
Fiscal Year 2005 Secretary of Defense
US Army Environmental Awards Nomination
THE PYRAMID LAKE
TORPEDO AND BOMBING RANGE
RESTORATION PROJECT
ENVIRONMENTAL RESTORATION
SUSTAINING
THE ENVIRONMENT
FOR A SECURE FUTURE

INTRODUCTION

The US Army Corps of Engineers (USACE) led a team who located, retrieved and disposed of ordnance discarded decades ago on the Pyramid Lake Torpedo and Bombing Range (PLTBR) on the Pyramid Lake Paiute Tribe Reservation. They utilized an innovative approach by partnering with the Paiute Tribe, the US Navy and private contractors. Furthermore, they used non-traditional leadership approaches to problem-solving, advanced US Navy protocols for deep diving at high elevations and developed a unique Deepwater Ordnance Recovery System (DORS) that overcame challenges and reduced costs. The team solved problems, expanded the boundaries of known technologies and successfully recovered ordnance from a sensitive environment with minimal disturbance.

BACKGROUND

Pyramid Lake Paiute Tribe Indian Reservation

In 1859, the Bureau of Indian Affairs established the Pyramid Lake Reservation, located in the Great Basin area of Nevada, for the Northern Paiute Tribe.

Figure 1. Pyramid Lake Indian Reservation Facts

Founded	1859
Location	35 miles NE of Reno, Nev.
Size	477,000 acres (742.2 mi^2)
Nearby towns	Sutcliffe, Nixon and Wadsworth
Pyramid Lake	119,000 acres (26 x 10 miles) 350 feet depth

Pyramid Lake is wholly contained within the reservation and is home to the endangered Cui-ui lake-sucker and the threatened Lahontan cutthroat trout. The Paiute Tribe holds the lake and its wildlife in high regard culturally because of the history with the tribe's ancestry. Pyramid Lake is one of the tribe's most valuable economic and cultural assets. The reservation's economy is centered on fishing and recreational activities, like boating, day use and overnight camping.

Pyramid Lake Torpedo and Bombing Range

In April 1944, the Department of Navy negotiated and entered into two separate leases with the Pyramid Lake Paiute Tribe and the Pyramid Lake Ranch for a total of 76.5 acres of land. The acreage was used as a mobile water target and dive-bombing practice area, strafing area and a supporting shore facility. The leases were canceled in December 1945 and January 1946.

The Department of Defense (DoD) is responsible for the environmental restoration of properties formerly owned by, leased to or otherwise possessed by the United States and under the jurisdiction of the Secretary of Defense. Such properties are known as Formerly Used Defense Sites (FUDS). The PLTBR was declared a FUDS in September 1999.

Native American Lands Environmental Mitigation Program (NALEMP)

NALEMP is a DoD program created to address the environmental impacts of prior DoD activities at FUDS located on Native American or Alaska Native Claims Settlement Act (ANCSA)-conveyed lands. While these activities were critical to the DoD mission to defend and protect the nation, they may have impacted the tribal environment, health, safety, economy and cultural ways of life. NALEMP is tailored to resolve environmental impacts in agreement with the unique Native American way of life, in particular the subsistence lifestyle and cultural significance of nature.

The USACE is DoD's lead agency for executing NALEMP. The USACE works with the tribal government to create a Cooperative Agreement (CA), which forms a partnership to complete remediation. This partnership confers a large degree of responsibility for the project to the tribe that leverages their existing skills and knowledge and ensures their concerns are appropriately addressed. Moreover, the CA is a winning solution for both parties as it facilitates a long-lasting partnership and builds the tribe's expertise, which positively impacts economic development.

PROJECT SUMMARY

In May 2002, the USACE contacted the Paiute Tribe regarding the PLTBR and the tribe's eligibility for NALEMP funding to remediate impacts from the Navy's activities in the 1940s. The tribe viewed the discarded ordnance as a potential environmental and health hazard and looked to DoD to rectify any environmental injuries caused by defense activities.

The USACE worked with the tribe to develop a CA to complete a Strategic Project Implementation Plan

(SPIP), map Pyramid Lake, locate any ordnance in the lake and remove abandoned land-based structures. The first CA was signed in September 2002.

The USACE mapped Pyramid Lake using sonar and magnetic surveys, focusing on areas where historical evidence indicated ordnance might be found. Sediment sampling was also conducted at this time and did not find any accumulation of toxic or hazardous agents. At this point, the USACE pursued a partnership with Explosive Ordnance Disposal (EOD) personnel at Naval Air Station (NAS) Fallon, Nev. NAS Fallon dispatched divers to Pyramid Lake to explore shallow water anomalies. No ordnance was found at that time, but this new relationship would prove fruitful later in the project.

