Programming Services

BEAR LAKE MARINA EXPANSION

UTAH STATE PARKS

Programming Report

DFCM Project No.: 15120510

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Prepared by:

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Acknowledgements

We would like to acknowledge the efforts of many professionals in developing the Bear Lake Marina Expansion program. This work was completed through cooperation and coordination of multiple Federal, State and local government agencies. Without their efforts, this project would not be possible. Specifically, we would like to recognize Tim Parkinson and Dan Clark from the Department of Facilities and Construction Management (DFCM), Richard Droesbeck from Utah State Parks and Chris Peterson from Utah Department of Transportation (UDOT) Region One. We also would like to recognize the efforts of the local government officials such as Bill Cox, Tom Weston and Norman Weston from Rich County; and, Mayor John Spuhler from Garden City.

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1 Executive Summary

1.1 Background

The Bear Lake Marina (Marina) is a vital part of the economy in the small Bear Lake shoreline communities and is one of few improved boat launch areas on Bear Lake. Currently, the Marina serves as the primary boat access to Bear Lake for both Utah and Idaho. The demand on the Marina increases annually, providing the lowest water-level access to the lake. Other boat ramps are not accessible to the water when lake levels are low. The Marina is a harbor for many of the area's sail boat enthusiasts that recreate at the lake.

Bear Lake State Park headquarters are located at the Marina. They dock patrol boats at this location and verify that decontamination requirements of visiting watercraft are met to prevent the Quagga Mussel from establishing in the lake. They provide maintenance and security to the Marina. Emergency boats access the lake at this location due to low-level access limitations and its proximity to US-89.

1.2 Project Justification

The purpose of the Bear Lake Marina Expansion is to provide additional facilities and amenities to accommodate increased visitor demand as more and more visitors come to Bear Lake. There are several key points why the Marina should be expanded and improved.

- **Improved Lake Access** – When water conditions are low, there are no other improved locations to launch boats into the Lake. An additional boat ramp is needed to allow recreationalists to access the Lake. Further, the expanded area of the marina will be deeper than the existing marina allowing access to the lake for larger boats.
- **Increased Capacity** – Increased visitation over the past several years requires additional boat slips and parking; especially boat trailer vehicle parking.
- **Safety** – Several accidents occur at the US-89 entrance to the park annually due to turning lane lengths and road layout. Also, an expanded marina will provide for quicker access for those providing emergency services on the lake.
- **Protection of the Water Resource** – Currently, when demand is high, people will launch their watercraft in many other locations to avoid delays preventing the ability to inspect watercraft for invasive species that may affect the biology of the lake. Better access will allow for proper inspection.
- **Revenue Generation** – Secondary to the points above, Bear Lake State Park is the only park in the state that generates revenue above its operating expenses. Revenues from the park supplement funding to Utah State Parks which financially assist other parks in the state. Improved concessionaire facilities will complement the revenue generations at the park which lead to more funds for the division.

This programming document will further explore the concept, refine the anticipated project costs and explore further studies that will need to be performed as part of the project.

1.3 Programming References and Site Information

Many people provided input and site information has been gathered to complete the programing document. Utah State Parks personnel were interviewed regarding operations and needs at the facility. On site investigations included a preliminary geotechnical investigation of soil conditions and site suitability. A wetland delineation was completed to determine the wetland areas and type of impact so site mitigation costs could be calculated. Local utility providers, several contractors and special marine equipment suppliers were contacted in order to accurately determine project costs.

A large amount of earth material will need to be imported for the improvements. Site visits to three potential material borrow sites for the project were conducted and visually evaluated. The property owners were contacted with regard to interest in allowing material to be mined for the project.

1.4 Programming Team

Tim Parkinson was DFCM's project manager for the Programing document. Dan Clark, Construction Manager for State Parks, provided input for state marina standards for design. Richard Droesbeck, the Bear Lake State Park Manager, gave detailed input for the site relating to conditions, operations and needs.

J-U-B ENGINEERS, Inc. led the programming document efforts. They managed the specialty consultants' work and coordination with the Utah Division of State Parks. They prepared the preliminary site layout, architectural concept renderings and cost estimate for the project. Terracon, Inc. conducted the geotechnical investigation and prepared the soil report for the project. Envirocentric Design Inc. completed the wetland delineation and assisted with conceptual mitigation design and costs.

1.5 Building Programming Committee

Since the programming of buildings was limited for this scope of work, the programming team acted as the building programming committee for the project. Input from the Utah State Parks' representatives, Dan Clark and Richard Droesbeck, regarding concessionaire functions, marine vessel decontamination, fee collection and park entry and restrooms were received and incorporated into the programming document.

1.6 Area Comparisons

Area comparisons for the site were based upon the existing marina, its usage and space requirements. Currently, there are 377 existing boat slips that are rented on a seasonal and daily basis. All of those slips are obligated and the waiting list for openings is 50% more than what is available. Many of the boats in the existing marina have large keels and need deeper water to access the lake during low lake levels. All of those vessels will need to be accommodated in the new marina.

Parking for passenger and boat towing vehicles is extremely limited at the existing marina. Saturdays are the busiest of the summer season and parking, even in the overflow area, is often exceeded. Fridays and Sundays can be equally busy. To access overflow parking, users must cross US-89 and hike up a

substantial hill. Doubling the boat trailer vehicle stalls would ease congestion and be used every day and weekend during the season.

Many of the new buildings will be replicas of those existing on site. The restroom building and fee station will model the existing buildings, maintaining the nautical design theme of the park. The new concessions building will provide a cooking area, but the remainder of the constructed building will remain open for tenant finishes. Pavilions will be provided around the Marina to allow for picnics and reunions on site.

1.7 Program Spaces Summary

The existing marina area and slip spaces will double in number with the project completion. All large-size (measuring 26' feet long and longer), long-term slip rental spaces will include the following utilities: water, power and communications. A pump-out dock will be provided to allow sanitary waste to be removed from the boats that remain in the water for long periods of time. This will allow tenants to stay on their boat overnight through the season without removing their boat from the water.

Daily slip rentals for visitors and slips for water craft rentals will be provided near the concessions building. The spaces will be separate from the long-term slip rentals. Long term tenants will have slips located in a more secure are with fencing and gates.

Parking spaces will be added increasing Boat trailer parking by 60%. Passenger vehicle spaces will provide at least one for each slip.

Restroom space will increase by three women's, three men's stalls and four showers in the restroom building. A men's and women's public restroom will also be provided in the concessionaire building for patrons.

A summary of these described spaces is included in Table 1-1.

Table 1-1: Summary of Spaces

Space	Current Capacity	Proposed Improvements	Proposed Capacity
Boat Slips	377	340	717
Ramp	7 lanes	7 lanes	14 lanes
Boat Trailer Parking	39 (excluding over flow)	73	117
Passenger Vehicle Parking	219	419	638
Restrooms	3 Women/3 Men/4 Showers	4 Women/4 Men/4 Showers	7 Women/ 7 Men/ 8 Showers
Concession Building	1000 SQ FT	2800 SQ FT	3800 SQ FT
Fee Station (Replaced)	300	300	300
Decontamination Area	0	5220 SQ FT	5220 SQ FT

1.8 Cost Model

There are many factors that affect the cost of this project. The study and investigation areas performed under this scope of work were completed to further understand those factors that significantly impact the costs of the Marina Project.

The most significant of the costs is earthwork. In order to construct the Marina, specific materials must be used in the saturated conditions of the lake and to protect the dikes from erosion. There are few open sources of these materials in the area. Let alone that have the necessary volumes of material needed for construction.

Environmental mitigation is also a significant cost component. Environmental permitting through the EIS process will determine the mitigation required for impacts to the lakebed. However, these cannot be determined at this time and will only be known when the EIS and design are complete.

A summary of the costs to build the proposed improvements is found in Table 1-2.

Table 1-2: Cost Overview

Description				Total
Earthwork				**$ 21,029,950.00**
Site work				**$ 2,261,584.40**
Roadway				**$ 131,678.00**
Boat Slips				**$ 4,536,100.00**
Boat Utility Dock				**$ 15,700.00**
Site Sewer				**$ 116,180.00**
Water				**$ 182,450.00**
Electrical				**$ 243,500.00**
Storm Drain				**$ 102,000.00**
Landscaping				**$ 390,000.00**
Structures				**$ 1,041,500.00**
Environmental Mitigation				**$ 2,760,000.00**
Permitting				**$ 800,000.00**
Construction Subtotal				**$ 35,360,642.40**
Architectural & Engineering				**$ 2,002,000.00**
Additive Alternative 1 - Trailer Parking Center Dike				**$ 1,545,674.80**
Additive Alternative 2 - Lighthouse				**$ 80,000.00**
Additive Alternative 3 - Overflow Parking Access				**$ 197,560.00**
Sub-Total				**$ 39,185,877.20**
Construction Contingency	% Subtotal		10%	$ 3,536,064.24
Inflation	Years	3	2%	$ 2,398,489.17
Project Budget Total				**$ 45,120,430.61**

1.9 Project Schedule

Bear Lake is a pristine water source with many special interest groups. It is also a navigable water with impact requirements that fall under Section 10 of the Clean Water Act. Although construction of the dikes and the marina are fairly straight forward, the environmental permitting process is not. The schedule will take as long to permit as it will to construct the project. Listed below are estimated project dates for the Bear Lake Marina Expansion.

- Procure Environmental Impact Statement (EIS) team - March 2016
- Start EIS Permitting - March 2016
- Approved EIS - November 2017
- Design - 2017-2018
- Construction - April 2018- May 2019
- Operational - May 2019

1.10 Programmatic Analysis and Conclusions

The Bear Lake Marina Expansion will double the capacity of the marina and provide for better low water level operations. This programing analysis primarily focused on site improvements including environmental impacts, permitting, and construction of the dike and parking areas, boat ramp and site access for vehicles and boats. A brief review of the concessionaire area and other site buildings is included in this study.

The site is feasible to construct the marina expansion for Utah State Parks. There are many steps that will need to be taken in order to allow construction to move forward. These include an Environmental Impact Statement (EIS), mitigation of construction impacts to Bear Lake, detailed geotechnical investigation and design and identification of available construction material sites. The cost of the marina expansion would be $43,100,000 based upon the information used to develop this programing document. It will also take approximately four years to complete the project. This includes two years to complete environmental permitting and two years for construction.

2 Site Analysis

2.1 Project Description

The planned project will include building a dike to create an additional marina adjacent and south of the existing marina shown in Figure 2-1. The Marina and dike will encompass 47 acres and will be 31 feet tall from the marina floor to the top of the dike. The mouth of the Marina, located on the east wall of the dike will be approximately 195 feet wide providing access to the open water of Bear Lake. Directly opposite from the mouth of the marina will be a 7-lane boat ramp. At 84 feet wide and 252 feet long, this ramp will provide vital access to the water for mariners, search and rescue teams, Utah Wildlife Resources, and Utah State Parks service.

Figure 2-1: Existing Bear Lake Marina Looking South over Future Marina Site

The Marina will house 343 long-term boat slips with utility service, internet and cable television service. There will also be 17 transient boat rentals available for overnight storage or weekend stays. There will a crane pad (130’ x 110’) to lift large boats to and from the water. The pad will be made of a Mechanically Stabilized Earth (MSE) or Hilfilker wall, quite similar to the existing pad.

A large beach area in the southwest corner of the planned site covers approximately 3.75 acres and serves as an easy access to the water for beach goers and patrons of the personal watercraft rentals. Accompanying the beach area are five picnic pavilions. There is an additional seven pavilions placed around the dike for visitors to use.

Roadway widening is planned along US-89 for increased safety and access to the marina and overflow parking area. From the highway to the fee station there is a planned double lane queuing area to help alleviate the backup on US-89 during busy seasons and weekends. Internal to the marina will be widened access lanes including additional boat prep and wipe down lanes for mariners coming and going. There is also a significant amount of additional personal vehicle and boat trailer parking. Passenger vehicle parking extends around the dike providing access to all areas of the marina.

There are three additive alternatives that would be built according to desire and need of state parks if funds are available. These alternatives include additional boat trailer parking, a lighthouse, and overflow parking access road realignment. These additions provide further safety and convenience to Bear Lake State Park.

2.2 Existing Site

The existing Marina is located almost 2 miles north of Garden City. Its ideal location provides easy access for patrons from both Utah and Idaho. The site was initially developed in 1962 and provided a simple boat launch and dike for a sheltered harbor and boat traffic control. In 1971, boat slips and other amenities were added. Additional boat slips were added in 1993. A second marina expansion and improvements to the existing marina were then implemented in 2000. The old office was replaced in 2005 with a new State Parks office.

The proposed marina expansion is planned for the area immediately south of the existing marina. The new marina project site is currently undeveloped shore line that extends from Hwy 89 into the lake approximately 1,000 feet and will cover approximately 47 acres of lake bed. The vegetation along the shoreline consists of natural grass and brush along with silty lakebed. There are no existing buildings on the proposed site.

This land is owned by the State of Utah. There are no easement restrictions found in this report. This project should be built adhering to applicable Utah State Building Codes.

The geotechnical report indicates that the ground for the planned site is made up of silt, sand and clay. The hardness of the clay varies depending on the proximity to the shore. The material suggested to be use for the dike is imported clay fill. Silty soils onsite may be used if placed at optimal moisture content and compaction. Onsite clays should not be used for fill. Seismic hazards include fault traces located on the west boundary of the existing marina. Additional exploration is recommended before construction starts on the project. The full geotechnical report can be found in Appendix A.

2.3 Physical Characteristics

2.3.1 Visual Survey and Investigation

A visual survey was conducted by J-U-B. The results are listed below:

2.3.1.1 Existing Marina

The existing marina consists of a seven lane boat ramp, 377 boat slips, and 39 parking stalls for boat towing vehicles and approximately 219 parking stalls for passenger vehicles. A concessionaire has constructed a retail building on the water for sales of food, fuel and recreational items. The building also serves as the base for rentals from the Marina.

The Bear Lake State Park has its office space at the Marina. The existing site also has a building for restrooms and showers for visitor use. The amenities and utilities at the site include water, sewer, power and communication utilities to the buildings and some boat slips. There are other improvements at the marina for watercraft including crane pads and utility docks for wastewater. State Parks also has a reserved dock at the marina for patrol boats.

The existing construction and design of the Bear Lake Marina buildings boasts a nautical theme throughout the architecture and design.

2.3.1.2 Shoreline

The project area will impact approximately 1,000 feet of the west shoreline of the lake adjacent to US-89 which is shown in Figure 2-2. The shoreline consists of a steep embankment from the edge of the highway down to the lake bed. The shoreline area includes several large trees including cottonwoods and willows. A detailed investigation of the shoreline was to determine wetlands in this area. The US Army Corp of Engineers (USACE) has jurisdiction over wetlands. Details of the investigation are found in Appendix B.

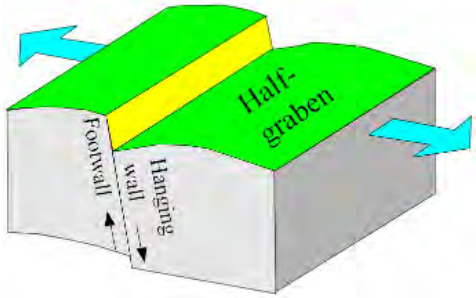
Figure 2-2: Planned Site of Bear Lake Marina Expansion Looking South along the Shoreline

2.3.1.3 Lakebed

Approximately 47 acres of lakebed will be affected by the Marina expansion. This area is used by small watercraft and fishermen when water levels are high. When water levels are low, it appears as a marshy area with some small trees, grasses and lots of insects. It is not used at all by visitors when the water level is low. Bear Lake is a navigable water and as such is under the jurisdiction of the U.S. Army Corps of Engineers (USACE). Impacts to the lake bed will require mitigation of some type.

The Bear Lake lakebed is made up of a half-graben geologic floor as shown in Figure 2-3. This is known as the Bear Lake Graben and is an important feature to the marina expansion. This geologic feature is a drop in the lakebed elevation approximately 1200 feet from the west shore. The steep drop off provides for a shallow marina setting that can be excavated to a required elevation and for easier construction of the marina dikes, but then drops to offer deep water access to the lake.

Figure 2-3: Diagram of Half-graben Valley



2.3.1.4 Overflow Parking

Figure 2-4: Overflow Parking

Overflow parking is located on the west side hill of US-89 as shown in Figure 2-4. This area is accessed by a paved steep roadway from US-89 that extends to the Division of Wildlife Resources Offices. The street intersection to the overflow parking area does not meet current State of Utah design standards and poses some safety concern. The overflow parking area surface is dirt and grass and does not have any formal layout for vehicles.

2.3.1.5 US-89 and Turn Lanes

Figure 2-5: Aerial Image of Right and Left Turn Lanes on US-89

In Figure 2-5, US-89 is shown as directly west of the marina. It is a primary corridor for travelers from the Wasatch Front to Yellowstone National Park. In 2008, the Annual Daily Traffic (AADT) was 1590. A right turn lane into the marina was constructed in 2000 to provide additional queuing into the marina and increased traffic safety. In 2013 the AADT was 2480 and at times traffic still backs up onto the through lanes impeding traffic on US-89 northbound, a short section of left turn lane exists between the overflow parking intersection and main entrance into the marina. Quick maneuvering is required to exit the marina and turn onto the overflow parking road or vice versa. This often leads to regular traffic accidents.

2.3.1.6 Harbor Village Intersection

South of the marina entrance is the intersection that provides access to Harbor Village. Harbor Village is a resort area with several condominiums and a restaurant. There are also several private residents that reside in this area as well.

2.3.1.7 Home to South

A new residence is being constructed immediately south of the State Property on the east side of US-89. This is displayed in Figure 2-6.

Figure 2-6: New Home Build to South of Marina Expansion.

2.3.1.8 Utilities

The existing marina has full service utilities. Water is provided by Garden City. Waterlines exist on each side of US-89. On the east side is an existing 8-inch line, on the west side is a 14-inch line. Sewer is provided by the Bear Lake Special Service District. A sewer line is located on the west side of US-89. Power is serviced by Rocky Mountain Power. There are several transformers on the existing marina site. Currently, the State Parks Office uses wireless services for internet. Phone communications are provided by CentraCom. There is no natural gas services in the area, but propane is used for heating purposes at the marina.

2.3.2 Independent Testing and Surveying

Several independent studies were performed on the site as part of this programming document. The results of the studies have been reviewed and summarized in this section. Significant schedule and cost impacts are summarized and included in the final cost model for the project in Section 4.

2.3.2.1 Hazardous Materials Assessment

Hazardous Materials Testing was not completed as part of the scope of this program. It is not anticipated that any hazardous materials will be on the project site since there has been no development on the site. Consequently no significant impacts to schedule or cost are expected. Further testing and reporting will need to be done during the EIS.

2.3.2.2 Geologic Survey

Figure 2-7: Geotech Survey on Future Site

The Geotechnical Report and Geologic Survey was completed by Terracon, Inc., Geotechnical Engineering Consultants, as part of the Geotechnical Investigation as shown in Figure 2-7. The Bear Lake Graben boarders the east edge of the Marina dike. This is the location of a seismic fault. The geotechnical report has not identified this as an area of concern for the project. Otherwise, there are no geologic concerns that were identified that will significantly affect the schedule or cost of the project. The geotechnical findings can be found in the Geotechnical Report in Appendix A.

2.3.2.3 Soils investigation

The soils investigation was completed by Terracon, Inc. The existing soils on the site consist of silty-sands and some clays. Unfortunately these materials are not ideal for construction of the dikes around the project without special preparation and placement. This will require a significant amount of imported material to be brought in for the construction of the dikes and parking areas. Where possible, we have planned for use of native materials at specific locations on the project where conducive. Imported materials and soil preparation are accounted for in the schedule and cost model. Settlement

of the native soils while the dikes are being built is not expected to impact the schedule or cost of the project. The soil report is a part of the geotechnical report found in Appendix A.

2.3.2.4 Surface Contours and Property Description Survey

A topographic survey was completed by J-U-B ENGINEERS, Inc. A map of the survey can be found in Appendix C. A property boundary survey has not been completed for the project. Records from Rich County show ownership of the parcel by the State of Utah. It is not anticipated that there will be any concerns with the schedule or cost related to the topography of the site or property issues.

2.3.2.5 Utilities Surveys

Utility data has been collected from the existing service providers and shown on the topographic map. Potholing to determine exact locations and depths of the utilities has not been performed at this time. This service should be completed during final design of the project. The existing utilities are all in the immediate area and extensions or upsizing of transmission lines are not anticipated. Therefore no significant schedule or cost impacts are anticipated. A map of the existing utilities can be found in the Appendix D.

2.3.2.6 Wetlands

The wetland delineation was conducted by Danny White, wetlands scientist with Envirocentric Design, Inc. According to the wetland delineation report, a Section 404 permit is required for any discharge of dredge or fill material in any navigable waters in the United States. This permit will need to be required before starting the project. The report also details the types of soils and vegetation found in the site area. This report can be found in Appendix D of this programming report.

2.3.2.7 Title Search

This was not part of the scope performed by J-U-B. It is assumed that all the land is owned by the State of Utah. Again, no impacts to the schedule or costs are expected.

2.3.2.8 Archeological Surveys

This was not part of the scope performed by J-U-B. Further surveying and reporting will need to be done during the EIS. Schedule impacts could occur if archeological items are found. Cost impacts are expected to be negligible.

2.3.2.9 Distance from Seismic Fault

The seismic fault distance is discussed in the Geotechnical Report in Appendix A. While there are some signs of faults in the area along the west side of Bear Lake, the cost or schedule to construct the improvements are not expected to be impacted.

2.3.3 Test and Survey Analysis

2.3.3.1 Utility Feasibility Studies

J-U-B consulted with Garden City and Bear Lake Special Service District to verify capacity of their systems to support the marina expansion. No concerns were expressed. There were no other studies completed as part of this study.

2.3.3.2 Site drawings

Figures 2-8 and 2-9 give conceptual renderings of the planned improvements. Site Drawings, Specifications and Studies for the project are found in the appendices.

Figure 2-8: Aerial Map and Specifications of Planned Site

Figure 2-9: 3-D Rendering of Planned Site Area

2.3.4 Orientation

2.3.4.1 Solar Exposure

Figure 2-10: South facing view of proposed Marina Expansion site

The Marina expansion location is on the west side of Bear Lake near the mountains immediately south of the existing marina. The mountains run north and south, so the site will receive direct sunlight in the morning as the sun rises and be shaded in the early evening by the mountains. In the mid-summer, sunlight will be directly overhead while in the winter months, the sun is in the southern sky. The concessions building should consider these solar exposure conditions in design to take advantage of the potential benefits. The restroom and fee station buildings are small or have little options for window placement, resulting in little benefit from solar exposure.

2.3.4.2 Site Views

The project site offers sweeping views to the east and mountain views to the west. East of the site is the lake. No building will occur between the marina and the lake, so views will be unobstructed from north to south in an easterly direction. The site planning should focus on the eastern views to achieve the greatest advantage. The western view contains the mountain range. While western vistas are potentially good they have been influenced by development of condominiums and cabins opposite of US-89.

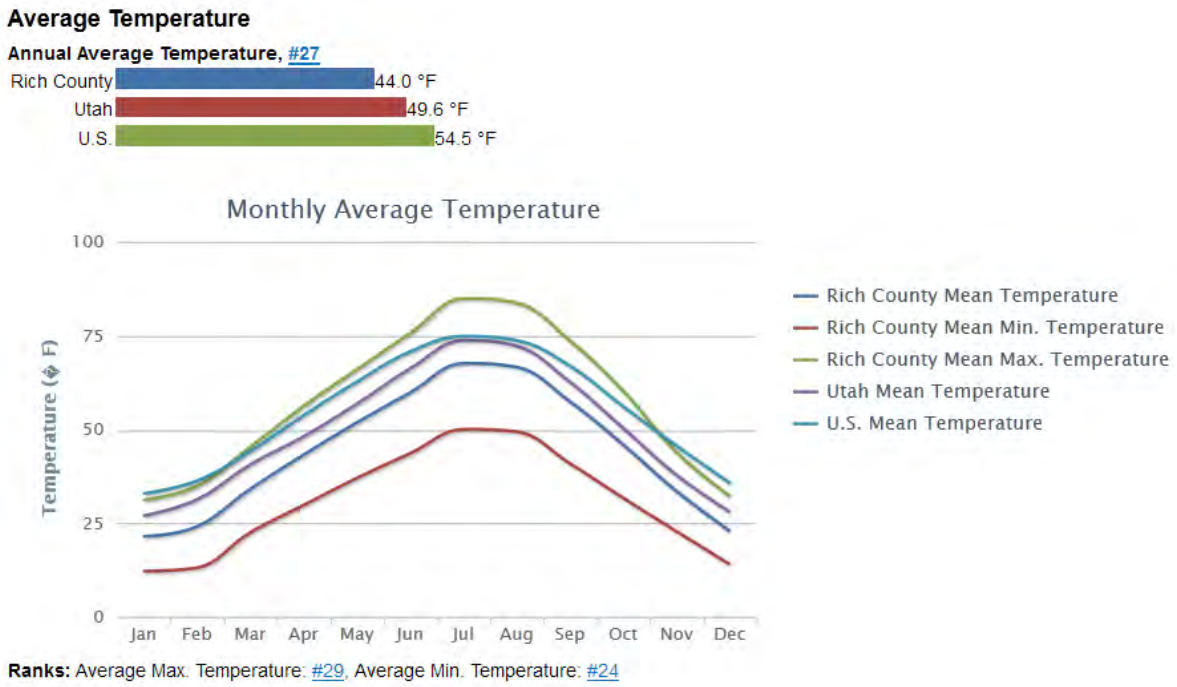
Figure 2-11: East facing view of proposed Marina Expansion site

2.3.4.3 Climate

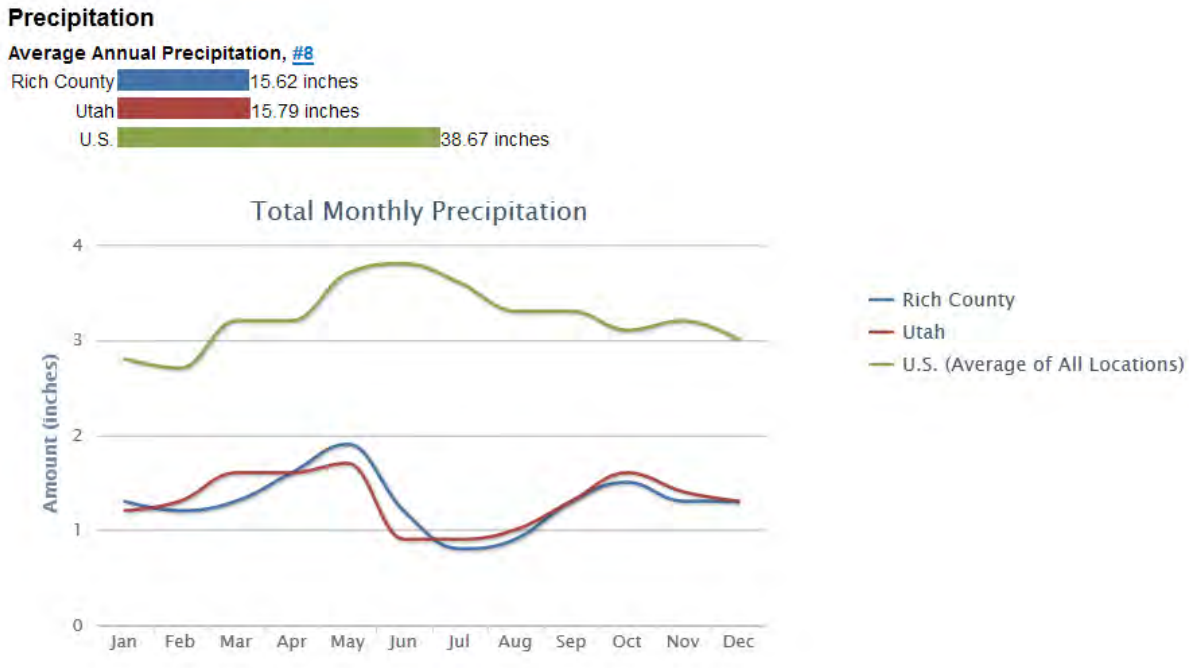
During the months of June through September, weather in Bear Lake is favorable for outdoor recreation activities such as boating, swimming, biking and off road vehicle travel. Average July temperature is 82 degrees Fahrenheit. Precipitation typically comes from thunderstorms that originate from the west and come across the lake after passing over the mountains. Spring and fall months have average high temperatures of about 45 degrees Fahrenheit. Winter months can be very cold with daily high temperatures in the teens and lows of minus 20 degrees Fahrenheit. *The majority of precipitation in the Bear Lake area comes in the winter months as snow with an average snow fall of 47.8". Spring months can be wet as well. Average temperatures and precipitation on a monthly basis are shown in Graphs 2-1 and 2-2 below.

**Information gathered from http://www.usa.com/rich-county-ut-weather.htm.*

*Graph 2-1: Average Temperature**



*Graph 2-2: Average Precipitation**



**Information gathered from http://www.usa.com/rich-county-ut-weather.htm.*

2.3.4.4 Prevailing Winds and Wind Exposure

Typical weather patterns bring winds from the west at Bear Lake. At times cold fronts enter the valley from the northwest and warm fronts from the southwest. It is common for the winds to shift quickly when a storm front comes through the area. The area is primarily open around the site and with open water to the east with no obstructions. The wind is categorized as Exposure D according to the IBC and ASCE-07 definitions.

Bear Lake is known for its afternoon winds that sweep across the lake. These winds are a mecca for sail boaters. Almost daily in the afternoon the lake around the marina will be populated with sailboats of various size taking advantage of the winds.

2.3.5 Site Functions and Relationships

2.3.5.1 Circulation of Vehicles/Boats/Pedestrians

The site currently has vehicles, trailers and boats, along with pedestrians, state park employees, and anglers. Figure 2-12 is a diagram of the traffic that will occur on the designed expansion. Vehicle traffic circulation is critical for operations at the Marina. Vehicles accessing the site range from small passenger cars to 40 foot long boat trailers behind motorhomes. Sail boats with tall masts also must be able to access the site parking and boat ramps. The primary destination of the vehicles and boat trailers are the boat ramps. Areas for staging including boat preparation and wipedown must be provided for around the ramps. These staging areas should contain multiple lanes to accomdate various stages of prepration and wipe down. Three lanes should be used in these areas as a minimum, the side lanes for staging and the center land for through traffic.

Access to parking must be designed to allow movement of large vehicles and trailers. Space for less experienced drivers should also be considered since many recreationalists that visit the site may not be experienced in driving vehicles with trailers. Where possible, boat trailer parking should be in close proximity to the gangways and docks that access the water. This will allow quick access to vehicles launching and pulling boats from the water and reduce the number of boats that are waiting in the marina for retrieval. Parking stalls for boat trailers should be a minimum of 84’ x 14’.

Passenger vehicle parking should be provided around the marina for those who have slip rentals. A passenger vehicle parking stall has been provided for each slip in the preliminary design. Minimum size of the stalls should be 9’ x 20’ to accommodate larger trucks and SUV’s that freqent the marina. Slip renters are able to store their trailers off site and can access smaller parking stalls located on the dike around the marina. A bypass lane around the boat ramp area is provided for access to parking.

Reserved parking for consessionaire visitors should be provided near the consessions building. Likewise, parking should be reserved for State Park office visitors and staff that must access their vehicles quickly in case of an emergency.

Pedestrian safety and access around the site is important . Pedestrian traffic related to boating will focus toward the gangway accesses and boat ramp area. Pedestrian crosswalks and appropriate signange should be provided..

Access to the overflow parking area west of US-89 should be addressed by UDOT with installation of a crosswalk or other features to allow for safe passage across the highway. Flashing lights may be beneficial as a warning system to motorists of pededstian crossing. This crossing should be studied by UDOT to provide a safe crossing route.

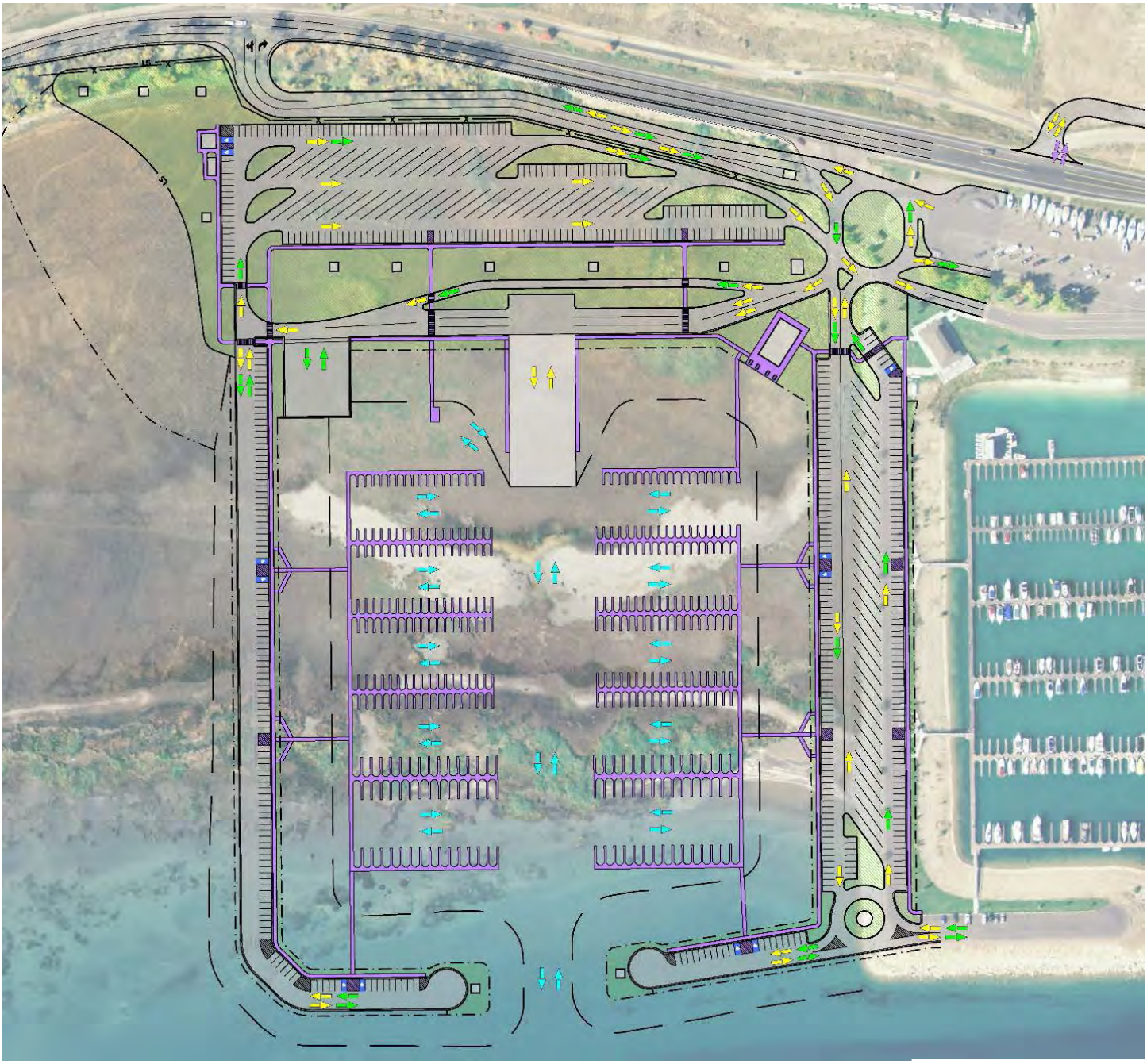
Near the beach area, pedestrian access will be from the adjacent parking area to the beach. This area will have little conflict with vehicles since there is adjacent parking for passenger vehicles to the beach.

ADA Parking and building access must be provided to all buildings and the ramp area. Special consideration must be given to handicap persons so they can access the water and beach areas.

2.3.5.2 Dumpster Locations

The focus of activity at the Marina will be near the State Park Office Building and proposed consession building. Dumpster locations should be placed away from these areas due to the high volumes of pedestrian traffic and visual destraction that might occur. Currently dumpsters for the site are located on the north end of the existing marina near the restroom building. It is proposed that a new screened dumpster location be placed on the south-end of the marina expansion near the restroom facility to not distract from the central area of the marina.

Figure 2-12: Traffic Flow and Usage



2.3.6 Code

2.3.6.1 Site Consideration Requirements

Fire lane access will occur via the bypass lanes around the boat ramps. There is also sufficient space for emergency vehicles to access the buildings in the parking access lanes. These areas should be striped and signed.

2.3.6.2 Occupancy Type

Occupancy types and cost impacts for the buildings at the Marina for expansion are shown in Table 2-1.

Table 2-1: Occupancy Types and Costs

Building Description	Occupancy Type	Cost Impact
Concession Building	M - Mercantile	Less than 1% of site program costs
Fee Station	B - Business	Less than 1% of site program costs
Restroom	U- Utility	Less than 1% of site program costs
Picnic Pavilions	U- Utility	Less than 1% of site program costs
Lighthouse (Alternative)	U- Utility	Less than 1% of site program costs

The buildings on the planned site will be built to meet the International Building Code and will follow the State requirements for design and construction.

2.3.6.3 County Zoning Ordinances

Since the project will be State owned, local zoning approval is not required, but coordination with Rich County should occur on the following items:

- Building Setbacks
- Building Heights
- Building Uses

2.3.6.4 Fire Marshal Considerations

The State Fire Marshal should coordinate with the local fire district for service and coverage to the site. The closest fire station is located in Garden City one mile south of the site. According to Garden City, there is adequate flow, storage and pressure to meet the fire protection requirements of the site.

3 Building Requirements

3.1 Identification

The mission of Bear Lake State Park and Utah State Parks is to provide a variety of desirable water and land-based recreation opportunities and increase community vitality, while protecting and enhancing park resources as well as to develop, maintain and enhance facilities that offer safe and suitable water and land-based recreation opportunities for users. (Bear Lake State Park Resources Management Team, 2004). With the current facilities available, State Parks is not able to further meet its mission.

The Bear Lake Marina Expansion Project will improve the ability for more of Utah citizens to enjoy Bear Lake in a safe manner while protecting its beauty and value as a water resource.

The Bear Lake Marina is owned by the State of Utah and managed by the Department of Natural Resources State Parks Division. The Marina is also used by the local search and rescue team, law enforcement, Division of Wildlife Resources, Forestry, Fire and State Lands.

The components of the marina must be well planned and highly integrated to meet the needs of the many diverse user groups at the facility. Visitors of the facilities include boaters, long-term slip renters, beach goers and State agencies. These user groups share interest in facilities such as the marina, boat ramp, parking, boat slips, utilities, restrooms and concessions. Each of these components is part of the Bear Lake Mariana Expansion Project.

3.2 Justification

The Bear Lake Marina currently services the recreational visitors of Bear Lake. These visitors include fisherman, paddle boarders; kayakers, power boaters and sailboat enthusiasts and other water sportsmen. The Marina also provides a great economic boost to the small shoreline towns of Garden City, UT; Pickleville, UT; Laketown, UT; Fish Haven, ID; and St. Charles, ID.

The marina also serves as the hub for the State Agencies of State Parks and Wildlife Resources. All safety and research operations stem from the Marina.

With the population of Utah expected to double in size by 2050, citizens will need a place to recreate. Bear Lake has tremendous capacity for recreation, but accessibility to the resource is limited especially when the lake water level is low.

3.2.1 Concerns

The Bear Lake Marina Expansion project addresses five main concerns of Bear Lake State Park and Utah State Parks: lake access, capacity, safety, protection of water resource and revenue generation.

The issues at hand are, first, improved **lake access**. Because of popularity growth, proximity and availability of the Marina, it is preferred by most boaters and patrons from Utah and Idaho for launching their vessels. The demand on the Marina results in congestion due to limited boat ramp width and minimal available parking for trucks and boat trailers as well as stand-alone vehicles.

A shallow marina with limited access for larger boats will be dealt with on this project. Bear Lake Shores are famous for the extremely shallow shore line and its cold water. In dry seasons, a shallow lake can result in a very shallow marina. A shallow Marina may cause larger boats to rest on the Lake floor causing significant damage to the keels. The boats may also be damaged when navigating and leaving a shallow Marina. To mitigate this, the design includes dredging the existing Marina an additional five feet and developing the new expansion at a matching depth.

The second concern of State Parks is **capacity**. Boat slips are limited in the current marina. Boat owners who own large sail boats, small yachts and large cruisers rent these slips to eliminate the expense and hassle of launching their vessels either by ramp or crane. The slips rented by frequent visitors of the park are at capacity. The waiting list for boat slip rentals is quite long. The expansion project will add an additional 340 boat slips to be available for rental.

Available parking also limits capacity of day use visitors. There are limited boat trailer parking stalls at the Marina as well. On weekends and holidays, the marina stalls and overflow parking are typically beyond capacity.

Safety is the next concern. Growth in visitation increases the potential for accidents. In 2014, there were visitors to the lake. Vehicle accidents have increased with visitation. Changes to traffic routing on US-89 and on the site should be made to reduce accidents.

With the overflow parking across the highway, pedestrians crossing traffic to access the marina causes another significant safety issue.

Protection of the Water Resource is a vital concern to the State Parks. The Bonneville Cutthroat Trout species had been isolated in various areas among Utah, Nevada, Wyoming and Idaho by the recession of the late Pleistocene Lake Bonneville. This species was recently designated as the official fish of the State of Utah. Bear Lake State Park is one of a few locations where pure Bonneville Cutthroat Trout are found. Because of the many threats to this fish, the Bonneville cutthroat trout is on the Utah Sensitive Species List (Utah Division of Wildlife Resources, 2015).

Bear Lake is well-known for its clear blue water. It's often referred to as the Caribbean of the Rockies. This clear blue water is due to the calcium carbonate deposits reflected in the lake. Its water properties have led to the evolution of several unique species of fauna that occur only within the lake (Utah.com, 2016).

When demand is high to access the lake, people will launch in many different locations to avoid delays. This can prevent the ability to inspect watercraft for invasive species that may affect the biology of the lake.

Though secondary to the other points above, **revenue generation** is the fifth area of concern. Bear Lake State Park is the only park in the state that generates revenue above its operating expenses. Revenues from the Park can supplement funding to the Division to assist with other parks in the state. Improved

concessionaire facilities will complement the revenue generations at the park which lead to more funds for the division.

The marina is a gateway to the lake for many patrons. Along with these mariners, other patrons come to picnic, fish, and enjoy the water. Traffic flow and parking of this many vehicles is of vital concern for safety on Hwy 89 as well as within the parking area along the marina and across the highway.

Figure 3-1: Future Site of Planned Marina

During the late summer months, the agriculturalist use water from this lake to water their crops during the dry summer season. The dry season coupled with the use of lake water in irrigation can cause a drop in the lake level resulting in low depths in the marina. Boats kept in the slip can suffer damage to their keels. Boats can also suffer damage to keels when exiting the marina.

Expanding the marina would increase economy to the shoreline communities and provide an increase in revenue for the state to support the state park. Utah State Parks coupled with DFCM feel that the time to act is now. The dramatic increase in park patrons has warranted

3.3 History and Growth

3.3.1 Lake History

Located in the top of the Rocky Mountains is Rendezvous Country, Land of the Sky Blue Water. High mountains mirrored in the turquoise waters of Bear Lake and valleys, traversed by the meandering Bear River, provide a striking physical setting for a historical heritage boasting of cowboys, Indians, mountain men and hearty pioneers.

Native Americans prized the Bear Lake valley as prime hunting ground as well as a meeting place. It was such a gathering in 1819 that Donald McKenzie first saw and named the area for the abundance of black bears. Black Bears Lake, quickly shortened to Bear Lake, was the site of two fur trader-trapper Rendezvous held during the summers of 1826 and 1827. Such notables as Jedediah Smith, Jim Bridger, William Ashley and Tom Fitzgerald were in attendance. The south end of the valley was described as a "lighted city" at one of these gatherings where fur traders, Indians and suppliers met to trade for traps, supplies and furs.

Pathfinders John C. Fremont and Captain Bonneville wrote of their findings in the Bear Lake valley. Fremont was responsible for naming mountain peaks, canyons and streams in the area. The Preuss Mountain range was named after his topographer. Bonneville wrote of the huge marsh located north of Bear Lake.

The accounts of pathfinders and fur traders led Oregon-bound emigrants into the Bear Lake valley by way of the Thomas Fork valley. U.S. Highway 30 North basically follows the old Oregon/California Trail. Many wagon trains stopped at Thomas L. "Peg Leg" Smith's trading post located near Dingle, Idaho for

supplies and trading stock. One traveler wrote of camping along the cottonwood-lined Bear River watching grass, tall as a man, wave in the wind.

Charles C. Rich led Mormon pioneers into the Bear Lake valley in September of 1863 and established the fledgling community of Paris, Idaho. Other communities were quickly established within the next few years. Accounts are told of hearty pioneers struggling with the harsh and diverse climate. The valley soon prospered as a farming and ranching area. Montpelier, Idaho, growing from the coming railroad, phosphate mining and other elements, became increasingly important in the economy of the valley.

The small farming communities around Bear Lake are giving way to recreational development. Summer home sites dot the hillsides around the lake. Recreational developments promise vacations accented by the sparkling waters of Bear Lake. Skiing, snowmobiling, sailing and swimming are offered to the recreationist. Prime hunting and fishing areas are located within the "Greater Bear Lake Valley", whether its trout fishing in the streams, ice fishing for "Cisco", hunting deer or seeking elk along the high mountain ridges. This scenic corner of Idaho and Utah offers outdoor recreation and historical interests away from crowds and high prices. (Bear Lake Valley Convention and Visitors Bureau)

3.3.2 Agency Presence

Currently, Utah State Parks Agency employees are stationed in the fee station at the highway entrance to the Marina. The concessionaire runs the concession stand that is currently located in the southwest corner of the marina. There are no other paid or volunteer personnel in this location.

3.3.3 Anticipated Growth

According to the Park Visitation Data (Park Visitation Data, 2016) between 2010 and 2015, Bear Lake Marina State Park saw an annual average of 220,846 visitors. Since 2013, visitation has increased steadily by an average of 11% each year. If the trend continues as anticipated the anticipated growth of visitation will average 500,000 by 2025.

3.3.4 Future User Needs

Since the last expansion of the marina, the parking areas and boat slips have reached capacity. Based upon future growth projections it is anticipated that over the next 35 years the State of Utah population will double. To meet the need of the growing population, the Marina will need an additional 350 Slips and parking spaces.

3.4 Master Plan Reconciliation

The State of Utah contracted with BIO-WEST, Inc. to develop a Utah State Comprehensive Outdoor Recreation Plan (SCORP). This plan indicates that the mission of State Parks is “to enhance the quality of life by preserving and providing natural, cultural, and recreational resources for the enjoyment, education and inspiration of this and future generations.” (BIO-WEST, Inc., 2014) This project relates directly to the mission of State Parks and is necessary to continue this mission.

The mission of the Bear Lake State Park (BLSP) is to provide a variety of desirable water and land-based recreation opportunities and increase community vitality, while protecting and enhancing park resources. (Bear Lake State Park Resources Management Team, 2004)

The Bear Lake Marina Expansion project directly relates to the issue stated in the Bear Lake State Park Resource Plan (Appendix E) to improve existing and develop additional boating facilities.

The BLSP vision includes developing, maintaining and enhancing facilities that offer safe and suitable water and land-based recreation opportunities for users. It also will provide access to the shoreline and lake for users at all water levels. These two items included in the vision of the BLSP is the biggest reason for the Bear Lake Marina Expansion.

3.5 Function

3.5.1 People

A marina, by definition is a boat basin offering dockage and other service for water craft. The main purpose of the Bear Lake Marina is to offer boat launching, dockage and safe access to Bear Lake. Bear Lake Marina is a multi-functional, multi-faceted site that provides service to the public and houses offices for the agencies that provide law enforcement, search and rescue, safety, concessions, and regulation of wildlife and water safety. The following sections provide a list consisting of categories of people described as using the facility and site.

3.5.2 User Groups

3.5.2.1 Boaters

As a hub to all activities at Bear Lake, there are a diverse number of users at the facility. Boaters make up a large portion of visitors to the Marina. They come to the Marina to launch and retrieve their boats on a daily basis to recreate in the water. When available, boaters will rent daily slips for easy access to the water.

The planned improvements and expansions to the marina will allow the boater, when approaching the Marina to do so away from US-89. Should traffic back up during peak usage, there will be sufficient room in the added queuing lanes, expanded right and left turn lanes. The boater will have room to prep his boat prior to launch in the boat prep lanes located just before entrance to the boat launch. The boat launch is a 7-lane launch that is sufficient to reach the water even during low lake levels. The exiting boat will have special wipe down lanes that will provide room enough for boaters to use these lanes without backing up onto the boat launch area. There will be plenty of boat trailer parking as well as overflow parking should that be necessary.

This group utilizes restroom facilities and occasionally the fish cleaning station. Boaters utilize the access lanes, decontamination station, boat ramp, access lanes and wipe down lanes. They also utilize the boat trailer parking at the marina and in the overflow parking area. They may use the concessionaire for fuel, watercraft rentals, and purchase of a forgotten item or food service.

As the population of Utah and Idaho increases, the number of boaters visiting the lake will also increase. Since the downturn of the economy, visitation has also increased as people desire to vacation closer to home. With the Wasatch Front only 2 hours away, it is a prime location for a quick getaway or extended vacation.

