

**National Oceanic and Atmospheric Administration  
National Ocean Service  
PORTS & NWLON Major Application  
006-48-01-15-01-3402-00-118-062  
Operational Analysis  
2009**

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## Executive Summary

### CO-OPS Mission Statement

*CO-OPS is the authoritative source for accurate, reliable, and timely tides, water levels, currents and other oceanographic information.*

*Our data, products and services support safe and efficient navigation, sound ecosystem stewardship, coastal hazards preparedness and response, and the understanding of climate change.*

### CO-OPS Vision Statement

*Everyone has ready access to tide, water level, current and other coastal oceanographic information needed for informed decision-making.*

The National Physical Oceanographic Real Time System (PORTS®) and NWLON (National Water Level Observation Network) Major Application ingests, quality controls, processes, analyzes, and disseminates water level, current, and meteorological observations and products based on measurements received from the oceanographic sensors installed at PORTS and NWLON locations. The application provides operationally sound observations and monitoring capabilities coupled with operational Nowcast/Forecast modeling.

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

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

This report focuses on the operational state of the application as of December 11, 2009, and is based on guidance developed by the Department of Commerce.

The PORTS and NWLON Major Application directly facilitates NOAA's Strategic Goals to:

- Support the Nation's commerce with information for safe, efficient, and environmentally sound transportation;
- Serve society's need for weather and water information;
- Protect, restore, and manage the use of coastal and ocean resources through an ecosystem approach to management; and
- Understand climate variability and change to enhance society's ability to plan and respond.

The current Major Application meets established cost, schedule, and performance parameters.

## 1.0 Customer Results

The PORTS and NWLON Major Application is meeting the customer's needs and is delivering the services that it intends to deliver. Throughout FY2009, the application continued to aid users by providing water level and elevation information for successful coastal wetlands rehabilitation; continuing to provide real time data to support safe navigation at twenty-one PORTS; implementation of web accessible electronic tide table information, providing real-time currents data on the web; implementation into production of the next generation of quality control monitoring application and providing improved data and product access through web server hardware upgrades.

The value and success of this major application in terms of meeting customers' needs mandates a continued need for this investment. Figure 1 describes the logic model employed by the application to determine its outputs and outcomes. The application provides these documented outputs and customer focused outcomes.

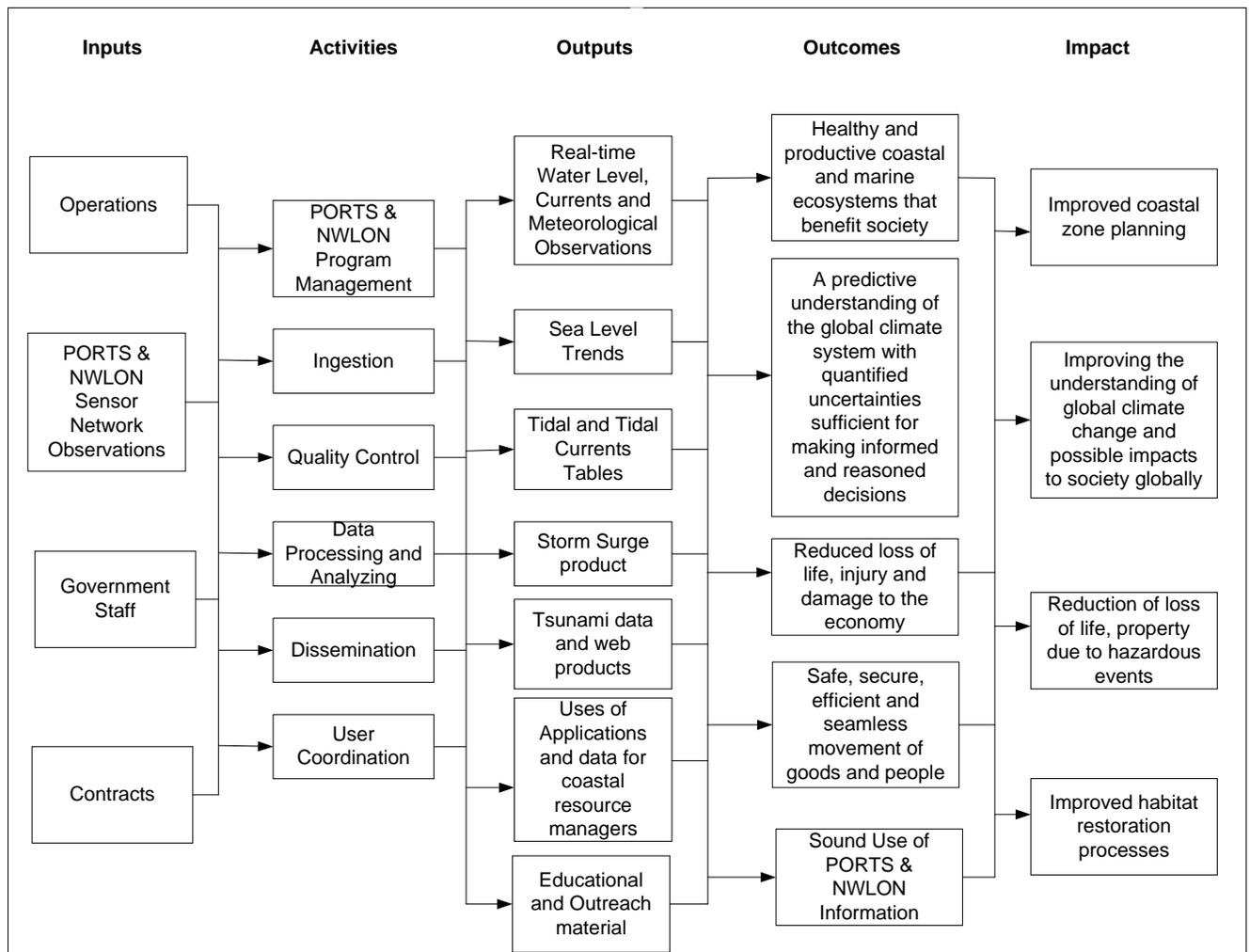


Figure 1 PORTS and NWLON Major Application Logic Model

## 1.1 Customer Requirements and Costs

The PORTS and NWLON application's principal customers and stakeholders are the commercial shipping industry, the US military, and government agencies responsible for search & rescue (SAR), hazardous material spill response and planning, and environmental management and the general public in coastal communities. PORTS and NWLON information, when combined with up-to-date electronic or digital nautical charts and precise global positioning data, provides the mariner with a clearer picture of the potential dangers that can threaten navigation safety. Shipping companies seeking to improve economic productivity use navigation systems aboard ships to maximize cargo load. Real-time knowledge of the currents, water levels, winds, waves, visibility, and density of the water gained through these navigation systems can decrease the turnaround time and increase the amount of cargo moved through a port and harbor by safely utilizing all available dredged channel depth. The economic benefit is significant. For example, one foot of draft accounts for between \$36,000 and \$288,000 of increased revenue per transit for vessels in Tampa Bay ([Estimating Economic Benefits from NOAA PORTS Information - A Case Study of Tampa Bay](#) July 2005). Another report for Houston/Galveston Bay PORTS suggests that a best estimate of the presently realized quantifiable economic benefit from Houston/Galveston PORTS® data is \$14.1 to \$15.6 million ([Estimating Economic Benefits from NOAA PORTS Information - A Case Study of Houston/Galveston](#) March 2007).

