State of Utah

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PUBLIC LANDS POLICY COORDINATION

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September 20, 2011

Kathleen Anderson
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Nevada-Utah Regulatory Branch
533 West 2600 South, Suite 150
Bountiful, UT 84010

Subject: Union Pacific Railroad Application for Work on Causeway across the Great Salt Lake

Dear Ms. Anderson:

The State of Utah appreciates the opportunity to provide comments regarding the July 2011 Nationwide Permit Pre-Construction Notification (PCN), *Great Salt Lake Northern Railroad Causeway – Culvert Closure and Bridge Construction* submitted to the U.S. Army Corps of Engineers (USACE) by Union Pacific Railroad (UPRR). Based on previous pre-application meetings between the USACE and state agencies, it is the understanding of the State of Utah that USACE is considering authorizing the UPRR proposed culvert project under Nationwide Permit (NWP) 14. The state further understands that UPRR has informed USACE that the culverts are in risk of imminent failure and that expedited action regarding closure and replacement of the culverts is required to avert a potential interruption of rail traffic across the causeway.

Division of Forestry, Fire and State Lands

As provided for in Utah Code Sections 65A-1-2 and 65A-10-1, The Division of Forestry, Fire and State Lands (FFSL) is the agency authorized to manage sovereign lands within the State of Utah, including the bed of the Great Salt Lake (GSL). Sovereign lands are managed under multiple-use/sustained-yield principles and the Public Trust Doctrine as directed by statute. In order to meet this mandate, FFSL must ensure that the all uses on sovereign lands are regulated such that protection of navigation, fish and wildlife habitat, public recreation, and water quality are balanced against the economic necessity or benefit to be derived from any proposed use. The

existing causeway structure was authorized under a grant of easement issued by the Utah State Land Board in 1956. Based on the language of the easement, it is to only be terminated if the causeway is no longer used for railway purposes. Therefore, it is assumed that the easement remains active.

After reviewing the information submitted by UPRR to the USACE, FFSL has identified several key issues in hopes of assisting USACE in their decision process, including the following:

1) **Insufficient Analysis**. FFSL understands that the GSL is a complex, dynamic ecosystem for which there is a great deal of insufficient data. Furthermore, based on previous statements from UPRR, it is their goal to maintain the status quo with regards to circulation and salinity considering the many competing interests on the GSL. As a result, some limitations on the extent of analysis of potential impacts are understandable. However, FFSL has received numerous specific comments from various agency representatives and other stakeholders regarding the sufficiency of the data, modeling, and assumptions included in the information provided to date by UPRR. These comments include the following:

a. The modeling conducted by UPRR consultants is based on the average lake elevation of 4,200 feet above mean sea level (amsl). The modeling should include analysis of potential impacts at varying lake levels since, as seen this past year, lake levels can vary drastically from year to year.
b. The assumption in the modeling that there will be no mixing of the two brine layers is not supported by any evidence in the reports. The proposed design for the flow area of north to south flow is 466.8 ft^2 providing a flow rate of 1,760 ft^3/s. The flow appears to be turbulent and the resulting mixing that would occur should not be excluded from the modeling. The same could be said for the south to north flow as well.
c. The assumption that water density does not vary with depth is not entirely accurate. According to the Utah Geological Survey Open-File Report 485, this assumption might be valid only as long as the lake elevation is no higher than approximately 4,205 ft amsl.
d. No study or modeling was submitted that examines the effect of lake elevation on the bidirectional flow.
e. There is no supporting evidence for the assertion that hydrostatic conditions are consistent b/w the culvert and proposed bridge locations.
f. Potential losses have been ignored. It seems that this is based on the assumption that there is no mixing, hence the flow is assumed to be laminar.
g. Bernoulli's principle is the only theorem used to examine velocity and pressure differences. A project of this magnitude must include fluid mechanics theorems well beyond the Bernoulli's principle. USGS Water-Resources Investigations Report 00-4221 clearly shows that Bernoulli's principle is not valid alone to predict the flow between both arms of the GSL. The breach channel was deepened in 2000 after the date of the above-referenced report, but the flow measurement data collected by USGS

showed the same conclusion: Bernoulli's principle is not adequate alone to predict the flow between both arms of the lake.

h. The effect on brine density and material balance of minerals and ions in the lake is unknown. Therefore, the impact upon the mineral extraction industry is also unknown.

i. The calculations included in the UPRR report seem to misrepresent the observed north to south brine flow behavior of the lake. The bi-directional flow of brines in the lake has been extensively studied by Dr. Wallace Gywnn of USGS (retired) and has been shown to be a function of brine density and lake level elevation which vary as a function of time and other parametric variables. These variables appear to have been ignored in the engineering assumptions. There may be a net increase in the flow of minerals from the south to the north arm of the lake as a result of the construction of the proposed project.

