



US Army Corps  
of Engineers®

# Inland Marine Transportation System Progress Report





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of Engineers®

# IMTS Progress Report

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Send questions, comments or suggestions to [IMTS@usace.army.mil](mailto:IMTS@usace.army.mil)

# History

The U.S. Army Corps of Engineers (USACE) launched the Inland Marine Transportation System (IMTS) Implementation Plan and Execution Strategy in Fiscal Year 09. The IMTS Board of Directors (BoD) and Working Group (WG) were created to implement the 115 improvement ideas that came from the USACE Navigation workforce and industry during a study conducted 2006-2008. The Nav-Locks Study's intent was to create a high-performing organization, or HPO, resulting in the IMTS Improvement Report and Implementation Plan. The 115 ideas were consolidated into

business organizations in the private sector.

The creation of the IMTS Implementation Plan did not create a new national organization or cause any major disruption to the existing workforce. Rather, the IMTS BoD and WG have been strengthening the existing chain of command and using existing employees in virtual teams to implement the ideas for improvements. More details on the IMTS are in the final report from the study and are available at <https://cops.usace.army.mil/sites/NAV/IMTS/wg/Navlocks%20Report%20-%20Final%202Sep08> Questions, comments or suggestions

can also be sent by e-mail to [IMTS@USACE.army.mil](mailto:IMTS@USACE.army.mil).

Since its launch the IMTS WG and numerous action teams have accomplished much of the initial work prescribed in the BPRs plus other actions tasked by the IMTS BoD. The BoD is chaired by the Deputy Commanding General for Civil and Emergency Operations, MG Donald E. Jackson, Jr., and composed of the Major Subordinate Command (MSC) commanders and the chief of the Operations Di-



**Lock dewatering 2016:**  
Lock 13 Upper Mississippi River  
MVR District.

25 major Business Process Review (BPR) topics and were placed under three major categories referred to as pillars (Human Capital, Operations and System Availability). The study focused on how to improve the USACE business practices (how we do our work). This type of study has been a standard practice of modern

Figure 1 (see pg. 15) vision at HQ USACE.

The BoD oversees the IMTS WG. The WG is the executive agent of the BoD and is comprised of staff from MSCs with a navigation mission. The WG reports directly to the BoD. Members of the WG are a diverse set of subject matter experts that ensure an adequate and appropriate cross-section of operation and engineering skills and experience.

# Vision

## *The three major elements in the IMTS vision*

### **World Class Maintenance Management System**

We have a national Maintenance Standard in place that is updated periodically with critical information for both our workforce and for customers. This Standard is being supplemented with Division Maintenance Standards. IMTS is totally aligned with the national Asset Management (AM) Program and the Inland Navigation Design Center (INDC).

Together, these represent the cornerstone of our Maintenance Management system. The AM program supports USACE's strategic plan and performance measures, institutionalize a system-wide approach in the use and investment of as-

sets and establishes an integrated USACE-wide standard asset management process within and across business lines with respect to inventory, condition, and quantification of risk.

The IMTS and MSC Maintenance Standards set the logistics of implementing the AM program, setting schedules for dewaterings, major maintenance and other activities. The IMTS has also regionalized much of our maintenance crews, allowing more efficient use of labor, equipment and resources across district and MSC boundaries.

The INDC works to standardize facility components for more efficient and cost-effective repair and replacement of components (e.g., miter gates) plus storage of components resulting in reduced inven-

tory needs and costs. We are also strengthening our coordination with our customers in regard to schedules for major maintenance to minimize the impacts to customers.

### **Lock Operations with Stronger Customer Focus**

We already have in place standard processes for locking procedures, crew change policy and major improvements in communications with our customers. The River Information System (RIS) will develop a user-friendly, internet-based suite of services where all partners in the waterway can view shared, "harmonized" data. This will help the IMTS boundaries be more transparent to the users of the system.

### **Enhanced Processes for IMTS Workforce**

We have in place a process to develop our lock operators as trained and certified members of IMTS. We have standard job descriptions for lock operators and will be working to standardize other job descriptions such as maintenance crews. This will help with recruitment and hiring timelines. We are working to further enhance the hiring process to fill vacancies without long delays. We are working to optimize shift schedules for workers on rotational shifts to improve safety and to improve the quality of life for the workforce. We have also finalized guidance for uniform programs, to be developed at the district levels.



Figure 2 (see pg. 12)

**IMTS Working Group Meeting (2016) - Working group members sitting from left to right:** Sheryl Carrubba, NWD; Andy Harkness, INDC; Eddie Wiggins, ERDC; Russ Tolle, HQ; Pat Chambers, LRD; James McKinney. **SWL; Back row from left to right:** Kevin Baumgard, MVP; Doug Ellsworth, HQ; Rich Thorsen, NAD; Stephen (Scott) Beams, SAM; John Cheek, LRD.

# IMTS Progress to Date

The following are improvement ideas related to establishing a consistent, uniform approach to IMTS workforce policies and procedures. IMTS accomplishments to date include the following completed or nearly completed items. The items are listed under the appropriate pillar. These three pillars - Human Capital, Operations and System Availability - are of equal importance to improving system reliability.

## Human Capital

BPR Topics plus other items that relate to the Navigation workforce including training, certification, work shifts and staffing:

**Lock Operator's Training & Certification** - Developed standardized, nationwide training and certification for new lock operators.

**Standardized Lock Position Descriptions (PDs)** - Developed standardized PDs and associated job titles for IMTS lock personnel and entered them into national database.

**Standard Staffing Models** - Developed and implemented IMTS staffing guide as a best practice for operational (which includes minor maintenance) staffing at lock sites.

