

## Organizational Excellence

### **Peter Neilley, Director of Weather and Forecasting Technologies at The Weather Company**

"GSD's development of foundational and pragmatic state-of-the-science technologies to improve predictions of weather and its impacts on society has been one of nation's true success stories that is significantly under-appreciated given the enormous value it returns to the nation."

## **Organizational Excellence - Data Management Services**

### **Ghassan J. Alaka, Jr., Ph.D., IT Specialist, NOAA/AOML/Hurricane Research Division**

"Just chiming in that we especially appreciate your efforts with a strong hurricane out there. It seems to have been an especially difficult season for data staging on Jet. Thanks for being there for us."

### **Steven Bernard, Financial Times Group Limited, London, UK**

"I hang my head in shame that I neglected to mention that this wouldn't have been possible without the help of Bob Lipschutz at @NOAA and his incredible team, who processed the data for me in record time!"

## Advanced Technologies

### **Advanced Technologies - Science On a Sphere®**

#### **Ron Kagan, Detroit Zoological Society executive director and CEO**

"Science On a Sphere at the Detroit Zoo seems to have its own field of gravity the way it pulls our guests in," Kagan said. "It's a powerful tool that motivates learning in a fun way – as if one were an astronaut observing Earth from outer space."

<http://patch.com/michigan/royaloak/science-sphere-workshop-orbits-detroit-zoo>

#### **Arnold Chavez, Great Valley Museum Director, Modesto Junior College West Campus**

"Our SOS is used during school group tours, general public hours and special events. This very unique educational tool allows us to educate our visitors in a way no textbook or any other digital device can. Upon seeing it for the first time, the eyes of some of our younger visitors open almost as wide as the SOS itself! With that kind of attention, we can teach them anything. "

**Tim Gallaudet, Deputy NOAA Administrator**

UNITED STATES DEPARTMENT OF COMMERCE  
Assistant Secretary of Commerce for Oceans and Atmosphere  
Washington, D.C. 20230



January 20, 2021

**Dear Members of NOAA's Science on a Sphere Team,**

I am delighted to commend you for your superior performance in building NOAA's Science On a Sphere (SOS) community. The SOS is NOAA's most far-reaching and dynamic education and outreach tool. It is a tremendous technology for engaging the public in understanding the NOAA mission, and your contributions through it have reinforced our reputation like never before!

With over 170 Science On a Sphere exhibits on display worldwide, our reach extends to some of the largest and best known public-serving science centers and museums, including Smithsonian's Natural History Museum. Working together, you have built and sustained an active user network with over 154 member institutions that collaborate with NOAA to improve their work and ours. Through this remarkable network, NOAA science reaches nearly 70 million people every year – an extraordinary impact that makes even NASA's outreach look average.

Your SOS network helps us understand public interests and guides us on how to best serve these interests with our data. These partners showcase NOAA's work on an ongoing basis with very little additional effort provided by NOAA to maintain these relationships and exhibits. In the 15-year history of the program, only 2% of all SOS installations have been removed at existing facilities. This history of success speaks to the lasting power of this technology and its sustained interest from our partners and the public viewers. We use the sphere at 8 NOAA facilities to showcase NOAA's work. At NOAA Headquarters, I have used the sphere to brief the White House Science Advisor, and it is used for nearly all VIP visitors, including Congressional visits, media events, and science and education meetings.

External institutions that have an SOS tell us how much they appreciate NOAA and how the sphere benefits their efforts and helps the public understand the value of the government to their lives. Ron Kagan, CEO of the Detroit Zoo said that the "Science On a Sphere at the Detroit Zoo seems to have its own field of gravity, the way it pulls our guests in. It's a powerful tool that motivates learning in a fun way - as if one were an astronaut observing Earth from outer space."

Because of NOAA's ability to provide real-time data and to continuously evolve the technology and support a user network, there is a significant commercial market built around NOAA's SOS program. The SOS data catalog has tremendous value for the private sector as well as our education partners. NOAA's name gives the datasets a stamp of authenticity that is highly marketable. The other, commercial sphere-display companies use the SOS data catalog and have built their systems to be compatible with these data sets. Planetarium companies also market that they offer the SOS data catalog.

Thank you for your energy and expertise. The SOS has done an exceptional job making NOAA more visible and valued, and I expect to see NOAA's Science on the Sphere for many years to come.