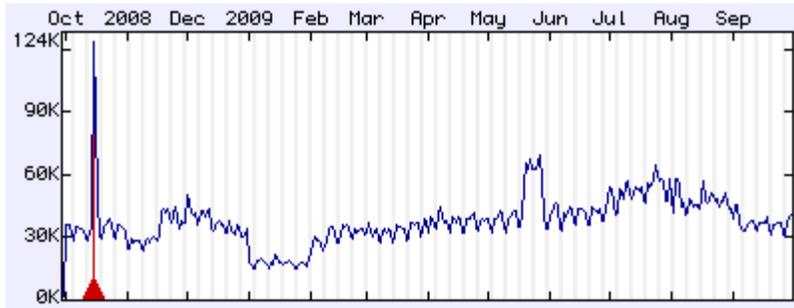
PORTS and NWLON information also benefits community preparedness and response during severe weather events. Timely information about coastal flooding and surf conditions can help coastal communities develop better evacuation and hazard response plans, protect lives and property, and minimize impacts to sensitive habitats. Physical characteristic data such as currents, water levels, salinity, and meteorological variables in and around waterways has been used to document freshwater inflows into sensitive saltwater habitats and minimize environmental impacts from pesticide spraying, one of many sources of non-point source pollution.

PORTS installations are customer/stakeholder driven and cost shared. Before establishing a PORTS site, requirements from customers and stakeholders are gathered, documented and agreed upon to make sure their local needs will be met. This process may involve talking with site managers, harbor masters, regional resource managers, usually those interested stakeholders that will be investing in the system. The PORTS and NWLON application works with other partners, such as the NWS Tsunami Warning Centers, the NWS Weather Forecast Offices, the OAR Office of Global Programs, and coastal estuarine managers, by providing them with timely, quality controlled real-time water level information for their programs. Working with partners helps to ensure that the best value is achieved for everyone involved.

Tidal current observations are conducted at various key locations around the nation to update tidal current predictions primarily used by mariners for safe navigation. Locations are prioritized by user feedback on locations where tidal current predictions are no longer accurate due to local bathymetric changes, the age of the original observation data and other factors. User feedback is gathered through a variety of methods ranging from outreach efforts on a local level to web based reports.

Methods used to track performance are conducting economic benefits analyses, and gathering user feedback with the customers and stakeholders at meetings, conferences, and on-site. In addition, user information can be gained from a NOAA web statistics web page for the PORTS and NWLON application ([Overview of Tides and Currents web pages](#)). These pages present the daily, weekly,

monthly, quarterly and yearly number of visits, hits, types of users, popular pages as well as other relevant information which can be used to tailor the web site's pages. For example, Figure 2a shows the number of visits for FY2009 to the tidesandcurrents.noaa.gov domain. Figure 2b shows how there have been a significant increase in traffic for the tidesandcurrents.noaa.gov domain between FY2008 and FY2009. In FY2008, tidesandcurrents.noaa.gov received 84,273,190 hits and served 1,194.6 GB of data to visitors. In FY2009, tidesandcurrents.noaa.gov received 297,265,291 hits and served 4,208.8 GB of data to visitors. In one year, CO-OPS more than tripled visitors to tidesandcurrents.noaa.gov web domain.



124,083 on 10/15/08. There was a spike in visits, about 87,154 extra visits or 236% above average. Unique hosts (+48,038/+282%) and 1 page visits (+81,507/+323%) also spiked.

**Figure 2a Number of visits for FY2009**

How has traffic varied from year to year						
Year	Pages	Hits	Errors	GigaBytes	Visits	Visits
2008	23,593,172	84,273,190	2,049,460	1,194.6G	3,305,169	
2009	79,848,921	297,265,291	6,598,259	4,208.8G	10,313,741	

**Figure 2b Significant increase of visits between FY2008 to FY2009**

## 1.2 Performance Measures

The PORTS and NWLON Major Application supports the customer's requirements. These measures align with the Customer Results Measurement Area within the Performance Reference Model developed by the Federal Enterprise Architecture Program Management Office (FEA-PMO). Table 1 summarizes these measures.

**Table 1: Customer Results Performance Measures**

Measurement Area	Indicator	FY2009 Baseline	FY2009 Target	FY2009 Actual Result	Comments
Customer Results	# of operational nowcast/forecast models	9 operational nowcast/forecast models	11 operational nowcast/forecast models	9 operational nowcast/forecast models	To enhance the maritime navigation capabilities, conservation management of coastal and marine resources.

Measurement Area	Indicator	FY2009 Baseline	FY2009 Target	FY2009 Actual Result	Comments
Customer Results	% of data quality controlled through an operational automated process using artificial intelligence	0% of data quality controlled through an operational automated process using artificial intelligence	25% of data quality controlled through an operational automated process using artificial intelligence	25 % of data quality controlled through an operational automated process using artificial intelligence	To enhance customers usability and reliability of PORTS and NWLON data

## 2.0 Strategic and Business Results

The PORTS and NWLON Major Application is meeting its own goals and objectives as well as those of the agency. Program management and controls are in place to ensure the Major Application continues to meet its goals and objectives and monitor how well the PORTS and NWLON Major Application performs.

### 2.1 PORTS and NWLON Helps to Achieve Strategic Goals

The PORTS and NWLON Major Application directly facilitates NOAA’s Strategic Goal to support the Nation’s commerce with information for safe, efficient, and environmentally sound transportation. Specifically, by providing near real-time oceanographic information, products and services to mariners, navigational safety and efficiency are improved. In particular, NOAA’s “air gap” technology received the ultimate test on the morning of June 27, 2009 as the new U.S. Navy LPD ship, the USS New York, sailed down the Mississippi River, clearing the underside of the Huey P. Long Bridge just north of downtown New Orleans by 64 centimeters (2.1 feet) – See Figure 3.



**Figure 3** By a margin of 64 centimeters, the USS New York clears the Huey P. Long Bridge.

The PORTS and NWLON Major Application helps achieve NOAA’s goal to serve society’s need for weather and water information by providing real time data to support emergency responders and to

improve NWS forecasts for storm surge, tsunami and other hazardous events. Specifically, at 1748 UTC on September 29, a magnitude 8.3 earthquake occurred southwest of American Samoa, and a destructive basin-wide tsunami was generated. This event was confirmed at both coastal tide gauges and DART buoys throughout the Pacific Basin. Due to the location of the earthquake, and the proximity to American Samoa, the NOAA tide gauge at Pago Pago was critical in confirming tsunami generation and developing initial arrival times for the Pacific and West Coast. The official Tsunami Warning Centers measurement at Pago Pago was 1.57 m at 1825 UTC. The CO-OPS Tsunami Web Site, developed in collaboration with the NOAA Tsunami Warning Centers and the Pacific Marine Environmental Laboratory, provided a comprehensive source for the NOAA tide gauge data.

