NOAA 'S NATIONAL OCEAN SERVICE
NATIONAL GEODETIC SURVEY
FEDERAL GEOSPATIAL SUMMIT

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REPLACING NORTH AMERICAN DATUM OF 1983 (NAD 83) AND NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88)

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NOAA AUDITORIUM
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P R O C E E D I N G S

>>MR. DOYLE: Good morning everybody. Welcome back for our second day. Our minute sessions: When looking at the signup for the minute sessions --well, let me give some background. When we started planning this whole thing, we tried to provide the forum today for everybody who attended to have a few minutes to talk. That was our goal.

In looking at the signup sheet that we got for the minute sessions, we got enough to really fill up the morning. So we are going to do that, have the minute sessions this morning and have a follow on panel to address some of those issues that are raised in this minute session and begin this dialogue. And we will have lunch and have a nice day.

So, first of all, let me begin by thanking everybody for yesterday. The team got together last night. We assessed yesterday's events and I think everybody was exceedingly pleased, at least everybody on our team was exceedingly pleased with the interaction that we have seen. And again, this is just the beginning. We have at least --well, you heard Juliana yesterday, depending upon what the budget looks like, what's the likelihood we will get huge amounts of money flowing down the hill any time soon, whatever, we are some distance out from this.

So this is just the beginning and we do realize these exchanges require a lot of discussion. There are only a certain number of these elements that are absolutely cast in stone, if you will. We will have a new 3 dimensional datum, a new vertical determination. How those are implemented and when those are implemented, that is still up for significant discussion.

One of the things we do want to discuss and we like to have this early on today, time for you to think about it and give us some response. We will put up some kind of survey monkey on the website for this Summit but we like to know when you would like to do this again. Do we want to have this annually? Is this a good thing for to us sit down as Feds and related partners to do this once a year and track where our status is, 18 month, 24 months? We'd really like your feedback. Obviously, it requires resources to put something like this together, not only from NGS but you got to come here. We would really like your thoughts on this and we will plan out from there.

A couple of other things I would like to mention, some housekeeping issues.

The bios for everybody that's participated in this, all the speakers and those of us on the panel, those will be posted to the website. In fact, I think they might already be there this morning. All the presentations that have been given including those people who are providing power point presentations for the minute sessions, they will be posted on the website. They are already there through the webinar link but you got to make like two steps and that will probably go away next week some time. There will be a direct link on the web page for all the presentations. And they will be kept out there for quite some time. So several people had asked about that.

Okay. Let's go ahead and get started with the quote, "minute sessions." Now, we would like to have these limited to about five minute and we are not going to pull the hook out at five minutes if you still got something significant to say but we'd kind of like to limit that because we do have a number of people that want to speak. And again, I want to really stress that we want to hear your real thoughts. Don't pull any punches which is why we are going to ask Lou to do this first.

We are doing that in deference to the fact that Lou is in fact a former director of the National Geodetic Survey and that earns him a special place.
So Lou, you need another minute or so? You good to go? Okay Lou Lapine, from South Carolina Geodetic Survey, the former director of the National Geodetic Survey.

>> MR. LAPINE: Good morning. The biggest constraint I ever had is that I can only speak for three minutes or five minutes even. My father once said if they asked me what time it was, I would begin by telling them how to build a watch. So bear with me on that.

They sprung this on me a few minutes ago and I think like Admiral Bossler, that's good because I put down a few of my initial thoughts which are probably the most important ones that I try to relate to you.

First of all, I want to thank Juliana and the National Geodetic Survey for even giving us the opportunity to voice our opinions. We are the users and we may have slightly different ideas on how this should all happen. So thank you Juliana. I'll talk to you about what I need later on.

At any rate, first of all, the National Geodetic Survey always and always will be a world leader in geodesy. There is no question about that and I'm not saying that just because I'm the director. All through college, every textbook I had, every photograph was courtesy of the Coast and Geodetic Survey so I have a reputation, a good reputation. If that means joining the rest of world with an international datum, that's what we have to do. There will be some pain in that but that's what we have do. And so when I go back to South Carolina, I'm going to start talking about what that change is going to be and what impact that has? The first impact is our local real time network will be more accurate. And that's good. And we will have to apply fewer corrections to make it accurate. That is good for me as an operator.

So, there is very positive things to come out of it. However, as a user, a daily user, I access NGS database five to ten days a day. I'm the director of the South Carolina Geodetic Survey. I'm not actively involved in the day-to-day survey and if I'm hitting your database that many time as day, should be an indication of how important it is.
I think somebody told me yesterday, 40 percent of the hits are on the IDB. And that is passive networks. And 40 percent is on the CORS. We use the CORS but mainly, we use one very small portion of it. We take the precise orbits and we use those to post process our national height modernization control network. And as you saw South Carolina, North Carolina, very dense, 6,000 miles, 3000 points just paid off in spades when it comes to operating a real time network. We were able to tune our network to that control. So a surveyor goes out and does not just one mark but visits a couple of marks. That means he knows the marks there are good and the network is performing unless you had some really weird combination of canceling errors there.
But getting back to the users, we really need some consistency in our coordinates.
90 percent of the states are located on a fixed crustal plate.
So even though I believe and encourage NGS to move forward with ITRF, we need a subset or a second set of coordinates that are earth-fixed and that can be accurately

transformed back to ITRF when we need them. And as ITRF coordinates change like you do right now, the transformation will change and we can always go back and forth between ITRF with crustal motion or without crustal motion. That is the one big thing I want to make a point of today. And also, I have to tell you, I'm going to get tarred and feathered as you heard yesterday but I just heard this morning, I'm going to get tarred and feathered a second time because I examined the change in the vertical from what we have on 88 to what we are going to and in South Carolina, that's going to mean reverting back to NAVD 29. And I tried for 12 years to get everybody on 88 and now, I'm going to have to start off, hey, you know, you should have stayed on 29 longer. It sort of made sense because the vertical datum of 29 was based on oceanography. And being a coastal state, we will be reverting back to in some essence oceanographic defined vertical datum. I murdered the geodesy on that but the point is made. So that is where we stand right now.

I think a piece of advice to NGS that has nothing to do with geodesy, you need to stop talking about horizontal and vertical. You need to talk about a datum that includes a gravimetric and geometric base. I think it is a little confusing. It is dated. We always did horizontal work or vertical work. Now, we are doing a 3 dimensional coordinate system data based on both gravimetric and geometric principles. That will make the message a little clearer to some.

