



FRIENDS of *Great Salt Lake*

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www.fogsl.org

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Buffalo Bill on Antelope Island

Oil Painting by Ross Crane

Submitted for the 2018 Alfred Lambourne Prize

The mission of FRIENDS of Great Salt Lake is to preserve and protect the Great Salt Lake ecosystem and to increase public awareness and appreciation of the lake through education, research, advocacy, and the arts.

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EXECUTIVE DIRECTOR'S MESSAGE

PROPOSAL FOR UNION PACIFIC RAILROAD COMMUNAL TRACK TO SERVE PROMONTORY POINT INDUSTRIES LACKS NECESSARY DETAILS AND RAISES RED FLAGS

*"Pay no attention to that man behind the curtain."
The Wizard of Oz*

On August 7th, 2018, the Union Pacific Railroad (Union Pacific) submitted partial information to the Army Corps of Engineers (the Corps) for a Pre-application Meeting on August 21st. The meeting was intended to support Union Pacific's request that the Corps authorize a Letter of Permission (LOP) for proposed "minor impacts" – less than one acre - to aquatic resources of the U.S. under Section 404 of the Clean Water Act, and/or to navigable waters under Section 10 of the Rivers and Harbors Act. These impacts would come from the construction of a communal track (industrial siding) at the Lakeside Subdivision on the Promontory Peninsula to support industry rail service on Promontory Point in Box Elder County, Utah. The estimated time to complete the project is 3 to 4 months.

For obvious reasons, whenever impacts to Great Salt Lake wetlands and waters are being considered, FRIENDS wants to know more about the issue. The Great Salt Lake Ecosystem is hemispherically important, ecological critical, and economically significant. Any proposals that could jeopardize the integrity of the system are always of great concern. Because the LOP process is tailored for small projects with "minor impacts" it's streamlined. The Corps isn't required to issue a public notice for public participation. Instead federal and state agencies are involved on behalf of the public interest. Under these circumstances, the applicant is required to provide a complete proposal two weeks in advance of the pre-application meeting to give the agencies adequate time to review it. Right out of the gate Union Pacific failed to meet this requirement. **For starters, the proposal failed to include a complete description of the proposed activity including the purpose and need of the activity.**

On August 10th FRIENDS filed an Expedited Freedom of Information Act Request with the Corps of Engineers. We wanted to review the pre-application information that would be discussed. We also requested a list of the invitees because we wanted to be sure that the Utah Division of Forestry, Fire and State Lands (which has jurisdictional management responsibility for Great Salt Lake), the Division of Water Quality, the Division of Waste Management and Radiation Control, and a representative from the Great Salt Lake Advisory Council (which advises the

governor on Great Salt Lake issues) were also included. Except for the Division of Water Quality, the others were not on the list until we suggested them.

Our primary concerns with the proposal focus on the rationale and the process for authorization. What we saw in the pre-application information did not reflect the true scope of the proposed project because given where it is and its adjacency to Great Salt Lake, there's no question that it would exceed the limits of "minor impacts." This means that it doesn't fit with the process that's necessary for the Corps to issue a Letter of Permission. It doesn't comply with meeting all of the criteria identified in an August 1, 2001 U.S. Army Corps of Engineers Public Notice *Implementation of Minor Impact Letter of Permission (LOP) Procedures in Utah, and with EPA's 404(b)(1) Guidelines.*

The other concern about it comes from our work on tracking the Promontory Point Resources, LLC (PPR) landfill on Promontory Peninsula (see Spring 2018 newsletter). In its application for a Class V permit that would allow it to take out of state waste, PPR stated that a railroad spur to move inventory onto the site would be needed. And although on February 16, 2018, PPR withdrew its Class V permit application, at that time under review by the Division of Waste Management and Radiation Control, rail access to that facility might make taking another run at it more attractive even though other obstacles still remain. Among those obstacles is a failing grade on its *Needs Assessment Report* which is used to determine whether another Class V landfill is even needed in Utah. With over 1000 years storage capacity among the existing facilities, that base is well covered. However, through the grapevine we have heard that an attempt to legislatively eliminate this evaluative criterion from the Administrative Rule puts a finer point on Union Pacific's proposal.

You may recall that in response to PPR's Class V application the Division was presented with a White Paper titled *Great Salt Lake as an Ecologically Significant Natural Area* by the Great Salt Lake Institute at Westminster College. This reference tool is intended to help enlighten the Division about the kinds of cumulative impacts this operation could have on the Lake and how much is at stake with this kind of adjacent land use.



So what's there and what's missing in the proposal?

The pre-application proposal is described as a "small construction activity" of less than 5 acres in scope. The construction of the communal track would consist of a new 1.2 mi. long parallel track with a western and eastern terminus located 115 ft. north of the existing mainline track. The mainline track we're talking about here is the 21 mi. Union Pacific causeway that bisects Great Salt Lake and for about 5 miles runs around the tip of Promontory Peninsula where this activity would occur. Since the best design and exact location of the construction was based on accommodating the proposed rail car length, turning radius, and access to *the industrial spurs* referenced in the text and diagrams, it doesn't seem likely that even this stepsister's foot is going to fit into Cinderella's shoe for a LOP authorization.

A July 27th aquatic resources delineation report identifies general cover types as playa and saline wet meadows. The proposal suggests that permanent wetland impacts to saline wet meadows from fill to construct the communal track would be less than one acre, or as indicated in Table 1. *Permanent Wetland Impacts* – a total of 0.994 acres. This is only 0.006 acres below the highest threshold for a Letter of Permission. That's 260 square feet (how big is your livingroom?) Again, under the circumstances of where this activity would be happening, it's inconceivable to think that secondary and cumulative impacts to wetlands and playas would not occur.

