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Operational Analysis –FY2010

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Executive Summary

This 300 addresses the IT portion of AHPS (Advanced Hydrologic Prediction Service), NOAA's Water Resources program, and the IT elements of the OHD organization.

NOAA's Water Resources program improves NOAA's suite of products by investing in research and development to advance science of hydrologic prediction and to advance science and technology of hydrologic observing systems. The IT investment for this program focuses on (1) generating gridded forecast and water resource information for the entire U.S., (2) opening the hydrologic modeling system using a service oriented architecture approach, and (3) developing products and techniques for disseminating those products.

The Advanced Hydrologic Prediction Service (AHPS) improves flash flood and river forecasts by the infusion of new science and technology, and provides maintenance and upgrades for OHD software.

As of September 30, 2010, the OHD systems are (1) Hydrometeorological Automated Data System (HADS) and (2) Development Environment Information Technology (DEIT). HADS provides

hydrometeorological observational information to NOAA operational and laboratory facilities. DEIT is the local set of systems used for software development and testing. Due to reorganization within the National Weather Service, the FY11 OHD investment will also include the system used by the National Operational Hydrologic Remote Sensing Center (NOHRSC, NOAA8874).

This investment supports NOAA's Strategic Plan Mission Goal 3, to serve society's needs for weather and water information. This includes the delivery of flash and river flood watches and warnings for emergency response and river and lake level forecasts to water resource managers to optimize decisions concerning flood control, water supply, river and lake transportation, irrigation, hydropower, ecological maintenance, and recreational usage.

There are no alternative sources in the public or private sectors that could perform this function. NOAA is the only agency whose mission is to produce forecast and warnings for rivers, lake levels, floods and droughts. The Organic Act, passed in October 1890, assigns the reporting of river levels and flood forecasting to the Weather Bureau, now the National Weather Service. Public Law 107-253, the Inland Flood Forecasting and Warning System Act of 2002, direct NOAA to improve the capability to accurately forecast inland flooding, including flooding caused by coastal and ocean storms, through research and modeling, training, and outreach.

This report focuses on the operational state of the program as of September 30, 2009, and is based on guidance developed by the Department of Commerce. OHD directly facilitates NOAA's Strategic Goal to "Advance understanding and predict changes in the Earth's environment to meet America's economic, social, and environmental needs." The current program meets established cost, schedule and performance parameters.

This operational analysis (OA) is an annual, in-depth review of the program's performance based on the following:

- Customer Results
- Strategic and Business Results
- Financial Performance
- Innovation

1.0 Customer Results

OHD leads the research and development activities for NOAA's Hydrology Program. The Hydrology Program supports its customers by providing river level, flood and flash-flood forecast and warnings, water resource information. Customers include emergency response managers; other federal, state and local water management associations; and the general public. Emergency managers use the forecasts and warnings for both strategic, long-term planning as well as tactical, short-term planning. Water resource managers make critical decisions that affect flood control, water supply, river and lake transportation, agriculture and hydropower.

The Hydrology Program provides critical information which provided an estimated cost savings of over $943M annually in FY07 dollars. Details of the economical benefits are described in Use and Benefits of the National Weather Service River and Flood Forecasts.

1.1 Customer Requirements and Costs

The Hydrology Program completed its third biennial American Customer Satisfaction Index (ACSI) survey of emergency response managers in FY08; other federal, state and local water management associations; and the general public to identify successes along with areas for improvement. ACSI is a uniform, cross-industry measure of satisfaction with goods and services available to U.S. consumers, including both the private and public sectors. The ACSI methodology is used within the Hydrology Program to identify areas of customer satisfaction and, more importantly, dissatisfaction. This will help the Hydrology Program address areas to improve services.

The survey has shown customer satisfaction with hydrologic services (score = 80) to be higher than average for other Federal programs (score = 68). The composite score reflects improved customer satisfaction with web products, water supply and reservoir information, and drought information. The survey also shows an overall improvement in the survey respondent's confidence in the National Weather Service.

The program also continually solicits customer feedback from on its Web pages and evaluates it on a regular basis to prioritize the need for improved or new water forecast information products and services. Additionally, the Hydrologic Service Division (HSD) leads a customer outreach program which serves as the interagency liaison, maintains policy and requirements for and assesses the performance of the overall hydrologic services program and provides technical support for the River Forecast Centers (RFC) and Weather Forecast Office (WFO) hydrologic operations.

Hydrological services are provided through NWS Web pages at no cost to its customers.

1.2 Performance Measures

These measures align with the "Customer Results Measurement Area" of the Performance Reference Model developed by the Federal Enterprise Architecture Program Management Office (FEA-PMO). Table 1 summarizes the performance measures.