One other thing as a piece of advice, I understand NGS is moving toward real time networks and I have to caution them a little bit, there is a whole lot of more work when you start going real time. You can tell your customers, well, we only guarantee it when we can guarantee it but it will sooner or later take over all your resources to try and keep a system like that running. Farmers will want it at 2:00 a.m. and you can't give it to them and you will say, that's not our responsibility. It will be your responsibility if they dispel are depending on them. So if you got the resources, go ahead. If you need to concentrate on what you do best at least for the time being and then venture on in that new technology. That is based on my personal experience We set it up to run 6:00 a.m. to 8:00 p.m., running it 24/7, 365 and we have to because our customers now expect it.

One last thing: I wanted to dispel the rumor about Lou Lapine retiring. Lou will be retired by the time this new data comes around. But I will work my hardest in the south, in the southeast and I know Dave will be with me. We will work our hardest to convince people that this is the right thing to do. So good luck and I might not be here but I'm always here in spirit. So thank you very much.

>> MR. DOYLE: Thank you Lou, glad to see you be here in spirit. We'll bring in an exorcist. I'm going to follow now in order people signed up. George Semples from the Federal Aviation Administration. George, would you like to give us a few comments, please.

>> GEORGE SEMPLES: Good morning and thank you for the opportunity to speak with you this morning. Before I start, I was thinking about how often you should hold these? In my opinion, annually would be a good time. And then the closer to realization, you might want to space them a little closer. Once a week or something like that.

I want to share with you today some of the things that we down at the FAA and give you some potential effects that a new datum horizontal vertical would affect things in the FAA.

As I speak today, the FAA is moving toward modernization of the air traffic control system. You may have heard this in the news known as NEXTGEN, the next generation air transport system. Our European partners is doing the same type of thing; theirs is called SESAR which is single European sky but that's their sandbox in this particular case. So, next generation involves hundreds and hundreds of different programs over the years and many, many different programs of which there is one particular aspect that this subject matter will affect. What NEXTGEN will involve is a moving away from ground-based navigational aids, traditional radars and communication to space-based GNSS enabled by navigation and data uplink. I'm an old cartographer. You can tell by my white hair. And the way you would fly from California to New York, is you fly through a labyrinth zig zag from South Carolina with GPS, that will enable you to fly a great circle route which in effect would reduce the amount of fuel, make it greener skies, so on and so forth. So to do all this, accurate geodetic data will be a critical enabler for the next transition, especially in the approach departure and ground movement environments. There is one accomplishment of this I would like to share with you after we turned on the WAAS system enabling vertical guided approaches into airports. WAAS approaches now out-number instrument landing system approaches. So what are the effects?

Well, there are many things I have to consider. There are thousands and thousands of instrument approach ground-based approaches and GNSS derived airport approaches that depend upon accurate geodetic information. There are hundreds of minimum vectoring altitudes and minimum in-route altitude charts that depend upon elevations and position. There are thousands of GPS derived approaches, departures and in-route wave lengths that are dependent upon this data. There are hundreds of thousands of regulatory obstructions, man-made things sticking up out of the ground in the way of approaches and departures and perhaps millions of naturally occurring features, the trees, the mountains, so on and so forth that can't report themselves to the FAA. We have NGS to go out and survey those for us and depend on latitude, longitude and elevation. There are thousands of existing airport surveys and hundreds of planned airport surveys in the future that this transformation is going to affect. And finally, there are thousands of regulatory and non-regulatory air space areas dependent upon geographic data.

So the reason why I ask about the magnitude is how much is that going to affect all the products that we have? Because in short, we have millions and millions of points in elevations that's used to describe the national air space system. I don't know exactly how we will go about all this because after all, this is all relational data. Are we going to apply the changes all in one piece? Or are we going to work them as we work each particular procedure? I don't know yet. So that's why I'm interested and would like to come back as often as we can so we can prepare for this. Thank you.

>> MR. DOYLE: Just for the benefit of everybody here, I would like to point out that the National Geodetic Survey has a very special longstanding relationship with the FAA.

We've been responsible for the airport surveys going back to the early 1940's, so we've been with them a long time. In fact, their aeronautical charting division is right next door to us. So they are a big player with us.
Rick Koehler, National Weather Service?

>> RICK: Good morning, I'm Rick Koehler, I'm a, instruction hydrolologist with the National Weather Service and an old hydrographer for NOS so I have some geodetic backgrounds here. Some overviews for weather service. We also forecast rivers and stages. So it does both weather and water. Certainly the Corps of Engineers, NWS also does forecasting. But the bulk of forecast, what will be happening down the road for rivers, focused on the water resources, Weather Service has a tremendous responsibility for putting out flood stages and things along those lines.
As far as horizontal accuracy, probably Weather Service is not a very high accuracy user. Our work station that we had in our forecast office use 1 to 100 thousand scale backgrounds so probably an accuracy of 500 meters with one centimeter will not make a difference. What that means when you get that tornado warning, that will be plus or minus a couple of kilometers so keep that in mind.
As far as vertical goes, there is much higher responsibility and the hydrology does know this. We need to know water levels down to a 1 inch accuracy. And a lot of our service hydrologists will go out into the field and they will locate not just the flood plain but those that might have any kind of damage for potential `rises and having a autonomous system go out there would be a tremendous break-through of wonderful tools for the Weather Service to do that. So I can see that as being a very big plus for coming out of this adjustment.
Other things, hydrology, we are moving from a hydraulic kind of modeling which means much more detailed information especially for elevations and we are trying to use more lidar data. Along those lines, there are models out there looking at gravimetric studies groundwater. A gentleman from the FAA talking about those man-made structures going up. I'm worried about the man-made structures going down which can affect water resource and environmental areas along rivers like that. So those type of studies will be enhanced by this changing to a new datum.
The other thing is Weather Service uses other people's system. We work cooperatively with USGS so whatever they have, we will use that. We have some of your standards from FEMA. What FEMA decides, Weather Service will incorporate that.
Finally, the big player on the block as far as Weather Service is something called the Community Hydrologic Prediction System, a cooperative program for public, private and academic types. So whatever comes about from this meeting, it has got to be across the board and used by many different groups so we can all be talking on the same plain. So that's all I have. Thank you.

