

REMAINING ITEMS

Investigations

Construction

Operation and Maintenance

Harbor Maintenance Trust Fund

Mississippi River and Tributaries

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REMAINING ITEMS
(Ordered by Appropriation)

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APPROPRIATION TITLE: Investigations, Fiscal Year 2020

Coordination Studies with Other Agencies

PROJECT NAME: Access to Water Data, Engineer Research and Development Center 1/ 2/

Allocation in FY 2016	Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Budgeted Amount in FY 2020
\$ 750,000	\$ 360,000	\$ 360,000	\$ 360,000 3/	\$ 360,000

1/ This activity is funded at 100 percent Federal expense.

2/ The costs of this activity are accounted for in Aquatic Ecosystem Restoration, Flood and Coastal Storm Damage Reduction, and Navigation business lines.

3/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2018 to FY 2019 was \$3,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2020 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: Section 2017 of Water Resources Development Act 2007 (33 USC 2342), as amended

DESCRIPTION; Annual funding provided under this program is used to develop standard business processes, procedures and database models to manage water quality and quantity data generated by the full range of Corps water resources activities in conjunction with the Environmental Protection Agency (EPA), the U.S. Geological Survey (USGS) and the National Oceanic and Atmospheric Administration (NOAA) Water Control and Water Quality Programs. This may include water quality/quantity information associated with stream gages, water quality gages and other monitoring devices and water resources model and analytical tool output. These data include variables such as precipitation, water chemistry, temperature, evaporation, sedimentation, biological and habitat data, riverine discharges and stages, reservoir storage, inflows and outflow. This will include developing quality assurance/quality control processes and criteria for collected data. Water quantity and water quality data will be made available to the public through a standard web interface in a downloadable format as soon as quality assurance/quality control has been conducted by the USACE. The Corps routinely coordinates with other Federal agencies to solicit feedback on management and implementation of this program.

APPROPRIATION TITLE: Investigations, Fiscal Year 2020

Collection and Study of Basic Data

PROJECT NAME: Automated Information Systems Support Tri-CADD, Engineer Research and Development Center 1/ 2/

Allocation in FY 2016	Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Budgeted Amount in FY 2020
\$ 251,000	\$ 251,000	\$ 250,000	\$ 250,000 3/	\$ 250,000

1/ This activity is funded at 100 percent Federal expense.

2/ The costs of this activity are accounted for in the Aquatic Ecosystem Restoration, Flood and Coastal Storm Damage Reduction, and Navigation business lines.

3/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2018 to FY 2019 was \$60,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2020 from prior appropriations for use on this effort is \$0.

DESCRIPTION: All Corps districts use Computer Automated Design (CAD), Building Information Modeling (BIM), Civil Information Modeling (CIM), and Geospatial Information Systems (GIS) computer systems for Civil Works engineering, design, mapping, planning, and facility management. All manual engineering design practices have been replaced with automated computerized design platforms or automated electronic mapping systems and most Corps environmental and natural resource analyses are being performed using GIS platforms. Standards and productivity enhancement tools are used for both in-house and contractor produced drawings, maps and analyses, which assure that all Corps offices have the ability to exchange their work among themselves and with others, including the private sector. The deployment of these automated systems at field offices achieve maximum productivity when users leverage the economies of scale offered by sharing the development and use of common data standards, procedures, and applications. This sharing is accelerated through a concerted effort by the Center, working with various field-working groups, to draw from field expertise and dissemination of this knowledge in the form of lessons learned and standards to benefit all Corps users. Comprehensive data standards supported by the Center permit government and industry users to produce equivalent designs, maps, and analysis on a variety of computer systems using commercial off-the-shelf BIM, CIM, CAD, and GIS software.

Annual funding is used to ensure that the Corps obtains the maximum return on its investment in automated systems such as BIM, CIM, CAD, and GIS by coordinating development efforts and distributing products to Corps offices and to support over 3,000 users of BIM/CIM/CAD/GIS and facility management technologies for Civil Works projects. All work accomplished using these funds is limited to support for automated information system improvements.

APPROPRIATION TITLE: Investigations, Fiscal Year 2020

-
Collection and Study of Basic Data – Flood and Storm Damage Reduction

PROJECT NAME: Coastal Field Data Collection, Engineer Research and Development Center 1/

Allocation in FY 2016	Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Budgeted Amount in FY 2020
\$ 1,000,000	\$ 1,000,000	\$ 1,000,000	\$ 1,000,000 2/	\$ 1,000,000

1/ This activity is funded at 100 percent Federal expense.

2/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2018 to FY 2019 was \$2,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2020 from prior appropriations for use on this effort is \$0.

DESCRIPTION: The Corps uses this funding to measure, analyze, and assemble long-term, high-resolution coastal data sets that are nationwide or regional in scope. The Coastal Working Group of the Hydraulics, Hydrology and Coastal community of Practice, in response to two Corps-wide surveys on data requirements (in 2009 and 2012), has highlighted the need for the systematic collection of these high-quality coastal observation data.

The Corps uses these data sets in its storm damage reduction and its commercial navigation programs to improve project design and performance. Inaccurate and insufficient observation data can lead to project design errors. For example, when designing a coastal rock structure, wave data with a 20% error will yield a 70% error rate in the stone size used to build the structure. Oversized stone makes initial construction costs much higher, while undersized stone results in early failure and higher than necessary life cycle repair costs. Similarly, a 5 degree to 10 degree error in wave direction can result in an error, or even reversal, in predicted sediment transport, compromising the success of a regional sediment management strategy. High-quality data sets can also assist in the development and evaluation of options where climatic changes may impact Corps projects.

The Field Research Facility (FRF) in Duck, North Carolina (<http://frf.usace.army.mil>), is a real-world coastal facility that collects a comprehensive suite of wave, current, meteorological, bathymetric, and topographic data. At this facility, the Corps evaluates oceanographic measurement techniques and equipment, collects high-resolution data during storms, and collects spatially and temporally intensive long-term measurements to improve our understanding of complex coastal processes and coastal climate. The FRF makes these data available online in real time to the other engineers and scientists of the Corps, other agencies (NOAA, NSF, Navy, USCG, USGS, etc.), universities, and the private sector. They are used for coastal research and for developing coastal engineering tools that predict wave environments and sediment movement affecting coastal projects, navigation safety, and dredging quantities. In addition, the facility serves as a testbed for evaluating and developing coastal numerical models (many models exist, but few have been rigorously evaluated). As a unique coastal observatory, the FRF is a significant Corps contribution to the Integrated Ocean Observing System (IOOS) as authorized in the Integrated Coastal and Ocean Observation System Act of 2009 (PL No. 111-11).

Recent activities at the FRF include the development and deployment of state-of-the-art lidar and radar systems for monitoring beach and nearshore changes in real-time including during storms; allowing highly accurate, temporally detailed observations. CLARIS, the Coastal Lidar and Radar Imaging System, is a mobile

system for rapidly mapping the beach, both alongshore and offshore. RIOS, the Radar Inlet Observation System, is a radar-based system for remotely mapping evolving inlet shoals in real-time for navigation safety and dredging activities. A permanently mounted Terrestrial Lidar system, which continuously maps the beach and breaking waves. This system, the only one of its kind in the world, has captured an hourly record of wave run-up and beach change during five hurricanes and four tropical storms since its permanent deployment in 2013.

The Corps also uses this funding to:

- Continue this long-term coastal ocean data collection, and the data requirements of the real-time model test bed. These wave observation systems provide data to advance coastal wave modeling technology and coastal inundation predictions.
- Continue the long-term coastal morphology survey program. These observations provide insight to erosion, inundation, and dune resilience, and inform development of sediment transport, shoreline change, and beach morphology models.
- Continue the collection of estuarine data (waves, water levels, winds, etc.) to assist in understanding sediment transport processes in estuarine environments, which supports research on various Corps activities including: re-suspension due to dredging, dredge material placement, and ecosystem restoration.

APPROPRIATION TITLE: Investigations, Fiscal Year 2020

Coordination Studies with Other Agencies – Navigation

PROJECT NAME: Committee on the Marine Transportation System 1/

Allocation in FY 2016	Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Budgeted Amount in FY 2020
\$ 125,000	\$ 90,000	\$ 50,000	\$ 50,000 2/	\$ 50,000

1/ This activity is funded at 100 percent Federal expense.

2/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2018 to FY 2019 was \$1,000. There was an additional \$0 of unobligated funds that are committed within the Corps for scheduled ongoing requirements in FY 2019. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2020 from prior appropriations for use on this effort is \$0.

The Committee on the Marine Transportation System (CMTS) was established as directed by the President in the *Ocean Action Plan – The Administration’s Response to the U.S. Commission on Ocean Policy* – 17 December 2004. The CMTS held its first meeting in July 2005 and continues to meet three to four times per year. The Assistant Secretary of the Army for Civil Works has been named as the Department of Defense (DOD) representative to the CMTS. The Chief of Engineers was selected to be the initial chair of the CMTS Coordinating Board, which advises and implements directives of the CMTS. The Chief of Engineers assumed to chair again on 1 August 2018 and will remain the chair until 31 July 2019. An interagency Executive Secretariat supports the day-to-day activities of the CMTS on behalf of the Coordinating Board. The Corps provides a full-time GS-15 liaison to the CMTS Executive Secretariat. This position reports to the Chief of Operations, HQUSACE, and HQ Operations has had the lead in CMTS coordination.

Funding will be used to coordinate with other Departments and agencies participating in CMTS; provide support for studies and initiatives requested by the CMTS; and support the DOD share of other initiatives requested by the Committee such as the Marine Transportation System (MTS) Data and Information Portal, MTS Research & Development Needs, as well as other Integrated Action Teams.

APPROPRIATION TITLE: Investigations, Fiscal Year 2020

Coordination Studies with Other Water Resource Agencies, Other Coordination Programs

PROJECT NAME: Coordination with Other Water Resource Agencies 1/ 2/

	Allocation in FY 2016 \$ 3/	Allocation in FY 2017 \$ 4/ 5/	Allocation in FY 2018 \$ 6/	Allocation in FY 2019 \$ 7/	Budgeted Amount in FY 2020 \$ 8/
Total	1,939,000	2,155,000 4/	2,160,000	1,200,000	350,000
CALFED	81,000	21,000	15,000	18,000	
Chesapeake Bay	350,000	55,000	104,000	97,000	
Gulf of Mexico	250,000	84,000	80,000	51,000	
Lake Tahoe	50,000	30,000	30,000	0	
Pacific Northwest Forest Case	10,000	0	0	0	
International and Interagency Support	400,000	300,000	400,000	400,000	
National Shoreline Management Study	400,000	1,400,000	1,310,000	400,000	
Other Programs	398,000	265,000	221,000	234,000	

1/ These activities are funded at 100 percent Federal expense.

2/ The costs of this activity are accounted for in Aquatic Ecosystem Restoration, Flood and Coastal Storm Damage Reduction, and Navigation business lines.

3/ Chesapeake Bay line item includes an additional \$275,000 reprogrammed in FY 2016; CALFED line item reflects \$19,000 reprogrammed away from the line item in FY 2016.

4/ \$50,000 was reprogrammed to this line item in FY 2017.

5/ In FY 2017, this remaining item consolidated six separate line items included in prior Budgets, which will enable improved execution of coordination funds by increasing the Corps' flexibility to administer these funds as needed and improve visibility of the suite of interagency coordination activities. Those programs are CALFED, Chesapeake Bay, Gulf of Mexico, Lake Tahoe, and Pacific Northwest Forest Case.

6/ \$50,000 was reprogrammed to this line item in FY 2018.

7/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2018 to FY 2019 on these efforts was \$896,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2020 from prior appropriations for use on this effort is \$0.

8/ In FY 2019, this remaining item consolidated two additional separate line items included in prior budgets – International and Interagency Support and the National Shoreline Management Study.

AUTHORIZATION: Fish and Wildlife Coordination Act of 1946 (16 USC 661 et seq.); Section 5 of the Watershed Protection and Flood Prevention Act of 1954, as amended (16 U.S.C. 1005); Section 1 of the Flood Control Act of 1944 (33 U.S.C. 701-1; Section 7 of the Small Reclamation Projects Act of 1956 (43 U.S.C. 422a); Section 320 of the Water Quality act of 1987 (and Section 102(2)(c) of the National Environmental Policy Act of 1969, as amended (43 U.S.C. 4332); Clean Water Act of 1972, as amended (33 U.S.C. 1251 et seq.); Section 234 of the Water Resources Development Act of 1996 (33 U.S.C. 2323a), as amended;

HQUSACE/Multiple Districts

Coordination with Other Water Resource Agencies

Section 215 of Water Resources Development Act of 1999.

DESCRIPTION: Funds provided under this program are used to enable efficient and effective coordination with other water resources agencies, which often support multi-agency, national initiatives and strategies such as:

- a) reviewing the environmental impacts that would result from installation of Department of Agriculture project features;
- b) preparing estimates of flood control requirements, and benefits, and reservoir operating criteria for storage reservoirs to be constructed with Federal funds for Department of Interior (Bureau of Reclamation) projects;
- c) supporting actions related to the North American Waterfowl Management Plan, most recently revised in 2012; d) cooperate with Federal, state, and local agencies such as River Basin Compact Commissions; Interstate River Basin Compacts; and Regional Planning Commissions as well as for participation in Regional Planning Bodies of the National Ocean Council, as needed; and technical advisory committees of the National Estuary Program; and
- e) supporting, after consulting with the Department of State, international organizations and foreign governments efforts to address domestic and international problems related to water resources, infrastructure development, and environmental protection and restoration;
- f) participating in specific regional initiatives, such as:
 - i. Federal Leadership Committee for the Chesapeake Bay;
 - ii. RESTORE, NFWF, and/or NRDA responses to Deep Water Horizon long term recovery;
 - iii. Lake Tahoe Federal Interagency Partnership to restore ecosystems at Lake Tahoe while maintaining a viable economic climate;
 - iv. ecosystem management of the public lands in the Pacific Northwest within the range of the Northern Spotted Owl;
 - v. the Southern Nevada Public Lands Management Act Program; and
 - vi. collaboration with NOAA, USGS, and the Coastal States Organization to describe the extent and cause of shoreline erosion and accretion on all the coasts of the United States and describe the economic and environmental impacts of that erosion and accretion and to improve our understanding of long-term regional trends.

APPROPRIATION TITLE: Investigations, Fiscal Year 2020

Other, Miscellaneous – Navigation

PROJECT NAME: Disposition of Completed Projects, Multiple Districts 1/

	Total Estimated Federal Cost \$	Allocation in FY2016 \$ 2/	Allocation in FY2017 \$	Allocation in FY2018 \$	Presumed Allocation in FY2019 \$ 3/	Budgeted Amount in FY2020 \$ 3/	Balance to Complete After FY2020 \$
Programmatic Management	100,000	50,000	30,000	20,000	0	0	0
West Pearl River Navigation Project, MS & LA	433,000	350,000	83,000	0	0	0	0
Kentucky River Locks and Dams, 1-4, KY	400,000	116,000	284,000	0	0	0	0
Willamette Falls Locks, OR	520,000	60,000	420,000	40,000	0	0	0
Allegheny River Locks 5-9, PA	450,000	100,000	350,000	0	0	0	0
Upper Monongahela River, PA	450,000	100,000	350,000	0	0	0	0
St. Anthony Falls, Mississippi River, MN	1,250,000	0	75,000	471,000	325,000	218,000	161,000
Salinas Reservoir (Santa Margarita Lake), CA	1,250,000	0	50,000	445,000	350,000	243,000	163,000
Cape Fear Locks and Dams 1-3, NC	1,250,000	0	0	445,000	300,000	393,000	112,000
Los Angeles County Drainage Area (Channels), CA	1,250,000	0	0	0	0	350,000	900,000
Apoon Mouth of Yukon, AK	150,000	0	0	0	0	46,000	104,000
St. Michael Canal, AK	150,000	0	0	0	0	50,000	100,000
Unallocated Funds		1,284,000	642,000	225,000	300,000	0	0

1/ These studies are conducted at 100 percent Federal expense.

2/ This effort was initiated in FY 2016. There were no allocations prior to FY 2016.

3/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2018 to FY 2019 was \$1,211,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2020 from prior appropriations for use on this effort is \$300,000.

AUTHORIZATION: Flood Control Act of 1970, Section 216 – Review of Completed Projects.

DESCRIPTION: The Corps uses an asset-based and risk-informed investment strategy for the lifecycle management of civil works assets. Asset management includes developing consistent, transparent, and repeatable tools and processes to inform strategic maintenance; performing condition and risk assessments and identifying associated consequences; and using that information to prioritize investments. Cost savings from asset management can be derived from reductions of project operation and maintenance or divestiture of assets that are no longer providing benefits that warrant continued Federal investment. Program execution is currently aligned with the scope and schedule of the Interim Guidance issued on August 22, 2016. The timing of guidance late in the fiscal year resulted in less work being accomplished in FY 2016 than was originally planned. However, after development of program guidance in FY 2017, program execution accelerated and is anticipated to continue to accelerate.

HQUSACE

Disposition of Completed Projects

Annual funding will be used to undertake disposition studies needed to identify necessary actions to safely dispose of infrastructure; ensure compliance with laws and regulations, including the National Environmental Policy Act; and verify interest in future ownership of the properties. Deauthorization and disposal of the facilities will eliminate future Federal operation and maintenance funding requirements after the facilities have been turned over to a non-Federal entity or removed. Prior to disposing of the facilities, the purpose of the infrastructure would be deauthorized. In some cases, ecosystem restoration may be a viable path toward disposal of the projects and that will be considered in the disposition study.

The study of each disposition will follow the current planning process. Disposition studies will be selected from facilities for which the Corps has ongoing maintenance responsibilities. Disposition studies will be focused on facilities that are expected to result in a net cost savings to the Federal government. In some cases, facilities have been identified as candidates for disposition, but a non-Federal interest has not expressed interest in assuming responsibility for the facility. While it is preferred to have an identified end user, a disposition study may continue without a committed end user.

Fiscal Year 2020 funds are being used to continue the St. Anthony Falls, Mississippi River, MN, Cape Fear Locks and Dams 1-3, NC and Salinas Reservoir (Santa Margarita Lake), CA, disposition studies, and initiate new disposition studies on Los Angeles County Drainage Area (Channels), CA; Apoon Mouth of Yukon, AK; and St. Michael Canal, AK. The Willamette Falls Locks, OR disposition study is being finalized using previously appropriated funds.

St. Anthony Falls is located at Mississippi River 853.3 in Minnesota. The Corps' original involvement at St. Anthony Falls followed the Eastman Tunnel collapse when the Corps built dams, a dike and apron to prevent the destruction of St. Anthony Falls. Subsequently, the Corps constructed the Upper Harbor Project consisting of horseshoe and chord dams and the Upper and Lower Locks. In June 2015, the St. Anthony Upper Lock was closed per WRRDA 2014, in an effort to prohibit Asian carp's upstream migration. The Lower St. Anthony Falls Lock continues to be operated on a limited basis.

Salinas Dam impounds the Salinas Reservoir (Santa Margarita Lake). Salinas Dam was originally constructed by the War Department in 1941 to create a water supply for Camp San Luis Obispo. Salinas Reservoir was transferred to the Corps in 1947. Salinas Reservoir is currently operated by San Luis Obispo County Flood Control and Water Conservation District under a Corps of Engineers lease and is water supply storage for the city of San Luis Obispo.

Cape Fear Locks and Dams 1-3, located on the Cape Fear River, were originally constructed in support of commercial navigation. After construction these were authorized for recreation. Commercial navigation traffic has ceased. The facilities now provide recreational opportunities, and a minimal level of service to ensure safety.

Los Angeles County Drainage Area (LACDA) is a series of flood risk management features operated and maintained in concert by agencies and entities located in southern California. The channel portions of LACDA no longer function efficiently and provide a diminished level of flood risk management.

Apoon Mouth of Yukon River, Alaska was originally authorized to provide for a channel through bars located in Apoon Mouth, bend widening and a channel through the bar located in Pastol Bay. The need for waterborne transportation in this area was eliminated by construction of the Alaska Railroad and modern transportation systems. Apoon Mouth of Yukon River no longer supports navigation traffic.

St. Michael Canal, Alaska provided a channel from St. Michael Bay to the St. Michael Canal north and south branches. The need for waterborne transportation in this area was eliminated by construction of the Alaska Railroad and modern transportation systems. St. Michael Canal no longer supports navigation traffic.

ACCOMPLISHMENTS:

HQUSACE

Disposition of Completed Projects

The West Pearl River Navigation Project, MS & LA disposition study was terminated when Congress deauthorized and directed conveyance of the Pearl River, MS & LA project in Section 1321 of the Water Resources Development Act of 2016.

The Kentucky River Locks and Dams 1-4, KY disposition study was completed in April 2018. Congress deauthorized and directed conveyance of the Locks and Dams 1 through 4, Kentucky River, Kentucky project to the State of Kentucky in Section 1331 of the America's Water Infrastructure Act of 2018.

The Allegheny Locks 5-9, PA and Upper Monongahela River, PA disposition studies are closed out with no path forward to disposition.

APPROPRIATION TITLE: Investigations, Fiscal Year 2020

Collection and Study of Basic Data– Aquatic Ecosystem Restoration

PROJECT NAME: Environmental Data Studies 1/

Allocation in FY 2016	Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Budgeted Amount in FY 2020
\$ 98,000	\$ 1	\$ 80,000	\$ 80,000 2/	\$ 80,000

1/ This activity is funded at 100 percent Federal expense.

2/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2018 to FY 2019 was \$14,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2020 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: Section 2036, Water Resources Development Act (WRDA) 2007 (P.L. 110-114)

DESCRIPTION: The Environmental Data Studies program includes general national or regional environmental data collection and support of field offices in the use of innovative information system technology, including geographic information systems to demonstrate the relationship between project-funded environmental activities with national or regional environmental issues. Environmental data includes biological, physical, and/or cultural resource components. The access to data systems that house information is both intra agency and interagency, involving all concerned Federal agencies, notably the U.S. Fish and Wildlife Service, National Oceanic and Atmospheric Administration, U.S. Geological Survey, U.S. Forest Service, Natural Resources Conservation Service, Environmental Protection Agency, as well as State fish and wildlife and natural resource agencies, and non-governmental organizations like NatureServe. The program supports the development of the Civil Works Mitigation and Endangered Species Act Compliance Database and the Ecosystem Restoration Business Line Database, which summarizes important information on projects and informs decision-making. The aim is to reduce costs, avoid duplication, improve procedures for complying with environmental statutes, and aid in addressing environmental issues of national and/or regional significance.

Annual funding is used to:

- Maintain and support upgrades to the Holistic Ecosystem Restoration Online Network (HERON), the Civil Works Mitigation and ESA Compliance Database and Ecosystem Restoration Business Line Database
- Improve the efficiency with which District staff assemble and analyze environmental information for Civil Works projects;
- Develop new or updated linkages to ensure access to current data sources; and
- Maintain and support the access and sharing of environmental information for national and regional inventories and assessments and train field personnel in its access and use through the USACE environmental databases.

Examples of prior year accomplishments include; training and support to Districts on environmental data; NatureServe data subscription; and support upgrades to the Holistic Ecosystem Restoration Online Network (HERON).

APPROPRIATION TITLE: Investigations, Fiscal Year 2020

Coordination Studies with Other Agencies, Other Coordination Programs

PROJECT NAME: FERC Licensing 1/ 2/

Allocation in FY 2016 \$	Allocation in FY 2017 \$	Allocation in FY 2018 \$	Allocation in FY 2019 \$	Budgeted Amount in FY 2020 \$
200,000	100,000	100,000	100,000 3/	100,000

1/ This activity is funded at 100 percent Federal expense.

2/ The costs of this activity are accounted for in the Aquatic Ecosystem Restoration, Flood and Coastal Storm Damage Reduction, and Navigation business lines.

3/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2018 to FY 2019 was \$66,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2020 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: Federal Power Act

DESCRIPTION: The funds provided under this line item enable the U.S. Army Corps of Engineers to conduct reviews of pre-applications for Federal Energy Regulatory Commission (FERC) preliminary permit and license applications for development of hydroelectric power at Corps and/or non-Corps projects to ascertain potential impacts to the Corps of Engineers' responsibilities and mission in operating projects for authorized purposes. Also, the Corps reviews applications for surrender or termination of licenses to ascertain impacts to Corps' responsibilities and mission. This work was funded under a different budget line item until 2012.

APPROPRIATION TITLE: Investigations, Fiscal Year 2020

Collection and Study of Basic Data – Flood and Storm Damage Reduction

PROJECT NAME: Flood Damage Data 1/

Allocation in FY 2016	Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Budgeted Amount in FY 2020
\$ 300,000	\$ 220,000	\$ 230,000	\$ 230,000 2/	\$ 230,000

1/ This activity is funded at 100 percent Federal expense.

2/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2018 to FY 2019 was \$4,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2020 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: Section 904, Water Resources Development Act (WRDA) 1986 (P.L. 99-662); Section 308, WRDA 1990 (P.L. 101-640)

DESCRIPTION: The Corps uses this funding to collect and maintain basic flood damage data, improve the technical quality and accuracy of the available flood damage data, and improve our understanding of the interrelationships of the characteristics of flooding on property damage. The probabilities and damages associated with various flood events reflect multiple factors and are key elements of the risk-based analytical framework used in water resource studies. The evaluation and formulation of options to reduce flood risks require knowledge of the relationships between flood depth, flood duration and velocity, and the value and type of damageable property in the floodplain. In estimating the flood risk, the Corps uses standard damage-frequency integration techniques, and computer programs that relate hydrologic and hydraulic flood variables (such as discharge and stage) to damages and the probability of their occurrence.

A centralized, objective source of depth-damage relationships using empirical data results in the standardization of flood damage estimates across the Corps and reduces the need for Districts to compute the relationships themselves for each separate study, resulting in substantial savings as well as reducing likelihood of bias.

The activities of the program are to:

- (1) Conduct actual flood damage surveys following riverine and coastal flood events;
- (2) Provide this post-flood damage information to the affected and nearby communities for their use in managing their flood risks;
- (3) Develop, maintain, and improve the general economic database of flood damages that the Corps uses to develop its depth-damage relationships for a variety of structure occupancy types;
- (4) Calculate flood depth-damage functions for riverine and coastal flooding based on empirical damage data;
- (5) Collect data and derive damage relationships for the flooding of roads, public buildings and facilities, and other public infrastructure;
- (6) Develop and maintain a floodplain inventory software tool that organizes floodplain information, which is then exported to the Corps' Flood Damage Assessment software tool.
- (7) Collect data on clean-up costs, evacuation costs, relocation costs and other costs associated with flood events.

The Corps also uses this funding to update and maintain data collection survey forms and other data collection techniques, to develop and share a flood damage database, to update and maintain a geospatial computer application for floodplain inventory data, and to certify models for estimating residential and nonresidential structure values. In addition, it uses this funding to facilitate collaboration in collecting and sharing of flood damage data within the Corps and between other agencies, and to refine functions for estimating cleanup and relocation costs associated with flooding. Finally, the Corps uses these funds to develop and refine depth-damage curves for coastal areas, for which the Corps has limited information, and for which effects (wave attack, erosion, storm surge, saline water) are markedly different from riverine flooding.

APPROPRIATION TITLE: Investigations, Fiscal Year 2020

Collection and Study of Basic Data – Flood and Storm Damage Reduction

PROJECT NAME: Flood Plain Management Services 1/

	Allocation in FY 2016 \$	Allocation in FY 2017 \$	Allocation in FY 2018 \$	Allocation in FY 2019 \$ 2/	Budgeted Amount in FY 2020 \$
Total	15,000,000	15,300,000	15,000,000	17,000,000	15,000,000
Non-Structural Alternatives	4,000,000	7,000,000	6,919,000	7,000,000	6,500,000
Other Technical Assistance	6,080,000	6,000,000	6,326,000	8,500,000	7,000,000
SAGE	2,000,000	1,000,000	400,000	500,000	500,000
National Hurricane Program	500,000	800,000	855,000	500,000	500,000
National Nonstructural Committee	420,000	500,000	500,000	500,000	500,000
Silver Jackets 3/	2,000,000	0	0	0	0

1/ All of these activities are funded at 100 percent Federal expense.

2/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2018 to FY 2019 was \$7,748,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2020 from prior appropriations for use on this effort is \$0.

3/ Since 2017, the Corps has funded its participation in the Silver Jackets Program elsewhere in the Investigations account, under the National Flood Risk Management Program remaining item.

AUTHORIZATION: Section 206 of the 1960 Flood Control Act (P.L. 86 645), as amended.

DESCRIPTION: The Corps uses this funding to provide technical assistance (information, analysis, guidance) to states, tribes and local communities that are taking, or considering, actions to improve their flood plain management, with a focus on non-structural measures, and the planning and implementation of actions at the State and local levels that reduce flood risk through wise use of floodplains. Examples include evaluating site-specific flood and flood plain data; hydraulic and hydrologic modeling services; identifying potential flood hazards in areas where a community expects future development to occur; technical support on ways to enhance resiliency to flood events; helping develop a flood warning plan; and technical assistance for a pre-disaster evacuation and preparedness study.

The Corps provides this technical assistance based on the flood and flood plain concerns that the local community has identified. The Corps uses this funding to supports locally based planning efforts, providing them access to the most current technology, research and skills on flood risk and floodplain management, including small communities that may have limited expertise in this area. For example, the Corps could help interpret flood and flood plain data, or to identify options for addressing the local concerns. The Corps could provide guidance that will help the local community and the private sector to improve the way that they are now managing their flood risks. This guidance could cover all or particular aspects of flood plain management planning, such as off-flood plain use changes, communications conveying, and fostering public understanding of flood hazards, and of the options for achieving flood plain management goals.

The Corps also funds four related activities under this remaining item:

- Through its Interagency Nonstructural program, the Corps uses this funding to promote small-scale efforts to improve flood risk management, which emphasize development and implementation of nonstructural approaches to manage and reduce flood risks. The Corps undertakes these efforts together with others, where multiple partners can achieve benefits that any one of them could not achieve alone.
- Through its Systems Approach to Geomorphic Engineering (SAGE) program, the Corps uses this funding to work with other agencies and stakeholders to investigate and support coastal resiliency on a landscape scale.
- Through its National Nonstructural Committee (NNC), the Corps uses this funding to provide technical expertise on all aspects of nonstructural flood risk reduction adaptive measures, focusing on reducing the consequences of flooding.
- Through its National Hurricane Program (NHP), the Corps uses this funding to provide real-time support in hurricane situations and input affecting emergency management, services, evacuation, and actions to enhance preparedness. The NHP works closely with FEMA and other emergency management organizations to maintain the capability to respond to the threats posed by coastal storms.

APPROPRIATION TITLE: Investigations, Fiscal Year 2020

Collection and Study of Basic Data – Flood and Storm Damage Reduction

PROJECT NAME: Hydrologic Studies 1/

Allocation in FY 2016	Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Budgeted Amount in FY 2020
\$ 1,743,000	\$ 500,000	\$ 500,000	\$ 500,000 2/	\$ 500,000

1/ This activity is funded at 100 percent Federal expense.

2/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2018 to FY 2019 was \$25,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2020 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: Section 7 of the 1944 Flood Control Act, 33 U.S.C. 709

DESCRIPTION: The Corps uses this funding to perform engineering analyses of hydrologic data on one or more specific storm events, outside of the scope of a Corps project study. It conducts these analyses to advance our general understanding of the hydrology of major storm events and certain special hydrologic processes. The Corps also applies the conclusions that it derives from these analyses to improve the hydrologic engineering techniques that it uses in the planning, design, construction, and operation of water resources projects. The program consists of four sub items:

- 1) Storm Studies: The Corps uses these funds to gather comprehensive rainfall data in order to refine regional hydro-meteorological information throughout the nation. This up-to-date hydro-meteorological information informs Corps water resources studies, and supports the design of proposed projects. The Corps also uses these data in its safety assessments of existing Corps projects, the evaluation of flood producing potentials of river basins, and the development of probable maximum precipitation determinations.
- 2) General Hydrologic Studies: The Corps uses these funds to analyze rainfall runoff relationships; to estimate flood frequencies; and in snowmelt studies, hydrograph development and routing at selected watersheds, model calibrations in urban areas, analyses of past floods, the development of methods for the hydraulic analysis of non-gauged streams, and other studies of a related hydrologic nature.
- 3) Sedimentation Studies: The Corps uses these funds in non-project sedimentation studies, and for the Corps share of the cost of the cooperative Interagency Sedimentation Project at the Hydraulics Laboratory, Waterways Experiment Station. For example, these studies have supported the standardization and development of equipment, criteria, and methodology for the collection and analysis of suspended and bed load sediment characteristics of natural streams; and related laboratory studies.
- 4) Stream Flow and Rainfall Data Analysis: The Corps uses these funds to install and operate hydrometeorology gages unrelated to a specific Corps project, where needed to support the studies described above.

APPROPRIATION TITLE: Investigations, Fiscal Year 2020

Coordination Studies With Other Agencies, Other Coordination Programs

PROJECT NAME: Interagency Water Resources Development 1/ 2/

Allocation in FY 2016	Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Budgeted Amount in FY 2020
\$ 721,000	\$ 177,000 3/	\$ 100,000	\$ 100,000 4/	\$ 100,000

1/ This activity is funded at 100 percent Federal expense.

2/ The costs of this activity are accounted for in the Aquatic Ecosystem Restoration, Flood and Coastal Storm Damage Reduction, and Navigation business lines.

3/ \$2,000 was reprogrammed to this line item in FY 2017.

4/ The actual unobligated carry-in from FY 2018 to FY 2019 was \$87,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2020 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: 33 U.S.C. 2323a; 42 USC 1962d-16.

DESCRIPTION: Funds provided under this program are used to cover activities including meeting with City, County and State officials to:

- a) help them solve water resources problems when they have sought advice;
- b) determine whether Corps programs are available and may be used to address the problems; and
- c) ensure they understand study cost-sharing and obtain an indication of their interest in participating in a future study.

Efforts are often part of or complementary to regional and local plans that address water resource problems.

APPROPRIATION TITLE: Investigations, Fiscal Year 2020

Collection and Study of Basic Data – Flood and Storm Damage Reduction

PROJECT NAME: International Water Studies, Multiple Districts 1/

Allocation in FY 2016	Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Budgeted Amount in FY 2020
\$ 150,000	\$ 125,000	\$ 125,000	\$ 125,000 2/	\$ 125,000

1/ This activity is funded at 100 percent Federal expense.