A remotely operated vehicle (ROV) was deployed to further inspect 36 sites, resulting in the discovery of military ordnance at depths of 46 to 220 feet. Confirmation of ordnance in Pyramid Lake prompted a second CA between DoD and the tribe, signed in July 2004, which called for locating and removing ordnance from the lake to the maximum degree possible.

Figure 2. PLTBR Project Milestones

Sept 2002	· First Cooperative Agreement Signed
July 2003	· Strategic Project Implementation Plan Complete
Nov 2003	· Lake Mapping · Land-based Structures Removed · Sediment Sampling · Debris Investigation by Divers
Apr 2004	· Debris Investigation by ROV
July 2004	· Second Cooperative Agreement Signed
Aug 2004	· Operation Sutcliffe Rocket Lift Phase 1
Apr-Jun 2005	· Operation Sutcliffe Rocket Lift Phase 2

The tribe wanted to avoid recovering the ordnance through excavation or dredging due to Pyramid Lake's cultural significance, the sensitivity of the federally endangered Cui-ui and the recreational and sport fishing value of the lake. Moreover, the lake bottom contained settled contaminants from natural and manmade runoff that could have endangered environmental health and the tribe's economic well being if disturbed.

Addressing the tribe's concerns necessitated the use of a non-traditional approach to ordnance recovery. To do so, the team leveraged its working relationship with the Navy's EOD Unit to develop a strategy that used sonar technology to target ordnance disposal areas and Navy divers to recover the ordnance. The entire ordnance recovery effort was dubbed Operation Sutcliffe Rocket Lift. Phase I focused on recovering ordnance in shallow waters up to 100 feet, while ordnance located in depths up to 220 feet was recovered during Phase II.

Ordnance handlers from NAS Fallon grapple with recovered ordnance during Phase II.

Team Member Responsibilities

As project manager, **Jerry Vincent** (USACE Sacramento District FUDS program manager and NALEMP project manager) provided contract vehicles, funding and information on NALEMP; provided CA guidance to the Paiute Tribe; and facilitated team communication.

Anna Keyzers, the NALEMP project manager and Pyramid Lake Paiute Tribe project manager, supported the team by managing budgets, contracts and contractors; supervising and coordinating activities with tribal leaders; and assisting in developing CAs.

Dan Gross (Senior Chief, Master EOD Technician, US Navy Ret., EOD Mobile Unit Eleven, Detachment Fallon, NAS Fallon, Nev.) acted as project site manager. In this role, he oversaw planning and coordination of logistics, operations, personnel and safety; and developed procedures for recovery, storage, protections, transport and disposal of recovered ordnance.

Raymond Kayona (Senior Chief, Master Diver, US Navy, EOD Mobile Unit Eleven, Whidbey Island, Wash.) served as project site supervisor and performed planning, management and safety tasks for dive operations and served as technical expert on deepwater diving, dive equipment and ordnance recovery.

Jon Dasler, PE, the director of marine services from support contractor David Evans and Associates, Inc., managed the survey, mapping and ROV exploration components of the project. In this role, he provided technical consultation on development of recovery methods and technical approach; and designed the barge mooring layout and four-point mooring system.

Tim Chapman, PE, acted as the senior program manager for EM-Assist, Inc. He provided technical support to the Paiute Tribe and USACE.

Cindy Vincent, also of EM-Assist, Inc., was the team's public affairs specialist.

AWARDS AND SERVICES

In January 2006, the PLTBR project received an Engineering Excellence Award from the American Council of Engineering Companies of Oregon. Moreover, the team consisted of accomplished professionals who participate in diverse professional organizations:

Figure 3.

Prior Recognition	Representative Professional Affiliations
· Navy Achievement Medals (seven) · Navy Commendation Medals (four) · Commander's Award for Public Service (two)	· Sierra Army Depot Restoration Advisory Board · National Tribal Air Association · National Groundwater Association · Society of American Military Engineers · National Society of Professional Engineers · Society of Professional Journalists

ACCOMPLISHMENTS

Technical Achievements

Operation Sutcliffe Rocket Lift Phase II presented a special challenge due to Pyramid Lake's high elevation and depth. Moreover, the required resurfacing time for divers in such conditions was extraordinary for relatively small amounts of time at depth, which might have affected the project's schedule and cost. All team members helped to develop a tailored solution to overcome these challenges.