>> MR. DOYLE: Mr. Abdullah, from Fugro Earth Data.
>> MR. ABDULLAH: Thank you. I want to reiterate what I said yesterday and what Dr. LaPine said, I'm glad he changed his mind because I thought he would never praise ITRF, that is a big change.
That's good. We are in good shape now. So, because it goes along that there was

concern about you know, whether I use lat or long, how can we live without that NAD 83, which is true the way we are. We have to make a leap, a very courageous leap; we will have to sacrifice, otherwise we will stick to the NAD 83 and NAVD 83 the way we are sticking to the international feet. We cannot move to metric because community that is big but our community, we should be able to move to ITRF.
I tell you, a future generation will sit in a hall like this and they will praise your step whatever you took.
And for the common reason, NAVD 27, when we created it we were isolated, North American continent. This is not valid any more. The communication and the GPS connected. The International Society got permission of earth rotation; they have access to universities, organizations. They are building the best model. Those people determine the center of the centimeter.
So let's benefit from their knowledge, cooperate with them, provide -- put it in the model, the model and ours will be accurate because if we have Dr. Lapine and other stations, you will overweight everything so you will be accurate over North American continent.
When I started with mapping photogrammetry, I started with Kelsh plotter -- I'm not very old. I'm old but … there is the generation. When I think now, I can fly laser on the airplane and I collect 400,000 points per second. Please pay attention. I'm not talking about compiled point every 3 seconds or four seconds. I'm talking about 400,000 that the optic latest one, the pulse rate, 400,000 per second. So I want you to look ten years from now. Is anybody dare to tell me where our industry is going to be, where the GPS, the accuracy?
So let's stay away. I know it's we are very comfortable passionate about this whether passive control, whether monument, but, I tell you, in ten, fifteen years, there is a big chance people will laugh at it when they think those people, they used to build monuments, concrete, 10 feet to 20 feet to the ground because look at the GPS, the GNSS in general, if China sends us COMPASS, an GALILEO and in our lifetime , 5 and in 20 years, we don't know, you might somebody said like Dave, your watch can give you five centimeters so why do I need benchmarks. That's all it to say.
Thank you.

>> MR. DOYLE: Thank you. I think we are all hopefully very attuned to today what's going to happen in the future and anxious to see what that's going to look like. Carl Brown from National Park Service. Carl?
>> MR. BROWN: Good morning. So I would like to maybe break this into 3 pieces for the ideas of what we say. The start of that is of course, thanks for the ability to come and talk and I'm from that part of the country that is not exactly fly-over country but, I'm from Colorado. And so, the passion and interest in what's going on here certainly has a slightly different twist outside of the beltway.
And so but I do want to thank.. I'm part of an agency that manages an incredibly diverse set of national treasures and for those of you that seen the Ken Burns series on the national parks idea, you get some idea of the breadth of that somewhere north of 390 items that are currently being managed by the National Park Service. I've been a inventory and veg mapping person all of my career. And that started with the U.S. Forest Service and spent time in the U.S. Geological Survey.

And now I run the Vegetation Mapping Program for the Park Service. That is a staff of three and just to give you some idea of the numbers we have applied about 9.9 million acres about 8.3 million acres underway and 12 million to go.
So, we are very interested in the positioning and the correct determination of what that stuff is. We do a range of things at the Department of Interior, in the National Park Service that are related to this change and we have had our share of excitement going from 29 to 83. But between the veg mapping, veg inventories, fire, I been involved with this since about 1974 and the things that have happened have taught me that these agencies are way more similar than they are different. And what we found is that in being involved with the Federal Geodetic Control Subcommittees since 1986 and Rear Admiral Yeager and other directors that have come along, it's been important for us to continue to remind folks that there is real stuff being done out there on the ground that matter and the question is, well, does it really relate to the kind of topics and accuracy that we are talking about here. That's why I want to get to the next piece of this which is the places that we are at. But before I leave the thanks section, I also want to say that tying this meeting together with the chance to have the Feds talk more later this week is very important. Not only is this a horizontal vertical discussion, it is also an opportunity for feds to get together and talk about how we cooperate, collaborate and work together, how we can all leverage our limited budgets and all of that. And the other thing is that the industry here is a partner and it is not just about the federal agencies talking. There are ways and there have been ways for the venue of that Geodetic Control Subcommittee to involve industry. And there are some rules about FACA and federal meeting rules but simple fact is we need all of that input and we can take all that input. And if we get to some kind of policy setting thing, we can sequester it down to just the feds. And the point is, use the people here this week, use them as much as you can and I think if there is a way to even extend some discussion this afternoon, if we will break at noon, a lot of us have traveled in here, getting here cost money. We are not in the beltway, we have to get here so give us some notice when you want to do that and thank you director for sponsoring that.
The places: Let me talk about some of these places to give you some perspective. Positioning is so important for us because we also have an international component. The first international Peace park ever created was between Canada and Montana in glacier. It's known as Watering Glacier International Peace Park. Our inventory worked with the Province of Alberta. We were able to work that successfully together and was a great example of international cooperation. So, that international peace park has now spawned several others that are spanning borders between in some cases, warring countries and are seeing the peace park as an opportunity to diffuse some of that border issue. Commonly, these ridge tops, that's no real surprise to geographers. Also, on the southern border, the Organ Pipe, and the Chicos mountains, okay, even though we got a border fence ripping right through the biology there, the fact is just south of it in Mexico is the Pinacate and that is a national park on the Mexican side. And they have exactly the same issues and challenges and being able to work on a common landscape that happens to have an administrative boundary going through it.
In Grand Portage, the northern end of the Great Lakes. It sit right across from the Pigeon River. Another place for Canada to work with us. And the North Cascades National Park, relatively large piece of ground in Washington, it crosses over in

