely. And I have a question coming for Dr. and Anna. Before Chip I was going to ask you what you just said about whether this kind of research that you are doing and these amazing results and conclusion is communicated to FEMA? But it sounds they are not listening. Is any is there any way we can force it through them, because I will support it for flood insurance and things like that.
>> The line staff are very well aware of these problems. I think the problem rests with Congress. Not with FEMA.
>> We need lobbying that okay thank you.
>> That is just my observation.
>> Qassim: Anna, I am glad about what you said moving from static PDF to interactive GIF. This is the wave of the future definitely. My humble request the fiscal year 23 and 24 you presented your plan. Let us be bold and move because I that is what we call digital. Just because you can take data and all of the data and put it in that and for the coastal innovation. This is really able (Indiscernible) that is my request on that thank you very much that is all I have.
>> Thank you Qassim Lindsay?
>> Lindsay: Great presentation from everybody I had a question for Jessica. You mentioned that you're things like the relative sea level change projection calculator is directly fed by the NOAA data. Does that mean that you just re- printing the NOAA data or is there a calculation of your own that goes on in between?
>> Jessica: There is a calculation. We base our curves on the NRC curve. The National resource Council. We use the relative sea level rise late provided by NOAA to populate the low curve which is a straight line and the acceleration is part of it.
>> Lindsay: When you say your projects need sea level projections, it is not, it would not be the same as NOAA's projectionist Sally?
>> Jessica: I think some overlap before curves of Noah. We have similar curves that are projected

similarly but there different.
>> Lindsay: That content potentially be a source of confusion.
>> Jessica: Yes that is a subject of discussion whether we are talking to nonfederal sponsors or others. We are using the NOAA curve or other curves which was right or higher.
>> Lindsay: Or a related question to all three of you is a philosophical question. And that is when you start creating dashboards and displays for public consumption. How do you handle the issue of uncertainty?
>> Jessica: I can start to speak to that. Since we do interact with the public quite a bit on a lot of our project. That is really that something we have been trying to work on. Is communicating risk. So as I mentioned in my project which they call them shore protection products. There are no longer called after coastal storm damage risk production. We try to communicate to the public you know, because we bill something does not mean that your house is protected inevitably. It is hard to explain statistics sometimes in a public forum. We show that you know this is the chance that this 100 year storm could happen. The 1% annual a seeded probability. We are trying to communicate their wrist to the public, and say we are not eliminating all risk we reduce risk. Sometimes that translates and sometimes it does not it is a challenge.
>> Larry as you know as a scientist you cannot get publishing I should do do a good job nailing down the uncertain. And that has actually been a very fun part of our research, as you know what is the uncertainty? Associated with our work. Now the urgency users are not interested in that. The planning departments at the county level and at the state-level use for instance sure line change data and 70 times our annual change of shoreline change was average lifetime of a woodframe house in the United States. Plus a buffer creates a coastal setback. I was shoreline change data is used for managing where you can build and rebuild a house.

They specifically asked us not to provide the uncertainty on our rates. The truth is 80% of our rates are not distinguishable from zero. Because the uncertainty in his shoreline is so huge. So you get them published but then they want a derivative from that.
>> I worry about liability associated with that. Somebody says I built my house, and you said it was not going to happen.
>> Did you have something Lindsay?
>> Lindsay: I guess the three, I'm sorry the panel itself is great and we have a public partnership that you guys do not have. I see the slides and all of the different agencies working. But then one of the areas I guess maybe you've already answered my question here. The insurance industry and the public itself and how they involve, can they be more involved and how do you, how are you bringing them in? It seems like just cutting off your insurance, there is some worthwhile partnership with that group of insurance industries. And also the public. Instead of just the seawall as an example I know it is change. I understand down the beach and the seawall down there, like all of them got together and try to get the county in the state to fund the repair of the seawall. That they built to protect it just seems back to front to me. You build that you are responsible. But now because of other factors we want the state to look after it. It is like how do you bring that and to the how are they involved in is there any further partnership with the insurance industry. The second question is separate in the partnership, it seems like everywhere we need better data obviously with the water level sensors. Is there a way with crowd source imagery that we talk about in that imagery area. Is it away a crowd source that can add to and improve the data. Particularly in a remote area where there is a way to enable those in the area to be able to do that. Two totally separate questions.
>> Regarding insurance questions. You your largest portion related to that is how do we figure out this

problem on his shoreline, and we haven't yet, maybe you noticed my last image showed a house tipped over on Sunset Beach. The next day they went stood back up, and they shoved it further back on the lot. And then they clicked down a bunch of sand bags to protect it from erosion. And everybody knows about it it violates the public trust doctrine of the Constitution of the state Hawaii. They have been fine, and it is still there. And so, you know what agency is going to go up and remove the sandbags guaranteeing that that property is destroyed? We have not found that agency yet that is going to do that. [.
>> The sandbags they put in there is actually destroying part of the beach worst on the other rent.
>> Exactly you do something on the shoreline on one spot and you create accelerated erosion and everybody pays.
>> and you have a question?
>> At:
>> I was going to address the second question the crowdsourcing. There is one project called the King ties project where you know around the Hawaiian Islands when there is a king tides event, you take your pitcher and you submitted and the database of areas that are being inundated and flooded jerking tide. One potential way.
>> So Jessica I'm glad you mentioned the word 100 year storm. This question is for you and probably you to Julie. I was based in Houston from 2014-2021. Seven years there was to 100 year events 1500 year event and one 1000 year event. So what is going on with adjusting that statistic? And then of course we hear about in Kentucky and other places we were just talking about Houston. It is a lot more extreme events going on what mathematically is going on to make that more realistic even if it is scary?
>> , I think you are absolutely right. And we are moving towards looking at joint probability statistic. The joint probability of a rainfall event with a hurricane coastal school storm

inundation event. That is something we have not done in the past. We are still trying to get our arm around it. But if you have an inundation event that is a 50 year water level and then you have rainfall on top of that. As shown in some figures it is obviously higher than what we would have as a 100 year event. Capturing the overlap of interrelated parameters, is something that we are working towards and planning for on our projects. And yet we start to say annual exceed its probability instead of 100 year event now. Because people are saying it happened last year it will not happen for another 100 years that is not the case. Again communicating that risk, and using and choosing our words wisely is a big part of it as well.
>> chip you want to answer that also?
>> No I do not have thoughts on that thank you.
>> Julie: Nicole?
>> Nicole: Thanks great panel to the HS RP welcome to my world. So, yes. Lots of great things highlighted here. How challenging it is to take hydrographic data and apply it in the Army Corps and apply it to the local level. And you see the examples that ship highlighted FEMA, and no will, and everything they are doing in their mission. In terms of sea level rise planning. And setbacks, and we see that all over the country. This is how the scale of coastal management and resilience is distributed between the federal, state, and local entities. Thank you that was highlighted really well here thanks. So my question is getting back to Anna's presentation in the excitement that I have about the 500-meter grid and all of the products to be applied at high resolution along the coastline because that is another thing the community is asking. In the state of South Carolina the entire state all we can give them is the Charleston product. Because we are in the tide gauge that is really needed. So my question is for Jessica and Anna, so Jessica, as seen something very similar to this called the coastal hazard system. That doubt

you know we sat in a panel ten years ago and we were super excited about it. It takes a lot of time and money to apply that resolution to the nations coastline. So Jessica maybe you can talk about how where you are with the specific version of that? And at what you see in terms of implementation and time and money for that product thanks.
>> Jessica: So the coastal hazard system is the Army Corps of Engineers high resolution data. It provides both water level statistical analysis, and wave analysis. Along the coast. So it started in the Northeast after hurricane Sandy. That was a big regional grid that was created. Down to the very small resolution level. We have been doing it in pieces. So I believe now we have done the Gulf, Southeast, it is just about complete. The Great Lakes, in the Pacific we have been asking for it for years now and they are finally talking about doing the Pacific basin. So that does provide local level water levels and waves. Which becomes a tricky proposition here in the Pacific where we mentioned their way of transformation over recent info gravity race, it is going to be a big project. The Pacific basin as we know is large. I believe as it starts it is going to start in the Pacific Northwest, and work its way down the West Coast and eventually make it out here to this Pacific Islands. When you start to talk about modeling of each individual island and going to Guam and as Nicole said maintaining that system for the Army Corps of Engineers has a big lift. It is great when we get it into place, but to keep it alive and updated and keep those products live has been a significant effort.
>> We are in the first year of five-year funding for pilot region as a Southeast U.S. so we are going from North Carolina down to Miami area. It is just a first year, and is what we are doing with historical data right now come up with a 500 resolution creates the infrastructure for us to be able to host other climatology is like our way predictions is very important part of what we need to understand. And then the hope is to by the end

of the five years to be able to provide coverage and information even if it is just a story great out. Between for all of our areas that we haven't stations. That includes the Pacific territories as well. So that I hope by the end of the five years we will have at least 500-meter historical data in between all of our national stations. And that will build infrastructure to move forward.
>> I will add one part I left out, it is ensemble modeling so it takes a tropical storm and earning thousands of fronts to use historical information for validation and prediction some lessons to be learned from our past.
>> Follow-up once more if I forgot to mention presentation all the information is available in application platform interfaces. So where information gestures to be available in a CSV that you download and you don't know how often is calculator updated all of the information that we are getting is going into this it creates accessibility on a variety of formats of data that you need. You can have your CSV if it is helpful. Every time you link to the API that will give you the potential to continuously have your product updated as well.
>> Julie: Okay thank you, I will ask one quick question and that we will break. Chip, I want to know how receptive are the local or Jessica if you go around and I know, receptive the local agencies the local urban planners of the city levels of the local levels. Are they receptive to your ideas in your information that you bring them?
>> Chip: That very much so. I give an average of two charts a week outside of the University. So real estate groups, are important out because they just passed the first real estate requirement that if you are selling land falls within the 1 meter sea level rise in addition area. That is downloadable to GIS later from Jessica's back website. The selling apostle there in an area that has been modeled and exposed to sea level rise and backs. And so and a whole list of other applications and

policy development from the counties and who moved state agencies.
>> Julie: You know I have a reflection and actually I should bring up after all of the panels because a spoken. I feel like there is definitely an island mentality here. Where you are a lot dependent upon that. There's a lot more communication than in Los Angeles these are big and urban. Or California and I think other parts of the states too. But I feel like there is a lot more communication going on. And interaction.
>> We all know each other that which is why you do not want your own.
>> Exactly, okay let's take a break, I appreciate the penalty at thank you. Let's do a 15 minute break.
[Captioner standing by]
>> Julie: Alright let's go ahead and reconvene for the 2nd half of the session. Chip, as you walk in, that was a little bit of a set up question I went around asking you about how responsive the local agencies were. Knowing and both live in Southern California. Ed knows we live in a community, and we have been to other communities, that are not always a response. So Ed, go ahead and take a couple of minutes, and share your observations there.
>> Ed: First of all from the San Diego County point of view. The two of us know there are certain cities along the coast there that have made it, nobody wants to hear it, no one uses the term manage retreat or hear any of these type of things that you talk about. Because the current homeowners have astronomical values on their property, and they are running around with blinders on. In that same context, it is really great, that we all get around and we are here in Hawaii right now and the last two years have missed and I bring that up because a few years ago we were in another city in the state, where your equivalence told us that by law they were not allowed to use the term sea level rise in global warming and all of that in many of their official

documents
>> That is a great way to solve the problem.
>> The you go. Here it is a few years later, it is incredible that you guys are doing and weak openness of it, and obviously the importance of it so thanks a lot.
>> Julie: Yes we just want to highlight that, and in some of the local communities that Ed and I are around, they actually pull language out of their planning documents before the city because these are homes that are variable on a very wealthy piece of real estate is Southern California. And they pulled all of the language out of the document. So I am so glad that the island mentality is working over here Melissa turning over to.
>> Can I just not say it is all roses here. There is a new setback law that has been proposed for this island and it is just died in County Counsel. So it is not all roses.
>> Melissa: A work in progress I'm sure. We will continue with the panel, we have rate to now bait with the weather service thanks Ray.
>> Ray: Thanks Melissa, good morning everyone and thank you for the opportunity to speak with you this morning. My presentation is going to be decidedly non-technical. But I just wanted to share a couple of personal stories. And also provide contacts through the importance of the work that we all do in this community. I want to start out with the slide. This drives a lot of what I do personally in the Pacific. It is one of my inspirations and it is just simply it is water. Whether freshwater, or the ocean, I have heard it most eloquently stated that for every ten breaths you take on the planet you can think the ocean for seven of them. 70% of the earth surface. By extension, if you go to the Pacific it can take credit for three of those. That is pretty powerful. It is an awesome responsibility that we all have here. The second inspiration that I have our people. And so this is just a few examples of some of the wonderful people that I have met throughout the Pacific, these are the people that we

really care about this is why the work that we do is important. For the National Weather Service, our mission statement is we protect lives and property by forecasting extreme weather, water, and climate events. And to me, if I take care of the water and I take care of these people then we are fulfilling the mission of the National Weather Service and that is important to me. What is the risk? At the United Nations publishes a great report everywhere is called the world the risk index. In 2021, it assessed the disaster rips for 181 countries. It covered about all of the earth's population. A total of ten island states made the top 15. Right here in the Pacific the top three Solomon Islands in Tonga. The Philippines and a break, and Fiji at number 14 and Kiribati was outside of the top 15. They included them because I have a couple of stories about them later on. I want to talk about these three tenants. What I feel have an important contributing factor to resiliency in the Pacific Islands. That's communication, resource, and traditional knowledge. When it comes to language, language is a significant belly rear to resiliency. In my amp and in the Pacific. There is really difficulty in translating technical terminology and meteorological phenomenons into this local language and dialect. Translation are also tied to location and time of year, there is up called (Indiscernible) which is a collection of Hawaiian rain and aims. This book has one chapter and is 282 pages long. That is the sheer amount of terminology that could choose. Bought New Guinea as 800 dialects and languages, a lot of languages are similar. In Samoa and Tonga and not exact. Words are which spelled the same Alston pronounced differently and have different meanings. Here is a great example, of something that we deal with all the time in the National Weather Service. This is American Samoa and the independent state of Samoa. You can don't have to go into reading the little words. For the same impact from a tropical cyclone we have different wind terminologies. They speak the same

language, they are 20 minute apart. But that is some of the difficulty that we have been present when we issue a warning for American Samoa, we talk about wins, if you are on and up the Samoa and you hear the radio broadcast, it means something completely different to you and it is unfortunate. Communication is tied to connectivity right? The sheer distance and remoteness of the Pacific Islands. The lack of television, radio, cellular coverage and many rely on still VH -- VHF and HF radios. The meteorological service date physically shipped paper copies of seasonal outlooks to the outer islands. And the met service north of the some more islands that you still town criers to disseminate warnings on the islands. This is an interesting map it is opposite of what you might think red means good, green means fair, and so while the majority of the Fiji group has at least fair cell phone coverage, there is still a lot of violence that are locked up. Connectivity. Resources, both physical and human, the extreme remoteness of many of the Pacific islands it limits the accessibility and the supplies right scarcity, limited supply lines, we have been talking about supply lines recently in the U.S. as it relates to covid-19 and the war in the Ukraine. But the Pacific has been dealing with supply chain issues for a long time. This creates a challenge in maintaining observation platforms. You have a lack of trained scientists. And a lot of the met services are not 24/seven. A great example the new way met service. Ten staff and the director are not 247. A sample of their typical schedule is Mondays and Fridays they are open from 12-4 that's when the flights coming from New Zealand. That to provide observations of the aircraft and land. Tuesdays and Thursdays are normal government working hours. And they are there for just an hour and a half on Saturday and Sunday and public holidays. So if you can imagine in the National Weather Service in the U.S. If that was our schedule it would be great for me. Not so good for everyone else. This is a great

example of supply chain issues. I took a fishing trip with my son. This was our second trip there. The second day after we finished our first day of fishing. I walked across the street from the Lodge and I wanted to the local bar. And I wanted to order a beer. And this was the response, and these six words scare me.
[LAUGHTER]
and the poor bartender said sir, I am sorry, there is no. On the island? What you mean I am here for a week? And I am fishing? I have to have beer.
And she you know she told me that departs from Fiji comes once a month could not make it that month, because of the rush rough ocean conditions. And they were not able to dockets of the barge turned around. There is a once weekly air flight between Honolulu and here. It stops at Kiribati on the way down. Literally the whole island had no. I looked.
I spent a day at the island whether office. They have an outstanding staff and they make the most of what they have. That is the office at the airport at the time. That is some of the staff and that is the conditions that they deal with. That which is what the inside of the building looks like. You can see communication device and orange it is the chatty Beatle. We provide that to the service there is a satellite text messenger. It can last about two days on a full charge. They use that to transmit observations when normal communication lines go down. You can see, the national weather service has millions of pages of directives that govern what we do. All of the directors are hand written up in the wall. Amp up there with duct tape. They are really dedicated staff that work are there. Traditional knowledge plays an important role in resiliency in the Pacific. A lot of risk information is usually found in historical problems, legends, myths, dance and traditional place names. Communications and dissemination, are often tied to traditional knowledge. And there is a lot of local resources that increase resiliency because of their subsistence lifestyle. You know, we lose a house

here, due to a hurricane or flooding, and it takes us a while to rebuild the house because of the politico. Out there a lot of the local building uses local resources and traditional building methods, and they can get their residents up pretty quickly. Food preservation is a another one, just over the years they have learned how to keep food edible, for weeks. By preservation. The greatest example I think of traditional knowledge is the great frigate bird. We hear stories throughout this period the frigate tells of bad weather and Tonga. If you are not familiar with this bird. It is the type of seabird that has things on his feathers and if it gets wet it cannot fly and will sink and parish in the ocean. In Hawaii we call this bird thief, and the word is used because it cannot die for his fish by itself, it waits for other fish and birds to grab fish from the ocean and it steals it from that bird in the air. An important indicator of these birds is when it starts to rain over the ocean. It has to seek shelter. It cannot stay out there so it comes in then. And I'm sure we have a lot of stories about the frigate bird. It is a sign of incoming weather. It is so important throughout the Pacific that the Tonga met service in the Kiribati met service feature the frigate bird in their logo as a sign and symbol of warning. The great frigate bird also appears in the coat of arms and Kiribati national flag. It is a great example of what traditional knowledge can do. What happens if the great frigate birds disappear due to climate change and impacts that you are seeing? I am not going to click on the article, but there is a heat wave off of the West Coast of the U.S. that killed off a lot of the seabirds in the area. What happens if we have something similar? And we lose this source of traditional knowledge this is becoming more important as we see sea level rise. We are starting to see things at present, their historical storytelling in the historical history. We have not seen before. We do not even have a benchmark on historical knowledge. Communication and

dissemination these are traditional forms of communicating risk and warning. The drums and concrete shells in the lower left it was an example from Tonga. They are making cloth. So during these sessions when the women get together to make the cloth, they are talking to each other they are gossiping. These are other forms of traditional communication devices. We still use stone money and some areas that are forms of currency. And my 2 cents on the afford is as much of the risk is tied to water security. That security through water and fresh water is important for hygiene. And security from water, so rising sea levels and other things like tsunamis. What can we do? We are doing it in this room. We need to sustain observing systems that are simple and sustainable and not shiny. There's a lot of projects that come in that install these at sophisticated pieces of equipment, and it two years they are rusting away because we don't have the wherewithal of the resources to maintain them and some of these remote locations. If we can improve these observation systems that drives high resolution modeling as Chip mentioned, and the ultimate goal is it will drive the economy which will pay for resources to build things. Why this is important on the left, is a forecast in observation of sea surface temperatures and sea surface temperatures are anomalies in the greater Pacific. A lot of the countries that we are dealing with are even specs on the map. The forecasts, that provides El Nino and southern observation pages. Come from the climate prediction Center which is over 8000 miles away on the East Coast. So when we talk about the Pacific you need to zoom in to see the countries. Zoom in and see the islands, and zoom in to see the people. These are our NOAA staff in Micronesia. And zoom in see this little guy. All of the work that we do here, all of the work that you are doing here in this room, is to keep the little guy say. When he has to go back and forth to go to class every day. And that is it I want to thank all of you.

