DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT
1325 J STREET
SACRAMENTO CA 95814-2922

REPLY TO
ATTENTION OF

CESPK-RD

28 September 2015

REGULATORY DIVISION MEMORANDUM 2015-02

SUBJECT: Method for Identifying the Ordinary High Water Mark for the Great Salt Lake

1. Background. The Great Salt Lake (GSL) is a terminal playa lake located in northwest Utah, the second driest state in the U.S. Although it is a relatively shallow lake, GSL's surface area is approximately 2,625 square miles at a water elevation of 4,200 feet mean sea level (MSL), comprising about 3% of the state's land mass. The GSL is the largest natural lake west of the Mississippi River.

The drainage basin of the GSL covers about 34,000 square miles and includes most of northern Utah as well as parts of Nevada, Idaho, and Wyoming. It includes three major river systems; the Bear River, Ogden/Weber River and the Jordan River. The basin spans four distinct geologic provinces: the Wasatch Plateau, the Uinta Mountains, the Rocky Mountain thrust belt, and the Basin and Range province. Each has a unique set of bedrock and surficial geologic character that impact the hydrology and chemistry of the lake.

The annual average precipitation within the GSL's watershed is approximately 16 inches. The hydrology and water levels are highly dynamic, driven by seasonal variations as well as multi-year drought and wet cycles. The GSL's hydrology is generated primarily by surface flows and precipitation, with only 3% supplied via groundwater. As such, the lake is almost entirely dependent on limited precipitation and spring runoff from the surrounding mountain ranges.

In the late 1950s, the GSL was effectively divided into two separate water bodies, known as the North Arm and the South Arm, when the Union Pacific Railroad (UPRR) constructed a 13-mile section of solid fill causeway across the middle of the lake. The two arms of the lake are currently connected via one 300-foot bridge/breach in the causeway located on the west shore of the lake. When the connections between the arms are limited, the causeway can result in a difference in the water elevations, as much as 2 feet between the two arms on multiple occasions. This occurred as recently as June 2015[1]. The hydrology of the GSL has been further manipulated over the past 30 years. Between 1987 and 1989, the West Desert Pumping project withdrew approximately 2,730,000 acre feet of flood waters from the lake, sending it west to the Newfoundland Evaporation Basin. After completion of the Central Utah Water Project in 1996, an additional 163,400 acre feet of water from the Colorado River watershed was imported annually to the GSL drainage basin. Further, increased demand for water from development has reduced the amount of water entering the lake, and industry engaged in mineral extraction operations on the GSL have increased the rate that water evaporates from the lake. These companies pump water from the lake into shallow ponds to increase the natural rate of evaporative loss in order to precipitate out and harvest the minerals.

Because of the dependency on precipitation and the manipulation of hydrology, the GSL's water levels have varied dramatically over time, between 4,191 ft MSL recorded in 1963 and 4,212 ft MSL in 1986. On average, the lake level fluctuates one to two feet annually, rising to its highest level during May through July following the melting of the mountain snowpack and dropping to its lowest point during October through November after the hot summer months. The GSL's water elevations have steadily declined over the past decade due to multi-year droughts. In November 2014, the lake's lowest water

[1] A second 180-foot bridge/breach is planned to be constructed by UPRR in 2016. This new bridge should help maintain a consistent water surface elevation between the two arms.

elevation in 52 years was recorded at 4,193.2. Scientists studying the lake indicate that water levels will continue to lower until multiple years of above average precipitation occur.

The GSL is a hypersaline lake, being 3 to 8 times saltier than the oceans, which limits its biological diversity to just a handful of species that are tolerant to these harsh conditions, such as algae and brine shrimp. GSL's three major tributaries enter from the eastern side. As a result, the lake is fresher on the eastern shore and is bordered by more than 400,000 acres of saline and fresh water emergent wetlands. The GSL is internationally recognized for the vast amount of migratory bird species it supports; however, those birds concentrate in the fresher portion of the eastern shore and Bear River Bay. The north, south and west shores are mostly devoid of wetlands and other special aquatic sites due to the lack of fresh water inputs.