Table 1: Customer Results Performance Measures

Measurement Area	Indicator	FY10 Target	FY10Actual Result	Comments
Customer Requirements	Hydrology program customer satisfaction index	79	80	
	Hydromet observation data delivery to NWS field offices (Minutes)	3.0 Minutes	2.3 Minutes	
	OHD development environment IT availability	95%	97%	

2.0 Strategic and Business Results

OHD and the Hydrology Program facilitate NOAA's Strategic Plan Mission Goal to serve society's needs for weather and water information. Goals and objectives for the past year have been met or

exceeded as the result of program management and monitoring processes in place to ensure continued progress. In addition to program initiated controls, independent evaluations are routinely and independently conducted to ensure the program is effectively accomplishing its mission and meeting its long-term goals.

2.1 The Hydrology Program Helps to Achieve Strategic Goals

The Hydrology Program supports the DOC Strategic Goal 3.1 "Advance understanding and predict changes in the Earth's environment to meet America's economic, social, and environmental needs" and the NOAA Goal to "Serve Society's Needs for Weather and Water Information".

Listed below are activities which support the DOC and NOAA goals:

- Implement River and Lake Probabilistic Forecasts locations which incorporate new science to improve forecasts and provide probabilistic information which provides users with information to make risk based decisions.
- Reduce the time for delivery of Hydromet Information to NWS field Offices. Timeliness in delivering data contributes to the efficiency and accuracy for forecast issued by the operational facilities.

2.2 Business Results

2.2.1 Program Management and Controls

The Hydrology Program collects performance information to manage and improve the program; this includes quarterly measures such as flash-flood forecast accuracy and lead times which help evaluate the adequacy of training programs, hydrologic tools and procedures used by forecasters to generate and issue forecasts; and measures such as schedule performance and implementation status to measure timely delivery of services. These measures are reviewed by managers during monthly, quarterly and annual review to evaluate system performance.

Project statuses are reported monthly to the OHD Director to ensure that project targets and goals detailed in the Annual Operating Plan (AOP) are being attained. The OHD Director presents quarterly program updates on cost, schedule and performance to the NOAA executive panel which oversees the NOAA planning, programming and budgeting process. The NOAA Deputy Undersecretary who heads this panel, then meets with the NOAA administrator on a quarterly basis to review cost, schedule and performance result for all NOAA programs.

2.2.2 Monitoring Cost, Schedule and Performance

<u>Cost</u> – The cost for the Hydrology Program in monitored through a monthly report prepared by the OHD financial officer. The report contains financial information on estimated and actual costs versus projected program cost. Monthly budget reviews are held by the Hydrology Program Manager to assure the program is being managed with cost and schedule. Quarterly reports are submitted to the NOAA executive

<u>Schedule</u> – Key milestones contained in the Annual Operating Plan (AOP) are evaluated each month by project managers. The Hydrology Program 'Quad Chart' contains schedule information which is

prepared for the NOAA Deputy Undersecretary each quarter. The Exhibit 300 schedule information is updated monthly in compliance with IT Dashboard requirements. Milestones have consistently been accomplished on or ahead of schedule.

Performance – Performance measures, including cost and schedule are review monthly at the program level. Quarterly and annual reviews are conducted at the NOAA executive level to assure compliance with baseline measures.

2.4 Security

The HADS and DEIT systems are accredited under requirements spelled out in NOA 212-13 (08/06/90) and NWS Information Technology Security Policy that are based on OMB and NIST guidance. System Security Plans, Risk Assessments, and Contingency Plans were certified and approved in August 2007. New Certification and Accreditations (C&A) were completed in January 2008. Management, operational, and technical security controls are adequate to ensure the confidentiality, integrity and availability of information. OHD successfully completed the annual FISMA requirement for continuous monitoring in August 2010. This requirement includes review and testing of contingency plans. Vulnerability scans are performed quarterly, and more general system security / antivirus scans are performed weekly. FY2010 POA&M actions were completed on time. All current POA&M actions are on target for timely completion.

2.5 Performance Measure

In November 2007 the National Weather Service approved a new baseline for the "River and Lake Probabilistic Forecasts" performance measure. OHD successfully implemented its target of 243 new service locations for FY2010. By the end of FY10, AHPS services were available at 2,733 locations. A 20-location deficit due to reduced FY08 funding was carried through this year.

The performance measure in Table 2 shows the Hydrology Program performance with respect to Strategic and Business Results. Strategic and Business Results performance measures introduced in FY2000 include the number of locations reporting River and Lake Probabilistic Forecasts. These measures align with the Strategic and Business Results Measurement Area, of the Performance Reference Model developed by the FEA-PMO.

Table 2: Business Results Performance Measures

Measurement Area	Indicator	FY2010 Target	FY2010 Actual Result	Comments
Strategic and Business Results	River and Lake Probabilistic Forecasts (Locations)	2753 Locations	2733 Locations	243 new locations implemented.

3.0 Financial Performance

3.1 Current Performance vs. Baseline

The current OHD financial performance, shown in Figure 2, is based on a pre-established cost baseline (e.g., annual spend plan). Program costs are steady state and consist of staffing and contractor expenditures, and information technology equipment such as routers, desktops and data storage devices. Other planned project costs cover the support and services contracts at each data center.

