

2017 US Hydro Conference

Non-Academic Poster Abstracts

1) Brian Anderson

Commercial Hydrographic Survey with ASV Force Multiplier – Alaska, 2016

TerraSond, along with their subcontractors, Autonomous Surface Vehicles (ASV Global) have recently completed a landmark project offshore Nunivak Island, Alaska. Using an ASV C-Worker 5 as a “force multiplier”, the ASV and the mother vessel worked in parallel to effectively halve the ship time required in a remote area. This talk will outline the design and operational performance of the ASV, and briefly showcase several other recent applications in industry. TerraSond will be presenting examples of the 4,100 line kms of hydrographic data (multibeam and sidescan sonar) acquired by the C-Worker 5 ASV , along with TerraSond’s expert analysis of the data from both the mother vessel and the ASV when running in parallel.

2) Peter Barron

Monitoring the Fate of Artificial Reefs: Using Hydrographic Methods to Examine Degradation and Movement

Artificial reefs are used around the world for a variety of purposes, yet few long-term studies have been conducted with a focus on interannual changes to the individual structures. Throughout the U.S. Mid-Atlantic region, several programs have utilized retired subway cars as artificial reef structures. “Redbird Reef”, a site located off the coast of Delaware, is an example of this, with over 900 emplaced subway cars in the artificial reef system. Sonar surveys have been conducted over the period 2008-2016, providing one of the most extensive monitoring efforts for an artificial reef. This study focuses on the changes to emplaced structures at a .45 x .2 km section of Redbird Reef on both short and long timescales. We analyze changes to the positions of the subway cars relative to the seabed over the period 2008-2016 in terms of horizontal rotation and vertical subsidence. We also analyze the storm-response dynamics of the cars, focusing on the extent and rates of vertical subsidence and structural degradation during Hurricane Sandy in 2012 and Hurricane Joaquin in 2015. Changes in response to storm events can alter the relief of the artificial reef, potentially altering its ecological function within the local benthic and pelagic ecosystem.

3) David Evans and Associates, Inc.

Jason Dorfman and Kathleen Schacht

Considerations when operating a multibeam sonar in a stratified water column

4) Dr. Timothy Dellapenna

Merging hydrography and geology to understand the Geological Framework of Follets Island: a rapidly eroding barrier island along the Texas coast of the northern Gulf of Mexico

Averaging ~200 m wide, Follets Island (FI) is a rapidly eroding, landward retreating (transgressive) barrier island. During Hurricane Ike (2008), the island was breached in over 75 places and on average, the shoreline is retreating at 1-3 m/yr. In 2013 the entire shoreface of the island was mapped

using high-resolution side scan sonar (SSS), swath bathymetry, and CHIRP subbottom profiling from the 3-10 m isobaths. Additionally, combined topographic/bathymetric elevation profiles were collected along the island. The combined offshore data revealed that because FI is retreating landward, the sand bearing shoreface is very thin, at the 3 m isobaths it is only 0.5-0.9 m thick at the 5 m isobaths it is less than 0.25 m thick. Additionally, the shoreface sits directly atop back barrier lagoon deposits consisting of mud (no sand). As the island retreats landward, ravinement erodes only mud. With no shoreface sand deposits, there is no local supply of sand to replenish the island as it erodes. This is in sharp contrast to adjacent Galveston Island, which originally built seaward, and sits atop older barrier island deposits, containing an abundant supply of sand.

5) Rob Downs

Activities to Incorporate Unmanned Surface Vehicles into NOAA's Hydrographic Survey Fleet

NOAA's Office of Coast Survey, in partnership with NOAA's Office of Marine and Aviation Operations, has been conducting activities to incorporate Unmanned Surface Vehicles (USVs) into NOAA's hydrographic survey fleet to support its navigation safety and nautical charting missions. The efforts began aboard the NOAA Ship *Thomas Jefferson* with the evaluation and operational use of man-portable USVs to survey shallow, near shore areas to fill coverage gaps between LIDAR and survey launch-based sonar, and have continued with the operational evaluation of a large, long-endurance USV aboard the NOAA Ship *Nancy Foster* to conduct off-shore surveys. Both activities contribute to Coast Survey's plans for the agile development and incremental adoption of unmanned technology to support its seafloor mapping requirements. This presentation will summarize the activities to date, present the key lessons learned, and introduce Coast Survey's strategy for future work.