The proposal indicates that the design of the track is such that it avoids impacts to the playa part of the shoreline of the Lake. And although it claims that no hydrological connections will be impacted by the project, no proof other than surface observations is provided. We know that ample research exists that confirms that areas and wetlands around the Great Salt Lake have extensive hydrological connections. Much more is needed to show that there would be no impacts to springs, aquatic habitat, migratory bird breeding areas, threatened or endangered species, or the management of water flows that are a part of the interface of the landscape of Promontory and the Lake.

It's stated that reseedling of peripheral vegetation would be addressed if necessary. And that best management practices would help avoid and minimize impacts. Mitigation between 1:1 and 2:1 to compensate for permanent wetland impacts would

come from the purchase of saline wet meadow credits from the Machine Lake mitigation bank. However, the mitigation bank is meant to replace "isolated wetlands of minimal or degraded use" which these wetlands are neither. They are a part of a large and vital ecosystem.

Soil erosion, sediment controls and permits for storm water discharges would be covered by Section 402 of the Clean Water Act and the Storm water Pollution Prevention Plan, although Union Pacific may apply for an "erosivity construction waiver" because of the "abbreviated" nature of the construction. A 401 Certification through the Division of Water Quality would also be required.

After careful analysis of the *Implementation of Minor Impact Letter of Permission (LOP) Procedures in Utah, and EPA's 404(b)(1) Guidelines* our conclusion is that Union Pacific has failed to identify whether this activity qualifies as a "single and complete activity", and is trying to segment out the cumulative impacts of this project by focusing only on the construction of the "communal track". This is intended to keep the designated impacts under the 1-acre threshold for a Letter of Permission, while ignoring what they've clearly designated as the "future rail connections." By designating those connections as "future work by others" they appear to be trying to play a bit of a shell game with the Corps in order to avoid having to run the gauntlet for an Individual Permit authorization.

Forgive me for this exhaustive description and analysis of this proposal. Ironically, I could go on, but it's important that we all recognize how much could go wrong and what this means to the Lake.

FRIENDS believes that this proposal should not be authorized under a Letter of Permission by the U.S. Army Corps of Engineers. This proposal and the Great Salt Lake Ecosystem are worthy of the rigor, the scrutiny, and the public participation that an Individual Permit process would require.

In saline,

Lynn de Freitas, Executive Director



FRIENDS' ORGANIZATIONAL STATEMENT

Founded in 1994, FRIENDS of Great Salt Lake is a membership-based nonprofit 501c3 with the mission to preserve and protect Great Salt Lake ecosystems and increase public awareness and appreciation of the Lake through education, research, advocacy, and the arts. The long-term vision of FRIENDS is to achieve comprehensive watershed-based restoration and protection for the Great Salt Lake ecosystem.

FRIENDS of Great Salt Lake sponsors programs related to our mission statement: Lakeside Learning, the Doyle W. Stephens Scholarship, the Great Salt Lake Issues Forum, and the Alfred Lambourne Prize.

Lakeside Learning Field facilitates 2.5 hour inquiry-based educational field trips for 4th grade students. The trips combine informal environmental education strategies while incorporating science, technology, engineering, art and math (STEAM) to reinforce the Utah Common Core State Science Standards. Lakeside Learning emphasizes learning through participation.

Within the research component of our mission, we sponsor the Doyle W. Stephens Scholarship for undergraduate or graduate research on Great Salt Lake ecosystems. Established in 2002, the scholarship supports students in new or on-going research focused within the Great Salt Lake watershed. Recent project winners span the effects of changing salinity on microbialites to the impacts low water levels in Great Salt Lake have on Utah's air quality.

FRIENDS is actively involved in advocating for Great Salt Lake. Every two years, FRIENDS hosts the Great Salt Lake Issues Forum to provide focused discussions about the Lake for a variety of stakeholders including policy makers, researchers, and industry leaders. Each Forum engages the community in constructive dialogue regarding the future of Great Salt Lake.

In 2014, FRIENDS established the annual Alfred Lambourne Prize for creative expressions of our Inland Sea in the categories of visual art, literary art, sound, and movement. FRIENDS celebrates the relationship between local artists and one of Utah's most precious natural resources, Great Salt Lake. Through artistic expressions, we enhance our capacity to build awareness about the Lake and our need to preserve and protect it for the future.

FRIENDS maintains a Board of Directors and Advisory Board composed of professionals within the scientific, academic, planning, legal, arts, and education communities. Staff members include, Lynn de Freitas, Executive Director; Holly Simonsen, Membership & Programs Director; and Sarah Radcliff, Education & Outreach Director.



Black Rock Tranquility
Oil Painting by Laura Boardman
Submitted for the 2018 Alfred Lambourne Prize
See more at lauraboardmanart.com

ON THE COVER

"My painting *Buffalo Bill On Antelope Island* was an idea I had in 2000 when I read that William Cody visited Antelope Island a few years before his death in 1917. I wanted to create an image of his visit to record this historical event. I originally envisioned the painting to be of him atop a bison. I completed a few sketches, but then filed them away. In 2015, I found my sketches and was excited to rework the idea. Because the idea of Buffalo Bill with his steed being a bison is not accurate, I wanted a slightly whimsical feel to the piece. I built a 30"x30" masonite board and began painting during the summer of 2015 and completed the painting in February of 2016. The painting was an enjoyable project. It was first displayed at the March 2016 Poor Yorick Studios Open Stroll, where my wife, Denise Crane, and I have a studio. The next Open Studio Stroll will be in March of 2019, where this painting will be on display."