The total OHD IT expenditures in FY10 were $4.61M, which is $126K (2.8%) over budget.

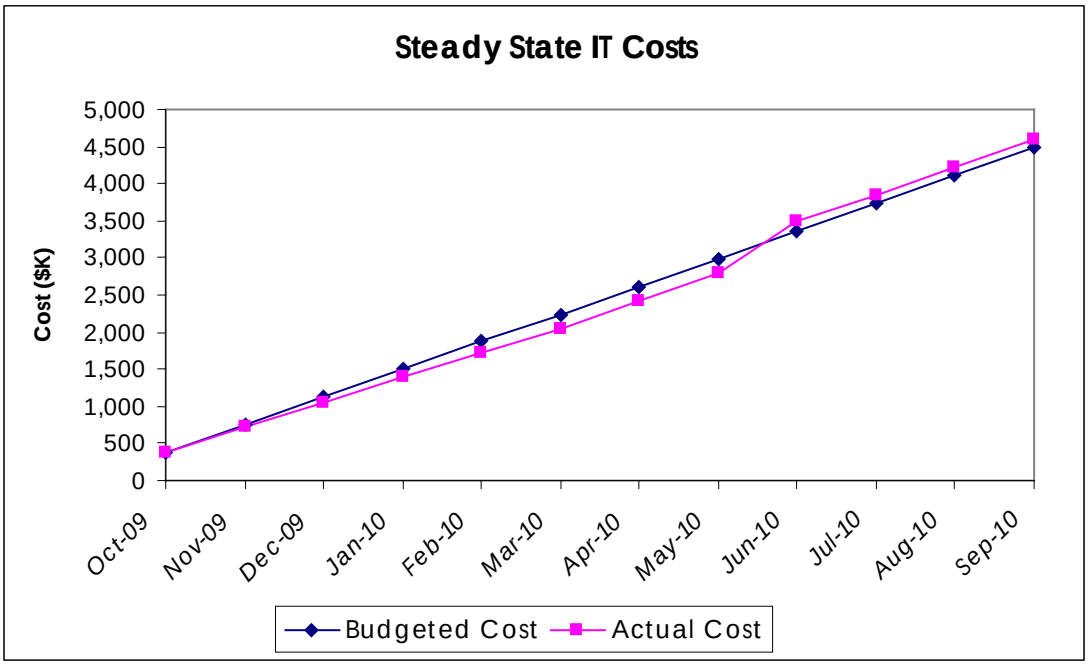

Figure 2: Budget vs. Actual Costs

3.2 Financial Performance Review

OHD's annual spend plan determines the specific dollars to be applied to scientific research (non-IT) and software development / equipment support (steady state IT).

Financial performance is typically subjected to a periodic review for reasonableness and cost efficiency. Weekly budget discussions are held with the program manager, CORs and contract managers to ensure contracts are within cost and on schedule. The contractors issue monthly invoices for all products and services supplied under the contract. These are tracked and evaluated by the COR as well as each government task manager who is responsible for issuing the task order and monitoring the task for deliverables and for the quality assurance of these products and services. Progress meetings are conducted to review each task for its progress, quality, and costs. A detailed review of work and priorities is undertaken if cost is significantly above base lined values. Also, any necessary corrective actions are also identified and implemented.

OHD uses the General Services Administration's (GSA) Federal Supply Schedule Contract Blanket Purchase Agreements (BPAs). The BPAs eliminate contracting and open market costs such as: the search for sources; the development of technical documents and solicitations; and the evaluation of bids and offers. The BPAs further decrease costs, reduce paperwork and save time by eliminating the need for repetitive, individual purchases from the schedule contract. This creates a purchasing

mechanism that works better and costs less. By using BPAs, purchases cannot exceed funds available thus always keeping the program within budget.

The OHD funding requirements discussed in this OA report cover a significant portion of the "Support" capability within NOAA's Hydrology Program. The cost lines are reviewed on an annual basis as part of NOAA's Planning Programming Budgeting and Execution System (PPBES) process.

4.0 Innovation to Meet Future Customer Needs

The following work highlights the efforts in the past year to address future challenges, better meet customer needs, make better use of technology, and lower operating costs.

4.1 Next Generation Radar (NEXRAD) Software

OHD Supported the release of NEXRAD release Builds 11.2 and 12. Build 11.2 provided security updates and fixes an issue with the Radar Data Acquisition (RDA). Build 12 is currently under System Test with deployment scheduled to begin in January 2011. The major changes with this build include extending the 8-bit super-res velocity and storm relative velocity products to a range of 300 km and providing a new scanning strategy called the Automated Volume Scan Evaluation and Termination (AVSET) which provides faster volume scan updates for all volume coverage patterns. For more information on AVSET, see http://www.roc.noaa.gov/WSR88D/PublicDocs/NewTechnology/AVSET_FAQs030910.pdf. For this build, HSEB fixed a task fault in the Precipitation Preprocessing Subsystem (PPS).