Navigability of the GSL has been addressed in several court decisions. In *Utah v. United States*, 403 U.S. 9 (1971), the Supreme Court determined that GSL was navigable for purposes of determining whether the United States or the State of Utah owned the bed and banks of the GSL. The Supreme Court stated that if the GSL was navigable at the time Utah achieved statehood in 1896, then ownership of the bed and banks would vest with the State. The Court found that the GSL was navigable at the time of statehood, based on the use of the lake to haul livestock and salt, and therefore denied the United States' claim of ownership. In reaching this decision, the Supreme Court stated that the GSL, an intrastate water body, was navigable for purposes of determining ownership even though it is not part of a navigable interstate or international commerce highway used to transport "water-borne freight." The Supreme Court held that the historic hauling of animals by ranchers constituted "use as a highway and that was the gist of the federal test." Navigability of the GSL under the Rivers and Harbors Act of 1899 (RHA)(33 U.S.C §401 *et seq.*) was not at issue in *Utah v. United States* and was not addressed at all by the Supreme Court's decision.

However, a later Tenth Circuit Court of Appeals case, *Hardy Salt Co., et al. v. Southern Pacific Transp. Co., et al.*, 501 F.2d 1156 (10th Cir 1974), specifically addressed navigability of the GSL under the RHA and concluded that the GSL is not a navigable water as defined under the RHA. In the *Hardy Salt Co.* case, Plaintiffs alleged, among other things, that Southern Pacific had violated the RHA by constructing a causeway across the GSL without first obtaining permission from the U.S. Army Corps of Engineers (Corps). The Tenth Circuit concluded that the GSL is not navigable for purposes of Sections 9, 10, and 13 of the RHA because the GSL does not form "a continued highway over which commerce is or may be carried on with other states or foreign countries, by water." Because the evidence before the Court only showed navigation on the GSL within Utah to the railhead, the Court was compelled to conclude that the GSL is not navigable under the RHA.

The Tenth Circuit considered the Supreme Court's decision in *Utah v United States* and determined that case was not relevant to the question of navigability under RHA because it "contains no implication whatsoever that the Congress has already chosen to regulate the Lake under the Rivers and Harbors Act."(*Hardy Salt Co.* at pg. 1169) The Supreme Court denied Plaintiffs' petition for *certiorari* and declined to hear an appeal of the *Hardy Salt Co.* case. There have been no other Tenth Circuit or Supreme Court decisions that have overturned *Hardy Salt Co.*, therefore, the Tenth Circuit's decision remains the definitive decision on navigability of the GSL under the RHA.

Although GSL is not a navigable water under the RHA, it is a "navigable water" for purposes of the Clean Water Act of 1972 (CWA) (33 U.S.C. §1251, *et seq.*). The CWA defines "navigable water" as "the waters of the United States, including the territorial seas". The CWA implementing regulations further define "waters of the United States" in 33 C.F.R. §328.3(a)(1) –(8) and 40 C.F.R. §230.3(s)(1) – (8). Specifically, 33 C.F.R. §328.3(a)(1) and 40 C.F.R. §230.3(s)(1) encompass those waters that are commonly referred to as "traditional navigable waters." For purposes of the CWA, waters are considered "traditional navigable waters" and therefore jurisdictional under 33 C.F.R. §328.3(a)(1) and 40 C.F.R. §230.3(s)(1), if they meet one of the following criteria:

- Are subject to section 9 or 10 of the Rivers and Harbors Appropriations Act of 1899;
- Have been determined by a Federal court to be navigable-in-fact under Federal law;

• Are waters currently being used for commercial navigation, including commercial waterborne recreation (for example, boat rentals, guided fishing trips, or water ski tournaments);

• Have historically been used for commercial navigation, including commercial waterborne recreation; or

• Are susceptible to being used in the future for commercial navigation, including commercial waterborne recreation.

The GSL meets the second criteria, above, having been found navigable-in-fact under Federal law in *Utah v. United States*, 403 U.S. 9 (1971) as discussed above. Thus, the GSL is a "traditional navigable water" and is regulated by the Corps under Section 404 of the CWA.