With gratitude and respect,

A handwritten signature in blue ink, appearing to read "Tim Gallaudet".

Tim Gallaudet, Ph.D., Rear Admiral, U.S. Navy (Ret.)  
Assistant Secretary of Commerce for Oceans and Atmosphere /  
Deputy NOAA Administrator



**Janeen, Dawson School 2nd/3rd grade teacher**

“The data is presented in such a complete and visually easy to understand way that you can almost talk around your lesson based on just what you see. The data drives what I’m talking about.”

**Amy, Dawson School 2nd/3rd grade teacher**

“The 2nd and 3rd graders were able to digest the wow factor and REALLY had some interesting questions and observations about what they were seeing. The level of engagement is not like any other tool that I’ve ever used.”

**Grace Simpkins and Nicole Bartlett, Woods Hole Seagrant , NOAA Live! Webinar Series Coordinators**

“We would like to extend our sincere thanks for Beth Russell’s participation in our on April 27, “Explore the World with NOAA’s Fun New App.” Beth, alongside Hilary Peddicord, provided a comprehensive introduction to the different types of information available in SOS explorer and deftly handled a variety of questions throughout. Their enthusiasm for their work and their experience as outreach veterans was also obvious. We had over 40 participants and over 200 engagements during the 1 hr webinar. Their webinar is now available for viewing on our [YouTube channel](#) and already has almost 100 views!

... we much appreciate Beth’s willingness to step up when given the opportunity. Without people like Beth, we would not be able to respond to this critical need right now.”

**Earth System Prediction****Jeff McQueen, Air Quality Modeling Team Leader for the NWS (2021)**

“When HRRR-Smoke first emerged, it surprised forecasters with its ability to provide local information on wildfire smoke at a resolution four times greater than what they were accustomed to with other weather models. HRRR-Smoke sees smoke at a spatial resolution of nearly 2 miles by 2 miles per pixel.”

“It was kind of revolutionary the first time we saw smoke forecasts at that resolution,” McQueen said. For the first time, he said, they were seeing how smoke interacted with sea breezes or with air flows east of the Rocky Mountains. “Before this product, smoke would get trapped against the mountains, and we’d miss the true impact of smoke stuck in the valleys,” he said.

**Mike Staudenmaier, division chief of the National Weather Service’s Western Region Science and Technology Infusion Division**

“As weather drives the behavior of smoke, smoke, in turn, influences the weather and it can be on the orders of several degrees of temperature differences,” he said. “That’s the exciting thing with this (HRRR-Smoke), it’s showing how back and forth engagement between chemistry and atmospheric models can provide a more accurate forecast.” The recent move (of HRRR-Smoke) to NCEP operations means a more reliable dataset for users, Staudenmaier said.

“When something is experimental, we’re at the whims of bandwidth, availability, that kind of thing,” he said. “If a server or computer system goes belly up, that data is not available. Now that it’s operational, it has a requirement to be available at least 99 percent of the time.”

**Steve Abelman, Manager, Aviation Weather Research Program, Federal Aviation Administration**

“The FAA has long supported {NOAA’s} numerical modeling research and the most recent operational transition of the HRRR to NWS operations improves aviation forecasts at air terminals and aloft, reducing air traffic delays, which cost the airline [industry] billions of dollars annually.”

**Steve Abelman, Manager, Aviation Weather Research Program, Federal Aviation Administration**

“NOAA’s research efforts have been crucial to improving the forecasts of hazardous aviation weather which impact the safety and the efficiency of the National Airspace System (NAS). Long-term research has led to new and improved weather prediction models such as the High-Resolution Rapid Refresh which is integrated into FAA decision-making every day. NOAA-led quality assessments have validated the performance of new and improved turbulence, inflight icing, and thunderstorm forecasts for operational use in the NAS. The FAA has long supported NOAA’s weather research efforts which are contributing directly to the benefits desired in the Next Generation Air Transportation System (NextGen).”