– Ross Crane



CREATIVE EXPRESSION INSPIRED BY OUR INLAND SEA



Micro Worlds, Hidden Birds – Southern Arm, Great Salt Lake

Oil Painting by Marcia Walke

Submitted for the 2018 Alfred Lambourne Prize

Great Salt Lake is my refuge and mystical companion. The Lake reveals hidden worlds. Teeming with micro-aquatic life, Farmington Bay, beats with a bird heart, that is so inter-connected it changes form with a wave, a wing, a simple ripple of water. My piece conveys the mystery of changing shapes, in plain sight, and brilliant colors. The bright colors come from the warble of the red-wing blackbird, which is a trill so beautiful it must be seen. A continuous, evolving wonder begins.



The Other Dead Sea

No less holy, this one was born in a high desert valley
surrounded by mountains flanked with bitterbrush,
its banks striated not by ibex but mule deer trails

which I followed from childhood across salt flats,
toward aspen groves, alcoves, and caves, over
rocky passes and ensign peaks, but never ranged too far

from waves. Hence my affinity for lines that lead upward
and away, but with an imprint of hoof and dewclaw
to retrace when I am lost, to descend when the blue shock

of heaven boils with black clouds, and Frary Peak
suddenly veils its scars with a lacey skiff of snow.
Once I found a dead godwit, stuck in a polluted eddy

of the Jordan River, a film of ice bracing it against
the bank's frozen mud. I kicked it loose and watched it float
under I-80 toward the lake where it would be baptized

in salt and find no outlet unless, like water, it take wing.
I wandered home on a crooked path, questioning which side
of the world I was on, indifferent gulls laughing above.

– Jim Richards

The Other Dead Sea by Jim Richards
Submitted for the 2018 Alfred Lambourne Prize

In this poem I attempt to capture Great Salt Lake's diverse beauty and rugged mystery, its fragility and strength, how we affect it as humans and how it affects us, and how its orientation and landscape mirror that of the Dead Sea region. This poem also expresses my personal affinity with the lake as one who grew up staring at it through my window every day, and it staring back at me.



TARGET SHOOTING AT GREAT SALT LAKE:

A REMINDER TO ADHERE TO STATE REGULATIONS

On September 15th, the Division of Forestry, Fire and State Lands celebrated International Coastal Cleanup Day with FRIENDS of Great Salt Lake and their partners by cleaning up an area south of the Antelope Island gate house. This is a well-known and popular area for target shooting. Volunteers collected approximately 1,200 pounds of trash at this site on the cleanup day.

Over the past several years the Division has placed informational signage in the area to educate people about unsafe shooting practices at this location. The primary concerns are that the area is located within 600' of buildings in the vicinity and there is not a sufficient backdrop, meaning that rifle and handgun shots cannot be accounted for. In addition, trail users cannot be seen and lead accumulation on the lakebed can impact the health of waterfowl.

Litter accumulation at this site has become a growing concern over the last few years. A large amount of shell casings and target material was retrieved from the site during the cleanup. While the Division discourages use of this location as a shooting area, Utah state law is very technical when it comes to restricting firearms use. Users are reminded to adhere to state laws and regulations when operating a firearm. Users should always operate their firearm in a safe, ethical and responsible manner. All shot shells and target materials must be cleaned up, and the use of ammunition containing lead is discouraged on the lakebed. As part of the management process, the Division will continue to monitor the impacts at this location and advocate for safe and responsible use.

Jamie Barnes and Ben Stireman
Utah Division of Forestry, Fire and State Lands



Ben Stireman with shell casings, target material, and litter during International Coastal Cleanup. Photo courtesy of Sabrina Astle.



TOIL AND TROUBLE OR A MIDSUMMER'S DREAM?

DEVELOPMENTS FROM A VISIT TO U.S. MAGNESIUM

During fall of 2016, we reported on a visit to the U.S. Magnesium Superfund/RCRA site, which we described as a veritable earthen cauldron of brimming acidic waste dissolving the underlying oolitic sands and occasionally discharging beyond its boundaries (Boil, Bubble, Toil and Trouble: A day at the U.S. Magnesium Superfund Site, FOGSL newsletter).

While the boil, bubble, and toil continue, a lot has transpired since then, and with another site visit just completed in mid August, 2018, we're prompted to make another report. Among the notable developments are:

1) An official letter of violation from UDWQ to U.S. Magnesium in November, 2016 regarding unpermitted discharge to groundwater.

2) A draft proposal from U.S. Magnesium to UDWQ to engineer a vast slurry wall surrounding a retrofitted waste pond over the footprint of most of the existing Superfund site (under review).

3) A proposal to cap the retrofitted waste pond (on closure) with a salt layer (demonstration in progress).

The letter of violation regarding unpermitted groundwater discharge laudably demonstrates UDWQ's active promulgation of groundwater regulations at the site. As a result, U.S. Magnesium has developed a highly substantial plan to address their containment issue. Containment is challenged both by the highly acidic waste ($\text{pH} < 1$), as well as by the fact that the waste pond is underlain by clay, silt, and silty sand sediments with interbedded 2-12 ft. thick oolitic carbonate sand layers that easily transmit waste, and which dissolve in it, continuously emitting carbon dioxide bubbles and creating discharge paths.

Fortunately, a very low permeability 11-18 ft. thick clay layer at a depth of 37-42 ft. below ground underlies the oolitic sand layers, and this forms the basis for U.S.

