

CH2MHILL



**US Army Corps
of Engineers** ®

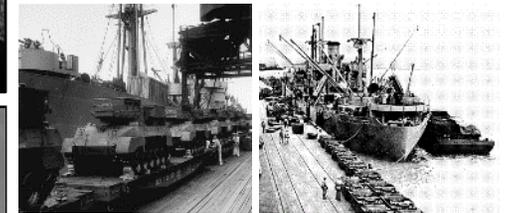
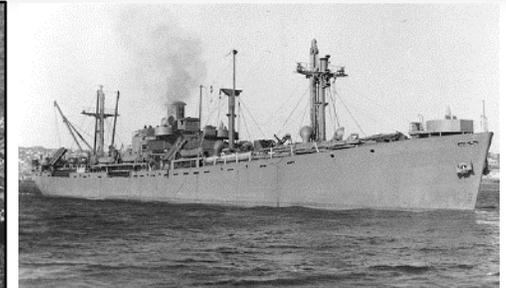
Preparation Begets Safe Performance Planning for an Underwater Munitions Investigation



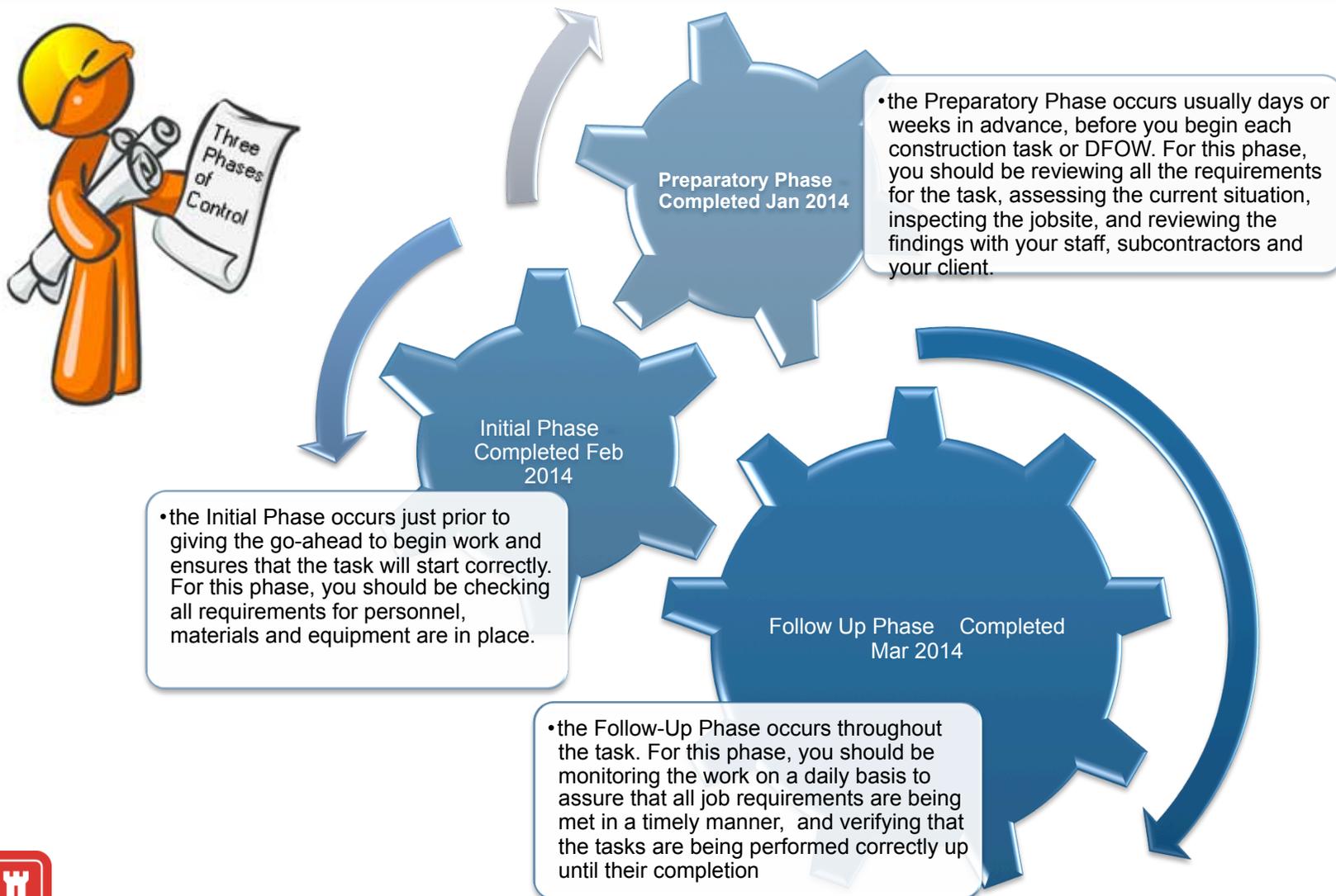
2015 M2S2 Webinar Series – April 23, 2015