**R.C. Cherrett, Commander, U.S. Navy**

DEPARTMENT OF THE NAVY  
JOINT TYPHOON WARNING CENTER  
425 LUAPELE ROAD  
PEARL HARBOR, HI 96866-3103

IN REPLY REFER TO:  
04 Dec 18

Ms. Jennifer Mahoney  
Acting Director  
Global Systems Division  
NOAA Earth System Research Laboratory (ESRL)  
325 Broadway R/GSD  
Boulder, CO 80305-3328

SUBJECT: LETTER OF APPRECIATION

Dear Ms. Mahoney:

I extend my sincere appreciation to the ESRL Global System Division for providing outstanding, ongoing technical support to Joint Typhoon Warning Center (JTWC) operations. JTWC forecasters regularly access and apply real-time data from ESRL-hosted numerical model forecast data applications. I am particularly grateful for recent collaborative development of the tropical cyclone diagnostics ("TC diag") tool, spearheaded by Dr. Michael Fiorino. Our organization's tropical cyclone (TC) track and intensity forecasters enable critical resource protection and safety of personnel for Department of Defense and other US Government assets throughout the Pacific and Indian Ocean basins. While there have been vast improvements in track predictions in recent years, tropical cyclone intensity forecasting remains one of JTWC's most significant operational challenges. In order to improve forecast accuracy, our forecasters require access to timely, accurate and detailed information about storm structure and storm-scale environmental conditions. The TC diag tool offers such storm-scale data in a format that forecasters can readily access and interpret. The latest version of the tool, tailored specifically for JTWC, has already been successfully integrated into our center's operations. Dr. Fiorino brings a wealth of knowledge, experience, and enthusiasm, and I am pleased that our forecasters have been afforded the opportunity to contribute their ideas to further enhance the already valuable tool. I look forward to continuing our collaboration and observing the positive impacts of its application on the JTWC intensity forecasting process during the years ahead.

Sincerely,

A handwritten signature in black ink, appearing to read "R. C. Cherrett".

R. C. CHERRETT  
Commander, U.S. Navy  
Commanding Officer

Copy to:

Dr. Curtis Alexander, Chief, GSD Assimilation Development Branch (ADB)  
Dr. Dave Turner, Section Head, GSD ABD Model Assessment Section  
Dr. Therese Ladwig, CIRES ADB support

**Fred Carr, University of Oklahoma School of Meteorology**

“As Co-Chair of the Modeling Advisory Committee for the National Weather Service, I am acutely aware of the vital role of GSL in the development of weather prediction modeling systems that will improve weather forecasts for the American public - especially those for severe and hazardous weather.”

**Drake Bartlett, Xcel Energy.**

“Improvements to weather prediction models that produce higher-resolution forecasts with greater frequency are helping Xcel Energy and the electric power industry cost-effectively and reliably integrate higher levels of renewable generation. We can also use more accurate weather forecasts to reduce costs and improve reliability by proactively sending crews to respond to storm damage before it occurs.”

**Dr. Jim McCaa, Manager, Vaisala Energy Advanced Applications**

“NOAA’s continual advancement of forecast skill improves the stability of our electric grid, and directly reduces the cost of integrating more renewable energy into our resource mix.”

**From a Vaisala Press Release on WFIP-2**

"Complex terrain creates substantial forecast challenges for wind plants in most regions," said Jack Peterson, Manager of Energy Operations Support at Southern California Edison. "We have seen many situations where the forecasts are dramatically different at neighboring wind farms with only slight elevation changes. Improving the science behind forecasts is an important step and will greatly benefit the industry by removing some of the challenges we face.”

"Wind energy is an inherently variable resource," said Dr. James McCaa, Manager of Advanced Applications at Vaisala and Principal Investigator for WFIP2. "However, as modeling and forecasting techniques improve, we are increasingly able to calculate and predict that variability, a key factor for developers and operators worldwide as they make crucial long-term investment decisions. In mountainous areas, where atmospheric phenomena and unique topography expose some weaknesses in current models, there is still work to be done to enhance the reliability of forecasting.”

"As an area with both extremely complex terrain and one of the world's largest concentrations of wind turbines, the Columbia River Gorge provides an ideal study site. Our work will examine a wide range of meteorological phenomena that impact the operation of wind farms in mountainous terrain worldwide and improve the short-term predictability of wind energy, ultimately reducing the challenges of wind energy integration not just in North America, but also in emerging markets around the globe.”