In 1990, SPK established a policy for determining the Ordinary High Water Mark (OHWM) of the GSL for purposes of Section 404 Clean Water Act. Under the policy, the OHWM was found to be the average of the water levels of the preceding two months as measured by the U.S. Geological Survey (USGS) Great Salt Lake Boat Harbor gauge but would never be lower than 4,205 ft MSL. The policy did not however account for the differing water elevations of the two arms and was not aligned with national guidance regarding the use of physical indicators of OHWM as the primary source for identifying the CWA jurisdictional boundary for open water habitats. Issued in 2005, RGL 05-05 stressed the use of physical characteristics but indicated where those characteristics are inconclusive, misleading, unreliable, or otherwise not evident, districts can determine OHWM by using other appropriate means that consider the characteristics of the surrounding areas, provided those other means are reliable. Other reliable methods that may be indicative of OHWM include, but are not limited to, lake and stream gage data, elevation data, spillway height, flood predictions, historic records of water flow, and statistical evidence.

2. Methodology. Given the its dynamic nature, the reliance on physical indicators as the sole basis for OHWM identification for the GSL is problematic because the physical indicators may be absent or obscured or a relic from previous water elevations remaining for a decade or more. As such, SPK will use the following approach for OHWM determinations for the GSL:

a. Where physical indicators are present, SPK will rely on a combination of USGS gauge data and physical indicators observed in the field to determine the OHWM elevation for the GSL.

b. Where the physical indicators and gauge data do not align, the average elevation of the two will be used.

c. Where physical indicators are absent (or otherwise unreliable), the 30-year average of OHWM gauge data will be the sole basis for the determination.

Typical physical indicators of OHWM such as a clear, natural line impressed on the bank and shallow shelving created from wave action occur on the GSL[2]. However, other unique physical indicators observed on the lake shores may include: immediate transition from vegetated to unvegetated soils on gentle slopes, establishment of shallow sand dunes, salt rings, and presence of deposited rafts of brine fly casings, algal mats or dead brine shrimp. Elevations of these physical indicators can be measured with the use of a sub-meter GPS unit or other survey device.

OHWM will be determined separately for the North and South Arms due to the differences in water surface elevations resulting from modified hydrologic connectivity. If, at some point in the future, management of the lake is such that full hydrologic connectivity is restored between the arms, then SPK will consider evaluating the USGS gage data together for determining OHWM.

---

[2] The presence of "staining" lines on wood or metal pilings should not be used due to the wicking nature of the salt and gradual rusting of all metal, which will occur at a higher elevation than the actual water level. Additionally, staining on rock structures is not a prevalent indicator because the GSL is a very harsh environment causing the bleaching of most materials which obscures the typical prominent staining seen on bridge pilings and concrete walls located in freshwater environments.

Two USGS gaging stations are located on the GSL, (1) USGS 10010100 Great Salt Lake near Saline, UT (North Arm) and (2) USGS 10010000 Great Salt Lake at Saltair Boat Harbor, UT (South Arm). To determine the elevation via gauge data, SPK will use the average of the annual high water surface elevations for the 30-year record compared with the elevation of physical indicators. A 30-year record is consistent with many weather and water monitoring exercises and represents a reasonable and available range for this dataset. As of the date of this memo, the OHWM for the respective arms of the Great Salt Lake calculated from the physical indicators and the 30-year record are as follows:

- North Arm OHWM from 1989-2015 = 4199 feet MSL
- South Arm OHWM from 1989-2015 = 4200 feet MSL

For this initial calculation, gage station data prior to and including 1988 was excluded due to the initiation and operation of the West Desert Pumps project. According to the Utah Department of Natural Resources, permit and operational limits allow for pumping to commence at water surface elevations greater than 4,208 feet MSL, and thus lake elevations above that level would likely not occur in the future. As such, they have been excluded from this analysis.