British Columbia and there is a provincial park there. So these are some of the issues -- how we can share that data.
So of the 12 million acres we have left, let me give some places we have left to map. We are in the middle of the Grand Canyon, going downstream to the lake working on that. And the two other sister parks of the Park Service are the Death Valley and the Mojave Preserve, almost a million acres each. We have yet to do Yellowstone, North Coast Cascade Network is currently in Rainer and Olympic and North Cascade.
Those are the kind of landscapes we have left to do and we are going to need to be able to support the positioning that helps do that.
On the hope, let me give you some hope here -- I think this is a tremendous opportunity that we are working on here together. The passive control does matter to us in difference to the previous speaker. We are dealing with not only natural landscape but cultural landscape and many of the 1860 and earlier and mapping efforts were tied to some kind of control. We need those pieces of control. They are like the Tim Smith's term , the Rosetta stone to get us back to that original information, if you abandoned the passive marks, you lose the connection to that path.
It is great we are looking forward but to even learn from your history and be able to relate to your history, you have to be able to go backwards too. So, there is a good case for why the passive marks is needed. Now, maybe as cultural resource, those passive marks need to be maintained as a cultural resource, nine and correct in ten, fifteen years if we get five centimeters out of watches, we may argue why we need those because they help you tie.
I've been an active FGCS member since 1996, there's been a GPS challenge team spreading across the Agriculture Department, U.S. Forest Service, Natural Resource Conservation Service, all of the Interior agencies, 7 of them, we've been working on doing testing of GPS and we know that all of our maps currently are coming out, NAD 83, CORS 96 and NAVD 88. And those are the kind of standards we have to do. So I know that my veg mapping are 1:24,000 based scale, Alaska is a different animal, 1 to 63 but that is a pretty fine resolution and so we are very interested in how this can work.
The last thing I'll say in the hope category is we're not just mappers working with Garmins. We got hand-held receivers that are completely blurring the break between the surveying community and the GIS mapping community. When you can run a hand-held with real time differential and best a here and down there in the centimeter range, we are talking about things that matter to more than just the surveyors so remember that population of users far eclipses the surveying community. So when we talk about working groups and standards and mission statements and all, that's when you start saying we're only talking about survey, you are leaving out a very large population that I don't think you want to ignore. Thank you for your time.

>> MR. DOYLE: Thank you Carl. Park Service deal was a huge inventory issue. I would like to comment very briefly on a couple of things that Carl brought up, the Federal Geodetic Control Subcommittee, Juliana Blackwell, Director of NGS chairs that and will be meeting tomorrow morning. Most of the federal agencies involved in some form of spatial data have representation on there. If you do not know who your representative is, please contact us. We will certainly let you know that so you can be in direct touch with that individual. Make sure that any issues you see or your office sees are

addressed at the FGCS. If you do not have a representative, please see us if you will like to participate in that because through the FGCS is how the nuts and bolts of what we will ultimately do both in the short term and long term get accomplished. So your representation is critical in that arena. The other is -- Tim?

>> TIM SMITH: Some of the people that are part (low audio) ….
>> MR. DOYLE: Oh, absolutely, we need to light a fire. There are lots of members regrettably as Tim points out, many of them are not terribly active and this is an important time for us to have that interaction.
Carl also mentioned the issue with vendors, the private sector, those that provide us with the tools and toys that we play with. The National Geodetic Survey has been engaging with GIAA, Geomatics Industry Association of America a trade group that represents most of the manufacturers of GPS and GIS software in the country. So we've been debating with them developing a technical working group so that we can address many of these issues that we have directly with the vendors.
We have representatives from Topcon here and they are part of that, just to recognize one. And we feel that is an important part of this, that we can bring the various issues, whether we are talking datum transformations or other models, tools or educational issues. What we would like to have is some form of standardization so that regardless of who's box you buy, you know you will get the same models and tools, and if you take training from Trimble,Topcon, Leica, Ashtec, Sokkia, whatever, you are going to be hearing basically the same thing that you would hear if you went to hear Bill Henning talk about real time networks. So we do have some aggressive issues there.
Next on our list, is going to be a call in, Doug Vandegraff from Fish and Wildlife. Doug, are you on line? Doug's not here. No, Doug is not with us.
Okay, Mike Londe are you on line? BLM in Wyoming.

>> MR. MIKE LONDE: Yeah, I'm here, I was not expected to go for another hour but I'm ready.
>>MR. DOYLE: We are ready for you if that's okay.
>>MR. LONDE: If you will get my power point pulled up, there is about a two minute lag between so I'm going to get mine started so I can see what's going on here. I got about a foot of snow on the ground here.
>> MR. DOYLE: Following Mike, I would like to ask Alan Jones from FAA. Okay.
>>TECHNICIAN: We're loading from here so don't start.
>>MIKE: Will you let me know when you're ready please.
>> MR. DOYLE: The speakers who participated in the minutes sessions if you would Take a few minutes to jot down the highlights, the notes that you talked about this morning or will talk about this morning, if you would give us some of that background material, provide that to the staff here that's involved in this, then we would like -- we will post that on the web so we will have everybody's comments so others can come back and reflect on that. And certainly, any of the power points like Mike's power point, that will be posted on line as well. Thank you.
>>MR. LONDE: Are we ready to go Dave?
>> DAVE: They are working on it, a minute, seconds, I don't know. It's soon. They are working on it.

>> We have two computers we have to boot up for this.
>> MR. DOYLE: Tell you what, since they are booting up, why don't we give them a minute do that and Allen Jones from the Federal Aviation Administration will take his time.

>> MR. JONES: Thank you for the opportunity. First, a few disclaimers: I do work for the FAA, have done so for over 20 years now. I was a public school teacher before that.
I have no background whatsoever in geodesy. But at the same time, I really enjoy the subject and however, more disclaimers, I'm not here to make any policy for the FAA, and I'm not sure that I make policy in my own family. So with that, in my home library, I have a college physics book published in 1903, not my personal one when I was in college but it is there and as many science textbooks want to do, the opening chapter is a discussion on the scientific method. And in this discussion of scientific method, the author of the book points out that the earth is solid through and through, except for the oceans of course. And the scientific method that he applies to verify this is that there are more scientists that believe that it is solid than those that do not believe that it is solid. So therefore, it must be solid through and through. So, you know, even when I read that the first time, I thought, you know, that does not even account for volcanoes let along anything else that might be going on. So I had even doubt then. You have to realize this book was published before the special and general theories of relativity so it is over 100 years old.
Now, let's leap forward about 60 years. I was a geology student in high school. There was absolutely no mention in that text whatsoever of anything called plate tectonics. Everything was based upon (low audio) and Isostacy or whatever they call it, isostasies I think they call it, whereas mountains wear down, the junk flows downhill and it gets weightier and does this number, I'm thinking that can't be right. So a couple of 3 years later, a college geology class had a single paragraph, a single paragraph that suggested that the new theory of plate tectonics and now, the dynamics are well, use the term loosely are well understood.
So here we are, now, we believe in a continuously, shifting and colliding plate that is interacting with a dozen or so other shifting and colliding tectonic plates and we are in a dynamic situation. I mean, can't you feel the earth move?
But at the same time, historically as geodesists, map makers, cartographers, whatever our pasts may be, or a simple mathematician as myself, we tend to want to pin down our coordinate systems. But since the last revelation of NAD 83 or NAVD 88 or WGS 84, we have been on the move. And we will continue to be on the move.
Our coordinate system must move with the earth. If we are -- if I can read my own notes, if we nail down our coordinate system, then, in a short time, as we are doing now, we will have to pull up those nails and nail them down again someplace else. If we fix the coordinate system not by fixing the coordinate system but by incorporating not only they the XYZ and their associated velocities and even possible associated accelerations, then we will have a coordinate system that moves with us and remains precise over time. Now, even that in time will be off.
Now, as one mathematician I want to say, is Irving Box, but I don’t think his first name was Irving because Irving is a lawyer in Oklahoma City but a mathematician named Box

