Planning Treatment Plant Infrastructure for Sea Level Rise

Tim Hayes, San Jose-Santa Clara Regional Wastewater Facility, Timothy.Hayes@sanjoseca.gov
Kent Brown, San Jose-Santa Clara Regional Wastewater Facility, kent.brown@sanjoseca.gov
Jim Ervin, San Jose-Santa Clara Regional Wastewater Facility, james.ervin@sanjoseca.gov

The San José-Santa Clara Regional Wastewater Facility (Facility) is located in the Lower South San Francisco Bay. The oldest structures were constructed in 1956, and structures that control outfall to San Francisco Bay were constructed in the 1970s. Typical of wastewater treatment plants, the Facility is located at low elevation close to the shoreline. The Fifth Assessment Report by the Intergovernmental Panel on Climate Change (IPCC) projects sea level rise between 1 to 3 feet by year 2100. Will Facility structures be threatened by rising seas over the next century?
Original elevations of the Facility outfall structure, and pre-existing sewage outfall structures from the 1950s and early 1900s, were recorded with respect to Mean Sea Level (MSL). Past MSL values can be correlated to National Geodetic Vertical Datum (NGVD) elevations. Comparison of sea level to existing facilities is complicated by the effects of land subsidence which occurred over the past century. Poland and Ireland (1982) documented land subsidence in the vicinity of these structures: 1 foot from 1960 to 1967, and between 1.5 to 2.5 feet of subsidence from 1934 to 1960. Changes to nearby levees and land use also complicate the picture.
Current survey results compared to historical elevations are surprising. Despite 3 to 4 inches of known sea level rise and 1 to over 3 feet of subsidence, existing structures do not appear threatened. Also, land use practices over decades have raised surrounding landscape by up to several feet. Over the same 3 to 6 decades, Facility infrastructure has deteriorated and is now scheduled for replacement or rehabilitation.

Results indicate that 1 to 3 feet of relative sea level rise over 30 to 60 years has had negligible effect on Facility infrastructure.

Keywords: sea level rise, wastewater treatment, land subsidence, infrastructure

Poster topic: Global Perspectives

The Behavior of and Benefits to Researchers Using Open Access Electronic Journals

Lauren Muscatine, John Muir Institute for the Enivronment, U.C. Davis, ldmuscatine@ucdavis.edu
Sam Luoma, John Muir Institute for the Environment, U.C. Davis, snluoma@ucdavis.edu
Sheila Chandrasekhar, Persuasive Pages, sheilability@gmail.com
Mary Beth Sanders, Metography, marybeth@metography.com

Publishers began to provide online access to articles in scholarly journals just over a decade ago. Numerous studies have shown how much researchers have welcomed enhanced and easy access to unprecedented numbers of journals. Downloads of journal articles are rising faster that the worldwide growth in the number of articles published each year. *San Francisco Estuary and Watershed Science* -- an open access scholarly journal -- began publishing research 11 years ago and has remained a steadfast outlet for research on California's Bay-Delta region. Until recently there has been little detailed evidence about how researchers have changed their behaviors in response to this revolution in access, about how they make use of online journals, or about the benefits that flow from that use. What connections can be made by investigating how researchers use and benefit from online journals? This poster presentation presents key findings from a worldwide perspective and a regional focus to give an overview of the behavior of and benefits to researchers using online journals in an open access platform.

Keywords: open access, scholarly referencing, online journal, research publications

Poster topic: Global Perspectives

The Use of Antifouling Coatings to Deter Biofouling on Commercial Ships Arriving to San Francisco Bay-Delta Ports

Raya Nedelcheva, Marine Invasive Species Program, California State Lands Commission, raya.nedelcheva@slc.ca.gov
Chris Scianni, Marine Invasive Species Program, California State Lands Commission, chris.scianni@slc.ca.gov
Christopher Brown, Marine Invasive Species Program, California State Lands Commission, chris.brown@slc.ca.gov
Jonathan Thompson, Marine Invasive Species Program, California State Lands Commission, jonathan.thompson@slc.ca.gov
Nicole Dobroski, Marine Invasive Species Program, California State Lands Commission, nicole.dobroski@slc.ca.gov