Magnesium's proposal to contain the waste within an impressively long (25,000 ft.) slurry wall (24-30 inches thick). The slurry wall will be notched into the underlying clay layer and supported by an earthen berm. A recent water balance showed that once the slurry wall is in place, the area needed to contain the waste, even after considering evaporation, will encompass both the current and old waste ponds, essentially converting the old waste pond Superfund site into an operating RCRA site, a novel proposal that warrants serious consideration. The proposed containment structure is therefore called the "retrofitted waste pond."



View north near U.S. Magnesium's 1N solar pond; salt piles are distributed by Broken Arrow, Inc.

The height of the slurry wall and earthen berm will reach 4,218 ft. in elevation, corresponding to 6 ft. above the maximum height of Great Salt Lake (4,212 in 1986), or about 12 ft. above the floor of the retrofitted waste pond on its eastern perimeter. The contained sediments and oolitic sands are estimated to provide at least 20 years of neutralizing capacity for the acidic waste, during which time U.S. Magnesium plans to evaluate in-stream

neutralizing capacity upstream of the retrofitted waste pond.

The water balance and monitoring performed by U.S. Magnesium indicate that groundwater influx into the containment structure above the underlying clay is negligible (~25 gal./min.) compared to the waste flow (~1,100 gal./min). To demonstrate successful containment, U.S. Magnesium will install piezometers to compare hydraulic heads across the slurry wall, and plans to distinguish groundwater influx from waste water using stable isotopes (^{18}O and ^2H).

Notably, during our visit in mid August, 2018, the active waste pond was only half full due to the high evaporation and negligible precipitation during July and August of 2018.





FRIENDS U.S. Magnesium Committee Members, Joy Emory and John Vernath, with U.S. Magnesium's Rob Hartman

The waste constituents that brought U.S. Magnesium into Superfund status are dioxins and hexachlorobenzene (HCB), that are generated in magnesium production, and which are constituents in the waste. These toxic organic compounds are relatively insoluble and sorb to particles. For this reason, U.S. Magnesium is also developing a filtration unit to remove dioxin and HCB, which will then be disposed of as solid waste in an appropriate landfill.

Also under development is the proposed closure plan involving a salt cap. U.S. Magnesium proposes to capitalize on the abundant salt in the adjacent Great Salt Lake to develop this cap over the retrofitted waste pond upon closure some day in the future. This is another novel idea also worthy of serious consideration. Waste caps are generally composed of fine earth materials such as clay or geomembrane, so salt is an unusual option. However, it may well turn out to be a better option than clay or a geomembrane for the reason that salt is highly porous (50% porosity) but very impermeable (permeability similar to clay). With the high porosity but low permeability, liquid brine remains trapped in pores in salt. Both clay and salt crack with changes in humidity and temperature; however, in the case of salt, cracks that form will fill with brine and selfseal. Geomembranes are thin and relatively easily compromised, particularly when they cover large areas. U.S. Magnesium states that generally about 0.5 ft. of salt is deposited per year in the solar ponds. A dem-

onstration pond has accumulated two ft. of salt over the past two years, corroborating their observation.

In addition to the above potential advantages, a salt cap can potentially be established by a short (~1000 ft.) diversion from Solar Pond 1N to the retrofitted waste pond, obviating the need to haul in vast quantities of clay and other fine material. A major consideration will of course be the ability of a salt cap to withstand potential shifts in freshwater influx or stage of Great Salt Lake. Notably, when the old waste pond was overrun by increased Great Salt Lake stage in the 1980s, the amount of salt dissolved versus remaining over that period was characterized in a Dames and Moore consulting report that will serve as a useful indicator of the long-term viability of a salt cap.

Whereas the challenges are significant, the developments we report herein are promising, and we will report on the above considerations as these proposals/projects progress.

William P. Johnson
Anna Rasmuson
Samuel Lopez
U.S. Magnesium Technical Advisors for
FRIENDS of Great Salt Lake



BEHRENS TRENCH: THE UNDERWATER RIVER OF GREAT SALT LAKE

Compass Minerals, formerly Great Salt Lake Minerals, has been operating in southern Bear River Bay since 1970, and the site in Clyman Bay (located on the west side of the North Arm) since 1993. The operation now includes 55,000 acres of solar evaporation ponds, and a production facility west of Ogden where Compass Minerals produces sulfate of potash (SOP), magnesium chloride and salt. Compass Minerals is the only domestic producer of SOP, including certified organic SOP, which is a specialty potassium for high-value crops that have sensitivity to chloride-based fertilizer, including tree nuts, citrus, grapes, potatoes and turf grass. The salt harvested from Great Salt Lake keeps people safe in the winter, while magnesium chloride has a variety of uses, including reducing dust on dirt roads.

The Process

The process of concentrating the brines is complex, and takes about three years to complete. The first step involves pumping brine into the company's west ponds, located in Clyman Bay (Figure 1: Facility Map) from the North Arm of Great Salt Lake. The brine in the west-pond complex is concentrated for about one year through solar evaporation, and then transferred to the east-pond complex for an additional two years. Various salts precipitate as solids in the east ponds during the final two years of the process, where they are harvested and further processed at the production facility which employs over 300 full-time workers, many of whom have been with the company for decades.