2/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2018 to FY 2019 was \$8,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2020 from prior appropriations for use on this effort is \$0.

The Corps uses this funding to prepare studies that support the participation of the United States in boundary water treaties and other international agreements with Canada. Under these treaties and agreements, various Boards and Committees, consisting of officials from both nations, hold joint meetings, review report drafts and correspondence, and report their findings to the establishing parties. The degree of study activity varies depending upon the requirements of the Commission or Treaty under which they were established. These efforts assure better management, use, and orderly development of the shared water resources of the river basins that cross the United States and Canadian border.

Under the Boundary Waters Treaty of 1909, the International Joint Commission (IJC) was established and empowered to establish local boards, which conduct investigations and ensure adherence to orders of approval pertaining to use of boundary waters issued by the IJC. Corps officials serve on and chair the United States Sections of the following IJC Boards: Saint Croix River, Champlain Richelieu, Lake Champlain, St. Lawrence River, Niagara, Lake Superior, Lake of the Woods, Rainy Lake, Souris Red Rivers Engineering, Souris River Control, Kootenay Lake, and Osoyoos Lake. In support of the Saint Croix River Board of Control, the Corps retrieves and analyzes water data to assure compliance with IJC rules and annual inspection of dams and fish passage facilities. The Niagara Treaty of 1950 between United States and Canada supports the most beneficial use of waters of the Niagara River. Corps officials serve on and chair the United States Sections of the International Niagara Committee and the International Lake Memphremagog Board. The Corps provides flow data and updates the flow rating curve used to verify compliance with Niagara Treaty requirements.

Together with Bonneville Power Administration and British Columbia Hydropower, and under the Columbia River Treaty of 1961, the Corps annually develops the Assured Operating Plan and the Detailed Operating Plan for the Columbia River Treaty storage projects. The Corps also supports the work of the Columbia River Treaty Permanent Engineering Board, including publication of its annual report to the Governments, the Columbia River Treaty Entities, and the Columbia River Treaty Operating Committee. The Corps undertakes special studies related to international impacts of evaluation of endangered species compliance related to Columbia River Treaty projects and coordinates operations of Libby Dam under the 2001 Libby Coordination Agreement.

APPROPRIATION TITLE: Investigations, Fiscal Year 2020

Coordination Studies with Other Agencies, Other Coordination Programs – Flood and Storm Damage Reduction

PROJECT NAME: Inventory of Dams 1/

Allocation in FY 2016	Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Budgeted Amount in FY 2020
\$ 400,000	\$ 400,000	\$ 400,000	\$ 400,000 2/	\$ 400,000

1/ All activities are funded at 100 percent Federal expense.

2/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2018 to FY 2019 was \$84,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2020 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: Section 215 of the Water Resources Development Act of 1996 (P.L. 104-303), as amended by Section 3001 of the Water Resources and Reform Development Act of 2014 (P.L. 113-121).

DESCRIPTION: The Corps uses this funding to maintain and update data on dams in the United States, using a database called the National Inventory of Dams (NID). The Corps initially compiled the NID in 1975, and has been updating it periodically since then with information provided by the state dam safety agencies, other Federal agencies that own dams, and the Corps (for its dams). The updates reflect changes such as the construction of new dams, changes in ownership, major modifications to existing dams, decommissioning and removal of dams, and improvements in data accuracy and completeness. The NID now includes 90,580 dams, most of which are privately owned. The Corps uses the internet to provide ease of use, accuracy, and accessibility for the data in the NID.

With this funding, the Corps updates the data on these dams, improves information flow, and performs data quality control processes. The database provides a central nationwide source of publicly available information used to track and manage dam safety efforts. The data in the NID informs a nationwide, coordinated effort to improve dam safety. This effort involves the entire federal and non-federal dam safety community, in cooperation with the Interagency Committee on Dam Safety, and the Association of State Dam Safety Officials.

The Secretary of Homeland Security and the National Dam Safety Review Board use the NID to allocate dam safety program assistance funds among the states, in proportion to the number of regulated dams in each state. The Corps provides summaries and analysis of the dam inventory data (such as inspections, emergency action plans, etc.) to the Federal Emergency Management Agency (FEMA) for its use in preparing the Biennial Report to Congress on the National Dam Safety Program. FEMA also uses this information in its oversight of the implementation of the Federal Guidelines for Dam Safety. The Corps pays all of the costs of the ongoing administration, maintenance, and publication of the NID.

The Corps now updates the NID each year, based on information that it collects from each of the state and federal agencies with dam safety responsibilities, such as inspection completion dates and condition assessment data. (Prior to 2016, the Corps updated the NID roughly once every 2 years - 3 years.) As a result of this data collection, almost 80 percent of the dams in the Nation that are known to have a high hazard potential now contain an assessment in the NID of the dam's condition based on the last inspection (compared to only 40 percent in 2009). Continuing efforts

include routine maintenance on the inventory data and ensuring the internet based, searchable inventory remains available to all federal, state, and local government agencies and the public. In calendar year 2017, more than 23,000 users accessed the NID website. Based on their login selection, 20 percent of them were from academia, 17 percent were from engineering/construction businesses, 16 percent were from federal government, 11 percent were from the general public, and 5 percent were from the media.

The Corps also uses this funding to upgrade the Geographic Information System interface used by the NID and to increase the integration of the NID with other dam and levee safety resources. Modifications to the web-based data submittal tool continue to improve ease of access and information updates by federal and non-federal dam safety agencies.

APPROPRIATION TITLE: Investigations, Fiscal Year 2020

Other, Miscellaneous – Flood and Storm Damage Reduction

PROJECT NAME: National Flood Risk Management Program 1/

Allocation in FY 2016	Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Budgeted Amount in FY 2020
\$ 6,000,000	\$ 5,175,000	\$ 5,300,000	\$ 5,000,000 2/	\$ 5,000,000

1/ This activity is funded at 100 percent Federal expense.

2/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2018 to FY 2019 was \$975,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2020 from prior appropriations for use on this effort is \$0.

DESCRIPTION: The Corps uses this funding to support its participation in interagency technical and policy coordination groups on issues of flood risk management at the national and state levels. This work of the Corps involves coordinating the existing Federal programs that affect flood risk (for example, federally funded mitigation activities); ensuring that they complement the primary roles of the states and local communities in flood risk management; sharing data, knowledge, and lessons learned; and eliminating duplicative or conflicting Federal activities or policies. For example:

- At the national level, the Corps uses this funding to support its participation in the FEMA-chaired National Mitigation Framework Leadership (MitFLG). Specifically, the Corps participates on one of the formal sub-teams to further the coordination of various Federal programs for flood and other hazard mitigation activities and to develop a national mitigation investment strategy. Also at the national level, the Corps uses this funding to support its participation in the work of the Federal Interagency Floodplain Management Task Force (FIFM-TF). The FIFM-TF, co-chaired by FEMA and the Corps, is a national level task force of agency representatives from Federal agencies with major water resources programs. The task force is responsible for updating and maintaining a Unified National Program for Floodplain Management; coordinating Federal agency policies for flood risk management; and identifying, developing, and recommending actions and policies by the Federal government necessary to reduce flood risks, including residual risks and the risk of loss of life of flood plain residents. Quarterly meetings of the FIFM-TF provide an opportunity for FEMA, the Corps, and other Federal agencies to coordinate their flood risk management programs, policies and activities to improve overall federal flood risk management program implementation. In between the quarterly meetings, the FIFM-TF Working Group, composed of senior staff from the member agencies, implements the FIFM-TF Work Plan activities.
- At the regional level, the Corps uses this funding to support its involvement in intergovernmental partnerships during recovery from major flood/disaster events. These Regional Flood Risk Management teams, which the Corps leads, provide a venue for interagency and intergovernmental coordination at the regional level to manage flood risks by integrating pre-flood mitigation with a long-term strategy to plan and implement pre-flood and post-flood emergency actions, while developing promising nonstructural alternatives and other flood risk mitigation actions.
- At the state level, the Corps uses this funding to provide direction and oversight to its involvement in the Silver Jackets program. Under this program, teams of Federal and state staff from multiple agencies with flood risk management expertise work to identify ways to help address the state's flood risk management and hazard mitigation priorities. For example, this would include assisting state agencies and local communities in identifying opportunities to leverage information and resources, helping them to improve their processes for public risk communication, and showing them ways to approach flood risk management issues holistically and implement workable solutions at the state and local levels.

The Corps also has used this funding to improve its approach to flood risk management and to develop supporting technical products. For example:

- Developing and initiating a management framework to improve internal communication both within the Corps and with FEMA's Headquarters and Regions on policy, practices, and guidance for flood risk management.
- Developing tools and methods for communicating flood risk and encouraging public involvement in flood risk management planning.
- Developing recommendations that will enhance the ability of the Corps both to manage flood risk within its own programs and to be an effective partner with other federal agencies, non-federal governments, and communities that help manage flood risks.

The Corps develops its priorities for the use of this funding (across the multiple potential activities included in its scope) through its Senior Executive National Flood Risk Management Program Steering Committee, with input from FEMA and other federal partners. The Corps also takes into consideration input from key groups such as the Association of State Floodplain Managers, the National Association of Flood and Storm Water Management Agencies, and the Association of State Dam Safety Officials when setting these priorities.

APPROPRIATION TITLE: Investigations, Fiscal Year 2020

Coordination Studies with Other Agencies

PROJECT NAME: Planning Assistance to States 1/ 2/

Allocation in FY 2016	Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Budgeted Amount in FY 2020
\$ 6,000,000	\$ 6,750,000	\$ 8,000,000	\$ 9,000,000 3/	\$ 5,000,000

1/ With limited exceptions, non-Federal sponsors are responsible for 50 percent of the cost of efforts undertaken with these funds.

2/ The Budget accounts for this activity under the Flood and Storm Damage Reduction program.

3/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2018 to FY 2019 was \$5,624,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2020 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: Section 22 of the Water Resources Development Act of 1974, as amended, 42 U.S.C. 1962d-16.

DESCRIPTION: The Corps uses this funding to provide technical assistance to states, local governments, Indian tribes, and regional and interstate water resources authorities to assist them in their water resources planning efforts. The Corps would use the requested funds for work related to flood risk management.

States, local governments, Indian tribes, and regional and interstate water resources authorities that are working to develop locally directed solutions to their water resources problems are eligible to compete for this funding. The program provides a means for Corps staff to work with them on the water resources issues that are of interest to them, outside of the Corps process for the planning and authorization of a specific proposed Corps project. The Corps does not use this funding to conduct project or watershed studies, or to develop analyses intended as preparation for a Corps project or watershed study.

Through this program, the Corps generally provides technical analysis to a community that is working on a specific water resources issue, such as where a local authority seeks to develop or update its hazard mitigation plan, or otherwise to improve the way that it is managing its flood risk. The Corps also is able under this program to provide technical analysis to support a broader effort by a state, regional, or interstate authority (such as the Susquehanna River Basin Commission River Basin Commission, Delaware River Basin Commission, or the Interstate Commission on the Potomac River Basin) that is evaluating options involving a range of issues across a large watershed.

Examples of the kinds of issues on which the Corps has provided such assistance include floodplain management, coastal zone management, water conservation, drought management, restoring urban river environments, water quality, and pre-disaster emergency planning.

APPROPRIATION TITLE: Investigations, Fiscal Year 2020

Other, Miscellaneous

PROJECT NAME: Planning Support Program 1/ 2/

Allocation in FY 2016	Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Budgeted Amount in FY 2020
\$ 3,100,000	\$ 3,150,000 3/	\$ 3,500,000	\$ 3,500,000 4/	\$ 3,500,000

1/ The activities supported by this remaining item are funded at 100 percent Federal expense.

2/ The costs of this activity are accounted for in the Aquatic Ecosystem Restoration, Flood and Coastal Storm Damage Reduction, and Navigation business lines.

3/ \$150,000 was reprogrammed to this remaining item in FY 2017.

4/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2018 to FY 2019 was \$599,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2020 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: Section 936, WRDA 1986; Section 216, WRDA 2000; Section 2033(e), WRDA 2007

DESCRIPTION: The Planning Support Program provides technical and managerial assistance for project planning, development, and implementation; peer reviews of new major methods, models, or analyses used in feasibility studies; and support independent peer review panels as well as maintaining core planning competency within the workforce. The key components of this program are as follows:

1. Planner Capability and Training. The Planning Community of Practice is comprised of Corps employees who share best planning practices, test innovative solutions, and coach and mentor each other. The Planning Associates Program is an advanced training program for journeyman level water resource planners in the Corps. The program includes 20 instructional units held at various locations and extends over 1-3 week increments for 11 months. The goals of the program are to broaden the planners' competencies in solving complex water resources problems; to strengthen their leadership skills; and to retain critical planner capability as they progress toward expert planner. Since 2003, 149 planners have completed this training.

2. Planning Centers of Expertise: Six national Planning Centers of Expertise for inland navigation, deep draft navigation, ecosystem restoration, coastal and storm damage reduction, flood damage reduction, and water management and reallocation have key roles in maintaining and strengthening the competency of the Planning Community of Practice by providing technical assistance, conducting or managing peer review, and transferring the latest technology or methodologies and sharing lessons learned and best practices throughout the planning community.

3. Planning Modernization: The current planning process - Specific, Measurable, Attainable, Risk Informed, Timely (SMART) Planning - for feasibility studies is risk-informed and decision focused and utilizes the 6-step planning process (identify problems and opportunities, inventory and forecast conditions, formulate alternatives, evaluate alternatives, compare alternatives, select the recommended plan) while deliberately scoping analyses to what is necessary for decisions. SMART planning provides a framework to allow for the identification of a recommended plan through more direct collaboration between the District, Division, Headquarters and the non-Federal sponsor, and eliminates extraneous analysis while improving the quality of the decision.

HQUSACE

Planning Support Program

APPROPRIATION TITLE: Investigations, Fiscal Year 2020

Collection and Study of Basic Data – Flood and Storm Damage Reduction

PROJECT NAME: Precipitation Studies 1/

Allocation in FY 2016	Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Budgeted Amount in FY 2020
\$ 225,000	\$ 200,000	\$ 200,000	\$ 200,000 2/	\$ 200,000

1/ This activity is funded at 100 percent Federal expense.

2/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2018 to FY 2019 was \$3,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2020 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: Section 206 of the Flood Control Act of 1960, P.L. 86-645, 33 USC 709a

DESCRIPTION: The Corps uses these funds to perform hydrologic and meteorological analyses of a general nature. These analyses focus on the specific regions of the country that are most likely to experience widespread flooding. With these funds, the Corps will also:

- (1) Compile and review the meteorological aspects of storm data;
- (2) Develop meteorological parameters pertaining to hurricanes, northeasters, and other wind phenomena;
- (3) Develop hydrologic criteria for use in evaluating flood risks, and in floodplain management generally;
- (4) Update precipitation frequency estimates for regions and the nation;
- (5) Conduct precipitation analyses including depth-duration-frequency estimation for regions and the nation; and
- (6) Maintain the precipitation Frequency Data Server (PFDS) portal.

APPROPRIATION TITLE: Investigations, Fiscal Year 2020

Collection and Study of Basic Data

PROJECT NAME: Remote Sensing/Geographic Information System Support, Engineer Research and Development Center 1/ 2/

Allocation in FY 2016	Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Budgeted Amount in FY 2020
\$ 350,000	\$ 75,000	\$ 75,000	\$ 75,000 3/	\$ 75,000

1/ This activity is funded at 100 percent Federal expense.

2/ The costs of this activity are accounted for in the Aquatic Ecosystem Restoration, Flood and Storm Damage Reduction, and Navigation business lines.

3/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2018 to FY 2019 was \$27,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2020 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: Water Resources Development Act of 2016 (Public Law 114-322, section 1135).

DESCRIPTION: The Remote Sensing/GIS Center (Center) is the USACE Center of Expertise for Civil Works Remote Sensing and GIS technologies. Continuing interaction with other researchers and practitioners throughout the Corps, government, the private sector, and academia assures that knowledge of evolving trends that are relevant to Corps activities are available, and that duplication of effort is avoided.

The Center promotes sensors, data collection, analysis, and storage systems, building on commercial software, and integrating these with operational technologies that are then delivered to the USACE divisions, districts, and other agencies' activities. The Center develops approaches for the integration of data from disparate sources to inform comprehensive and collaborative land and water resources management and ensures that the necessary support can be rapidly directed toward solving operational problems that require specialized expertise. The Center provides guidance and technical support throughout the Corps and supports the transfer of technical knowledge to those who are, or soon will be, using these technologies via training conducted in the field through workshops, conferences, and distance learning. The Center also develops white papers; publications, including Engineering Letters, Circulars, and Manuals; etc. to transfer procedures and lessons learned to end users.

Annual funding is used to provide technical support and expertise throughout the Corps of Engineers for Civil Works remote sensing and GIS and continue to expand GIS and remote sensing capabilities to maintain technical leadership for USACE programs.

APPROPRIATION TITLE: Investigations, Fiscal Year 2020

PROJECT NAME: Research and Development 1/ 2/

Allocation in FY 2016	Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Budgeted Amount in FY 2020
\$ 27,711,000	\$ 22,150,000 3/	\$ 25,000,000	\$ 25,000,000 4/	\$ 13,000,000

1/ The activities under this line item are funded at 100 percent Federal expense.

2/ The costs of this activity are shared between the Aquatic Ecosystem Restoration, Flood and Coastal Storm Damage Reduction, and Navigation business lines coincident with the Environmental, Flood and Coastal Systems, and Navigation subtotals detailed herein.

3/ \$150,000 was reprogrammed to this program during FY 2017.

4/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2018 to FY 2019 was \$83,000. There was an additional \$2,223,000 of unobligated funds that are committed within the Corps for scheduled ongoing requirements in FY 2019. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2020 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: 10 U.S.C. 2358 ("The Secretary of Defense or the Secretary of a military department may engage in basic research, applied research, advanced research, and development projects that are necessary to the responsibilities of such Secretary's department in the field of research and development.")

DESCRIPTION: Annual funding enables the Corps to take advantage of rapidly developing technologies and techniques that will promote monetary savings and greater reliability, safety, enhanced efficiency, and environmental sustainability in planning, design, construction, operations and maintenance of civil works activities. Annual funding is categorized and managed as follows: Navigation, Flood and Coastal Systems (including Flood and Coastal Storm Damage Reduction, Emergency Management, Water Supply, and Recreation), and Environmental (including Aquatic Ecosystem Restoration, Regulatory, and Environmental Stewardship).

Results of the Corps' R&D are directly incorporated into practice within the Civil Works Program through revisions or additions to Engineer Regulations, Engineer Manuals, Technical Guidance Manuals, Engineer Technical Letters, or Guide Specifications. Numerous other means of technology transfer are also used such as training courses, workshops, demonstrations, technology availability in commercial tools and services, and other professional contacts.

The Corps conducts Civil Works R&D through the U.S. Army Engineer Research and Development Center (ERDC) and the Institute for Water Resources (IWR). The ERDC consists of seven research laboratories:

- Coastal and Hydraulics Laboratory, Vicksburg, MS
- Cold Regions Research and Engineering Laboratory, Hanover, NH
- Construction Engineering Research Laboratory, Champaign, IL
- Environmental Laboratory, Vicksburg, MS
- Geospatial Research Laboratory, Alexandria, VA
- Geotechnical & Structures Laboratory, Vicksburg, MS

Engineer Research and Development Center

Research and Development

Information Technology Laboratory, Vicksburg, MS

The IWR is located in Alexandria, VA, and its Hydrologic Engineering Center (HEC) in Davis, CA. Policy guidance and executive oversight are provided by the Civil Works R&D Steering Committee co-chaired by the Director of Research and Development and the Director of Civil Works and comprised of Civil Works (CW) division chiefs, one Major Support Command (MSC) Commander, one MSC Senior Executive Service representative, and the CW lead for ERDC. The Director of Research and Development is responsible for developing the annual program. The Directors of ERDC and IWR are responsible for execution of the CW R&D program.

In order to most effectively use the available R&D resources and to avoid unnecessary duplication of research effort, the Civil Works R&D program maintains external technical exchange and technology transfer efforts with other Federal and major water resource agencies including the TVA, Bonneville Power Administration, Western Area Power Administration, EPA, NSF, Department of Agriculture (NRCS), Park Service, NOAA, DOI (USBR, Forest Service, FWS, USGS, DHS (USCG, FEMA, US Border Patrol), DOT (FHWA, FAA, MARAD), NASA, International Boundary Water Commission, International Joint Commission, DOE (NRC, FERC), the Navy, and state and local governments.

Corps researchers also maintain contact with the research activities of universities and industry through regular membership in such organizations as the American Society of Civil Engineers, the Civil Engineering Research Foundation, the American Concrete Institute, the American Society of Testing and Materials, the International Conference on Coastal Engineering, the American Association of Port Authorities, the American Society for Photogrammetry and Remote Sensing, Society of Environmental Toxicology and Chemistry, the Coastal Society, International Society of Soil Mechanics and Foundation Engineering, U.S. Society of Dams, International Committees on Large Dams, the International Association for Hydraulic Research, the Association of American Geographers, Western Dredging Association and the International Navigation Association. The Corps also participates extensively with the National Academy of Sciences, the Transportation Research Board, the Water Science and Technology Board, the World Association for Waterborne Transport Infrastructure (PIANC), and the National Research Council in coordinating and leveraging research activities.

a. Navigation

Allocation in FY 2016	Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Budgeted Amount in FY 2020
\$ 12,511,000	\$ 8,936,648	\$ 9,800,000	\$ 9,800,000	\$ 5,097,000

Navigation research delivers products that improve efficiency and reliability of the waterborne transportation network. The research framework integrates infrastructure engineering, physics, economics, innovative construction, coastal and riverine hydrodynamics and processes, monitoring and sensing technologies, operations research, environmental solutions, and emerging technologies to create effective solutions in concert with the multiple demands, requirements, and constraints of real world commodity transport and power production problems. Research efforts target navigation channels, locks, jetties, breakwaters, harbors, and dams to optimize among life-cycle and reliability trade-offs, assure defensible economic assessment, and provide better investment decision tools for predicting performance and deterioration with time, and for scheduling and prioritizing maintenance and repairs balanced with the consequences of delays. Essential to this effort is the development of tools for determining the condition of infrastructure components and for enabling risk-based prioritization of operation and maintenance needs. R&D efforts for development of condition index products include: Developing a standardized method and associated computer program for life-cycle engineering analysis of coastal rubble mound breakwaters, Improved Condition Indexing for Coastal Structures, Monitoring of Concrete Navigation Structures,

Inspection and Condition Assessment of Steel Hydraulic Structures, and Condition Monitoring and Predictive Maintenance for Infrastructure. Funding is used to develop improved navigation economic technologies that can be used to support better-informed decision analyses and management of the deep-draft coastal ports and of the inland waterways.

This R&D area provides advanced and innovative tools and technology for the Corps to improve navigation functional performance, reduces unit costs, and improves safety. On the inland waterways, for example, R&D efforts are used to reduce the costs associated with delays due to closures for both scheduled and unscheduled repairs, as well as reduce the risk of catastrophic failure of a major infrastructure component. Through the R&D program, the Corps is better able to apply robust, reliable, and comprehensive capabilities to assess all impacts of alternative plans for projects and to select the most balanced and sustainable solutions. R&D delivers efficient and effective capabilities to plan, design, construct, operate, maintain, and upgrade transportation projects in inland and coastal locations and in all climates, from warm to ice-affected. Capabilities to improve system reliability are used in an asset management framework to extend project life and reduce life cycle costs. Engineering and environmental aspects are integrated in the development of processes and design models, decision support software, infrastructure condition assessment techniques, risk frameworks, infrastructure and design guidance, and innovative monitoring, operation and maintenance technologies.

b. Flood and Coastal Systems

Allocation in FY 2016	Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Budgeted Amount in FY 2020
\$	\$	\$	\$	\$
9,800,000	7,376,820	8,530,000	8,530,000	4,435,000

Corps projects across the Nation reduce the risk of flooding and storm damage. In the daily and seasonal operation of hundreds of Corps projects, national requirements for water supply and opportunities for recreation and environmental stewardship are also balanced. The Nation expects the Corps to guarantee that its existing projects maximize efficiency and effectiveness, and that new projects incorporate the most advanced knowledge and capabilities in planning, design, construction, operation, and maintenance. Through R&D, the Corps develops technology that optimizes daily operations of water resources projects to meet multiple objectives, including water supply and environmental stewardship. The Corps' R&D creates new solutions to challenging infrastructure engineering problems in building, maintaining, upgrading, and operating the Nation's water resources infrastructure such as dams, locks, spillways, channels and levees. Through R&D, the Corps provides guidance and tools to understand the natural setting of water resource projects, to incorporate environmental & economic objectives, to manage flood risk, to assess alternative solutions, and to make optimal decisions. The technological requirements of emergency management are addressed to make possible the most rigorous planning and preparedness and the most efficient and effective response and recovery.

The Corps manages many of its existing water resources projects around the country to reduce the risk of flood damage, but also seeks to balance this objective in many cases with other authorized project purposes. As enabling technologies are developed, the Corps may use that information to upgrade and improve existing water resource projects; assess the risk of alternative operational scenarios; and assess the economic and environmental effects of alternative plans for new projects to inform selection of the most balanced and sustainable solutions. R&D delivers efficient and effective capabilities to plan, design, construct, operate, maintain, evaluate, and improve water resource projects in all climates and settings, from warm to ice-affected, and from inland to coastal.

Capabilities that prevent loss of life, minimize property damage, and reduce the life-cycle costs of projects include: advanced processes and design models, economic models and decision support software, infrastructure condition and risk assessment tools, infrastructure design guidance, innovative operation and

maintenance technologies, flood-alert instrumentation and expedient emergency response capabilities, and new real-time data sources (e.g. precipitation radar) to accurately forecast real-time flow and stages.

This R&D component provides advancements in hydrologic and hydraulic simulation, water resources project optimization, tools for effective alternative analyses for solutions, infrastructure safety, structural design and performance, assessment of the risk and uncertainty associated with project designs, and assessment of non-structural, natural, and nature-based features to reduce flood risk. This R&D component also improves the technology available to emergency managers for emergency planning, preparedness, response, recovery, and assessment.

c. Environmental

Allocation in FY 2016	Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Budgeted Amount in FY 2020
\$ 5,400,000	\$ 5,940,000	\$ 6,670,000	\$ 6,670,000	\$ 3,468,000

The Corps has ecosystem restoration and environmental stewardship and management responsibilities on more than 11 million acres of land and water resources. Due to the enormous scope of this mission, it is imperative that Corps field personnel can apply the latest technologies for ecosystem restoration and natural resource inventory. The scale of these activities ranges from large projects such as the Florida Everglades down to much smaller, local wetlands/stream restoration projects. The broad scope of these environmental activities (as well as the frequent changes to the legislative mandates that govern them) demands sound research and development to address these critical needs. The goal of this R&D is to provide cost-effective/innovative technologies for project planning, design, engineering/construction, and operation & maintenance. Products include concise, how-to guidance documents that provide rapid/low-cost technologies and methods for high priority field needs as well as sophisticated ecological process assessment models that are critical to the success of the Corps' Ecosystem Restoration business line.

Wide-ranging environmental compliance, management, and restoration efforts have become crucial parts of the Corps water resource management mission. The Corps must consider environmental issues related to the operation and maintenance of its existing water resources projects as well as the restoration of degraded ecosystems. This research area addresses the Corps' highest priority environmental issues through the development and application of cost-effective, time-saving technologies. There is a growing emphasis on "integrated" ecological restoration and management that couples the requirements for ecological restoration and stewardship with other attainable services that ecosystems can provide. For example, ecological restoration efforts that achieve not only environmental benefit, but provide flood risk reduction, and reservoir management protocols that achieve not only a reliable water supply, but necessary environmental flows and water quality objectives. The current research portfolio can be categorized into seven (7) broad categories that generally capture the breadth and focus of the current environmental research program:

- 1) Maximizing value of ecosystem restoration projects;
- 2) Restoring ecological integrity and sustainability;
- 3) Management of inland aquatic and interdependent terrestrial resources;
- 4) Ensuring resilience, function and value of coastal ecosystems;

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- 5) Management of Threatened and Endangered and Invasive Species in Ecosystem Restoration projects;
- 6) Providing modeling tools and decision frameworks for evaluation and comparison of ecological restoration alternatives; and
- 7) Ecological Infrastructure - assessing the ecological role, function and design of natural and nature-based features in "integrated" multi-objective (ENV, NAV, FRM) projects.

User-oriented products will provide scientifically defensible and field validated solutions to the Corps' highest priority environmental problems.

Quantifying the environmental benefits and ecological outputs of proposed Corps ecosystem restoration projects is essential for decision makers to be able to select those projects that will yield the highest social, economic, and environmental services. The scientific community has criticized the underlying model assumptions, oversimplified relations, excessive data requirements, complexities in integrating impacts, and the lack of meaningful metrics to permit biologically-effective decisions. Moreover, current assessments are static and frequently insensitive to important system dynamics, not applicable across multiple scales, and incapable of predicting future conditions. Corps decision makers need robust assessment tools that: incorporate modern ecosystem principles that are easy to apply, offer significant user flexibility to meet individual project requirements, and that provide quantifiable output relevant to the Corps' performance measures. These tools are provided in brief user-focused technical guidance documents, web-based decision support systems, webinars (interactive web presentations between R&D Scientists and Engineers and Corps Practitioners), classroom and internet based training, and product technical support, as required.

APPROPRIATION TITLE: Investigations, Fiscal Year 2020

Collection and Study of Basic Data

PROJECT NAME: Scientific and Technical Information Centers, Engineer Research and Development Center 1/ 2/

Allocation in FY 2016	Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Budgeted Amount in FY 2020
\$ 47,000	\$ 47,000	\$ 50,000	\$ 50,000 3/	\$ 50,000

1/ This activity is funded at 100 percent Federal expense

2/ The costs of this activity are accounted for in the Aquatic Ecosystem Restoration, Flood and Coastal Storm Damage Reduction, and Navigation business lines.

3/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2018 to FY 2019 was \$9,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2020 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: Public Law 99-802, Federal Technology Transfer Act of 1986, requires technology transfer from Federal agencies to the private sector.

DESCRIPTION: The function of the five information analysis centers (coastal engineering, cold regions engineering, concrete technology, hydraulic engineering, and soil mechanics) located at the U.S. Army Engineer Research and Development Center (ERDC) is to acquire, examine, evaluate, summarize, and disseminate newly published scientific and technical information generated within the Corps of Engineers and other activities. These centers are a major technology transfer resource between the Corps of Engineers and the public and private sectors, including the scientific and engineering community and academia, for results of over 75 years of research results conducted by the ERDC laboratories in the fields of soil mechanics and foundation engineering, cold regions engineering, concrete technology, hydraulic engineering, and coastal engineering.

Each center, supported by their host laboratories, critically evaluate and summarize the technical validity and merits of published and unpublished research and technical publications on design, construction, or other technology utilization. User communities have been well established and distribution lists for technology transfer are continuously updated. Each center is supported by multi-disciplinary technical staff and has a comprehensive library of published materials. In a typical year, each Center responds to hundreds of information requests on subjects within its purview. These services are free to the users. In addition, services such as literature research, information synthesis, publication location, research reviews, and methodology comparisons on subjects of mutual interest to ERDC laboratories and other interested parties are available on a cost-reimbursable basis.

Annual funding is used to provide technical expertise in the form of copies of reports, arranging to speak with an expert, furnishing generalized technical advice, or giving updates on technical developments; digitize older ERDC research reports of significant technical value and place them on the internet for ready access by the public; and distribute reports, technical notes, computer programs, geographic information systems (GIS) data, abstracts, information bulletins, and other scientific and technical information to the Defense Technical Information Center (DTIC), Corps libraries, depository libraries, and identified user communities to ensure wide circulation and availability. The effectiveness of activities and services is evaluated on a continuing basis, and technology transfer products and methodology are revised when appropriate.

Engineer Research and Development Center

Scientific and Technical Information Centers

APPROPRIATION TITLE: Investigations, Fiscal Year 2020

Coordination Studies with Other Agencies, Other Coordination Programs

PROJECT NAME: Special Investigations 1/ 2/

Allocation in FY 2016	Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Budgeted Amount in FY 2020
\$ 1,326,000 3/	\$ 1,300,000	\$ 1,000,000	\$ 1,000,000 4/	\$ 1,000,000

1/ This activity is funded at 100 percent Federal expense.

2/ The costs of this activity are accounted for in the Aquatic Ecosystem Restoration, Flood and Coastal Storm Damage Reduction, and Navigation business lines.

3/ \$24,000 reprogrammed away from this activity in FY 2016.

4/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2018 to FY 2019 was \$345,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2020 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: 33 USC 2282(f)

DESCRIPTION: The Corps uses this funding to answer general inquiries from members of the public on the work of the civil works program, outside the scope of a specific Corps study, project, or program. For example, the Corps would use this funding to attend a meeting to explain to a potential local sponsor of a Corps study or the public how the Corps study process works.

APPROPRIATION TITLE: Investigations, Fiscal Year 2020

Collection and Study of Basic Data – Flood and Storm Damage Reduction

PROJECT NAME: Stream Gaging, Institute for Water Resources 1/

Allocation in FY 2016	Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Budgeted Amount in FY 2020
\$ 1,097,000	\$ 750,000	\$ 550,000	\$ 550,000 2/	\$ 3,550,000

1/ This activity is funded at 100 percent Federal expense.

2/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2018 to FY 2019 was \$96,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2020 from prior appropriations for use on this effort is \$0.

The Corps uses this funding to pay the U.S. Geological Survey (USGS) to operate, maintain, and gather data from roughly 80 stream gage stations, sited at locations that are not directly associated with a project that the Corps owns or with a particular Corps study. The Corps funds these gages to track stream flows in these specific locations, and uses this information to improve our understanding of flood risks in those watersheds. The increase in the requested funding for FY 2020 would enable the USGS to install additional stream gage stations on behalf of the Corps, at specific locations that the Corps has selected. The National Weather Service also uses the data collected at these gages in developing its public flood forecasts.

The Corps makes extensive use of the streamflow records collected through these gages in the planning, design, construction, and operation of water resources projects. For this purpose, it is best to have continuous records of streamflow at specific sites over a long period, in order to provide a more reliable measure of the likely water resources that are available for various uses. The Corps started working cooperatively with the USGS to install these gages in March 1928, with a focus on collecting data that would assist the Corps in implementing its water resources responsibilities.

