U.S. DEPARTMENT OF COMMERCE

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NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA)

HYDROGRAPHIC SERVICES REVIEW PANEL

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PUBLIC MEETING

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THURSDAY
SEPTEMBER 17, 2015

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The Hydrographic Services Review Panel met in the Pinnacle Grand Ballroom, Doubletree Hotel, 8727 Colesville Road, Silver Spring, Maryland, at 9:00 a.m., Scott Perkins, HSRP Chair, presiding.

MEMBERS PRESENT

SCOTT R. PERKINS, HSRP Chair
WILLIAM HANSON, Vice Chair
DR. LARRY ATKINSON
RADM KENNETH BARBOR
DR. LAWSON W. BRIGHAM
RADM EVELYN FIELDS
ED J. KELLY
DR. FRANK KUDRNA
DR. GARY JEFFRESS
DR. DAVID MAUNE
JOYCE E. MILLER
CAPT. SALVATORE RASSELLO
SUSAN SHINGLEDECKER

NON-VOTING MEMBERS

ANDY ARMSTRONG, Co-Director, NOAA/University of New Hampshire Joint Hydrographic Center
JULIANA BLACKWELL, Director, NOAA/NGS
RICH EDWING, Director, CO-OPS, NOAA

SPEAKERS

DR. IRVING LEVESON, President, Leveson Consulting (participating via webinar)
JEFF LILLYCROP, Technical Director, Civil Works R&D, U.S. Army Engineer Research and Development Center, U.S. Army Corps of Engineers
STEPHEN MALYS, Senior Scientist for Geodesy and Geophysics, National Geospatial-Intelligence Agency
PAUL ROONEY, Geospatial Information System Specialist, Risk Analysis Division, Federal Emergency Management Agency
SUSAN RUSSELL-ROBINSON, Acting Program Coordinator, Coastal and Marine Geology Program, U.S. Geological Survey
GEORGE SEMPELES, Senior Aeronautical Information Specialist, Federal Aviation Administration

STAFF PRESENT

RADM GERD F. GLANG, HSRP Designated Federal Official
MICHAEL ASLAKSEN, Chief, Remote Sensing Division, NOAA/NGS
TIM BLACKFORD, NOAA/NGS
W. RUSSELL CALLENDER, Ph.D., Acting Assistant Administrator, NOAA/NOS
ALISON CARISIO, NOAA/NOS/CO-OPS
ASHLEY CHAPPELL, NOAA/OCS
MICHAEL DAVIDSON, NOAA/OCS/NSD/NRB
RADM SAM DE BOW, JR., NOAA
TIFFANY HOUSE, NOAA/NGS
HOLLY D. JABLONSKI, NOAA/OCS/NSD/NRB
NIC KINSMAN, NOAA/NOS/NGS
GARY MAGNUSON, NOAA
RACHEL MEDLEY, NOAA/OCS
LYNNE MERSFELDER-LEWIS, HSRP Coordinator
RUSS PROCTOR, Chief, Navigation Services Division, NOAA/OCS
SASHA PRYBOROWSKI, NOAA/IOCM
ADAM REED, NOAA/IOCM
RICK SCHWABACHER, NOAA/NOS

ALSO PRESENT

DR. QASSIM ABDULLAH, Woolpert, Inc.
DR. RACHEL BERNSTEIN, National Geospatial-Intelligence Agency
BILL CAIRNS, American Pilots Association
CAPT. BRIAN CONNON, National Geospatial-Intelligence Agency
J. ANTHONY CAVELL, NSPS
DR. JOHN FARRELL, USARC
JON HEINSIUS, GeoNorth
DREW HOPWOOD, GeoNorth
JONATHAN KEMMERLEY, Mariners' Advisory Committee
BENJAMIN M. MILLER, RAND Corporation
TODD MITCHELL, Fugro
DR. NIKOLAOS PAVLIS, National Geospatial-Intelligence Agency
RUDY PESCHEL, U.S. Coast Guard (Retired)

A-G-E-N-D-A

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

(9:11 a.m.)

CHAIR PERKINS: Good morning. We would like to officially convene day two of the Hydrographic Services Review Panel. If we could begin today as we did yesterday with a quick pledge of allegiance, please. So if you would all join me, please stand.

(Pledge of Allegiance.)

Thank you. Please be seated. Logistics: men's and women's restrooms are directly behind me across the hall from the main entrance to this building. Emergency exit is?

RADM GLANG: To our left, and then of course they are all marked, and back out the way we came in.

CHAIR PERKINS: Great. Our first speaker of this morning?

RADM GLANG: Thank you, Mr. Chair. My name is Gerd Glang, Director of Coast Survey and your DFO. Two pieces of information for the panel members: we do have Wi-Fi, I can pass the

sheet around so you can connect your devices. Then a reminder for this evening's dinner, we are asking for the $26.00 that you can pass to Lynne at some point today. Thank you.

CHAIR PERKINS: Great. Thank you. So this meeting is a public meeting. It is being held here live at the Doubletree in Silver Spring. We also have a live WebEx with 101 people registered to be participating virtually, and our first speaker of this morning is also going to be virtual, calling in remotely.

So with that our first item on the agenda is a presentation on the current NOAA economic studies from Dr. Irving Leveson. He is president of Leveson Consulting, he is an economist with extensive experience in strategic and economic consulting and research in private industry, prominent research organizations, and government. He founded Leveson Consulting in 1990.

Dr. Leveson has worked extensively with NOAA since 2001 examining diverse programs

and issues. So please join me with a warm welcome to Dr. Leveson. I hope you can hear me and thank you sir for being with us this morning.

DR. LEVESON: I'm glad to be here. As some of you know I was planning to attend in person, but due to circumstances I am calling in. I was able to catch some of the conference on the webinar. What I want today is to concentrate on NOS studies, even though I've done work much more widely in NOAA. Just to make it manageable for the time available in the presentation. Next slide, please.

I want to talk at length about approaches, or methods for benefit estimation, which comes up very frequently, and then give a couple of examples of studies I have been involved with for NOS and others. And finally make some remarks about lessons from my experiences as well as my own studies and research needs. Next slide please.

Now, on the question a benefits estimation, next slide, I want to start

off by strongly emphasizing that economics is a behavioral science. It is used for program analysis include examining customer responses, availability of services, responses of suppliers to changes in technology and markets, and what people are ultimately doing is providing the framework for evaluation of benefits and costs.

But don't think of it as a cash tool or what you think of as gross domestic product. Behavior markets, and market participants are the critical part of benefit estimation. Next slide, please. Benefit information can be valuable in improving the understanding of applications, constituents, markets, returns to investments and costs. It can support program planning, architectures, budgeting, and legislation.

Assessing outcomes is important for understanding impact, long term initiatives, and developments, and providing a baseline to determine gain or loss of benefits from alternative developments.

Of course the major use of benefit of

information is advancing recognition on the contributions of the program, and that requires, in particular, a great deal of reinforcement both through repetition of results and demonstrating how things how they apply in specific contexts, and what they can do for you. Next slide please.

It is useful to think of program evaluation the way you think of hypothesis testing. In other words, you want to specify in advance what the outputs and outcomes are that we would expect, and then evaluate the actual results against it.

This is not the usual case. It is especially important when we have new programs and we are trying to understand better what is going on without having existing measures of what the results would be. The results that we test should be related specifically to expectations based on services, technology, distribution, et cetera, so that we can see, not just how well the program is working overall, but which component seems to be configured into success and various

outcomes. But this is an ideal formulation and you can't do it all the time. But it is something that we should strive for.

Values that we attach to outcomes, the dollar values, should be consistent across programs. That goes without saying, but it is very hard to do bureaucratically, so scenario planning is very important in understanding future benefits because you can specify component trends and groups of trends that make up themes that give you a feel for what the broad changes are that are going on.

And looking at new products, it can be useful to consider behavior of other programs and market experiences, and not just the same program, because a lot of things can be quite different from simple extrapolation of what has been done before. And finally, we want to institutionalize the analytic process, and that does not have to mean very detailed guidelines, like OMB's statements of what you have to do to discount future earnings, what rates to use. It

would be a much more collaborative process in which researchers sharing information comment on each other's, across departments and agencies, as well as within programs. Next slide please.

There is often confusion between what I've labeled as economic impact and economic value. Economic impact, I am referring to measures of the importance of sectors. We hear it all the time. This what Google or Facebook contributes anytime you hear of them in any private studies. The value of geographic information systems, so much -- which has to be just measures of what the size of the effected sectors are, and you can take various ones, including revenue, expenditures or value added.

Value added being the use of resources in a in particular process or sector without counting what they buy from other sectors. Economic value, on the other hand, is the addition to the value of the economy from a good or service or the introduction of a technology. That is basically grown into what would have been

expected in the absence of that service or technology. Direct economic value is the increase of the value in the sector that is using it. The total economic value is the full impact, taking into account that what users do impacts the rest of the economy. Next slide please.

There are a lot of measures of economic values. Those relating to productivity cost savings are very common and tend to be quite useful, may include productivity gains, cost reduction, avoided costs, and value of time saved. A number of studies have looked at willingness to pay, which can be very useful, but the kind of studies that calculate it properly are costly and have very great difficulty getting OMB approval, under the Paperwork Reduction Act, so those have not been done as widely as they need to be.

A willingness to accept is the same thing on its head as what it would take to get you to do something. For example, I recently saw a study that looked at how much people would be

willing, would have to have to be paid in order not to have ads on Internet sites, just to give you a feel for that.

Consumer surplus is the amount that some consumers would have been willing to pay, if the market price had been higher than the existing price. So if you take the downward sloping demand curve, each additional user pays a lower price, or the price of the goods is falling over time. For example, those who come in early, early adopters for example, are willing to pay a higher price, and those who come in later on at a lower price.

So if the price comes down quickly and your early adopters pay a low price, and they would have been willing to pay a lot more, they would have consumer surplus.

Producer surplus is a similar concept on the production side, and it's the amount that the producers would get above the cost of production. Similar to profit, a lot of times we do not have to deal with that because we are

looking at revenue, and it is included in revenue.

Just to mention that willingness to pay, if we use productivity or consumer surplus as our measure, it would include much if not all of the consumer surplus. Some studies have its effect on value of property, if you are living near a park, or a beach, or a dock, that kind of thing is part of the environmental studies.

Where possible studies use the value of information approach, and that requires looking at alternative choices where you have the ability to know what the probabilities of different outcomes are. So that test, the use is much more limited than expected, even though it is quite useful where it is used. Next slide please.

Economists have assigned measures to -- measures out values to fatalities, to loss of ability due to injury and so forth, some people are a little uncomfortable with that, but there is a wide range of literature and government

agencies, routinely now, use those kinds of measures.

Most of the benefits tend to come from the valuation of lives saved. Economists use a measure called the value of a statistical life, which is based on comparing risk associated with small changes in probabilities of that in large groups and it is not intended to be assigning value to the worth of individuals. It is often been done in studies that look at what people have to be paid in order to be willing to go into high risk occupations. There are a lot of estimates in use.

Federal agencies tend to value a life at around ten million dollars. OMB reportedly has recommended using no less than five million. There has been a great deal of inflation in the numbers used to make programs look good. Two million is a more typical value in Europe.

For injury, the agencies have usually been assigning a percentage of the fatality value based on severity of injury, and a couple of

examples are given here, there are much different life categories, but the best have undergone wide acceptance and it is very important in a lot of the programs that NOAA deals with where life and health are significant outcomes. Next slide please.

Now in determining the benefits of any particular program, it is necessary to consider what was done in the absence of that program, and to compare the program's additional impact relative to what the alternative was, and the alternatives are called the counterfactuals. Now in the simplest and most common case you could pair it with another technology that exists. I will show you an example, where I compared the benefits of CORS with the value of -- with CORS and traditional leveling.

But in many situations, the technology would have changed, the programs would have changed over time, so if you have a technology or service that would have been ready to come into widespread use at the time the program you were

evaluating began, then it is more appropriate to look at what the benefits of that technology or service would have been.

Sometimes it is not even on the verge of becoming available, but you consider that there would have been strong pressures to develop a capability if the program didn't exist, and you can look at, hypothetically, how that type of program could have developed. So for this purpose you need to consider some scenarios, and some people are uncomfortable with that.

In a study that I just worked on for GPS benefits where we had to take it to interagency economic advisory group, there were some theorists who wanted to only consider comparison with programs that were available at the time GPS became available, and in that case, well, most notably in figuring out the value of GPS timing. It turns out there are a lot of other timing sources that could have come in.

You could have had a system similar to the WAAS, Wide Area Augmentation System for

aviation, we put up three satellites with timing on them, rather than a full GPS system of thirty-odd satellites, or you could have had an eLORAN develop earlier rather than dismantling LORAN.

Those would have been very low-cost. So you get a tiny fraction of the benefits to GPS timing, when you compare it to those kinds of alternatives that could have come in, rather than not having timing all together, to push it into GPS. The point is that -- this will be the last bullet -- you don't take it to account expected technology market changes, you can get a huge overestimate of the benefits of the program. Next slide please.

Often we have a program which has multiple outputs, or we have multiple programs working at the same time, together or otherwise, that are producing the outcomes that are observed. And it is necessary to make allocations about them to determine what the benefits are to each program, or to a particular program that we are interested in.

Usually, there is no scientific way of doing that. I give the example of Electronic Nautical Charts depending -- the benefits that we observe also depend on the ship bridge systems, GPS, weather information, and other things. So you have to make assessments, and one approach is to use a group of experts to allocate a contribution, a share of the benefits to a particular program.

I am not convinced that that creates any increase in validity, but it does increase acceptability. There are cases where you get -- look at changes in one program when other programs do not change.

The problem is that, even if you are able to do that for each program that was operated together, to produce a specific outcome, the effects of multiple programs changing at the same time are not going to be the same as the sum of the effects of the programs you wanted to find. So you do not particularly get the right answer that way.

In any case, you have to make the best assessment you can. Then test implications or alternatives allocations in decisions you would make to see if other allocations would have produced a different decision. Next slide please.

Finally, we have the same kind of issues in the allocation. Of course, because of that some studies focus of gross benefits without subtracting costs. That can still useful when comparing with other programs. Let's go on to talk about a couple of benefit studies. Next slide.

There has been a long history of efforts to escalate the benefits of Nautical Charts. Most notable is the 2007 study by Hauke Kite-Powell in which he estimate benefits of 42.8 million from electronic charts above the value of paper charts. He measures benefits by consumer surplus. That is the amount people would be willing to pay above costs, not total willingness to pay.

Since the benefits were above paper charts, they do not include benefits of the data collection, and charting required to produce paper charts. That is all -- that is, the information is also used in Nautical Charts.

In a 2012 scoping study of National Ocean Service Coastal Mapping Program benefits, I updated the estimates, based on industry size and added in commercial fishing, which it did not include, and looked at total benefits, including spending as well as consumer surplus.

In a 2004 study of GPS benefits which was actually completed in 2005, which I think it references, I made a rough estimate of how much benefits might increase, based on the fact that they are charging you more than what was, in the earlier Kite-Powell study, considered to be ideal charts. And we get some much larger numbers with all these adjustments, coming up to around four hundred million per year. Next slide please.

This is a description of the methods that I used in a study for the NGS Coastal

Mapping Program to determine the values of different components of the program. You can see the program had a lot of different products for Nautical Chart production, willingness to pay, change analysis, effectiveness cost based on additional construction, boundary determination, legal aspects, delays in offshore oil production, avoidance of delays in wind power production costs, title insurance; the point is that a lot of different methods had been used depending on what was possible in each of the cases and what was applicable for that particular program. Next slide please.

In a closer look at the Nautical Chart estimates in that study, for commercial vessels and recreational boating, I updated Kite-Powell's willingness to pay, based on changes in the number of vessels. I added commercial fishing conservatively, assuming then the benefits were about half as much as the commercial boaters.

I want to focus on this last point. It was necessary to take the overall estimates of

the benefits of Nautical Charts and determine how much was the contribution of the Coastal Mapping Program's Nautical Chart Program, which involved aerial views and other things.

What happened is that one of the personnel at CMP was gracious enough to make some calculations based on the vertices in nautical charts. Doug Grant looked at it several types of charts, looked specifically at the shapes of each feature, and in each case came up with a percentage attributable to the information that came from CMP, and we aggregated that to come up with a percentage for the share overall. So this is a rare case in which we were able to find a technical basis to make an allocation. Next slide please.

We did also a scoping study of the benefits of CORS and GRAV-D. CORS is the Continuously Operating Reference Station program that collects position information and shares it among users in a crude form. What I did was I built on some calculations that Richard Snay had

done at NGS, that system value of savings based on what it would have taken in a study, of course, of traditional surveying.

Then I made adjustments to that. The first adjustment was looking at the extent to which more reasonable alternatives such as real time networks has become available, and how that would affect use. So that is a case of looking, even with comparing to an earlier technology, looking at market changes that developed further. Also then also looking at the fact that had they had the costs of the earlier technology, none of them would have used it.

What my part in the impact study was to estimate the National Spatial Reference System building on revenue from private surveying and mapping and getting information on profits and non-profit. There are societal benefits very crudely, probably a very conservative estimate.

Now what would I have done differently? What I have done differently here is to consider the cost saving from fewer

traditional surveys have to be done because the information is shared. Sharing is a critical feature of the program.

Also, try to look even qualitatively for a societal value of more improved information becoming available as a result of the constitution of course.

I should mention what I would have done differently or what I would do now on Nautical Charts is to, beside the updating and response that we always do, is look at comparisons and changes among geographic areas where paper charts and things are encouraged. This an approach that I suggested three years ago, and for various reasons, I was not able to implement it.

GRAV-D, which is the other part of the 2009 study, GRAV-D is Gravity for the Redefinition of the American Vertical Datum which is an attempt to get better elevation measurement, basically to have virtual benchmarks instead of the ones, the more physical benchmarks

that were being used.

Our study estimated some of the methods based on cost savings and long line leveling and floodplain management, assessing how much the structures that might restrain damage in other locations, and the resulting reduction in damage and loss of life and injury.

What would be useful to do there is to look at what is happening now that GRAV-D is in the middle of implementation and cases before and after where it has actually been rolled out and see what kinds of impacts can be measured.

Two slides forward please.

Next slide.

I have a variety of suggestions about what should be done. What extent? I choose to have a long term program of studies which is laid out in advance and provides a pathway to achieving research objectives. The two studies I just talked about were -- grew out of a 2006 NOS Evaluation Conference, and that acted as the blueprint. Second, it is important for NOAA

personnel to be better involved in the process, and that includes leaders of the units of study being done, involving their staff and facilitating access to NOAA's data and assistance in obtaining information from external sources that they have contacts with.

Next slide please.

I am discussing it at length, but a major part of any Benefits Study is improving knowledge of users and applications, and it is important to include both economic and non-economic benefits. Particularly safety-of-life, where appropriate, the environment, which is harder to measure, and we don't have time to get into that.

Studying the future is very important in planning programs, assessing them against expectations. Surveying can be very eclectic regarding the methods of measuring benefits. Surveying, there are a variety of methods that were used, and we had to make judgments about the contributions of jointly operating program, even

if they're very crude.

Next slide please.

We systematically research to fill in gaps in adoption, productivity, cost savings, safety impacts, do the comparative studies, before and after as well as the case studies. Much more information is needed about private users of services through resellers, like nautical charts, imbedded systems, the Internet and mobile devices.

Sometimes this requires major multi-year efforts with targeted new data collection, which is not very often. Information needs to be much more granular. One example is a study which is preliminary by a new Ph.D., Benjamin Miller, which compares injuries, fatalities, and property damage across all three thousand counties in the United States over the last several decades with the dates of installation of tornado warning Units, and he got quite large impacts.

That's similar to what I was talking about with the Nautical Chart example has a

structure of a quantitative study that is useful when you use it.

Finally, lags in data collection and research can lead to significant understatements of use and benefits of programs because often those benefits are increasing as more people use them and as the technology improves, as the distribution of systems improve.

Next slide please.

So there are a lot of studies that could be done to update the benefits of hydrology and very little innovation. That goes back three decades to a tiny study in Canada, and we have all of the new technological changes that Admiral Glang was talking about yesterday in hydrographic services and in the impact of bathymetric services, and there isn't really much quantitative leadership when a company that provides satellite-based topobathymetric services that has some claims about benefits.

They are a private service, but there is nothing systematic available, nothing that

allows systems to update the full benefits or compare the technologies.

Nautical Charts we talked about. Fortunately, they're undergoing enormous changes with ships around the Panama Canal and other developments, and the port is demanding an unbiased analysis of the changes that would be useful.

GRAV-D in actual operation, we talked about, and CORS, looking at its wider impacts, and finally user benefits of alternative distribution systems, including the growing use of mobile devices, social media, how it affects ways of reaching clients, and responses of markets and programs to spectrum reallocation. Which is something I started researching and was going to go a lot further and potentially affects distribution systems. Thank you.