The PORTS and NWLON Major Application helps achieve NOAA's goal to protect, restore, and manage the use of coastal and ocean resources through an ecosystem approach to management by providing accurate tidal datums, frequency of inundation analyses, and other tools which are used to improve how habitat restoration is planned, implanted and maintained. For example, during June and July 2009, CO-OPS stations recorded higher than normal sea levels (SL) along the U.S. East Coast. Near-peak levels in the latter half of June coincided with a *perigean-spring* tide, an extreme predicted tide when the moon is closest to the Earth during a *spring* tide. This tidal event added to the observed SL anomaly, produced minor coastal flooding, and caught the attention of many coastal communities because of the lack of coastal storms that normally cause such anomalies. For more detailed information, see NOAA Technical Report NOS CO-OPS 051, *ELEVATED EAST COAST SEA LEVEL ANOMALY: June – July 2009*, August 2009 ([http://tidesandcurrents.noaa.gov/publications/EastCoastSeaLevelAnomaly\\_2009.pdf](http://tidesandcurrents.noaa.gov/publications/EastCoastSeaLevelAnomaly_2009.pdf)).

The PORTS and NWLON Major Application helps achieve NOAA's goal of understanding climate variability and change to enhance society's ability to plan and respond. Specifically, updating and adding new long term sea level trends support coastal zone management and long term planning for development along the coast. It also aids in understanding the state of the climate system.

CO-OPS released an initial version of a software product, referred to as NOAA Tides, at the beginning of FY2010. This web based application is able to generate on-line Tide Tables. It is anticipated that this product will eventually replace the need for the publications. The software product is platform independent, meaning it will work well on a variety of operating systems; the prediction results are displayed based on user selectable units and output options; and a GIS interface option is provided for the selection of stations for which predictions are being requested. An electronic predictions product will increase the accuracy of tide and tidal current predictions because the predictions can be generated from accepted harmonic constituents rather than the less accurate method of generating predictions based on an average adjustment value.

## **2.2 Business Results**

### **2.2.1 Program Management and Controls**

The NWLON is statutorily authorized to collect, analyze, and disseminate data on tides pursuant to the 33rd United States Code, Sections 883a-883f established under the auspices of the Act of August 6, 1947 (61, Stat, 787). Each PORTS implementation is a partnership effort in consultation with the local harbor or waterway organizations and with the local community providing installation and

operation costs and is guided by an agreement between the Federal Government and the local partner. PORTS is explicitly authorized through the Hydrographic Services Improvement Act of 1998. Through this United States Code and these agreements new requirements or enhancements to the PORTS and NWLON Major Application are driven.

A detailed baseline of anticipated activities and expenditures is provided on an annual basis which includes maintenance of operational systems as well as new development, expansion, and modernization. The baseline takes into consideration the planning contained within the various IT Plans and within the context of the IT Architecture Plan. Prior to submitting the detailed baseline for the coming year, it is checked for any course corrections that are needed using actual activities and costs from the previous year as a guide and benchmark. This plan is submitted for approval by the Director of the Center for Operational Oceanographic Products and Services (CO-OPS).

The PORTS and NWLON Major Application is managed by teams which meet on a weekly basis to discuss operational issues, including performance, cost, and scheduling concerns. A report of any relevant issues is made to senior management every week. Once a quarter, the baseline plan is reviewed. An analysis of any budget and performance level variances is conducted by the Information Systems Division, program manager(s) and budget control staff of CO-OPS. Significant variances that would keep a project from returning to the plan if not addressed and mitigated trigger management action. Although all causes of variances revealed in the analysis are addressed, technical issues, more often than not, cause unfavorable cost or schedule conditions. If technical deficiencies are found, alternatives for corrective action are considered including but not limited to redesign, scrap and remake, rework, etc. When considering these alternatives, the impact on cost and schedule is weighed in addition to the technical considerations. After an alternative is selected, it may become necessary for the PORTS and NWLON baseline plan to be adjusted. In some cases, a decision may be made to provide additional resources to the plan. Ultimately, the cost/benefit and price/performance factors are weighed in the decision making process to select the best response to any variance. What is most important is that the PORTS and NWLON application is monitored regularly, any and all variances are analyzed, and CO-OPS remains vigilant in refusing to address variances by simply increasing the budget, assigning more staff or extending the schedule.

### **2.2.2 Monitoring Cost, Schedule and Performance**

Cost – Every quarter the Deputy Director meets with each Division Chief to review the quarterly budget. Monthly reports are submitted by contractors to their respective contracting Officer's Representatives (CORs) to ensure contracts are within cost and on schedule. Tools used for budget tracking (i.e. planning and execution) are CAMS (Commerce Administrative Management System), Management Analysis and Reporting System (MARS), and AAP (Advanced Acquisition Plan).

Schedule – Microsoft Project is used to track various technical components, critical tasks and milestones of the PORTS and NWLON application. This software tool integrates the scope of work to be conducted with schedule and personnel resource elements for optimum project planning and control. Microsoft Excel is used to track cost components of the PORTS and NWLON application. This software tool tracks monthly spending, both planned and actual, for any IT-related costs. Accounting codes dedicated to IT are used.

Performance – The PORTS and NWLON application contribute to a number of corporate milestones and performance measures associated with a number of NOAA programs. Quad charts are generated

on a quarterly basis to provide execution details regarding the performance parameters, schedule, budget, and any key risks that arise. This information is reported by the Program Manager of the Marine Transportation System Program, a component of NOAA's Commerce and Transportation Strategic Goal. The Program Manager reviews this information to ensure consistency with agency established budgets, program goals and policies, and mission objectives and requirements.

### **2.3 Reviews**

A comprehensive review and assessment of the current information architecture for the PORTS and NWLON Application was performed by a consulting contract with Northrop Grumman in FY2003. The assessment noted two distinct data flows, a PORTS data flow and a NWLON data flow. It found that these two data flows sufficiently supported the original goals of PORTS and NWLON when each was an individual program, but that the capacity to leverage the information available through both data flows as they exist now in an attempt to meet the increasing information needs of the business requirements of today since the merger of the two programs is severely limited. It was therefore recommended that the capacity of the current information architecture be restructured to better accommodate the business user requirements that span both data flows. Based on the assessment, a decision was made to proceed with the recommended changes to the architecture. As the requirement analysis and the development of proposed solutions progressed, it became apparent that the level of effort required to complete the re-engineering of the information architecture exceeded available resources. As a result, an information architecture team was established and focused on the procurement of contract services to perform the re-engineering efforts. A 5-year contract award was made to Project Performance Corporation (PPC) in August, 2006. Since the award of the contract PPC has been successful in reviewing the requirements for a consolidated metadata database, investigating database server performance and helped with the initiation of migrating to new database hardware. During this past fiscal year, they have succeed in consolidating four separate metadata databases into a single metadata database, provided the mapping to bulk load existing metadata information from the operational database to the new consolidated database and provide documentation of the differences between the old and the metadata information.