[APPLAUSE]
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>> Melissa: Thank you Ray thank you for being a back and centering us and what this is really all about. What we all do. Now with that I will turn it over to Tara Owens, another great partner from you HC Grant and placed in the County of Maui thank you Tara.
>> Tara: Good morning, I guess it is still morning. I am able to share stories from our way. My name is Tara Owens. I am Extension faculty with University of Hawaii Sea Grant program. I focus in coastal processes and coastal resilience. In that extension role, even though the University of Hawaii and the program is based on Oahu, I am based on my way. And I am parted with the County of Maui where the coastal zone management program operates. So we operate at the local level. It is a home rule state. So these players that I work with, they are truly different lines of coastal management. They are the ones having to make decisions every day on how to deal with some of the issues that we have seen in some of the photos that Chip showed you. I am a connection to the community and I am a connection to them. I know, you all, being here and why recognize that is a special place and it is beautiful, and we exhibit this cultural identity. But of course, we have the same issues and may be worse ones of coastal hazards. Then even other places in the world. But because of the magnifying effects of sea level rise, our communities as you have heard, are very aware and active and the mantra on Maui is that we want tools and resources that are community led and government supported. Community led government supported. So I would like to share a few examples of our issues and policies that are coming together. And we have touched on some of these already. So lots of beautiful places like this I healthy wide beach a coastal dune made of plants. Natural buffer to coastal hazards. This is what you might imagine when you think of Hawaii. But of course, we have many scenarios, many

scenarios like this. Where you know we have crumbling infrastructure, where buildings and infrastructure that are eminently threatened and the image here is his danger, Sewall is crumbling. I think our charge collectively is to try to avoid more of this as we go far in the future and that starts with the admissions of your agencies and the things you do in terms of data development, and then getting that into the hands of the planners and making sure that it is implementable so you saw pictures from a Wahoo already. Chip showed feature scenarios. Erosion is widespread in Hawaii. You can say it is even worse on Maui. Chip mentioned subsidence. Because of the combined sea level ride in subsidence, my Wii has the distinction of having the highest rates of sea level rise. The largest amount of base loss. These are images from around the island. And you notice, it is a combination of erosion, and then high wave impacts that really change the face of our shoreline areas. Again building on what Chip said earlier. Because of these issues, it was back in 2014 I think initially. Our state legislature took action. They required what you see on the left inside the Hawaii seal vulnerability and adaptation report. That was released in late 2017. A whole group of partners, UH, Sea grant, they work together on the companion Hawaii sea level rise. And Chip already reference that earlier. You know the beauty of the localized tool is that for the first time it provided a tangible basis. For developing plans and policies. It did just that. I will get to that in a minute. One thing I will mention and Chip already touched on this earlier. There are three ways essentially that sea level rise will affect our coastlines. All three ways are modeled and mapped in that viewer. Including high tide flooding or passive flooding. Annual Highway flooding, and coastal erosion which is not a formal flooding at all but land loss. I find working in the community it is helpful to make the distinction between these different types of price. Because it goes along with the responses and

solutions. What may have surprised all of us to some degree, is how quickly and widely that information was accepted and put into use. So that again it was the end of 2017. Since that time, our local governments have made a ton of headway and terms of applications of this information. So we are you know we are including this in our state and county had sued mitigation plans. On Maui every department from the county was given a directive, and each Public Works, the people who manage rows, environmental management, who deal with wastewater. Two parts that there were parts, they have all undertaken vulnerability assessments to look at how they are, how their resources will be impacted now capital improvement projects will go forward. Now integrated into community plans. These are the plans that direct land use for the next 20-30 years. The one that I will mention in a few minutes, Chip already talked about a little bit but I will bring it back again is how this information is being used in shoreline development setbacks. What I wanted to just emphasize for you, DHS RP, is what would make all of this snowball from the initial legislation, developing tools and products, and applying it and getting it down to the community level. Is partnership. Again, we are a small island community. Nothing gets done, we would have no progress without partnership. So you will see every day won of these projects, it is always a combination of federal, state, local, and university resources coming together. In this case NOAA provided funding for the sea level rise viewer. Through the coastal resilience program. Of course the elevation data we information we have is coming from the federal government. This sea level rise viewer, the counties, rely on this science. And this university -based information as their unbiased source of information. And then it is myself, and I have a whole team of Sea Grant Extension agents across the state and in the Pacific Islands. They are sort of the messengers and conduits to these local communities and decision-makers. Now it is

great to have these nationwide tools that are consistent like the NOAA sea level rise viewer and state like districts statewide consistent tools.
One of my favorite part of being an extension agent as we get to work with the community. We get to see firsthand what the cops issues are, and then try to find ways to help with either data or solutions.
And so, one of the ways that we have done that is through a partnership project, so Melissa if there is any questions about this project they can jump in at some point C grant, the University of Hawaii oceanography team and many others. And so in this case, we want to tailor information for this West Maui committee. So have you been to Maui? You might know this area it is a major resort area and West Maui, so this is an important community. It is an economic center it is a cultural center. What you might not know, it is one of the hardest hit areas is statewide in terms of impact of erosion and sea level rise. Again trying to respond to that issue and make tailor twos. In this case we set out to do two different things. We wanted to develop a wave run up forecast. So this is a site specific forecast for real-time coming six days. In a way of flooding to that looks at future scenarios. It kinda builds upon what is on the sea level rise here that you have already seen. Again, we rely a lot on NOAA tools and data sources that already exist. High gauge data, we have a wave washed three and model data. And just a quick demonstration of how those things work. The sixth day forecast we developed a new localized wave model we are modeling over here. This is a 2D model it is a step up from what we have in the Hawaii sea level rise viewer. Then we were able to, somebody mentioned could outsource earlier. Crowd source data from the community took pictures during high wave events. And we use that to calibrate the model. They turned into a forecast you see the blue line right here. It represents the total water little from tides and waves and sea level. If those water levels reach the red zone means we will probably have impacts in

that area. And for the future scenarios, we are looking at modeling flooding over land. And we look at have options in this view are looking at wave heights. Sea level, and wave exposure or basically wave direction. Again to look at future a more physically accurate numerical model at a finer spatial resolution of this flooding overland from highways going forward. I am going to obviously wrap up quickly. All of this comes down to me from my perspective. How do we help the decision-makers on the ground? How do we respond to these things? We have got this coastal zone management toolbox. We do things like protect, accommodate, through ecosystem -based adaptation or retreat. If you look on the left-hand side, that is sort of a range of options. On one end of the spectrum you might harden the shoreline we do not like to do that is a solution of last resort. On the bottom is to do nothing and let things fall into the ocean and obviously that's not ideal for a lot of reasons. In his focus on the things in the middle. I don't have time to share all the wonderful stories. But I will focus on what came up early. Retreat and setbacks. And this will be my last slide. Pope setbacks in Maui. We have the sea level rise viewer. We have projections of erosion with 3 feet of sea level rise that is the redline on the image. It represents 80% confidence that a property will be safe from erosion of that line. The County of Maui proposes to use that line plus a 40-foot buffer as the new setback. This is now 3-4 years in the making. As Chip says it is not all rosy. There is a lot of folks in the community who support it but there is also land owners and land use attorney to fight it. We will see where it leads. I've already mentioned all of the NOAA support that we get so I will focus on the left-hand side of this side. I was offered the opportunity to share our wish list. And I will a lot of what you already heard particular from Jessica this morning. I reached out to my colleagues across the state and into the islands American Samoa. The main thing is more tied gauges

and more water level information. Now in Samoa, they do not have a working tide gauge, for the last two years. There is a temporary one from the Army Corps of Engineers that will be pulled out of the water. Unless somebody can produce funding to keep it there and maintain it. So my coworker there made a desperate plea on that issue. And also reaps marking where subsidence has been issued. And they cannot do this mapping and modeling like we have without the constraints on that. Joe boat data is coming and one of my coworkers mentioned it would be great to have a regional map level of anomalies since we have interannual and seasonal availability. So thank you very much for hearing me today. I will leave you with a beautiful picture of resilience. This is a restored coastal doing that I worked on. Again thank you for your partnership opportunities it is what it takes out here in the Pacific islands. [APPLAUSE]

dance Melissa: Thank you so much and thanks for reaching out to the other colleagues and C grant that's helpful. Next we have represented learning Arizona State University.

>> So I wanted to take us out of the urban area. And I wanted to share a little bit of the work that we are doing to assess coastal change along rocky and remote shorelines. I am with ASU for now, but I am based in Hawaii. So I am here all of the time. And I get the pleasure of working and some of these places that are very important and that are going to be impacted heavily and are being impacted by changes in climate. But they are often not included in a lot of resource priority assessments. So, I do a lot of work in the lot of remote low lying islands. I share a little bit on Tuesday I believe, about some of the work that we do in that area. This series of islands located to the northwest. There really is a great need for these islands as well as many low-level lying islands across the Pacific. Because many of the featured sea level rise estimates exceed the average estimates of these islands. I will share with you today about the

impacts of not only sea level rise but also storms. It how they can devastate natural farms resiliency. That allowed these islands and these pace desperate places to deep -- to recover. Everybody says the Pacific has limited data, this is even more of an issue when you are dealing with small islands that are low and hard to get to. Again limited access, as well as a lot of the remote reset data which is useful for assessments and analysis, are poorly geo-referenced. It does require people on the ground periodically to help update the quality of these data sources. Some of the solutions that we have been using our line and marine surveys whether it be a diverse survey or drone surveys as well as GPS service. And then trying to get an understanding of the natural resiliency of these places we look at sediment. Try into try -- try to tie in assessments on the island and nearshore areas. On the use of aerial imagery and surveys. So, Ray was talking earlier about our various knowledge sources. And I want to share a proverb with you. As you can see from this image this is an image of an atoll island. Literally it translates to a coral reef that grows into an island. If you were to look at this image, you would see there is a very thin soil layer, and everything within the island itself is carbonate material.

These islands are literally being fed sentiment, pieces of coral, algae, shells, what not from the reef. So the reef is not only a buffer on these islands from storms and wave run up and other things related to climate change. But they are actually feeding the islands with sentiment. When we think about islands himself they are like systems you cannot separate the islands from the reef. They are bio geological factories. Like I said before the reef provides not only a framework that the Allen sits on but they also provide that source of sediment both from the corals as well as from individual organisms like shells. Sources of erosion include not only physical storms and changes in water chemistry, but also things like urchins,

and fish help to naturally erode these areas and transport that sediment so it can feed our islands and it continued to work for them in the future. From changes. So I've mentioned this event on Tuesday the 2018, the category three hurricane for the first time impacted in island north of the tropics. And as you can see from these top images it resulted in the complete loss of both the reef as well as near loss of the island itself. And you can't see it here this island is ease island it was used during World War II by the military. But it has been occupied yearly by field no caps. This was previously home to 95% of the Hawaiian green sea turtles. Which are critically impacted here in Hawaii. As well as an important place for the endangered Hawaiian monk seal. You can see after the hurricane, what was remaining were two small sandy islands. In the island itself was reduced to 5% of its size. Shortly after this, covid-19 happen. And it took us a few years to get back out there to really observe what the recovery process look like and it wasn't until 2021 that we were able to do some follow-up surveys using drones in this area. This area was done by NOAA. You can see through 2021 the island recovered 253%. You can see island recovery is possible at following a huge event such as a hurricane. But what you don't really see until you start looking at the monthly imageries what does this recovery process look like? So, read was pretty hurricane, yellow was immediately following the hurricane, and each year 2019 being a blue, black was 2020 and 20201 being a read. What we see through this recovery process, is we have the island starting to migrate back to her where it previously was. We have this process known as rollover process. We have sediment from this shoreline and transported back onto the other side of the island. And the island is literally rolling or migrating back to where it was. So if you just look at this first pitcher and say this is great. The island came back. But, if you can't imagine people trying to live on this island. What with

that recovery process mean? Trying to live on an island that is moving. We got a short glimpse of that with save the sea turtles and monks see ills. Turtle nest being washed out. Throughout the season they are creating nest on shoreline that are moving. On other islands we saw such as turn this is a man-made engineered island with a runway strip. Used during World War II. We see that here the island was not lost. Instead it was built up. We see that approximately half a meter of sediment was deposited across the island. And this Brown unit on the right was the old soil layer. This as well has impacts on a lot of the assessments of sea level rise for the future. Saying don't worry, islands will grow, as sea level rises because we will have more sediment being thrown on the islands. But again, we see the wave over wash and the sediment deposition. There is also subsequent causes. One of those causes was in this example. Sea turtles were having a hard time nesting, because they could not penetrate or dig their nest beyond the soil there. And then what we looked at the reef itself a pristine proper reef was reduced to rubble and sand. Again, there is a little bit of hope. We see within three years, we are starting to see coral recruits. The real hero of the story have been the binders. So sponges and forms of allergy are starting to bind gravel together allowing small coral to grow on top of them. And then I am just going to go really briefly over rocky and intertidal shorelines. For many of us here say for example Hawaii Island, I know you guys are working on it, but we still don't have a coastal or erosion shoreline assessment like the rest of the islands do. And often times rocky shorelines are overlooked entirely because they are seen as stable features. But they are also very important for local communities as they are places of important fisheries and access points to the ocean. Again, we have limited data and there is gaps in knowledge of how these intertidal habitats will evolve with elevated water levels.
Our lab is trying to take a stab at this using a

multiscale approach. We are still in the beginning stages and it is a funded project we are trying to compile a number of data sets that many of which Noah provides. So we are using satellite data sets as a source of imagery as well as sea surface size and we are trying to tie that in with airborne imagery and elevation data sets provided by ESU. In through those assessments we are looking at what can you see? What can you see from a 10-meter 30-meter resolution image versus a 1 meter aerial image versus a centimeter to 1 millimeter resolution image from drones. And then tying into those water level heights with our tide gauges to help us understand how Hawaii Island is being impacted by sea level rise. Our students have created a vulnerability assessment for Hawaii Island for the County. They have also tried to translate some of the sea surface height maps with the buoys. And this summer our students were able to do some king tide mapping with drones to assess the impact high tide events on our coastal ecosystems. So I will just leave it there.
[APPLAUSE]
>> Melissa: Thank you so much that was a great presentation I learned a lot you have been up to a lot in the past three years. I have not seen you.
So to round out our paneled before we open it up to the Q&A, we have Ed Carlson from the national geodetic survey. He is well-known on the islands. And almost needs no introduction.
>> Edward: Those are all of the language saying hello. Those of the islands that are work and I wanted to say I have been back in the islands sense 2002 working as an advisor. I was born and raised on the islands. I have gone traveling on the islands with my dad when he was in the Navy. He was a part of the 14th naval district and he worked with trust territories at the beginning. So I have been to some of these islands before. One thing that I like to show is my favorite photo that I have in the repertoire it is this photo, which is Cliff who I put on a boat to go survey the Northwest Hawaiian Islands. He is being supervised he's

having his supervisor geologist follow him. Some of the work that we do over the 20 years that NGS is done we've done a lot of work out here. I have done a lot of work with the help of the other parts of the agency. It is we have done work in upgrading the geodetic control and Hawaii American Samoa, Guam, Palau and other areas. What we did is establish high accuracy reference network stations using GPS. We establish geodetic quality leveling networks. Where we got the values from a tight station from co-ops and we would hold that fix. I also trained the personnel on how to use GPS and how to forward this after I left. All of these projects were done with very few people from NGS. It was all local help that we would enlist to help ourselves help with this project and like everybody said Thomas said and Ray said, we always had to go the islands and we always had to do the cultural information first. Like in American Samoa I could not do the leveling until I met with all of the village chiefs and elders. To say that they would allow us to walk through their village. People say that is just the road it's run by American Samoan government you can do whatever you want. No you can't. You can, but it might not be pretty. The other thing you have to do is they have a culture there too. At 6:00 o'clock they have something called Saab. Which is a time for the family to get together and reflect so you're not supposed to be out on the street. So if we were working at six they would ring a bell. All the kids would come in from playing and it would go to the house. And then at 615 or 620 and it would bring it again and we would sit down and wait until that time. So these other things that we have to know and we should know when you go out to these islands to work. And I walked the whole island of Guam doing the leveling. That was over 135 kilometers on Guam and over 165 kilometers in Palau. The other work that we have done, is we are also helping improve the geospatial infrastructure in the territories of Guam in common north Marianas. What we need is we need

to know this for the Pacific plate movement when we do the 2022 data. So we can know what the rotation of the plate is. So we sent, I've had people go out and 2003. They go survey islands and we charted a bow, and we went to all these islands, and I sent to NGS employees, and a NOAA officer on a 58-foot boat and I said go, and have fun, I will see when you get back. There is a theme to this. I sent people, I do not go. I organize. So then we just had reindeer did some work for us too in his last survey that they did so now we will have more information so we can turn determine what the tectonic motion of the plate motion is on the right is what the plate motion was from 2003 2017. Group GR a V-D. Everybody has heard about it we are collecting it across the whole continental United States and the Pacific we have completed 97% in Hawaii. American Samoa we've only done 40% and we are planning to go back in 2023 and 2024. To complete the rest of it. And we have got 82% done this year it went we were out there. We just finished it in April of this year. We are not sure if we are going back if we have to go back and finish the rest of the work that we have done that needed to be done. Mikey can't answer to that better than I can. The future work that we are planning on doing in NGS, is improving the geospatial infrastructure for American Samoa. This will be a joint thing where co-ops installed new tide gauges it was installed 2021. U.S. Corps of Engineers installed the temporary tide gauge and we will work with co-ops to get title elevation. And lidar is going to be done in 2023 and we plan to also when they are doing next year. We plan to do re- leveling the American Samoa Google vertical network that we did in 2002. Since there was an earthquake in 2009. We also planning to install one new continuing operating station that we are continuing to bring back. The reference station at the American power Authority that has been out for two years. I have also helped other parts of NOAA and NOS. I've help with the charts the first project I worked on a 2002 or 2000 when I first came

back out here and then I came back for the advisors ship. Is the northwest Hawaiian Islands project. It is a geodetic chart update and a mapping project. I have done chart updates in American Samoa, I have done chart it dates in Guam and northern Marianas. John Nyberg and I went together and he trained me how to do chart updates and how to reposition a navigation on the charts. I have worked in Palmyra, I have gone down with fish and wildlife to Palmyra to do geo- referencing of their charts. And they submitted that data for special projects at NOAA. I sent John Nyberg on a Coast Guard buoy tender to Jarvis Island and other areas. And these were like I said for all the coast pilots in the chart updates. Also I have worked with co-ops I've helped co-ops and doing observations and all of these ties where they have tide stations and all of these islands. And we have done it to working with and doing the work myself, we get other people to do it when they go to those projects. Midway was done by I talked to people from the weather service into taking the observations for us. And they brought the data back and have process and got it put into our database. High modernization projects. I've done a few of these. If you don't know what height modernization projects are. Is projects we use GPS to determine accurate elevations to 2-5 centimeters. So you don't have to do leveling at every station. I've done the ever playing with the DOT. The downtown area and the international Airport. Guam shoreline I've done the Bay and agate Harbor. With the Bureau of land management gone. Do your U.S. Army Corps of Engineers I assisted them and I trained one of their personnel or two of their personnel on how to do GPS observations. They did the observations on the Guam levees and the harbors in the shoreline protections. And in Saipan and Hawaii harbors in the American Samoa harbors. They sent me the data, and then I processed it and got it put into the database. Other projects we have worked on this is a very important one that I do. This is one that came when I first came to light is

working with the Pacific island water science center. Wells, water is gold here in Hawaii. Very much gold, and what they need to know they need to know the elevation of the wells. So I work with them and I have been working with them over the years in determining the elevation at these wells. From Maui, Hawaii, Molokai, Pearl Harbor, radio, Kawai, Guam, and Saipan. We determined in elevation or a mark for them, and from there they take it and determine how much water is in the aquifer. This is very important. Right now because of the Red Hill disaster. If it was not for them having accurate elevations, and knowing how much water was in the aquifer, because we lost 20% of our water. Isn't that right? 20% with the Red Hill. So the state and that USGS knew enough information, so they knew that they would just say how we have to cut back on water usage so we would have enough water. Ask for voluntary water cutbacks and we have made that goal, so we did not have to have mandatory water restrictions put on. Of course other height modernization products I worked is that Sentinel site that you went to and the Republic of the Marshall Islands, this is a joint project between USGS the University of Guam, us, and RMI. Chip Fletcher was part of it, they wanted to do a use drones to fly to determine DEM till 3 meters. If you want know more about I did the fieldwork he knows the technical stuff of what went on. My job was to position all of the panels and give them elevation so they could process the data. DOT out here is done a lot of work when I first came out I work for them I was under them. They wanted to do leveling and Hawaii the last time we had leveling done on these islands was a 1976. A Big Island has never had a whole level network the only level network we have on the Big Island goes from the harbor all the way up to the observatory. And Maui the last time they had worked on was a 1978. We came out and did the leveling, and for some reason the data never got process. So they contracted out, and we have gotten leveling done on Hawaii, Maui,

and Lanai at this time. It is all on the database. And what they are working on right now is Kawai, and Molokai, and the Big Island. Kawai is under contract right now. And then the last thing that we are working on is a also working on a virtual reference network with GPS. They want to have been on all of the islands it is going to be free to the public or free to the users. And the goal is with this is they will tie all of the sites to the leveling network so they will have a good elevation. And you are doing this work and we hope that you will be able to get with your GPS going out in real time and getting to centimeter accuracy elevations. Other things that happen with management applications.