**Standard IMTS Uniforms** - Developed national plan for standardizing work uniforms for lock operators.

**HR Center of Standardization** - Established a center of expertise to provide consistent guidance for updating personnel actions.

**Enhance hiring process for lock operators** - Reduced time to back-

fill positions by standardizing hiring processes and planning for expected turnover.

**Improve Alignment of IMTS Administrative Tasks** - Provided staffing guidance for administrative personnel to include all appropriate permissions and authorities to perform duties.

**Supervisor Training** - Enforcing mandatory completion of supervisory development courses for new supervisors. Expanded opportunities for additional supervisory training.

**Lock Operations Workshop** - Established a bi-annual workshop national workshop on lock operations to expand sharing of IMTS knowledge and information. This provides similar opportunities and benefits as the National Maintenance Workshops to a different audience.

## Operations

BPR Topics plus other items that focus on the critical business and operations processes of the IMTS including standardizing and streamlining practices to facilitate easy transit through a series of locks and establishing a standard set of operating practices:

**Lock Levels of Service** - Utilized a formal decision process to identify Navigation locks that have an opportunity for reduced hours of operation.



**Lock dewatering 2016:**  
Lock 16 MKARNS (McClellan- Kerr Arkansas River Navigation System)  
SWT District

Figure 3 (see pg. 16)

## **IMTS Booklet for Equipment**

**Acquisition** - Proposed standardized sizes and shapes of USACE plant assets and drafted recommended revisions to Engineering Regulation (ER 1130-2-500).

## **Plant Replacement & Improvement Program (PRIP) user guide**

- Drafted recommended improvements to plant asset replacement to expedite acquisition and reduce costs.

## **Tow Boat Crew Change Policy**

- Established standardized methods for accomplishing tow boat crew changes at lock sites (this has been overcome by security issues).

## **System Availability**

BPR Topics plus other items focused on the system's ability to provide unrestricted passage including coordination of major maintenance activities, means of sharing lessons-learned, and equipment pools for faster access to leased or owned equipment.

## **National Maintenance Workshops - Annual**

- Established national workshop on lock maintenance to expand sharing of IMTS knowledge and information. These workshops provide opportunities to exchange successes, challenges, and ways forward to ensure sustained project performance. These also provide awareness of research and innovative technology development (see Fig. 5, 6).

## **National Maintenance Standards, both national & regional & Interlock Standards**

- Established and implemented a national stan-

dard maintenance management system through a National Maintenance Standard, supplemented by MSC Maintenance Standards and aligned with USACE's national Asset Management Program.

## **IMTS alignment with Asset Management (includes FEM, OCAs and MMIP Implementation)**

- Asset Management is an important addition to a smart long-term planning strategy for O&M to extend the useful life of the infrastructure in an environment of constrained funding and the IMTS Implementation Plan is part of that long-term strategy.

## **Lock Operations Management Application (LOMA)/Automatic Identification Systems (AIS)**

- In concert with the Coast Guard requirement for commercial vessels to carry AIS equipment, the LOMA concept is to provide to the navigation community (lock operators, district managers, vessel operators, etc.) navigation information, in an easy to understand format, that will expand situational awareness, improve navigation safety, and promote better, more efficient communications within the community.

## **Capital Projects Business**

**Model 2010** - USACE and the Inland Waterways community established a capital investment strategy that looked at what needs to be done, developing a priority for that work, determining the level of investment to continue to be successful in the navigation mission and developing cost-sharing alternatives and finally a revenue method, and presented it to the Inland Waterways Users Board (IWUB). On 13 April

2010 the IWUB unanimously approved and adopted this report and transmitted the report to the Assistant Secretary of the Army for Civil Works (ASA(CW)). They requested that the Administration adopt and implement those recommendations of the report within the purview of the Administration.

## **Capital Investment Strategy (transmitted to Congress 24 March 2016)**

- This planning report is a follow up to the 2010 Capital Projects Business Model strategy and was prepared in response to Section 2002 of the Water Resources Reform and Development Act of 2014. This represents a cooperative effort between the U.S. Army Corps of Engineers and inland navigation stakeholders.

**IMTS Progress to Date**-Of the original 115 improvement ideas, the WG has completed 70 (approx. 60 percent). They have recently updated the BPR list, coordinated with HQ and MSCs and have prioritized the remaining improvement ideas.

# Ongoing and New Activities

The following Action Teams have recently been developed to address high priority BPRs from 2008 Report:

**Schedule and Budget Major Maintenance (MM) (System Availability pillar)** – This Action Team is forming to address BPR #16. It has been determined that Asset Management efforts are addressing the budgeting of MM, therefore this team will focus on scheduling and coordination. Primary focus will be scheduling lock closures so as to minimize impact on navigation, and ensure system-wide coordination and communication with the navigation industry at all levels. Scheduling of MM will primarily be at the MSC level.

**Optimize Shift Schedules (Human Capital pillar)** – This Action Team is forming to address BPR #18. Objective is to maximize the use of family-friendly, practical shifts for IMTS. This team will review shift schedules and practices for compliance with EM 385-1-1 and circadian-cycle best practices and assure they are in compliance with federal regulations.

**Acquisition of Land and Floating Plant Equipment (Operations pillar)** - This Action Team is forming to address BPR #12. In order to increase consistency and reduce cost, this team will consider standardized sizes and configurations for USACE plant assets. This team may also recommend changes to ER 1130-2-500 with regards to plant acquisition and cost accounting.

**Strengthen Leadership and Management (Human Capital pillar)** - This Action Team is forming to address BPR #4. Team objective is to share best practices and develop specific performance goals for lock supervisors and managers. This team will also encourage leadership training to include developmental assignments at districts, MSCs and HQ.