### **2.4 Security**

The PORTS and NWLON system is accredited under requirements spelled out in NOA 212-13 (03/17/03) and the DOC IT Security Program and Minimum Implementation Standards (2005) that are based on OMB and NIST 800-53 security controls as mandated by the Office of Management and Budget (OMB). System Security Plans, Risk Assessments, and Contingency Plans were reviewed and approved; all NIST 800-53 security controls were tested; and the PORTS and NWLON Major Application received the "Authority to Operate" (ATO). CO-OPS used an independent party, Science Applications International Corporation (SAIC), to do the testing. Based on the test results, appropriate Plans of Actions and Milestones (POA&Ms) were created and will be completed in FY2010.

All CO-OPS systems contributing to the PORTS and NWLON Major Application are scheduled to be re-certified and re-accredited by FY2012. For 2010 and 2011, the years in between the more formal certification and accreditation process, all systems will undergo continuous monitoring by CO-OPS as well as by an independent party to make certain these systems continue to be compliant with security policies and maintain a strong security posture.

The systems are continuously monitored for security incidents by the NOAA Computer Incident Response Team (N-CIRT) and undergo quarterly vulnerability assessments.

## 2.5 Performance Measures

The PORTS and NWLON Major Application supports the strategic and business requirements. These measures align with the Mission and Business Results, Processes and Activities, and Technology Measurement Areas within the Performance Reference Model developed by the Federal Enterprise Architecture Program Management Office (FEA-PMO). Table 2 summarizes these measures.

**Table 2: Business Results Performance Measures**

Measurement Area	Indicator	FY2009 Baseline	FY2009 Target	FY2009 Actual Result	Comments
Mission and Business Results	# of NWLON Stations	205 NWLON Stations	210 NWLON Stations	210 NWLON Stations	To expand area of coverage for which water level information can be provided
Mission and Business Results	# of PORTS	19 PORTS	21 PORTS	21 PORTS	To expand area of coverage for which oceanographic information can be provided for maritime commerce
Processes and Activities	% of real-time current data processed and analyzed via an automated system (C-MIST)	0% of real-time current data processed and analyzed via an automated system (C-MIST)	100% of real-time current data processed and analyzed via an automated system (C-MIST)	100% of real-time current data processed and analyzed via an automated system (C-MIST)	To improve the timeliness and accuracy of real-time currents information into the PORTS IT database
Processes and Activities	% integration of the PORTS and NWLON IT processes	20% integration of the PORTS and NWLON IT processes	40% integration of the PORTS and NWLON IT processes	40% integration of the PORTS and NWLON IT processes	To improve the accuracy, efficiency and reliability of the metadata and data
Technology	% integration of the PORTS and NWLON IT systems	20% integration of the PORTS and NWLON IT systems	40% integration of the PORTS and NWLON IT systems	40% integration of the PORTS and NWLON IT systems	To improve the accuracy, efficiency and reliability of the metadata and data
Technology	% of metadata converted to DMAC/FGDC compliant standards	0% of metadata converted to DMAC/FGDC compliant standards	100% of metadata converted to DMAC/FGDC compliant standards	100% of metadata converted to DMAC/FGDC compliant standards	To improve the accuracy, efficiency and reliability of the metadata and data

## 2.6 Other

The PORTS application has a requirement that 80% of the real-time data be acquired, be of good quality, and be displayed in real-time. During FY2009, 84.3% of real-time data is meeting these performance metrics. The NWLON application has a requirement that 95% of the near real-time data be acquired, be of good quality, and be displayed in real-time. For the fiscal year, 97.7% of near real-time data was meeting these performance metrics.

## 3.0 Financial Performance

### 3.1 Current Performance vs. Baseline

The current PORTS and NWLON financial performance, as shown in Figure 2, compares the actual cost of the program compared to an annual spending plan.

Monies were budgeted in five major areas: Hardware, Software, Contracts, IT Security and Government Staff. The deviation in Contracts was the result of higher costs for the Re-engineering the Information Architecture within CO-OPS (RIAC) project and an unexpected Sybase-mandated change in licensing within our Sybase maintenance contract. The RIAC contract had an additional person brought on the project at the end of Q3 when it was realized that the data transformation and cleansing work was larger than anticipated. In addition, the increase in Sybase licensing fees was significant and unexpected. The deviation in Government staff was the result of being down 1.5 Government positions at the end of FY2009.

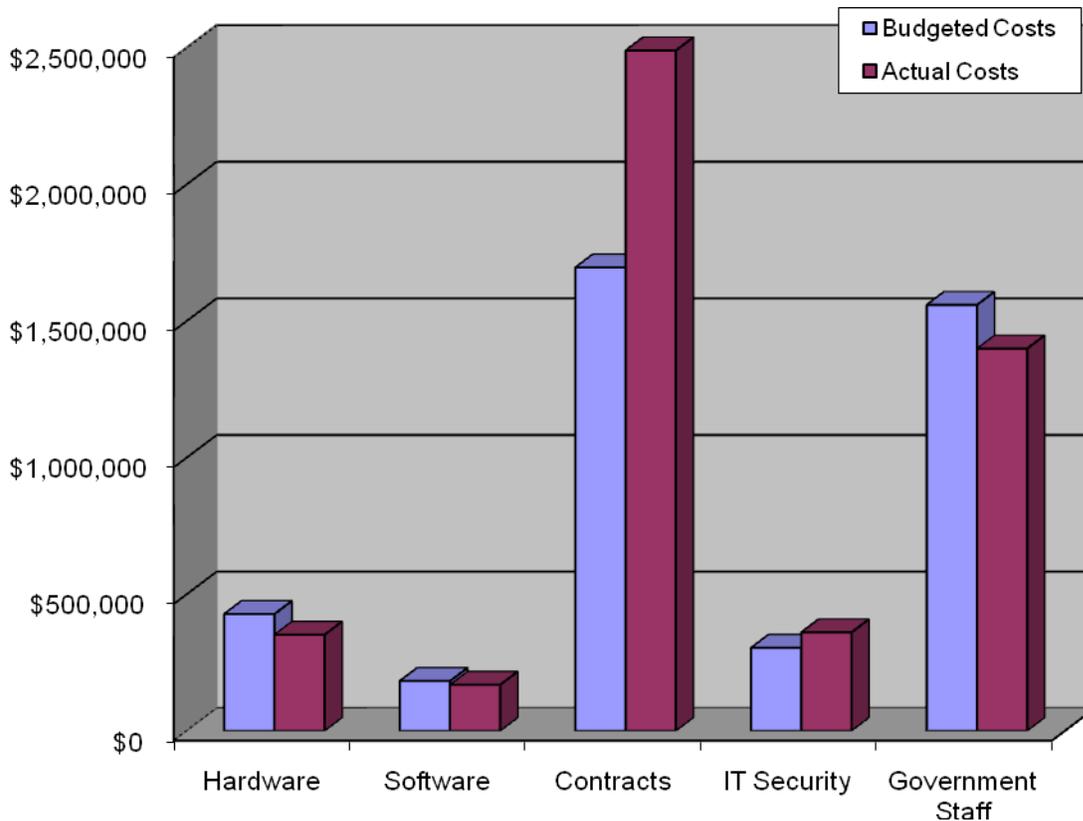


Figure 4 FY2009 Budget vs. Actual Costs

## 3.2 Performance Measures

During the reporting year, financial performance of the PORTS and NWLON Major Application is achieved through divisional monthly reviews and quarterly reviews with the Deputy Director of CO-OPS in examining quarterly variance measurements of what was planned for in the yearly spending plans and what was actually spent. By creating spending plans prior to the beginning of each fiscal year, it is possible to track spending for each month down to the object class level. In addition, by submitting anticipated major procurements early in the planning process, it is possible to track spending more closely.