>> And? We are running out of time. So finish it up.

>> I am, okay, management applications the state of Hawaii is using the elevation data in a car from the leveling work on Maui so it can do a new bypass, and the reason why they want to do the bypasses the need to elevation so they make sure that they have the road outside of the synonymy zone. So they needed the elevations from that. That is a 500 million-dollar project. The other applications that have come up from the tools that we have done when we did the South Coast work. This is an app that you can get from PNC. It shows the vulnerability of the pools in that area and was sea level rise. And it will help with restoration and project managers. Last we had I worked in Guam and we did the leveling we also did work on determining the water line in the bay. With the DLM. And the reason why we did that is because the Department of planning needed to know that because they were having construction being done by a lot of people for new motels and buildings. They want to make sure that the hotels were back where the setbacks were. So they needed to know where they were so they would be within them. In summary, via geodetic bills the geospatial foundation for all charting and mapping and modeling. We start with consistent

spatial reference framework accurate elevations, and water levels enables the user to turn the data into information for planners and decision-makers. Which supports our blue economy. Finally, all of this great work being done by the presented is moot if the sea level rise to what these people are expecting. Thank you.
>> Julie: All right, we are unfortunately running into lunchtime. I know we have become his too. For Paul, thank you so much that was all great. And I am really going to turn it to Paul to see any closing comments on the panel?
>> Paul: No except thank you, those are great activities and efforts and we really appreciate all the time that you shared with the panel thank you.
>> How about you been?
>> Ben: I think I will pass at this point, will have Representative comments later.
>> This is the rapid comment okay for the big picture. Okay great let's open it up to the panel then. And see if anybody has any further discussions or comments? You guys are quiet I guess everybody's getting hungry. Rich and then Larry.
>> Rich: Thank you all for the great presentations. I just want clarity about the American Samoa. So we have a long-term station in Pongo Pongo. In January of 2028 we were notified that you need to move your cage because we are getting ready to destroy the. And we add to have three sanctuaries and weather station personnel pulled the equipment out because that enough time to people there. We had everybody ready go in the equipment ready be shipped. The next month and then all of a sudden covid-19 hit and everything shut down. And it was a two-year gap to we can get it reestablish in September of 21. It was there in time to record the synonymy and so forth. But the other gauge that has been discussed, the three months gauge. We have a deal with the Army Corps of Engineers is they we have a due process form. And continuing that gauge, because of Tsunami concerns his office he very a seismic active area. And so we have been talking behind the scenes

here. We have connected the weather service Tsunami folks because it is there requirement if you want to to continue the gauge for synonymy warmer morning purposes they are the ones with the funding back into that. However we have offered to work with the company to change communications and other things so that if it does get continue, that data can be transmitted more frequently and be accessed directly by the tsunami warning Center. There is a number of things that is going to have to happen here to work out. And is not a good time at the end of the fiscal year that move money and all sorts of things. We are working on that. Thank you.
>> Thanks Rich Larry?
>> Larry: Thanks everybody great presentation at a quick question for Tara. It may help inform our discussion and partnerships later. You talked about the West Maui community toolbox that you put together and that look like a beautiful collaboration between NOAA and the Sea Grant and the community and crowdsourcing and so on. How did that work? Did one of those organizations write a proposal to somebody and get funding for all of it? Did everybody say we will use the funding that we have and contribute our effort and time? I am just curious if this collaboration based on a grant of some sort and overarching grant? Again this organization said this is good will do it.
>> Tara: Good question, I think it started by Melissa -- Melissa and the team coming around as they used to do before covid-19. Talking to people who live on the islands about what their needs and wishes are very kind of like what we are doing here. So I think it was myself, and a couple of the planners that I work with that said it could be really great if we had some better constraints on wave run up and impacts in West Maui. Because that is our problem area. That led to Melissa reaching out when the NOAA resistant grants were still around. And we collaborated on a proposal and then in terms of implementation. Melissa as partners they are at UH, I have partners at the local level.

I think everybody on my Wii has my cell phone number. When we need community support we can't sound the message and we have usually it is dedicated cadre of people who will go out and do that kind of work. So it started with an idea, and we all contributed.
>> There was a new mechanism? Okay thanks.
>> Real quick thank you all of you I just want to hi light we are still actively collecting (Indiscernible) next month and then ask. We really need to get to Midway in order to try to finish with the rest of the monument. Anything you can do to help facilitate that there is a process and everything. But we have plans and intent to finish that work. And (Indiscernible) great panel I have experience with that too.
>> Julie: Alright I believe Ann is online are you there you have a question?
>> Ann: Just a couple of quick observations I lived in coastal New England nobody built on the bench we knew better. I lived in Maui in the mid- 1970s, it is kind is scary to see the highway threatened to disappear. And so close to the ocean and now I am living in Southern California where I listen to the folks in Solana Beach complaining that they won't beef up the bluffs. They built on top of an eroding piece of land in the first place. When a week going to be able to get the attention. I don't know if it is the legislature or the insurance companies or maybe it is the lawyers in this case. To have people stop creating essentially a nuisance that other people then going to have to pay for. We have all of this tremendous data, we have all of this history. On both coasts and throughout the islands, of Haiti, things fall apart when the ocean takes over. And I do not know how to make enough noise to tell people to stop building where you know you are going to get flooded. Whether it is the coast of New England, or the bluffs in Solana Beach. Or right along the edge in the Valley.
>> Julie: That is a little bit what we talked about getting local support and government support. I do

not know if you were in on the discussion, and you were online a little bit earlier. We did address that.
>> Ann: Even more than getting local support, I have been complaining about FEMA for decades because they kind of make it easier for you to live in a hazard zone. And this really ought to be much higher level. Yes local is important, but it really needs to get pushed right back up to the national level because frankly it is coming out of my pocket and your partner too. Because we are paying the taxes to be able to fund these rescue organizations. And until we get the mentality to change, this idea that I can live anywhere I want. I am impervious and I am not impervious the government will take care of me. The government needs to stop taking care of that attitude.
>> Julie: Okay, thank you in. I do not know if anybody Sean do you want to jump in here?
>> I will be real quick I just want to say I thought this was a great group. It is always amazing to me too see similarities that you know are happening in the Pacific. That are happening in the Gulf Coast. A lot of the flood pictures could have been areas that I have been to most of my life. I have seen it, the inner agency discussions and collaborations that is great. We are not on an island but sometimes we feel like we are. Maybe we are in danger of becoming an island at that time. I will have to say, the frigate bird, I mean, the connection to a culture. Across Louisiana, they are referred to as storm birds. Because they show up in storms. We had one just a few years ago where I woke up and open my door and there were a hundred storm birds over as the hurricane was coming through. So those cultural connections are always unique. Thank you all well done.
>> Julie: That was really interesting I am thinking about the town crier and the conch shells giving the warnings or whatever. That gets us back to basics. Okay, is does anyone else have any questions on this? I think we will wait till later, so I think

we are going to wrap up our panel thank you so much.
[APPLAUSE]
I'm glad we find he made it after two and a half years. I can take it out of my e-mail now. Okay, go ahead, you can't get out, we are going to shift into a different thing here so. Please feel free to be excused. We are just going to do a few public comments I believe to wrap up before we break for lunch go ahead Ben.
>> Ben: Lynn do you have the public comments available can you summarize those for us, I think we just have a couple.
>> We had another comment from Robert who shared an Army Corps of Engineers display an argument. For an area in Hawaii, and that will be also in the public comments that will be available for anyone to see and in the meeting report. He did mention there are roughly 80,000 surveys and 800 in the database. And they are updated leak we -- weekly. He thinks it is revolutionary for navigation map, and he wants tran want to consider how they would help support using that. Jackie commented about the recent slow to navigation because of whales. And her fuller comments will be in the meeting notes. I am not sure do you want me it is a pretty long comment. I will just summarize that. Steadfastly opposed to this proposal. Lack of evidence, problems with enforcement, doesn't think there was enough consulting with stakeholders. Does not want slowdown. And additional information. We will share that with our colleagues in fisheries because that is not our area. From Captain Ed Enis about Rich's comment about clinical maintaining data collection stations. Around the Pacific, please consider looking at commercial maritime business is based in Honolulu. That do voyages around the Pacific Islands. They are not well known or do regular service, but they go around often enough to help them carry equipment and maybe even people to these places to conduct work on these stations. Many businesses would be okay with providing the service and charge or fruit or a very low because

since they are going there anyway. The lower Mississippi River timely training needs to continue to rise. In response to -- in response to the NTSB August 9 the necessary accurate (Indiscernible). Three new dogs have been requested in 2022 to be added to charting and has yet to be addressed. Know what -- NOAA chart 11364 as requested change through the finally rule. It has yet to be addressed since it was approved on 2022.
>> I cannot speak for these companies but I know they do it all of the time. If you have a package of equipment or gear that you want to get some remote location and a shipboard tug barge or research special kind of going there or nearby. Throw it on board, you know, it is what they consider an in-kind service. They are helping themselves if they can help you get your stuff out there right? So, even yesterday, they do that stuff all of the time. Whenever there is arcades in Guam he will take stuff out there he will throw a container of things on board a ship and go. There is tugs and barges that go carrying equipment around the line islands down there. They are rebuilding runways and things. There is a sailing vessel that just left Honolulu last night. They just built these little islands all around. Carrying mayonnaise and spam and rice and beer. So there is ways of getting stuff to these places that you want to go to. But I understand you have to figure out who is that and who's doing it? Get a hold of me or Melissa knows too. They are working down there too. There his ways of helping you guys out that is pretty low cost if not three okay?
>> Julie: Thank you. And for those who do not remember that is Captain Enos from yesterday start.
>> I will take a moment to address these comments. First, the comment I would suggest that I believe that was in response to a Federal Register notice. I would recommend to that individual and to anyone else interested in commenting on that. That they provide their comments in response to the Federal Register notice that will ensure that it gets to the

people who are running that process. So we appreciate the comment here. But that is not within this panel or the offices that you advise.
>> And export of that date is extended that 30 days.
>> The last comment about Mississippi charter needs. These are very similar to the commissary received yesterday, and I think we definitely heard that loud and clear. And we are taking that election.
>> If I might say a word on both. You know I know they will help him off line to get that followed up as directed. And then I will be careful what I say but there has been a lot of discussion about the Mississippi River and following similar of what we saw today with interagency cooperation in trying to collectively solve problems. Is I believe in the works and I take their comments personally and this is very important and I know that Noah and different staff has spent a lot of time working with the Pirates and will continue to do so and I thank you for
>> Last call for comments from the audience, public comments. Okay hearing none Julie back to you.
>> Julie: All right we are on lunch break and we have until 1:00 o'clock today. We only have an hour yesterday we had an hour nap. Tony I know that you are going to have a little sub group meeting on the partnership panel right with the group? Okay, so that is great. All right, we will have a lunch that thank you.
[Captioner standing by]
>> Darren: Since I am a panel of one, the camera says I cannot move from the spot I was standing. I want to thank the panel to give me a few minutes to give you guys an update or some updates on what is going on in marine weather in the national weather service. I am Darren right I am a national Marine program manager for the national weather service. If you have not heard, there is some breaking news, I have recently accepted a position as the season marine navigation manager for office of Coast survey.
[APPLAUSE]

I start that position in a few weeks, so probably at the Puerto Rico meeting I will give that update is that of Julia. Today what I want to talk about, are a couple of new things that are happening in marine weather in the weather service and the issue that we are having at the moment. We will start off with whether any nation ambassador programs, -- weather ready nation ambassador program. This is a program where we partner with businesses where we force multipliers for training people on how to handle hazardous weather. But that program was kind of focused on terrestrial hazards not necessarily Marine. So the Marine program created a marine layer to this program. Where we provide training videos, safety information, and this is a way that you can't have a direct tie and feedback with the National Weather Service. We also put out a quarterly newsletter where we provide the latest information on what is going on. Some of this topic that I will talk about here in a minute is a topic that would be in a newsletter. So, you can go to the weather ready nation ambassador website, if you click on the ambassador tab and scroll down to Marine and click on that and that will take you right to this new webpage that has all of this Marine information. You can also sign up to PA weather ready nation ambassador we are looking for businesses and organizations in general. When you get in there there is a form to fill out, and then there is an option for what best applies to your organization if you put Marine or maritime. You will be on a special sublist. So if we have something specifically for mariners, and we send that out we can get that out to you. So radio FA ask, we have an interesting information and then we have hardware and software that converts that weather into a fax signal. And we transmit that out into ships. Well, the contractor that we used to do that conversion from our maps to the fax signal, they went out of business. And they did not tell us. So, so we are doing two things right now. We are kind of doing an informal inquiry on who is

still using radio facts? But at the same time we are still looking to get alternate solutions on creating that signal again. We have partnered with international communities particularly Australia. They are doing this capability, so we are seeing how they are doing it and maybe we will be able to utilize the same hardware and software that they are using. it's a way of getting information as well as the small ships, through primary way of getting it. I don't think this is going away. So don't panic, but if you will pull me aside, off-line and let me know how your folks use this technology or not. It will help us with our assessment. What I really want to focus on, is a new product, it is an experimental product. We need an additional to the coastal waters forecast. Normally we provide only significant wave height as part of that. But using the near short way prediction system which is a weight model within the weather service. That model has the ability to capture waves systems that make up significant wave height. We will start to provide that information. I have a nice video here, it was so well done it explains better than I could I was sure that video with you right now.
[VIDEO PLAYING]
On behalf of the National wave team am excited to have this experiment to the forecast. Before going to the specifics of the experimental coastal water forecast your it is important to a high relate the three characteristics. Always have height, area, and direction. Wave height and direction are basic. The height is out of the wave is from trough to crest. In the direction indicates where the wave is coming from. Not the direction that they are headed towards. It is a little more complicated. Wave.
It is more complicated but is the most important of all characteristics of ways. The simple definition of way. It is how long it takes for two successive wave crests or troughs to fax it as a fixed point in the ocean such as a boy. Wavelength is the distance between two successive drops. Wave. It is also related to other parameters such as wave speed, how

energy it is, and how deep it extends into the ocean. It also influences the size of the breaking waves that you might see at a beach or near inland. One reason the National Weather Service is adding way detailed to the weight forecast. Because it is incredibly common to have multiple coexisting wave systems passing through a particular point in the ocean. All of these different wave groups can have different heights, different variants, and different directions. I must have very different impacts on vessel behavior and wave characteristics in the surf sound. If you don't provide that information we may not provide mariners and beachgoers information that they need, to assign whether it is safe to venture out in a particular vessel or not. Presently most of the National Weather Service office on the East and Gulf Coast only provide significant wave height which is the average of the highest one third of waves at any location. Significant wave height is extremely valuable, but it is not tell us when multiple wave groups are passing through each other at a particular location and also does not tell us vital fundamental things like way. And wave direction. Meanwhile most of the West Coast and Hawaii come up provide wind, wave, as well direction. But they do not provide all of that height and direction of each wave system. This animation shown on the screen is an illustration of what is fairly common across the ocean. Imagine the arrows on this graph are different wave groups that are impacting the sailboat at the same time. Then there is wave group impacting the sailboat politely producing rough conditions, as the boat has waves coming at it from all different directions, and perhaps different heights in different areas as well. Our projects to try to break this information down so mariners know exactly what to expect before the adventure out into the water. Frequent occurrence on the East Coast in the fall is to have a short or mid. Wave from the north and northeast behind a cold front or associate it with a nor'easter. At the same time having a longer. Wave

system from the south east of the cell. Associated with a distant tropical assistant system, such as a hurricane. It is common on the West Coast to have a shortwave system from the Northwestern North associated with the subtropical high pressure in the Pacific, along with longer. Wave systems from the west, northwest, and a south associated with this in activity. The same can be said for Hawaii which has exposure to storms from all different directions that can lead to a variety of made too long. Waves that coincide with the frequent short. Waves associated with local East and northeast Tradewinds. We have learned over the years that different mariners and users care about very different things. So we want to provide the details that you need so you know exactly what you are getting into before you venture out into the ocean. For example small boats especially those with flat bottoms may want to know about short. Waves this is because there flight might be seep in choppy, and that is a capsizing hazard. Meanwhile, other customers may be more interested in long. Ways because they generate shoaling hazards near the coast and inland. Some mariners may care about all of the ways present at any given time at any given location. The point is, when you only provide wave height it can be misleading given that they are may be multiple wave systems with various heights and directions that are occurring simultaneously. As a result the experiment provide you with the current operational version of a coastal water forecast and comparison allow you to view it side-by-side with the proposed version that adds more detail. In the first example shown here you can see the existing forecast on the East Coast that provides significant wave height as sees in the red. In the proposed version in green, which will continue to show the way fight in the wave detail that makes up the significant wave height. It is shown here that is a 5-foot northeast wave at five seconds and a 4-foot Southeast wave at 15 seconds which is a common occurrence. In the next example you can see an existing forecast from

the West Coast, that provides a win wave and swell forecast and read. But the proposed version keeps that information and adds a period in a direction for those waves which are currently labeled as wind waves. It also removes the win wave and swell terminology so we can focus on that important height, Perry, and direction of the individual wave system. We have also added the way fight by popular demand. Which allows us to quickly compare the forecast to what is being observed in the network. Thank you so much for your time and we hope you see the value of the wave detail experiment have a safe and proper his stay at sea.
>> Darren: Yes, that video is done by just some folks on my wave team. It was not professionally done and I was so proud of it I have to show that. Because that explains it a lot better than I could. Anyway that is it, thank you for the time, and if you have any questions about this or anything else please see me afterwards.
>> Julie: You know Mark Willis used to work for a shoreline so they are one of the best forecasters around. So, we now are going to go to our public/private partnership. If you want to go ahead and take your places up here. And Gary, is he online Virginia?
>> Gary: Yes.
>> Julie: Great I'm so glad you're on the line I will that you take it from here. I think I need to apologize to Tony Lavoie first. Because I've been mispronouncing your last name, I just got back from three weeks in France. So I looked at it. Okay sorry.
>> Gary: Thank you Julie, this session on public-private partnership it's really well into with me because in the previous sessions we've heard a lot about partnerships. And so we are going to talk about partnerships under the session and give you some examples. Of some successful partnerships. And I encourage agencies to look at doing public-private partnerships. Before we get started, I will give you an overview of what's, I also serve

on the National geospatial buys advisory committee. A couple years ago, we created a subcommittee of public-private partnership subcommittee. And the result of that subcommittee, was a report in that report was received by December of 2020. The title of it was public/private partnerships SDI through public/private partnership and innovative partnerships. So, not all partnerships that go into the public/pirate definition. But some of them are successful. They are working together and they come up with innovative ways to work together as a team. The report noted the importance of leveraging public/private partnerships as a tool to advance the national spatial data infrastructure. And also DG zero spatial data act it encourages partnerships and that works with state and local governments academia, and the private sector. One of the things that an SDIs goal is nation why of geospatial data. A lot of times that data is available at the state or local level or even private sector. So we were together and partnerships can help fulfill that goal of nationwide data sets. So a report was developed a definition about during the session. We also documented importance of public/private partnerships. And we look at case studies. And different types of data sharing, and a couple for them I am familiar with. When is there program at USGS and the GPS benchmark partnership at the national geode dedicate survey. We owes look at the public-private partnerships and some of the statutory legal considerations that agencies have to work with to develop a public/private partnership. And also provide fiber connections. There is a slide would you show with a link to the report I encourage you to go look at the report. And with that we will turn it over to the panel and I think Tony will be the first presenter.