said all math models are in error but some of them are good. Some of them are useful. And that's what we are trying to do. Whatever we come up with, we know is in error. But, is it useful? Now, technology being what it is, my first calculator to explain to the peers out here in the audience, my first calculator would gobble up four double AA batteries in about 4 minutes and nixi tubes. Go look that up. I mean, I started drawing the sand before I got my first abacus so technology has changed some in these years. But, we need to move toward a dynamic in-motion coordinates system within the FAA, within hydrology, within the Weather Service, within Charting and Mapping. When we put a benchmark down, it's got to have date and what system was used to put it down so when someone else comes up and says, I'm going to start here, I will use this coordinate. Oh, it's five years later, let's apply the velocities and accelerations and see where we are, we're not here anymore. What was it in -- I wanted to say in 1997 when the FAA change from NAD 29 to NAD 83. I was thinking boy, that is the first time in history that I was in two places at once.

Well, we don't want to be in two places at once. We like everybody to have a good idea where they are and have that consistent with their neighbors who think they know where they are as well. So, I of course will be pushing for personally, a dynamic ITRF system that can be updated on a continuous basis based upon the velocity and acceleration from known geodetic points whether it's done with the GPS or old chain and theodolite or whatever method you're using. That's what we have to move toward.

And sure, our calculators at the current time do not necessarily have the capability to do that in a rapid motion. But how many years ago was it that it took ten minutes or so using Loran C citing different stations independently and using hyperbolic geometry to get a fix on where you were mid-ocean? It has not been that many years. And I don't believe it will be that many years before not only can I pull out my cell phone and get my GPS coordinates, but I will be able to push a couple of buttons and go either forward in time and find out where I was and where I will be if I stand on the same spot for a number of years.

So that is just food for thought. I hope that some of you digest it. The rest of you may spit it out wherever you choose. Thank you very much.

>> MR. DOYLE: Thank you Allen. I also reflected in high school, my geology text only made a very brief mention of the concept of play tectonics.

Are we ready to go with Mike's material?

>> MIKE LONDE: Okay, I'm going to get started.

This is Mike Londe, geodesist with the Bureau of Land Management and I'm also the NGS state coordinator for Wyoming. I've been in this business for about 40 plus years started out with a 300-foot chain and worked with plane table, EDM, Transit, GPS now, worked with both mapping and resources so you know, I've been kind of around the block a few times with this now. In my typical fashion, I'm going to break the love fest that has been going on this morning since we have some real issues that we really need to address.

Next slide, please.

We can see -- we recognize that there is a need for development of 3 dimensional data will support modern technology. We recognize the need for improvements in the geoid

to support the use of GNSS height transfer. BLM has projects, require elevations but we have difficulty in finding existing and consistent benchmarks for the project. So we recognize there is a need.
However, next slide
-- is there really truly a need to define a new datum? Or is this just a chance to do neat science? And this has been a question that has been bothering me for a couple of years. What does the conversion to a geometric or geocentric datum gain us? It does not seem a real convincing argument. The BLM has the need to tie past, present and future survey and the mapping projects together. We are I believe the largest land management agency within the Government. We are responsible for all of the federal land surveys, cadastral surveys so we have data that goes back I think next Thursday is 225 years of cadastral surveying.
We also have multiple mapping projects that we have to tie through time. So, the question would be with the proposed change, will the tools be developed and available in a timely fashion to transport between the datum vertical because it will not do us any good to have a data with transformation tools promised later. That will be critical that if we proceed forward with the new datum, you know, that the tools will be delivered in a timely fashion.
Next slide:
Now, new coordinates will be introduced on the CORS this year. A big question we've got is, is this going to be the first of many changes by 2018 or whenever the new datum will come into effect? In a sense this is causing datum creep. It is not clear to us what the magnitudes of the changes in the CORS position. There are email discussions with the NGS, graphics that seem to show some locations 5, 6, 7 centimeters relative to the ITRF 2008. When you come back and ask if that is true, you are told it is always not that bad. We need better information. How well if we relate surveys that I say start next fall, you know, using new course positions, how well might you be able to base that on stuff that I started earlier this summer or last year because we have multiple projects across the BLM that we are building out and expanding. So we need a better idea of the implementation and what these interim changes are going do to us.
Next, slide.
Another major concern is it took the BLM more than a decade to convert our existing GIS data to the NAD 83. And while those of you that know me, know I'm a stickler for epoch dates we got because of the types of accuracies, we have different data realizations. It took us so long because there was not a budget, personnel or the resources for that conversion and if anything over the next several years, with the way the budgets and stuff are looking, it's not going any better in terms of the amount of money that it will take us to convert all those GIS and survey data to a new system. If the magnitude of the proposed changes that we heard yesterday are about 2 meters, then, it might not make any sense to actually transform in which case the needs for the tool are going to be important. So that which have not done a good job to date. You can incorporate these tools re-project on the fly, software if we have that capability, ESRI, Map Info, Trimble, Topcon, whatever, we might be able to alleviate some of that transformation pain.
Next slide:
So what do we want to see, what requirements? Basically, we want to see a stable

horizontal and vertical datum referenced to a specific epoch or epochs where practical. And we will need the transformation tools to move positions between these various realizations of NAD 83, WGS 84, ITRF, various vertical datums. In many cases, because of the nature of our missions, it is not practical to store the raw of observations and recompute every time a new realization comes in.
The next slide:
Finally, again, to reiterate transformation tools need to be available at the time of release of the datum and not at a promised future date. Lastly, better explanations and more transparency needs to be done on proposed changes in where we are going. As Dave mentioned earlier in his lead off to his session, OK, it's cast in stone but outside of some small circles, meetings and stuff, I have not seen a lot of discussion especially on the federal side. So if we want to make this a success, we do need to engage all of the both the private and the government sectors to put forth ideas; to make this successful to actually producing something now, if we expect to get everything done in the next decade. I would like to thank you folks for this opportunity to put these thoughts forward. That's all I got.