**NWS Boulder Weather Forecast Office, RE: Denver Blizzard**

**Boulder NWS Area Forecast Discussion  
UPDATE ISSUED AT 745 PM MDT TUE MAR 22 2016**

**THE LAST SEVERAL RUNS OF THE RAP ARE SHOWING THE 500 MB LOW BEING A SLOWER...STRONGER AND SOUTH. BECAUSE OF THIS...PRECIPITATION TOTALS HAVE INCREASED IN THE RAP MODEL TO 0.80 TO 1.50 INCHES IN PARTS OF LARIMER...WELD AND BOULDER COUNTIES. THE HRRR IS ALSO SHOWING THIS INCREASE IN PRECIPITATION. THE 18Z GFS AND NAM ALSO HINTED AT THIS AS WELL WITH A SHIFT WESTWARD AND AN INCREASE IN PRECIPITATION AROUND 12Z. UPGRADED THESE AREAS TO WINTER STORM WARNINGS AND WELD COUNTY TO A BLIZZARD WARNING DUE TO THE STRONGER WINDS. BECAUSE OF THIS...THE EASTERN PLAINS TOTALS MAY BE A LITTLE LOWER...BUT THE SNOW AND STRONG WINDS ARE STILL EXPECTED TO PRODUCE BLIZZARD CONDITIONS.**

**Amber L. Motley, Manager, Short Term Forecasting, California Independent System Operator (CAISO)**

“Improvements that have been made within the HRRR model over the years have been important factors to assist with real-time solar and wind forecasting accuracy. One example was in relation to HRRR v2 changes were made to the downward shortwave flux at the surface assisting with the model bias that existed previously of having an average excess of ~80 to 100 W/m<sup>2</sup> of incoming shortwave radiation. More changes have been made to the model since then, making this model an important tool to use for more real-time forecasting for the energy industry.”

**Decision Support**

**Paul Schlatter, NWS Boulder Weather Forecast Office, Sciences and Operations Officer (SOO). 9/16/2020 NWA Annual Meeting Presentation “Probabilistic Snow Forecasts for Denver International Airport”**

**“Improved Presentation and Use of Probabilistic Forecast Products”**

- Numerous in-person interviews
- Attended coordination calls
- Tag-alongs with plow operators

• SREF, HRRRE, WFO Boulder PSAs for an analysis of forecast accuracy

• Tool development

→ WFO Boulder grateful for the collaboration with GSL!

**NCAR**  
NATIONAL CENTER FOR ATMOSPHERIC RESEARCH

National Oceanic and Atmospheric Administration  
U.S. Department of Commerce  
Earth System Research Laboratory  
**Global Systems Division**  
*Research today for better forecasts tomorrow*

## Decision Support - Hazard Services

### Margaret, Meteorologist - NWS Gray, ME

“The GSL Hazard services program is probably the best development effort I have seen in my 10 years with the National Weather Service. As a test site I have found the developers very attentive to not only any problems with the software but also to the users requests and suggestions. Changes I have suggested to the structure of the code to improve configuration management in the field have been quickly adapted and incorporated into the baseline. I have also been impressed with the documentation, which is readily accessible and frequently updated as well as the utility for patching Hazard Services which makes it easier to keep track of the rapid updates. Programs are only as good as they are able to be implemented and used by the field and Hazard Services is doing an excellent job of ensuring field offices have what they need to utilize the software.”

### Nicole McGavock, Service Hydrologist - NWS Tulsa, OK

“It has been a pleasure working with GSL on the Hazard Services Project. The iterative process GSL uses between its software developers and the software users has yielded a warning software package that is usable and meets the varied needs of the NWS. Not only is GSL open to feedback from the NWS, but actively seeks it. Needed changes, both in the developmental phase as well as patches for the current operational phase, have a fast turnaround time, which is greatly appreciated. GSL has also gone the extra mile by providing detailed documentation for users, including user guides and patch utility instructions. GSL balances the needs of replicating current functionality of the NWS software Hazard Services is replacing and maintaining a forward-thinking posture for the shift in paradigm Hazard Services will bring.”



**Phil Kurimski, Senior Meteorologist, NWS Green Bay, WI**

“I have been nothing short of impressed with how GSL has performed with Hazard Services. You often can fix problems in a matter of days and are very responsive to the needs of the field. I dare say if the rest of the applications were as efficient and responsive as GSL we would have a lot less issues in the field after a software upgrade. This program would be in serious trouble if GSL did not continue in its development!”