>> Tony: So good afternoon everybody. So, we have the opportunity to meet this morning the panelists, and have come up with a approach where I will give an overview then I will turn it over to the floor -- Mike D for HSRP members give short presentations and

then Bree will go last to pose a series of questions. I will mention that I am also a member of the national geospatial advisory committee so I serve on that as well. Before I get into the slides which originally did not have slides. Based on this morning's discussion, we thought it would be helpful to put a couple together. From a CDO perspective participating in this meeting I think I mentioned the other day I have been with NOAA for 25 years. The majority of the time is been spent with the ocean surface. But at the past three or four years I moved into the chief office rule I've spent time and is fantastic the past two and a half days hearing what is going on with the primary ocean service data program. And I love the focus on end-users. And the use of NOAA. A full size from a couple presentations last week in the conference that we had. In reference to the discussion over the past couple of days I just want to let you know a little bit of what we are doing within NOAA with building our data foundation. So we have actively involved in building an open data enterprise across the organization. All right, so Gary just mentioned that geospatial data act on the left-hand side so if you happen to have it the federal community this is what the past four or five years have looked like. On the left-hand side you have the evidence act as a piece of legislation that acquired the creation of cheap dating officers within federal agencies so basically it was a senior executive position. Responsible for data governance and data management and policy and workforce and other things. Within the Department of Commerce as you move across, you see a series of documents from the NOAA data strategy Department of Commerce data strategy the new NOAA's strategic plan. A through line for all of these documents is open data. It is all about open science and open data. So in terms of specific NOAA data strategy. Which we passed in 2020 and it was signed off by NOAA leadership. We have five goals in it. But in terms of the vision. It is all about changing the culture in the organization of

valuing data. Thinking about data throughout the entire lifecycle from requirements all the way to archives. It is all about open and equitable access. We have heard so much about getting more of the Hydro data out. And the foundational to is the data strategy and that partnerships are critical .
So the next slide. These are just some of our short-term priorities, so building out a series of within each mission line so the ocean service Assistant Chief data officers who will be the point person within my office. We are developing data governance and policy handbooks. There is been a handbook that there is been discussion when we talk about digital twins. A lot of you use a IML in the organization. We have a NOAA Center for artificial intelligence of recognition is more data comes in we deploy more and more observing platforms that we can continue to operate the data the same way. Somebody said there's not enough grad students out there to process the data from all of the new sensors. So utilizing AI and ML. Developing the workforce that is a huge issue for us. Retaining the workforce as data community becomes more competitive. And then the partnerships. So as you all know she has been actively working in support of NOAA areas. He is working very hard and have the opportunity to work directly with him and supporting some of the outreach to the commercial community. This development of a commercial enterprise he has held over 130 meetings with private sector and government and philanthropy leaders. This week, he was participating in marine technology workshops. In a couple weeks there is going to be one focus on climate and data. This is foundational to his vision for the organization. So I wanted to give, this came up at breakfast I want to touch on and this is an example of the program that is underneath the chief data officer. This is at its core public/private partnership the basic story here eight years ago NOAA said we have a lot of data. We create terabytes of data every day An early a certain percentage of that data makes it into a

final product and makes it out the door, what if we worked with cloud service providers were we provide full and open access to more data that currently makes with that enable cloud service providers, to not only provide access, but also to build their ecosystems their communities spur on the economy and generate new innovation and products? So we have this thing it was called the data program we put out a creative research and development agreed to rent which is one of the mechanism tran one can enter into a play. We have five for companies in one university we at Amazon, Microsoft, IBM, Google in the open comments Consortium. We worked on creating the environment for four years. At the end Amazon Microsoft and Google said you know what we want to continue this. So we continue to work. So in terms of how this truly is a private public partnership. But tran one is providing access to data and access to our scientist. Which it turns out it has been as important if not more important than access to the data. Entry and one we work with all kinds of data, we might think people understand it, whether it is an academic research or private they want to be able to pass the scientists how should I use it? Can I make these assumptions? If I do this is this appropriate and all of that. So by putting the data out in these cloud service providers with Amazon and Microsoft and Google open club programs. It is increasing access to data the data in an environment. Everybody is loot moving to cloud computing anyway. Few people download data. They're bringing their models into these cloud platforms, and that data is provided free of charge. So the cloud service providers agree if we provide the data and access to science they would provide free access if people do not want to download it. But what's in it for Amazon and Microsoft and Google is more people are staying on platforms and doing the computing and data development and service delivery and that's how they recoup their investment. From an equity perspective the bottom left-hand corner democratizing data. So this is

what it looks like. On the left-hand side is that is all the NOAA data we work through data brokers. It is at North Carolina State University. What they do the data leaves our firewall it leaves the protection of the NOAA IT. It the network goes through the data broker and then it goes to the cloud platform. At that point, the data is publicly available and openly available people can come and download it or they can be computed instantly. Just to give you an idea, what these are some of the metrics pages. If you look on the left demographic in the upper right hand corner there is now almost 23 petabytes of data. That's a lot of data. On by any pieties measure that is a lot of data. And you can see is probably tough you to read on this, on the left-hand side that is the data dissemination weekly totals. 1.85 petabytes of data access. So that is to put the bytes of data. There are tremendous use of these products. So this is something that may be HSRP would be interested in learning more about. I have one minute excellent. The next slide, the other thing that I want to mention. I brought it up at breakfast and not everybody was aware of it. Another fact within NOAA -- within NOAA is a science advisory board.

They also have a P3 working group. This working group and the science advisory Board has a broad initiative. But what they are looking at is developing a report around non- monetary e- three. So we look at for what other models might exist. You can see the six models they identify. They're looking at shared technology development. Transition of technologies not surprising given that the science advisory Board has a heavy focus on research operations. They are looking at those to his potential P3 models. And you can read the rest data collection might be interesting. Quick decision-making and workforce development. On the right-hand side is what that final report will deliver. So again these might be interest areas. The next science advisory board meeting is the last day of November beginning of December where I expect

it will get an update. So I would be happy to share with HSRP. I do think that there is some opportunity for collaboration between this is where you mentioned this morning and where the opportunities to align across this. That is it. So thank you all very much, and at this point I will turn it over.
>> Thanks Tony. So we are as you know there is four of us from the piano that are going to give various phases shall we say on the public private partnerships. Lindsay and I will eat it off and we will try to give a quick background and Lindsay will talk a little bit about where we are going before I handed over for more specific examples. So, I am going to be brief, because all I can say about the last presentation is wild. I had no idea that was even going on. And I think that is really important. Because what if we get deeper and deeper into ATP. We realize more and more about examples that are already happening in the breath of all this. So, it is been a point of discussion within the HSRP for several years. Several presenters today have been providing examples and discussion points on the subject. During the past few weeks, these discussions and comments and growing significantly including two sessions over two days during recent UNH see COM annual industrial up her event. Which also others that were participating. It was incredibly open and candid and really productive. But that just got everybody's juices going even more. Which led to us having more internal discussions to be able to get to the point where were you at right now. The main points of those discussions from my point of view of her background was still trying to define what is a PPP, we have lots of examples that grow. Examples of successful PPP within successful government agencies which are endless. Why do we advocate for PPP what are the benefits of all parties involved. And what other hurdles and stoppers preventing us from increasing activities in the storms. We even discussed that is still in the table contractually

what are the limitations, and how to identify that and how do you start to change policy? Collectively, many of us that are members of the HSRP there is now serious momentum building to move or expand on PPP concept and to help achieve significant increase and projects a significant level of two partnerships of participation. In a much broader application of the PPP format across many NOAA offices. The following presentations are designed to demonstrate examples of why we advocate for expanding PPP, what this may mean, and who benefits. On a personal note from me, I think expanding the use of PDP P between various treatment offices and private companies, personnel, and academia. Will generate huge opportunities for efficiencies cooperations and data sharing. Building on the long-standing philosophy of map once used many times. P for is its global initiatives see page 2030 and UN decade of the ocean up on the concepts of their goals can be achieved via global partnerships and countries and companies in a wide variety of modern technology and industry. NOAA is all in on supporting these initiatives and recognizing the benefits. So I say let's grow it domestically as well. Just as one last quick note, when you look before here and you add Gary to the list there's about 200 years of experience. In doing all of this type of stuff. But I don't want to use experience I want to use the term of evolution. And we go back to doing things manually, the very hard way, and going back all the way to dance and all types of data gathering. With remote operations and autonomously et cetera. So I just early Jew to listen. I think there will be a lot of discussion after this. We definitely don't have the answers but every time we open up the topic it is incredible amount of information to the flows also thank you. I will handed over to Lindsay.

>> Lindsay: Thanks Ed, and so the I guess a lot of discussion after this after the meeting up in New Hampshire. It's interesting not having seen the slides. That last line that Tony had it is

different. But it's similar things about technology and how we do that. One of the things that Ed talks about is defining it. It is like why do we need to do it? And I think that is coming from a government perspective. And we need to find that with the companies too the combination of the finding the transparency and what we really mean about that and how does it look at everybody else. Just because it is a public/private partnership what does that mean? Does it include money or not? There was a discussion in New Hampshire about it probably can include money but if it does you really nearly carefully define where it is a partnership and it where it is related to a contract. Or if you cannot do that, what you do them separately? I think that is important and to build a trust across the industry. In the government. What it also means is I think I'm at one of the things that industry and companies whether small business or big business. They partner all of the time. And within that it is part of business planning. To be able to do it for a specific reason because they want to do the job and it is revenue and profit. But there is also a business plan there is all of other reasons and gains in solving regained you want to make. And that is what we were talking about this morning. It is hard to be straight on the financial benefit. I think it's harder from the government side that is my view. How do you do that business planning to see where that gain is? And how do you quantify that. Not only how do you do it? How are you going to marry that up with the partnership and the industries. and whether it is partnerships with that. I think one of the experiences that I had, it is really successful if you can do it properly. And it is still there. So in defining the public-private partnership I hope you do not get. In trying to define it. It may be that is kind of an umbrella of different partnerships as you say SBIR, there is many ways to do it. It is almost setting a guideline of what my qualified so you can call the people. And that is where SAT had a

different model and what they were talking to do. One of the things we don't want to be driven by the technology. And I think we sometimes mentioned the other day we get lost in the technology driving us, where it is trying to meet the goals that we have. But because of that technology it is rapidly evolving. So we need to make sure that we have methods to do that. And I think that is where industry has a short sometimes, the government can have a long-term view as long as that is communicated and what they are trying to do. The industry can sometimes be more flexible. So from a pressure point of view, it is how do we leverage that? And what each of those has in that. What else was there? Yeah sorry and then really the early engagement was something that I think, and again sitting here and seeing Hawaii and the small area and others it is just is it because it is a small and they have a big problem to small solve in a small place there is not many people where they can get together to be very transparent and work together right from the very beginning. And I think that is another area I am not saying the government people don't want to partner. I am saying across the climates that you have to meet make it difficult to make it part a and two will all. Say clearly what you are trying to achieve, and transparently do that without the constraints of other contracting and looking for those vehicles. So I think enabling a way to engage early in the process. I think that was another one that was in the essay. So it keeps coming back. This many may be that we can do it and hopefully with ongoing concessions we can bring it down. Ed and I was saying just think about the services that they provide. That's one area we can look at. But as we discussed it is going to broader and broader. Then what we were doing that I think is a challenge for us coming down with some recommendations it is difficult. To keep focused on thank you.

>> Good afternoon everyone. I was start my presentation, you might see a little bit I apologize

this overlap between the slide is good to repeat some things. So I just want to presents as private industry I just want to convey the way we look at PP, the team for example how we look at it and how we define it. So that is so many forms of PPP, they present all different types of long-term contracts between public and private institutions. It must combine the rest of the public and private sectors with an emphasis on the value of the money and delivering quality services. And here I just want to echo what Lindsay just said. We don't have to limit ourselves or get caught up on how we defined PP, every model is different. Every opportunity is different. We just need to be ready for it. And act upon it. I don't care how you define it. You have to pay attention to the terms of these PPP and the location of all parties. Funding and revenue arrangement must be figured out. The transparently requirements intellectual property protection for example. Conformance, to a performance standard. Those need to be clarified up front. So the experience will be pleasant to everyone. So you see a few definitions in the front here. Private capital financing government projects and services upfront, and then drawing revenues from taxpayers and/or users over the course of the PPP contract. Another one says partnerships between public and private sectors for the purpose of delivering project or service traditionally provided by the public sector or if it is too big, to be handled by the private sector alone. We need the help of the public. So that is a lot of examples of that. That is a good example of this definition. But I really like what the National oceanographic partnership program definition for it. They say to facilitate partnerships between federal agencies, academia, and industry to advance ocean sciences research and education. Through this collaboration federal agencies can level resources to invest in priorities that fall between agencies missions or are too large for any single agency to support. That is a great concept. So it is there for us to follow next slide

please. So why PPP? A partnership between private companies in the government is a win-win situation to all parties. PPP goals are to lower cost, for taxpayers and consumers and/or offer improved services. That makes everybody happy. You get it as a government agency when the taxpayers and use it. The private sector technology and innovation help provide better public services through improved operational efficiencies. Maybe federal agencies or governments have a center for that. The private public sector financial support and incentive for the private sector on time using the budget that PPP can contribute to diversification resulting in a stronger economy as a nation. Using asset government and private allies seeing significant cost savings can be realized along with higher productivity and acquisition efforts. So what is the incentive in costs for the private on the side of the private industry. In these incentives, it can provide business opportunities that may not be exist outside of PPP. And it provides access to public sector vast resources financial and scientific and technical public outreach that is all good for us. As private industry. And it builds the trusts and improve relationships with the public agencies that we work with. You sit with them at the table as a partner this time. You divide the responsibility and risk. As the form of costs that is a criticism. We do have the definition around there is a lot of it and feel about it about the concept. So the concept in some PP I am specifying some not all. The private sector provides public service and assumes huge financial, technical and operational risk in the project. Again in sump PP, the feeling of lack of control due to leadership agreements. Especially not saying it openly and ahead of time. And then in some PPP clashing goals and visions. And then some of these arrangements or partnerships are not mature enough for example when they set for the work. And the possibility of going over budget. That is what the cost or fear of the PPP concept. Next line please. So a good example

to bring to trim one attention. I think NOAA has a great project as PPP but that is recent. And now we are finding any opportunities in aligning goals of the private industry as a user with that of NOAA and OCX charting and navigation missions using current and future fleet mobilizations. So that is what I call informal in fact for the money I thought it should be that. It works, but we thought informal was a betting spittle for your. So I changed it.
So that an innovation happening between NOAA and the private sector I will use a couple of examples contractors for example. It is not really the PPP that we are talking about for example. The example of multibeam survey in remote Alaska. It goes out 70 feet the vessel was mobilized from homework to conduct NOAA task after the cast was completed the vessel immediately transited to I apologize for my pronunciation of that town. To perform a cable crossing survey for a private client. That is the industry benefiting from that. Saving a huge amount of money when you talk about 70-foot multibeam mobilization from remote Alaska to another part of remote Alaska. That is saving, that is definitely it can reflect on the services and the taxpayer benefits next slide please. Another example our operation in the South Pacific. We have operations in the South Pacific for the past several years and we have cap our NOAA point of contact in form of where we are working so the government can utilize and currently deploy their aircraft and sensors instead of mobilizing from the area. That is a new revelation starting that is great next line please.
And another example I keep talking about that you will dig deep into this. Is that the USGS free program might consider it a very successful program. And we can take some lessons from it and what they do is, the maiden agency announcement. It marketing and knocking on the doors of other federal agencies local and state and tribal and private. Who has the money and the need? We are going to fly to this state or this county. And that's how they did it they made it. You see the green cover in the United

States. Multiple times here. So, this agency is about 20% and they go and they do it. And they made it happen. So that is the example we can follow up for our constant mapping. Next line please. I know there's no time here. So, my suggestion for example, what can we do to engage more with the private interest. We can probably transition some of the work we do internally. In the routine things from the science and fire report recommendations. To align with that there are things I move to the contractor and the consultant. But we are not advocating to move everything. Because we need the know-how, so now I need to do some of that activity diversely. And with the ports operation coastal data acquisition and mapping for example. Increasing this outsource for example. And then executing that for example do I have another slider is that it? Is that the end of it? We're not talking about just partnership with contractor in private industry and data acquisition. Technology research and development. Believe it or not the admiral we feel strongly about the role and the value of NOAA and NOAA data and NOAA services in all of life. I can say truly from the bottom of my heart. Without NOAA, the geospatial industry that would clash. Without NGS services in the core and the GPS, it is just an example. So we really truly look at NOAA as the NASA of the universe. Whether you like it or not that's how we look at it. Because nobody else will take care of these things. You have a brain, you have the power of whether oceanic modeling. You have it all. So we just we like to give you all of that support you need. And definitely we can advocate for you whether it is Congress or money. We do everything definitely to make sure that you get what you need for that. So we need to partner with technology for example a company to get something that doesn't exist. Or develop great technology with the help of the government and public money definitely. And that is what we need to extend our support so we have that to go with the manufacturer. I mean, for example 22-foot Marine advance robotics

deployed from the
ship and it ran alongside the ship in a force
multiplication scenario. We need more of that.
Andy and Larry I'm sure they support that. And they
are doing a great job and NOAA is doing a great job
and this is a good example. That is a great example
for forcing this type of technology. I think this
is the last sigh. Thank you very much. Sorry it
took a little bit long.
>> Okay I'm a magnetics. I think we can excite you
with some success stories from USGS. We believe we
will be relevant also to NOAA. And I'm glad to have
the opportunity to brief on this subject. This
starts with the definition from the federal
geographic data committee on what a public-private
partnership is. I want to point out one word at
risk. There is a risk involved in this. And part
of a sensitive partnership is what can we do to
minimize that risk? USGS as succeeded with both
formal and informal public-private partnerships.
They have already showed you this like this is from
the 3D elevation program. Which a number of years
ago USGS decided he needed to have a three T program
to develop quality level line are nation wide. How
do they do that? They did that with a broad agency
announcement. USGS approved 74% of 259 announcement
requests for car sharing between 2015 and 2021. Two
high accuracy and consistency standards. Today
about 90% of the country has been mapped through
that very successful program. So, that is one
success story that I am not going to focus on what
because I think my main message to you is a
successful informal PPP. In 2008 Alaska had never
been mapped at any scale on the national mapping
standard. Nowhere was it map a national map
standard on any scale. They recommended mapping
through clouds and USGS asked them to develop a plan
for the Alaska statewide visual mapping initiative.
I had to subcontractors and we decided that Grote
should do with their one airplane they should do
they area map in blue. With their wider plane and
that Intermec should do three quarters of the

country they had three airplanes with X-band only. So they had assigned areas of responsibility. We just did not know how long it would take. We said initially, we can't wrap the whole state into years if you give us enough money so that we can't map half the state per year in large contiguous blocks. But that large continuous box did not happen. This slide shows you piecemeal matter in which most of the funding was received. Installed non- connected blocks. Totally inefficient you cannot get hear from there and do it efficiently. For example, the two arrows point to the third year in which one of the companies was assigned to small areas. Glacier bait national Park and Copper River, and the company said I cannot go up there and just acquire those two small areas. I got a fill in the gap in between. [Away from mic] we told USGS that and they said you cannot do that. We have not cashed you we do not have money to pay for that. And it is illegal. And they said we are going to do it anyway and he did it anyway, and when all was said and done the whole state of Alaska got map this way, and USGS said we are sure glad you did it that way and you say that tons of money because you did it that way. And after they started to enter mapped in the same thing. And to bury did some of its own speculative maps. This slide shows in pink, the areas that were mapped on . And that pink area is a very large percentage of the total. They had $9.2 million acquiring 71% of this area on speculation. South and east of the yellow line shown there. Enter map risks $11 million acquiring 20 per 6% of his area of speculation. And that was the key to us being able to do the job cost effectively and saving a ton of money. Dewberry also wrist money by hiring the TOA survey to acquire survey check points for QA QC. We did not have the money for, but we knew we were going to need it ultimately and we needed to acquire the checkpoints in an efficient manner so we worked out on an annual basis of what we needed to do to stay a step ahead of USGS, so we invested that. And so the next line please. The public sector table is