3.5.2.2 Long Term Slip Renters

Long Term Slip Renters primarily visit the lake to recreate on the water. Sail boaters make up a large number of this group. Moving their watercraft in and out of the water daily is time consuming, so long term portage is needed. Their boats are often longer than powerboats and many of them reside on their boats for a weekend or longer stay at Bear Lake. Consequently, utilities such as power, water, sewer and communications are required.

Long Term Slip Renters primarily use the slip area of the marina and passenger vehicle parking. Many will use the boat ramp to launch their water craft at the beginning and end of the season. The sail boaters in this group utilize the crane pad for standing their masts and placing boats as well as the utility dock to pump wastewater from their vessels. Their trailers are typically located at the overflow parking area west of US-89. Those who stay for extended periods of time may use the concessionaire for fuel, food service or forgotten items while they visit the lake.

With drought conditions in the region, sail boat users look for an area where they can harbor their boats and access them throughout the season. Many of the lakes in northern Utah including Utah Lake and the Great Salt Lake have extremely low water levels. As such, larger sailboats are not able to access the water. Bear Lake has the best available access to the water and potential to access the water in times of drought. It is expected that long term slip renters at Bear Lake will only increase as population rises and drought occurs.

3.5.2.3 Beach Goers

Beach goers are another group who come to enjoy the marina. Just north of the marina is a small beach area where the concessionaire provides amenities such as kayaks, stand up paddle boards, shade canopies and wave runners for rent. This allows those visitors to enjoy what the lake has to offer.

Beach goers typically use pavilions, passenger vehicle parking and restroom facilities at the marina while the recreate. They also utilize the concessionaire rentals and food services.

Population increase in the state and the economy will continue to increase beach goer visitation. The state has invested a significant amount of money to improve beach access around the lake and beach quality around the lake. Many visitors do not have the finances to rent or purchase a watercraft, but would simply prefer a day of playing on the beach where there are facilities such as restrooms, food small watercraft rentals are available.

3.5.2.4 Government Agencies

As mentioned before, many **government agencies** utilize the Marina and Bear Lake. This location is the center point of all recreation, research and rescue efforts for Utah in the Lake. Consequently the office building, patrol boats and vehicle access are located at the marina.

State agencies use the boat ramp, passenger vehicle parking and administrative facilities. They may also frequent the concessionaire for fuel and food services.

State Parks and Wildlife Resource employees have stayed consistent over the past decade at the Lake. As the visitation at the park increases, there will be a need for additional employees, but they are seasonal and do not require office space to complete their assignments. Therefore, no increase in administration or office space is anticipated with the project.

Employees of Utah State Parks have headquarters at the Marina. The State Park employees are charged with maintenance, safety and regulation of the State Park. The Utah DWR is also responsible for law enforcement, safety and regulation of park visitors. The Division of Wildlife Resources is responsible for wildlife regulation and will use the marina as well.

Search and Rescue is a vital source of rescue on the lake. The operation requires immediate access to the boat launch and dock.

3.5.2.5 Other Users

Part of providing access to the lake, the marina currently offers concessions to patrons of the Lake. A fueling station is available for boaters so they do not have to pull the boat out of the water. Along with fuel, a sewage dumping station is also available. The concessionaire also provides water craft rentals along with fast food. The culmination of these services requires that the concessionaire have a larger work space. The building suggested in pre-design addresses the space issues by more than doubling in size.

Other people who will visit the beach at the Marina are expected to be those who are renting personal water craft from the concessionaire. Because rentals are based on an hourly rate, it is unlikely that those renters would take the water craft elsewhere and spend their rental time traveling to another beach. Most likely they and their group may set up an area on the beach where kids can play in the water and where they are close to maximize their time on the rented watercraft.

The estimated number of people who will use the marina and afore mentioned buildings would be an annual average of 100,000. This is based on the rapidly rising attendance to Bear Lake in the preceding years.

3.5.3 Location – User Relationship

The marina has the following location/user relationships:

Beach - Beach Goer

Ramp - Boaters, Long Term Slip Renters, State Agencies

Concessionaire - Boaters, Long Term Slip Renters, Beach Goers, State Agencies

Picnic Pavilions - Beach Goers

Slips - Long Term Slip Renters, State Agencies, Boaters

Boat Trailer Parking - Boaters

Passenger Parking - Long Term Slip Renters, State Agency, Beach Goers

3.5.4 Relationships

The relationship of the varying areas of the Marina is important to comprehend when developing the design of the site. The following bubble diagram (Figure 3-2) illustrates the relationship of each of the areas as tabulated in Table 3-1.

Figure 3-2: Relationship Diagram for Space Relationship

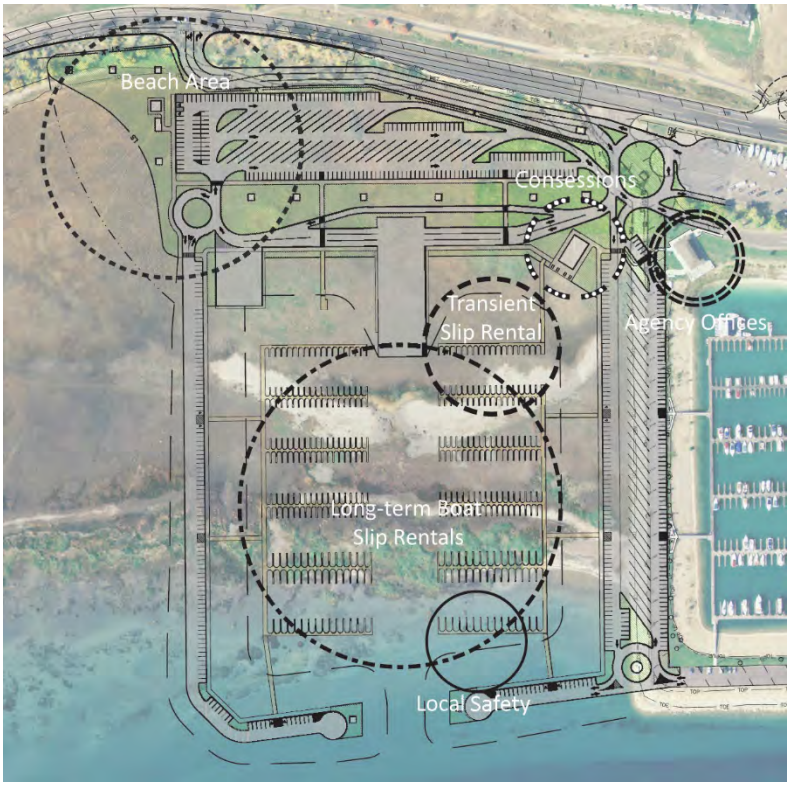


Table 3-1: Space Relationship

SPACE	USER	FUNCTION	RELATIONSHIP TO OTHER SPACES
BEACH AREA	Visitors without watercraft, but who have come to recreate on the beach in the proximity of the marina.	Provide park-like area and sandy access to the water from the marina to picnic and recreate in the water without the need of a water vessel.	Close proximity to passenger parking, restrooms and concessionaire
CONCESSIONAIRE BUILDING	Boaters, Long Term Slip Renters, Beach Goers, State Agencies , Concessionaire employees	Sell concessions, retail, fuel, and to rent personal watercraft and OHVs	Needs to be easily accessible to all users. Space for gathering. As a public space, this should be located separate from the long term boat rental slips. Close proximity to the marina for watercraft rental. Close to parking for OHV Rental. Passenger parking needed
TRANSIENT RENTAL SLIPS	Boaters who are camping or staying on their boat short-term, but do not have a long-term rental in the Marina.	Provide overnight slips to boat owners who wish to stay the night either on their boat or at a nearby campsite.	The transient rental slips are located separate from the concessionaire for security concerns and privacy.
LONG-TERM BOAT SLIP RENTALS	Mariners who leave watercraft in the marina for the season utility hookups for long-term stay or storage.	Provide safe, secure location where utility hookups are available.	Like the transient slips, the long-term slips are located away from the concessionaire for security and privacy. Also other distractions that might lead to disrupted stay at the marina.
AGENCY OFFICES	Employees of federal, state and local agencies	Provide offices and administrative area for employees	Central to the operations at the marina. Close proximity to boat ramps for operations and marina for emergency operations.
LOCAL SAFETY	Search and Rescue team	Provide easy access to Search and rescue boat for immediate assistance	Dock Ramps

3.6 Form

3.6.1 Quality and Image

The sites and structures of this Marina expansion will need to meet the State of Utah Standard of Quality. Along with that, the structures will need to coordinate with the nautical theme portrayed in the existing structures on the Marina. In 2004, when the existing marina was improved, an office building was constructed for the State Parks professionals. This building was designed with significant nautical elements including exposed beams on the interior, timber, stone and stucco elements on the exterior. Also, an oversized cupola serves to add natural lighting and provides an elevated lookout. The concessionaire building should be built with similar nautical elements to carry out the structural design theme of the Bear Lake Marina. Likewise, the structural elements of the other buildings to be constructed (restroom, pavilions, fish cleaning station, fee station, etc.) should mirror those that are in existence now.

The goals of these new buildings is to alleviate the congestion at the existing marina and provide a more adequate space for the concessionaire. Additionally, the other structures and sites are to provide addition service and convenience to the addition to the Marina. This specifically and wholly is the purpose of the Marina expansion in relation to funding and project goals.

3.6.2 Space Utilization Efficiency

The following is a list of sites and structures and their estimated dimensions to identify the portion of the marina expansion that will be used.

Site	Measurement in Square Feet	Percentange of Total	Total Acreage in Square Feet
7-Lane Boat Ramp	17136	0.84%	2,047,320
Concessionaire Structure	2800	0.14%	2,047,320
Boat Crane Pad	14300	0.70%	2,047,320
Fee Station	300	0.01%	2,047,320
Restrooms	625	0.03%	2,047,320
Pavilions	3075	0.15%	2,047,320
Beach Area	163,106	7.97%	2,047,320
Inspection and Decontamination area	5220	0.25%	2,047,320
Relocated right turn lane	5768	0.28%	2,047,320
Left Turn lane Extension	13468	0.66%	2,047,320
Queuing Lanes	19600	0.96%	2,047,320
Boat Prep Lanes	7140	0.35%	2,047,320
Boat Wipe down Lanes	4830	0.24%	2,047,320
Rental Slips	15140	0.74%	2,047,320
Slips with Utilities	305010	14.90%	2,047,320
Added Alternative: Additional Trailer Parking	56993	2.78%	2,047,320
Added Alternative: Lighthouse	530	0.03%	2,047,320
Added Alternative: Overflow Parking Access Road realignment	15330	0.75%	2,047,320
Sub Total	650371	31.77%	2,047,320
Remaining Unimproved Area (water way)	1,396,949	68.23%	
Total Improved	650371	31.77%	2,047,320

3.6.3 Guidance

The scope of this program does not allow for the specific design of the anticipated buildings. The design will be included in the architectural and engineering services of the property development which will provide the net-to-gross factors at that time. It is expected that the buildings will be designed and built with a similar net to the existing Marina buildings.

3.6.4 Code Impact

There are three buildings that will be constructed as part of the marina expansion project. These are the Fee Station, Restroom Building and Concessionaire Building. Each of these buildings will mimic existing buildings on site. The buildings are primarily constructed of CMU block and wood framed trusses. Each building is single story and has small occupant loadings. Since the scope of this report does not include a detailed design of the floor plan or space layout, final code considerations will need to occur during design. The DFCM High Performance Building Standard will need to be followed unless an exception is granted. The Fee Station and Restroom Building will be winterized and not occupied during the winter months. Because of this, there may be some exceptions to the standard allowed by the Building Official.

3.6.5 Structural Requirements

Buildings on the site will be two stories or less and steel, wood frame or CMU block construction. Building Loads should be determined by ASCE 7 and structural design according to the latest edition of the International Building Code (IBC), to include Appendix J, Issued by the International Code Council. The latest industry standard design codes for each building material should be followed.

3.6.6 Mechanical Requirements

Air conditioning will be required in the concessionaire, fee station and restroom buildings. The latest edition of the International Mechanical Code (IMC), issued by the International Code Council should be followed. The concessionaire building and restroom buildings will require plumbing. The latest edition of the International Plumbing Code (IPC), issued by the International Code Council should be followed.

3.6.7 Electrical Requirements

Site lighting and building lighting will be necessary. The latest edition of the National Electrical Code (NEC), issued by the National Fire Protection Association should be followed.

3.6.8 Communication Requirements

Communications will be required at the fee station, concessionaire building and boat slips. Communication requirements will be determined by the State of Utah.

3.6.9 Energy Efficiency Requirements

The latest edition of the International Energy Conservation Code (IECC), issued by the International Code Council should be followed for the concessions, restroom and fee station buildings.

3.6.10 Hazardous Materials

A Hazardous Materials inspection or report has not been completed in the scope of this programming report. Further investigation will need to be completed prior to design and construction of the project.

3.6.11 Other Relevant Codes

- NFPA 303: Fire Protection Standard for Marinas and Boatyards

3.6.12 Existing Facilities

There are no existing facilities on the planned project site.

3.6.13 Individual Space Requirements

There are currently no individual space requirements.

3.7 Function and Activity

The marina has been laid out to provide optimum functionally for the wide variety of activities that it will support. Figure 3-3 shows the project and identifies the key components. Table 3-2 outlines the key information for each of the individual spaces

Figure 3-3: Site Plan Image

Table 3-2: Individual Space Outlines

1	7-Lane Boat Ramp	84' x 252'	Ramp will need to extend into the water far enough to provide water access to the marina floor
	Functions: Provide easy launch for boats from land to water. **Occupants/ Visitors:** Boaters and recreationalists, State-owned boats **Hours:** Dusk until dawn; Spring to Fall. **Utah Space Standards:** Not applicable **Lighting:** None **Windows:** None **Views:** None **Acoustics:** None		**Security:** None **Temp, Vent and Humidity:** None **Materials:** Reinforced concrete with roughened surface for traction. **Electrical:** None **Communications:** None **Audio-visual:** None **Ceiling:** None **Furnishings:** None
2	Concessionaire Building	70'x40'	Concessionaire building will be finished in
	Functions: The Concessionaire building will operate as the location for fast food, fuel, retail sales, marine and OHV rentals. **Occupants/Visitors:** Boaters and recreationalists, beach goers, state agencies **Hours:** Dusk until dawn; May to September. **Utah Space Standards:** Not applicable **Lighting:** To be determined **Windows:** To be determined **Views:** None **Acoustics:** None		**Security:** (cameras, locks on doors and windows, metal gates) **Temp, Vent and Humidity:** Standard furnace/AC, ventilation above cook area, etc. **Materials:** Reinforced concrete with roughened surface for traction. **Electrical:** per design **Communications:** Internet, phone line **Audio-visual:** None required **Ceiling:** (height) **Furnishings:** None
3	Boat Crane Pad	130'x100'	Located on the Northwest corner of the existing marina, the crane pad serves as boat launch for sailboats who have large keels and hulls. An additional pad will be built to serve the addition and will be located on the Southwest corner of the new expansion
	Functions: The boat crane pad will provide a solid location where the chosen crane can safely lift large watercraft (that which is too big to be launched with a trailer) into the marina. Large enough for both the crane and the said watercraft. **Occupants/Visitors:** Boat owners and state park employees. **Hours:** Dusk until dawn; May to September. **Utah Space Standards:** Not applicable **Lighting:** None **Windows:** None **Views:** None **Acoustics:** None		**Security:** None **Temp, Vent and Humidity:** None **Materials:** Reinforced concrete with roughened surface for traction. MSE wall. **Electrical:** None **Communications:** None **Audio-visual:** None **Ceiling:** None **Furnishings:** None

4	Relocated Fee Station	20'x15'	The fee station will be relocated to accommodate the new marina approach. The size and structure will be similar to the existing structure.
	Functions: The relocated fee station will be a small building for park patrons to pay entrance fee. This will be located at the entrance of the Marina. **Occupants/Visitors:** 2 State park employees. **Hours:** Dusk until dawn; May to September. **Utah Space Standards:** Not applicable **Lighting:** should include electric lighting to accommodate functions of office/point of sale (POS) station **Windows:** Sliding windows or doors on two access sides to provide access to park patrons **Views:** None **Acoustics:** None		**Security:** Deadbolt Door Locks **Temp, Vent and Humidity:** None **Materials:** Reinforced concrete with roughened surface for traction. MSE wall. **Electrical:** electrical conduit to provide service to computer and POS systems **Communications:** Internet for receipt of entry fee payments, phone line **Audio-visual:** None **Ceiling:** None **Furnishings:** Desk and chairs to support computer and POS.
5	Restrooms	25x'25'	The restroom will provide individual showers, men's and women's restroom. The construction will mirror that of the existing building at the existing marina.
	Functions: provide toilets, running water and showers **Occupants/Visitors:** Beach goers, boaters, recreation, State Park employees. The restroom will have three men's stalls, three women's stalls and four showers. **Hours:** Dusk until dawn; May to September. **Utah Space Standards:** Not applicable **Lighting:** should include electric lighting to accommodate the functions of restrooms **Windows:** small ventilation windows **Views:** None **Acoustics:** None		**Security:** Deadbolt door locks **Temp, Vent and Humidity:** None **Materials:** Concrete block, wood trusses, reinforced concrete. **Electrical:** electrical conduit to provide service for restroom. **Communications:** None **Audio-visual:** None **Ceiling:** Per architectural design **Furnishings:** None
6	Pavilions	15'x15' (11) 30'x20' (1)	Pavilions will be placed all around the marina providing picnic spots in various locations.
	Functions: The picnic pavilions are an amenity of the State Park. The structures will provide shade from the sun and a place for families and groups to gather when visiting the Marina. **Occupants/Visitors:** Beach goers, boaters, recreation. 1 large pavilion for groups of <20, 11 smaller pavilions for groups >20 **Hours:** Dusk until dawn; May to September. **Utah Space Standards:** Not applicable **Lighting:** Not applicable **Windows:** None		**Views:** None **Acoustics:** None **Security:** None **Temp, Vent and Humidity:** None **Materials:** Steel pillars, wood trusses, reinforced concrete. **Electrical:** None **Communications:** None **Audio-visual:** None **Ceiling:** per design **Furnishings:** per design

7	Beach Area	163,106 SF	Area south of the Marina that will provide sandy beach area for PWC rentals and families to gather while recreating
	Functions: To provide a sandy area where people can access the lake from the shoreline. **Occupants/Visitors:** Beach goers, boaters, recreationalists. This area is designed to accommodate more than 500 visitors. **Hours:** Dusk until dawn; May to September. **Utah Space Standards:** Not applicable **Lighting:** None **Windows:** None **Views:** None		**Acoustics:** None **Security:** None **Temp, Vent and Humidity:** None **Materials:** sand imported from external sources **Electrical:** None **Communications:** None **Audio-visual:** None **Ceiling:** None **Furnishings:** None
8	Inspection and Decontamination Area	5,220 SF	The inspection and decontamination area will be an area where a temporary, portable building can be set up for the State Parks to inspect watercraft prior to entry in the marina.
	Functions: A temporary, portable building that can be set up for the State Parks to inspect watercraft prior to entry in the marina. **Occupants/Visitors:** Beach goers, boaters, recreationalists, State Park employees. **Hours:** Dusk until dawn; May to September. **Utah Space Standards:** Not applicable **Lighting:** None **Windows:** None **Views:** None **Acoustics:** None		**Security:** None **Temp, Vent and Humidity:** None **Materials:** sand imported from external sources **Electrical:** RV Hookup **Communications:** RV Hookup for Internet Connection **Audio-visual:** None **Ceiling:** None **Furnishings:** None
9	Relocated Right Turn Lane	412 LF	Roadway to relocate right turn lane to allow safer approach to marina entrance
	Functions: Provide safer approach to the Marina entrance and fee station. **Occupants/Visitors:** All visitors and State Park employees (anyone entering the Marina). **Hours:** 24 hours per day/7 days a week. **Utah Space Standards:** Not applicable **Lighting:** None **Windows:** None **Views:** None **Acoustics:** None		**Security:** None **Temp, Vent and Humidity:** None **Materials:** Road Base and Asphalt **Electrical:** None **Communications:** None **Audio-visual:** None **Ceiling:** None **Furnishings:** None

10	Left Turn Lane Extension	962 LF	Roadway to expand left turn lane to allow safer approach to Marina entrance.
	Functions: Provide safer approach to the Marina entrance and fee station. **Occupants/Visitors:** All visitors and State Park employees (anyone entering the Marina). **Hours:** 24 hours per day/7 days a week. **Utah Space Standards:** Not applicable **Lighting:** None **Windows:** None **Views:** None **Acoustics:** None		**Security:** None **Temp, Vent and Humidity:** None **Materials:** Road Base and Asphalt **Electrical:** None **Communications:** None **Audio-visual:** None **Ceiling:** None **Furnishings:** None
11	Queuing Lanes	700 LF each lane / 1400 LF total	Two queuing lanes will be available approaching the entrance fee station to the Marina allowing a significant number of vehicles with boat trailers to approach and enter the marina without backing up on US-89 causing traffic hazards
	Functions: Provide safer approach to the Marina entrance and fee station. **Occupants/Visitors:** Beach goers, boaters, recreationalists, State Park employees (anyone entering the Marina). **Hours:** 24 hours per day/7 days a week. **Utah Space Standards:** Not applicable **Lighting:** None **Windows:** None **Views:** None		**Acoustics:** None **Security:** None **Temp, Vent and Humidity:** None **Materials:** Road Base and Asphalt **Electrical:** None **Communications:** None **Audio-visual:** None **Ceiling:** None **Furnishings:** None
12	Boat Preparation Lanes	170 LF Each / 510 LF Total	The lanes boaters will prepare boats before launching. Most boaters take equal time to prepare for launch.
	Functions: Provide safer and efficient area for boaters to prepare to enter water. **Occupants/Visitors:** Boaters and State Park employees (anyone entering launching watercraft). **Hours:** Dawn to Dusk. **Utah Space Standards:** Not applicable **Lighting:** None **Windows:** None **Views:** None		**Acoustics:** None **Security:** None **Temp, Vent and Humidity:** None **Materials:** Road Base and Asphalt **Electrical:** None **Communications:** None **Audio-visual:** None **Ceiling:** None **Furnishings:** None

13	Boat Wipe Down Lanes	115 LF Each / 345 LF Total	This is an area that will be used to wipe down the boat after use, put covers on, secure skis boards and floatation. This area needs to be designed to allow for easy pull in and out as some boaters take longer to secure their vessel.
	Functions: Provide safer area for boaters to clean up and prepare to tow boat on roadway. **Occupants/Visitors:** Boaters and State Park employees (anyone entering leaving Marina with watercraft). **Hours:** Dawn to Dusk. **Utah Space Standards:** Not applicable **Lighting:** None **Windows:** None **Views:** None **Acoustics:** None		**Security:** None **Temp, Vent and Humidity:** None **Materials:** Road Base and Asphalt **Electrical:** None **Communications:** None **Audio-visual:** None **Ceiling:** None **Furnishings:** None
14	Transient Boat Slips / Dock	15,140 SF	Overnight or weekend slip rentals. These do not come with amenities.
	Functions: Provide in-water boat storage for short-term boaters. **Occupants/Visitors:** boaters staying longer than one day, but not longer than three days. **Hours:** 24 hours per day/7 days a week. **Utah Space Standards:** Not applicable **Lighting:** None **Windows:** None **Views:** None **Acoustics:** None		**Security:** None **Temp, Vent and Humidity:** None **Materials:** Dock material **Electrical:** None **Communications:** None **Audio-visual:** None **Ceiling:** None **Furnishings:** None
15	Slips with Utilities	305,010 SF	Slips are rented on a seasonal basis and are provided with amenities to lessees.
	Functions: The structure is designed to anchor boats in the marina. It has power, internet, cable television and water hookups at each slip. The dockage will also be secured at the gangplanks securing the docked vessels **Occupants/Visitors:** Long-term boaters (Sail boats, power boats, cruisers, small yachts. **Hours:** 24 hours per day/7 days a week, during boating season. **Utah Space Standards:** Not applicable **Lighting:** None **Windows:** None **Views:** None		**Acoustics:** None **Security:** Locked and gated gang planks **Temp, Vent and Humidity:** None **Materials:** Road Base and Asphalt **Electrical:** RV Hookup **Communications:** RV Hookup for Internet Connection **Audio-visual:** None **Ceiling:** None **Furnishings:** None

16	Relocated Right Turn Lane	412 LF	Roadway to relocate right turn lane to allow safer approach to marina entrance
	Functions: Provide safer approach to the Marina entrance and fee station. **Occupants/Visitors:** Beach goers, boaters, recreationalists, State Park employees (anyone entering the Marina). **Hours:** 24 hours per day/7 days a week. **Utah Space Standards:** Not applicable **Lighting:** None **Windows:** None **Views:** None		**Acoustics:** None **Security:** None **Temp, Vent and Humidity:** None **Materials:** Road Base and Asphalt **Electrical:** RV Hookup **Communications:** RV Hookup for Internet Connection **Audio-visual:** None **Ceiling:** None **Furnishings:** None
17	Added Alternative: Additional Trailer Parking	56,993 SF	**This is an add-on option to the design based on budgetary allowances**
	Functions: Provide additional area for boat trailer parking. **Occupants/Visitors:** Boaters. **Hours:** 24 hours per day/7 days a week. **Utah Space Standards:** Not applicable **Lighting:** None **Windows:** None **Views:** None		**Acoustics:** None **Security:** None **Temp, Vent and Humidity:** None **Materials:** Road Base and Asphalt **Electrical:** None **Communications:** None **Audio-visual:** None **Ceiling:** None **Furnishings:** None
18	Added Alternative: Lighthouse	500 SF	**This is an add-on option to the design based on budgetary allowances.** The Lighthouse will provide additional safety and will have similar nautical elements as the existing State Parks office.
	Functions: The lighthouse is a beacon to the Marina and provides a lookout tower for Search and Rescue. There are multiple windows spanning the circumference of the building. It will also have lighting to State Building code as well as plumbing to serve those (not public) using the building. **Occupants/Visitors:** State Park officials, Search and Rescue Crew. **Hours:** 24 hours per day/7 days a week. **Utah Space Standards:** Not applicable **Lighting:** Based on typical building standards **Windows:** Based on design and need		**Views:** 360 degree of lake and mountain areas **Acoustics:** None **Security:** None **Temp, Vent and Humidity:** None **Materials:** Wood, stucco, open beams and other nautical design features. **Electrical:** Based on building code **Communications:** Ba **Audio-visual:** None **Ceiling:** None **Furnishings:** None

19	Added Alternative: Overflow Parking Access	356 LF	**This is an add-on option to the design based on budgetary allowances.** The overflow parking entrance can be realigned to allow for easier US-89 access.
	Functions: The road realignment will allow vehicles exiting and entering US-89 to do so safely and will ease traffic flow. The realignment will be 356 LF and will not require additional lighting or electricity. **Occupants/Visitors:** State Park officials, Search and Rescue Crew. **Hours:** 24 hours per day/7 days a week. **Utah Space Standards:** Not applicable **Lighting:** Based on typical building standards **Windows:** Based on design and need **Views:** 360 degree of lake and mountain areas **Acoustics:** None		**Security:** None **Temp, Vent and Humidity:** None **Materials:** Wood, stucco, open beams and other nautical design features. **Electrical:** Based on building code **Communications:** Ba **Audio-visual:** None **Ceiling:** None **Furnishings:** None

4 Cost Model

Below is the summarized Cost Model for the Bear Lake Marina Expansion. This cost model shows the costs for the project by category.

Item #	Description	Unit	Estimated Quantity	Unit Price	Total
1	Mobilization, SWPPP, Traffic Control	Lump Sum	1	$ 1,750,000.00	$ 1,750,000.00
	Earthwork				**$ 21,029,950.00**
2	Clear and Grub	Acre	46	$ 6,500.00	$ 299,000.00
3	Excavate and Dispose Native Material	CY	210,500	$ 10.00	$ 2,105,000.00
4	Excavate and Reuse Native Material	CY	67,000	$ 3.00	$ 201,000.00
5	Remove and dispose of Asphalt	SF	85,750	$ 0.20	$ 17,150.00
6	Remove and Dispose Tree	Each	16	$ 350.00	$ 5,600.00
7	Structural Fill	CY	451,000	$ 28.00	$ 12,628,000.00
8	Salvage and Reuse Riprap	CY	5,220	$ 20.00	$ 104,400.00
9	36" Riprap	CY	15,400	$ 150.00	$ 2,310,000.00
10	24" Riprap	CY	2,822	$ 100.00	$ 282,200.00
11	12" Riprap	CY	20,000	$ 100.00	$ 2,000,000.00
12	Separation Geotextile	SF	388,000	$ 0.20	$ 77,600.00
13	Dewatering	LS	1	$ 1,000,000.00	$ 1,000,000.00
					$ -
	Sitework				**$ 2,261,584.40**
14	Sawcut Asphalt	LF	150	$ 1.20	$ 180.00
15	4" Sidewalk	SF	39,000	$ 6.00	$ 234,000.00
16	6" Sidewalk	SF	27,750	$ 8.00	$ 222,000.00
17	Curb and Gutter	LF	7,400	$ 22.00	$ 162,800.00
18	ADA Ramp	Each	17	$ 1,500.00	$ 25,500.00
19	12" Base Course	SF	390,084	$ 1.60	$ 624,134.40
20	8" Untreated Base Course	SF	390,084	$ 1.30	$ 507,109.20
21	3" Ashpalt	SF	390,084	$ 1.20	$ 468,100.80
22	Paint Striping	LF	0	$ 0.40	$ 9,760.00
23	Signs	Each	20	$ 400.00	$ 8,000.00

Item #	Description	Unit	Estimated Quantity	Unit Price	Total
	Roadway				**$ 131,678.00**
24	Sawcut Asphalt	LF	650	$ 2.00	$ 1,300.00
25	18" Base Course	SF	16,300	$ 3.50	$ 57,050.00
26	12" Untreated Base Course	SF	16,300	$ 2.20	$ 35,860.00
27	6" Asphalt	SF	16,300	$ 2.00	$ 32,600.00
28	Paint Striping	LF	4,780	$ 0.60	$ 2,868.00
29	Signs	Each	5	$ 400.00	$ 2,000.00
					$ -
	Boat Slips				**$ 4,536,100.00**
30	20' x 10' Boat Slip	Each	95	$ 6,500.00	$ 617,500.00
31	25' x 10' Boat Slips	Each	95	$ 9,000.00	$ 855,000.00
32	26' x 11' Boat Slip	Each	75	$ 12,000.00	$ 900,000.00
33	32' x 13' Boat Slip	Each	75	$ 18,000.00	$ 1,350,000.00
34	Electrical - Boat Slips	Each	170	$ 3,500.00	$ 595,000.00
35	Water - Boat Slips	Each	170	$ 700.00	$ 119,000.00
36	Security Gates	Each	7	$ 2,800.00	$ 19,600.00
37	Gangeway	Each	8	$ 10,000.00	$ 80,000.00
	Boat Utility Dock				**$ 15,700.00**
38	Sewer Dump Station w/Dock	Each	1	$ 12,000.00	$ 12,000.00
39	Potable Water for Dock	Each	1	$ 700.00	$ 700.00
40	Electrical for Dock	Each	1	$ 3,000.00	$ 3,000.00
					$ -
	Site Sewer				**$ 116,180.00**
41	Manhole	Each	2	$ 4,500.00	$ 9,000.00
42	Lift Station	LS	1	$ 50,000.00	$ 50,000.00
43	Highway Bore	LF	100	$ 160.00	$ 16,000.00
44	4" Force Main	LF	560	$ 18.00	$ 10,080.00
45	8" Gravity Sewer	LF	920	$ 30.00	$ 27,600.00
46	Connect to Existing Sewer	Each	1	$ 3,500.00	$ 3,500.00

Item #	Description	Unit	Estimated Quantity	Unit Price	Total
	Water				**$ 182,450.00**
47	8" C-900 Water Main	LF	3,750	$ 25.00	$ 93,750.00
48	Connect to Existing Water Main	Each	2	$ 3,500.00	$ 7,000.00
49	Fire Hydrant	Each	8	$ 4,500.00	$ 36,000.00
50	6" Meter	Each	2	$ 18,000.00	$ 36,000.00
51	8" Gate Valve	Each	6	$ 1,400.00	$ 8,400.00
52	8" Tee	Each	2	$ 650.00	$ 1,300.00
					$ -
	Electrical				**$ 243,500.00**
53	Transformers	Each	5	$ 11,800.00	$ 59,000.00
54	4" Conduit / Conductors	LF	2,500	$ 25.00	$ 62,500.00
55	Highway Bore	LF	100	$ 100.00	$ 10,000.00
56	Light Poles	Each	32	$ 3,500.00	$ 112,000.00
					$ -
	Storm Drain				**$ 102,000.00**
57	15" Storm Drain	LF	2,500	$ 25.00	$ 62,500.00
58	Catch Basin	Each	10	$ 1,500.00	$ 15,000.00
59	Oil Water Separator	Each	1	$ 12,000.00	$ 12,000.00
60	Storm Drain Mainhole	Each	5	$ 2,500.00	$ 12,500.00
					$ -
	Landscaping				**$ 390,000.00**
61	Hydroseed	SF	260,000	$ 0.25	$ 65,000.00
62	Irrigation	SF	260,000	$ 1.25	$ 325,000.00
					$ -
	Structures				**$ 1,041,500.00**
63	Conssessionaire Building	SF	3,200	$ 120.00	$ 384,000.00
64	Restroom Building	SF	625	$ 180.00	$ 112,500.00
65	Fee Building	SF	100	$ 100.00	$ 10,000.00
66	Decontamination Facility	LS	1	$ 200,000.00	$ 200,000.00
67	Fueling Station	Each	1	$ 20,000.00	$ 20,000.00
68	Crane Pad Wall	SF	4,200	$ 75.00	$ 315,000.00
					$ -
	Environmental Mitigation				**$ 2,760,000.00**
69	Mitigation Site	Acres	138	$ 20,000.00	$ 2,760,000.00

Item #	Description	Unit	Estimated Quantity	Unit Price	Total
	Permitting				**$ 800,000.00**
70	EIS	LS	1	$ 800,000.00	$ 800,000.00
					$ -
	Construction Subtotal				**$ 35,360,642.40**
					$ -
	A&E				**$ 2,002,000.00**
71	Surveying	LS	1	$ 32,000.00	$ 32,000.00
72	Geotechnical	LS	1	$ 100,000.00	$ 100,000.00
73	Civil	LS	1	$ 1,400,000.00	$ 1,400,000.00
74	Architectual	LS	1	$ 50,000.00	$ 50,000.00
75	Electrical	LS	1	$ 20,000.00	$ 20,000.00
76	Construction	LS	1	$ 400,000.00	$ 400,000.00
	Additive Alternative 1 - Trailer Parking Center Dike				**$ 1,318,666.00**
1	Structural Fill	CY	37,500	$ 28.00	$ 1,050,000.00
2	12" Base Course	SF	120,668	$ 1.60	$ 193,068.80
3	8" Untreated Base Course	SF	120,668	$ 1.30	$ 156,868.40
4	3" Ashpalt	SF	120,668	$ 1.20	$ 144,801.60
5	Paint Striping	LF	2,340	$ 0.40	$ 936.00
	Additive Alternative 2 - Lighthouse				**$ 80,000.00**
1	Lighthouse Structure	LS	1	$ 80,000.00	$ 80,000.00
	Additive Alternative 3 - Overflow Parking Access				**$ 197,560.00**
1	12" Base Course	SF	11,600	$ 1.60	$ 18,560.00
2	8" Untreated Base Course	SF	11,600	$ 1.30	$ 15,080.00
3	3" Ashpalt	SF	11,600	$ 1.20	$ 13,920.00
4	Retaining Wall	SF	2,000	$ 75.00	$ 150,000.00
	Sub-Total				**$ 39,185,877.20**
	Construction Contingency	% Subtotal		10%	$ 3,536,064.24
	Inflation	Years	3	2%	$ 2,398,489.17
	Project Budget Total				**$ 45,120,430.61**

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APPENDIX A: GEOTECHNICAL ENGINEERING REPORT

Preliminary Geotechnical Engineering Report

Bear Lake State Park
New Marina Expansion – Programming
DFCM Project #15126510
Rich County, Utah

October 27, 2015
Terracon Project No.61155051

Prepared for:
J-U-B Engineers, Inc.
Logan, Utah

Prepared by:
Terracon Consultants, Inc.
Bluffdale, Utah

October 27, 2015

J-U-B Engineers, Inc.
1047 South 100 West, Suite 180
Logan, Utah 84321

Attn: Mr. Zan Murray, S.E.
P: [435] 713-9514
M: [435] 757-5767
E: zpm@jub.com

Re: Preliminary Geotechnical Engineering Report
Bear Lake State Park
New Marina Expansion – Programming
DFCM #15126510
Rich County, Utah
Terracon Project Number: 61155051

Dear Mr. Murray:

Terracon Consultants, Inc. (Terracon) has completed the preliminary geotechnical engineering services for the above referenced project. This study was performed in general accordance with our proposal number P61150032 dated June 12, 2015. This report presents the findings of the preliminary subsurface exploration and provides preliminary geotechnical recommendations concerning earthwork and the design and construction of proposed dikes for the proposed project.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report, or if we may be of further service, please contact us.

Sincerely,
Terracon Consultants, Inc.

Jeff W. Gilbert, P.E.
Project Geotechnical Engineer

Rick L. Chesnut, P.G., P.E.
Principal

Enclosures
cc: 1 – Client (PDF)
1 – File

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EXECUTIVE SUMMARY

A preliminary geotechnical exploration has been performed for the proposed Bear Lake Marina Expansion project located at the Utah Bear Lake Marina State Park in Rich County, Utah. Terracon's geotechnical scope of work included the advancement of three borings to depths of approximately 30 to 64 feet and five test pits to depths of approximately 10 to 12 feet below the existing ground surface. Two geophysical arrays were completed, one along the existing dike and one along the shoreline. During a site visit, Terracon visited multiple borrow and riprap sources near the site with JUB.

This exploration was completed to provide preliminary geotechnical information to assist in project planning and development of preliminary project costs. Additional geotechnical exploration, laboratory testing and analysis must be completed for final design of the project.

Based on the information obtained from our subsurface exploration the following preliminary geotechnical considerations were identified:

- **Subsurface Conditions**: Existing embankment fill was encountered to depths between 12 to 18 feet and ranged from clay and silt to silty gravel with sand and cobbles. Native soils encountered below the embankment and in the borings and test pits completed in the footprint of the proposed expansion generally consisted of silt and sand. Boring B-2, located closer to Highway 89 in the northwest corner of the proposed expansion generally consisted of medium stiff to hard clay to the maximum depth explored.

- **Proposed Dike Geometery:** The new dike slopes may be constructed at 3 Horizontal to 1 Vertical (3H:1V) and 2.5H to 1V, interior and exterior slopes, respectively, provided dikes consist of granular material.

- **Dike Material/Reuse of Existing Soils:** Based on our explorations, the majority of the material excavated for the proposed expansion will likely consist of a mixture of silt and sand, though some clay may be encountered, as evidence from boring B-2 that encountered medium stiff to hard clay. Silty soils are recommended for reuse if they are above water and have a granular cap or shell to help stabilize and protect them. Drying will be required. Compaction and moisture content in this type of soil can be difficult to achieve. Silts may be used within the dike core if they can be compacted, kept above water and have a granular shell to protect them. If encountered the clay soils will likely be highly plastic, absorbing water and potentially becoming unstable under construction traffic or during compaction. Clays are not recommended for resuse unless approved by the geotechnical engineer.

- **Dike Settlement:** Based on the limited subsurface information completed during this preliminary exploration, approximately 18 to 30 inches of primary settlement is anticipated beneath a new 30 foot tall embankment that is 50 feet wide across the top, constructed with

the recommended slopes. Primary settlement is anticipated to occur relatively quickly, and surcharging to reduce secondary settlement is not anticipated to be required.

- **Seismic Hazards:** Geologic maps of the area suggest that fault traces may be located on the west boundary of the existing marina facility. Liquefiable soils were encountered at the site resulting in liquefaction induced settlement on the order of 1 to 7 inches during a design seismic event. We understand that additional exploration will be completed during final design to verify presence of liquefiable soils and magnitude of liquefaction induced settlement and/or lateral spread.

- **Riprap:** Dikes surfaces exposed to wave action should be protected using durable rock that is properly sized and placed. Several potential borrow locations near the project site were visited with JUB to assess riprap suitability. While none of the sites were currently being mined, and quality, size and quantity of riprap was based on visual observations only, one site (The Pointe) consisting of quartzite material immediately adjacent to Highway 89 appeared more suitable.

- **Final Design:** Additional field exploration, laboratory testing and engineering analysis should be completed to provide final design recommendations for the marina expansion, verify dike global stability and investigate liquefiable soils. This should include investigating subsurface conditions along the footprint of the proposed marina dike, especially in areas where the dike will be the tallest. Field exploration and settlement and stability analyses should also be focused on the east side of the proposed marina where the lake bottom appears to quickly drop. Recommendations provided in this report are based on limited field exploration and laboratory testing, and showed be considered suitable only for preliminary planning purposes and conceptual design. We recommend that Terracon be retained to complete final geotechnical explorations and design services for this project.

This summary should be used in conjunction with the entire report for design purposes. It should be recognized that details were not included or fully developed in this section, and the report must be read in its entirety for a comprehensive understanding of the items contained herein. The section titled **GENERAL COMMENTS** should be read for an understanding of the report limitations.

GEOTECHNICAL ENGINEERING REPORT
BEAR LAKE STATE PARK
NEW MARINA EXPANSION – PROGRAMING
DFCM #15126510
RICH COUNTY, UTAH

Terracon Project No. 61155051
October 27, 2015

1.0 INTRODUCTION

This report presents the results of a geotechnical exploration performed for the proposed Bear Lake State Park Marina Expansion project in Rich County, Utah. The purpose of these services is to provide information and preliminary geotechnical engineering recommendations relative to:

- subsurface soil conditions
- groundwater conditions
- embankment design and construction
- earthwork

Three soil borings, designated B-1 to B-3, five test pits designated TP-1 to TP-5, and two seismic arrays were performed at the existing marina and in the proposed expansion to depths of approximately 10 to 64 feet below the existing ground surface. Logs of the test pits and borings along with Site Location, Site Geology, and Exploration Plans are included in Appendix A of this report. Geophysical results consisting of shear wave profiles and p-wave 2-dimensional profiling are also summarized in Appendix A. The results of the laboratory testing are included in Appendix B. Descriptions of the field exploration and field and laboratory testing are included in their respective appendices.

2.0 PROJECT INFORMATION

2.1 Project Description

Item	Description
Site layout	See Appendix A, Exhibit A-1, and A-3
Description	Expansion to the south of the existing marina. New improvements include new dikes, boat docks, ramps and crane pads, parking, drive lanes and concession building.

Item	Description
Conceptual Plan	
Dikes	Top elevation – match existing (approximately 5940 feet[2]) Bottom elevation (outboard side) – 5927 feet[2] (assumed) Bottom elevation (inboard side) - 5899[3] Side slopes – 3H:1V (assumed)
Marina excavation[3]	The proposed marina will be excavated deeper than the existing by approximately 5 feet. It is reported that a hardpan layer encountered during initial marina construction resulted in a shallower pool than anticipated. Excavated materials are anticipated to be reused in the proposed dikes.
Borrow sources	Several nearby borrow sources to generate material and rip rap to construct the dikes have been identified.

Site	Name	Latitude	Longitude
1	Elk Ridge	41.954929°	-111.412254°
2	The Pointe	41.931789°	-111.433329°
3	Water Tank	41.957158°	-111.418338°

2.2 Site Location and Description

Item	Description
Location	Bear Lake State Park Marina, approximately 1 mile north of Garden City, Utah.

Item	Description
Existing improvements	Marina constructed in the 1960s, with additional work being completed in the 1970s[1]. Operational marina with dikes, boat ramp and docks, crane pad, concessions and facilities building, parking and drive lanes that extend out onto existing dikes. Approximately 2,400 linear feet of dikes that extend approximately 13 feet above the water surface.
Current ground cover	Asphaltic concrete pavement, grass and trees in landscaped areas, and riprap and gravel on sides of dikes.
Existing topography	Relatively level grade across the paved areas and top of dikes. Top of Dike – 5940 feet[2] Water level – 5927 feet[2] Marina bottom – 5904 feet (estimated) Moderately steep grades dropping down from US Highway 89 to the shoreline of the lake.

1. Verbal communication at project meeting with Utah State Parks, Department of Natural Resources, J-U-B Engineers, Bear Lake Yacht Club, and Division of Facilities Construction and Management at the Bear Lake Marina on June 9, 2015.
2. Elevations based on Google Earth Pro

3.0 SUBSURFACE CONDITIONS

3.1 Geology

The site is located on the west side of the Bear Lake Graben, and bounded on the west by the Bear River Range. Numerous faults, generally trending north to south run along the west side of Bear Lake.

Mapped geologic units[1] at the proposed marina expansion and borrow sources are summarized below. A plan showing site geology is provided in Appendix A.

3.1.1 Marina

- Qa: Main-stream alluvium (Holocene) – unconsolidated, crudely sorted lake and alluvial fan deposits.
- Ts?: Salt Lake Formation (Pliocene and Miocene) – white to pale green or gray, poorly consolidated, tuffaceous to marly sand and silt with thin beds of volcanic ash and gravel.

[1] Dover, J.H., 1995, *Geologic Map of the Logan 30'x60' Quadrangle, Cache and Rich Counties, Utah and Lincoln and Uinta Counties, Wyoming*, US Geological Survey, Map I-2210

- Tw: Wasatch Formation (middle and lower Eocene) – red conglomerate and siltstone with interbedded limestone and marl. Conglomerate contains pebble to cobble size, and may be gray.

3.1.2 Borrow Source 1 – Elk Ridge

- Og: Garden City Formation (Middle and Lower Ordovician) – Gray, thin-bedded, slabby limestone characterized by intraformational limestone conglomerate and breccia
- OCs: St. Charles Formation (Lower Ordovician and Upper Cambrian) – gray dolostone, dolomitic limestone and limestone.
- Tw: Wasatch Formation (middle and lower Eocene) – red conglomerate and siltstone with interbedded limestone and marl. Conglomerate contains pebble to cobble size, and may be gray.
- Cg: Geersten Canyon Quartzite (Lower Cambrian) – coarse grained quartzite, arkose, grit and conglomerate.

Photos taken at this site are included in Appendix A.

3.1.3 Borrow Source 2 – The Pointe

- Cg: Geersten Canyon Quartzite (Lower Cambrian) – coarse grained quartzite, arkose, grit and conglomerate.
- Tw: Wasatch Formation (middle and lower Eocene) – red conglomerate and siltstone with interbedded limestone and marl. Conglomerate contains pebble to cobble size, and may be gray.
- Ts?: Salt Lake Formation (Pliocene and Miocene) – white to pale green or gray, poorly consolidated, tuffaceous to marly sand and silt with thin beds of volcanic ash and gravel.

Photos taken at this site are included in Appendix A.

3.1.4 Borrow Source 3 – Water Tank

- Cg: Geersten Canyon Quartzite (Lower Cambrian) – coarse grained quartzite, arkose, grit and conglomerate.
- Tw: Wasatch Formation (middle and lower Eocene) – red conglomerate and siltstone with interbedded limestone and marl. Conglomerate contains pebble to cobble size, and may be gray.

Photos taken at this site are included in Appendix A.

3.2 Geophysical Analysis

Seismic Refraction and Refraction Microtremor (ReMi) data were acquired at two locations within the proposed marina expansion area. It is understood that development of the existing marina was impacted by unexpected geologic conditions encountered during its construction

which limited the depth the marina could be excavated. The objective of the seismic surveying was to determine the primary-wave and shear-wave velocity characteristics of the underlying geologic materials as they relate to construction and geotechnical design considerations for the proposed marina expansion. To meet this objective, both primary wave (body) and surface-wave (Raleigh) seismic data were acquired along the two seismic lines.

Primary-wave seismic refraction data were acquired with the goal of generating 2-dimensional profiles of primary-wave velocities (V_p). Determination of seismic velocity has been shown to be an effective means of assessing the rippability production of rock masses. The modeled 2-D profiles of V_p are presented as contoured plots of primary-wave velocity plotted as a function of depth and distance along the survey line. Low velocity zones are depicted in cooler colors (blues and greens), while higher velocity zones are depicted in warmer colors (orange and red). In addition, surface-wave seismic data were acquired along the same survey lines to obtain 1-dimensional profiles of shear-wave velocity (V_s) that were used to determine International Building Code (IBC) seismic site classification values. The modeled 1-D profiles of V_s are shown in a stair-step form showing velocity and layer thickness as a function of depth.

Access to areas directly within the proposed marina expansion area was limited and, therefore, limited the number of seismic survey lines to only two. One seismic survey line was located on the shoreline in the area of the proposed development and the second survey line was located along the southern levee of the existing marina. Exhibit A-13 in the Appendix of this report shows the locations of the two survey lines.

Data acquisition was accomplished thought the use of a portable, high-resolution, 24-channel seismograph and 4.5 Hz natural-frequency geophones. An active seismic source consisting of a 10-pound sledgehammer and a metal plate was used for throughout this investigation.

3.2.1 Shoreline Survey

Seismic surveying along the shoreline was limited to an area that was accessible to the survey crew. High water levels limited access to an area approximately 250 feet south of the southern levee of the existing marina. The survey line consisted of a single spread of 24 geophones spaced at 10-foot intervals: total survey line length was 230 feet. Exhibit A-16 shows the resulting 2-D profile of modeled V_p that obtained for this survey line.