**Jonathan Lamb, Meteorologist, NWS Charleston, SC**

“Software developed by GSL is always nothing short of outstanding. Having been a NWS forecaster for 18 years and dealing with the software side of things for more than 12 years, I can say unequivocally that GSL software is the gold standard. Their technical ability, combined with their eagerness to fully understand the hows and whys of NWS operational software, including working directly with forecasters and field IT staff, results in a superior product for the agency. I am frequently wowed by the speed at which GSL can replicate, research, and develop a fix for incredibly complex issues that crop up during field testing. GSL really puts Raytheon to shame when it comes to providing the NWS with high-quality software in a timely manner. Best of all, the people working at GSL are some of the nicest, most humble folks I've ever encountered in NOAA. If only GSL could support the rest of AWIPS! We can only dream...”

**Jennifer Shomake, Forecaster at WFO Albuquerque, New Mexico**

“GSL's work on the Hazard Services Program has been nothing but impressive. The developers have been extremely quick to turnaround fixes and improvements that the field suggests. Often, these fixes come out in the next version of the ATAN, generally only a week or two down the road. I'm always grateful for their critical thinking when it comes to these changes. You can tell they are thought through, and won't have impacts to other features down the road. Furthermore, they are very good about detailing the pros and cons to each change in the weekly conference calls. All ATAN (Hazard Services) changes are also very well written and disseminated. Changing overrides and implementing new features would be much harder if it were not for the well-written release notes. So often in the NWS, new programs are implemented without enough feedback from the field and those using it and the rollout is not well-received. This has not been the case with Hazard Services and it has been very refreshing to work with GSL on this endeavor.”

**David Tomalak, Information Technology Office, NWS Boulder, CO**

“Working alongside GSL on various projects for well over 20 years, GSL has demonstrated the true definition of customer service. GSL values operational and customer feedback and always goes the extra mile to make sure needs are met. GSL's passion for customer service and support cannot be underestimated. Hazard Services is one such example. GSL's value in understanding National Weather Service (NWS) operations, and their core partners, has significantly increased their efficiency and productivity for this effort. Collaboration, along with an agile work environment, have played a significant role in quickly evolving and transitioning Hazard Services for the NWS. Hazard Services is complex and spans over multiple service areas. Hazard Services is not only built to help transition our warning process in the short term but also provides a framework for future growth and innovation in the long term.

Various weekly meetings, workshops, cloud instances, FATs, and an effective ATAN process, have allowed Hazard Services to evolve quickly over the past few years. GSL's ability to properly test, value training and documentation, and listen to feedback has helped further this process. Finally, relationships developed among NWS leadership, operational staff, academia, centers, and GSL have significantly enhanced this effort. GSL's talent, leadership and willingness to work alongside

NWS Leadership and operational staff has permitted GSL to not only make a positive contribution in the transition of Hazard Services but demonstrate an effective process for others to follow.

Bottom Line: Without GSL's leadership, process, and passion for our mission, Hazard Services would be well behind schedule and nowhere close to where it is today. Hazard Services is one of the best development projects of the National Weather Service and an example for others to follow."

**Virgil Middendorf, Information Technology Office, NWS Billings, MT**

"The NWS Billings Office has been working with GSL to test the new Hazard Services application for Winter and Non-Precipitation Weather Hazards for over 6 months. We went operational with the software early in March and the software has performed perfectly thus far.

My office constantly beta tests software on our operational computer systems and GSL has been the fastest in delivering bug fixes and needed enhancements of any organization that I have worked with. Many times we would get a fix within a week. GSL has weekly google-meets to run NWS field offices through the bug fixes and enhancements they are working on, to make sure the field offices get what they want with the software.

As long as Hazard Services is in development, I want GSL to be doing the work."

**Evan Bookbinder, Information Technology Officer, NWS Pittsburgh, PA**

"Over the past 7 years, I have been heavily involved in the design, testing, feedback and deployment of the NWS' next-generation warning software -- Hazard Services. As a 22 year NWS employee in the IT field, I have considerable experience working directly with many contract groups over the years with the AWIPS program. The first 4-5 years of my involvement with Hazard Services (2014-2018), under the direction of Raytheon Omaha were fraught with major problems across every aspect of the software -- all stemming from a core group of developers who simply did not understand NWS meteorologist operations nor ask for their input. It was all about the bottom line and not providing timely solutions to literally hundreds of software defects in their deliverables.