The Corps funds stream gages associated with the projects that it owns or with a particular Corps study under those projects or that study. The Corps also funds certain stream gages at non-Corps projects through its Operation and Maintenance program, under Scheduling Reservoir Operations.

APPROPRIATION TITLE: Investigations, Fiscal Year 2020

Collection and Study of Basic Data

PROJECT NAME: Transportation Systems 1/

Allocation in FY 2016	Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Budgeted Amount in FY 2020
\$ 1,593,000	\$ 3,430,000	\$ 1,000,000	\$ 1,000,000 2/	\$ 1,000,000

1/ This activity is funded at 100 percent Federal expense.

2/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2018 to FY 2019 was \$75,000. There was an additional \$20,000 of unobligated funds that are committed within the Corps for scheduled ongoing requirements in FY 2019. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2020 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: Section 904, Water Resources Development Act (WRDA) 1986 (P.L.99-662); Section 334, WRDA 1992 (P.L.102-580); and Section 230, WRDA 1996 (P.L. 104-303).

DESCRIPTION: The process of planning improvements for waterway and harbor navigation projects necessitates consideration of needs, opportunities, benefits, and economic costs of project improvements in the context of the project-specific areas as well as the overall national transportation system. The Transportation Systems remaining item is used to fund information and technical services and support for navigation projects including viable and practical analytical techniques, sources of information, tools and methods including the development of deep draft and shallow draft vessel operating cost data; provision of timely information regarding the global deep draft vessel fleet; preparation of commodity and cargo flow forecasts; and the publication of reports documenting the results of research and program-wide investigations associated with the Transportation System Analysis Program. The goals for the use of these funds include: (1) improve the technical quality, accuracy and consistency of navigation planning studies and procedures; (2) improve the strategic planning and management of navigation improvements; and (3) reduce the costs of individual navigation studies through shared data, methodologies, and analytical applications.

Fiscal Year 2018 funds were used to update shallow and deep-draft vessel operating costs; continue certifying several navigation models; complete a draft national inland waterway traffic forecast, and purchase trade and shipping subscriptions used for navigation feasibility studies. In addition, funds were used to update and improve the data and methods used to estimate shipper response to cost changes on the inland waterways as well as to update computer models to complete a draft update to the Congressionally-directed Port Modernization Study, and to continue to make improvements to the Regional Economic System (RECONS) model.

Fiscal Year 2019 funds are being used to update shallow and deep-draft vessel operating costs; to finalize and certify navigation models; and to acquire trade and shipping subscriptions used for navigation feasibility studies. In addition, funds are being used to finalize the data and methods used to estimate shipper response to cost changes on the inland waterways (Upper Mississippi River and Ohio River), to initiate work on a container vessel deployment study as well as to update computer models and analyses related to the impacts of the recent Panama Canal's expansion and other world events as well as finalizing and releasing the update to the Port Modernization Study

Institute for Water Resources

Transportation Systems

Fiscal Year 2020 funds will be used to update shallow and deep-draft vessel operating costs; to upgrade, finalize and certify navigation models; and to acquire trade and shipping subscriptions used for navigation feasibility studies. In addition, funds will be used to finalize a container vessel deployment study as well as to update computer models and analyses related to the impacts of the Panama Canal's expansion, shipbuilding changes, protectionism, and other world events.

APPROPRIATION TITLE: Investigations, Fiscal Year 2020

Other, Miscellaneous

PROJECT NAME: Tribal Partnership Program 1/ 2/

Allocation in FY 2016	Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Budgeted Amount in FY 2020
\$ 1,432,925 3/	\$ 1,750,000	\$ 1,500,000	\$ 2,500,000 4/	\$ 500,000

1/ The non-Federal sponsor is generally responsible for 50 percent of the costs of all feasibility studies and technical assistance and 25 percent of the costs of all watershed studies funded out of this remaining item with the exception of a \$484,000 waiver for Federally-recognized Tribes that is subject to inflation.

2/ The costs of this remaining item are accounted for in the Aquatic Ecosystem Restoration and Flood and Coastal Storm Damage Reduction business lines.

3/ \$67,075 was reprogrammed away from this line item in FY 2016.

4/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2018 to FY 2019 was \$2,570,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into FY 2020 from prior appropriations for use on this effort is \$500,000.

AUTHORIZATION: Sec. 203 of Water Resources Development Act (WRDA) of 2000, as amended by Section 2011 of WRDA 2007; Section 1002 and 1031 of the Water Resources and Reform Development Act of 2014; and Section 1156 of the Water Resources Development Act of 1986 as amended by Section 1119 of the Water Infrastructure and Investment Act of 2016 and Section 1156 of the America's Water Infrastructure Act of 2018.

DESCRIPTION: Funds provided under this program may be used, in cooperation with Indian Tribes (as defined by 25 U.S.C 450b) and heads of other Federal agencies, to carry out water-related planning activities and study, and determine the feasibility of carrying out water resources development projects that will substantially benefit Indian tribes and are located primarily within Indian country or in proximity to Alaska Native villages. A study under this authority "may address (A) projects for flood damage reduction, environmental restoration and protection, and preservation of cultural and natural resources; (B) watershed assessments and planning activities; and (C) such other projects as the Secretary, in cooperation with Indian Tribes and the heads of other Federal agencies, determines to be appropriate." Various activities may be considered pursuant to this broad authority such as floodplain mapping, water control management, self-reliance and economic capacity building, technical capacity building, erosion control, cultural resources, comprehensive planning, emergency management, water quality, water supply, community infrastructure, and hazardous and toxic waste assessments. Prior to FY 2008, these activities were funded in the Construction account.

Feasibility Studies focus on a specific problem area (e.g. Flood and Coastal Storm Damage Reduction) within a limited geographic area and result in a specifically recommended project. Technical assistance includes stand-alone water-related planning activities independent of feasibility studies and watershed assessments and does not result in a specifically recommended study or project. Watershed Studies examine a broad array of watershed challenges, identify an array of potential corrective actions, and result in a Watershed Management Plan as the final product. Watershed Management Plans do not result in specifically recommended projects. All studies follow the standard Civil Works planning process.

HQUSACE

Tribal Partnership Program

No feasibility studies have yet been completed under this program. The Pueblo of Santa Clara, NM Watershed Assessment was completed in FY 2018.

There are currently nine on-going feasibility studies, seven on-going watershed assessments, and two technical assistance activities with cost-sharing agreements signed between the Department of the Army and the non-Federal sponsor.

Annual funding and prior year appropriations will be used to continue and complete work on feasibility studies and watershed assessments with signed cost-sharing agreements, including the termination of activities where appropriate; to develop, negotiate and execute cost-sharing agreements for new feasibility studies and/or watershed assessments; and for program coordination. The majority of the Tribal Nations are not located near Corps District Offices and require greater levels of coordination due to the remote geographic location of the Tribes.

The total FY 2019 appropriations, plus actual unobligated carry-in funding, and the FY 2020 funds, plus planned unobligated carry-in funding, will be applied as follows:

On-going watershed assessments

State	Study Title	Local Sponsor	Funding through FY 2016	Allocation in FY 2017	Allocation in FY 2018	Presumed Allocation in FY 2019 1/	Budgeted Amount in FY 2020 1/	Date of Cost-Sharing Agreement
AZ	Bird Springs Watershed Assessment	Navajo Nation at Bird Springs	\$147,525	\$0	\$155,000	\$150,000	\$50,000	October 2017
ME	Meduxnekeag Watershed Assessment Management Plan	Houlton Band of Maliseets	\$235,000	\$105,000	-\$975	\$157,000	\$50,000	April 2017
NM	Pueblo of San Felipe, NM Watershed Assessment	Pueblo of San Felipe	\$353,114	\$116,000	\$45,970	\$94,470	\$50,000	March 2013
NM	Acoma Pueblo, NM, Watershed Assessment	Pueblo of Acoma	\$994,926	\$85,000	\$251,373	\$80,000	\$0	March 2013
NM	Pueblo of Santo Domingo, NM, Watershed Assessment	Pueblo of Santa Domingo	\$508,390	\$100,000	\$83,293	\$76,488	\$0	June 2014
NM	Pueblo of Santa Ana, NM Watershed Assessment	Pueblo of Santa Ana	\$787,033	\$60,000	\$66,301	\$200,000	\$0	June 2013

NM	Pueblo of Zia, NM, Watershed Assessment	Pueblo of Zia	\$167,206	\$200,000	\$147,586	\$200,000	\$50,000	March 2017
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1/ Includes carry-in amounts from the prior fiscal year.

On-going feasibility studies

State	Study Title	Local Sponsor	Funding through FY 2016	Allocation in FY 2017	Allocation in FY 2018	Presumed Allocation in FY 2019 1/	Budgeted Amount in FY 2020 1/	Date of Cost-Sharing Agreement
AK	Elim Subsistence Harbor	Kwethluk Native Village of Elim	\$0	\$0	\$300,000	\$600,000	\$200,000	March 2018
CA	Clear Creek Ecosystem Restoration, CA	Mechoopda Indian Tribes of Chico Rancheria	\$0	\$0	\$0	\$228,000	\$200,000	September 2018
ID	Lapwai Creek Restoration	Nez Perce Tribe	\$0	\$0	\$0	\$510,000	\$200,000	January 2019
KS	Soldier Creek Watershed	Prairie Band Pottawatomie	\$100,000	\$0	\$0	\$450,000	\$100,000	November 2017
ME	Shoreline Erosion Study	Passamaquoddy Tribe, Pleasant Point Reservation	\$50,000	\$50,000	\$0	\$210,042	\$0	May 2016
MI	Bay Mills Shoreline Erosion	Bay Mills Indian Community	\$0	\$5,000	\$18,500	\$120,000	\$0	Feb 2019
MN	Prairie Island Sturgeon Lake Habitat Restoration	Prairie Island Indian Community	\$0	\$0	\$238,106	\$438,000	\$100,000	October 2018
SD	Lower Brule Sewage Lagoons, SD	Lower Brule Sioux	\$0	\$0	\$355,000	\$100,000	\$0	October 2017

WI	Big Sandy Lake Shoreline Stabilization	St. Croix Chippewa Indians of Wisconsin	\$0	\$0	\$0	\$200,000	\$0	September 2018
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1/ Includes carry-in amounts from the prior fiscal year.

On-Going Technical Assistance:

State	Study Title	Study Title	Funding through FY 2016	Allocation in FY 2017	Allocation in FY 2018	Presumed Allocation in FY 2019 1/	Budgeted Amount in FY 2020	Date of Cost-Sharing Agreement
ID	Fort Hall Bottoms Resource Inventory & Management Plan	Shoshone-Bannock Tribe	\$0	\$0	\$30,524	\$444,000	\$0	December 2017
MN	Little Minnesota Fish Passage Investigation	Sisseton Wahpeton Oyate of the Lake Traverse Reservation	\$0	\$0	\$238,106	\$312,000	\$0	March 2018

1/ Includes carry-in amounts from the prior fiscal year.

The following feasibility studies are expected to commence with signed cost-sharing agreements in FY 2019 or FY 2020:

State	Study Title	Local Sponsor	Funding through FY 2016	Allocation in FY 2017	Allocation in FY 2018	Presumed Allocation in FY 2019	Budgeted Amount in FY 2020	Anticipated Date of Cost-Sharing Agreement
AZ	Tohono O'odham Flood Risk Management Study	Tohono O'odham Nation	\$160,333	\$0	(-\$15,531)	\$0	\$0	FY 2020
AZ	Polacca Wash Feasibility Study	Hopi Tribe	\$77,925	(-\$3,198)	\$0	\$0	\$0	FY 2020
CA	Torres-Martinez Ecosystem Restoration Study	Torres-Martinez Desert Cahuilla Indians	\$150,867	\$0	(-\$18,565)	\$0	\$0	FY 2020

WI	Buffalo Bay Fishing Pier	Red Cliff Band of Lake Superior Chippewa	\$0	\$0	\$15,000	\$0	\$0	FY2020
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The following eight reconnaissance studies were completed under this program at 100 percent Federal expense: Land Augustine Watershed Study, Coachella (CA), Lapwai Creek Reconnaissance Study (ID), the Kickapoo Tribe (KS), Menemsha Pond Restoration (MA), Indian Island Feasibility Study (ME), Nottawaseppi Band of Huron Potawatomi Indians (MI), Forest Potawatomi Watershed Study (MI), and Stockbridge Munsee Indian Community (WI).

The following watershed assessment has been completed:

State	Study Title	Local Sponsor	Funding through FY 2016	Allocation in FY 2017	Allocation in FY 2018	Date of Cost-Sharing Agreement	Date Study Completed
NM	Santa Clara Pueblo, NM, Watershed Assessment	Pueblo of Santa Clara	\$1,096,189	\$183,000	\$25,000	Sept 2011	Sept 2018

The following studies are inactive or terminated:

State	Study Title	Local Sponsor	Net allotment through FY 2018
AK	Villages Erosion Studies		>\$707,882
AK	Kuskokwim-Middle River Watershed Study	Kuskokwim Corporation	\$86,391
AZ	Middle Gila and Lower Santa Cruz River, AZ Watershed Study	Gila River Indian Community	\$91,286
AZ & NM	Navajo Nation – Little Colorado (Upper Puerco), NM & AZ, Watershed Assessment	Navajo Nation, Little Colorado (Upper Puerco)	\$79,038
AZ, NM,	Navajo Nation – San Juan (Chinle), NM, AZ & UT, Watershed Assessment	Navajo Nation, San Juan (Chinle)	\$57,832

& UT			
CT	Mohegan Tribe, CT	Mohegan Tribe	\$72,016
MA	Santuit Pond Restoration Shoreline Erosion Study 5/	Mashpee Wampanoag Tribe (MA)	\$67,774
NM	Navajo Nation – Rio Puerco (Arroyo Chico), Ojo Encino Chapter, NM, Watershed Assessment	Navajo Nation, Rio Puerco (Arroyo Chico)	\$61,966
NM	Pueblo of Laguna Watershed Assessment	Pueblo of Laguna	\$29,141
NM	Pueblo of Picuris, NM, Watershed Assessment	Picuris Nation	\$56,099
NY	St Lawrence River, Akwesasne, St Regis Mohawk Tribe	St. Regis Mohawk Tribe	\$100,000
WA	Hoh Tribal Partnership Project	Hoh Tribe	\$84,718
WA	Makah Tribal Partnership Study	Makah Tribe	\$2,070
WA	Lower Elwha Klallam Tribal Partnership Project	Lower Elwha Tribe	\$1,638
WA	Jamestown S'Klallam Watershed Study Project	Jamestown S'Klallam Tribe	\$99,989
WA	Quileute Tribal Watershed Study	Quileute Nation (WA)	\$160,974
WA	Sauk-Suiattle Tribal Partnership	Sauk-Suiattle Tribal Partnership	\$24,842
WA	White Swan Tribal Partnership Study	Yakama Nation	\$92,227
OR	Willamette Basin Pacific Lamprey Study	Grand Ronde Tribe	\$14,618

APPROPRIATION TITLE: Construction, Fiscal Year 2020

PROJECT NAME: Continuing Authorities Projects Not Requiring Specific Legislation (Continuing Authorities Program (CAP))

Aquatic Ecosystem Restoration (CAP Section 206)

	Allocation for FY 2015	Allocation for FY 2016	Allocation for FY 2017	Allocation for FY 2018	Allocation in FY 2019 2/	Budgeted Amount in FY 2020
CAP Section 206 1/	\$8,000,000	\$8,000,000	\$ 8,000,000	\$ 8,000,000	\$ 12,000,000	\$1,000,000

1/ Non-Federal interests are required to share in a minimum of 35 percent of the implementation cost of construction including provision of all lands, easements, rights-of-way, and necessary relocations.

2/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2018 to FY 2019 was \$6,860,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into FY 2020 from prior appropriations for use on this effort is less than \$2,000,000. This amount will be used to perform work on the project as follows: Continue planning, design, coordination, and construction activities.

AUTHORIZATION: Section 206 of the Water Resources Development Act of 1996 (PL 104-303), as amended.

DESCRIPTION: Annual funding is used to investigate, design, and construct aquatic ecosystem restoration projects that will improve the quality of the environment, are in the public interest and are cost-effective. Not more than \$10,000,000 in Federal funds may be allocated to a project at a single locality. Up to \$62,500,000 may be appropriated annually to the Section 206 program.

Small Flood Control Projects (CAP Section 205)

	Allocation for FY 2015	Allocation for FY 2016	Allocation for FY 2017	Allocation for FY 2018	Allocation in FY 2019 2/	Budgeted Amount in FY 2020
CAP Section 205 1/	\$10,000,000	\$ 8,000,000	\$ 8,000,000	\$ 8,000,000	\$ 8,000,000	\$1,000,000

1/ Non-Federal interests are required to share in a minimum of 35 percent of the implementation cost of construction including provision of all lands, easements, rights-of-way, and necessary relocations.

2/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2018 to FY 2019 was \$17,486,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into FY 2020 from prior appropriations for use on this effort is less than \$5,000,000. This amount will be used to perform work on the project as follows: Continue planning, design, coordination, and construction activities.

AUTHORIZATION: Section 205 of the Flood Control Act of 1948 (PL 80-858), as amended.

DESCRIPTION: Annual funding is used to investigate, design, and construct flood and coastal storm damage reduction projects, including structural and/or nonstructural measures that are designed to provide the same complete project and same degree of protection provided under regular authorization procedures.

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Continuing Authorities Program

Each project selected must be economically justified and complete within itself. Federal cost participation is limited to \$10,000,000 per project at a single locality. Up to \$68,750,000 may be appropriated annually to the Section 205 program.

Project Modifications for Improvement of the Environment (CAP Section 1135)

	Allocation for FY 2015	Allocation for FY 2016	Allocation for FY 2017	Allocation for FY 2018	Allocation in FY 2019 2/	Budgeted Amount in FY 2020
CAP Section 1135 1/	\$6,600,000	\$ 3,000,000	\$ 3,000,000	\$ 4,000,000	\$ 8,000,000	\$1,000,000

1/ Non-Federal interests are required to share in a minimum of 35 percent of the implementation cost of construction including provision of all lands, easements, rights-of-way, and necessary relocations.

2/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2018 to FY 2019 was \$2,550,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into FY 2020 from prior appropriations for use on this effort is less than \$3,000,000. This amount will be used to perform work on the project as follows: Continue planning, design, coordination, and construction activities.

AUTHORIZATION: Section 1135 of the Water Resources Development Act of 1986 (PL 99-662), as amended.

DESCRIPTION: Annual funding is used to review Corps water resources projects to determine the need for structural or operational modifications for the purpose of improving the quality of the environment in the public interest; to determine if the operation of such projects has contributed to the degradation of the quality of the environment; and to carry out a program of such modifications that are feasible and consistent with authorized project purposes. Not more than \$10,000,000 in Federal funds may be expended on any single modification or measure pursuant to Section 1135. Up to \$50,000,000 may be appropriated annually to the Section 1135 program.

APPROPRIATION TITLE: Construction, Fiscal Year 2020

PROJECT NAME: Dam Safety and Seepage/Stability Correction Program 1/ – Flood and Storm Damage Reduction

Allocation in FY 2016	Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Budgeted Amount in FY 2020
\$31,200,000	\$21,000,000	\$34,300,000	\$100,405,000 2/	\$17,001,762

1/ Dam Safety Studies are funded at 100 percent Federal Expense. The non-Federal cost for Pre-construction Engineering and Design activities varies and is identified and calculated in the decision documents prepared during the Dam Safety Modification Study in accordance with either the Water Resources Development Act of 1986 as amended, or the Reclamation Safety of Dams Act (P.L. 98-404) as amended.

2/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2018 to FY 2019 was \$13,177,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2020 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: Section 2 of National Dam Inspection Act of 1972, P.L. 92-367 (authorized the Secretary of the Army to inspect dams across the country; and to issue a report to the Congress that includes an inventory of all dams in the United States, and provides recommendations for a comprehensive national program for the safety of dams), Section 215 of the Water Resources Development Act of 1996, P.L. 104-303 (authorized FEMA to lead the National Dam Safety Program, a Federal interagency to encourage the Federal agencies with dams, and the States, to establish effective dam safety programs); Section 1 of Dam Safety Act of 2006, P.L. 109-460 (authorized the Secretary of the Army to maintain and update the national inventory of dams, including any available condition assessments performed by a Federal agency or a State dam safety agency); and Section 3001 of Water Resources Reform and Development Act of 2014, P.L. 113-121 (reauthorizing National Dam Safety Program, which FEMA leads).

DESCRIPTION: The Corps uses this funding to evaluate and study options for addressing dam safety assurance, seepage control, and static instability concerns at completed dams that the Corps owns and operates. The Corps owns 715 such dams and appurtenant structures, which are located at 555 of its projects. Based on the available information on these risks, the Corps has assigned a Dam Safety Action Classification (DSAC) to each of its dams. Many of these dams have the potential, either now or in the future, to pose a life safety, economic, or environmental risk to the downstream population centers and floodplains. The Corps uses a risk-based approach to dam safety management to reduce this risk, with the goal of ensuring that all of its dams are designed, constructed, regulated, operated, and maintained as safely and effectively as practicable. Central to this approach is a process for establishing priorities among the potential investments, by addressing first the concerns that pose the greatest potential risk, when viewed from the perspective of the entire portfolio of Corps dams as a whole. The Corps also uses this risk-informed approach to the management of the portfolio of its dams to ensure compliance with “FEMA 93 - Federal Guidelines for Dam Safety”.

The Federal Guidelines for Dam Safety (FEMA 93), which FEMA issued pursuant to a presidential memorandum from President Carter dated April 23, 1977, require each Federal agency with responsibility for the operation and maintenance of dams to have a dam safety program including provisions for dam safety modification. Dam safety ensures the integrity and viability of dams such that they do not present unacceptable risks to the public, property, or the environment. It requires the collective application of engineering principles and experience, and a philosophy of risk management that recognizes that a dam is a structure whose safe functioning is not determined solely by its original design and construction. While no Corps dam is in imminent danger of failure at this time, some of these dams have been identified as having a higher risk of a dam safety incident than originally anticipated based on new data, inherent flaws or defects that manifest over time, or the potential adverse effects that could occur from extreme flood or seismic loads. In FY 2019, the Corps has approximately 270 dams under consideration for

HQUSACE and Institute for Water Resources

Dam Safety and Seepage/Stability Correction Program

potential evaluation and study, based on the currently available information on the risks that they may pose.

The Corps uses this funding to perform non-routine dam safety evaluations and studies; and to support engineering analysis required to ensure these structures comply with risk-informed engineering criteria. The program focuses on Corps dams with a rating of extremely high risk or very high risk (DSAC 1 and DSAC 2), but also will evaluate and study safety concerns at some dams with a rating of moderate to high risk (DSAC 3). Through Issue Evaluation Studies (IES), the Corps evaluates high-risk dams identified from the Portfolio Risk Analysis program, makes risk-informed decisions on the need for their modification or reclassification, and evaluates the risks of dam safety incidents that manifest over time or exhibit unsatisfactory performance during high pools or seismic events. Through Dam Safety Modification Studies (DSMS), the Corps investigates dam safety deficiencies that could result in loss of life, formulates one or more alternatives that reduce the risks to tolerable levels. Where the Corps recommends a project to reduce the safety risk, it will conclude the DSMS by issuing a Dam Safety Modification Report. The Corps would then undertake Pre-construction Engineering and Design (PED) activities prior to construction.

The Corps funds the construction of dam safety modifications through project-specific line items in the Construction account. Starting in FY 2019, the Corps has also budgeted all new DSMS studies through project-specific line items in the Investigations account.

DESCRIPTION OF WORK FOR FY 2019: Funds are being used to execute multi-year dam safety studies on the highest risk projects in the Corps inventory of dams. Ongoing DSMS studies at five Corps dams are being funded in FY 2019 (Moose Creek Dam, Whittier Narrows Dam, General Edgar Jadwin Dam, Pipestem Dam, and Keystone Dam). At four of these dams, following completion of the DSMS study, the Corps also expects to start PED in FY 2019 (Moose Creek Dam, Whittier Narrows Dam, General Edgar Jadwin Dam, and Pipestem Dam). Multiple IES studies will continue and new IES studies initiated to perform the preparatory work that provides the technical basis for DSMS studies, risk assessments, DSAC characterizations, and risk informed portfolio management. In addition, a portion of the cost in FY 2019 of ongoing dam safety construction work at another dam is being funded (Herbert Hoover Dike). The total unobligated amount available in FY 2019 is being allocated as follows:

Pre-Construction Engineering and Design	\$ 5,000,000
Dam Safety Modification Studies	\$ 12,000,000
Issue Evaluation Studies	\$ 30,177,000
Herbert Hoover Dike	\$ 66,405,000
TOTAL	\$113,582,000

DESCRIPTION OF WORK FOR FY 2020: Funds will be used to execute multi-year dam safety studies on the highest risk projects in the Corps inventory of dams. The Corps expects to fund PED work on five projects (Moose Creek Dam, Whittier Narrows Dam, General Edgar Jadwin Dam, Keystone Dam, and Pipestem Dam) in FY 2020. Multiple IES studies will continue and new IES studies initiated to perform the preparatory work that provides the technical basis for the DSMS studies, risk assessments, DSAC characterizations, and risk informed portfolio management.

Pre-Construction Engineering & Design	\$ 7,250,000
Issue Evaluation Studies	\$ 9,751,762
Total	\$ 17,001,762

Summary of Planned Work (IES, DSMS, and PED)

<i>Project</i>	<i>DSAC</i>	<i>Activity Description</i>	<i>Funding Allocated Through FY 2018 for All prior studies (DSMS and IES)</i>	<i>FY 2019 Funding Allocation</i>	<i>FY 2020 Funding Allocation</i>	<i>Balance to Complete (BTC)</i>
Issue Evaluation Studies 3/	DSAC 2 & 3 Dams	Risk Assessment and hazards analysis (Hydrologic, Seismic, Inundation Mapping, Consequence analysis) on over 200 DSAC 2 & 3 Dams.	\$189,358,000	\$18,000,000	\$8,751,762	N/A
Moose Creek Dam, AK	3	DSMS in FY19/PED in FY19 and FY20	\$10,900,000	\$1,000,000 (4/)	\$2,000,000 (4/)	\$0
Whittier Narrows Dam, CA	1	DSMS in FY19/PED in FY19 and FY20	\$16,300,000	\$1,500,000 (5/)	\$2,500,000 (4/)	\$0
General Edgar Jadwin, PA	2	DSMS in FY19/PED in FY19 and FY20	\$4,300,000	\$1,000,000 (4/)	\$1,500,000 (4/)	\$0
Pipestem Dam, ND	2	DSMS in FY19/PED in FY19 and FY20	\$3,100,000	\$1,250,000 (5/)	\$1,250,000 (4/)	\$0
Keystone Dam, OK	2	DSMS in FY19 and FY20/PED in FY20 and FY21	\$8,406,347	\$1,500,000 6/	\$1,000,000 (5/)	\$4,000,000

New DSMS studies (budgeted in the Investigations account)				\$9,750,000 (7)	NA	NA
Herbert Hoover Dike	1		\$0	\$66,405,000 (8)		
TOTAL:			\$223,958,000	\$100,405,000	\$17,001,762	\$4,000,000

3/ Allocations for IES Studies since the implementation of the EC 1156 draft guidance in FY 2008.

4/ PED estimated funding requirement.

5/ Combined ongoing DSMS completion and initial PED estimated funding requirement.

6/ Ongoing DSMS estimated funding requirement

7/ Six new DSMS projects were budgeted in the Investigations Account in FY 2019 but were appropriated funds in this program.

8/ The FY 2019 funding for the Dam Safety and Seepage/Stability Correction Program included \$66,405,000 that the Corps allocated to accelerate the rehabilitation of the Herbert Hoover Dike. The Corps also provided \$96,000,000 for that project in FY 2019 under the construction account line item for that project.

APPROPRIATION TITLE: Construction, Fiscal Year 2020

PROJECT NAME: Employees Compensation (Payments to the Department of Labor) 1/

Allocation in FY 2016	Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Budgeted Amount in FY 2020
\$17,530,000	\$19,000,000	\$17,000,000	\$17,000,000 2/	\$17,000,000

1/ There are no non-Federal costs.

2/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2018 to FY 2019 was \$3,749,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2020 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: This program is conducted under the general authority of Public Law 94-273, approved April 21, 1976, 5 USC 8147b.

DESCRIPTION: The Employees Compensation program (Payments to the Department of Labor) provides that each agency shall include in its annual budget estimates, a request for an appropriation equal to costs previously paid from the Employees Compensation Fund on account of injury or death of employees or persons under the agency's jurisdiction. The budget request for Fiscal Year 2020 represents the total estimated cost of benefits and other payments made from the Employees Compensation Fund during the period July 1, 2017, through June 30, 2018, due to injury or death of persons under the jurisdiction of the Corps of Engineers civil works functions and also includes \$1,100,000 for the investigation of fraudulent claims for workers' compensation benefits.

APPROPRIATION TITLE: Construction, Fiscal Year 2020

PROJECT NAME: Inland Waterways Users Board, Institute for Water Resources 1/

	Allocation in FY 2016	Allocation in FY 2017	Allocation in FY 2018	Allocation in FY2019	Budgeted Amount in FY 2020
Total	\$325,000	\$325,000	\$335,000	\$335,000	\$335,000
Board Expense	\$50,000	\$50,000	\$60,000	\$60,000 2/	\$60,000
Corps Expense	\$275,000	\$275,000	\$275,000	\$275,000 3/	\$275,000

1/ This activity is funded at 100 percent Federal expense. All costs associated with this remaining item are attributed to the Navigation business line.

2/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2018 to FY 2019 was \$70,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2020 from prior appropriations for use on this effort is \$0.

3/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2018 to FY 2019 was \$232,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2020 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: The Board was established by Section 302 of the Water Resources Development Act of 1986, (PL 99-662) and pursuant to the Board's charter, originally approved by the Secretary of the Army on March 3, 1987. The Board is an advisory committee subject to the requirements of the Federal Advisory Committee Act (PL 92-463, as amended).

DESCRIPTION: The Inland Waterways Users Board (Board) is an advisory committee representing the interests of the commercial navigation users of the inland and intracoastal waterways of the United States. Its purpose is to make recommendations to the Secretary of the Army and Congress, reflecting its independent judgment, regarding construction and rehabilitation priorities and spending levels on commercial navigation features of these waterways. Generally, issues regarding the Inland Waterways Trust Fund fall within the scope of the advisory role of the Board. The Deputy Commanding General for Civil and Emergency Operations has been designated Executive Director to the Board, and he has designated staff members to provide continuing Board support.

Annual funding for the Corps expense are used for personnel costs for administrative Board meeting support, including coordinating meetings, staff travel, clerical, and related administrative needs, travel to Board meetings, and to provide objective analyses related to potential investments in the inland waterways and the financial outlook for the Inland Waterways Trust Fund. These funds are not used for any personnel or travel expenses incurred by Expenses account funded staff or the Office of the Assistant Secretary of the Army.

Annual funding for the Board expense are used for the 11-member Board's travel, meetings and other needs to meet the requirements of the charter. The Board has requested they meet four times annually.

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2020

PROJECT NAME: Aquatic Nuisance Control Research – Navigation

Allocation in FY 2016	Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Budgeted Amount in FY 2020
\$ 668,250	\$ 668,000	\$ 668,000	\$ 2,970,000 1/	\$ 675,000

1/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2018 to FY 2019 was \$1,000. There was an additional \$0 of unobligated funds that are committed within the Corps for scheduled ongoing requirements in FY 2019. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2020 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: The Non-indigenous Aquatic Nuisance Prevention and Control Act of 1990 (Public Law 101-646), as amended by the National Invasive Species Act of 1996 (Public Law 104-332)

JUSTIFICATION: Annual funding is used to address invasive aquatic species that impact the Nation's waterways infrastructure and associated resources including development of control strategies for: navigation structures, hydropower and other utilities, vessels and dredges, and water treatment, irrigation, and other water control structures. Funding provides Corps managers and operational personnel with innovative technologies regarding risk assessment, prevention strategies, species life history/ecological data, and cost-effective, environmentally-sound options for managing aquatic nuisance species (ANS).

Program research focuses on:

- 1) The evaluation of potential control/barrier methods to prevent the transfer of Asian carps and other ANS (e.g. sea lamprey) between the Mississippi River and Great Lakes Basins;
- 2) New techniques for control of zebra and quagga mussels moving westward past the 100th meridian;
- 3) Improved detection and control methods for harmful algal blooms;
- 4) Corps personnel training in recognition and control methods of ANS on Corps lands/waters;
- 5) Web-based regional lists of aquatic invasive species on Corps projects;
- 6) Methods that reduce invasive species impacts to threatened and endangered species and provide restoration of natural habitats; and
- 7) Complete annual reporting requirements to the National Invasive Species Council on USACE Invasive Species expenditures.

ACCOMPLISHMENTS IN FY 2018:

- Completed field studies to monitor and determine longevity and fecundity estimates for Asian carp populations. Data used to re-parameterize and improve existing population models for assessing Asian carp impacts to aquatic ecosystems.
- Completed field studies to evaluate the performance of deployed traps and barriers retrofitted with submersed metals to prevent passage of sea lamprey.

Engineer Research and Development Center

Aquatic Nuisance Species Research

- Initiated the development and evaluation of new, non-toxic antifouling technologies for protection of Corps hydraulic structures to reduce the corrosion risk and maintenance costs associated with invasive mussels (zebra and quagga mussels) and other aquatic invasive macro-fouling organisms.
- Completed cost assessment of invasive species impacts and costs to USACE hydropower operations.

DESCRIPTION OF WORK FOR FY 2019:

- Utilize new Asian carp datasets on maximum burst speeds, jumping characteristics, salinity responses, and longevity, to re-parameterize and update population viability models on range-wide trajectories of Asian carp population distribution and responses to management actions. Results will improve predictions of movement and spread and assist with prioritizing future management actions.
- Evaluate new antifouling coatings/paints to determine impact on mussel fouling performance metrics and environmental toxicology.
- Develop a risk assessment framework to determine priority species impacting USACE projects to assist and prioritizing decision making of operational funds for ANS management activities.
- Investigate the use and feasibility of gene drive technologies to suppress establishment of zebra and quagga mussels.