Behrens Trench

The current solar evaporation pond footprint has been in place for decades, but prior to 1994, the operation solely relied on its east-pond complex, drawing brine from the ambient North Arm of the Lake at Promontory Point. The generally flat-laying Clyman Bay was identified in the late 1980s and early 1990s as a potential location for new solar evaporation ponds to enhance production in response to record high lake levels in the mid-1980s. However, the concept of expanding our solar evaporation operations into Clyman Bay created an engineering challenge: How to transport the concentrated brine from the west ponds to the east solar evaporation complex? A number of concepts were considered, including a pipeline. However, an engineer, and one of the founders of the Compass Minerals Ogden site, Peter Behrens, came up with a truly innovative and brilliant idea: an underwater trench. The trench concept relied on the construction of a channel on the lake bottom, which happens to slope gently west to east toward the eastern shore of the North Arm at Promontory Point. In theory, since concentrated brine from the west-pond complex is heavier, the brine would be able to flow beneath the ambient brine in the North Arm with minimum mixing and dilution. This incredible concept was turned into reality, along with the Clyman Bay solar evaporation pond complex in 1994. The channel has since been named, Behrens Trench, in honor of Peter Behrens (Photo 1).



Figure 1: Compass Minerals Facility Map, North Arm Great Salt Lake





Photograph 1: Plaque commemorating Peter G. Behrens, developer of the trench.

The Behrens Trench is approximately 21 miles in length, and ranges in width from 30 to 110 feet, and 8 to 34 feet in depth. A cross-section included in the initial permit application materials is illustrated in Figure 2. The cross-section illustrates the grade and trend of the trench along the lakebed. The original construction of the Behrens Trench was supported by permits granted through the U.S. Army Corps of Engineers (ACOE) and the Utah Department of Environmental Quality (DEQ) for the initial impacts to the lakebed during excavation of the trench.

The Behrens Trench is used exclusively in the evaporation season — June through September. It takes approximately seven days to transport brine from the west to east. Once the brine reaches the east side of the Behrens Trench, it is lifted at Promontory Point by a pump station that transfers the brine via overland canal to Compass Minerals' east-pond complex in Ogden.

Collaboration with Lake Stakeholders

The Behrens Trench remains intact and continues to operate as designed. However, about five years ago, salt accumulations were observed in the base of Behrens Trench, which threatened to degrade optimal flow. In 2016, Compass Minerals applied for a maintenance dredging permit from the ACOE and DEQ to dredge the accumulated salt over approximately 16.5 miles of the trench.

Even before starting the permitting process, Compass Minerals collaborated with many lake stakeholders to understand any potential concerns and leveraged learnings from engagement and participation in the various GSL meetings, lectures and conferences to voluntarily integrate several operational concepts to minimize impacts on the lake, its ecology and its stakeholders:



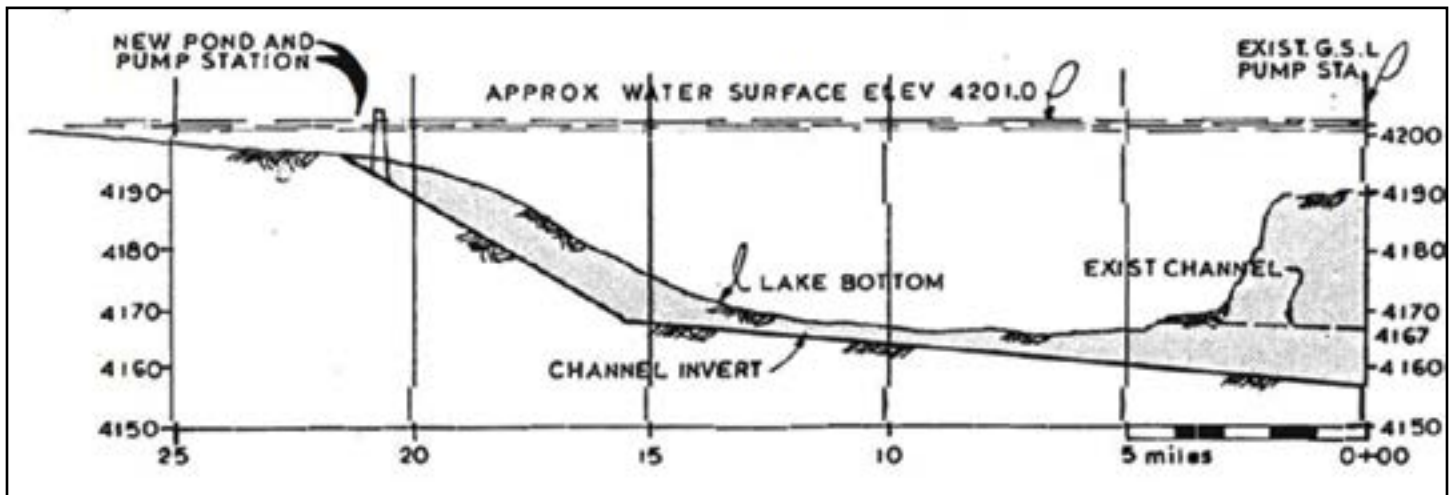


Figure 2: Cross-section illustrating the grade and trend of the trench within the Lakebed

- With an enhanced body of research and literature on the presence of bioherms and stromatolites on the lake bottom, and specifically the presence of relic bioherms and stromatolites in the North Arm of Great Salt Lake near Promontory Point, Compass Minerals committed to discharge salt cuttings on the original windrow from the construction of the Behrens Trench that remains in these areas, so as not to cover relic bioherm or stromatolite structures.
- Compass Minerals followed the original Behrens Trench design concept of leaving 350 foot breaks every 3,000 feet along the salt-cutting windrow to avoid disrupting lake-bottom currents that could impact brine shrimp and overall current hydrodynamics.
- Compass Minerals committed to avoid conducting dredging activities in the fall near the new opening in the Union Pacific Railroad Causeway to avoid any potential disturbance to brine shrimp harvesting activities, that from time to time could extend into the North Arm.