The transition of this project to GSL has brought a new life to the software that one could never have imagined. Under the incredible leadership of Darrel Kingfield, and the NWS liaison Dan Nietfield, the development of this application has not only accelerated at any amazing pace, but has meet numerous delivery milestones with flying colors. Darrel's group, including Jim Ramer, Vada Dreisbach and others, have been one of the most welcomed NWS-contractor partners in my 22 year career. This group FULLY understands NWS operations and policy, and immediately asks field subject matter experts for feedback when they don't. Their often-times daily communication with core team members is a breath of fresh air. We are always in perfect sync with understanding where the software is at, which allows development and addressing defects to occur in near real time. Software changes and adaptations occur without delay. The COVID pandemic has not slowed GSLs Hazard Services work in any capacity, and may have in fact accelerated it, being one of the first groups to make great utilization of virtual meetings, cloud-based tools for testing/development, and other technologies to keep the team motivated and moving forward.

I have also, in a more limited context, worked with GSL, primarily Tom Lefebvre in the Digital Aviation project. This interaction has also been positive. We only wish that more resources could

be dedicated toward its further development and research-to-operations.

If anything, I wish that many other aspects of the AWIPS program and the Raytheon contract would be transitioned to GSL if we could get anywhere near the impressive results we've seen from this group over the past few years. The group of people working for GSL is of the top echelon of work ethic, dedication and devotion to providing operational meteorologists with cutting edge, fully functional tools. Well done!"

"Phenomenally well expanded. Phenomenal job addressing what was brought up in October. Workflow makes sense. No reservations about moving forward."

**Samuel Shea: SOO - WFO Anchorage**

"Quite impressed. Nice leap forward. Need to make the code more efficient. There are many things that can be customized to cut down on the time needed. Everything is going great."

**Aldis Strautin: Service Hydrologist - WFO Grand Junction(re: HazSimp)**

"Good impressions; a few fixes needed - eg. dam breaks. There is a workaround in the IOC version for rainfall rate. This was a very large, multi part (three part), Winter Weather evaluation."

**Mike D'Angelo: Senior Forecaster - WFO State College, PA**

"I love what I see. There are some little bugs. Need different coloration for different fields. Need work on "Proposed" and then "Save" buttons. Pleased; went smoothly overall. Good knobology and workflows. Big improvement over October (2019) FAT."

**Shannon White: Meteorologist Instructor - Forecast Decision Training Division**

"Have a clear understanding on how to train the update. Not nearly the hurdle [I was] worried about in October. Lowest number of comments - 45 on Winter Weather and 13 on HazSimp."

"I was really worried about these workflows for long-fused products, (winter, etc...), but ever since GSL took this over and worked closely with all the forecasters, it's really been night and day. I'm very happy with the progress."

**Chris Jacobson: Senior Forecaster - WFO Key West, FL**

"It worked well... really good. Excellent test case and instructions."

**Thomas Pepe: General Forecaster - WFO Great Falls, MT**

"I'm ... really impressed. There are still a few things that need to be worked out, but it should be better for streamlining the way we deal with hazards."

"These are some of the best instructions I've ever seen for training or testing..."

**Ashley Kells, Mike Rega: NWS, Central Processing**

"Good collaboration between GSD and WFOBOU. Vada did a great job translating the Nov snow storm into Hazard Services."

**Jennifer Shoemaker, Forecaster at WFO Albuquerque, New Mexico**

"I've never issued a marine product in my life, but because the workflow is so simple and similar to other products, it was no problem to do that."

**Mark Armstrong, NWS Hazard Services Program Manager with NWS Office of Central Processing**

"This was, by far, the most positive feedback I've ever heard after a FAT."

**NWS WFO, Grey, ME**

"The GSL Hazard services program is probably the best development effort I have seen in my 10 years with the National Weather Service."

**NWS WFO, Charleston, SC**

"Software developed by GSL is always nothing short of outstanding. Having been a NWS forecaster for 18 years and dealing with the software side of things for more than 12 years, I can say unequivocally that GSL software is the gold standard."

**NWS WFO, Albuquerque, NM**

"So often in the NWS, new programs are implemented without enough feedback from the field and those using it and the rollout is not well-received. This has not been the case with Hazard Services and it has been very refreshing to work with GSL on this endeavor."

**NWS WFO, Pittsburgh, PA**

"The transition of this project to GSL has brought a new life to the software that one could never have imagined...The group of people working for GSL is of the top echelon of work ethic, dedication and devotion to providing operational meteorologists with cutting edge, fully functional tools."