## 3.3 Cost Benefit Analysis

Two economic benefit reports were completed, one for Tampa Bay PORTS in 2005 and the other for Houston/Galveston Bay PORTS in 2007, which showed the economic benefits derived from each the PORTS. The reports describe the estimated benefits in terms of dollars to the extent possible, and they also describe non-quantifiable benefits.

Sources of economic benefit include:

- Greater draft allowance/increased cargo capacity and reduced transit delays for commercial maritime transportation (water level information)
- Reduced risk of groundings/collisions for maritime traffic (currents and wind information)
- Enhanced recreational use of the Bays by boaters, windsurfers, fishermen, etc. (winds, weather forecasts, and other information)
- Improved environmental/ecological planning and analysis, including hazardous material spill response

Houston/Galveston Bay PORTS economic benefit report (March 2007)

URL to report: [Estimating Economic Benefits from NOAA PORTS Information - A Case Study of Houston/Galveston](#)

The report estimates suggest that some \$11.9 million in direct annual economic benefits can be attributed to PORTS data in the Houston/Galveston area with a reasonable degree of confidence. Another \$2.2 to \$3.7 million in annual benefits are less easily traced but may be linked to PORTS; and an additional \$1.8 to \$2.8 million could potentially be realized with the full utilization of PORTS data. Thus, our best estimate of the presently realized quantifiable benefit from Houston/Galveston PORTS data is \$14.1 to \$15.6 million. This estimate is best interpreted as a lower bound on total benefits flowing from PORTS data, since not all uses of PORTS data can be quantified.

Most of these benefits are in the nature of avoided costs (increased producer surplus, or profit) for commercial operations in the Houston Ship Channel and adjacent waterways and approaches, and avoided costs or increased consumer surplus, including non-market benefits, for recreational users of Galveston Bay.

Tampa Bay PORTS economic benefit report (July 2005)

URL to report: [Estimating Economic Benefits from NOAA PORTS Information - A Case Study of Tampa Bay](#)

The report estimates suggested that \$2.4 to \$4.8 million in direct annual economic benefits can be attributed to PORTS data in the Tampa Bay area with a reasonable degree of confidence. Another \$2.2 million in annual benefits are less easily traced but may be linked to PORTS; and an additional \$2.2 million could potentially be realized with the full utilization of PORTS data. Thus, the best estimate of the 2005 realized quantifiable benefit from Tampa Bay PORTS data is \$4.4 to \$7.0 million. This estimate is best interpreted as a lower bound on total benefits flowing from PORTS data, since not all uses of PORTS data can be quantified.

Most of these benefits are in the nature of avoided costs (increased producer surplus, or profit) for commercial operations and avoided costs or increased consumer surplus, including non-market benefits, for recreational users of the Bay.

### **3.4 Financial Performance Review**

Financial performance is typically subjected to a periodic review for reasonableness and cost efficiency. Monthly budget reviews are held with the program manager, CORs and contract managers to ensure contracts are within cost and on schedule. Quarterly budget reviews are held between the Division Chief and the Deputy Director to ensure that project spending is reasonable. Monthly reports from contractors are required to ensure the Government has the information it needs to evaluate cost performance. 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.

### **4.0 Innovation to Meet Future Customer Needs**

To better understand and meet customer needs, CO-OPS conducted a satisfaction survey to measure CO-OPS customer satisfaction with current products and services and to gain insight for future areas of focus. The results from the survey are posted on CO-OPS' Publication web page. The survey data were collected via links on NOAA Websites and email invitations from May 13-June 10, 2009. In total, 601 responses were collected. The highlights of the survey are that CO-OPS earned an overall satisfaction score of 82.1, which is strong and is much higher than the Aggregate 2008 Federal Government ACSI score of 68.9. In FY2010, an area in which CO-OPS can focus on, learned as a result of the survey, is that for the Great Lakes and Marine and Coastal products, is to improve the visual appeal of the products.

#### **4.1 Number and Types of Users**

The number (Figure 5) and types (Figure 6) of users continue to rise overall at the local, state and national levels as the importance of oceanographic information for coastal projects increases as well. Users of the PORTS and NWLON application primarily are ships underway and navigating through major U.S. harbors, U.S. Coast Guard, estuarine managers and other federal environmental agencies.

How have visitors found the site each year

Year	Visits	1 Page Visits	1 Page Visits % of Visits	Search Visits	Search Visits % of Visits	Robot Visits	Robot Visits % of Visits
2008	3,305,169	2,424,466	73.35%	105,302	3.19%	1,031,929	31.22%
2009	10,313,741	6,890,936	66.81%	488,346	4.73%	3,641,834	35.31%

Figure 5 Number of visits to the CO-OPS tidesandcurrents.noaa.gov web site FY2009

Which top level domains did the most requests come from?

Most top level domains correspond to a single country but some of the common ones, such as .net and .com, are used internationally.

Top Level Domain	Description	% of Pages	Pages	Hits	GigaBytes
net	Network Providers	31.39%	32,469,120	133,815,358	1,355.9G
com	Commercial, frequently U.S.	26.04%	26,936,469	66,679,143	766.7G
gov	U.S. Federal Government	19.39%	20,061,897	70,145,446	1,248.9G
(Unknown)	Numeric IP Address	11.00%	11,376,615	62,028,035	888.0G
edu	U.S. Educational Institutions	7.04%	7,279,710	13,302,670	743.8G
mil	U.S. Military	2.93%	3,033,325	29,023,875	146.3G
org	Organizations, mostly U.S.	0.88%	913,111	2,195,620	24.3G
arpa	DNS misconfiguration	0.58%	598,116	671,192	30.6G
us	United States	0.14%	141,556	876,041	14.6G
200	Unknown	0.11%	111,595	168,147	7.0G
gbl	Unknown	0.10%	100,763	136,707	10.5G
noaa	Unknown	0.06%	57,451	505,324	4.6G
ca	Canada	0.05%	55,025	547,423	9.0G
ru	Russian Federation	0.04%	38,711	65,335	112.3G
tw	Taiwan, Province of China	0.04%	38,286	45,856	1.2G
jp	Japan	0.02%	22,682	88,308	1.7G
uk	United Kingdom	0.02%	18,351	126,164	3.2G
au	Australia	0.02%	17,387	111,967	3.3G
de	Germany	0.02%	17,313	74,567	2.8G
nl	Netherlands	0.01%	13,505	78,211	2.9G
id	Indonesia	0.01%	12,862	35,812	2.1G
at	Austria	0.01%	11,830	21,840	1.9G
mx	Mexico	0.01%	8,148	76,856	1.3G
fr	France	0.01%	5,885	42,195	1.7G
it	Italy	0.01%	5,526	43,892	1.4G
br	Brazil	0.00%	5,170	42,027	1.2G

Figure 6 Types of visitors to the CO-OPS tidesandcurrents.noaa.gov web site for FY 2009

\*Information from [NOS Web Site Analytics and Guidance](#)

As the number and types of users increase, their demand for denser coverage, new sensors, timeliness of data and new applications also increases. These issues pose interesting challenges for the PORTS and NWLON application. Issues that will have to be addressed are:

- How best to determine areas for improved coverage?
- How to meet the regional or local marine observational needs?
- How to improve data ingestion and delivery to users in a timely manner?
- How to ensure the data is adhering to established quality control measures?