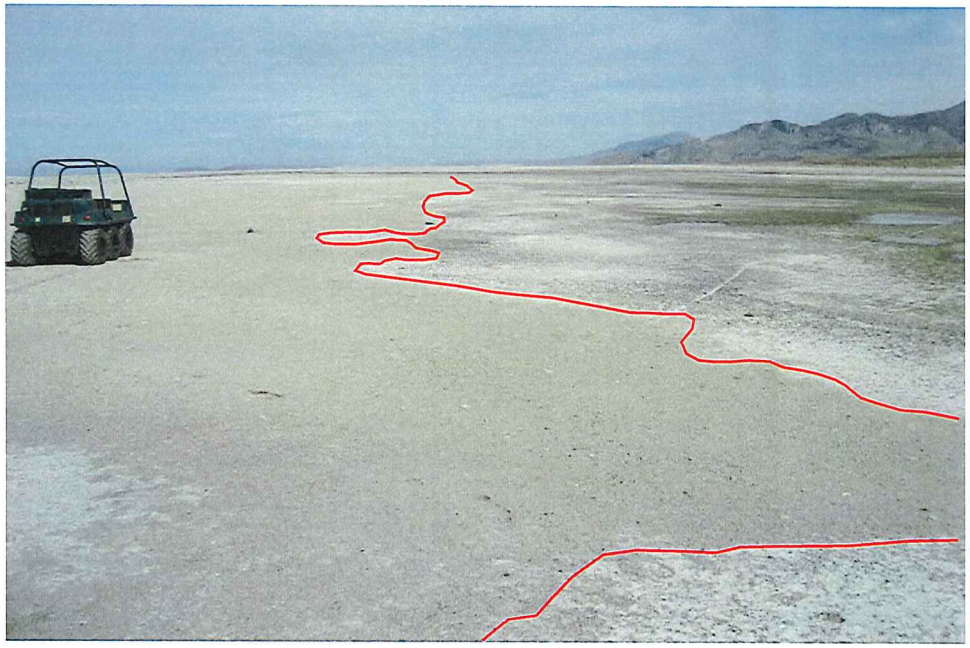
SPK will recalculate the 30-year average every 5 years. Physical indicators will be observed at the same locations for each recalculation. The Great Salt Lake Boat Harbor will be used for the South Arm and a publically accessible location on the west shore of the North Arm will be identified in the future and used thereafter during the next re-evaluation period.

3. Conclusion. Because they can be unreliable given the dynamic and manipulated conditions of the lake, physical indicators alone will not be used by SPK to determine the OHWM for the GSL. Instead, SPK will rely on the use of physical evidence and gage station data. When physical indicators are absent altogether, SPK will rely on gage data alone. This memo rescinds the 1990 policy for determining the Ordinary High Water Mark (OHWM) of the GSL.

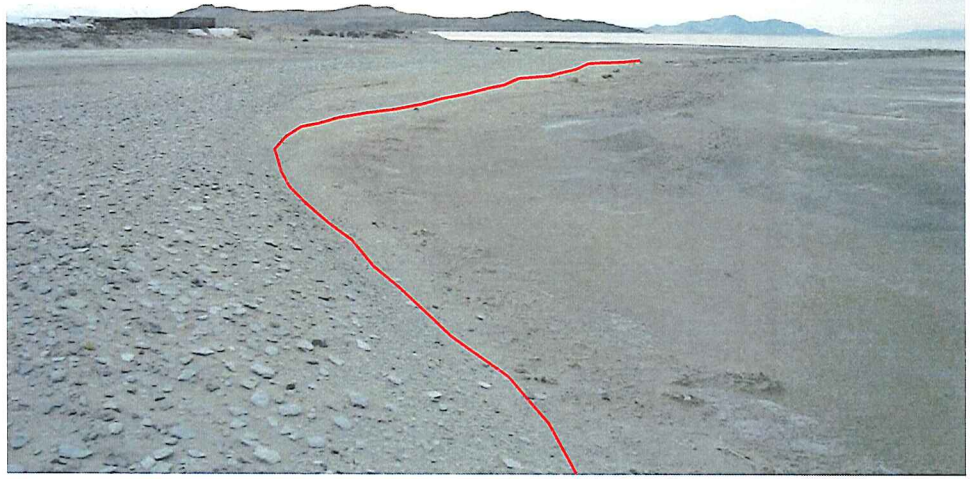
Michael Jewell
Chief, Regulatory Division
Sacramento District