The section shows a very thin layer of relatively low velocity material that appears to terminate approximately 65 feet from the north end of the survey line. This thin veneer of low velocity materials likely represent unconsolidated shoreline deposits (silts and sands). Velocities associated with this thin layer range from approximately 700ft/s to over 4,000 ft/s and tend to be variable. Some of the velocities in this this zone are higher than expected but are generally consistent with the saturated conditions that exist along the shoreline.

Generally, deeper portions of the profile show velocities that range from between approximately 5,500 to 7,000 ft/sec. The velocity structure, however, appears to be horizontally discontinuous. A vertical zone of much higher velocity is visible in the section that appears to intersect the surface. This may represent a high angle, dipping structure.

3.2.2 Levee Survey

Seismic data were acquired along the levee that separates the existing marina and the proposed development area. Data were acquired along two spreads of 24 geophones having a geophone spacing of 16 feet and a three-geophone overlap between spreads. Exhibit A-17 of the Appendix shows the resulting 2-D profile of modeled V_p that obtained for this survey line.

The resulting model shows a generally horizontally continuous velocity structure across the majority of the section. Velocities in the upper 12 to 15 feet of the profile range from approximately 700 to 2,000 ft/s and are generally consistent with constructed levee materials. At depths between approximately 13 feet to 25 feet velocities range from about 2,000 to 4,500 ft/sec. From 25 ft to the bottom of the model section, velocities range from approximately 4,500 to 10,000 ft/s. A zone with relatively high velocities, ranging from 10,000 to 14,000 ft/s, is seen in at depth at approximately 300 feet along the survey line.

3.3 Typical Profile

Based on the results of the field explorations, subsurface conditions on the project site can be generalized as follows:

Table 3.3-1 Existing Marina Embankment[1]

Stratum	Approximate Depth to Bottom of Stratum (feet)	Material Description	Consistency/ Density
1	12 to 18	Embankment fill ranging from lean clay, silt and sandy silt to silty gravel with sand and cobbles. Cobbles[2] approx. 6 to 9 inches in size encountered between 5 to 12 feet.	Field blow counts: Clay and Silt-9 – 14 Silty gravel with sand cobbles - > 50
2	20	Sandy Fat Clay	Stiff
3	50	Poorly Graded Sand with varying amounts of Silt, and Silt with varying amounts of Sand	Medium stiff to stiff / Medium dense to dense
5	52	Lean Clay	Very stiff
6	60	Sandy Silt and Silty Sand	Very stiff / Dense
7	64[3]	Silty Clay	Hard

Stratum	Approximate Depth to Bottom of Stratum (feet)	Material Description	Consistency/ Density

1. Based on Boring B-1 and the levee geophysical array
2. Cobbles encountered were very hard and difficult to drill through.
3. Maximum depth explored.

Table 3.3-2 Proposed Marina Expansion[1]

Stratum	Approximate Depth to Bottom of Stratum (feet)	Material Description	Consistency/ Density
1	19	Silt with varying amounts of Sand, and Silty Sand[2]	Soft to medium stiff
2	24	Silty Sand	Medium dense
3	31	Silt with varying amounts of Sand, and Silty Clay	Very soft to medium stiff
5	38½ [3]	Silty Sand and Silt with Sand	Very stiff

1. Based on Boring B-3 and TP-1 to TP-5, and the shoreline geophysical array
2. Varying resistance noticed during excavation in the silty sand in the upper 12 feet, however the excavator could excavate through the soil with relative ease.
3. Maximum depth explored.

Table 3.3-3 Proposed Marina Expansion – Northwest Section[1]

Stratum	Approximate Depth to Bottom of Stratum (feet)	Material Description	Consistency/ Density
1	4	Silty Sand overlain by several inches of lake bottom mud	Very loose
2	8½	Silty Clayey Gravel	Loose to very dense
3	31[3]	Lean Clay with Sand[2]	Medium stiff to hard

1. Based on Boring B-2 and the shoreline geophysical array
2. This soil stratum may represent what locals call “hardpan”.
3. Maximum depth explored.

Specific conditions encountered at the boring and test pit locations are indicated on the individual logs. Stratification boundaries on the boring and test pit logs represent the approximate location of changes in soil types; in-situ, the transition between materials may be gradual.

3.4 Groundwater

Groundwater is controlled by the level of Bear Lake.

Due to the drilling method (mud rotary) used for boring B-1, a groundwater measurement could not be taken.

All borings or test pits completed in the proposed marina expansion area had water at the ground surface or several inches above the ground surface.

4.0 PRELIMINARY GEOTECHNICAL OBSERVATIONS AND RECOMMENDATIONS

4.1 Preliminary Geotechnical Considerations

This site appears suitable for the proposed expansion from a geotechnical engineering perspective, provided the preliminary recommendations presented in this geotechnical report are considered and final recommendations are developed based on additional field exploration and laboratory testing.

Geotechnical considerations for this project include:

- Dike/Embankment Material - Based on our explorations, the majority of the material excavated for the proposed expansion will likely consist of a mixture of silt and sand, though some clay may be encountered, as evidence from boring B-2 that encountered medium stiff to hard clay. Silty soils are recommended for reuse if they are above water and have a granular cap or shell to help stabilize and protect them. Drying will be required. Compaction and moisture content in this type of soil can be difficult to achieve. Silts may be used within the dike core if they can be compacted, kept above water and have a granular shell to protect them. If encountered the clay soils will likely be highly plastic, absorbing water and potentially becoming unstable under construction traffic or during compaction. Clays are not recommended for resuse unless approved by the geotechnical engineer.
- Dike Construction – Preliminary estimates should be based on constructing dikes with exterior slopes of 3H:1V and interior slopes of 2.5H:1V, provided granular soils are used. Terracon should review stability of dikes once geometery has been confirmed and design phase field explorations have been completed.
- Dike Settlement - Based on the limited subsurface information completed during this preliminary exploration, approximately 18 to 30 inches of primary settlement is anticipated beneath a new 30 foot tall embankment that is 50 feet wide across the top,

constructed with the recommended slopes. Primary settlement is anticipated to occur relatively quickly, and surcharging to reduce secondary settlement is not required.

- Final Design – Additional geotechnical field work, laboratory testing and analysis should be completed to provide final design recommendations for design and construction of the proposed expansion. The preliminary recommendations presented in this report are based on limited information that is presented only for conceptual planning and budgeting purposes.
- It is anticipated that excavations for the proposed construction can be accomplished with conventional earthmoving equipment. Seismic velocities provided with this report should be referenced to assist in planning for types of excavation equipment. Excavation for the marina bottom my encounter cemented soil and may require heavy duty excavation equipment. Additional explorations should be completed to confirm subsurface stratigraphy.
- Dikes exposed to wave action should be armored with a protective layer of riprap this is durable, sized and placed properly, with sufficient thickness to protect the dike material. The Bureau of Reclamation publication, Design of Small Dams, Third Edition, 1987, may be one possible source for designing riprap for the project.

4.2 Seismic Considerations

The site-specific seismic class survey along two geophysical arrays indicated that the shear wave velocity in the upper 100 feet of the soil profile ranged between 1057 to 1764 feet per second. Based on the seismic arrays, and boring blow counts, the subsurface soil profile can be represented by Site Class D according to the Site Class Definitions in IBC 2012, Section 1613.3.2, however liquefiable soils were encountered in the explorations. The subsurface soil profile is best represented by Site Class F according to the 2012 International Building Code (IBC) due to liquefaction potential at the site.

The National Seismic Hazard Map database was searched to identify the peak ground acceleration (PGA) and spectral accelerations for 0.2 second (Ss) and 1.0 second (S1) periods for a 2% probability of exceedance (PE) in 50 years at the project site for site class B. These values should be adjusted for site effects using appropriate site class factors from the 2012 IBC.

Description	Value
Site Class [1]	F [2] (with liquefaction) D (without liquefaction)
Site Latitude	N 40.153123°
Site Longitude	W 111.671561°
S_o PGA	0.438g
S_s Spectral Acceleration for a Short Period	1.127g
S_1 Spectral Acceleration for a 1-Second Period	0.341g

Description	Value
F_a Site Coefficient for a Short Period	1.049 [2]
F_v Site Coefficient for a 1-Second Period	1.718 [2]

1. Note: In general accordance with the *2012 International Building Code*. IBC Site Class is based on the average characteristics of the upper 100 feet of the subsurface profile.
2. As per Section 20.3.1 of ASCE 7-05, site class coefficients may be selected based on the soil profile neglecting the potential for liquefaction if the structure period is less than 0.5 seconds. Based on the results of the field exploration, Site Class D may be used to determine the values of F_a and F_v in accordance with Section 1316.5.2 of the 2012 IBC.

Portions of the site soils are liquefiable; consequently, the Site Class is F per 2012 IBC, for any profile containing soils vulnerable to potential failure or collapse under seismic loading such as liquefiable soils.

4.5.1 Earthquake Hazards

Mapped faults near the project site are indicated below.

- Western Bear Lake Fault[2] – 3.5 kilometers
- Eastern Bear Lake Fault[2] – 10 kilometers
- Multiple fault traces[3] within 3 kilometers with an inferred trace running along the west side of the existing marina facility.

The geologic map of the Logan 30'x60' quadrangle indicates there is significant faulting west of Bear Lake and that a fault trace may run along the west side of the existing facility. The USGS Quaternary Fault and Fold database shows a fault trace on the west side of Bear Lake, but terminating more than 5 kilometers north of the Idaho border. Additional exploration would need to be completed to determine the presence and location of a fault adjacent to or running through the proposed marina expansion. This could include fault trenches combined with geophysical profiling.

Estimated liquefaction induced vertical settlement (total and differential) for the site during an earthquake event with a 2% probability of exceedance in 50 years (PGA = 0.438g) and based on the boring data is summarized below.

- Total Liquefaction Induced Settlement - 1 to 7 inches.

[2] U.S. Geological Survey and Utah Geological Survey, 2006, Quaternary fault and fold database for the United States, accessed Oct. 26, 2015 , from USGS web site: http//earthquakes.usgs.gov/regional/qfaults/.
[3] Dover, J.H., 1995, *Geologic Map of the Logan 30'x60' Quadrangle, Cache and Rich Counties, Utah and Lincoln and Uinta Counties, Wyoming*, US Geological Survey, Map I-2210

- Differential Liquefaction Induced Settlement – ½ to 4 inches. The range provided represents the considerable settlement difference calculated between individual borings completed within the expansion footprint. Considerable differential settlement should be anticipated during a design seismic event.

The liquefaction analysis was performed using methods by Youd and Idris, 2001[4] based on an evaluation of soil boring data collected at periodic sampling intervals in the soil borings. Additional explorations across the proposed expansion area using borings and Cone Penetration Testing (CPT) should be completed during the final design phase to confirm this preliminary liquefaction analysis, and aid in determing lateral spread potential at the site.

If, after additional exploration and analysis, the projected liquefaction induced settlement and potential lateral spread (to be determined) are considered to be excessive, consideration should be given to mitigation of liquefaction hazards at the site to achieve an acceptable level of risk. The choice of mitigation methods depends on the extent of liquefaction/lateral spread, and the related consequences, as well as cost in light of the acceptable level of risk. Mitigation alternatives for embankments typically include soil reinforcement utilizing stone columns, or deep soil mixing. Additional information regarding mitigation alternatives will be provided upon request.

5.0 GENERAL COMMENTS

Terracon should be retained to provide final field exploration, laboratory testing and engineering analysis to develop final design plans. Terracon should also review the final design plans and specifications so comments can be made regarding interpretation and implementation of our geotechnical recommendations in the design and specifications. Terracon also should be retained to provide observation and testing services during grading, excavation, foundation construction and other earth-related construction phases of the project.

The analysis and recommendations presented in this report are based upon the data obtained from the borings and test pits performed at the indicated locations and from other information discussed in this report. This report does not reflect variations that may occur between exploration points, across the site, or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. If variations appear, we should be immediately notified so that further evaluation and supplemental recommendations can be provided.

[4] Youd, T.L., and I.M. Idriss. (2001). "Liquefaction resistance of soils: summary report from the 1996 NCEER and 1998 NCEER/NSF workshops on evaluation of liquefaction resistance of soils." Journal of Geotechnical and Geoenvironmental Engineering, Vol. 127, No. 4.

The scope of services for this project does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

This report has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No warranties, either express or implied, are intended or made. Site safety, excavation support, and dewatering requirements are the responsibility of others. In the event that changes in the nature, design, or location of the project as outlined in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless Terracon reviews the changes and either verifies or modifies the conclusions of this report in writing.

APPENDIX A
FIELD EXPLORATION

TOPOGRAPHIC MAP IMAGE COURTESY OF THE U.S. GEOLOGICAL SURVEY
QUADRANGLES INCLUDE: GARDEN CITY, UT (1/1/1998) and BEAR LAKE SOUTH, UT (1/1/1986).

Project Manager: JWG	Project No. 61155051	Terracon 14850 Pony Express Rd, Ste 150N Bluffdale, UT 84065	SITE LOCATION	Exhibit
Drawn by: CMA	Scale: 1"=24,000 SF		Bear Lake Marina Expansion **Rich County, UT** **JUB Engineers**	A-1
Checked by: JWG	File Name: NA			
Approved by: JWG	Date: 8/11/2015			

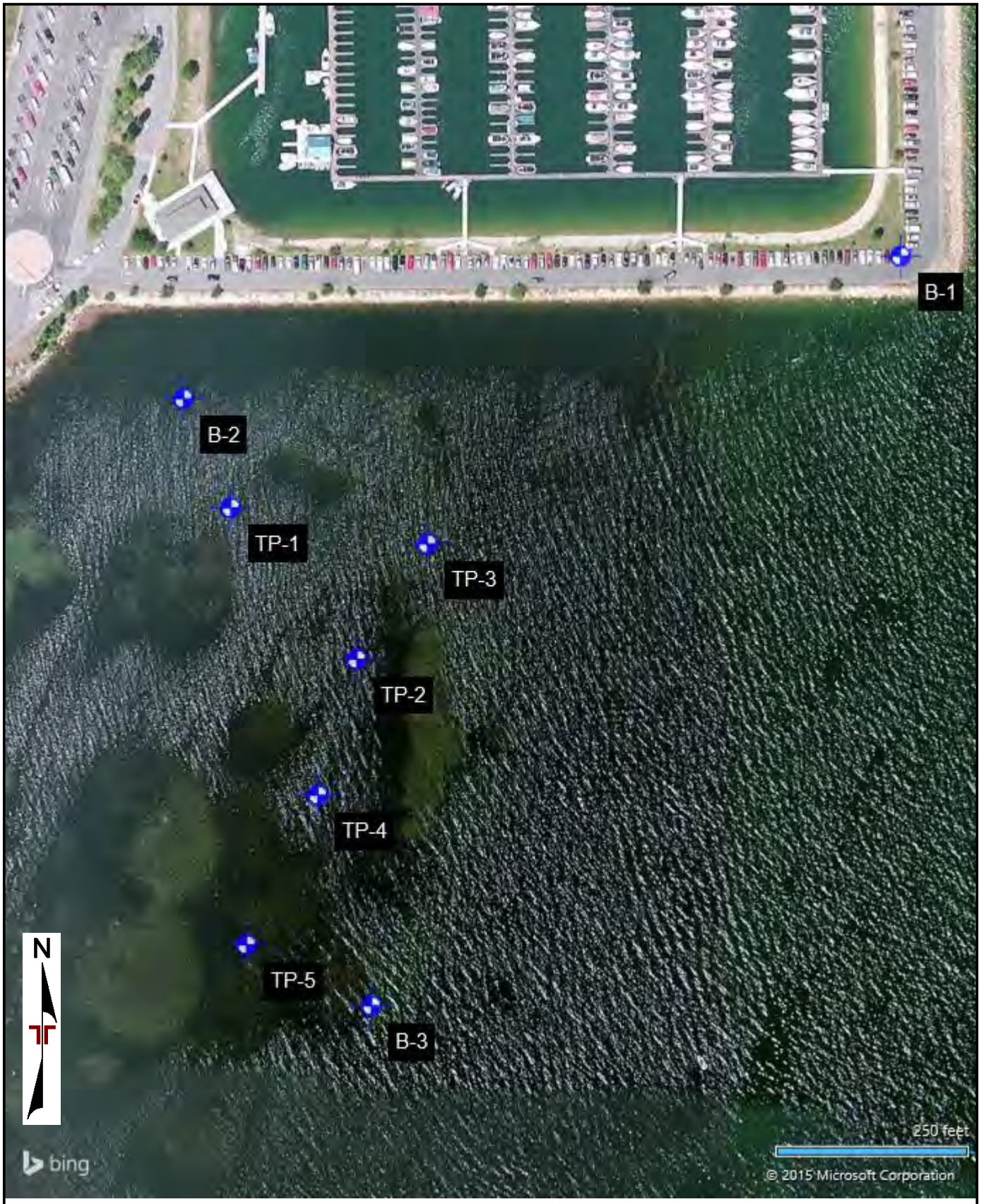


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

AERIAL PHOTOGRAPHY PROVIDED BY MICROSOFT BING MAPS

Project Manager: JWG	Project No. 61155051	Terracon 14850 Pony Express Rd, Ste 150N Bluffdale, UT 84065	EXPLORATION PLAN	Exhibit
Drawn by: CMA	Scale: AS SHOWN		Bear Lake Marina Expansion **Rich County, UT** **JUB Engineers**	A-3
Checked by: JWG	File Name: NA			
Approved by: JWG	Date: 8/11/2015			

Field Exploration Description

The exploration locations were marked by Terracon personnel based on the supplied site drawings in relation to the existing site features, aerial images, estimated coordinates and using a hand-held GPS to locate those coordinates. Exploration locations were documented using a hand-held GPS with an accuracy of approximately 20 feet. The locations of the exploration points and seismic lines should be considered accurate only to the degree implied by the means and methods used to define them.

The borings were drilled with a truck-mounted rotary drill rig using advance casing mud rotary drilling methods, and with an all-terrain track rig using continuous flight hollow-stem augers. Samples of the soil encountered in the borings were obtained using the split barrel and thin-walled tube sampling procedures.

In the split-barrel sampling procedure, the number of blows required to advance a standard 2-inch O.D. split-barrel sampler the last 12 inches of the typical total 18-inch penetration by means of a 140-pound hammer with a free fall of 30 inches, is the standard penetration resistance value (SPT-N). This value is used to estimate the in-situ relative density of cohesionless soils and consistency of cohesive soils.

A CME automatic hammer was used to advance the split-barrel sampler in the auger advanced borings performed on this site and a cathead and rope system with a pin hammer was used for the truck-mounted advanced borings on the site. A significantly greater efficiency is achieved with the automatic hammer compared to the conventional pin hammer operated with a cathead and rope. This difference in efficiency has an appreciable effect on the SPT-N value. The effect of the hammer's efficiency has been considered in the interpretation and analysis of the subsurface information for this report.

In the thin-walled tube sampling procedure, a thin-walled, seamless steel tube with a sharp cutting edge is pushed hydraulically into the soil to obtain a relatively undisturbed sample. Bulk samples were collected from drill cuttings.

Test pits were completed using a CAT 320 CL excavator with a 24 inch bucket and rock teeth.

The soil samples were tagged for identification, sealed to reduce moisture loss, and taken to our laboratory for further examination, testing, and classification. Information provided on the test pit and boring logs attached to this report includes soil descriptions, consistency evaluations, depths, sampling intervals, and groundwater conditions. The borings and test pits were backfilled with drill and excavation cuttings prior to the drill crews leaving the site.

A field log of each boring and test pit was prepared by the field engineer. These logs included visual classifications of the materials encountered during exploration as well as the field engineer's interpretation of the subsurface conditions between samples. Final logs included with this report

represent the engineer's interpretation of the field logs and include modifications based on laboratory observation and tests of the samples.

Terracon used a seismic refraction system (SRS) consisting of a seismograph and 24 geophones to perform a site-specific seismic class survey. Linear arrays of geophones were placed along the shoreline and the existing dike as illustrated on Exhibit A-13. A computer was used to record refraction microtremors produced by ambient seismic noise. The data was then processed using a wavefield-transformation data-processing technique and an interactive Rayleigh-wave dispersion-modeling tool. The refraction microtremor method exploits aspects of spectral analysis of surface waves (SASW) and multi-channel analysis of surface waves (MASW) to derive a shear wave profile and an average shear-wave velocity along the arrays for corresponding depths of about 80 to greater than 100 feet. The estimated shear wave velocity profiles are provided in Exhibits A-14 to A-15.

BORING LOG NO. B-1

PROJECT: Bear Lake Marina Expansion

CLIENT: J-U-B Engineers, Inc.
Logan, Utah

SITE: Bear Lake Marina State Park
Garden City, Utah

LOCATION Dike

Latitude: 41.963847° Longitude: -111.395237°

Approximate Surface Elev: 5927 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	Description	DEPTH (Ft.)	RECOVERY (In.)	FIELD TEST RESULTS	N1(60)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
0.2	5927+/-	**ASPHALT CONCRETE**, approximately 2 inches thick								
		FILL - LEAN CLAY, gray and brown, note some hard nodules		2	4-3-4-6 N=7		32			
5.0	5922+/-	grinding at 5 feet	5							
		FILL - SILTY GRAVEL WITH SAND, with cobbles, gray, with 6 to 9 inch cobble. Very difficult drilling on very hard cobble. Use both tricone, cutter head and core head bits to advance casing.		2	50/4"					
12.0	5915+/-		10							
		FILL - SANDY SILT, and some shells, gray with trace of red-brown mottling, some mottling may indicate decompsoed roots, sand lenses every 2 to 4 inches		10	16-8-6-7 N=14		23		NP	67
16.0	5911+/-		15							
		FILL - SILT, trace of sand and shells, gray		8	4-5-4-5 N=9		26 27		NP 50-25-25	67 52
18.0	5909+/-									
20.0	5907+/-	**SANDY FAT CLAY (CH)**, with some sand layers, light gray, slightly block structure	20							
		POORLY GRADED SAND WITH SILT (SP-SM), gray, medium dense to dense, decreasing silt with depth, some shells		12	13-18-16-12 N=34					
25.0	5902+/-			10	14-8-9-8 N=17		23		NP	11
		SILT (ML), gray, medium stiff, with some silt layers	25							
				24	1-2-3-4 N=5		35		NP	96
			30							
34.0	5893+/-			24			27	98	NP	97
36.0	5891+/-	**SILT WITH SAND (ML)**, gray, medium stiff, note root in drill fluid return	35							
		SILT WITH SAND (ML), with sand layers, gray, stiff		0			33		NP	84
		note sand layes with shells	40	0						
		note sand layers 2 inches thick, every 10 to 12 inches		2	6-3-8-11 N=11					

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Rope and Cathead

Advancement Method:
0 to 13 feet - tricone, cutter head on casing
13 to 64 feet - core head on casing

Abandonment Method:
Borings backfilled with soil cuttings, bentonite and concrete mix upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:
22 ft - Soil sample collected for Direct Shear analysis
32 ft - Soil sample collected for UU triaxial and Consolidation analysis
37 ft - No recovery in Tube, advanced SPT to get some sample recovery

WATER LEVEL OBSERVATIONS

Not measured due to drilling method

Terracon
14850 S. Pony Express Rd, Suite 150N
Bluffdale, Utah

Boring Started: 6/26/2015	Boring Completed: 6/26/2015
Drill Rig: CME-55	Driller: Great Basin
Project No.: 61155051	Exhibit: A-5

BORING LOG NO. B-1

PROJECT: Bear Lake Marina Expansion

CLIENT: J-U-B Engineers, Inc.
Logan, Utah

SITE: Bear Lake Marina State Park
Garden City, Utah

LOCATION Dike

Latitude: 41.963847° Longitude: -111.395237°

Approximate Surface Elev: 5927 (Ft.) +/-

DEPTH		ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	N1(60)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
46.0	**SILT WITH SAND (ML)**, with sand layers, gray, stiff *(continued)*	5881+/-	45									
48.0	**POORLY GRADED SAND WITH SILT (SP-SM)**, gray, medium dense, with some shells	5879+/-										
						16	13-13-12-11 N=25		24		NP	31
50.0	**SILTY SAND (SM)**, gray with 2 inch red-brown layers at 48.5 feet, medium dense, trace of shells	5877+/-	50									
52.5	**LEAN CLAY (CL)**, light brown, very stiff, with moderate plasticity	5874.5+/-										
						14	10-19-15		34 61			67
56.0	**SANDY SILT (ML)**, gray, very stiff	5871+/-	55									
60.0	**SILTY SAND (SM)**, gray, dense	5867+/-				20	13-20-21-19 N=41					
64.0	**SILTY CLAY (CL-ML)**, trace sand, gray to light brown, hard	5863+/-	60			20	4-10-23-27 N=33		34			
	Boring Terminated at 64 Feet											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Rope and Cathead

Advancement Method:
0 to 13 feet - tricone, cutter head on casing
13 to 64 feet - core head on casing

Abandonment Method:
Borings backfilled with soil cuttings, bentonite and concrete mix upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:
47 ft - Soil sample collected for Direct Shear analysis

WATER LEVEL OBSERVATIONS

Not measured due to drilling method

Terracon
14850 S. Pony Express Rd, Suite 150N
Bluffdale, Utah

Boring Started: 6/26/2015	Boring Completed: 6/26/2015
Drill Rig: CME-55	Driller: Great Basin
Project No.: 61155051	Exhibit: A-5

BORING LOG NO. B-2

PROJECT: Bear Lake Marina Expansion

CLIENT: J-U-B Engineers, Inc.
Logan, Utah

SITE: Bear Lake Marina State Park
Garden City, Utah

LOCATION Shoreline

Latitude: 41.963337° Longitude: -111.398684°

Approximate Surface Elev: 5914 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	N1(60)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
0.2	5914+/-									
LAKE BOTTOM MUD, black to dark gray, with organics										
SILTY SAND (SM), brown to reddish-brown, very loose			SPT	12	2-1-2 N=3					
			Shelby	20			29		NP	30
4.0	5910+/-									
- grades gray			SPT	3	15-27-29 N=56					
SILTY CLAYEY GRAVEL (GC-GM), gray to dark gray, loose to very dense		5								
8.5	5905.5+/-		SPT	10	8-2-2 N=4		16			
LEAN CLAY WITH SAND (CL), light gray, medium stiff to hard		10	Shelby	18			42	87	49-19-30	71
			SPT	18	10-17-19 N=36					
- grades brown		15	SPT	18	7-9-9 N=18		20			
20.0	5894+/-	20	SPT	18	20-49-50/5"		18		39-19-20	71
LEAN CLAY WITH SAND (CL), brown to gray, hard										
		25	SPT	0	50/4"					
30.8	5883+/-	30	SPT	10	40-50/4"					
Boring Terminated at 30.8 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

0 ft - Shelby tub attempted but no recovery. Advanced SPT.
2.5 ft - Soil sample collected for Direct Shear analysis
10 ft - Soil sample collected for Consolidation analysis

WATER LEVEL OBSERVATIONS

+3" - water above ground surface

Terracon
14850 S. Pony Express Rd, Suite 150N
Bluffdale, Utah

Boring Started: 6/22/2015 Boring Completed: 6/22/2015

Drill Rig: CME-850 Driller: Haztech

Project No.: 61155051 Exhibit: A-6

BORING LOG NO. B-3

PROJECT: Bear Lake Marina Expansion

CLIENT: J-U-B Engineers, Inc.
Logan, Utah

SITE: Bear Lake Marina State Park
Garden City, Utah

LOCATION Shoreline

Latitude: 41.961166° Longitude: -111.397781°

Approximate Surface Elev: 5914 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	N1(60)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	SILT (ML), gray, soft				6	0-0-1 N=1					
4.7	5909.5+/-										
					20	100 to 200 psi		27		NP	88
	SANDY SILT (ML), dark gray to gray, medium stiff to stiff	5			16	2-4-5 N=9					
					12	2-3-3 N=6					
		10			10	250 to 900 psi		28		NP	61
					16	3-5-9 N=14					
		15			10	0-2-5 N=7		28			
19.0	5895+/-										
	SILTY SAND (SM), gray, medium dense	20			8						
					12	5-8-13 N=21					
24.0	5890+/-										
26.0	**SILT (ML)**, with some sand and shells, gray and white, medium stiff 5888+/-	25			18	2-3-5 N=8		43		NP	92
28.5	**SILTY CLAY (CL-ML)**, with trace of organics, gray and brown, medium stiff 5885.5+/-										
31.5	**SILT WITH SAND (ML)**, gray to light brown, very soft to soft 5882.5+/-	30			8	0-3-1 N=4		51		NP	79
	SILTY SAND (SM), with silt layers, gray, decreasing sand content with depth	35			24	250 to 650 psi		27	96	NP	41
37.0	5877+/-										
38.5	**SILT WITH SAND (ML)**, gray, very stiff 5875.5+/-				12	6-12-16 N=28		26		NP	80
	Boring Terminated at 38.5 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

2.5 ft - Soil sample collected for Direct Shear analysis
10 ft - Soil sample collected for Direct Shear analysis
35 ft - Soil sample collected for Consolidation and Direct Shear analysis

WATER LEVEL OBSERVATIONS

2" - water below surface of sand bar

Terracon
14850 S. Pony Express Rd, Suite 150N
Bluffdale, Utah

Boring Started: 6/22/2015 Boring Completed: 6/22/2015

Drill Rig: CME-850 Driller: Haztech

Project No.: 61155051 Exhibit: A-7

TEST PIT LOG NO. TP-1

PROJECT: Bear Lake Marina Expansion

CLIENT: J-U-B Engineers, Inc.
Logan, Utah

SITE: Bear Lake Marina State Park
Garden City, Utah

LOCATION Shoreline

Latitude: 41.962947° Longitude: -111.398457°

Approximate Surface Elev: 5914 (Ft.) +/-

DEPTH		ELEVATION (Ft.)
0.9	**TOPSOIL**, silt with organics	5913+/-
	SILTY SAND (SM), gray, trace of fine rounded gravel, some roots extending to 1-1/2 ft.	
3.5		5910.5+/-
	SANDY SILT (ML), gray, some sidewall caving in this zone	
11.0	- more caving and sloughing	5903+/-
	Test Pit Terminated at 11 Feet	

DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	N1(60)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
5						29		NP	54
10									

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
2 ft. bucket with rock teeth

Abandonment Method:
Backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

+2" - water above ground surface

Terracon
14850 S. Pony Express Rd, Suite 150N
Bluffdale, Utah

Test Pit Started: 7/9/2015	Test Pit Completed: 7/9/2015
Excavator: CAT 320 CL	Operator: Circle C
Project No.: 61155051	Exhibit: A-8

TEST PIT LOG NO. TP-2

PROJECT: Bear Lake Marina Expansion

CLIENT: J-U-B Engineers, Inc.
Logan, Utah

SITE: Bear Lake Marina State Park
Garden City, Utah

LOCATION Shoreline

Latitude: 41.962405° Longitude: -111.397851°

Approximate Surface Elev: 5914 (Ft.) +/-

DEPTH		ELEVATION (Ft.)
1.0	**TOPSOIL**, silt with organics	5913+/-
2.5	**SILT (ML)**, trace sand, dark gray	5911.5+/-
6.0	**SILTY SAND (SM)**, gray - excavator notes zone of stiffer resistance full depth of test pit but only in one section	5908+/-
10.0	**SANDY SILT (ML)**, gray, with some sand layers	5904+/-
	Test Pit Terminated at 10 Feet	

DEPTH (Ft.)	SAMPLE TYPE	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
5		26	NP	40
10				

GRAPHIC LOG; WATER LEVEL OBSERVATIONS; RECOVERY (In.); FIELD TEST RESULTS; N1(60); DRY UNIT WEIGHT (pcf)

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
2 ft. bucket with rock teeth

Abandonment Method:
Backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

+3" - water above ground surface

Terracon
14850 S. Pony Express Rd, Suite 150N
Bluffdale, Utah

Test Pit Started: 7/9/2015 | Test Pit Completed: 7/9/2015

Excavator: CAT 320 CL | Operator: Circle C

Project No.: 61155051 | Exhibit: A-9

TEST PIT LOG NO. TP-3

PROJECT: Bear Lake Marina Expansion

CLIENT: J-U-B Engineers, Inc.
Logan, Utah

SITE: Bear Lake Marina State Park
Garden City, Utah

LOCATION Shoreline

Latitude: 41.962818° Longitude: -111.397512°

Approximate Surface Elev: 5914 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	N1(60)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1.0	5913+/-		▽								
POORLY GRADED SAND (SP), gray, water flowing in at 1 ft.											
SILT (ML), trace sand, gray to brown, increasing excavation resistance with depth, increasing sand content with depth		5									
10.0 - note some poorly graded sand seams throughout silt	5904+/-	10						27		NP	53
Test Pit Terminated at 10 Feet											

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
2 ft. bucket with rock teeth

Abandonment Method:
Backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *1' below ground surface of sand bar*

Terracon
14850 S. Pony Express Rd, Suite 150N
Bluffdale, Utah

Test Pit Started: 7/9/2015	Test Pit Completed: 7/9/2015
Excavator: CAT 320 CL	Operator: Circle C
Project No.: 61155051	Exhibit: A-10

TEST PIT LOG NO. TP-4

PROJECT: Bear Lake Marina Expansion

CLIENT: J-U-B Engineers, Inc.
Logan, Utah

SITE: Bear Lake Marina State Park
Garden City, Utah

LOCATION Shoreline

Latitude: 41.961919° Longitude: -111.398038°

Approximate Surface Elev: 5914 (Ft.) +/-

DEPTH		ELEVATION (Ft.)
1.0	**TOPSOIL**, silt with organics	5913+/-
2.0	**SILTY SAND (SM)**, gray	5912+/-
	SILT (ML), trace sand, gray, increased digging resistance, maintains vertical sidewall during initial excavation	
	- note more sand in zones/layers	
10.0		5904+/-
12.0	**SILTY SAND (SM)**, gray, sidewall begins to slough and cave in this zone	5902+/-
	Test Pit Terminated at 12 Feet	

DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	N1(60)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
5									
						29		NP	82
10									

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
2 ft. bucket with rock teeth

Abandonment Method:
Backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Water at ground surface

Terracon
14850 S. Pony Express Rd, Suite 150N
Bluffdale, Utah

Test Pit Started: 7/9/2015	Test Pit Completed: 7/9/2015
Excavator: CAT 320 CL	Operator: Circle C
Project No.: 61155051	Exhibit: A-11

TEST PIT LOG NO. TP-5

PROJECT: Bear Lake Marina Expansion

CLIENT: J-U-B Engineers, Inc.
Logan, Utah

SITE: Bear Lake Marina State Park
Garden City, Utah

LOCATION Shoreline

Latitude: 41.961384° Longitude: -111.398381°

Approximate Surface Elev: 5914 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	Description
0		**TOPSOIL**, brown to gray, silty clay with organics
2.0	5912+/-	
3.5	5910.5+/-	**SILTY SAND (SM)**, gray, note water seeping into excavation through this layer
		SANDY SILT (ML), gray to brown, with silt and sand layers. Some sand layers appear wet
12.0	5902+/-	gray, caving and sloughing in this zone
		Test Pit Terminated at 12 Feet

DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	N1(60)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
5	▽								
10		I							
		I				27		NP	63

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
2 ft. bucket with rock teeth

Abandonment Method:
Backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *2' below ground surface*

Terracon
14850 S. Pony Express Rd, Suite 150N
Bluffdale, Utah

Test Pit Started: 7/9/2015	Test Pit Completed: 7/9/2015
Excavator: CAT 320 CL	Operator: Circle C
Project No.: 61155051	Exhibit: A-12

N

GRAPHIC SCALE

0’ 50’ 150’

DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

LEGEND

SEISMIC SURVEY LINE LOCATION

Project Manager: JWG	Project No. 61155051
Drawn by: JBF	Scale: 1” = 100’
Checked by: JBF	File Name: 61155051
Approved by: RLC	Date: 10/21/2015

Terracon
Consulting Engineers & Scientists
10625 W. I-70 Frontage Rd. N. Wheat Ridge, Colorado 80033
PH. (303) 423-3300 FAX. (303) 423-3353

SEISMIC SURVEY LINE LOCATION MAP

Bear Lake Marina Expansion
Rich County, Utah
JUB Engineers

Exhibit A-13

Shoreline - V_s *Profile*
Bear Lake Marina Expansion

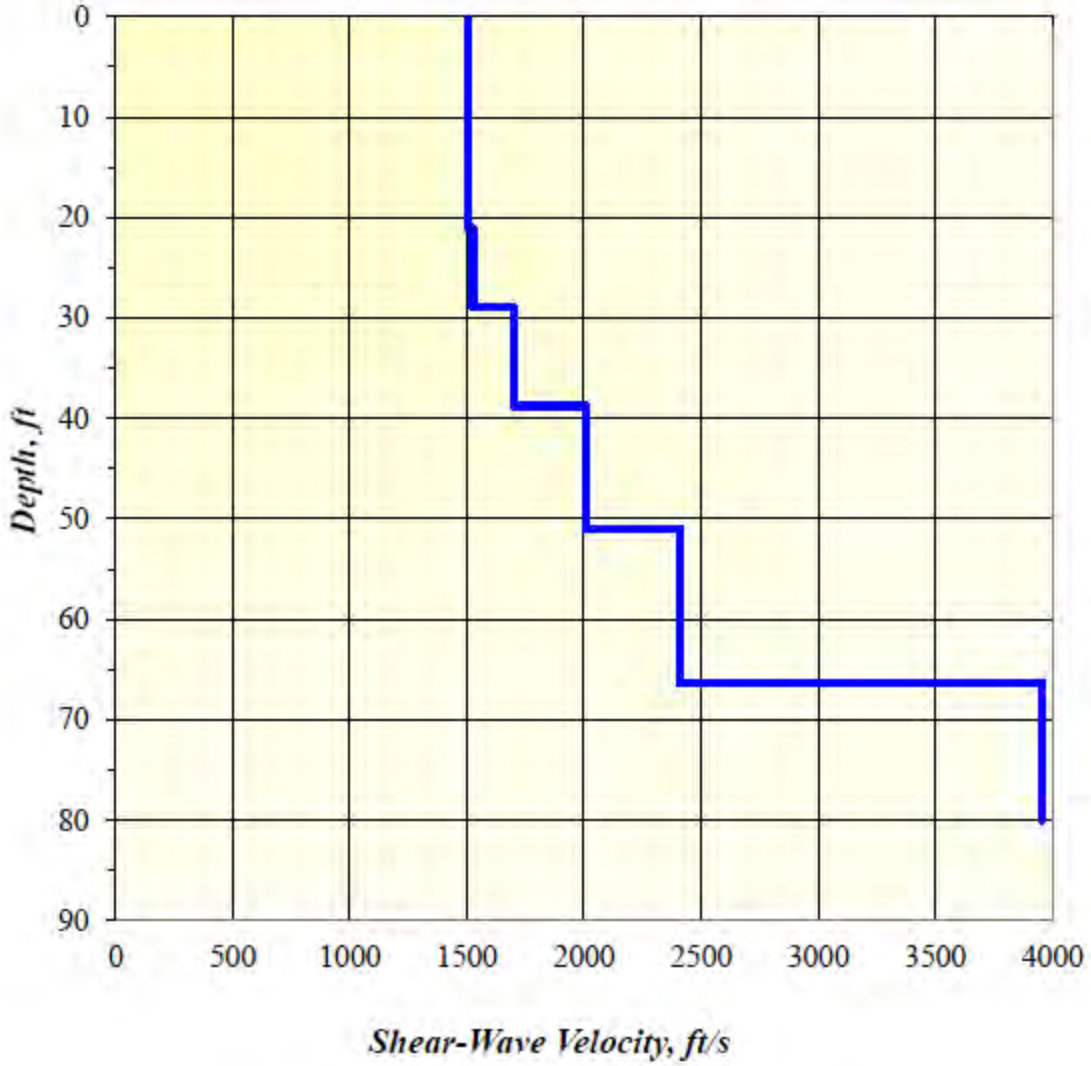


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES.

Project Mngr:	Jwg
Drawn By:	others
Checked By:	jwg
Approved By:	rlc

Project No.	61155051
Task No.	0
Scale:	Not to Scale
Date:	10/27/2015

Terracon
Consulting Engineers & Scientists
14850 S Pony Express Rd., Ste 150N
Bluffdale, Utah 84065

GEOPHYSICAL SHEAR WAVE VELOCITY PROFILE

Bear Lake Marina Expansion

Rich County, Utah

JUB Engineers

EXHIBIT

A-14

Dyke - V_s *Profile*
Bear Lake Marina Expansion

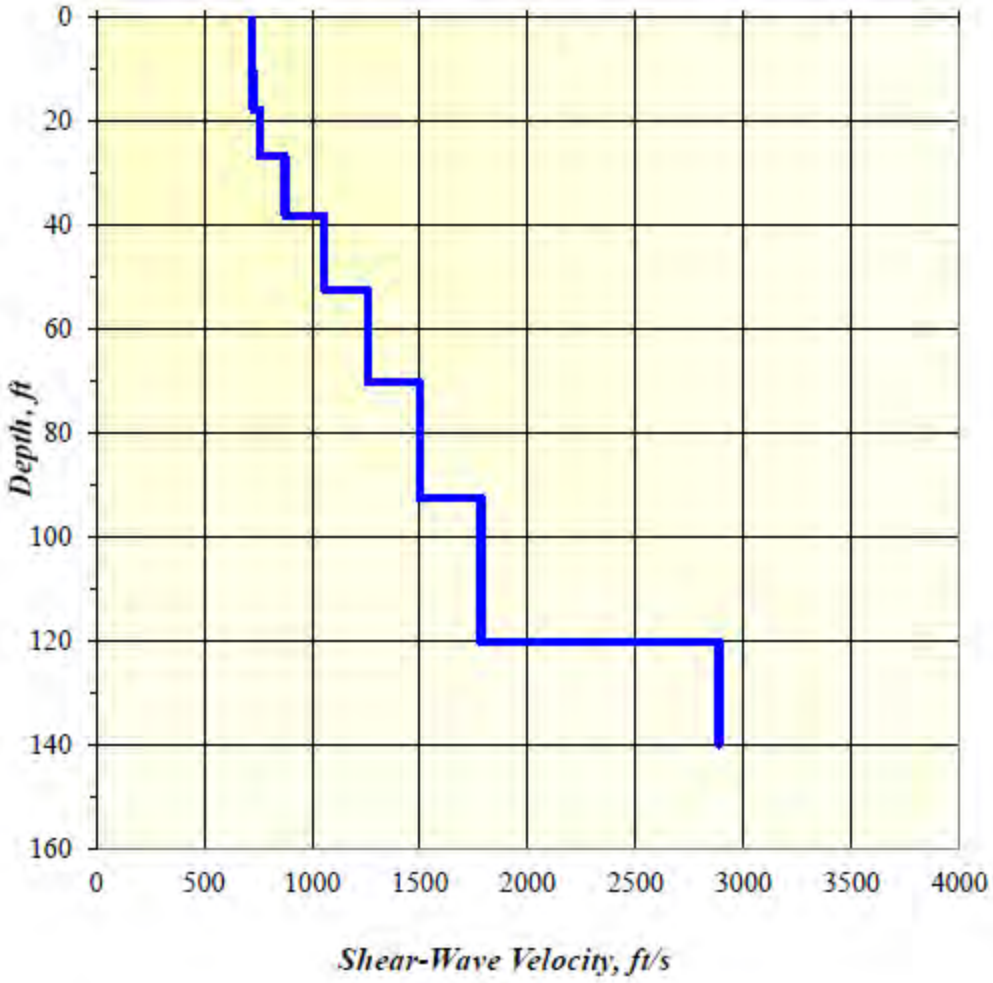


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES.