>> MR. DOYLE: Thank you Mike. It's good to hear the challenges that BLM could be faced with these. And I think many of us would certainly agree with your issue of more explanations and as you pointed out, transparency. As Dru pointed out yesterday, that the ten year plan has been vetted if you will, through the American Congress on Surveying and Mapping and we made several presentations there and realizing that is far away insufficient to meet the needs of many of our user communities. So what we are doing here yesterday and tossed is a kickoff, if you will, the beginning of this effort to increase the visibility of this, and will certainly be developing not only this particular forum but outreaching to states and the private sector through a variety of other venues as well and we appreciate everybody's input on where is the best place to go.
Carl Brown pointed out something that we are very well aware of at NGS, but it is somewhat problematic and that is a significant portion of our user community now is not the surveyors. The surveyors are vitally important to this and they are more our historic user community and we deal with them very well, they're very organized and we know how do that. But there are many other disciplines out there that are challenging for us, and that's creating new environments for us to participate in. So we are anxious to hear from those of you who may represent those various communities and how we can best meet those needs whether it's forums like this or through the use of our State geodetic advisers or webinars that is part of our agenda here today.

>> MR. BROWN: Dave, how about jumping ahead and say, industry and the Feds are going to have this discussion in an open transparent way, besides 6 months ahead, published. We will all show up if you publish a meeting.
>> MR. DOYLE: I hope everybody heard that. Carl said if I may paraphrase him, correct me if I'm wrong, Carl, if we can come up with these meetings publish them at least, 6 months in advance. We talked about this. Just let me give you a little bit of background on what this thing was about. Originally, this particular event was the genesis of Renee Shields and our efforts on height modernization and as you heard, and Renee has quite

a number of state and federal partners involved in Height Modernization and held a federal forum, small one in Miami last year.
And she had been discussing do we really need a little more expanded one this year? So we discussed that at great length obvious to us that not only was this a matter of just the height component but as Lou points out, a whole transition to a new datum, coming up with that definition. So this has evolved into that. It did come about I would say rather quickly. We only a couple of months lead time. We did talk about this a great length as to should we put this off but realizing we also had a need for an FGCS meeting coming up.
Let's try to do this but we are very cognizant of the fact that people have the plan for her travels in many cases a year in advance or more. We go through the same thing at NGS. So Carl, I can guarantee you those comments are heard and will be incorporated into however we plan this whether next year on, 18 months, whatever. Thank you for that.

>> TECHNICIAN: If folks on the phone can you please mute their microphones. That will help us here.
>> KEVIN KELLY: Talk about exposing this to other communities. I don't know if you already have this in mind but, or already have a shot but use the ESRI user conference to expose this to a huge contingent if you don't have a slot there, I can promise you some time there to be able to expose this to that community at the User Conference.
>> MR. DOYLE: Thank you, I didn't think anybody from NGS was going to ESRI this year. That is an excellent point. Some of you may not know this but next year, the American Congress on Survey and Mapping will host the annual conference meeting in conjunction with ESRI, part of the International Users Conference in San Diego. So that will be another venue for us to expand on this. So again, we are looking at all of these opportunities.
Dr. Vandegraff, is Doug on line? No. Paul Rooney? is Larry here from USGS?

>> MR. MOORE: I'm here representing the National Geospatial Program at the USGS, not the USGS as a whole.
Most of you probably know, the 7 and half minute topographic map series was officially declared complete in 1992. And for all practical purposes, we stopped publishing topographic maps in the mid-1990's. One of the things that means, for a good two decades, the United States has not had a national map series that is cast on a modern datum and depicts modern coordinate systems. Almost every presentation I give about maps, and I always wanted to say it in front of a group that understood the significance of it, and I think this is it, if there ever was such a group, I thank you for the opportunity.
About a year and a half ago, Mark Demolder returned to the USGS after spending several years at NGA and is now the head of the USGS National Geospatial Program. Mark has made it a personal priority to revive the quadrangle mapping program.
Yesterday, Admiral Bossler mentioned that in the 27 to 83 conversion, the USGS was kind of resistant to the whole thing. That was early in my career so I don't take any personal responsibility for it but that was a true statement, in hindsight those dash corner ticks were really not a good idea and the last 7 or 8,000 topographic maps published contained a bewildering variety of ways to explain the projection line and the

dash corner ticks and how they relate to each other and that is a source of confusion that is still haunting us today. Something we can probably learn from.
As I said, Mark Demolder has made it a priority to revive the 7 and a half minute mapping program and we are in the process of designing a new map product and producing it and publishing it. Mark has an objective that he's almost obsessed with, with refreshing the 48 continuous states everything 3 years, with a 1 to 24,000 seven and a half minute quad map.
This product is not the old map but has many superficial similarities to the old map; it is deliberately designed on the 7 and a half minute cell format with the familiar quadrangle layout, collar, grids all intended to raise the comfort level of the nonprofessional map user.
And we are actually doing this and in the last year, since last June, we've published 20,000 and some quadrangles and are currently producing them at the rate of about 100 a day. There is about 54,000 quadrangles in the continental United States. So that pretty much puts us on a pace to meet his goal of 3 year refresh cycle. The products are geo pdf, ones we published can be downloaded from one of our web sites. The issues we are talking about here at this meeting don't have a lot of scientific significance to a 1 to 24,000 scale general purpose map. The shifts being talked about on this new datum are typically less in aligned with and completely swamped by other sources of error and the data that we are using.
But as Dave mentioned yesterday, meta data is important and there will come a point sometime in the next few years where we will need to change the credit note and change the associated meta data files on this product to reflect whatever this new reference system is called. And I guess I would like to suggest that is a fairly important point in time because it will start to expose some of these issues to a larger and less professional and less knowledgeable group of map users.
I think we know from experience, these kind of things just confuse the hell out of the average map user and it's pretty important to do it as correctly and as transparently as you possibly can.
>> Thank you Larry.