2) **GSL Planning**. FFSL is currently in the process of completing significant revisions to the Comprehensive Management Plan (CMP) and Mineral Leasing Plan (MLP) for the GSL. As a part of this extensive planning process, the Director of the Division implemented a moratorium on new proposed uses of sovereign lands within the GSL until the planning process is completed. Because the potential impacts of this proposed project may not have been analyzed in sufficient detail, many of the assumptions and predications on which the revised CMP and MLP are based may be altered as a result of the proposed project, which could have significant ramifications on the FFSL's planning process.

Division of Water Quality

The EPA has delegated the administration of Clean Water Act (CWA) §401 Water Quality Certification to the Division of Water Quality (DWQ). This certification is a formal statement from DWQ that a proposed project will not violate water quality standards which include degradation of aquatic life and recreation uses (See UAC R317-23), The PCN correctly points out that the broad revisions established in NWP 14 were previously certified by DWQ in 2007. However, NWP 14 allows for "additional water quality management measures to ensure that the authorized activity does not result in more than minimal degradation of water quality" (refer to NWP 14 General Condition A 21 Water Quality).

After careful review of the PCN, DWQ could not find sufficient detail to make an informed decision on whether the proposed project will lead to a violation of water quality standards, or has the potential to improve conditions. DWQ has consulted numerous scientists and all agree that there is too little time and background information to adequately evaluate potential impacts of this project. However, all agree that the project could alter salt concentrations within Great Salt Lake (GSL), with potential impacts to two multimillion dollar industries, commercial harvests of brine shrimp cysts and mineral extraction from Gunnison Bay. DWQ proposes to move as quickly as possible with the project provided that plans are in place to monitor for unanticipated deleterious effects to aquatic resources and to address any harmful

effects that are observed. It is anticipated that through an agreement we can promptly move forward on this significant transportation issue, while fulfilling our water quality responsibilities to protect the beneficial uses of GSL.

If the USACE authorizes this activity under NWP 14, DWQ requests the following specific "Water Quality Measures" are included verbatim in the permit to ensure minimal degradation of water quality occurs:

1. An evaluation of changes to water quality and flow exchange between Gilbert Bay and Gunnison Bay that are attributable to the bridge opening and culvert closure by using the existing U.S. Geological Survey's Salt Balance Model, which would involve:
a. Installing flow gages at the bridge opening between Gunnison and Gilbert Bays and the low point in the ridge separating the north and south basin of Gilbert Bay.
b. Populating, updating, and recalibrating the Salt Balance Model to simulate stratified flow through the submerged culverts, and loads and concentrations of chloride, magnesium, potassium, and sodium in the lake.
c. Identifying numeric values that would indicate a potential concern for several water quality indicators, including: salinity values, atypical declines in brine shrimp populations, and increases in several toxic pollutants of concern (e.g. mercury, selenium) in water and tissue that may negatively impact brine shrimp or waterfowl that feed on them.

2. A plan to sample water quality and brine shrimp at a minimum 4 sites each in Gilbert Bay and Gunnison Bay once during the fall brine shrimp cyst harvest (September – November). At each site, we anticipate that the following parameters would be sampled:

a. Field measurements including: salinity, dissolved oxygen, pH, temperature, conductivity, secchi depth, total water depth, and the depth of the deep brine layer (if present).
b. Metal concentrations of the water column and brine shrimp tissue for several pollutants of concern, including: copper, cadmium, lead, selenium, mercury, thallium, and sulfate.
c. Nutrients and chlorophyll (chl-a) concentrations within the water column.
d. Collection of brine shrimp samples to evaluate the population of key life stages of brine shrimp.

3. To protect all parties, the plan should also specify conditions for continuing or discontinuing these monitoring efforts based upon an empirical comparison of CMS data against historic GSL data. For instance, the data provided by this monitoring plan could be assessed every 2 years by UPRR to determine the effects, if any, of the bridge opening on the beneficial uses of the lake. If the effects are adverse and detrimental to the water quality as determined by DWQ, UPPR will be required to submit a plan to mitigate the effect within 30-days of the determination. Similarly, if these evaluations suggest that neutral or positive effects have occurred, a decision could be made to

terminate these monitoring efforts provided that sensitive lake conditions have been evaluated.

Division of Water Resources

The new opening near mile post 740, at the east end of the causeway "Rambo" fill, will be more than double the combined area of the existing culverts which will tend to equalize the elevations of Gilbert Bay in the south and Gunnison Bay in the north. When the elevations of the two bays become closer, flow will be increased from the north to the south and circulation in general between the bays will be increased.

As part of the bridge design, the new opening needs to be protected from filling with gravel washed in during storm events. The culverts had breakwater dikes installed intended to intercept gravel mobilized by wave action. Some equivalent and equally effective structure should be included. UPRR should have an operation and maintenance plan to keep the channels (north and south) open leading to the bridge to better facilitate flows through it.

As the 24-inch steel pilings, partially filled with reinforced concrete and coated with epoxy, will be exposed to corrosive hyper saline waters which can be anoxic and contain low concentrations of sulphuric acid, a regular inspection and maintenance program is recommended as part of the part of the project. A secondary protection system of impressed current could be used as well.