Former Raritan Arsenal

- The Raritan River provided significant access for shipments across the Atlantic Ocean to the European theater during WWI and WWII, and as a result infrastructure was established along the river to load and offload ships.
- The lower Raritan River was periodically dredged to maintain a channel and turning basin for ships loading and unloading at the arsenal.
- Discarded military munitions (DMM) discovered in the dredge spoils indicated that the river had the potential to contain munitions.
- Dredge spoils were deposited on former arsenal property as well as on the opposing side of the river.

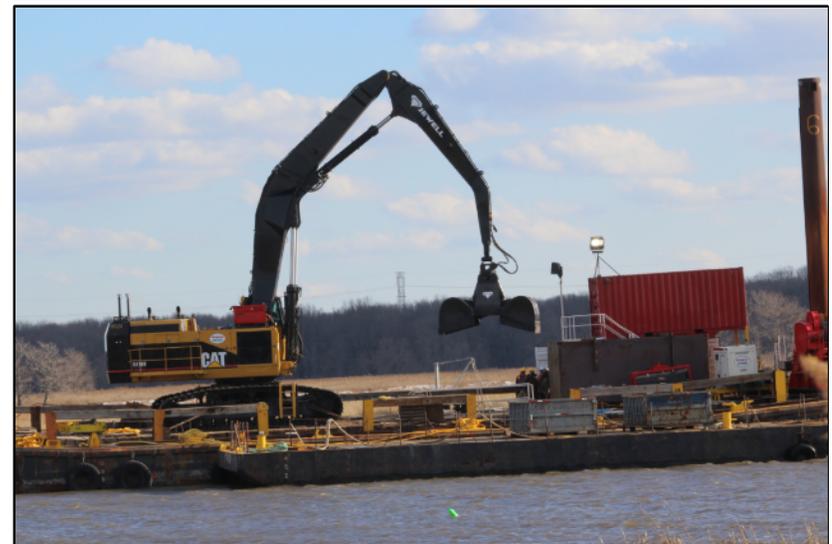


Planning and Underwater Investigation ~ The Three Phases of Control



Preparatory Phase ~ Planning an Underwater Investigation

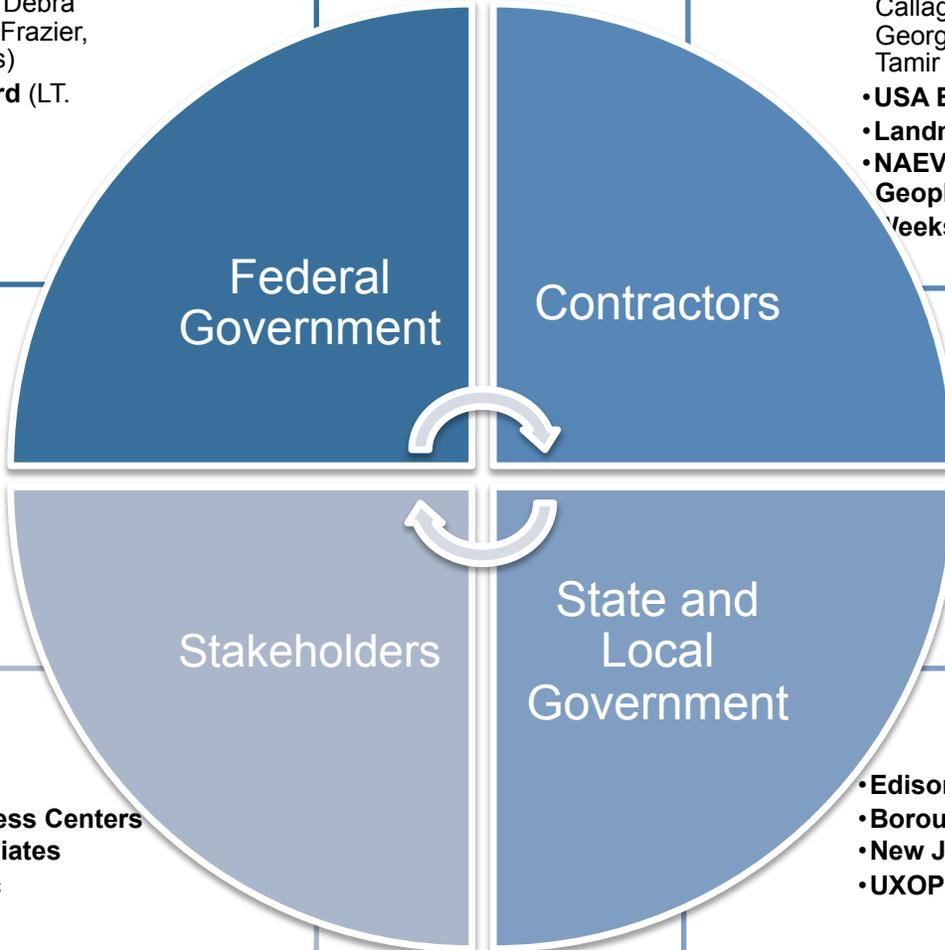
- In 2013, during the remedial work planning process, the USACE and CH2M HILL began a separate planning process for the underwater investigation of DMM in Areas 12 and 13.
- The investigation would be performed using a long-reach excavator mounted onto a barge platform with GPS positioning for location control. This was a new application of existing tools for stakeholders.
- Implementing the three-phase control system, the preparatory phase included:
 - Reviewing the requirements for the task, and discussing the proposed technical approach with all stakeholders.
 - The scope of the work was defined and site conditions reviewed.
 - Project instructions and Activity hazard analyses were developed and reviewed.