Project to Address Challenge: *Expansion of area coverage for which water level and current data is provided by installing additional PORTS and NWLON stations*

To meet user's needs, it is desired that by 2015 there will be approximately 500 NWLON station observing systems (300 stations associated with NWLON and 200 cooperative regional and local stations) and to operate and maintain PORTS services at the top 150 U.S. seaports.

The challenge in expanding the coverage of the PORTS and NWLON application is in creating partnerships with regional and local harbor or waterway organizations, with the local community and implementation partnership effort based on extensive collaboration to identify and satisfy user needs in order to improve safety and derive economic benefits. PORTS comes in a variety of sizes and configurations, each specifically designed to meet local user requirements, and to take into account very real geographic and hydrologic differences between waterways. In the past, these types of partnerships have been very successful and will be continued to be pursued. To improve the coverage of NWLON stations, efforts are currently underway to identify those areas with under-coverage (not enough sensors in an area) and over-coverage (too many water level sensors too close together in an area). By identifying these areas, corrections can be made with local resource managers for improving coverage in an area.

FY2009 CO-OPS install two new PORTS. The new sites are New Orleans, Louisiana (Lower Mississippi PORTS) and Lake Charles, Louisiana (Lake Charles PORTS).

The Lower Mississippi PORTS was requested by the Lower Mississippi River Waterway Safety Advisory Committee (LMRWSAC). New Orleans is the #7 port in the U.S. based on tonnage handled according to U.S. Army Corps of Engineers, Waterborne Commerce Statistics Center. Environmental conditions which impede safe navigation of the river include swift currents, severe weather, and periods of low visibility. Further complicating navigation of the system are the high volume of traffic, draft limitations, recreational and ferry traffic which crosses the navigation channel, and clearance under several bridges which cross the waterway.

The Lake Charles PORTS was requested by the Lakes Charles Port Authority and completed installation in Q3. Lake Charles is the #12 port in the U.S. based on tonnage handled according to the U.S. Army Corps of Engineers. Lake Charles is a relatively shallow waterway. Storm surge and associated flooding is a serious problem. The passage of frontal systems and associated winds significantly affect the movement of water and the maneuverability of vessels within the waterway.

Project to Address Challenge: *Expansion of on-line product suite*

Because of the speed in which it is easier to update web base software versus paper products, it will be necessary for traditional paper products, such as Tidal and Tidal Current tables and charts to be made available online. There will be challenges with bringing these paper-based products to the web in an efficient and reliable manner.

In late FY2009, CO-OPS released an initial version of a software product, referred to as NOAA Tides, to generate on-line Tide Tables. It is anticipated that this product will eventually replace the need for the publications. The software product is platform independent, that is work well on a variety of operating systems; the prediction results will be displayed based on user selectable units and output options; and a GIS interface will be considered for the selection of stations for which predictions are being requested. An electronic predictions product will increase the accuracy of tide and tidal current predictions because the predictions can be generated from accepted harmonic constituents rather than the less accurate method of generating predictions based on an average adjustment value.

In addition, at the end of FY2009, CO-OPS obtained software development services to construct a World-Wide-Web-accessible set of tools to improve data processing capabilities for permanent CO-OPS stations and the processing of data for temporary stations. These software products will provide CO-OPS and CO-OPS contractors with the capability to load data into the CO-OPS database and to process the data according to established specifications using CO-OPS provided programs. These services are necessary in order to carry out tasks related to the American Recovery and Reinvestment Act of 2009 (ARRA). It is estimated that these capabilities will be provided at the end of FY2012.

Project to Address Challenge: *Maximize capabilities of data ingestion and data storage*

Meeting the needs for rapid data ingestion and data retrieval is vital for a real time system. To overcome these challenges for the PORTS and NWLON application, separation of the ingestion and quality control processes from the data retrieval processes will improve data reliability and delivery. This will be achieved by separating a single operation database into two. One will be a dedicated operational database for performing data ingestion and quality control processes; the other will be a data warehouse database for performing data retrieval processes.

Project to Address Challenge: *Increase data available to the public that has been quality controlled*

CORMS (Continuously Operational Real-Time Monitoring System) is a manned quality control support system which provides 24 hour a day, 7 day a week quality control monitoring of real-time marine environmental data to ensure the availability and reliability of this data before application of the data by real-time users such as the maritime navigation community. Currently, CORMS performs minimal quality control checks on discrete 6-minute samples and flags these values for further investigation and action by watch standing personnel. As the amount of data being acquired in real-time has increased and the need exists for more sophisticated quality control checks to better ensure reliability, CO-OPS has embarked on the development and implementation of a new toolset for CORMS known as CORMS AI (Artificial Intelligence). CORMS AI will: 1) employ rule- and case-based logic to monitor the status of CO-OPS data acquisition and dissemination networks and perform real-time quality control on collected data; 2) notify watch standing personnel of communications outages and suspect data, and; 3) identify potential mitigating actions to correct the

reported problem.

In FY2008, CO-OPS released an initial version of CORMS AI to a limited audience of designated CO-OPS employees. During FY2009, these employees tested CORMS AI and provided comments on the application so that further refinements could be made. As a result of comments and testing, CORMS AI was limitedly released into production in Q4 FY2009 with a new, more robust user interface, improved quality control algorithms, issue identification notification and management. CORMS AI is being run in parallel with the existing CORMS applications for comparison of the application. Following this, enhancements to the system are being planned and prioritized for follow on enhancements and the addition of currents data quality control processing.

## 4.2 New Technological Growth Areas

CO-OPS growth in new areas (National HF Radar Program, mobile devices PDAs, etc.) will require monitoring infrastructure and modeling enhancements. CO-OPS is assuming the lead for providing the NOS contribution for the operational coastal component of the U.S. Integrated Ocean Observing System (IOOS). Expanding the suite of sensors (parameters and quantity) will require a corresponding expansion in CORMS real-time quality control, commercial communications, data and information management, and product development. Expanding the number and function of operational models will require additional partnerships with both the academic and scientific consulting communities.

