

Molly Graham: This begins an oral history interview with Juliana Blackwell for the NOAA Heritage Oral History Project. Today's date is July 18, 2024. We left off at a pretty interesting time in your career; it was a pivot point for both the NOAA Corps and you. Could you paint the picture of when your career with the Corps was winding down and how you achieved your next step?

Juliana Blackwell: I was very fortunate that when I had planned on getting out of the NOAA Corps there was also an opportunity to apply for a federal civilian position with the National Geodetic Survey. There was a lot going on. One was learning new things on my ship assignment regarding hydrographic surveying, which was all new to me; I'd only surveyed on land before. That was a unique experience, and I had a great crew on *Whiting* that helped me understand the mission of that ship. At the same time, I was looking ahead to getting married and moving back to the Rockville, Maryland area, and then setting my sights on the National Geodetic Survey but in a different role. I was able to begin my new job in a civilian position as the field operations liaison to the National Geodetic Survey, supporting the operations, the field operations, as I mentioned before. The things that I was previously out in the field doing, now I was going to be supporting those individuals, both from a logistics perspective as well as from a GPS processing and project planning perspective. It was the natural next step in my work, learning about and supporting the basics of field operations in NGS.

MG. Did having had some experience in field operations help inform your work?

JB: Absolutely. That was invaluable. Also, having a little bit of time doing hydrographic surveying helped me understand more of the connection with creating the nautical charts and how the geodetic reference points on land are really important for the control for any of the hydrographic surveying. It was really a little sweet spot to be able to do that for six months and understand really what was the primary mission for the National Geodetic Survey, which was developing and surveying the coast in order for charts and things to be developed more than two hundred years ago, and how that mission is still really relevant today.

MG: Where was the *Whiting's* purview? Where was it charting?

JB: When I was on board, we were working out of Wilmington, North Carolina, and Charleston, South Carolina. Besides learning about the whole hydrographic surveying process, I learned what it feels like to have a hurricane pass right over you. We were in Wilmington for Hurricane Bertha and Hurricane Fran in 1996. I remember tying up in the Port of Wilmington, which is about a three-hour transit on the ship that I was on up the Cape Fear River. We weren't out at sea; we were tied up along the pier, but just how scary that is just even be tied up and have to be on board a ship and how things leak and what big things can come down river and hit you – you're a sitting duck so to speak. I can remember, one, when the eye of the storm went over, just how peaceful and calm and beautiful it was and how relieved you were to be through the worst part. And then, two, waking up in the morning after the back end of the storm had passed and looking out and seeing that one of the – I think it was an old Navy ship that had been tied up further upriver and had broken loose from its lines. The only thing that prevented it from coming down the river to where we were was the highway bridge. It had gotten stopped by the bridge that was there. I did not know during the time of the hurricane that that was happening, but it

was just one of those moments you're like, "Ah, this is a little scary thinking about this." It really changed my perspective. We were in one of the safest places possible. But even there, things can happen.

MG: Can you remind me of your position title when you were supporting the field operations? Do you remember which office this was in?

JB: It was with the National Geodetic Survey. There were a lot of organizational name-changing and things that were going on at the time, but basically, it was the Field Operations group of NGS. Field Operations Liaison, I believe, was my title. But it was really a geodesist position that did a lot of managing and looking into new techniques of how to support the processing of the GPS surveying that was upcoming and still very much in need of refinement and new technologies, and how to make all that as efficient as possible.

MG: Who did you work with and under?

JB: At that time, I was working for Libby (Elizabeth) Wade, who was the Division Chief of the Observation and Analysis Division. That was the division within the National Geodetic Survey that the field operations and geodetic operations and liaison position were under. Elizabeth Wade was the only female division chief at the time. She was a great mentor, an informal mentor, in just the fact that she got things done. She taught me a lot about hiring people and making sure that budgets were planned. She was very open to sharing with me and others her planning process and process for hiring new individuals to continue to refresh and bring people into the divisions. She fought for what she wanted. She was a great role model and, as I said, an informal mentor, too. She was just a terrific person to work for. I can remember her having the vision of making sure that the field was supported. At the same time, there was a lot going on with trying to get the field personnel from being full-time field to being part-time field, having rotating crews going out, and having a home base for that group out of Norfolk, Virginia, rather than field at large that were permanently assigned to Silver Spring at that point. There was a lot of change going on, too, and she made sure that things got done to take care of her folks. She was a great model.

MG: What was the idea behind those personnel changes and proposals? Was it to help folks become more upwardly mobile in their position?

JB: I would say it was more the technology was changing. Using GPS required fewer individuals from a field operations perspective – first of all. It was budget, it was personnel, it was technology, and it was how to keep people from getting burned out. There were a lot of different pieces to this that were brought together. Before that, the people that were assigned to the field parties were full-time field. They were out for a large part of the year, constantly traveling from project to project to project. Thinking about retention for people that want to have a more stable family life as well as the fact that GPS was enabling smaller groups of people to do surveying over a larger distance. You didn't need as many people doing the laborious work of the traditional line-of-sight type of surveying. There were a lot of things that were changing. It was embracing that change and understanding how to give personnel some time to have more of a home base and be able to have a life and to maybe even go back to school if they wanted to.

It was a culmination of things. It was probably also financially a good thing because then you weren't paying for everybody to be out in the field on per diem most of the year; it was only happening for part of the year. I would say half the year, on average.

MG: I wondered, too, if it was a way to get more women involved in this work because there is a home base.

JB: I don't know that that was necessarily stated, but I'm sure that it was something that was considered, especially Elizabeth being a woman and making sure that she took care of everybody and thought how she can keep the best talent possible in her division.

MG: GPS is a bit of a black box for me. Can you describe what this processing looked like and what it meant? I process oral histories. What does it mean to process GPS?

JB: So, there's GPS data that's continuously collected by GPS receivers, and then there's a lot of modeling and [inaudible] double differencing and a lot of things that are done behind the scenes in the software that shows you, by each collection point to each satellite, how well things fit together. Over time, there are visualizations of it, a graph of the data showing all these different measurements over the course of an observation session. In our case, it was usually about a five-and-a-half-hour observation. Looking at the graph, there would be things called cycle slips; there would be things that you could look at that picture, that graph, that would stick out and say, "Hmm, something's not quite right there." Or you would have a power outage, and you would have this period of time where you lose your "fix," so to speak, on your position. There's a whole bunch of things about fixing integers. There are a lot of details that I, one, don't remember all of; two, I would bore you to death with them if I did. But the fact is there was, at the time, a lot of human interaction with the data to delete outliers, to look at how these integers were being fixed to see if the software was performing correctly, comparing information, comparing data over different observation collections over different days, different times of the day, trying to figure out if there was some sort of interference or reflection of the satellite signals that were given some kind of erroneous type of information. So there was a lot that went into it. You were really looking at the final X, Y Z's, thinking about a geometric system, the X, Y Z's of your point, and then translating that to latitude, longitude, and ellipsoid height. So again, there's lots and lots of data. The people that were looking at this data were trying to clean it up as best as possible. But a lot of times, anyone that would be processing the data would have their preferences and techniques. Somebody else could process that data and maybe come up with something slightly different. Now, with geodesy, we're operating at the millimeter/submillimeter level; we're really trying to nail it down. I'm not saying that GPS gives you exact millimeters, but we were doing our best to make the most of the data that was collected. Again, that was back in the mid-1990s. Since then, there have been a number of different software processing engines and improvements that have been made not only by NGS and how we do it in-house with our software but also by a number of GPS manufacturers, surveying and software manufacturers. There was also the May 2000 change to GPS in which selective availability that was turned off during the Clinton administration to make GPS more responsive to civil and commercial users worldwide. I probably should fact-check that before putting that into this history here. Things that kept getting better and better over time for GPS processing.