Project Mngr: Jwg	**Project No.** 61155051	Terracon Consulting Engineers & Scientists	GEOPHYSICAL SHEAR WAVE VELOCITY PROFILE	**EXHIBIT**
Drawn By: others	**Task No.** 0		**Bear Lake Marina Expansion**	
Checked By: jwg	**Scale:** Not to Scale	14850 S Pony Express Rd., Ste 150N Bluffdale, Utah 84065	**Rich County, Utah**	**A-14**
Approved By: rlc	**Date:** 10/27/2015		**JUB Engineers**	

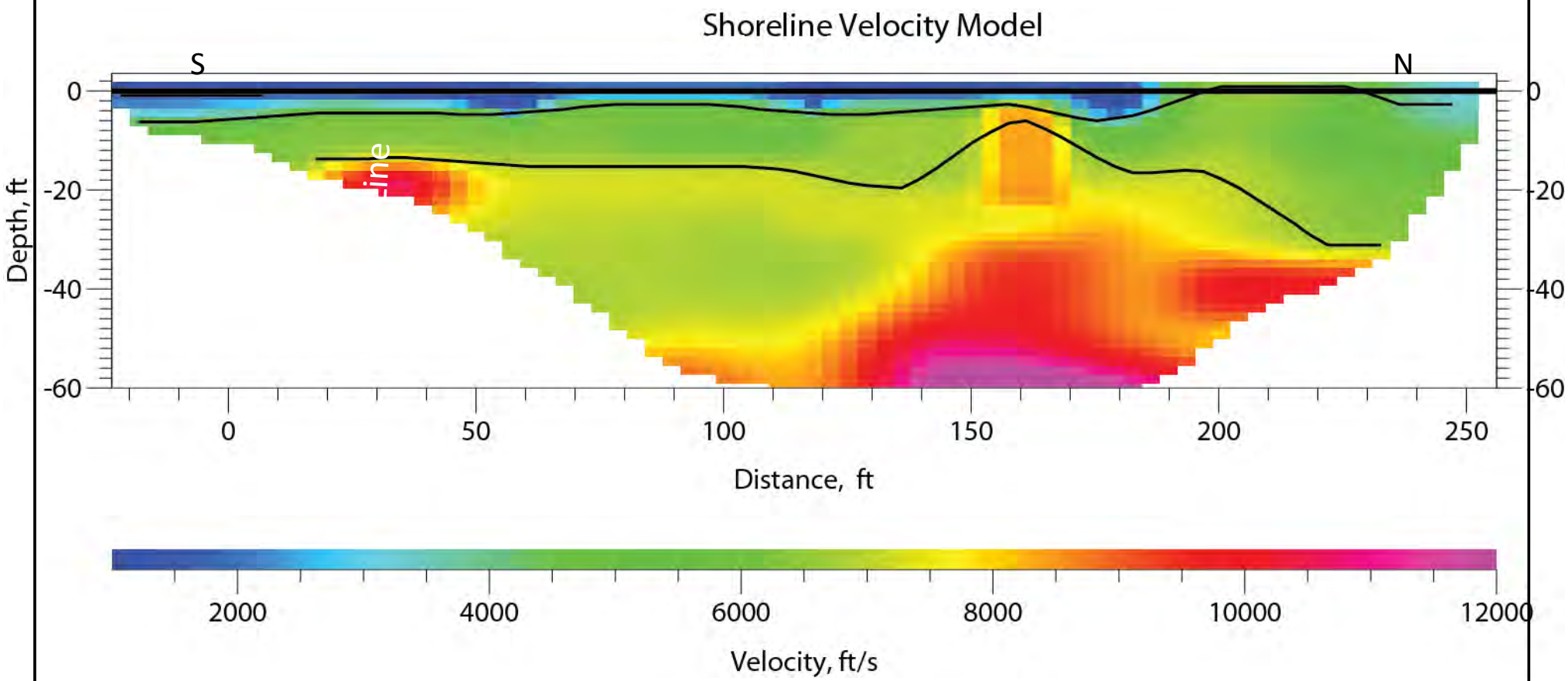


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

Project Manager: JWG	Project No. 61155051
Drawn by: JBF	Scale: 1" = 100'
Checked by: JBF	File Name: 61155051
Approved by: RLC	Date: 10/21/2015

Terracon
Consulting Engineers & Scientists
10625 W. I-70 Frontage Rd. N. Wheat Ridge, Colorado 80033
PH. (303) 423-3300 FAX. (303) 423-3353

SEISMIC SURVEY LINE LOCATION MAP

Bear Lake Marina Expansion
Rich County, Utah
JUB Engineers

Exhibit
A-16

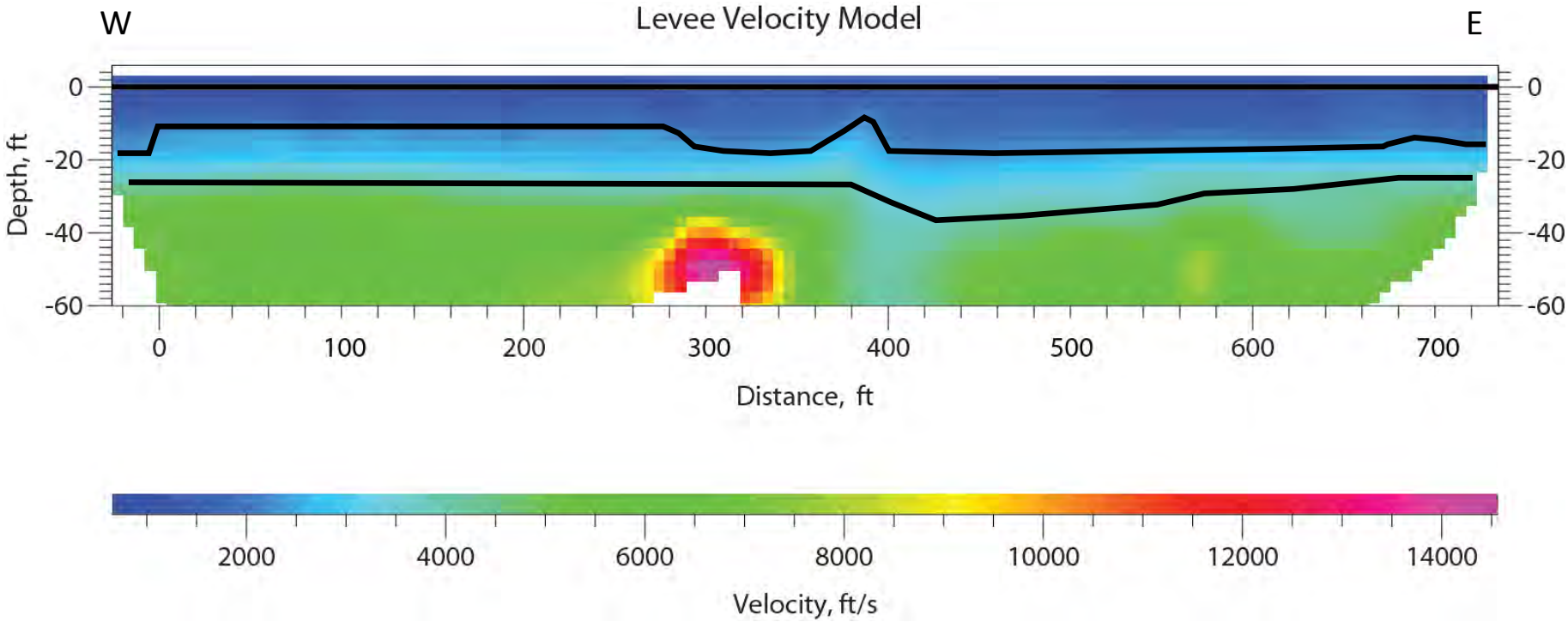


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

Project Manager: JWG	Project No. 61155051
Drawn by: JBF	Scale: 1" = 100'
Checked by: JBF	File Name: 61155051
Approved by: RLC	Date: 10/21/2015

Terracon
Consulting Engineers & Scientists
10625 W. I-70 Frontage Rd. N. Wheat Ridge, Colorado 80033
PH. (303) 423-3300 FAX. (303) 423-3353

SEISMIC SURVEY LINE LOCATION MAP

Bear Lake Marina Expansion
Rich County, Utah
JUB Engineers

Exhibit
A-17

APPENDIX B
SUPPORTING INFORMATION

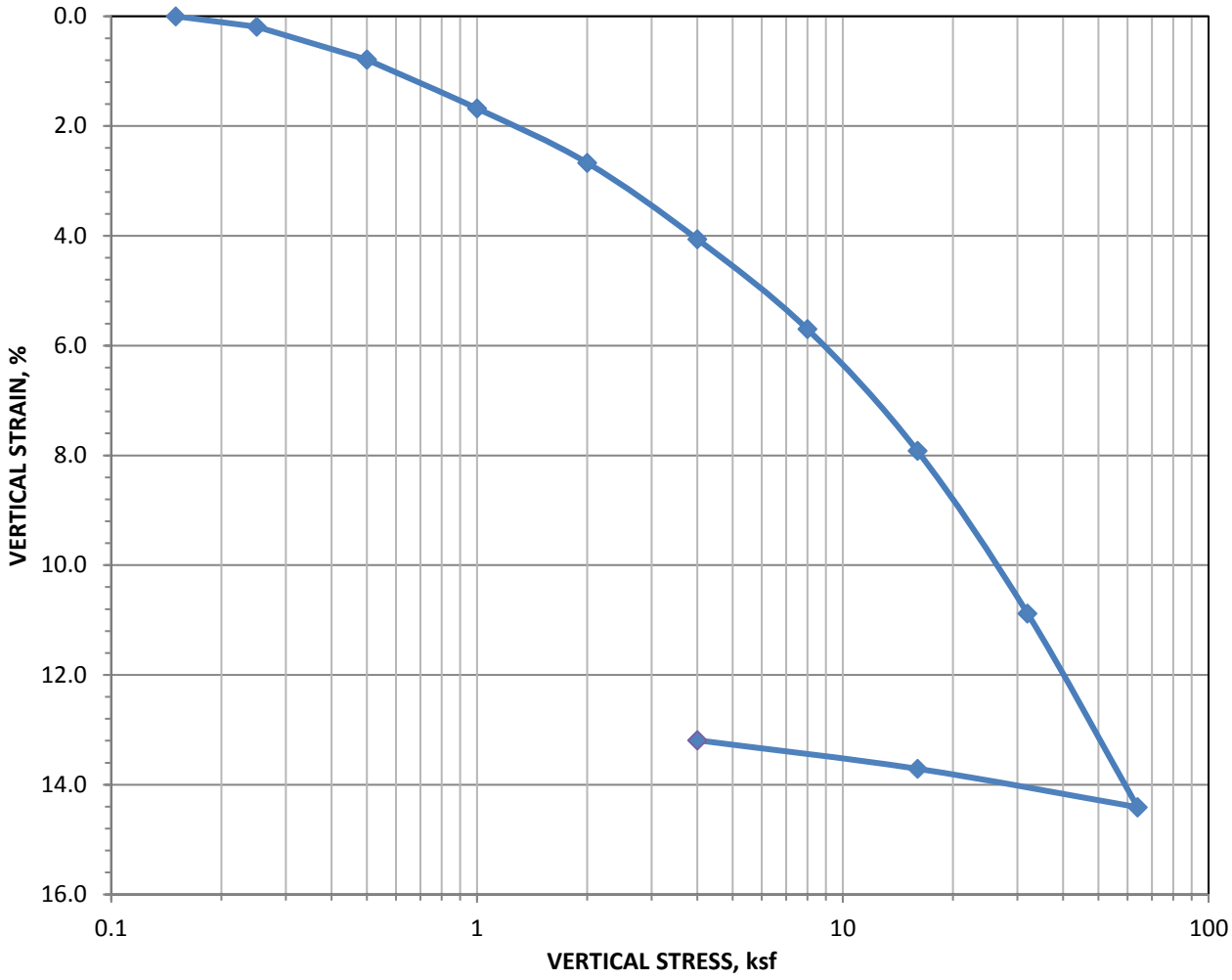
Laboratory Testing

Laboratory tests were conducted on selected soil samples and the test results are presented in this appendix. The laboratory test results were used to classify the soils, for the geotechnical engineering analyses, and the development of earthwork recommendations. Laboratory tests were performed in general accordance with the applicable ASTM, local or other accepted standards.

Selected soil samples obtained from the site were tested for the following engineering properties:

- In-situ Water Content
- Sieve Analysis
- Atterberg Limits
- Direct Shear
- Dry Unit Weight
- Consolidation
- Percent Fines

Consolidation Test Data (ASTM D 2435-04)



Before Consolidation

Sample Diameter (in):	2.50	Moist Unit Weight (pcf):	**85**
Sample Height (in):	1	Moisture Content (%):	**34**
Sample Volume (cf):	0.0028	Dry Unit Weight (pcf):	**63**

After Consolidation

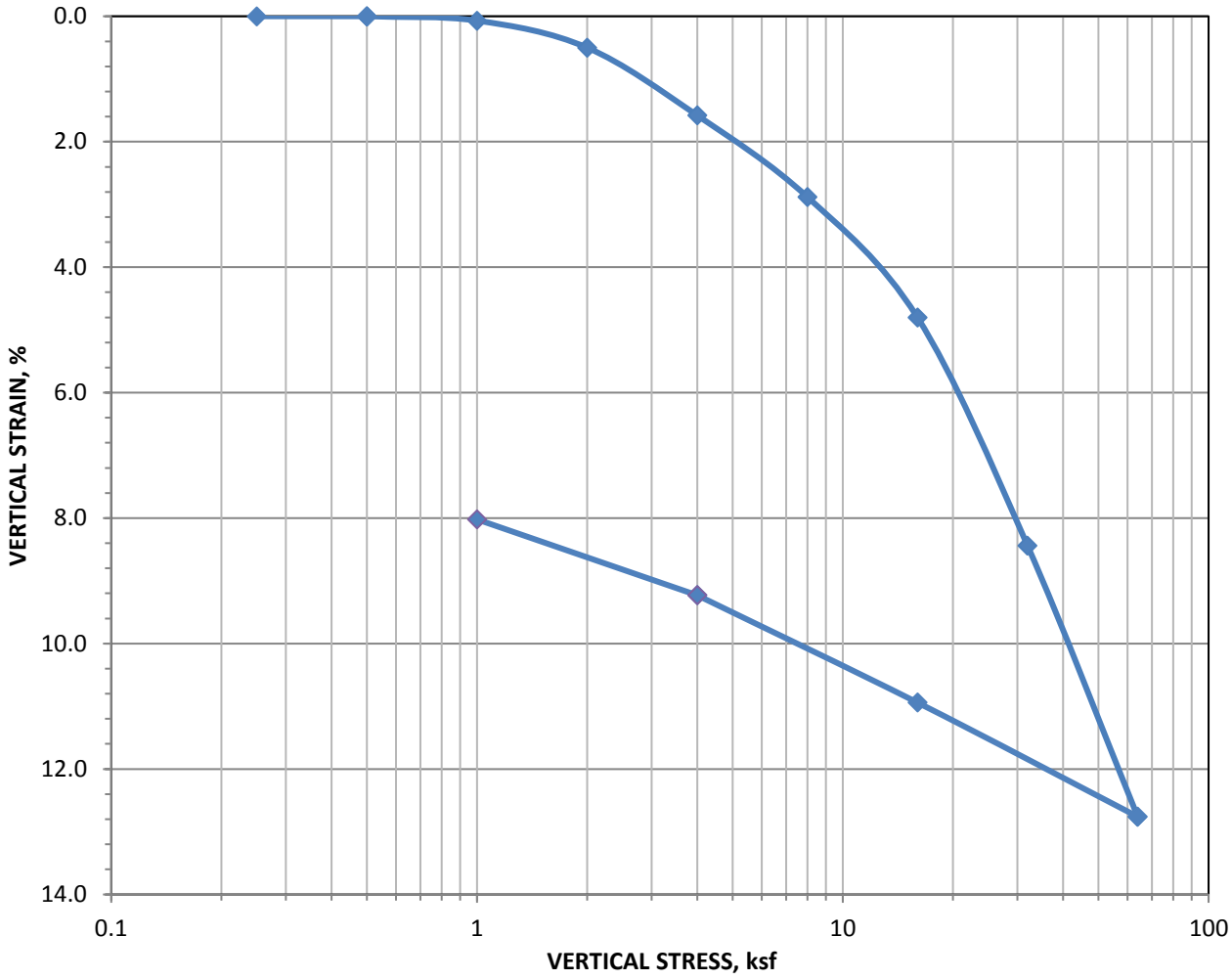
Sample Diameter (in):	2.50	Moist Unit Weight (pcf):	**93**
Sample Height (in):	0.854	Moisture Content (%):	**25**
Sample Volume (cf):	0.0024	Dry Unit Weight (pcf):	**74**

Liquid Limit:		Percent Fines:	97.4
Plasticity Index:	NP	Classification:	ML

Terracon

Project Name:	Bear Lake
Project No.:	61155051
Location:	SLC, Utah
Sample:	B-1 @ 32'

Consolidation Test Data (ASTM D 2435-04)



Before Consolidation

Sample Diameter (in):	2.50	Moist Unit Weight (pcf):	**117**
Sample Height (in):	1	Moisture Content (%):	**34**
Sample Volume (cf):	0.0028	Dry Unit Weight (pcf):	**87**

After Consolidation

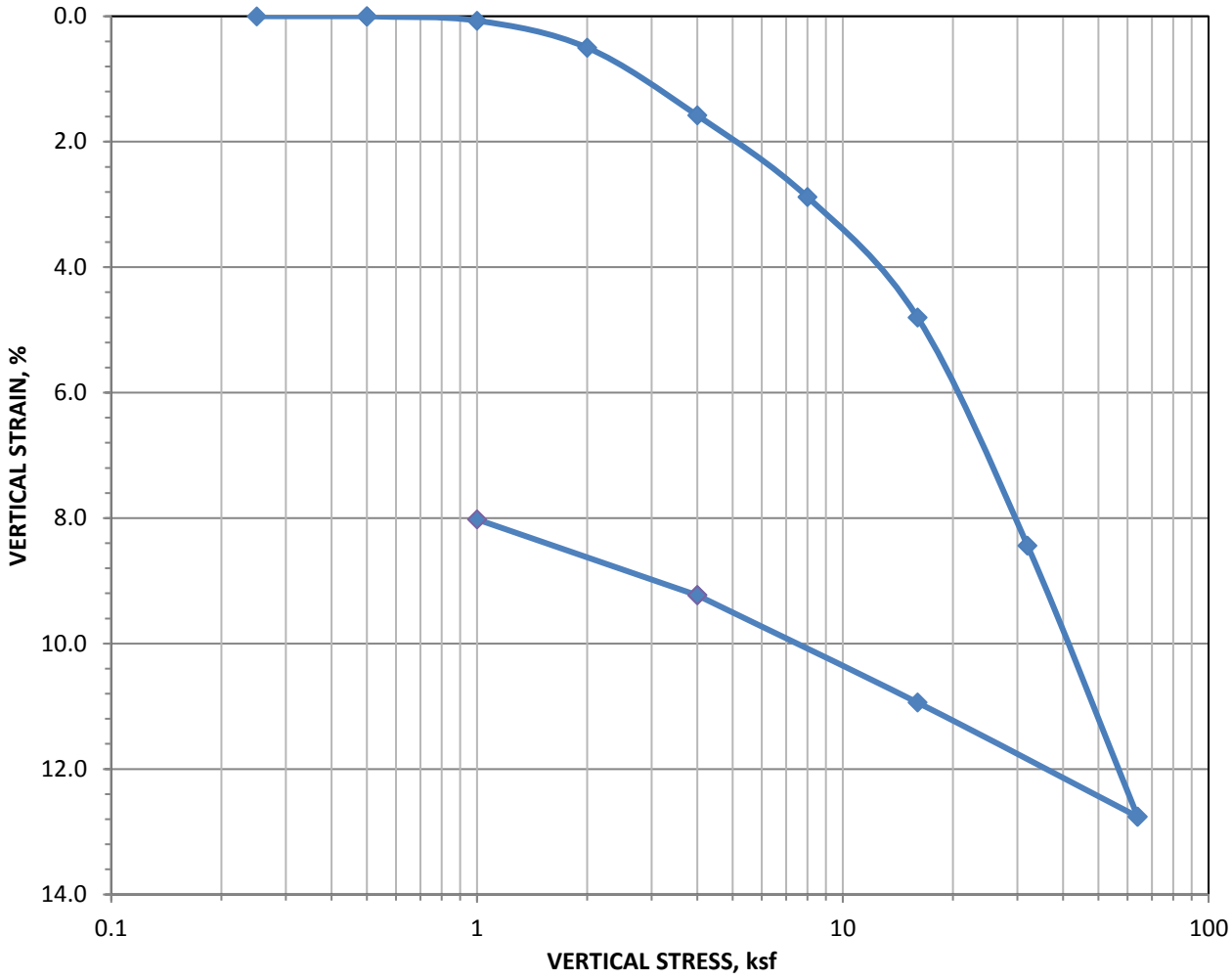
Sample Diameter (in):	2.50	Moist Unit Weight (pcf):	**122**
Sample Height (in):	0.90722	Moisture Content (%):	**27**
Sample Volume (cf):	0.0026	Dry Unit Weight (pcf):	**96**

Liquid Limit:	49	Percent Fines:	70.6
Plasticity Index:	30	Classification:	CL

Terracon

Project Name: Bear Lake Marina Expansion
Project No.: 61155051
Location: Garden City, Utah
Sample: B-2 @ 10 ft

Consolidation Test Data (ASTM D 2435-04)



Before Consolidation

Sample Diameter (in):	2.50	Moist Unit Weight (pcf):	**124**
Sample Height (in):	1	Moisture Content (%):	**29**
Sample Volume (cf):	0.0028	Dry Unit Weight (pcf):	**96**

After Consolidation

Sample Diameter (in):	2.50	Moist Unit Weight (pcf):	**133**
Sample Height (in):	0.90722	Moisture Content (%):	**26**
Sample Volume (cf):	0.0026	Dry Unit Weight (pcf):	**106**

Liquid Limit:		Percent Fines:	41
Plasticity Index:	NP	Classification:	SM

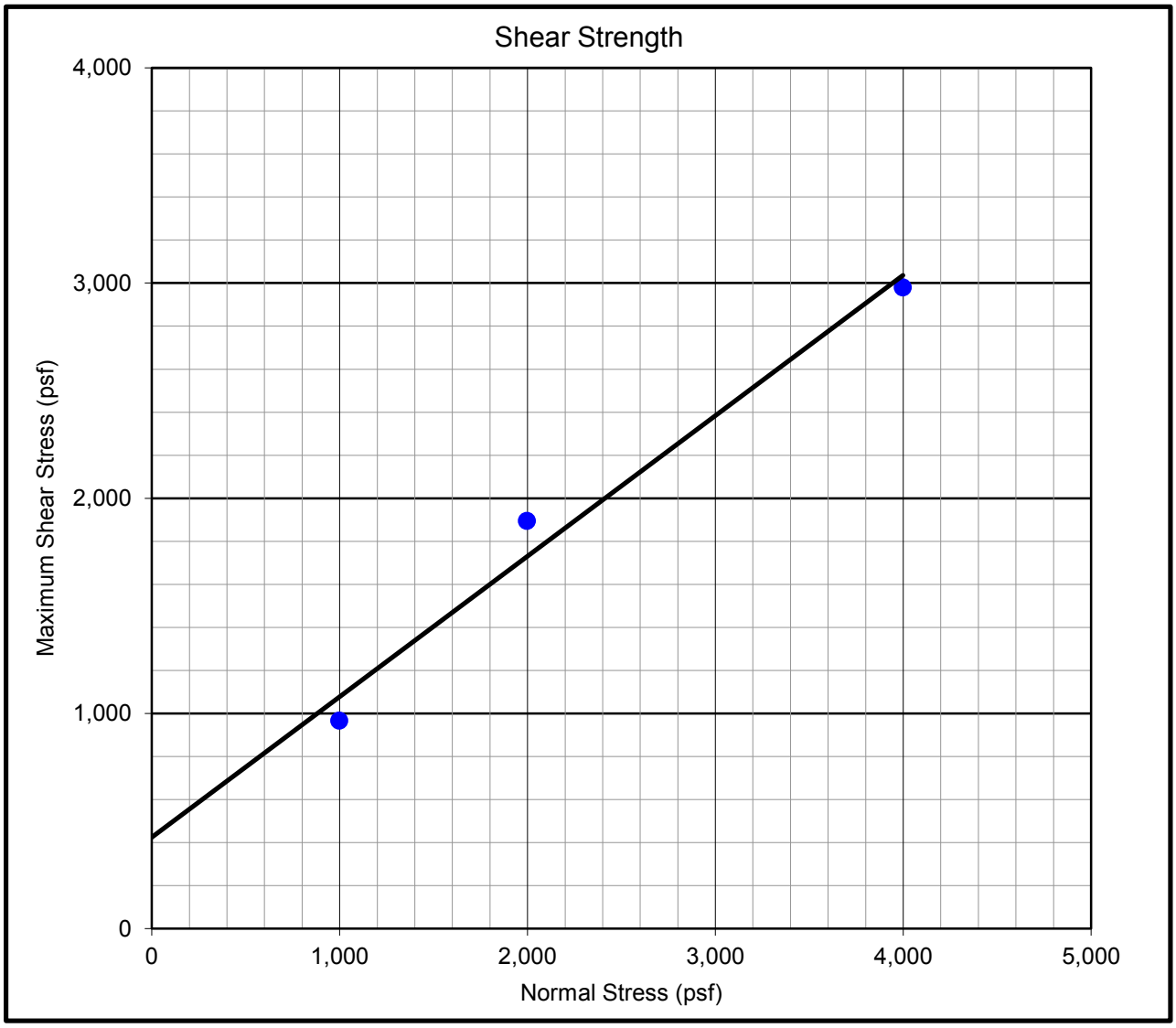
Terracon

Project Name:	Bear Lake Marina Expansion
Project No.:	61155051
Location:	Garden City, Utah
Sample:	B-3 @ 35 ft

Terracon
750 Pilot Road, Suite F Las Vegas, Nevada 89119
PH. (702) 597-9393 FAX. (702) 597-9009

SOIL DIRECT SHEAR RESULTS

Sample Location: B-1 @ 22



Test Parameters

Sample Information				Test Stresses		Initial Conditions			Final Conditions	
Test #	Sample Lab ID	Depth (ft)	Diameter (in)	Normal (psf)	Max Shear (psf)	Height (in)	Moisture (%)	Density (pcf)	Height (in)	Moisture (%)
1	A	22	2.41	998.8	966.8	1.00	17.6	120.6	1.00	21.2
2	B	22	2.41	1,997.8	1,895.4	1.00	17.6	120.7	1.00	21.2
3	C	22	2.41	3,998.8	2,980.4	1.00	17.6	120.3	1.00	21.4

Notes and Special Test Conditions

Project Information

Project Name	**Bear Lake**
Location	
Client	
Project #	**61155051**

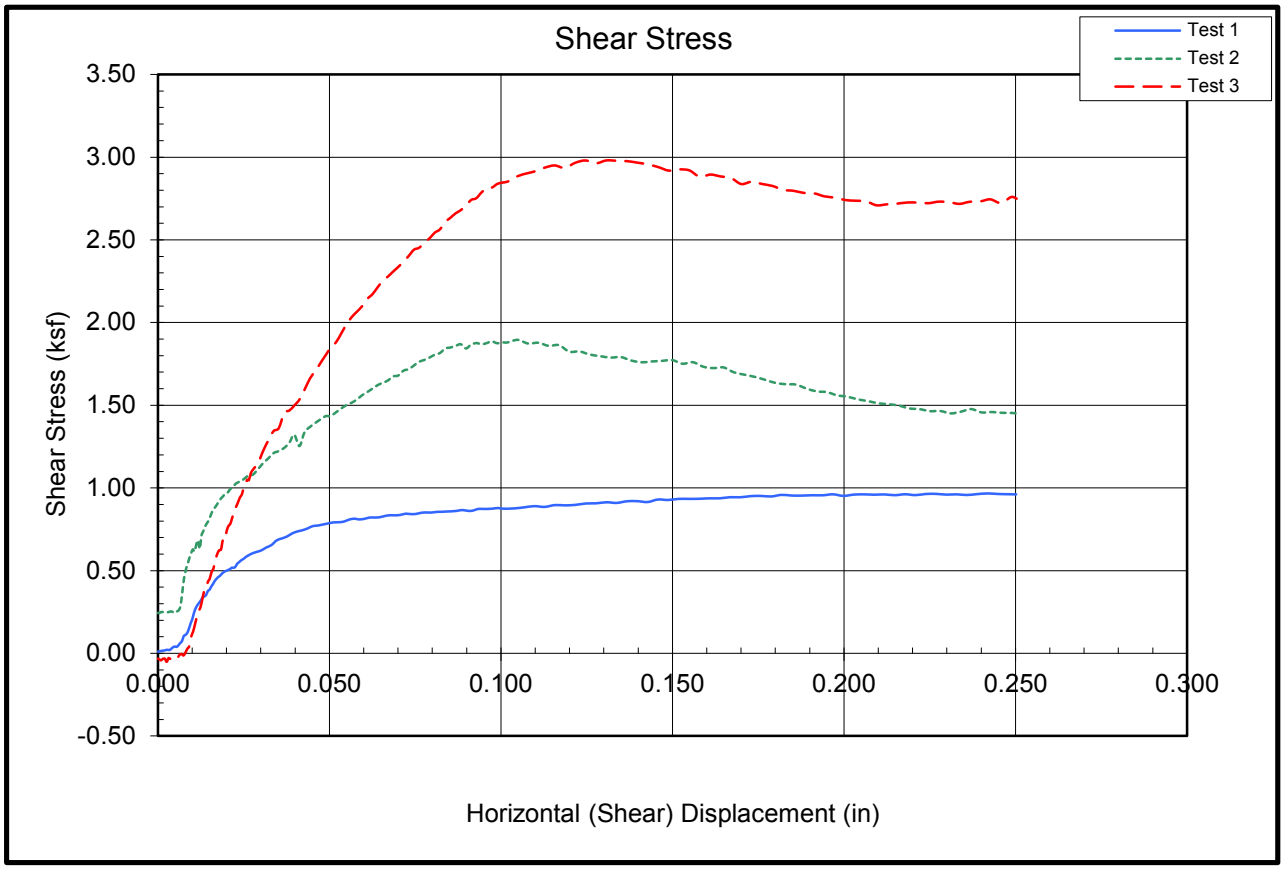
Test Results

Friction Angle (°)	**33**
Cohesion (psf)	**425**
Shear Rate (in/min)	0.01

Terracon

SOIL DIRECT SHEAR RESULTS (PAGE 2) B-1 @ 22

B-1 @ 22



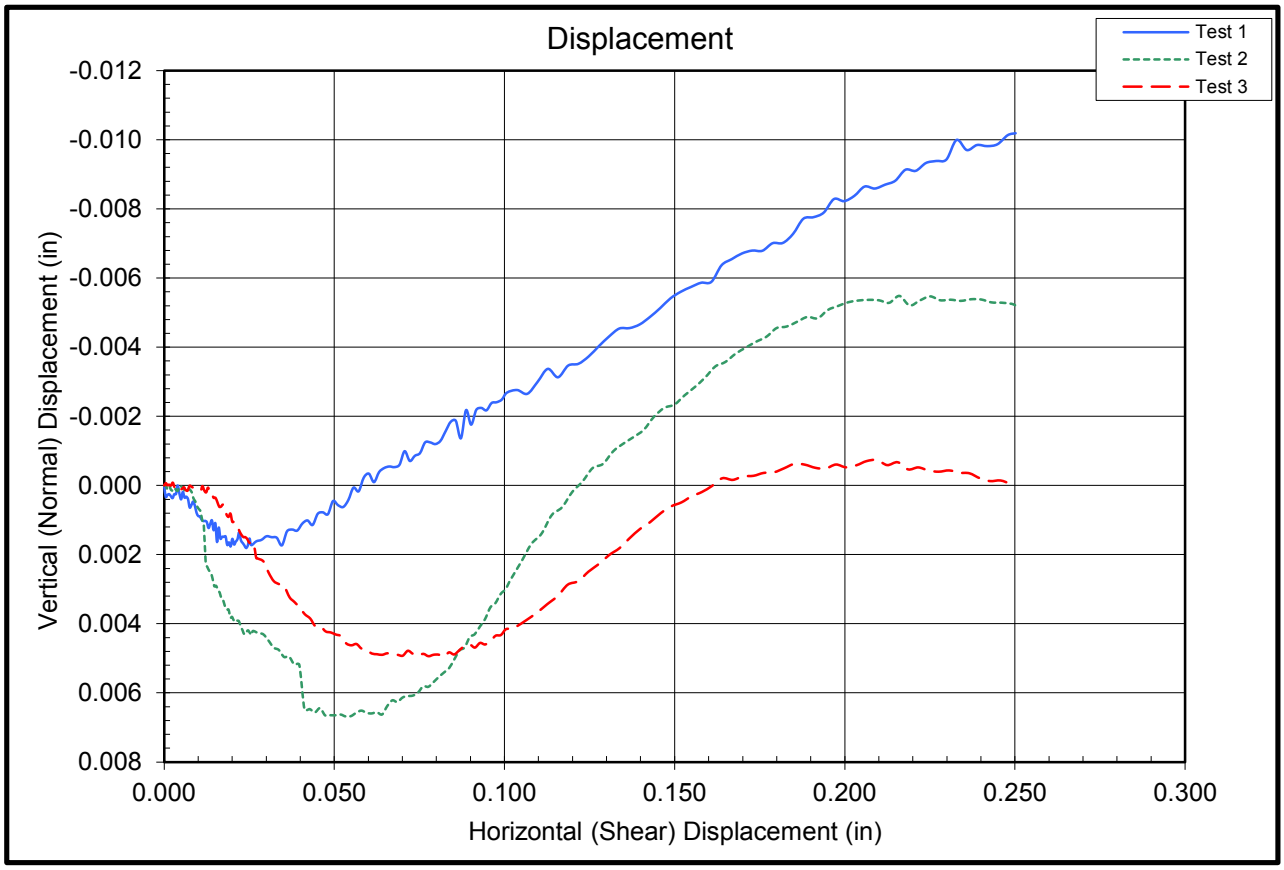
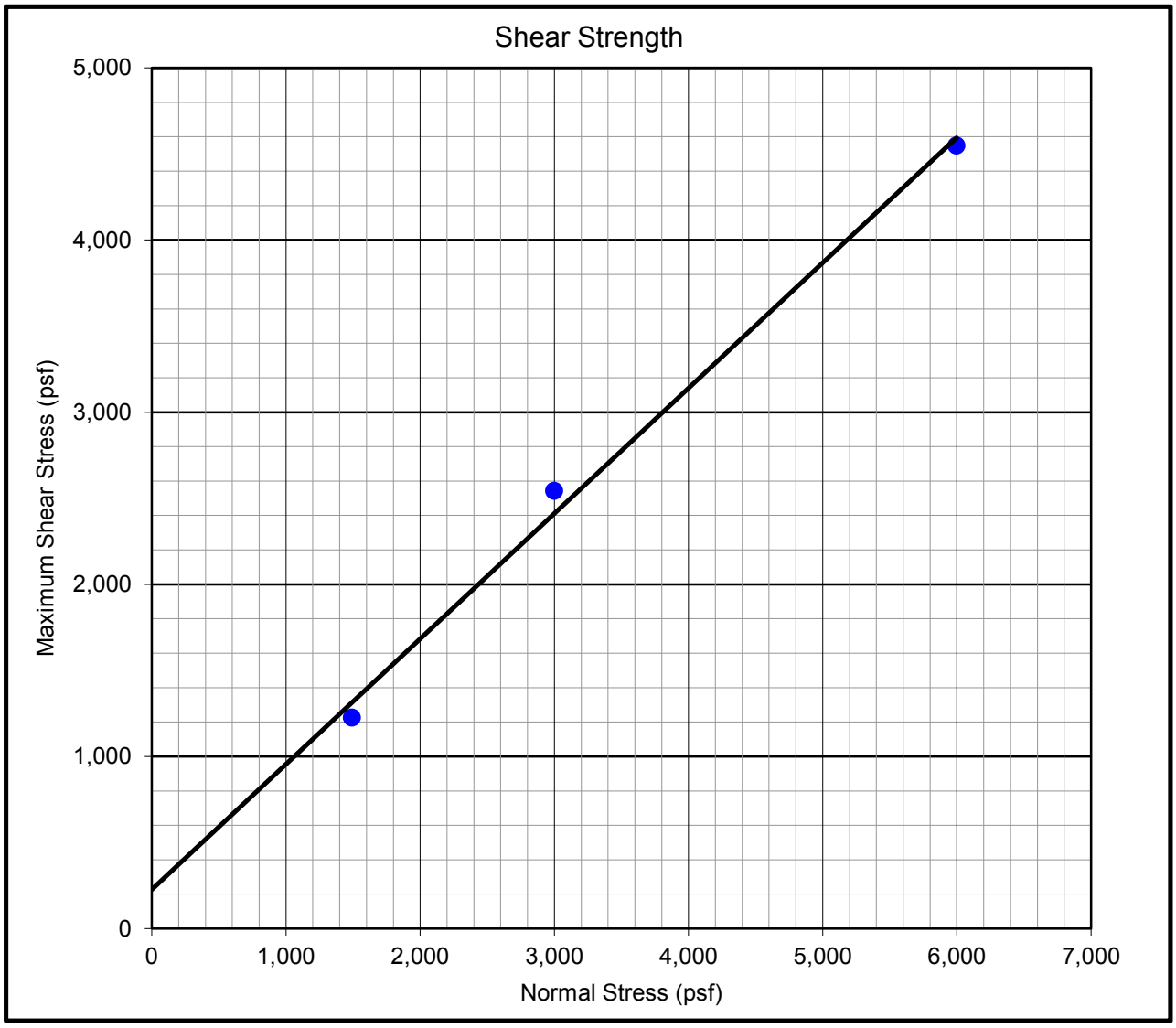


Exhibit B-

Terracon
750 Pilot Road, Suite F Las Vegas, Nevada 89119
PH. (702) 597-9393 FAX. (702) 597-9009

SOIL DIRECT SHEAR RESULTS

Sample Location: B-1 @ 47B



Test Parameters

Sample Information				Test Stresses		Initial Conditions			Final Conditions	
Test #	Sample Lab ID	Depth (ft)	Diameter (in)	Normal (psf)	Max Shear (psf)	Height (in)	Moisture (%)	Density (pcf)	Height (in)	Moisture (%)
1	A	47	2.41	1,491.2	1,225.4	1.00	18	118.1	1.00	21.7
2	B	47	2.41	2,998.3	2,543.7	1.00	18	118.9	1.00	21.3
3	C	47	2.41	5,997.1	4,549.2	1.00	18	118.6	1.00	21.6

Notes and Special Test Conditions

Project Information

Project Name	**Bear Lake**
Location	
Client	
Project #	**61155051**

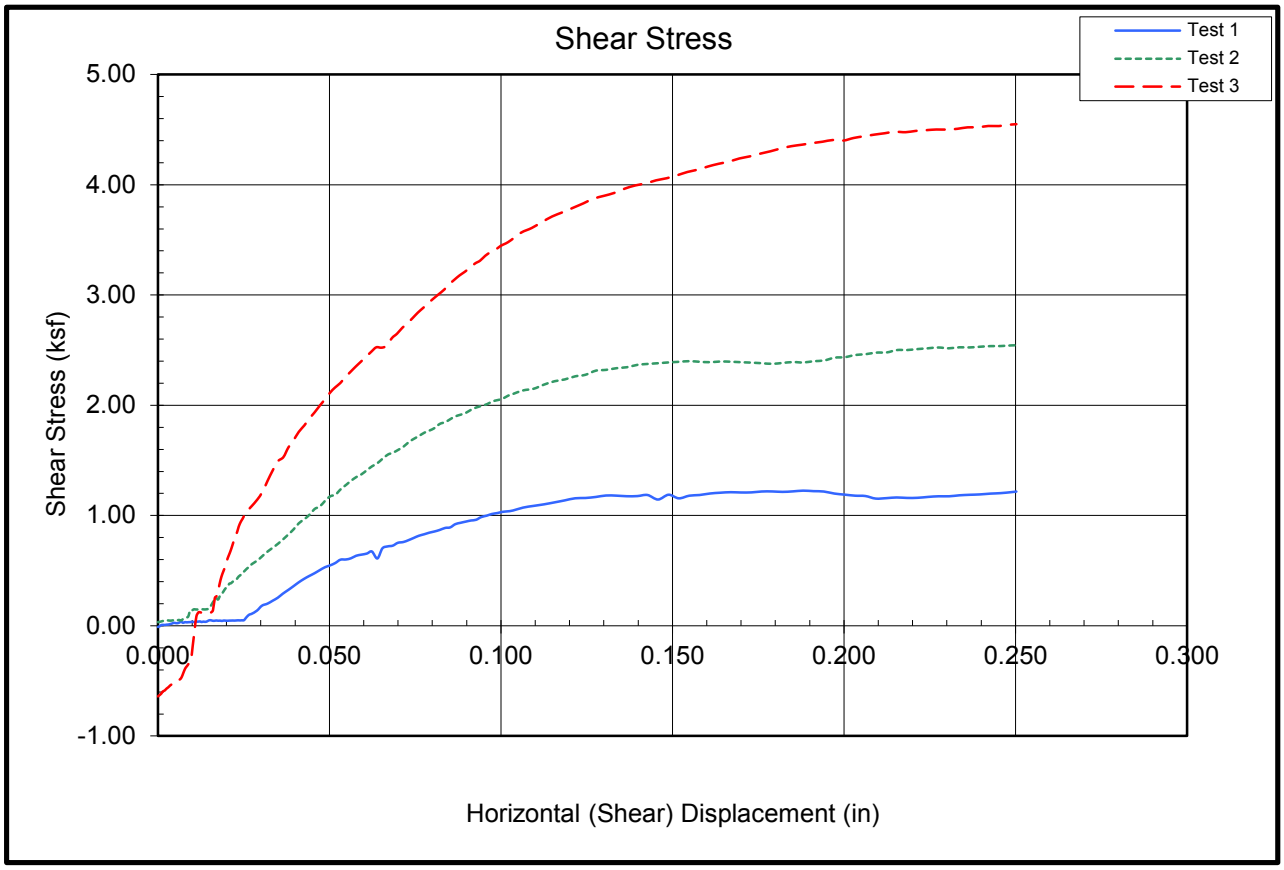
Test Results

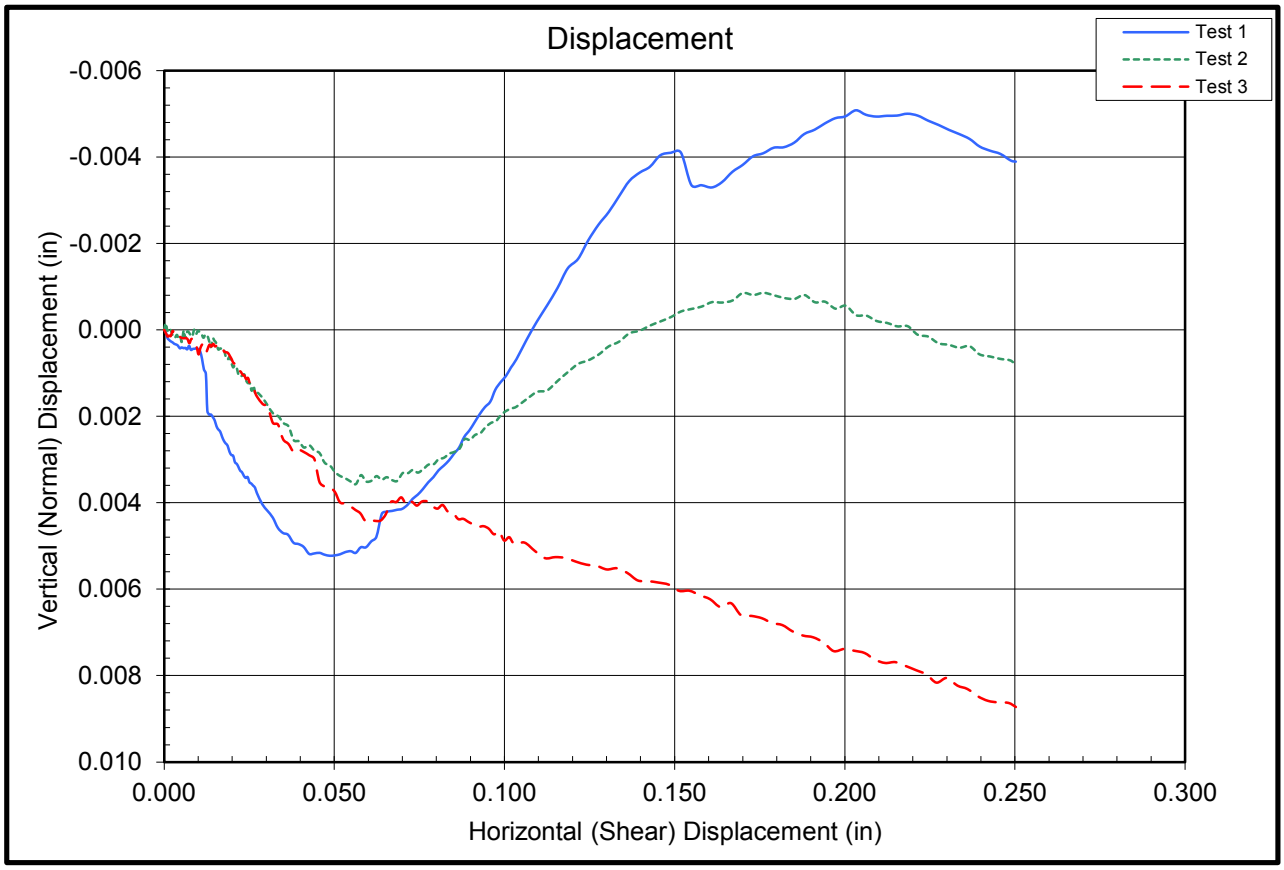
Friction Angle (°)	**36**
Cohesion (psf)	**228**
Shear Rate (in/min)	0.01

Terracon

SOIL DIRECT SHEAR RESULTS (PAGE 2) B-1 @ 47B

B-1 @ 47B





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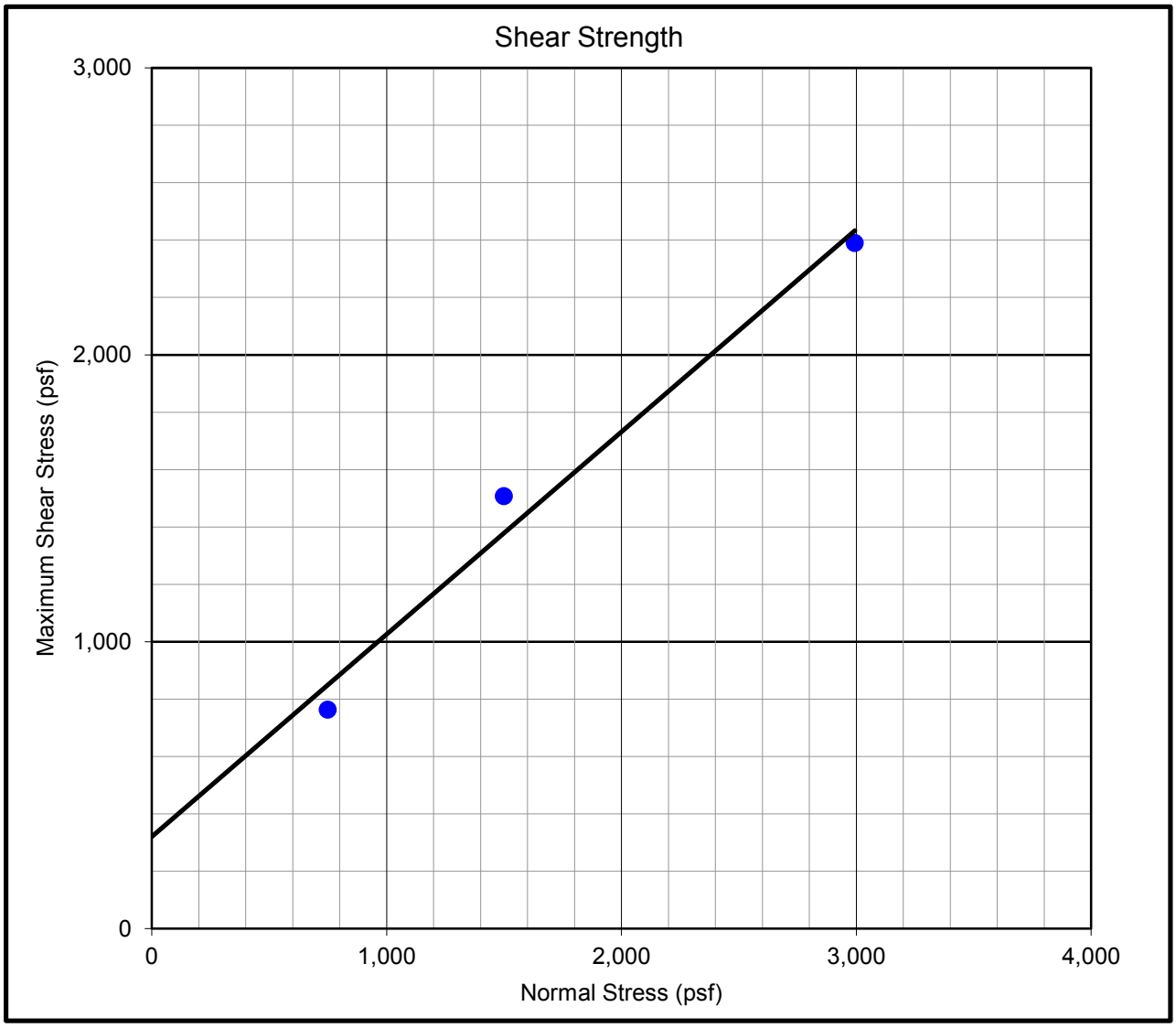
PH. (702) 597-9393 FAX. (702) 597-9009

SOIL DIRECT SHEAR RESULTS

Sample Location: B-2 @ 2.5



Test Parameters

Sample Information				Test Stresses		Initial Conditions			Final Conditions	
Test #	Sample Lab ID	Depth (ft)	Diameter (in)	Normal (psf)	Max Shear (psf)	Height (in)	Moisture (%)	Density (pcf)	Height (in)	Moisture (%)
A	1	2.5	2.41	749.3	763.5	1.00	28	120.6	0.99	32.8
B	2	2.5	2.41	1,499.4	1,507.2	1.00	28	120.4	0.99	33.5
C	3	2.5	2.41	2,994.2	2,389.6	1.00	28	120.2	1.01	33.2

Notes and Special Test Conditions

Project Information

Project Name	**Bear Lake Marina Expansion**
Location	
Client	
Project #	**61155051**

