

A New Life for Spectacle Reef Lighthouse

By Peter Blanken

The Great Lakes affect several aspects of our daily lives, including weather and climate, transportation, agriculture, the economy, health, recreation, etc. Although it can be quite hard to imagine landscape with the Lakes appearing much different than they do today, the Lakes are geologically very young, and are dynamic.

Changes in water temperature, chemistry, ice cover, lake ecology and lake levels do occur at various time scales and for various reasons. Superimposed on natural ecological and geological changes are additional factors such as population growth, and of recent concern is how lake water levels are affected by current and projected climate change.

The Lake's water levels are affected by numerous factors across various time scales. Large-scale, relative slow processes include the continued uplift of the Great Lake Basin after removal of the Laurentide Ice Sheet beginning



Dick Moehl

Cake & Ice Cream crew took turns manning the vessel as she lied at anchor off the light

14,000 and ending 4,000 years ago; smaller-scale, relatively fast processes include the Lakes' annual water budget. Each of the Great Lakes has a topographically-defined drainage basin that defines the catchment area where any precipitation that falls drains into

the lake through rivers and streams. Other than the sheer volume of melt water from the Laurentide Ice Sheet that created the Lakes, precipitation is the only contemporary source of water to the Lakes. Outputs, or losses of water from the Lakes are increasingly



Terry Pepper

After landing on the crib, entry into the lighthouse tower itself is made up this double flight of stairs in the fog signal building
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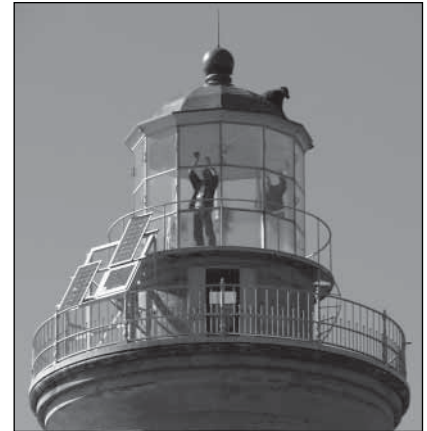


Dick Moehl

Chris Spence pulls equipment up from the dinghy, which made numerous trips back and forth between the light and the boat numerous, and include runoff from one lake to another (ultimately leaving the Basin through the St. Lawrence River & Chicago River), withdrawals for residential, agricultural, and industrial

use, and evaporation; with the balance of inputs versus outputs determining the lakes' water levels.

The purpose of our trip to the Spectacle Reef Lighthouse was to directly measure one component of Lake Huron's water balance, evaporation, and to determine the physical processes regulating evaporation to help understand how the lake's water levels may change with predicted climate change scenarios. Understandably, other than several ice-free season buoy and ship-based observations, there are few meteorological observations made directly on the Lakes, and no direct measurements of evaporation. Our measurements of evaporation are based on high-frequency wind and water vapor density measurements, and require a high, stable platform that is free from the splash of waves and especially the winter ice. A tall, stable structure located far from shore, the Spectacle Reef Lighthouse is an ideal



Dick Moehl

Newell Hedstom works on the lantern roof, while Peter Blanken and Pakorn Petchprayoon seek ways to route the wiring

measurement location.

The instruments required for this research are delicate and complex, with each having demanding calibration and power requirements. In total, we are measuring nearly 200 variables, some at a rate of 10 times per second. Making sure the instruments work properly, and planning for how to install the



Terry Pepper

While paint is peeling badly throughout, the lighthouse appears to be in good condition after being untended for almost 25 years

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instruments on a 135 year-old structure that you've never been to before is a huge challenge. Added to the challenge is the limited amount of time you have at the site, no AC power, no knowledge of the condition or type of structures on which to mount the instruments, and the requirement that everything must be removable without any structural damage to the lighthouse (no drilling holes) and the navigation aspects must not be interfered with.

After securing funds for this project from the International Joint Commission, the instruments were tested in my laboratory. Then, with the approval of the State of Michigan's Historic Preservation Office and the US Coast Guard, Kevin Robinson (US Coast Guard) suggested I contact Terry Pepper. Terry was instrumental in arranging local logistical support and travel to and from Spectacle Reef on the boat *Cake & Ice Cream* captained by Dick Moehl. The history and old drawings and photographs of Spectacle Reef provided by Terry and Dick, helped my planning for several