DESCRIPTION OF WORK FOR FY 2020:

- Complete small-scale field assessment of antifouling coatings for USACE infrastructure; finalize commercial vendor agreements where feasible and provide recommendations for operational use.
- Initiate large-scale demonstration-validation study to assess newly developed antifouling coatings; document technology application and lessons learned and develop final guidance and criteria recommendations.
- Determine the feasibility of developing and utilizing gene drive technologies for creating multi-YY (all male) stocks as a method for reducing non-native, invasive fish populations on USACE projects.
- Develop effective operational guidance for mitigating harmful algal blooms on USACE projects.

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2020

PROJECT NAME: Asset Management/Facilities and Equipment Maintenance 1/

Allocation in FY 2016	Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Budgeted Amount in FY 2020
\$ 7,142,000	\$ 3,218,000	\$ 7,464,000	\$ 3,747,000 2/	\$ 3,285,000

1/ The costs of this activity are accounted for and evenly divided between the Navigation, Flood and Coastal Storm Damage Reduction, and Hydropower business lines.

2/ The Critical Infrastructure Cyber Security Center of Expertise (CICS-CX) and cybersecurity activities were funded through this Remaining Item through FY 2018. In FY 2019 a separate Remaining Item was established to fund the CICS-CX and its activities.

3/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2018 to FY 2019 was \$2,207,000. There was an additional \$179,000 of unobligated funds that are committed within the Corps for scheduled ongoing requirements in FY 2019. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2020 from prior appropriations for use on this effort is \$624,000.

DESCRIPTION: The Corps of Engineers is responsible for managing thousands of water resources infrastructure projects. This infrastructure provides critical services supporting the Nation, primarily in terms of commercial navigation, flood and storm damage reduction, and aquatic ecosystem restoration. Effective asset management informs planning, design, construction, operations, maintenance, recapitalization and disposition decision-making.

The Corps' asset management program includes Maintenance Management Improvement Plans (MMIPs) that are used to inventory existing assets, Project Maintenance Management Plans (PMMPs) that provide a detailed plan for maintenance of a specific project, and tools such as Operational Condition Assessments (OCA), Operational Risk Assessments (ORA), and the Corps Value Model, which help define risk. Its goal is the development of a strategy to create, sustain, or increase the delivery of benefits from Civil Works water resources by using risk as a common measure to inform investment decisions during the entire life cycle of Civil Works projects, including inception, significant decision points, and ultimately disposition.

In addition to the specific examples provided below, annual funding is used to:

- maintain a current asset inventory;
- assess benefits, risks, and consequences of failure among similar projects and similar assets through risk-based assessments;
- develop tools and processes to reduce risk and improve performance;
- develop and utilize quantitative information to prioritize the use of available Federal resources;
- formalize business processes that standardize best practices, promote accountability, and predict work requirements; and
- train Corps staff on how to implement pertinent methodologies.

ACCOMPLISHMENTS IN FY 2018:

1. Revised navigation lock & dam ORA tool for FY21 budget development.
2. Coordinated draft outputs from Corps Value Model effort to inform O&M 20/20 budget prioritization refinements for FY21 budget development.
3. Continued development of improved tools and processes to assist with budget prioritization.
4. Developed improved reporting for two of eight PMMP pilots, including automation of data between the Facilities and Equipment Maintenance (FEM) system and the Enterprise Data Warehouse (EDW).
5. Assisted Hydroelectric Analysis Center (HAC) with system modeling on Missouri River hydropower system to improve Hydropower Modernization Initiative results for 20-year capital investment strategy.
6. Continued to develop draft enterprise guidance for Asset Management in coordination with other functional areas.
7. Continued completion and refinement of condition assessments for Corps assets.
8. Completed OCA tool, training, and guidance for recreation assets.
9. Continue development of ORA for navigation channels, flood risk management, hydropower, and environmental stewardship assets.
10. Continued to train Major Subordinate Command (MSC) teams and implement maintenance management, condition and risk assessment, and consequence methodologies across portfolio of infrastructure assets which will feed future budget work packages.
11. Continued implementation and refinement of MMIP Phases 1-3, including developing better reports and metrics for measuring progress.

DESCRIPTION OF WORK FOR FY 2019:

1. Implement ORA and refinements for flood risk management and coastal storm damage reduction.
2. Complete guidance to formalize implementation of asset management throughout the Civil Works program and begin/continue associated tasks.
3. Review, revise, and implement the draft Corps Value Model for FY22 budget development.
4. Review results of PMMP efforts at 10 pilot sites, including automation of data between the Facilities and Equipment Maintenance system and the Enterprise Data Warehouse.
5. Continue to assist the HAC with system modeling on Missouri River hydropower system to improve Hydropower Modernization Initiative results for 20-year capital investment strategy.
6. Continue to complete automated hydrographic survey condition automation via eHydro, and linking to Shoaling Assessment Tools and Channel Prioritization Tool to assist in developing risk information for coastal and inland Navigation Channels.
7. Implement Dredge Project Selection and Dredge Schedule Optimization for high and moderate use coastal navigation channels.
8. Continue development of baseline OCA and ORA for environmental stewardship assets.
9. Continue implementation and refinement of MMIP, including developing better reports and metrics for measuring progress.

DESCRIPTION OF WORK FOR FY 2020:

1. Begin implementation of asset management throughout the Civil Works program based on completed guidance, and continue achievement/completion of associated tasks.
2. Refine the draft Corps Value Model.

3. Apply results of PMMP pilots to selected operating projects nationally, including automation of data between the Facilities and Equipment Maintenance system and the Enterprise Data Warehouse.
4. Continue to complete automated hydrographic survey condition automation via eHydro, and linking to Shoaling Assessment Tools and Channel Prioritization Tool to assist in developing risk information for coastal and inland Navigation Channels.
5. Complete transition of O&M 20/20 task into Asset Management effort.
6. Continue implementation and refinement of MMIP, including developing better reports and metrics for measuring progress.

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2020

PROJECT NAME: Civil Works Water Management System (CWMS) – Flood and Storm Damage Reduction 1/

Total Estimated Federal Cost	Allocations Prior to FY 2017	Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Budgeted Amount in FY 2020	Additional to Complete After FY 2020
\$	\$	\$	\$	\$	\$	\$
128,000,000	29,509,000	9,652,000	9,900,000	9,900,000 2/	7,650,000	61,389,000

1/ From FY 2012 through FY 2015, funding for the activities covered by this remaining item were sourced out of other programs, projects, and activities within the Civil Works program. Since FY 2016, the Corps has funded these activities through a separate line item to provide transparency of the costs of this program. The amount shown for allocations prior to FY 2017 includes all funding provided prior to FY 2017 for this effort, which started in FY 2012.

2/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2018 to FY 2019 was \$499,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2020 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: The River and Harbors Act and Flood Control Act of 1948, Section 102 of the Rivers and Harbors Act of 1962, Section 216 of the River and Harbor and Flood Control Act of 1970, Section 731 of the Water Resources Development Act of 1986, Section 729 of the Water Resources Development Act of 1986, specific project and purpose authorizations, Executive Order 13653, and Executive Order 13514.

DESCRIPTION: The Corps is using this funding to develop a suite of state-of-the-art watershed models called the Civil Works Water Management System (CWMS), which its project managers use to help achieve the authorized purposes the projects that the Corps owns and operates, and which its planners use to help identify options for addressing water resources issues. These models provide a direct, accountable means for updating data that the Corps uses to assess and manage the operation of its projects, communicate the risk associated with those projects, and to apply lessons learned consistently across the nation. These models support multiple Corps programs including Dam Safety, Levee Safety, Planning, the Operations Center/Flood Risk Management of the Corps, and its Critical Infrastructure Protection and Resilience program.

For example, the Corps has used these models to produce inundation maps for the affected Corps districts and provide them consequence data (structures impacted, potential loss of life, damage values) during the December 2015/January 2016 flooding of the Mississippi River. The Corps uses these models after a flood as well, for example, in its “after action” reporting and when planning for a future flood fight in that watershed. The Corps also has used these models to inform decisions on the operation of Corps reservoirs. The models also incorporate lessons learned from extreme events (such as Hurricane Katrina, Hurricane Sandy, the 2012-2013 drought, the greater Mississippi River Basin flood of 2011, the Nashville flood of 2010, Hurricanes Harvey, Florence, Irma and Maria). The Corps also uses CWMS hydrologic models to run multiple scenarios. The Dam and Levee Safety community has used these hydrologic models in developing dam break models, and in some Semi-Quantitative Risk Assessments and some Issue Evaluation Studies.

The CWMS models are a tool that is helping the Corps to improve how it approaches water resources management. They are part of the broader Corps effort to move from an investment strategy based on individual projects and individual program areas to a systems-oriented approach across all Corps projects in the watershed and multiple Corps programs.

DESCRIPTIONS OF WORK FOR FY 2019: Funds are being used to continue to the nationwide CWMS modeling effort to enhance the operational decision making for floods, droughts, operations planning and real-time operations. This will include developing the hydrologic and hydraulic models required for a watershed approach to effectively meet authorized purposes. Data collection, data dissemination, and modeling and analysis capabilities will be addressed on a national level. Funds from this account will be used to complete the 24 basins started in FY 2018. An additional 22 basins will be started in FY 2019; due to size and complexity, all of these basins will be completed in FY 2020. At the end of FY 2019, 143 of the 201 basins will be implemented. In addition, the funding will be used to help establish continuity of operations capabilities that fully support the water management mission and complies with U.S. Army Corps of Engineers and Department of Defense Corporate Information Assurance and Security requirements. With the basins scheduled for completion through FY 2019, 71% of the total Corps land area will be modeled, 81% of the Corps river miles will be modeled, and 84% of the Corps reservoirs will be modeled.

DESCRIPTIONS OF WORK FOR FY 2020: Funds will be used to carry out a concentrated program to enhance the operational decision making for floods, droughts, operations planning and real-time operations. This will advance the implementation of CWMS nationwide, including developing the hydrologic and hydraulic models required for a watershed approach to effectively meet authorized purposes. Data collection, data dissemination, and modeling and analysis capabilities will be addressed on a national level. Funds from this account will be targeted for the most critical watersheds that have not yet moved into the CWMS environment. Funds from this account will be used to complete the 22 basins started in FY 2019 and carried into FY 2020. An additional 18 basins will be started in FY 2020; due to size and complexity, all of these basins will be completed in FY 2021. At the end of FY 2020, 165 of the 201 basins will be implemented. With the basins scheduled for completion through FY 2020, 82% of the total Corps land area will be modeled, 87% of the Corps river miles will be modeled, and 89% of the Corps reservoirs will be modeled. In addition, the funding will be used to help establish a National Enterprise Water Management System with continuity of operations capabilities that fully supports the water management mission and complies with US Army Corps of Engineers and Department of Defense Corporate Information Assurance and Security requirements.

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2020

PROJECT NAME: Coastal Ocean Data System (CODS) Program 1/ 2/

Allocation in FY 2016	Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Budgeted Amount in FY 2020
\$ 5,346,000	\$ 5,940,000	\$ 5,940,000	\$ 6,435,000 3/	\$ 2,250,000

1/ The costs of this activity are accounted for in the Flood and Coastal Storm Damage Reduction and Navigation business lines.

2/ This program has also been budgeted under the title Coastal Data Information Program (CDIP).

3/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2018 to FY 2019 was \$18,000. There was an additional \$126,000 of unobligated funds that are committed within the Corps for scheduled ongoing requirements in FY 2019. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2020 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: 33 USC 426a which originated with the River and Harbor Act of 1945, which originated in the River and Harbor Act of 1930.

DESCRIPTION: The over-arching objective of the CODS Program is to provide high-quality long-term coastal wave information along with storm-event data nationwide, to develop and provide tools for using wave and other data for managing coastal sediment, and to support sustainable coastal and navigation projects under a changing climate.

Ocean observations are used to validate numerical hindcast models that calculate wave information over 30 to 50 year periods on the Atlantic & Pacific coasts, Gulf of Mexico and Great Lakes. This wave climate information is combined with storm wave information producing validated long-term and storm waves that drive our next generation risk-based coastal models.

Ocean waves deliver energy to the coast and impact Corps projects and operations. Wave information is imperative for products for operational guidance of USACE dredging, navigation, maintenance, and emergency operations. Wave observations are used in the development and validation of new hindcast wave models and for storm analysis and new wave products are transforming how the Corps, other Federal Agencies, States, Academia, Public, and the Nation use and access accurate wave information. High quality wave information is required for the design of storm protection and navigation projects; to inform regional sediment management strategies; and as boundary conditions for all coastal modeling. Inaccurate and insufficient coastal wave data can result in project operation and design uncertainty. Long-term (multiple decades) wave and storm information are also required to determine how climatic changes and extreme events will impact Corps' facilities, projects and mission operations.

Because of the Corps interest and expertise in waves, this program has been involved in the global effort to test and evaluate various wave-measuring systems. Evidence indicates that differences in the quality of wave parameters depend on the platform/sensor combination being used, with the potential that during extreme storm scenarios, there could be as much as a 50% over-estimation in the significant wave height from commonly used platforms. This activity is guided under the international Intergovernmental Oceanographic Commission (of UNESCO), and the World Meteorological Organization.

Engineer Research and Development Center

Coastal Ocean Data Systems Program (CODS)

The latest Engineering Regulation governing implementation of the CODS program is ER 1110-2-1406 dated 1990.

In addition to the specific examples below, annual funding is used to support the following CODS activities:

- (1) Wave Observations: Observation efforts are conducted in partnership with the NOAA National Data Buoy Center (NDBC, www.ndbc.noaa.gov) and through the state of California, the Scripps Institution of Oceanography that maintains a network of shallow-water coastal gauges under their Coastal Data Information Program (<http://cdip.ucsd.edu>). These observations are high resolution and of appropriate accuracy for use in Corps wave information hindcast efforts for validation. The data are automatically provided to national data servers of NOAA and are publically available. The popularity of the program is evident from the usage statistics, daily hits averaged 330,000 (2015) and increased significantly during El Nino (415,000) with an average data download of 15 gigabytes per day. In 2009, the Interagency Ocean Observation Committee (IOOC) finalized the first *National Operational Wave Observation Plan* developed by the Corps in collaboration with the NOAA Integrated Ocean Observing System (IOOS) program office. This was a science-based assessment of the nation's wave observation requirements that identified observation gaps and for the first time, defined a measurement accuracy requirement sufficient to satisfy the directional resolution required by the Corps and others. The plan has already led to national improvements. An update to the Plan was completed in FY16 and is a milestone requirement of the National Ocean Policy (NOP). The update includes a re- assessment of the number, location, and priority for new locations; tighter integration between wave observations and wave modeling; and strategic recommendations for new products to meet national needs for wave information. Annual funding is used to support the directional wave measurements presently conducted by the NOAA NDBC program and the Scripps Institution of Oceanography under CODS; continue intra-measurement evaluations conducted under the Joint Oceanographic Commission of Oceanography and Marine Meteorology; and continue monitoring sand level changes on several southern California beaches to evaluate response to variable wave conditions. These observations and long term observations at the Field Research Facility in Duck, NC are being used in the development of coastal process models.
- (2) Wave Information Studies. The objective of wave information studies is to provide high-quality coastal wave information, wave analysis products, and decision tools nationwide. The focus is to integrate measurements with model results so that the Corps has access to all available wave information (real-time observations, model hindcasts, and long-term archives) to perform their mission. Wave hindcasts use high quality wind fields and the latest wave modeling technology. To satisfy the Corps requirement for risk-based designs, at least 20-30 years of continuous wave climatology data are required. Hindcast datasets provide hourly wave information for locations every few miles along the coast. Because of this coverage, the Corps, the coastal engineering community, and the public routinely use these datasets for coastal studies. The long-term hindcast wave data are accessible through a website that receives over 16,000 monthly requests for data downloads and over 1 million visits per year (<http://wis.usace.army.mil/>). Available observations are used to confirm and validate the hindcast/model data, for quantifying actual conditions, and for understanding long-term wave climatology. Under this activity, wave data users are able to access either hindcast or observed wave data transparently and select powerful analysis products and tools for wave climate and extreme event planning and for decision making using either observations or model estimates, or both. Annual funding is used to provide annual updates to the Hindcast for all domains (Atlantic, Pacific, Gulf of Mexico, Great Lakes).
- (3) Storm Event Data Sets. Corps project designs require estimates of the extreme conditions that define and quantify an acceptable level of risk. Because project life cycles can be 50-100 years, it is desirable to extend the extreme event climatologies to be as long as possible, much longer than the maximum wave observation record, which is only 35 years. This also suggests going back in time, defining extreme events (meteorological, and/or hydrodynamic), develop the wind forcing, and perform wave hindcasts. The wave climatology (similar to that

now used by FEMA) based on storm events could be extended over possibly 60 to 70 years. Storm event data of interest besides waves include storm track, wind fields, atmospheric pressure, surge levels, wave run up and beach/channel response.

The Integrated Ocean Observing System Participation: CODS observations are a Corps contribution to the IOOS. They support the Coastal Hazards topic under the National Ocean Policy. IOOS is an interagency activity with NOAA as the lead agency. Participating agencies pool, share and coordinate their ocean observations for the benefit of all. To facilitate this coordination, the Corps participates in IOOS workshops, regional associations, and meetings. The Corps has also established a liaison with the IOOS program office. Annual funding is used to support the activities of IOOS by participating in the IOOC; promote the involvement of Corps District and Division offices in their local IOOS regional associations through meetings and workshops; and to serve on the IOOS Quality Assurance or Real-time Oceanographic Data Board of Advisors and other IOOS Committees.

DESCRIPTION OF WORK FOR FY 2019:

- Initiate efforts to enable users to download more information than before, including populating files to a Thredds/Opendap server that will house all WIS files. These files are hdf5-netCDF constructs where the *oneline*, spectral estimates and wave fields are contained. All other domains and files have been converted to this construct and are contained on the Thredds/Opendap server. WIS also maintains its permanent archive on the HPC system and duplicate files on resident RAID systems
- Develop and assess the ability to use Unmanned Aerial Systems (UAS) to improve the Corps management of coastal flood risk. Coastal and riverine shorelines are dynamic landscapes that change continually in response to environmental forcing. The combination of static infrastructure with the dynamic landscapes creates management challenges for navigation, storm damage reduction, and ecosystem health that are exacerbated during natural disasters. UAS provides accurate, detailed, and timely data that is critical to monitoring of topography and bathymetry, flood risk management infrastructure, and ecosystem health. The work unit team consists of Principle Investigators from the Geospatial Research Laboratory, the Environmental Laboratory, the Cold Regions Research Laboratory, and the Coastal and Hydraulics Laboratory to identify defensible and consistent UAS-based methodology to support flood risk management actions. The project goals include (1) developing, testing, and evaluating existing UAS technology to determine best practices for collection of terrain, infrastructure, and ecosystem health data with appropriate error and uncertainty quantification; (2) developing and evaluating UAS-based capabilities to collect simultaneous topographic and bathymetric data of the coastal zone; and (3) developing model-data assimilation frameworks that can seamlessly integrate variable data types, sources, and quality with the Corps numerical models to provide robust risk assessments and planning tools with proper uncertainty quantification.
- Deploy an array of acoustic altimeters to precisely monitor changes in nearshore morphology continuously and in real-time. Bathymetric surveys can only be conducted safely in calm conditions before and after storms leaving researchers with very little information about the morphology of the surf zone during storms. This large scale deployment is part of a multi-program effort to evaluate and improve Corps nearshore morphologic modelling capabilities by integrating CSHORE and C2SHORE in the Coastal Model Test Bed. Building on the dataset collected by three acoustic altimeters deployed in the FRF surf zone in 2017, an additional twelve altimeters were deployed creating three cross-shore transects of five altimeters each. The acoustic altimeters can resolve seafloor elevation changes of as little as a few centimeters and report values as often as every two minutes even during strong storms. Previous data from the three existing altimeters have demonstrated an incredibly dynamic seafloor with measured elevation changes of as much as a meter in a few hours. These expanded

measurement capabilities have facilitated model improvement and validation and elucidated feedbacks between waves and morphology in the highly dynamic surf zone in a full range of conditions.

DESCRIPTION OF WORK FOR FY 2020:

- Investigate the uncertainty of wave measurement systems that are used for evaluating the Wave Information Study (WIS) long-term hindcast to better understand temporal and spatial variability, and risk assessment. The importance of quantifying the accuracy in wave measurements is critical to not only the understanding of complexities of wind-generated surface gravity waves, it is also imperative to any user of that data to understand that all wave data have an inherent uncertainty. Measurement methods are evolving quickly and both new data and established sources (e.g., NDBC buoys) are using new technologies. Addressing errors/uncertainties in wave measurements will benefit all users of the data for model evaluation, model development, and R&D studies requiring high-quality directional wave data. Knowledge of the uncertainties, long-term trends, and spatial variations in the wave climates along US coastlines will benefit risk-based project analyses. Quantifying errors in wave measurements will lead to improved QA on WIS hindcast efforts, allow for R&D in the field of wave physics (and modifications to existing models), and provide better estimates in long-term climate trend analyses along with homogeneity in the data sets for risk analyses.
- Lidar research on coastal hydrodynamics will analyze data collected with the FRF's continuously operating lidar systems to improve USACE's understanding of coastal hydrodynamics and the resultant beach evolution. Common parameterizations for during-storm wave runup, setup, and shoreline wave-heights were developed using limited data sets but are often applied during extreme storms. In particular, common wave runup parameterizations often ignore surf-zone bathymetry and phase-averaged wave models force sea/swell energy to go to zero at the shoreline, which initial analysis our lidar data shows is incorrect. In addition beach morphology observations at the same time-scale as hydrodynamic forcing conditions are rare, making identification of the processes leading to that morphology evolution difficult to quantify. The continuous data collected by the dune lidar system are unique to CHL and present an opportunity for USACE to advance our physics-based understanding of these processes. This R&D will better constrain our uncertainty estimates when using common hydrodynamic parameterizations during extreme storm conditions, and we hypothesize will demonstrate the necessity of knowing surf-zone bathymetry in predictions of storm impact and shoreline water levels. These findings will also directly impact the tools USACE districts use to plan for coastal flood risks, as well as improve our ability to simulate the evolution of federal beach projects.
- The coastal model test bed (CMTB) will utilize the FRF's extensive nearshore wave, current, and morphology data to quantify uncertainty in nearshore model results. Through this analysis, areas of deficient model physics will be identified, facilitating model enhancement and identifying future research focus areas. Understanding the strengths and weaknesses of these numerical models will identify appropriate use cases for each USACE numerical model, improve confidence in their applicability, reducing risks associated with resultant engineering decisions. In addition, the CMTB facilitates collaboration in the nearshore research community by inviting others to evaluate their models in the same framework, ensuring USACE remains up to date on the to the state of the art in nearshore numerical modeling.

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2020

PROJECT NAME: Coastal Inlets Research Program – Navigation

Allocation in FY 2016	Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Budgeted Amount in FY 2020
\$ 3,173,000	\$ 2,673,000	\$ 2,945,000	\$ 7,895,000 1/	\$ 2,430,000

1/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2018 to FY 2019 was \$0. There was an additional \$0 of unobligated funds that are committed within the Corps for scheduled ongoing requirements in FY 2019. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2020 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: Authorization for the Corps of Engineers' Engineer Research and Development Center (ERDC) to conduct research and development is codified in 10 U.S.C. 2358: "The Secretary of Defense or the Secretary of a military department may engage in basic research, applied research, advanced research, and development projects that are necessary to the responsibilities of such Secretary's department in the field of research and development."

DESCRIPTION: The Corps operates and maintains more than 1,000 coastal navigation projects that cover 13,000 miles of coastal navigation channels. Coastal inlet navigation channels must be maintained in a complex environment of waves, tidal and wave-induced currents, sediment transport, and vessel-induced flow and wake, with consideration of ecological and sustainable practices. In Fiscal Year (FY) 2014, the Corps spent approximately \$734 million for routine dredging of 142 million cubic yards from Federal navigation channels, and an additional \$450 million for the supplemental and emergency dredging of 27 million cubic yards. Adjusted for inflation, dredging costs have increased approximately \$5.9 million per year (from \$1.53 to \$2.97 per cubic yard) from FY 1963 through FY 2012. Additionally, harbors and ports have elected to deepen and widen navigation channels to accommodate larger vessels due to the increased ship sizes allowed by the expanded Panama Canal; however, deeper and wider channels are more efficient sediment traps, therefore increasing shoaling and O&M costs. Modifications to coastal inlet channels and jetties can have a profound effect on the integrity of the navigation structures, adjacent beaches, estuaries, and ecosystems. Renewable, cost-effective placement sites for dredging must also be designed such that sand moves onshore, fine sediments are dispersed offshore, and re-deposition into the navigation channel is minimized. Such projects require characterization of hydrodynamics, wave forcing, sediment transport, and morphology change, as well as geomorphologic approaches. Thus, navigation project O&M, structure integrity and implications of ongoing and future dredging actions must be considered within a sediment-sharing system including the inlet, navigation channels, structures, and adjacent beaches.

Annual funding for the Coastal Inlets Research Program is used to advance knowledge and tools to better predict future channel shoaling, to provide quantitative and practical predictive tools and data to reduce the cost of dredging for Federal navigation projects and to maintain jetties, identify potential unintended consequences, mitigate for engineering activities related to navigation channels, and prioritize maintenance options.

ACCOMPLISHMENTS IN FY 2018:

Structures and Navigation Focus Area

- **Identify Critical Dredging Needs in Navigation Portfolio (Addresses Statement of Need (SoN) 2017-N-12, SoN 2017-N-52).** Updated the Channel Portfolio Tool (CPT) to better support the districts/divisions with a more efficient and robust tool that identifies critical dredging needs for deep-draft navigation channels within the national USACE navigation portfolio. Using the latest channel condition data and shoaling forecast capabilities of the Corps Shoaling Analysis Tool (CSAT, which was integrated with CPT during FY 2015), and, populated the full national portfolio of navigation channels to complete a national picture of critical dredging needs. Location map of channels included in CPT interface for spatial view of the decision tree for channels. Query functions for international cargo flows were also added to the CPT interface.
- **Establish Guidance and Best Practices for Efficiently Maintained Deep-Draft Channels (SoN 2017-N-12).** Compared deep-draft entrance channels nationally in terms of the efficiency with which waterborne freight (imports, exports, and domestic shipments) transports through the marine transportation system, in terms of cumulative dredging costs relative to commerce supported. Using the knowledge gained, establish guidance and recommend best practices for cost-effective (relative to national baselines) deep-draft navigation channel maintenance dredging and coastal navigation structure upkeep.
- **Develop a Coastal Inlet Navigation Vessel Behavior Atlas Dashboard (SoN 2017-N-52).** Improvements to the user interface for navigation managers to observe changes in vessel use patterns within high-use coastal channels, based on aggregated datasets compiled from the USCG's Automated Information System (AIS) vessel position reports archive. Interface updates include more efficient data request and download routines using a cloud based platform.
- **Integration and Support of CPT/ AISAP/CSAT (SoN 2017-N-52).** Automatic linkage of CSAT output to CPT for efficient transfer of data between the tools. Continued support of the server maintenance activities to ensure CPT, AISAP, and CSAT tools are functioning and readily available to all Corps employees.
- **Develop long-term predictive capability to examine the effects of climate change to coastal navigation (SoN 2017-N-71).** Studies built upon existing work in long-term morphodynamic predictions using the CMS wave, current, and morphology modeling system. This work will include evaluating model performance, efficiency, and accuracy in the context of predicting the response of coastal inlet systems to climate change. Specific response metrics included changes to tidal prism, water levels, bay area, and navigation channel sedimentation under a regime of rising sea level. The research will aid long range planning efforts by developing quantitative methodologies to predict physical coastal change over the next century. Literature review report was completed, USACE/NOAA/NRC curves were tested and added to the SMS GUI, and CMS simulations investigated and compared system geometry and morphological responses to different SLR scenarios.
- **Upgrade the Coastal Modeling System with Lab-Based Bedload Algorithms (SoN 2017-N-1).** Started to develop bedload algorithms based on lab experiments and began to incorporate the new formulations to calculate bedload transport process in CMS.
- **Integrated CMS into the Coastal Model Test Bed Framework (SoN 2017-N-1).** Nearshore numerical models (CMS-Flow and CMS-Wave) are used by the Corps' Districts to estimate the wave conditions, circulation, and the morphology potentially impacting a project site. The FRF has established the Coastal Model Test Bed (CMTB), a live modeling framework which utilizes the high temporal and spatial resolution

morphologic, oceanographic, and meteorological data collected at the FRF. This modeling framework has been designed to exploit the FRF's real-time data collection and assess nearshore numerical models. The CMS models have been integrated into a live work flow that already exists and is validated. Setup has been documented in reports.

- **Upgraded Tool to Quantify Erosion Caused by Vessel Wake (SoN 2014-N-6; 2011-N-24; SoN 2017-N-09).** Based on District feedback, upgraded tool to quantify the erosion created by vessel wakes was completed. With the arrival of New Panamax vessels and projected increases in US seaport traffic and other navigation activities, the effects of vessel wake on shoreline erosion and water quality is an increasing concern for the USACE Civil Works mission. The tool includes physics-based approaches to determine erosion potential based on statistical distributions of vessel traffic as well as methods to aid in channel design and shoreline protection strategies.
- **Upgrade Web-based Metocean Data Access, Processing and Analysis Tools: WaveNet and TideNet (SoN 2013-N-22).** Upgraded WaveNet and TideNet tools for District applications. Major additions included both data and numerical modeling databases of directional wave spectra, two-dimensional currents, and two-dimensional wind and pressure fields; the upgrades provided input data for circulation and wave models supported by the USACE.
- **Develop and enhance capabilities of CIRP CMS models (SoN 2015-N-35, 2009-N-5, 2017-N-01).** Conducted verification and validation (V&V) of CMS, with extended data sets, coastal forcing, and settings, using available field data sets. Used existing field data to evaluate skills of CMS models for nearshore processes common to typical project applications in East Coast, West Coast, Pacific Islands, Alaska, and Great Lakes. Validated models with recent field data near and at inlets and ports/harbors by investigating impacts of multi-directional wind-waves and long-period infra-gravity waves on harbor operations, surges, navigation issues, and wave effects on reefs, and structural design in District projects. Incorporated combined forcings of the short-period seas and swells in models to quantify their impacts on navigation safety, harbor surges, ship transits, moorings, and infrastructure design and maintenance. Documented findings in technical guidance.

Sediment Management Focus Area

- **Released Version 4 of the Regional Shoreline and Inlet Sand-Sharing Model, GenCade (SoN 2017-N-1).** Version 4 of GenCade includes the implementation of a curvilinear grid/shoreline to better resolve regional morphological trends; Technical Reports and the CIRP Wiki provide documentation. The process of integrating GenCade with the breaching model (2014-N-14) began in FY 2018. Ten new GenCade videos were produced describing advanced cards, post-processing, calibration strategies, and other advanced topics.
- **Developed inlet breaching code as a stand-alone model (2014-N-14).** Conducted a tech-transfer webinar to describe the concept and introduce the GUI package. The tool is available in a form that allows engineers and managers to make a rapid assessment of the breach growth and closure potential. Technical Report/User's Guide describing the breaching tool and a journal paper describing the theory was produced.
- **Quantify Dune Resilience (SoN 2014-N-11; 2015-N-11; 2014-N-10; 2018-F-1192).** Developed approach to quantify engineering resilience of coastal dunes which utilized the R&D knowledge gained in the field studies and data analysis during FY 2014-FY 2018. This work included testing and evaluating dune evolution models against lidar data, including collision regime conditions experienced during Hurricanes Hermine and Joaquin, as well as monthly dune surveys (submitted journal article on this work). The research has supported the development of a user-friendly web-based tool to easily run a collision regime dune erosion model on a variety dune shapes (initial profile) given probabilistic waves &

water levels (forcing conditions). Continued collaborative interagency work (NRL, USGS) on developing numerical models to predict dune scarping and overwash magnitudes during storms for improved planning and vulnerability assessments.

- **Monitor a Full-Scale Nearshore Berm composed of Mixed-Sized Sediments (SoN 2016-N-4).** The majority of sediment dredged in the USACE is composed of mixed sand, silt, and clay. Predicting transport of these mixed-sediments is an active area of research, and of keen interest to resource agencies that often restrict placement of dredged material in the nearshore. Nearshore berms are created through placement of sediment in the nearshore and are desirable to keep sand in the littoral system and facilitate "engineering with nature" to sort fines offshore and transport coarser sand to the nearshore. However, there is little guidance to design and evaluate the spatial and temporal characteristics of nearshore berm migration, and resource agencies are presently not allowing placement because of concerns of dispersion of fines during and following placement. This research task conducted a large scale sediment transport experiment on a nearshore berm project in Florida. Nearshore sediment transport processes analyzed and modeled and summarized in technical documentation.
- **Sediment Mobility Tool (SMT) Web Application Improvements (SoN 2016-N-4).** The web application for the Sediment Mobility Tool (SMT) will be improved by incorporating the methodology created in FY 2017 to calculate the aleatory and epistemic uncertainties in the model equations. The addition of the uncertainties in the web application will provide users with more knowledge to make informed decisions using the results of the SMT.
- **Nearshore Berm Migration Methods (SoN 2016-N-4).** Districts have regularly asked for more tools to be converted to web applications so software is not required to be installed on their computers. The statistically derived wave data was compiled from the Wave Information Study (WIS) and applied to a variety of nearshore berm geometries to evaluate the migration potential various designs. This information can be used to inform guidance on the project viability and expected lifetime given environmental conditions.
- **Numerically Model Field Studies of Nearshore Berm Placements (SoN 2011-N-15, SoN 2011-N-19, SoN 2016-N-4, SoN 2017-N-69, and SoN 2017-N-70).** The nearshore placement of dredged sediment at Sand Island, Mississippi has been monitored with sediment tracers and the wave conditions have been monitored with two Acoustic Doppler Current Profilers (ADCP's). The data collected was used to validate several models including SMT, GTRAN, and the Particle Tracking Model (PTM) and is documented in a technical report.
- **Rapid Method for Statistically Averaged Wave Climate (SoN 2016-N-4, SoN 2017-N-69, and SoN 2017-N-70).** Various statistical techniques were evaluated for determining a rapid method to statistically average wave climate from WIS wave hindcasts that were then applied to the SMT model to improve understanding of sediment mobility under typical wave conditions and applied to GTRAN to estimate nearshore berm deflation.
- **Initiate Field Studies of Nearshore Berm Placements at South Padre Island (SoN 2016-N-4, SoN 2017-N-69, and SoN 2017-N-70).** The nearshore berm at South Padre Island, TX was monitored with sediment tracers, altimeters, Acoustic Doppler Velocimeters (ADV's), and ADCP's. The data was used as a demo project to quantify the shoreline response and benefit of nearshore placements. The data collected was also be used to validate several models including SMT, GTRAN, and the Particle Tracking Model (PTM).
- **Coastal Inlet Database Update (SON 2017-N-67).** The CIRP developed Coastal Inlet Database has been revamped to include new features and data, including a new method to compute inlet ebb-tidal delta volumes for 3D Lidar data. Ebb-tidal delta volume computations were completed for the West-central Florida coast, which has the most comprehensive dataset available. The Coastal Inlet Database has been

compiled into a geodatabase and made available as an ESRI ArcGIS Online web application for users to find information relevant to their tidal inlets, linked through the CIRP Website. Updates will be documented in a Technical Note.