CHAIR PERKINS: Thank you, Dr. Leveson. Do we have time for questions?

We can also accept questions from the online participants, so if anyone participating

virtually using the GoToMeeting Chat mechanism, you can put forward questions electronically as well.

DR. LEVESON: While we are waiting let me just mention that Paul can answer the same questions.

VICE-CHAIR HANSON: I just have one question. The bullet about needing more information about private users and how they use it is something that we have been focusing on as well. We heard some of the users yesterday who had a panel as well.

DR. LEVESON: Who is speaking, please?

VICE-CHAIR HANSON: I am sorry, this is Bill Hanson.

DR. LEVESON: Who is speaking?

VICE-CHAIR HANSON: Bill Hanson.

DR. LEVESON: Yes.

VICE-CHAIR HANSON: HSRP Committee. Do you have any thoughts about how you collect that private data? That that would be useful for you?

DR. LEVESON: I would have to look at specific types of data. In some cases, you are going to need user surveys and not any one single survey. In some cases, you might be able to collect it on the web based on numbers of visits. I think you can do more in terms of asking people to fill out surveys, but the Paperwork Reduction Act restricts what government can do directly but you can put information on the web.

That lets people respond with unstructured answers without going through the whole OMB process. You can put up materials that people are asked to comment on, and I think that kind of thing is worth starting even though it does not reach as wide an audience.

So the point is there are multiple methods. Ultimately, I think it is going to involve a lot of customer surveys, a lot of interviews, sometimes you can get a Trade Association or other organization to propose that they interview or survey their members and provide information to you so you don't have to

go through the OMB process.

It is kind of hamstrung by that but there are several things that can work.

CHAIR PERKINS: Dr. Brigham?

MEMBER BRIGHAM: Yes, Dr. Leveson. Lawson Brigham, University of Alaska, Fairbanks. I am an HSRP member. I just wanted to ask you how you use scenarios and plausible futures in your work and whether it has been helpful in trying to tease out possible futures for some of these services?

DR. LEVESON: There is no simple method. I have done a lot of it. I spent a decade at Hudson Institute, which was a pioneer in scenario work and you develop understanding of individual trends.

You start with the trends. You start with potential developments. You consider which are most probable. Which things might cause particular developments to occur or not occur. And you have to work through a large number of possibilities in doing that, and then you see how

they can be grouped into major themes.

You have to have alternative scenarios that you can assign rough probabilities to, but that is one of the ways you get around the fact that you are dealing with the future, which nobody really knows.

You can do some things with trend extrapolation or formal forecasting methods, and really what you are doing is combining lots of different ways of getting at things so if there is a --

You can have a consensus estimate in some cases, or you can have an estimate based on what would happen if it were similar to what happened in another sector. And you really have to use a wide range of techniques. It is not an instantaneous process. You get input from various kinds of experts along the way. I hope that answers it.

MEMBER BRIGHAM: Thank you. Lawson Brigham, again. I just -- we use scenarios in trying to develop plausible futures for the

Arctic, and we found in using these that there was a single driver that was driving most of this activity, and that was the price of oil because when we did this study the price of oil, back in 2007, was $148 a barrel, and then it went down at the end of the study, just in the five year period of the study down to $48 a barrel, and of course today it is lower than that.

So for the marine world, there are certain drivers, and we found that one driver was overwhelming in the scenarios work.

DR. LEVESON: Right. Well that makes it easy obviously. But the commodity price decline is much broader than oil, and some of the commodities that you would be looking for if you wanted to create a pathway to the Northwest Passage, for example, would still be viable if other commodity prices were higher.

But I see what you are saying, and that is a case that makes it very simple. Sometimes it can be as simple as saying well what if Moore's Law continues? But usually it is not.

MEMBER MAUNE: David Maune. I am a member of the HSRP. Bill asked a question about customers, and I learned a lesson from the National Enhanced Elevation Assessment that we performed. I mentioned yesterday that we had collected 600 plus mission critical requirements from federal, state, and government agencies, but I was later to find out that just by knowing who downloads LiDAR data from the National Open Topography Portal, they have some little questionnaire that says are you private sector? What kind of business are you in?

Asks a few questions, helped us understand who is the most common user of LiDAR data. The people who most commonly download it, and it turns out that is mom and pop, privately owned survey firms that do land surveys.

Why do they do it? Because they get paid $1,000 or so a pop to give a little topo survey of somebody's property or a subdivision or something. Where they used to go out with survey equipment and have to survey a whole bunch of

points to come up with contour lines for the shape of the terrain, and now they say oh I just download this LiDAR data set, and I use this software and miraculously -- I mean I did this for my own son-in-law.

He was required to provide a topographic map for a property where he was building a wholesale nursery. And he said they want a couple thousand dollars for it, and two hours later I gave him exactly what he needed, and the guy said it was the most beautiful thing he ever needed. And we need thousands of these kind of maps every year.

We go through every county; this was one county. You multiply that, and you find out that -- I had no idea that the mom and pop surveyors were the ones who most commonly downloaded LiDAR data sets.

My point being, if NOAA has a way of tracking who downloads Electronic Navigation Charts and things like that, and maybe you already do, you might have a better understanding

of who your users are.

DR. LEVESON: I looked into it at the time, and they didn't have it. I am in the process of trying to get something similar to what you just described in a study I am currently doing for NESDIS. So yes, it is a great approach when the data is there, but maybe from my policy point of view, there can be more reference to ask people to fill in that data when they do download it.

CHAIR PERKINS: Rich Edwing?

MR. EDWING: Yes. Good morning, Dr. Leveson. This is Rich Edwing, Director of CO-OPS. I kind of have a higher level question. Looking at your presentation, I am kind of struck by the number of individual studies we've done, and I think you are familiar with the port studies that my office has done, and I am wondering if --

DR. LEVESON: Yes I am.

MR. EDWING: Thank you. I am wondering if there is value and even feasibility

of doing a more holistic study. In other words, these three offices provide a provide a suite of proxy services whose most high-level stated goal is to improve the efficiency and safety of the Marine Transportation System. Is there value to kind of doing a study that tries to tackle it at that high level?

The pros and cons? Is that even feasible? Pros and cons, because at the end of the day we are trying to support these services. Now, recognizing the CORS and GRAV-D kind of has a broader mission, but there is some overlap with the MTS.

DR. LEVESON: First of all, I do think it is feasible, and I think it is essential. Some of the private work that has been done has been very biased. That is why I said we need an objective study of meeting the changing needs of CORS. This is much bigger, of course, than that. We can build on the individual studies that have been done, but depending on resources, it might be appropriate to do other

individual studies at some level within the context of a broader study to help fill out the pieces.

Then there are efforts to look econometrically at different industries and their contribution that might be fed in.

I think it is definitely feasible, and it -- even though there are underestimates in a lot of the pieces that we have already, I think we can combine those with other kinds of information and the research to get something worthwhile.

MR. EDWING: Thank you.

MEMBER KUDRNA: Frank Kudrna, Panel Member. Dave Maune who spoke to you a minute ago is leading us in presentations and discussions of private and other government agencies in terms of what uses and needs they have for NOAA data and leading toward what the benefit cost of that information would be and whether it would be of value to them in some sort of cost sharing.

Do you have any suggestions of

previous studies or agencies that have looked at this particularly? Are there any studies or similar reviews that have been done for other organizations that might lead us to some answers on those questions?

DR. LEVESON: I didn't catch the beginning. I caught everything but the noun in this, so what is the studies of that you are interested in?

MEMBER KUDRNA: We are trying to find out if, either on the private side or on the government side, there are agencies that have needs for NOAA data information in which there could be some potential benefit or potential cost sharing if the benefits of acquiring additional data or using data would take place.

I guess I am asking, have you, are you aware of, or have you performed any studies for any of these other agencies that might be useful to us?

DR. LEVESON: Not really, no. I am not really aware of anything like that.

MEMBER KUDRNA: Thank you.

CHAIR PERKINS: I do want to mention that we are also able to entertain any questions from the audience that is here in the room.

DR. ABDULLAH: Good morning everyone. My name is Dr. Qassim Abdullah I am with Woolpert Incorporation, and my question for Dr. Leveson, I didn't see in your study or analysis anything about increasing the public awareness about what NOAA is doing. I mean, do we need to invest in that to increase that kind of awareness? Whether education, online courses, how to, I know like Ms. Juliana mentioned, NGS has a few courses, but I don't think we really have enough to educate the public about what we offer. How you do it? Where to get it? Example of Dr. Maune on LiDAR for example.

That is a great thing. But the data that NOAA is offering has the same greatness, but does every surveyor, everybody riding a boat know where to get the data and how to get it?

So lastly my question to you,

increasing the public awareness, if we invest in it, would it affect the final statistic you come up with for example for the user attention on what NOAA is offering? Thank you.

DR. LEVESON: My position is the same as what Dr. Sullivan stated yesterday, which some people who are here today may not have heard, which is that it can be really costly to advertise an agency to get -- or an overall organization to get it known when people don't think if it that way.

That it is better off to concentrate on each of the individual units or programs, going after the types of customers that might be interested in their own products. Without them caring whether or not there is some overall entity called NOAA behind it.

She gave the example of, I think it was a fast food place, where you don't know the name of the parent company, but you know the name of the restaurant. I think that is what has to be applied in this case.

There is really no overall way of approaching it without spending a large amount of money and not getting the same kind of impact as focusing on individual constituents who might be interested in particular services.

CHAIR PERKINS: Well Dr. Leveson, thank you so much. I appreciate you participating in the HSRP this morning. I know it is always challenging to do it remotely, but from this end, the audio and the PowerPoint went through very well, so for not being in the room with us you did extremely well in keeping our attention, and I think the question and answer period here at the end here reflects that.

So thank you sir.

DR. LEVESON: Thank you. It was a pleasure to do it. Enjoy the rest of the meeting.

CHAIR PERKINS: We are a little bit ahead of schedule. We have a break up next, and then after break, we have our Government Panel. So yesterday we had a Non-Government Association Panel. Today we have the pendulum swinging in the

other direction, and we have the counterpart of that, so the Government Panel.

MEMBER MAUNE: Might we be able to start before 10:30?

CHAIR PERKINS: I see no problem with that. Are all of the panelist present?

MEMBER MAUNE: Is Susan here? Is Susan here from USGS? Okay, yes, the panelists are all here.

CHAIR PERKINS: Okay, great. I am always in favor of finishing projects ahead of schedule. You know I get better marks when I do that. So think that is a great idea.

MEMBER MAUNE: I told all the speakers they had twenty minutes, and when I had up to twenty minutes, we'd run past the time allotted. So --

CHAIR PERKINS: Yes.

MEMBER MAUNE: So it is either give them less time, or give us more time.

CHAIR PERKINS: Yes we would like to --

MEMBER MAUNE: We can -- if we can start in fifteen minutes, if we can start at 10:20 a.m. instead of 10:30 a.m., that would help a little bit.

CHAIR PERKINS: Yes. I think that is fine, because I would like to end it on time because we do have a very good presentation from Admiral Lopez that -- I don't want to lose control of the schedule. So 10:20 a.m. we will break until 10:20 a.m. and then we will reconvene.

(Whereupon, the above-entitled matter went off the record at 10:05 a.m. and resumed at 10:20 a.m.)

CHAIR PERKINS: If you could please find your seats, we will get the panel reengaged.

MEMBER MAUNE: Well we can get started, Scott, because a little bit of this is going to be a repeat from what I discussed yesterday for some of those who are missing.

CHAIR PERKINS: Yes. Dr. Maune, you are going to do the introductions for the

panelists as well?

MEMBER MAUNE: Yes I will.

CHAIR PERKINS: Okay, then I think we can start with that.

MEMBER MAUNE: Okay, thank you everybody. In yesterday's session, we had a number of presentations in which Dr. Russell Callender started off by mentioning the need to engage stakeholders. Then we had customer support; Juliana Blackwell mentioned the need for customer engagement, rather, and then we had Admiral Glang mention, how do our customers use our products? And how do they want them changed? Dr. Sullivan said, what do our customers need from NOAA? And Jeremy mentioned, what is the value of what NOAA does?

That is all very consistent with what the theme of this session is, and we just got a nice presentation on benefit cost analysis and that sort of thing.

This shows what one of our objectives was by inviting our panelists today to discuss

what is NOAA doing right? What is NOAA doing wrong? How can NOAA improve? Does NOAA need to change course?

I was involved in a couple of studies, one going back to 1998, the National Height Modernization Study in which we started with user forums and case studies. We documented the accuracy and cost benefits of modernizing the National Height System in the United States where we previously used differential leveling, and now we are going -- we recommended CORS and differential GPS, and we documented some other needs in the elevation arena as well.

Then in 2012, I was involved in the National Enhanced Elevation Assessment in which we again started with questionnaires and user interviews. We documented requirements and benefits for 602 mission critical activities and resulted in USGS's 3D elevation program to develop QL2 LiDAR nationwide and QL5 IFSAR for Alaska. We looked to the future with new technologies on the horizon.

So, the relevance to today's presentation, both studies were based on customers stating their problems with the status quo and their need for change. Cited improved accuracy as major benefits. Both studies succeeded partly because dollar benefits were quantified, and they both resulted in major program changes.

To NOAA, NOAA wants to improve its products and services today. We hope you can help the HSRP quantify the needs and benefits, and we can make some assumptions concerning intangible benefits, and we had some lessons this morning on the prior presentation which I thought were excellent. In couching value and things like that to the benefits gained.

Okay, we are not sure if this will succeed, but we are going to give it a try and hope we can get some future directions out of our panelists today. These are our five speakers in order. Jeff Lillycrop told me he has been waiting very long time to be given the

opportunity to tell NOAA what he really thought they ought to be doing. Is, that right Jeff, did I get that?

Okay. Well Jeff is the lead technical director for Civil Works Research and Development and technical director for Navigation R&D at the Engineer Research and Development Center, ERDC, U.S. Army Corps of Engineers.

He is responsible for the integration of the environmental flood risk management and navigation R&D, and he is responsible for nine R&D programs covering a wide range of topics including navigation infrastructure, channel dredging and performance, coastal inlets and sedimentation, surveying and mapping technologies, e-navigation, regional sediment management and many more. He is chair of the committee on the Marine Transportation System Integrated Action Team for R&D.

Jeff, the floor is yours.

MR. LILLYCROP: Thanks David. I have been working with NOS for my whole career, and

actually before my career began, I was a graduate student at the University of Florida, and NOS, the Tides Group, paid for my thesis, and I worked with them as an employee at the Jacksonville District. Then when I got into R&D -- and then I was in Mobile working in operations and coastal mapping, and then now in D.C. there are a lot of interactions between us and NOS, and I think that the most value that we have gotten out of all your products is the efforts in collaboration, the expertise, the professional relationships, as well as the data and your products.

One of the key responsibilities that I have in the R&D community is to identify what are the priority research needs for each year and over the horizon. It is always difficult to try to put a dollar value on the return on investment or try to quantify some way the value to the nation of what we do, but if you think of Ford Motor Company, if they'd stopped at the Model A and put away their research program, where would we be today?

The world is a technically-based world; you are not going to be able to keep up and provide the goods and services that are needed without continued research, without continued collaboration and without science and technology.

So to give you a little history on those not familiar with the Corps. We are civil engineers. Our services are design, construction and operation of water resources projects.

We have an incredible value to the nation that is summarized in this slide. We have eight mission areas in our Civil Works Program that include navigation, flood risk management, ecosystem restoration, water control, water management, and a host of others. Emergency response, and we work with NOAA in most of these areas on a daily basis, at a national level and at local levels in the districts.

Most of the water resources projects were built in the last thirty to a hundred years. So they are beginning to age and show their age.

Our annual budget is about five billion dollars a year. About sixty percent of that is for navigation. That is our largest single mission in the Corps of Engineers, Civil Works. Thirty percent is flood and the rest trickles out from there.

If you look at our navigation assets, we have really about fifty nine ports, channels, coastal channels, that move about 90 percent of the cargo in the U.S. by weight annually. So fifty nine channels move about 90 percent of the commercial cargo. About one hundred other channels move 9 percent, and those are our definitions for high use and moderate use channels.

So on an annual basis, we are maintaining somewhere around 150 to 200 channels a year. In the total portfolio of active commercial harbors, there are about 250-ish that are really high, used a bit. The remaining up to 1000 are low use, a lot of them are recreational channels like the one at East Pass, Destin,

Florida. It is a shallow channel that really only has the recreational traffic with a few charter boats.

So our focus is on commercial navigation. In addition to the channels that we consider infrastructure, we also have coastal locks. You are familiar with into the New Orleans over in Florida and Texas, and on the inland side we've got over 171 lock sites on 27 river systems, so in navigation the bulk of our focus on the inland side is steel and concrete, navigation locks, aging infrastructure. On the coastal side, it is really all about dredging and placing material.

Also on the inland side, we are the charting authority for the U.S. just like NOS NOAA is for the coastal areas. They have asked us to identify what are the most used products? We use these products primarily for our missions. We are not mariners per se. We are not navigators. We are civil engineers, and we use these data sets, these products in the planning, the design,

the construction and the operation of our projects.

Many of them we used as intended; many of them we use probably that you would have never guessed. A lot of your output is input to the applications that we create around your tools and products.

I am sure I have missed some. I am sure some of these are not all from the hydrographic sciences, hydrographic services side. I know some of these are from other parts of NOAA, and that is one thing that I will say is that I get pinged on a lot that it is hard to find our data, our navigation data across the Corps. It is hard to find NOAA data. There is no single entry point. You can Google what you are looking for, but my standard is, can I get to it in three clicks?

That is what people ask me for. Most of our data you can't; we are working on that, but one of the recommendations I will have at the end is easier access to your data. You are the

big data guys in the -- in NOAA, so where you go the rest of NOAA can hopefully follow. But these are all products that get used.

I canvassed our primary communities of practice to develop this list. Our surveying and mapping, our planning organization, and our operations groups. So all of these are great products and used pretty much on a daily basis in various ways.

To give you an idea of some of the collaborations that we've had and how these products are actually used, I have got a few examples of where we collaborate. As I said, I think the collaboration aspect is the most important and provides the best value I know to us and I think back to you all.

The Corps moved from local datums to going to a Mean Lower Low Water datum. It was painful. It was a change in business processes for a number of the districts, and each district kind of did things a little bit differently.

We are still -- we have been working

on it for a decade, and we are still wrapping up some of that. New Orleans and Galveston have been the very last two to fully convert over. But for our purposes it wasn't important that we convert. We knew our local datums. We knew our charting or our dredging depths.

So it wasn't as important for us. It was really more important for the rest of the nation and other users and certainly for charting purposes. So it became important and a priority within the Corps, and as a result, we reached out to the Tides and water levels authority, and you guys helped us immensely.

You put together training courses, you put together guidance on how to do it, and it has been a very good success story.

We've worked together on WAVES. I know waves is not exactly a hydrographic product, but it is very important in navigation. We developed a national WAVES plan together. Version one that looked at where were observations needed around the U.S..

Through the IOOS program we began implementing that and realized that was not going to work. That none of the federal agencies had enough money to put out the hundreds of wave measurement devices, buoys and others that were needed or called for, so we took a step back and developed a version 2 that looks more at developing WAVES from hind casts and using observations to actually validate those hind casts.

That provides a better product for us in the sense that we are able to create long term records and use those long term records in risk based probabilistic calculations. The ability to validate that set still requires observation. So those observation buoys are a combined collaborative effort. We used National Data Buoy Center buoys. We paid to upgrade tens of, at least tens to 100 accelerometers because it is so important that high precision accelerometers are used in the NDBC buoys to accurately determine the waves.

Direction. We have worked together with CDIP, you all are contributing a little bit to CDIP. The Corps is, the Navy is, California is, so that is a collaboration.

We have also worked on WAVES at the field research facility which was one of our sites down in North Carolina. In developing new gauges, looking at ways of taking new measurements. So that has been a great experience and success in collaboration.

The guy who came up with the Joint Center, what a brilliant guy, I would like to meet him some day.

This was really a no brainer. This was leveraging a lot of things that were going on in the Federal community back into the late seventies. NOAA, Navy, NASA, have done a lot in bathymetry, LIDAR bathymetry. The Corps came along, we really leveraged what everybody else was doing, Navy, NOAA, was involved in the development of all the sensors, the NOAA's depth extraction algorithms are still used in the third

generation of sensors.

Gary Guenther's work was/is phenomenal, but there is a lot that can still be done in this area. There have been, there is really two components to it. The operations side and the research and development side. Both can stand to continue the collaboration and take a new look at some of the things that are going on to see where we can expand that collaboration.

One of the areas that is important to us, and I know to you all as well, is the ability to push data out to the public, we think that the digital coasts is a great capability for public distribution of information and data.

We contributed to its development directly financially and we contribute our data to it.