**Recreational Lockage (Operations pillar)** - This Action Team has structured a generic tri-fold pamphlet to provide recreational mariners guidance for locking



**Lock Dewatering 2016:**  
Lock 16 MKARNS Miter Gate Maintenance.  
SWT District

Figure 4 (see pg. 16)

through USACE locks. This effort is intended to standardize recreational lockage procedures, communication processes and consistency as much as is practical. Due to Code of Federal Regulations (CFR) differences around the country, the ‘one size fits all’ is not feasible. The team is also working with HQUSACE PAO to set up a web-site for recreational users to select the locks they will use for site-specific guidance. Some information has already been uploaded (more will follow soon) and can be viewed using the following link: <http://www.usace.army.mil/Missions/Civil-Works/Navigation-Locks/>.

## Monitoring & Other Activities

IMTS also performs monitoring activities including measuring the progress and levels of implementation of completed projects and reviewing completed reports to ensure they are sustained as up-to-date, usable resources. Reviews are performed as needed to ensure continued relevance, and typically reviewed at least every five years.

Examples include the *IMTS Maintenance Standard*. This was recently updated to better align with the USACE national Asset Management (AM) program and, more specifically, the USACE Maintenance Management Improvement Plan or MMIP as commonly known.

The purpose of this Standard is to develop a systemic program of inspection, preventative maintenance, repair, and replacement of IMTS equipment and facilities to ensure optimal utilization and resiliency of equipment and facilities throughout the IMTS consistent with applicable regulations and the AM Program. The main focus of the Standard is the maintenance management and execution, rather than the detailed prescription of how to perform maintenance. The intent is to enhance reliability, resiliency, efficiency, emergency response capability, and safety of IMTS by system-wide standardization of best business practices related to maintenance based upon risk-informed considerations and priorities.

A standard risk-informed decision making process can help quantify the risk of critical components along the IMTS, identify the consequences of component failure and help to prioritize the most critical maintenance needs along the system. The main portion of this Standard are the system-wide, baseline requirements. Baseline Requirements are the minimum level of maintenance that is required to keep the locks functional and reliable. This Standard is supplemented by an annex for each of the six IMTS MSCs. Most MSCs have complete or draft Maintenance Standards. For example, SWD has prepared a draft final SWD Maintenance Standard Annex in 2014 and updated it in 2017. It is currently being worked on by SWD staff to present that as an Operational Order for commander's signature.

These Standards help ensure that IMTS maintenance workers are consistent in making cost-effective, efficient and safe repairs and are at the top of their game when responding to critical emergency needs, resulting in more rapidly completed repairs and reduced impacts to the navigation industry.

Another example is the *IMTS Training & Certification for Lock Operators*. This training provides a single, IMTS-wide objective standard for certification of lock and dam operators that will promote excellence and recognize the achievements of operators. It allows the training principles and materials of successful programs in several districts (their "best practices") to be shared throughout the IMTS and thereby reduces the time and costs for others to develop a training program. It enhances the skills of lock and dam operators to deal with the complex situations they can face (especially in emergency or unusual situations) and thereby reduce risks to lives and property. This training was initiated in 2011 and was revised in 2016 to include updated information and technologies.

Another monitoring example is the *Lock Levels of Service and Staffing Models*. It was clear to the Corps that not every facility has sufficient traffic or user demand to justify the cost of "Full Service" (24 hours a day for 7 days a week and 365 days a year) operation. That Full Service cost not only takes the form of increased "O" -



**Lock Maintenance Workshop 2016:** Figure 5 (see pg. 7)  
Tour of Mississippi River Stabilization Revetment Operations.  
MVK District

Operating costs but with flat budgets results in reduced funding for Big "M", Major Maintenance needs. The IMTS BoD saw the need for a system-wide approach to operations through Levels of Service (LOS). The goals had been to 1) provide levels of operating service for all locks across the IMTS with a consistent logic; 2) optimize operations and maintenance expenditures for these assets; and 3) improve reliability and extend the service life of navigation locks by optimizing levels of service. LOS Standards were implemented in 2012. The IMTS WG recently reviewed the

*Continued on page 10*





**Lock Maintenance Workshop 2016:** Figure 6 (see pg. 7)  
Tour of ERDC Facilities Tainter Valve Research. ERDC  
Vicksburg MS

progress of these Standards and determined that the existing Standards will be sustained for the long term. These will be reviewed periodically to ensure updates in traffic are factored in to future evaluations.

In addition, the IMTS BoD has directed implementation of *River Information Services (RIS)* as described in the PIANC “RIS Guidelines”. In May 2016 the RIS Key Team Members proposed implementation of RIS on the USACE Inland Marine Transportation System. RIS is a series of “services” based upon “key technologies” that will provide all waterway users with ability to optimize their use of the waterway and the Big Data Evaluation, Predictive Analysis, and Visualization that turns existing data into Actionable Plans and Decisions.

The IMTS RIS team will be pursuing a Progressive Implementation Pilot Project. This will allow a small pilot project startup with capabilities for expansion, exportation and execution of mature services across the IMTS system. While new services are being developed, mature services are implemented and made available to all waterways users. This program will be very interactive and transparent to all users, both within and outside of USACE. The Pilot Project will be based in the Pittsburgh District AOR.

In the short term, RIS will provide a user-friendly, internet-based suite, of services where all partners in

the waterway can view shared, “harmonized” data.

In the long term, RIS services will go significantly beyond the bounds of River Navigation (Great Lakes, Coastal, and Watershed Management) and provide fully integrated evaluation, big data analysis, and drive actionable decisions for all aspects of US waters and watersheds.

