# RESULTS FROM
# *CONTAMINATED WATER DIVING WORKSHOP*

## HOSTED BY
## NOAA DIVING CENTER

## AT
## NOAA WESTERN REGIONAL CENTER, SEATTLE, WA

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## INTRODUCTION

On November 17 & 18, 2004, the NOAA Diving Center hosted a 2- day workshop on contaminated water diving. This event was open to divers from all federal, state, and local government agencies.

Day 1 included a series of lectures covering a wide variety of topics related to diving in contaminated water including: hazards in polluted water diving and hull searches, equipment selection, diving techniques, and decontamination procedures. This program discussed the risks associated with contaminated water diving and what steps can be taken to help protect divers and topside support personnel involved in such diving activities.

This session had 81 participants from the following organizations:

Federal Agencies
Bureau of Reclamation
Environmental Protection Agency (EPA)
Federal Bureau of Investigation (FBI)
National Oceanic and Atmospheric Administration (NOAA)
US Coast Guard (USCG)
US Navy

State Agencies
Oregon Department of Transportation (OR DOT)
University of Washington
Washington Department of Transportation (WA DOT)
Washington Department of Natural Resources (WA-DNR)
Washington Department of Fish & Wildlife (WDF&W)

Public Safety Agencies
Arlington (Texas) Fire Dept
Columbia Basin Dive Rescue
Edmonds Police Dept
King County Marine Unit
Mercer Island Police
Pierce County Sheriff's Dept
Port of Seattle
San Juan County Sheriff's Dept
Seattle Fire Department
Seattle Harbor Patrol
Snohomish County Sheriff's Dept
Whatcom County Sheriff's Dept

Day 2 included a series of directed discussions and group participation exercises designed to address some of the information presented on Day 1 and to help develop a list of issues, both operationally and technologically, needing further investigation in order to improve the health and safety of those government employees required to work underwater in potentially contaminated conditions. This report focuses on these discussions.

This session had 41 invited participants from the same organizations.

## SUMMARY

The day started with a discussion of the previous day's activities, then proceeded into an introduction of this day's activities. The introduction included a brief history of what NOAA has done as well as the current state of affairs.

At this point, eight groups were established with four to five members for the purpose of Brainstorming. The activity was to establish what each group felt were the needs for a safe, contaminated water diving program. The target areas discussed were Pre-Dive, Dive, Post-Dive, Training, and Miscellaneous. Then the eight groups' results were compared and consolidated into one main list. This list was in turn prioritized into a High, Medium or Low needs. Following is the complete prioritized list with a brief explanation.

### High

*Standards* - #1: Standards will establish the groundwork for all other efforts. This will provide national guidelines for all teams. Since Mutual Aid was a very important issue, national standards will greatly enhance cooperative efforts.

- Inoculations: a set of standards to state what inoculations are needed per member
- Decontamination: a set of standards to state what decontamination procedures should take place for various contaminants.
- Turnout truck: a set of standards to state what the response vehicle should have
- Tender protection: a set of standards to state what the tender should wear

*Procedures*

- SOPs: nationally accepted SOPs
- Team roles (scuba vs. Surface-Supplied): clearly define the responsibilities of each of the team members for both a scuba team and a surface-supplied team
- Incident command – decision making: creation of aids to help managers make better decisions
- Small boat procedures (decontamination stations): creation of procedures and equipment for use in small, confined spaces such as dive boats
- Decontamination procedures (general and specific): procedures for decontamination ranging from very general for unknown to very specific procedures for known contaminants
- Checklists (medical, physiological, microbiological): creation of checklists for operations
- Mobilization and disposal: creation of nationally accepted procedures for both the mobilization of a team and the disposal of contaminated materials

- Portable decontamination station/interface with truck: creation of procedures for uniform portable decontamination stations and for interfacing decontamination sprayers with vehicles
- Cooling system during decontamination: creation of a system to provide external cooling to the diver during decontamination that will also provide positive pressure to keep contaminants out of the suit
- Contamination exposure matrix: creation of a scientifically-based matrix that
- will show exposure times for various contaminants
- Decontamination solutions: creation of a list of solutions that are effective in neutralizing a contaminant
- Prophylactic medications: creation of a nationally accepted list of medications that teams need to carry on site or that need to be taken annually
- Medical evaluation: creation of a standard medical evaluation to be given to team members after the operation and up to and including 72 hours later
- Container for comprised equipment: development of a container that can be used for the encapsulation and disposal of contaminated equipment
- Equipment testing: creation of nationally approved testing procedures to ensure that the integrity of the equipment is intact