In addition to improving the hardware infrastructure and expanding the quality control algorithms, CO-OPS has many data offerings suited to display on PDA devices. Information such as Automated Real-Time Narrative Summaries (ARNS) for PORTS sites, tide predictions, water level observations, and more could be easily modified to display on modern consumer PDAs and cell phones. With data offerings already present on the web, minor modifications would allow CO-OPS to disseminate an entire suite of data products to mobile users in a fashion readily accessible and easy to read. The mobile market is constantly expanding: a 2006 survey by the Bureau of Labor Statistics revealed that the average US household spent nearly as much on wireless products as on land-lines and the current trends point to 2007 as being the first year when wireless spending will surpass land-line spending ([Cell Phone Spending Surpasses Land Lines - The Associated Press](#)). In FY2009 CO-OPS implemented a new application for viewing PORTS text screens on mobile devices such as cell phones and PDA's. Users are able to pull up PORTS data on their mobile device and get a quick overview of data, such as water level, air and water temperature, and currents, at each station, separated by data type.

In FY2008, CO-OPS, in coordination with the IOOS Program Office and the National Data Buoy Center (NDBC), released an initial version of the Integrated Ocean Observing System Data (IOOS) Data Integration Framework (DIF) web services for currents, water levels, winds, water temperature, air temperature, barometric pressure, conductivity, and salinity. These web services are compliant in file content, file format, and file transport to the Sensor Observation Services (SOS) standards. In FY2009, a limited audience of designated IOOS data users implemented these services and provided comments on these web services for further refinement. By the end of FY2009, these services were declared operational and made available to the general public. Completion of these tasks represented a major achievement for CO-OPS, the NOAA IOOS Program, and all of NOAA's associated partners and collaborators. It represents true interoperability in that an end user can retrieve data from any

organization that has a similar SOS implementation without having to write additional data retrieval applications.

### **4.3 Improving IT infrastructure**

CO-OPS must maintain computational equilibrium with other IT intensive organizations. Further, the office network infrastructure must allow seamless capability to fully utilize computational capacity. CO-OPS will stay current with IT hardware and software technology in general and solicit and engage specialists in IT fields such as AI that can apply the technology to solve real world operational problems. Toward this goal, an effort is underway for improving internet connectivity between the CO-OPS field facility in Chesapeake, VA and CO-OPS Headquarters in Silver Spring, MD. Providing the field office with increased bandwidth will result in greater productivity of reviewing data outputs, troubleshooting failed sensors, and improving metadata quality.

Based on an analysis of CO-OPS data logs, CO-OPS broke records on many occasions over the past year in terms of visits to the Tides and Currents web site. For example, during Hurricane Ike, visits were in the millions per day as opposed to the usual millions per month. As a result, CO-OPS upgraded its current architecture to better sustain the traffic increases. CO-OPS switched to a clustered server configuration. An expandable array of two clustered, high performance web servers were placed behind two redundant load balanced servers, which serves to process incoming web site requests. By switching to this architecture, CO-OPS is able to easily expand and upgrade its web server hardware by adding more machines to the cluster. The new servers are roughly 4 times more powerful than the existing servers.

For FY2009, the new consolidated metadata data model was transferred from paper to the development environment. This was accomplished by using Extract, Transform, and Load (ETL) software that extracts the existing data from the production database, transforms the data to fit into the new data model and loads the data into the new model. This process also required the data to undergo 'data cleansing'. This means that before the data is stored in the new metadata model, the data will be verified and validated as being 'good' data. In addition, through this iterative process of extracting, transforming and loading, the consolidated metadata model has been updated to reflect present business practices that presently do not exist in the current database. Concurrent to this effort, the RIAC project began to do detailed analysis of the measurement databases.

### **4.4 Funding Levels**

Recent trends in government spending indicate that agencies should not expect significant increases in their budgets. This, coupled with the requirement to accommodate more users and incorporate evolving technology, will force the program to find efficiencies and to do more with the same amount of resources.

#### Project to Address Challenge: *Leveraging external resources*

There are countless benefits with doing business in concert with partners. Shared ownership of an activity leverages the resources (including intellect) of all partners. In addition, non-Federal partners have license to influence the legislative process. Partnerships are resource intensive. Considerable effort goes into the partnership process. CO-OPS strengthens core capabilities through additional partnership links with outside groups including private organizations. CO-OPS is a highly leveraged

organization that is in the business of partnering with other parties to meet the needs of a broader user community. The strategy for the future includes building upon and enhancing the existing NOS operational infrastructure and culture which has emphasized cross-program and cross-NOAA integration. CO-OPS mission growth has been accomplished through advances in technology and outsourcing, while streamlining the number of personnel required maintaining the internal core workforce capability.

## Annex A

### System Interconnections/Information Sharing

System Name	Organization	Type of Interconnection	ISA/ MOU MOA	Agreement Date	FIPS 199 Category	C & A Status	Authorizing Official
NOAA6001 National Ocean Service (NOS) Enterprise Information System	National Ocean Service (NOS)	General Support System; Network (LAN) NOS SSMC Campus Backbone, AAMB LAN, and Secure Public Information Network (SPIN) (i.e., secure web farm network). Trusted connection. Located in a Government facility with both government and contractor personnel operating the IT systems.	NOAA6205 SLA for NOAA0200; NOAA6205 SSA for NOAA6001 (separate files from this plan)	June, 2006 (NOAA0200)  July, 2006 (NOAA6001)			Elizabeth Scheffler, Chief Financial Officer, NOS