MG: Was there any resistance to this kind of work? I've been at an AI conference all week, and it reminds me a little bit of that, where things are getting sharper and smarter, but human interference is certainly still needed.

JB: I think people, again, were wondering just how accurate GPS was going to be compared to the previous way of doing things – line-of-sight measurements with theodolites. Again, there was a lot of uncertainty in the mid-1990s. I think GPS has definitely proven itself and is a lot more valuable than anybody ever really imagined it would be given the fact that it was developed for military/Department of Defense uses and since then, it has just become ubiquitous, right? I don't know how we would get through a day without using GPS. There are a lot of uses for it that we don't even realize that are happening behind the scenes. But anyway, I don't think there was resistance to it. I think there was a lot of trying to figure out how these different types of GPS equipment were working together, what was different about different brands – the Trimbles, the Ashtechs, the Leicas – trying to mix different types of receivers and antennas to see if you got the same kind of results, depending on what hardware you used, also, what type of software processing you used. There were a lot of unknowns with what's the right answer. What happens if you mix things up a little bit? What happens when it rains? Because there are a lot of atmospheric effects to the GPS signal that people don't really think about. There's a whole science behind that, and what's happening in the atmosphere at different levels that affect the signals and can help or hurt you, depending on your project and what else is going on at that location at that time. GPS is also something where if you have trees that have their leaves on, it might be affecting the way that the signals can get to the antenna. Whereas, if you survey something where there's not as much tree coverage at the time – leaf-off – does that impact it? There were a lot of experiments that were also happening during the '90s to improve the operations as well as the processing and analysis of GPS data.

MG: Were you coordinating these efforts with other groups like the military or academic institutions?

JB: I myself was not, but our scientists at the National Geodetic Survey were very much in tune with what other groups were doing internationally, probably on the defense side as well – though, I don't think we talked about that as much – and also with the academic institutions that were certainly very engaged in trying to figure things out, too. Our research division in the National Geodetic Survey had brilliant scientists, as well as others within NGS that were continuing to look at what everyone else was doing and how we could improve things internally with not only our data collection and our software but also with our surveying techniques – how far away can you survey points and get accurate positions on these survey disks? There are a whole bunch of different things that have to be factored in as far as how far apart the survey points should be, how long you have to occupy these stations, and what happens if two stations are close together and you're trying to get a really accurate baseline between the two. Every time you change some aspect of it, there's a whole other bunch of things you have to consider in order to get the best information out of the survey data that you have.

MG: How were you personally adjusting to this new position, role, and organization? Were you enjoying the work? What was it like for you?

JB: I felt like I was continuously learning each and every day about what was happening and learning from the people that were in the NGS headquarters office. It was great being in the field to learn about the fieldwork, but it was great being in the office to learn about how all this fits together. Because again, I had only been with the National Geodetic Survey a couple of years as the NOAA Corps officer field geodetic and operations liaison, and then in my civilian position, I had a chance to work with a lot more of the office personnel who had been processing data and looking at these other projects. I was learning from them about historic projects, too, because you're doing comparisons of surveys that were conducted pre-GPS, looking at the data that was coming out of the GPS surveys and determining how they aligned, and then looking at setting up other projects to experiment and what type of information could be gleaned from pushing the envelope even further with the types of processing and techniques that we were trying to develop.

MG: How long were you in this role for?

JB: For my role as the field geodetic operations and liaison position, from the end of 1996 to 2002 – about six years. I was looking at the different types of GPS processing and continuing to support new ways of looking at the data as well as helping the field personnel and their projects and their project submission. A lot of things were changing. Again, that's also when the field personnel were being given more responsibilities for the GPS processing side of things. That was one of the things that I was also working on. Anything that was learned as an improved technique, since there were people that were not in the field all the time that they were more rotational-based field crews, being able to be the liaison with what's happening in Silver Spring for processing and getting the field personnel to understand how to look at this data so that they could submit a cleaner project to headquarters to make it easier on the folks that were in Silver Spring to get the project to the finish line. But also to make sure while the data was being collected in the field, the field personnel were getting the first look at it, and they could determine if the data was of high enough quality or if they had to go back and do additional observations before they wrapped up a project area. So, about six years doing that type of work. From there, I got more involved in what was called Height Modernization, still within the Observation and Analysis Division because it had to do with processing and improved techniques. Dave Zilkoski, who at that time was the deputy director of NGS, was very involved in trying to improve the way GPS was being observed and processed in order to get improved height information, not just an ellipsoid height, but making that into an orthometric height-based height, which is really more of a height above sea level, if you want to think about it that way, versus height above a model, or in relation to an ellipsoid model. So, a real-world height out of GPS. That was the one thing that I learned during my time both in the field and my initial processing in the office was that the heights that you get out of GPS are all relative to a model. There's an ellipsoid height, and there's a geoid model that has to get applied in order to make a more realistic comparison to, again, what I would call an elevation or height above sea level. The geoid model itself is something that was not perfect. I mean, it was certainly better than nothing. But it was one of the up-and-coming areas of improvement that was needed in order to have GPS become the tool for determining accurate heights that would be used in engineering and real-world surveying to the accuracy that people sought for things like “which way is water going to flow?” and “how high do we need to build this road or this bridge in order to ensure that there's the clearance that is necessary?” and taken into all sorts of accounts other things that are