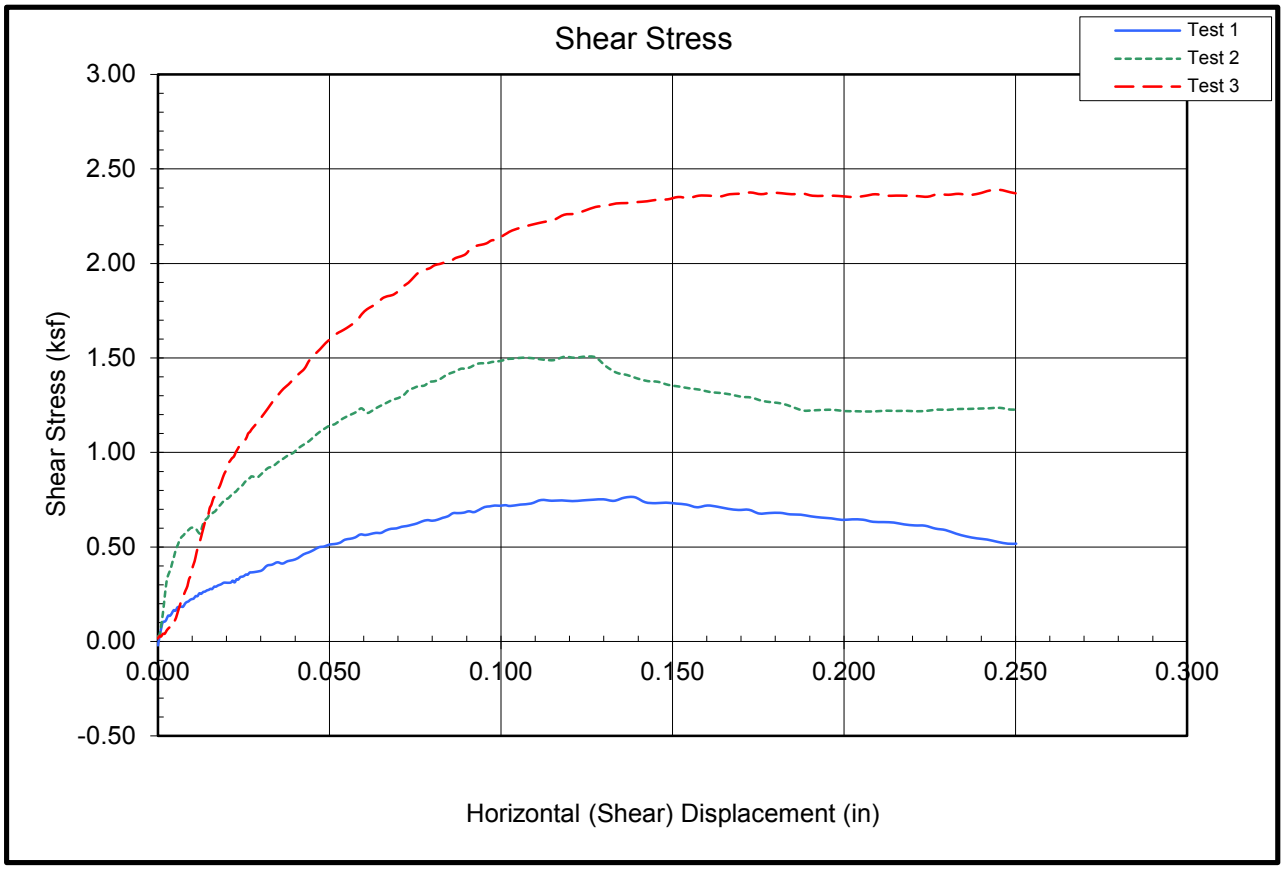
Test Results

Friction Angle (°)	**35**
Cohesion (psf)	**321**
Shear Rate (in/min)	0.005

Terracon

SOIL DIRECT SHEAR RESULTS (PAGE 2) B-2 @ 2.5

B-2 @ 2.5



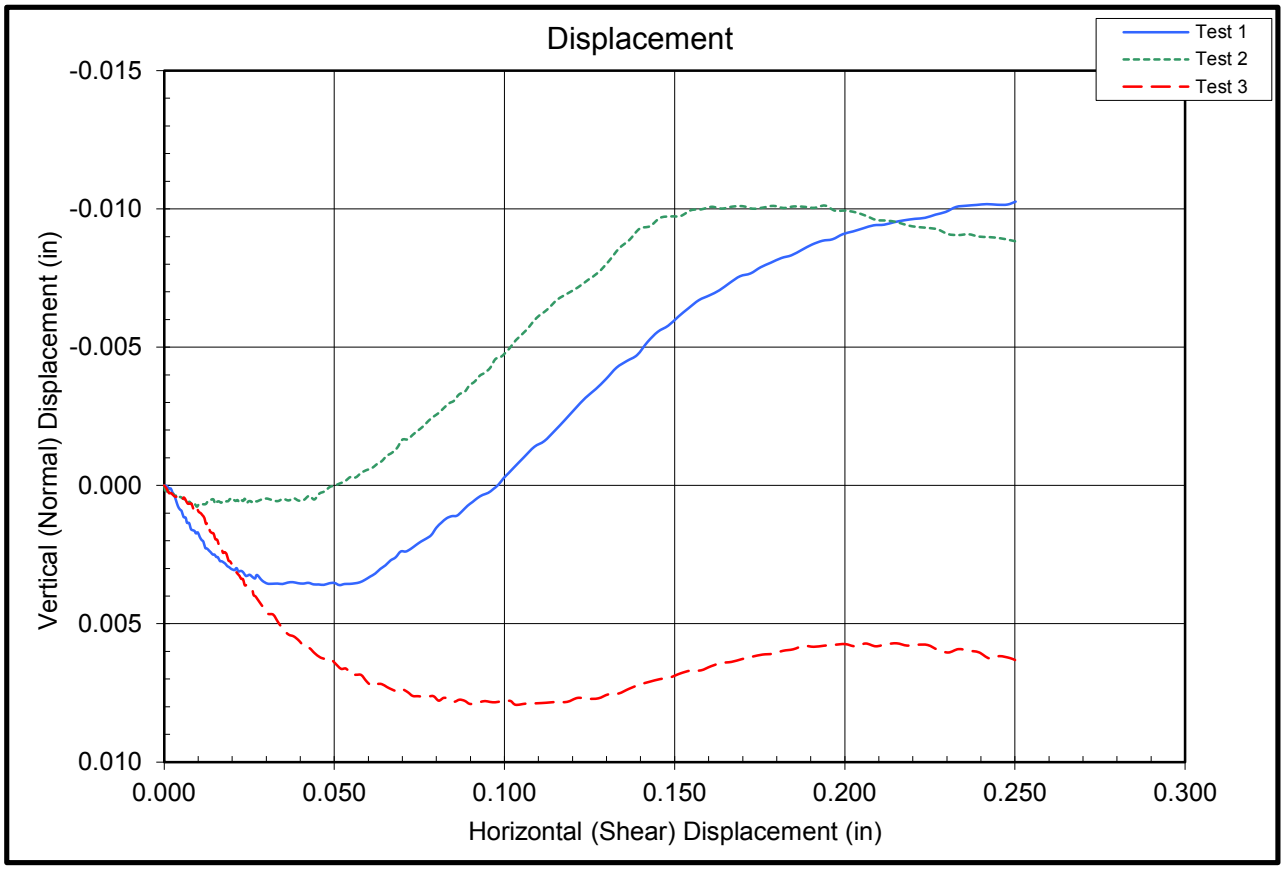


Exhibit B-

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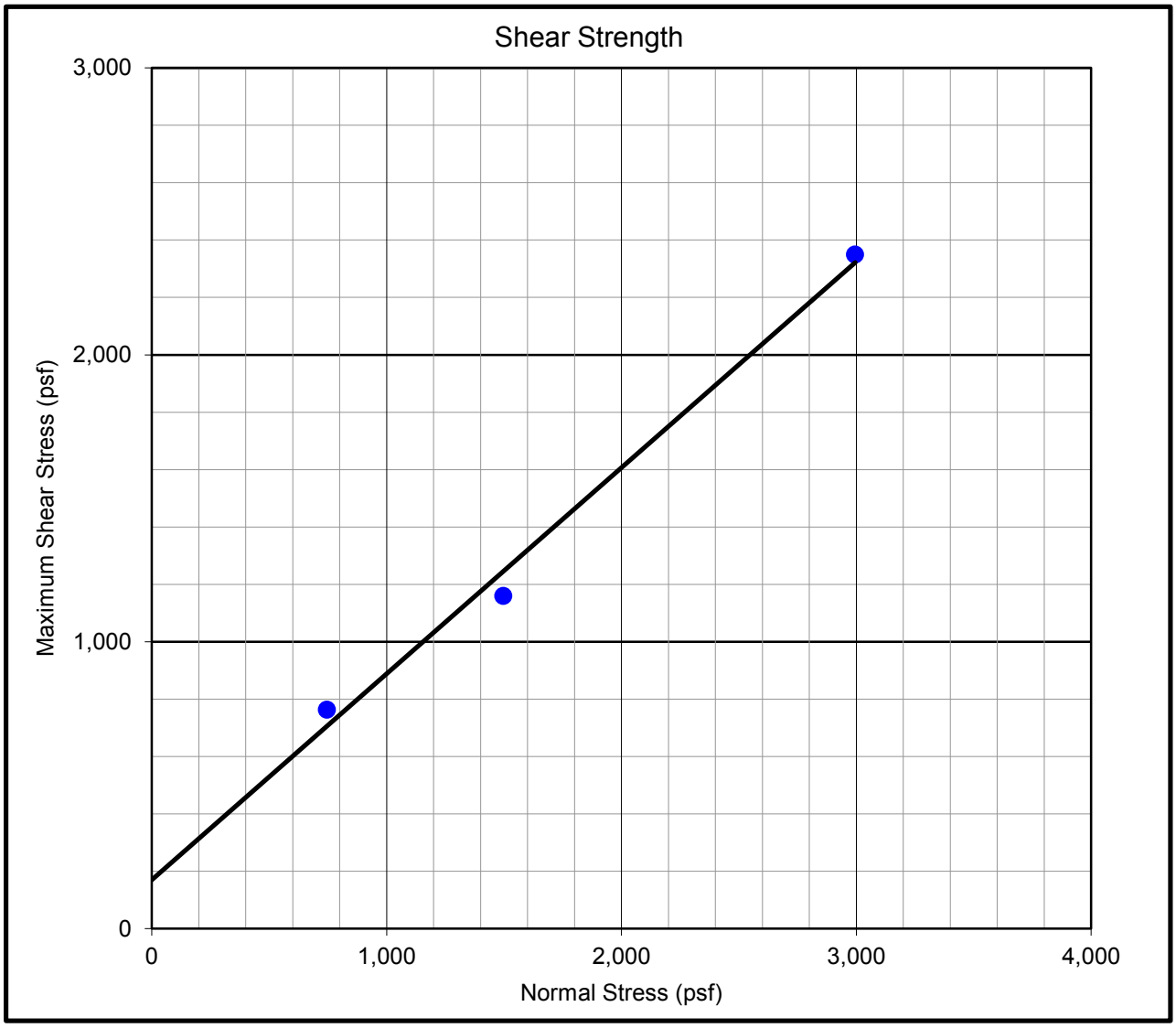
PH. (702) 597-9393 FAX. (702) 597-9009

SOIL DIRECT SHEAR RESULTS

Sample Location: B-3 @ 2.5



Test Parameters

Sample Information				Test Stresses		Initial Conditions			Final Conditions	
Test #	Sample Lab ID	Depth (ft)	Diameter (in)	Normal (psf)	Max Shear (psf)	Height (in)	Moisture (%)	Density (pcf)	Height (in)	Moisture (%)
A	1	2.5	2.41	746.2	763.2	1.00	26	118.4	1.00	32.7
B	2	2.5	2.41	1,497.3	1,159.9	1.00	26	119.0	1.00	32.4
C	3	2.5	2.41	2,995.2	2,350.1	1.00	26	118.9	1.01	32.3

Notes and Special Test Conditions

Project Information

Project Name	**Bear Lake Marina Expansion**
Location	
Client	
Project #	**61155051**

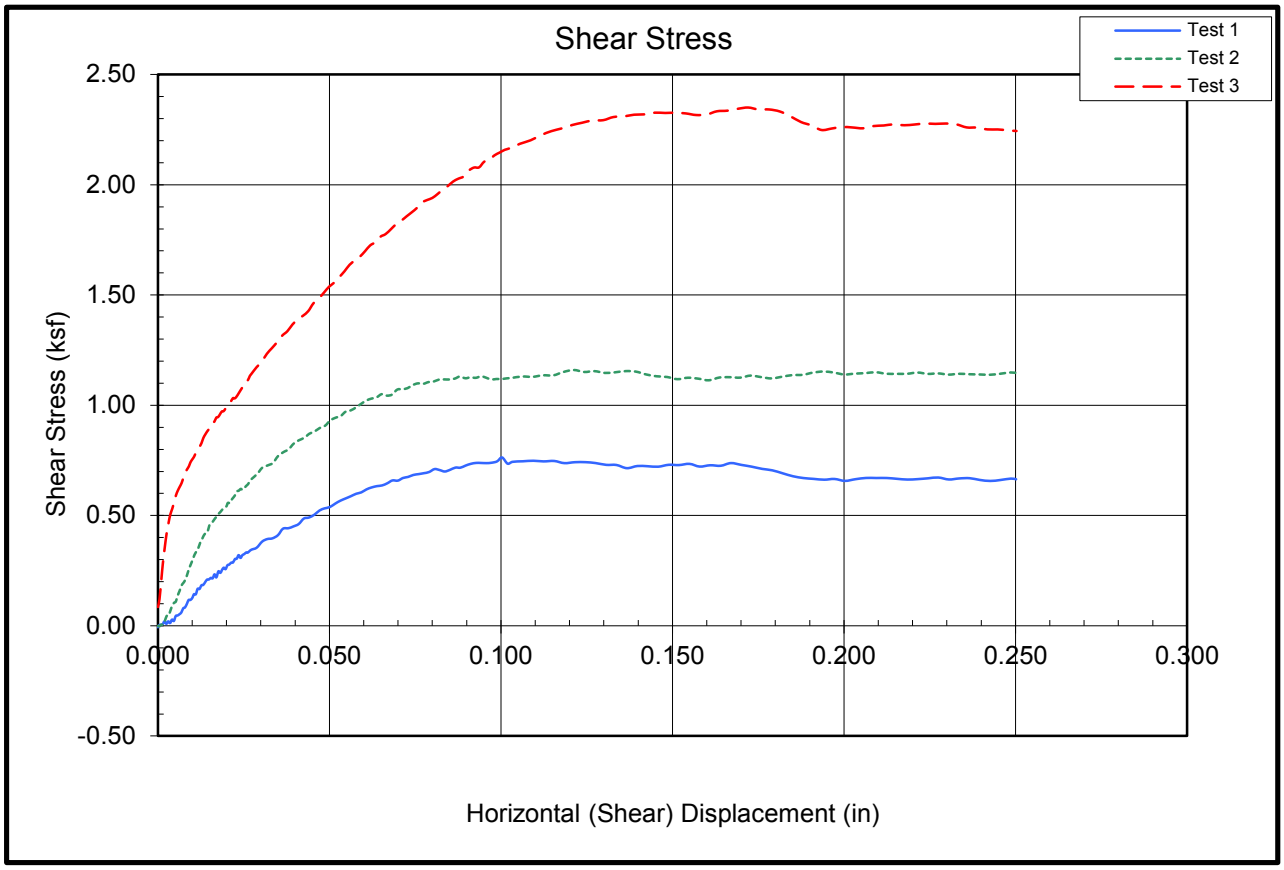
Test Results

Friction Angle (°)	**36**
Cohesion (psf)	**170**
Shear Rate (in/min)	0.005

Terracon

SOIL DIRECT SHEAR RESULTS (PAGE 2) B-3 @ 2.5

B-3 @ 2.5



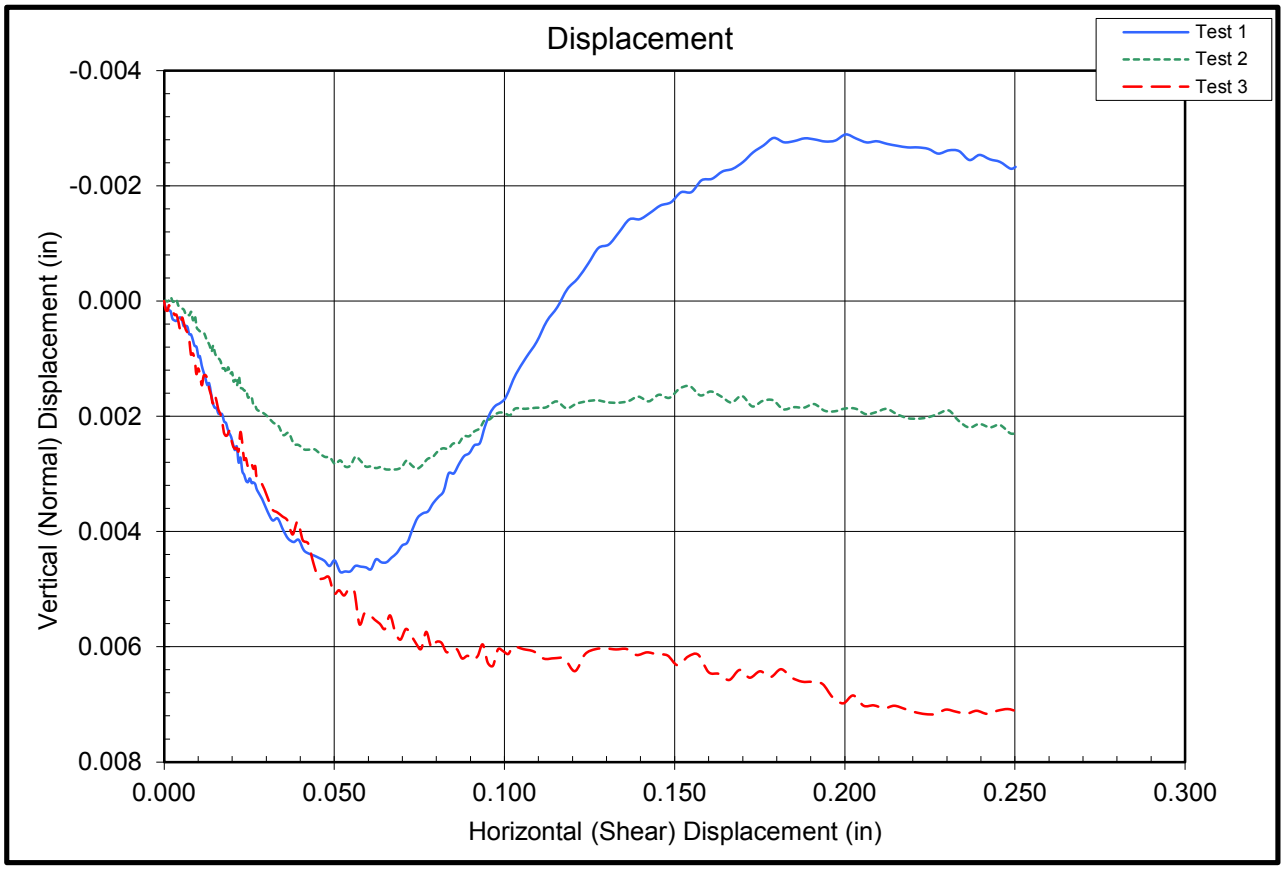


Exhibit B-

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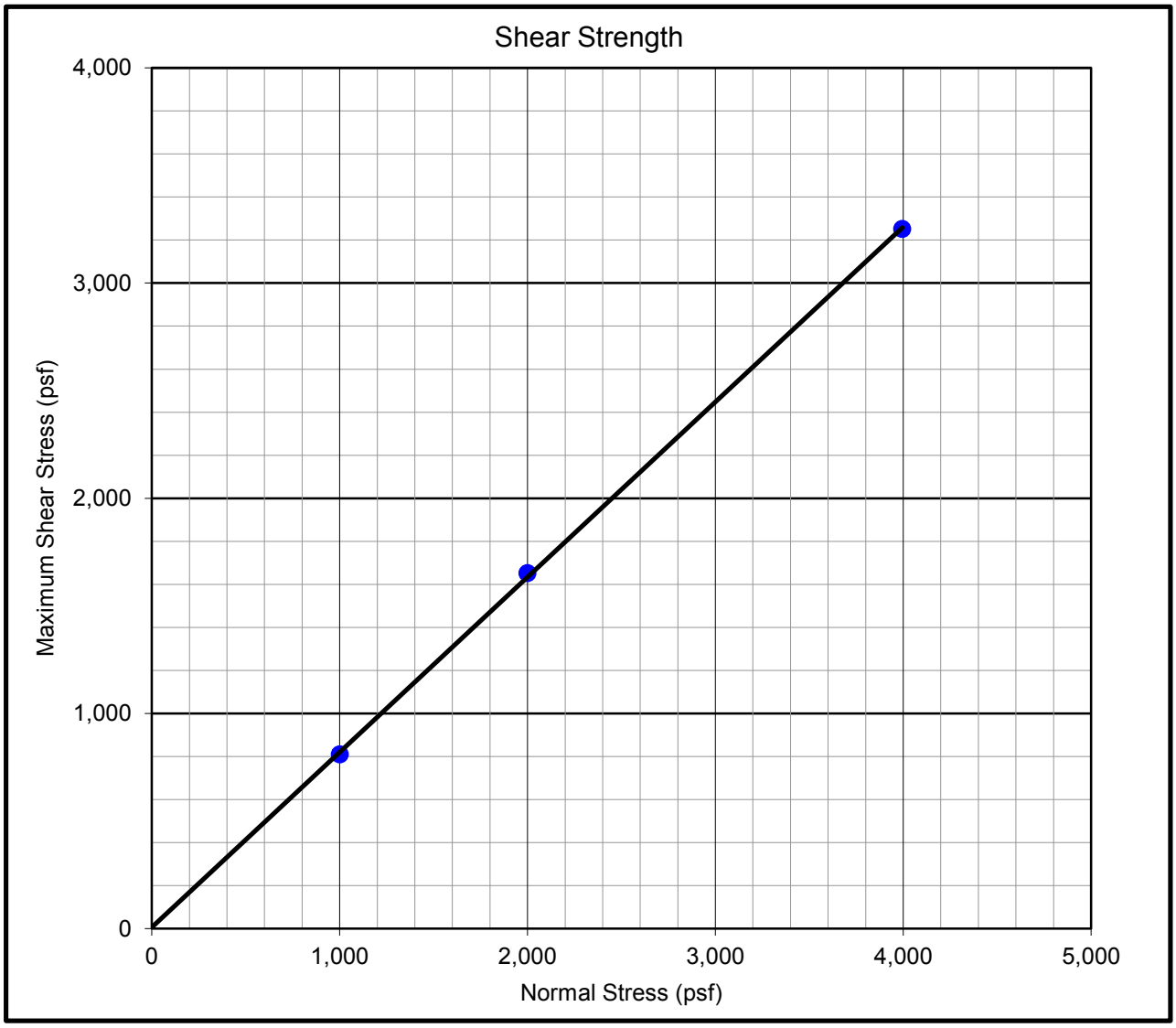
SOIL DIRECT SHEAR RESULTS

Sample Location: B-3 @ 10



Test Parameters

Sample Information				Test Stresses		Initial Conditions			Final Conditions	
Test #	Sample Lab ID	Depth (ft)	Diameter (in)	Normal (psf)	Max Shear (psf)	Height (in)	Moisture (%)	Density (pcf)	Height (in)	Moisture (%)
A	1	10	2.41	1,001.7	810.0	1.00	28	120.3	0.99	33.1
B	2	10	2.41	1,999.7	1,652.4	1.00	28	120.9	0.99	32.5
C	3	10	2.41	3,994.9	3,252.3	1.00	28	120.6	1.00	33.8

Notes and Special Test Conditions

Project Information

Project Name	**Bear Lake Marina Expansion**
Location	
Client	
Project #	**61155051**

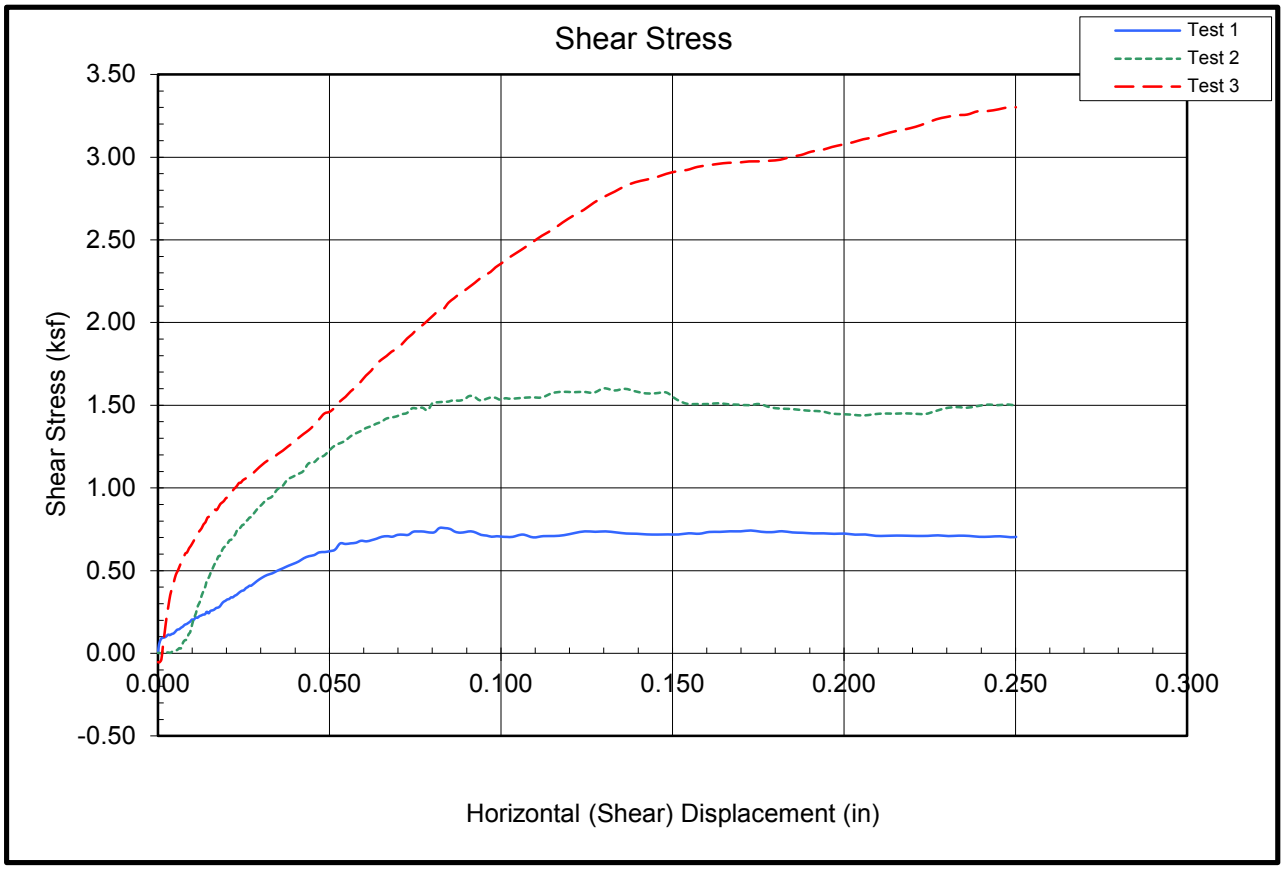
Test Results

Friction Angle (°)	**39**
Cohesion (psf)	**7**
Shear Rate (in/min)	0.005

Terracon

SOIL DIRECT SHEAR RESULTS (PAGE 2) B-3 @ 10

B-3 @ 10



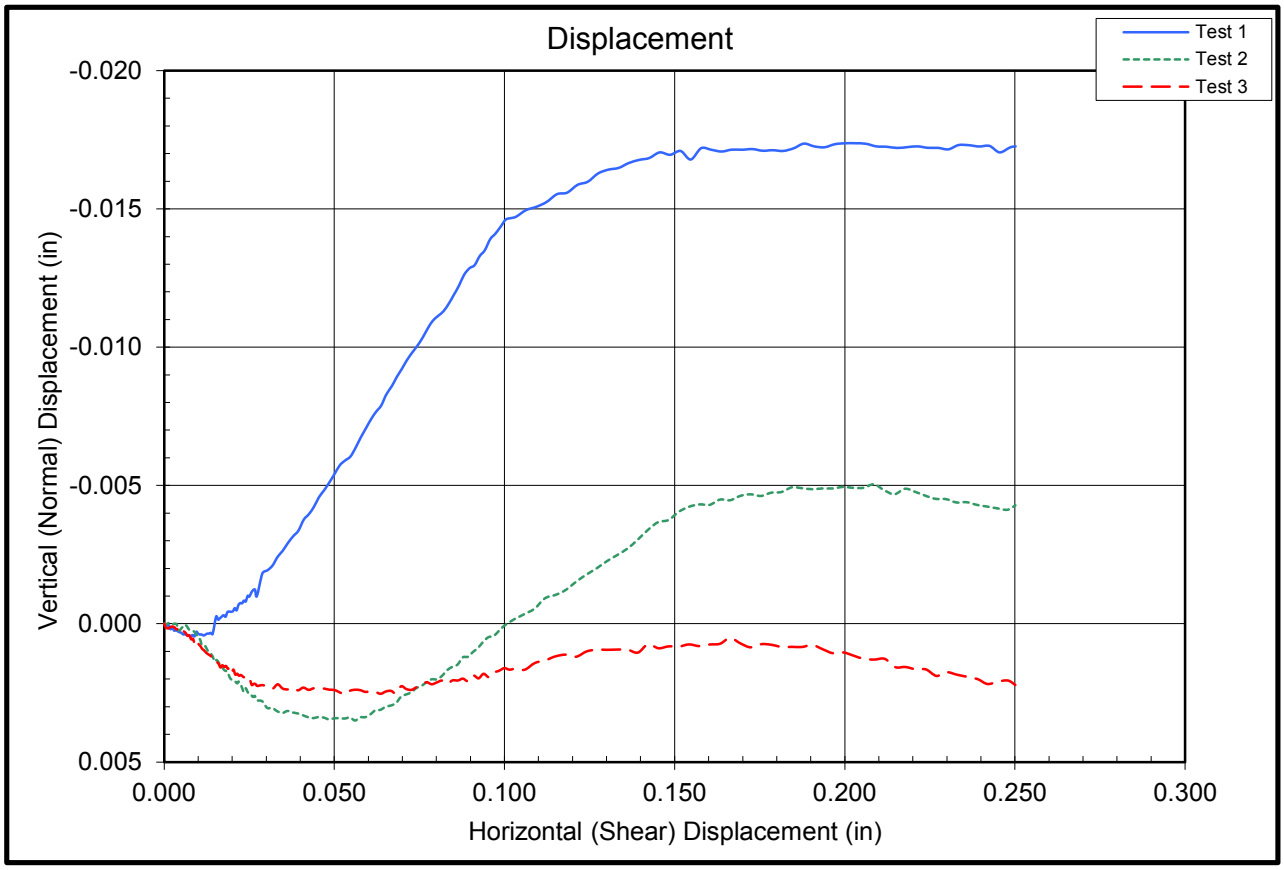


Exhibit B-

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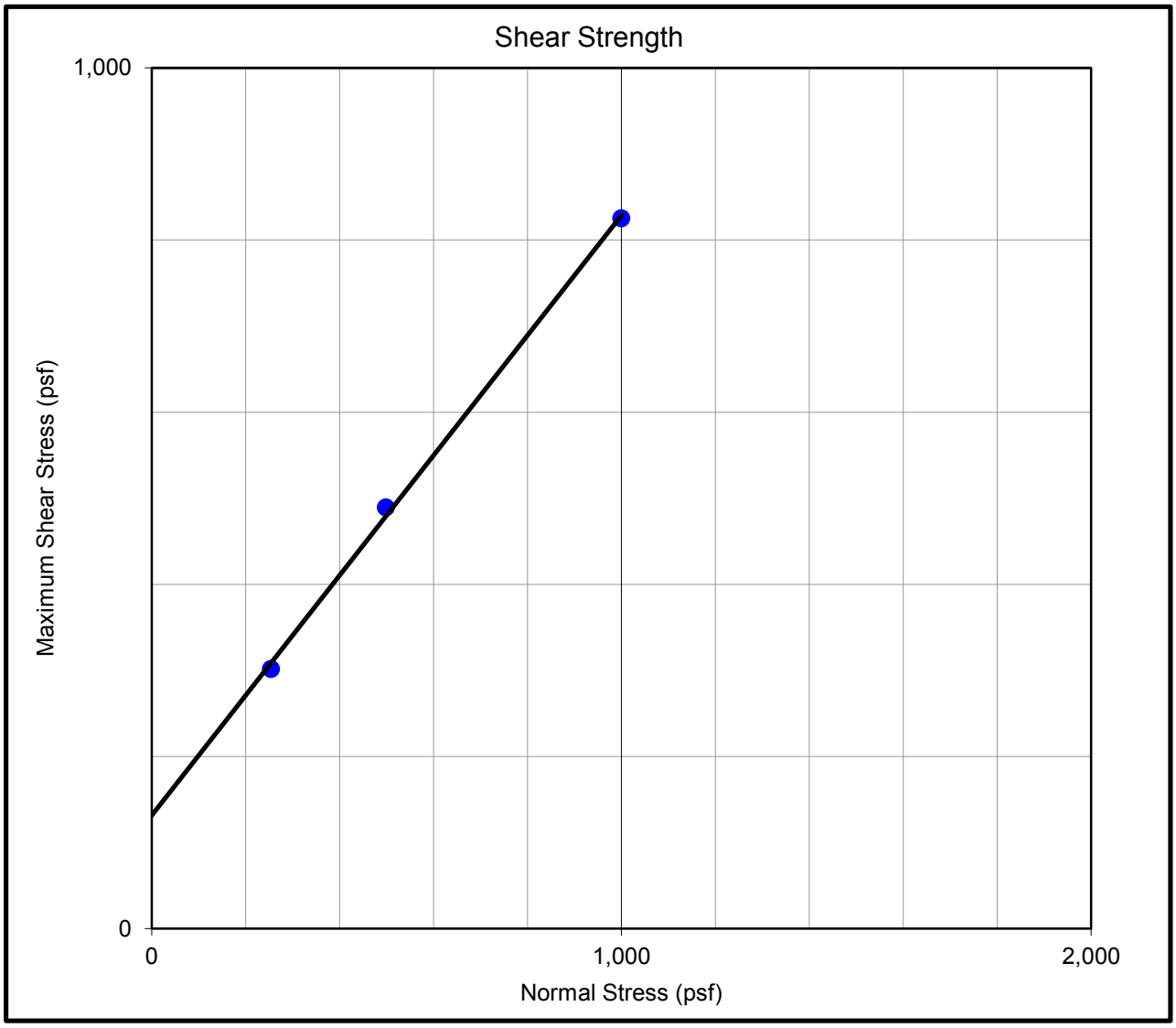
SOIL DIRECT SHEAR RESULTS

Sample Location: B-3 @ 35



Test Parameters

Sample Information				Test Stresses		Initial Conditions			Final Conditions	
Test #	Sample Lab ID	Depth (ft)	Diameter (in)	Normal (psf)	Max Shear (psf)	Height (in)	Moisture (%)	Density (pcf)	Height (in)	Moisture (%)
A	1	35	2.41	253.9	301.7	1.00	25	119.0	0.98	30.5
B	2	35	2.41	498.8	489.4	1.00	25	119.2	0.99	30.5
C	3	35	2.41	1,000.1	825.3	1.00	25	118.9	0.99	31.2

Notes and Special Test Conditions

Project Information

Project Name	**Bear Lake Marina Expansion**
Location	
Client	
Project #	**61155051**

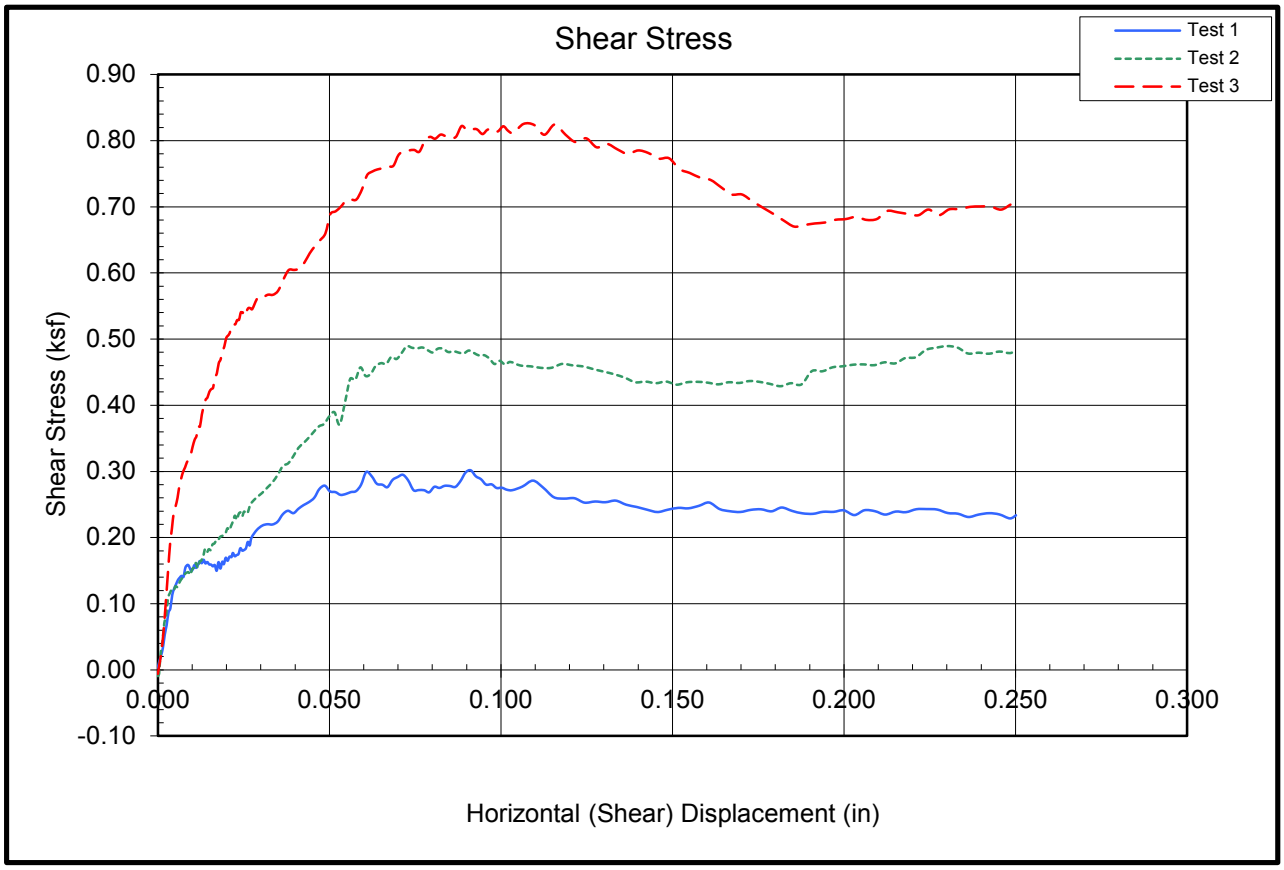
Test Results

Friction Angle (°)	**35**
Cohesion (psf)	**132**
Shear Rate (in/min)	0.005

Terracon

SOIL DIRECT SHEAR RESULTS (PAGE 2) B-3 @ 35

B-3 @ 35



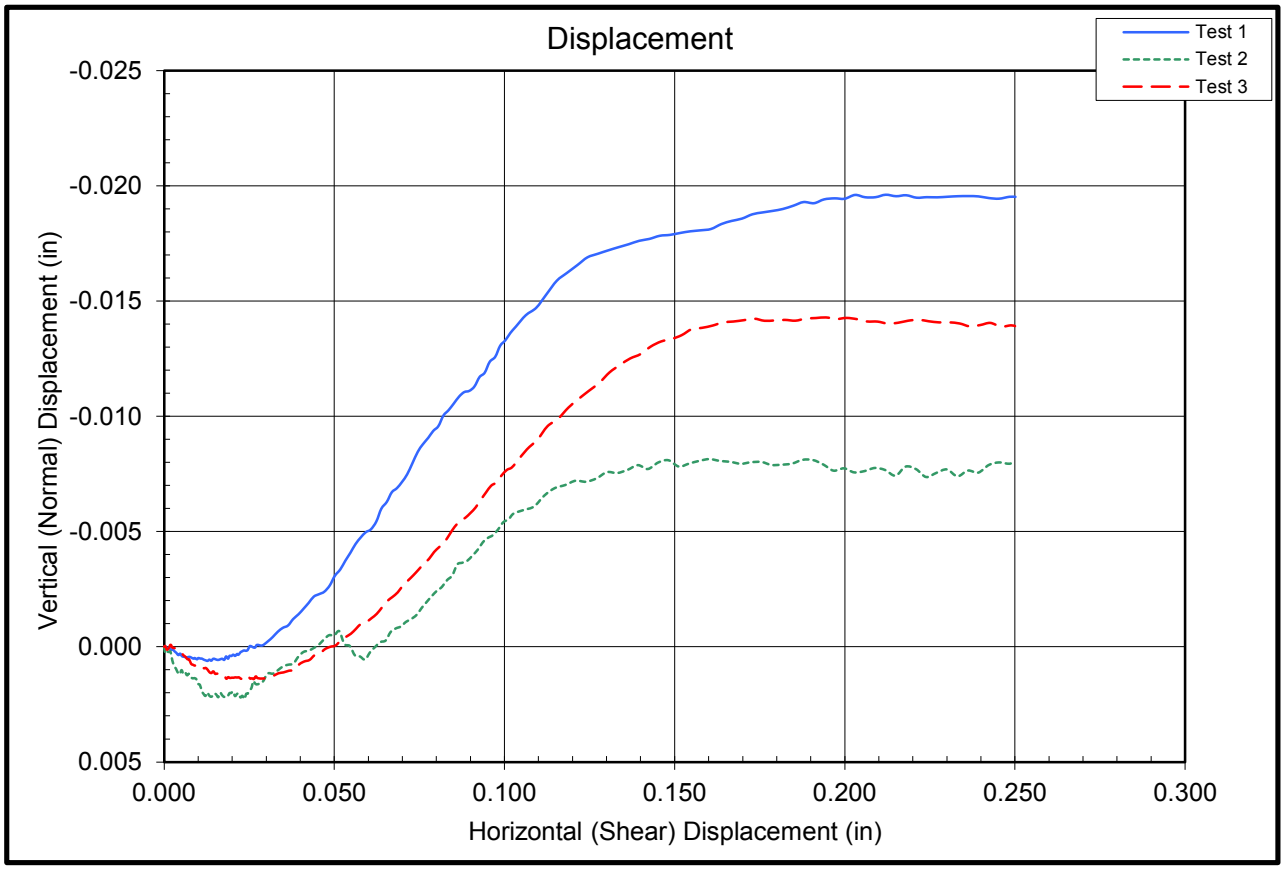
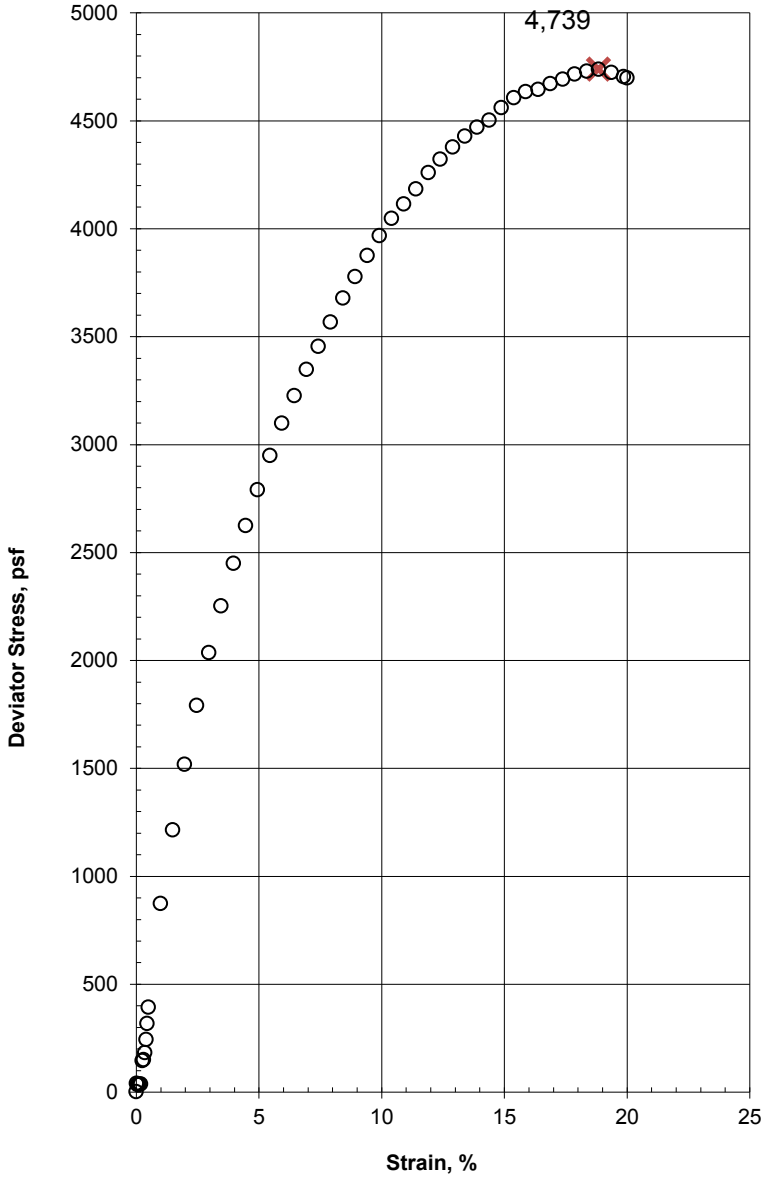


Exhibit B-

Unconsolidated-Undrained Triaxial Compression Test (ASTM D2850)



Axial Strain (%)	Deviator Stress (psf)	Shear Stress (psf)
0.00	2.2	1.1
0.04	35.5	17.8
0.12	36.7	18.3
0.25	146.2	73.1
0.34	183.8	91.9
0.44	317.8	158.9
0.99	874.6	437.3
1.96	1519.1	759.5
2.95	2035.7	1017.9
3.95	2449.7	1224.9
4.94	2791.4	1395.7
5.93	3099.0	1549.5
6.93	3348.3	1674.1
7.91	3568.0	1784.0
8.91	3777.8	1888.9
9.90	3967.5	1983.7
10.89	4115.4	2057.7
11.90	4259.8	2129.9
12.89	4379.3	2189.7
13.89	4470.9	2235.5
14.87	4560.6	2280.3
15.87	4634.9	2317.5
16.87	4672.4	2336.2
17.86	4716.7	2358.4
18.85	4739.2	2369.6
19.86	4704.3	2352.2

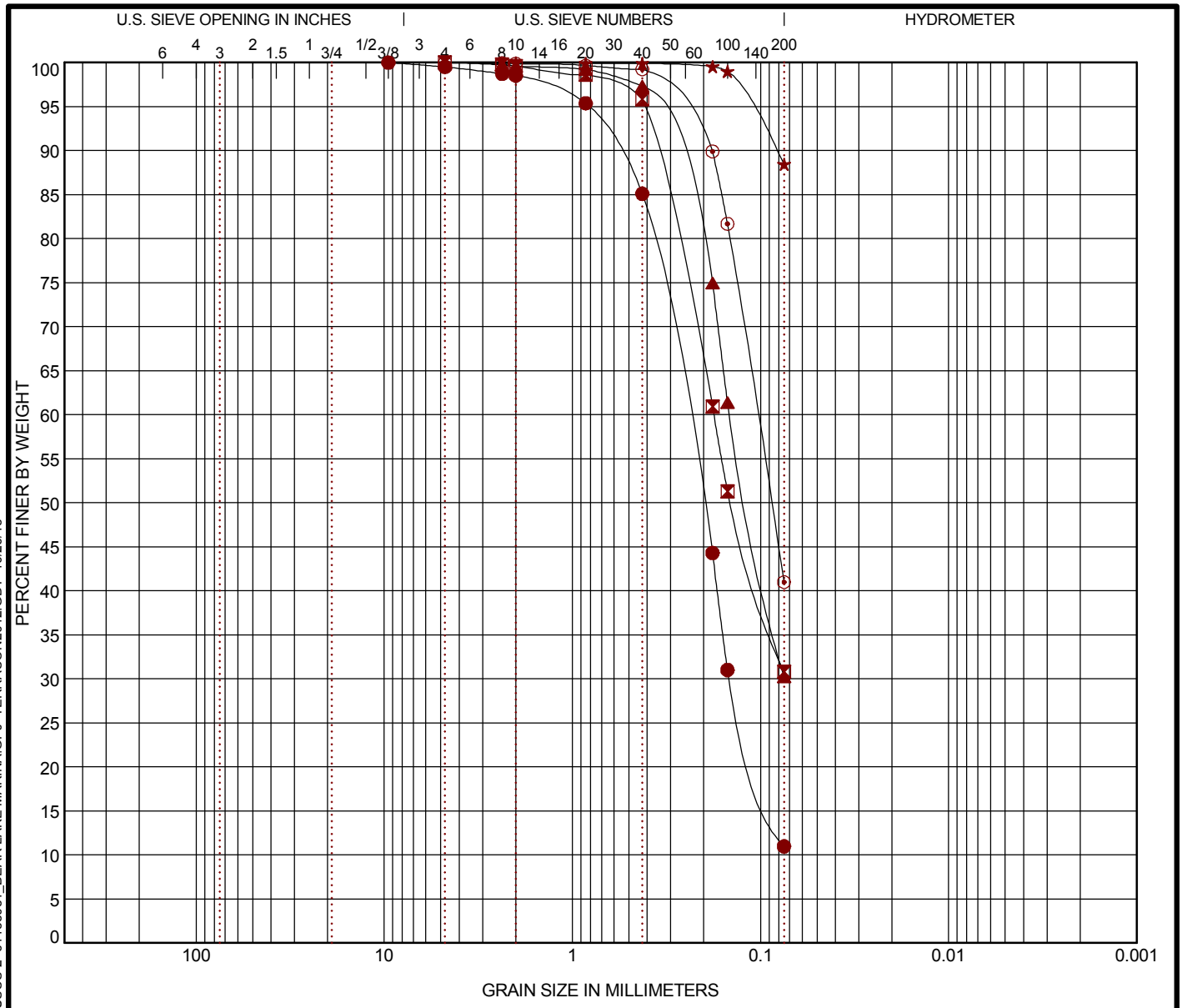
Sample Diameter (in):	2.87	Moist Unit Weight (pcf):	**118**
Sample Height (in):	6.119333	Moisture Content (%):	**27**
Sample Volume (cf):	0.0228	Dry Unit Weight (pcf):	**93**
Confining Stress (psf):	3832	Strain at Falure (%)	**19**
Strain Rate (%/min):	0.5	Shear Stress at Falure (psf)	**2370**
Strain Rate (in/min):	0.03		

Terracon

Project Name: Bear Lake
Project No.: 61155051
Location: Garden City
Sample: B-1 @ 32'
Sample Description: ML - Silt

GRAIN SIZE DISTRIBUTION

ASTM D422



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring ID		Depth	USCS Classification	LL	PL	PI	Cc	Cu
●	B-1	22 - 24	POORLY GRADED SAND with SILT (SP-SM)	NP	NP	NP	1.16	3.46
⊠	B-1	47 - 49	SILTY SAND (SM)	NP	NP	NP		
▲	B-2	2.5 - 4.5	SILTY SAND (SM)	NP	NP	NP		
★	B-3	2.5 - 4.5	SILT (ML)	NP	NP	NP		
⊙	B-3	35 - 37	SILTY SAND (SM)	NP	NP	NP		

Boring ID		Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Fines
●	B-1	22 - 24	9.5	0.25	0.145		0.5	88.5	11.0
⊠	B-1	47 - 49	4.75	0.177			0.0	69.2	30.8
▲	B-2	2.5 - 4.5	4.75	0.145			0.0	69.8	30.2
★	B-3	2.5 - 4.5	2				0.0	11.5	88.5
⊙	B-3	35 - 37	4.75	0.104			0.0	59.0	41.0

PROJECT: Bear Lake Marina Expansion

SITE: Bear Lake Marina State Park
Garden City, Utah

Terracon
14850 S. Pony Express Rd, Suite 150N
Bluffdale, Utah

PROJECT NUMBER: 61155051

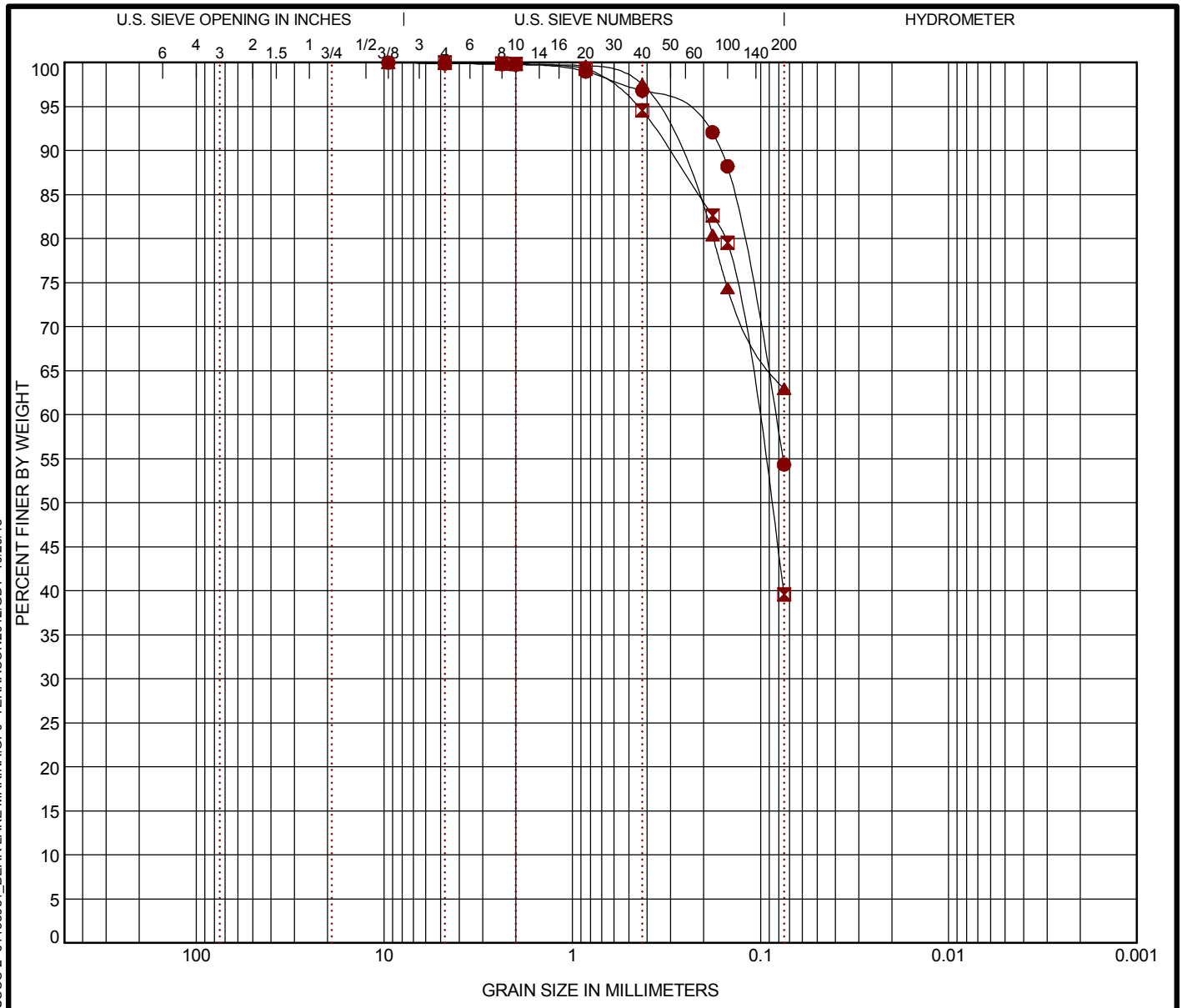
CLIENT: J-U-B Engineers, Inc.
Logan, Utah

EXHIBIT: B-7

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS-2 61155051_BEAR LAKE MARINA.GPJ TERRACON2012.GDT 10/26/15

GRAIN SIZE DISTRIBUTION

ASTM D422



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring ID	Depth	USCS Classification	LL	PL	PI	Cc	Cu
● TP-1	4 - 6	SANDY SILT (ML)	NP	NP	NP		
⊠ TP-2	3 - 4	SILTY SAND (SM)	NP	NP	NP		
▲ TP-5	11 - 12	SANDY SILT (ML)	NP	NP	NP		

Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Fines
● TP-1	4 - 6	9.5	0.084			0.1	45.6	54.4
⊠ TP-2	3 - 4	4.75	0.107			0.0	60.4	39.6
▲ TP-5	11 - 12	9.5				0.1	36.9	63.0

PROJECT: Bear Lake Marina Expansion

SITE: Bear Lake Marina State Park
Garden City, Utah

Terracon
14850 S. Pony Express Rd, Suite 150N
Bluffdale, Utah

PROJECT NUMBER: 61155051

CLIENT: J-U-B Engineers, Inc.
Logan, Utah

EXHIBIT: B-8

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS-2 61155051_BEAR LAKE MARINA.GPJ TERRACON2012.GDT 10/26/15

APPENDIX C
SUPPORTING DOCUMENTS

GENERAL NOTES

DRILLING & SAMPLING SYMBOLS:

SS:	Split Spoon - 1-3/8" I.D., 2" O.D., unless otherwise noted	HS:	Hollow Stem Auger
ST:	Thin-Walled Tube – 2" O.D., 3" O.D., unless otherwise noted	PA:	Power Auger (Solid Stem)
RS:	Ring Sampler - 2.42" I.D., 3" O.D., unless otherwise noted	HA:	Hand Auger
DB:	Diamond Bit Coring - 4", N, B	RB:	Rock Bit
BS:	Bulk Sample or Auger Sample	WB	Wash Boring or Mud Rotary

The number of blows required to advance a standard 2-inch O.D. split-spoon sampler (SS) the last 12 inches of the total 18-inch penetration with a 140-pound hammer falling 30 inches is considered the "Standard Penetration" or "N-value".