- **Guidance of Numerical Modeling of Navigation Inlet Mining Studies (SON 2017-N-67).** New methods in numerically simulating sediment transport have been tested and further developed to reflect driving questions from the field about sediment management of inlet-shoal resources in a regional setting. A report documenting the present state of the science was completed as a Special Report.
- **Implement “Dredging Module” in the Coastal Modeling System (SoN 2017-N-12; 2016-N-10).** Incorporated the process of dredging operations, both temporal and spatial footprints, in CMS to enhance CMS’s capability in modeling sediment transport and morphology change.
- **Integrate CMS into the Coastal Model Test Bed Framework (SoN 2017-N-1).** Nearshore numerical models (CMS-Flow and CMS-Wave) are used by the Corps’ Districts to estimate the wave conditions, circulation, and the morphology potentially impacting a project site. The FRF has established the Coastal Model Test Bed (CMTB), a live modeling framework which utilizes the high temporal and spatial resolution morphologic, oceanographic, and meteorological data collected at the FRF. This modeling framework has been designed to exploit the FRF’s real-time data collection and assess nearshore numerical models. The process of integrating the CMS models into a live work flow that already exists and validated on a dedicated CMTB cluster was initiated.
- **Continue technology transfer of the Coastal Modeling System (CMS).** Several tech transfer workshops and webinars were given and technical reports, technical notes, eNewsletters, and website/wiki updates were published.
- **USCRP Nearshore Processes Initiative:** Supported the nearshore coastal processes research initiative to conduct collaborative research across the coastal community through participation in workshops and tech transfer activities, including the USCRP Workshop on Coastal Storms in April 2019.

DESCRIPTION OF WORK FOR FY 2019:

Structures and Navigation Focus Area

- **Upgrade Web-based Metocean Data Access, Processing and Analysis Tools: WaveNet and TideNet (SoN 2017-N-1).** Extend WaveNet and TideNet tools to include directional wave spectra, and two-dimensional wind and pressure fields. The upgrades will provide comprehensive input data for circulation and wave models preferred by the HH&C CoP and supported by the USACE.
- **Develop Guidance for Reducing Surge and Infragravity Waves within Ports and Harbors (SoN 2016-N-13).** Continue to use time- and frequency-domain analyses of NOAA 1-Hz data at selected sites to identify the contribution and influence of infragravity wave (IG) phenomena in the recorded water levels. The study will be steered by a District-led advisory PDT to identify project-specific conditions and problems experienced at each selected test-bed site. Evaluation of capabilities will build on existing models at test sites with comparison to field data to develop guidance for application of models. Modeling deficiencies will be identified with the help of data to develop improvements to numerical models. New features will be added to predictive tools and findings will be documented in technical notes, reports, and journal articles. Study results will be incorporated into design guidance through Engineering Manuals to advance the state-of-the-art for design procedures.

- **Develop and enhance capabilities of steady-state coastal wave models (SoN 2017-N-01).** Continue verification and validation (V&V) of CMS, with extended data sets, coastal forcing, and settings, using available field data sets. Use existing field data to evaluate skills of CIRP wave models for wave processes including multi-directional wind-waves and long-period infra-gravity waves on harbor operations, surges, navigation issues, and wave effects on reefs, and structural design in District projects. Support development of new wave model that expands the capabilities of CMS-Wave and document initial findings in technical guidance.
- **Implement Design Procedures for Navigation Structures in Wave Models (SoN 2016-N-14).** Include methods and engineering guidelines in wave models to optimize performance and design of navigation structures. Provide additional capabilities for design of structures to protect navigation channels, inlets, harbors, and adjacent beaches. Summarize advancements in guidance documents.
- **Incorporate Vegetation Effects on Wave Propagation (SoN 2014-N-12).** Incorporate and validate vegetation effects on wave propagation in CMS-Wave, a wave model in Coastal Modeling System (CMS) with field datasets. Include vegetation effects for Natural and Nature-based Features (NNBF) in the reduction of waves and storm surges in coastal areas. Investigate wave damping effects as a function of water level, wave height and period, and vegetation characteristics. Quantify and document the protective sheltering effects of islands and emergent NNBF in regional wave predictions in guidance documents.
- **Critical Dredging Needs in Navigation Portfolio (SoN 2017-N-52).** Continue with improvements to the Channel Portfolio Tool (CPT) to better support the districts/divisions with a more efficient and robust tool that identifies critical dredging needs for navigation channels within the national USACE navigation portfolio. Efficiencies to process large data queries is essential for continued utility. In addition, the spatial interconnection of the data in CPT, AISAP, CSMART, and CSAT will continue to be explored with the goal of identifying new coastal navigation metrics.
- **Coastal Navigation Portfolio Management: CPT, AISAP, CSAT (SoN 2017-N-52).** These tools as well as research efforts as part of this work unit help advance objective, quantitative, and systems-based approaches to management of the Corps' large coastal navigation portfolio of projects. Coupling the datasets provide enterprise capability to determine channel reliability for the full channel cross-section and further support navigation optimization. Channel reliability model uses the AIS data combined with hydrographic surveys, shoaling predictions from CSAT, and the Waterborne Commerce data available from CPT to advance a consistent approach to quantify channel reliability. In addition, the datasets are available via other platforms that can be connected to provide seamless data sharing for the existing CIRP suite of models.
- **Validate Tool to Quantify Erosion Caused by Vessel Wake (SoN 2017-N-09).** With the arrival of New Panamax vessels and projected increases in US seaport traffic and other navigation activities, the effects of vessel wake on shoreline erosion and water quality is an increasing concern for the USACE Civil Works mission. Expanding on previous work that developed a desktop application to determine the potential effects of vessel wake on shoreline erosion, the work will focus on model validation and to identify the types of vessels for which the tool can be used in applications.

Sediment Management Focus Area

- **Nearshore Berm Migration Methods (SoN 2016-N-4).** Methods developed in FY18 will be added into a web application to make the use of the nearshore berm transport model more accessible and easily applied to nearshore berms. The web application will calculate the temporal and spatial footprint of the berm and its deflation rate. This will be summarized into a technical note.
- **Monitor a Full-Scale Nearshore Berm composed of Mixed-Sized Sediments (SoN 2016-N-4, SoN 2017-N-69, and SoN 2017-N-70).** Several new methods of nearshore berm monitoring will be tested and analyzed to compile and provide guidance on a suite of scaled monitoring tools that can be tailored to the data requirements of individual projects. New field and analysis techniques will include stationary and mobile aerial photography of shoreline and features and other new methods developed by the CHL Field Research Facility. These efforts will be summarized in to guidance documentation.
- **Addition of SACCS into Sediment Mobility Tool (SMT) (SoN 2016-N-4, SoN 2017-N-69, and SoN 2017-N-70).** In FY 2017, the NACCS data were integrated into the SMT to assist user determine the sediment mobility of dredged sediment placed in the nearshore under storm wave conditions. In FY 2018, SACCS data were generated for the entire SAD. The SACCS data will be implemented into SMT in FY 2019 to assist users in the SAD to understand nearshore placed sediment transport under storm wave conditions.
- **Coastal Inlet Database Update (SON 2017-N-67).** The CIRP developed Coastal Inlet Database web application will be updated to include remaining tidal delta volume computations for time period (2014-2017). Additional relevant data will be appended to the geodatabase, and outside datasets will be linked for visualization in the web-application. Updates will be documented in a Technical Note.
- **Guidance of Numerical Modeling of Navigation Inlet Mining Studies (SON 2017-N-67; SON 2017-N-13).** New methods in numerically simulating sediment transport will be published as a journal article. Guidance documentation on methods will be tested in demo version for CoP guidance developed under SON 2017-N-13 “Modern dissemination, access, and approval methods for USACE Engineering Regulations and Manuals”.
- **Develop Long-term Predictive Capability in a Selected Inlet System (SoN 2017-N-71; SoN 2017-N-59).** Studies will build upon existing work in long-term morphodynamic predictions in a selected inlet system using the CMS wave, current, and morphology modeling system. This work will predict physical coastal change under varying scenarios of barrier island reconstruction and sediment management techniques to evaluate modeling capabilities that have been designed to include climate change factors (e.g. sea level change). This study will incorporate multiple barrier island resiliency techniques including shoreline stabilization, beach and nearshore nourishment, dredging, and island raising. Initial findings will be summarized in a technical report.
- **Continue Applications and Validation of the Coastal Modeling System (CMS) (SoN 2016-N-4; SoN 2016-N-10; SoN 2017-N-1).** Continue verification & validation of CMS, with extended data sets, coastal forcing, and settings, using available analytical, laboratory, and field data sets.
- **Continue to Test New CMS Features (SoN 2017-N-1).** As requested by district applications new features implemented in CMS will be tested. These features included newly merged CMS code, C2SHORE, dredging module, sediment mapping, and mixed-sized sediment routine.

- **Rollout Operational Tool to Quantify Erosion Caused by Vessel Wake (SoN 2017-N-09).** Rollout operational tool to quantify the potential effects of vessel wake to shoreline erosion. The tool will be distributed as an executable and will be vetted based on feedback from USACE planners and engineers. The tool will be maintained on the CIRP website with user guidance documentation. Operational effectiveness will be gauged by monitoring use statistics and feedback from District users.
- **Quantifying Dune Resilience (2017-N-72; 2018-F-1192).** Currently enhancing and transitioning tools for estimating dune erosion and growth at short and long time-scales to District engineers to better support sediment management near inlets. The work includes the incorporation of improved physics-based dune response (erosion and accretion) inside of BeachFx as well as the creation of new tools for simulating dune response to potential storms and wind/wave climates for planning and vulnerability assessments to better inform District planning. The work has also considered the impacts of infragravity waves on dunes. Submitting journal article on tool performance in different environments and conditions.
- **Implementation of Monte Carlo Method to GenCade for uncertainty analysis and sea level change (Addresses Statement of Need (SoN 2017-N-71 and SoN 2017-N-67).** Uncertainty needs to be addressed to provide confidence in management and engineering decision based on GenCade model application. The capability is included in GenCade model by using Monte Carlo simulation based on randomness of wave climate. This approach further is extended to sea level change.
- **Verification and Validation of GenCade Model application using FRF (Field Research Facility) long term shoreline survey data (Addresses Statement of Need (SoN 2017-N-71 and SoN 2017-N-67).** Based on analyses of FRF transect survey database, processes in GenCade model has been studied. Longshore transport, which is the major process for GenCade, has been assessed and other pertinent terms have been scrutinized. GenCade Model application for 2000 - 2007 was verified and validated for the shoreline around the FRF.
- **USCRP Nearshore Processes Initiative:** Support the nearshore coastal processes research initiative to conduct collaborative research across the coastal community. This will involve coordinating coastal model development with new innovative field data collection efforts to improve model fidelity. Engage coastal community on numerical advances in coastal modeling and collaborate where appropriate.

DESCRIPTION OF WORK FOR FY 2020:

Structures and Navigation Focus Area

- **Develop and enhance capabilities of steady-state coastal wave models (2017-N-01).** Continue development of a new steady-state coastal model and incorporation of CMS-Wave features into prototype model. Initiate testing of various verification and validation (V&V) projects to debug and build a robust technology. Document V&V efforts in technical documentation.
- **Coastal Navigation Portfolio Management: CPT, AISAP, CSAT, CSMART (SoN 2017-N-52).** The coupling of the CPT, AISAP, CSAT, and eHydro tools/datasets provide enterprise capability that will support research efforts aimed at understanding and quantifying channel optimization, jetty functional performance metrics, and other opportunities to connect within CIRP models/tools. These tools as well as research efforts as part of this work unit help advance objective, quantitative, and systems-based approaches to management of the Corps' large coastal navigation portfolio of projects.

- **Assessing a EWN Approach for Navigation Structures in Wave and Circulation Models (SoN 2018-ID-1198, 2018-ID-1218).** Use wave and hydrodynamic models to evaluate combined benefits of engineering and Natural and Nature-Based Features (NNBF) with conventional navigation structures. The goal is to produce cost-effective and sustainable EWN solutions for reducing operation and maintenance (O&M) costs of the structural measures.
- **Rapid Assessment Models for Tsunami Damage (SoN 2018-ID-1228).** Develop wave and flow models integrated with historical tsunami data from NOAA Deep-ocean Assessment and Reporting of Tsunamis (DART) and harbor 1-Hz surge data to provide rapid damage assessment in coastal infrastructures impacted by tsunamis. Develop guidelines for damages for quick response and recovery efforts and identify potential obstruction of Federal channels.
- **Vessel Wake Analysis System (SoN 2018-N-20; SoN 2018-N-21 2017-N-09).** Channel deepening to support larger commercial vessels has led to a number of new and planned field campaigns to monitor currents and water levels due to vessel wake. Extracting the vessel wake signal from time series is cumbersome, and new techniques to automate extraction are needed. The work will continue development of an automation system that can extract the vessel wake signal from time series data. Work will focus on vessel-generated currents and algorithms to cross-correlate vessel wake with AIS ship data and to develop statistical metrics to relate shoreline energy dissipation and erosion to vessel traffic patterns.

Sediment Management Focus Area

- **Barrier Island Sustainable Dynamics that include Engineering With Nature Techniques (SoN 2017-N-43; SoN 2017-N-71).** Barrier islands are fundamental components to the coastal zone of the United States. Large coastal storm events, sea level rise, deep draft navigation channels (e.g., resulting sand traps), and other activities derived from human populations are exacerbating rapid, large-scale geomorphic changes. This study seeks to identify and recommend a suite of EWN methods/approaches that are deployed and leveraged in conjunction with the beneficial use of dredged material on barrier islands and/or strategically in the adjacent waters that support and maintain a resilient, sand sharing system on the order of decades to centuries.
- **Develop next generation of sediment transport 2D/3D model (2017-N-01).** Initiate development of a new coastal model that incorporates Coastal Modeling System (CMS), C2Shore, and other nearshore coastal sediment transport modules and features into a prototype model. CORSED will be the Corps' next generation sediment transport library that will be applicable to all hydrodynamic models. The next step in development is to bridge gaps in methods and consolidate sediment transport formulations for the nearshore, inlets, and estuaries. This will be tested in multiple 2DH drivers with varying grid capabilities for initial verification to analytical solutions. Initial documentation on technical advancements will be provided in a report.
- **Develop Long-term Predictive Capability in a Selected Inlet System (SoN 2017-N-71).** This work seeks to predict physical coastal change and the response of coastal inlet systems to climate change (e.g. sea level change) over the next century. The CMS will be used to analyze a range of barrier-inlet environments to analyze differences in wave climate, sediment transport rates, and effects of multi-inlet system management.

- **Continue to Test New CMS Features, Validate, and Tech Transfer (SoN 2017-N-1).** As requested by district applications new features implemented in CMS will be tested. These features included newly merged CMS code, C2SHORE, dredging module, sediment mapping, and mixed-sized sediment routine. Continue Applications and Validation of the Coastal Modeling System (CMS) (SoN 2017-N-1; 2016-N-4; 2016-N-10; 2014-N-7). Continue verification & validation of CMS, with extended data sets, coastal forcing, and settings, using available analytical, laboratory, and field data sets. Continue technology transfer. Several tech transfer workshops and webinars, the Coastal Modeling System (CMS)/the Particle Tracking Model (PTM), will be given and technical reports, technical notes, eNewsletters, and website/wiki updates will be published (SoN 2017-N-1).
- **Develop GenCade Model application for Regional Coastlines (SoN 2017-N-71 and SoN 2017-N-67).** New regional coastal coastline modeling domains are to be tested and added to a suite of regional products. Regional numerical simulations can be used to simulate long-term effects of coastal inlet and adjacent beach sediment management practices. Much of the coastline shares sediment between regions, and therefore each region will be connected to improve predictive capabilities on continental scales. This application will develop the Delaware coast between Rehoboth Beach and Ocean City Beach. The Delaware coast includes 4 major shore protection projects—Rehoboth Beach, Dewey Beach, Bethany/South Bethany, and Fenwick Island. The Indian River inlet navigation project and Sandy bypass project have been a focus of many studies for sand bypass, dredging, etc. Shoreline survey data and wave data will be analyzed and a GenCade model application will be developed.
- **Develop of unified cross-shore transport processes modules in GenCade Model (SoN 2017-N-71 and SoN 2017-N-67).** Cross-shore transport module in GenCade are fragmented including rudimentary overwash and dune erosion as well as cross-shore transport by wave asymmetry. A module will be rewritten to have unified cross-shore transport processes.
- **Develop of linkages between GenCade Model and CMS Model (SoN 2017-N-71 and SoN 2017-N-67).** GenCade can provide shoreline change to CMS while CMS can provide wave and bathymetry change to GenCade. A linkage between GenCade and CMS Models will be developed to take advantages of both models and improve decision making based on either models.
- **Quantifying Dune Resilience (SoN 2014-N-11; 2015-N-11; 2014-N-10, 2017-N-72; 2018-F-1192).** Refine and simplify dune growth assessment tool, finishing the polish for independent user use. Complete transition of prototype tool to District engineers with webinar/training. Coordinate additional verification and validation of tools across additional datasets provided by the 2020 interagency DURING Nearshore Event eXperiment (DUNEX). Begin incorporating dune tool into Coastal Model Test Bed (CMTB), which will further inform dune response model tools by testing them against real-time data to support further identification of strengths and weaknesses.
- **Mixed Sediment Aggregates (SoN 2018-N-20; SoN 2018-N-24).** In a number of environments such as reservoirs and navigation channels, the primary physical state of sediment is in the form of mixed aggregates. Unlike individual grains or flocs, aggregates form on the bed and are transported in suspension in tightly bonded groups. Work will continue to understand the breakup processes of mixed aggregates. Flume work will include developing algorithms that relate shear stress to disaggregation for multiple mixed sediment mixtures. This algorithms will be incorporated into existing sediment transport models developed at ERDC.

- **USCRP Nearshore Processes Initiative:** Support the nearshore coastal processes research initiative to conduct collaborative research across the coastal community. This will involve coordinating coastal model development with new innovative field data collection efforts to improve model fidelity, including that proposed for the DUNEX experiment being led by the Flood & Coastal Systems Research Program. Support and coordinate field data collection efforts for storm impacts on tidal inlets under DUNEX experiment.

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2020

PROJECT NAME: Cultural Resources 1/

Allocation in FY 2016	Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Budgeted Amount in FY 2020
\$	\$	\$	\$	\$
2/	1,485,000	990,000	990,000 3/	900,000

1/ The costs of this activity are accounted for between the Navigation, Flood Risk Management, Hydropower, and Environmental Stewardship business lines.

2/ Prior to FY 2017, funding for this activity was appropriated under the Cultural Resources (NAGPRA/Curation) line item.

3/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2018 to FY 2019 was \$11,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2020 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: The Native American Graves Protection and Repatriation Act (NAGPRA) enacted on 16 November 1990, and the implementing regulations at 43 CFR Part 10, contains data gathering, reporting, consultation, repatriation, and permitting provisions that have near-term and long-term implications for Civil Works programs and projects. The Curation of Federally Owned and Administered Archeological Collections (36 CFR Part 79), required by the Antiquities Act (16 U.S.C. 431-433), the Reservoir Salvage Act (16 U.S.C. 469-469c), National Historic Preservation Act (16 U.S.C. 470h-2), and the Archaeological Resources Protection Act (16 U.S.C. 470aa-mm), requires Civil Works programs and projects to properly house their archaeological collections to federal standards including NAGPRA-related materials.

DESCRIPTION: Annual funding is used to provide overall management of the Corps' NAGPRA programs and serves as a centralized base for compliance, an information source, and contracting. The Corps facilitates consistent nationwide NAGPRA program implementation and operation, which includes inventorying and summarizing collections, consulting with Indian tribes, researching cultural affiliation and aboriginal occupation, and returning NAGPRA collections to the appropriate Indian tribes.

The Corps is responsible for the management of at least 46,255 cubic feet of artifacts collected from its water resources development projects and at least 3,511 linear feet of associated records. NAGPRA review and proper storage of these materials, which are over 80 percent of the total DoD collections and one the largest volume of all Federal agencies responsible for this activity, is required by a number of public laws including NAGPRA with implementing guidance in 43 CFR Part 10 and 36 CFR Part 79. Corps-wide NAGPRA collections are estimated to include 5,000 individual sets of human remains and 200,000 objects. Through FY 2018, a total of 75 NAGPRA compliance notices were published, resulting in the repatriation of over 1,800 individuals and over 190,000 objects. The costs are to accomplish NAGPRA work and to fund compliance support to the districts, including Native American consultation. Funding this item will ensure full Corps compliance with NAGPRA legislation, facilitate Native American consultation, and will enable districts to repatriate Native American human remains and NAGPRA cultural items to the affiliated and aboriginal Indian tribes.

Division: Mississippi Valley

District: St. Louis

Cultural Resources

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2020

PROJECT NAME: Civil Works Cyber Security Control Systems

Allocation in FY 2016	Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Budgeted Amount in FY 2020
\$ N/A 1/	\$ N/A 1/	\$ N/A 1/	\$ 3,960,000 2/	\$ 3,600,000

1/ Prior to FY 2019, Civil Works Cyber Security Control Systems was funded as part of the Asset Management/FEM and CIPR Remaining Item.

2/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2018 to FY 2019 was \$0. There was an additional \$0 of unobligated funds that are committed within the Corps for scheduled ongoing requirements in FY 2019. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2020 from prior appropriations for use on this effort is \$0.

DESCRIPTION: The Critical Infrastructure Cyber Security Center of Expertise (CICS-CX) was established in October 2013 as a regional center of expertise to provide services related to the cybersecurity of control systems (CS) within the Southwestern Division. The CICS-MCX now operates as a national mandatory center providing guidance and oversight for CS cybersecurity policy and regulation implementation and compliance, monitoring cybersecurity status and reporting to the appropriate Command, providing assessment and authorization assistance and services, integrating control system physical security with cybersecurity, and educating the workforce for the entire Corps. The CICS-MCX serves as the organization within the Corps for all matters related to cybersecurity of all Corps owned and operated control systems.

Budgeted funds are used for: conducting cybersecurity assessments of Corps CS currently in service; maintaining a comprehensive inventory of Corps CS; managing and directing the Corps' CS risk management strategy; developing and maintaining policy guidance directing/supporting cybersecurity activities for CS in order to obtain an Authority To Operate (ATO); providing guidance and assistance in using the Enterprise Mission Assurance Support System for system registration and implementation of the Risk Management Framework (RMF) process; assisting system owners with the mitigation and remediation of vulnerabilities listed on the system's Plan of Action and Milestones (POA&M); serving as the first point of contact of any cyber event or incident on a Corps CS; maintaining a test lab to support the development and testing of CS-specific engineered cybersecurity solutions; providing oversight for the physical security of control systems; maintaining the Physical Security Minimum Standards for the Corps; providing oversight and guidance on continuous monitoring strategies; executing multi-tier training on control system cybersecurity in accordance with Department of Defense and Army regulations; operating as an official representative of Corps CS cybersecurity and sharing information with internal and external stakeholders; participating in cybersecurity working groups and seminars; and providing Federal support to the Department of Homeland Security Dams Sector working group in accordance with Presidential Policy Directive 21; and improvements, expansions, additions and repairs to the existing facility and grounds.

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2020

PROJECT NAME: Dredging Data and Lock Performance Monitoring System – Navigation

Allocation in FY 2016	Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Budgeted Amount in FY 2020
\$ 1,283,000	\$ 1,108,000	\$ 1,284,000	\$ 1,609,000 1/	\$ 1,010,000

1/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2018 to FY 2019 was \$145,000. There was an additional \$0 of unobligated funds that are committed within the Corps for scheduled ongoing requirements in FY 2019. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2020 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: The authority for the U.S. Army Corps of Engineers to collect data on vessel operations and cargo transiting navigation locks is contained in 33 C.F.R Part 207.800 Collection of Navigation Statistics (b)(2)(F)(3)(iv). These data are necessary to provide dredging and lock data for efficient management of Congressionally authorized navigation projects, to meet the Office of Management and Budget performance requirements, to supply data for analysis and modeling, as well as to respond to specific public laws, including P.L. 96-269 (Minimum Dredge Fleet), P.L. 100-656 (Small Business Set-Aside), and to meet the Government Performance and Results Act (GPRA), the Government Paperwork Elimination Act (GPEA) and Clinger-Cohen/IT Management Reform Act.

DESCRIPTION: The dredging and lock data collection and processing programs provide baseline navigation information and analysis to support operational and strategic management decisions, the budget formulation process and performance measures for the Corps navigation projects and program. This includes lock operations on the inland waterways; the operation and maintenance of federally authorized navigation channels, performance measures to determine the quality and level of service and meet Office of Management and Budget performance measures, implementation of findings from Government Accountability Office review of the Corps Dredging program, support for the projections of capital investments, and justification and validation of future national navigation needs. Information includes Corps performed and contracted dredging (location, quantity, cost etc.); all lock activities (barges and tons of commodities, chamber unavailability, processing times, delays etc.), and physical descriptions of all the Corps owned/operated locks. The funds support the database management, operation, quality control, user assistance, training, compliance with security requirements and Corps-centric information technology services. The Lock Performance Monitoring System (LPMS) is the sole source of lock data information for the Corps, Federal government and industry. LPMS and Dredging Information System databases are transactional systems.

Technological change in the shipping industry is a continual process requiring ongoing analytical efforts to estimate the nation's future maintenance dredging needs. Update of current and future vessel characteristics, channel dimensions, commodity origins-destinations, vessel cost parameters, and other shipping data are needed to support the Corps dredging program.

This funding is used to continue to support the Corps Navigation responsibilities and respond to changing data needs by maintaining the Lock and Dredging information systems and data warehouse; providing essential upgrades, security and user support; maintaining and upgrading the automatic data recording of lock timing data, and developing additional data warehouse reports within the Enterprise Data Warehouse to support emerging data requirements for the performance based budget. Maintain the standardized National Notice to Navigating Interests (NTNI) database

Institute for Water Resources

Dredging Data and Lock Performance Monitoring System

and continue coordinating with the Coast Guard to integrate their notice system. Enhance the search capabilities on the NTNI public website. Provide uninterrupted database access by migrating to a Department of Defense approved cloud based computing site. Deploying approved Common Access Card enabling for dredging and lock data collection applications. Work with the other Federal agencies (including U.S. Coast Guard, National Oceanic and Atmospheric Administration, Federal Communications Commission) to enhance the LPMS to identify vessels not currently in the database. Work with the Lock Operators Management Application team to deploy additional capabilities for the navigation information portal for Corps and industry; maintain a working relationship with the Inland Marine Transportation System to update the data entry portion of the Lock Operators User Guide and to monitor performance as implementation progresses. Through the Navigation Data Integration Framework effort coordinate and share data with other navigation information databases such as Dredging Quality Management, Asset Management, and Resident Management System to reduce data redundancy and provide more robust information. Continue tracking forecasts for the world vessel fleet, commodities and trade; expand voyage ports-of-call information for containerships; and continue analyses of marine transportation system current and future channel and infrastructure requirements for coastal harbors and inland waterways. Provide dredging and lock analytical, technical, and data support for Corps Headquarters, division and district offices.

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2020

PROJECT NAME: Dredging Operations and Environmental Research (DOER) Program – Navigation

Allocation in FY 2016	Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Budgeted Amount in FY 2020
\$ 6,385,000	\$ 6,386,000	\$ 6,386,000	\$ 6,886,000 1/	\$ 5,000,000

1/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2018 to FY 2019 was \$46,000. There was an additional \$0 of unobligated funds that are committed within the Corps for scheduled ongoing requirements in FY 2019. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2020 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: The Clean Water Act; the Marine Protection, Research and Sanctuaries Act; and Water Resources Development Acts from 1986 and following contain numerous requirements and provisions addressing contaminated sediments in navigation channels, dredged material management, and beneficial uses of dredged sediments that focus the continued need for innovation and technology development.

DESCRIPTION: The Dredging Operations and Environmental Research (DOER) program is the only research program in the Federal government that addresses the science, engineering, and technology needs related to dredging and managing between 200 and 300 million cubic yards of sediment that must be removed from navigation channels, ports, and harbors in the United States every year. The risks and opportunities related to 1) contaminated sediments in navigation channels and harbors, 2) optimizing dredged material management, and 3) beneficial use of dredged sediment to enhance habitat, ecosystems, and coastal recreation services mandate a continuing need for developing and applying innovative practice and technology. Contaminant detection limits are now so low that sub-trace levels of toxic substances are identified. High profile contaminants continue to plague numerous Federal and permitted dredging projects. Traditional upland disposal areas have reached or are rapidly approaching capacity with few opportunities for new facilities. Aquatic placement of dredged material, which can provide both economic and environmental benefits, must be performed in a sustainable manner that addresses the risks associated with contaminant exposures, the presence of threatened and endangered species, and other uses of the water body. Innovative management practices are required to ensure that environmental standards can be achieved for dredging operations in a way that minimizes costs while maximizing sustained environmental benefits from using dredged material to accomplish habitat and ecosystem restoration and produce recreational benefits. Existing knowledge gaps in physical, chemical, biological, and engineering processes lead to inefficient operations, higher management costs, and limited management and beneficial use options. Performance standards and guidance for existing and improved practices are critical needs. Risk-based assessment and management practices are needed to ensure both the economic and environmental viability of navigation dredging operations. Beneficial use of dredged material is a priority and environmental resource protection is a mandate; however, costs are increasing due to the constraints noted above. Continued economic viability and security of the nation will depend upon our ability to remove, manage and beneficially use dredged material in a cost-effective and environmentally responsible manner. Continued engineering and environmental innovation will be essential to managing costs and risks.

The DOER Program is an integral and highly beneficial component of the Corps' navigation dredging and environmental protection missions. Dredging and dredged material management must be accomplished within a climate of increased dredging workload, fewer placement sites, increased environmental constraints, and decreasing fiscal and manpower resources. Balancing environmental protection, restoration opportunities and critical economic needs, while maintaining and enhancing navigation infrastructure, presents significant technical challenges. The DOER program has

Engineer Research and Development Center

Dredging Operations Environmental Research Program

validated innovative technologies for managing high profile contaminants and developed risk-based assessment and management practices that will significantly reduce costs for all navigation projects, ports, and harbors. Advancing the assessment and management practices used by the U.S. Navigation Program is critical to sustaining the economic and environmental benefits produced by the USACE dredging program.

The funds under this program are not used for work at specific projects, but are used to fund activities that can be used to benefit both current and future projects. Major focus areas of DOER include:

(1) Sediment and Dredging Processes:

- a. Develop improved understanding of dredged sediment properties and transport processes associated with mixtures of sand, silt, and clay to support regulatory compliance, habitat protection, habitat enhancement, dredged material management, beneficial use of dredged sediment, natural and nature-based features (NNBF), regional sediment management, and Engineering with Nature® (EWN®);
- b. Develop more accurate characterization methods for transport and deposition of suspended sediment to support environmental evaluations of dredging projects, beneficial use of dredged sediment, and engineering design for wetland and other habitat creation using dredged material;
- c. Develop engineering and operational practices that enable more mixed-grain sediments from navigation projects to be used for beach and nearshore nourishment;
- d. Develop experimental results demonstrating the use of strategic sediment placement associated with dredging operations to support coastal resilience;
- e. Develop more accurate understanding of hopper dredge suction velocities to facilitate better understanding of entrainment risk to threatened and endangered species;
- f. Demonstrate and document methods for measuring very small amounts of sedimentation (on the order of 1 mm) necessary to evaluate risk resulting from dredged sediment deposition on sensitive resources;
- g. Develop tools to support optimization of shallow water pipeline placement operations;
- h. improve dredged sediment fate models used to evaluate regulatory compliance, long term management strategies, beneficial use options, and risk characterization
 - i. Develop, test, and calibrate new sediment process algorithms;
 - ii. Improve sediment process descriptions; and
 - iii. Expand applicability to include vegetated and wetting/drying environments;
- i. Develop methods for measuring site-specific cohesive sediment processes including erosion, settling, flocculation, aggregation and probability of deposition;
- j. Improve science-based risk assessment for beneficial use and EWN® sites that include robust sediment fate and sediment exposure predictions; and
- k. Measure and predict sediment accretion at beneficial use sites.

(2) Dredged Material Management:

- a. provide tools that allow for internal and external collaborative, cost saving opportunities for beneficial use, EWN®, and Regional Sediment Management projects;
- b. provide web-based applications for use throughout the nation and highlight and provide synergistic natural infrastructure opportunities in partnership with other government and private organizations;
- c. develop guidance for the implementation of thin layer placement to enhance and increase beneficial use of dredged material for increasing

- the resilience of eroding wetlands;
- d. provide an improved barge measurement system to allow more accurate quantification of dredged material to optimize project management and incentivize dredging contractors to maximize production;
- e. improve understanding of the physical processes involved in placement, dewatering and settlement of dredged material in wetland environments;
- f. expand modeling capabilities to predict dredged material settlement over time to optimize attainment of the design elevation(s) and facilitate maintenance of sustainable wetlands via thin layer placement of dredged material;
- g. develop an automated accurate hopper dredge bin measurement system as a payment basis that could be used in lieu of rental contracts to incentivize dredging contractors to maximize production;
- h. expand the technology base to facilitate increased beneficial use of dredged material;
- i. standardize use of applicable DOER-developed dredged material management tools on a USACE-wide basis;
- j. develop methods and guidance for district engineers to evaluate and implement the use of sustainable, lower-cost sediment management options for channels and reservoirs; and
- k. expand suite of planning tools to facilitate increased beneficial use of dredged sediments and illustrate the importance of applying EWN® principles that result in collaborative outcomes for dredge material management and expedite the identification of innovative solutions that ultimately save time and money for placement of material.