happening to the Earth that things are being built on. The height modernization aspect of this was one area of focus, looking at techniques to do these projects and tie them to previous vertical control, i.e., leveling surveys that had been done for the nation. Then, two, seeking support from our partners as well as Congress to continue to fund projects and support for building out more of the geodetic infrastructure and the collection of data in order to modernize the height system for the country. Height modernization was the catch-all for how to improve our methodologies, support our partners who were interested in working with us, and find a better way to get a more improved height out of GPS than we'd ever had before. So, I did that for a couple of years under Elizabeth Wade. Again, I was really working pretty closely with Dave Zilkoski, who was the lead for making this happen. I then became the Height Modernization Program Manager, basically, the titled position that gave me the opportunity to go down and brief Congress on several occasions about how important this type of work was and to work with our partners in different states, including California, North Carolina, Louisiana, Wisconsin – those were the first four states that were really very forward-thinking about using GPS to improve the height systems that they had in their in their states. The height modernization program was very state-based at that time. There were a lot of congressional earmarks that were being written into the budget to help these states continue to further their geodetic control and systems that they were putting into place, including the development and densification of Continuously Operating Reference Stations, or CORS, which is not something we've talked about yet during this interview. But in addition to being able to set up temporarily on different survey marks for periods of time, whether it be an hour or two hours, five hours, or whatnot, there were a number of entities that were establishing stations that were set up on a permanent basis, the first being the U.S. Coast Guard. The Coast Guard was using GPS for differential GPS purposes to help ships that were coming into harbors and ports to get more accurate positioning using a differential GPS, basically, a radio-based correction so that they could get more accurate positioning as they were coming into port. But what the National Geodetic Survey did under William (Bill) Strange, the chief geodesist at the time – who came up with a proposal if these Coast Guard and other transportation groups are putting up these continuous reference stations, why don't we – NGS – get the data and see what we can derive from it after the fact, post-processing it, to determine what we can learn from it and how we can improve our knowledge of where these Coast Guard antennas are. That became a whole different project called CORS, C-O-R-S. Back to the height modernization aspect of this, the Congressional earmarks that were coming in were designated to different state entities who were developing new CORS so that they could densify and get more permanent high accuracy geodetic station data within their state, as well as take more observations within the state and to work with NGS as partners and to collect and have their data submitted to the National Geodetic Survey for our research and operational purposes. The Height Modernization Program Manager position was a little bit of everything. It involved knowing the technology, knowing the research that was going on behind the scenes with the data, as well as having the ability to brief and represent a very complicated concept to congressional staffers and others. I was trying to get them to understand the importance of the work that is being done not only by our federal agency, but by the state, academic, and local agencies that were all jumping in and trying to work together to see how we could improve the height system component of the National Spatial Reference System, which is under the mandate of NGS to provide for the nation.

MG: This seemed to be concurrent with some other modernization efforts within NOAA at the time. The Weather Service was going through its own modernization. What else did this entail? Did you have to replace and upgrade equipment, move around personnel, and train employees?

JB: The Height Modernization aspect of it, I would say, was more of a partnership effort. We were still doing a lot of state or regional surveying, but it was more of a group effort, which was different. In the past, NGS would go out and do the surveys. We were looking for ways to partner with other people to get them to build things to our standards and collect data to our standards. The modernization is still continuing today. Things take a long time, geodetically speaking. The Height Modernization aspect of this was being done basically in a piecemeal fashion because of the funding aspect to it. If you think about trying to put a puzzle together, and you've only got so many pieces in your hand. The rest of the areas are not being covered and supported, there were not resources available to do the same for other states that were not currently being funded. The Height Modernization Program really became the foundation for the National Spatial Reference System modernization, which is really what I'm most proud of leading during my career and my directorship. Height modernization was transitioning from a congressionally funded, earmarked patchwork program to a federally-funded, nationally-focused effort to upgrade, basically replace, the current vertical and horizontal datums as well as to develop a gravimetric geoid model that is going to be the basis for the height system for the improved geopotential or the height datum that's going to be rolled out here, hopefully in the very near future.

MG: Is that something you're still staying aware of even in your retirement?

JB: Absolutely, absolutely. Originally, we thought the datums were going to be replaced in 2022. Government shutdowns and funding issues and pandemic and all sorts of things have happened to delay the modernization effort. Things never speed up, certainly not in the federal world, probably not in anybody's world. Things don't get done faster; they just take more time because of other challenges that have to be overcome. But I'm still tracking it. I'm really happy that the basis is complete for the improved geoid model that's going to support the improved vertical, or geopotential, datum. This required airborne gravity collection over the entire United States and its territories. We were able to complete that project before I retired in March. We completed that at the end of 2023. That was one of the greatest things that NGS accomplished during the time that I was director. The Height Modernization Program went from a patchwork, earmarked program to something that was nationally focused and supported one hundred percent coverage of the country. The Gravity for the Redefinition of the American Vertical Datum, GRAV-D for short, which sounds like "gravity," is really the basis of what the data is all about – being able to get all of that airborne gravity collected so that we could have an improved model everywhere, not just in places that were easy to get to or funded by some other entity, but the fact that, in a sense, it's inclusive and fair. Maybe the data is not perfect in every location because some places are a little harder to get to, like the Aleutians. But we did the best with the coverage that we could up there. It was really important to get the entire dataset so that our scientists in the National Geodetic Survey can complete their processing, analysis, cleansing, and modeling aspect of it to get us to the new datum that will support improved information about heights of land and where water is going to flow. That's really important for anything having to do with flooding, surveying, building roads, buildings, and homes, and measuring changes over time to

see how the Earth is changing. Not only do earthquakes disrupt land and create a lot of changes in where things are horizontally, but there's also subsidence and uplift changing the elevation of land, which, again, is going to impact where water is going to flow, as we've seen in a number of places along the coast. That coupled with the impacts of climate change, sea level rise, really is devastating in a number of areas. The National Geodetic Survey can't change what's really happening, but we can at least measure and monitor it and provide that information so others can use it to the best of their abilities to make sure that they have the best information about the actual heights of places and survey marks used for development and analysis and monitoring of change over time, regardless of what the cause is, whether it's manmade or natural.

MG: There's also a connection to helping mitigate fertilizer and pesticide runoff. Can you say how that works?

JB: I think there's a couple of aspects to that. One is that GPS enables agriculture to have GPS-controlled machine positioning so that when farmers are applying herbicides or pesticides or fertilizer, there's a lot less guesswork. The coverage can be more exact because they know exactly where those machines are. But also having an exact map of the fields, the elevations of those fields, how those elevations change relative to gravity, and where that extra chemical is going to go in the case of runoff. Precision agriculture is one of the uses of GPS that I don't think really was thought about back in the 1980s, but it certainly has come along. Pretty amazing. Pretty amazing the folks that came up with the whole GPS system.

MG: Yeah, who do you credit with its invention, introduction, and operation?

JB: At the end of 2023 – I don't know if it was September or December – we celebrated fifty years of GPS. I don't know that there was a big fanfare for it because it was really about the fifty year anniversary of when the group of individuals – and I know Brad Parkinson is one of them, and there are probably other names that I should know off the top of my head, but I don't – who got together at the Pentagon over a weekend and sat down and started really planning out what this satellite based-positioning system would look like. It's hard to believe that in fifty years' time, it went from all of these incredibly smart people sitting around together, figuring this out, to something that is everywhere. It's not just the United States, right? I mean, this is a global system that is used maybe not a hundred percent everywhere, but I think it can be. It's something that got built out over time that affects all of our lives, and is free for everybody to use. It's phenomenal. I'm sure the budgets aren't ideal for what is required for the DOT [Department of Transportation] and the DOD [Department of Defense] who operate this system, but just what has been made possible based on the brilliance of the developers and leadership of the Global Positioning System.

MG: You mentioned these four or five states that were early adopters, including Wisconsin. I was curious why those four or five states were initially interested.