*Detection*
- Local threat analysis: develop test kits that will analyze the water (both at entry and mid-water), and sediment
- Central evaluation center: create a center to analyze water samples very quickly such as the air samples for compressors
- Diver real-time monitor: develop in-suit monitoring of contaminant exposure to diver

*Health Monitoring*
- Long-term monitoring: develop a central location to carry out long-term health monitoring of divers
- Update epidemiology study: update and expand the study done by the University of Maryland in the late 1970s

*Headgear* (Mask/hat)
- Low volume/light weight hat: since total encapsulation is the ultimate target, and the current effort is for self-contained, then a helmet that will mate to the dry suit and allows for easy swimming.
- Mask attached to hood attached to suit: for operations that a helmet is not needed, then a mask that also allows for total encapsulation.
- Helmet Mounted Display: a method of being able to see critical data in a ‘hands off’ mode.
- Block to plug in air supply during decontamination: a method that allows for removal of any back mounted gas supply and provide unlimited air to the diver during decontamination.

*Detection/Monitoring:* Sampling: develop protocols for the more thorough testing of water (sometimes it is not possible to test prior to the operation) to ensure all contaminants have been identified

*National Certification*

- Creation of national training standards (working diver level), Contaminated Water certification
- Creation of National Academy: create a national training center that provides either on-site training or training at strategic locations
- Develop a basic hazmat course that is diving related
- Develop refresher courses and continuing education
- Creation of a national conference

*Standardized curriculum and materials*

- Development of training beyond the sport level
- Creation of educational videos and/or CDs
- The NOAA Diving Center create a website dedicated to contaminated water
- Development of contaminated water equipment repair training curriculum

*Follow up to workshop*: The findings from this workshop need to be available

*Access to money workshop*: Develop a workshop to provide information on how to pursue funding, including proposal writing

*Establishment of national org such as AAUS*: Create an organization to represent the contaminated water diving programs for support in such areas as mutual aid, legislative representation, etc.

**Medium**

*Information Access*

- Risk Level Database (Clearinghouse): creation of a capability to consolidate/analyze/disseminate data and information related to contaminants and other hazards
- Interagency grid/flow chart: creation by each department of a list of contact information to assist in mutual aid efforts
- Creation of a list of proven equipment for diving in contaminated water
- Computerized forms: creation of electronic forms to be used in conjunction with an on-site PDA, computer, etc.

*Education/PR:* Educate the public and managers: develop accurate information to educate both the general public and the non-diving managerial level personnel on contaminated water diving.

*Suits*

- Mobility suit: develop a dry suit that decontaminates like vulcanized rubber, but is flexible like a wet suit with a front entry and integrated boots and gloves
- Request manufacturers to offer a larger suit size selection
- Disposable suit: investigate new materials and determine feasibility of a disposable suit

- Tank/suit integration: design a suit that incorporates a tank mounting system in order to reduce snags
- BC/suit integration: integrate the BC into the suit in order to eliminate one more item from decontamination
- Investigate into the creation of a suit that is puncture-proof and self-sealing

**Medium/Low**

*Data/Image Transfer*: Provide a method for simultaneous transmission of both imaging (video stream from helmet-mounted camera) and data (health monitoring sensor data)

**Low**

*Undergarment*
- 2-layer system: the second layer would be as a chemical protective layer
- Color metric approach for exposure monitoring: provide a method for obvious notification of contaminant exposure similar to $CO_2$ absorbent where the material changes color upon infiltration
- Integrated boots and gloves: follow the concept of total encapsulation

*Extended Bottom Time*: Keep abreast of new technologies so that bottom time extension may be possible without the use of an umbilical

**Unranked**

*Integrated block to change tanks underwater*

*Investigate relations with DAN*

**Mutual Aid**
An area that was of major concern was the issue of mutual aid. In the discussions it was apparent that the areas of planning and execution needed to be addressed, but it was the consensus of the group that we should postpone any significant discussions until many of the other high priorities were addressed since they need to be in place first.

Finally, a brief discussion on how and where to proceed took place. The consensus was that this day's exercise was important to get down on paper what the needs are, but there was little to no money available to carry out any sort of plan. There were some comments by individuals willing to look into starting a 'grassroots' effort.