The *Inland Navigation Design Center of Expertise (INDC)* is a recent addition to the USACE navigation infrastructure program. In 2013, then Chief of Engineers, Lt. Gen. Thomas Bostick, endorsed the creation of an INDC. The purpose of the

new organization was to use in-house technical expertise in both the Mississippi Valley Division (MVD) and the Great Lakes and Ohio River Division (LRD) to deliver inland navigation projects. Expert resources from across USACE could then be engaged if the workload demanded or specialization in specific areas were needed.

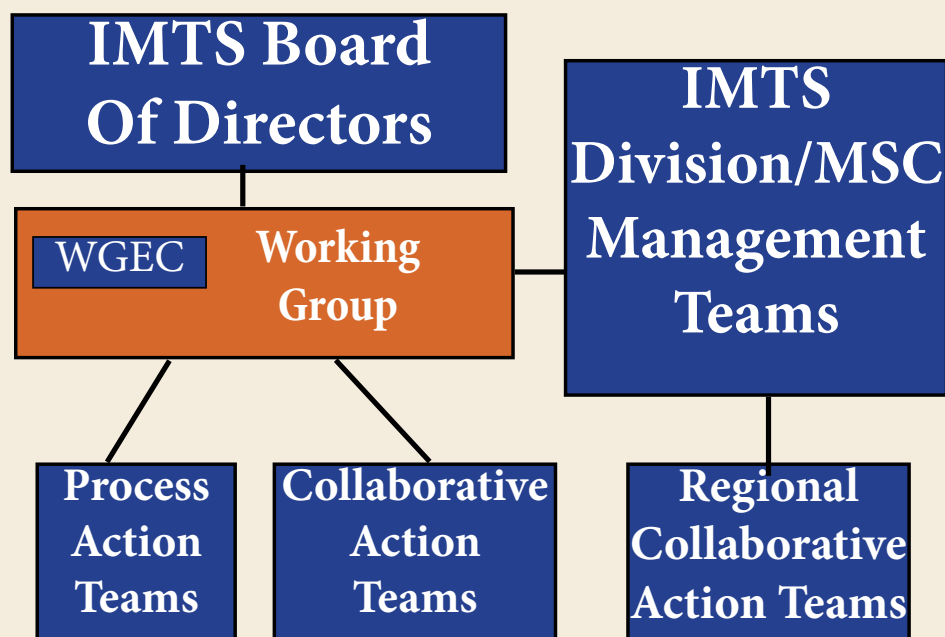
The IMTS WG has been tasked to collaborate with the INDC and form an action team to develop a long-term plan (for the next 100 years) to 1) Enhance Navigation System Performance, 2) Reduce Life-Cycle Costs and Improve Sustainability and 3) Leverage Technology. This can result in consistency in facility usage for customers, reduction in maintenance costs, continuing operations, reduced inventory and storage requirements, optimization of components, efficient contracting, reduced training needs, reduced requirements for repair fleet and less unique repairs through standardization methods.

The initial efforts during the first five years include development of Standardization Framework & tools to assess life cycle cost reduction, focus on high-value opportunities such as miter gates, system planning and the start of long-term implementation.

# IMTS Current Structure

The IMTS WG Charter was reviewed and revised in 2015. This updated Charter emphasizes the strong communication links throughout the IMTS. The Charter defines the membership, roles and responsibilities of the IMTS WG and the IMTS WG Executive Committee (WGEC) – senior WG members who advise/assist the IMTS WG PM. The WG is the executive agent of the IMTS BoD; it is comprised of staff from MSCs with a navigation mission; the WG are non-voting members of the BoD and report directly to the BoD.

IMTS Management Structure is shown in the chart below:



# IMTS Leadership Team

The WG includes inland navigation subject matter experts that represent each of the MSC commanders and the Navigation Business Line Managers (BLM). To give the appropriate cross-section of skills on the working group, there is at least one at-large member from each of the six inland navigation MSCs. The nominations of these members are coordinated through the regions to ensure an adequate and appropriate cross-section of operation skills and experience. It is imperative that at-large members represent all aspects of the O&M community (for example, lock masters, repair center managers, operations project managers, etc.) (see Fig. 2, 7).

Composition of the WG will also include, at a minimum, representatives from HQUSACE, INDC, ERDC and IWR. This team is led by a Program Manager, currently Michael (Steve) Jones, a Rehired Annuitant from MVD working specific to the IMTS WG. Other members include David Frantz and Doug Ellsworth (HQ), Mark Pointon and Forrest Vanderbilt (IWR), Kareem El-Naggar and John Cheek (LRD), James McKinney (SWL), Elaine Newbaker-London (SWD), Rob Germann (SAD), Robert George (SWG), Scott Beams

(SAM), Cody Eckhart and Pat Chambers (MVD), Kevin Baumgard and Bryan Peterson (MVP), Mike Cox (MVR), Sheryl Carrubba (NWD), Doug Stamper (NAD), Andy Harkness (INDC, LRP) and Eddie Wiggins (ERD-MS).

IMTS members utilize developmental opportunities or promotions for training, gathering additional knowledge to share with others plus backfilling subsequent temporary or permanent vacancies to help build the bench for succession planning. For example, SWD Deputy Chief of Operations and Regulatory, Mr. Theodore Kerr, was promoted to work in the Office of the Assistant Secretary of the Army for Civil Works. The SWD position was temporary filled by Mr. Jeff Knack, Operations Project Manager from SWT until permanently filled earlier this year by Constance Williams.

The IMTS WG members continually change due to promotions, attrition and retirements.

Mr. Simon Desoto, an IMTS Working Group member since 2008 has retired on December 29, 2016.