on the left that shows the USGS funded about 54% of Alaska. And then other public partners funded 46%. That was a success story in SL. The private sector tables on right show the financial risk by the three companies. Full row risk 9.2 million, Intermec $3,700,000. We had a small part of it because it's mostly these guys. All areas were ultimately funded. The private-sector risk about $21 million completing the project more quickly and cost-effectively and by the way it is a higher quality data if you acquire it in large contiguous parts because if you do it in small plots in different years. You have edge drawing problems from getting the data to match data from prior years. So we get a better quality product by acquiring if it efficiently and it received the American taxpayers an estimated $30 million. By doing what USGS said. USGS was ever so thankful and this was totally informal. Nobody signed any paperwork saying if you do this I will do that. It was totally informal. Based on trust. It I go back to what Bill Thomas said on Tuesday. Relationships move at the speed of trust. This relationship for our informal partnership was based on trust. We were able to minimize that trust because they knew in advance what is very responsibility was going to be. So they knew they were going to come in and do part of that area. So if they took a risk in the area that they knew they were going to get, that minimize the risk for them and ultimately they were paid and ultimately we saved $30 million. It was eight when/win for everybody. And I maintain if NOAA can find some way to talk to your contractors and what area they were ultimately map and funds become available, I would bet that they would be willing to and able to come up with ways to file the data more cost-effectively next line please. This slide shows a blue area in which NOAA funded hydrographic surveys. And I looked at that graphic and I said okay. It is going to cost a lot of money to re- mobilize a ship to pull in the areas in white. I mean, these ships cost 40,000 hours a day to mobilize. And you have to do that to remobilize

in another year to come back and fill the white areas. That is not the efficient way to do it. I maintain that if NOAA had a way of letting some contractor know that ultimately you are going to have the area surrounded by the red box. That they would figure out a way to acquire the data at a lower cost. I'm hoping tran one can think outside the box, of ways to reduce risk so that your contractors will be able to do some things informally to get your data acquired more cost-effectively. So that is my final message, I have one minute left, I will yield that minute.
>> Thanks Dave, yeah, I guess I am wrapping up this session and kind of maybe being a bit of a Debbie downer. Or bring it back to reality a little bit. Sorry about that. But here I am nevertheless. My name is Breanna Elster and I am the chief of the hydrographic survey division in my division is kind of a dated division. We are in charge of acquiring data and assessing that data and ensuring the quality of the data. So, in researching this and being part of this group. I have been in this position for about a year I have been moco survey for about over 19 close to 20. I spoke to a lot of people that were in my position. And had the benefit of being a part of the hydrographic service division as it has evolved. So I will take you down a history lane. A number of people here were part of it. And so, I am looking forward to any comments or discussions that is not in written record. I also want to acknowledge, I am not a lawyer I am not a contract specialist, I am just a high drug for trying to get the work done. That everyone here is describing. Before I get into that, I want to tip my hat to the existing public/private partnerships that exist in hydrographic services. The image on the left is a graphic that indicates throughout the entire production system where there is you know, there is public, there's private, and there is a combination of both. And also, I tip my hat to the Center for coastal mapping the giant hydrographic Center. The Center for Ocean mapping and innovative

technologies. Great partnerships that have ways and mechanisms to partner with industry and academia and the government. Also, you know it is been met you many time cores and ports. And then our IOC and partner that worked to join us all, to help capitalize on bringing resources together, and maximizing the amount of time that we are out acquiring data not mobilizing or demobilizing. Because we get nothing for that and it drives me nuts. So I will leave that there. I also wanted to acknowledge existing support structures for our partnerships. NOAA has a technology partnership office. It also has the National oceanic partnership program, which you guys have already shared. I recently learned that in addition to all of the things listed in the table to the right. That is found and taken directly of the technology partnership office. Noah has prize authority for moonshot objectives. It is new and not captured here. And also recently, OTA, other transaction authority, those were expanded to train one and 2020. And that is an interesting mechanism that I would like to learn more about, and I think this entire body should learn more about but emotionally used by NASA and DOD. So I wanted to at least put that out there, because it's not on the website it is new, it is something that we are exploring. So anyway, I will leave that there and move on. Okay, so went I was asked to speak and I was originally going to go after Tony I was going to talk about the challenges that my office faces. So try to summarize them I group them into three categories. It really comes back to our authorizing statues of hydrographic services and ocean and coastal mapping. To follow on the laws come out, there is language and the laws, and then NOAA or NOS create contracting policies to comply with those statutes. And so I will get into a little bit of that. My presentation gets boring at the pictures are all gone it is just words. But it turns out, words really matter. What is written into law and what is written to policy. Because we get all of these

ideas in the great in their good. But you know, if we don't get that right, and you don't get those interpretations, we all might find ourselves in more risk that we wanted to be in. So, really it is about finding those flexibilities and exercising them, but staying within the bounds of the law. So, you go back to the authorizing statutes. This is not totally comprehensive but primarily the coast and geodetic survey act of 1947. Establish the program that NOAA is the authority for this type of work. And then the hydrographic service improvement act of 1998. And then in zero two NOAA. And then also I'm sorry about the formatting. Ocean and coastal mapping integration act in 2009. When you go through those statues you will learn that those acts, formed this body itself the hydrographic service review panel. It takes establish equality assurance programs within my office. The Atlantic hydrographic branch in the Pacific hydrographic branch. Data against international standards and ensuring that that quality exist. And I think the elevation of the hydrographic specification and deliverables document. It really sort of elevated the profession of high drug of the itself. Of a civil works type of profession. In the zero eight amendment and the coastal mapping integration act of zero nine. It broadened the notion of hydrographic surveys ocean mapping data and establishes a specific hydrographic service account. That we my office, traditionally administers. So you might think why am I focusing on all this? Well about 95% of the money that we have to work with is governed by this. So this is why I am focusing a because you all might think you have all of these good ideas why aren't you doing it? Well, we have limitations. So next line. More specifically drilling down into the HSI A, there is very specific definitions of data versus services. And even further, it drills down into some provisions of how the data should be acquired. It is specifically sites sub chapter six of chapter ten of title ten. What is that? Colloquially it is referred to the act professional

services architecture nature of surveying and mapping. Which is primarily what we do. And following the amendments of zero nine, there was a pre-existing 2006 NOAA contracting policy. It is published in the Federal Register. After the zero eight/zero nine amendment to the HSI A, and then the I referred to it is IOC M act. A follow up policy for NOAA ocean and coastal mapping contracting policy was published in the Federal Register in 2010. That was largely influenced, by the proceedings of this very body back in Duluth Minnesota in 2009. So, tying all of this together and thinking back to the history of the hydrographic contracting program. It is my understanding Andy, Jeff Ferguson and others, if they recollect the first contract was maybe late 1990s An early 2000's. And it was not in ID IQ contract. Meaning architectural and engineering contract where we could decide what the best value was, not just the cheapest contract, but the best value for the government because it is a civil works type of business. And so over time, we started to get a little bit smarter. And the advice of the hydrographic service panel have sort of evolved into what we are today. Now we are at a five-year ID IQ indefinite delivery indefinite quantity contract it has a $250 million searing and we have seven prime contractors on it. Looking back over the last 15 or 20 years, it really has evolved, and we have tried to maximize our flexibilities. To the greatest extent that we can but there is a whole bunch of things that come into play. This is a list of all of them. I'm sure it is not comprehensive. You know, we consulted with general counsel, worked with our partners at acquisition in the grants office. I think to do this as much as we can. I wanted to sort of spend my last minute or so, on questioning whether or not this is the right model or if it is still the right model and kind of remind ourselves what are we trying to do here right? We are trying to map the EEZ. That's a lot to do. Any sonar that does not paying any boat that does not run, any high

drug or for that sits idle, we want to be collectively maximizing the amount of data that we mobilizing and demobilizing. I hate paying those costs. We get nothing for that. With the government gets nothing. Whether it is this sort of bigger program, or you are focused on two contractors that they think I will not get into that. Creating an open environment where legal communications legal competition, legal you know activities where we can communicate needs and requirements and priorities so there is nothing no part of the hydrographic capacity is idle. The other part I want to highlight is open technology. We use see sketch to coordinate our activities. Where we say we all go. But maybe that is not the best entire model. So my time is up I will stop there. Just sort of leave it there. And hope that helps.

>> I would like to add that piece to examples for USGS were done with Brookside contracting. It is all Arctic tech engineer services that were repeated by the different firms. So we were all winners in these contracts.

>> Dave can you expand on how they were able to buy data for that means? Was that specifically in where they could buy data? We can do services, and not incur and buy data?

>> Well, they acquired the USGS spatial products and services contract requires a lot of data. You acquired the raw data and you process it to USGS product specification. Then you make it publicly available. It is all done by Brooks contracts and I know that Wilford is one of lot of Brooks contracts and other firms have as well. I was hoping that NOAA would have some way of signing this firm might do the North Pacific this firm South Pacific this firm Atlantic this firm go, that kind of thing. And we don't know where we going to pay you but ultimately that is going to be your area. Because you have one some form of contract and we may not be able to finish it even. During a five-year contract for example. It may have to be extended into the

following contract. USGS, there is actually expanded Alaska was mad between 2010 and 2020. That was over the span of two different Gypsy contracts.
>> With Gary not here do you want to MC?
>> I was just going to already if you give me a minute Gary?
>> Hello I was having trouble muting. I wanted to see if we had time for questions?
>> It since you cannot see the panel, I thought maybe Ed could lead the questions were there any comas that you wanted to add at the end here before or now before we go into question mode?
>> Gary: No, just good examples, there was opportunities here, we just need to see if we can find the legal avenues to take advantage of that. Not just the private sector but with stakeholders there is a lot of data being collected. That can be utilized by everyone and save money and also provide safety especially for navigation type applications.
>> Julie: Okay thanks Ed want to take it from there.
>> Ed: I would like to thank Gary for making a big staff to get us all organize with his initiative a couple of months ago I guess. Anyway,
>> Thank you so much, great presentation it shows the challenges and where we don't fit together and create challenges. Dave you spoke about risk, and I think that is a key aspect. Especially Commander Hills drum, when you come when you mention, is this the right way? Because we have been doing for so long does not make it right. I want to give you an example of what they are doing. And you have got to think outside the box. Last two and half years, we have seen how supply chains have done on its head. And it is basically upset the way of life. We note that this will continue at least through June next year. So we are looking at that time frame. So what it can do? The second aspect to it, as much as shipping costs have come down by 74%. We have never said that in the winter by 12 100%. Even to date they are sitting at 250% of what they were pre-covid-19. Why am trying to give these numbers?

Is to understand how important your supply chain and planning is. Now consider that in your side. You got 75 contractors, what is your supply chain for future contractors? We have proved it and said repeatedly, it only happens in small businesses and small firms, where you know it is in garage is where it happens. And then it gets picked up. GOG has an amazing program, where it is a requirement for all the prime contractors to take on small businesses under their wing. And mentor them. Into getting innovative contracts. And there is money set aside for that is already happening. The framework is there it is there in the Constitution. So all of the amendments and all the laws are dead. Why cannot we adopt that? Today we have the seven, but maybe we are not looking at the new box what is the unknown of the unknown? That is really the challenge. So I encourage NOAA leadership to be bold in this period and go forward and explore what other agencies have done and learn from them, and then look at that over the horizon. Which will take us to the next level of this. Thank you.
>> I will comment on that I think NOAA has done a pretty good job of bringing in small businesses, unfortunately they get gobbled up by large businesses. Which is exactly what happened in the last couple of years Larry?
>> Larry: Yeah, I just want to offer maybe a positive observation from at least the government side. Having listened over the last two or three days to all of these wonderful examples that we have heard of local partnerships, it seems to me every organization that uses NOAA data really represents a successful partnership. You know, and I think if you dismiss that that is crazy. Think about all of the organizations industry, local, everything we solve. Those organizations whether they acknowledge it or not are dependent on the NOAA data entry and what is a partner. And so you know you you may be able to cover your rear end a little. By saying we have partnerships all over the world. And it is not an active contractual relationship. But by doing

our job and doing it well, if I was writing a paper. And I use NOAA data and I acknowledge tran one is a contributor that's a partner. To my success, and I think it was quite obvious over the last few days that this has happened. And so I think there is a potential positive side and what is going on with this concept of PPP.
>> I just want to comment on what you said, like I mentioned earlier in my comment. I mean, we cannot survive without tran one. But having NOAA collect data and process it and make it available. This is not the kind of partnership we are talking about. We are talking about giving them more influence and more power by not waiting until project available for them to conduct a project. That PPP we are talking about, they could be doing it with only 30% of the cause. And 70 can come from somebody else. That will give them provide them more capability to provide more service and more data.
>> I just want to add on to what Larry just brought up. I think that is an excellent point. I would a send it to say the partnership has enhanced and we have the kind of feedback that we got in the meeting over the past three days. I mean, it is great to know that we put data out there and the people are consuming it. What is more important is when we hear what is working and what is not working so we can fold that back into our product development and future innovation and whatever. It is at dialogue.
>> Is truly the partnership I absolutely agree, and the discussion to be honest we got to the near in the first thing that they said was gosh tran one is our greatest partner. All of the data all the stuff that NOAA provides. It is very different than the models we are talking here. And I don't think we want to get, yes we want to look for other ways to expand partnerships I absolutely agree and increase efficiency and all of that. But we should not the baby out with the bathwater. And say tran one is not partnering because we haven't been able to do that. We should seek out to do that but also acknowledge there are really good partnerships there

and to Anton's point. We have to make sure that those are, we have the kind of comments that we heard in the last few days the people are recognizing that.
>> Truly do you want to say some?
>> Julie: I consider myself a partner of NOAA since 1970. I have to take 2 minutes to say to add on to what Larry is saying. 1978, Scripps through the scenic wave program as actually been sending all of our wave data to and DBC. They send it out it goes to the National Weather Service. It is broadcast, this is so important for us. So the wave map work is 68 of the way breweries around the coastal U.S. are actually these high resolution red Desmet high resolution buoys. Which by the way though but we they handled the feel component but all of the central processing is done at Scripps. And this is so important because to us, we could not exist without that partnership. Because the ultimate and is getting the data out to the Maritime news service. So that but we does not get hit. Because the Coast Guard puts it on the nautical chart. You know they see it on the website. So that is how we can actually eat state functioning is by getting our data through this NOAA network and out to the maritime community. There are eight ports that actually overlap with Rich's port program we have buoys and that goes directly into the port system. Which also is a partnership. Because of course the pilots use that wave data. I work with NOAA several years on these partnerships and there's been many meetings to make this a smooth transpire including we all have to do the same high quality data. We have to have the same standard of process et cetera. But there are ways that we have really me this come together as a contributor to NOAA data. And I actually feel that there are many ways that we can make this partnership work. You said partnership has many flavors to it. And this is just a another flavor that I wanted to point out.
>> Thanks Julie Admiral Evans we will wrap up in a few minutes I did not know if you want to take the

floor?
>> Admiral Evans: I did not raise my hands because I was listening to the conversation. So this may be a little disjointed. But there is a lot here to think about. And I already Bree has not gotten it yet but I sent her a note, saying I want to go into her presentation in more detail when we get back because I haven't dug into that as deeply as I need to. I do want to just to the point that Larry has been echoing around the room. I don't want to dwell on that and I recognize that that is not the primary point of the panel. I will say, and I think most people recognize this. At that open data concept, that NOAA follows, including the hydrographic data, that is not true in a lot of parts of the world. And John and I as I mentioned earlier we were just at the ark Dick regional meeting last week. And there are member states of that commission that don't follow that standard. So I think it is, again I do not want to track from the point of the panel. It's a little bit of a pat on the back for ourselves it is appropriate here. That does enable partnership in a different way than what you are talking about. So I want to acknowledge that. Kind of rewinding from the beginning and thinking back to the conversation at UNH a month ago? About six years ago now I don't know. I just want to reiterate what I think NIC is the clear and important tenants of this PPP concept and I think Lindsay, you touched on this. The notion of shared risk and shared reward. The idea that it is probably unrealistic it to say that these cannot involve the exchange of funds. And the important.while they may involve exchange of funds, the partnership is distinct from a contractual relationship. That is where we get into a lot of trouble. I realize that does not sound very visionary perhaps on my behalf but there is a lot of rest for the government. Frankly a lot of risk for our private sector, contractor partners when we start playing with the rules. And makes those two concepts. And I don't think, we have got to find a

way to say on the right side of that while exercising the maximum flexibility and discretion that we can. And that is the narrow the narrow needle and had that we are trying to thread here. I do, and partially for that, I respectfully, I heard you say at one point maybe we don't need to worry so much about the definition of this? We should just be prepared to take the opportunity as they come. I agree with that the second part of that statement that we need to be ready to take opportunities as they come and understand the full extent of the flexibilities and where those lines are. I do respectfully disagree that we don't need to define it. At least to some level as we understand it within our community. Because as Bree noted words have meaning. Words tend to get tossed around. Particularly when they are frankly buzzwords like PPP. I am worried without the finding extent of the sandbox that we are working in. That we risk again, we get ourselves in potentially risky zones. Or people expect that we will be going to areas where we simply cannot go. I appreciate the sentiment that is behind that. I worry that leaving this totally undefined, just leaves it open to anybody's interpretation. And that's where we have to's have misunderstandings. I can pause there if you like to reflect on there.

>> I totally agree with you, I did not mean to just leave it open ended. If you remember I have 45 bullet points. Those contractual things that is in the definition for each opportunity. You know like defining risk, defining the sharing, define the governor's all of that. I didn't mean it to just lose the term. It has to be within that structure for example to make sure it will be executed right that is all.