DUAL POLARIZATION:

The formal testing for the NEXRAD dual polarization upgrade began in April 2010. HSEB tested the software for the dual polarization QPE algorithm and products which they delivered to the ROC. In addition, HSEB helped ROC and OST assess the quality of the data output by the test-bed radar that has been upgraded with dual polarization by the contractor, Level III communications.

During our quantitative evaluation of the dual polarization QPE algorithm, OHD identified a number of issues and is working mainly with the algorithm source scientists at NSSL to correct the issues. For dual polarization QPE issues, NSSL provides corrections, and OHD validates and implements the fixes in the operational baseline. In addition, OHD is part of a team of dual polarization experts, including ROC, NSSL, WDTB, and SEC, which oversees the evaluation of dual polarization data quality and algorithms.

Although all of the dual polarization QPE algorithm issues will not be fixed in the initial dual polarization build (RPG Build 12.1), we plan to have the most serious issues fixed soon after dual polarization hardware deployment begins. Some of these algorithm issues have arisen seemingly late in the dual polarization program because of 1) a lack of consistent quality data from the test-bed radar (KOUN) and 2) a lack of diversity of climate and terrain at KOUN. The calibration problem (mentioned above) causes a high bias in Zdr and results in underestimation by the DP QPE. The dual polarization contractor (Level 3 Communications) is working to solve this issue.

4.2 AWIPS Release OB9.2

The deployment of OB9.2 release, which contained fixes for several bugs and the MPE/Daily QC changes for NMQ and CHPS, was completed. Several catastrophic releases (OB9.2.x) of the AWIPS software were deployed later. While some of the fixes affected hydro software, HSEB acted as a consultant rather than directly contributing to the software changes. OB9.3 was canceled.

PRECIPITATION PROCESSING IMPROVEMENTS

The MPE/Daily QC changes are described below in more detail. The changes related to CHPS are described in the CHPS Forcings section.

For 1-hr MPE precip processing, new options were added to read, process, and display NMQ-based grids. NMQ is an experimental system developed and maintained by NSSL; for more information see http://nmq.ou.edu/. The new options include the ability to read and display the raw radar-only NMQ grid and to use the raw grid to generate a local-bias corrected grid. The local-bias corrected grid can be used to generate a multi-sensor grid using the same algorithm used to generate the other multi-sensor grids within MPE. For Satellite-Radar-Gage (SRG) fields, a check was added so that if a top-of-the-hour satellite product is missing, MPE will look for a 15 minute after-the-hour product.

For 6-hr and 24-hr MPE/Daily QC precip processing, new options to generate netCDF format files and GRIB1 format files were added. The netCDF format files can be read by GFE. Also, the ability for the forecaster to edit a time distributed 6hr precip value was added.

4.3 AWIPS 2

HSEB personnel supported the testing of the interim releases of AWIPS II software provided by Raytheon. As a part of this effort, HSEB wrote additional test procedures to eliminate gaps in testing coverage of hydro applications as critical or important to test.

HSEB developers have begun examining the AWIPS II source code in anticipation of beginning to develop enhancements which will be delivered in the AWIPS II environment. The first enhancements of this type are planned to be those needed to support the hydrometeorological forcings for CHPS, i.e., MPE/DailyQC.

OHD has been working with OST to advance the completion of some of this software (especially MPE/DailyQC) to allow us to have more time with it prior to the beginning of the Field OT&E, which is currently slated to begin in February, 2011.

In August, OHD sent a developer to Omaha to work out a mechanism for collaborative development with Raytheon. The OHD AWIPS II development environment is being set up to allow for such collaboration.

4.4 Community Hydrologic Prediction System (CHPS)

Visit the CHPS web site at http://www.nws.noaa.gov/ohd/hrl/chps/index.html to review the history of the project. The "News & Activities" section contains reports from these HSEB quarterly newsletters. The CHPS page can also be accessed from the main OHD page (http://www.nws.noaa.gov/ohd/).

CHPS PROJECT MANAGEMENT TEAM

CHPS migration is split between a pilot group (the CHPS Acceleration Team, or CAT), followed by the remaining offices (CAT-II). Each CAT-II office has a CAT "buddy" to help them transition to CHPS. The CAT weekly conference call minutes are available at http://www.nws.noaa.gov/oh/hrl/chps/meeting_minutes.html.

CAT: Deltares led two days of CHPS User Training at each of the CAT RFCs in early October. At ABRFC, CNRFC, and NWRFC the first day was comprised of presentations and exercises to teach forecasters how to use some basic CHPS Interactive Forecast Display (IFD) capabilities.

The second day provided an opportunity for forecasters to exercise their new skills during a predefined major flood event. CHPS User Training at NERFC was handled slightly differently; in this case, Deltares provided "Day 1" of the schedule to half of the staff, followed the next day by a repeat of the same material for the remaining staff. A "Day 2" training class was subsequently provided to NERFC in early December. Dave Cokely from the NWS Training Center (NWSTC) attended the training sessions at ABRFC.