JB: I would say they're all different in a way. California is very geodetically active where the tectonic plates are changing all the time. In California, you've got earthquakes, and you know things are going to continue to move, having universities and having a state that's very forward thinking about using technology to monitor change, try to prevent disaster, and trying to build

things that last, California made a lot of sense. They were very much involved in a height modernization study that was done in the late '80s and early '90s that launched this whole approach to improving heights from GPS. So, they have a real-world need to try to figure out what's happening with positioning things in their state. North Carolina is also involved. North Carolina has a very advanced geodetic network in their state and actually has a State Geodetic Survey. South Carolina does as well. But North Carolina, by far, I would say, is the most connected with not only geodetics and having that as a base layer for all surveying and mapping but also very connected to FEMA [Federal Emergency Management Agency] and floodplain mapping and using all sorts of remote sensing technologies to map and keep fresh the datasets in their state and geospatially tying them all together. Gary Thompson, who I've worked with for decades, has been a champion for the state of North Carolina. I mentioned Louisiana because there's a huge need in Louisiana with the issue of subsidence. The National Geodetic Survey, for decades, partnered with Louisiana because of the elevation challenges they have, not only with sea level rise, but the fact that there are fluids being pumped out of the ground, that being oil as well as fresh water for certain areas, which then affects the aquifer that's underneath, and then the land that's sitting on top of it is sinking because of the withdrawal that's happening. The culmination of the subsidence and the sea level rise and all of the different oil and gas and other economies that are critical in the northern Gulf Coast, particularly Louisiana, made that one of the states that were very, very interested, along with Texas, to ensure that they had the best ability to measure what was happening in their areas. So, the Gulf Coast states, again, are very active. Louisiana was one of the early ones that was on the Height Modernization Program list, so to speak. We've got Wisconsin which was very motivated by improving their transportation system, their highway system. It had also been very geodetically active in conducting surveys, both leveling type of surveys, as well as GPS surveys, to ensure that they had accurate information for the transportation corridors and also, along the lakes, in making sure that they had information with continuously operating reference stations across the state, as well as in areas along the lakeshore, tying it to lake levels/water level stations in those areas, too, to see what was happening with the change in the levels of water in the lakes. So, a lot of different reasons, but all very important and applicable to other parts of other states within the country. It was a really nice way to get different perspectives of what was important to communities and partners in determining how an improved height system would benefit those areas. If it benefits them, it's going to benefit others, too; it just depends on what the priorities are, depending on the geography and the economics.

MG: I wanted to ask if leading the Height Modernization was a role in and of itself or a major focus of your work.

JB: It became a role in and of itself as the program manager. Again, being able to understand the technologies, being able to look at who the partners are that want to work with us, and then trying to garner support for those efforts. It was a little bit of everything.

MG: And how long were you in that role for?

JB: That was, I'd say, about four years.

MG: Okay, until about 2006?

JB: Yeah.

MB: Well, up until this point, are there other events or incidents that stand out to you?

JB: Well, personally, there was a lot going on in my life, too. Right before I finished up my role as the Height Modernization Program manager, I had gone back to school to get my master's degree in business administration. The way I fit that in was I did an Executive MBA program at the University of Maryland every other weekend, full-time, taking classes, and then coming home and working. It was less than a forty-hour workweek, but it wasn't much less than a forty-hour workweek, it seemed, and I was able to accomplish the master's degree in eighteen months. The master's degree was really very helpful for me but not in learning about more of the technology side, but looking at the different components of what is required for running any kind of business or organization.

MG: Were any of your colleagues or supervisors also encouraging you to get a business degree?

JB: They were encouraging me to think about going back to school when the Executive MBA program came up because there was another woman in NGS who was also interested in doing the same thing. Again, this was one of those things where you don't know what you don't know. Sometimes, the thing that you're looking for is right in front of you. As soon as somebody says, "What about this?" You go, "Oh, yes, that's perfect. That's exactly what I'd like to pursue next." In fact, it was my husband, who I think at the time was finishing up his master's degree, who had mentioned the Executive MBA program at the University of Maryland. So, I got connected with the university and really just fell in love with the opportunity that was there close to home because, at that point in time, I was living close to Silver Spring. It was a very easy commute for me to get to the University of Maryland in College Park.

MG: What was the curriculum like, and how were you able to connect to the other students and your professors at this different stage in your life?

JB: It was great because everybody was kind of my age. There were a few federal employees who were part of the program, but many of them were entrepreneurs and looking at having their own businesses or more of the private sector executive type. The age group was perfect because everybody was a working adult. The curriculum went from, again, things related to human resources and hiring, facilitating difficult conversations, and the people side of things. There was also the accounting/finance component, which, even though I love numbers, was not my favorite thing. There was also an IT [information technology] component -- using information and the evolution of technology and trying to figure out how you position your business to be successful as things continue to change from an IT and information perspective. The professors were really amazing and very thought-provoking. I never thought I wanted to go back to school, but after getting into that program, I was energized again. It was definitely well worth it.

MG: Did you have a sense then that you were on track for these different leadership roles that you'd go into?

JB: Yes, at that point. I also saw that around me, in the National Geodetic Survey, there were a number of people who would blow me away on any scientific aspect of the work that was being done. I did not grow up doing surveying; I did not go to school to learn surveying or geodesy, so I knew that I was way behind the curve with advancing on the scientific side of things. I saw that there were a number of brilliant scientists who were in leadership positions and supervisory roles that probably didn't love that aspect of their job as much as they did doing the hands-on science and geodesy. One of the things that taught me, going back for the MBA, was I really liked the variety of having all these different aspects to think about and to make work together. As I got through the master's program, I was more interested in supervisory positions, and that came to fruition because in 2006 I did become the chief of the Observation and Analysis Division. When Elizabeth Wade retired, I applied for her position. I was selected for her job, and was able to start my supervisory career with a group that I knew well. I was very fortunate to be there and be able to use my recent learning, as well as my understanding of the mission and the components of the field operations in the Observation and Analysis Division, and to put it all together.

MG: It sounds like this was also the time when you started and raised your family. I'd love to hear a little bit about what that was like for you and John. Tell me also about your work/life balance during this time.

JB: We have three children. Our youngest was born in 1997, and our oldest was born in 2001. It was always busy. The way we were able to make that work is we had the grandparents that were in the area that were able to help us, and when we moved further out, away from them, my husband stayed at home and took care of getting the kids places they needed to go. He was home base, so to speak, while he did his consulting work.

MG: My parents have been my childcare, and it's a huge help. You mentioned John also pursued his master's degree. What was his degree in?

JB: I think it was more on project management, but project management for technology. After he retired from the NOAA Corps, he went back to school, got his master's degree in Technical Management, and worked for AOL for a number of years as a project manager. He shifted to the private sector and had a number of years doing real project management for some really important things at AOL. We had a number of conversations, not only about work at NOAA, but also management of projects and programs. I always look to him as one of my mentors because he had some great experience on both sides – federal and private sector.

MG: Yeah, it's a benefit to have someone handy who can advise you, understand you, and give you some feedback.

JB: Absolutely. Couldn't have done it without him. He's very supportive. And again, picking up the kids was pretty important, too. [laughter]

MB: A big job. Well, tell me a little bit about this new role in 2006. Where does the Observation and Analysis Division [OAD] sit within NGS?