We actually used it as a leverage to get the Corps to use our data. It is sometimes easier to get other agencies and other groups to use your data. Outside of Federal Agencies and your own guys inside but this graph is produced

by us for by the Digital Coast every year and since 2004 when we started we have had over 26,000 people download our data.

What we told our internal organization was that if you are going to court, you better believe that other people are using this data. You better at least know what they've got. It took a while, but getting a new technology accepted, getting it into practice is always a challenge and R&D products don't just fly off the shelves at times. Sometimes it takes a little bit more.

But this is a great capability. It really accentuates the need to share data to make data accessible and that is a theme that keeps coming back to the Corps in just about every meeting.

We are moving from a project centric perspective over the last decade to really looking at regional concepts. Regional management of our projects within that broader context. What are the interdependencies, how do they all work

together, and it really takes measuring, monitoring and data to determine some of that and you guys are a huge data source.

Making your data available is as important to us as us getting our own data out. And I will say more about that in a bit.

Another area that we collaborate on that is all interconnected is in this committee on the Marine Transportation System. E-navigation, Interagency Action Team, and its co-led by NOAA, by the Coast Guard and by the Corps. We are the big agencies in that effort. One of the things we are working on now is developing, and e-navigation was all about harmonizing data, making authoritative data sources available to all those that need it. And really getting into the exchange of data and turning that data into information for decisions.

So one of the products we were working on together is an Integrated Notice to Mariners. We each produce some sort of notice that goes out and typically we cut and paste the unique

information from the other agencies to stick in ours. So the concept is can we create a website that through web services in real time, based on your geographic location provides you with the most authoritative information for marine safety from the agencies and is created in real time when you need it.

The challenge is moving a lot of that data from the way we use it now, store it now and create it now into services architecture that really allows this. We have got a working prototype that is pulling data from the four agencies, but we need to continue to fill out all the fields that the agencies have identified as priority.

We need more collaboration in research and development. That is an area that is extremely near and dear to my heart. We have had many successes on the R&D side not just on the using your products and data side. The R&D side, we are in this together and there is a lot of things that we have created looking at the upper

left hand corner modeling.

We have used some of our models with NOAA data and created capabilities for storm prediction that is being used by the Pacific Disaster Center. Transferred some of that technology that we helped create to one of your operational groups.

Measuring and Monitoring in the upper right Coastal Mapping, Coastal Data, Coastal Measurements, We have collaborated a lot, as I said in our Mapping Program and in the FRF designing and creating new ways to collect these measurements. Better, faster, cheaper, more robust, more resilient.

The bottom one is, we really leveraged the concept of the data integration framework. To make our data available Margaret Davidson was on our Coastal Engineering Research Board for a few years. She would not let go that it was impossible to get our data. If you wanted data from Seattle you had to go to Seattle. If you wanted data from Jacksonville District you had to

go to Jacksonville District.

Well we worked on that and taking a lot from the IOOS concept, from the Digital Coast concept and put together our navigation portal which gives you one door into all of our navigation data across the Corps and it is navigation.usace.army.mil, and it has been up and running for a few months and we are continuing to make all the links behind the scenes to our data. And you can't get everything in three clicks but the idea is that it is simple, self-explanatory and a tool not only for the public but for developers.

If somebody wants to access our web services for our data that is where you go. So my recommendations, Dave asked me to try to quantify some of these, first I would like to unofficially say we are more than happy to pay for half of your charting program. We would love to contribute as long as you guys are willing to pay for half of our dredging program.

But these products I think are

important, again these are from our guys in the field and across the Corps. The OPUS projects should be used to establish and publish new control points within the National Spatial Reference System. We calculated that it would save us about ten hours per time that we did it at a guy's salary of about $100 per hour. We do about a thousand of them a year. That would be about a thousand bucks per 200 a year. 220, meant to be 200.

So we would save about $200,000 that is a rough estimate, don't send me a bill please. But it is an indication of the value of that one capability.

Another one is that online tools for data conversions. We have had our Corpscon software that we developed back in the nineties I think it was, maybe even in the eighties and it has been limping along. I know that you all are developing your own and we see that as a phenomenal step for us because it will have the Tides authority produce what we have been trying

to keep going out of passion for decades and it really moves it out of our area and into yours.

We have been using ours for pretty much all of our projects for a long time. The problem is, it hadn't been funded. So it doesn't save, we can't put a dollar value on it but it does provide great capability. I was told that we need to release WALI? I don't know who WALI is, I feel sorry for him.

But WALI needs to come out and be available to the public. He turns water level measurements into title datum calculations which would be very valuable for our dredging program. We use local Tide, staff's Tide gauges and the closer they are to our dredging channels the more accurate our surveying is and along those lines I know you are working on channel forecasting water levels, anything that you can do to provide a real time water level anywhere along a navigation channel will improve our hydrographic surveys.

I think in the Coastal Mapping Program there are a lot of, we spend about five million

dollars a year covering about 20% of the U.S. coast. Repeat cycle of about every five years.

We also survey after storms. There has been a lot of work through the interagency working group on Ocean and Coastal Mapping. There is a new plan that is out and I know there is a lot of collaboration in there. I think if the charting organization would take a look at the data right now I believe you are only using the mean high water line that is calculated. There is a lot of value in that data. It is surveying areas you are not typically and can help update some of your products and I also think that if you look at the operations you could collaborate on where they are going to survey in a given year and try to match some of your requirements with theirs.

And get a lot of bang for the buck that way. On the research side there is a list here that has been produced through a collaborative effort. Through the Joint Center, these are research topics that could yield both

organizations a lot of value. Maybe not just the charting organization but throughout NOAA and the Coastal Zone Management Group.

Then all data available through REST and web services. We are getting further and further away from just trying to access data. We spent a lot of money putting our tools or plumbing into our pools, tools, the actual location of the data so that the user of the tool doesn't have to go out and find data all over the community.

We are trying to make it so that the tools actually access data and figure out what's needed or at least provide the user of that tool with the ability to format or make decisions about the data.

So being able to access it through applications is more important than being able to access it through a website just by clicking and looking.

Likewise a lot of your final products like your charts are not as important to us

because they represent a shoal-biased situation. The bathymetry is actually your raw data, is actually more important for us because that's what we are trying to use to look at, compare it with what's been previously for that area and determine change and rates of changes. So that is different than perhaps many other users.

Then my last is three clicks to access all the data for all purposes for all of NOAA that would be nice. Thank you.

Then these were some that I was not exactly sure how to roll them up and I will just leave them here. I think the ability to collaborate, the ability to work together, the ability to leverage each other's expertise has been the best value that we have had. There are a lot of tools, there are a lot of challenges that we have got that if we work together on, continue to work together on, we will be able to solve more efficiently and effectively and the more we collaborate, I think the better it is for the nation.

CHAIR PERKINS: Thank you.

MEMBER MAUNE: Much appreciated Jeff.

CHAIR PERKINS: Are you doing questions now? Or, holding at the end?

MEMBER MAUNE: I am going to wait at the end.

CHAIR PERKINS: Okay. Thank you.

MEMBER MAUNE: Our next speaker is Mr. Stephen Malys, Senior Scientist for Geodesy and Geophysics at National Geospatial Intelligence Agency. Steve serves as the NGA senior scientist for Geodesy and Geophysics. He has earned a B.S. in Earth Science from Penn State in 1981 and an M.S. in Geodetic Science from my Alma Mater Ohio State in 1988. He represents NGA on the DoD Positioning Navigation of Timing Executive Committee and the International Committee on GNSS.

He is a founding member of the Editorial Board of the journal GPS Solutions. He was designated as Science and Technology Fellow by the Office of the Director of National

Intelligence in 2007. Welcome Steve.

MR. MALYS: Thank you very much David. Happy to be here. I think all of you are familiar with NGA but if not I will just remind you we are both a defense agency and an intelligence agency as you probably know we have a longstanding relationship with NOAA. We will go through some of the highlights of that.

Before we get into the slides I do want to mention we have a couple of team members here with us. I am happy to say our Director of our Maritime Safety Office, Navy Captain Brian Connon is here with us as well as one of our senior experts in gravity field modeling and the geoid, Dr. Pavlis and one of our scientists working on Arctic issues, Dr. Bernstein so it was a team effort to put this together. We appreciate the opportunity to do that.

While we are not going to hit everything that we do with NOAA there are a few things we will highlight and I will have a few recommendations to discuss for your

consideration.

So let's see I have the button here. Right side. Okay. No, there we go, went too far.

So in terms of outline I will just give an overview of the broad working relationships we have regarding nautical charting and other issues we jointly work on. I will talk about our complementary geodetic missions you are aware that NGS and NGA share a lot of Geodesy goals. I was here yesterday and I was trying to count how many times I heard the word Geodesy. Which is really rare because it is a very niche field.

For me it was a pleasure, so I feel right at home here. We do have a lot in common with NGS on that. We will talk about recent Arctic initiatives, I know there is discussion about that and a lots of interest about how we can better support the country at large in those areas and there are certainly things we can do together on Arctic issues to do good things for our nation.

And then a couple of recommendations to summarize at the end.

So nautical charting, you know that NGA is in the business of supporting nautical charting around the world. Of course NOAA has the mission of U.S. waters, U.S. territories. We deal with other parts of the world as well.

We actually use different formats, you are probably all aware of the ENC's and the DNC's. Digital nautical charts are what the Navy continues to use and we certainly support to the extent we can. And Navy transitioning to the ENC's as they are able to do that. But these things are closely coordinated. There are regular meetings between our NGA, Maritime people, and NOAA on how to move forward with nautical charting.

I won't focus on that, just to remind you we do that together. We also coordinate on things like the IHO. What is the U.S. position when it comes to the International Hydrographic Organization. There are regular meetings among

our agencies to help coordinate a single position on that. Things like digital bathymetry, GEBCO, the crowd sourcing effort was mentioned yesterday under IHO. We are certainly interested in that and again establishing a U.S. position on any policy issues related to crowd sourcing. If volunteer geographic information like bathymetry is collected somewhere that some countries might object to or might not agree with sharing it.

We want to have a common U.S. position on those things. We expect not everyone will want to share that data as much as we would like for them to share that data and we think it is important to have a common position when it comes to the U.S. position on that.

There are nations around the world that don't like to share with us. You probably know that.

International standards and of course we heard yesterday also map once, use many times we are certainly in favor of that. We know resources are limited to the big wet world and

there is lots of data to collect and we don't want to be duplicating anything wherever we can avoid that.

Okay, moving on to other more geospatial functions. I mentioned NGS, I will get to that in a minute. You may or may not be aware that we are hooked up with the National Center for Environmental Information formerly known as NGDC. One of our missions within NGA is to produce on a five year cycle a world magnetic model.

A global mathematical model of the Earth's magnetic field which is still necessary and still needs to be updated because it changes that rapidly it needs to be updated every five years. That is more or less a standard product at this point. However, we continue to be closely following data sources that we use for that world magnetic model, not all of those data sources come from U.S. sources.

So we have been using recently for example the European Space Agency's SWARM Mission

as a source of data to go into that world model.

We are interested in improving that model and through NCEI we are pursuing what is called an enhanced magnetic model and there are potential new uses for that kind of modeling for the magnetic field at a higher resolution. So that is something we do with NOAA.

NGS, I'll start off with the Corbin, Virginia facility. If you are not familiar with it, it is a test facility in Virginia that is a survey training area as well as a very useful place to test out the geospatial accuracy of many different sensor types. So we have ongoing use of that facility in collaboration with NGS and expect to continue to use it for LIDAR, just one example of the types of sensors we evaluate at that test site.

Yesterday was also mentioned the conference for the Geospatial Summit that NGS held back in the springtime, we became much more aware of and participated in that Geospatial Summit which outlined NGS's plans to update or

replace NAD 83 and NAVD 88. So by 2022 we will hopefully be in a much better position to minimize any differences between WGS 84, which we created and maintained in the DoD and the national system that is based on NAD 83.

So that is a very good thing in the long term. We can pursue much more interoperability. There will be small, hopefully statistically insignificant differences between NAD 83 and WGS 84 for example. Also the vertical datum we should be much more consistent with from a defense side versus NGS's side.

We look forward to that. We look forward to working with NGS as we can to pursue those goals.

Another area we collaborate on you may be familiar with the U.N.'s International GNSS Committee ICG. That is an annual gathering of all the nations that are so called providers. So providers of global navigation satellite systems like GPS. The Russian GLONASS, the Chinese BeiDou system, the European Union Galileo system. All of

those provider nations try to coordinate under that UN body to maintain interoperability to the extent we can so of course we have a global mission. I am sure NOAA's interests in exploiting those other GNSS's in the future you are probably aware that commercial vendors of GPS equipment are already marching down the path of producing multi GNSS type devices and that has certain advantages in certain situations and they have to be interoperable to use them. We have to understand what differences might exist between those GNSS's and our own GPS so that's another area we have in common that we participate in, there is a meeting coming up in November out in Boulder for this year's International Committee on GNSS.

Just to focus a little bit on the reference frame. As NAD 83 gets updated by 2022 we have been for a number of years trying to align WGS 84 with the best international standard. The ITRF, the International Terrestrial Reference Frame. That is produced by a group of

scientific contributors that have really done a great job using GPS and other methods to improve our knowledge of the size and shape of the Earth. The center and mass of the Earth. And the orientation of the axes we defined so I would like to use the postage as a good example in that we know where the center mass of the Earth is to less than the size of a postage stamp now.

That little postage stamp by the way is 19 millimeters x 22 millimeters and if you compare our knowledge of today's WGS 84 to that postage stamp, we are in that little green box shown there in the diagram.

The ITRF, at least ITRF 2008 is somewhat better than that. It is at the level of 5-8 millimeters and if we are to get better as this 2010 National Research Council study suggests, if we are going to reach the goal of 1 millimeter reference frame by 2030 then we need to understand how that geocenter moves. So when you are measuring sea level changes at a few millimeters per year and other very precise

measurements of geodynamics we believe, the people who did that study believe we need a reference frame that is accurate to 1 millimeter with a 1/10 of a millimeter per year drift.

Now if we do that together with NGS with their thousands of stations around the U.S. I think we can do a better job if we do it together and coordinate on that. So it's another area we have in common in the geodesy area.

We also have common interest in the vertical datum, the new updated vertical datum NGS is working on is being assembled, data is being assembled over the continental U.S. as well as Alaska, Hawaii and other areas. We have our global model at the moment. Earth Gravitational Model 2008.

We have been using that vertical reference surface, a gravimetrically defined reference surface for many different applications within the DoD. So it's again a common goal.

We would better like to understand the geoid over Alaska, the U.S. Gravimetric Geoid

2012 is the current best realization of a geoid over Alaska. It does become important for Arctic issues and I will mention that again in a minute.

So the highest area of interest for us concerning the GRAV-D collection would be in the Arctic area. Our mission of course is more global. We as a DoD agency do support national interests in the Arctic. It is recognized that climate change and other things going on in the Arctic is a national security issue so we are interest in supporting that to the extent that we can. We don't dictate what happens within NGS, they decide their own priorities. But if we had a voice in it, we would suggest that the Alaska area and other nearby Arctic areas would be of the highest priority to do collection of gravity data perhaps at a lower altitude than what current missions are collecting to get the kind of resolution that we need.

What I am recommending here is that we join these studies for the benefits of a better geoid over and around Alaska. Not just the land

areas but the ocean areas as well. Because a better geoid around the Alaskan waters will help oceanographers and others understand the currents around that area which of course would be of interest to NOAA. So we think there is a, some benefits to studying that at least to begin with understand the current accuracy of the geoid over Alaska now.

To our knowledge that has not been assessed accurately. So if the geoid is to be used as a reference surface for elevations for example. First of all we want to know if there are any biases between what NGS uses and what we might use when we collect digital elevation data. Or oceanographic data of any kind.

So that is one recommendation. We also have gravity data of our own that we collected under this Arctic Gravity Project which ended a few years ago. We believe some of it is still being processed. But there may be some data we can contribute to a regional geoid if that were to be a desired goal in and around Alaska.

So we just want to point out this is a scenario we should discuss together and see if there is a benefit to focusing on it in more detail than has been done to date.

You are all aware of the President's involvement in the Glacier Conference just a few weeks ago? This is a top of a press release from NGA, the President did mention by name NGA and NSF working together on digital elevation models over Alaska which is one of our contributions as the Arctic gets more and more focus from the Administration.

We produced this particular graphic in support of that Glacier Conference. It more or less outlines a number of important layers of information in the Arctic region at large. I know you can't read it from there. There are paper copies that we left on the back table if anybody would like to take them with you, you are welcome to do that.

A number of these layers are based on NOAA data. We collaborated with NOAA and others

to produce it. We expect this type of information will continue to be important as we develop our national policy. Especially when it comes to boundary disputes and territorial claims and other things in the Arctic and our Maritime Safety Office again is the primary point of contact for that.

There are other polar issues we are interested in. Of course we think it is important to prioritize bathymetry collection. We of course support any increased bathymetry collection or reprioritization and of course crowd source data anywhere in the Arctic would be valuable. We are also interested in understanding NOAA's possible role in the Southern Ocean.

Currently we don't know what that role might be. I think it is worth a discussion. We have interests certainly in the Southern Ocean. As well Antarctica is a very unique place and it has a very sparse data collection. Even more sparse than what is in the Arctic.

So just a recommendation to

understand, at least for us to better understand if NOAA has a role and if so, what is it in the Antarctica area?

Finally, this is really the final recommendation. I think it is a significant opportunity. We heard about CORS. You are all familiar with CORS, the Continuously Operating Reference Station. You know that GPS of course has enabled countless applications for positioning navigation and timing at many different levels of accuracy.

The CORS network is really a unique asset with thousands of stations somewhere in the vicinity of two thousand stations if not more. Because the positions of those stations are known very accurately for survey quality purposes, they can be used to detect interference to the GPS signals. Either intentional interference or unintentional interference. You know that the spectrum is becoming more and more crowded. There are concerns about how we can protect the GPS infrastructure so using the CORS network as a

tool to detect and warn of or localize interference sources in my view is a very rich opportunity to use a NOAA resource for a national purpose that has our defense interests of course. We want to protect GPS we depend on GPS for many, many things. The feasibility of this has already been demonstrated.

So we know it can be done, I am recommending that it be pursued in a more operational sense with other government elements like DHS or possibly the Coast Guard.

I certainly can't speak for them but I know they are interested in this kind of detection tool. So again because the locations of these thousands of stations are known very well, it is straightforward to detect anomalies in the GPS signals or other GNSS signals should they be used operationally.

So if it is something that could be done, it is something that could support a national level mission, it is a good fit with what NOAA already does. This CORS network is

going to be in place for the foreseeable future and I think it could be used very effectively for that national interest.

With that I think I will stop. I just have a summary of the recommendations here which is nothing new, the bottom two are the most significant to the contributions or recommendations that we are offering at this time.

To study the geoid around Alaska to understand it in more detail. And to pursue this interference detection tool using the CORS network so I will stop there. Thanks.

MEMBER MAUNE: Thank you very much.

Our third speaker is an old friend of mine, Mr. George Sempeles. Aeronautical Information Specialist Air Traffic Safety Oversight, FAA. George is an Aeronautical Information Specialist responsible for oversight of navigation products and services provided by FAA. As a credentialed Air Traffic Safety Inspector George performs audits and assessments

to ensure the Nation's Air Navigation Products and Supporting Digital Data and information comply with FAA and international standards.

George helped me a whole lot when I did a study on Alaska a few years ago and helped determine the direction for ASR mapping of Alaska. I really appreciate that, George, and the podium is yours.

MR. SEMPELES: Good morning everyone. Thank you very much for the invite to address the Hydrographic Service Review Panel today. I want to segue a little bit off of what Dr. Maune said earlier about the questions he wanted answered and what you are going to find with this presentation is it only answers one question.

What are the things that NOAA is doing right? So with that said, one might think it odd for an aviation employee to be addressing the Hydrographic Services Review Panel today but as I am about to explain the FAA and NOAA in 2016 is about to celebrate a ninety year relationship.

Which represents a long, long

relationship.

Next slide please.

Now as we know, NOAA is the oldest scientific agency in the United States. It was created by none other than Thomas Jefferson in February 1807. As the Survey of the Coast. It was renamed U.S. Coast and Geodetic Survey in 1878 and of which in 1903 the USC&GS transferred to the Commerce and Labor Department.

The actual relationship between NOAA and the FAA didn't actually occur until the Air Commerce Act of 1926. Obviously we had to wait for the invention of the aircraft and then its practical use so it took a little while for that industry to develop.

Of which in 1926 Coast and Geodetic Survey began charting the nation's airways in providing weather service to civilian aviation. In 1927 the very first aeronautical chart was published which was Kansas City to Moline, Illinois. The next major milestone in 1946, the Airports Obstruction Charts Program began. Which

was a program for five years that I ran for the FAA.

Next slide please.