Simon was the lock master at Colorado River Locks and had 42 years of federal service with Galveston district. He represented interests of Galveston for the Gulf



Figure 7

## IMTS WG Meeting 2014 (LRD)

### Back row from left to right:

John Cheek, LRD; John Dills, LRP; Rich Thorsen, NAD; Jim Piper, MVR; Tilton (Kellis) Higgenbotham, SAM; James McKinney, SWL; Mike Cox, MVR; Jeff McKee, HQ.

### Front row from left to right:

Kathleen Wu, SWD (ret.); Kareem El-Naggar, LRD; Willie Maynard, LRP; Darrell Davis, LRD; Cody Eckhardt, MVD.

Intracoastal Waterway (GIWW) in Texas and infused expertise on many completed IMTS business process review topics -- HR Center of Standardization, Lock Levels of Service, GIWW-Texas Recreational Lockage Policy, Lock Operator's Training Manual & Certification, Standardized Position Descriptions (PDs), Standard Staffing Models, Lock Operations Management Application (LOMA)/Automatic Identification Systems (AIS), Standardized Lock and Dam Operator

navigation program and worked with a national team developing the 115 improvement ideas recommended to IMTS Board of Directors and completion of the Navigation Lock Study in 2008.

Mr. Jim Piper, Lockmaster at LD 11 within MVR in Dubuque, Iowa, retired May 28, 2016, after 40 years of service to the government. He was a member of the Working Group since 2008, and a member of the nav-locks study, which started in 2006. Jim played an

integral part in developing the IMTS program that we have today. He started out with the IMTS WG as a co-team leader for the WG and served as a member of the executive committee to provide the overall direction. Jim remained very active and led or served on many Action Teams including Lock Operator training and certification, LOMA-AIS, crew change policy, supervisors' training, uniform program, shift schedule optimization, marine radar standard and recently completed updating the Lock Operator Certification manual (see Fig. 8). Jim has always been a constant source of valuable insights from the perspective of people who work at the locks and serve customers directly.

We thank these and others for the work that they have accomplished as well as the expertise and passion that they have shared with others in IMTS. Thanks for your service!



Figure 8

**Jim Piper presents a plaque to his Action Team leader Kevin Baumgard in May 2016.**

Uniforms, and Safety Locking Through of Recreational Vessels.

Mr. Greg Barnes, the Major Maintenance Unit Operations and Maintenance Manager, with the Tulsa District Navigation Project Office, has retired in January 3, 2017. He was instrumental in representing SWD inland

# IMTS Training Opportunities

In addition to IMTS Training & Certification for Lock Operators, previously mentioned, the IMTS WG has established a project delivery team (PDT) to develop formal leadership and management training to the IMTS workforce. This WG PDT is coordinating with the US Army Career Program which offers on-line continuing education that supports training and developmental needs of the workforce including IMTS workers. The Army CP 18 Office

understands there are unique challenges associated with training Wage Grade employees. The challenges are many, like employee rotation schedules, short staff, safety, compliance, and resource constraints that impact employee training opportunities. However the CP 18 Office provides occupation Army Career Maps developed by SMEs that shows employees “Career Path” specific competencies across the enterprise; what the employee needs to know and do

to be successful in their current position and be competitive for other positions in their career path. Army occupation Career Maps encourages participation by all employees, whether they be General Service or Wage Grade, in their Training, Education, and Professional Development. Email your questions to [CP-18ProponencyTeam@usace.army.mil](mailto:CP-18ProponencyTeam@usace.army.mil). IMTS workers should discuss options with their supervisor or their training coordinators.

## IMTS Projects *Dewaterings*

One of the primary missions of the IMTS is to help the navigation MSCs and districts continue to provide a safe, reliable, efficient and sustainable waterborne transportation system for the nation. To accomplish this in an efficient and effective manner for the long term, the IMTS recognizes the need for effective use of the information produced by the comprehensive inspection programs that apply to IMTS equipment and facilities.

The IMTS systemic program of inspection, preventative maintenance and repair allows updating the condition of all components at IMTS navigation locks and dams. Lock chamber dewaterings are required to ful-

ly inspect underwater lock components and perform needed repairs. Locks will be dewatered in accordance with general guidance and factors specified within each MSC Maintenance Standard.

For example, unless there are problems during lock operation that would require an emergency dewatering to prevent potential component failure, priority order of dewaterings is developed within the MVD IMTS as described below.

The MVD Prioritization of Maintenance (POM) team will annually review the regional lock and dam dewatering schedule and provide recommendations to MVD for budget purposes. Consideration is also given to each district’s need to dewater based on planned replacement work. (Example: Buy miter gate in 2017; dewater/install in 2018.)

*The ranking process takes into consideration three factors:*

- Length of time since the lock was last dewatered
- Tonnage passing through the lock on an annual basis
- Number of gate swings (lockages) on an annual basis

Lock dewaterings will be scheduled based on these three factors. The time frame based on tonnage ranges from every 15 years for locks supporting an annual tonnage of more than 20 million tons to dewatering only as



**Lock Dewatering 2016:** Figure 9 (see pg. 16)  
Lock 6 MKARNS command site visit.  
SWL District

conditions warrant for locks with less than one million tons transiting annually.

MVD has many high-use locks that have not been dewatered for nearly 30 years. Some of these dewaterings have been successfully accomplished since implementation of the MVD dewatering schedule in 2014. Locks 9, 13 and 21 were dewatered in 2016 and Lock 17 was dewatered in 2017 (see Fig. 11).

The lock dewatering process has become somewhat routine for some of the maintenance crews within the IMTS. First, bulkheads are installed at each end of the lock which serve as temporary walls to keep the river out when the lock chamber is emptied. Then large pumps are lowered in the chamber and crews begin removing the water by pumping it to the main river channel. Removing the water takes about 24 hours for a typical lock chamber and depends on the water level of the river at the time of dewatering. When all the water is removed, stair towers are installed along the sides of the lock to give workers access to areas that require inspection or maintenance and repair.