 - Preparatory meetings and conference calls were held weekly with key participants.
 - Roles and responsibilities were developed and agreed to.
 - Contact lists were developed.



Key Participants



- **USACE** (Dorothy Richards, Sandra Pietro, Debra Edwards, Brett Frazier, Emmet Hopkins)
- **US Coast Guard** (LT. Hanna Eko)



- **CH2M HILL** (Mark Callaghan, David Nelson, George DeMetropolis, Tamir Klaff)
- **USA Environmental**
- **Landmark Surveying**
- **NAEVA and 3D Geophysics**
- **Weeks Marine**



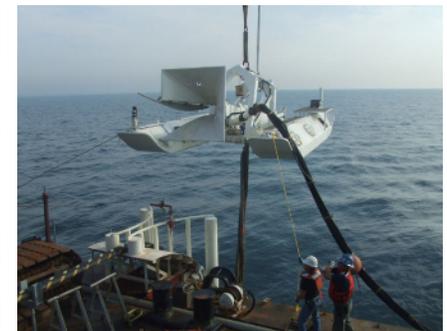
- **Neptune RTS**
- **Federal Business Centers**
- **Summit Associates**
- **General public**

- **Edison Township**
- **Borough of Sayreville**
- **New Jersey DEP**
- **UXOPro**



Neptune Regional Transmission System ~ Avoiding a High Voltage Power Cable

- During the preparatory phase it was learned that the river, although maintained and used for general transportation, also included utility corridors, and most significantly a high voltage underground power cable.
- The Neptune RTS is a 65 mile undersea and underground high voltage direct current line that provides 660MW of power to Long Island electricity consumers, approximately 600,000 homes and businesses, and provides more than 20% of Long Island's electricity demand.
- The cable system consists of three cables: a main high voltage cable that carries up to 660MW of electricity at 550 kV, a medium-voltage return cable (for carrying current in a DC system) and fiber-optic cable.
- The three cables are bundled and buried 4-6ft under the river and sea bed.