(3) Environmental Resource Management:

- a. Develop design guidance for incorporating NNBF for engineered resilience;
- b. Develop quantitative methods for incorporating ecological resilience into beach nourishment;
- c. Develop a quantitative model for modeling episodic sediment pulses into marsh dynamic models;
- d. Developed technology that integrates remote sensing data and computational ecological models to determine critical habitat for endangered species near Corps project sites;
- e. Develop a framework for managing risk related to underwater sound produced by dredging;
- f. Develop guidance on incorporating section 7(a)(1) of the Endangered Species Act into Corps planning and operations;
- g. Improve multi-model integration to determine environmental benefits from beneficial use and other EWN® projects;
- h. Enhance modeling capabilities for quantifying multiscale impacts and benefits from Corps projects;
- i. Demonstrate methods for using landscape architecture to incorporate EWN® into existing USACE infrastructure;
- j. Develop quantitative modeling tools to determine storm-generated sediment loads on marsh dynamics; and
- k. Quantify the benefits and risks associated with chain curtains on dredge draghead arms to reduce sea turtle take.

(4) Risk Management:

- a. Develop risk-based methods and technology to improve cost efficiencies and sustainability of the navigation dredging program;
- b. Develop risk management strategies for contaminated dredged materials to reduce long-term O&M costs and environmental liabilities;
- c. Improve model and laboratory evaluations for the design and implementation of innovative risk management strategies for contaminated dredged material to reduce maintenance costs;
- d. Improve environmental test procedures and interpretative tools to reduce cost and enhance accuracy and reliability of dredged material assessments;
- e. Develop understanding of the prevalence and potential risks associated with emerging contaminants in dredged materials; and
- f. Provide decision-making tools that facilitate stream-lined, cost effective, risk-informed decision making.

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2020

PROJECT NAME: Dredging Operations Technical Support (DOTS) Program – Navigation

Allocation in FY 2016	Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Budgeted Amount in FY 2020
\$ 2,792,000	\$ 2,792,000	\$ 2,792,000	\$ 2,792,000 1/	\$ 2,550,000

1/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2018 to FY 2019 was \$8,000. There was an additional \$238,000 of unobligated funds that are committed within the Corps for scheduled ongoing requirements in FY 2019. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2020 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: 10 U.S.C. 2358 ("The Secretary of Defense or the Secretary of a military department may engage in basic research, applied research, advanced research, and development projects that are necessary to the responsibilities of such Secretary's department in the field of research and development.")

DESCRIPTION: The Dredging Operations Technical Support (DOTS) Program fosters a "one-door-to-the-Corps" clearinghouse for access to comprehensive information on technology related to navigation O&M functions, including technology demonstrations and training essential to all stakeholders involved in Federal and permitted navigation projects. DOTS is structured as a centralized source for technology transfer and is intended to maximize cost effectiveness and facilitate expeditious and consistent implementation of national policies and laws. The DOTS program's technology transfer function provides access to an extensive, up-to-date, consistent technology base whereby timely, proactive responses to technical issues can be made as they emerge. This approach promotes networking and solutions to common problems confronting the navigation dredging community. DOTS supports knowledge-based exchange of information throughout the interagency coordination process. DOTS fosters productive, collaborative relationships with other Federal and state agencies with missions relevant to navigation. The DOTS Program also fosters application of new and existing technologies and ongoing research for high priority problems identified by field offices, including short-term work efforts to address generic Corps-wide technical problems encountered during maintenance of navigable waterways and infrastructure.

The Dredging Innovations Group (DIG), within DOTS, fills an important functional gap for the Corps Dredging Program through highly responsive and adaptive management for the delivery of innovative solutions to the most pressing problems and evolving issues affecting the execution of the Corps' navigation mission. The DIG engages Corps interests to anticipate and identify priority problems, needs, and opportunities; address requirements; translate R&D program knowledge and products into best practice; lower technical execution barriers under changing conditions; inform decision-making with credible, defensible science; and build and sustain USACE institutional capacity.

Annual funding is used to:

- Continue expansion of technical response support to field offices encountering problematic navigation and dredging issues and increase vital

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Dredging Operations Technical Support Program

investments in training of Corps staff in dredging and other navigation mission processes.

- Conduct face-to-face training sessions at the regional level. Tailor the training to meet regional needs including sessions providing dredged material management, in-water assessment and management, upland and aquatic placement, regional threatened and endangered species dredging issues, and emerging research and development from the Dredging Operations Environmental Research Program.
- Continue to sponsor the Webinar Series which has proven to be an efficient and effective technology transfer mechanism to communicate advances in the navigation and dredging community.
- DOTS and DIG will continue to document good navigation and dredging practices to be shared across the Corps.
- DOTS and DIG will continue to be proactive by updating existing tools and databases to maintain functionality and compatibility with emerging Information Technology requirements.
- DIG will continue technology transfer and dissemination of significant research findings to dredging practitioners at all levels of Corps management.

ACCOMPLISHMENTS IN FY 2018:

- Conducted one face-to-face training session at the regional level.
- Continued to support the collaborative effort of the Corps and U.S. Environmental Protection Agency (USEPA) to update and combine the Inland and Ocean Testing Manuals. These documents have not been revised since the 1990's and are being revised to reflect the various advancements related to testing, evaluation and management of dredged material. The final product will be published as a joint Corps-USEPA document which will be disseminated widely.
- Updated specific DOTS databases and models and modernized the DOTS website. Focused on the platforms which provide data related to environmental residue effects, biota-sediment accumulation factors, and an online database to fulfill the annual Endangered Species Act (ESA) required reporting of all T&E species costs incurred by the USACE.
- Pursued rollout of an enhanced version of the dredge fleet scheduling optimization model to all six of the Pacific coast Districts (Los Angeles, San Francisco, Portland, Seattle, Alaska, and Hawaii) as well as to all of the South Atlantic Division (Wilmington, Charleston, Savannah, Jacksonville, and Mobile Districts). Both efforts were at the request of field-level practitioners seeking to inform their dredging business practices and budget development processes via the robust mathematical formulations and insights afforded by the dredge fleet scheduling model. Conducted data gathering efforts for project dredging requirements, environmental work windows, and dredge fleet production rates and costs in close coordination with district practitioners.
- Conducted several data mining studies using readily available archival databases of Corps dredging activities. These data sets included those

of the Dredge Quality Management (DQM) program as well as the DOTS-funded Ocean Disposal Database. Both databases are structured and offer a wealth of information concerning historical trends and baseline performance measures that could be used to inform dredging operations. They also served to inform high-level, programmatic questions concerning the overall efficiency and cost-effectiveness of the Corps dredging program in support of the Navigation mission. Completed a separate effort extracting historic, quantitative dredging data from scanned versions of the annual Chief of Engineers' Reports to Congress dating to the early 20th century.

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2020

PROJECT NAME: Earthquake Hazards Reduction Program 1/

Allocation in FY 2016	Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Budgeted Amount in FY 2020
\$ 270,000	\$ 99,000	\$ 297,000	\$ 297,000 2/	\$ 300,000

1/ The Budget accounts for this activity under the Flood and Storm Damage Reduction program.

2/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2018 to FY 2019 was \$157,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2020 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: The Earthquake Hazards Reduction Act of 1977, as amended (42 USC 7701); Section 1151 of the Water Infrastructure Improvements for the Nation Act (33 USC 2353); and Executive Order 13717 (Establishing a Federal Earthquake Risk Management Standard).

DESCRIPTION: The Corps has adopted a risk-based approach to the seismic risk at the buildings that it owns or operates, consistent with the overall Federal approach to seismic risk outlined in Executive Order 13717. The Corps uses these funds to assess the ability of its buildings to withstand an earthquake. Through these evaluations, the Corps identifies the buildings that are most at risk. It uses the Seismic Safety Action Classification System (SSAC) to rank them on this basis. The SSAC considers both the probability of a range of possible earthquakes at that location, and the likely consequences for each such event (in terms of loss of life and economic loss). Using this approach, the Corps has completed an initial inventory of the over 12,000 of the buildings and powerhouses that it owns or operates. The Corps has completed seismic screenings of over 700 of these buildings in all seismic regions, and seismic evaluations on over 200 buildings and powerhouses in various geographic regions, primarily in high and moderate seismic regions.

The Corps also uses this funding to support the work of a group of Corps experts (composed primarily of structural engineers, geotechnical engineers, and geologists) called the Army Corps Seismic Safety Committee. This group provides advice and direction to the Corps on seismic risks and the technology and strategies available for addressing them. The Corps has issued general guidance for use by the Corps districts and divisions, and plans to extend this guidance to include powerhouses. The Corps also is working on criteria for civil works buildings seismic design and evaluation. The Corps also uses these funds to prepare seismic evaluation and mitigation seminars and webinars for district and division personnel, and to provide technical support on specific issues to districts and divisions as needed upon request.

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2020

PROJECT NAME: Fish & Wildlife Operating Fish Hatchery Reimbursement 1/

Allocation in FY 2016	Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Budgeted Amount in FY 2020
\$	\$	\$	\$	\$
5,346,000	5,346,000	5,346,000	5,346,000 2/	5,400,000

1/ The costs of this activity are accounted for between the Flood Risk Management and Hydropower business lines.

2 /Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2018 to FY 2019 was \$46,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2020 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: Public Law 111-85

DESCRIPTION: The U.S. Fish and Wildlife Service (USFWS) was authorized by Congress in 2008 to seek reimbursement from the U.S. Army Corps of Engineers (Corps) for operation and maintenance costs incurred by National Fish Hatchery System for mitigation of certain Corps dam projects which typically predated the National Environmental Policy Act. Subsequent congressional direction as well as concurrence by the Office of Management and Budget and the Assistant Secretary of the Army for Civil Works has resulted in a specific line item in the Corps budgets to meet the Corps mitigation requirements. This funding is transferred to the USFWS to produce and release approximately 12 million mitigation fish at 45 different receiving waters impacted by 37 Corps dams to meet mitigation requirements.

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2020

PROJECT NAME: Facility Protection – Flood and Coastal Storm Damage Reduction

Allocation in FY 2016	Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Budgeted Amount in FY 2020
\$ 3,960,000	\$ 3,960,000	\$ 5,937,000	\$ 5,940,000 1/	\$ 4,181,550

1/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2018 to FY 2019 was \$2,016,000. There was an additional \$83,000 of unobligated funds that are committed within the Corps for scheduled ongoing requirements in FY 2019. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2020 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: Presidential Policy Directive/PPD-21, Critical Infrastructure Security and Resilience, Executive Order 13636, Improving Critical Infrastructure Cyber Security, Executive Order 13800, Strengthening the Cybersecurity of Federal Networks and Critical Infrastructure, Presidential Policy Directive/PPD-8 National Preparedness Goal, the National Security Strategy of the United States, and Army regulations relating to critical infrastructure security and resilience. The Robert T. Stafford Disaster Relief and Emergency Assistance Act (Public Law 100-707), signed into law on November 23, 1988, as amended on February 23, 2018, which constitutes the statutory authority for most Federal disaster response activities; and, the Disaster Relief Act of 1974 (Public Law 93-288), as amended.

DESCRIPTION: As a Federal owner of critical infrastructure, the Corps has a national responsibility to ensure their safe and reliable operation, minimize the consequences arising from potential disruptions from either manmade or natural hazards, and enhance their resilience. Stakeholders, including Congress, have clearly and emphatically stated that they expect Corps projects to continue to provide their authorized purposes and realize positive net benefits from cost-shared investments despite potential disruptions arising from either manmade or natural hazards. These goals will be attained by developing solutions, methodologies, and tools to address key vulnerabilities to manmade incidents, implementing effective programs to minimize consequences, improving the response and recovery capabilities, and prioritizing life-cycle investments.

This funding supports the development of guidance and engineering tools for the implementation of physical security risk assessment and prioritization activities at Civil Works critical projects under the auspices of the Critical Infrastructure Protection & Resilience Program in accordance with ER1110-2-1156 (Dam Safety Policy and Procedures). These program activities are critical to the identification, prioritization, and sustainment of Corps budget investments to mitigate identified risks and improve the security profile of Corps critical infrastructure. Critical projects identified through screening and prioritization efforts will be assessed using risk assessment methods and engineering tools currently under development that are unique to Corps projects. These capabilities support blast analysis and consequence assessment studies; training and exercise programs targeted for security staff to assist in the implementation of security risk assessments, and; emergency preparedness and response activities to enhance resilience at Civil Works critical infrastructure projects for all-hazard conditions.

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Facility Protection

APPROPRIATION: Operation and Maintenance, Fiscal Year 2020

PROJECT NAME: Inland Waterway Navigation Charts – Navigation

Allocation in FY 2016	Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Budgeted Amount in FY 2020
\$	\$	\$	\$	\$
4,455,000	4,455,000	4,455,000	4,455,000 1/	4,050,000

1/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2018 to FY 2019 was \$8,000. There was an additional \$239,000 of unobligated funds that are committed within the Corps for scheduled ongoing requirements in FY 2019. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2020 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: Public Law 85-480, approved 2 July 1958, authorizes the Commander, U.S. Army Corps of Engineers (Corps) to publish information pamphlets, maps, brochures, and other material on river and harbor, flood control, and other civil works activities, including related public park and recreation facilities that may be of value to the general public.

DESCRIPTION: The Corps provides Electronic Navigational Chart (ENC) data for all inland waterways and other federal navigation channels maintained by the Corps to be used by commercial Electronic Chart Systems (ECS), which when combined with the existing Differential Global Positioning System (DGPS), will improve the safety and efficiency of marine navigation in both inland and coastal waterways of the United States. The use of ENC data with commercial ECS will allow for safe navigation through bridge openings during fog and other bad weather conditions as well as during heavy traffic situations, and provide an accurate base display for other systems such as radar and Automatic Identification Systems (AIS).

Within inland waterways (rivers), the Corps is responsible for the creation and provision of navigation charts in both paper and electronic format. Where the paper chart products are updated every 2-5 years, the Inland Electronic Navigational Chart (IENC) data are updated on a monthly basis, and as such, help to tremendously improve safety of navigation. The IENC data format is based on the S-57 international data exchange format, the electronic data transfer standard prepared by the International Hydrographic Organization, however additional inland features have been added to the standard to allow for proper encoding of all real-world features. The IENC standard is consistent with electronic chart products produced by the National Oceanic and Atmospheric Administration (NOAA) and the chart products produced by the two agencies are coordinated for compatibility in adjoining areas. The Corps also coordinates with the U.S. Coast Guard for aids to navigation information and collaboration on rules for chart carriage by inland waterway users.

In coastal and Great Lakes areas, the Corps produces and provides standardized channel condition chart products and hydrographic survey data to NOAA, which ensures consistent and reliable information to NOAA for chart updates, in accordance with Water Resources Development Act of 2000, Section 558. The standardization of these products has been made possible through the implementation of eHydro, which uses Navigation Channel Framework (NCF) as its foundational data. NCF is a GIS geodatabase which contains channel limits, construction centerlines, top of slope lines, channel reach positions, and inside channel quarters for all Corps-maintained navigation channels. In addition to providing foundational data for eHydro, NCF supports the Dredging Quality Management program, and other applications and connects to the Corps Project Notebook, providing consistent inventory of projects and subprojects across the Navigation business line.

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Inland Waterway Navigation Charts

Such development and publication activities are in accordance with National Transportation Safety Board recommendations to the Corps, and subsequent commitments made by the Chief of Engineers.

ACCOMPLISHMENTS IN FY 2018: Updated and maintained 107 navigational charts on a monthly basis. On a weekly basis, charted over 12,000 buoy locations provided by the US Coast Guard. Provided over 2 million chart downloads to public through Amazon Web Services. Held annual IENC Program Review meeting to review all aspects of the program including quality control and collecting new features for charts. Presented IENC briefings at several national conferences. Attended international meetings regarding inland standards. Continued making all updated paper navigational charts available for Print On Demand through the Government Publishing Office website. Completed the development of an on-line IENC Quality Control interface, which will allow Districts to submit new source, Chart Producers to integrate source into history files, and Districts to perform Quality Assurance to verify that source updates were correctly implemented. eHydro application and reporting formally implemented and operational through a Daily Tasking Order for all Coastal Districts and for 80% of Inland Districts with navigation missions. The NCF was reported and completed for all coastal authorized navigation channels.

DESCRIPTION OF WORK FOR FY 2019: Continue to update all existing IENCs on a monthly basis. Subject to chart production software capability, convert charts from IENC 2.3 to IENC 2.4 Product Specification. Migrate all IENC maintenance to the same software platform: CARIS Hydrographic Production Database (HPD). Expand the capability of the on-line IENC Quality Control interface to include direct linkage to CARIS HPD. Continue international coordination to include the development of IEHG S-401, the product specification for IENCs that aligns with the International Hydrographic Organization's S-100 Universal Hydrographic Data Model. S-401 development is anticipated to be a long-term (5 year) task, as migration to S-401 cannot occur until S-101, the Electronic Navigational Chart Product Specification (for maritime) is completed. eHydro application and reporting formally implemented for all Corps Districts with a navigation mission. Develop a semi-automated tool for the production of IENC overlay files for the U.S. Coast Guard (USCG) using survey data downloaded from eHydro; overlays aid the USCG in more accurate buoy placement and increase safety to navigation. Coordinate with the USCG the best means with which to transfer IENC overlay files. Work with the USCG to develop an IENC overlay containing lights and beacons on the inland waterways, similar that produced weekly for buoys.

DESCRIPTION OF WORK FOR FY 2020: Continue to update all existing IENCs on a monthly basis. Continue international coordination to include the development of IEHG S-401, the product specification for IENCs that aligns with the International Hydrographic Organization's S-100 Universal Hydrographic Data Model. S-401 development is anticipated to be a long-term (5 year) task, as migration to S-401 cannot occur until S-101, the Electronic Navigational Chart Product Specification (for maritime) is completed. Begin developing a mechanism for providing IENC overlay products to the towing industry. Collaborate with NOAA to establish a website for downloading all US electronic charts (NOAA ENC and USACE IENC). Continue technical assistance to districts and end users.

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2020

PROJECT NAME: Inspection of Completed Federal Flood Control Projects – Flood Damage Reduction

Allocation in FY 2016	Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Budgeted Amount in FY 2020
\$ 27,720,000	\$ 30,196,000	\$ 19,800,000	\$ 19,800,000 1/	\$ 15,000,000

1/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2018 to FY 2019 was \$1,880,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2020 from prior appropriations for use on this effort is \$0.

AUTHORIZATIONS: Section 221 of the Flood Control Act of 1970, as amended (84 Stat. 1831, 42 U.S.C. 1962d-5b).

DESCRIPTION: The Corps uses this funding to provide central oversight and support for its nationwide effort to enable local communities to understand the risks associated with the levee systems that the Corps constructed for them. These local communities are responsible for the operation, maintenance, repair, replacement, and rehabilitation of those levee systems. The Corps uses this funding to maintain an effective governance framework for its participation in this effort, by funding the following four categories of activities.

- First, the Corps uses this funding for basic program management of the Corps levee safety program. The activities that fall within this category include the work of two programmatic decision groups, the Army Corps Levee Senior Oversight Group and the Army Corps Levee Safety Steering Committee. They provide quality control and ensure national consistency in the risk assessments of levee systems that the Corps performs, and provide direction to guide overall implementation of the Corps levee safety program.
- Second, the Corps uses this funding for program policy development, including policy and procedures to provide consistent implementation of programmatic activities, such as for inspections, emergency action plans, and interim risk reduction measures.
- Third, the Corps uses this funding to support technical training, such as workshops on consequence modeling, and joint support training with the Bureau of Reclamation on best practices in risk assessments; and to fund developmental positions for early career professionals.
- Fourth, the Corps uses this funding for data management, mainly for the development and management of search engines between levee safety databases and other Corps databases, and for the maintenance of the file management systems that store working documents such as reports.

The Corps also uses this funding to conduct risk assessments of certain high-risk federally authorized levee systems. The Corps provides the results of these risk assessments to the local authorities that are responsible for these levee systems, in order to help them in managing their flood risk. The Corps also uses this risk-based information to guide the development of options for improving its overall approach to flood risk management nationwide.

OTHER INFORMATION: Pursuant to Section 221 of the Flood Control Act of 1970, as amended, the Corps enters into a written agreement with the non-federal sponsor, before undertaking a water resources project, which identifies the responsibilities of each party. These "items of local cooperation" include that the non-Federal sponsor will be responsible for all future operation, maintenance, repair, replacement, and rehabilitation work, and associated costs.

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2020

PROJECT NAME: Inspection of Completed Works

Allocation in FY 2016	Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Budgeted Amount in FY 2020
\$ 28,914,000	\$ 31,632,000	\$ 29,903,000	\$ 29,700,000 1/	\$ 32,784,000

AUTHORIZATION: Section 221 of the Flood Control Act of 1970, as amended (84 Stat. 1831, 42 U.S.C. 1962d-5b)

DESCRIPTION: The Corps uses this funding to inspect locally maintained levee systems that the Corps constructed. The local communities are responsible for the operation, maintenance, repair, replacement, and rehabilitation of these levee systems.

During the inspection, the Corps notes any changes in the condition of the levee system since the last inspection, and identifies any deficiencies or other concerns that may warrant repair or monitoring. The Corps and the local authorities use this information to understand the key risk drivers of each levee system. The Corps provides the results of the inspection to the local entity, and updates this information in the National Levee Database.

The Corps also uses the information that it collects through these inspections to decide whether it will undertake a more detailed risk assessment of a particular levee system. Where it does so, the Corps would use funding provided under the Inspection of Completed Federal Flood Control Projects remaining item to perform the risk assessment.

1/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2018 to FY 2019 was \$4,916,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2020 from prior appropriations for use on this effort is \$0.

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2020

PROJECT NAME: Monitoring Completed Navigation Projects (MCNP)

Allocation in FY 2016	Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Budgeted Amount in FY 2020
\$ 6,440,000	\$ 7,920,000	\$ 9,855,000	\$ 10,395,000 1/	\$ 3,780,000

1/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2018 to FY 2019 was \$17,000. There was an additional \$271,000 of unobligated funds that are committed within the Corps for scheduled ongoing requirements in FY 2019. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2020 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: Authorization for the U. S. Army Corps of Engineers Engineer Research and Development Center (ERDC) to conduct R&D is codified in 10 U.S.C. 2358 ("The Secretary of Defense or the Secretary of a military department may engage in basic research, applied research, advanced research, and development projects that are necessary to the responsibilities of such Secretary's department in the field of research and development.")

JUSTIFICATION: These monitoring efforts, governed by Engineer Regulation 1110-2-8151 (Monitoring Completed Navigation Projects [MCNP]), are essential for providing data for efficient and effective management of critically important Federal shallow- and deep-draft navigation projects and infrastructure for both national economic and military sealift security reasons. The Corps operates and maintains more than 1,000 navigation projects encompassing more than 25,000 miles of waterways. The Corps requires a national program to identify the best navigation project practices, and to use them to improve all other navigation project performance. Optimizing Civil Works navigation infrastructure performance requires that they be monitored upon completion, evaluated against preconstruction and present needs, and lessons learned translated into proactive operations management and design guidance for Corps Districts. Information gained from the MCNP program, including changes in sediment transport, water levels, currents, waves, flushing, river flows, ice, structure deterioration, and other coastal and river hydraulic phenomena with associated marine transportation and environmental impacts, will be used to verify design expectations, determine benefits, and identify operational and maintenance efficiencies. Information collected will significantly improve projects' performance, and optimize opportunities for marine transportation and environmental enhancement. The MCNP program collects valuable navigation data, documents successful designs, disseminates data and lessons learned on projects with problems, and provides upgraded field guidance for solutions that will reduce life-cycle costs on a national scale.

The MCNP program includes development of a real-time monitoring capability of the navigation system through River Information Services, to improve inland navigation reliability and address the Administration High Priority Performance Goal for USACE Navigation that calls for decreasing unscheduled navigation lock closures on the inland waterways. Additionally, MCNP enhances research and development specific to Navigation Structures and USACE Infrastructure to link the knowledge gained through navigation project monitoring with emerging technology and materials, to reduce unscheduled repairs, and increase system efficiency and reliability. No other programs in the USACE or Federal sector address these critical requirements. Non-destructive techniques for Structural Health Monitoring (SHM) are being developed to provide damage detection and condition

assessment tools and technologies for structural managers. Previously, application of such tools and techniques for SHM at large civil navigation infrastructure has been exceedingly limited.

Shallow- and deep-draft navigation projects located in ports, harbors, rivers, reservoirs, lakes, estuaries, and in the coastal zone are included in this program. Projects that provide maximum cost savings are identified, and those that best address high-priority life-cycle O&M project cost savings are selected for monitoring and evaluation. The Corps Districts and ERDC develop monitoring plans jointly.

Coordination between the Corps and other Federal, state, and local agencies, and with industry is essential for proper accomplishment of this program. In addition to satisfying Corps' requirements, the data are made available through publications and electronic technology transfer, and will be of great value to local, state, and other Federal agencies with navigation management policies. Results are communicated immediately to other member agencies of the Marine Transportation System (MTS).

DESCRIPTION OF WORK FOR FY 2019:

Focus Area 1: Monitoring Existing Structures

Reliability Analysis of Coastal Rubble-Mound Structures

- Quantify uncertainty of reliability by application of optimized forcing through design of experiments techniques.
- Expand stochastic forcing methodologies to additional types of coastal structures, and will recommend statistical methodologies in accordance with desired levels of fidelity. Relating traditional return period design to life cycle performance using StormSim software and Coastal Hazard Systems statistics.
- Develop a web-based interface for StormSim reliability software within the context of the Coastal Hazards System and probabilistic hazard assessment. A working concept version of the web-service will be available.
- Develop recommend reliability prescribed safety levels based on performance modes to guide design and risk evaluation for funding prioritization.
- Provide design guidance update through the Guidance Update and Maintenance Program (GUMP) for computed response and reliability. Incorporating design guidance into USACE Coastal Engineering Manual (CEM) for application by the Coastal Navigation Structure Asset Management (CNSAM) product delivery team for critical decisions regarding Asset Management Rehabilitation and Maintenance funding.
- Make Reliability Analysis of Coastal Rubble-Mound Structures guidance applicable for desktop computing by USACE District Design Engineers.

Monitoring Fiber Reinforced Polymer (FRP) Composite Material Demonstrations at Navigation Lock and Dams

- Conduct inspections at 8 field demonstrations of different FRP composites, and documenting weathered conditions.
- Assigning field demonstration materials to a continued bi- and tri-annual performance inspection based on performance to date.
- Train field site personnel on previously developed inspection protocols to perform performance inspections.
- Continue laboratory-scale long-term testing and correlation of all field and laboratory FRP data.
- Continue development of material degradation prediction algorithms and display plots.
- Develop peer reviewed Technical Journal article and comprehensive technical presentation on work to date.
- Refine and updating cost-benefit analysis based on latest results and conclusions.

Monitoring Effectiveness of Coatings, and Corrosion Prevention and Control (CPC) Systems, at Lock Hydraulic Steel Structures (HSS)

- Evaluate the ruggedness of remote monitoring equipment installed at Selden, Holt, and Clairborne Locks, AL; Emsworth Lock, PA; and The

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Monitoring Completed Navigation Projects

- Dalles Lock, OR; and documenting maintenance and repair activities related to the sensors and Remote Monitoring Units (RMU).
- Collecting Cathodic Protection (CP) and water quality data at the 6 field data collection sites, by automatic data collection system.
- Verify and fine tuning the predictive maintenance algorithms to account for variations in CP system rectifier, and anode currents and corrosion potentials due to seasonal variations in water quality.
- Integrate CPC remote monitoring systems with Smartgate communications systems and data storage (cloud).
- Implement CPC remote monitoring data analysis algorithms into PI Vision, Structural Health Monitoring software.
- Install CPC remote monitoring systems at a Smartgate site, and integrating directly into Smartgate communications and data storage system.
- Evaluating the capability of the new sensor technology to monitor sacrificial CP systems at the high-interest quoin region of a navigation lock gate.

Focus Area 2: River Information Services (RIS)

Enhancing Inland Waterway and Traffic Information to Users

- Conduct test beds in support of RIS development, and integrating capabilities developed with existing RIS key technologies and services.
- Continue interagency and international work to develop and implement RIS services in alignment with newly-updated RIS Guidelines.
- Participate in applicable RIS Standards bodies to provide USACE input on new and evolving standards and guidelines.
- Making RIS developments available through web services and the cloud environment, and beginning migration of RIS capabilities to the cloud.

Focus Area 3: Structural Health Monitoring (SHM)

Advancing Structural Health Monitoring (SHM) Methods for USACE Infrastructure

- Construct prototype life cycle performance model for a lock project that takes in inspection information and sensor data, and outputs predicted performance over time.
- Develop visualization capability for crack initiation computations, and update existing design guidance.
- Develop numerical modeling techniques for crack propagation in hydraulic steel structures.

DESCRIPTION OF WORK FOR FY 2020:

Focus Area 1: Monitoring Existing Structures

Reliability Analysis of Coastal Rubble-Mound Structures

- Will include near-structure morphology into Monte Carlo life cycle modeling of structure reliability.
- Will expand application of momentum flux for additional performance modes.
- Will complete preliminary web-based interface that will facilitate use of the coastal structure reliability tools across the USACE.
- Will develop a User Manual and Technical Documents with application examples for the web-based coastal structure reliability application.

Monitoring Fiber Reinforced Polymer (FRP) Composite Material Demonstrations at Navigation Lock and Dams

- Will conduct additional laboratory testing on last remaining weathered samples, as needed.
- Will conduct additional inspections on field demonstration materials, as needed.

Engineer Research and Development Center

Monitoring Completed Navigation Projects

- Will complete photogrammetry wear analysis.
- Will finalize material degradation prediction algorithms/plots, and will prepare Technical Report to include all data, results, and recommendations.
- Will consolidate all laboratory and field results, and write comprehensive field guidance for use of FRP composite materials as various components of navigation locks.
- Will refine and update cost-benefit analysis based on latest results and conclusions.

Monitoring Effectiveness of Coatings, and Corrosion Prevention and Control (CPC) Systems, at Lock Hydraulic Steel Structures (HSS)

- Will continue evaluating the ruggedness of remote monitoring equipment installed at Selden, Holt, and Clairborne Locks, AL; Emsworth Lock, PA; and The Dalles Lock, OR; by twice-yearly visits at 5 sites to monitor condition of CPC sensors and RMUs.
- Continue collecting Cathodic Protection (CP) and water quality data at the 5 field data collection sites by automatic data collection system, and by manual spot measurements to verify the accuracy of the automated measurements.
- Will continue verifying and optimizing the predictive maintenance algorithms to account for variations in CP system rectifier, and anode currents and corrosion potentials. Manual measurements will be made to determine the accuracy of the automated measurements and compensate for the natural aging of the monitoring system.
- Continue evaluating capability of new sensor technology to monitor sacrificial CP systems at quoin region of a navigation lock gate by twice-yearly site visits to determine condition of CP sensors and RMUs

Focus Area 2: River Information Services (RIS)

Enhancing Inland Waterway and Traffic Information to Users

- Will deploy updated navigation information services capabilities that have been developed and tested in RIS proof-of-concepts and test beds.
- Will continue interagency implementation of enhanced navigation information services, including rapid prototyping and evaluation of emerging RIS technologies.
- Will participate in national and international RIS Standards and coordinating bodies to enhance existing, and development of new, RIS technologies.

Focus Area 3: Structural Health Monitoring (SHM)

Advancing Structural Health Monitoring (SHM) Methods for USACE Infrastructure

- Will improve lock project life cycle performance for use by Asset Management.
- Will model and demonstrate crack propagation computations for hydraulic steel structures.
- Will develop optimized technique for evaluating lock embedded anchorage fatigue.

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2020

PROJECT NAME: National Coastal Mapping Program – Navigation

Allocation in FY 2016	Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Budgeted Amount in FY 2020
\$6,737,000	\$6,237,000	\$6,237,000	\$12,870,000 1/	\$4,875,000

1/ Unobligated Carry-in Funding: The actual unobligated carry-in from Fiscal Year (FY) 2018 to FY 2019 was \$0. There was an additional \$0 of unobligated funds that are committed within the Corps for scheduled ongoing requirements in FY 2019. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2020 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: Section 516 of Water Resources Development Act of 1996

DESCRIPTION: The National Coastal Mapping Program (NCMP) is the only Federal coastal mapping program that produces regional, operational data along the coast of the U.S. on a re-occurring basis. Regional Sediment Management and Quantifying Coastal Resilience require regional measuring and monitoring to provide engineering, environmental, and economic data and information for decision makers and managers. No other program in the Corps (or other Federal agencies) provides consistent, re-occurring, regional data to characterize physical, environmental, and economic conditions along the shoreline, and their changes over time. Quantification of regional conditions and changes leads to improved management practices of entire regions and projects within those regions. Without these data, the Corps cannot fulfill its goal of a resilient, systems approach to coastal management, including navigation, coastal flood risk reduction, and ecosystem restoration projects. The National Coastal Mapping Program also continues evolution of technologies for regional characterization and change detection of engineering, environmental, and economic conditions along the shoreline. Coastal Zone Mapping and Imaging Lidar (CZMIL) advances the state-of-the-art in data exploitation workflows, algorithms, hardware, and software, and provides a sustained focus and collaboration among academia, industry, and the federal government to constantly review, refine, and expand our capability to produce a wider range of engineering, environmental, and economic data and products over a broader range of operating environments.

Since 2004, the NCMP has collected re-occurring data along the Gulf of Mexico, Atlantic, Great Lakes, and Pacific coasts. The data collected during these surveys have been developed into products that are widely used by the Corps for regional sediment management, regulatory, flood damage reduction, asset management, emergency operations, and environmental stewardship in the coastal zone, and by other agencies: for the FEMA RiskMap modeling efforts; the USGS Coastal and Marine Geology Program's National Assessment of Shoreline Change and extreme storm studies; and National Oceanic and Atmospheric Administration (NOAA) nautical chart production. NCMP funding is used to extract new information products quantifying shoreline, sediment volume, infrastructure, and habitat changes from consecutive datasets collected on the Great Lakes (Ontario, Erie) shorelines from 2006 to 2011. Survey data help quantify coastal changes that have occurred since previous surveys for the formulation of sediment budgets, quantifying area change of sensitive habitats like submerged aquatic vegetation and wetlands, identifying patterns of erosion and accretion, and for assessing the condition of coastal infrastructure. The data are made available to the public through NOAA's Digital Coast website and to emergency responders through the USGS Hazard Data Distribution System and are also used to inform formulation of plans for potential new projects as well as for management of existing Corps assets. State and local agencies use the data for

Division: South Atlantic

District: Mobile

National Coastal Mapping Program

shoreline management, environmental permitting, emergency management, marine spatial planning, and planning for resilient communities. The CZMIL effort has resulted in new airborne technologies and supporting software that improves operational efficiency, decreases time between data collection and final decision-support product, expands the variety of products derived from the basic datasets in a data fusion approach, improves performance in very shallow and turbid waters, improves navigation hazard detection, and improves overall data accuracy.