In 2016, when Lock 13 in MVR in Fulton, Illinois, was dewatered the crews ran into a unique situation that prevented the lock from being completely dewatered (see Fig. 1, 10). While pumping the water out of the chamber, crews found an excessive amount of water seeping through the floor. Small holes in the concrete allowed unwanted water into the chamber. The holes, known as weep holes, were originally added to the lock to decrease pressure on the concrete. Not every lock is like Lock 13, only the ones without a bedrock base have a need for the concrete floor. To address the issue of the unwanted water, which was also carrying erod-



**Lock Dewatering 2017:** Figure 11  
Lock 17 Upper Mississippi River equipment and fleet in use  
MVR District

ed soil from beneath the lock, crews installed plastic tubes called stand-pipes in the weep holes to balance the pressure.

These stand-pipes did not stop the water from coming through the floor but they reduced the overall volume and prevented most of the soil from entering the lock. Water that did enter the lock was continually removed with 12-inch pumps. Once the water level was stabilized, the crews were able to stay on task and complete the maintenance work as scheduled. Work included installation of a bulkhead sill beam which is necessary for future dewatering projects, replacement of filling valve cables and grease lines plus repair of a bubbler system that keeps lock gates free of ice and debris. Crews evaluated the lock floor system and made needed repairs to damaged weep holes.

The crews also found unexpected maintenance needs during inspections. A mounting point on one of the filling valves was damaged. During this dewatering, the crews were able to remove the valve, make needed repairs and replace it in time for the main navigation season to begin (see Fig. 12). Underwater lock features cannot be adequately inspected until either the lock is dewatered or until the component fails. Fortunately, this scheduled dewatering prevented a potential failure with resulting impacts to navigation due to an unscheduled lock closure.

MVR also used resources from St. Paul District (MVP) to accomplish the maintenance work during the dewaterings and utilized expertise from the INDC.

SWD performed two lock dewaterings in 2016 for inspection and repair operations. These were synchronized closures - in the same time window of no more



**Lock dewatering 2016:** Figure 10  
Lock 13 Upper Mississippi River  
Weep holes stand pipes  
MVR District

*Continued on page 16*

*Continued from page 15*

than 14 days - to minimize lock closure impact with industry.

SWT dewatered Webbers Falls (MKARNS Lock 16) to correct upstream miter block leakage, to repair downstream miter gate torn seals, to rehab structural member and to repair or replace air and grease lines (see Fig. 3, 4, 13, 15).

SWL dewatered David D Terry (MKARNS Lock 6) to replace downstream landwall miter gate bottom seal, repair or replace grease lines, anodes and bubblets as needed, and to complete inspections to areas of the lock that are normally under water (see Fig. 9, 14, 17).



**Lock 13 Tainter Valve removed for repairs, 2016 Figure 12 (see pg. 15)**  
MVR District

# Recreational Lockages within Regions

USACE districts of Little Rock and Tulsa that operate and maintain infrastructure of the McClellan-Kerr Arkansas Navigation River System (MKARNS) have re-evaluated the recreational lockage policy implemented

since 2012 and rescinded it in 2013. That policy did not render efficiencies for the barge industry or optimize the lock usage.

Since April 2013, the Galveston District has implemented a recreational vessels lockage policy on the Gulf Intracoastal Waterway (GIWW) in Texas. The Brazos River Flood Gates and the Colorado River Lock had initiated a scheduled recreational lockage window that optimized the high ancillary recreational usage at the top of each hour.

These examples show some of the differences across the systems and emphasize the need for flexibility while striving for greater consistency in processes. Communicating these procedures aligns with efforts to improve consistency (see the national recreational lockage guide and website link on page 8).



**Lock Dewatering 2016:** Figure 13 (see pg. 16)  
Lock 16 MKARNS  
Equipment and Fleet in use  
SWT District

## Lock Rehabilitation

A system rehabilitation study of the Gulf Intracoastal Waterway (GIWW) in Texas has been in progress for Brazos River Flood Gates (BRFG) and Colorado River Locks (CRL) since 2016. Both infrastructures were built in the 1940's. Texas Department of Transportation (TXDOT) is the study partner of the project.

TXDOT started assessment of navigation within the state in 2014. TXDOT has developed an array of alignments for the Brazos that are included in this study. The study will reduce navigation impacts and costly waterborne traffic delays that are a result of aging infrastructure and inadequate channel dimensions for wider barge and shipping vessels that travel through these structures.

*The study objectives will include the following:*

- Reduce operational delays of outdated floodgate and lock structures
- Reduce impacts to navigation during high river periods
- Reduce and/or manage sedimentation in the GIWW per the study authority
- Reduce navigation risks to shipping crews and

recreation participants who travel through the GIWW and along bypass canals

- The IMTS WG will align with the INDC to share best practices and lessons learned.



**Lock Dewatering 2016:**  
Lock 6 MKARNS  
Gate Seal Replacement  
SWL District

Figure 14 (see pg. 16)



# *O&M FY16 McClellan-Kerr Arkansas River Navigation System (MKARNS) Investment Strategy*

In August 2016, the Planning Center of Expertise for Inland Navigation and Risk-Informed Economics Division (PCXIN-RED) endorsed the review plan for the MKARNS, investment strategy Arkansas and Oklahoma, in accordance with EC1165-2-214 “Civil Works Review.”