WATER LEVEL MEASUREMENT SYMBOLS:

WL:	Water Level	WS:	While Sampling	BCR:	Before Casing Removal
WCI:	Wet Cave in	WD:	While Drilling	ACR:	After Casing Removal
DCI:	Dry Cave in	AB:	After Boring	N/E:	Not Encountered

Water levels indicated on the boring logs are the levels measured in the borings at the times indicated. Groundwater levels at other times and other locations across the site could vary. In pervious soils, the indicated levels may reflect the location of groundwater. In low permeability soils, the accurate determination of groundwater levels may not be possible with only short-term observations.

DESCRIPTIVE SOIL CLASSIFICATION: Soil classification is based on the Unified Soil Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are principally described as clays if they are plastic, and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

CONSISTENCY OF FINE-GRAINED SOILS

Unconfined Compressive Strength, Qu, psf	Standard Penetration or N-value (SS) Blows/Ft.	Consistency
< 500	0 – 1	Very Soft
500 – 1,000	2 – 3	Soft
1,000 – 2,000	4 – 6	Medium Stiff
2,000 – 4,000	7 – 12	Stiff
4,000 – 8,000	13 – 26	Very Stiff
8,000+	> 26	Hard

RELATIVE DENSITY OF COARSE-GRAINED SOILS

Standard Penetration or N-value (SS) Blows/Ft.	Relative Density
0 – 3	Very Loose
4 – 9	Loose
10 – 29	Medium Dense
30 – 50	Dense
> 50	Very Dense

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 15
With	15 – 29
Modifier	≥ 30

GRAIN SIZE TERMINOLOGY

Major Component of Sample	Particle Size
Boulders	Over 12 in. (300mm)
Cobbles	12 in. to 3 in. (300mm to 75mm)
Gravel	3 in. to #4 sieve (75mm to 4.75mm)
Sand	#4 to #200 sieve (4.75 to 0.075mm)
Silt or Clay	Passing #200 Sieve (0.075mm)

RELATIVE PROPORTIONS OF FINES

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 5
With	5 – 12
Modifier	> 12

PLASTICITY DESCRIPTION

Term	Plasticity Index
Non-plastic	0
Low	1 – 10
Medium	11 – 30
High	> 30

UNIFIED SOIL CLASSIFICATION SYSTEM

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A]					Soil Classification	
					Group Symbol	Group Name [B]
Coarse Grained Soils: More than 50% retained on No. 200 sieve	**Gravels:** More than 50% of coarse fraction retained on No. 4 sieve	**Clean Gravels:** Less than 5% fines [C]	$Cu \geq 4$ and $1 \leq Cc \leq 3$ [E]		GW	Well-graded gravel [F]
			$Cu < 4$ and/or $1 > Cc > 3$ [E]		GP	Poorly graded gravel [F]
		Gravels with Fines: More than 12% fines [C]	Fines classify as ML or MH		GM	Silty gravel [F,G,H]
			Fines classify as CL or CH		GC	Clayey gravel [F,G,H]
	Sands: 50% or more of coarse fraction passes No. 4 sieve	**Clean Sands:** Less than 5% fines [D]	$Cu \geq 6$ and $1 \leq Cc \leq 3$ [E]		SW	Well-graded sand [I]
			$Cu < 6$ and/or $1 > Cc > 3$ [E]		SP	Poorly graded sand [I]
		Sands with Fines: More than 12% fines [D]	Fines classify as ML or MH		SM	Silty sand [G,H,I]
			Fines classify as CL or CH		SC	Clayey sand [G,H,I]
Fine-Grained Soils: 50% or more passes the No. 200 sieve	**Silts and Clays:** Liquid limit less than 50	**Inorganic:**	PI > 7 and plots on or above "A" line [J]		CL	Lean clay [K,L,M]
			PI < 4 or plots below "A" line [J]		ML	Silt [K,L,M]
		Organic:	Liquid limit - oven dried	< 0.75	OL	Organic clay [K,L,M,N]
			Liquid limit - not dried			Organic silt [K,L,M,O]
	Silts and Clays: Liquid limit 50 or more	**Inorganic:**	PI plots on or above "A" line		CH	Fat clay [K,L,M]
			PI plots below "A" line		MH	Elastic Silt [K,L,M]
		Organic:	Liquid limit - oven dried	< 0.75	OH	Organic clay [K,L,M,P]
			Liquid limit - not dried			Organic silt [K,L,M,Q]
Highly organic soils:	Primarily organic matter, dark in color, and organic odor				PT	Peat

[A] Based on the material passing the 3-inch (75-mm) sieve

[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay

[E] $Cu = D_{60}/D_{10}$ $\quad Cc = \dfrac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains ≥ 15% sand, add "with sand" to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H] If fines are organic, add "with organic fines" to group name.

[I] If soil contains ≥ 15% gravel, add "with gravel" to group name.

[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

[L] If soil contains ≥ 30% plus No. 200 predominantly sand, add "sandy" to group name.

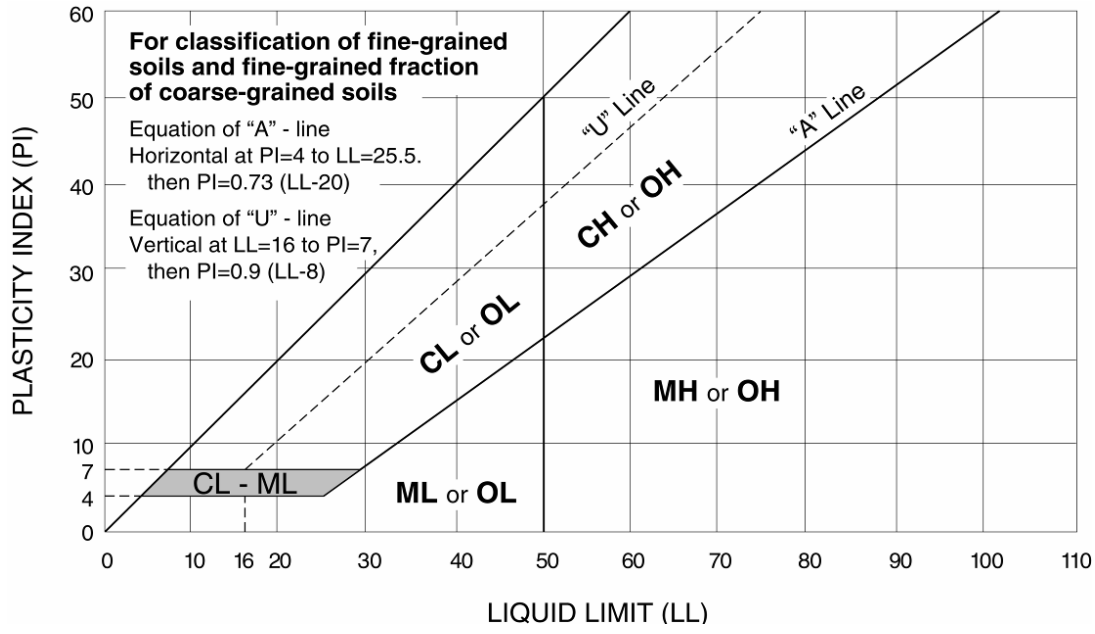
[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.

[N] PI ≥ 4 and plots on or above "A" line.

[O] PI < 4 or plots below "A" line.

[P] PI plots on or above "A" line.

[Q] PI plots below "A" line.



GENERAL NOTES

Description of Rock Properties

WEATHERING

Fresh	Rock fresh, crystals bright, few joints may show slight staining. Rock rings under hammer if crystalline.
Very slight	Rock generally fresh, joints stained, some joints may show thin clay coatings, crystals in broken face show bright. Rock rings under hammer if crystalline.
Slight	Rock generally fresh, joints stained, and discoloration extends into rock up to 1 in. Joints may contain clay. In granitoid rocks some occasional feldspar crystals are dull and discolored. Crystalline rocks ring under hammer.
Moderate	Significant portions of rock show discoloration and weathering effects. In granitoid rocks, most feldspars are dull and discolored; some show clayey. Rock has dull sound under hammer and shows significant loss of strength as compared with fresh rock.
Moderately severe	All rock except quartz discolored or stained. In granitoid rocks, all feldspars dull and discolored and majority show kaolinization. Rock shows severe loss of strength and can be excavated with geologist's pick.
Severe	All rock except quartz discolored or stained. Rock "fabric" clear and evident, but reduced in strength to strong soil. In granitoid rocks, all feldspars kaolinized to some extent. Some fragments of strong rock usually left.
Very severe	All rock except quartz discolored or stained. Rock "fabric" discernible, but mass effectively reduced to "soil" with only fragments of strong rock remaining.
Complete	Rock reduced to "soil". Rock "fabric" not discernible or discernible only in small, scattered locations. Quartz may be present as dikes or stringers.

HARDNESS (for engineering description of rock – not to be confused with Moh's scale for minerals)

Very hard	Cannot be scratched with knife or sharp pick. Breaking of hand specimens requires several hard blows of geologist's pick.
Hard	Can be scratched with knife or pick only with difficulty. Hard blow of hammer required to detach hand specimen.
Moderately hard	Can be scratched with knife or pick. Gouges or grooves to ¼ in. deep can be excavated by hard blow of point of a geologist's pick. Hand specimens can be detached by moderate blow.
Medium	Can be grooved or gouged 1/16 in. deep by firm pressure on knife or pick point. Can be excavated in small chips to pieces about 1-in. maximum size by hard blows of the point of a geologist's pick.
Soft	Can be gouged or grooved readily with knife or pick point. Can be excavated in chips to pieces several inches in size by moderate blows of a pick point. Small thin pieces can be broken by finger pressure.
Very soft	Can be carved with knife. Can be excavated readily with point of pick. Pieces 1-in. or more in thickness can be broken with finger pressure. Can be scratched readily by fingernail.

Joint, Bedding, and Foliation Spacing in Rock [a]		
Spacing	**Joints**	**Bedding/Foliation**
Less than 2 in.	Very close	Very thin
2 in. – 1 ft.	Close	Thin
1 ft. – 3 ft.	Moderately close	Medium
3 ft. – 10 ft.	Wide	Thick
More than 10 ft.	Very wide	Very thick

a. Spacing refers to the distance normal to the planes, of the described feature, which are parallel to each other or nearly so.

Rock Quality Designator (RQD) a	
RQD, as a percentage	**Diagnostic description**
Exceeding 90	Excellent
90 – 75	Good
75 – 50	Fair
50 – 25	Poor
Less than 25	Very poor

a. RQD (given as a percentage) = length of core in pieces 4 in. and longer/length of run.

Joint Openness Descriptors	
Openness	**Descriptor**
No Visible Separation	Tight
Less than 1/32 in.	Slightly Open
1/32 to 1/8 in.	Moderately Open
1/8 to 3/8 in.	Open
3/8 in. to 0.1 ft.	Moderately Wide
Greater than 0.1 ft.	Wide

References: American Society of Civil Engineers. Manuals and Reports on Engineering Practice - No. 56. Subsurface Investigation for Design and Construction of Foundations of Buildings. New York: American Society of Civil Engineers, 1976. U.S. Department of the Interior, Bureau of Reclamation, Engineering Geology Field Manual.

APPENDIX B: WETLANDS REPORT

WATERS OF THE UNITED STATES REPORT

FOR THE
BEAR LAKE MARINA EXPANSION PROJECT

Sections 9 & 16, Township 14North, Range 5 East

RICH COUNTY, UTAH

Prepared for:

JUB Engineers
1047 South 100 West, Suite 180
Logan, UT 84321

Prepared by:

145 West 100 South
Wellsville, Utah 84339
(435) 554-8465

December 2015

Table of Contents

SECTION
1.0 INTRODUCTION

1.1 Project Description

The State of Utah plans to expand their existing marina on the west shore of Bear Lake just north of Garden City, Utah. This expansion will double the number of boat slips and significantly increase the amount of parking.

1.2 Project Location

This project is located in Rich County, Utah along the shoreline of Bear Lake. The site can be accessed from Bear Lake State Park located at 1030 North Bear Lake Blvd just north of Garden City. It is situated within Sections 9 & 16, Township 14N, Range 5E. See figure 1 for a USGS map of the location.

Figure 1

0 1 2 4 6 8 Miles

envirocentric design

Bear Lake State Park
Marina Expansion - Programming
DFCM Project # 15126510
Rich County, Utah

Legend

Project Location

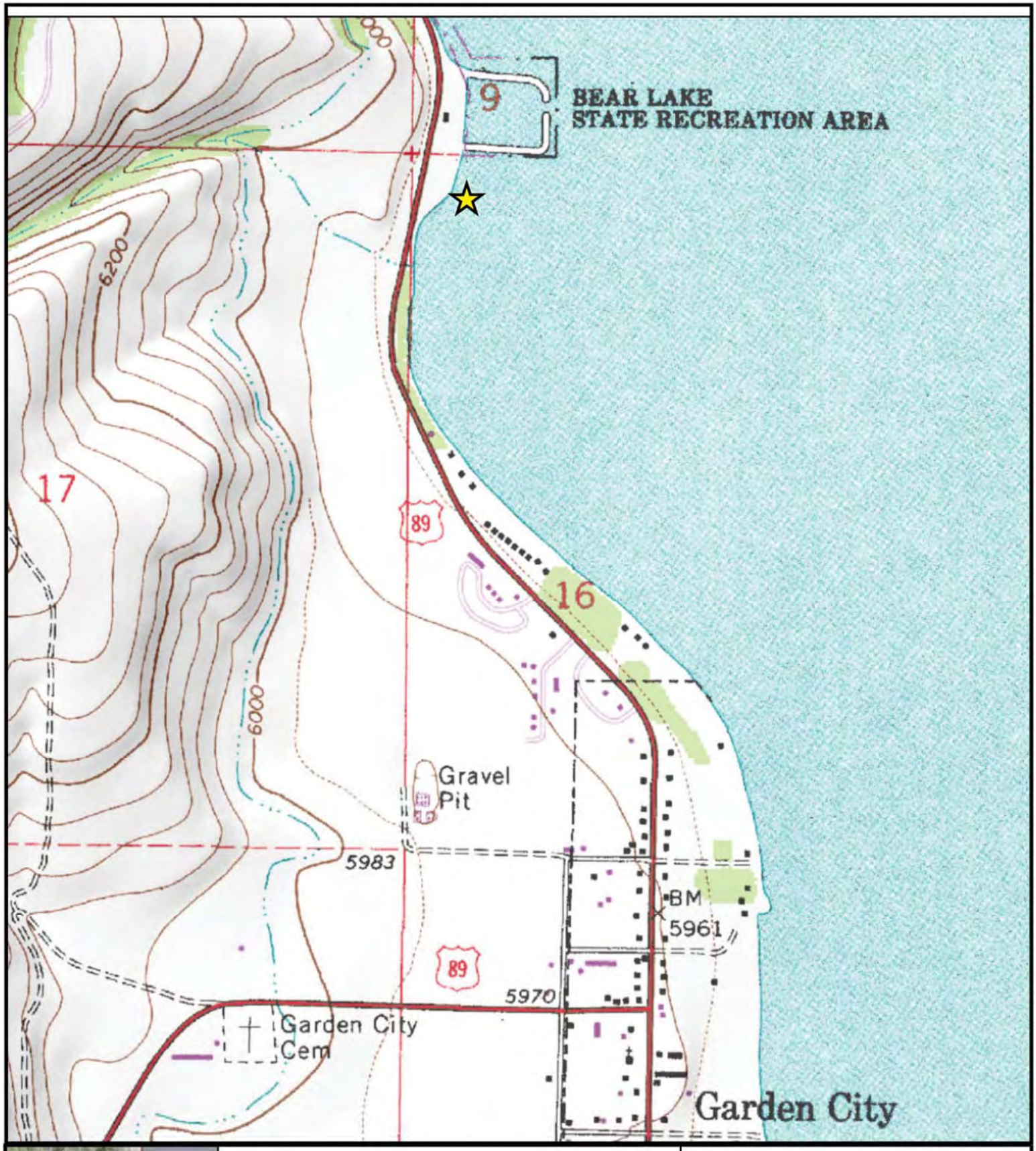


Figure 2

0 250 500 1,000 1,500 2,000 Feet

1" = 1,000' NAD 1983, Zone 12 N

Legend

Project Location

envirocentric design

Bear Lake State Park
Marina Expansion - Programming
DFCM Project # 15126510
Rich County, Utah

Figure 3

0 125 250 500 750 1,000 Feet

1" = 500' NAD 1983, Zone 12 N

Legend

Project Boundary

envirocentric design

Bear Lake State Park
Marina Expansion - Programming
DFCM Project # 15126510
Rich County, Utah

SECTION
2.0 REGULATORY SETTING

2.1 Federal

2.1.1 Clean Water Act – Section 404

Pursuant to Section 404 of the Clean Water Act (CWA), the USACE regulates the discharge of dredge and/or fill material into waters of the United States. Section 404 requires that any person proposing an activity that would discharge these materials must first obtain a permit from the USACE. For discharges proposed in the Project region, Section 404 Permits are issued by the USACE's Sacramento District. The CWA stipulates that the USACE may not issue a Section 404 Permit if the proposed activity would be contrary to the public interest or would cause substantial degradation of the nation's waters, or if a less environmentally damaging practicable alternative exists.

Waters of the U.S. generally include navigable waterways and wetlands adjacent to navigable waterways, non-navigable tributaries to navigable waterways, and wetlands adjacent to non-navigable waters that are contiguous with navigable waterways. Regulatory definitions of wetlands and waters of the U.S., as well as recent Supreme Court decisions affecting the interpretation of those definitions, are discussed below.

2.1.1.1 Waters of the United States Defined

The term "waters of the U.S." is defined in regulations promulgated by the USACE under the authority of the CWA (see 33 CFR Part 328) and typically includes all navigable waters (including all waters subject to the ebb and flow of the tide); all interstate waters and wetlands; all impoundments of waters mentioned above; all tributaries to waters mentioned above; the territorial seas; and, all wetlands adjacent to waters mentioned above. However, recent Supreme Court decisions have curtailed CWA jurisdiction in some cases, as described in Section 2.1.1.2 below. In water bodies lacking adjacent wetlands, the lateral extent of the USACE's jurisdiction is bounded by Ordinary High Water Mark (OHWM). The OHWM is defined at 33 CFR 328.3(e) as "that line on the shore established by the fluctuations of water and indicated by physical characteristics such as a clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas." Where adjacent wetlands are present (see Section 2.1.1.3), CWA jurisdiction extends laterally to the landward edge of the adjacent wetlands. The upstream/downstream limit of CWA jurisdiction is the point beyond which the OHWM is no longer perceptible.

2.1.1.2 Wetlands Defined

Wetlands are defined in USACE regulations at 33 CFR 328.3(b) as "those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions." In 1987, the USACE published the Corps of Engineers Wetland Delineation Manual (Environmental Laboratory 1987; Wetland Delineation Manual) to guide its field personnel in determining jurisdictional wetland boundaries. In 2008, the USACE published the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (USACE 2008; Arid West Regional Supplement) to complement the Wetland Delineation Manual in the southwestern U.S. The methods set forth in the Wetland Delineation Manual and the Arid West Regional Supplement involves the delineation of wetlands based on the presence of three wetland parameters: a predominance of hydrophytic vegetation; wetland hydrology; and hydric soils. These wetland parameters are discussed in greater detail below.

2.1.1.2.1 Hydrophytic Vegetation

A site is considered to have a "predominance of hydrophytic vegetation" when 50 percent or more of the dominant plant species are classified as Obligate Wetland, Facultative Wetland, or Facultative according to the National List of Plant Species That Occur in Wetlands (Reed 1988). Hydrophytic vegetation can also be demonstrated using a different mathematical equation called the "Prevalence Index," as described in the Arid West Regional Supplement.

2.1.1.2.2 Hydric Soils

A hydric soil is defined by the National Technical Committee for Hydric Soils (NTCHS) as "a soil that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part" (USDA-NRCS 1994). A hydric soil may be drained or undrained, and a drained hydric soil may not continue to support hydrophytic vegetation yet still retain the appearance of a hydric soil. The Wetland Delineation Manual and Arid West Regional Supplement describe visual and textural indicators of hydric soils used in the field to determine the presence of hydric soils. In most situations, only one of these indicators is required to make a positive determination.

2.1.1.2.3 Wetland Hydrology

Wetlands are characterized by various hydrologic regimes that range from permanently inundated to irregularly inundated or saturated. In other words, some wetlands are always wet while other wetlands may contain water during only part of the year. For an area to have "wetland hydrology," as defined in the Wetland Delineation Manual, the area must be "inundated or saturated to the surface for at least five percent of the growing season in most years." In the Arid West Region, the minimum threshold for wetland hydrology under most circumstances is 14 or more consecutive days of flooding or ponding, or a water table 12

inches or less below the soil surface, during the growing season at a minimum frequency of 5 years in 10. The Wetland Delineation Manual and Arid West Regional Supplement describe visual indicators of wetland hydrology used in the field to determine the presence of wetland hydrology. Where either a single primary indicator or two secondary indicators are observed, a positive determination for wetland hydrology is made.

SECTION
3.0 STUDY METHODS

Waters of the U.S. within the project site were delineated using a combination of desktop literature review and field mapping methods.

3.1 Delineation Of Waters Of The United States

A formal wetland delineation and jurisdictional determination of waters of the U.S. was performed on the Project site on June 18th and 19th, 2015. The methods used during the field surveys are described below. The field delineations were conducted by Envirocentric Design Wetland Scientist Danny White and in accordance with the United States Army Corps of Engineers 1988 Wetland Delineation Manual and the current Arid West Regional Supplement.

3.1.1 Delineation Approach

Initially, scientists walked the project area to determine if atypical conditions existed and to determine the homogeneity of the vegetation communities. Once it was confirmed that plant communities were relatively homogeneous it was determined that a simple routine approach would be appropriate.

Once the approach was selected, scientists chose representative datapoints for each plant community (pairs of datapoints were collected for each community to illustrate variations in wetland/upland boundaries) to collect detailed information on the following:

1. Characterized each community by visually identifying dominants vegetation in each stratum.
    a. Record indicator status of dominants.
    b. Determine the presence of hydrophytic vegetation.
    c. Apply wetland hydrology indicators.
2. Prepared soil pits to a depth sufficient to determine hydric condition.
    a. Record horizon color and depth.
    b. Identify presence of redoximorphic features.
    c. Record soil texture.
    d. Apply hydric soil indicators
3. Determine presence of wetland hydrology.
    a. Apply wetland hydrology indicators.
4. Make wetland determination and delineate wetland/upland boundary.

SECTION
4.0 LITERATURE REVIEW

Results of the wetland delineation and jurisdictional determination are presented below. An overview of the site's vegetation, hydrology, and soils is presented, followed by a description of the jurisdictional areas identified during the delineation.

4.1 Site Overview

This section provides an overview of the existing vegetation, soils, and hydrology within the project site, to provide a context within which to understand the delineation results.

4.1.1 Vegetation

The project site is located in the Bear Lake Valley along the shoreline of Bear Lake in Northern Utah. A wide range of vegetation was observed along the shoreline, with dominant species including: *Acer grandidentatum, Betula occidentalis, Elaeagnus angustifolia, Calamagrastis* canadensis, *Eleocharis palustris, Hordeum jubatum, Juncus alpinus, Juncus arcticus, Juncus effuses, Panicum capillare, Phalaris arundinacea, Phragmites australis, Schoenoplectus americanus,Salix spp.,* and *Typha latifolia.*

4.1.2 Soils

The descriptions of the soils below are abridged from the USDA-NRCS Official Soil Series Description database (USDANRCS 2015) and reflect characteristics of the soils as series, not specific characteristics of the project site. See **Figure 4** for a map of the soil types.

4.1.2.1 Sc - Saleratus Variant-Canburn Variant Complex Series

Saleratus variant-Canburn variant complex can be found along the shores of Bear Lake. Slopes are generally from 0 to 2 percent. Elevation is 5,925 to 5,950 feet. The average annual precipitation is about 12 to 14 inches, the mean annual air temperature is 42 to 44 degrees F, and the average freeze-free season is 85 to 90 days. This soil unit is 45 percent Saleratus Variant loamy fine sand and 45 percent Canburn Variant loamy sand. The Saleratus Variant soil is very deep and somewhat poorly drained. It formed in beach deposits derived from mixed parent material. Slopes are short to medium in length and are convex. The present vegetation is mainly wiregrass, jointgrass, and Kentucky bluegrass. Typically, the surface layer of the Saleratus Variant soil is brown loamy fine sand about 3 inches thick. The underlying material to a depth of 60 inches or more ranges from brown fine sand to gravelly coarse sand. Permeability of the Saleratus Variant soil is rapid.

The Canburn Variant soil is very deep and somewhat poorly drained. It formed in beach deposits derived from mixed parent material. Slopes are short to medium in length and are concave. The present vegetation is mainly water birch, willows, broadleaf sedges, wiregrass, and cottonwood. Typically, the surface layer of the Canburn Variant soil is very dark brown loamy sand about 18 inches thick. The upper 7 inches of the underlying material is gray loamy sand, and the lower part to a depth of 60 inches or more is brown loamy fine sand. Permeability of the Canburn Variant soil is rapid. Available water capacity is about 4.5 to 5.5 inches. Effective rooting depth is limited by a seasonal high water table that is at a depth of 12 to 24 inches from May to July. Runoff is very slow, and the hazard of water erosion is slight. This soil is subject to occasional periods of flooding in spring.

4.1.2.2 HBD – Hawkins silty loam, 6 to 25 percent slopes

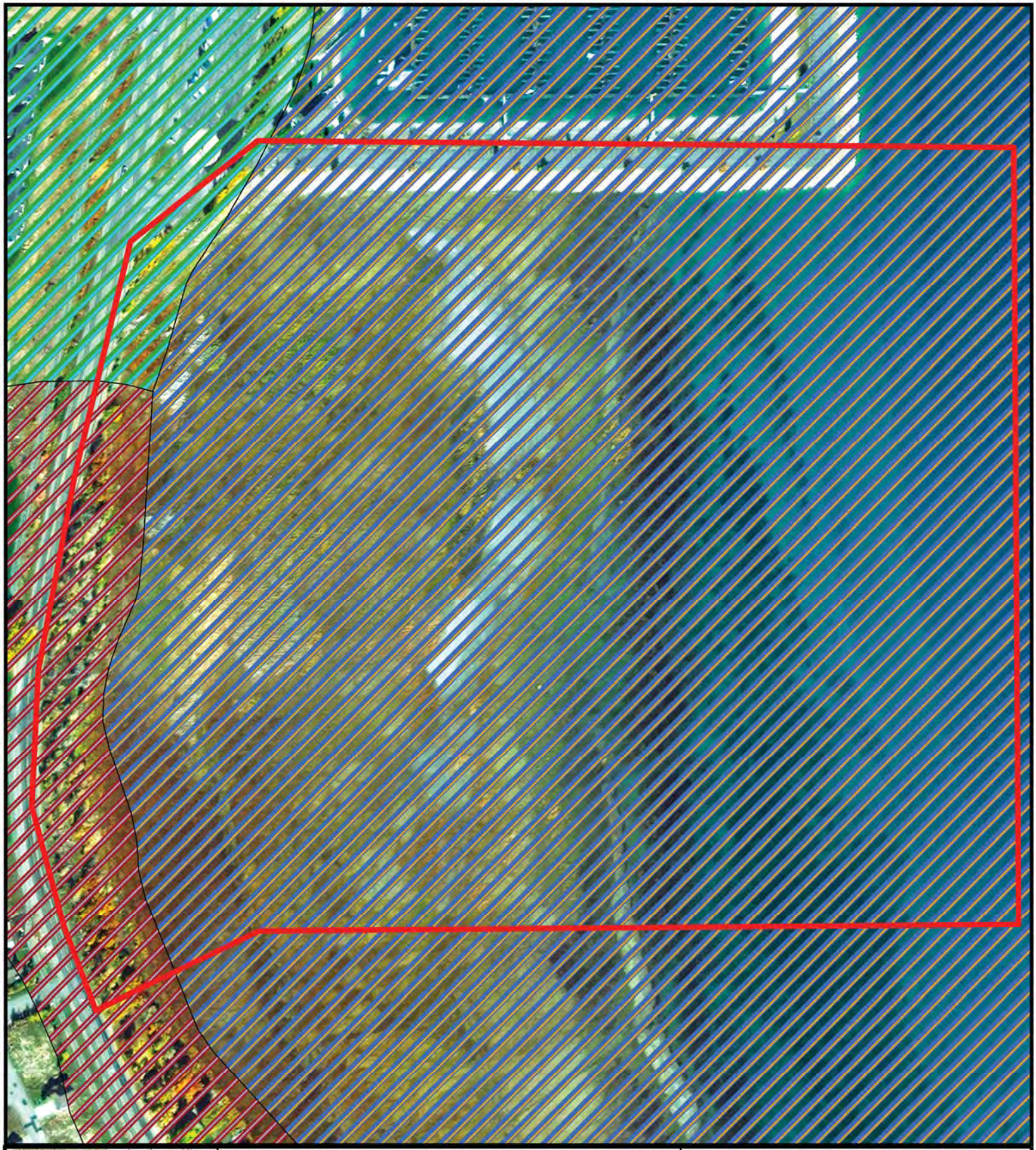
This very deep, well-drained soil is on mountainsides south and west of Bear Lake. It formed in alluvium and colluvium that are derived dominantly from tuffaceous material and are high in content of volcanic ash. Slopes are long and convex or concave. They face north, east, and south. The present vegetation is mainly big sagebrush, slender wheatgrass, Sandberg bluegrass, and antelope bitterbrush. Elevation is 6,000 to 7,500 feet. The average annual precipitation is about 16 to 24 inches, the mean annual air temperature is 37 to 43 degrees F, and the average freeze-free season is 70 to 85 days.

Typically, the surface layer is very dark grayish brown silty clay loam about 10 inches thick. The subsoil is dark grayish brown clay about 17 inches thick. The substratum to a depth of 60 inches or more is light brownish gray silty clay loam. Cracks extend to a depth of 30 to 40 inches late in summer. They are at least 1 centimeter wide at a depth of 20 inches. Permeability of this Hawkins soil is slow. Available water capacity is about 1 0 to 11 inches. Water supplying capacity is 12 to 19 inches. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

Most areas of this unit are used as rangeland and for wildlife habitat. A few areas are used for homesite development. The potential plant community on this unit is mainly slender wheatgrass, bluebunch wheatgrass, western wheatgrass, and Idaho fescue. The suitability of the unit for rangeland seeding is good.

4.1.3 Hydrology

According to the United States Geological Survey's National Hydrography Dadaset the project falls within the Garden City Canyon-Frontal watershed. Both of these watersheds flow towards Bear Lake. Bear Lake receives the majority of its hydrologic input from a system of canals and pumps which connect the lake to the Bear River. Onsite drainages originate offsite (west) in the Bear River Mountain Range and convey flows downstream and through springs toward Bear Lake.



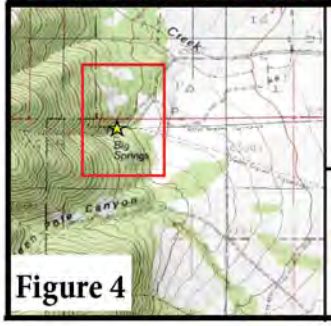


Figure 4

0 62.5125 250 375 500 Feet

1" = 250' NAD 1983, Zone 12 N

envirocentric design

Bear Lake State Park
Marina Expansion - Programming
DFCM Project # 15126510
Rich County, Utah

Legend

- Project Boundary
- HBD
- SC
- W

SECTION
5.0 DELINEATION RESULTS

5.1 Determination Results

Figure 5 provides a delineation of Wetland/Upland boundaries as well as locations of datapoints. The attached figure also shows where wetland delineation forms were completed per the Army Corps of Engineers 1987 Wetland Delineation Manual incorporating the Arid West Supplement.

Completed wetland determination data forms are included in **Appendix A**. **Appendix B** contains a list of plant species (common and scientific names) found within the study area.

Fieldwork determined that 58.47 acres of the survey area is wetland and 5.07 acres of upland. Dominant vegetation found throughout the project area was broken into four wetland classifications and one upland classification (Table 1) and described in **section 5.2 and 5.3** of this report. Additionally, there was a significant amount of lakebed found within the project area which contained less than 5% aquatic vegetation.

Table 1. Classification of Wetland/Upland
Bear Lake State Park New Marina Expansion – Programming

Classification	Area	Datapoint #'s
Wetlands		
Emergent Marsh	0.182 AC	11
Wet Meadow	17.99 AC	1, 2, 5, 6, 7, 8, 10, and 14
Phragmites	3.18 AC	
Lakebed	37.12 AC	
Uplands		
Upland	5.07 AC	3, 4, 9, 12, and 13

5.2 Wetlands

The study area wetlands were grouped into four categories based on its dominant vegetation.

Emergent Marsh

General Description. Emergent marsh vegetation was observed primarily adjacent to the shoreline in areas with concave slopes. Additionally, these sites received a perinnial flow of water from springs or other natural features in upland areas. The dominant species consisted *of Schoenoplectus acutus, Schoenoplectus americanus,* and *Typha latifolia.*

Soils and Hydrology. Soils within the emergent marsh wetlands were observed at sample point BLM_11 and consisted of a sapric organic soil extending at least 14" below the soil surface. Hydrogen sulfide was detected in the upper 6" of the soil horizon. Saturation was present at the soil surface and the water table was at 9" from the soil surface. Although no data was collected within emergent marsh

wetlands on the lakebed, observations made by Envirocentric Design for the Bear Lake Improvement Project indicate that the following conditions can be expected:

> Soils are dominated by a sandy gleyed matrix which typically starts within the first 2"-3" of the soil surface and extended down to the depth of pit which in most cases was 24". Surface water can be found in small pools in most of the emergent marsh wetlands. Additionally, a water table is typically found within 10" of the soil surface with the majority of the emergent marsh having a water table to the surface.

NWI Codes. The NWI codes for freshwater emergent wetlands are:

- PEM1B (palustrine, emergent, persistent wetlands, saturated)

Wet meadow

General Description. Vegetation within the wet meadow was very diverse, with dominant species including *Calamagrastis canadensis*, *Eleocharis palustris*, *Hordeum jubatum*, *Juncus alpinus*, *Juncus arcticus*, *Juncus effuses*, *Panicum capillare*, *Phalaris arundinacea*, and *Schoenoplectus americanus.* Wet meadow vegetation was observed in a variety of locations along the shore, but was typically found in areas with a flat to slightly concave slope. However, there were instances where wet meadow vegetation was observed on slightly convex slopes; these areas tended to have no surface water and dominant vegetation that was facultative or dryer.

Soils and Hydrology. Soils in the wet meadow were as varied as the vegetation, which ranged from a very fine sandy loam, to clay and muck. The color of the soil was also diverse; consisting of 5 YR, 7.5 YR, 10 YR, 2.5 Y, and Gley1. Redoximorphic concentrations were found in the matrix and pore linings in most of the soil samples and were typically 5% or greater in abundance. With the exception of a few areas with convex slopes, soils saturation and water table could be found within the upper 12" of the soil surface

NWI Codes. The NWI codes for freshwater emergent wetlands are:

- PEM1A (palustrine, emergent, persistent wetlands, temporarily flooded)
- PEM1E (palustrine, emergent, persistent wetlands, seasonally flooded/saturated)

Phragmites

General Description. Although stands of Phragmites had been recently sprayed and killed, new starts of actively growing vegetation consisting primarily of Phragmites australis was observed within the these previously sprayed stands.

Soils and Hydrology. No soil pits were dug in Phragmites wetlands. However, the following description is typical for the west shore of Bear Lake. Soil textures tend to be sandy – very fine sandy loam texture. Redoximorphic concentrations are frequently observed in the pore linings starting at 4" below the soil surface. The water table can typically be found within 15" of the soil surface.

NWI Codes. The NWI codes for freshwater emergent wetlands are:

- PEM3A (palustrine, emergent, phragmites australis, temporarily flooded)

Lakebed

General Description. The lakebed classification was given to areas that had less than 5% coverage of aquatic vegetation. Lakebed was primarily found between the other wetland types described above and the waterline of Bear Lake at the time field work was performed. This classification was also given to the rip-rap berms adjacent to the existing marina in areas that extended below the Historic High Watermark.

Soils and Hydrology. Soils within the lakebed had a sandy – sandy loam texture. Almost all of the lakebed was inundated with water at the time of the site visit.

NWI Codes. The NWI codes for lakebed wetlands are:

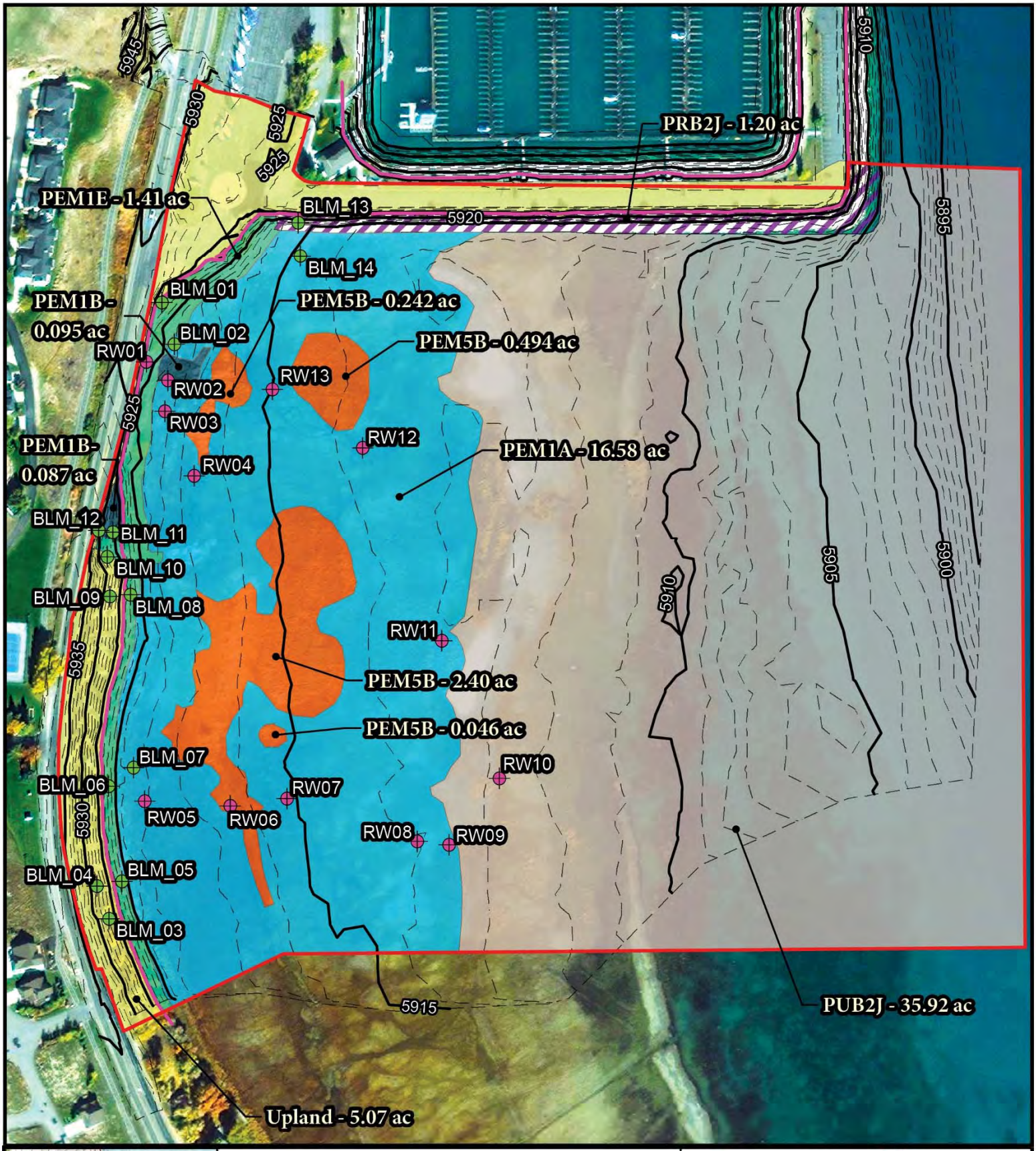
- PUB2J (palustrine, unconsolidated bottom, sand, intermittently flooded)
- PRB2J (palustrine, rock bottom, rubble, intermittently flooded)

5.3 Uplands

Upland

General Description. Uplands were found within a narrow band that extended from the south west portion of the project up to the marina and then along the upper portion of the marina's berm. Uplands were only found in areas above the Historic High Watermark. The uplands found along the southwestern portion of the project, adjacent to Bear Lake Blvd, dominant vegetation consisted of *Acer grandidentatum, Calamagrastis canadensis, Equisetum laevitatum, Poa pratensis, Rosa woodsii,* and *Salix spp..* The uplands found along the northwestern portion of the project and along the marina's berm were very sparsely vegetated consisting of *Bromus tectorum, Medicago lupulina,* and *Thinopyrum intermedium*.

Soils and Hydrology. Soils within the upland were typified by a loam – to sandy loam texture. No hydric soil or wetland hydrology indicators were observed in the uplands.



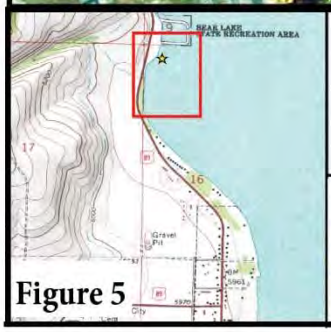


Figure 5

0 125 250 500 Feet

1" = 250' NAD 1983, Zone 12 N

JD Data Point
Wetland Photopoints
Survey Area
Historic HWM
PEM1A=16.58 ac
PEM1B=0.182 ac
PEM1E=1.41 ac
PEM5B=3.18 ac
PRB2J=1.20 ac
PUB2J=35.92 ac
Upland=5.07 ac

envirocentric design

Bear Lake State Park
Marina Expansion - Programming
DFCM Project # 15126510
Rich County, Utah

Date Prepared: 11/30/2015
Image Source: Appolo Mapping, 10/23/2013

SECTION
6.0 CONCLUSIONS

Bear Lake is a highly dynamic waterbody whose surface elevation is dependent upon a number of natural and anthropogenic factors. The two primary factors controlling its water level are winter precipitation with its associated spring runoff and the use of the lake as a reservoir for the irrigation of downstream properties. During years of high precipitation the lake will fill to near capacity inundating wetlands along the shoreline significantly impacting the composition and distribution of wetlands. When the water is pumped out of the lake for irrigation the water recedes and the aquatic vegetation migrates with the waterline.