During the software acceptance test (SAT) at OHD on December 7-11, forecasters from NWRFC and NERFC conducted further testing of the IFD. The latest version provided significant enhancements to the previous release which was distributed in September, and which formed the basis for CAT RFC forecaster training. Work on the IFD continues, with limited changes (primarily bug fixes, and some remaining missing functionality) expected in a late January release. Joe Ostrowski from MARFC (a CAT-II RFC) also participated in this SAT.

In November and December ABRFC and NERFC moved into the "parallel operations" phase of the project. This involves using CHPS for the first time in a more realistic environment; i.e., running through selected basins/forecast groups in a practice mode. No operational forecast products are generated during this phase.

CHPS Acceleration Team (CAT)

The CAT held a workshop in Silver Spring during the week of January 5. With the CAT-II offices just beginning to migrate their operations to CHPS (see below), the primary focus is to ensure Deltares, HSD, and OHD have the necessary resources to support 13 RFCs during the transition.

Forecasters from NWRFC and NERFC conducted further testing of the Interactive Forecast Display (IFD) during Software Acceptance Testing (SAT) in March. This latest version of the CHPS interface provides enhanced performance as well as some greatly anticipated functionality. We did experience some issues concerning consistency of environments between the RFCs, the NHOR, and the test system in Delft; in the coming months we will take steps to configure the NHOR machine in Silver Spring to more accurately reflect one of the CAT RFCs.

During a meeting in March, the CAT agreed to suspend work on the CHPS-based calibration until Deltares has developed enough of an Application Programming Interface (API) that will permit OHD to add user interfaces on top of FEWS without impacting FEWS itself. Deltares took an action to form a small API team, create a plan, and do some development. FEWS already addresses the vast majority of the calibration requirements; OHD is in the process of learning FEWS and identifying the relevant capabilities before defining the remaining requirements.

Although the original schedule called for these RFCs to "Go Live" with CHPS in approximately April 2010, some technical issues over the past winter, such as missing or incomplete functionality and sluggish system performance, have prevented them from switching to CHPS as the primary system in operations. With the completion of an Advanced Configuration Training class in June at NWRFC in Portland, OR the CATs have received all formal training from Deltares under the CHPS Implementation contract. Any further training needs for the CAT will be assessed and handled via other mechanisms.

After the March Software Acceptance Testing (SAT) in Silver Spring, the CAT representatives concluded there was no need to personally attend the SAT scheduled for June. Instead Deltares adjusted the plan to conduct some of the testing in Silver Spring with HSEB staff, followed by field (beta) testing at the CAT RFCs and subsequent distribution to the CAT-II offices. Accordingly, the June release is (as of June 30) being tested by the 4 CAT RFCs, with distribution to the CAT-II expected soon.

During the week of May 10 the CAT held a 3-day workshop at CNRFC in Sacramento, CA. The primary focus has now shifted away from CHPS software functional requirements to operational support. The threat of inadequate support coverage is now a show-stopper for the CAT RFCs. In response to their concerns HSEB has directed all 12 CHPS software developers to participate in operational support activities. Developers have begun their training via a combination of attendance at available classes, weekly mentoring from Deltares, and experience with real questions and problems posted by the RFCs. Two of HSEB's developers (Ai Vo and Xuning Tan) attended the Advanced Configuration Training at NWRFC in April. Developers will form support team pairs containing one more knowledgeable individual and one individual with less CHPS experience.