USACE Little Rock and Tulsa districts will evaluate alternatives that address rehabilitation and replacement of dam tainter gates to provide for long-term sustainability of the navigation system. Sixteen of the system’s dams have a total of 225 tainter gates that are used to regulate pool elevations to maintain minimum navigation depths. The gates were put in service between 1967 and 1970, yielding an average time in service of about 47 years. The investment strategy area is defined as the portion of the system between Lock #2 (Mile 13.3) and the head of navigation (Mile 444.8). This portion of

the system includes pools formed by dams with tainter gates.

The Inland Navigation Design Center (INDC) will collaborate with PCXIN to ensure the quality of a decision document that will likely include environmental coordination (under the National Environmental Policy Act (NEPA) per an Environmental Assessment (EA).

The INDC will also recommend inclusion of standardized components where feasible to improve reliability of the system and reduce future maintenance costs. The investment strategy is scheduled for completion in 2017. The IMTS WG members remain heavily engaged in these types of collaborative activities to help ensure full exchange of information, practices, lessons learned and efficiencies implemented.



**Lock dewatering 2016:** Figure 15 (see pg. 16)  
Lock 16 MKARNS  
SWT District

# USACE Standardization of Components and Repairs for Navigation Locks and Dams Nationwide Initiatives

Simply stated, the network of inland navigation infrastructure owned and operated by the US Army Corps of Engineers is burdened by a lack of interchangeable parts and major components resulting in operational and financial inefficiencies.

A national view is needed to build an overarching strategy to move from unique site specific designs to national universal standard designs for lock configuration and construction, standardized gate systems that are deployed for easy adaptation to many sites on the system and strategies for maintenance and repair on high value areas such as lock wall rehabilitation, gate sill renewal, hydraulic systems, maintenance closures, and others.

The Inland Navigation Design Center (INDC) is a new center of the US Army Corps of Engineers with responsibility to standardize design of components for navigation locks and dams. The development of stan-

dards and repair strategies for implementation throughout USACE portfolio being initiated by HQ and INDC in close coordination with engineering and maintenance and operations teams to maximize life cycle value and savings potential to USACE. A joint integrated team using the Inland Navigation Design Community of Practice resources as the base, with oversight provided by the INDC and strategic direction provided by the Inland Navigation Design Oversight Committee (INDOC), has been formed to study and effect change.

This team will develop a path forward to implement national standardization criteria for the design of new locks and the standardization of replacement of major components for existing facilities. Solutions for interchangeable components will be built around cost savings from design, contracting, quality improvements, reduced outage durations, storage yard requirements, best practices and lessons learned, and other guiding principles.

The IMTS WG will remain engaged with INDC and standardization strategies to help share best practices and lessons learned. Future news articles will be posted as the work continues. POC: INDC-MCX



**Dresden Island Lock - IWW Figure 16**  
600' chamber with 1200' tow broken into two cuts for lockages  
MVR District

# Inspection of Major Maintenance Projects

## *The Three-Phase Inspection System*

Within USACE, it is standard practice to use the Three-Phase Inspection approach in construction projects: (1) Preparatory, (2) Initial and (3) Follow-up.

The use of the Three-Phase Inspection process for in-house maintenance work has been strongly supported by the IMTS leaders. USACE regions have formalized their inspection processes already in place to achieve compliance with the three-phase inspection system.



**Lock 6 Setting Dewatering Bulkheads** Figure 17 (see pg. 16)  
**2016:**  
SWL District

**1. Preparatory Phase** - This phase shall be performed prior to beginning work on each definable feature of work. Perform this work as detailed below:

- A review of each paragraph of applicable specifications and references.
- A review of plans.
- A check to assure that all materials and/or equipment have been tested, submitted, and approved.
- A check to assure that provisions have been made to provide required inspection and testing.
- Examination of the work area to assure that all required preliminary work has been completed.
- A physical examination of required materials, equipment, and sample work to assure that they are on hand and conform to approved shop drawings or submitted data.
- A review of the appropriate activity hazard analysis (AHA).
- Discussion of procedures for constructing the work including the review of repetitive deficiencies.

This phase shall include a Preparatory Meeting conducted by the supervisor, other QA personnel (as applicable), and the foremen responsible for the definable feature. The results of the preparatory phase actions shall be documented by separate minutes prepared by the supervisor or QA manager.

**2. Initial Phase** - This phase must be accomplished at the beginning of a definable feature of work. The Initial Phase will verify that inspection for the work developed in the Preparatory Meeting is implemented and the work is performed to the level of workmanship mutually

agreed to. Perform this work as detailed below:

- Review minutes of Preparatory Meeting.
- Check preliminary work.
- Verify adequacy of work to ensure compliance with scope of work.
- Establish level of workmanship.
- Resolve all differences.
- Check safety to include compliance with the safety plan and AHA. Review the AHA with workers.

The Supervisory or QA Manager is in charge of the Initial Phase Meeting. Separate minutes of this phase shall be prepared by the Supervisor or QA Manager. The initial phase shall be repeated for each new crew to work on site, or any time established level of workmanship is not being met.

**3. Follow-up Phase** - Daily checks shall be performed to assure continuing compliance with scope of work, including safety and applicable testing, if any, until completion of the particular feature of work. The checks shall be made a matter of record and documentation. Final follow-up checks shall be conducted and all deficiencies corrected prior to the start of additional features of work. QA personnel should continually refer back to the standards set in the “Preparatory and Initial Phases.”

Training for this approach is available in the PROSPECT program, located using the following link:  
[http://ulc.usace.army.mil/CQMLinks\\_Grid\\_v2.aspx](http://ulc.usace.army.mil/CQMLinks_Grid_v2.aspx)

# IMTS Upcoming Activities

The IMTS WG will be scheduling a face-to-face meeting later this year to focus on new Action Team activities, long-term vision and ways forward, membership, plus increasing our communication efforts across USACE boundaries and with Inland Navigation users. The WG will also be preparing for the next BoD meeting. IMTS reps also participated in the national Lock Maintenance Workshop in March 2017.