APPENDIX A

WETLAND DETERMINATION DATA FORM – Arid West Region

e: Bear Lake Marina Expansion City/County: Rich County Sampling Date: 6/18/205

ant/Owner: State of Utah State: UT Sampling Point: BLM01

Investigator(s): Danny White Section, Township, Range: S:9&16, T:14N, R:5E

Landform (hillslope, terrace, etc.): Lake bed Local relief (concave, convex, none): Flat Slope (%): 1

Subregion (LRR): Lat: Long: Datum:

Soil Map Unit Name: NWI classification: PEMIE

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation N, Soil N, or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes X No

Are Vegetation N, Soil Y, or Hydrology Y naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No	**Is the Sampled Area within a Wetland?** Yes X No
Hydric Soil Present?	Yes X No	
Wetland Hydrology Present?	Yes X No	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size:)			
1. Betula occidentalis	15	Y	FACW
2. Elaeagnus angustifolia	1		FACU
3. Chrysothamnus nauseosus	3		UPL
4.			
5.			
	19 = Total Cover		
Herb Stratum (Plot size:)			
1. Phalaris arundinacea	20	Y	FACW
2. Mentzelia laevicaulis	2		UPL
3. Poa pratensis	20	Y	FAC
4. Medicago lupulina	25	Y	FAC
5. Asclepias speciosa	3		FAC
6. Cynoglossum officinale	15		FACU
7.			
8.			
	83 = Total Cover		
Woody Vine Stratum (Plot size:)			
1.			
2.			
	= Total Cover		

% Bare Ground in Herb Stratum % Cover of Biotic Crust

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%

__ Prevalence Index is ≤3.0[1]

__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No

Remarks:

SOIL

Sampling Point: BLM01

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-5	10YR 5/2	85	5YR 4/6	5	C	M	LSa	
~~5-9~~			10YR 2/2	10	D	M		
5-14	10YR 5/2	90	10YR 2/2	10	D	M	SaL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- X Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- X Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): _____

Water Table Present? Yes ___ No X Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): _____

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Bear Lake Marina Expansion City/County: Rich County Sampling Date: 6/16/2015
Applicant/Owner: State of Utah State: UT Sampling Point: BLM02
Investigator(s): Danny White Section, Township, Range: S: 9&16, T: 14N, R5E
Landform (hillslope, terrace, etc.): Lakebed Local relief (concave, convex, none): Flat Slope (%): 1
Subregion (LRR): Lat: Long: Datum:
Soil Map Unit Name: NWI classification: PEMIA
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)
Are Vegetation N, Soil N, or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes X No
Are Vegetation N, Soil Y, or Hydrology Y naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes X No
Hydric Soil Present? Yes X No
Wetland Hydrology Present? Yes X No

Is the Sampled Area within a Wetland? Yes X No

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size:)			
1. Eleocharis palustris	90	Y	OBL
2. Phragmites australis	3		FACW
3. Typha latifolia	2		OBL
4. Juncus arcticus	2		FACW
5.			
6.			
7.			
8.			
	97 = Total Cover		
Woody Vine Stratum (Plot size:)			
1.			
2.			
	= Total Cover		

% Bare Ground in Herb Stratum % Cover of Biotic Crust

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)
Total Number of Dominant Species Across All Strata: 1 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:
X Dominance Test is >50%
__ Prevalence Index is ≤3.0[1]
__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No

Remarks:

SOIL

Sampling Point: BLM92

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR3/2	100					SaL	
4-10	Gley1 7/10Y6	98	10YR5/6	2	C	PL	C	
10-15	Gley1 6/N	50					C	
	5YR 6/2	50					C	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- X Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- X Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- X Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes X No ___ Depth (inches): 1

Water Table Present? Yes X No ___ Depth (inches): 0

Saturation Present? (includes capillary fringe) Yes X No ___ Depth (inches): 0

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Bear Lake Marina Expansion City/County: Rich County Sampling Date: 6/16/15
Applicant/Owner: State of Utah State: UT Sampling Point: BLM03
Investigator(s): Danny White Section, Township, Range:
Landform (hillslope, terrace, etc.): ~~Eroded~~ Hillslope Local relief (concave, convex, none): Convex Slope (%): 2
Subregion (LRR): Lat: Long: Datum:
Soil Map Unit Name: NWI classification:
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)
Are Vegetation N, Soil N, or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes No X
Are Vegetation N, Soil N, or Hydrology N naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No	**Is the Sampled Area within a Wetland?** Yes No X
Hydric Soil Present?	Yes No X	
Wetland Hydrology Present?	Yes No X	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1. Betula occidentalis	50	Y	FACW
2.			
3.			
4.			
	50 = Total Cover		
Sapling/Shrub Stratum (Plot size:)			
1. Betula occidentalis	10	Y	FACW
2. Rosa woodsii	20	Y	FACU
3.			
4.			
5.			
	30 = Total Cover		
Herb Stratum (Plot size:)			
1. Poa pratensis	25	Y	FAC
2. Equisetum laevitatum	15	Y	FACW
3. Cynoglossum officinale	15	Y	FACU
4. ~~Cynoglossum officinale~~	3		
5. Calamagrostis canadensis	5		FACW
6. Chamerion angustifolium	3		FACU
7.			
8.			
	66 = Total Cover		
Woody Vine Stratum (Plot size:)			
1.			
2.			
	= Total Cover		

% Bare Ground in Herb Stratum % Cover of Biotic Crust

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)
Total Number of Dominant Species Across All Strata: 6 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 66.6 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:
X Dominance Test is >50%
__ Prevalence Index is ≤3.0[1]
__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No

Remarks:

SOIL

Sampling Point: BLM03

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-16	10YR2/1	100					L	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (inches): _____

Water Table Present? Yes _____ No _____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): _____

Wetland Hydrology Present? Yes _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Bear Lake Marina Expansion City/County: Rich County Sampling Date: 6/18/15

Applicant/Owner: State of Utah State: Ut Sampling Point: BLM04

Investigator(s): Danny White Section, Township, Range: _____

Landform (hillslope, terrace, etc.): ~~Lakebed~~ Hillslope Local relief (concave, convex, none): Convex Slope (%): 2

Subregion (LRR): _____ Lat: _____ Long: _____ Datum: _____

Soil Map Unit Name: _____ NWI classification: Upland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes _____ No X (If no, explain in Remarks.)

Are Vegetation N, Soil N, or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation N, Soil N, or Hydrology N naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____ No _____	**Is the Sampled Area within a Wetland?** Yes _____ No X
Hydric Soil Present?	Yes _____ No X	
Wetland Hydrology Present?	Yes _____ No X	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1. Salix spp.	5		
2.			
3.			
4.			
	_____ = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1. Rosa Woodsii	10	Y	FACU
2. Salix spp.	10		
3.			
4.			
5. Mahonia repens	2		UPL
	22 = Total Cover		
Herb Stratum (Plot size: _____)			
1. Po. pratensis	25	Y	FAC
2. Calamagrostis canadensis	15		FACW
3. Equisetum laevigatum	25	Y	FACW
4. Equisetum palustris	5		OBL
5. Cynoglossum officinale	5		FACU
6. Phalaris arundinacea	4		FACW
7. Cardaria draba	5		UPL
8.			
	64 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum _____ % Cover of Biotic Crust _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 63.3 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species _____	x 1 =	_____
FACW species _____	x 2 =	_____
FAC species _____	x 3 =	_____
FACU species _____	x 4 =	_____
UPL species _____	x 5 =	_____
Column Totals: _____ (A)		_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%

__ Prevalence Index is ≤3.0[1]

__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No _____

Remarks:

SOIL

Sampling Point: BLM04

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-18	10YR 2/1						LS	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ____ No X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ____ No ____ Depth (inches): _____

Water Table Present? Yes ____ No ____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ____ No ____ Depth (inches): _____

Wetland Hydrology Present? Yes ____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Bear Lake Marina Expansion City/County: Rich County Sampling Date: 6/18/2016
Applicant/Owner: State of Utah State: UT Sampling Point: BLMOS
Investigator(s): Danny White Section, Township, Range: S19 & 16, T14N, R5E
Landform (hillslope, terrace, etc.): Lakebed Local relief (concave, convex, none): Flat Slope (%): 1
Subregion (LRR): Lat: Long: Datum:
Soil Map Unit Name: NWI classification: PEMIE
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)
Are Vegetation N, Soil N, or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes X No
Are Vegetation N, Soil Y, or Hydrology Y naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No	**Is the Sampled Area within a Wetland?** Yes X No
Hydric Soil Present?	Yes X No	
Wetland Hydrology Present?	Yes X No	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size:)			
1. Salix spp.	10	Y	
2. Betula occidentalis	3		FACW
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size:)			
1. Equisetum laevigatum	60	Y	OBL
2. Equisetum palustris	15		FACW
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		
Woody Vine Stratum (Plot size:)			
1.			
2.			
	= Total Cover		

% Bare Ground in Herb Stratum % Cover of Biotic Crust

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)
Total Number of Dominant Species Across All Strata: 1 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:
X Dominance Test is >50%
__ Prevalence Index is ≤3.0[1]
__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No

Remarks:

SOIL

Sampling Point: BLM05

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-16	10YR 5/2	95	7.5YR 5/6	5	C	M	Sg	
16-20	10YR 5/2	90	5YR 5/6	10	C	M	Fsg	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- X Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- X Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): _____

Water Table Present? Yes ___ No X Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): _____

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

At time of field visit sand was moist within the upper 12" of the soil surface.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Bear Lake Marina Exp. City/County: Rich Sampling Date: 6/18/15
Applicant/Owner: State of Utah State: Ut Sampling Point: BLM 06
Investigator(s): Danny White Section, Township, Range:
Landform (hillslope, terrace, etc.): Lakebed Local relief (concave, convex, none): slight concave Slope (%): 10
Subregion (LRR): Lat: Long: Datum:
Soil Map Unit Name: NWI classification: PEMIE
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)
Are Vegetation N, Soil N, or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes X No
Are Vegetation N, Soil N, or Hydrology N naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No	**Is the Sampled Area within a Wetland?** Yes X No
Hydric Soil Present?	Yes X No	
Wetland Hydrology Present?	Yes X No	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size:)			
1. Calamagrostis canadensis	60	Y	FACW
2. Equisetum palustris	25	Y	OBL
3. Equisetum laevitatum	15		FACW
4. Juncus articus	3		FACW
5.			
6.			
7.			
8.			
	103 = Total Cover		
Woody Vine Stratum (Plot size:)			
1.			
2.			
	= Total Cover		

% Bare Ground in Herb Stratum % Cover of Biotic Crust

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)
Total Number of Dominant Species Across All Strata: 2 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:
X Dominance Test is >50%
__ Prevalence Index is ≤3.0[1]
__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No

Remarks:

SOIL

Sampling Point: BLM26

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-14	10YR3/1	100					SaL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- X Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No ____

Remarks:

Soils are naturally problematic due to Human induced fluctuations in Lake level.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ____ No X Depth (inches): _____

Water Table Present? Yes ____ No X Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ____ No X Depth (inches): _____

Wetland Hydrology Present? Yes X No ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Bear Lake Marina Exp. City/County: Rich Sampling Date: 6/15/15
Applicant/Owner: Utah State: Ut Sampling Point: BLM07
Investigator(s): Danny White Section, Township, Range:
Landform (hillslope, terrace, etc.): Lakebed Local relief (concave, convex, none): Flat Slope (%): 1
Subregion (LRR): Lat: Long: Datum:
Soil Map Unit Name: NWI classification: PEMIA
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Hydric Soil Present?	Yes X No ____	
Wetland Hydrology Present?	Yes X No ____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: ____)			
1. Willow sp	2		
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: ____)			
1. Juncus articus	5		FW
2. Schoenoplectus acutus	10		OBL
3. Potentilla spp.	5		
4. Juncus articulatis	10		
5. Calamagrostis canadensis	2		FW
6. Equisetum palustris	3		OBL
7. Eleocharis palustris	70	Y	FW
8. Schoenoplectus americanus	3		
	105 = Total Cover		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	= Total Cover		

% Bare Ground in Herb Stratum ____ % Cover of Biotic Crust ____

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)
Total Number of Dominant Species Across All Strata: 1 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species ____	x 1 = ____
FACW species ____	x 2 = ____
FAC species ____	x 3 = ____
FACU species ____	x 4 = ____
UPL species ____	x 5 = ____
Column Totals: ____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:
__ Dominance Test is >50%
__ Prevalence Index is ≤3.0[1]
__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks:

SOIL

Sampling Point: C2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-3	10YR 5/1	90	7.5YR 4/6	10	C	M	LSa	
3-9	10YR 4/1	96	10YR 5/6	2	C	M	SaL	
9-19	10YR 4/1	97	10YR 5/6	3	C	PL	LSa	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- X Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No _____

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- X Hydrogen Sulfide Odor (C1)
- X Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No X Depth (inches): _____

Water Table Present? Yes X No _____ Depth (inches): 4"

Saturation Present? (includes capillary fringe) Yes X No _____ Depth (inches): 0"

Wetland Hydrology Present? Yes X No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Bear Lake Marina Exp City/County: Rich Sampling Date: 6/16/15

Applicant/Owner: Utah State: UT Sampling Point: BLM02

Investigator(s): Danny White Section, Township, Range:

Landform (hillslope, terrace, etc.): Local relief (concave, convex, none): slight concave Slope (%): 1

Subregion (LRR): Lat: Long: Datum:

Soil Map Unit Name: NWI classification: PEMIE

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No	**Is the Sampled Area within a Wetland?** Yes X No
Hydric Soil Present?	Yes X	No	
Wetland Hydrology Present?	Yes X	No	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size:)			
1. Betula occidentalis	3	Y	FLJ
2. Elaeagnus angustifolia	2	Y	FAC
3.			
4.			
5.			
	5 = Total Cover		
Herb Stratum (Plot size:)			
1. Calamagrostis canadensis	20	Y	FLJ
2. Equisetum palustris	30	Y	OBL
3. Juncus articus	25	Y	FLJ
4. Poa pratensis	15		FAC
5. Equisetum laevitatum	3		FLJ
6.			
7.			
8.			
	93 = Total Cover		
Woody Vine Stratum (Plot size:)			
1.			
2.			
	= Total Cover		

% Bare Ground in Herb Stratum ____ % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 5 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%

__ Prevalence Index is ≤3.0[1]

__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No

Remarks:

SOIL

Sampling Point: 08

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-3	10YR 3/1	100					CL	
3-11	10YR 3/1	100					SaCL	
11-15	10YR 6/1	90	7.5YR 5/6	10				

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- X Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- X Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): _____

Water Table Present? Yes X No ___ Depth (inches): 11"

Saturation Present? (includes capillary fringe) Yes X No ___ Depth (inches): 6"

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Bear Lake Marina Exp. City/County: Rich Sampling Date: 6/16/15
Applicant/Owner: Utah State: UT Sampling Point: PLM 04
Investigator(s): Danny White Section, Township, Range: _____
Landform (hillslope, terrace, etc.): Hillslope Local relief (concave, convex, none): Convex Slope (%): 2
Subregion (LRR): _____ Lat: _____ Long: _____ Datum: _____
Soil Map Unit Name: _____ NWI classification: _____
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)
Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____
Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____ No _____	**Is the Sampled Area within a Wetland?** Yes _____ No X
Hydric Soil Present?	Yes _____ No X	
Wetland Hydrology Present?	Yes _____ No X	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1. Salix spp	30		
2.			
3.			
4.			
	30 = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1. Salix spp.	40		
2. Rosa woodsii	5		FU
3. Acer grandidentatum	20	Y	FU
4.			
5.			
	65 = Total Cover		
Herb Stratum (Plot size: _____)			
1. Poa pratensis	65	Y	FAC
2. Cynoglossum officinale	5		FU
3. Calamagrostis canadensis	3		FU
4.			
5.			
6.			
7.			
8.			
	73 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum _____ % Cover of Biotic Crust _____

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)
Total Number of Dominant Species Across All Strata: 2 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 50 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:
___ Dominance Test is >50%
___ Prevalence Index is ≤3.0[1]
___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes _____ No X

Remarks:

SOIL

Sampling Point: 04

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-15	10YR 2/1	100					L	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (inches): _____

Water Table Present? Yes _____ No _____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): _____

Wetland Hydrology Present? Yes _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Bear Lake Marina Expansion City/County: Rich Sampling Date: _____

Applicant/Owner: Utah State: UT Sampling Point: BLM10

Investigator(s): Danny White Section, Township, Range: _____

Landform (hillslope, terrace, etc.): Hillslope Local relief (concave, convex, none): Concave Slope (%): 1

Subregion (LRR): _____ Lat: _____ Long: _____ Datum: _____

Soil Map Unit Name: _____ NWI classification: PEMIE

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No _____	**Is the Sampled Area within a Wetland?** Yes X No _____
Hydric Soil Present?	Yes X No _____	
Wetland Hydrology Present?	Yes X No _____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	_____ = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1. Rosa woodsii	2		FU
2. Salix spp.	15		
3.			
4.			
5.			
	17 = Total Cover		
Herb Stratum (Plot size: _____)			
1. Calamagrostis canadensis	35	Y	FU
2. Equisetum palustris	40	Y	OBL
3. Typa latifolia	5		
4.			
5.			
6.			
7.			
8.			
	80 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum _____ % Cover of Biotic Crust _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No _____

Remarks:

SOIL

Sampling Point: 10

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-3	10YR2/1	100					Organic	<5% sand

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- X Histic Epipedon (A2)
- ___ Black Histic (A3)
- X Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- X Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): _____

Water Table Present? Yes X No ___ Depth (inches): 5"

Saturation Present? (includes capillary fringe) Yes X No ___ Depth (inches): 0"

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Bear Lake Marina Exp City/County: Rich Sampling Date: 6/15/2015
Applicant/Owner: Utah State: Ut Sampling Point: BLM11
Investigator(s): Danny White Section, Township, Range:
Landform (hillslope, terrace, etc.): Hillslope Local relief (concave, convex, none): concave Slope (%): 1
Subregion (LRR): Lat: Long: Datum:
Soil Map Unit Name: NWI classification: PEMIB
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No	**Is the Sampled Area within a Wetland?** Yes X No
Hydric Soil Present?	Yes X No	
Wetland Hydrology Present?	Yes X No	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size:)			
1. Typha latifolia	30	Y	OBL
2. Solanum dulcamara	60	Y	FAC
3. Equisetum palustris	15		OBL
4. Calamagrostis canadensis	10		FW
5.	5		
6.	5		
7.			
8.			
	125 = Total Cover		
Woody Vine Stratum (Plot size:)			
1.			
2.			
	= Total Cover		

% Bare Ground in Herb Stratum ____ % Cover of Biotic Crust ____

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)
Total Number of Dominant Species Across All Strata: 2 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:
X Dominance Test is >50%
__ Prevalence Index is ≤3.0[1]
__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No

Remarks:

SOIL

Sampling Point: 17

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
14-0							Sapric	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- X Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No _____

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- X Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- X Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes X No _____ Depth (inches): 1"-2"

Water Table Present? Yes X No _____ Depth (inches): 2"

Saturation Present? (includes capillary fringe) Yes X No _____ Depth (inches): 0"

Wetland Hydrology Present? Yes X No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Bear Lake Marina Exp City/County: Rich Sampling Date: 6/19/15
Applicant/Owner: Utah State: Ut Sampling Point: BCM12
Investigator(s): Danny White Section, Township, Range:
Landform (hillslope, terrace, etc.): Lakebed Local relief (concave, convex, none): Flat Slope (%): 1
Subregion (LRR): Lat: Long: Datum:
Soil Map Unit Name: NWI classification:
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No
Hydric Soil Present?	Yes X	No
Wetland Hydrology Present?	Yes X	No
Is the Sampled Area within a Wetland?	**Yes X**	**No**

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size:)			
1. Hordium Jubatum	3		FAC
2. Thinopyrum intermedium	20	Y	UPL
3. Poa Pratensis	5		FAC
4. Bromus tectorum	5		UPL
5.			
6.			
7.			
8.			
	33 = Total Cover		
Woody Vine Stratum (Plot size:)			
1.			
2.			
	= Total Cover		

% Bare Ground in Herb Stratum ____ % Cover of Biotic Crust ____

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)
Total Number of Dominant Species Across All Strata: 1 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	
FACW species	0	x 2 =	
FAC species	6	x 3 =	24
FACU species	0	x 4 =	
UPL species	25	x 5 =	125
Column Totals:	33 (A)		149 (B)

Prevalence Index = B/A = 4.5

Hydrophytic Vegetation Indicators:
N Dominance Test is >50%
N Prevalence Index is ≤3.0[1]
N Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
N Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No X

Remarks:

SOIL

Sampling Point: 12

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-9	10YR 5/3	100					SaL	
9-18	5YR 6/4	100					Sa	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No X Depth (inches): _____

Water Table Present? Yes _____ No X Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No X Depth (inches): _____

Wetland Hydrology Present? Yes _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Beginning @ 9" from surface, sand is moist

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Bear Lake Marina Exp. City/County: Rich Sampling Date: 6/19/15
Applicant/Owner: Utah State: UT Sampling Point: BLM13
Investigator(s): Danny White Section, Township, Range:
Landform (hillslope, terrace, etc.): Hillslope Local relief (concave, convex, none): Convex Slope (%): 20
Subregion (LRR): Lat: Long: Datum:
Soil Map Unit Name: NWI classification: PRB2J
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)
Are Vegetation Y, Soil Y, or Hydrology Y significantly disturbed? Are "Normal Circumstances" present? Yes X No
Are Vegetation , Soil Y, or Hydrology Y naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes	No X	**Is the Sampled Area within a Wetland?** Yes X No
Hydric Soil Present?	Yes	No X	
Wetland Hydrology Present?	Yes	No X	

Remarks: Sample area occurs below the OHWM of Bear Lake & is therefore designated as Sovereign lands by the state of Utah.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size:)			
1. Mentzelia laevicaulis	1		FAC
2.	2		
3. Bromus tectorum	2	Y	UPL
4. Cynoglossum officinale	1		FU
5. Medicago lupulina	2	Y	FAC
6. Thynapsicum intermedium	1		UPL
7.			
8.			
	7 = Total Cover		
Woody Vine Stratum (Plot size:)			
1.			
2.			
	= Total Cover		

% Bare Ground in Herb Stratum 90 % Cover of Biotic Crust

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)
Total Number of Dominant Species Across All Strata: 2 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 50 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	3	x 3 =	9
FACU species	21	x 4 =	84
UPL species	3	x 5 =	15
Column Totals:	7 (A)		34 (B)

Prevalence Index = B/A = 4.9

Hydrophytic Vegetation Indicators:
N Dominance Test is >50%
N Prevalence Index is ≤3.0[1]
__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes No

Remarks:
90% Boulders
Although no hydrophytic vegetation is present, the sample area occurs below the OHWM of the lake.

SOIL

Sampling Point: 13

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No X Depth (inches): _____

Water Table Present? Yes _____ No X Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No X Depth (inches): _____

Wetland Hydrology Present? Yes _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Bear Lake Marina Exp. City/County: Rich Sampling Date: _____

Applicant/Owner: Utah State: UT Sampling Point: BLM 14

Investigator(s): Danny White Section, Township, Range: _____

Landform (hillslope, terrace, etc.): Lakebed Local relief (concave, convex, none): Slight Concave Slope (%): 1

Subregion (LRR): _____ Lat: _____ Long: _____ Datum: _____

Soil Map Unit Name: _____ NWI classification: PEMIE

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No _____	**Is the Sampled Area within a Wetland?** Yes X No _____
Hydric Soil Present?	Yes X No _____	
Wetland Hydrology Present?	Yes X No _____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	_____ = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
Herb Stratum (Plot size: _____)			
1. Calamagrostis canadensis	15	Y	FW
2. ~~Juncus confusus~~			
3. Juncus arcticus	15	Y	FW
4. Typha latifolia	5		OBL
5. Schoenoplectus americanus	25	Y	OBL
6. Castilleja miniata	1		FW
7.			
8.			
	61 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum _____ % Cover of Biotic Crust _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%

__ Prevalence Index is ≤3.0[1]

__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No _____

Remarks:

SOIL

Sampling Point: 14

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-6	2.5Y 5/1	80	10YR 5/6	5	C	PL	VFSaL	
	Gley 1 2.5/N	15					Sapric	organic lenses
6-14	2.5Y 4/2	85	7.5YR 4/6	15	C	M	FSaL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- X Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- X Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- X Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- X Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ___

Water Table Present? Yes X No ___ Depth (inches): 12"

Saturation Present? (includes capillary fringe) Yes X No ___ Depth (inches): 10"

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

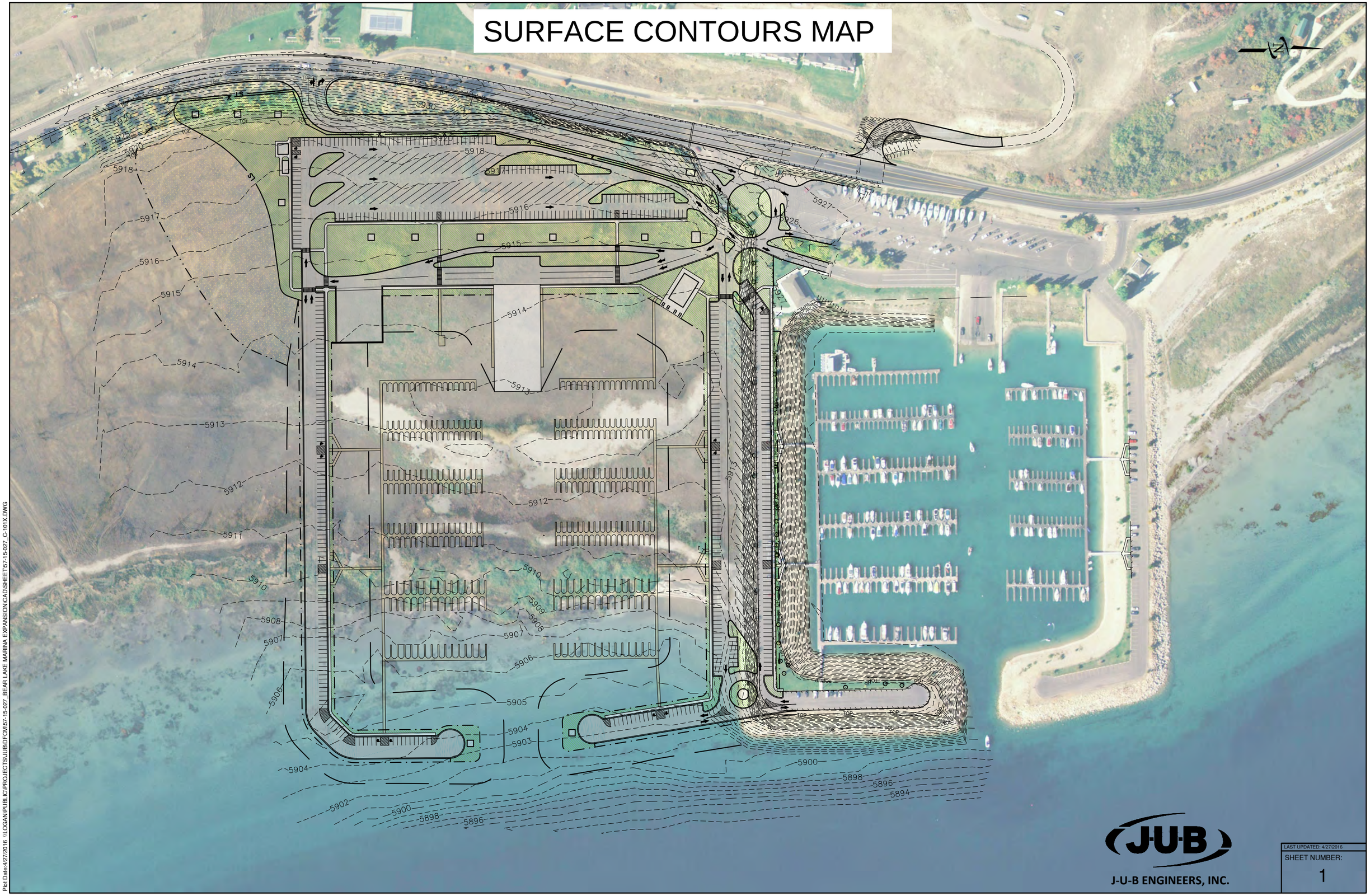
APPENDIX B

PROJECT PLANT LIST

Scientific Name	Common Name	Wetland Indicator Status
SHRUBS/SAPLINGS		
Acer grandidentatum		FACU
Betula occidentalis		FACW
Salix spp.		NA
SHRUBS/SAPLINGS		
Rosa woodsii	Woods Rose	FACU
Acer grandidentatum	Bigtooth Maple	FACU
Betula occidentalis	Water Birch	FACW
Elaeagnus angustifolia	Russian Olive	FAC
Chrysothamnus nauseosus	Rabbitbrush	UPL
Salix spp.	Willow	NA
HERBS		
Asclepias speciosa	Showy Milkweed	FAC
Bromus tectorum	Cheatgrass	UPL
Calamagrastis canadensis	Bluejoint Bentgrass	FACW
Castilleja miniata	Giant Red Indian Paintbrush	FACW
Cardaria draba	Whitetop	UPL
Chamerion angustifolium	Fireweed	FACU
Cynoglossum officinale	Gypsyflower	FACU
Eleocharis palustris	Common Spikerush	OBL
Equisetum laevitatum	Smooth Horsetail	FACW
Erigeron lonchophyllus	Shortray Fleabane	FACW
Hordeum jubatum	Foxtail Barley	FAC
Juncus alpinus	Northern Rush	FACW
Juncus arcticus	Arctic Rush	FACW
Juncus effuses	Common Rush	FACW
Juncus torreyi	Torrey Rush	FACW
Mahonia repens	Creeping Oregon Grape	UPL
Medicago lupulina	Black Medick	FAC
Mentzelia laveicaulis	Blazingstar	UPL
Panicum capillare	Witchgrass	FACU
Phalaris arundinacea	Reed Canarygrass	FACW
Phragmites australis	Common Reed	FACW
Poa pratensis	Kentucky Bluegrass	FAC
Potentilla spp	Cinquefoil	NA
Rumex crispus	Curly Dock	FAC
Schoenoplectus acutus	Hardstem Bulrush	OBL
Schoenoplectus americanus	Chairmaker's Bulrush	OBL
Solanum dulcamara	Bittersweet Nightshade	FAC
Typha latifolia	Cattail	OBL

APPENDIX C: SURFACE CONTOURS MAP

SURFACE CONTOURS MAP



J-U-B ENGINEERS, INC.

LAST UPDATED: 4/27/2016
SHEET NUMBER:
1

Plot Date:4/27/2016 \\LOGANPUBLIC\PROJECTS\JUB\DFCM\57-15-027_BEAR LAKE MARINA EXPANSION\CAD\SHEET\57-15-027_C-101X.DWG

APPENDIX D: UTILITIES MAP

EXISTING UTILITIES MAP

SYMBOL LEGEND	
DESCRIPTION	MARK
SANITARY SEWER	
CLEANOUT	
SS MANHOLE	
STORM DRAIN	
CATCH BASIN	
SD MANHOLE	
COMMUNICATION	
TELE. PEDESTAL	
TELE. POLE	
DOMESTIC WATER	
FIRE HYDRANT	
WATER VALVE	
IRRIGATION	
IRRIGATION VALVE	
IRRIGATION VALVE BOX	
ELECTRIC	
ELEC. TRANS.	
JUNCTION BOX	
GUY WIRE	
POWER POLE	
STREET LIGHT	

LINE LEGEND	
DESCRIPTION	LINE
STORM DRAIN	SD
SANITARY SEWER	SS
WATER	CW
IRRIGATION	IRR
UNDERGROUND POWER	E
UNDERGROUND TELEPHONE	UT

J-U-B ENGINEERS, INC.

LAST UPDATED: 4/27/2016

SHEET NUMBER: 2

Plot Date:4/27/2016 \\LOGANPUBLIC\PROJECTS\JUB\DFCM\57-15-027_BEAR LAKE MARINA EXPANSION\CAD\SHEET\57-15-027_PROGRAMMING-EXHIBITS.DWG

APPENDIX E: BEAR LAKE STATE PARK RESOURCE PLAN

Bear Lake State Park

Resource Management Plan
October 2005

STATE OF UTAH
NATURAL RESOURCES
Division of Parks & Recreation


Utah State Parks
&
Bear Lake Resource
Management Plan
Legend:
Utah State Park Locations
Resource Management Plan Study Locality
Bear Lake
RMP Study Area
CACHE
RICH
BOX ELDER
Hyrum
Willard
Lost Creek
WEBER
MORGAN
Antelope Island
DAVIS
East Canyon
SUMMIT
DAGGETT
Jordan River OHV
Great Salt Lake
Historic Union Pacific Rail Trail
Rockport
This Is The Place
SALT LAKE
Jordanelle
Wasatch Mountain
Deer Creek
Red Fleet
Steinaker
DUCHESNE
Utah Field
House Of
Natural History
TOOELE
Stagecoach Inn
Camp Floyd
Utah Lake
WASATCH
Starvation
UTAH
UINTAH
JUAB
Scofield
CARBON
SANPETE
Yuba Lake
Huntington
Palisade
MILLARD
Millsite
Territorial Statehouse
Green River
EMERY
GRAND
SEVIER
Fremont Indian
Goblin Valley
Dead Horse Point
BEAVER
Piute
PIUTE
WAYNE
Otter Creek
IRON
GARFIELD
Anasazi
Escalante
Edge of the Cedars
State Park Museum
Old Iron Town
Iron Mission
Kodachrome Basin
Mountain Meadows
SAN JUAN
Gunlock
Snow Canyon
Quail Creek
KANE
Goosenecks
Sand Hollow
WASHINGTON
Coral Pink Sand Dunes

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Acknowledgements

Bear Lake State Park Resource Management Planning Team

Bryce Nielson – Utah Division of Wildlife Resources, concessionaire at the Park Marina
Kirk Rich – Park Manager, Idaho State Parks, Bear Lake State Park
Ken Hansen – Mayor of Garden City, concessionaire at Rendezvous Beach
Judy Holbrook – Bear Lake Regional Commission
Doug Keller – Bear Lake Yacht Club
Connely Baldwin - PacifiCorp
Tom Weston – Rich County Commissioner
Kelly Allen - Division of Forestry, Fire & State Lands
Larry Gray – Park Manager, Utah Division of State Parks and Recreation, Bear Lake State Park
Jay Christianson – NW Region Manager, Utah Division of State Parks and Recreation

Other Participants

Gordon Topham – Deputy Director for Operations, Utah Division of State Parks and Recreation
Jamie Dalton – Manager Planning and Development Section, Utah Division of State Parks and Recreation
Shannon Peterson – Planner, Utah Division of State Parks and Recreation
Evan Sullivan – Project Engineer, Utah Division of State Parks and Recreation
Susan Zarekarizi – GIS Coordinator, Utah Division of State Parks and Recreation
Rock Smith – Research Consultant, Utah Division of State Parks and Recreation

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List of Figures and Maps

Figures

Maps

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Table of Contents

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Executive Summary

In October 2004, representatives from the Utah Division of State Parks and Recreation met with community stakeholders from the Bear Lake area to initiate a resource planning effort for Bear Lake State Park. The planning process was based on public input and involvement. The Bear Lake State Park Resource Management Planning Team - a citizen-based team representing community leaders, interested users, local residents and agency representatives – was at the core of the process. The recommendations contained in this document represent several months of work by the team as well as direct public input.

The plan provides recommendations founded upon nine primary vision elements that will guide future management of Bear Lake State Park. These elements focus on the following:

- Developing, maintaining and enhancing facilities that offer safe and suitable water and land-based recreation opportunities for visitors.
- Providing access to the shoreline and lake for users at all water levels.
- Providing management that preserves traditional recreational experiences, while being open to appropriate new activities.
- Being a positive factor for local and state economic stability and development.
- Planning and cooperating with residents, civic groups, businesses and agencies to supply a network of recreation sites and communities in the Bear Lake area.
- Protecting and preserving park resources and the greater Bear Lake environment by exercising good stewardship practices.
- Offering interpretive and educational programs that provide visitors the opportunity to develop an appreciation of the Park and its ecological, cultural and heritage resources.
- Ensuring the Park has adequate funding, staff, equipment and support.
- Continuing to support the Division of State Parks and Recreation's statewide boating and off-highway vehicle programs.

These objectives are geared towards improving and expanding the Park's recreational opportunities, protecting its resources and providing the visitor with a safe, enjoyable experience. Achievement of these vision elements will require the continued support of users, legislative and community leaders, and the Division of State Parks and Recreation.

The planning team issued a number of specific recommendations in support of the plan's vision elements. Five issue areas form the basis of the team's recommendations. Each issue area with its accompanying recommendations is outlined as follows:

Facilities Development

- Improve boating access and opportunities, including new deep-water marina boat launch facilities.
- Enhance opportunities and facilities for day-use, camping and lodging in the Park:
  - Improve facilities at the eastside areas to protect resources and enhance visitor experiences.
  - Upgrade opportunities and infrastructure at Rendezvous Beach.
  - Increase parking and day-use amenities at the Marina, and consider types of development at the Southwest (SW) Undeveloped area.
- Develop trails within the Park, and connections to existing and planned trails in the surrounding area.
- Expand access and opportunities for disabled visitors throughout the Park.

Staffing, Funding and Operations

- Address the need for more staffing and funding for the current operation by developing a business plan, with budget and staffing analysis. Fund and staff the Park accordingly.
- Consider changes in the Park's fee structure to increase revenue and meet management challenges.
- Ensure that on-going operational funding is included with any new development.

Natural Resource Management

- Protect against overuse or misuse of park areas by developing landscape plans for all areas, designing a specific plan to replace and maintain the trees in the Big Creek campground, and control types of use in some areas.
- Guard against pollution and protect water quality by developing a hazardous spill response plan for the Marina, revamping the sewage pump-out at the Marina to be more effective, and investigating opportunities to have a municipality provide culinary water to the park facilities and private residences on the Rendezvous Beach water system.

Economic and Community Impact

- Implement strategies to attract and/or extend the stay of visitors such as:
  - Providing ATV trailheads and access.
  - Developing park informational exhibit for area visitor center.
  - Encouraging concessionaire to keep cabins at Rendezvous Beach open year round.
  - Considering non-traditional, but appropriate, activities at the Park.
- Explore concession opportunities at the park by encouraging or partnering with concessionaire to supply more camping cabins, and other potential activities.

Interpretation and Education

- Create a comprehensive interpretive plan for the Park.
- Construct nature trails with interpretive signing and/or brochures.
- Continue to provide interpretive programs in area schools.
- Develop a nature center in the historic cabin at Rendezvous Beach.
- Provide exhibits to interpret other resources such as the lake and its uses.
- Partner with the community to develop and maintain an area website.

Implementing many of these recommendations will be dependent upon acquiring new funding sources. The funding requests arising from this plan may compete against other projects within the Division and other agencies in state government.

The plan's success is dependent upon the continued support of park stakeholders. Efforts must be made to preserve park resources, interact with local communities, and strive to meet the expectations of park visitors. The recommendations contained within this plan were based upon an open and collaborative process. It is imperative that this collaborative spirit continues as the plan's components are implemented.

Mission and Vision Statements

Mission Statement

Mission Statement

The mission of Bear Lake State Park is to provide a variety of desirable water and land-based recreation opportunities and increase community vitality, while protecting and enhancing park resources

A mission statement tells why a park exists. With this in mind Team Members developed a mission statement that recognizes the Park is part of a network of recreation providers in the Bear Lake area (Rich and Cache Counties, Utah and Bear Lake County, Idaho), and as such, is an important part of the local community and economy. Accordingly, the Park should partner with the community and other agencies where possible, to enhance community vitality. The team also realized that the Park should offer a wide variety of recreation opportunities, while ensuring that park resources are preserved for future enjoyment.

Vision Statement

A vision statement is similar to a compass; it charts a destination, sets the team and Park on the correct course of action, and provides the means to determine how closely team recommendations will follow that charted course.

Utilizing the basic principles developed in the mission statement, the team developed a vision to guide the development of the plan's recommendations and park management for the next few years. The vision statement provides the foundation for recommendations that balance recreational demands with preservation of the Park's natural and cultural resources, offer new and varied opportunities, and encourage community involvement.

Vision Statement

Bear Lake State Park will accomplish its mission by:

- Developing, maintaining and enhancing facilities that offer safe and suitable water and land-based recreation opportunities for visitors
- Providing access to the shoreline and lake for users at all water levels
- Providing management that preserves traditional recreational experiences, while being open to appropriate new activities
- Being a positive factor for local and state economic stability and development
- Planning and cooperating with residents, civic groups, businesses and agencies to supply a network of recreation sites and communities in the Bear Lake area
- Protecting and preserving park resources and the greater Bear Lake environment by exercising good stewardship practices
- Offering interpretive and educational programs that provide visitors the opportunity to develop an appreciation of the Park and its ecological, cultural and heritage resources
- Ensuring the Park has adequate funding, staff, equipment and support
- Continuing to support the Division of State Parks and Recreation's statewide boating and off-highway vehicle programs

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Resource Management Plan Purpose and Process

Purpose of the Plan

This Resource Management Plan is intended to help guide the Utah Division of State Parks and Recreation's stewardship obligations for Bear Lake State Park. Planning for the Park is essential, given the rapid increase in visitation to the Park in the past ten years and the increase in demand for the recreational opportunities provided by the Park.

Bear Lake State Park offers a variety of water and land-based activities and is a very popular recreation site for the population centers of northern Utah. The Park also draws substantial numbers of visitors from Wyoming, Idaho and elsewhere in Utah. Annual visitation to the Park tripled between 1994 and 2002, rising from 105,655 visitors in 1994 to 310,175 in 2002.

The Park's campgrounds are some of the busiest in the Utah State Parks System. The Rendezvous Beach management area accounts for more camping reservations than any other single state park in Utah, and has an 80-100 percent occupancy rate throughout its recreation season.

The Park's eight management areas are situated along the west, south and east shores of Bear Lake. The increased visitation, dispersed nature of these areas, and the diversity of facilities and activities they offer, provide the park staff with many operational and management challenges.

In recent years, drought conditions caused the water level in Bear Lake to drop to a level that limited public access at existing boat launches. The low water level also restricted the use of the state park Marina to smaller craft, causing a loss of revenue in slip rentals. Visitors and local community leaders have expressed a need for a deep-water marina to maintain boating access to the lake regardless of the lake's water level.

The eastside management areas have only rudimentary facilities that do not meet current visitor demand and do not promote protection of park resources.

Some park areas are experiencing overuse that is damaging resources. Undersized and aging facilities and utility infrastructure are becoming problems.

The planning process will assist in the wise use of available funding, and will increase the likelihood of obtaining additional development, renovation and operational funding to complete team recommendations.

A number of issues ranging from facilities development to natural resource management were identified by various sources including input from planning team members and the public at large through public meetings and a visitor survey. Team members aggregated nine major issues into five distinct categories addressing: facilities development; staffing, funding and operations; natural resource management; economic and community impact; and interpretation and education. This plan and its recommendations address each of the issue areas. It will provide flexible guidelines for the management and development of the Park over the next five to 10 years. More importantly, it will provide this direction on a foundation of public input and consensus of key stakeholders, rather than by the unilateral direction of the Division of State Parks and Recreation.

The Planning Process

Planning for an outstanding recreational resource such as Bear Lake State Park is required for the protection of this unique area and to ensure the efficient and effective expenditure of state and private funds. It is necessary for the long-term protection and public enjoyment of Bear Lake's many opportunities and resources. This Resource Management Plan (RMP) is required by the Utah State Legislature and the Board of the Utah Division of State Parks and Recreation to guide short and long-term site management and capital development.

The Utah Division of State Parks and Recreation's long-range strategic plan, Vision 2010, outlines the required planning actions needed to effectively meet customer recreational and leisure needs for the next five to 10 years. Vision 2010 identifies resource management planning as essential to the effective administration and operation of all parks in the agency's system. Under the guidance of Vision 2010, each RMP is developed around one core concept: meeting the needs and expectations of customers, visitors, and the citizens of the state of Utah, while protecting each park's unique resource base. In short, the process is "customer driven and resource-based."

The planning process recommends limits of acceptable change or modification and a future vision for the Park. Specifically, the process: (1) recognizes impacts will result from use and enjoyment of the site; (2) defines how much and what types of impacts may be accommodated while providing reasonable protection of the resources for future visitors; (3) incorporates values of resource sustainability, quality facilities, education and interpretation for visitors; and (4) seeks to determine the conditions under which this can be attained.

In October 2004, Division representatives met with community stakeholders to familiarize them with the planning process and the need for creating a RMP for Bear Lake State Park. During this meeting, the Division solicited the names of community members and various users with an interest and expertise in the Park to serve as members of a Resource Management Planning Team. Team members were selected for a variety of reasons ranging from technical expertise to interest in the Park. All team members participated on a voluntary basis and expressed a willingness to sacrifice a significant portion of their time and expertise to the process. Ten individuals were selected to serve on the planning team and three representatives from the Division served as staff to the team.

Marina Entrance Station and Visitor Center

The team participated in two public meetings (Salt Lake City and Garden City) that were facilitated by Division planners. These meetings were an opportunity for the public to provide input for the planning team to consider as they developed issues and recommendations for the Park. The team met five times between December 2004 and June 2005 to develop issues and recommendations for the Park.

About the Park

Park History

The Bear Lake area has been used for recreation since the late 1800s, when residents of the Wasatch Front area traveled to the Lake to fish, boat, swim and enjoy the cooler summer temperatures. In the middle to late 1900s, the area's recreational popularity began to increase dramatically, with development of Bear Lake's resorts, public beaches, and summer homes. Revenue generated from recreation has helped to diversify Rich County's economy.

Marina Boat Ramp 1963

Bear Lake State Park was established in 1962. Since that time, the Park has been attracting ever-increasing numbers of visitors. The state park lands remain the only public facilities on the Utah portion of the lake. The Park has eight separate management areas (see Figure 3 and Map 2). The Marina on the west side of the lake opened in 1962. Rendezvous Beach, on the south side of the Lake, was purchased in 1978 and opened in 1981. The five park areas on the eastside of the lake (First Point, South Eden, Cisco Beach, Rainbow Cove and North Eden) were obtained through a number of transactions from 1962 through 1987. An undeveloped site on the southwest corner of the lake was also obtained in 1962.

Physical Setting and Facilities

Bear Lake is located 122 road miles north of Salt Lake City and 40 miles east of Logan, Utah. The lake was formed some 28,000 years ago by earthquake activity. Its unique aqua-blue color is the result of calcium carbonates suspended in the lake. Its elevation is 5,923 feet; Bear Lake is 20 miles long, 8 miles wide, 208' deep, and covers 112 square miles. Favorite recreation activities on the lake include water skiing, swimming, scuba diving, sailing, and fishing. Groomed snowmobile trails (200+ miles) connect Utah and Idaho in one of the nation's first interstate snowmobile trail complexes.

Bear Lake is near the mid-point of the Bear River. Historically, the Bear River did not naturally flow into Bear Lake (though it may have in prehistoric times). It did charge the wetland at the north end of the lake, which in turn supplied water to the lake. In 1902 a predecessor of Utah Power and Light constructed inlet and outlet canals in an effort to divert Bear River water into the lake for later release during the agricultural growing season. River modifications have created an active storage capacity of 1,452,000 acre-feet in Bear Lake and the ability to control the flow of the river.

The Marina facilities include a sheltered harbor, 7-lane concrete boat ramp, 355 seasonal and 21 daily boat slips, boat pump-out facility, modern restrooms, hot showers, group use pavilion and visitor center.

The sandy, 1.25-mile long, Rendezvous Beach provides excellent camping, picnicking and small watercraft activities.

Rendezvous' four campgrounds, Willow, Birch, Cottonwood and Big Creek, contain a total of 178 campsites. Each campground has modern restrooms with hot showers. Boat launching is available during high water years. The beach is named for the famous rendezvous of fur trappers and Native Americans held in the summers of 1827 and 1828.

The Park has five areas on the Lake's east side. These include North Eden, Rainbow Cove, Cisco Beach, South Eden and First Point. They are primitive areas located approximately 10 miles north of Laketown. The terrain is rocky and the water depth drops off quickly to 208 feet. Activities include boating, year-round fishing, camping and scuba diving. There are three concrete boat ramps. Cisco Beach is famous for its midwinter fishing with dip nets for the seven-inch Bonneville Cisco, a member of the whitefish family. For a week to ten days each January, swarms of the fish come close to the rocky shore to spawn. They are easily scooped up by hardy fishermen wading waist-deep in the icy water or through holes in the ice if the lake is frozen. Cisco Beach is also known for its excellent inland scuba diving opportunities. The rock bottom and the steep drop off close to shore make this location a favorite of divers.

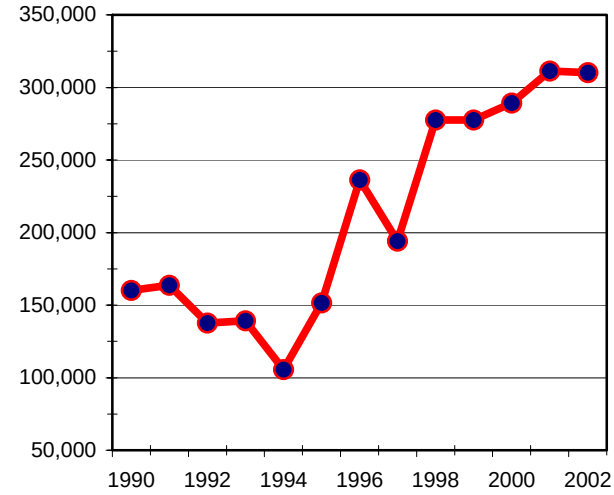
Climate

Bear Lake is located in a high valley located between the Wasatch Mountains to the west and the Bear Lake Plateau to the east. Due to its elevation (5,920 feet at the lake surface), the Bear Lake Valley has relatively cool temperatures. Maximum temperatures at the Bear Lake State Park Marina range from an average of 84 degrees in July to 34 degrees in January. Average minimum temperatures vary from 49 degrees in July to 15 degrees in February. The Bear Lake Valley has a semi-arid climate with an average total precipitation of 16.5 inches at the Park. The average annual snowfall is about 42 inches with the majority occurring December through February.

Park Visitation

Bear Lake State Park's annual visitation has been trending upwards since 1990, despite dips in visitation in 1994 and 1997. Visitation increased 94% from 160,205 visitors in 1990 to 310,175 in 2002.

Figure 1: Bear Lake State Park Visitation 1980-2002

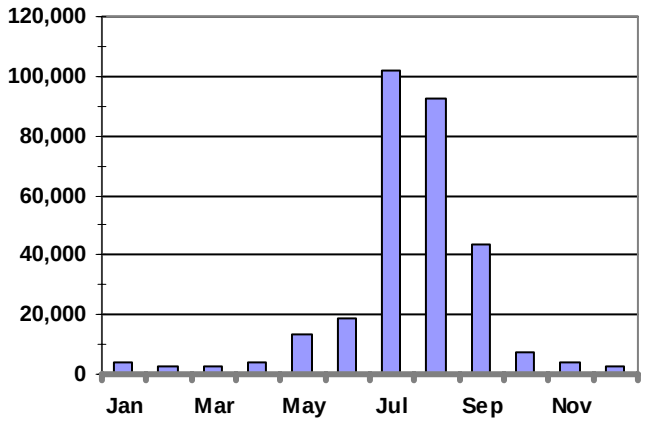


Most visits to Bear Lake State Park occur between July and September (80 percent of the total visitation). July, with an average 101,876 visitors, is the busiest month, accounting for 34 percent of the yearly total visitation. August is the second busiest month with 92,515 visitors. September is next with 43,661.