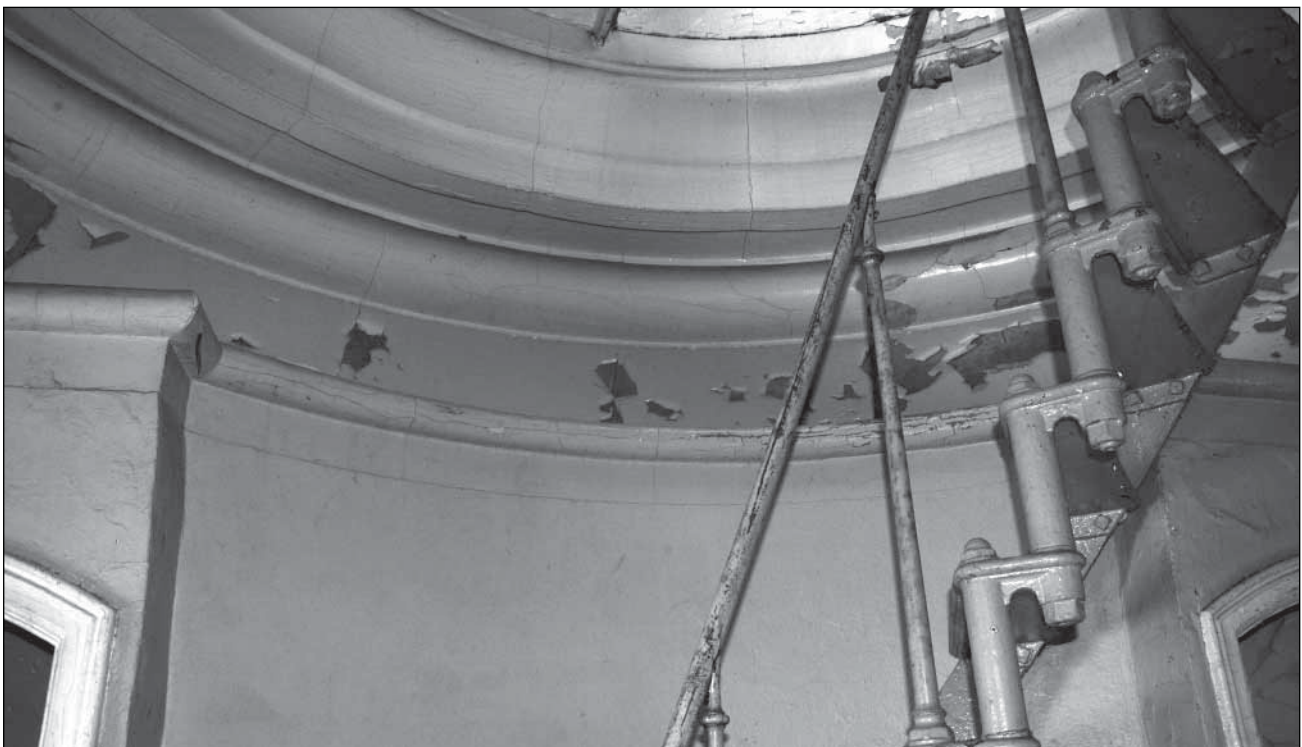


Terry Pepper

Peter Blanken (left) Mark Siegman (center) and Pakorn Petchprayoon (right) insert the mast into its flange on a custom cut plywood base on the narrow lantern gallery

scenarios for mounting the instruments and solar panels. Every possible size of u-bolt and hose clamp, along with several crates of instruments were shipped from the Department of Geography and the University of

Colorado, Boulder, to the GLLKA office in Mackinaw City. Along with my graduate student Pakorn Petchprayoon from Thailand, and Chris Spence and Newell Hedstrom from Environment Canada, Saskatoon, we all boarded



Terry Pepper

Although suffering from badly peeling paint, the room immediately below the service room contains beautiful solid stone molding
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planes and arrived in Cheboygan, MI on September 21, 2009 to install the instruments.

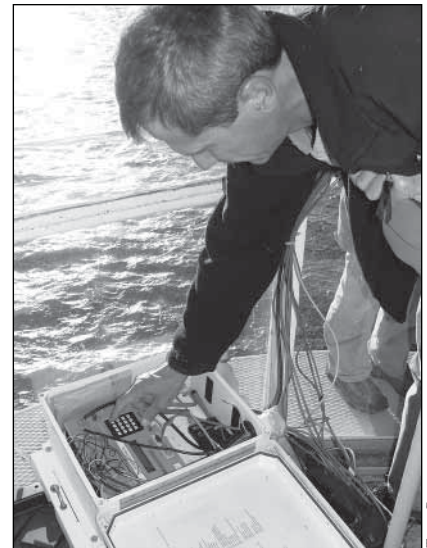
Although we planned for one long day at the lighthouse, I scheduled one full week for the installation, to allow for weather or other unforeseen delays (the forecast was for rain and wind for the entire week). The four of us spent our first day visiting every hardware store in town buying more u-bolts, hose clamps, plywood, pipe, batteries, tools, etc. We had a half-dozen contingency plans for ways to secure instruments and solar panels 85 feet above the water to endure the harsh conditions far offshore on Lake Huron.