JB: It is one of six divisions. It was a pretty big division because of the field operation component of it. It was the group that was not only collecting data but receiving the projects that came in not only from NGS but from other partners that were collecting project data and submitting it to become part of the National Spatial Reference System. So, a lot of data focus in that group and a lot of the geodetic data itself being managed within that division. OAD was very focused on data and projects and making sure that they were up to par for being part of our larger database of geodetic data for the nation.

MG: How did you manage in that role? I think I read somewhere that you were supervising a staff of sixty employees. That sounds like a lot of people to manage.

JB: That was a big group for me, starting off in my first supervisory role. There were three branch chiefs to help manage the branches themselves. A lot of different things were part of OAD's work, including some very unique stuff that the National Geodetic Survey does that I don't think we've talked about, which is a partnership with the FAA, the Federal Aviation Administration, and NGS's Aeronautical Survey program. This airport survey program was under the Observation and Analysis Division as well as the Remote Sensing Division [one of the six divisions within NGS] in supporting the Nation's air transportation system and the FAA and making sure that the runways and airports are all surveyed up to par and that the data gets reviewed and basically a stamp of approval, so to speak, from the National Geodetic Survey. It was during this time when NGS started on the path toward a resurgence of the gravity program. By that, I mean gravity, G-R-A-V-I-T-Y, of which the GRAV-D program, with the capital letters G-R-A-V-D, launched. So, seeing gravity become more important, knowing that it was critical for height modernization and the modernization of the National Spatial Reference System. Seeing a resurgence of the importance of gravity and bringing in new gravity experts to support that – I think that's the one component under my supervisory role in the Observation and Analysis Division that I'm really, really excited about. The fact that we were able to get more engaged with gravity experts and bring those types of geodesists and scientists into the National Geodetic Survey because we didn't have many of them when we first kicked off this campaign to get gravity across the entire country, and it was a huge endeavor.

MG: In researching for this interview, I learned that gravity isn't universal. It's not the same everywhere. Can you explain that a little bit more?

JB: Yeah, I thought that it was too, from high school. I was like, "Okay, gravity is ...". There's one number, right? No, that's not true. It changes slightly depending on where you are and what is underneath the Earth's crust. Knowing what those very slight differences are in gravity is important as a factor in the determination of heights. There are global gravity models that are used by the National Geodetic Survey and others. The refinement of global models comes from additional data collection at a lower altitude, as in by plane, that helps densify those gravity measurements over the land masses that you're most interested in, that being for us, the United States and its territories. So, the GRAV-D mission was about collecting from an airplane-similar type of gravity data, basically, mowing the lawn, going back and forth over areas, and making sure that there was a hundred percent collection and some redundancy. The GRAV-D airborne gravity collection was really important to be able to improve the overall modeling that we needed for the United States. Based on the size of the land mass and the challenges of flying

over mountains and flying remote areas such Alaska and American Samoa, you think about all the different types of aircraft and personnel that are needed to get those very challenging areas flown, I think we, as a country, did a pretty good job of getting GRAV-D done given the time and the resources that we were given.

MG: Was this something you started in 2006 or as the chief of the Observation and Analysis Division?

JB: Some of the hiring for gravity personnel started then. Some of the pilot projects to try to recreate the airborne gravity efforts that we had heard others internationally were researching and starting to utilize started then too. Then, it was the 2009 timeframe, I think, when really – 2008/2009 – when gravity got off the ground with a funding push in order to help with purchasing of equipment as well as hiring and the fieldwork that was required to get the data collected.

MG: How large was the program in terms of resources or people power? I was also curious about the outputs.

JB: At the time, we had an increase of three million dollars to our budget to support GRAV-D, which seemed like a lot, but when you think about the fact that there's lots of overhead that comes off of that and everything else, it wasn't as much as we probably should have had. We were hoping to be able to get GRAV-D done in a ten- year timeframe, and it took longer than that. Hiring also takes a while. It would be a six to twelve-month timeframe to get people on board. Things were a little bit slow at the start, just as they typically are with a big project like that. It was a learning curve for how to collect the data. What's the right altitude? What's the right type of plane? How fast should it fly? Making sure that the meters that are on the airplanes are collecting data correctly. How do you know if it's correct? What do you compare it to? There's an international group that was really important to be a part of and to have the support of what other researchers and scientists are doing around the world with gravity. NGS was able to get the people hired on that were able to work within this community, which is how it was all possible. I mean, if it wasn't for their brilliance and their connections with others within their community, it wouldn't have happened.

MG: Were there other efforts or smaller initiatives going on during this time?

JB: I'm sure there were. I'm trying to think. [laughter] Maybe I'll switch gears a little bit and talk about things that were happening probably before, during, and continuing to this day that we haven't talked about, and that is the Remote Sensing Division. This is one of the six divisions within the National Geodetic Survey and is focused on collecting data from aircraft, primarily LIDAR [Light Detection and Ranging] data and aerial imagery for the purposes of mapping the shoreline and mapping the coast. The shoreline gets applied to the nautical charts that NOAA produces. The data for the coast gets used in that purpose, but it also gets used by so many other entities. Data is made available to the public. From academia to states to other federal agencies, there are myriad uses for that type of data, as well as the fact that the shoreline changes because of natural and manmade impacts. Certainly, anytime there's a hurricane, definitely along the sandy banks of North Carolina, South Carolina, and Florida, you're going to see something

shifting, some shoals. So, there's always a need to replenish and renew that data from a shoreline perspective. The National Geodetic Survey and the Office of Coast Survey work hand in hand for those charting updates and the use of improved technology to get that data to the Coast Survey faster and more accurately so that they can make use of it for updates to their products, including electronic charts. So, the Remote Sensing group was definitely on the cutting edge of a lot of that work. Mike Aslaksen has been the Division Chief for that group for a number of years. He's a wealth of knowledge, both from a technology standpoint as well as from a personnel and a partner standpoint. We've got a number of contractors that work primarily on shoreline mapping and surveying aspects for the National Geodetic Survey, and Mike is at the center stage of working with a number of those private sector entities and ensuring that there's a coordinated effort not only with the work that we ask for our contractors to do on our behalf for the federal government but also collaborating with our federal partners that are also doing coastal mapping work, USGS [United States Geological Survey] being one of them and US Army Corps of Engineers being another. Nobody wants to have more than one group doing the same work. The coordination effort to make sure that the mapping and collecting of data and the provision of that data to the public is coordinated, thought out, and available to the highest accuracy possible and the higher accuracy needed from the groups that are being funded to do that type of work, regardless of what department those federal organizations are in. The other remote sensing aspect is using the technologies that are available from an imagery perspective to collect data on the airport surveys that I was talking about that we do in support of the FAA. The role for NGS these days is more on a quality control/quality review of data that's submitted by third-party surveyors for the FAA that gets sent to the National Geodetic Survey to review, analyze, send back if necessary to have something redone, and then get a stamp of approval, so to speak, on the actual airport surveys that are being used to make sure that aircraft get in and out of airports safely and efficiently. Again, that's an ongoing thing that needs to be updated as airports build out, things get replaced, and trees grow. Things change all the time, so there's a constant need to refresh. There are always improvements that are being assessed to see how we get the most out of the technologies that are available.