You will get there. Yes, I am sorry.

In 1957 the first aerial photographic mission was performed by the Coast and Geodetic Survey of which in 1959 the first survey was performed using photogrammetry. Which is used to this very day to produce the products and services.

In 1970 Richard Nixon created NOAA of which C&GS was reorganized into the National Ocean Service of which aeronautical services were assigned.

NOAA was reorganized in 1977 of which aeronautical services were assigned to Office of Ocean and Atmospheric Services. Of which in 1994 the Airport's Navigation Approach Program began.

Finally in the year 2000 Public Law 106-108 transferred aeronautical charting functions from NOAA to the FAA but, next slide.

But, the NOAA FAA relationship did not

just stop in 2000 as a result of the transfer.

Next slide.

After the aeronautical services were transferred to the FAA, an interagency agreement was quickly drafted and put into place to continue the services NOAA provides in support of the safe and efficient use of the National Airspace System. Within this IA, NOAA agreed to continue to provide, first off quality review of third party aeronautical surveys. I believe the gentleman from Woolpert would be familiar with that.

This is in direct support of the FAA office's Airport Surveying Geographic Information Systems program.

Also, of course NOAA our surveyors also that entered into the agreement asks NOAA to continue to conduct aeronautical surveys in accordance with those office and airports advisory circulars of which we use the data for downstream programs within the FAA, of which aeronautical information services is one, the

Wide Area Augmentation System Program is another one. Transponder Landing System Program. Airway Facilities Tower Integration Lab and now the new-fangled GPS navigation stuff that goes along with performance based navigation and procedures.

Next slide please.

Also within the IA, NOAA is asked to continue obstruction verification. This is basically your redetermination of the accuracy of legacy FAA obstruction data. The effect of this is the increased of the FAA hostable databases which also improves the downstream products. Primarily instrument approach procedure development and required navigation performance.

Finally the IA asks for technical advice, studies, and public education.

Next slide.

Now as mentioned NOAA continued to provide airport surveying and as depicted on the screen was the tabular result of the universal data delivery format of either a NOAA conducted or a NOAA verified aeronautical survey of

Ontario, California. What we see in the collection of the airport safety critical data that includes on the left all the runway data. Top right are all the navigational aid data. And on the bottom is data concerning obstructions in the way, in front of the airport itself. Next slide.

In addition to the ground survey, we see on the screen the actual air photography of Ontario California Airport, of which aeronautical data is extracted. Next slide.

The combination of the ground and air survey produces the venerable airport obstruction chart of which is a state required product according to the International Civil Aviation Organization Annex IV. Now I say venerable because we no longer produce airport obstruction charts. But as you will see shortly, what we do have is the ability to produce a digital version, of which the data was either NOAA collected or NOAA verified.

So we have all these services. So

what we do from that? Well, next slide.

So from these services, the FAA makes, next slide, instrument approach procedures. Which basically includes approach, departure, circling and satellite navigation varieties. NOAA collected or verified third party survey data supports the production and/or maintenance of these procedures, which as of the 20th of August 2015 publication cycle, numbers at 33,119. This literally means NOAA has been involved in either the collection of millions upon millions of obstructions and tens and tens of thousands of runway ends, displaced thresholds and navigational aids. Next slide.

Airport diagrams, otherwise known as the airport surface navigation map, the majority of these, which now numbers more than 800 range were created from those airport obstruction charts previously mentioned. Next slide.

The digital obstacle file, otherwise known as DOF. This is a collection of all known manmade objects reported to, or surveyed for, for

the FAA under 14 CFR Part 77. In the case of what we see on the screen, I know these objects were either NOAA collected or NOAA verified because of the very high accuracy code of 1A that's assigned to each one of these objects. This is a public product of which third party procedure developers can also use to create procedures themselves. Next slide.

The airport facility directive. NOAA data also appears in FAA publications such as the Airport Facility Directory, which we call the AFD. Now at this point the NOAA data has been transformed into usable information critical to air operations. Information such as runway lengths, runway declared distances, runway slopes, navigational aid positions all derive from original NOAA collected data. Next slide.

Okay. Now earlier I mentioned we no longer produced the traditional Airport Obstruction Chart. But what we do produce is all the data that was either NOAA collected or NOAA verified, that can be used to make any airport

related product in the FAA inventory. On the screen we see data layers, which are the same as required on the Legacy Airport Obstruction Chart. In the airport's GIS environment, which depicts the runways, the obstruction identification surfaces and areas of vegetation which penetrates those surfaces. With this NOAA collected or verified information, not only can we make instrument procedures, but the airport now knows which trees are to be removed or cropped in order to protect the air space in the terminal environment. Next slide.

Also, as I earlier mentioned, FAA airport diagrams used for airport service navigation were made from Legacy Airport Obstruction charts. In the airport's GIS environment, we can now simply turn on those data layers required to produce and/or revise an airport diagram. Again made possible by NOAA collected or verified airport survey data. Now two more slides for you, and they're a little bit different. Next slide.

Now so far I've talked about NOAA airport survey surfaces in support of FAA products. But airport surveys are not the only geographic data NOAA provides to the FAA. Now depicted on the screen is a portion of the U.S. Gulf Coast Visual Flight Rules Navigation Chart.

Produced annually, this chart is heavily used by the helicopter community in support of the offshore oil industry. See all those little black dots that are out in the Gulf of Mexico? Those are the positions of each and every offshore oil rig in the Gulf of Mexico. And on an annual basis NOAA provides the FAA a revised plot of each and every oil rig depicted on this chart.

Then on the final slide, now this is something that doesn't happen very often. Now what doesn't happen very often, perhaps every 50 or 60 years, the nation requires a new realization of its geographic reference system. It's data. And when new realizations occur, usually the magnitude of geodetic shift is not

large enough to visibly affect most air navigation charts which are produced at scales of 1 to 250,000, 1 to 500,000, 1 to 1,000,000 and smaller.

And as a general rule of thumb, this old cartographer learned back when he had black hair and a lot more of it, if the geodetic shift is equal to or less than the width of the projection line, there is virtually no difference in the data. I think we've all done that in one shape or another, especially with the scales that we work at.

However, when we went from North American datum 1927 and updated to North American datum 1983, Hawaii was visibly in the wrong place, literally. So much so that Diamond Head and Honolulu vortex were literally sitting in the Pacific Ocean. NOAA provided the geodetic shift values in order to place the islands in its correct NAD 83 position. Eventually the VORTACs dried out and they returned to service. That's what I have for you today. Good job NOAA.

MEMBER MAUNE: Our next speaker is Susan Russell-Robinson, acting program coordinator, Coastal and Marine Geology Programs, US Geological Survey. She's -- well, I just mentioned her name there. Working with science centers in Santa Cruz, California, St. Petersburg, Florida and Woods Hole, Massachusetts. Susan has nearly 40 years of experience with USGS from research on global explosive volcanism and experimental earthquake prediction, to communicating risk associated with natural hazards.

She's got a bunch of different things listed here. Chief Reston, Washington, D.C. Earth Science Information Center, Acting Chief Center for Integrated Natural Disaster Information, Deputy Regional Executive for Eastern Regional Geography, Staff Scientist for Northeast Region and Chair of the New England Disciplines Management Advisory Council. She's an active member of the Department of the Interior's Ocean, Coastal and Great Lakes

Coordination Team. She has served on several committees involved with developing and implementing the National Ocean Policy. Welcome, Susan.

MS. RUSSELL-ROBINSON: Thank you. We're going to have some talking about slides for a few moments, but that's just fine. So I'm very delighted to be here representing the US Geological Survey. But I also did a little surveying around the Department of Interior. So I hope my examples give you a broader perspective than just the USGS.

So thank George for your background around NOAA, because US Geological Survey has similar roots. We go back to the 19th Century. Surveys of the United States in that early part of our nation. We were formed in 1879 and our mission has been for 136 years to map the lands and characterize the resources of the nation.

Presently the USGS is about 1.1 billion dollars annually. We're one of the smallest bureaus in the Department of Interior.

We have about 12,000 employees in more than 400 centers nationwide. And our focus is on geology, geography, hydrology and biology and all the other things that go along with that. I'm going to talk today about our role from a USGS and from a BOEM perspective.

So what I did is I sent out a call to several dozen scientists, both at the USGS and BOEM to give examples. And, yeah, next, second slide.

And they all sent back lists of five or eight or ten examples and the applications they're using. So here's just one person's list. At the USGS on the west coast they're using the multi-beam and single beam bathymetry soundings. Tsunami inundation maps. Looking at different kinds of coastal relief models, gridded at the 100 meter resolution.

Focused in southern Alaska with a relief model. Custom grid extraction. All kinds of global topobathy data. Particularly looking at high-resolution coastline work and looking at

the digital charts. And as Jeff mentioned in his presentation, there is a lot of work that the survey's doing also with tides and water level data. So let's go to the next slide.

I want to talk about a few very specific examples. So hydrographic survey data is really underpins a lot of USGS modeling. We've done a lot of work in hindcasting and forecasting. Changes to, and evolution of the coastal systems. A lot of our information and products are distributed through digital coast. And one of our major roles is characterizing vulnerability of the coastlines, using a coastal vulnerability index to storms. And today if it makes the news, we just really -- this is a brand new product that's served through the USGS Coastal Hazards Change Portal, which links the 48 hour before a hurricane makes landfall data from the National Weather Service Hurricane Center, which is showing surge modeling information.

They have linked to a set of models we have. And that forecast will in 100 foot

increments, show you the probability of erosion, inundation and then over wash. And areas of breach. And we're really excited with the collaboration that we've had with NOAA on this. It's going to be very, very valuable to coastal managers.

Things that we've been involved in, for example, trying to figure out after Deepwater Horizon what happened to the tar balls? Some things washed up. Some things sunk. And so we've been able to use a lot of NOAA data to look at the sea floor and do modeling for sea floor stress.

This has also been very applicable to work we've done looking at offshore wind energy sites from a regional cumulative impact. How are sediments and sands going to shift around those structures? And how does that inform the process of permitting. Also what are the impacts of anthropogenic use? And the diagram on the bottom left near Pensacola, one of the interesting things we were able to use the data for looking

at the long term bathymetric change was we realized a lot of tar balls were actually being eroded out and they weren't from Deepwater Horizon.

So we were able to bring in experts that we have in California on tar ball providence and a chemical footprint and merge that together. And demonstrate that there is that recirculation of tar balls. Next slide.

So let me give you a very specific example. And I want to go into some of the dollar figures you're looking at. So here are two brand new products that the USGS put together for the Delmarva Peninsula area. We have a responsibility because they're our Park Service and Fish and Wildlife's lands to help them with assessment of what's going to go on with their coastal insure processes.

And so one of our scientists based on Woods Hole, Elizabeth Pendleton, went to some of her NOAA colleagues and pulled up two data sets. So they're from 2006 through 2011. Twenty-three

hydrographic surveys. They covered an area about 4,100 cubic kilometers and it's a portion on the inner-shelf that you can see here on the map. So she figured out that if we were to collect the data today, it would take around 1,100 days to collect the data, at a cost of ship time only of $14,000,000.

So if this was a new collect, it would be $14,000,000 just for the vessel, no less the time. She also worked with people at the National Geophysical Data Center and was able to get some unpublished backscatter data. And so on the right you see the backscatter information that's seamed together.

And so this mosaic, which is greater than five terabytes is underpinning work that the USGS is doing to model what is happening along the coastal part of the Delmarva Peninsula. And so this is something the USGS, which I said we're at 1.1 billion a year. The Coastal and Marine Program is about 40,000,000 a year. Ship time is something very difficult for us to afford. So

having the hydrographic survey information coming from NOAA is of tremendous financial value for us. And there are many ways we've been able to leverage that. Next slide, please.

So I talked to some of my BOEM colleagues and here's a very specific example for the Virginia wind energy area. That's offshore of southeastern Virginia. What you'll see is there's NOAA data from 2011 and then we were able to get other data from 2013 and then make a comparison of how this dune crest has changed. And then areas of erosion in that very short period of time over that 1,100 meters cubed. Next slide.

One of our major projects for the last -- it's a ten year project. It's done in collaboration with the state of California is to do a series of sea floor maps for all California coastal waters. The products come out in roughly a one degree sheet size. And one of the first approaches that was done with the California Ocean Protection Council was to take a look at

what available existed -- what data was available through NOAA.

What was the resolution of the bathymetry data and then to set up a common standard for the data. I believe it was something like 45 percent of the data was current enough and at the standard that was established for the state of California. And then through collection, the USGS, the CSUMBC Floor Mapping Lab, that's California State University Monterey Bay Lab and Fugro with a contract that they have with NOAA has supplied all the current high resolution bathymetry. And here's an example of the shade of relief off of San Mateo coast. At this point we've published 50 percent of the state waters.

And then there are many geological layers that go with it. Looking at sediment thickness. Determination on different hazards that would be associated with earthquakes and things like that. And I put up the website where you can go. And there are I think 70 map

products there right now. And there will be about 150 when it's completed. And then some of this, of course, was collected in the near shore, with merged data. And that's available through NOAA's digital atlas. Next slide.

One of our interests as the agency responsible for issuing warnings for earthquakes, volcanic eruptions, landslides, and other geological catastrophes is what has happened post-major earthquakes. So one of the largest earthquakes in recent history of the United States was the 1964 Great Alaska Earthquake and there was significant tsunami, significant collapse and slumping. And we knew that there were landslides off the coast of Valdez or just south of Valdez. So this shows where we were able to use 1957 data and then several other data sets that we've been able to collect in a recent multi-beam collection that was done in 2013 and start doing analyses of what's happening with the slide paths of those soft, loose sediments.

And this will be important because

this is a region where just south of it the Queen Charlotte fault. There's tremendous research going on between Canada and the U.S. on that fault potential which might produce an earthquake more significant than the Alaska '64. Next slide please.

So when I sent out the call for information, one group misinterpreted, but they sent back something that was really important. They sent back how NOAA is using USGS data. And I thought well that would be a good thing to share because we have had this long history. And one thing that NOAA is certainly doing is a lot of deep-sea coral research. And there's the program.

And so this is an example of something called Piggy Banks seamount. I love the name. And here is a product that was put together where a lot of it's NOAA's bathymetry data, but the USGS coral study data is put on top of that. And then, sorry, and then with it there's a whole geology underlain. And so you can see how

structures are changing at this seamount. So I just thought, you know, hey, we're doing it both ways. Next slide.

So future needs, future benefits. I think we've heard a lot of needs that are very common. And for Interior, where Park Service is concerned about what they have to do with the Antiquities Act for things like shipwrecks and archeological sites that are in submerged lands for the Fish and Wildlife Service that has many coastal refuges where there are a lot of concerns for bomb ware, particular in the Atlantic. We're looking at new uses of the Atlantic that had been sort of in a moratorium situation for decades.

It's really, really, really important to have this modern high-resolution bathymetry data. And we really want to look at being able to model impacts to better position the United States to be resilient and sustainable in the changes that are coming and the impacts associated with sea level rise. So I came up with four real straight-forward things we need.

And I said I think you've heard it before. We really need that seamless topographic bathymetric data. We don't -- we have lots of different ways we can get that, but most people need to be able to get it as just a common set.

And I know that the inter-agency working group on coastal mapping has been putting this together. But I think it's something we really need to pay a lot of attention to. We need increased coordination in collecting data and information and putting it out. Particularly so many of us have interlink missions. And we really need to leverage our limited resources, avoid duplication.

And I must say USGS is really thankful to NOAA when we get a ship of opportunity. We've done a lot of ocean chemistry work. We've done a lot of gas hydrates work, and things where we've been able to go out when there's space on a vessel. And it's really valuable. We need, and I think we need this everywhere, increased frequency of data collection. The landscape near

our shores changes rapidly, frequently. And we really need to understand those changes.

During Hurricane Sandy when we were looking at data just off of Fire Island, New York, before the storm about three days we had some bathymetric information and you could see a large borrow pit. Three days after we could see the borrow pit had been filled in about 50 percent. What kind of sediment is moving, is going out on these big sand ridges towards the Fire Island shore. That analysis of change really helps us understand the conveyor belt that's coming in there and why Fire Island on the whole is such a stable barrier island, unlike others.

And we need to really understand that again for resilience of a nation. And I think I heard this before when I was listening to Dr. Leveson, we really need to anticipate new technology and methods for collecting data that we need to do that modeling, and be able to offer different scenarios, alternate futures, as our

nation is trying to address the impacts we're going to change.

I want to tell kind of a funny story. In 1995 the USGS wanted to think about the future of our maps. So they brought together some of us that they thought were out-of-box thinkers. And so we had to think what would we do different. And since I was a field geologist I was asked to join the group. And so I came up with I wanted something that looked like an Etch-A-Sketch in size. I could pull up an antenna so I could transfer information. I wanted my map on there. I wanted to be able to draw what I saw. If I was in the field and mapping an outcrop, I wanted to be able to mark where it was and have it exactly geospatially located. I wanted to be able to talk to it and say, "Okay, here's my notes about today, October 17th, point 772" and just have it, type it in there. So what was I told? Preposterous.

So what should -- yeah, I know, pick up, we have devices like that. So I would

encourage, particularly when you have bright young people, out-of-the-box thinkers, don't dismiss their ideas because they may be on to something. And really look into that because in our future is in all these electronic gadgets and gidgets and things.

And there's going to be new ways to present our information, that aren't just for scientists, or mappers, or charters. But really for the public who really wants to understand what's going on and make informed decisions. Thank you.

MEMBER MAUNE: By the way I have a little bit of trivia here for you. Can you imagine where there might be a case where the USGS and National Geodetic Survey collaborated to determine where's the last place in the United States we need to worry about sea level rise? The very last point where we have to worry about sea level rise? Julianna knows the answer to this question. You probably do, too.

The president renamed it, gave its

name back, Denali, just a couple weeks ago. And USGS and NGS and Dewberry and the University of Alaska Fairbanks collaborated. There's a new GPS survey of Denali. Its elevation is 20,310 feet, which is ten feet lower than the previously accepted elevation.

President Obama did not want to announce the new elevation when he was there because -- I'm told. I don't know if this is true or not, I'm told it was considered bad news and he didn't want to be blamed for lowering the elevation. Now that may be a joke, but it's also -- there's probably some political truth to that. He gets blamed for so many things, he doesn't want to be blamed for lowering Denali. Anyway he gave the rightful name back to it.

Okay. Our next speaker is Paul Rooney, who is an old friend from FEMA. Geospatial information system specialist. Paul's a mapping technology specialist in the risk analysis division of the Federal Emergency Management Agency. He's responsible for providing

technical leadership on mapping and GIS issues for the National Flood Insurance Program.

Paul is responsible for the development of FEMA's risk map standards and is a technical expert for elevation data, basemaps and digital flood data. He is also responsible for the coordination of mapping activities with other federal agencies to participation in the 3D Elevation Program and the National Digital Orthophoto Program. Welcome, Paul. The floor is yours.

MR. ROONEY: Okay, thank you, Dave. Can we go to the next slide?

The good news is the National Flood Insurance Program was only founded in 1968 and FEMA wasn't founded until 1979, so I have a lot less history than the previous ones. But a quick recap, the National Flood Insurance Program insures about 1.3 billion in property. It's sort of set up as a voluntary, you know, enforced program where, you know, communities have to agree to adopt minimum standards for flood plain

management in order to participate.

If they don't, however, there's sanctions in terms of their eligibility for certain types of disaster relief in other federal assistance programs. And then the property owners in those communities need to -- if they're in the high risk area, they need to build to the minimum standards. And we publish maps that define those standards. We define the area of the high risk and we define the expected flood elevation that becomes the building requirement in those areas. And so, obviously to do all this, we depend very heavily on accurate elevation data. Next slide.

So often these maps are not perceived as good news. Right, like we've lowered the Denali ten feet. You know, we've found out the flood plain extends further than we thought, and you're in it, and now you have to buy insurance, right? So we're trying to deliver this information in a better context. And that's the framework Risk MAP that we've defined.

So we have the data, which we believe

is accurate, quality data. But try to put it in the context of what does it mean? How does it -- how does it help you understand what your risk is and what sort of actions can you take to address that risk? So that's the Risk MAP framework that we try to put around this mapping endeavor. Go to the next slide.

So primarily -- I mean it's still a little bit fuzzy on the exact scope of this panel. So clearly inland we use a lot of the geodetic framework and other things. But I focused on our coastal mapping for the purposes of this talk. The coastal update process is a four to six year process.

You know, it starts out with development of an elevation of bathymetric surface starting way offshore and then coming onshore in the areas that are at risk from coastal flooding. We've built these very large area hydrodynamic storm surge models, so that it might be two, three, 400, 500 miles of coastline in one of these models.