The required permits were issued in 2016, and dredging commenced in early 2017.

Dredging Operations

Maintenance dredging operations involve using a 109 foot watercraft to operate a 24 inch spud cutter head that cuts through the salt, and a pump connected to an 18 inch suction slurry hose that pumps and transfers the salt cuttings approximately 1,000 feet north of the maintenance dredg-

ing activities. The cuttings are distributed along the lake bottom, creating a 3 foot high windrow of salt on the lake bottom, which is treated as a temporary fill.

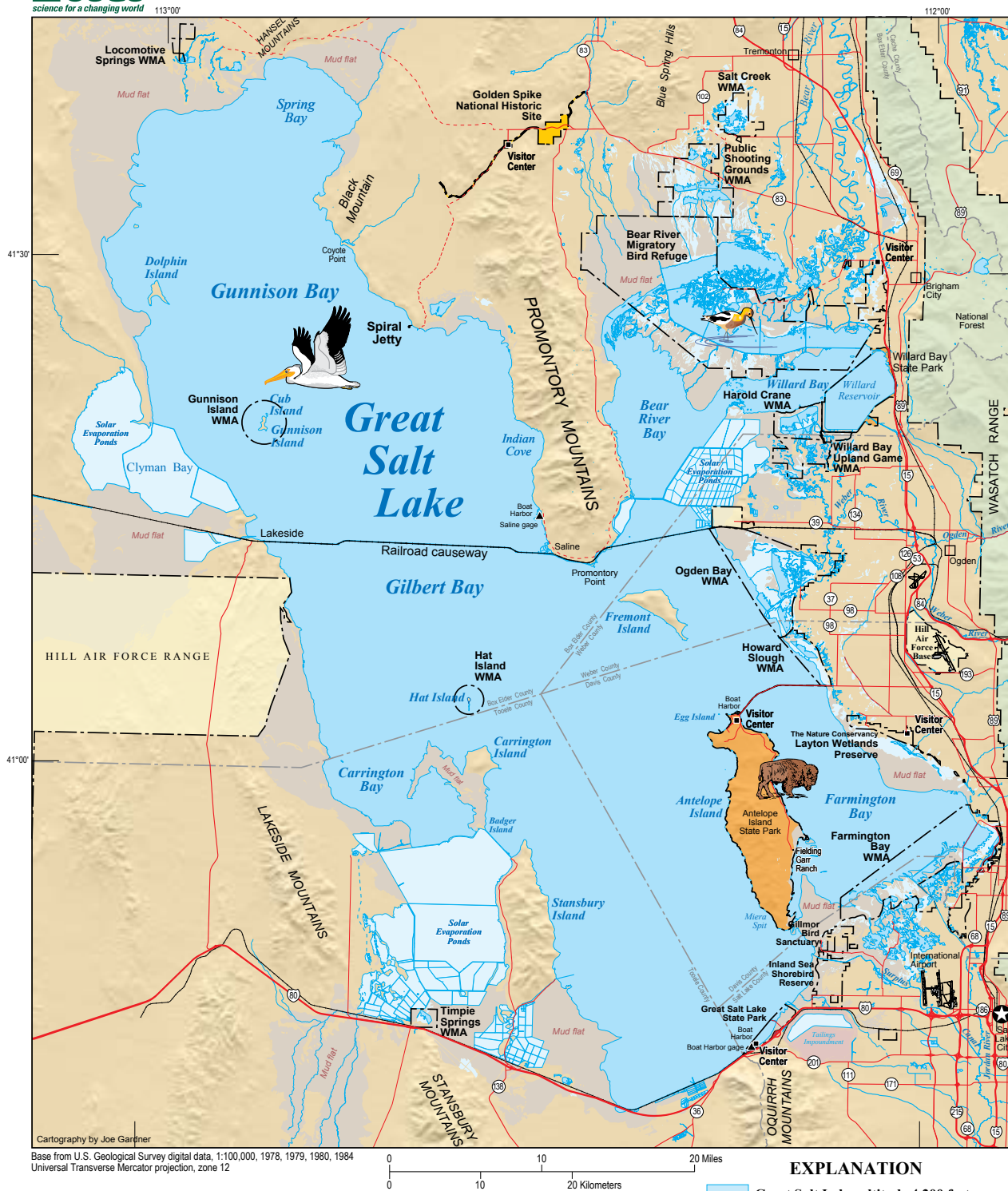
Dredging operations are discontinued during the summer months, when brine is transferred from Compass Minerals' west-pond complex through the trench. Due to lake conditions and inefficiency of operating in the cold, dredging operations shut down in the winter months as well. There have been three episodes of dredging to date: spring 2017, fall 2017 and spring 2018. The fourth and final dredging event will occur during the fall of 2018.

Through three seasons of dredging to date, operations have gone very well and are ahead of schedule. Compass Minerals believes that this project illustrates the value of having a tightly knit stakeholder and regulator community, and the value of having open communication channels and transparency. Compass Minerals greatly appreciates the engagement and support provided by all involved on this project that will maintain a truly brilliant engineering concept, the Behrens Trench!