Ultimately each developer will be available to provide individual support.
In August ABRFC and NWRFC issued their very first operational products using CHPS! This momentous occasion was captured in a NWS News (NWSN) article dated September 3, 2010 ("Retirement News: NWSRFS Submits its Papers! CHPS Taking Over.").
A technical problem subsequently prevented ABRFC from continuing to use CHPS in operations; ABRFC did however return to operational use of CHPS in September once the problem was addressed. Meanwhile the NWRFC began using CHPS in their routine operations as part of a "shake down" period; their goal is to evaluate the readiness of the system in all aspects (functional completeness, system performance and reliability, and quality of operational support). In both cases the RFCs are running NWSRFS in "quiescent" mode as a backup should CHPS fail for some reason. The remaining two CAT RFCs (CNRFC and NERFC) plan to go operational with CHPS over the next few months with CNRFC starting in mid-October.
Also in August, OCWWS HSD arranged for special advanced system manager training for the CAT RFCs using leftover FY10 NSTEP funds. A FEWS system expert from Deltares, Frederick van den Broek, met in Silver Spring, MD with CHPS system managers from all four CAT RFCs to provide some supplemental training and troubleshooting techniques.
Deltares and OHD announced that the September release of CHPS would be the first to meet all of the BOC functional requirements, and would include some significant performance improvements. Based on the CAT's decision in March to forego further attendance at Software Acceptance Testing (SAT) in Silver Spring, the project manager instead arranged for Deltares to lead daily conference calls during the Beta testing period of this release, to facilitate accurate and complete information sharing when problems are encountered, and to enable fast turnaround of software fixes. So far this approach seems to be going well. A more formal SAT (required for hand-off from the contractor to the government) will occur in October at the very end of Beta testing. The release is scheduled to be deployed to the CAT-II RFCs in mid-October.
CAT-II: To satisfy a request from Deltares for current station point data and mean areal data from the CAT-II distributed a CHPS version of the ofsde program to those RFCs. The CHPS version of ofsde produces slightly enhanced station data. This enhanced station data, along with basin average data (mean areals) from the NWSRFS fs5files, will be shipped to Deltares via NOHRSC to provide test data for the CAT-II initial basin configurations.
Deltares conducted Migration & Configuration Training for CAT-II RFCs in February. CAT representatives ("buddies"), OHD, OCWWS HSD, and others also attended the training. Immediately following Migration training, Deltares and the CAT "buddies" conducted on-site visits for all CAT-II RFCs, during which time Deltares installed the first release of CHPS at those sites.
In May Deltares delivered to the CAT-II RFCs a System Manager's Training class. Originally scheduled for April, the class was postponed until May due to ash clouds from the eruption of an Icelandic volcano, grounding flights from the Netherlands. The CAT "buddy" RFCs also attended the training to provide additional support for the CAT-II.
A national RFC CHPS workshop was held during the week of June 21 at the UCAR facility in Boulder, CO. This provided an opportunity for the CATs to give a detailed view of their CHPS activities along with some planning advice for the CAT-II RFCs; the CATs laid out a tentative timeline to get all CAT-IIs to CHPS operations by April 2011. Going operational with CHPS will, however, be a local decision made by each RFC. Securing adequately experienced HSD and HSEB resources to support all 13 RFCs using CHPS operationally is now on the critical path for completion of the project.

CHPS COMMUNITY

The subject of community is beginning to play an important role as the NWS gets closer to implementing CHPS. HSEB has begun discussions with the Bonneville Power Administration (BPA) in Portland, OR, which has plans to implement CHPS over the next several years. With common

interests and a shared desire to leverage capabilities developed by or for either federal entity, HSEB and BPA are discussing ways to share CHPS-based tools and information and pilot some mechanisms. We have begun monthly conference calls.

CHPS HARDWARE

During January and February 2010 the CAT-II RFCs installed the first set of CHPS hardware; OCWWS HSD subsequently installed the FEWS infrastructure software. The second CHPS hardware purchase for the CAT-II RFCs was completed over the Summer. OCWWS HSD is working on the installation procedures ("Mod Note") for distribution next quarter; HSD will lead the installations.

CHPS SOFTWARE

HSEB developers finished migration and testing of the legacy models required for BOC II. The models were formally tested in December. With the conclusion of the December SAT, the initial model development for BOC is complete. In addition, the BOC implementation of various baseline ensemble programs was also completed and tested, including ENS_PRE, ENS_POST, and ESPADP Input Generator. Any future development for BOC models will be in response to bug fixes or enhancements.

HSEB developers worked on non-model related BOC features. These will be tested and delivered as part of future CHPS builds They include

1. A utility to automatically convert NWSRFS mods to FEWS xml files through IFP.
Currently only the SSARREG, WECHNG and SETQMEAN have been identified as needed for BOC
2. Generating headwater flash flood guidance (FFH) and area based flash flood guidance (FFG) in CHPS. This consists of porting the existing NWSRFS algorithms to CHPS and includes generating the SHEF formatted text products for FFH and FFG and the GRIB formatted grid product for FFG. With the September release the following FFG related capabilities will be available: (1) The ability to use the existing FFH algorithms along with functionality for creating the FFH SHEF-encoded text product; (2) The ability to use the existing gridded FFG (i.e., the legacy version of FFG available in NWSRFS; gridded in that the result is a grid of FFG values) along products with the functionality for creating the FFG SHEF-encoded text and grib products; and (3) An automated way of going from NWS RFS FFG configurations (FFH and GriddedFFG) to FEWS configurations.
3. Porting the parts of the Site Specific Hydrologic Predictor (SSHP) that are responsible for extracting data from the RFS data base for transmission to the WFOs and eventual use by SSHP. Note: the program used today extracts data from NWSRFS FS5FILES, but the future program will extract the data from the FEWS DB. The SSHP data extraction utility is targeted for the December 2010 release.
4. Improve the performance of ESP runs (by using multi-threaded FEWS option). Initial testing showed good results. ABRFC noted model runtime went from 15:58 to 10:41, and ESP runs were down from 15m 52s without multi-threading to 7m 3s with 8 processors. The ability to use multi-threaded ESP runs will be released as soon as possible

HSEB developers attended CHPS training with a view to providing operational support when called upon by HSD. Training involved attendance at RFC training classes (as space permits), plus weekly coaching sessions provided by Deltares at OHD. HSEB developers have now started fielding CHPS support issues. Our developers are delving into all areas of CHPS for the purpose of training and improving CHPS support. We've set up an internal buddy system where a pair of developers works on issues originally posted to the chps_ofs infolist and then passed on to HSEB from HSD. All indications are the CHPS support is adequate and our HSEB folks are getting valuable hands-on training.