And then there's a wave set-up computation so it looks at how the water accumulates over the course of a storm from the waves breaking onshore. There's a primary frontal dune stage, where, you know, sort of the geomorphologic feature that over the long term shows you where the ocean typically gets to, right, it leaves the sand at the end of its reach. They're not everywhere, but where they exist they're a key definition as part of the program.

And then the onshore analysis looks at the probability of the storm-induced erosion and then the detailed wave and mapping is done on top of that eroded shoreline to produce the likely inundation areas for the flood banks. And so we build the high-risk flood zones and the -- and the expected flood elevations from that final product. So it's a very long process.

We are essentially in sort of the third major cycle of doing it, since the inception of the program. We did one cycle back

I think in the '70's. And then there was sort of an update when some of this wave setup behavior was a little bit better understood, so it was an update to a lot of them. And then over the last five years we've made like more than a $250,000,000 investment in getting everything underway for the whole coastline.

Because it's a four to six year process, most of those maps aren't done yet, but they're all at various fairly advanced stages of completion.

So what are the challenges in thinking about your question of what's the benefit? Well, in our current thinking, we're probably not doing another one of these major updates for another 20 years. Right? There's a lot of, you know, site-specific updates in areas where there's change onshore and you can recompute the wave action onshore. But those offshore storm surge analyses don't need to be updated on a monthly basis to keep up with the chain. However, it's a dynamic time. We have an advisory committee of our own

that's giving us advice on how to update the program. Juliana's a lucky member of that committee.

And one of the things they're looking at is how to address climate change and future flood risk in our maps. And so we'll be getting some recommendations next couple months on that. And that may play into when we have additional needs in the coastal area to do updates. In the big picture that's what we do. So if you'll go to the next slide I can talk specifically about some of the data needs.

So, obviously we start off with elevation data requirements. Really the biggest challenge for us is coverage more than anything else. So the places where there are data gaps create a lot of difficulty and they have to, you know, somehow interpolate or estimate depths in those areas in order to build the models. The near-shore bathymetric LIDAR is still doing a lot of that, so the work that JALBTCX does is very helpful for those near-shore areas. But there's still gaps

in some of the bays and inlets and also places where it's shallow, offshore for a ways where the survey ship can't get in there, but the swath of coastal bathymetric LIDAR doesn't reach out there.

Generally where there is data, it's adequate for our needs. Offshore, like I said, those models are over hundreds of square miles of ocean and so the specific sounding here and there doesn't really drive the results of the model. Where it really starts to matter is when we come on shore and we start computing the wave dynamics onshore and so it's really the onshore LIDAR that -- elevations where the precision is really the driver. Clearly newer, more dense, more accurate is better, but it's not the thing that really drives the difficulties with doing studies.

The other I think challenge that we run into with it is the way the data is managed. It's, you know, all separate surveys. So in order to build one of these big basins for modeling, you have to go out and get all the separate surveys and then

sort of integrate them together.

So some sort of full bottom coverage integrated bathymetric data set would be the ideal product that we could just sort of take and plug into our models and start working from there. Would you go to the next slide?

In terms of datums, you know, one of the things we've encountered and I'm not sure, this may be more of a legacy issue than a current day issue is some of the surveys not having the datum explicitly referenced on them. And so you have to do some investigation to figure out how to adjust that data. The VDatum tool is a real boon for us in order to do the modeling.

What they do is bring everything into a local mean sea level datum. Run the modeling and then we convert the results back into a geodetic datum so that we can publish those elevations on a terrestrial framework so that surveyors can then match them in the terrestrial space.

So there's a lot of conversion back

and forth taking all the different surveys, getting them all in a common datum, getting all the land stuff into a local mean sea level and then bringing it all back again at the end. The biggest challenge on that for us currently is that the VDatum data doesn't go far enough inland.

So places where there's surge and run-up that's going up rivers and other places where it extends very far inland, we need our terrain surface to go into those places and the VDatum conversion as I understand it, doesn't go all the way in in some of those cases. Can we go to the next slide?

The tide and wave gauges are a critical part of the analysis. In some cases it's sort of like where the extratropical storms dominate. Like in the northeast we do long term frequency analysis on that and use that to estimate the heights. In other places we're doing model storms that we're running through these models. And then they use the tide and

wave data to calibrate and validate the storms that are going through.

In general there's not as many as the modelers would like. Right? They would like gauges that are closer to the places that they're modeling, and particularly sort of near shore to tide and wave gauges rather than ones that are -- that are far offshore. Because again the dynamics that we're most interested in is where the water is hitting the shoreline and then, you know, running up and inundating the coast. You know, there's a lot of temporary gauges. I think the NGS does some for shoreline mapping and that type of thing. But what we really need is the longer records, both for that verification process that has to capture some analogous events that can be used, and also to do that long term probability analysis.

We often have a need for the tide and wave data to be synthesized with the meteorologic data. You know, so what was the parameters of this storm that produced this surge and this wave

action. And typically we've been buying that from Ocean Weather, Inc. They're sort of the industry leader. And when we need it now, that's where we go. Can we go to the next slide?

The last thing I was going to touch on was sort of post-storm stuff. This is a little less in my space and more in the response side of things. But clearly when there are big events, there are then obstacles to navigation and FEMA has -- one of the first things they typically are doing is how do we get resources into this area that's impacted? Can we use the ports? Can the ferries operate if you have islands or what not? And understanding those dynamics in the hours and days immediately following the disaster is a challenge.

So I think the post-storm imagery serves that need and also sometimes there's a need for, you know, sidescan sonar or other underwater surveys in order to identify those obstructions and then get them out of there. And I'm not sure how that works between Coast Guard

and NOAA and who else does all that, but there may be some Corps of Engineers for their place as well, but it's certainly a need that we have. I think some of the -- there were some of the other data services mentioned like the long term change in ocean heights.

I think we've been doing some pilot tests on how to incorporate climate change into the coastal flood settings and we've been using that data in those projects. And as I mentioned we're likely to be doing more of that in the future. And that post-storm data, I think we use sometimes in the -- for big flooding events we'll do recovery maps. So if something like Sandy happens, we say oh, our maps are clearly a little bit dated in this area and we'd like to produce an updated map, and also something that sort of characterizes the event in a way that informs people about rebuilding.

You know, it's one thing to say this is the flood -- the probabilistic flood that FEMA's computed, you know, using a bunch of

sciences. It's another thing to say this is how high the water was here four weeks ago. You know, when you rebuild your house, you should think long and hard about how high and how far back from the water.

So we'll use a lot of that post-storm data collection to put onto those recovery maps, both to inform the science of, you know, what should the long term probability look like, but also to inform people like what was -- to characterize the event in a way that's meaningful to the map users. So that's all I have. I believe it's -- I'll turn it back to you, Dave.

MEMBER MAUNE: Thank you. Please give a round of applause. I'm very pleased with the input we received this morning. Thank you all. It was a great job. We now have some time to open the floor for questions for our speakers. Please. Yes.

MEMBER BRIGHAM: Lawson Brigham, University of Alaska, Fairbanks. Steve, I can ask this question of Juliana, but I'd rather ask

you. Are there mechanisms, for Corps sharing for Corps -- for the Corps stations around the country? And specifically where there's -- in some areas of Alaska that reach out into the maritime world there's a need to have more stations. So I wondered if there are mechanisms available.

MR. MALYS: Well, I think that's probably a question GS would be in a better position to answer. But I can offer you one piece of input. There are DOD facilities in Alaska, a few military bases. So you know, it's something that could be pursued as a possible, or at least a host to some stations and maybe provide some infrastructure to install some that are in areas -- if those are areas where they're needed.

That's one thing I would suggest. But we, the DOD have not directly participated in Corps, other than to temporarily deploy to stations like that to other military theaters where we would use them during a conflict.

MEMBER BRIGHAM: Yes, I think the issue is co-locating with type gauges so we can have some references for the offshore where we already have the lease sites that are in the offshore and the reference to that data for that is incomplete.

MEMBER MAUNE: Yes.

MEMBER MILLER: Joyce Miller. I have worked in multibeam data collection and I've sailed NAVOCEANO ships. I was up in the Arctic in 1982 collecting bathymetry data. And so my question is to Steve, I've been trying for pretty much my entire career to get NGA data and I know where lots of it has been collected, as a matter of fact, because I've been on NAVOCEANO ships. Are you saying that you're declassifying the Arctic data so that it can be used for bathymetry charts in the Arctic?

MR. MALYS: The specific chart I think you're thinking of was labeled the Arctic Gravity Project so I'm specifically talking about gravity data in the Arctic Region, which I believe is

sharable. I'll need to double-check that, but I believe it's open for other uses and my colleagues are shaking their head yes. So it's not bathymetry data we're referring to there. Okay.

Any bathymetry data we have in the area -- Captain Connon may want to weigh in on this. But, you know, we have to honor the designation of the organizations the collected it. And anything collected by the Navy, that's a Navy decision. Okay, so we certainly would like to make as much data available as possible, but that specific graphic was about gravity data, and that is available.

MEMBER MILLER: Also, I've been data manager mostly for multibeam data out at the University of Hawaii. I must have gotten at least five inquiries about the South China Sea in the last two years.

MR. MALYS: We understand.

MEMBER MAUNE: Okay. Juliana?

MS. BLACKWELL: Just one follow up

comment and question regarding gravity in Alaska and the Arctic. Steven you mentioned that, you know, NGS is interested in GRAV-D being completed for Alaska and it is a priority for NGS to do Alaska. We've got about 50 percent of the mainland part of Alaska collected. We collected the easy parts first. It's a challenging environment. It's a costly endeavor. We are looking at continuing to do additional data collection, you know, in the next few years to try to wrap up at least the mainland part, which would enable us to produce a better interim-type model. At least for that area that could be shared, you know, in a test mode.

If there are opportunities to partner on that, collaborate on that with either NGA or others, we certainly continue to welcome that. Obviously the west coast of Alaska, that whole area, from fueling to aircraft to, you know, just the weather challenges and the short seasons that is available. Any way that we can focus our attention in getting that done, we'd be happy to

talk to you and others about possibilities. Thanks.

MEMBER MAUNE: Yes, Frank.

MEMBER KUDRNA: Frank Kudrna and I'm a member of the HSRP and this question is for Jeff. I come from the Great Lakes and Lake Michigan is up three feet, so drudging is not a huge issue other than our CDF in Chicago is pretty full. But the big issue is ANS and Asian and bighead carp moving up the waterway and the Corps did the preliminary study and now is looking at some other options for barriers and lock modification and all of that. And I sit on an advisory committee with the government entities and the NGOs. The Corps commonly mentions USGS and Fish and Wildlife, but there's probably data sources from NOAA that are important in that process. Is the Corps discussing in those other environmental areas that they might be looking at for data NOAA use?

MR. LILLYCROP: Yes. I know that we've got quite a few folks working with some of the

Habitat people across our research domains. I'm sure that there's a lot of interaction with NOAA through our district offices as well. I'm not familiar with specifics. But you know, the Asian carp issue has been such a national issue that I would presume that everybody's talking to each other. I can't say who, but I know that one of my leads in the R and D community has attended numerous meetings with as many federal agencies as they can get together because it really isn't just a Corps problem, it's a national problem.

MEMBER MAUNE: Joyce?

MS. BLACKWELL: Another question for Jeff. You mentioned Army Corps' need for access to the raw bathymetry data rather than just the charts or the -- my impression over the last several years on this panel has been that NOAA is very active in getting their data to, I can't remember the new name, NGDC, National Center for Environmental Information so does Army Corps regularly visit and cull that data?

MR. LILLYCROP: We would in the

progress of a study. We don't have a mechanism really for dissemination, you know, to pull that data and then disseminate it to where it needs to go in the Corps. It's usually driven by the need of a study. And I know that we're familiar with NGDC.

And the -- I know our coastal mapping data goes to them as well as to Digital Coast and some other national archives. The Corps isn't a national archive, so we don't want to become one. We want to push our data to them -- to those who are. And make sure that it's available that way. Digital Coast is a community -- coastal community best practice, I guess for lack of a better term. Because it not only allows access to the data, but it connects tools and provides some of the knowledge and guidance on using tools and looking at coastal issues. So it's more than just a data distribution center. It's really a knowledge distribution capability. And that's what we see being of such value is not just the data distribution piece of it.

MEMBER MAUNE: Admiral Barbor.

MEMBER BARBOR: I will assume, and I'm pretty sure most all of you are part of the IOCM effort. Is that something that you are seeing working well, working, or needs more emphasis?

MR. LILLYCROP: I'd like to see more emphasis. I know they just came out with a report. It's at our headquarters to take a look at. I received it, I think this week. And it's what I plan to do this afternoon is actually go review it. But you know, for us collecting data in the coastal zone is so expensive and is so valuable, that anything we can do to bring attention to the coastal mapping is I think important. You know, it's almost understated the amount that we need it. But the amount of visibility it gets is so low. And it's such a dynamic zone that it's not something that you can map once every 20 years and be able to really base decisions on that are -- that are, you know, annual decisions. Our requirements that our coastal working group gave us was that they'd

like us to do the entire U.S. once a year. And that's -- you know, we're just not able to do that ourselves. But a coalition through the IOCM I think is a way to improve that capability and yes, I think greater visibility nationally would be great.

MEMBER MAUNE: I have a question myself, Dave Maune, for Paul Rooney. Paul, from my experience, historically, senators and congressman have often argued with FEMA when new flood maps come along and say more people have to buy flood insurance. And they say oh, I've been here for so many years and we've never been flooded. And why do you say I need flood insurance and that sort of thing. How has the political climate changed since Hurricane Sandy came along?

MR. ROONEY: I don't think that basic dynamic has changed much at all, you know. There's still that mindset that, you know, Sandy was an unprecedented once in a lifetime event, you know, as opposed to this is what a low

frequency big event looks like. You know, but people's brains just don't understand the probability stuff all that well, I think.

So, you know, the biggest impacts there have been there were some scandals around the insurance claims adjusting process, and there's a lot of scrutiny on that in the New York area. You know, so I think it's more or less --

MEMBER MAUNE: Aren't some governors now encouraging free board above the BFE that used to not do that?

MR. ROONEY: I don't know. When we did some of the Sandy recovery stuff, I think it was largely driven by Shaun Donovan when he was at HUD that for a lot of the recovery grants you had to adopt -- yeah, they adopted free board as part of the recovery construction.

So there was some of that in the Sandy area, yeah, but I don't think -- I didn't see it as a national phenomenon.

MEMBER MAUNE: Right.

MR. ROONEY: But more of the impacted

area. And that's typical, right? The area that gets impacted, there's a short window where they're willing to be more proactive about risk reduction. And then that sort of fades as time goes on.

MEMBER MAUNE: Okay. And how about mapping future conditions? How is that changing?

MR. ROONEY: Well, we're really waiting on the recommendations from the Technical Mapping Advisory Council. I think it looks like they're heading towards recommendations to produce coastal, you know, sort of climate change influence, sea level rise influence, flood estimates that wouldn't be the basis for the insurance or any of the building requirements, but would be an additional piece of information that people could use.

And then inland it's more of a future development and river and erosion sort of thing as opposed to climate driven because the science inland isn't there to be more specific about where it's going to go up and down. That type of

thing.

MEMBER MAUNE: Okay. Thank you. Did you want to say something?

MR. ROONEY: He actually would like the answer on the IOCM from everybody I think. And, you know, we participate on the inter-agency working group on ocean and coastal mapping but our main focus is on the terrestrial elevation which we really have coordinated primarily through originally the National Digital Elevation Program now the 3D Elevation Program. But over the last couple of years, I think that we've been able to bring those two things together.

You know, we sort of share mechanisms now for tracking and disseminating information about planned projects. And so I think that's been a real nice benefit out of participating in that and bringing those two things together, so I think that's worked well.

MS. RUSSELL-ROBINSON: I would say from the USGS perspective, I have already reviewed the plan. I got it earlier this week

also. That one of the features of the 3DEP is something called the Coastal National Elevation Data Set. And the Gulf of Mexico portion was released in December, Mid-Atlantic and New England will be released that that model of trying to have that seamless topobathy data set and then recollected at least every five years is a goal. And I think that will be really important if it can be achieved. And it requires resources from all the agencies that are out collecting.

And so it's that balance between the opportunity collectings before and after say a Hurricane Sandy, or Superstorm Sandy, or areas that because development and growth are issues need to be collected more frequently. So I think you will see a lot of vision and dream there. And then some ideas of how to accomplish it.

MEMBER MAUNE: Anybody else want to comment on Ken's question?

MR. MALYS: I'll just comment, from the DOD I'm not aware of us being a participant

in that working group. I don't think we are, but since it's U.S. waters.

MR. SEMPELES: I'm not sure if the FAA is on that, Steve.

MEMBER MAUNE: Yes.

MEMBER BRIGHAM: Just back to Steve on U.S. waters versus international -- of course, most of the Arctic in the United States Maritime Arctic is both because the Bering Strait is an international waterway, so I wonder how you tease out that distinction when related to the Arctic.

MR. MALYS: I think that's a very good question for our Capt. Connon in the back to perhaps address if he can. How do we make that distinction or how do we treat that issue?

MEMBER MAUNE: There's a microphone back there.

CAPT. CONNON: Good afternoon. So I think the distinction where there is joint kind of waters there, within our agencies we defer to NOAA for the charting responsibility there, so that charting responsibility. And as far as

collection of things there, if there is data collected as there may have been previously again. Just to reiterate what Steve was saying that it depends on how it was collected for what purpose.

But generally anything that NAVOCEANO collected that is in public domain has already been sent to what was NGDC and is available there. So if it was available it was already shipped there.

MEMBER MAUNE: Go ahead.

MS. RUSSELL-ROBINSON: Since Joyce -- you know, back to your question about the Arctic and bathymetry I do want to share there is a joint Department of State, NOAA and USGS effort to map the Arctic for the extended continental shelf. And so for that purpose, to characterize the foot of the slope and determine where the extension might be of the EEZ, there's been work completed for the Arctic and it's in line for publishing. And part of that we collected it jointly with the Canadians.

So there was really what I call the leap frog. The Canadian icebreaker would go first and the U.S. one would go behind with multibeam and then we'd flip it around. So there will be newer information coming out. The highest resolution information may have to wait until or if, the U.S. signs the law, the Sea Treaty. So we'll -- but I can put you in touch with people if you would like some more information.

MEMBER MILLER: Yes, I'm already quite well aware of that. I track a lot of different synthesis efforts. And it's just -- we've been told to be edgy. It has always frustrated me that there is so -- I know personally there is so much bathymetry data that is just not available to the general public.

And I understand the security reasons in some cases, in other cases, but you know I wonder, especially given our very limited mapping resources. You know, if there's already bathymetry data, can we re-inspect it and see if

perhaps it could be reclassified. That's just my thoughts.

MEMBER MAUNE: Do we have any questions from the public in back? Gary?

MR. MAGNUSON: Gary Magnuson, NOAA CMTS. It's more a statement than a question. Jeff Lillycrop I need to commend him and bring to your attention his degree of collaboration on behalf of the Corps of Engineers with NOAA through the CMTS. And Jeff, Dr. Holly Bamford met with the panel earlier this morning and she talked about the R and D conference coming up in June. I think some panel members were interested. Would you take a minute to explain those conferences, please?

MR. LILLYCROP: Yes, thanks, Gary. We have a biennial conference that's co-sponsored by the Committee on the Marine Transportation System and the Transportation Research Board. It's a biennial R and D conference to look at whatever. Each conference has had a theme. We're going to have the fourth conference in June of this coming

year. June 16. The focus is going to be to look at what are the research needs to support the new CMTS National Strategic Plan and our first conference five years ago was on the same theme, but we ended up actually addressing most of the items that were identified.

So now that there's a new strategy, we'll take another look at what the national R and D needs are and assemble teams and address as many of them as we can. And NOAA's been a strong participant in the IAT, the R and D IAT as well as many other IATs through the CMTS. So I appreciate your long term support on it and look forward to your participation in the next one in June.

MEMBER MAUNE: Thank you. Yes, Frank.

MEMBER KUDRNA: This is a comment for Paul. David you mentioned earlier that the reaction to the changes in FEMA mapping and we're in the same business. Over the years mayors and county boards have gone ballistic many, many times because generally the elevations go up and

the areas get broader in terms of areas covered. And they're in shock over these kind of things.

One thing we found is that after you do your technical data it ends up in the process of buying insurance, and any insurance agent has a computer program they go to with FEMA. And what happens is that system takes a floor elevation from a survey and it rounds it up or down. So that a tenth of a foot determines whether you're up to the higher foot elevation or lower to the lower foot elevation.

And we've seen a couple of examples where the exact same home built in the same year, with maybe the concrete pour being a tenth of a foot different doubles the insurance rate. And I think the granularity of that is a real disadvantage to FEMA. And I think if that allowed a more accurate reflection of that elevation at risk, it would help alleviate some of that reaction that happens, particularly when you do remapping.