## Face-to-Face Meetings



## Site Education



## Research

## Lock Maintenance Workshops



# Benefits of the Waterborne Transportation, IMTS Value to the Nation

According to the Institute for Water Resources (IWR) and based on Waterborne Commerce Statistics Center data, the nation's inland and intracoastal waterway system carries nearly 1/6 of the cargo moved between cities in the U.S. America's utility industry depends on the nation's rivers for over 20 percent of the coal they consume to produce the electricity we depend on to run our homes, offices and industries. About 22 percent of domestic petroleum is shipped by water. More than 60 percent of farm exports move on inland waterways such as the Lower Mississippi or Columbia rivers to downstream ports such as New Orleans for shipment overseas. Nearly 80 million tons of grain move by barge annually.

Inland and intracoastal waterways directly serve 38 states throughout the nation's heartland, the Atlantic seaboard, the Gulf Coast and the Pacific Northwest. All domestic waterborne commerce (inland, coastal and Great Lakes) amounted to over 1 billion tons with a value of over \$380 billion in 2007.

It is \$13.72 cheaper per ton to send these goods by water compared to other forms of transportation (such as trucks or trains). That translates into an estimated \$7.6 billion in annual transportation savings for America's economy (based on the approximately 554 million tons of cargo transported via the inland waterway system in FY 2010 and as described in the IWR 2013 December Report (Value to the Nation of the U.S. Army Corps of Engineers Civil Works Programs Estimates of National Economic Development (NED) Benefits and Revenues to the U.S. Treasury for 2010)).

In addition, waterborne transportation results in other benefits to the nation including reduced air pollution (by tons of particulate matter, nitrogen oxide and CO2 equivalents per million ton miles), fewer accidents (by fatalities and injuries per billion ton miles) and reduced congestion (by cost of delay to road users) when compared to road and rail transportation (GAO analysis of data from DOT, EPA and Texas Transportation Institute).

## Summary and Next Steps

Our goal is to update and strengthen our vision and identify where we expect IMTS to be in five years.



Downbound tow making approach to Lock 4, UMR, using helper boat.

Figure 18

The original Nav-Locks study generated 115 improvement ideas within 25 BPRs from both industry and the workforce. IMTS has completed over 60 percent of these improvement ideas plus other actions identified through the BoD. We will be working to accomplish more of these improvements in the coming years. In addition, more ideas are expected to be added as we move forward.

The IMTS WG recently met face to face to develop specific plans for the future of the IMTS. The WG will identify remaining items and improvement ideas that need addressing. They will identify items needing immediate attention, those that require short- and long-term actions in addition to those items that will need periodic and ongoing monitoring, evaluating and updating as needed.

The WG will develop an action plan for the IMTS and plan to submit a final draft to the IMTS BoD in early 2018. Development of this action plan will include

coordination both within USACE and with the IMTS users and stakeholders to ensure the WG is focusing on the most critical actions.

## **GET INVOLVED!**

If you are working within the IMTS and are interested in sustaining or improving the system but are not involved in any improvement efforts, you should be! If you see areas that need change you should speak up and let us know. How? Talk with your supervisor; learn more about the IMTS Improvement Plan; check out the Nav Gateway (using [https://operations.ercd.](https://operations.ercd.dren.mil/navigation.cfm)

[dren.mil/navigation.cfm](https://operations.ercd.dren.mil/navigation.cfm)); contact the IMTS WG Program Manager (Michael (Steve) Jones); contact your counterparts on the IMTS WG to see how you can help improve the system (members are listed on page 11). If you work outside of USACE and have similar interests in the IMTS, contact your USACE POC or any USACE Inland Navigation District and they will get you to us. There are lots of challenges across the IMTS and lots of ongoing activities, opportunities and efforts working toward improvements and long-term sustainability. We need your help and welcome your input and ideas, your expertise and experiences and especially your passion and attention. Give us a call or send an e-mail. Thanks!

# IMTS Videos & Links

## *A Reference Guide to Videos and Links*

### **THE POWER OF THE RIVER (2004)**

<http://www.youtube.com/watch?v=jXA6S6HftMk&feature=&p=EB0C6CB86F51708A&index=0&playnext=1>

The film is 25 minutes and split into three parts. It highlights the Mississippi River from its source to the mouth, exploring the culture that lives along its banks. The film is shown at the U.S. Corps of Engineers National Great Rivers Museum in the Discovery Theater. The film production was shared by the U.S. Army Corps of Engineers and the Meeting of the Rivers Foundation.

### **AMERICA'S INLAND WATERWAYS SYSTEM (2009)**

<https://www.youtube.com/watch?v=rxHlk5ARHLI&feature=&p=CB82258F0C745866&index=0&playnext=1>

The film is 16 minutes split into two parts

### **RECON THE BIG MUDDY (2009)**

<http://www.youtube.com/watch?v=Gp62nr2oKlg&feature=&p=54ECD360CDB71E01&index=0&playnext=1>

The film is 17 minutes long split into two parts

### **SUSTAINING THE MIGHTY MISSISSIPPI (2002)**

<http://www.youtube.com/watch?v=l4yFFEtevWM>

The film is nine minutes

**Other videos exist and will be made available as resources allow. Titles include:**

- America's Inland Waterway System
- The Awesome Power
- Introduction to Vessel and Barge Terminology
- Locks and Lines
- Not by a Dam Site
- Taming the Mississippi
- Locking Through



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