CHPS FORCINGS

Progress towards generating gridded forcings for use in CHPS continued. The list-server continues to be used as a medium for discussion between RFCs of the setup and use of MPE/DailyQC.

OHD completed upgrades to MPE/DailyQC to generate grids in netCDF and GRIB1 formats. The netCDF format grid can be ingested by GFE for further processing. The GRIB1 format file can be sent directly to CHPS. The NC2GRIB application can be used to transform netCDF format files (output from GFE or MPE/DailyQC) into GRIB1 format. This application offers a second pathway for generating grids to be ingested by CHPS. OHD worked with NWRFC and Deltares personnel to successfully test ingest of GRIB1 format grids into CHPS. The NC2GRIB application is not part of the AWIPS baseline and is available from HSEB (contact Paul Tilles or Joe Gofus for the application).

HSEB developers completed changes to MPE/DailyQC aimed at AWIPS Release OB9.2 and provided support for OB9.2 testing. In addition, developers are working on a few further enhancements which have been identified as being necessary for smooth operations in CHPS. These enhancements will be completed and tested under an ATAN at the CAT RFCs after OB9.2 has been deployed.

Webinars were held in December and January 15 to provide an overview of MPE/DailyQC with a focus on those RFCs which are not yet using the application. Subsequently, HSEB worked with the CAT II RFCs and HSD to create and prioritize a list of "showstopper" issues which would need to be addressed before the CAT II RFCs could effectively use MPE/DailyQC to generate gridded input for CHPS operations. HSEB completed work on the list of "show-stopper" issues in Q4.

Note that these "show-stopper" changes are beyond what is available in AWIPS OB9.2.x. HSEB is making plans to ensure that these enhancements will be available in the AWIPS II environment as soon as possible after AWIPS II is deployed. The enhancements will need to be re-implemented in the AWIPS II environment (since Raytheon has rewritten MPE/DailyQC for AWIPS II) to minimize the disruptions to the use of CHPS during the transition from AWIPS to AWIPS II. HSEB is in contact with Raytheon discussing how to get this accomplished.

HEC RAS

Deltares conducted further tests of the HEC-RAS during the December SAT, using a more comprehensive configuration developed by Deltares for the Lower Columbia River (NWRFC).

A system problem prevented completion of all tests during SAT, but remaining functionality was successfully demonstrated to OHD by the end of December.

HEC RESSIM

OHD learned in December that changes to the FEWS-ResSim adapter required to handle an updated version of ResSim were not implemented in time for the December SAT. Deltares made the necessary changes for the January maintenance release.

EXPERIMENTAL ENSEMBLE FOREAST SYSTEM (XEFS)

The XEFS includes experimental non-baseline versions of new ensemble-related software interfaced to CHPS and FEWS through model adapters. Any new baseline ensemble-related software will become part of the HEFS which is intended to be the operational name to follow XEFS.

XEFS/HEFS components are: a new Ensemble Pre-processor (EPP), Ensemble Post-processor (EnsPost), Ensemble Verification System (EVS), and Hydrologic Model Output Statistics (HMOS), and the Graphics Generator. Each of these components is available to RFCs with CHPS for field testing. In addition, each of these components will undergo a second phase where the prototype is re-factored into baseline CHPS software.

In Q1 and Q2 we completed integration and testing of EPP3, EnsPost, and HMOS and their model adapters with CHPS and started beta testing. The EVS (which completed integration and testing earlier) was made available for distribution. In Q4 HSEB worked to make the EnsPost, HMOS, and EPP software easier to use by improving the configuration of the XEFS model adapters.

The Graphics Generator is a Graphical User Interface (GUI) where users can change the look of graphics or displays and an engine to create special graphics not available through the standard CHPS GUI, the IFD. In Q2, the Graphics Generator completed Phase 1, which includes the same

functionality of the existing Ensemble Streamflow Prediction Analysis and Display Program (ESPADP). In Q3 and Q4 we started modifying the Graphics Generator to incorporate feedback from the RFCs, and we are making changes to make the Graphics Generator easier to use. Over the next few months, we will work with Forecast Decision Training Branch to develop Graphics Generator training. For Phase 2 of the Graphics Generator, the functionality will be extended to deterministic and spatial displays. For Phase 3, our current plan is to make the Graphics Generator functionality available to external users.

To help make XEFS easier to use and move toward operations, OHD will be setting up a web page to provide the XEFS software (models and adapters) and documentation (installation and configuration notes and users guides).