High Altitude/Deepwater Diving Tables

The high altitude limited the use of current dive tables to safely dive beyond depths of 100 feet using standard SCUBA equipment. Navy EOD personnel recruited a Master Diver from their parent unit to resolve this problem. The Master Diver determined that the MK 16 MOD 1 Closed-Circuit Mixed-Gas Underwater Breathing Apparatus (UBA) could be used to complete the project. However, that equipment had never been used at high altitudes. The Master Diver enlisted Naval Sea Systems Command (NAVSEA) to develop protocols to use the MK16 MOD1 at higher elevations. In April 2005, NAVSEA issued guidance and procedures for use of the apparatus at high altitude.

Deepwater Ordnance Recovery System (DORS)

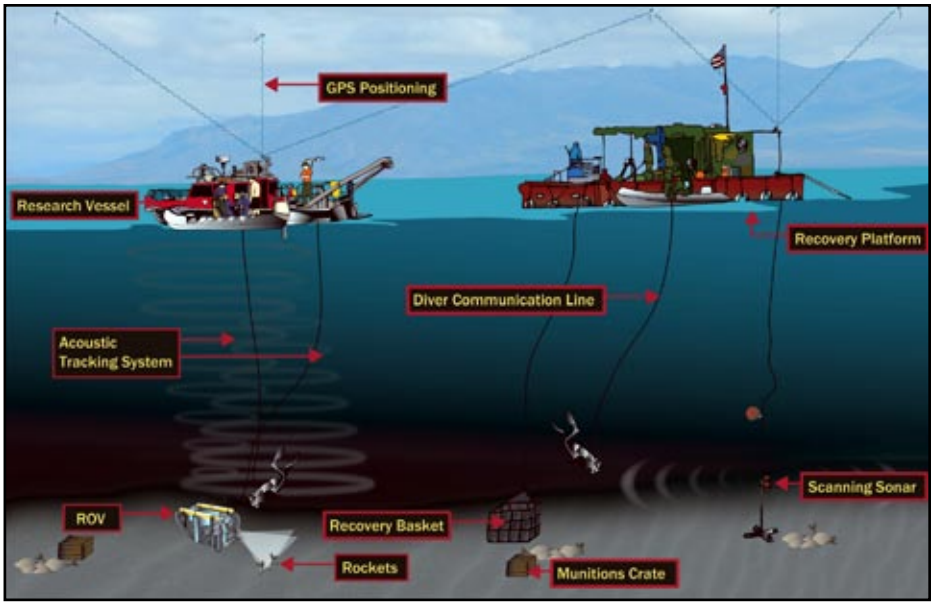
The team jointly developed a one-of-a-kind DORS to locate and recover ordnance using the Navy diver. It consisted of two specially modified 20 by 40 foot barge platforms, an innovative mooring configuration for placement and movement of the two barges, sonar to locate ordnance and a crane lift to retrieve ordnance from the bottom. The diving system was also modified to include a two-way communication system.

The sonar was lowered from each barge and displayed images to the sonar operator and dive supervisors on deck. Ordnance could be located and recovered from each of the platforms in an area approximately 300 feet by 300 feet. The barges were systematically moved to pre-determined moorings to cover the entire 500 feet wide by one mile long ordnance field. Sonar personnel used the two-way communication system to direct the diver to ordnance for placement in the recovery basket. The barge layout, equipment, anchoring, underwater sonar and anomaly interpretation, communication between sonar operator and diver, and systematic movement was crucial to precise positioning of the barge and diver over the ordnance fields, minimizing bottom time for the divers. This reduced decompression time, maximizing time to recover ordnance. Barge anchoring systems designed to withstand the high winds and waves permitted efficient barge movement.

Program Management

Partnerships to Leverage Expertise

As the NALEMP project manager, the USACE directed the creation of a robust project plan in collaboration with key stakeholders to incorporate and address the Paiute Tribe's concerns. Furthermore, the USACE proactively partnered with the Paiute Tribe, the US Navy and contractors to leverage each partner's resources and unique knowledge.



The PLTBR team successfully addressed challenges by designing the unique Deepwater Ordnance Recovery System (DORS).

Collaborative Cross-Organization

These partnerships were key to achieving the CA goals. The team was dedicated to investigating and determining the environmental impacts of previous defense activities to Pyramid Lake and to recovering ordnance in a manner consistent with the tribe's concerns within available funding constraints.

This effective management strategy resulted in stakeholder needs being met, leveraging skills among all parties, cost savings, knowledge sharing and opportunities for training and growth.

Significant Savings

The methods and system used to recover ordnance from the submerged environment resulted in greatly reduced time and costs compared to estimates produced by the USACE's Remedial Action Cost Engineering and Requirements® (RACER®) estimating tool.