>> MR. DOYLE: I was part of the transition team that worked with USGS to come up with those tick marks and I have to agree, it was a monumental effort on their part and one that required significant resources and we realize the importance of that particular issue.
I didn't see Paul come back in yet.
So, Jim you got really, two left, Paul Rooney and Jim Garster. Jim, are you on line? Oh, you're here. I thought you were on line. In person, even better. You're way cuter in person than on line.

>> JIM GARSTER (USACE): A couple of slides if you can bring them up.
Just give you my background, I call myself a surveying engineer so that you won't find me in any federal register but I went to the University of Maine so that's what we call ourselves there. So I've also been working on for the last four years or, so trying to get the Corp of Engineers on the right datums and getting them to understand what datums are has been the biggest challenge and getting to learn how to spell datums. A lot

project managers and engineers, they think datums are something that are a bother and we just rather, we need a big construction project and those are more important. So, it's been sort of an educational issue.
And just by the way, everybody hopefully knows that NGVD 29 is not equal to mean sea level, never has, never will be and only within a few miles of those tidal stations. So that is one big thing we discovered and, well, not discovered but made me realize that a lot people had that misconception. And one of the things we found from our IPET study, looking at what happened during Katrina.
Over the last several years, I've been working on trying to educate the CORPS and I'm putting in a little plug here for the work we've been doing with NOAA. Working closely with NGS, Office of Coast Survey, and CO-OPS, assisting and developing guidance and have An engineer manual on vertical datums coming out the end of this year. And also in doing workshops and training, going around the different districts and education and providing these workshops on datums we're looking at trying to develop a certification program for what we called district datum coordinators within our districts that will oversee any issues related to datums within the CORPS and tools for connection to do the national spatial reference, OPUS-DB we're really relying on and VDATUM is the other thing we are pushing for, and also going through and updating so all of our projects are tied to the NSRS.
Next slide.
So these are some of our requirements that we are doing and it says underneath that "resume slide slow" -- thank you has relate all of our projects and we have a policy in place, we put in place in March of last year, and it says that all of our projects shall be tied to NSRS whether tidale gauge or NGS benchmark whether passive or by the use of establishing OPUS DB. You see our nominal accuracy requirements, and we say nominal because it's not hard and fast; if somebody ties to the NSRS and gets .26, sorry I'm using feet instead of metrics, we like to use feet. We have a history issue there and so, you see our nominal accuracy because we don't want somebody saying, sorry, it does not meet that .25 and therefore, we are going to throw it out, it's not related to the NSRS, and these are accuracies related to the NSRS, and these are related to the rest of the world because we deal mainly with our local project areas and the relativeness of the project and the water level surface within that area and how it relates to the geodetic.
We are also requiring all our projects have duel elevations. That is a scary thing but we want to eliminate the problem that we ran into down in Katrina where people assumed that geodetic datum was equal to a water level surface, and we are trying to eliminate that issue. Therefore we have to have the water level surface relationship and the geodetic and then, maybe eventually with this new magical datum that is supposed to do everything, maybe we can go to one, I don't know we will see and also tidal benchmarks very for the benchmarks tide as well for coastal and shore protection projects are very important.
We need to have published values in NSRS control and in this here, this conversion tool, transformations, current and past. We don't want to see changes just for the sake of changing. We don't want to see every year coming out with a new value new elevation on benchmarks or even on the CORS network that we are tied to because we then have to go back in time. If we have a project spanning the life of 10, 20, 30, 40, 50

years, we need to go back and be able to monitor that and that is extremely important to have those transformations in place. I think somebody brought that up earlier. The last presentation about BLM talking about the issue of transformation tools in place when the datum is in place, not some time afterward when we have to go around and figure out how they get put in place. The use of OPUS DB is essential, we are relying heavily on that, and, we are relying on the existing bench marks that are in place as long as they are checked and are verified marks that we are trying to do this at fairly minimal cost. And so by using OPUS DB is cost effective or using existing benchmarks if they are still valid, there is no reason to throw them away. But OPUS Projects will really help us. That needs to continue because that will help us with these large levy projects where we have to have multiple primary project controls that we are calling so they are tied to the NSRS and make sure all of our projects are tied to each other. So having that NSRS control really provides us consistency throughout our projects and that's really very much desired for us. We built a private control database. And this is going to allow to us to manage our local project control but relying on those connections in NGS so we are using NGS as the feed for that control. So we have -- every project has a primary control point which is tied into the NSRS and are related to that is our local control. So if for some reason, something changes in the NSRS control, we know we have that relationship to our local control and therefore, the project manager has to make a decision, not an automatic transformation. It alerts them to say something is going on here. You need to go out and resurvey, do a check and Dru was mentioning yesterday that going out and having those checks. And it's also important with this whole thing too, and I think Dru mentioned yesterday that the idea of having those uncertainty values associated that. That is extremely important for doing our risk assessments and the thing on the bottom here, this is very important because I think NGS likes to put out procedures and specifications that says if you follow these, you will you get it but we know with Blue Booking, as Dave always say, like is a sharp stick in the eye. So, we don't want to end up with sharp sticks in the eye procedures we want performance-based standards for our contractors to follow and check those and verify those.
Next slide please.
So continuing challenges: Areas of subsiding and uplift. Are we going to still have vertical time dependant positioning in these areas? That is very important. We need to be able to monitor these particular areas and know what's going on. Implementing various standards establishing geodetic and water level references. Education, this is critical to making sure -- I forgot my thought there, making sure -- making sure that we all know what's going on and not just-- we know what's going on because it's the people that will be using this, the person with the watch who has 10 centimeter accuracy and goes out and think they can start establishing elevations. That scares the heck out of me that everyone is going to think they are surveyors.
So that is really a big issue. Tidal areas, new datum related to tidal gauges. That's real important. and real time networks. These are being used and these need to be tied to NSRS and that is extremely important and how they are related to the NSRS and how they are used. Again, we have folks going out and using this information.
Next slide please.
Some visuals here, Showing you what we've been doing as far as guidance development from our IPET report and developing into our draft DM will be done this