>> No, I appreciate that and I may have over interpreted what you were saying there. But I think, I will turn to Julie on this, I think if there is a, if the agents are contemplating a product from this discussion, including those tenants that loose definition or proposed loose

definition would be helpful. So the notion of informal partnerships and Dave I love the story of the Alaska mapping projects. I think, I love the story at the same time but it, it is not what it leads within the rules that we have been given to work with as it was laid out. It is hard for me too see how we would do that? And that is probably a failure of imagination on my part. At the same time, because it worked out so beautifully right? It worked out beautifully, it was informal, nothing was written down. And went I think about well okay maybe we could come up maybe we should be more, one of the notes I wrote down, maybe we need to be more transparent about what our priorities are? What are long-term priorities are. And does that mean that we devote more resources to keep in the Hydro health model updated and publicize? I think that the coordination becomes a challenge there. And if there is an expectation that we are going to ultimately pay for data that is acquired on because our private health model suggested it. But the Hydro health model is a dynamic living model and suddenly the area is required on and is no longer of priority and it's an expectation that we will pay for that. I think it gets risky for us that is one example where I'm not saying it cannot be done we need to figure out how that will work. I have to pause there.
>> USGS knew that they had to map the whole state of Alaska. And then in the final analysis, USGS said they got a better quality product at hefty price. We got it quicker, we change the rules, but it is a win win for everybody and that ought to be a good way for other people to think also think outside the box to say how might we be able to do that and not why can't we do that? Or the reasons why we can't do it, think about what will it take for us to do something like that too. Think outside of the box. That is what we are stating.
>> and showed Julia how we doing for time to make you going?
>> Julie: You know I was just thinking we are

actually at the end of the time for the session the next session is talking about between us and what we want to do for issue papers and whatever. I think if there is no comments
>> There is still comments and I was going to give Gary the wrapup.
>> I think we should continue and I also think it would be a good time to talk with Tony like what do we want to do? What is our O come of this? Okay back to.
>> Yes there is one as you said we did have a number of discussions and one of it was led by ship. Now I am going to say this I think you might you set me up to say this but anyway, I am going to do it and I did not understand. I'm not a contractor I've never noncontract surveys. But there was a number of things about how can we possibly do that. The Hydro health program, and then there is also being the number of areas I don't know what is call will report the coins in for priorities and they put coins where they want to survey mapping done. I think that was seascape or something? But that was just a guidance and everybody knew what it was. But one of the things that I have heard with the hydrographic services is like we have to allocate. It is always pushing the contractor. You have a contract to do that at a certain time. You will going to diss at a certain time why don't we turn that around. If we could define those coins that people put into that, into that priority or the Hydro health. It actually put a value on those piles. And that value can be the priority, it can be how difficult it is. So out in the open ocean it goes right to deep water. You do some calculations of this. This is the ponte system that calls and eco- like a nickel in an acre but this is the way that you do it. And inside okay here it is, and this is our priority for this year. And this is where we wanted. Now, it is sort of like half and not have . You can say you have a year to do this, and then the contract they can't do it when it suits them and is most efficient, and if they want to do

multiple ones down in that area they can put on it and those coins, they know how much it is going to cause and what they will charge. Tran one knows and you benefit for the mobilization. A hybrid of not taking a full list can say we need to map everything. And we probably will never know when we will get the money. The other think that it does is other people go wait a minute, I have already done that. And I have got it in my file drawer I can't make some money on this. I go straight to my file during here it is. And I just have to go to the client. And convince their clients on other jobs to be able to make the date is successful. If we have and save money by doing that it is still available. In the data that is already available. Again, this is trusting the early in that priority and showing people you know what the priorities are, and popping some of the control when they want to do it to them instead of having them allocate those contracts. I don't know if that is possible contractually and how you fit it in. It seems like it is a hybrid of these areas and if you also want to say when you did all of these coin drops that USGS wanted to this area. Okay you guys, inner agency wise don't put the priorities you can put some money in there as well. There is contractual you can do that. That was turning it around a little bit instead of controlling all of the contracts above. They are open and transparent in Hydro and other things and say here is where we needed. When can we do it and when you want to do it. And which areas you want to do it. That was just an idea that was floated
>> As we pay some I will take it one step further. Maybe one of the outside of the box items is don't rent -- make don't look at it as a one year event look at is a five year event. What does NOAA need to do over a particular area in a five-year period that opens up the flexibility for a contractor to say and to choose the time to get it done over that five-year period where it gets done at one point Eric is done over five years as opposed to every single year to go through the whole contractual

obligation. That is just throwing it out there and I guess.
>> I just want to add I want to be fair to Noah. I hope you understand. I am not accusing know what to be in a box. I was discussing in the bar one night when some of you about thinking outside of the box. And they told me but the box is real. We all live in that right? So we are not really saying just to correct that box. We just want the mentality for the future to stay away and the legal way. To fight the circulation and for the benefit of the creativity in the contract. I like Tony Lavoie, of the science advisory board, and the report and I would love to read the report if we have a chance Tony. Share technology development that is what we presented. Collaborative data collection. The transition of technology that is exactly what we are trying to hit. And when you have opportunities, we need to know what to focus on science, on the you know the the area of things that we do not have other than NOAA can solve it for. So move in other words Spring example NASA. NASA spent all of their lights doing rockets. Now they are over to blue origin and space acts, and I was wondering? I was shocked when I heard that. But it is all of a sudden, so probably, I mean, all of us need to do that. Firefighting every day, but focus on the more important thing which is the the science and technology thank you.
>> Okay anyone else on the subject? Go ahead
>> I am not sure if we talked about this, I did not really hear people talking about the data versus services contracts. It feels like that data contract is one that if it was explored a bit more might offer some of these opportunities.
>> That's a good point we're talking about that this morning in terms of it is not just about collecting the data and that's where he got off on the subject of digital twins and his giant databases in the end, and all of the things that you can do with it.
>> I will be defensive about this I actually started the contracting program tran one. It was in the

'90s, because that's when I was there. And it did not come without considerable conflict and anxiety and negotiations and finally accommodation on multiple people's part. We reached where we were through a significant effort and struggle. And it is been very good for the agency and is been very good for the industry. I think we start tinkering with that contracting policy at some peril of reopen some of those wounds and restarting some of that conflict. That is not to say that we cannot think about partnerships, and what we do may be outside of that contracting policy. So there are many opportunities for mutual requirements for data. If you can share the cost of acquisition without going into the contract mechanism per se. And ways we can tinker with the contract mechanism that can up the function of that service and make it more efficient. I think we should focus our PPP on things other than trying to say we have this contracting process that is not efficient. So let's try to redefine that. Let's look at PPP as some other things. Some other opportunities to do things together to meet our common goals. For example they have agreed to run their multi- beams on trances between projects. We are working on volunteer sources of data will we can develop means to test the credibility of those different data sets. And use them for charting. Areas where we can collect this volunteer data and say we thought we needed to do a survey here but everything looks fine so maybe we don't need to do the survey? So that is just my sort of defensive view of the conversation. And I think there are certainly ways to to get into some great public-private partnerships, without spending all of our time poking around at the contracting process. Thanks for hearing me and give me the time.
>> I will add Joyce and I were are on the receiving end of what I would describe as painful. But they had to start someplace. All joking aside I would disagree that that is been 28 years of doing it this way. And maybe it is time to look at doing it a different way. With my own personal experience,

which I am retired now so I do not have to face it. It has become a lot more difficult to deal with the contracting office in the last several years.
>> Right, and I think that is the area that we can work on on the process those kinds of things. You know, and not to throw blame on the contracting office, because they have their constraints. But everybody in the process may be as gotten a little down, and so without without crossing the line into the chance of awarding contracts that will ultimately get paid. I don't think we are in the position that USGS was in and says you know we are going to do Alaska this is a priority we will do the whole state. We have a core door of things, the fishing fleet will go here this year, and you go someplace else next year end that is no longer a priority. So those kind of things can change. So I would say work on the details look for other ways that we do PPP.
>> Thanks Randy, Nathan?
>> Nathan: Yeah just a couple of thoughts. Well actually a question the conversations involving PPP talks here. It about reducing the risk for private and public and cost-effective ways in collecting data on speculation. So my question is, you know and DAC is having the same discussion what is driving the discussion's call, is it a similar type of discussion of data and collection speculation and then just one more comment following up on Andy here. There is a coastal mapping implementation. So there is a program to map Alaska's coast. That could be what is driving some of this discussion. We know we want to get Alaska's coast mapped the most effective way to do that. So yeah, I mean, that is a consideration.
>> So I can speak to the D acquisition was part of the discussion. But I think even a larger part was a different governance model. When you look at the concept of the National spatial dating infrastructure and when the Federal geographic data was created back in the early 1990s. The federal government was to the vast majority of data

development. And funding to be data development. Now you look at who is actually spending and acquiring data in accruing data. It is the private sector, it is academic and his multi levels of government. The challenge is we still got a federal centric model for the an STI. And what we need is a truly national perspective. So the idea of a public/private partnership in the end cap in act data acquisition was everybody has an equitable seat at the table. That was the difference that I have not heard overtly in this discussion. But part of partnership is the Admiral was saying is defining the roles. In defining those roles and responsibilities speaks to governance that is the additional layer there.
>> Ed I think we should wrap up.
>> Ed: Okay Gary we are going to wrap up I'll give it back to you thank you everyone.
>> Gary: Thanks everyone, I think all of the presenters, it and it was a really great discussion on this topic. The goal of the session was to highlight the benefits of E3. Also bring some thought into this of how fellow agencies could utilize this within the current guidelines and rules. But a great discussion and hopefully we can continue this discussion and look for ways that we can take advantage of this.
>> Gary, I think we should think about what the next step is on this? If there was that mention of common conference call with EN DAC and users who have examples of partnerships. Where would you like to go with this now?
>> Gary: Yes, I think we are discussed that, so we just need to sit down and plan that and I think that would be a good opportunity to have the discussion and bring more information.
>> Julie: Okay thank you. All right, thanks to all thank you so much Gary for getting this together. And all of our panel thank you so much.
[APPLAUSE]
's
So we are going to, what do we have we have

35 minutes before break. Let's have Paul Turner come on up. And Paul as been working, he is the acting director of integrated ocean a coastal mapping program. And you will talk a little bit about the SON. I think right? Okay thank you.
>> Paul: Good afternoon on Paul Turner I work with NOAA off co- survey mapping program. Acting program coordinator for IOC M. I am here thank you for inviting me too give a short briefing update on this standard ocean mapping protocol. This is a quick overview slide give a very brief overview of the then no MECA Council enter agency group on ocean and coastal mapping in the strategy and how they go with the standard mapping protocol. The goals and the writing team over the last years worked and getting this all together and we have an overview of chapters in status in the next steps where we are in our process. So here is a slide, just some quick background on the national open -- national ocean mapping expiration counsel. I'm sure you're familiar with the Council a quick update on overview on the net it was established to coordinate federal agency policy and actions needed to advance ocean mapping and expiration also to support characterization and to support collaboration within the government and outside stakeholders. The Council reports to the ocean science and technology subcommittee. Which provide support and guidance for the Council as well. On the Council are members of from IW GOC M interagency working group ocean coastal mapping. And that particular working group reports to OST and the gnomic counsel. There is three cochairs I am interim cochair for now until Ashley returns. That was stood up in 2006, and to facilitate coordination of ocean coastal mapping heavy reliance on lidar and integration of ocean mapping. In the activities to coordinate with Federal and nonfederal. So we will work a lot with the various federal agencies. But also partner with state academia, and private industry. There is a link at the bottom with more information on that. The reason why I wanted to explain about these

elements here it is how it is connected with the standard protocols. It is actually a component of the NOMEC strategy. Which are five main strategies the goals within the strategy is sub go 2.1 under goal number two is map the United States easy. And establish a standard ocean mapping protocols. We convened a group that is largely made up from the IW G and supporting subject matter experts within that and that is the rating team. I certainly didn't raise this myself. Our team was about 50 or so members. From the different disciplines within the mapping protocol which I will talk about in a second period and we each broke up into our own industry sort of speak. It wrote the different chapters. Here are seven primary chapters. Which we will go through here in a few minutes. The basis behind writing standardization method protocols was to leverage the expertise within the field of ocean and coastal mapping across sectors for government and outside of the federal government. We kind of pulled together leverage various existing standards and procedures that are already in place. To better maximize and incentivize more efficient acquisition and processing. We will talk about acquisition it is a whole another side to that. Which is the processing and archiving our access. And that is also a big element for the mapping protocol. As I got ahead of myself with the rating team is put together with subject matter experts from other federal agencies within the IW G OC M. These are the seven primary chapters. So an introduction in a summary before then these are seven primary was data management, bathymetry, backscatter, while a calm, side scan sonar, sub bottom and magnetometer. And the next couple of slides will have a summation of each one. I have to forewarn you the next two slides are for pretty wordy I will not read them verbatim. We will start with data management methods that was that chapter focuses on best management practices for data management and metadata format and archiving processes. Within this chapter we reference NOAA environmental

information as the primary data archive. That team worked largely was made up from representatives from NCI who wrote that. Bathymetry chapter you can see here some of the components of that. The next six are largely structured around data collection and processing and configuration and some of the QA QC techniques and procedures. They largely already lean on existing standards that the industry already uses. And we identify that in each chapter. So we are not necessarily reinventing anything or changing up anything. More or less putting all of these together into one document and resource. The backscatter chapter was actually the most challenging of all of them. Which was surprising, we went back and forth for a while trying to decide on the best method for putting them together and in the end we kind of coalesced around 42 to backs data working group in the seafloor mapping guidelines and conditions. That is the authoritative source for backscatter and directing the regions to that there is source of best practices for backscatter acquisition. I have to admit this slide induces a copy and paste here. The water column section it does system configuration calibration operation frequencies and whatnot. However, it focuses more on detection and observation in exploration of water columns. It has two primary focuses one is on water column logged during high Pro survey and operations. That also includes restoration and characterization. And water column logged during fishery surveys. (Indiscernible)
We had a chapter on side scan and that references some of the specs from the hydrographic service packs. I know resources are heavy on hydrographic surveying. The practices and methods within there as well. That brings us to our next steps. We have written it is gone through one review cycle with the Council. And it has come back to the writing team and we incorporated all of the feedback. We have run into a little bit of a lag here. We have 50 people writing this and we have to get down to one voice and then format it into the correct format for

to get through the review cycle. So we are partnering with science technology and policy Institute. And they will look at it and look at it on October two to get an editorial view and I will get into the correct format. Following that we will send it through for review and we will incorporate their feedback and after all of that we will posted for general registry notice with a 60-90 day release. At which point we will also share it with other working groups outside of the federal government for their input as well. And we would like to request comment from HS RP members. We really would appreciate feedback and recommendations from HS RP members and we will wait for the FRN.
>> Thank you very much Paul it is great to have an update on that does anybody have any comment do we have for one question or comment I already see to it and Lindsay. I see three let's just go for it.
>> Thank you Paul, I am just wondering is this the work with together about (Indiscernible) I hear you guys are working together
>> So that section
>> Is any private industry or academia involved?
>> Not on the initial draft but we once we get it through zero STP, we will ask for public comment outside. The public comment with all respect for it, and national development it really has very slight influence on changing the way you go with it if any. I mean, I will I would like to see like you include academia, and then industry. Especially in manufacturing. A lot of the information you are trying to gather, they are the one who knows the most. So it would be nice, and that is the kind of corporation that we would like to open up. Because this is probably outside the box we are talking about. Coming up with specification can be a joint venture it is nonpaid volunteering. And that is how we do it. But you have everybody around the table to develop work for the nation, I think they could benefit from that wealth of information and bring academia into it and then industry and then your experience and knowledge that's all I have thank

you.
>> I think that is a recurring theme that the HS RP feels on other publications also that have come up that is nice to be in on the beginning is nice to be in on the discussions because there is so much expertise out there in the community. And people have already done this a lot, already have these manuals started. And so if there is a way that can be you know, involved with experts at the beginning outside of NOAA. I think that is one of the comments that keeps coming up. Look at that, don't answer me right now let me go to the other do questions and then I will give you a chance. Just because we are running short of time.
>> Thanks thanks for this Paul, I am going to reiterate some of the things that was said. Especially in this context of moving away from hydraulic or fee NGO sensors and all of that. I feel the industry is so far of anything NOAA and USGS is doing. It is critical to get industry involved now, long before these other decisions are being made. I completely agree with but Julie and Qassim said. You are a messages stepping into this. And have been quite animated in our response is to return to get in on the front end of it now that we move into territory where again, my mind industry is so far of headed by a else it is crazy not to have them in there. Thanks.
>> You are the messenger and we understand we are knocking up on you here. It is something I think that is particularly after the public-private partnership meeting is one of the things we talked about his trust and building that initially. We understand that there was regulations that stop apparently stop the industry and academia being involved in this. But I think it is a good example of like, because there was no money involved in this, it just seemed the industry view on this is like it there should've been more effort made by it not you but the individual I'm not saying but generally with that, all of the agencies to say hang on a minute. And all MEC required industry

participation in this. And it is in the paper that we put in there right from the start. We do look forward to seeing it and commenting. But I understand it is big, and it is just it puts how big it is for 60 days, to realize it one of the reasons is why it is going to be real work from somebody in the industry and all of those industries to actually review it. And then where it is at a contribution it could have taken less time and once it is into this. The industry review will review it. But is it really going to change? That is our beef I guess and we understand you are the messenger but that is the kind of and related to public private partnership it is build a trust in the beginning I think is important for all of this thank you.
>> Okay go ahead.
>> I don't really necessarily want to pile on. Working in Alaska so many times I see this where, I mean, there is specifications that Jews do not work for the state and cannot be met and so getting input on those protocols ahead of time is so valuable.
>> I can't say we did not rewrite how to go about doing this. We just more of less pulling together already existing industry standards that is a focal.to one document. And really focusing on it is based around to pull it all together in the way that it is more accessible. It under some common agreed-upon formatting framework that can be reused more than once and also fully recognizing that there is always going to be specific operations that we don't want to deter from or detract from. With the other 93% of operations are specific to one data acquisition. It could be more collaborative in nature and more coordinated to be able to use it. And that is the basis behind bringing us together we want to exclude we did not want to exclude academia or private industry. However as was brought up earlier there is definitely things that we have to maintain around for legal reasons and for optics. And that was one of the reasons legally that was primarily but also optics was another to have the federal working group into coastal mapping. And

lead the effort in writing this for the national ocean mapping characterization strategy. I know I hear your frustrations and I appreciate that and I am I don't know what else to say. It is not final we were looking for as much comment and I totally welcome your feedback and comments. The more the merrier I would rather have people provide you know legitimate feedback and you go back and rework things if it is necessary. We have done that already once. That is a pretty big standard for the first go around. Around revisions and comments from the Council. So I definitely welcome any and all feedback and comments that people would like to have incorporated into that. And I look forward to hearing from you.
>> I think I would just close the discussion by saying I appreciate Paul providing the update. Taking the difficulty back, and I think we will close it there thank you.
>> Thanks a lot Paul that was great.
[APPLAUSE]
Okay why don't we take a break, and then we can come back and reconvene. What time is it? Let's do 3:30 p.m.
[Captioner standing by]
>> All right, we have some interesting things coming up at the end. Of today Qassim are you ready to talk about the technology working with the digital twin? Okay you know what, our team here actually has their resilience paper up first. Let's do that first I want to let you know the panel know that Amanda took a stab at reducing down the seven lines that were over. So what we have now, is a revision of what you wrote and sent to everyone this morning Nicole. Zero this is the one that you sent,
>> We have another iteration since Amanda's. So this is everything. Everything is now incorporated now including a mantis.
>> Okay I did not know if you are up on that or not? Do you want to go ahead and take a minute and talk about it.
>> Sure, as you may recall this is actually an edit of our previous paper and it is what was a call

before? So we change the name to coastal resilience and made some significant changes. While trying to kind of keep the spirit of that original paper. So the definition in the beginning as I mentioned incorporates short and long-term impacts. And coastal hazards are defined, and then sort of the recommendation therein pole. You can read that one basically it encourages tran one to play a more proactive role. In addressing the threat of resilience related issues through prioritizing investment Inc. coastal hydrographic data in gathering and dissemination. Then Nathan reminded me today we should define what coastal hydrographic data art which is in the third sentence there. Then we go into the background of why this is important, we did really appreciate all of your comments, and we got lots of great examples of coastal resilience around the nation but the paper was six pages long. So we unfortunately had to take all of those L. And page number two gets into a little bit more about you know, why do we need to collect the hydrographic data that we are recommending. The list of recommendations again, is sort of massage of what we see in the paper. And what we have here is the consolidated probably from the list of you remember it reviewing initially. Also I added where there were repetitions and redundancies I've added in things that were discussed over the course of this week's including this resilient session.
>> Thanks Nicole like Nicole said I really appreciated all of the comments and Ed thanks for getting this up off of the ground and getting this going. So we would like to submit this paper with our administrative letter, I don't know if you really have, certainly you have not read this latest version which has a few words different. But I think, in general, we need to agree or not agree, if anybody has any comments, or questions about this? Or, if you are good with submitting this minor edits are fine. We can go back in here and make minor edits, and we will definitely read it through a few more times. And also at a graphic to it. But let's

see, I think we will just go around the room and make sure everybody is good with the concept here?
>> I am fine with that thank you.
>> I think this is great
>> I have nothing to add is so far out my area of expertise we did talk so much it would be nice in our letter if we tie a specific reference into
>> That is a good idea. Dave?
>> Dave: I concur and for the work of the project I concur.
>> Likewise thank you Nicole great day.
>> Rich did you have a common you want to make?
>> Rich: First I had three major comments so we you addressed all of them that is great but the one minor comment I would have on that first bullet I was a sustained and expand. We are having a hard time keeping all that we have right now. And then you might want to just add into critical capture like after the ports fill critical gaps and go on to state leverage existing yada yada.
>> And then critical. Second line down,
>> Right after it says ports. Critical maps.
>> The, I think what he is saying after real-time system, fill critical gaps.
>> To fill critical gaps.
>> To fill critical gaps. Perfect, okay good suggestion.
>> And Julie can I get one more?
>> Of course.
>> All right, I have not read it in detail, but this morning what we were talking about PPP, we made a comment internally that you can be close coastal resilience without digital 20.
>> Okay, let me just say we, Qassim added we did not take it out completely.
>> It is still in there twice but we did take the bullet out on it. I felt you know we are going to have and talk about more at that next public meeting. And at some of our.
>> Just having the words and there is good.
>> Okay, all right. Let's see Alex?
>> That was great work from the group, and I agree

with it.
>> Sean?
>> So icy like a couple of real minor tweets if you people up like the first page like the second paragraph. And I know we said we can do minor adjustments. I think, it here we are saying on the second page we say topo bathymetric by it are I think we should be consistent there. I think there is a word missing coastal hydrographic data. You know just a couple of real minor tweaks like that. Which I don't want to tie up, but I would happy to share. Assuming that is the latest version?
>> To get the language is consistent with appropriations we want to say the same language over and over again is because of it does not say the same language gets redirected.
>> Julianna actually submitted to say is it topo graphic? Remember she had a comment on that.
>> From what we saw especially today and all of the leveling. Effort involved for this very long island for example. I mean, I know we focus here on the cause and the support of the cause. And the modernization of that so should we mention about the continued support for the leveling efforts around this island? It sounds like very important to me.
>> Right, that will be we always send that letter to the administrator we have always had some bullet that is to that effect. Not just around the islands but you can you do support. Of the base stations. So you are thinking that we should add it to this too? Can you go down to the recommendations at the bottom of the bullets please. Do we have something? Continue to sustain and modernize. The national spatial reference system. I do not know if that is exactly where that should go.
>> Maintain and modernize.
>> We need that bullet to emphasize the importance of accurate and periodical of this island. I mean, I can't help with that.
>> Do you want to just send look at the recommendations and send in some wording? Okay? Nathan?