The significant reduction in cost and time to complete is the result of many factors:

- The impact of the strategic partnership, including:
  - Synergies from the combined knowledge and collaboration that resulted in the proposition of unique and tailored solutions;
  - Partners completing their specialized tasks in agreement with each other; and
  - Use of lower cost tribal, military and government employees and military and government equipment when practicable.
- The CAs and SPIP focused team members on common goals;
- Effective use of historical data and technology to target possible ordnance disposal areas for further exploration; and
- The DORS system and use of Navy divers resulted in precision diving that enhanced recovery efforts.

Figure 4.

	Years to Complete	Cost to Complete
RACER® Estimate	50	$142.8 million
Actual	3	$1.5 million

Stakeholder Interaction

Facilitation of NALEMP Cooperative Agreements

The USACE-initiated contact with the Paiute Tribe resulted in a mentoring relationship with the tribe and provided a conduit for funding, information and ideas between NALEMP and the tribe. This initial contact set the foundation for a relationship built on trust, common goals and shared responsibilities that was a winning solution for all parties. For the tribe, an economic resource and cultural emblem was restored. For the government, a positive partnership was created and a restoration project was successfully completed.

Community Outreach

The partnership between DoD and the tribe deeply involved tribal leadership. The Tribal Council served as a vital partner during the project and was kept informed by the project team throughout the project.

The project team included a public affairs specialist who addressed tribal members' long-running concerns about the impacts of the Navy's use of their lake, while also educating key stakeholders about the remediation process and updating them on project progress. The team created five inserts for the tribe's newsletter at key milestones, which were distributed to all tribe members. Tribal Council meetings were also effectively utilized to update the tribe in an open forum. Finally, media relations activities were conducted that targeted local television and newspapers to inform surrounding communities of remediation efforts.

Knowledge Transfer

The development of high altitude dive protocols and the design of the unique DORS will be useful in similar applications to locate and retrieve widely dispersed ordnance at underwater locations. A number of actions ensured the knowledge gained from this project was captured and will be available for future use:

- The revised protocols for deepwater, high altitude diving using MK 16 MOD 1 Closed-Circuit Mixed Gas UBA were documented in NAVSEA guidance used by the diving community;
- This project will be presented at the annual Navy Working Divers Conference (May 2006); and
- Project briefings and displays were created for use at related conferences, including the Partners in Environmental Technology Technical Symposium & Workshop (December 2005) and the Army Environmental Cleanup Workshop (January 2006).

The Paiute Tribe benefited from the partnership with DoD as well. One of the project goals was to foster economic development by building on preexisting tribal expertise. The mapping data collected was shared with the tribe and will be used to enhance their recreational activities and economic development endeavors. The project also created training and mentoring opportunities for tribe members and staff. For example, tribe members were invited to participate in the 40-hour Hazardous Waste Operations and Emergency Response training to expand their knowledge and to fulfill a requirement for participation in cleanup operations. Finally, the tribe demonstrated mutual goodwill by placing some recovered items in a tribal history museum recounting military activities at Pyramid Lake.

"The lake mapping data has a wide range of uses for Pyramid Lake Fisheries, Water Resources and future economic development."

- Anna Keyzers, Paiute Tribe, Environmental Dept.

"The Pyramid Lake Paiute Tribe applauds the clean-up effort and positive working relationship with the Department of Defense."

- Norman Harry, Tribal Chairman

Military Readiness

The cost-effective execution and training benefits of the PLTBR project enhance military readiness. Cost efficiencies improve military readiness by freeing monetary resources for reallocation to pressing mission needs. Moreover, the project was a unique cross-training experience for more than 20 sailors. The Navy EOD technicians previously had little opportunity to dive on live ordnance and therefore gained immeasurable diving experience, while the Navy divers' prior experience focused on salvage and repair, not ordnance recovery. Team members enhanced their skills by combining diving and EOD functions with specialized equipment. This will enhance their performance and influence command mission capability for the rest of their careers.

CONCLUSION

The USACE, the Pyramid Lake Environmental and Fisheries Department, Navy divers and support contractors successfully partnered to execute the ordnance recovery effort. In August 2004, Phase I resulted in the recovery of 204 high velocity rockets and 12 crates of small arms from depths up to 100 feet. Phase II was executed over six weeks in April through June of 2005 and recovered 243 rockets and 182 crates of small arms munitions weighing more than 13 tons over the course of 149 successful dives from depths up to 220 feet. In July 2005, the tribe acknowledged the project team with a special ceremony on the reservation.

On the cover: Top: Scenic view of Pyramid Lake. Bottom: Navy divers prepare to conduct a recovery dive in Pyramid Lake.