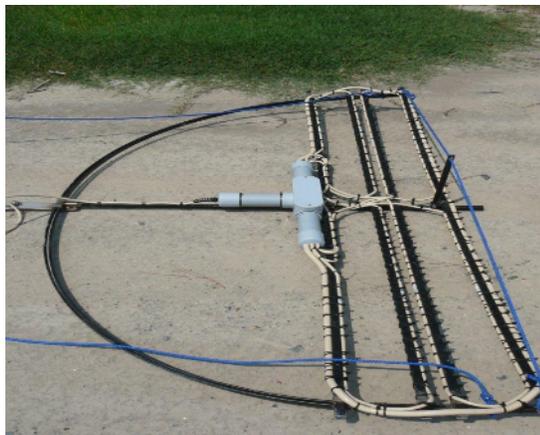
Initial Phase ~ Ongoing Planning

- Although this new information regarding the buried cable was surprising, the team (which now included representatives for the Neptune RTS) smoothly discussed and incorporated the details into the overall planning process.
- Meeting minutes and major documents (i.e., the work plan and explosives site plan) included the new information developed during the preparatory phase, which allowed key stakeholders the opportunity to review and accept the planned approaches.
- The initial phase of the project was completed at the end of the field mobilization and as part of practice runs through the tasks.
- Testing and practice was completed in February 2014, discussion and review of practice measures were completed to ensure compliance with the quality plan. Once the team of subcontractors and stakeholders were satisfied, and any conflicts resolved, mobilization to the site began.



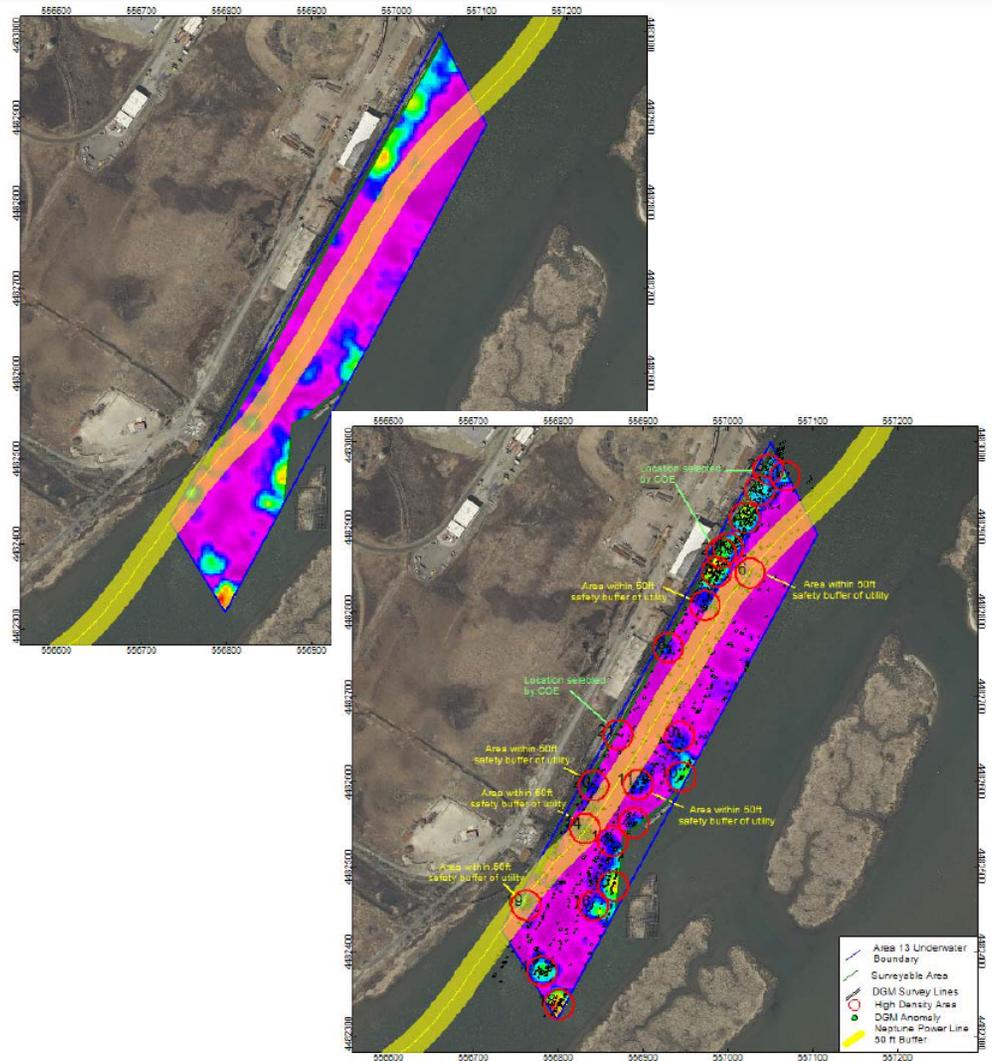
Follow Up Phase ~ Underwater Digital Geophysical Mapping

- Initially, underwater Digital Geophysical Mapping (DGM) was conducted using the EM61-Flex3 time domain electromagnetic induction detector.
- This was operated using the 3Dgeophysics (3Dg) Underwater UXO Towed Array (UUTA), with a Trimble 5700 real time kinematic (RTK) Global Positioning System (GPS), and a Trimble AgGPS FmX integrated navigation system.