ACCOMPLISHMENTS IN FY 2018: Funds were used for routine NCMP survey operations in New England and on the U.S. Great Lakes shorelines. These survey operations will collect the third consecutive engineering and environmental dataset for New England (2005, 2010, 2018) and the Great Lakes (2006-2008, 2011-2013, 2018-2020).

DESCRIPTION OF WORK FOR FY 2019: Funds are being used to continue routine NCMP survey operations on the U.S. Great Lakes shorelines. At the current level of funding, the program takes 8 years to cover the sandy shorelines of the U.S. Coast. These survey operations will collect the third consecutive engineering and environmental dataset for the Great Lakes (2006-2008, 2011-2013, 2018-2020).

DESCRIPTION OF WORK FOR FY 2020: Funds will be used for routine NCMP survey operations on the U.S. Great Lakes shorelines and on the U.S. West Coast in Washington State. These survey operations will collect the third consecutive engineering and environmental dataset for the Great Lakes (2006-2008, 2011-2013, 2018-2020) and Washington State (2009, 2014, 2020).

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2020

PROJECT NAME: National Dam Safety Program (Portfolio Risk Assessment)

Allocation in FY 2016	Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Budgeted Amount in FY 2020
\$ 9,900,000 1/	\$ 9,900,000	\$ 9,900,000	\$ 13,860,000 1/	\$ 7,650,000

1/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2018 to FY 2019 was \$1,357,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2020 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: Section 2 of National Dam Inspection Act of 1972, P.L. 92-367 (authorized the Secretary of the Army to inspect dams across the country; and to issue a report to the Congress that includes an inventory of all dams in the United States, and provides recommendations for a comprehensive national program for the safety of dams); Section 215 of the Water Resources Development Act of 1996, P.L. 104-303 (authorized FEMA to lead the National Dam Safety Program, a Federal interagency effort to encourage the Federal agencies with dams, and the States, to establish effective dam safety programs); Section 1 of Dam Safety Act of 2006, P.L. 109-460 (authorized the Secretary of the Army to maintain and update the national inventory of dams, including any available condition assessments performed by a Federal agency or a State dam safety agency); and Section 3001 of the Water Resources Reform and Development Act of 2014 , PL 113-121 (reauthorized the National Dam Safety Program, which FEMA leads).

DESCRIPTION: The Corps uses this funding to manage its overall effort to help reduce risks of loss of life and property damage that would occur from the failure of a Corps dam. The Corps Risk Management Center (RMC) leads this effort based on a Corps-wide Portfolio Risk Assessment (PRA) process covering the 715 dams and appurtenant structures that the Corps owns, which are located at 555 of its projects. For each of these dams, the Corps performs a risk assessment to estimate the probability of failure and consequences for each identified potential initiating event. In addition, the Corps formulates risk reduction measures where needed, and estimates their cost and effectiveness in reducing the risk of failure. It uses the results of these detailed PRA's at the national level to further formulate study plans, identify appropriate corrective actions, and determine the urgency of such actions.

The Corps also uses this funding to update its Dam Safety Investment Plan (DSIP), with the goal of determining short-term and long-term strategies for modification and repair of the dams in the portfolio that pose the highest risk. The Corps uses the DSIP to demonstrate the effects of each of these potential strategic investments, with the objective of reducing the overall risk of the portfolio of Corps dams in the most efficient and cost-effective manner. The dam safety work of the Corps supports advancements in technical areas related to dams such as investigations of dam internal erosion, filtering materials, seepage and piping incidents, dam grouting, spillway systems reliability, dam instrumentation, and hydrologic methodology development. The Corps also updates its technical manuals and policy guidance to reflect the state-of-the-art in these disciplines.

The Corps uses these funds to perform Periodic Assessments (PA) of Corps dams; review Semi-Quantitative Risk Assessment and PA reports; review dam instrumentation; update and publish dam safety policy and guidance; conduct dam safety training and workshops for Corps staff;

HQUSACE

National Dam Safety Program (Portfolio Risk Assessment)

review, respond to, and implement IEPR comments; develop modeling, inundation mapping, and consequence work products through the Modeling, Mapping, and Consequences Center; cover the cost of Corps staff attendance at meetings of the Interagency Committee on Dam Safety (ICODS); and cover the cost of the membership of the Corps (as a participating organization) in various national and international dam organizations.

The Corps began to manage its dam safety efforts centrally in FY 2011. From FY 2011 through the end of FY 2018, the Corps has used this funding to complete 325 Periodic Assessments (PA) at 284 of its projects, covering about 51% of the 555 Corps projects with a Corps dam. The Corps also used this funding to conduct Independent External Peer Reviews (IEPRs) in FY 2013 and FY 2017, and to address the IEPR comments from those reviews; and to publish several guidance documents relating to Dam Safety.

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2020

PROJECT NAME: National Emergency Preparedness Program (NEPP) – Emergency Management

Allocation in FY 2016	Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Budgeted Amount in FY 2020
\$ 4,555,000	\$ 4,484,000	\$ 5,445,000	\$ 5,445,000 1/	\$ 4,500,000

1/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2018 to FY 2019 was \$1,724,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2020 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: Executive Orders 10480 and 12656, National Security Presidential Directive-51/Homeland Security Presidential Directive-20 (NSPD-51/HSPD-20), the National Continuity Policy Implementation Plan (NCP/IP) and the Department of Homeland Security (DHS), Federal Emergency Management Agency (FEMA) under the Robert T. Stafford Disaster Relief and Emergency Assistance Act, 42 USC 5121 et seq.

DESCRIPTION: In accordance with NSPD-51/HSPD-20 and the NCP/IP, the NEPP program ensures the Corps is ready to respond rapidly to a catastrophic disaster, should one arise, whether caused by natural phenomena or man-made disaster (acts of terrorism), and includes planning to provide for continuity of operations of the Corps and government missions during such a disaster. More specifically, these funds ensure that the Corps work force is capable of shifting from routine missions to crisis operations, with the organizational command and control structure(s) necessary to provide a coordinated comprehensive response in the critical early stages of a catastrophic disaster. Preparedness activities supported by these funds include development of national level preparedness plans; training employees; and conducting national level training exercises, including support to Federal Emergency Management Agency (FEMA) exercises and coordination within DOD, and with other Federal agencies, and with state and local governments. Preparation also includes the Corps Headquarters sponsored Corps-wide programs necessary to provide the capabilities and operational command and control required by Corps field commands in order to accomplish their NEPP responsibilities, both routinely and in specific emergency response situations.

The Corps uses this funding to support its national-level requirements for preparedness training with regard to man-made disasters (to include acts of terrorism), catastrophic disaster planning (review/revision of no-notice disasters, such as earthquakes along known seismic zones), and to fund continuity of government (COG) and continuity of operations (COOP) equipment and exercises. COOP and COG help to ensure that the Corps will be able to provide uninterrupted command and control of all Corps activities and missions should the need arrive. To achieve this objective, the Corps uses this funding to cover the cost of an annual exercise on the displacement of Corps emergency operations centers to alternate locations; and for upgrades, security, and user support to maintain and upgrade high-frequency radio communications.

NEPP builds upon, but differs from, the preparedness work that the Corps performs with the funding provided through the Flood Control and Coastal Emergencies (FCCE) appropriation. The two programs are complementary.

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National Emergency Preparedness Program (NEPP)

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2020

PROJECT NAME: National (Levee) Flood Inventory – Flood Damage Reduction

Allocation in FY 2016	Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Budgeted Amount in FY 2020
\$ 15,840,000	\$ 4,950,000	\$ 9,900,000	\$ 4,950,000 1/	\$ 4,500,000

1/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2018 to FY 2019 was \$839,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2020 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: Title IX of the Water Resources Development Act (WRDA) 2007, as amended.

DESCRIPTION: Since 2011, the Corps has maintained a publicly available database called the National Levee Database (NLD), a central source of information on the condition of and risks associated with levee systems in the United States. The principal purposes of this effort are: (1) to encourage communities to improve their flood risk management; (2) to inform decisions on the ground by state and local emergency management officials as they plan for a specific expected flood; and (3) to improve our overall understanding of these risks, viewed from a national perspective.

The Corps uses this funding to operate, maintain, and update the NLD to reflect the best available risk-based information on levee systems, and to implement software revisions to improve its functionality and usability based on user feedback. Operation and maintenance activities for the NLD include supporting NLD related tools such as the Levee Inspection System (LIS) Tool and the Levee Screening Tool (LST), including training for these tools.

The Corps also uses this funding to continue its ongoing work with other Federal agencies to develop a common set of guidelines, criteria, and best practices for their use on the levees that are subject to their jurisdiction, and to develop strategies to improve risk communication. The Corps also uses some of this funding to work at the State and Tribal levels, on a voluntary basis, on information transfer of inspection and assessment practices in order to help them establish or improve their own levee safety programs.

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2020

PROJECT NAME: National (Multiple Project) Natural Resources Management Activities 1/

Allocation in FY 2016	Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Budgeted Amount in FY 2020
\$ 6,492,000	\$ 4,562,000 2/	\$ 3,663,000	\$ 5,148,000 3/	\$ 3,330,000

1/ This activity is accounted for in the Recreation, Navigation, and Flood and Coastal Storm Damage Reduction business lines.

2/ \$248,000 was reprogrammed away from this line item in FY 2017.

3/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2018 to FY 2019 was \$3,385,000. There was an additional \$31,000 of unobligated funds that are committed within the Corps for scheduled ongoing requirements in FY 2019. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2020 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: Flood Control Act of 1944 (58 Stat. 887), Public Law 78-534.

DESCRIPTION: This remaining item is used to conduct certain, specified operation and maintenance activities, such as procurement of park ranger uniforms through a contract administered by the National Park Service, that benefit all or a majority of operating Civil Works projects. This project is an agency-wide project that is directed by HQUSACE.

ACCOMPLISHMENTS IN FY 2018: A wide variety of national program initiatives were accomplished such as, the park ranger uniform contract was funded at nearly \$675,000; \$350,000 supported the national partnership program including seven “Handshake” partnerships; \$600,000 supported the Water Safety MCX and national programs; \$400,000 supported environmental compliance work; \$150,000 supported the printing and publishing of a wide array of NRM materials; \$125,000 supported volunteer clearinghouse; \$150,000 supported national sign program activities; \$170,000 supported the Career Assignment Program; and \$1,000,000 supported a variety of sustainability work efforts including energy audits, Energy Savings Performance Contract (ESPC) work, sustainable buildings assessments, campground metering, and data management to support USACE Sustainability Plan, year-end report, and Scorecard submission.

DESCRIPTION OF WORK FOR FY 2019: A similar set of national recreation program initiatives will be accomplished such as the funding of: the park ranger uniform contract; approximately ten “Handshake” partnerships; the Water Safety MCX and associated national programs; environmental compliance work; the printing and publishing of NRM materials; support to the volunteer clearinghouse; and a variety of cost saving measures including sustainable building assessments, power purchase agreements, utility metering, and data management to support USACE implementation of Executive Order 13834, *Efficient Federal Operations*.

HQUSACE

National Natural Resource Management Activities

DESCRIPTIONS OF WORK FOR FY 2020:

1. National NRM Activities work that will be accomplished with these funds include the following:

Allocation in FY 2016	Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Budgeted Amount in FY 2020
\$ 3,247,000	\$ 2,262,000	\$ 2,673,000 2/	\$ 2,700,000 3/	\$ 2,700,000

The National (Multiple Project) Natural Resources Management Activities supports many national programs, including:

- a. Water & Public Safety Program. The Water and Public Safety Program is centrally managed at the Corps Water Safety National Operating Center (NOC) which provides national guidance, programs, educational materials, media outlets, and printed and electronic information to ensure a nationally coordinated and consistent safety campaign is delivered to the public.
- b. Park Ranger/Manager Uniforms. The Corps Uniform Program is managed centrally out of HQUSACE. Implementation of national policy and oversight of an interagency uniform contract administered by the National Park Service ensures program cost effectiveness and adherence to uniform standards across the Corps. The Corps purchases uniforms for field personnel through the interagency contract. Since this arrangement was established in 1984, significant economies of scale have been achieved. Costs include the authorized employee allowance funds, NPS contract administration costs, buy out of discontinued items, program management/committee support, and the purchase of required emblems.
- c. Sign Program. The Corps Sign Program is managed centrally at the Sign Program Center of Excellence (MCX). The MCX ensures consistent implementation of Corps Sign Standards and oversees the management, use, and implementation of national sign standard policies. The MCX works with project, district and MSC sign program coordinators to resolve policy and legal issues. The MCX provides technical support and assistance to all projects and maintains the Sign Standards Program Manual and software. These efforts allow the Corps to maintain consistent standards for public safety and information.
- d. Partnership Program. The National Partnership Program oversees the management and implementation of national partnership and volunteer policies to ensure coordinated and consistent program execution nationwide, including the deployment of training opportunities. The program leverages the financial and human resources provided by partners and volunteers to support recreation and environmental stewardship programs.
- e. Volunteer Clearinghouse Operation. The Volunteer Clearinghouse that coordinates volunteer recruitment and data collection is operated under contract with Goodwill Industries to support volunteer efforts at all Corps projects. Use of a single nationwide contract achieves economies of scale and reduces administrative costs by eliminating the need to transfer funds from each project.

- f. **Printing and Publishing.** The centralized printing of regulations, forms, and public information and interpretive materials used by all Corps projects achieves economies of scale and reduces total administrative and procurement costs. Printed materials are stored at the Corps Publications Depot for distribution to all projects upon request.
- g. **Other Nationwide NRM Activities.** The following centrally-managed program initiatives are supported at the national level: Environmental Compliance support; Challenge Partnership Funds; Natural Resources Management Website Information (Gateway); Nationwide Recreation Visitation Surveys (Visitation Estimation and Reporting System (VERS)); and support for the Partnership Advisory Committee, Recreation budget Coach, Assist and Train Team, Career Assignment Development Program, and Bilingual Support Team.

2. Cost Saving Measures and Environmental Management System (EMS) Implementation work that will be accomplished with these funds include:

Allocation in FY 2016	Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Budgeted Amount in FY 2020
\$ 3,245,000	\$ 2,300,000 2/	\$ 990,000	\$ 1,000,000 3/	\$ 1,000,000

Navigation and Flood and Coastal Storm Damage Reduction Projects: The latest revision of Engineering Regulation (ER) 200-2-3 in October 2010 expanded the coverage of the USACE EMS to include all Civil Works missions and facilities with significant environmental compliance requirements, and also incorporated Federal statutory and executive order-based energy, water and petroleum efficiency requirements.

In addition to traditional water, air, waste and materials compliance requirements, the USACE EMS includes the energy, water and petroleum efficiency requirements of the Energy Independence and Security Act of 2007 and the Energy Policy Act of 2005, as well as sustainable acquisition, electronics stewardship, waste reduction/recycling, and various federal energy, water and petroleum related accounting and reporting requirements under EO 13834. Funding these requirements as a nationwide activity allows USACE to reduce costs and improve performance by implementing standardized compliance, efficiency and cost reduction policies, procedures, and tools for auditing, data management, metrics, reporting, and management review at USACE facilities. Specific requirements include:

- a. Centralized utility cost and consumption data management, tracking and reporting capability;
- b. Preparing and submitting energy and water utility and petroleum related submittals in accordance with Administration and Congressional requirements. Examples of annual, recurring submittals include the Sustainability Plan (SP), and the Consolidated Annual Energy Data Submission.
- c. Advanced metering system operation and maintenance serving all facilities that trigger the Federal Energy Management Program advanced metering requirements under Energy Policy Act (EPA) Section 103.

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2020

PROJECT NAME: National Portfolio Assessment for Reallocations – Water Supply

Allocation in FY 2016	Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Budgeted Amount in FY 2020
\$ 1,060,000 1/	\$ 792,000	\$ 792,000	\$ 495,000 2/	\$ 500,000

1/ Prior to FY 2017, this remaining item included funds for the Sustainable Rivers Program, which is now funded under its own remaining item.

2/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2018 to FY 2019 was \$43,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2020 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: Specific project authorizations, Section 216 of the River and Harbor and Flood Control Act of 1970.

DESCRIPTION: These funds are used to assess data and develop a consistent national approach to achieving consistent and sustainable water withdrawals (permanent reallocations and surplus water) including identification of status and challenges for Corps Reservoirs and to conduct initial assessments of pending reallocation requests. These assessments represent a streamlined approach to obtaining the information necessary to determine Federal interest.

The National Portfolio Assessment for Reallocations began as a two year appraisal, initiated in FY 2008, to develop a portfolio of existing Corps of Engineers multipurpose projects to be used as a screening tool to identify the best candidates for opportunities for operational changes and/or reallocation opportunities. During the development of the survey for the National Portfolio Assessment, the Corps was considering two other national surveys, one on the water management aspects of Corps reservoir projects and another on sedimentation management concerns. Corps leaders recognized that combining these efforts would result in cost and time savings. This combined effort provided not only data for the Portfolio but also created a database to examine the status of Corps water management from local, regional, and national perspectives, an engineering and scientific foundation for a national adaptive management program, a baseline data set for investigating the evolution of operational water management policies, an assessment of sediment infilling, its impacts to operating purposes and management practices, and a database for sediment data collection efforts.

These efforts have proven relevant to the assessment of reallocation opportunities at multi-purpose reservoirs where any change in operation affects multiple purposes. As a result, after the initial Portfolio Report was completed, this effort was transformed into an Assessment of Data study for FY 2011 and FY 2012 and included the water supply, water management, and sediment management components as well as information gained through collaboration with other Corps work efforts. Major products developed include a portfolio of Corps projects that identified the best candidates for opportunities for operational changes and/or reallocation opportunities to ensure existing Corps reservoirs contribute to enhance economic and ecosystem values as water demands evolve and a better understanding of climate change issues are gained, (2) a paper on alternative funding arrangements for water supply reallocation studies, and (3) a final report on the National Portfolio Assessment of Data for Reallocations: Status and Challenges for USACE Reservoirs.

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2020

PROJECT NAME: Optimization Tools for Navigation – Navigation

Allocation in FY 2016	Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Budgeted Amount in FY 2020
\$ 319,000	\$ 319,000	\$ 319,000	\$ 444,000 1/	\$ 392,000

1/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2018 to FY 2019 was \$8,000. There was an additional \$0 of unobligated funds that are committed within the Corps for scheduled ongoing requirements in FY 2019. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2020 from prior appropriations for use on this effort is \$0.

DESCRIPTION: This funding is necessary to provide practical quantitative and predictive tools and data for minimizing and optimizing the costs of dredging of Federally-sponsored navigation projects. The objective is to be able to identify more efficient and effective management strategies for existing navigation infrastructure and to improve the analysis of proposals to deepen and widen channels. These efforts will help lead to an improvement of channel design criteria across the Corps, the U.S. Navy, and other government and academic institutions. The National Navigation Operation & Maintenance Performance Evaluation Assessment System (NNOMPEAS) has been developed to demonstrate whether such a metric can be provided across all coastal deep-draft harbors and waterways. This tool uses domestic and foreign trade data to determine and analyze the loaded or immersed drafts and related utilization of vessel cargo-carrying capacity for all recorded cargo vessel calls for individual harbors and channels. The system in turn can provide for the estimation of incremental transportation cost benefits foregone with reduction or absence of maintenance for waterway depth, and of the transportation cost savings with a limited increase in depth. This could offer the potential to optimize maintenance dredging requirements for individual channel reaches and across much of the overall USACE dredging program. A companion tool being developed under the OTN program is the Channel Analysis Design Evaluation Tool (CADET), which allows sophisticated vessel hull modeling not previously available. The Institute for Water Resources (IWR) is conducting this modeling activity jointly with the USACE Engineering Research and Development Center and the U.S. Naval Surface Warfare Center. CADET will render advanced technologies for methods of analysis and compilation of new physical and numerically-generated data sets descriptive of vessel movement and response within confined waterways and offshore channel areas subject to significant wave climate.

The budgeted funding will be used to continue the deployment and maintenance of the NNOMPEAS capabilities and methodology and further its use as a budgeting tool and general navigation project evaluation tool. Funding will also be used for continued maintenance of the CADET and maintenance of a comprehensive vessel lines library to allow use of CADET without proprietary hull line information and to ensure technology transfer so that USACE can independently support general update and maintenance of the algorithms integral to CADET. Funds will also be used to provide technical input and support for ongoing development or improvements to the Resident Management System database and to expand the system structure, and to implement changes to NNOMPEAS deemed critical by field analysts to more efficiently facilitate project evaluation and analysis. Funding will also be used to assess the feasibility of expanding NNOMPEAS and availability of data for including inland harbors.

ACCOMPLISHMENTS IN PRIOR YEARS: Funding for this ongoing activity has allowed for initiation of development for capabilities to account for primary factors for horizontal vessel motion within CADET with limited additions to support physical specifications and vessel motion response
 Institute for Water Resources Optimization Tools for Navigation

parameters for evolving vessel classes. In addition, efforts for scoping of horizontal motion requirements for CADET have been updated and are 90 percent complete and preliminary technical review has been conducted for simplifying wave transformation inputs in cooperation with NAVSEA-Carderoc. Ongoing CADET activities also includes field verification and tests on current studies and providing technical support to districts in helping to determine need or applicability with associated support to be extended for the subject fiscal year and availability of funding. Continued development of NNOMPEAS to evaluate the validity of expansion beyond the harbor projects currently covered totaling approximately 225 coastal harbor projects and continuing efforts for development of data error checking or validation routines for critical parameters. Development of routines for more efficient statistical analysis of the world deep draft cargo fleet have been initiated in addition to development of routines to allow comparative analysis of the deep draft fleets serving coastal regions of the United States. On-going efforts for NNOMPEAS include additional updates of ocean-going distances between domestic and foreign ports for domestic ports were added and annual update of coastal deep draft transit statistics as subject information and data become available. Continued use of NNOMPEAS allowed for further development of efforts to measure incremental transportation costs and benefits including update of estimated benefits for Value-to-the-Nation and for HQUSACE O&M Program budgeting input. NNOMPEAS was also employed for evaluation of vessel calling patterns and supporting load factor analysis (LFA) critical to coastal deep draft studies, and as an input to prioritization of survey work performed by NOAA.

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2020

PROJECT NAME: Performance Based Budgeting Support Program

Allocation in FY 2016	Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Budgeted Amount in FY 2020
\$ 3,917,000	\$ 4,158,000	\$ 4,158,000	\$ 1,980,000 1/	\$ 2,000,000

1/ *Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2018 to FY 2019 was \$1,399,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2020 from prior appropriations for use on this effort is \$0.*

AUTHORIZATION: Modernizing Government Technology Act

DESCRIPTION: The success rate of government digital services improves when agencies utilize resources to provide modern design, software engineering, and product management. To ensure the U.S. Army Corps of Engineers (Corps) Finance Center can effectively build and deliver important digital services, Digital IT funding supports modernization of the Corps of Engineers Financial Management System (CEFMS). CEFMS fully supports USACE business processing, project and financial management, reporting and audit readiness with ten consecutive, unqualified unmodified opinions, but needs to move to support budgeting. An FY 2017 contract award in support of the CEFMS modernization effort will provide the Corps with a prototype system architecture to support CEFMS as a modern enterprise system, improve user interface capability and provide improvements and benefits to the overall IT structure of USACE as well as other USACE information systems. The production application of this modernization architecture will enable the Corps to improve the support for budgeting, execution and transparency in financial reporting of Civil Works Appropriations and support the continued improvements for DATA ACT reporting to USASPENDING.gov. CEFMS modernization will provide new capability to systematically produce mock SF133 and automated reconciliations of the mock SF133 to the SF132 prior to financial information being submitted to the Government-wide Treasury Account Symbol system (GTAS). This will improve and ensure the integrity of the financial data in OMB MAX A-11 system. CEFMS modernization will also provide automated capability to readily produce monthly/quarterly or annual execution and status of fund reports that will provide Public Law level detail data. Stakeholders will have access to modern enterprise financial reporting, data analytics and dashboards for management and transparency of Civil Works Programs and Projects.

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2020

PROJECT NAME: Recreation Management Support Program – Recreation

Allocation in FY 2016	Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Budgeted Amount in FY 2020
\$ 1,633,000	\$ 1,534,000	\$ 1,535,000	\$ 1,535,000 1/	\$ 1,400,000

1/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2018 to FY 2019 was \$310,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2020 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: Flood Control Act of 1944 (58 Stat. 887), Public Law (P.L.) 78-534.

DESCRIPTION: Annual funding supports the recreation program through the conduct of focused management studies to improve operational efficiencies and the provision of technical assistance, to include technology transfer and technology support and maintenance for recreation-specific automated information systems. Funding also supports strategic planning for and performance monitoring of the Corps recreation business program, subject to the Government Performance and Results Act.

The Recreation Management Support Program (RMSP) has 5 major components, which together provide comprehensive support to the Corps Recreation Business Program:

1. **Focused Management Studies.** RMSP provides focused management studies and reports to acquire and analyze information about recreation trends, accessibility, emerging issues, user conflicts, visitor diversity, use fee impacts and similar elements affecting the Corps recreation program. Analyses are conducted to support the recreation area modernization program, implementing facility and service standards, and in similar product delivery improvement efforts. Information and technology transfer pursuant to these studies is funded by the RMSP. Ongoing trends analysis provides valuable data on which to base decisions about necessary short and long term adjustments to the program to meet public needs.
2. **Management/Technical Assistance.** RMSP provides technical assistance to the Recreation Community of Practice in the development of management tools, which quantify recreation program outputs and relate them to customer needs and budget allocations for the purpose of measuring performance. This includes gathering and analyzing information about customer satisfaction with the Corps recreation program. RMSP assures the field workforce is equipped with "state-of-the-art" skills and knowledge to deal with a rapidly changing public. RMSP provides technical support and maintenance of performance based budgeting tools, visitation monitoring and analysis systems, fee collection and reporting, economic analysis, facility inventory and condition assessment, and similar automated information programs. RMSP provides short-term assistance to projects in solving specific technical problems.

3. Support to Recreation Program Strategic Planning. Funding to support the activities of the Recreation Leadership Advisory Team (RLAT) is included in this program. The RLAT is composed of representatives from the division, district and project levels of the Corps natural resources management program. It provides input, advice and support to the Corps strategic planning for the recreation business program.
4. RMSP supports nationwide recreation visitation surveys. Accurately estimating the number of visitors to our projects is key to making wise investment and management decisions. The Visitation Estimation and Reporting System (VERS) modernization effort is centrally managed within RMSP to bring greater accuracy to our visitor estimates across the Corps.
5. Recreation.gov and Volunteer.gov are two initiatives designed to improve access to recreation-related information from the Federal government, streamline the systems used to manage that information, and increase sharing of recreation-related information among government and non-government organizations. Providing a nationwide funding source at HQUSACE for centralized procurement of these items used by all operating projects having a natural resources management program precludes the need for funds to be transferred by each project or district to a single procurement agent, a savings of from 60 to 300 transactions a year. Funding for these initiatives is sufficient to also cover the costs of the Recreation One-Stop Initiative, which was previously funded as a separate line item in the Budget.

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2020

PROJECT NAME: Regional Sediment Management Program – Navigation

Allocation in FY 2016	Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Budgeted Amount in FY 2020
\$ 2,282,000	\$ 1,782,000	\$ 8,915,000	\$ 3,465,000 1/	\$ 3,500,000

1/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2018 to FY 2019 was \$5,002,000. There was an additional \$1,126,000 of unobligated funds that are committed within the Corps for scheduled ongoing requirements in FY 2019. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2020 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: Section 516 of the Water Resources Development Act of 1996 authorizes the development of long-term strategies for the management and control of sediments through studies and operational activities.

DESCRIPTION: The Regional Sediment Management (RSM) Program objectives are to establish regional sediment management strategies that link sediment management actions across multiple authorized U.S. Army Corps of Engineers (Corps) projects, and to coordinate management activities with other Federal agencies, State, and local governments within the boundaries of physical systems including inland watersheds, rivers, estuaries, and the coast. The goal is to demonstrate short- and long-term cost savings and increased economic and environmental benefits through adaptive management of sediments from a regional perspective. The approach provides opportunities to achieve greater effectiveness and efficiency and to realize significant cost savings relative to traditional project management practices. The improved regional approach to the navigation program assists nationally to identify common issues that are better solved on a regional basis, improving channel availability and subsequently life cycle costs and project benefits through more efficient practices, and improving regional efficiencies by engaging cross-mission objectives of the Corps (i.e., navigation, flood risk management, and environmental restoration regarding sediments). Cost savings may be realized from leveraging multiple project resources (funding, sediments), reduced re-handling of material, reduced sedimentation, optimized beneficial use or placement of material, extended dredging cycles and combined equipment mobilization and demobilization for linked projects (e.g., dredging and shore protection). Costs may also be reduced by sharing information, improved data management, and reduced duplication of field data collection, or by reducing duplication in model and tool development and application.

The funds under this program are not used for work at specific projects, but are used to fund activities that will benefit the entire Civil Works program.

Annual funding is used to:

- Coordinate RSM efforts nationally to promote systems-based approaches to improve the management and use of sediments across multiple projects to benefit a region in support of the Civil Works mission, including coordination and support across the Corps to implement regional and local studies which result in RSM strategies and solutions to improve the use of sediments, cost savings, increased benefits, and improved relationships.

Engineer Research and Development Center

Regional Sediment Management Program

- Conduct the annual RSM In-Progress-Review and Workshop to review on-going initiatives, promote program goals, share knowledge and experiences, and technology transfer among RSM practitioners; conduct bi-monthly Corps-wide webinars to share knowledge, tools, and case studies; and conduct workshops to educate and outreach RSM practices, tools, and address challenges.
- Develop and enhance tools and technologies for implementing RSM approaches;
- Continue support of the USACE Data Integration Framework (DIF) effort to populate National enterprise databases and integrate tools and models that utilize the data.
- Participate in regional and national initiatives to promote the RSM concepts and approach; and
- Document successes, benefits, challenges and lessons learned through technical reports.

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2020

PROJECT NAME: Review of Non-Federal Alterations of Civil Works Projects (Section 408) – Flood and Storm Damage Reduction 1/

Allocation in FY 2016	Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Budgeted Amount in FY 2020
\$ 3,960,000	\$ 3,465,000	\$ 8,415,000	\$ 8,415,000 2/	\$ 8,500,000

1/ The Budget accounts for these funds under the flood and storm damage reduction program. However, the Corps also uses these funds to review requests to alter a commercial navigation project. The Corps will execute these funds under the appropriate business line, based on the Section 408 requests actually received.

2/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2018 to FY 2019 was \$1,793,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2020 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: Section 14 of the Rivers and Harbors Appropriations Act of 1899, as amended, 33 U.S.C. 408 (Section 408) authorizes the Secretary of the Army to grant permission to other entities for the temporary or permanent alteration or use of a U.S. Army Corps of Engineers civil works project if the Secretary determines that the alteration or use will not be injurious to the public interest and will not impair the usefulness of the project.

DESCRIPTION: In FY 2016, the Corps established this remaining item to improve transparency over its management and use of funds to review requests under Section 408 to alter an authorized Corps project. With this funding, the Corps reviews these proposed alterations, and works with the requester and others to facilitate the Corps review of these proposals. Through Section 408 reviews, the Corps ensures that the alteration will not adversely impact the public interest and will not impair the usefulness of the authorized Corps project. The number of Section 408 requests in any year depends on many factors – primarily on actions, schedules, and resources external to the Corps. In its review of Section 408 requests, the Corps considers a range of factors, such as the effects of the proposed alteration on the reduction of risk to life safety, the reduction of the risk of flood damages, the environment, the project’s ability to meet its other authorized purpose(s), and tribal considerations. The Corps also uses this funding for program management (such as coordination and tracking) for construction oversight (as needed to ensure compliance of the conditions of the approved Section 408 request).

The Corps does not use these funds to review requests under Section 408 for the development or alteration of a non-Federal hydropower project at a Corps dam. The Corps funds its review of those proposals with Federal Energy Regulatory Commission licensees' annual payments collected as provided pursuant to 16 U.S.C. 810(a).

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2020

PROJECT NAME: Scheduling Reservoir Operations

Allocation in FY 2016	Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Budgeted Amount in FY 2020
\$ 6,311,000	\$ 6,427,000	\$ 6,947,000	\$ 7,157,000 1/	\$ 8,564,000

AUTHORIZATION: Section 7 of the Flood Control Act of 1944, 33 U.S.C. 709 (directing Secretary of the Army to prescribe regulations for use of storage allocated for flood control or navigation at reservoirs constructed wholly or in part with Federal funds provided for those purposes).

DESCRIPTION: The Corps uses this funding to support its participation in the flood operations of certain dams, which the Corps does not own, during a flood. Through its involvement in these operational decisions during a flood, the Corps helps to manage the overall water releases in the watershed, balancing the flows to reduce the risk of flood damage and loss of life.

The Corps also uses these funds to install, manage, and operate certain technical instruments at these dams (such as stream gages, rain gages, and reservoir level gages) in order to collect technical data for use in flood forecasting and to inform decisions on water releases from these dams during a flood. The owner of the dam could use these data for other purposes as well, such as in deciding whether to take a drought contingency action. The Corps also uses this funding for flood training exercises at these dams.

The Corps does not use this funding to support water control manual updates at these non-Corps dams, or to evaluate their effects (if any) on the operation of other Corps projects in the watershed.

1/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2018 to FY 2019 was \$331,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2020 from prior appropriations for use on this effort is \$0.

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2020

PROJECT NAME: Stewardship Support Program – Environmental Stewardship

Allocation in FY 2016	Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Budgeted Amount in FY 2020
\$ 986,000	\$ 941,000	\$ 891,000	\$ 891,000 1/	\$ 900,000

1/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2018 to FY 2019 was \$179,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2020 from prior appropriations for use on this effort is \$0.