MG: I recently interviewed Admiral Freddie Jeffries, who started his career with the Coast and Geodetic Survey conducting airport surveys. This made me curious to ask where all of this data is being stored. Does it get sent to NCEI [National Centers for Environmental Information]? How do you access this historical data?

JB: There's historical data, and then there's the current data. The airport surveys, once they are approved by NGS, I know that NGS keeps a copy of it. I know that all of our data is backed up and archived. That's GRAV-D data, CORS data, remote sensing and all the geodetic types of data. We have also the FAA that is receiving the data that is being done for airport surveys. A really huge part of our mandate is making sure that we are managing our records, our geodetic records, as well as any of our other official records that are not about surveying and making sure that those are kept based on the records retention schedule that we have. There's so much of the geodetic and the remote sensing that just never goes away. It's just a matter of continuing to store it in the right and most economical way possible. As you can imagine, the remote sensing data is huge. NCEI is one of the primary groups that we work with to make sure that that data is archived. A lot of the data is currently being served up on our website at geodesy.noaa.gov too. There are opportunities to search there and find all sorts of information. There's also a Digital

Coast website [coast.noaa.gov/digitalcoast/] that one of our other fellow program offices in the National Ocean Services provides, which provides coastal data from different groups, not just from the National Geodetic Survey.

MG: Can you also discuss the role professional organizations played in your career and in advancing your knowledge and professional connections?

JB: The National Society of Professional Surveyors [NSPS], is a group that is very supportive of the work that NGS does which is really important to the surveying community. There have been a number of partnerships. There are a number of recurring meetings that we have with the leadership of NSPS to inform each other. It's certainly critical during this upcoming change with the datums and the fact that there are a number of other things that have changed over time that we want to make sure that the surveying community is not surprised by, so having that high-level relationship with NSPS was really critical to keeping the channels of communication open. There are a lot of legislative things that have to happen in order to ensure that the new changes to the National Spatial Reference System are adopted by different states; every state has its own way of doing things legislatively. So, working hand in hand with them [NSPS] has been critical to not only the technical but also the legislative side of the house to make sure that we're all on the same page. The other group is MAPPs, M-A-P-P-S. This is the remote sensing photogrammetrists professional group that has been instrumental in supporting and advocating for the use of remote sensing technology for not only NGS but for the country and other federal agencies that are collecting data. There are a number of different entities that are part of MAPPs that are really critical, primarily to the remote sensing photogrammetry side but also to the geodetic component. The basis for all this remote sensing data ties back to geodetic control and the models that we are updating in order to provide a new set of reference frames and geopotential datum for the Nation here in the very near future.

MG: Juliana, tell me now about this next big step: becoming deputy director of NGS. How did that happen? Talk me through what you expected and how that all unfolded.

JB: That was a quick phase of my career. There were a lot of moving parts at that point. When Dave became the director for NGS, Doug Brown was also – Doug Brown was another individual who was part of the leadership team -- he was the deputy under Dave Zilkoski for a while. Then, there was an opportunity for him to serve in a different program manager role, and somehow or another, I ended up in a stint as deputy director at the same time Dave Zilkoski was thinking about retiring. My job as the deputy director was kind of short-lived because other things were happening at the same time, and I applied for the director position and was selected for that role. So, talk about just a blur. There was a lot going on in the 2008/2009 timeframe.

MG: Tell me a little bit about your working relationship with Dave. You've said he's been a mentor to you. So, I'm just curious what your partnership was like.

JB: Dave is a very energetic person. He's always thinking, "What else can be done?" Very optimistic. "Let's make it happen. I have this vision. Let's talk this out." He was always walking around, talking to folks, sharing ideas, listening to what people had to say. He had a strong basis in the technical side, especially on the leveling and the height side of things. He

knew leveling very well, the vertical control, very passionate about NGS and geodesy, but very much a people person and really liked being able to speak to people one-on-one as well as speak to large groups of folks and get them excited about geodesy in the National Geodetic Survey. His enthusiasm was just contagious, right? He would come to your desk like he liked to do early in the morning and say, "Hello," and say, "Hey, how's this going?" or, "Hey, I just thought about this idea. What do you think?" He would walk around and sprinkle these little areas of excitement, different things to look into. Height modernization was one of those things, and using different techniques to try to get this improved geoid model. That was just one of one of many things. He was inspirational in the sense that he was always thinking about what else can we do and who else can we work with to make that happen. The downside of that – sometimes there are a lot of over-commitments that get done. That was one of the things as a manager that maybe I was not as appreciative of because now, all of a sudden, there are ten new things to support. I would say the best part about it is because of the person that he was, if you had a concern about something, he would listen to what you had to say. He would share his ideas. We'd get lots of things that could be done. But if you had a problem, or you thought that you were being overstretched in some way, he would welcome you to come in and have a conversation with him and tell him what was going on. I learned a lot from him through that and, again, pretty informally, I would say, because we didn't have any kind of mentoring formal relationship. That's just who he was, not just for me, but I think for many others, too. He was very supportive of me and others advancing in their career, taking opportunities, taking risks, which is not something that I was ever really comfortable with, but sometimes, it's like, "Okay, how would you like to do this? How would you like to lead this effort?" Of course, you didn't want to say no because he believed in you, and he gave you the confidence to believe in yourself. That was really invaluable to me.

MG: I think I read that you established a mentoring program in 2019. I was curious about the impetus for that and also if you've had mentees.

JB: Sure. One of the things that I implemented when I was director was when we would bring a new person into NGS. I felt like they often maybe didn't get the connection that they needed – didn't have a buddy to go to. So, we had what we would call new employee mentoring, where they would get assigned somebody who would – mentoring might not have been the right word, but it was more like informally somebody that they could go to to ask those questions, who was not their supervisor, who was somebody that was paired with them. We had this idea of trying to help people navigate a new job or a new organization, make them a little bit more comfortable with those things that they didn't feel comfortable asking people about; they had a go-to person. As part of that, I was pitching the idea of that kind of mentorship with my leadership at the National Ocean Service. At the same time, we were trying to address some federal employee viewpoint survey [FEVS] results that were showing that we could always do better within our organization. As part of that, there was an initiative to stand up a mentoring pilot program within the National Ocean Service, the line office of which the National Geodetic Survey is part. I ended up in one of the leadership roles for that initiative, which I felt very passionate about. That's one of the things that I think is important for anybody; there are plenty of things that you can do that you can get involved in, but the things that you're most passionate about are the things that you're really going to put your heart and soul into. It's really great when you're able to get paired with an initiative that is really meaningful to you, personally. So, being a part of

the pilot program to stand up a mentoring program within NOS that hopefully would become a NOAA mentoring program was something that I, and others, stood up within NOS. It was great to have people that were part of the organization want to serve as mentors. One of the fun things that we did as part of that is to have matching, like speed dating but speed mentor matchup type of things where people got together in person and had a chance to talk to their potential counterpart in this mentoring relationship and see what clicked. Despite reading bios and trying to match things up behind the scenes, it was really fun just to see face-to-face what sparked when people wanted to have a mentoring relationship with a certain person and why. The pilot program went very well; it went so well that it ended up being stood up as a NOAA mentoring program. I served as a mentor for a couple of years and had a couple of different mentees in different parts of the organization. And mentoring really gave me a chance to see how critical it is to have somebody in a position outside the supervisory chain be able to work with an individual on the things that they are seeking to enhance their career. There's a lot of informal mentoring that happens, too, that doesn't get measured, but I think is just as impactful from a workforce perspective of having one or more informal or situational mentors that people can rely on. I don't think that that relationship ever ends. I think it's always there. Sometimes, it's just dormant for a while, but I think it's huge in the workplace.