Enclosures
Appendix A: Photos of typical physical indicators of OHWM on GSL
Appendix B: Current 30 year record

Physical Indicators of Ordinary High Water Mark at the Great Salt Lake

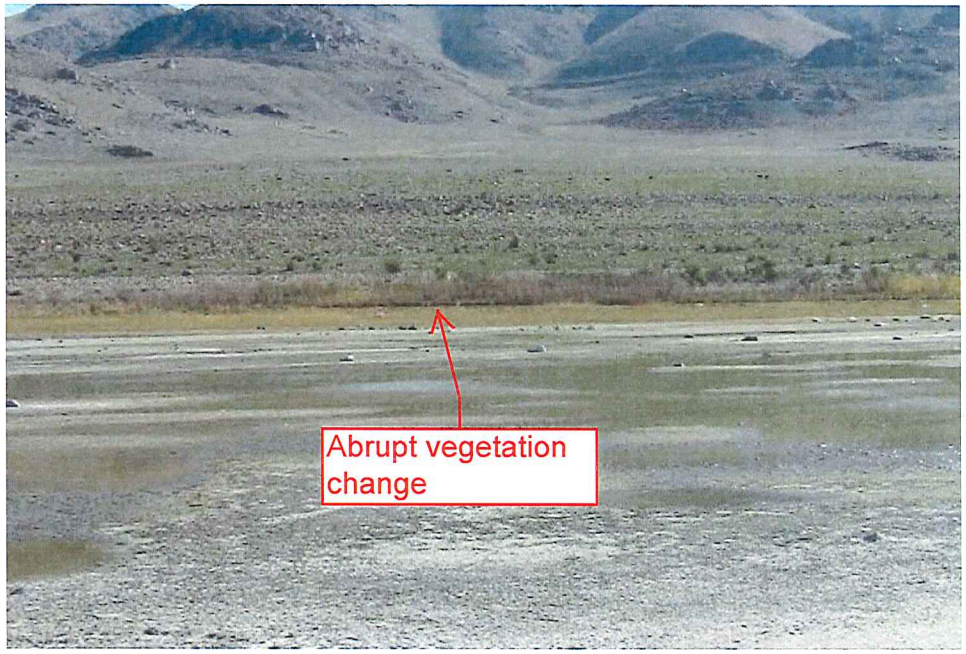


Salt crust rings



Shelving caused by wave action

Clear natural line impressed on the banks



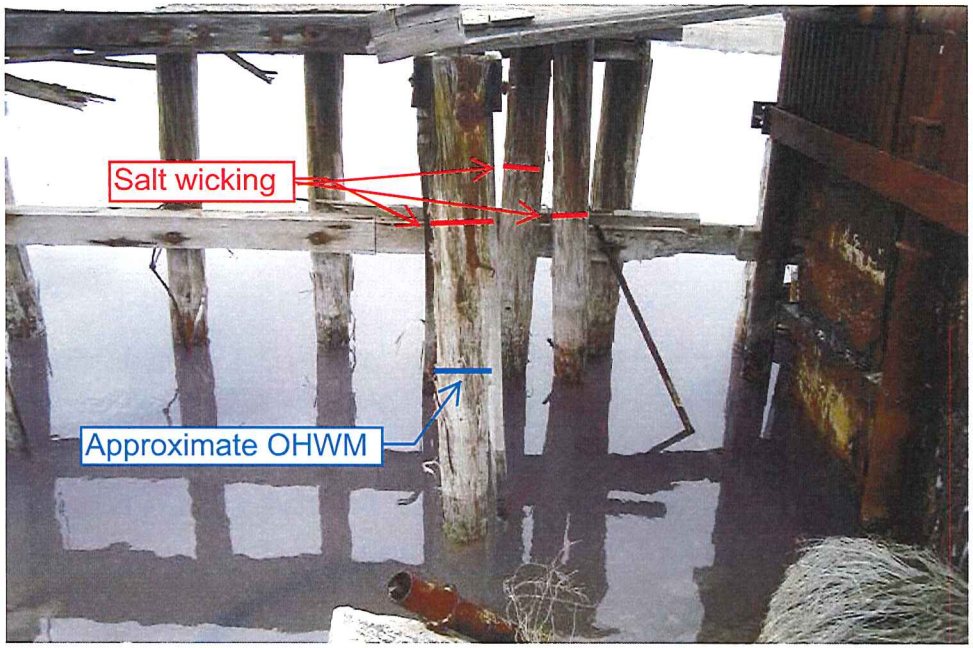
Abrupt vegetation change on gentle slope