DESCRIPTION: These funds will be used to conduct focused management action studies and recommend guidance to address high priority program efficiency and effectiveness concerns, including responses to new protocols for asset and risk management, regulation changes, and administration priorities through the Stewardship Support Program (SSP). Efforts will continue in support of performance based budgeting, in monitoring program performance and risk analysis, and in development of strategies to improve program outputs and outcomes

Progress in recent years on developing standards, published protocols, and web-based data entry programs have resulted in improvements in advancing completion of the inventories and will result in expanded data from national GIS analysis to prioritize work. The SSP will also continue support of the Environment-Stewardship CoP including further development of the Natural Resources Management (NRM) Gateway, a knowledge management tool for the NRM community, for information and technology exchange. The Gateway continues to be the central location of program knowledge within the Corps to quickly share policy updates, emerging issues and technical support. These activities will provide benefits in increased program effectiveness through implementation of assessment recommendations. Improved program performance will be facilitated through increased CoP access to best practices and policy guidance and effective development and execution of performance based budgets.

The SSP was established by regulation in FY 2002 to provide broad support to Environment-Stewardship function at operating projects by assisting in the identification of national program needs, the development of new national program activities, strategic program planning, and the recommendation of national stewardship program funding priorities. Support will be provided in refining the Environmental Stewardship business program strategic plan and goals, and budget processes, to address the targeted outcomes of the overall Corps Civil Works Strategic Plan, using input from the Stewardship Advisory Team, other associated Corps business programs and stakeholders. Goals and objectives have been refined, and actions will be identified to achieve them. Funding this program from a single source reflects the nationwide application and supports standardization in program direction and outputs.

The three basic components of the SSP are:

- (1) Focused Management Actions. These activities are to implement a course of action or practice within field office activities, a region, or nationwide. Management actions may include collaboration and participation with stakeholders to improve interagency efficiencies and focus on habitats of national concern. Examples include geospatial decision tools for use at the projects and nationally to address land use challenges such as threats to resources including property and boundary line encroachments; request to use federal property and impacts due to rapidly

increase adjacent development which aid in prioritizing preventative measures to reduce encroachments and prioritization of project master plan updates.

(2) Policy Guidance and Management Support. Such activities relate to the development and/ or implementation of guidance. Specific work will include amending the annual Budget Engineer Circular and the Environmental Stewardship budget program development manual to provide emphasis on new environmental threats or nationally significant resources that adjust to administration initiatives and priorities, national pollinator strategy and supporting land, water conservation, overall asset management, and continue efforts to prioritize Federal investment in environmental stewardship activities across the Nation. Funding to support the activities of the Stewardship Advisory Team (SAT) is included in this program. The SAT is composed of representatives from the division, district, and project levels of the Corps Environmental Stewardship Program. It provides input, advice, and support to the Corps strategic planning for the Environment-Stewardship business program.

(3) Information Exchange. These activities are designed to build, integrate, and share our knowledge base to support greater understanding of the environment and the impacts of program work. The development of the NRM Gateway to provide technical knowledge as well as improved understanding of interagency national programs that contribute to national priorities

ACCOMPLISHMENTS IN PRIOR YEARS: Components of the Environmental Stewardship portion of the NRM Gateway have been completed, including pollinator initiatives such as the National Pollinator Strategies and pollinator best management practices; posting of guidance, training modules and examples of Master Plan revisions to support increasing Master Plan development; and content specific information on invasive species especially those species that are causing eminent threats to Corps projects.

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2020

PROJECT NAME: Sustainable Rivers Program

Allocation in FY 2016	Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Budgeted Amount in FY 2020
\$ 1/	\$ 396,000	\$ 396,000	\$ 396,000 2/	\$ 500,000

1/ Prior to 2017, Sustainable Rivers Program was funded as part of the National Portfolio Assessment for Reallocations. This remaining item is the only national funding source for the Sustainable Rivers Program.

2/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2018 to FY 2019 was \$57,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2020 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: Specific project authorizations, Section 216 of the Rivers and Harbors and Flood Control Act of 1970.

DESCRIPTION: The Sustainable Rivers Program (SRP) was initiated in 2002 and is implemented in partnership with The Nature Conservancy and numerous other Federal, state, and nongovernmental partners. SRP efforts complement other reservoir-centric water resource projects by demonstrating that a strategic and science-based approach can be used at USACE projects to maintain or enhance benefits provided to the nation while reducing negative environmental consequences.

Annual funding is used to evaluate flows below specific USACE reservoirs and use the resulting information to inform project operations. USACE prioritizes work on reservoirs based on size, level of downstream influence, authorized purposes, and several other factors. The SRP process for implementation follows:

- Define the flows needed to maintain ecosystems in sustainable condition below USACE reservoirs;
- Perform trade-off analyses to quantify effects of potential reservoir reoperations;
- Implement and monitor operational changes to meet flow needs resulting from changes to the operation of particular reservoir systems;
- Assess the economic impacts or enhancements that result from operational changes; and
- Update reservoir management policies to ensure operations reflect current, increasing, and competing demands for water and associated effects on biodiversity.

These funds will be used to accomplish national and site work in accordance with the following SRP principles: 1) Build capacity within the water management community to implement environmental flows with little or no direct involvement of SRP resources; 2) Engage partners to focus on sustainability and avoid conflict, including Endangered Species Act (ESA) consultations; and 3) Advance innovative efforts to implement environmental flows.

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2020

PROJECT NAME: Veterans Curation Program and Collections Management 1/

Allocation in FY 2016	Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Budgeted Amount in FY 2020
\$	\$	\$	\$	\$
2/	6,435,000	6,435,000	6,435,000 3/	5,025,000

1/ The costs for this activity are accounted for evenly between the Navigation, Hydropower, Flood and Coastal Storm Damage Reduction, and Environmental Stewardship business lines.

2/ Prior to FY 2017, funding for this activity was appropriated under the NAGPRA/Curation line item.

3/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2018 to FY 2019 was \$46,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2020 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: The Curation of Federally Owned and Administered Archeological Collections (36 CFR Part 79), required by the Antiquities Act (16 U.S.C. 431-433), the Reservoir Salvage Act (16 U.S.C. 469-469c), the National Historic Preservation Act (16 U.S.C. 470h-2), and the Archaeological Resources Protection Act (16 U.S.C. 470aa-mm), requires Civil Works programs and projects to properly house their archaeological collections to federal standards. On 6 July 2016, H.R. 3114, a bill to support Wounded Warriors and Veterans through the formal recognition of the Chief of Engineers' Veterans Curation Program was signed by President Obama and is now Public Law 114-189. On 7 September 2017, a policy memo (Regionalization of U.S. Army Corps of Engineers Archaeological Collections to be managed by the Mandatory Center of Expertise MCX for the Curation and Management of Archaeological Collections (CMAC) was signed by the Director of Civil Works to designate the Mandatory Center of Expertise (MCX) CMAC to manage the Corps-wide regionalization effort.

DESCRIPTION: The Veterans Curation Program serves as a primary means of rehabilitating and processing archaeological collections owned and administered by the Corps to meet Federal standards. The Corps is responsible for the curation of an estimated 46,255 cubic feet of artifacts collected from its water resources development projects and an estimated 3,511 linear feet of associated records. Curation of these materials, which are over 80 percent of the total DoD collections and one of the largest volume of all Federal agencies responsible for this activity, is required by a number of public laws with implementing guidance in 36 CFR Part 79. These extensive collections are located in over one hundred fifty curation facilities across the nation. The Mandatory Center of Expertise, located at the St. Louis District, provides overall management of the Corps' collections management programs and serves as a centralized base for curation and collection compliance, an information source, and for contracting collections related services. The MCX leads the implementation of an agency-wide long-term plan for the curation and collections management of the Corps' archeological collections, which involves addressing the rehabilitation needs of the Corps' most critical archeological collections through the Veterans Curation Program (VCP). The MCX has been operating the VCP since 2009 to ensure proper processing of Corps archaeological collections through the employment and training of veterans. The MCX facilitates consistent nationwide curation and collections management programs implementation and operation. The MCX has accelerated the process of effectively managing the Corps curation effort with the VCP, which provides disabled veterans with employment and additional job skills in archaeological collections management, while providing for the rehabilitation of the fragile collections. The MCX, in providing collections assessments, has assisted in establishing the extent and locations of Corps holdings. The MCX has established standardized, uniform curation assessment procedures, which were used to assess all Corps collections, and is working to verify the long-term curatorial responsibilities for all collections. A phased task plan

Division: Mississippi Valley

District: St. Louis

Veterans Curation Program and Collections Management

using the VCP for appropriate processing and curation has been developed and is being implemented on at-risk collections. Data for Corps archaeological collections derived from prior year surveys of districts and from the VCP laboratories has also been used to populate an updated collections dataset that provides accurate accounting information for the total collections holdings of the Corps. These funds are used to fund MCX's operation of the VCP laboratories and expedite collection stabilization, proper storage, and collection management support to all districts.

The MCX continued to fulfill its chartered activities in support of Corps districts, other military services, and DoD. MCX leads in the implementation of an agency-wide, long-term plan for the curation of Corps archeological collections (heritage assets). The MCX continued to address the rehabilitation needs of the Corps' most critical archeological collections through the VCP. The staffing of veterans and the rehabilitation of at-risk archaeological materials and associated records in FY 2017 was 89 veterans employed by the five labs, which included the first full year of veterans in an expanded Alexandria laboratory, as well as in two smaller laboratories established at Arizona State University (ASU) and at the reservation for the Confederated Tribes of the Colville Reservation. ASU maintains a digital repository known as the Digital Archaeological Record (tDAR) and the artifacts and records being rehabilitated by all VCP labs began being placed on tDAR in FY2017. This provides educators, researchers, and the public digital access to this material. In FY2017, the process of entering VCP digital collections data for tDAR was done by ASU student veterans as part of the VCP. VCP graduate veterans are also being hired by other contractors working on rehabilitation of collections under the consolidation effort. At the end of FY2017, the program had employed 418 veterans since its inception in 2009. For the collections management program, MCX continued to populate a database that was developed to track Corps collections. Data in the database is being drawn from the VCP, consolidation research, and data provided by districts. MCX continues to work with MSCs on consolidation plans for their collections. NWD and SPD continued their real estate research to identify the collections for which they have long-term responsibility. MVD established one regional repository which now houses all collections from two districts and hosted two tribal consultation meetings on this effort. Regionalization discussions were initiated within SWD, LRD, and NAD.

Annual funding is used to implement the agency-wide long-term plan for the curation and collections management of Corps archeological collections through the Veterans Curation Program.

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2020

PROJECT NAME: Waterborne Commerce Statistics – Navigation

Allocation in FY 2016	Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Budgeted Amount in FY 2020
\$ 4,772,000	\$ 4,622,000	\$ 5,534,000	\$ 6,148,000 1/	\$ 4,200,000

1/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2018 to FY 2019 was \$105,000. There was an additional \$2,000 of unobligated funds that are committed within the Corps for scheduled ongoing requirements in FY 2019. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2020 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: Section 3 of the 1945 River and Harbor Act (as amended by Section 915 (g) of the Water Resources Development Act of 1986); Sections 15, 19, and 20 of the Rivers and Harbors Act of 1899, as amended; River and Harbor Act of 1922 as amended; Public Law (P.L.) 103-182.

DESCRIPTION: The Corps serves as the Federal central collection agency, and is the sole U.S. Government source for U.S. domestic waterborne commerce and vessel statistics. The Office of Management and Budget (OMB) pursuant to Title 44 U.S.C. 3509 and 3510 transferred primary responsibility for U.S. foreign waterborne transportation statistics mission from the Bureau of the Census to the Corps in 1998. Funding for this activity is used to develop data that provide essential information for navigation project investment analyses and annual funding prioritization for operation and maintenance of existing projects; as project output information for computation of performance measures; for input into the U.S. National Accounts; and for regulatory compliance, emergency management decisions, and homeland defense. Activities supporting this national statistics mission include:

- a. Collecting and reporting of water transportation statistical data. Under Federal law, vessel operating companies must report domestic waterborne commercial movements to the Corps;
- b. Developing and operating automated systems (transactional systems within Operation and Maintenance corporate information system), processing, compiling, and publishing statistical data and information on waterborne commerce and vessels moving on the internal U.S. waterways, the Great Lakes, and through all U.S. ocean channels and ports;
- c. Documenting and publishing the Nation's commercial port infrastructure served by Federal channels;
- d. Documenting and publishing the U.S. vessels available for operation in waterborne commerce, their principal trades and zones of operation; and
- e. Acquiring and using software tools for program analysis, diagnostics and quality control. This item is reported under Civil Works Business Intelligence (CWBI) in Information Technology Investment Portfolio System (ITIPS) and the OMB 300b.

The budgeted funding funds will be used to perform operation, maintenance and necessary enhancements of the nation's waterborne commerce, vessel and shipper data and statistics programs. Funds will also be used to increase project detail data requirements for budget submission and economic justification and to collaborate with partner agencies to improve navigation data from a Federal perspective including, Institute for Water Resources

Waterborne Commerce Statistics

acquiring and using software tools for program analysis, diagnostics and quality control. Implementation, with continued modification of Corps automated systems, to accept new domestic electronic data to improve accuracy of domestic statistics; and modification of programs to integrate U.S. foreign import/export data from the International Trade Data System and U.S. Customs and Border Protection (CBP) to improve processing efficiency and accuracy of foreign transportation statistics in accordance with Executive Order 13659, *Streamlining the Export/Import Process for American's Businesses* (Executive Order), signed on February 19, 2014 by President Obama. Among other things, this Executive Order mandated the completion and government-wide utilization of the International Trade Data System. When implemented, the International Trade Data System will provide an automated and electronic single window for businesses to provide the information required by government for the export or import of cargo and for government agencies to download their required datasets.

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2020

PROJECT NAME: Water Operations Technical Support (WOTS) – Flood and Storm Damage Reduction

Allocation in FY 2016	Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Budgeted Amount in FY 2020
\$ 5,445,000	\$ 5,445,000	\$ 5,445,000	\$ 7,920,000 1/	\$ 500,000

1/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2018 to FY 2019 was \$157,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2020 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: The basic authority for this program is 33 U.S.C. 426a, which originated with the River and Harbor Act of 1945, which in turn originated in the River and Harbor Act of 1930. In addition, Public Law 99-802, Federal Technology Transfer Act of 1986, requires technology transfer from Federal agencies to the private sector.

DESCRIPTION: The Corps uses this funding to identify, develop, and share innovative concepts and technologies that will support sustainable engineering solutions to complex environmental problems at Corps projects nationwide. The Corps also uses these funds to manage its efforts to apply these concepts and technologies consistently, both at the project level and when responding to requests by others for technical assistance.

This research and technology transfer is part of the overall effort of the Corps to comply with the environmental laws that apply to its projects. It uses this funding to assist that effort on environmental issues such as: problems caused by aquatic invasive species; water quality impacts of land use, sediment and nutrient loadings, erosion, and reservoir sedimentation; tailwater fisheries concerns at pump-back hydropower projects; enhancement of habitat for aquatic endangered species at risk; and project operations related to environmental and water quality. For example, the Corps uses this funding to support the incorporation of Green Infrastructure and Low Impact Development (GI-LID) technologies at its projects, through integration of Engineering with Nature (EWN) principles, in support of its environmental objectives.

The Corps conveys these concepts and technologies through the best available mechanisms, such as direct technical assistance, specialty workshops, information bulletins, technical notes, executive notes, technical reports, webinars, miscellaneous papers, instruction manuals, videos, meetings, seminars, briefings, and the Internet.

From FY 2015 through FY 2019, the Corps also used this funding for a study of atmospheric rivers and their effects on possible options to improve Corps reservoir operations. This study involved research and development of a concept called Forecast Informed Reservoir Operations (FIRO). The effort consisted of investigating the feasibility of using predictive capabilities of atmospheric river events to inform reservoir operations at Corps dams in the Western United States. Prior year funds focused on two main areas: 1) quantifying the predictability of atmospheric rivers in timing and location of precipitation and the resulting stream flow; and 2) developing a prototype reservoir operations simulator for the pilot watershed and reservoir, Lake Mendocino, on which to test alternative operations scenarios. Current efforts include: 1) conducting retrospective evaluations of events over the past 20 years of record using potential alternative operations scenarios; and 2) designing a demonstration prototype system for conducting quantitative evaluation of a FIRO-based system.

Engineer Research and Development Center

Water Operations Technical Support (WOTS)

APPROPRIATION TITLE: Harbor Maintenance Trust Fund - Construction, Fiscal Year 2020

PROJECT NAME: Continuing Authorities Projects Not Requiring Specific Legislation (Continuing Authorities Program (CAP))

Beneficial Uses of Dredged Material (CAP Section 204)

	Allocation for FY 2015	Allocation for FY 2016	Allocation for FY 2017	Allocation for FY 2018	Allocation in FY 2019 2/	Budgeted Amount in FY 2020
CAP Section 204 1/	\$3,500,000	\$ 500,000	\$ 1,000,000	\$ 1,500,000	\$ 10,000,000	\$1,000,000

1/ Non-Federal interests are required to share in a minimum of 35 percent of the implementation cost of construction including provision of all lands, easements, rights-of-way, and necessary relocations.

2/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2018 to FY 2019 was \$1,802,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into FY 2020 from prior appropriations for use on this effort is less than \$5,000,000. This amount will be used to perform work on the project as follows: Continue planning, design, coordination, and construction activities.

AUTHORIZATION: Section 204 of the Water Resources Development Act (WRDA) of 1992 (PL 102-580), as amended.

DESCRIPTION: Annual funding is used to investigate, design, and construct projects using sediment obtained through the construction, operation or maintenance of an authorized Federal navigation project that will restore or create aquatic habitat, including wetlands. Not more than \$10,000,000 in Federal funds may be allocated to investigate, design, and/or construct a single modification or measure. Up to \$62,500,000 may be appropriated per fiscal year to the Section 204 program.

APPROPRIATION: Harbor Maintenance Trust Fund, Fiscal Year 2020

PROJECT NAME: Dredge McFarland Ready Reserve – Navigation

Allocation in FY 2016	Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Budgeted Amount in FY 2020
\$11,573,000	\$11,573,000	\$11,573,000	\$11,573,000 1/	\$10,521,000

1/ Unobligated Carry-in Funding: The actual unobligated carry-in from Fiscal Year (FY) 2018 to FY 2019 was \$0. There was an additional \$0 of unobligated funds that are committed within the Corps for scheduled ongoing requirements in FY 2019. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2020 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: Water Resources Development Act (WRDA) of 1996 (PL 104–303) as modified by Section 2047 of WRDA 2007 (PL 110-114), which limits use of the dredge solely for urgent and emergency purposes and limited training days.

DESCRIPTION: The Government dredge McFarland was placed in ready reserve status in December 2009. The dredge will be placed in an active status in order to perform work in those instances when private industry fails to submit a responsive or responsible bid for advertised dredging, or where industry has failed to perform under an existing contract or other urgent or emergency requirements as determined by the Secretary.

This funding is used to maintain the dredge McFarland in ready reserve status with sufficient crew to respond within 72 hours when directed to do so for urgent and emergency purposes, and to perform 70 days of required training work in the Delaware River and Bay as specified in its authorization, with dredging work charged to the project dredged.

In FY 2018, the Government dredge McFarland performed 70 days of required training work in the Delaware River and Bay with dredging work charged to the project dredged. The dredge was also activated for assignments in Wilmington District for the Morehead City Harbor, NC project and in Galveston District for the Brazos Island Harbor, TX project for a combined total of 129 days of dredging.

APPROPRIATION TITLE: Harbor Maintenance Trust Fund, Fiscal Year 2020

PROJECT NAME: Dredge Wheeler Ready Reserve, LA— Navigation

Allocation in FY 2016	Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Budgeted Amount in FY 2020
\$14,850,000	\$14,850,000	\$14,850,000	\$14,850,000 1/	\$13,500,000

1/ Unobligated Carry-in Funding: The actual unobligated carry-in from Fiscal Year (FY) 2018 to FY 2019 was \$520,000. There was an additional \$0 of unobligated funds that are committed within the Corps for scheduled ongoing requirements in FY 2019. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2020 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: Section 237 of the Water Resources Development Act (WRDA) of 1996 contained a provision requiring the Corps Hopper Dredge Wheeler placed in a ready reserve status.

DESCRIPTION: The hopper dredge Wheeler is docked at the U.S. Army Corps of Engineers' New Orleans District. Section 237 of WRDA 1996 requires that no individual project funds may be used to fund the dredge in its ready reserve status unless the dredge is specifically used in conjunction with a project. The dredge Wheeler is funded out of project funds when it is performing dredging during readiness exercises or when the dredge is activated to perform work on a project. During September 1982, the dredge was placed in an active service status in order to perform work in those instances when private industry fails to submit a responsive or responsible bid for advertised dredging, or where industry has failed to perform under an existing contract. The Wheeler has been called out to perform urgent dredging to assist industry dredges in restoring navigation channels and waterways most years since it was placed in Ready Reserve on October 1, 1997.

This funding is used to maintain the Wheeler in ready reserve status, and will not be assigned any scheduled hopper dredging work other than 70 days of maintenance dredging that will be completed in conjunction with readiness exercises to maintain the skills of the crew, and ensure that the Wheeler remains in a fully operational state, ready to respond to any emergent dredging requirements. The Wheeler will remain at the dock, with sufficient crew to respond within 72 hours when directed to do so.

During Fiscal Year (FY) 2018, the Wheeler completed 136 days dredging through a combination of readiness exercises and multiple deployments by Headquarters, U.S. Army Corps of Engineers, to perform urgent dredging on the Mississippi River and the Calcasieu River Bar Channel.

APPROPRIATION TITLE: Harbor Maintenance Trust Fund, Fiscal Year 2020

PROJECT NAME: Harbor Maintenance Fee Data Collection – Navigation

Allocation in FY 2016	Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Budgeted Amount in FY 2020
\$ 787,000	\$ 787,000	\$ 787,000	\$ 932,000 1/	\$ 795,000

1/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2018 to FY 2019 was \$62,000. There was an additional \$0 of unobligated funds that are committed within the Corps for scheduled ongoing requirements in FY 2019. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2020 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: Section 3 of the 1945 River and Harbor Act (as amended by Section 915 (g) of the Water Resources Development Act of 1986).

DESCRIPTION: Up to \$5,000,000 is authorized to be used annually for the administration of the Harbor Maintenance Trust Fund (HMTF). Most of these funds are used by U.S. Customs and Border Protection (CBP). The Corps performs analyses of the HMTF revenues and transfers to document the operation of the trust fund and to prepare and distribute the Annual Report to Congress on the Status of the Harbor Maintenance Trust Fund. Analysis of waterborne commerce shipments and vessel movement data is also needed to respond to legal questions to the Harbor Maintenance Tax (HMT); to analyze alternative funding options; and to assess the economic and competitiveness impacts of other potential funding sources. The Corps is also required to collect data on foreign and domestic shippers subject to the fee. Therefore, the Corps requires a portion of the administrative funding to continue its ongoing HMTF support efforts. The General Accountability Office (GAO) issued its final report (GAO-08-321), which recommended that the CBP and the Corps improve their coordination and procedures in order to increase HMT collections by auditing domestic shippers failing to pay or underpaying the HMT mandated by law. This item is reported under CWBI in ITIPS and the OMB 300b.

Annual funding will be used by the Corps to document the operation of the trust fund, analyze waterborne commerce shipments and vessel movement data to respond to legal questions to the HMT and the increasing requests for HMTF data/analyses, collaborate with CBP to improve CBP-Corps data communication systems to target delinquent domestic shippers for audit to increase HMT collections, continue ongoing HMT data collection and analysis programs, and to develop and implement improved data collection processes and systems and data analysis models and program computer enhancements to provide more complete/accurate domestic shipper information, as well as, the origin/destination of the vessel movements in order to more accurately identify those moves subject to the HMT.

APPROPRIATION TITLE: Harbor Maintenance Trust Fund, Fiscal Year 2020

PROJECT NAME: Project Condition Surveys

Allocation in FY 2016	Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Budgeted Amount in FY 2020
\$	\$	\$	\$	\$
17,572,000 2/	18,915,000 2/	19,094,000 2/	19,845,000 1/ 2/	20,087,000

AUTHORIZATION: Public Law 85-480, approved in 1958 authorizes the Chief of Engineers to publish information, including condition surveys that may be of value to the general public.

DESCRIPTION: This national program consists of performing hydrographic and topographic project condition surveys (PCS) for Federally-authorized navigation projects, including navigation channels, inlets, anchorages, structures such as jetties and breakwaters, and other navigation features within the states. The surveys are used to ascertain channel and structure conditions and disseminate the conditions to users of the waterways and to plan future channel and structure maintenance activities. Funds are also used to respond to unanticipated needs, including concerns raised by the U.S. Coast Guard, local harbor masters, or other agencies regarding projects that have become shoaled as a result of severe storms and/or abnormal deposition rates that may have compromised safe navigation. The selection of which projects to survey and scheduling of surveys is based upon channel usage, shoaling rates, maintenance dredging schedules, and when that project was last surveyed. The surveys are generally conducted on a rotational basis, taking into account the expected sedimentation rates and historic maintenance. This generally includes projects that do not routinely receive O&M appropriations and that are not regularly maintained. For those projects scheduled to be dredged or maintained in the budget year, funds for PCS of the project are included within that project.

1/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2018 to FY 2019 was \$4,868,000. There was an additional \$62,000 of unobligated funds that are committed within in the Corps for scheduled ongoing requirements in FY2019. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into FY 2020 from prior appropriations for use on this effort is \$0.

2/ Funded out of the Operation and Maintenance account.

APPROPRIATION TITLE: Harbor Maintenance Trust Fund, Fiscal Year 2020

PROJECT NAME: Surveillance of Northern Boundary Waters 1/

Allocation in FY 2016	Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Budgeted Amount in FY 2020
\$	\$	\$	\$	\$
10,128,000 2/	11,928,000 2/ 3/	14,914,000 2/ 4/	15,592,000 2/ 5/ 6/	6,716,000

AUTHORIZATION: Boundary Waters Treaty of 1909

DESCRIPTION: The Corps uses this funding for its work on the waters that cross or are along the Canada-United States northern boundary, including the Great Lakes, Puget Sound, the Columbia River, Lake Champlain, and the Bay of Fundy. These waters are subject to International Boundary Waters Treaties and other agreements between the U.S. and Canada. The Corps conducts this work mainly under the Boundary Waters Treaty of 1909, including technical and secretarial support of the International Joint Commission (IJC), its Boards of Control, Committees, and other various study boards. These activities support the principles and mechanisms to help resolve disputes and to prevent future ones, primarily those concerning water quantity and water quality, along the boundary between Canada and the United States.

The Corps uses this funding to monitor and approve international apportionments of water; forecast lake levels and river flows during periods of high or low water; collect, analyze and maintain hydrometeorologic data, including post-flood reports; monitor flood operations; assist in transboundary dispute resolution; and prepare and disseminate information to the public. For example, the Corps uses this funding for technical activities associated with the Board of Control for the Great Lakes. This Board considers water levels and outflows in the Great Lakes, which affect shipping and dredging costs.

1/ The cost of this activity is accounted for in the Flood and Coastal Storm Damage Reduction program.

2/ Funded from the Operation and Maintenance account.

3/ The FY 2017 allocation included \$5.3 million for Columbia River Treaty 2024 Implementation efforts.

4/ The FY 2018 allocation included \$9.5 million for Columbia River Treaty 2024 Implementation efforts.

5/ The FY 2019 allocation included \$10.3 million for Columbia River Treaty 2024 implementation efforts, but the continued funding for those efforts was moved to the Investigations account in FY 2020 due to the nature, magnitude, and duration of the required work.

6/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2018 to FY 2019 was \$2,328,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2020 from prior appropriations for use on this effort is \$0.

APPROPRIATION TITLE: Mississippi River and Tributaries, Fiscal Year 2020

PROJECT NAME: Collection and Study of Basic Data, Investigations – Flood Damage Reduction

Allocation in FY 2016	Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Budgeted Amount in FY 2020
\$ 9,700,000 1/	\$ 7,000,000	\$ 5,660,000	\$ 7,800,000 2/	\$ 4,960,000

AUTHORIZATION: The Flood Control Act of 1928.

DESCRIPTION: The Corps uses this funding to collect and analyze system-wide data on the water and related land resources of the lower Mississippi River and its alluvial valley, develop the modeling capabilities and other tools and techniques needed to support that analysis, and replace and repair stage gages. This work will improve our basic understanding of the river, its impacts, and the way that it has evolved and is changing. These analyses will inform how the Corps manages the interrelated features of the Lower Mississippi River Main Stem (LMRMS) project to achieve their authorized purposes. The LMRMS project helps to reduce the risk of flood damage to a large region and to human safety, while supporting commercial navigation.

This data collection and analysis will support a more risk-informed, system-wide approach by the Corps to its management of this river. For example, the Corps is conducting system-wide geomorphic, hydraulic, and sedimentation technical investigations that improve our understanding of the stage-discharge relationships, and their effects on river stages and sedimentation. The Corps is evaluating the transport of water and sediment throughout the complex system at the lower end of the river (which includes the Old River Control Complex, Mississippi River, Atchafalaya River, and Red River) to inform options for addressing excess sediment deposition and increased flood risk, and support water control operations. The Corps also uses this funding for system-wide scientific field evaluations that will support conservation measures to maintain and improve habitat values for the recovery of listed species on this river.

1/ \$3,400,000 reprogrammed away from this line item in FY 2016.

2/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2018 to FY 2019 was \$1,418,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2020 from prior appropriations for use on this effort is \$0.

Division: Mississippi Valley

District: Memphis, Vicksburg,
and New Orleans

Collection and Study of Basic Data,
AR, IL, KY, LA, MS, MO, and TN

APPROPRIATION TITLE: Mississippi River and Tributaries, Fiscal Year 2020

PROJECT NAME: Mississippi River Commission (New) 1/

Allocation in FY 2016	Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Budgeted Amount in FY 2020
\$ N/A	\$ N/A	\$ N/A	\$ N/A	\$ 90,000

1/ This activity is funded at 100 percent Federal expense.

LOCATION: Mississippi Valley Division

DESCRIPTION: The Mississippi River Commission works with stakeholders in the lower Mississippi River valley and its tributaries, and with the U.S. Army Corps of Engineers on the flood damage reduction challenges posed by the river. Mississippi River Commission expenses are for the three presidentially appointed Civilian Members.

AUTHORIZATION: The Mississippi River Commission (MRC) was established by the 1879 Mississippi River Commission Act, Sixth Congress, Session I Ch. 43. 1879 (now codified in 33 U.S.C. 641). The Commission's authorities include those codified in 33 U.S.C. 641 – 653a and 33 U.S.C. 702h.

JUSTIFICATION: The purpose of this line item is to provide transparency on the expenses incurred by the Mississippi River Commission and to keep track of those costs over time.

FISCAL YEAR 2020: The budget amount of \$90,000 will be applied as follows:

Civilian Members Stipends and associated travel	\$90,000
Total	\$90,000

PROPOSED ACTIVITIES FOR FISCAL YEAR 2020: The Corps will use this funding to cover the expenses for three Civilian Members (including a stipend of \$21,500 for each of them annually) and their associated travel expenses. The remaining four Commission Members are military officers, who receive no extra compensation for their service on the Commission.

APPROPRIATION TITLE: Mississippi River and Tributaries, Fiscal Year 2020

PROJECT NAME: Inspection of Completed Works, AR, IL, KY, LA, MS, MO, and TN (Flood and Storm Damage Reduction) – Operation and Maintenance

Allocation in FY 2016	Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Budgeted Amount in FY 2020
\$ 2,795,000	\$ 3,117,000	\$ 2,924,000	\$ 1,694,000 1/	\$ 1,417,000

1/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2018 to FY 2019 was \$157,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2020 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: The Rivers and Harbors Act of 1899 (30 Stat. 1151) and the Flood Control Act of May 15, 1928 (70th Congress, 1st session, Ch. 596).

DESCRIPTION: The Corps uses this funding to inspect levee systems that it constructed on the main stem of the Lower Mississippi River and on its tributaries. In this watershed, the Corps generally is responsible for major maintenance of these levee systems, while local entities such as a levee district generally are responsible for routine maintenance.

During the inspection, the Corps notes any changes in the condition of the levee system since the last inspection, and identifies any deficiencies or other concerns that may warrant repair or monitoring. The Corps uses this information to understand the key risk drivers of each levee system. The Corps provides the results of the inspection to the local entity, and updates this information in the National Levee Database.

The Corps also uses the information that it collects through these inspections to decide whether it will undertake a more detailed risk assessment of a particular levee system. Where it does so, the Corps would use this funding to perform the risk assessment.

The Corps also uses this information to develop an emergency action plan for each project. These plans identify, based on the condition of each levee system, the flood stages that will guide or trigger actions by the Corps, and state and local authorities, to reduce the risk of loss of life and property damage during a flood.

Division: Mississippi Valley

Memphis, Vicksburg, and
New Orleans Districts

Inspection of Completed Works, AR,
IL, KY, LA, MS, MO, and TN

APPROPRIATION TITLE: Mississippi River and Tributaries, Fiscal Year 2020

PROJECT NAME: Mapping, AR, IL, KY, LA, MS, MO, & TN – Operation and Maintenance

Allocation in FY 2016	Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Budgeted Amount in FY 2020
\$ 1,138,000	\$ 1,127,000	\$ 1,139,000	\$ 819,000 1/	\$ 1,219,000

1/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2018 to FY 2019 was \$12,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2020 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: The Flood Control Acts of 1928 (P.L. 70-391) and 1937 (P.L. 75-406)

DESCRIPTION: The Corps uses this funding to prepare and update topographic maps of the alluvial valley of the lower Mississippi River and its tributaries, with emphasis on the projects that the Corps has constructed in this region. The Corps uses these updates in its engineering studies and to inform its decisions on the operation of individual projects (e.g., flood and floodplain management, and navigation channel identification). It also uses them to track changes to the main stem of the lower Mississippi River over time.

The Corps uses these digitally converted quadrangle maps in the computer-aided design environment for a multitude of applications, including geographic information systems and historical data preservation.

Division: Mississippi Valley

District: Memphis, Vicksburg,
and New Orleans

Mapping, AR, IL, KY,
LA, MS, MO, & TN