6) Amanda Hacking

High resolution bathymetric and topographic survey to inform restoration efforts in Port Gamble Bay, WA.

In March 2014, the Washington State Department of Ecology Coastal Monitoring & Analysis Program (CMAP) conducted a high-resolution bathymetric and topographic survey of Port Gamble Bay, WA, which had been prioritized by Ecology's Toxics Cleanup Program for restoration. The purpose of the survey was to create a high-resolution DEM and to identify material to be removed during restoration efforts.

The survey was conducted onboard CMAP's R/V George Davidson, utilizing an R2Sonic 2022 multibeam echosounder, an Optech ILRIS-HD-ER mobile laser scanner, and an Applanix POS MV 320 v5 receiving real-time kinematic positioning corrections.

During data acquisition and processing, over 300 environmental and navigational hazards were identified for removal, including creosoted pilings, intertidal structures, derelict vessels, and fields of submerged logs. The DEM was merged with a contractor's neighboring dataset to assist with removal of contaminated sediments. Precisely locating these hazards greatly increased the efficiency of restoration by freeing resources to focus on natural resource studies, including eelgrass restoration and Olympia oyster enhancement by state and tribal entities. This survey provided the first high-

resolution contiguous bathymetric and topographic dataset of Port Gamble Bay, which has further applications in morphology, research, coastal management, and navigation.

7) **George Kaminsky**

Integration of Survey Platforms and Methods for Mapping an Extremely Shallow River Channel Reservoir for Water Resource Management

In October 2016, the Washington State Department of Ecology Coastal Monitoring & Analysis Program conducted a combined boat-based lidar, multibeam and single beam sonar, and groundbased RTK-GPS survey to collect high-resolution topographic and bathymetric data extending from the Zosel Dam upstream along the Okanogan River channel to Osoyoos Lake spanning the U.S.-Canadian border. The survey represents the first comprehensive baseline survey to assess channel capacity and possible flow constrictions caused by the accumulation of sediment and debris within the channel reservoir. Of particular concern is determining the capacity of the dam to sufficiently convey flood flows required to maintain consistent water surface elevations.

The survey was challenging due to extremely shallow water with limited navigability, debris and mud deposits, trees and vegetation within and along the channel banks, large patches of dense aquatic vegetation, a bridge with limited overhead clearance, a log boom just upstream of the dam, and a power plant intake structure and an old fish trap weir within the river channel. This paper will discuss the complementary use of multiple data collection platforms and methods to develop an integrated topographic and bathymetric digital elevation model (DEM) of the channel reservoir.

8) **Dennis Wilson**

A Cost-Benefit Analysis for the Application of Lidar for Hydrographic Survey using Quality Levels for Airborne Lidar Bathymetry and CZMIL data from survey in Coos Bay, Oregon

The development of Airborne Lidar Bathymetry (ALB) has presented the field of hydrography with an efficient method of obtaining wide swath near shore bathymetric data for coastal zones. The Interagency Working Group on Ocean and Coastal Mapping (IWG-OCM) was tasked by Congress, in 2009, to develop a National Coastal Mapping Strategy (NCMS). This strategy defined quality levels (QLs) for bathymetric Lidar collections and datasets to be adopted for all ALB applications across all fields. These QLs define the vertical accuracy, nominal point spacing, and point density required to produce bathymetric surveys with equivalent International Hydrographic Organization (IHO) standards. ALB QLs provide a quantitative means for an analysis of the proposed application of an ALB, MBES, or a multi-sensor approach to near shore hydrographic survey. A cost-benefit analysis of a CZMIL survey conducted in Coos Bay, Oregon, will consider the economic benefits of ALB and the advantages that ALB QLs provide to near shore hydrographic survey planning. It is our intention to further develop the ongoing dialogue surrounding the application of ALB to nautical charting and the consideration of ALB QLs in hydrographic surveys.