MR. ROONEY: Yeah, I think you're

right. I think, you know the -- instead of two sciences both operating in parallel, right, the actuarial science and the flood risk science. The easy solution is you don't build right at the flood elevation you build a couple of feet above, and then there's not that much variation. But when you get down to at the flood elevation, a little bit above versus a little bit below is a huge price difference. And so that's exactly what happens.

MEMBER MAUNE: Scott?

CHAIR PERKINS: Thank you, Dave. Great presentation. Each of you did a nice job of conveying the mapping program that you're responsible for. I think it's safe to say that none of you have adequate budget to do everything that you need to do.

One of the challenges the Hydrographic Services Review Panel has been asked to look at is coming up with criteria for how we can prioritize where surveys should be conducted. So I just would like to take this opportunity to ask

each of you, and whether you can speak to it now, or whether you can provide us input, you know, later on, what criteria are you using within your organization to help prioritize where you do your mission?

Knowing that you don't have enough budget to do your full mission, geographically everywhere. Do you have some best practices or criteria that have been effective for your organization and how you prioritize? Because that's a task that this panel has been asked to undertake by Dr. Callender. So if you have any input on how -- or anything you can share on how you're prioritizing and when you don't have adequate budget to address all of the need.

MS. RUSSELL-ROBINSON: For the USGS in the last seven years we've been cut from a $48 million program to a $40 million program, so our prioritization for sea floor mapping activities is do we have partners who can bring in funds to help us do it. So for example, California and Massachusetts have been two areas where we've

done major work the last five years and that's why they are a priority.

CHAIR PERKINS: So you're following the money?

MS. RUSSELL-ROBINSON: It's a combination of the science and the money. There are -- in addition to sea floor mapping we would look at the other things we're trying to do so are we doing part of our 150-year shoreline change assessment which is part of -- so is that an area that is ready for the next repeat? So California is. It was first published 12 years ago so we're on our repeat cycle. In the case of Massachusetts, the Department of Interior was concerned about the cumulative regional impact of our shore wind energy, Cape Wind was one of the first proposals and so that nailed the science need and the partnership brought it together.

CHAIR PERKINS: Great, great. That's helpful, if you could share with us, you know, offline criteria that you would use and if you could put your wish list forward for where NOAA

should go next that would help support your mission, I think that would be beneficial.

MEMBER MAUNE: Excellent question. Paul, you have criteria too, don't you, prioritized by risk?

MR. ROONEY: Yes, Steve looked like he had an answer to this too.

MR. MALYS: Go ahead.

MEMBER MAUNE: Okay.

MR. ROONEY: Yes, our primary system is looking at the level of risk, right, so we have a bunch of sort of natural data looking at, you know, flood losses and density population and things like that, right, so where's the exposure to flood losses and then the need for updates. So what is our inventory management say about how old the maps are, and that type of thing. But there is an overlay of follow the money, right, so where there are active partners who have resources that they want to bring that biases the process of little bit towards them.

The net outcome of this, though, is

that there's parts of the country that have pretty low risk, they have pretty big needs but they have very low risk and they still haven't seen a new map in 20 years and so there's a real tension there in the Technical Mapping Advisory Council is struggling with the same question, right, how do we prioritize those areas that have the oldest, least up-to-date information but also have very low populations and relatively low risk and then very little building going on and that kind of thing.

The one caveat to that or sort of exception is the coastal area, right, so I mentioned the cycles are very long and the products are very expensive in the coastal space so we sort of decided we need to do it all, right. We've done it 20 years ago, everything had changed, the science had changed, the date of availability had changed, you know, the accumulation of more climate data so we just said we need to do everything on the coast and we just did the whole thing all at once and now it will

probably be pretty stable for a number of years except for the new direction we get from the Congress and stakeholders.

MR. MALYS: So for the Defense Department it's really straightforward, we are constantly struggling for resources like everyone else but it's a fairly periodic process where we get priorities from the combatant commands, NORTHCOM, CENTCOM, EUCOM, right. No one can predict where a conflict will break out but there's always an anticipation of where we're going to need to update products and hydrographic products of course are used primarily by the Navy but not just the Navy and we take their inputs as to where things are needed most. I'd ask Capt. Connon, if you want to elaborate?

CAPT. CONNON: So I think what we do is we get the priority around the world for where the Navy's going to go and we kind of focus our efforts there. What we have done in the past few years is collaboration with NOAA so that we are no longer producing charts for home waters, we

can rely on NOAA to do that. So that's been able to save us some money there and some personnel to work on other priority ports.

For us the hardest part is getting source for those ports around the world. Someone had mentioned not everybody wants to give us data, that's true but we do have great agreements with a lot of people and we're working more towards we collaborate every day with NOAA on how we can continue to utilize more of the NOAA products in the US waters. We have a lot of ships who have not gone to electronic navigation yet so we still have to use paper charts for them but we're trying to get everybody into that electronic navigation world.

We do not use the ENC, we use DNC which is different and in fact I will tell you that very few of Navy ships can display an ENC. So that's another thing we're going to undertake to come into the ENC world down the road but for the Navy that's a big undertaking as well because that's a change out of their equipment. So that's

how we're doing it to try and best utilize the funds that we request.

MEMBER MAUNE: Okay, Josh.

MR. SEMPELES: This is my first time at this particular activity and I'm perceiving that this is not an airspace kind of crowd so I'm not quite sure what anything I have to say would be of benefit to you. The data that we have NOAA collect is so highly specific I don't really think it's terribly germane to all the subject matters that you're doing here and most of the things that we draw from would be United States Geological Survey for the topography, the obstructions that we have collected so I'm not quite sure that anything I say can help you in this case.

MEMBER MAUNE: Jeff.

MR. LILLYCROP: For the Corps our coastal mapping is tied to our dredging program really trying to understand where the sediment is coming from and where it's going to and so we're trying to quantify change and rates of change.

So what we've determined is that we will do about 20 percent of the US coast measuring the dynamic zone along the coast and get about 20 percent per year.

When we go to plan a survey we work through the IWG-OCM and talk to the other federal agencies about our plans, sometimes some of the agencies want to add to that. We also work with our district offices and their local stakeholders and sometimes additional areas get added that way. So we generally work it around the US and let as many organizations and agencies add to the requirements with additional funding in order to maximize the use of that capital asset and we've been doing this now since 2004 and it seems to be going pretty well. I think there is a lot of good communication through the IOCM and the ability to leverage each other I think is the way it's going to -- you know, we're going to have to work that way in order to get as much surveying as we can do as opposed to everybody duplicating.

MEMBER MAUNE: Do we have any

questions from people that call in by telephone? Is that open to them? Okay. Do you have something?

MR. EDWING: Yes, I do.

MEMBER MAUNE: Okay.

MR. EDWING: Rich Edwing, I have a question for Paul. Paul, my program runs the -- or operates the long-term tide gauge you were talking about that you said you needed some more of, have you -- has FEMA sat down and kind of figured out where they need more long-term stations or could provide us with some methodology requirements where we could look at that issue?

MR. ROONEY: You know, you probably have to follow that up with the people who do the coastal work. You know, we had a discussion last week to sort of get all this stuff together and I think that was the general observation but I don't believe that there's been anything systematic like that but it seems like it could be worthwhile. I think again it's that challenge

of we're probably not doing another big analysis for a number of years and so -- but we can start building up the data now.

MR. EDWING: Okay, thank you.

MEMBER MAUNE: Yes, sir.

RADM GLANG: Thanks, Dave. Gary Glang from Coast Survey and the DFO for this panel. I have lots of questions but I'll be brief. Paul, yesterday I don't know if you had the chance to listen in, we had our non-federal panel and asked them the same questions and one of the speakers was Steve Bowen from AON Benfield and they're a reinsurance -- they do catastrophe modeling for the reinsurance industry so not unlike I would imagine the kind of modeling that you all are doing at FEMA. But he had the same thing on his wish list for higher resolution LIDAR so I'm assuming elevation data and bathymetry data and my question to him was so what are your requirements for that because you had the same thing on your list for more bathymetry or better bathymetry, I'm not exactly sure what was on your

slide.

And then -- and you mention that the bathymetry you do get, the data sets are small, they don't cover large enough areas and I'm wondering if you're able to take advantage of the tsunami digital elevation models that the organization formally known as NGDC now NCEI puts out, if you're able to use those and is the resolution of the bathymetry that you need driven by the models that you're running and then -- you don't have to answer all this now I'm happy to take this off-line and continue the conversation, and I'm also curious about the models you run and how you coordinate your modeling effort with the rest of the modeling communities like what NOAA has in our remodeling group? There's lots in there, you don't have to answer it all, you can say I'll get back.

MR. ROONEY: Yes, I mean there is a lot of good questions I think on the coordination part, you know, I think there's a lot of informal coordination that goes on, we've had a lot of

discussions about how do we share, you know, some of the data that we've built with other modelers, you know, and we're working on solutions for that. I think a lot of that goes to the folks at the Coastal Services Center is -- you know, but we also often have scientific sort of advisory panels on some of this stuff that brings in a lot of other agency folks as well.

But I think those are probably better discussions, there were too many pieces to retain them all but we could talk about more. But the high level messages for us that it's not really the precision of the density of the bathymetry that drives our needs, it's more of the onshore stuff so the places where we really have issues is just where there's a gap where there's no data available at all.

RADM GLANG: Thanks, Paul. Can I follow up with a question to the panel, is that all right, Dave? Or we can think about this, is that okay?

MEMBER MAUNE: Yes.

RADM GLANG: So my question to the panel is you've heard from a variety of federal agencies that do mapping work for their mission-specific purposes and you know a little bit more perhaps about NOAA's mapping missions. So my question, the panel can reflect on this, we can talk about it tomorrow in our sessions but do you see gray space between the different organizations? Do you understand why these different organizations map and how what they do is different than what we do or are you still concerned it sounds like duplication? Because this is really important that we have federal agencies that do mapping for their own purposes and when we tried to explain our story for instance on the Hill oftentimes -- and you know, this is where we run into trouble and oftentimes there are legislative attempts to stitch us all together and say well, we only need one kitchen for everybody to cook in so everybody get in the same kitchen.

So this is one of my areas of concern

in messaging and I have you all here as representatives from these federal agencies, this is a hard story for us to tell, IOCM is one way to do that. We can't do IOCM by ourselves, we absolutely need the other agencies to participate so -- but I think it would be good for the panel to reflect on this, is it still gray between the different agencies that do mapping work or are you starting to see a bright line and understand that there are differences. So that's kind of an open question, you don't have to think about it but one of the things that I worry about.

MEMBER MAUNE: Yes.

MEMBER BRIGHAM: Lawson Brigham, just to add to what the Admiral said. For the Arctic where one percent of the United States Maritime Arctic is charted to modern standards but charted to a higher percentage across the other standards, but we have economic security issues, environmental, human security issues, climate change security issues and national security issues and when we have the President of the

United States talking actually about charting hydrography the Arctic I think the whole government approach is what it's supposed to be that in this case all available bathymetric data be contributed to the whole range of securities for the United States and the Arctic. And our panel will be working on that issue and hopefully winding its way up to the top, and it deals with the Defense Department, intelligence agencies and obviously the sensitivity of the technical means and how all of that is -- but there is data. I mean, I know it from my days in the Arctic Research Commission and sailing on the Polar Sea, there is data available it just hasn't been released but it needs to be released now for a variety of security interests of the United States.

MEMBER MAUNE: In response to your question, Admiral, I know that USGS, NOAA, and FEMA, and probably the Corps of Engineers too, are interested in the merger of bathymetric data with topographic data along that shoreline area

and so that's an area in which I know that NOAA is doing that, you said that USGS is doing it, FEMA needs that data.

MS. RUSSELL-ROBINSON: Well, I want to give you an example and these might be the things that you want to ponder so -- I'm getting old so I think it was 2009 but it might have been 2010 we had a workshop in New England, so Maine to actually New York, New Jersey Harbor to look at the need for topographic and bathymetric data in the coastal zone, for the coastal zone.

So the Department of Interior had our money, we had the workshop, we brought in Jen Wozencraft, we brought in a quite a number of people from NOAA, we had people there from EPA, we had a large federal community that does collect LIDAR data. We also had all the states and the states were part of the effort and so what we see together was a total data collect from Maine to the New York, New Jersey Harbor area to a common standard and then there was the ability to buy up the standard. So some states,

some federal agencies had other money and so we did the entire swath.

So one big collect because we all realized we have to do that leveraging and that we had different objectives for the data and so that's where we came up with the common data standard that met the minimum for everyone, but then we also tried to maximize it and it's very wonderful data set, and it will be coming out in December as part of what's called the COMET.

CHAIR PERKINS: Dr. Maune, I gave you extra time and you used all of it and a little bit more so --

MEMBER MAUNE: Well, I will shut up.

CHAIR PERKINS: Well, I thank you, an excellent panel but Admiral Lopez is here so I would like to try and maintain some schedule control. So the public is excused, the panel will convene in the Discovery Room across the hall and we will reconvene back here at 1:30.

(Whereupon, the above-entitled matter went off the record at 12:37 p.m. and resumed at

1:41 p.m.)

CHAIR PERKINS: All right. I apologize for our tardiness but we had a very nice lunchtime presentation from Adm. Lopez on the situation with the NOAA fleet, so.

A couple of housekeeping orders, anyone who has parked here at the Doubletree, if you'll see Lynne, she may be able to facilitate getting you were parking voucher. For the panel members, you should find at your seat here at the table your required paperwork that you need to complete and sign and return to Tiffany, you know, so we can all be processed accordingly.

Next on the agenda is a report from our Emerging Arctic Priorities Working Group by Dr. Lawson Brigham.

MEMBER BRIGHAM: This on and working, good. Good afternoon everyone, let me explain what we're trying to do today. This is a report of one of the working groups, this is mostly for the audience, public audience. This is a report of a working group, EAP, Emerging Arctic

Priorities within the HSRP. The HSRP has a draft of our comments, narrative and what some of this that you will see and the HSRP, the entire group still has to reach consensus on our recommendations. So it's really a draft, it's not yet ready to pass up to Dr. Sullivan but that's where it's headed.

And then of course when we get a consensus document it will be on the website and transparent and we'll ship it around everywhere and everyone can download it. We have, I think, some strong recommendations.

Before a show you my slides I wanted to quote a few things from a document from the White House on 1st of September just to remind us what we're talking about. And it is the fact sheet and it says, issued by the White House Office of the Press Secretary, President Obama announces new investments to enhance safety and security in the changing Arctic. He says a lot here of course as you know, NGA knows, NOAA knows and the Coast Guard knows, but let me quote, NOAA

and the Coast Guard will take action to promote safe marine operations and transportation, a pretty big job, in the Arctic through mapping and charting efforts in the Bering, Chukchi, Beaufort Seas, regions with newly open waters for which existing maps and charts are non-existing or outdated. I'm sorry that the hydrography of the United States is not here right this moment but I'm sure he's read this.

Additionally north of Dutch Harbor located on the Aleutian chain, of course there are no deep water harbors in the United States Arctic capable of providing shelter to vessels, operating in or transiting through the US Arctic region and the Corps is evaluating the feasibility of deepening and extending Nome's Harbor capabilities.

To that end he also, the President, says or his fact sheet says to that end the administration with DOI in the lead will continue to consult with the Alaska native communities with respect to shipping issues and climate

induced impacts. And then finally in the near future NOAA will modernize and install additional instrumentation on the Arctic coast to monitor the effects of climate change and enable safe marine operations and transportation.

All of these issues including icebreaker issues are relevant to the HSRP. Relevancy of icebreakers are whatever icebreakers built in the United States in the future has to be a hydrographic ship. In other words, have the appropriate multi-beam sensors, whatever the gizmos are that might be in the next 10 years or so must be on this ship as part of the federal fleet to do in fact hydrography in the remote areas of the United States Maritime Arctic. Next slide.

Oh, go back, I'm sorry. The ship there is the MV Arctic, you can't read it but it is the MV Arctic and that ship although it's icebreaking bulk carrier, Canadian flagged has come Kivalina and picked up zinc ore and taken that zinc ore to BC, British Columbia's smelters

there and around the Pacific so in fact this ship, but when it comes to the United States Maritime Arctic, it's not using any of its icebreaking capabilities because we do not allow any icebreaker ships to come to Kivalina.

Actually, I should say it a little differently. The Kivalina operation with the barges are incapable of operating in the ice and so no ships like this, that can break a heck of a lot of ice, come to the United States Maritime Arctic in the wintertime. So there's no traffic, no commercial traffic in the wintertime in the United States Maritime Arctic. Next slide.

So again, NOS posed questions of us, the HSRP in LA in April at our last meeting, so we're going to put you through this torture test of seeing the questions and a lot of bullets, I apologize for all of the information on the slides. The HSRP has a narrative and a report and I'll try to summarize. But there's the first question what criteria, it's not an easy one, none of these questions are easy, but that's why

the Admiral and the team asked us these.

What criteria should NOAA consider to prioritize its national mission for hydrography and charting between the US Arctic and the rest of the country? Well, the straightforward answer is I think from HSRP there are no criteria, you can't compare LA, New York, Charleston, Houston, wherever with the frontier area, I think that will be one of our approaches to the answer. So we're not answering the question -- Well we are answering the question, but we can't conceive of any criteria that you can evaluate two different places, why? Current economic activity that supports domestic and international trade in all the ports except for Anchorage outside of Alaska there's just no criteria and so I think our approach is no criteria, no easy criteria. This linkage and the economic vitality is linked to political capital, et cetera, so if we, NOS reprograms money from surveying Houston, pick your port, up to Alaska were quite convinced that you'll hear about it in five seconds from the

Hill.

The third point here is this we know, we don't have any information in HSRP of any compelling national security requirements and yet there are important economic security, human security, you heard me ask the question I think of Steve previously, and a whole range of broad security issues that involve the United States Maritime Arctic.

Of course you all know we have leasing and I'll show you the these map in a second here, so whenever that leasing took place, 15, 18 years ago, obviously the United States government assumes the responsibility of providing whatever infrastructure there is to provide for the security safety network. Of course we don't have that infrastructure and we don't have the breath of hydrography and charting that is necessary and yet we have the leases and the lease wherever the amount of money that would pay for the leases wherever that went in the government none of that that we know of was teased off to pay for the

attended an important infrastructure to protect the place and protect the people.

So it is a huge issue, it should be in the calculation of priorities but when DOI was conducting the leases through MMS back then I mean it would be fun, interesting to do an analysis of who talked about the attended infrastructure and the responsibilities of the federal government to provide the safety net, particularly our interest hydrography and charting and geoid observations, who's going to provide that to support the now lease areas where we have operations out there without the attended infrastructure. A reasonable question to ask.

So I mean, one of our recommendations you'll see in a minute is that somewhere there has to be some new funding to be provided so that NOS doesn't have to keep re-prioritizing some of the funds that might go to some other ports, up to Alaska to give it a minimal amount of annual surveying done. The key link in this topic and one of the answers to this question on criteria

is that in the highest document we have or one of the two most important documents, the National Strategy for the Arctic Region, the only thing mentioned there specifically is hardware or infrastructure. Of course it charts the Arctic region, it's spelled out specifically in that document that is signed by the President and it's Under the Line of Effort as we know pursue responsible Arctic region stewardship. Next slide.

The leases and the drilling of course is taken place here but this gives a whole idea of the Northwest coast of Alaska, Point Hope, Wainwright you can't see, Barrow. Interesting enough as an aside when we start talking about places of refuge, harbors of refuge, safe harbors, whatever you want to called them, there's a part of a national wildlife refuge, the Arctic Maritime National Wildlife Refuge is along this coast. An area that is designated area for specifically for the safety and protection of the eiders, spectacled eiders and so there are some

regions here where. And of course you have communities that are depended upon whaling, hunting, walrus, seals or whatever so it's unlikely that any of these places are available for any safety reasons where you take a damage tanker, damaged icebreaker that might be leaking oil or whatever the situation is when the government decides maybe through CMTS on what the priority of the places of refuge. When we have the priority list than Adm. Glang and his team can go out and actually survey it so we don't create a disaster in the place of refuge without having charts.

So this practical safety issue which is relevant to HSRP of where the places of refuge in the United States Maritime Arctic is a big issue, political, challenging, it has to be sorted out so that again the hydrographers who actually go and do the job and create a safe haven with, and most of these areas of course as you know or coastal, either for anchoring, most of it would be for anchoring but there are a lot

of areas already closed off or presumably closed off for such an area. Next slide.

So out of this question here are two recommendations from HSRP draft, one is that we really do need a line item in the budget for hydrography and charting. I mean, I know already I can hear all the chores that there's no new money in the government for this, well, but that doesn't stop us as a federal advisory body to recommend that for this frontier area for a whole host of security reasons that we have a line item budget, whatever that amount might be we wouldn't be able to tell you that. I mean, it may be talking with the Adm. Glang that we could come up with a number but I don't think it's necessary. The issue is we do need a line item budget for the most fundamental other than environmental observations, the most fundamental piece of the pie here in the maritime world is proper charting and hydrography. And again just to reiterate that only 1 percent of US Maritime Arctic is charted to modern international standards so

there's a lot to go.