Joe Havasi, Director Natural Resources,
Compass Minerals



GREAT SALT LAKE AT A GLANCE



USGS has measured lake altitude at or near Boat Harbor gage since 1875, and at Saline gage since 1966
Great Salt Lake historic maximum altitude 4,211.60 feet, June 3, 1986, and April 1 and 15, 1987
Great Salt Lake historic minimum altitude 4,191.35 feet, October 15 and November 1, 1963

Courtesy U.S. Geological Survey





E•phy'•dra, a noun; a genus of two species of brine flies that live on the bottom of the Great Salt Lake as larvae and pupae, and along the shores of the Lake as adults.

NUTRIENT REGULATION BALANCING ACT – HOW GREAT SALT LAKE FITS INTO THE PICTURE

For the North Davis Sewer District (District), selecting a recommended alternative for meeting new nutrient regulations has at times seemed like a balancing act between the varied goals of stakeholders. One of the stakeholders that weighs heavily in that balance is the Environmental Protection Agency (EPA), which is the primary influence in why we do what we do at the sewer district.

Why Do We Do What We Do?

A renaissance of environmental consciousness began to build in the late 1960's. The environmental movement gained heightened national attention when the Cuyahoga River in Ohio again caught fire in June of 1969. The river was highly polluted with petroleum products and other chemicals discharged from industries located in the area. In reaction to this extreme example of water pollution, as well as a general decline in the quality of important water bodies throughout the nation, along with the proliferation of pollution to air and land, the federal government established the EPA in 1970. In 1972, Congress passed the Federal Water Pollution Control Act known as the Clean Water Act (CWA).



Lightening storm at Great Salt Lake courtesy of Kevin Cowan

The primary goal of the CWA is to restore and maintain the chemical, physical, and biological integrity of waters in the U.S. Specific milestones set by the CWA included eliminating all pollutant discharges to navigable waters by 1985 and achieving fishable and swimmable waters wherever attainable by 1983. The

state of Utah enacted the Water Quality Act in 1991, which established the Water Quality Board and sets forth the guiding principles for accomplishing the goals of the CWA. The North Davis Sewer District is permitted under the Utah Pollutant Discharge Elimination System (UPDES) program that is administered by the State Division of Water Quality (DWQ) under delegated authority given by the EPA.

Nutrient Regulations

One of the more recent regulations promulgated by DWQ is a 1 mg/L limitation on phosphorous discharge concentrations known as the Technically Based Phosphorous Effluent Limit (TBPEL). Phosphorous is a nutrient that under certain conditions may contribute to the unwanted growth of algae in streams and lakes. Publicly owned treatment works (POTWs) like North Davis Sewer District and across the state now have to determine what modifications and expenses will be required to comply with the new TBPEL as well as a pending future regulation on another nutrient, total inorganic nitrogen (TIN). In some cases, the cost of compliance for POTWs to meet both the phosphorous and nitrogen limits will cost hundreds of millions of dollars.

The District's Proposal and Great Salt Lake

The District's treatment facility is located near the shore of Great Salt Lake (GSL) just south of the Antelope Island causeway. Its discharge flows into Farmington Bay. The District's selected plan for meeting the nutrient regulations affects many stakeholders including: regulators, ratepayers, conservation interests, industrial enterprises, and the Lake's ecosystem. The goal of the District is to understand and fairly consider the goals of all stakeholders and to implement a solution that will maximize support for those goals, which in some instances may have competing interests. In pursuit of this goal, the District has been actively involved in discussions with DWQ, Division of Wildlife Resources, Dept. of Natural Resources, FRIENDS of Great Salt Lake, National Audubon Society, Great Salt Lake Brine Shrimp Cooperative, Inc., the Nature Conservancy, and the Utah Waterfowl Association. The discussions have been productive because they give everyone an opportunity to hear and understand





Antelope Island rainbow courtesy of Kevin Cowan

different interests, concerns, and goals while exploring options that can lead toward mutually beneficial results. In the end, North Davis' goal is to make the best possible decision for complying with nutrient regulations while considering important stakeholder input.

One option in particular offers an opportunity to meet many of the goals of stakeholders. This option is available because of the location of the District's facility being close to the Antelope Island causeway that separates Farmington Bay from Gilbert Bay. The facility currently discharges into Farmington Bay but is proposing to relocate its discharge point to Gilbert Bay. The water of Gilbert Bay is hypersaline: 12% salt concentration compared to only 3% in Farmington Bay, and naturally nitrogen limited. Gilbert Bay, therefore, has a much greater natural assimilative capacity for phosphorous and nitrogen with much less potential for negative impacts from harmful algal growth like cyanobacteria (blue green algae) that is a primary concern to DWQ.

The Gilbert Bay discharge option also provides other benefits to stakeholders. As regulations become more stringent and the demand for a higher quality discharge increases, the discharged water becomes more desirable for reuse purposes that divert its flow away

from the Lake. Discharging into Gilbert Bay increases the likelihood that the District's treated discharge will continue to flow to the Lake and continue to support the Lake's valuable and important ecosystem. More nutrients in Gilbert Bay benefits the brine shrimp population and the brine shrimp industry. The rate-payers benefit because this option costs less while still complying with nutrient regulations. And finally, the regulators achieve their goal of reducing nutrient loading to Farmington Bay by completely eliminating the District's source of nutrients.

We at the District take pride in our vital role in modern society. We take pride in our operations and the quality of the discharge from our treatment facility. We also take pride in our contributions to protecting the environment and the role we can play in preserving and supporting the valuable natural resources that Great Salt Lake and its ecosystem provide. When contemplating important and often challenging tasks of finding an acceptable and successful balance between the goals of the many stakeholders interested in the welfare of Great Salt Lake it's good to remember that if we all work together we can all benefit.