**NWS WFO, Billings, MT**

"As long as Hazard Services is in development, I want GSL to be doing the work."

**NWS WFO, Tulsa, OK**

"The iterative process GSL uses between its software developers and the software users has yielded a warning software package that is usable and meets the varied needs of the NWS. Not only is GSL open to feedback from the NWS, but actively seeks it. Needed changes, both in the developmental phase as well as patches for the current operational phase, have a fast turnaround time, which is greatly appreciated. GSL has also gone the extra mile by providing detailed documentation for users, including user guides and patch utility instructions. GSL balances the needs of replicating current functionality of the NWS software Hazard Services is replacing and maintaining a forward-thinking posture for the shift in paradigm Hazard Services will bring."

**NWS WFO, Green Bay, WI**

"I dare say if the rest of the applications were as efficient and responsive as GSL we would have a lot less issues in the field after a software upgrade. This program would be in serious trouble if GSL did not continue in its development!"

**Decision Support - Graphical Forecast Monitor****Sutton, NWS WFO, Grand Rapids, MI**

"GFM is a great Situational Awareness tool for field sites. It allows forecasters to determine at a glance if the forecast is on track, or if adjustments are needed. Additionally, it allows you to determine which parameter(s) need attention at a glance. From a system administration/AWIPS focal point perspective, it helps the field know that the system is still working as expected. The addition of marine site monitoring capabilities helps WFOs with marine responsibility, as offshore and nearshore locations can be monitored easily. Again, GFM allows you to combine the standard land-based observations with marine observations in one view, which helps operations."

**NWS WFO, Boulder, CO**

"The GFM has been a valuable addition to our Enhanced Short Term Forecast (ESTF) program at WFO BOU. We keep the GFM displayed on our SA monitors in the center of the operations room, allowing the short-term forecaster or mesoanalyst to keep strong situational awareness regarding short-term forecasts and trends. We find the color coding quite advantageous for a quick look at how our existing forecast compares to real observations (METAR or GFE Obs). This allows the forecaster to obtain a quick glance and overview of how the forecast is evolving and if any short-term updates should be made. We have been very happy that the WFO feedback to the GFM team has been well received and acted upon. An example of this was the changing of the color coding for aviation impacts, determining what matched critical MVFR/IFR/Flight categories and then coding according to differences in these categories based upon visibility and/or ceiling differences.

We feel further expansion of the GFM into forecast monitoring tools could be well received at local forecast offices. Ideas would include: Ability to compare future forecasts and current

observations with various model output, similar to what was available in the Grid Monitor tool, and the ability to use the tool to compare PoPs to radar and sky cover to satellite. I could see this bleeding over into using the data to provide a good first guess similar to what's being done in the Central Region ESTF initiative. “

### **NWS WFO, Morristown, TN**

“The GFE Forecast Monitor (GFM) is a great tool to help maintain situational awareness of our hourly forecast. Essentially, the review from one of our forecasters clearly states its usefulness, "Without it (the GFM), it would be much harder for me to maintain awareness of how my forecast was doing." The GFM is the only tool available that helps forecasters check their current GFE forecast to area METAR observations, RTMA or GFE Obs, in an easy-to-understand monitor display. From a specialized program perspective, The Relative Humidity and Wind Speeds forecast -vs- observation check quickly alerts us via the color scale when our fire weather forecast needs updated. This can be critical due active fire activity.

The main developer of the application, Paula McCaslin, has always been very responsive to suggestions and a great person to work with. She quickly responds back to our emails. The GFM has become a very stable and dependable application. I can definitely recommend this application to other field offices across the NWS. I can also envision further development of the GFM to include the ability to monitor backup offices.”

### **McDonald, NWS WFO, Riverton, WY**

“GFE Forecast Monitor is an indispensable tool in AWIPS to help forecasters maintain situational awareness between current observations and the current forecast. It is easy to configure and easy to use. The display is great to read and quickly discern information, especially in the forecast where action needs to be taken. I encourage every forecaster to use this tool operationally, every shift. The Grid Monitor GUI has not been used at RIW, with minimal configuration for use - would like more training on how to use this feature.

RIW would really like GFM to be configurable in service backup situations. In addition, there seems to be a limit on the number of sites that can be configured for display in the GUI.”