>> Yeah I just wanted to with the edition of the riches comment. Critical gaps, I just want us to consider I mean we want to fill all caps it we just don't want to fill critical gaps so that is something for us to consider we want to have that in there. Specifically.
>> Right, I guess again it is a definition of what is critical. To me critical can be underrepresented communities as well as this is where we get into this thing. That I would consider them critical. That's how they get the fuel and supplies.
>> I like to comment one less word in its fill gaps. I am also tracking the edits so we compare notes after.
>> I was the first recommendation let's go down to the second page. That first bullet.
>> All right, are you okay with that rich?
>> Yes, I understand if it adds more to the paper that makes sense. It leaves interpretations of what is critical with the comment.
>> Does anybody else have a comment on the Sean?
>> So the other, there is another minor change I would be happy to just kind of note with. I think it is talking about multiple analysis agree that climate change is making these storms more intense. I think may be producing a little tweaking of the language there would be it is in the intergovernmental panel on the first page.
>> First page second paragraph under the bullet.
>> , climate change is making these storms more intense. Producing more intense storms.
>> Is the second do you see it is the second sentence. It is
>> Generating something.
>> You know I actually had okay go ahead. Just highlight it. Go up to the top again. The area word says we should have the alignment with topo bathymetric use later.
One is you just highlight it and we will standardize it. Okay, so I think everyone has improved it with minor edits. So we will, unless you want to say anything about it no okay. So I think we have moved

on past that. I'm sorry?
>> Sent it is to who?
>> To Lynn and Nicole. And Virginia I think. And Amanda. If you send them to Nicole that you will
>> Send it to me and Linda.
>> All right, I think we are ready for the digital twin discussion now so let's move on to that. Is there anyone that does not agree? I just went around the room, so I think everybody said yes with minor edits.
>> I was out of the room but I do agree with that.
>> Thank you, and actually I did not as durable people to but I'm sure everybody's on. Ann are you still there? And Gary is on still? Are you self muted?
>> You know what for the remote people we will send them a note, and say this is the update do we have your approval.
>> You just got mine so go for it this is clean come up much better than the first version.
>> Okay thank you.
>> This is Gary I am good with her too.
>> Thanks Gary. Over to you Qassim.
>> Qassim: Good afternoon, we are the technology within HSRP. We have been talking about it a lot among the group the technology group. We are excited about the topic for the following reason. For some of you who are not familiar this is the background. In that is the beauty of this high solution data. It shows you the ocean or the river bottom or the lake bottom. There is a lot of details can be preserved and that's what we are going to transition to the digital twin when you have something like that. So the digital twin some of you heard about it just recently, we have been hearing about it for probably during the last decade, but with all of the wrong reason we hear about it, the wrong definition for it. Because what we thought digital twin what people thought about digital twin it is a 3D model. At when we talk to people in investors and users, it doesn't not make sense for them to put out that much money to collect

a 3D model where you can. They don't see value. And they are right about that. That is our understanding but in the last few years, as a stronger wave can pushing digital twin, the adaptation went really fast. And because digital twin is not like what we thought. So I will define it as a dynamic up to date replica or representation of a physical object, an asset, or system. Anything this could be ocean, the entire earth. You could work on the entire earth, it could be an ocean for example it could be the ship that we visited or any asset definitely. With a complete collection of data in one place, it evolves with the flow of real time from sensors and more. And that is the difference between the long understanding, the one we said before. Versus this is a lively up to date physical environment. I mean, like if you are doing it on a ship, you have not just a 3D model but you have all your instruments there and your maps. You have a sensor, what is your temperature what is the humidity? What ever you measure is feeding into it at real time. It makes it really really good management of anything. So, you manage things virtually with that replica on the physical environment. It is not static 3D model again or simulation, it will continue to evolve with added data and information. Connection between digital and physical words offer enhanced lifecycles and informed decision-making's and protective capability. So here just to show the benefit and the life cycle. Again, what the project of asset could be anything you know. So if you have a project from planning to design, to building, to operation it is a continued cycle. And the experts say the investment on digital twin, 70% can on the operation and management of the project after completion. So, because it is so valuable for the asset manager, and that could be now for example for the project. So hearing just on the left is a list of some high level advantage. Operation readiness, lifecycle, with the use of maintenance a performance data and that is when we talk about think about it

as as it ocean way for example. This applies to it definitely. Want to digital data over project design and model. You don't want it in the file, that is the use of digital twin. A lot of the data still transfers on how to describe and sit on somebody's desk for months or years. Before it can be used. While with this concept, you throw it in, on the cloud could be with the best solution and it can be shared and used and updated all of the time. With digital twin approach analog and classified and disconnected data present challenges for owners. And managers without that. It assets connection between digital and physical worlds offer enhanced lifecycles, informed decision-making capabilities. This slide I stole it with his permission. Because I thought it was a great want to talk about what we are here for. The ocean, and how the digital twin looks like that. So you see it here on the right is a physical digital replica of the real ocean for example on the left. So the decision in visualization model and sensor data observation outcome. You can tell the decision-making in the management of this in a beautiful way. So the challenges in the industry is facing with it and the rewards of course. Not enough outreach and education to highlight the collective benefits of the concept to convince users to invest in such concepts. Especially on the geospatial and mapping industry. The concept is used a lot in industry and the big company IBM and thinks. They manage a lot of their projects with this concept now. And they have there is a digital insertion as a global thing is a big thing so if you have a chance to visit their website definitely you will get a lot of pressure. Our message should be digital twin not a static 3D model. Although it is slow, a large number of go agencies including the United Nations are realizing the return on investment and are willing to invest in building the digital twin for earth, ocean, and coastlines et cetera. NOAA has a great opportunity to offer their services data collection, data modeling, and data management. To

serve their clients by building digital twin for our coastlines and oceans for bettors data accessibility, better decision-making, and asset management. The problem is my last slide. Thank you.
>> Thanks Qassim, does anybody have a questionnaire? Yes?
>> I was add to it, take two critical real-time applications. All of us look concordia of the disaster that happened. Passenger companies and I'll try to replicate the live bridge. And from short manage it with safeguards, where the pistol twin of the navigation side has been real-time monitored with interventions. So that is number one. In today's terms, we have been talking about autonomous shipping. The foundation is distilled 20, so whether we look at a fully autonomous independent vessel or we are talking about a train concept, lead vessel is manned with three vessels behind it are autonomous. As a train, all of them are based on the distilled concept. It is already there, we can adopt it by saying we have a port model for top for a port. We have the pistol twin sitting, we know there is a stone comment we can model it, we have real-time data, we have real-time monitoring, we have modeled it before, we can see where the gap is, it helps us get a modeling more accurate. And real-time information in real-time actions. So there is lots of practical applications on a macro scale, it is the Globe and the earth and everything on a larger scale. But we can work with it and take one piece at a time, which may be a little bit easier to work it forward.
>> Julie if I may add, what in it showed us is eye-opening definitely. We are almost there with the dashboard data. We just need to move its to that concept. Too not say like we are here, let's just put it there. Because with the dashboard and the rendition and all of the day that we can add the weather, we can add whatever there is there. At that is for this island. And resilience is a great approach to have real time observations. So

citizens can go anytime on that website. And they can't read anything they want to read about our community, about their houses about the weather and so on thank you.
>> I think Tony is moving in place here.
>> Circling for a microphone. I just wanted to mention that two weeks ago I mentioned we have the NOAA Center for artificial intelligence. Two weeks ago we held the annual workshop so I think we had 750-800 attendees it was well attended. And external partners as well as tran one. There was three focus areas for the workshop, and one of them was in are operable digital twin Earth.
Specifically focused on tran one roll looking at the development of international standard to ensure digital twin are interoperable and easily integrated into other digital twin systems for that system. So what HSRP is talking about is something that is currently being discussed within tran one. This would be something the HSRP would be interested in and I could arrange for a briefing and one of the monthly meetings. But yes, it is open data right?
It is open data, its interoperability its standards.
>> Right, and I think we kind of table of it for a session at this particular meeting, because we have so much already planned. But we would like to get it on for our next public meeting, so that is one thing, we will definitely coordinate with you.
Then, we will probably have an update on one of our calls too. Because that meeting is at the end of February and if we have time we might do something on one of those calls too. But we know that it is becoming a hot topic been did you want to say anything about it?
>> Ben: I think that this is interesting. I think it in some respects we are closer to this than we realize we are not ecology a digital twin. I recall back in the spring, Sean took Bree and Julie and I to visit one of the pilot training centers maritime parlor training centers in his neck of the was.
Were they were incorporating NOAA's S100 data and as available in this particular case it was the S102

high resolution. But much higher resolution data then it would typically be available to a standard simulator. Using that to model and do risk assessment on vessel transit is particularly tight vessel transits. But it struck me at the time, that this is pretty close to what the concept you played out. It not be as overarching and it may not incorporate real-time data, but it is incorporating simulated situations exactly. Exactly, and for a come up for a application that is very close to our it directly in our warehouse, but nobody is calling that a digital twin.
>> Right, I thought the same thing, pieces of this have actually been done and many of our programs, but it has not really been this integrated. This name of digital twin before. So yes, we will follow up with that thank you Qassim for for bringing that to our attention. Nathan, we actually had a working group on the HSRP, and I do not know if it is something that you would like to reinitiate, and if you have any words to say about that?
>> Nathan: In your packet materials we had a one page of digital twins it has a link to great resources in an article that Qassim wrote and examples from digital twin ports around the country. Digital twins coastal communities to model them for resilience. So if you can't wrap your brain around it check out some of those resources. It is in the electronic folders that you have.
>> Great thank you very much I'm glad. My, I see you are leaving, I know you are sneaking out. But we just want to say thank you for your help, and actually Julianne appreciate you sending it forward. Bon voyage. Okay, back to you Nathan.
>> Yes, I don't have much to add, other than I recently found out that I was the chair of the working group. So yes, I am getting my feet wet with that one. I did reach out to the two previous chairs and I will be meeting with them next month. To get a little background on that.
>> Really it is just that we know that things, and it was this think that Arctic Alaska. I think we

decided it was really Alaska and in the Arctic there is a lot happening. Only Arctic? Thank you for setting me straight. It is only Arctic we know there is a lot happening up there.
>> The definition of art that covers a lot of states.
>> All right thank you, can't we have the priorities matrix? So I think the first meeting in Miami I found out up planning and engagement group and somehow that became cochair. But Dave has been heading that committee for eight years. And I want to acknowledge Dave right now. Because Dave will be turning out to this committee and this is his last full committee. Awful meeting. So I really wanted to say thank you, and I know we all appreciate your input and your expertise. At we will do our best to pursue with the issue papers. So I think we should give them a round of applause.
[APPLAUSE]
>> I would like to add, this obviously we have not had much chance to work together but, I definitely appreciated here. Your focus on the issue paper your focus on making helping the HS RP be output oriented and action oriented I think that is really critical, I do also want to read before he slipped out Mike sent me some words that he wanted me too specifically share with you. And I echoed these. But I will be here. We would like to recognize service to the HS RP for the past eight years he is a national treasure to the community by his service in the U.S. Army and director of the Army topographic engineering center. Offering and co-authoring major positioning accuracy standards and guidelines and specifications for several major U.S. governmental geospatial programs. As an important leading and pushing the HS RP to develop issue papers and to thrive and focus the panels priorities its recommendations to the NOAA administrator this is your legacy with us. So on behalf of Mike and I certainly share this thank you and
[APPLAUSE]

>> I work with Dave for the whole eight years and I really appreciate it is a treasure is a great word for day. And his passion for the position papers is well known and appreciated. I think the position paper is the legacy of the panel. And the panel members leave behind as they move on. You know it documents all of the things that have been worked on, and critical educational to and so forth that is a huge contribution right there. Besides everything else that you have contributed Dave and I will miss those payment midnight e-mails that you give every now and then thanks day.
>> Thank you everybody. Do I have a few minutes?
>> Go ahead.
>> I would like to pontificate here a little bit with some history. When I joined the HSRP in 2015, we had two different locations, and when all was said and done, we did not really have any recommendation for the tran 12 -- by NOAA administrator, so that is the purpose of HSRP if we are not coming up with suggestions and work came out that federal advisory committees were being investigated to see if they were worth the cost of having them. We were going to be scrutinized on whether we should continue or not. Joyce Miller because her name was alphabetically next to mine we were sitting side-by-side, and we said we have to do something about this. We have to come up with some way of making recommendations to the administrator. So Joyce and I came up with the idea of issue papers. And the issue paper will decide what we want to decide and how we want to present it. We said we need to identify an issue. We need to evaluate alternatives for satisfying the problems, we need to select the best alternative and make recommendations to the administrator on how to solve that. That was the big pitcher and then we said we would like to have it all on one piece of paper printed front and back because it is a large document people will not read it. With one page we can't leave it on the tabletops and give them to senators and know what the concern is about. And so

we started doing that, and now we publish somewhere around 20 issue papers. And our goal was to have two HS RP sessions. We only got one today, but we had three in the spring. So for this year we averaged out and today I am hearing we have received comments today about four suggestions for issue papers for next time. The value that I see on the HSRP is going from community to community. We visited Long Beach, Los Angeles, Seattle, Juneau, and Hawaii in the Pacific. On the Gulf we visit Galveston New Orleans, on the Atlantic we visited Miami Baltimore, and up in New Hampshire. And then on the Great Lakes we visited Cleveland that gave us a good perspective of local issues. And every time we visit a local community we would come up here to help the community there is so much value to plan out what their problems are that's the issue the HS RP can make a recommendation to the new administrator on how to solve that problem. With the concept of these issue papers, and I was so glad to be involved with this process, I think when Nicole told us a session or so ago they had available rated different middle advisory committees and found us to be one of the most productive ones in the government. And so by the way Tuesday I asked for volunteers to take over for me I had one person who said she would do it but she would have liked to have help with somebody else. Always smiling, with a big smile on her face and she volunteered to do this. I'm hoping somebody else will volunteer to help do this. It is sort of herding cats kind of thing. We are all cats that Lynn is hurting here for the eight years that I have seen. And this is herding cats to get people to submit their comments on this issue papers and to draft them. So for everybody that is contributed issue papers, I thank you for your effort and it is a pure joy working on this committee.
>> It is been great to have you Dave.
[APPLAUSE]
>> Of course Clint reminded me and I was going to bring it up now I was cochair, now we need a new

cochair on the planning engagement. You do not have to commit right now but if you ever want to help out, you know it does, it is nice to have another cochair there. Because one person is on the occasion and another one can't take it is not a ton of work. But it would be great so Nathan, Nicole, Alex? One of the new ones and we always having new people come on. So December or next year too. Okay, let's move on I put the priority matrix up here. I really don't want to take too much time on this. Because we all know it is wordy. Just look at column B and we want to see what is up there right now. There is only about I think seven of these. So the IO CM is up there. We know now that we will get a draft back later. So we don't have to we can't update the verbiage on that decision now. It is great now, we have Darren Wright, Darren is still here? He left I think. But we will update some of that and that might where we might want to put digital twin verbiage and there also. On the precision just to start getting it into. It is, all right, and I am is assuming precision navigation is something we want to keep in there?
>> Yes, I was going to say I think digital twin needs to be independent. Because it has much larger scope than precision navigation.
>> I was going to say that with digital tent but not excluding, okay let's go on to number three, national policy issues. You know, I don't know if we want well, what is your feeling on this? What I was going to say is, I don't know if you want to keep it there, because we don't really have a direct influence HS RP policy. Nicole you were going to say something on that.
>> I agree I don't think it is it within our purview and we get into policy a little bit on all of these don't we. I would like to take that one out are you okay doing that? All right, number four, partnerships, with the court, this came out, they were called out specifically hear it when it was his whole thing about the core having different data rooms with NOAA, any failings on that.

>> I think there was a question on the corps were working together to come up with standard specifications and used by both. But I've not heard it is really final on that.
>> Okay we will leave it in there then.
>> I would like to see it left and, throughout the meeting we hawed about in your agency coordination, and I think there has been a lot of good work, but I think it is stuff that we should follow up on, there is a lot of mention from the Mississippi River stuff, I mean there is still a key data disagreement. That in my opinion it is left between NOAA and the corps to sort out. This is the inter-agency that we see in progress and we should follow up on. Without it necessarily being in an issue paper. Just to leave it on hold and track it.
>> Okay?
>> I would you say I would agree and is a comment here about Admiral Smith previously being with the Mississippi River. Coalition, I think the Admiral just continue that on just to get the updates. And outside that, we did have feedback over the course doing here. In his new to most of us probably. It was a different kind of activity between them.
>> I agree, let's update it. What is in here now to some other things that we have heard this week. Including the weirdness about them using defense liver the C rise curve. You know there are things that we need to keep talking about.
>> What I am hoping is I want you to attempt to go through the column B. But please, if you have specific verbiage that you would like to update I will go to the update for as much as I know. But I would love verbiage from anybody on here on a particular topic. So, you know feel free to send it in. Okay, scrolling down. Number five. Identify and quantify the benefits of NOAA's hydrographic services. You know Dave, you were involved with Ashley on this.
>> S.
>> Mostly. What you think?
>> 3D nation elevation requirements benefit study

has now been published, it is formal, it went through user requirements and benefits for in land topography, and land bathymetry and primarily for the USGS and offshore for Noah -- for tran one. On the in the imports we were able to get a very high number of dollar benefits but we had a hard time getting dollar benefits under the high drogue for community particularly the users from shipping companies and that sort of thing that would tell us that if we get such and such we have such and such dollar benefits per year. We were unable to get good dollar benefits so there is not a very high return on investment. We had difficulty having return on investment better than one to one based on the low number of benefits that we were able to pull out and we worked on this for five years. So that is part is the disappointing from the setting. I am not sure that the HS RP can add anything to it so I think that we can
>> We can always track it. But I think Dan is a common thank you.
>> Thank you Julie, thank you for that context. Based on of bit disconnected because I would put these two things together. But we did within NOAA, the chief economist just finished a paper which is still under review and we expected to be academically peer-reviewed and published on the value of the nautical chart in general. Which I think would have direct connections to the intent of this point. As I said this paper is still under review and it is a long report and is a people from that. But I am hopeful that that would address some of these questions. I will also note that this issue in general of the value of our hydrographic data is something that we are consistently you know constantly patting await these challenges. So while we may Apple address one particular aspect of it, it is just a matter of time as I mentioned earlier the challenges that we face with the shipbuilding program based on I would personally argue flawed assumptions of the vague data. And the importance of the expertise that is held within the government.

So if we are constantly grabbing these things away, the position to make a request would be to keep your eye on this. Because we are always having answers to the solution.
>> We do have a section that tracks past priorities. And maybe we could move it down to the next section.
>> Can I just comment and say this review is it is good to have it done I did not realize I think you mentioned before it is doing it eternally. Island did this many years ago. I just put in the link in the document that came through Australia did this last year. It was an external review of the value. I don't know how you would do that here, but I think it is applicable for both of those a just a comment there.
>> Okay so Virginia is going to move that down to the tracking section of this.
>> So you know if you look at the first box here it says anyway it said the benefits of the hydrographic service it covers the full range. And you know been pointed out the report and I have seen that it is a good one, but we got a number of ports and economic benefit reports and GS has a height monitor eyes Asian and we have a lot of this information at different points of time. Maybe some of the states people together into one overarching document so we have that package together. Maybe these are some of the gaps that we should look at?
>> Okay that is a good comment Rich I am trying to think should we add should we broaden this particular bullet to track ongoing efforts of Hydro services
>> I think this might be important enough to actually include in the memo, right, for a federal agency demonstrating your value is one of the most important things that you can do to continue to get funding and it is not something that HSRP can do this is a big left. So I would think something.
>> We were just wondering if, that was also in our purview. Okay, well, we will look at that. All right, moving on. Yes?
>> We do number two before I had to comment on it.