Kevin R. Cowan, P.E., District Manager,
North Davis Sewer District



GREAT SALT LAKE LEGISLATIVE TOUR

THE IMPORTANCE OF WATER FOR GREAT SALT LAKE

You know, if you try hard enough you can explain everything with a limerick. Popularized during the 19th Century in England, they can be fun as well as expressive. Now, many limericks are described as follows:

The limerick packs laughs anatomical
Into space that is quite economical.
But the good ones I've seen
So seldom are clean
And the clean ones so seldom are comical.

You see, protecting Great Salt Lake is like cleaning the house in the limerick above. We all know it needs attention – more water. Most people love or support the Lake when asked, but beginning to get protections in place are always going to be done tomorrow – too many other important things to consider today. They are important, but maybe even more so is Great Salt Lake. Since water is needed, and current laws don't always (or ever) prioritize Great Salt Lake, Utah needs changes in the statutes to correct this.



Lynn de Freitas, Sen. Gene Davis, Rep. Brian King courtesy Leland Myers

So, you are probably asking, what has limericks to do with Great Salt Lake. I am going to answer that with yet another limerick:

I'm really determined and keen,
To start giving this house a spring clean.
I will do it I say,
Yes, I'll do it today,
Well, I'll do it tomorrow, I mean.

What we Lake lovers really want is attention from our caring legislators. That is where we come in. Informing legislators about the need and the need to act quickly should be done today, not tomorrow.

On September 6, 2018 the Wasatch Front Water Quality Council in conjunction with the Great Salt Lake Brine Shrimp Cooperative and FRIENDS of Great Salt Lake held a tour of Great Salt Lake for about a dozen





On board guests courtesy Leland Myers

interested legislators or potential legislators. The Lake's elevation on September 6 was approximately 4,192.7 feet, with an all-time low being in 1963 of 4,191.35 feet. These organizations gathered together with these legislators to talk about the importance of water to the Lake. Each sponsoring entity had their own views and interests in the Lake; however, on this day they were all united in the goal of getting water to Great Salt Lake. Important conversations were had with these legislators, with many legislators gaining a renewed interest in Lake protection.

The challenge for all of us Lake lovers is to help our friends and representatives in the Utah Legislature determine appropriate protective steps that are needed now. It doesn't take much, just a little effort. Let's end with a limerick:

A little Dutch Boy named Dinger,
Told to plug up a dyke with his finger,

Picked instead his own nose
While the dyke leaked like a hose,
And flooded the town while he lingered.

None of us should linger about Lake water supply. We just cannot wait. Be nice, but talk about the needed action. Today is the day!

Manjot Kaur is with Central Davis Sewer District

Leland Myers is with the Wasatch Front Water Quality Council





FRIENDS of Great Salt Lake

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Sept. 16 (Fall)
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Submit articles and
images for consideration
to Lynn de Freitas at
ldfreitas@xmission.com
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THANKS FOR MAKING A DIFFERENCE

New FRIENDS, Renewing Members, and Donors

from June 1 – November 15, 2018

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Save the Date:

December 13, FRIENDS of Great Salt Lake Holiday Open House



Lake Fact *Correction from our Summer Issue:

What is the average annual flow of the Bear River into Great Salt Lake?

Answer: The answer is NOT 1.2 M ac/ft. Due to climate change, the DWO indicates it's closer to 883,556 ac/ft., raising serious concerns about the Div. of Water Resources' projections for "developable" 250,000 ac/ft. from the Bear.



MAKING A DIFFERENCE

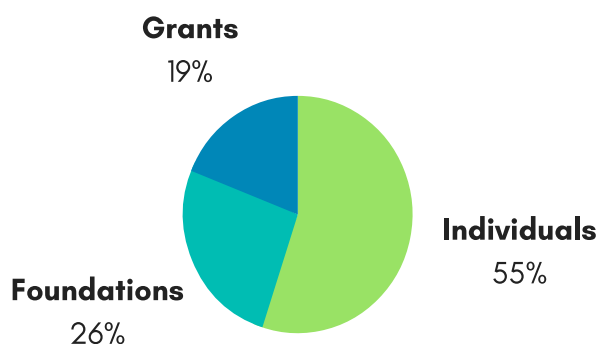
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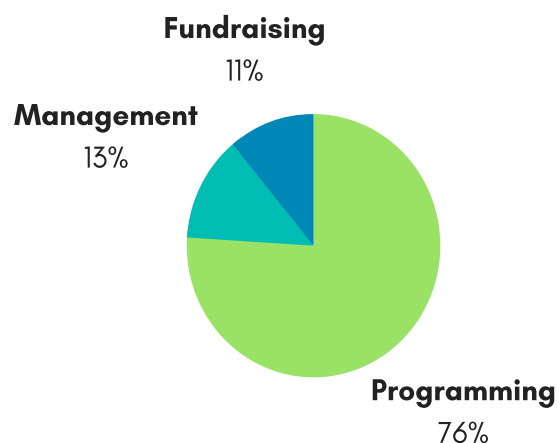
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With an annual operating budget of \$152,000, FRIENDS of Great Salt Lake spends a majority of funds on Programming (76%), including our Education Program Lakeside Learning Fieldtrips, The Doyle Stephens Scholarship Program, and the Alfred Lambourne Arts Prize. Management and administration costs average 13%, and general fundraising at 11%.

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Sunset Beauty, photograph by Steve Earley

The Great Blue Heron is a large wading bird found often on the shores of Great Salt Lake. To view more photographs by Steve Early visit gslimages.com





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Bonneville Speedway Watercolor by Kelly Hannah