MG: I'm wondering if you can talk me through your tenure as director of NGS and what it was like for you to be the first woman in this position.

JB: My first memories of becoming the director – and again, this is after having the courage to apply and having the support of family and friends and co-workers to put in for the position and then being selected for it. Once I got over that shocked feeling and enthusiasm, I realized that now I didn't have my Dave Z. mentor; he was gone. I didn't have a deputy because I had been in that role. I still had the leadership team of the National Geodetic Survey, but there were these two vacated key positions, and it was a little bit lonely. It was a little bit – “Okay, now what?” This is where I've got to start a new job, take on all these new responsibilities, find a deputy, hire a deputy, and figure out how to make the things happen that I dream about happening. The first year was really difficult. It didn't help that about a week or two after becoming the director, my father-in-law passed away. He was Wallace Blackwell, who, by the way, had also worked for the Coast and Geodetic Survey. I would have loved to have been able to talk with him because he was just such a great individual and had come up through the Coast and Geodetic Survey. My father-in-law, Wally, was just a great person. Anyhow, I had kind of a rocky start, missing Dave Z., dealing with a death in the family, and trying to pick things up and try to figure out how to get these folks that had been working for others for so long to come around to how are we going to work together and how are we going to make this modernization to the National Spatial Reference System work. So, a lot of moving parts. Being a woman in a male-dominated organization and also the fact that I was younger and didn't come up through the geodesy academic pipeline made it a little bit of a challenge. For the most part, I would say I was very supported across the board by folks. I don't think that there was any sexist type of “because she's a woman” – I just think any change is difficult for anybody to have to work through. It takes time. Everything takes a lot longer than you ever think it will and want it to when you're coming into an organization and trying to move people in a different direction. For the most part, I'd say I came out unscathed, and it was definitely a learning first year for sure.

MG: You oversaw a strategic plan during your tenure, too. Did you initiate that?

JB: I would say the strategic plan – I was more of the leadership support for it – instead of height modernization, let's make it the broader national modernization of the Spatial Reference System for the entire country, and let's see what all we can put into it. The actual pillars were more of the brainchild of Dr. Dru Smith, who was the chief geodesist at the time, who later became the NSRS Modernization Manager. There were a lot of people that were instrumental in formulating the components of the strategic plan. I was the one who wanted to ensure that it was going to happen and that it met the national inclusive vision that I had to make sure that if we're going to do something, we're going to do it for everybody. We're going to make sure that Puerto Rico and all the challenging areas that sometimes get left out are included in any modernization effort that we do. Because that was one of my other things that I felt very passionate about is, those places that are hard to get to or further from DC often would feel second or third-class, and I wanted to make sure that did not happen.

MG: What were some other initiatives or priorities during this time?

JB: I would say the strategic plan kept us pretty busy. There were a number of updates to it because it was originally a ten-year plan. It was a ten-year plan that we reviewed and updated every five years. There were a number of efforts that were underway as part of that strategic plan that we were able to accomplish. For one, there was a state advisor program transition. The cost-shared state advisor program entailed having a person from NGS in a state to help them with their geodetic needs, surveying and mapping needs. Twenty-two states, I think, was the most that we ever had at one time. We went through a phase of taking the state advisor program and turning it into a regional advisor program that was fully funded by the National Geodetic Survey. So, we were still trying to do the same service, but doing it for all states and ensuring that funding was coming from the National Geodetic Survey, which meant that we had more say in what those individuals were going to be doing rather than having it be kind of a division between what the state wanted and what the federal government was trying to accomplish with that role. So, we transitioned to a regional advisor program with fourteen regional advisors. That was one of the things that was accomplished as part of the strategic plan early on. Different things like that related to improving our relationship with professional organizations, trying to update our data models and tools and how data gets delivered. So, there were lots of pieces that are still ongoing today. If you think about modernization, you get to a point where you define what modernization looks like, where you're headed, and as soon as you're there, you know that there's more that can be done. You're going to continue to modernize and improve what you're delivering, and how you label that, and how you get to that next end goal is to be determined. There are always ways to improve the products, data, and services that are being provided. A lot of the same pillars were there throughout my tenure as director. They are getting closer and closer to the finish line. Again, one of them being the hundred percent collection of the airborne gravity [GRAV-D]. There are a number of things that are being done because of the amazing people in the workforce and our amazing partners.

MG: Towards the end of your time at NGS, you oversaw a number of crises that took place in the federal government and in the world, such as the government shutdown. [Editor's Note: The

2018-2019 U.S. federal government shutdown, lasting from December 22, 2018, to January 25, 2019, was the longest in history. It resulted from a funding impasse between Congress and President Trump, primarily over \$5.7 billion for a U.S.-Mexico border wall. Around 800,000 federal employees were furloughed or worked without pay, causing widespread service disruptions.] How did that impact your employees? I was also curious if you could talk a little bit about the impact of the COVID pandemic.

JB: The government shutdowns were really – I started counting them. I was thinking, “When I retire, I’m going to talk about how many different government shutdowns I survived.” You know what? There are too many of them. It wasn’t necessarily just the length of the shutdown; it was the threat of, the preparations for, and then the consequences of any of those shutdowns. It’s demoralizing, and it happened over and over and over again. As a result of those delays in getting funds when we finally did, everything gets pushed back. There’s a lot of uncertainty in trying to get the work done. Again, it’s not the number of days or the number of hours that a shutdown lasts; it’s the overall impact of all those things that I did not realize until it happened just how negative of an effect it is on not only the workforce but all of our customers and stakeholders, too. I don’t know how to solve that one. I hope somebody does, but it’s definitely something that it’s not just me; it’s everybody that’s affected by that in their organizations that they’re trying to manage. Again, I wish I had a solution. The second thing you asked about related to the pandemic and COVID. When that hit, there was also a lot going on in my life at the time, and I was serving as the Acting Deputy Assistant Administrator for NOS on a detail assignment when that happened. I think NOAA tried hard to get prepared once they knew that it was looking like a true pandemic by having a “Let’s all try to telework from home on a certain day,” and it turned out that was almost the exact day where everything was getting shut down. I would say that I did not have much of an impact on the NGS workforce pandemic transition because of the NOS role that I was in and things that were happening in my personal life. But my leadership at the National Ocean Service, Nicole LeBoeuf and Paul Scholz, and then my deputy, Brad Kears, who was running NGS at the time, did a tremendous job in ensuring that they were working hard to try to make all these things work and to connect the dots, what few dots there were. Pretty shocking time. I think we all know what happened. We all lived through it here at NGS. The people who may be listening to this years from now are going, “Oh, yeah, it couldn’t have been that bad.” It really was. It really was that bad. The fact that you were not going anywhere, that there was just no access to things, and you had to learn a whole new way of doing your work. Thank goodness we have computers and the internet. If you didn’t have that, it would have been impossible. On the plus side, what we learned was we can do a lot of our work remotely, and we don’t have to be sitting in the same building. We don’t even have to be working the same hours to get a lot of our work done. The biggest downfall was the actual collection of data because of the challenges of traveling to places and making sure that people were safe and not susceptible to the virus, supply chain issues, and all that. You couldn’t get the work done in the field as much, although we got a little bit done here and there. That set us back. But the fact that people could sit in their home offices, whatever that might be. I know that it was challenging for people, especially with other family members at home with them, to come up with a new normal way of getting the work done. I am amazed at how well people did from a work perspective. I know that it was emotionally and mentally draining for a lot of reasons on the entire workforce. But I’m very proud of how people pulled through and the new ways that we learned to do our work. The fact that we don’t need printers anymore, we don’t print stuff