And the other one is deals with the internal NOAA and then here there may be some edginess that it's not that we at HSRP are always aligned with the staff and all of NOAA, I mean they'd like some recommendations that actually aren't maybe countered to what they promote. And I think as a body we don't see hydrography and charting promoted internally in NOAA at an appropriate level that matches our national strategy. I mean, the strategy is clear, signed by the President, chart the Arctic is highest. If I was writing a strategic document for NOAA I think I would put charting and hydrography at the top of the list. So I think it's an important recommendation for the external one, to the Hill, to the administration about a line item and the second one, look internal and make sure and you hopefully expect that we on the HSRP would say the second one. And we've had some briefings and for me personally, I'll let the other members speak. For me personally, I was underwhelmed by

the level and the attention of this particular item which has a national importance. Next slide.

This is to give a little background to answer the next question that NOS has asked us. This is 2013 data from the Alaska Marine Exchange which is shore based AIS receivers. We have 100 and some odd, just for disclosure I'm a member of the board of the Marine Exchange of Alaska, a nonprofit, it's perfect example of a public-private partnership. The Coast Guard puts money in, the state and commercial industry.

So we have one of the most advance systems, it's not satellite-based although satellite information can be inputted into the system but ours is land-based and we have very precise, tremendous information about traffic that Adm. Glang uses in some of his strategy documents, where is the traffic. We have the picture, we the United States through the Alaska Marine Exchange. But it is telling where the traffic is, on the United States side the

majority of the traffic during the year or in the summertime is tug and barge operations, resupply of coastal communities, resupply of the Beaufort Sea operations and of the oil patch up on the North Slope.

What we see in this data for 2013 is tankers, bulk carriers, large ships around Chukotka and headed in this case either eastbound or westbound on the Northern Sea Route of the Russian Arctic. A couple of tankers coming into here, here's Nome, you can see traffic into Nome and most of the traffic into Nome, a couple of tankers, most of this traffic is tug and barge traffic, along the coast, Point Hope here, Wainwright, Barrow but all coastal barge traffic.

Plus 2013 we didn't have Shell out here in the lease site and Shell brings roughly 20 vessels, maybe a few more, few less, attending icebreaking support ships, oil spill response vessels, et cetera, and a couple of rigs for drilling and that small armada create hundreds of transits in this area of the northwest coast of

Alaska. Next slide.

Note that this is 1 June to the end of November, and here's the picture of the AIS tracked ships in the wintertime. So we have to all know and understand again this is seasonal, the place is ice covered, ice may be thinner, it may be all going to first year ice, the character of the ice is changing, whatever, the place is ice covered. And the regulators probably through the rest of the century, if forever, are not going to allow drilling in the ice, so this is a seasonal operation.

The question is how many ships there might be along the Northern Sea Route in the wintertime, through the Northwest passage in the wintertime, and the answer for most of us that work on this subject there aren't going to be many. The Russians may extend this season, the navigation season to be in the ice at the end of the season, but no one is really talking about a longer navigation then six months on the Northern Sea Route. No one in the maritime industry is

talking about any traffic from the Northwest passage, at least through beyond mid-century if ever. It's all economics.

What's driving across the global trade routes or potential routes through the Arctic is our natural resource development and global commodities prices; it's not the retreat of sea ice because the place is ice covered seven months out of the year, partially or fully, through the century and beyond. There's a lot of ice 3000 nautical miles across the top of the world from just south of the Bering Strait all the way across the North Pole to the Atlantic, and its 3000 miles of 2 meters of ice, it might be 1.5 meters of ice a decade from now, but it's a long way in the ice, and the question is whether it's economic or not. And I've given a couple of briefs before to our group here. Next slide.

And just to remind us, these are integrated passive microwave images for 2013 and '14. I just put them together and merged them to show that again the place is ice covered, and if

you look carefully up in our area that we're talking about today it's all ice covered, and this is six months so about seven and a half months ice covered. And this doesn't tell us much about thickness of the ice but you can infer that it's one to 2.8 meters thick. But again the place is ice covered which has the seasonality impacts everything, of course the hydrography actually doing the hydrography is one.

Next. Okay. So the criteria, the question that's asked is related to the internal use of the U.S. Maritime Arctic, and if you look at the maps it is very clear that the lease sites and the approaches to the lease sites are a one use, huge use and lots of requirements.

The Kivalina Terminal, I didn't point out but the largest ink mines in the planet, or one of the two largest ink mines in the planet, is located in the Chukchi Sea off Kivalina, the Red Dog Mine, and you can see some lines of cargo ships going into that port so that area has been quite well surveyed I think. Why, because of

safety reasons, 300 meter, a 1000 foot ore carriers come and they anchor off Kivalina, so we do need to know and they need to know in particular how much water they have under their huge ship, some of the largest ships in the world come in fact into the Arctic Ocean to northwest coast of Alaska.

That's the security law enforcement requirements are in there somewhere, and we haven't done enough research maybe in the HSRP to find out what those are. Some from the Coast Guard are related to this routing's system, voluntary routing system, but are there other and there are likely other national security reasons and law enforcement reasons.

Our coastal community supply might not get a lot of attention but it does when the you read the President's document on his take on indigenous people and climate change and their survivability. So on the list of criteria somewhere are the coaster communities of Alaska and the ability of the resupply companies to

reach them and supply them for their yearly sustainability. And then there's separate but related the resupply of the North Slope which happens every summer, again tugs and barge operation, Foss and Crowley and others. The Bering Sea fisheries has some requirements, merging port, it was specifically asked in the question, one of the questions coming up about port, that port likely to be Nome, so one of the approaches what hydrography needs we have to support that port becoming America's Arctic port. And then finally the question I've already raised is identification of places of refuge. And I don't think it's the part of the HSRP to determine what the priorities of all of these are. I mean, I probably would say while national security is probably number one as it usually is, but we don't know how that plays here. So were not answering maybe completely what NOS has asked in the question, but I think we might have expanded the range of issues. Hugely important is the traffic around the coast in many areas

that have very few charts of this tug and barge traffic. And I'm not quite convinced that that has been looked at carefully enough in the range of uses, marine uses to be considered in the priority scheme of what needs to be charted when.

Again, just again another point again is the national security requirements are unknown, will they be known, who knows but at least in the equation that Adm. Glang uses that they should probably be in that equation.

Protecting traffic is a very difficult thing; there are some projections produced by a study that my team of people at the university worked on and others, that show if we did have six to eight rigs out there drilling and in production phase, which would probably be down on the seabed, but in the exploratory phase the six to eight rigs would require some hundred vessels or more and then thousands of transits of ships to the coast, back and forth to Nome, if this is a support base, so in attempting to project what the United States Maritime Arctic would be, the

driver is offshore development and how many support ships are related to supporting the drilling rigs in the exploration phase over the next two decades. So next slide.

Three recommendations are general, I'm sorry you probably can't read them, but what again are the national security requirements and how do we get them, is there a role for CMTS, could CMTS be a facilitator to give it an integrated look at all of the requirements so that that can be passed and unless but we do see a role, if not for the CMTS then for the new Arctic Executive Steering Committee chaired at the White House. Somewhere in this bureaucratic structure someone should be able to tease out the integrated hydrography requirements of the United States.

The second bullet deals with the specific analysis or looking at the tug and barge community, talking to the commercial operators and what are their needs, it's been a pretty safe operation for many decades but they're expanding

their operation with deeper draft tugs and barges, and what are the implication of doing that. So I would think that the number one priority might not be the voluntary highway that the Coast Guard wants, but it might be in fact the coastal highway of the traffic of tug and barges; that's just my speculation, but it's a huge element here in coastal trade in Alaska.

And then finally that third recommendation that hopefully we'll have is we need to have a better understanding of the hydrographical requirements of the lease sites and the approaches to the lease sites because we have this amount of ships that operate inside and outside of the lease sites so what do we know about that and I think DOI might have some ideas and of course talking with Shell would have some pretty good ideas to. What does that entail? What are their needs? Next slide.

And here is the question is again from NOS how do we prioritize tides and currents and positioning requirements, a huge issue so that we

actually do the hydrography. And a few points here, I mean, I think as we review HSRP, this issue that there were inadequate, I mean it's quite clear inadequate geospatial and oceanographic infrastructure to give us the accurate positioning and hydrography information we need in the Chukchi Sea, Beaufort Seas and essentially the adjacent areas where the lease sites are located.

Highest priority is likely, given the appropriate resources, the highest priority would be to collate the tide gauges and CORS stations along the northwest coast of Alaska so we can triangulate and do all of what's necessary to provide adequate positioning to conduct the hydrography. Tough and expensive to have insight to measurements, Doppler current profiles, et cetera, expensive but nonetheless our priority required to get the current schemes, at least in the coastal area in this part of remote Alaska. The main constraint, of course, is NOS and NGS would execute all of this if they had the

appropriate funding to do this. Next slide.

It's really just a general summary, the recommendation is that -- oh, go back, I'm sorry. Here's the location of I guess current location I guess, maybe for -- let me just point here -- for the tide gauges here in the Bering Strait region I think, current or planned?

MR. EDWING: It's not current.

MEMBER BRIGHAM: The new ones. I don't know, Gary, can you comment?

MR. EDWING: I can tell you that it's not seven existing --

MEMBER BRIGHAM: Well, I mean whatever how many we have they're likely not to be enough.

MR. EDWING: I think in the Arctic is defined kind of by the Aleutian Islands North, there's a total of I believe nine inland stations but that's, you know, there should be some triangles down there along the Aleutians.

MEMBER BRIGHAM: So you think these are temporary?

MR. EDWING: Some of them are; there's

Nome and Red Dog Mine along there.

MEMBER BRIGHAM: Yes, there is one at Red Dog Mine; I've seen it.

MR. EDWING: Yes, there's a permanent stations but I think those are just two of those triangles seen it, the other ones must be --

MEMBER BRIGHAM: This one is at Nome.

MR. EDWING: Yes.

MEMBER BRIGHAM: This is at Kivalina and the other may be temporary.

MR. EDWING: Right. So the others may be temporary, but there's just Nome and Red Dog Mine and Prudhoe Bay is the other permanent one.

MEMBER BRIGHAM: And the CORS stations are, I'm pretty convinced are there.

MR. EDWING: Yeah. I'll have to defer to Juliana on that.

MEMBER BRIGHAM: But again in this corner of Alaska where we actually have marine activity and the lease sites there are none, I mean that's the point in this, I think in our recommendation that we need in particular maybe a

site in Barrow and maybe Point Hope down here. But in any way but of course the issue is those systems, whatever they are could be seasonal maybe but it's harder to do, if they're fixed it could be the ice on the coastal whatever. But the question does that here is an opportunity for the Coast Guard maybe to if in fact you would get funding to put the sites in maybe the Coast Guard buoy tender fleet could actually help you build the things wherever they might go so I mean, there's a degree of cooperation.

Would it be expensive? Most certainly, because these sites are going to be reinforced to withstand the winter ice in the Chukchi Sea. but they're necessary. Co-locating CORS and so I think a recommendation from us, HSRP, is that girth of observations here needed in fact to give us the right information for the current marine use that we have when they're drilling out there.

Anyway that's the general point. We didn't tell you in our recommendation how many, it's for all you to figure out. I mean, but

there are some locations particularly in the northwest coast of Alaska where they really need to have tide information anyway. Next slide.

And this question from NOS is a good one, it's hard to answer again with the realities of shorter navigation season, meaning, you know, it's only seven months, eight months of ice cover, so really just a three month season of surveying, and the mobilization cost to doing that, what are the realistic annual targets and percentage surveyed and charted over the next five years in the Bering Strait, and then what's the potential for deep draft ports and harbors of refuge, and how does that play into this question?

And we don't answer the question because one thing we have to define is if you're going to come up with the percentage what is the United States Maritime Arctic, and many of us would say well, it's the Aleutian chain all the way to the Canadian/U.S. border and the Beaufort Sea. But is that what we really mean? Likely

not, it's what's ice covered from maybe even the Bering Strait to cover this northwest coast and then the northern coast of Alaska, so in order to get a percentage are we talking about the whole of the United States Maritime Arctic, which is a pretty large number, or are we just talking about a small area, or in fact are we talking about just the highway, the voluntary corridor, so there are a lot of questions about what are we talking about as far as the area to be defined, and I think we need to maybe discussed that a little bit -- HSRP -- to provide better guidance, to you Admiral, on what are we talking about.

But anyway, talking with Andy and others in the team we said well, here's a guess at what we could do, and it's a little bit similar to what we do now under the current physical constraints we have so we do recommend in the end this 500 square nautical mile annual survey target, and if you look at, you know, a ten year plan or so, it's roughly then you get a little less than 6,000 square nautical miles,

that's a pretty good number but it takes ten years to get and how do you split the number and so we said well, some of it's the corridor and the access route that the Coast Guard and presumably the nation wants for voluntary, but then some is for the approaches to the lease sites, some approaches to Nome as the new Arctic port, and then this approaches to the refuge areas and the refuge area themselves, so this is components.

Now, I didn't speak at all to the issue I think is missing in this, is the corridor around the coast in the shallow waters for all the tug and barge traffic, but that could be in there -- if it's a higher priority issue, that could be in there as well. Next slide.

So our recommendation is pretty straightforward, and maybe we should have recommended twice as much or maybe three times as much, but the realities are in the current situation we thought maybe 500 nautical square miles. And maybe were doing more this is season

than this number but over the long haul this is at the current budget, even though you've re-budgeted do to some of this, maybe this is doable, but is it good enough for the whole of the place? Likely not, but it's within the budget constraints. And we also say that if in fact there was new money then NOAA needs a plan and OIS needs a plan to execute with this new money to get a higher annual survey out of the system. Next slide.

The question is a little bit lengthy but it's looking at that NOS has asked us alternative strategies to Arctic coverage other than our current approach to full bottom coverage what might be some recommended new and creative approaches to partnerships, funding strategies to increase gravity data, acquisition, develop Alaskan geode models, install tide gauges and survey for nautical charting.

Well, again this number of 1 percent of the US Maritime Arctic is charted in modern international standards, NOAA and NOS should

employ and explore all strategies. I mean most of the Arctic we have no or minimal data, so we ought to go after some information, recognizing the inherent deficiencies of accuracy in all the data, but we should have a strategy to get data in places where there are actually no information. But full bottom coverage is absolutely necessary to the new Arctic port in Nome, to the approaches to the lease sites and other potential traffic, so there's this dilemma of what's really has to be for bottom coverage and I would think that the tug and barge traffic might be one of those additional uses that requires full bottom coverage because they go to the coastline and they run some of the barges up on the beach, they roll out a hose and they fill up the tank, and that kind of operation in the 21st century is very interesting. I'll put it that way.

Another issue related to this is the use of new hydrographic survey tools of which NOS is already -- we've heard about at this meeting

-- employing, ROVs and AUV's in shallow water and coastal areas. I haven't heard too much about satellite-derived bathymetry; it doesn't seem to work too well. I know that NOS has had to experiment I think Point Hope, somewhere trying to use satellite information to look at a portion of Alaska. Of course the clarity of the water is all sediment-laden and not clear, so satellite-derived bathymetry might not be the greatest tool for Alaska, although some areas into the Arctic Ocean even north of Barrow could be possible.

Crowd sourcing, we've heard about here and the volunteer data collection, it would be interesting if we could employ all that tug and barge traffic, hundreds probably thousands now are transits, hundreds of transits along the coast if that sector of the industry could in fact help us in crowd sourcing and getting that information, it would be a huge information base of which to have information in some areas where there are minimal charting.

Certainly HSRP recognizes the great

work that both NOS and NGS has done GRAV-D all of the coastal tide gauges and all the information, and all that's driven and constrained all by the funding limitations within NOS and within NOAA.

Next slide is the recommendations from us to the administrator on this. One deals, the first one with employing crowd sourced bathymetry wherever, whenever, however, but at least exploring the limitations -- understanding the limitations and exploring how we can do that in this very remote part of the United States Arctic.

The second point relates to exploring in more depth the relationship of the Sikuliaq, the new ship that's operated by my university owned by NSF, how is that part of the hydrographic fleet and how can that be the United States hydrographic fleet which it is, it has multi-beam on it and a fine ship, can operate in the ice, coastal areas, it can operate in places where the Healy cannot, so how do we employ that as a hydrographic ship of the United States? Part

of UNOLS is part of the government fleet, not all by the science community, I'd like to think, you know, the science community has this ship locked up but there has to be time bought on that ship as a hydrographic ship of the United States, so more relationship with NSF on that and my university. Coast Guard have integrated pretty well, I think the Healy and the buoy tender fleet up in Alaska into this system to capture some data and any new polar icebreaker that's built in the United States in the future that the President talks about has to be a hydrographic ship, hydrographic survey vessel of the United States in some part because it, only that ship, like the Healy will go places where no other ships will go in the United States fleet.

And then finally maybe we should explore -- NOS should explore this private sector relationship with the tug and barge companies and their hundreds of transits and the information they might gain on those transits and be able to crowd source it, whatever and have that database

in our own database for the whole area. Next slide.

And then again, you probably can't read all of the words, but how might NOAA think about this region differently? Lots of marine uses in the area and every one of those marine uses needs base maps and geodetic information. There is, interestingly enough, a lot of attention and broad based interest -- private and public -- in this region, so we should somehow mobilize that interest. And this particular recommendation is a good one, comes from Larry May who is not with us from UNH -- he was out to sea when he gave us this one - but it's a good one that we really ought to maybe at the level of the Arctic Executive Steering Committee have an industry group that relates to the interagency government group to address cost sharing, the sharing of infrastructure and of course the sharing of information and having a frank exchange between the private sector and the public sector at the highest level of the

strategic planners or thinkers on where the United States is headed in this maritime arena.

And again the point of that the U.S. Government again assume the responsibility for the safety and environmental protection of the northwest coast of Alaska when they applied the map with all the leases on it, and yet the United States Government has not provided the proper funding for infrastructure; it's a reasonable point. It shows you that the whole government approach, which is the new kind of hallmark in this town, doesn't necessarily work too well or didn't the past. And so for infrastructure we already have marine use well beyond the proportional principal, and we have drilling going on without the attendant safety net, which of course Shell has to bring all of that themselves which I guess is fine. Next slide.

By all recommendations expand interagency private sector dialogue is one, and then perhaps elevate the hydrography and charting issue to the highest level of integration with

this Arctic Executive Steering Committee, I think it's -- I would say when the President's statement went out, we heard today that NGS -- the NGA director sent out a press release with how they would respond, I know the Coast Guard did when they saw the word icebreaker, the Commandant put out his own press release on explaining what the President said, what do we want and I don't know -- have not seen a press release from NOAA, and maybe there should be a response.

Maybe there has been, but I'm not aware of, and HSRP are not aware of that same kind of response and maybe there needs to be an action team within NOAA to actually respond to the President's initiative here and talk right now. Obviously you all gave information up the chain and it made it to the top, but we do know that two agencies have actually responded in kind getting the ball rolling, and I think the hydrography charting issues it's the time to strike.

Last slide, and it's more of a summary of things beyond hydrography and charting. I did put hydrography and charting as number one here, but all the other things, implementation of the IMO public code, we all know a robust Arctic Observing System, and that relates to what the administrator told us yesterday, environmental observations, environmental security, all of that. Domain awareness, we've heard, SAR, environmental response, obviously research and exploration, and then this issue of the Alaskan deep water port. So I'll finish there. We've got a few minutes for discussion, I guess. Mr. Chairman, Admiral.

CHAIR PERKINS: Thank you, Lawson. Yes, and we have, you know -- to stay on schedule we have about five minutes for questions.

VICE-CHAIR HANSON: Lawson, obviously this is a very important issue to you. I appreciate all the hard work on it. You brought a lot of issues to the table, a lot of work to be done from here on. And we talked about this

quite a bit, one of the things hearing you talk about it, seeing your points, I think one of the things that would be helpful because you do mention inadequate funding about a dozen times in there, is there a place to put in how much money we need and maybe be more specific with it?

MEMBER BRIGHAM: Sure. I mean that we would have to work with our colleagues in the staff to come up with some rational numbers. Sure, we could. I think our team when we were doing this were kind of reluctant to put numbers on it all.

VICE-CHAIR HANSON: Sure.

MEMBER BRIGHAM: Because we don't have the background to do that, but if we wanted to in our report, we could. But one serious issue, that has to define what area of the United States Maritime Arctic are you actually talking about? Because that will drive -- I mean, putting two tide gauges in ice-covered waters in the North West Coast of Alaska would be millions, I think, and then the operational cost for the Coast Guard

to do it, but maybe we could come up. I'm not sure in our report whether that resolution is necessary. We let the experts figure that out, but you may be right.