Biofouling consists of aquatic organisms attached to or associated with submerged or wetted hard surfaces. Biofouling on commercial ships has negative impacts to both the shipping industry and the environment. Organisms attached to the hull create drag when the vessel is moving leading to an overall increase in fuel consumption and resulting air emissions. Furthermore, vessel biofouling has been identified as one of the most important vectors of nonindigenous species (NIS) introductions, likely contributing up to 60% of all established aquatic NIS in California.
To prevent biofouling, commercial vessels currently use antifouling coatings on wetted surfaces. These coatings may contain biocides, such as copper and zinc, to deter organism attachment and survival. Antifouling coatings are developed for specific vessel operational profiles, making the careful selection of the coating, its proper application, and vessel operation in accordance with the coating's recommendations critical to the performance of the coating.
The California State Lands Commission Marine Invasive Species Program (MISP) collected annual hull husbandry data from all vessels calling to California ports from 2008 to 2013. An analysis of the vessel arrival patterns and the different coating types used by vessels calling ports in the San Francisco Bay-Delta (SFBD) was conducted. The majority of coatings used by the commercial fleet operating in SFBD are biocide-based with copper as the most common biocide. The use of biocide-free coatings also emerged as a strategy to prevent biofouling.
Tracking the use of antifouling coatings and their alignment with the vessel's operational profile can provide a better insight into the development of effective biofouling management strategies to prevent biofouling accumulation on commercial vessels.

Keywords: biofouling, biocide, commercial ships, copper, nonindigenous species

Poster topic: Global Perspectives

Rainwater Storage for Evaporative Air Cooling

Nasim Tajmand*, WCEC, ntajmand@ucdavis.edu

Evaporative cooling systems are an energy efficient cooling solution for hot, arid climates. While evaporative cooling systems have a large potential to reduce both the peak electricity demand and the energy use associated with cooling, water management for evaporative cooling systems is essential and particular care must be taken to reduce the effects of hard water and overall water consumption of the system. Evaporative processes lead to accumulation of mineral scale on the heat exchanger, whose performance thereby degrades over time. Several strategies have been put forward to improve water-use efficiency and/or minimize scale formation in evaporative cooling systems, however no cost effective solution has been found that enables long-term use of these systems in hard water areas.

My project investigates the benefits and feasibility of using harvested rainwater as a strategy to reduce tap water consumption and extend equipment life. It is expected that the small amount of hardness in rainwater compared to municipal tap water minimizes scale formation, which extends the system life and increases the system efficiency. This results in reduced consumption of water, electricity, and chemicals, and reduced water treatment needs (e.g. water softening).

For the first part of the project, the 2500 gallon tank was filled with rainwater collected from a residential composite shingle roof. The rainwater was stored for summer when cooling is needed and the water quality was examined on a weekly basis. According to the conducted field experiment, stored rainwater would not need any complex treatment to meet the minimum non-potable water quality guidelines developed by US EPA. This study suggests that the disinfection of stored rainwater before usage, as a relatively simple method, could result in a safe and reliable approach for use in an evaporative cooling system.

Keywords: Rainwater harvesting, Roof-runoff, Water quality, Microbial growth

Poster topic: Global Perspectives

Preliminary Review of the Relative Effectiveness of Ballast Water Management in Preventing New Introduction of Non-Native Zooplankton in the San Francisco Estuary

Jonathan Thompson, California State Lands Commission, jonathan.thompson@slc.ca.gov

Non-native species are moved around the world through the activities of humans, and once established these species can impact the environment, economy, human culture, and human health. One such human activity (i.e. vector) involves the ocean-based shipment of cargo around the world. Ships uptake ballast water to maintain stability and trim, and this water also acts as a vector for the transportation of non-native species. Local, state and federal laws have been implemented to prevent and respond to the introduction of non-native species. At the state and federal level, legislation has been adopted to manage the discharge of ballast water in order to prevent new species introductions. Ships arriving at ports within the United States typically comply with these laws by retaining all ballast water onboard or by conducting an open ocean exchange of ballast water prior to discharge. Zooplankton are one group of organisms that are likely to have been transported via ballast water and introduced to California's coastal waters. A preliminary review of the data on vessel compliance with ballast management requirements coupled with the data from the California Department of Fish and Wildlife's monthly zooplankton survey of the San Francisco Estuary was conducted. This cursory review represents an attempt to characterize the relative effectiveness of the prevention of new introductions of non-native zooplankton through the management of ballast water. This glimpse at the connections between a management action and biological survey results can inform invasive species detection techniques and prevention policy decisions in the future.

Keywords: Invasive Species, Non-native, prevention, management, ballast

Poster topic: Global Perspectives