HEFS Project planning has started, and will replace the XEFS Planning Team as the primary coordination group for this activity.

4.5 Development Environment Information Technology (DEIT)

CUSTOMER SERVICE TICKETS

- The Information Technology Support Group (ITSG) received 865 new work tickets in FY10, and closed 837 tickets. As of 9/30/2010 ITSG had 67 open tickets.
- ITSG supported the online publication of NOAA Atlas 14, Volume 5 "Precipitation-Frequency Atlas of the United States, Selected Pacific Islands"
- All FY10 POA&Ms were completed on schedule.

HARDWARE STATUS

- Three significant power outages impacted DEIT systems in FY2010. All three were due to external power outages which were longer than UPS supply. For the one outage which occurred during business hours, ITSG successfully managed a "graceful shutdown" of the system until power was restored.
- ITSG migrated the "Amazon" web + database server to the virtual machine environment.
- ITSG implemented "Zenoss" network monitoring software, which provides more detailed system information than the previous monitoring package.
- ITSG created and installed a virtual machine for "fogbugz", a web-enabled ticket system which is being used for CHPS support.

DEVELOPMENT SYSTEMS

- Through FY09, ITSG installed 2 cycles of CHPS and 4 cycles of AWIPS 2 for testing.
- DEIT now consists of multiple development environments – AWIPS 1 (OB9.2), AWIPS 2 (R1G1-4, both standalone and distributed), CHPS 1.0, and 15 virtual servers.

4.6 Hydrometeorological Automated Data System (HADS)

Visit our web page at: http://www.nws.noaa.gov/ohd/hads/.

SYSTEM AND SOFTWARE

Based on requests from the field, software has been enhanced to improve the delivery of hourly precipitation data (SHEF code PP) for those Data Collection Platform (DCP) sites that do not provide specific hourly rain fall amounts nor are their reporting times in sync with top of the hour data. The enhancement provides for the computation of hourly PP from sub-hourly PP and deriving these values for time stamps to the top of the hour. Similar work was done to compute top-of-the-hour PP from sub-hourly PC sensors.

The HADS web presence was expanded to include presentations of data platform locations via Google Map displays. The reporting locations are displayed on a state-by-state basis with Icons depicting the locations and a right-side frame alphabetically listing the locations names and their associated NWSLI. Clicking on the location name will cause an information window to appear on the

map above the data point. From the information window, a user will then be linked to the site's metadata records and then to the site's observational data. The pages are automatically updated on an hourly basis, at H+40. The Google application was displays the locations of 'New DCPs' – these are locations of GOES transmitters 'recently' activated by a GOES operator. On a daily basis, during the past several months, an average of 490 sites have been on this list. We will enlist the assistance of our field office users to advise if these data locations should be added to HADS processing or be removed from this list since their location(s) or data sensors are not required for NWS operations. HADS computing platforms were upgraded to the Red Hat Enterprise v 5.5 operating system and PostgreSQL version 8.1.2. One of the two systems that perform raw data acquisition via the DOMSAT satellite feed underwent a Red Hat OS upgrade, in addition to an upgrade to the Local Readout Ground Station (LRGS) application software.

DATA NETWORK

As of September 30, 2010 there were now 14,414 data locations defined for HADS processing, an increase of 442 data points since October 1st. From these sites, there are 9,200 locations reporting water level / river stage data and nearly 7,000 (6,898) sites proving rainfall observations. The number of data values delivered to NWS operations is now averaging 2.82 million each day. A detailed break-down of HADS network sensor information is maintained on a daily basis and can be viewed at: http://amazon.nws.noaa.gov/hads/parms/parms.html. The Historical Climate Network Modernization program has activated a number of sites in the Southwest region of the U.S. They are providing timely temperature and incremental precipitation data (SHEF code PP). These data are recorded at five-minute intervals and are transmitted less than five minutes after the most recent observation is recorded. It is expected that more of these sites will become active during the next several months. As the HADS program becomes aware of these new DCPs, and as NWSLI assignments are created for them, they will be added to HADS processing and their observations will be delivered as SHEF encoded data records.

Due to system issues at the NESDIS Data Collection System (DCS), most updates of platform metadata details are not becoming available in a timely manner. While evaluating the details for a number of existing locations it was discovered that the latitude/longitude values in the DCS were different than those on the agency's web pages and therefore incorrect in HADS. So, during that past several weeks, the HADS team has been checking the validity of latitude/longitude values for all defined USGS GOES locations. Many differences were discovered between USGS NWIS and HADS – as a result the HADS data where changed to match those of the USGS.

The number of locations that uplink data on an hourly cycle continues to grow as the GOES DCS steadily moves toward the operational environment in which all data platforms must employ High Data Rate (HDR) transmitters. The vast majority of the HDR sites now uplink their messages on a 60-minute cycle while a small subset of HDR units are reporting every 30 minutes. There are now 12,041 platforms processed by HADS that transmit on the hourly cycle and 17 sites that are providing new observations every 30 minutes.