Division of Wildlife Resources

The Great Salt Lake ecosystem is of local, state, national and hemispheric importance for millions of water birds which nest, stage, and forage within GSL and the surrounding wetlands. Several hundred thousand shorebirds can be found seasonally using the lake. For some species, over half of the entire North American population can be found on GSL at one time. GSL also supports millions of waterfowl during spring/fall migrations (approximately 40% of waterfowl using the Pacific Flyway are found at some time during the year within the GSL ecosystem). This makes GSL and its surrounding wetlands critical to the survival of numerous wildlife species. Additionally, GSL presents a multi-million dollar brine shrimp fishery that supplies high quality fish food to aquaculture operations worldwide. State revenue from this industry approaches nearly one million dollars annually.

The health of migratory bird populations and the fishery are both reliant on two key components of the GSL food web: the brine fly and the brine shrimp. The continued health of brine fly populations and brine shrimp populations in GSL ensures that critical food sources are maintained for migratory birds and that the brine shrimp fishery remains sustainable. Utah Division of Wildlife Resources (UDWR) is concerned that the proposed bridge construction would change the flow between the south and north arms of GSL, impacting the ecology of brine fly populations and brine shrimp populations within the lake.

Monitoring changes in flow between the south and north arms of GSL is critical to predicting salinity changes, and the extent of the deep brine layer in the south arm. Baseline flow conditions at the two causeway culverts are needed for comparison to future flow conditions under the proposed bridge. Although time may be limited by the imminent risk of causeway failure, this monitoring ideally would take place throughout the whole year, since flow rates change dependent on yearly cycles of surface flows and groundwater inputs into GSL. To gain an accurate picture of the complex, bi-directional flow rates at the culverts and the proposed bridge, multiple flow gauges and salinity sensors at various depths should be installed.

Furthermore, UDWR is concerned that the extent/thickness of the deep brine layer in Carrington and Gilbert bays may increase over time. Recent studies by the U.S. Geological Survey have measured high levels of methyl mercury in the deep brine layer, and if this layer grows in area and volume, the health of GSL biota could become adversely affected.

Epilimnetic phytoplankton community composition can be affected by salinity, particularly during winter months when brine shrimp are absent. Chlorophyte relative abundance is positively correlated with salinity, while diatom and cyanophyte relative abundances are negatively correlated with salinity. Diatoms are a poor food source for brine shrimp, so large increases in diatom abundance may negatively impact the brine shrimp population. These relationships were only tested for the salinity range experienced between 1994 and 2010. The impact of salinities exceeding 18% on the phytoplankton and brine shrimp populations are unknown, and may be severe, as the highly saline north arm of the lake is incapable of supporting a viable brine shrimp population during most years.

Based on examination of historical brine shrimp population data over a 13-year period, salinity and temperature appear to be important factors affecting the fecundity and survival of brine shrimp in the south arm of GSL. Statistical analyses show that during August, the densities of reproductive females with cysts (durable eggs that can survive harsh, winter conditions, and hatch in the spring) are correlated with salinity. Although the effect is reduced, females with cysts in September are also correlated with temperature. A simple regression model of females with cysts in August, compared to salinity, bounded on each side of *r* by one-half the standard error, would give reasonable threshold densities of females with cysts: above or below this threshold range, monitoring results would indicate that the south arm ecosystem had fallen out of ecological balance.

Request for USACE Action

Public Input: The State of Utah FFSL understands that issuance of an NWP 14 permit for the proposed project would possibly preclude any public involvement in the decision process. The public should be afforded the opportunity to provide comments regarding the potential impacts of the proposed project. At a minimum, stakeholders who may experience financial impacts as a result of the proposed project should be consulted, including the various extractive industries, representatives of the brine shrimp harvesting industry, and representatives from other key stakeholders. The state would also request that UPRR and/or the USACE provide a detailed overview of

the project to the Great Salt Lake Advisory Council, which is an advisory body formed as a result of legislation during the 2010 General Session of the Utah Legislature to advise on the sustainable use, protection, and development of the GSL.

Letter of Permission Procedures: The State of Utah strongly reiterates that this project has a high potential to significantly affect the water quality of the Great Salt Lake, and several industries that depend upon specific water quality conditions. Therefore, if the USACE decides to authorize this activity under NWP 14, but cannot include verbatim the Water Quality Measures outlined by the Division of Water Quality above, the state respectfully requests that USACE authorizes the activity under Letter of Permission (LOP) procedures. The LOP process will allow DWQ to issue an individual project specific CWA §401 Water Quality Certification in a timely manner, and which includes specific monitoring and assessment procedures such as those discussed above.

If the USACE decides to carry the project forward as currently proposed, the state fully supports the USACE's proposal to include adaptive management requirements as a part of the NWP 14 permit. The adaptive management approach should include provisions for mitigation by UPRR to address any documented impacts resulting from the project. The approach should also include specific sampling and reporting requirements.

The State of Utah appreciates the opportunity to review this proposal and we look forward to working with you to address these concerns. Please direct any other written questions regarding this correspondence to me at the address below, email me at johnharja@utah.gov, or call me at (801) 537-9802.

Sincerely,

John Harja
Director

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