Racking of brine fly casings, algae and brine shrimp

Typical Physical Indicators Used to Determine OHWM but Unreliable for Use at Great Salt Lake

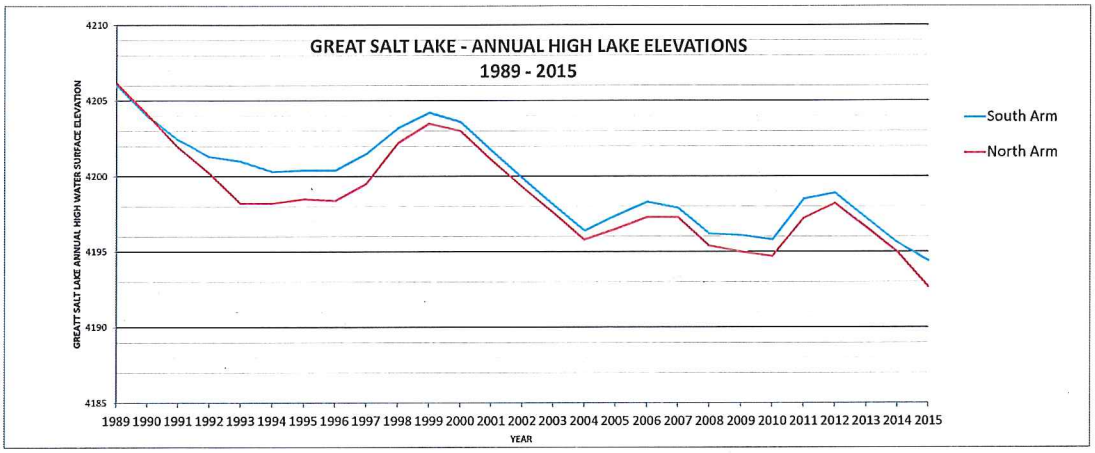
Uneven rusting of metal structures

Water staining obscured due to bleaching effects of GSL's hyper-saline environment



Wicking of salt above OHWM

GREAT SALT LAKE ANNUAL HIGH WATER DATA (1989-2015)



YEAR	ANNUAL HIGH WATER SURFACE ELEVATION SOUTH ARM	NORTH ARM
1989	4206.1	4206.2
1990	4204.0	4204.1
1991	4202.4	4201.9
1992	4201.3	4200.2
1993	4201.0	4198.2
1994	4200.3	4198.2
1995	4200.4	4198.5
1996	4200.4	4198.4
1997	4201.5	4199.5
1998	4203.2	4202.2
1999	4204.2	4203.5
2000	4203.6	4203.0
2001	4201.7	4201.1
2002	4199.9	4199.3
2003	4198.1	4197.6
2004	4196.4	4195.8
2005	4197.4	4196.5
2006	4198.3	4197.3
2007	4197.9	4197.3
2008	4196.2	4195.4
2009	4196.1	4195.0
2010	4195.8	4194.7
2011	4198.5	4197.2
2012	4198.9	4198.2
2013	4197.2	4196.6
2014	4195.6	4195.0
2015	4194.4	4192.7

ANNUAL HIGH WATER CALCULATIONS	South Arm	North Arm
Mean from 1989 - 2015	**4,200**	**4,199**

Note: the annual high water for 2015 is partial year only (Jan.1 through Aug.4); however the highwater mark regularly occurs during the spring runoff months and is presumed captured for 2015.