year. And the idea that we are trying to relate all of these various datums to a single system.
What that allows us to do is allows to do, it allows us – we don't work outside of the watershed within the CORPS. We are fairly local as far as our projects. Some water sheds are pretty big. But in most cases, we don't usually work outside of a watershed. So having consistent control out there is what we are looking for, consistent NSRS control. But outside of that, we don't really care if a dam breaks in Oregon. It's not going to have a effect on the Mississippi river flows, okay. If it does, we are all in big trouble. I just have an illustration, here. I think they are fun, to kind of show you how we are tying in our projects. So we have NSRS control and we have our primary project control where we don't distort what's going on at this dam. We have one control point that we have tied into the NSRS. All the rest are there. We maintain the accuracy – we might have millimeter accuracy on all the network control points - But where that red dot is maybe plus or minus a quarter of a foot and that is fine for us.
Next slide - That allows us to tie that into the network -- next -- and allow us to easily tie this in to this framework.
Next please. So then, we can relate other projects and that's really what we are trying to do and again, localized area trying to relate all these various things together and this is very important for us. So outside of this local area, you know, we're not that concerned. But inside this local area, we are very concerned what is going on.
Lastly, the big thing I think I mentioned, the idea that we don't want to see changes just because we can get it. We don't want to see changes every year. That is -- that would be a big issue if every year somebody goes out to a project and using control and it is now centimeter difference, people come to us ask us for going out and doing some data collection and they have no idea the accuracy they want and they say, we need centimeter or millimeter accuracy and no, that's not really what you want, that we need this.
So it is really finding out what overall requirements here, what we need to do to establish this network and not go beyond that because why go beyond that if what we have is going to meet our needs.
So thank you.

>>MR. DOYLE: I think many of us can certainly relate to the issue of people telling us I need the best I can get. Then when you tell them what it will cost they say, well, maybe I don't quite need that.
I would like to take this opportunity to thank Jim for the work that the Corps has been doing and really because of the impetus through the Corps that OPUS DB came along as quickly as it did. So we owe them a lot of gratitude. And I also just to make a point, I don't think this was made yesterday, we talked about the process of blue booking submitting data into the reference frame and now, OPUSDB. I hope everybody at least appreciates or understands, and I have had the opportunity to work in many places around the world with geodetic offices like this, but we are the only country in the world in which anybody, anybody can submit data to be included in the national reference frame. You don't have to be a licensed land surveyor. You have to follow the guidelines, dot the I's and cross the T's to don't have to show us your junior geodesist's

secret decoder ring to get in there. It is a unique system. Last presentation before we take a break but, certainly want of the most important, Paul Rooney from FEMA.

>> MR. ROONEY: Good morning. Well, thanks for the chance to talk about this a little bit. I probably reiterate some of what I said yesterday in the afternoon, vertical session, but my work is primarily on the flood insurance program and there is two major elements there. First, we have to identify the estimated levels of flood risk. And one of the principle ways that this is done is done is by identifying the projected elevation that the flood is likely to reach. And so, in that process, there's pretty large error budget, the minimum is a tenth of a foot. On the hydraulic side, and generally, probably significantly larger than that and the whole series of other things that go in there. But fundamentally, ground elevations are a key part of that example. The elevations of various other things, bridges, dams that sort of thing.

That has to be tied down to the NSRS. And the principle reason is -- the reason to identify those elevations is so when we build stuff, we can relate them to flood level to try to ensure they are safe. So you have to be able to relate that to flood elevations and the NSRS is obviously the way to do that.

The other side is building elevations surveys that happen potentially years after the flood elevations is established. And they are done independently, don't necessarily use the same control, so the issue is making sure they are comparable to those flood elevations so people are making the right decisions when they do the construction. So ultimately, those last few centimeters of precision are not really what's critical to us. It's consistency over the area and making sure if the flood study uses one set of data and the surveyor doing the building elevation use a different set, that they are general comparable. Uncertainties in the flood elevations will dominate the uncertainties in the surveys if they are done correctly. So, the real cost of those surveys is one of the real challenges I mentioned yesterday, impediment to people buying insurance, people considered it a big burden when they are right on the fringe, within a few inches of what we think the flood elevations is. And we draw them in and then they get a surveyor and demonstrate they are an inch higher than the flood elevation and they think we're crazy and how could we think they are subject to flooding and they are very angry they paid that thousand dollars. And they go to their congressmen, and their congressmen get very angry they paid that thousand dollars for the survey.

And so, bringing that cost down making that process simpler, quicker and more reliable is a huge potential benefit for the flood insurance program from this change. The big challenge for us, we have this huge inventory of elevations, flood elevations we identified and published on regulatory maps, 100,000 maps and inventories and each one have some spot flood elevations and dozens on it. And those are adopted by the community into their local zoning ordinances, a requirement that they haven't adopted and they are automatically kicked out of the flood insurance program and barred from various federal disaster-related benefits if they don't do that. So when we change them, they have -- there is this extended process that kicks off where they must then adopt those changes, make it officially part of their zoning and enforce them.

So there is a variety of challenges there.

We have a five year review cycle for our maps but that does not mean they all get updated. We try to be very judicious about only updating them when something really

changes and we have a set of criteria for that. Even though we might revisit those 100,000 maps on a 5 year cycle, they may not all be updated and so getting them changed over to a new datum is a huge challenge, still fighting that with 29 and I'm sure it will take us a while to figure it with this one too.
You can hope that maybe computers there make this easier and be able to convert entire profiles using transformation tools and get the communities to readopt them but ultimately, there is that organizational challenge, not just about the technology but that it’s about interaction with the local government and those processes you have to go through and make sure people' property rights are protected and that type of thing.
The other issues that are constantly a challenge for us is subsidence is clearly one of them, knowing which areas we need to worry about and having procedures that account for it without over burdening everybody else's whose marks are not moving substantially and doing that in a strategic way is a difficult challenge for us particularly with the assumptions that once we do a flood map, it is good for a while, an in areas of subsidence that assumption breaks down a lot quicker and we don't really have the spatial processes around that to deal with it effectively.
The other issue is the community implementing this program. It becomes a requirement, zoning but they are not elevation experts or geodesists and understanding what FEMA needs in terms of elevations and enforcing it in enactment of their local zoning ordinance is a challenge for them. And so I think Jim's point about the education in the whole community is a critical one that we rely on it, survey community to do these elevations and support those local officials with the elevations they need and having that group understand what's going on and being able to deal with it easily and correctly is a big issue for us.
That's all I have.

>> MR. DOYLE: Thank you Paul. We certainly understand and can appreciate the magnitude of the issues that FEMA faces here. I would like to thank all of our minute speakers. Let's go's ahead and take about a half hour break, get some coffee and a bagel and we will come back and our NGS panel will discuss what we talked about this morning. Thank you.
(Whereupon a morning recess was taken)