VICE-CHAIR HANSON: No other questions, but I know that Joyce has some, though.

MEMBER MILLER: Lawson, I think about half the panel that's here now was up in Alaska when we were there last, and one of the things that struck me was the rate of change in the coasts. I mean, the tug and barge captains talked about not knowing from one year to the other what an approach would be. So, you know, you were talking about what level of importance charting for the tug and barge fleet would have, and it just seems to me given the rapid change, which was just amazing how quickly things changed, is that something that's realistic in terms of charting need? I mean, you'd have to chart, re-chart every few years or every year. I don't know.

MEMBER BRIGHAM: We can have them help chart, right, and they would be there every season and see the changes which are dramatic in some areas, for sure. I mean, I think the crowd sourcing is a start where we have no information. You know, I don't know all the technical details, but I know that that's information, and I am always forgetting information where we have in some areas none. We have some charts of course along the coast for sure. What were the standards when they were created? I mean I think that there are some issues. Crowd sourcing is not going to solve all of our problems in this part of the world, but maybe there are some very specific operations where it's routine, like the tug and the barges. I think you could have a relationship with Foss and Crowley and others. It's a good point though, Joyce.

RADM GLANG: Gerd Glang, Coast Survey, I'm wearing my coast survey hat, not my DFO hat.

Where do I start? We have quite a few activities going on in the office, and so let me

just dive right in and describe them a little bit. If you will recall what we heard from Vetus Marine in particular during the Anchorage meeting, they identified the issue with the Western Alaska rivers, and they posed a challenge for them because our charts were way out of date. For instance, the Yukon River, the survey data is from 1893, I think, and the reason we were going up the Yukon to survey in the first place had to do with the gold rush. So as I've said before in public settings, the state of US charts in the US Arctic, Western Alaska is a patchwork that represents our national imperative, whether it was economic or energy exploration-related or some other natural resource.

Specific to the Western rivers in Alaska we restarted the conversation with Vetus Marine and several of the other operators. Well, let me back up: after the Anchorage meeting, there were several key places that were identified including Kotzebue, Kuskokwim, Nushagak, and Port Clarence survey and also, I

believe, Yukon. We did finally get Kotzebue done. We did the Kuskokwim and Nushagak. I don't live with got Port Clarence done, that was scheduled for this year, but we didn't get there.

We had our navigation manager meet with Vetus and with several of the other tug and barge operators just several months ago, I think, in mid-April, and we listened again and heard their requirements. We also had our team that's doing the research on satellite-derived bathymetry take a look at what could we do with the satellite-derived bathymetry as we now produce it to generate a provisional product, and since we know that the LANDSAT satellite imagery is reflown, it's the same place on a rate of about I think it's once every two weeks give or take, not every pass over a particular place is going to produce a useful image, but that's pretty high-frequency. We also know there are a lot of limitations for what you get out of the satellite-derived bathymetry as far as accuracy, are you actually able to see an interpretation of

the bottom, or is it an interpretation of something in the water column?

So what we've done is we're preparing to release an electronic navigational chart, so this chart will only exist in ENC form, not in paper, and that's part of our internal policy. I believe it's a one to 90,000 scale chart for the Yukon River, which we are going to call a provisional chart, and it's going to be bathymetry based on satellite-derived bathymetry, and working with NGS, the remote sensing division, will have the latest but best available shorelines. It doesn't necessarily meet all of our title control requirements.

We are going to produce a provisional ENC here. We want to get that in the hands of the tug operators this fall before the freeze up so they can at least try it out. The ENC format is compatible with the software they use. And then building on that, we're starting to talk about how do we operationalize this? How do we grow some confidence in a provisional satellite-

derived chart? So we do want to do some real hydrography to help validate what we're seeing.

I mentioned in my introduction yesterday my update that we've done some of that already up off of Barrow, and we already ran into some limitations. The second point has to do with the crowdsourcing and how we can empower, for instance, the tug and barge operators or any other near coastal operator who is interested in logging depth data and sharing that data as a volunteer spatial observation. So we had a demo, a pilot project; one of our very smart people demonstrated that a common software program that's used by many of the small boats, small vessel operators to navigate with, that it's really easy to interface echosounders with that, and so the next phase of that project, so we've got the feasibility piece out of the way, the next phase of it is to actually talk with the software vendor and see if they would be willing to incorporate some of these changes. And then the hope is that we will have the source of data

from these volunteer observers.

I talked yesterday about the in between piece that I'm really keen on getting that database established so that there can be some organization for what could potentially be a great deal of data. So I think on several of your points, we're already taking action. It's unfortunate that the way we have to interact with the panel is so limited. Otherwise, you may have known some of these things, but I just wanted to make you aware of specific to the Western Alaska rivers, in this case the Yukon, we do have a provisional product. It's going to demand some policy changes on our part; that's why I'm using the word provisional again. And again, and then we're looking at how do we validate what we get out of, for instance in this case, satellite-derived bathymetry. So I thought I'd give you that update in a public forum because I know many of the folks do listen from that part of the world. Thanks.

MEMBER BRIGHAM: Yes, before you came

in, Admiral, I mean I did say that were trying to answer these questions, and it's not to denigrate what everyone's doing or not doing; it was to give kind of high-level recommendations, many that are lower level ones maybe the NOS but others to other elements of the government, to the administrator, so you asked us these very difficult questions to answer, and we didn't answer many of them the way you might have expected, but maybe there are no answers to some of the questions or not good answers, but this is our attempt.

But I hear you that there are lots of things going on in our relationship, your relationship with IHO in the US being in the lead of some international efforts is quite far advanced, so there's a lot going on that's positive, but maybe not as much interagency, whole of government approach from an HSRP view of relationships to help in this particular area. But the other issue is the President of the United States has spoken on very specific issues,

which maybe FDR did, who knows? But we have an opportunity here at this moment to strike when the President wants to do something in his budget. So hopefully he'll tell OMB to move ahead on these initiatives.

RADM GLANG: So let me respond to that real quick, Lawson. I think that's a great point that coming off the White House's announcement on some of these issues in the Arctic that you see that NOAA has an opportunity, and I would recommend that the panel provide that feedback in the most immediate way, and we heard from Vice Admiral Brown. He's happy to receive an email from the panel when the panel regards it as appropriate. So I would suggest if the iron is still hot, we should strike at it, or the panel should strike at it, and that's the kind of thing that can be communicated more immediately to the Vice Admiral through email rather than through our very bureaucratic written letter process.

I do have one quick practical question, and you can answer me later. On the

places of refuge, I'd like to know how these are identified and who the authority on those are, and we can maybe have the EAP come back to us at a later time on that.

MEMBER BRIGHAM: Well, I am pretty certain it's the US Coast Guard, but the identification of them, even the Coast Guard would need some help I think because of the refuges and all of the other now complexity of marine use and well, what you saw on the map requires a lot of agencies to get involved in this. Because if we're going to take that leaking tanker to the wildlife refuge, I don't think that's going to work.

I mean, I'm being a little cynical here, but the practical issues are where are -- I mean the Coast Guard is going to have a tough time identifying places that you can then survey to make them safe as this harbor of refuge, which is a good question. We can explore it more.

RADM GLANG: Well, the converse is true also. If there's an area that they don't

absolutely want anyone to go into with a leaking tanker, do I have that information on my chart? Am I showing the right kinds of limits?

MEMBER BRIGHAM: Exactly. I guess the intent of our group is to get some consensus among the HSRP members and draft this thing and send it up the chain, but I would say for Admiral Brown maybe, if I was him, I'd have an action team at his level to respond to the President's initiative here from the fact sheet that you provided information to, and Dr. Sullivan should respond with some sort of press release and an action on it. That's what I personally would recommend, but we can get that out of the maybe consensus discussion among the HSRP as an immediate thing to just send up an idea.

CHAIR PERKINS: Okay. I know Dr. Kudrna is a question, and we do have a question that's been submitted electronically online from a virtual participant, so if we can get those two questions and then finish with Dr. Jeffress, then we could go on to the public comment period so we

don't keep the public waiting due to our inability to stay on schedule.

MEMBER KUDRNA: Good. Well, a very good report, and I agree with both you and the Admiral that there's an opportunity with the President's initiative on the Arctic. I guess the concern I would have is that based on everything we heard about budget and budget being tight, if you look at everything in here, this is a pretty massive amount -- a shopping list of items to do. Do you think it would be of value to have an initial step recommendation that might mean practical to be adopted by the administration to go forward, identifying what first step at some more modest pricing level could go forward?

MEMBER BRIGHAM: The President signed the national strategy for the Arctic region. It has one thing in it: it has chart the Arctic region. I think that's it. It didn't say environmental observation to do whatever, security, whatever. It says chart the Arctic

region. The reason why it's in there is because the National Security Council wrote that document. It was a Coast Guard officer who actually drafted it, and many of us said we need some charts for this maritime region, and it got in there, and I would say he needs to maybe advise OMB to put a line in his budget: chart the Arctic Ocean, chart the US Maritime Arctic in some way, in some level in the budget, and then the Hill can deal with it. I think they would go along with it, but who knows. That would be my way, but maybe the other members would have another view.

CHAIR PERKINS: Great. Can we get the questions submitted electronically online, on the screen? Would you mind reading that, Lawson?

MEMBER BRIGHAM: Yes, in question four, you discuss a survey season and using two NOAA ships and a contracting vessel, I think for Nome is what we had talked about. Have you been able to conduct surveys through entire three months or hampered by money to operate wholly?

Amy McElroy. Maybe the Admiral right. I am not sure I have the background and information to answer that, or Andy might have a thought about it. Go ahead, Admiral, please.

RADM GLANG: Thanks. Gerd Glang from Coast Surveys. So in question four, Lawson Brigham identified that for the FY15 field season, we were using two NOAA ships, the Rainier and the Fairweather and a contractor, and that's correct. That's what we planned to do, and that is what we did in fact. Have you been able to conduct surveys through the entire three months? So we were not hampered by money per se; the sea days were allocated for the Rainier and the Fairweather to operate in the Arctic region. Where we were hampered whereby unanticipated breakdowns, repair issues and to a lesser extent by staffing challenges. But mostly these were maintenance related issues that forced the ships to not be able to operate entirely the whole time. But in general, we did okay, all things considered. If you'll recall from yesterday's

presentation, of the planned 500 square nautical miles, I think we accomplished over 800 in the US Arctic. So not all that we wanted to get done but pretty darn good.

MEMBER BRIGHAM: Would you anticipate in the future longer seasons of survey? With the retreating sea ice into the Arctic Ocean.

RADM GLANG: I think it depends on where, so, you know, we planned to get the Rainier and Fairweather up into Kotzebue Sound as early as possible, and they were monitoring the ice coverage, and in fact, the ice didn't clear out of Kotzebue Sound until like mid-June, and the ship showed up a week after that, something like that. I mean, they were watching it week by week. Fortunately, they were working a project on the other side of the peninsula, and they were pretty much able to duck over there as soon as their schedule let them. So I wouldn't anticipate it necessarily getting longer, but we do have things, the information like what we get from our ice, satellite ice imagery with analysis

on thickness and how it's moving, and that's great intelligence to tell us how soon can we get up there.

MEMBER BRIGHAM: I was just thinking over the next ten years and a strategy for ten year period of surveying that clearly in the autumn, it would probably be ice-free into November or the end of November, maybe December. So the season operating --

RADM GLANG: As the season gets longer, theoretically.

MEMBER BRIGHAM: Theoretically.

RADM GLANG: Then we can plan to be up there longer. The planning of sending any of our ships anywhere occurs two years in advance, and when you actually get to that year, then there's still the question of did you get the money allocated for the days at sea? Sometimes yes, oftentimes no. Is the ship repaired and ready to go; is it available? And is it staffed and ready to go? And all three of those things have to align and often don't until, you know, right

about the time you're ready to leave.

And also I would caution that in ten years, the likelihood of the Rainier and Fairweather still being operational is extremely slim, so we may be losing the capacity, the internal NOAA capacity unless we recapitalize those ships.

MEMBER BRIGHAM: It puts more onus on the use of the Healy, use of the Sikuliaq, the use of whatever new icebreaker we get.

RADM GLANG: I think we have to set the expectation here though, Lawson, that while equipping Coast Guard vessels with hydrographic-capable systems seems like a prudent idea because they can acquire, and they have proven that they can acquire at least track line bathymetry incidental to their other missions, hydrography is not a primary Coast Guard mission, I believe. And so we could be running afoul of their primary purpose, so we really, you know -- while there's capacity there, and we can figure out how to leverage it, am I going to be able to ask a

smaller Coast Guard vessel to survey near shore in Alaska? Right now I don't believe that's possible. Certainly working in the margins of their other missions when they're attending navigation aids, we've proven that the data that they acquire in a reconnaissance mode to place a navigation aid, we can use that. The data they acquire your during their transit to a particular place for their primary mission, we can use that. In the case of the Healy, using that as a primary platform for surveying is certainly possible, but we would also have to be prepared to pay for those sea days.

MEMBER BRIGHAM: The buoy tender fleet of course in Alaska there are no aids to navigation to work. There are couple shore aids at a couple hundred miles apart, so there aren't any aids up there, so the buoy tender fleet is really out there for law enforcement, whatever search and rescue, operating around the lease sites to support whatever. I would bet that you could carve out time to do some coastal

surveying. I'm just suggesting --

RADM GLANG: Yes. And so we have to work on leveraging whatever time is there opportunistically, absolutely. They did a great job running some reconnaissance for us in Bechevin Bay, for instance, and that was actually a contractor-assigned survey. We had reconnaissance data from the Coast Guard in Bechevin Bay as well as satellite-derived bathymetry, and that fusion of information really helped execute a survey very quickly and efficiently.

MEMBER BRIGHAM: But if we build this new icebreaker, whatever it is, and it's to operate year round, what the President says in the Arctic Ocean, then that kind of capability is unusual and will allow -- the ship has to be a hydrographic ship at the highest order as well as an icebreaking ship.

RADM GLANG: One little wrinkle in that then is it would be my understanding that the Coast Guard would expect NOAA to help fund

the purchase of that equipment and potentially staff it. So there is a little bit of resource, something --

MEMBER BRIGHAM: Oh sure. Oh sure. But if we're going to use the whole government approach, it would seem that if we get this billion dollar machine or more that can operate year round in the Arctic Ocean, that it could do -- I think we're saying the same thing.

RADM GLANG: But I think from a policy point of view, I would really be concerned about in a whole of government approach that NOAA asks the Coast Guard to undertake a hydrographic survey, which is a systematic and controlled survey. We would have to come a long way on understanding the implication of that, and I believe the private sector would probably set up a howl of protest on that as well.

MEMBER BRIGHAM: Sure, using the Aiviq or another ship that could be a commercial icebreaker, sure. A great opportunity.

CHAIR PERKINS: Dr. Jeffress, if you

could as the last question for this session please.

MEMBER JEFFRESS: It's more of a comment rather than a question, but I'm just following up on what Joyce said about the radical change on the shoreline along the northern coast of Alaska. Last week, The Economist newspaper, which is in an international paper, picked up on the President's visit to the Arctic and commented on the human side is that there's a fair number of villages up there on the coast that need to be relocated as a result of the shoreline change, and the estimates are that about $400,000 to half a million dollars per person to relocate those villages. And neither the state of Alaska nor the federal government has a budget to do that.

MEMBER BRIGHAM: Just one thing, could the members of the EAP just raise their hands who participated in all our discussions so the public might know that there was -- and Larry you were part of it. So we had a good team, thank you, great. And then we had the information, of course, Ashley helped us immensely with the

internal information, so a good team effort. Thank you.

CHAIR PERKINS: Well done. This leads us to the public comment period. We're about 15 minutes behind schedule on that, so I do apologize to anyone either online electronically wishing to participate in the public comment session or anyone in attendance here in the room.

MR. PESCHEL: Good afternoon, Rudy Peschel. I'm retired Coast Guard and an Arctic groupie. While you people were in session yesterday hard at work, CSIS, the Center for Strategic and International Studies, hosted another Arctic event where the audience was thrilled to listen to Dr. John Holdren, the President's science advisor, who presented an awesome PowerPoint of the few weeks that the President spent in Alaska, and the slides from yesterday's presentation will be online through both his website and CSIS's website, and it might be good for all of us to absorb all the information that that portrays before we go into

further consideration of what you've been speaking about today. Thank you.

CHAIR PERKINS: Thank you, sir.

MR. FERRELL: Hello, I'm John Ferrell, from the US Arctic Research Commission, and I have a question about the report we just heard from Lawson Brigham. Lawson, I had a question for you about your committee's report, and I was just wondering from a public perspective, I think the public was pretty shocked when the Fennica, being driven by an experienced pilot, right outside of Dutch Harbor, major port in the Aleutians hit the shoal, ripped a large hole in an icebreaker hull, and yet we presume in the general public that this is a well charted area. Did that incident at all color the recommendations that you put into your report?

MEMBER BRIGHAM: Well, just a timely piece of information, I guess. I think the Admiral might answer to the issue of how was that surveyed, the area where they ran aground, but sure it's an issue. If you can happen in Dutch

Harbor, it can happen off Point Hope, it can happen in the area off of the lease sites where there are very minimal information, so who knows if there's some sort of sea mound or something there. I mean, we don't really know. I mean, maybe we do, but not 100 percent certainty that we know in the area of the lease siteswhat's there and the approaches. So it's a good example of what can happen. Now, I would say from my experience of being an icebreaker captain, that any other ship might be at the bottom there. I mean, you know, the thickness of the hull of the Fennica is an inch and a half or 2 inches thick and still had a 20 foot gash and had to go to the shipyard. It's just remarkable for the kind of ship that it is, so obviously doing whatever speed, and it came to a quick halt, and anyway -- no, we took that into account. It's timely; it's relevant.

MR. FERRELL: Thank you.

RADM GLANG: Gerd Glang from Coast Survey. So the NOAA ship Fairweather surveyed

the area where the Fennica went aground, and indeed we found several depths that were shoaler than what the chart showed. The soundings that the chart showed in that area were based on a 1935 lead line survey, visual control, so while the point soundings from the lead line may have been okay and certainly met the standards of the day, it's what was it between those lead line soundings. So that said, if you look at all of Alaska in particular and the vintage of the charts, the vintage of the hydrographic surveys that underlie the charts, it is a patchwork that represents 100 or 150 years of effort, and certainly the technology has changed.

I think most important for the program was our realization how much the usage of that area has changed, and it's understanding that change in usage that certainly needs to be driving our survey requirement priorities. We just had that Mayor of Unalaska come visit this morning, and I haven't heard back how that went but we're certainly concerned about where the

priority for Dutch Harbor is, and I'm pretty sure we've moved that priority way up.

On the other hand, when you have limited resources, you know, it's a little like Whack-A-Mole, do I survey here or there? And how do I decide? And that's partly one of the questions that we put to the panel, and you heard Lawson's group, how do I decide what criteria? Do I survey here or there? So it's dynamic, the input that we get, understanding change in use is particularly important, and we're open to receiving more input on maybe we should survey here and not there.

CHAIR PERKINS: Were there any online questions? Okay, great.

MR. MITCHELL: Todd Mitchell with Fugro. So I know that what we're really talking about here is trying to find a way to grow the pie in the minds of OMB and Congress and Senate. Does it make sense, is it within the realm of possibility to subdivide what we are doing in the Arctic as part of our charting mission away from

the backlog in order to demonstrate this is the amount that's being allocated? This is a rallying point for the House, the Senate and OMB to say yes, we do believe in that as a priority, and we see that it separate from what has been traditionally dubbed backlog? I'm not sure if that's one thing that we can create, if that needs to be through the House or Senate to change that as an appropriation, but maybe that's an avenue.

CHAIR PERKINS: Thank you, Mr. Mitchell. That's a good question, and I think that's consistent with the discussion, part of the discussion we had with subcommittee member Jeremy Weirich from Senate appropriations yesterday and Dr. Sullivan. So, you know, I think that's a topic that the panel, you know, is definitely going to take under consideration and see whether we have consensus on how we formulate a response, you know, of that nature. So thank you.

If there are no further questions,

then we're at the point of adjourning the public meeting. The panel has travel ahead of us, so we have a trip northward to the Linthicum, Maryland to the MITAGS Institute, so some practical exposure and hands-on learning and fellowship is ahead of the panel for this afternoon. I want to thank everyone on staff, want to thank the participants online, and those of you in the room who attended in person. So we will conclude day two.

(Whereupon, the above-entitled matter went off the record at 2:57 p.m.)

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C E R T I F I C A T E

This is to certify that the foregoing transcript

In the matter of: Hydrographic Services Panel

Before: NOAA

Date: 09-17-15

Place: Silver Spring, MD

was duly recorded and accurately transcribed under my direction; further, that said transcript is a true and accurate record of the proceedings.

Neal R. Gross

Court Reporter