I think we need to revise that. I would be happy to send some language to do that. Limiting precision navigation just to restrict visibility. It is you know, was pretty contentious issue amongst the stakeholders. And I think the navigation is much broader topic. And has much broader applications besides the navigation In-and-Out of poison restricted disability and we should revise that topic.
>> If you could help me with that one that would be great. Okay, all right so let's see, number six chart of the future.
>> I think chart of the future it has been beach replaced by digital twin and everything we worked about ENC and all of that.
>> It is under precision map. Okay so could you say combined with precision now. And then we do need to add digital twin and here we are getting to that. Disaster response tran one function product and services. This was like post- storm, post- storm assessments I believe. Yes propose disaster surveys because there was a thing of how quickly tran one with their coordinator got out to do post- post- storm recovery. So we are not sure if you want to keep that in there.
>> I think it should be continued to be included I think disaster response continues to be one of the most critical functions of NOAA, and every other agency. And I know last year, participated remotely through a hurricane. And greatly relied on information that came out of that switchblade that Swiss Army knife with NOAA, sometimes it is good to have a switchblade too. But anyway, I think it needs to continue and I think as we talk about emergency response we can add more increased storms and our frequency and strength and I think that is going to be critical to keep an eye on. And maybe update?
>> I think that word it needs to be updated there a little bit. Okay, let's move onto the next one number eight.
>> I saw that right, I did see that and that's why I

said I think we need to update that that wording a little bit maybe you can help me with that
>> Yes, I can help you, and just let me know what the HSR people would like for an update on it.
>> That would be great thank you.
>> I will throw out there disaster response and see level information that we got about sea level rising and the impact. So kind of overlapping,
>> That is true. But it could also be
>> And Xhosa resilience.
>> I think it is more than sea level I think we need coastal resilience to go so sea level and Xhosa resilience in there. Okay number eight public-private partnerships okay.
>> Can I make another suggestion we should put a date on all of these things of when we first put it up there.
>> That is a good idea because some of these, so we can add a column with the date, public-private partnerships, yes we definitely want to leave that in. I don't think we should spend time on changing that wording right now. I am going to spend some time and go through the s Whole thing afterwards. Number nine, that is let's leave that end, and then Nicole we can update the wording on their. Number ten, incorporating oh yes, what we do about this one? Ben or anyone I guess at you were the one that took the lead on this.
>> I am certain that nothing has changed is the last time we had looked at it.
>> Do we want to leave it in? Is it something that the HSRP, that we can address? Or have an impact on I guess that is the question?
>> It seems like it was a hot topic and ship was driving it. I don't know if it is lost its momentum.
>> And I am not sure how much impact we would have on.
>> It is not inconceivable that it rolls into public/private partnership too. Breanna is going to come join us.
>> When I look at this, I mean, this is the screams

external source data program that we have in place I mean if you are interested in a briefing update I think we could happily do that. A lot of those things are already happening with fixed streams from NCI and the crowd source. Mike is not here. The to incorporation and validation, and then continued IOC M and IW G working group initiative.
>> should remove it down to track?
>> Potentially it is up to you, I would not say from my perspective a lot of this is like ongoing if you like to inform it. Or comment on it, but you know we welcome that feedback too. I think there is quite a bit coin on that is pretty substantial.
>> I would just like to comment this is one of the areas the admiral mentioned. It says blindly incorporating it. But actually doing that is a bit of a challenge right now. And that is the last quality control data that we might. One on the next page page 14 I guess. So I think the challenge and the programs are in place. The challenges are there still how do we implement that with the resources that we have and maybe that that should be higher. If you see that is a real challenge right now with your work.
>> Actually, we're not doing these in any order. These are just topics that are priorities for us.
>> I think that has to do with streamlining and back was inefficiently things and things of that nature. We have a decoupling program, getting the individual components where they need to go as fast as possible.
>> Everything getting it into the ultimate whatever it is getting into the product.
>> It isn't NBS build out too. There is a lot going on. Is there is a lot going on the example use, I don't know we can probably team up with Larry's team. That is three years down the track and those sort of things is something that I think is important to address now. And that is where I think it can bring and potentially looking at the other resources and public-private partnerships and all of the things potentially and that. Maybe we just

reword those and combine them. That will cover that.
>> Okay, leave it in and put PPP by it.
>> I combined the quality the last one with that. We just say now incorporating into the products. But I think we are trying to say yes we want to make sure that there is no delays and that.
>> We are not moving the track we are leaving it.
>> We can combine the.
>> To restate what I think I'm hearing it I also agree with. Asbury mentioned much of the work identified by item ten is complete, but where we are that has led us to a point where now I don't 14 is really where we are running into a jam.
>> Yes exactly and we are also still saying how do we get more data quicker, enters like you are in a gym are ready right?
>> Okay thank you we are combining ten of 14. This was the hydrodynamic modeling. That was the ocean forecast system and validation of that. We aren't really addressing that are we? Anybody is that something that's HSR Pete wants to get involved with? I think
>> I think that will get covered under digital twin if we do it for the harbor, this could be an example that it can be added somewhere there.
>> All right, let's take that one out.
>> This ocean forecast system at one point we are kind of involved with the team actually but I don't know if the HSRP wants to get a briefing on that and follow the validation et cetera. Whether or not we leave it and there and if we leave it network with the action be?
>> Yes just so Julie was saying and I think it probably is.
>> I agree I think it is. Because of the impacts, the plus 100 navigation products so the next abrogation product can be a direct connected.
>> Okay, sure be with the precision map Julie did you want to say something?
>> I actually would recommend that it is separate, because it also has a lot of value beyond just

precision now. It seeds into a lot of other things the problem is developing a hydrodynamic model is a 3-5 year time and labor and computationally expensive process. It is out of our base funding, all of the plus money that we keep getting does not support development it supports all of the other development and if you want higher resolution and water level and service comes. You need your operational forecast systems.
>> The question is should we track it if it is a long-term thing or do you think it is something that we can act on?
>> Do you think we can provide it with digital twin because of that is exactly what we're trying to show the full model that we talk about the hydrodynamic modeling and validation would come once you have distilled twin for it that's what you do all of the morning and everything else that comes with it. That is why am saying there is an opportunity to combine it there, rather than keep it in isolation but both of them can work.
>> I think it is important to call out some of these you know water level and current related parts of our mission that are also hydrographic surfaces data. So I think I will be amending a lot of those I would vote both for leaving it in.
>> Okay, I think we will leave it in, but I think what we, you know
>> Speaker: We can always a digital twin will be a another to that will impact or advances or something. We could put comments in our comments section.
>> I think I agree with Julie because this is a feed to the digital. But if we just combine all of these and digital it might dissolve at its importance, I think it is better. Because the modeling, it is all (Indiscernible)
>> It should be a separate item and there also it supports the effort and without that modeling it will not happen. In the forecast models.
>> Okay great number 12. Offshore wind farms what we want to do with it?

>> Personally I say we keep it because it's only going to grow. And there is so much interaction with data sharing and NOAA direct involvement.
>> Okay let's move on digital trends we are say we are going to keep. If you want to look at that wording and send me any revisions that would be great. Number 15, 14, where is 14? Oh yes, we combined that one all right, so that is all of it.
>> Just make a note I know it's not directly to that one.
>> You have one minute Lizzie.
>> There is number 21 that says I remember that I have not read it lately, but it says that is a way we are tracking it. And to make a comment the comments are probably the same as it was back when we presented that. Just a note in the may be we address the before and it stays the same some.
>> I know it is a little bit of a pain but if you could look at the entire both the anti- think that you have expertise on for the first 15 items, please send me any wording, and the tracking once, if you have any updates on that or anything that would be great. Any other comments on?
>> Given what we learned at the breakfast about the fleet the other day perhaps that should be moved up to active. We've done a position paper but at the same time this matrix is kind of what is a priority for us right now it does not necessarily indicate that we are going to be writing a position paper about it. It seems you know loss of flea could be a big issue and not replacing that.
>> We can certainly add a line and therefore that. Okay. So, can you add another line in their Virginia for loss or sustainability of the fleet or something?
>> I can't move 21 up to active, that is what.
>> Is it number 21 I'm sorry. Okay it will move number 21 up.
>> Just a quick one do you think we could add something looking at so much of climate change we have been discussing? Do you think we could put up anything for actual emissions manage management

within the NOAA fleet and otherwise?
>> I guess the question is is that something that the HSRP could advise on?
>> Like Paul said think outside the box for me. It is an executive directive. It is there, we have been talking about it, we know greenhouse gas emissions have a direct impact. If we do not measure how we going to manage it? So at least get the measurement cycle started, get that process started, and then work it from there. We could that be one of the task to consider?
>> I will let you answer that.
>> Yes, I was just going to say I agree because Annie company any organization right now that run ships is basically being required to track. And to collect the data it does not mean we are supposed to do anything with it. But make a recommendation to start a baseline. It's coming with all the hydrographic offices that we dealt with it was mandatory.
>> Is that okay if we had it in there then?
>> Yes, I just I want to make sure, because I completely agree. And I want to make sure that we do it in a way that is using the HSRP time wisely in a way that is actually going to result in action by NOAA. I am not quite sure what that would look like, because I'm frankly not sure that would put the list on this. They might well regard this as you know getting in their lane.
>> Why don't we add the title and their Virginia. And then.
>> I was just going to say it is potentially something that we could connect it to the sustainability of the hydrographic's.
>> Okay, so I think that was number 21 that we are moving up.
>> Does anybody else ever thought?
>> Are we into suggesting a new topic?
>> A new topic for priorities? Okay, so we just have officially 10 more minutes of this meeting. We have not discussed Puerto Rico where our next meeting is and we haven't got close closing remarks.

Can you just send them to me and please, we want to keep their priorities of matrix more a less relevant. So if you could just send them to myself and land that would be great and then we will get them in, and we will discuss them at the next meeting. Planning meeting or whatever. Okay a people go with that? I wanted to just mention that the next meeting is in Puerto Rico. As you know. Lynn has the days that she can give you. We very briefly talked with Alex and I met with Lynn, I am just going to read what our session ideas are, because we are starting to brainstorm. And I want to get them out. To the panel, so some discussion on PPP, we did not figure out what all of these are yet. Something that will be related to navigation and of course, we will have Captain Alex to help us with that panel. And he has some good people that he can, so similar to the panel that and put together, we thought we would do the similar thing with Alex's help in Puerto Rico. And then a session on coastal resilience again because once again as you know Puerto Rico has suffered wildly from many storms a session on digital twin and we will have to talk about what that will be whether or not it is discussion or who we bring into. If it is a four panel or whatever. So that is all I am going to talk about for that right now. But seriously, if you have ideas, if you have things you want to make sure we cover. This is your meeting. So we want to put it together. Okay, Lynn should I just a wrap up? Okay wrap up yes please, we have 10 minutes. Okay, who are my starting with your Nathan.
>> Okay I know, we are focusing on our letter to the administrator so Lynn says what is the one sentence sentence you want in the letter. But you can also please send me any ideas that you really want to get in but because we will write that over the next couple of weeks. So, Nathan do you have can you summarize very quickly here your wrapup.
>> Not a lot of time I will summarize quickly and I think I heard a comment being throughout all of this all of the reasons that we have talked about.

Alaska Gulf Pacific Caribbean on the core services water levels. Elevation data are important so I would recommend that you need to include is how to increase funding for those.
>> For the bit core base stations?
>> Not the core base stations the programs the line items that support those programs.
>> Okay. Foundational data. Because it would be more proactive approach instead of a reactive approach with some of these disasters.
>> Got it. Alright Ed I'm going to skip you alphabetically and come back to you at the end because I know you have made some notes about things to include here. So we are going to go on to Lindsay right now.
>> This is for the letter right? Well it is your wrapup. Go back and's it is been a great meeting I feel like I got so much information. A couple things I go back to mapping. Without specific issues we noted there about its remote, it is such a large area at different type of approach and we need to get the right assets and get that done and collaborate on that. The supply chain, and that it was here it is always been here. And we are experiencing the same thing. But it was interesting today I think was Ray to see that first day mentioned how it can affect their operations at the national security issue but here it is, directly affecting getting stuff for somebody else's. So that was kind of interesting. That's probably it.
>> Okay that's fine please send me anything additional. Nicole?
>> Thanks I will not thank everyone like I want to and see how amazing everything was I only have one sentence. That sentence would be yeah kind of what Nathan said right? We need to advocate for continued funding of all three offices to provide that foundational data. Then I think more internally, I think that conversation we had about prioritizing how to address the data gaps that we know exist. We need more information about how to define underserved communities and you know how to

what it is done first.
>> Great thank you. Sean?
>> So I will come back to kind of being tired. Budget ability what can HSR be included in the letter I work in the language with you Julie. The ability to form base services as demands increase and new products come along. Some of those base services suffer. And trying to make sure that I won't say the word lobby but I will say the word advocate. And other meetings we can advocate for budget and different way. But it would be good to kind of nuance that to be within proper federal guidelines. So we know where some of the shortfalls are. And maybe how we can help.
>> Okay great, I think that falls under this foundational data. In services too. That were talking about. So let's move on to you Ann
>> Just a couple of things because I don't want to touch on too much on what everybody is a retouched on. Again at one of the breakfast we talk about making sure funds and programs were reauthorized. And I thought that was important. And I am going to again just go back to the cultural resources. And you know how underserved communities are address is not only addressing and assisting them is how do you take advantage of the resources that we have to offer. Which I think is and I know what Wacoal was saying as far as what model you used to the recipient of the resources that are available. As opposed to being a purely economic model.
>> All right okay yeah we won't go there with the authorization that is like in a whole other domain. But it is an interesting topic. But probably not for the letter. Okay let's see Dave.
>> I already told you that I have a one track mind. And Sean said we cannot lobby. But something I think we can do, is to visit senators and congressmen that control the NOAA budget, and drop off issue papers for them to know what the issues are and what the recommendations and I would pull the stuff. In a way are issue pagers are a legal form of lobbying. I will pass with that I said

enough thank you.
>> Okay, let's move on, Alex?
>> We've had an amazing meeting for the last few days. A lot of learning, very good to know what is going on on the other side of the world. Compared to our site. Xhosa resilience and sea level rise.
It is very important to note not just what happened on the coast but also what will happen to our poor infrastructure. And to see of our good services for the nation. I am looking forward to seeing you in Puerto Rico.
>> Great, okay
>> Speaker: .
>> Thank you great meeting I learned a lot I really like to cultural bit and the context to the local way of life. Two big takeaways, one was the data capability from Tony. And the high rise data and other pictures and the other side was like initiative on precision navigation. And the simulations between what we are talking about. Huge wins in that space. And of course looking forward to work on precision navigation.
>> All right Qassim
>> I absolutely agree it is a great meeting and thanks for the contribute of the success of this. I have a few things like listening to all of this energy going to the Pacific and the Pacific Islands, and the mapping of this. In this activity. How do you think we should generate the envelope concept of operations for the Pacific whatever you call it?
You cannot only see what needs to be done but what is happening but also it shows you the risk, and you have to come with the mitigation of that risk. So we will be good actually to double the concept of operation for the Pacific for example whatever we call it. The other thing is AI and deep learning we definitely need to put focus on it. We note just collect data but we have a solution. An efficient solution to use AI in the cloud for example. It was very clear we need to be engaged in direct dialogue with manufacturers for example. (Indiscernible) I applaud Admiral Emma's statement do not let perfect

be the enemy of good. This is very good wisdom definitely. I mean, we have a lot of great things. NOAA has great experience in generating paper and digital charts. And people are using it that is what you are using. So (Indiscernible) that will invoice confusion going through. I really like the listening session we did who was involved with that Julie was with me. We need to do another one to support tran one. We should not give up on them. We can do another listening session for the Congressman and Representatives I think it is very effective definitely. We can have a few presentations and on the problems presented in this meeting, we can take some of it and presented to them on the importance of NOAA work in this area. That's all I have thank you.
>> Thank you very much all right we have two members online. Gary are you there?
>> Yes, so great meeting another meeting where we heard a lot about data machine use that as a topic that we need to keep talking about. And also support funding for all offices.
>> Okay thank you let's see Ann are you online?
>> Yes, my brains are full again I have to say I was particularly interested in the session on precision navigation. My old focus frankly is getting good data so we have safe navigation out there. So lots of information, lots of stuff that holds together at some point. But I certainly want to see more emphasis on getting all of that data into the navigation data that gets to the maritime community.
>> All right thank you, Andy?
>> Everything I want to say has been said. Right from the start with Nathan especially. So I have nothing to add thanks.
>> Larry?
>> I will add will reiterate actually for all the years I come to these meetings I've never heard such arguments made. For the relevance and importance of the foundational data that we provide here. It is in the context of sea level rise which is just such a societal problem. These are really powerful

arguments. And so I think that was great, what scared me is that I also heard that the data that NOAA provides is interpreted by federal agencies in different ways. And the prediction is depending on what federal agency is presenting it. And I asked the question who is the authoritative of sea level rise information? I think it is an unanswered question.
>> It is unanswered and it's a sad case.
>> It will have all kinds of ramification and the only other thing I will say is that PPP discussion was really interesting. To me it was its discussion of constraints and difficulties in the NOAA contracting process. Not from PPP, but if it is the answer to get around those constraints may be that is the way to do it that is all.
>> I think we are going to circle back to PPP issue. At our next planning and engagement. Because I have kind of had thoughts about it too. And talking with them. And Bree, so rich by the way we really appreciate your thoughts on that. All right,
>> All right three main takeaways. The first was I was so impressed by the culture with a deep respect for the environment as well as each other and people. And that helps me too lead to the second.it helps with the trust that they have for each other. Which enables partnerships right? This is how you get things done. And then the last thing was the ever present supply chain issue. It is always been here it does not have to be ever diligent about mitigating it. They don't have the safety net of warehouses and inventory. And that is you need to hear. And I think we just need to help them with that as much as we can't and that is it.
>> Okay great then?
>> Thanks Julie I am not going to delve into any particular issues just say that I really appreciate the atmosphere here this week, the nudging and prodding and sometimes gentle and sometimes not so. And also the support. The recognition of the importance of the work. And the challenges and the real what I hear is the desire to ellipses together

and figure this out. And so just in the comments I hear so many things that keep me awake at night reflected in your comments. Which is gratifying, it is reassuring that I am not crazy, and that we are not crazy. But it also means that these are also challenges, real difficult challenges that are not easy answers to. I will continue to push ahead on the sinks and I will look forward to your continued engagement and recommendations to the administrator. I will also say I want to thank Julie for running an outstanding meeting. And then the panel for your engagement and the time that you took coming out here. And also everybody behind the scenes and the rest of the team who have made this go. Whether his logistics and air or the food across the way. And I will close there and again thank you very much.
>> And I will say thank you to all of the panel great discussion, and certainly appreciate our NOAA friends. I wasn't gonna dismiss everybody yet or adjourn the meeting. I just want to say thank you to all of the panel with a great discussion in particular we enjoyed having the NOAA representatives here. And kind of filling us in. That is what it is it is learning what tran what is doing now. And what we can do to help advocate for some of the things going forward okay let's move forward with the cultural. The Hawaiian cultural protocol. He will be coming up shortly.
>> I am currently working the national Monument. I assist with resilience development and I also help with permitting and I am also part of the cultural with an VOM and S. I am sorry I was not able to make the opening protocol with my colleagues but we felt that (Indiscernible) is extremely relevant to the work you folks do. It is labeled (Indiscernible). And it speaks which is one of the principal gods within Hawaii. They represent many it honors the body forms many marine species. In addition to the marine species it also represents elemental processes which are the ocean cyclical process and also some Hydro processes on land and underlain as well. We thought this was a really

great closing as we continue to work with on land and in the ocean. To acknowledge and honor (Indiscernible) ancestors that are associated with these processes. And environments that you work with (Indiscernible) in the archipelago that we are in now and around the world.
[Singing]
[APPLAUSE]
>> Thank you very much it was wonderful, nice adjournment. So I am now going to adjourn the meeting. Thank you very much. For those of you joining us at the Hawaii yacht club if you walk out the phone door go left fall the road as you are going to the beach access out to the left. Although the yacht club is off to your right you need to go to go around the boat park the boat basin and down the road that is closer to the beachfront.
>> Let's just be clear, which door the one towards or the once was a street not the street or the side door.
>> The Harborside thank you.
>> If you would like to walk over together five 35:00 p.m., whatever you prefer?
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