out. We don't walk things from desk to desk; you email it, or you put it up on a server, or you find ways to electronically sign these documents. The efficiency and the improvements to records management – I would say there are a lot of pluses from being forced to do things from remote locations. But it all takes time to network out, to figure out, to draw out, right? Again, this is not just NGS; this is happening across the board. If we had only had the forethought to do this in advance, [laughter] but I think we did a good job of trying to make sure that we connected with our people by having virtual meetings through Google Meet or whatever the platform was. We were calling people together, talking, reaching out to people who didn't have a support system where they were doing the best that we could to keep engaged on a personal level as well as a professional level. Now, we're still trying to get back into the workplace because in Silver Spring, the offices there were under a plan to be renovated during the period that the pandemic hit, so things got delayed from a renovation perspective. Our entire floor is being gutted and rebuilt. So, the planning for that, the building of that, the funding issues, and everything else that goes into it all got delayed. Our office is still not fully back in Silver Spring and probably won't be until the end of this summer.

MG: Yeah, I think we transitioned well to remote working. But there's something lost in what you described Dave doing earlier about visiting each other's desk and having these conversations that you don't anticipate having just by running into someone in the hallway.

JB: Yeah, the worst part is for the new people that were onboarded during that time. I can't even imagine what it would feel like coming out of college or entering into a new profession or organization and not being able to meet with people, not having that feel and understanding of the culture – because we all throw out names and words and stuff, and it's all got to be just totally confusing for people who are not part of the group. If you're somewhere together, there are plenty of lunchtime conversations, hallway conversations, talking to the person in the next cubicle, just conversations that happen that don't happen when you're in a virtual meeting, right? I don't care how much you want to chat and type in things; it's not the same. For the people that came in during the pandemic into a new job with NGS – super challenging for them. We did do some new employee briefings and tried to connect them as a group. It's still hard to get to know people if you don't bring them together. In 2024, for the first time in five years, we brought everybody from NGS that was able to travel, which was most folks, to Silver Spring for a gathering, an all-hands convocation we call it, which is something we had done in the past. We were able to do that this March before I retired, which was really great – being able to see people again and meet people for the first time that had come on board since 2020 and hadn't had a chance to meet face-to-face in person.

MG: I'm really struck by how quickly you went from being introduced to NGS to directing NGS. I'm curious if you can just reflect on that trajectory, your accomplishments, and anything else we've left out so far.

JB: I served as director for fifteen years, and looking back on it, it doesn't seem that long, but I know there were some really long days that were part of that tenure. A lot had happened. I think the most fun I had was being out in the field and learning the basics of what the National Geodetic Survey is all about. And again, it was more on the geodetic surveying side; I didn't get to experience too much on the remote sensing side. There were opportunities throughout my

earlier career to talk to people, to learn from them through a number of internal trainings, brown bags, lunch and learns, and things like that that were happening. That opportunity to learn earlier in my career – really, really fortunate to be in the places that I was both in the field and on the ships and then in the office when everybody was – and coming into an office working five days a week in person and having that experience. The second part being when I became the director and then was in charge of all these different aspects of running an organization. One, I guess reflecting back, is it felt lonely at first because all the people that you feel are your peers, you're parallel with you. You're now in a new role. You haven't changed as a person, but you're in a new role, and that relationship changes overnight. That was a little bit hard to become adjusted to because I went from having a lot of co-workers that I was very friendly with to then being seen differently because I was the director, and then having to take that role of I'm still your friend, but also at work, I'm now in charge of making some changes that you might not like, or not knowing something and needing you to help me with this that might seem a little more awkward now. There was definitely a learning phase, and I would say it took a few years. I would tell anybody that was in that role that came in with my level of experience not to be too hard on yourself and to realize that it's going to take time to figure it all out and for people to adjust and to make change. It takes longer than you ever expect it will, probably three times longer. What I learned about comparing myself to Dave Z. is that it's not a fair comparison. People told me, when he retired, "Oh, you've got big shoes to fill." I realized I could never fill his shoes; his shoes would never, ever fit me. Okay. I had to be comfortable walking in my own shoes. Everybody is different, and everybody has their own way of leading and managing. We all have our strengths and our weaknesses. So, finding what your strengths are, looking for people to help you in those areas that you are weak in, and building a strong team that is all working towards a common goal and listening to people when – like Dave Z. – listening to people when they come to you and say, "This isn't working," or "I have this concern," and being open to that, that part of his shoes I could fill because I do think that that feedback is important to a leader. One, to have people feel comfortable giving me that feedback, and then, two, doing your best to address that, whatever that might look like. Every day is different, right? Every person is different, but new leaders, people who are looking for challenges in their career – ought to realize that no matter what, whatever position they take, whoever they are backfilling that from, they're going to have their own way of doing things, and they should feel comfortable with that, but also be open to feedback on how they are doing within that role that they are new to. And it takes time. It was a great opportunity. Starting out in the NOAA Corps as an ensign, I never ever would have imagined that I would become a director of an esteemed office such as the National Geodetic Survey. I still can't believe it, to this day, that it all happened. I'm very proud of it. I'm very proud of the people that are part of the organization, who are very dedicated and committed to making sure that not only is the mission done well but that we're doing the best for the taxpayer and looking for ways to continue to improve and modernize into the future. So, I was fortunate to work with a number of great people and happy to have the opportunity to be part of an organization such as the National Geodetic Survey.

MG: I think it's probably a good place to end. You should be proud. I'm so impressed by all you've accomplished and the passion for the work you've done. It's contagious. I'm going to learn a lot more about geodesy now. I really appreciate your time, Juliana.

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Reviewed by Molly Graham 7/30/2024
Reviewed by Juliana Blackwell 8/22/2024
Reviewed by Molly Graham 9/1/2024