We met with Terry and Dick at the Cheboygan Marina, and began loading the boat with supplies. The weather was cooperating, and the next day looked promising for the trip. After meeting for an early breakfast, and a final check on the forecast, Dick decided that today was the day (Tuesday September 22, 2009), so along with crewmembers Terry Pepper, Mark Siegman and John Wagner, we boarded the boat and left the Cheboygan Marina at 7 am.

Some light fog and clouds and calm seas greeted us as we sailed past the historic

Cheboygan River Front Range, Fourteen Foot Shoal and Poe Reef Lighthouses. After 2 hours, Spectacle Reef was in sight, under clearing skies and increasing winds. The shallow water and 2-3 foot waves required us to use a Zodiac to reach the Lighthouse. Chris and I made the first trip to unlock the door and assess the condition of the lighthouse while the others began shuttling our instruments and equipment from the boat via the Zodiac to the lighthouse. Although suffering from thick peeling paint, the lighthouse was in remarkably good, clean shape. This made the long transfer of instruments, tools, and equipment from Cake & Ice Cream to the Zodiac, 20-ft to the top of the crib deck, pulled by rope, and then up 8 flights of tight, narrowing spiral staircases to the top of the lighthouse.

Newell quickly scrambled across the top of the lighthouse to determine the best way to secure the instruments, and after some discussion, we had a plan: two sections of threaded galvanized pipe resting on the upper deck (bolted to plywood), secured with u-bolts, metal strapping, and aircraft cable for guys, would get the instruments clear of the top of the ventilation ball. Newell and I went to work on this, while Pakorn and Chris mounted the solar panels to



Terry Pepper

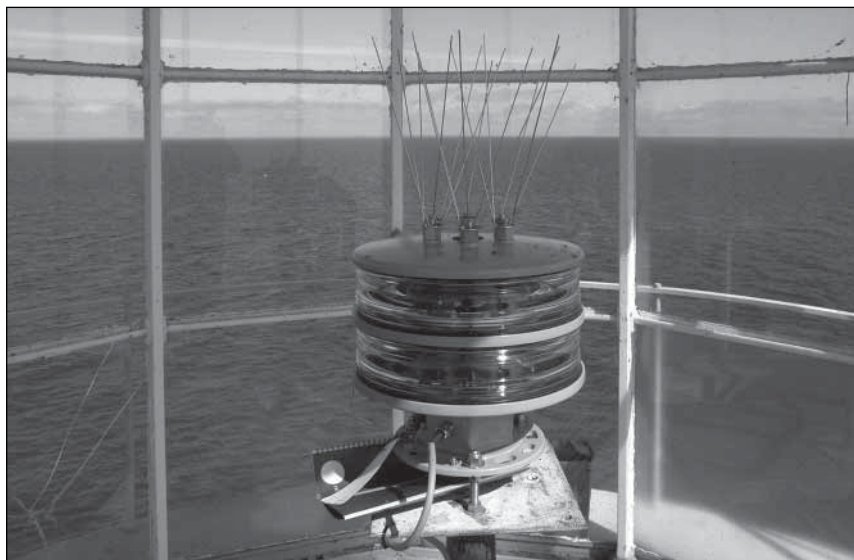
Peter makes some final programming adjustments to the monitoring equipment

an existing panel support, and Terry and John Wagner photographed and documented each and every crevice of the lighthouse.

After a very pleasant lunch provided by Terry, everyone continued working non-stop, and soon the sun was beginning to set. Thanks to all the planning efforts and solid, hard work from everyone, we finished the final wiring and programming of the data logger at around 6 pm.

We cleaned-up, and started transferring crates back to the Cake & Ice Cream as Spectacle Reef's red light began to flash, likely one of the few times in recent years when people were on the site when that happens. Having been engrossed in our work all day, it suddenly became clear to us just how high the waves had become through the day.

The persistent waves had pulled on Cake & Ice Cream's anchor non-stop for several hours, and we discovered that the anchor was stuck in the large rocks on the reef's bottom as we tried in vain to pull up the anchor. As the sun had set, we tied a buoy to the rope and gave up on the anchor. Once freed, we set course back to Cheboygan, watching the red light of Spectacle recede into the darkness.



Terry Pepper

The small but efficient solar powered Vega LED light which was installed by the Coast Guard in January 2009 is virtually lost in Spectacle Reef's large Second Order lantern