NOAA0200 NOAA Network Operations Center (NOC)	National Oceanic and Atmospheric Administration (NOAA)	General Support System. NOAA SSMC Campus backbone operated by the NOAA NOC. Trusted connection. Located in a Government facility with both government and contractor personnel operating the IT systems. This system provides campus level infrastructure including LAN, WAN, and MAN networking, secure networking segments, and Internet access. This system provides campus level network monitoring, network management, NOAA enterprise VPN management and administration, campus level network help desk support and services.	NOAA6205 SLA for NOAA0200; NOAA6205 SSA for NOAA6001 (separate files from this plan)	June, 2006 (NOAA0200)	July, 2006 (NOAA6001)			Joseph F. Klimavicz, Chief Information Officer, NOAA
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NOAA0100 NOAA Computer Incident Response Team (N- CIRT) Network	National Oceanic and Atmospheric Administration (NOAA)	General Support System. NOAA operated security monitoring for all Internet/Internet2 connection located in Silver Spring Metro Campus (SSMC) and NOAA wide computer incident response capabilities. Trusted connection. Located in a Government facility with both government and contractor personnel operating the IT systems. This system provides limited intrusion detection and monitoring services for NOAA networks scattered throughout the country. This system provides a centralized computer incident response support and reporting for all of NOAA.	NOAA6205 SLA for NOAA0200; NOAA6205 SSA for NOAA6001 (separate files from this plan)	June, 2006 (NOAA0200)	July, 2006 (NOAA6001)			Joseph F. Klimavicz, Chief Information Officer, NOAA
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NOAA0300 NOAA Message Operations Center (MOC)	National Oceanic and Atmospheric Administration (NOAA)	General Support System; NOAA Enterprise wide Messaging, LDAP Directory, and Calendar is operated by the NOAA MOC. It is a trusted connection and is located in a Government facility with government and contractor personnel operating the IT systems. This system provides NOAA wide email (as requested), LDAP Directory services, calendar (as requested), and help desk services for supporting these functions.	NOAA6205 SLA for NOAA0200; NOAA6205 SSA for NOAA6001 (separate files from this plan)	June, 2006 (NOAA0200)  July, 2006 (NOAA6001)			Joseph F. Klimavicz, Chief Information Officer, NOAA
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NOAA3100 Pacific Marine Environmental Laboratory (PMEL) Local Area Networks	NOAA/OAR Pacific Marine Environmenta l Laboratory (PMEL)	General Support System; Office of Oceanic and Atmospheric Research's Pacific Marine Environmental Laboratory Campus Backbone Network located in Seattle, Washington providing local campus, Internet access, and computer security monitoring. It is a trusted connection and is located in a Government facility with government and contractor personnel operating the IT systems. This system provides infrastructure and networking services to the Seattle Campus. This system provides intrusion detection and network monitoring to all organizations connected to this network.	This document has not been signed by PMEL. For two months, repeated attempts were made to get a signature, but PMEL refused to sign.	June, 2006 (NOAA020 0)  July, 2006 (NOAA600 1)			Eddie Bernard (Director, PMEL)
NOAA6201 CO-OPS Silver Spring LAN	National Ocean Service (NOS)	General Support System; CO-OPS operated LAN located in Silver Spring Metro Campus (SSMC). It is a trusted connection and is located in a Government facility with government and contractor personnel operating the IT systems. The NOAA6201 provides underlying enabling infrastructure for NOAA6205, such as user workstations for analyzing and processing data.	NOAA6205 SLA for NOAA0200; NOAA6205 SSA for NOAA6001 (separate files from this plan)	June, 2006 (NOAA020 0)  July, 2006 (NOAA600 1)			Michael Szabados (Director, CO- OPS)

NOAA5004 Data Collection System Automatic Processing System	National Environmenta l Satellite and Data Information Systems (NESDIS)	General Support System; NOAA5004 receives all GOES transmissions and retransmits the data to DOMSAT sites, as well as pushes the data to NOAA8870. It is a trusted connection and is located in a Government facility with government and contractor personnel operating the IT systems.	NOAA6205 SLA for NOAA0200; NOAA6205 SSA for NOAA6001 (separate files from this plan)	June, 2006 (NOAA020 0)  July, 2006 (NOAA600 1)			Kathleen Kelly
NOAA8870 National Weather Service Telecommunic ation Gateway	National Weather Service (NWS)	General Support System; NOAA8870 is the conduit over which all NWS data is transmitted. NOAA6205 provides water level and ancillary data to the NWS via NOAA8870. It is a trusted connection and is located in a Government facility with government and contractor personnel operating the IT systems.	NOAA6205 SLA for NOAA0200; NOAA6205 SSA for NOAA6001 (separate files from this plan)	June, 2006 (NOAA020 0)  July, 2006 (NOAA600 1)			Larry Curran

## Annex B

The following management control processes are implemented:

Operational Monitoring – The Continuous Operational Real-time Monitoring System (CORMS), a sub-system within the PORTS and NWLON Application, is primarily intended to provide quality assurance and monitoring of sensor data before application of the data by real-time and near real-time users. It is a decision support system which provides data communications, data analysis, system monitoring and notification support to a variety of users. CORMS provides seven days a week, twenty four hours a day monitoring and quality control of sensors and data in order to insure the availability, accuracy, and quality of tide, water level, current, and other marine environmental information. CORMS is intended to identify invalid and erroneous data and information before application of the data by the real-time and near real-time users. The Center for Operational Oceanographic Products and Services (CO-OPS) is responsible for the quality of the real-time data provided to local users in support of navigational safety. The system provides 24 x 7 personnel coverage.

Weekly Status Meetings – Twice a week, the Operations Manager meets with other divisional representatives within CO-OPS to gather information of the operational readiness of the PORTS and NWLON measurement systems in the field and the components within the PORTS and NWLON application. The information provided may address issues relating to station outages, data availability, data quality control and station repair status. In addition to these meetings, the Operations Manager provides senior management with weekly briefings on the operational readiness of the PORTS and NWLON system.

Configuration Control and Management – Configuration control is the systematic process of maintaining the formally established baseline identification and regulating all changes to the baseline. Configuration control is achieved through an ordered process of proposal, evaluation, approval or disapproval, and implementation of approved changes to a configuration item (CI) after a configuration baseline has been established. Configuration control maintains the integrity and continuity of the design, engineering, and cost trade-off decisions which are recorded, communicated, and controlled. Configuration control prevents unauthorized, unnecessary, or marginal changes, while expediting the approval and implementation of those that offer significant benefits. Changes to the CO-OPS baseline is monitored and implemented by the groups and policies listed: CO-OPS Web Committee (CWC), Software Configuration Control, Configuration Audits and Reviews, Functional Configuration Audit (FCA) and Physical Configuration Audit (PCA). Depending on the size and complexity of the system under control, other audits may be conducted to help ensure complete traceability of the requirement throughout the life cycle.

Configuration and Management (CM) is applied over the life cycle of a product (hardware and software) and provides visibility and control of its performance and functional and physical attributes. CM verifies that a product performs as intended and is identified and documented in sufficient detail to support its projected life cycle. Implementation of CM procedures and guidance is done in such a way as to complement other CO-OPS processes already established such as the planning and financial processes; systems integration management (SIM); and operational systems and technical architecture developments. The CM which is followed is the Department of Energy's Systems Engineering Methodology.

Project Process Improvements – CO-OPS has implemented a new process to facilitate the use of standard processes in the development and operation of applications such as the PORTS and NWLON application. This process is called the Reliable Operating System (ROS). It is the roadmap for operating with a systematic approach to continue CO-OPS' long tradition of providing critical products and services. The ROS provides checks and balances as well as clearly defines roles and responsibilities. It supports wise decision-making and efficient use of scarce federal resources. Most importantly it ensures:

- Systems that deliver products on time and within budget
- Systems that deliver consistently accurate data
- Systems that work as designed
- Systems that work upon installation
- Systems that operate at a high level of performance
- Systems that operate with a minimum of unscheduled repairs

To assist in implementing the ROS, this past fiscal year, a major effort was put forth in finding, updating, categorizing and publishing documents related to the PORTS and NWLON application from station reconnaissance, sensor installation, data ingestion, decoding, and quality control to data product outputs.

Monthly Budget Reviews – Monthly budget reviews are held with Division Chiefs, product managers, project managers and CORs to ensure products and their associated projects are within budget and on schedule. Monthly reports from contractors and their project managers are required to ensure that the Government is receiving the information and deliverables as stated in the contracts helps the Government with cost performance evaluations.

Quarterly Organizational Budget Reviews – Quarterly budget reviews are held between the organizational budget manager and the Division Chiefs to ensure that each division is meeting their quarterly objectives, their projects are on time and within costs and to identify any resources that may or may not be needed.