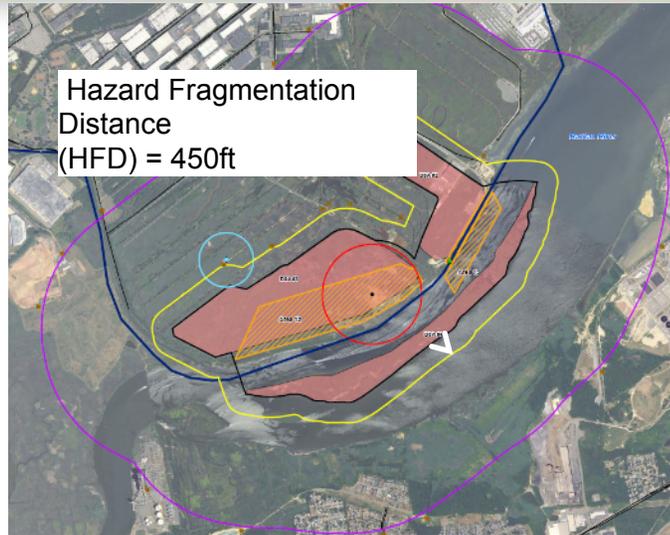
Follow Up Phase ~ Geophysical Evaluation

- CH2M HILL geophysicists used the geostatistical density mapping tool in Visual Sample Plan (Pacific Northwest National Laboratory, 2013) to extrapolate the anomaly densities from the underwater DGM survey.
- Based on the anomaly distribution and density mapping, clusters of anomalies were identified for investigation to determine if MEC/MPPEH was present.
- In consultation with representative from the Neptune RTS, a 10-meter wide safety buffer was established either side of the high voltage power cable, and the team agreed no anomalies would be investigated within this safety buffer.



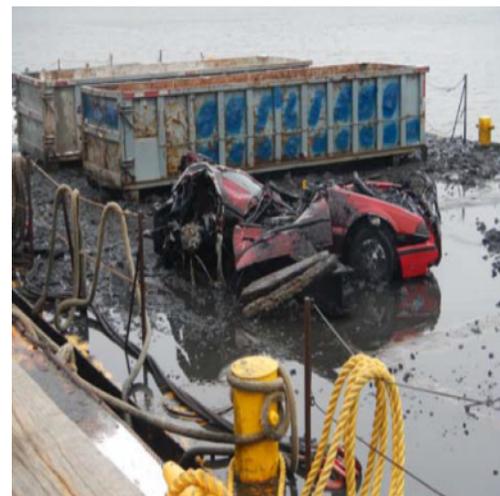
Follow Up Phase ~ Beginning the Intrusive Investigation

- The US Coast Guard established a safety zone within the waters of the Raritan River to provide for the protection of the maritime public and safety of navigation during removal of potentially explosive hazards in the Raritan River.
- This safety zone restricted unauthorized persons and vessels from travelling through or conducting underwater activities while the munitions investigation was on-going.
- During the active investigation, entry control points were established on land, additionally boats were also positioned in the river, and used to enforce the safety exclusion zones.



Follow Up Phase ~ Intrusive Investigation

- Within the cab of the excavator, a “3D indicate guidance” system was used, which consisted of a cab mounted computer programed with the design position of the anomalies.
- A dual-antenna RTK-GPS system was mounted on the excavator, and angle sensors mounted on the body, boom, stick and clamshell-bucket.
- RTK-GPS on the tug-boat was initially used to position the barge at the location of the anomaly or anomaly cluster for investigation.
- The excavator operator was then able to move the clam-shell to the designated coordinates by utilizing the navigation system provided on the onboard computer.
- Metallic debris removed from the river sediments was then evaluated by UXO technicians after being placed on a raised screening table.



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Question & Answer Session