The number of visits to the Park drops off sharply due to cooler weather October through April. In fact, these seven months

account for only nine percent of average annual visitation. Visits begin to increase in May and June as the weather improves, but increase dramatically in the peak month of July.

Figure 2: Average Monthly Visitation 1999-2002



Sailing on Bear Lake

Figure 3:
Bear Lake State Park Management Areas

- **Marina:** Located on the west side of the lake, offers new (in 2004) visitor center/office/concessions building, entrance station, parking lot, and restroom. Provides a large boat ramp with courtesy dock and 376 rental boat slips. A concession operator offers boat and personal watercraft rentals, marine fuel, and food and drinks.
- **Rendezvous Beach:** Located at the southern end of the lake, offers campers 178 total campsites in four separate campgrounds (Birch, Willow, Cottonwood, and Big Creek). Rendezvous has three group campsites with pavilions, which if not reserved, can be used for up to 30 individual campsites. A concessionaire offers five rental cabins. A large day-use parking lot will accommodate 120 vehicles. The area has a total of nine restrooms, all with showers. The concessionaire offers boat rentals, fuel, groceries and snacks, as well as the cabins. A wide, sandy beach provides excellent camping, picnicking and small watercraft activity. Rendezvous Beach is a popular area for groups and family reunions and the site of the annual Mountain Man Rendezvous.
- **First Point:** Is found on the southeast shore of Bear Lake, offers primitive dispersed camping, a vault toilet, and a small boat ramp.
- **South Eden:** On the east side of the lake, has drinking water, 25 primitive campsites, two group pavilions, and two vault toilets.
- **Cisco Beach:** Also on the east side of the lake, has a low-water boat ramp (boat ramp is underwater at a lake level of 5,914); dispersed, primitive camping; dispersed day-use sites; three pavilions; eight vault toilets; and entrance station. Cisco Beach is famous for its scuba diving and the mid-January fishing with dip nets for the Bonneville Cisco.
- **Rainbow Cove:** On the east side is primarily used for primitive, dispersed camping. Has a boat ramp, three vault toilets, and dispersed campsites with fire pits with grills.
- **North Eden:** Use at this east side location is mostly primitive, dispersed camping. Has two group pavilions, two vault toilets, tables, and fire pits with grills.

  ***Note:** All eastside management areas are popular for fishing from shore.
- **Southwest Undeveloped Area:** Located on the southwest corner of the lake. These areas are currently unused by the park, but could be used for a variety of activities in the future.

Relationship to the Community and Surrounding Area

Bear Lake straddles the Utah/Idaho border. Portions of the Lake are in Rich County, Utah and Bear Lake County, Idaho. People have inhabited southern Idaho and northern Utah for 14,000 years or more. Until about 8,000 years ago the prehistoric cultures were primarily big game hunters. Around 8,000 years ago, these prehistoric cultures shifted from big game hunting to a hunter and gatherer lifestyle. Historically the Bear Lake area was utilized by traveling bands of Shoshone, Ute, and Bannock people. These groups traveled through the Bear Lake area on hunting trips, primarily during the summer. The Bannock and Shoshone were still using the area when the first Anglos entered the region in the early 1800s.

Donald Mackenzie, expedition leader for the Northwest Fur Company, reached the shores of the lake in 1819. He and his party were probably the first non-native Americans to see the lake. The area around the Bear River became a favorite spot for trappers. Trappers' rendezvous were held on the south shore of Bear Lake in 1827 and 1828. The Oregon Trail, over which thousands of immigrants to the Northwest traveled, cut through the area. The first Anglo settler in the area, Thomas L. "Peg Leg" Smith, operated a cattle business, trading post, and horse exchange on the Bear River near present Dingle, Idaho. Brigham Young unsuccessfully attempted to purchase his business in 1848, and Smith remained in the area until 1863.

When Congress passed the Homestead Act of 1862, Brigham Young became anxious to obtain control of the land. In August 1863 he directed Charles C. Rich to lead an exploring party into the Bear Lake Valley to select a site for settlement. The first settlement, known as North Twin Creek and later Paris Creek, was made near present day Paris, Idaho. Since Bannock and Shoshone Indians also used the valley, Rich obtained their permission to settle there in order to minimize conflicts. Other settlements included Round Valley in 1863; Kennedyville (Garden City) and Laketown, 1864; Woodruff, 1865; Randolph, 1870; and Argyle, 1875.

Even though much of Rich County is highland, it also has fertile lowlands that can support productive farms and livestock production. Farming and livestock production have provided county residents with their livelihoods from the mid-1800s to current times. Three fourths of the county's land is used for agriculture and grazing. Livestock and livestock products account for the greater part of the county's income.

Figure 4:
Cities and Towns near Bear Lake State Park

Utah	Population	Location
Garden City	357	West side of Lake
Laketown	188	South side of Lake
Randolph	478	30 miles SE from Garden City
Woodruff	192	40 Miles SE from Garden City
Logan	45,626	West through Wasatch Mts 40 miles from Garden City
Idaho		
Bloomington	251	North of Lake
Paris	576	North of Lake
Montpelier	2,785	North of Lake

Demographic and Socioeconomic Information

As of the census of 2000, there were 1,961 people, 645 households, and 521 families residing in Rich County. The population density is 2 persons per square mile. There were 2,590 housing units in 2002 at an average density of 2 units per square mile.

Many of the housing units at Bear Lake are vacation properties owned by non-county residents.

The Rich County School District is the county's single largest employer followed by Ideal Beach Association, the Lodge at Bear Lake, Majestic Ranch Academy, and Rich County Corporation. A number of the retail establishments in the Bear Lake area, including gas station/convenience stores, are also major employers in the county (as is Bear Lake State Park). Most of these establishments rely on spending by the visitors to the area. Bear Lake State Park may account for as much as 29 percent of the total spending by visitors.

In 1999, the Utah State Parks Planning Section developed a basic community impact model to estimate the impact that Bear Lake State Park may have on the economies of nearby Laketown and Garden City, Utah.

Park visitation data and estimated visitor spending patterns from existing recreational studies were utilized. Economic data from Rich County was gathered to develop estimates about the economic profile of Laketown and Garden City. As is shown in Figure 5, it was estimated that the 186,003 day-use visitors would spend approximately $25.70 per day (note that this figure is based on data from a similar recreation study in California and is most likely conservative as anecdotal research shows that Bear Lake visitors would probably spend more). Similarly, it was estimated that there were approximately 91,613 overnight users who, because they are typically "self-contained," spent a lower amount of $14.44 per day.

As Figure 5 shows, multiplying visitation by expenditures per day yields total (annual) spending: about $4.8 million for day-use visitors and $1.3 million for overnight visitors. The majority of visitor spending is divided between five categories: Eating and Drinking, Lodging, Transportation, Entertainment and Retail Purchases. Clearly, visitors spend a portion of their travel monies in their hometown (gasoline, supplies, food, etc.), another portion in transit, and the final portion at their destination point. It is the visitors' spending at the final destination point (Laketown/Garden City) that is of most interest. Based on estimates of how spending is distributed through the local economies, it was estimated that approximately $1.5 million was injected into the economies of Laketown/Garden City by day-users and $237,736 by overnight visitors from Bear Lake State Park. This is approximately 29 percent of total visitor spending.

Figure 5: Bear Lake State Park Annual Visitors and Estimated Visitor Spending

	Day	Overnight
Visitors (1998)	186,003	91,613
Spending per Visitor	$25.70	$14.44
Spending by Item		
Eating & Drinking	$1,242,872	$464,800
Lodging	$1,242,872	$0
Transportation	$1,147,267	$429,046
Entertainment	$334,619	$125,138
Retail Purchases	$812,647	$303,908
Total Spending	$4,780,277	$1,322,892
% of Local Spending		
Eating & Drinking	30%	10%
Lodging	50%	0%
Transportation	20%	20%
Entertainment	60%	60%
Retail Purchases	10%	10%
Total Local Spending	$1,505,787	$237,763

PARK RESOURCES

One of the Bear Lake Planning Team's primary vision elements is to preserve the Park's resources by protecting the geological, historical, biological, and cultural attributes. To do this, the planning process calls for an inventory and analysis of park resources. It is essential that management decisions affecting the Park's natural environment be based on reliable scientific information. This section provides an analysis of Bear Lake's geological, biological, and cultural resources. A natural hazards analysis is also included.

Geological Resources

The Bear Lake Valley is a structurally complex region. Approximately 10 million years ago, the Bear Lake Basin was formed through the crustal extension process and subsequent faulting of the area. The largest of these faults is the East Bear Lake fault that roughly parallels the east edge of Bear Lake. It is a high-angle normal fault with mostly vertical slip, where a mountain block moves upward relative to an adjacent downward-moving valley block. This fault is the dominant geologic feature that created the scenery and topography of the area. The down dropped (west) side of the fault is expressed as the deep sediment-filled basin that contains Bear Lake. The up thrown (east) side of the fault is expressed as a steep, linear mountain front of exposed bedrock. The east-shore study areas are perched along this still active fault, between the lake and mountain front. The highly fractured rock of the steep mountain front erodes and is deposited on the narrow, rocky beaches of Bear Lake's eastern shore.

At the Cisco Beach scuba diving area, the East Bear Lake fault veers offshore and acts as a conduit through which deep ground water emerges into the lake. Dissolved calcium carbonate from the ground water precipitates in the lake to form interesting bulbous tufa (a type of limestone) formations.

Biological Resources

The Park supports an assortment of plants and animals in a variety of habitats, including aquatic habitats that are important to a number of sensitive fish species.

Flora

Bear Lake State Park contains four major terrestrial plant communities, and several micro-communities. At the Southwest Undeveloped and eastside management areas, the sagebrush steppe community is predominant at lower elevations. The sagebrush steppe community is dominated by shrubs such as sagebrush and rabbit brush mixed with various species of grasses. The juniper community is found at higher elevations. Depending on lake levels, there are micro-communities at the shoreline and exposed springs.

Rendezvous Beach and the Marina are wetland meadows and agricultural upland, with the native communities displaced by past agricultural use and development. There are riparian and wetland communities along and adjacent to Big Creek Creek at Rendezvous Beach. The riparian community is dominated by narrow leaf cottonwoods, water birch, thin leaf alder and willows, with an under story of shrubs, forbs and sedges.

There are no known plant species of special concern located within the Park.

Fauna
The Park's eastside management areas share similar terrestrial habitat, and, therefore, are home to similar types of land-based wildlife.

The upland areas of these sites may provide habitat for cottontail and pygmy rabbits, Uinta Mountain ground squirrels, chipmunks, and mule deer. Reptiles may include the wandering garter snake, valley garter snake, Great Basin rattlesnake, and northern sagebrush lizard. Birds that may visit or inhabit all park areas include bald and golden eagles, osprey, gulls, and magpies. Seasonally many different species of waterfowl, passerine and neo-tropical birds migrate through the park and adjacent lake/riparian areas.

The North Eden area's sandy, littoral zone lacks rock and gravel substrate, so the area provides limited habitat for Bear Lake's fish species.

The Rainbow Cove, Cisco Beach and South Eden complex provides valuable habitat for aquatic wildlife. Bonneville cisco, Bear Lake whitefish, and Bear Lake sculpin (all on the Utah sensitive species list) use the rocky lake bottom in this area. Bonneville whitefish (also on the sensitive species list) use this area for spawning, as do the Utah sucker, speckled dace, redsided shiner, and Utah chub. At normal water levels, Rainbow Cove contains a small wetland that supports a number of wetland species. During the spring and fall migration, birds such as common loons, terns, mergansers, goldeneye, and others frequent this area to feed on fish congregations.

At normal water levels, the rocky First and Second Point management areas provide aquatic habitat similar to that of the Rainbow Cove/Cisco Beach/South Eden complex. During low water, the majority of rock is dewatered.

Rendezvous Beach receives intensive recreational use during the summer limiting its wildlife value during that time. When visitors leave, the area is repopulated with many bird species including owls, raptors, and cavity nesting birds attracted to the old growth cottonwoods. The sandy beach area provides little habitat for fish, but Big Creek that flows through the area, provides spawning and rearing habitat for Bear Lake cutthroat trout (a sensitive species), Utah sucker, red-sided shiners, yellow perch, long nose dace, green sunfish, and carp. It also harbors a number of freshwater mussel species, and hosts a myriad of terrestrial animals (beaver, raccoon, skinks, red fox, coyote), birds, waterfowl, amphibians, and reptiles. Agricultural use has caused bank erosion along Big Creek. Utah Wildlife Resources, the Park and adjacent landowners are working to remedy this problem.

Bonneville Cutthroat Trout
Photo Courtesy of Utah Division of Wildlife Resources

The Bear Lake State Park Marina provides a unique aquatic habitat. The Marina's rip rapped exterior provides much the same habitat and function as that of the Cisco Beach area. The Marina functions as a protected pond, providing cover and rearing habitat for cutthroat trout, Utah chub, yellow perch and carp. It also provides spawning habitat for Utah suckers. This assemblage of fish provides food for western grebes, white pelicans, ospreys, and gulls.

There are no known animal species of special concern found in the Park. There is, however, potential habitat in the upland portions of the eastside management areas for the pygmy rabbit and the greater sage-grouse. These two animals are listed as wildlife species of concern on the state of Utah's Sensitive Species list because loss of habitat has reduced their populations.

The waters of Bear Lake are home to a number of sensitive species. The Bear Lake sculpin, Bear Lake whitefish, and Bonneville cisco are listed because they occur only in Bear Lake. The Bonneville cutthroat trout is listed due to loss or alteration of habitat, predation by and competition with nonnative fishes, and hybridization with nonnative fishes, such as the rainbow trout. This fish species is being managed under a conservation agreement to preclude the need for federal listing. The California floater is a mussel that has historically been found in the Bear Lake area. It is also a species of concern due to reductions in population and range. No live specimens have been found in the area for many years. It is thought that if this mussel was ever found in Bear Lake (there is some question of this), this population has been extirpated. Another mussel that historically was found in small streams in the Bear Lake area is the western pearlshell. It is also a species of concern, and it is unclear if it still exists in the area. The affect on these species must be examined when considering potential development.

Cultural Resources

There are no known cultural resources within the Park. The Utah Division of State History conducted a file search of records for past cultural resource project surveys conducted within the Park and in a one-mile buffer around the parklands. There had been one project survey completed within the park boundary. Within the one-mile buffer, there had been seven project surveys. Four cultural resource sites were located as a result of these survey projects. None of these sites were in the Park.

Natural Hazards Analysis

The Utah Division of Emergency Services and Homeland Security conducted a natural hazards analysis during the fall of 2004. This study discussed the risks associated with flooding, earthquake activity, landslides, wildfire, severe weather, and drought.

The risk of flooding to park facilities by Bear Lake is minimal because the lake level is controlled. Debris related flooding is possible along Big Creek in the eastern portion of Rendezvous Beach. The Park needs to monitor the stream flow and clear debris from culverts along the creek. It also needs to post warnings during flood events. Rock slides caused by severe thunderstorms or spontaneous spring snowmelt could impact access to park areas along the eastern side of the lake.

The East Bear Lake fault zone, that either runs through or adjacent to the Park's eastside areas, is geologically active and has experienced a larger magnitude (approximately 6.3) earthquake as recently as 1884. Earthquakes along this fault could cause rock falls along the eastern shore, fault rupture could cause surface and ground water flooding, liquefaction in sandy areas, and lakeshore flooding caused by a seiche. The park staff needs to implement the recommendations listed in the hazard analysis to minimize impacts from earthquakes.

Potential exists for landslides or debris flow to impact park facilities at North and South Eden. Park paths, trails, campsites, and other facilities should be kept out of the path of potential rock and landslides. Warning signs should be placed in areas of potential rock fall.

The potential for impact to park facilities by wildfire is minimal, except at South Eden and First Point, where the risk is extreme during hot, dryer months. Moderate risk for wildfire exists at North Eden and Cisco Beach. Park managers should discuss the possibility of controlled burns or thinning of wildfire fuels where fire potential is elevated. Fire restrictions should be posted and enforced during times of high fire danger.

Severe weather could close transportation routes, affecting the use of park facilities. Drought and associated lower water levels in the lake could impact recreation use at the Park.

Natural hazards can create safety concerns for visitors and staff, damage park facilities, and have detrimental effects on the economy of the Park and area, by interrupting access to, and use of, the Park.

VISITOR SURVEY

Summary of Results

The Division of State Parks and Recreation administered a visitor survey during the peak visitor months of 2002. The survey was conducted to better understand park users, their concerns, satisfaction with existing facilities and services, and visitor conflicts while visiting the Park. Survey results were incorporated into the planning process in the development of recommendations. It is important to note that the survey results reflect visitor use patterns during the study period only (e.g., peak visitation period between May and September). Moreover, several factors contributed to a lower than normal response rate. Consequently, one must be careful in using the results to draw generalized conclusions about the population of users who visited Bear Lake during the study period. With these limitations in mind, respondents noted several items of interest that are summarized below. This information provides important insight about visitor use patterns, activities, needs, and concerns.

BEAR LAKE IS A "DESTINATION" PARK

Nearly 70 percent of survey respondents indicated that Bear Lake State Park was the only destination of their trip. Of the remaining respondents, 21 percent planned a trip to Bear Lake along with other destinations.

THE MARINA IS THE MOST VISITED LOCATION

Seventy-two percent of those responding visited the Marina area of the Park. The next most visited area was Rendezvous Beach (35 percent), followed by Cisco Beach (15 percent), Rainbow Cove (10 percent), and the other areas of the Park in lesser amounts.

BEAR LAKE IS A MULTI-DAY DESTINATION

Most respondents (67.5 percent) indicated that they stayed more than one full day at the Park. Twenty-seven percent said they stayed three days or more. Only 31.1 percent stayed one full day or less.

GROUPS ARE AN IMPORTANT VISITATION COMPONENT

Many respondents indicated that they were part of a larger group. Nearly 35% of respondents listed a group size of 10 or larger. Fifty-nine percent were part of a group with six or more.

GROUPS ARE MADE UP OF FAMILY AND FRIENDS

Family and friends accounted for 92.7 percent of respondents. Family members accounted for 54.4 percent, 33.3 percent were a combination of family and friends, and five percent were friends only.

SWIMMING, BOATING, SUNBATHING, WATERSKIING, CAMPING AND PICNICKING ARE TOP RECREATIONAL ACTIVITIES

Respondents indicated that swimming (59 %), boating (57 %), sunbathing (55 %), waterskiing (46 %), camping (37 %) and picnicking (35 %) were the most popular recreational activities.

MOST RESPONDENTS ARE SATISFIED WITH FACILITIES AT MARINA AND RENDEZVOUS BEACH

Bear Lake Marina and Rendezvous Beach had the most opinions expressed possibly due to the popularity of those two areas. The majority of respondents at Bear Lake Marina and Rendezvous Beach were

satisfied with these facilities. No assumptions can be made about the sites on the east side of Bear Lake, due to the lack of opinions expressed by respondents.

MOST RESPONDENTS ARE FROM UTAH

The majority of respondents, 80 percent, were from Utah. Idaho was next with eight percent.

Marina Boat Ramp

ISSUES AND RECOMMENDATIONS

A number of issues ranging from facility development needs, to natural resource management, to land and property limitations were addressed in the plan. Also addressed were issues relating to staffing, funding and operations; economic and community impact; and interpretation and education. Each of these issues was identified by various means including input from planning team members, the public-at-large through public meetings, and by a visitor survey. Team members and the public identified nine major issues that were aggregated into five distinct categories. An analytical technique used to determine the Park's strengths, weaknesses, opportunities, and future threats (known as a "SWOT" analysis) helped in the development of these issues. A specific description or statement summarizing each issue was constructed to clearly identify and articulate each problem.

A number of constraints (e.g. available funding, sufficiency of staff, facility location and design, and federal regulations, etc.) will need to be addressed prior to issue resolution. Team members, planning staff, and division experts identified some of the limiting factors that may hinder implementation of a specific team recommendation.

The planning team developed specific recommendations for the identified issues. The team's recommendations were arrived at by consensus of opinion. The team also emphasized that recommendations be consistent with the mission and vision statements.

The five issue areas forming the basis of the team's recommendations include: (1) facility development; (2) staffing, funding and operations; (3) natural resource management; (4) economic and community impact; (5) interpretation and education.

Facility development proved to be of major concern to the team. Facility development recommendations identified by the team include a deep-water expansion of the current state park Marina, and development of the eastside management areas to improve visitor opportunities and protect park resources.

The team made a point to include a recommendation that full operational funding should be included with any future development. The recommended facility development is discussed in two phases, however the order of actual development is subject to change based on available funding. Multiple sources of funding are available for different portions of the overall project, but timing of funds availability is not predictable. In order to expedite development and maximize fiscal efficiency, the Planning, Facilities and Construction Section will be responsible for implementing the recommendations in a manner that balances the listed prioritization while utilizing available funding opportunities.

Facilities Development

At the onset of the planning process, team members set a goal to develop facilities that enhance visitor opportunities and enjoyment, while protecting the natural resources and aesthetic character of the Park's various management areas. The team developed specific recommendations for each management area that are consistent with this goal. These recommendations fit into the following broad categories (issues):

- Improvements to existing, and development of new, boating facilities.
- Improvements to day-use, camping and lodging facilities.
- Establishment of trails and trail connections.

Issue Area: Facilities Development

Key Issues:

- Improvements to boater access and opportunities.
  - Deep-water addition to Marina for mooring and launching.
  - Need to improve access to boat ramp at Rainbow Cove.
  - Consider a floating day marina with possible concession on eastside.
- Day-use, camping and lodging facilities and opportunities need to be upgraded and expanded.
  - Accessibility throughout the park for those with disabilities.
  - Site plans for eastside areas with recommended development to improve visitor experience and protect resources.
  - More day-use facilities and parking in the Marina area.
  - Redesign Big Creek Campground, and other needed improvements to Rendezvous Beach.
  - Safe access to lake from Rainbow Cove campsites.
- Trails and Trail Connections
  - ATV trailhead at Rendezvous to link to other lands and trails.
  - Plan for regional "Bear Trail" connections.
  - Big Creek nature trail.
  - Eastside viewpoint trails.

The team's facility development recommendations will increase park accessibility, provide more parking and opportunities for day-use visitors, supply more boat slips, and launching opportunities at all water levels, and enhance camping facilities.

These recommendations address the broad goals listed in the team mission and vision statements, and represent the issues identified by public input through public meetings and visitor surveys.

A number of criteria – feasibility, costs, available funding, availability of staff, etc. – will need to be considered in the planning, development, and implementation of each recommendation. Many of the team recommendations are conceptual in nature. The Division's Planning, Facilities and Construction Section will take these recommendations and work with a designated architectural/engineering firm to develop a formal design and construction program when funding becomes available. During the transition from concept to design, modification of original concepts may be required to feasibly implement specific recommendations.

Issue: Improve Existing, and Develop Additional, Boating Facilities

The park provides the only public access and facilities on the Utah portion of the lake. This includes boating access and facilities. The demand for boating facilities has been increasing for many years, as the visitation to the area increases. The demand for these facilities can far outweigh the supply. Recent low water conditions have added to this problem, reducing access to the water at boat ramps and in the Marina. Many of the Park's boat ramps are crowded during the season, and with the low water in recent times, they have been unusable. There is a need to improve and increase access through improved and additional boat ramps and marina boat slips. Improvements should be made compatible with low water conditions where possible.

Recommendations

The team and public listed additional marina facilities and low water boat access as top priorities. The team considered marina

locations on the eastside of the lake, but rejected that idea because of habitat concerns with sensitive fish species, construction costs, and operational efficiency and costs. The team recommends that a second marina should be built immediately adjacent to the existing marina. The new marina would share the south arm of the existing marina, saving some cost, and should be deep enough to be used during low water periods. The team did suggest studying the feasibility of constructing a floating marina somewhere on the Lake's eastside to provide safe storm shelter, another destination on the lake, and possible concession opportunities. Also suggested, were improvements to the eastside boat launch areas.

Phase I Recommendations

1. **Marina Area – Complete a feasibility study for expanding the current marina by placing a deeper expansion adjacent to the existing marina. Seek funding and build the expansion if the Division deems it feasible. An engineering firm has completed a conceptual plan for the marina addition (Appendix B).**
   A. The expansion would be built just south of the current marina and would share the south arm of the existing marina
   B. The marina expansion would have 250-300 boat slips with utilities, restrooms, and a sewage pump-out.
   C. The expansion would be built deep enough to allow use during low water levels.
   D. A boat ramp that could be used in high or low water would be included in the expansion.
   E. Fill material would be added along the shoreline, and arms of the existing marina to provide additional vehicle and trailer parking, and improved traffic control.
   F. Develop more overflow parking in the parking and dry storage area above and west of the Marina to service the users of the new marina. This may mean re-contouring some of the area and developing some means to control the parking configuration. Consider some rental, covered boat storage in this area.

Marina Entrance

2. **Rainbow Cove Area – Increase the radius of the turn in the approach road to the boat ramp to allow better access for vehicles with boat trailers.**
   A. This improvement should make it possible for vehicles pulling boats to have better access to the boat ramp area.

Phase II Recommendations

1. **Eastside Areas – Widen Boat Ramps as necessary and improve boat trailer parking.**
   A. Monitor use and crowding at ramps and widen if use dictates.
   B. Enlarge and define parking for boat trailers near eastside ramps.

2. **Eastside Management Areas – Investigate the feasibility of building a floating marina somewhere on eastside of lake.**
   A. A floating marina would not affect sensitive species habitat.
   B. It would provide safe storm shelter for vessels, a destination attraction for boaters and others, and offer potential concession opportunities.

3. **Eastside Management Areas – Courtesy docks at boat ramps**
   A. Study the feasibility of providing courtesy docks at eastside boat ramps.

4. **Rendezvous Beach – Develop a single width boat ramp adjacent to the concession fuel facility for concessionaire to launch and retrieve rental craft.**
   B. This ramp would be more convenient for the concessionaire, and would reduce congestion at the regular boat ramp.
   C. The concessionaire has indicated that he may fund and maintain this ramp.

Issue: Improved Opportunities and Facilities for Day-use, Camping and Lodging

The Park's various management areas have a number of problems and needs that these types of improvements can remedy. The Marina area is lacking in day-use facilities and parking, though many visitors are attracted to its location. These factors limit visitor use at the Marina. Rendezvous Beach has overuse and overcrowding problems that are impacting resources and visitor experiences. The eastside areas suffer from a lack of facilities and dispersed use. The eastside areas do not have defined day-use and camping sites. This leads to indiscriminant, dispersed use that damages the natural resources of the area.

Improvements at the eastside should be a high priority. The concessionaire at Rendezvous Beach has four camper cabins that have a high occupancy rate throughout the recreation season. Demand would seem to indicate that additional cabins would enhance visitor opportunities and park revenue.

Recommendations

The team identified a number of shortcomings in the types of land-based facilities and opportunities offered at the Park. Their recommendations, if completed, will help to alleviate theses shortcomings.

Phase I Recommendations

1. **All Management Areas – Improve ADA-type accessibility.**
   A. Make some sites in all campgrounds accessible to those with disabilities.
   B. Provide access to picnic sites, restrooms and other appropriate buildings, beaches, lake, and concession operations as outlined in the Park's ADA transition plan.

2. **Eastside Management Areas – Complete development site plans for all eastside management areas, and proceed with development, as funds are available.**
   A. As much as possible, maintain primitive feeling of experiences offered at the eastside areas, while delineating and defining individual and group day-use and camping sites to stop indiscriminate dispersed use and resource damage. Segregate day-use and camping areas where possible.
   B. Improve roads and parking using a balance of gravel and pavement as appropriate. Consider additional parking on eastside of paved road.
   C. Landscape plans should be a component of site plans. Consider

planting vegetation to provide shade and privacy. Develop water systems where possible to irrigate vegetation.

D. Where possible provide water and electricity for restrooms with showers.
E. Provide shade shelters at day-use and camping sites. Lack of shade was an issue at the eastside areas.
F. Design and develop multiple group sites with pavilions, water, electric and restrooms with showers at North Eden.
G. Provide at least one RV sanitary-dump station on the eastside.

3. Marina – Develop day-use facilities at the Marina.

A. Develop picnic sites near the Marina office/visitor center and concession operation, and on the Marina arms. These sites should have picnic tables, shade shelters and/or trees.
B. Develop picnic sites with shade shelters and tables along the edge of the hillside near the dry storage area, above and west of the Marina.
C. Widen both arms of the Marina to provide more day-use parking, and consider designating some of the existing parking as non-boating parking.

4. Rendezvous Beach – Redesign the Big Creek Campground.

A. Redesign should protect and preserve vegetation, improve the privacy at each site, upgrade the utility infrastructure (this should be done throughout Rendezvous Beach as needed), provide some ATV compatible campsites, and be compatible to large recreational vehicles. A group campsite should also be added to this location.

6. Rendezvous Beach – Develop clusters of camping cabins throughout Rendezvous Beach.

A. The concessionaire has four camping cabins near the Big Creek Campground. These cabins have a high occupancy rate throughout the recreation season. The Division should work with the concessionaire to place clusters of cabins in various places at Rendezvous Beach. The concessionaire or Division may build and/or manage additional cabins.

6. Rendezvous Beach – Develop a maintenance/storage facility.

A. There is currently no maintenance facility at Rendezvous Beach. Consequently, there is no secure place to store equipment and supplies, and no place for staff to work indoors. Also, the area currently used to store building and grounds materials is an open field, clearly visible and accessible from the Big Creek Campground.
B. The recommended facility would include a maintenance building with a fenced and screened yard.
C. This facility would serve both Rendezvous and the eastside areas.

Phase II Recommendations

1. Eastside Management Areas – Water and electricity in restrooms.

A. Wherever possible, provide water and electricity in restrooms.

2. SW Undeveloped Area – Complete a development site plan, and make suggested improvements as funds become available.

A. Plan should consider individual and group camp and day-use sites, and the possibility of providing long-term (season-long) camping for snowbird type users. Bring water, sewer and electricity to the area.

B. Provide parking for lake and beach access in this area.

3. **Rendezvous Beach – Complete a boundary survey.**

4. **Rendezvous Beach – Investigate day-use opportunities along south side of parking lot near the concession/beach area.**
   A. Consider both individual and groups sites in this area.

5. **Rendezvous Beach – Develop an amphitheater and overflow parking in the Cottonwood Campground.**
   A. These facilities would be located on the south side of the road opposite of the campsites.

6. **Rendezvous Beach – Consider another amphitheater and more overflow parking where appropriate.**
   A. The team thought, because of the size of the Rendezvous area, that a second amphitheater may be necessary to serve potential demand.
   B. There is a need for overflow parking for extra vehicles and utility trailers in all campgrounds at Rendezvous.

7. **Rainbow Cove – Improve lake access from campsites.**
   A. Construct stairways to provide access to beach and lake from campsites on elevated bench.

Issue: Trails and Trail Connections

Trails and their use are becoming a very important part of Utah's recreation estate. In fact, walking for pleasure is the most popular recreation activity in the United States. Communities are beginning to understand that trails can enhance their economies, and can help provide safe recreation and transportation routes that enhance real estate and business values. The Bear Lake area communities are planning and developing trails for these reasons. Several of these trails will provide, or potentially provide, connections between the various park management areas, other recreation sites, communities, and businesses. There are all-terrain vehicle (ATV) riding opportunities on the lands surrounding Bear Lake, in particular, the National Forest lands. The Shoshone Trail, a major ATV trail, runs through the area just south of Rendezvous Beach. The team recommended that a trailhead be developed at Rendezvous Beach to provide access to the Shoshone Trail. There are a number of trail needs within the Park.

Recommendations

The team suggested several recommendations to provide trail opportunities in and around the Park.

Phase I Recommendations

1. **Rendezvous Beach - Develop an ATV trailhead at Big Creek to link the Park to nearby public lands and the existing Shoshone Trail.**
   A. This trailhead would most likely be built at the eastern edge of Rendezvous Beach, adjacent to the Big Creek Campground. This location would allow the trailhead to also be used as parking for a proposed Big Creek wetlands nature trail.

2. **Rendezvous Beach – Plan for impact of the "Bear Trail."**
   A. The Park will cooperate with the Bear Lake Regional Commission to insure that the bike and pedestrian "Bear Trail" planned to circumnavigate the lake, and pass through Rendezvous Beach, will

meet the needs of both the Park and community.

3. **Rendezvous Beach – Provide trails for access to facilities and recreation areas, including access for those with disabilities.**
   A. Develop trails for access to restrooms and beach, to protect vegetation and to minimize cutting through campsites for this access.

Phase II Recommendations

1. **Rendezvous Beach – Big Creek Wetlands nature trail.**
   A. The Big Creek riparian/wetlands area of Rendezvous Beach is an important resource to the Park, offering recreation and nature study potential. There is a piece of private property that partially bisects the Park property, limiting the possibilities in this portion of the Park. A land trade with the private owner has been discussed and should be pursued.
   B. Construct a trail through the Big Creek wetlands/riparian area to encourage park visitors to visit and learn about this interesting area.

2. **Eastside Management Areas – Connections to proposed "Bear Trail."**
   A. The Park will coordinate with the Bear Lake Regional Commission to insure that the bike and pedestrian "Bear Trail" planned to circumnavigate the lake will meet the needs of both the Park and community.

3. **First Point – Overlook trail.**
   A. Consider constructing a trail to a high overlook east of the paved road.

4. **Rainbow Cove – Canyon trail to overlook.**
   A. Construct a trail up the canyon to the east of the paved road, terminating at a scenic overlook.

Staffing, Funding and Operations

The planning team and the general public identified concerns about the Park's limited funding for the current operational workload. They felt that the Park does not have adequate numbers or types of staff, or adequate funding to properly operate the Park at its current level of development. New development would only add to this problem, unless increases in ongoing operational funding were included with the new development.

Issue Area: Staffing, Funding and Operations

Key Issues:

- Lack of staff and funding for park operation
  - Need business plan for the Park that includes budget and staffing analyses.
  - Change Park's fee structure to improve ability to manage and operate the Park.
  - On-going operational funding is included with any new development.

The team felt that some analysis should take place to determine what staffing and funding levels should be with the current level of development, and for the proposed improvements to the Park. The team also felt that there were some measures that the Park could institute to help alleviate the lack of funding to the Park.

The team developed recommendations for one issue: the lack of staff and funding for park operation.

Issue: Lack of staff and funding for park operation.

The park does not have adequate operational funding, or numbers and types of employees, to properly operate the Park and meet off-park responsibilities. Maintenance of facilities, in particular, has suffered. The Park has had trouble in the past meeting the minimum Division of Facility Construction and Management maintenance standards. The eastside management areas, in particular, suffer from lack of staffing.

Recommendations

An analysis of staffing and funding levels will assist the Park in their requests for more operations staff and funds, and will help them justify more operational funding and staff for new development. Targeted user fees will help to protect and maintain the facilities and experiences for those specific activities.

Phase I Recommendations

1. **Complete a business plan for the Park.**
   A. The business plan should examine all aspects of the park operation, and should include analyses of budget and staffing use and needs for existing and future development.

2. **Change Park's fee structure to improve ability to manage and operate the Park.**
   A. Consider changes such as:
      - Surcharge fees, that remain available to the Park, for various activities such as slip rental surcharge to pay for dock repair and replacement, and camping surcharge to help pay for reforestation and tree care in campgrounds.
      - Lower fees for walk-ins and bicycles at the Marina (to encourage these uses to ease the parking problem), and for those wishing to access the concession operation.

3. **Ensure that on-going operational funding is included with new development.**

Scenic Bear Lake

Natural Resource Management

The planning team identified natural resource management issues relating to overuse by visitors, uncontrolled dispersed use, and pollution and water quality. Of utmost concern is the loss of cottonwood trees in the Cottonwood and Big Creek areas of Rendezvous Beach. Overuse has played some part in the death of these trees, and, along with dispersed visitor use, is damaging native vegetation in other areas.

Issue Area: Natural Resource Management

Key Issues:

- Overuse of park areas.
  - Landscape designs for all park areas.
  - Program to replace and maintain trees in Cottonwood and Big Creek Campgrounds.
  - Separate group and individual sites.
  - Use limits and closures to rehabilitate areas.
- Pollution and water quality.
  - Hazardous spill plan.
  - Re-engineer sewage pump-out at Marina.
  - Support efforts to maintain water quality.
  - Cleanup SW Undeveloped Area dumpsite.
  - Resolve Rendezvous Beach sewer lagoon site status.
  - Investigate municipality providing culinary water to Rendezvous Beach area.

A potential for hazardous spills in the Marina was addressed, as was general lake water quality, and the cleanup of a dumpsite on park property. The team was concerned about the Park's operation of a water system that supplies culinary water to private homes.

Issue: Overuse of Park Areas.

The trees at Rendezvous Beach were identified as an intrinsic value of that area. The trees, especially in the Cottonwood and Big Creek areas, have been dying at an alarming rate. Many have had to be removed because their state of health has made them a falling danger to visitors. The trees, and the shade they provide, are an important attraction to the area. The concentrated visitor use and campground design are contributing factors (along with drought) to tree loss.

Uncontrolled, dispersed use at the eastside areas is also causing damage to, and loss of, vegetation.

Recommendations

The recommendations outline ways to restore, improve and maintain the Park's vegetation, while protecting and improving visitor experiences.

Phase I Recommendations

1. **Landscape design plans for all park areas.**
   A. These plans will outline how vegetation will be restored and maintained, and will suggest species to be used. These plans were also mentioned in the Facilities Development section.

2. **Specific program to replace and maintain the trees in the Cottonwood and Big Creek campgrounds.**
   A. Should include a redesign of the Big Creek Campground to minimize impacts to vegetation and to distribute visitor use.
   B. Replace trees and protect new tree growth. Specify replacement tree species.
   C. Outline more extensive management of trees including supplemental watering systems.
   D. Provide educational material to visitors about trees and tree care.

3. **Management of trees at eastside areas.**
   A. Plant and maintain trees at eastside areas, and implement means to protect existing trees. These would provide shade and screening in day-use and campsites.

4. **Separate group-use and individual sites.**
   A. Group-use in individual or family campsites is compounding the overuse problem. Develop strategies to separate these types of use, including constructing more group sites.

5. **Use limits and closures.**
   A. Consider establishing use limits and/or closing areas for rehabilitation of resource damage if other means do not reverse impacts.

Issue: Pollution and Water Quality.

There is potential for pollution and an impact on the water quality of the lake due to hazardous spills in the Marina from fuel and sewage. There is a park area that has been used as a dumpsite by area residents and another that is the former site of a sewage lagoon. The team is concerned about the Park operating a water system that supplies culinary water to the Park and private residences.

Recommendations

These recommendations address resolving existing and potential pollution sources, and other potential problems to the Park and environment.

Phase I Recommendations

1. **Hazardous spill response plan.**
   A. The Park should develop a plan to deal with hazardous spills in the Marina and other areas where potential exists.

2. **Sewage pump-out at Marina.**
   A. The sewage pump-out at the Marina has had an ongoing problem. The pump has to be primed before each use. This makes the process more complicated and increases the chance of sewage being spilled into the lake.
   B. The Division Planning and Construction section will find a solution to this problem.

3. **Monitor, preserve and protect water quality of the lake.**
   A. The Division and Park should support efforts to monitor, preserve and protect the water quality of the lake.

Phase II Recommendations

1. **SW Undeveloped Area – Dumpsite.**
   A. There is a borrow site in this management area that has been used by locals as a dumpsite. This area should be cleaned up and protected from future use as a dumpsite.

2. **Rendezvous Beach – Sewer Lagoon Site.**
   A. This detached parcel south of Rendezvous Beach was formerly used as the sewage lagoon for Rendezvous. It no longer serves that purpose and could be liquidated.

3. **Rendezvous Beach Water System.**
   A. The Park operates a water system with well, storage tank, and supply lines that not only supplies water to Rendezvous Beach, but also to a number of private residences adjacent to the Park.
   B. The planning team is concerned about the responsibility and liability associated with this system.
   C. The Park should investigate having a local municipality provide culinary water to the Rendezvous Beach area.

Economic and Community Impact

The team recognizes that Bear Lake State Park has an important role in the wellbeing of the local community and economy, both in Utah and Idaho. As mentioned previously, the Park generates nearly 30 percent of the total visitor spending in Utah's Bear Lake communities. The Utah Division of State Parks and Recreation's long-range strategic plan, Vision 2010, recognizes that parks have an important role to play in the state and local economies. In fact, Vision 2010 directs the Division to "lead efforts to increase the impact of tourism and recreation on local and state economies." It also states, "the Division will actively seek partnerships and concession opportunities for the private sector in the state park system."

Issue Area: Economic and Community Impact

Key Issues:

- Economic impact.
  - Appropriate ATV trailheads and facilities.
  - Information panel for area visitor center.
  - Attract off-season use.
  - Consider non-traditional or new activities.
- Increase concession opportunities.
  - Increase number of camping cabins.
  - More boat mooring opportunities.
  - Consider new concessionaire suggested activities.
  - Visitor surveys should ask what concession services are desired.

Issue: Economic Impact

As mentioned above, the Park is important to the local economy, and has a responsibility, as outlined in the Division's strategic plan, to increase the economic impact of tourism and recreation in the Bear Lake area.

Recommendations

The Park will provide recreation opportunities to enhance visitation and visitor spending in the area.

Phase I Recommendations

1. **All-terrain vehicle (ATV) trailhead and access.**
   A. Where appropriate, provide ATV trailheads and/or trail access from campgrounds.
   B. As indicated in the Facility Development section, an ATV trailhead and access was recommended near the Big Creek Campground at Rendezvous Beach.

2. **Information panel at new overlook visitor center.**
   A. Work with UDOT and local travel councils to develop an informational panel highlighting park opportunities at the new area visitor center.

3. **Attract off-season use.**
   A. Encourage concessionaire to have cabins at Rendezvous Beach open year round to attract cross-country skiers, snowmobile operators, and other off-season use.

4. **Consider non-traditional or new activities at Park.**
   A. Investigate, and be open to, alternative (non-traditional) activities at the Park such as public/private partnerships, packages, tours, off-season activities, balloon festival, and Park participation in chamber of commerce activities.

Issue: Increase Concession Opportunities.

As directed by the Division's strategic plan, the planning team considered ways to augment concession opportunities in the Park.

Recommendations

Concession operations in parks must be appropriate to the park's mission and must meet visitor needs. The team crafted recommendations that fit these criteria.

Phase I Recommendations

1. **Increase number of camping cabins.**
   A. Work with concessionaires to increase number of camping cabins in the Park. Accomplish this by putting small groups of cabins in appropriate locations throughout the Park making use of existing facilities such as restrooms and showers.

2. **Increase boat-mooring opportunities.**
   A. Investigate the development and use of buoy fields, with wave breaks or floating docks, to provide increased mooring and possible concession opportunities.

3. **Additional services to be considered by existing concession operator.**
   A. Mast set-up and takedown assistance for a fee.
   B. Catering food for large groups within the Park.
   C. Improve and provide better signage for boat wash area. Concessionaire to consider installing coin operated pressure washers for boat washing.
   D. Provide Internet access.

4. **Surveys to determine concession services desired by visitors.**
   A. In all visitor surveys, ask visitors what types of concessions they would like.

Interpretation and Education

The Division's Vision 2010 plan, requires that all park RMPs address interpretation and education. Interpretation can improve visitor experiences, while building an appreciation of the park and its resources. This appreciation can lead to the proper use of park facilities and resources by visitors.

Issue Area: Interpretation and Education

Key Issues:

- Interpretive and educational opportunities for visitors and community.
- Comprehensive interpretive plan for park.
- Nature trails with interpretive signing or brochures.
- Continue school programs.
- Utilize the historic cabin at Rendezvous as a nature/interpretive center.
- Interpretive exhibits.
- Partner with community to develop and maintain an area website.

The Park needs to expand the interpretive/educational activities it offers to enhance visitor opportunities and experiences, improve regulation and rule compliance, and to better protect park and area resources and facilities.

Issue: Interpretive and Educational Opportunities for Visitors and Community.

The Park does not have a comprehensive interpretive plan, but has had some success with offering interpretive programs in park and community settings. Without an interpretive plan, the Park does not have clear goals for these efforts, and may not be getting their messages out in the most effective way. Also, visitors may not be getting the information that they desire.

Recommendations

The team recognized that an interpretive plan is needed for the Park. A number of possible interpretive facilities and exhibits were suggested, though an interpretive plan will ultimately direct the Park as to what types of interpretive medium and facilities are developed. Individual park interpretive plans are being completed as prioritized by the Division's Operation Management Staff.

Phase I Recommendations

1. **Create a comprehensive interpretive plan for the Park.**
   A. Use this recommendation to gain a placement on the Division's interpretive planning priority list.
   B. Work with the Division's Heritage Coordinator and Planning Section to complete an interpretive plan for the Park.

2. **Develop nature trails with interpretive brochures or signing where appropriate.**
   A. The Big Creek riparian/wetlands area was mentioned in the Facility Development section for this type of trail.

3. **Continue to provide interpretive programs in the area's schools.**
   A. Work with educators to make these programs curriculum based. These programs do educate young people about the Park and its importance, and improve the Park's standing in the community.

4. **Nature/interpretive center.**
   A. Utilize the historic cabin at Rendezvous Beach, Big Creek Campground as a nature/interpretive center.

Phase II Recommendations

1. **Aquatic wildlife exhibit.**
   A. Install an aquatic wildlife exhibit in the park office/visitor center, such as a refrigerated aquarium to interpret the native fishery.

2. **Exhibits to interpret water temperature, weather conditions, and Bear Lake water usage.**
   A. Develop exhibits to educate users about Bear Lake water use and associated fluctuations in water level. Currently little is understood about these topics.
   B. Install exhibit with visitor accessible water temperature and weather information. This exhibit would also serve a safety function.

3. **Bear Lake area website.**
   A. Partner with community to develop and maintain an area information website with live web cam and links to other recreation related sites. This would attract people to the area, and would provide important information to visitors before they arrive.

Figure 6: Issue/Recommendation Phase I and II Summary

Issue Area/Issues	Phase I - Recommendations	Phase II - Recommendations
Facility Development		
Improve Existing, and Develop Additional, Boating Facilities	1. Study feasibility for deep-water expansion at Marina, and develop expansion, if deemed feasible. 2. Improve approach to boat ramp at Rainbow Cove.	1. Eastside Areas – Widen boat ramps as necessary and improve boat trailer parking. 2. Study feasibility of a floating marina on eastside of Lake. 3. Study feasibility of providing courtesy docks at eastside boat ramps. 4. Rendezvous Beach – Develop a single-width boat ramp next to concession operation.
Improved Opportunities and Facilities for Day-use, Camping, and Lodging	1. Improve ADA-type accessibility. 2. Complete development site plans for all eastside areas, and proceed with development, as funds are available. 3. Develop day-use facilities at the Marina. 4. Redesign the Big Creek Campground. 5. Develop clusters of camping cabins at Rendezvous Beach. 6. Develop a maintenance facility at Rendezvous Beach.	1. Provide water and electricity in restrooms at eastside areas, where possible. 2. Complete development site plans for the SW Undeveloped Area, and proceed with development, as funds are available. 3. Complete a boundary survey of Rendezvous Beach. 4. Investigate additional day-use opportunities at Rendezvous Beach. 5. Develop amphitheaters and overflow parking at Rendezvous Beach. 6. Improve lake access from campsites at Rainbow Cove.
Trails and Trail Connections	1. Develop an ATV trailhead at Big Creek to link the Park to nearby public lands and the existing Shoshone Trail. 2. Plan for impact of the "Bear Trail" at Rendezvous Beach. 3. Provide trails for access to facilities and recreation areas, including access for those with disabilities at Rendezvous.	1. Develop a nature trail at the Big Creek wetlands. 2. Plan for impact of the "Bear Trail" at eastside areas. 3. Consider and construct overlook trails at First Point and Rainbow Cove.
Staffing, Funding and Operations		
Lack of Staff and Funding for Park Operation	1. Complete a business plan for the Park. 2. Change Park's fee structure to improve ability to manage and operate the Park. 3. Ensure that on-going operational funding is included with new development.	
Natural Resource Management		
Overuse of Park Areas	1. Landscape design plans for all park areas. 2. Specific program to replace and maintain the trees in the Cottonwood and Big Creek Campgrounds. 3. Management of trees at eastside areas. 4. Separate group use and individual sites. 5. Use limits and closures.	
Pollution and Water Quality	1. Hazardous spill response plan for Marina and other areas. 2. Re-engineer sewage pump-out at Marina. 3. Monitor, preserve and protect water quality of the lake.	1. Mitigate dumpsite at SW Undeveloped Area. 2. Resolve issue with sewer lagoon site. 3. Investigate municipality supplying culinary water to Rendezvous Beach area.
Economic and Community Impact		
Economic Impact	1. All-terrain vehicle (ATV) trailhead and access. 2. Information panel at new overlook visitor center. 3. Attract off-season use. 4. Consider non-traditional or new activities at Park.	
Increase Concession Opportunities	1. Increase number of camping cabins. 2. Increase boat-mooring opportunities. 3. Other opportunities for existing concessions. 4. Surveys to determine concession needs.	
Interpretation and Education		
Interpretive and Educational Opportunities for Visitors and Community	1. Create a comprehensive interpretive plan for the Park. 2. Develop nature trails with interpretive brochures or signing where appropriate. 3. Continue to provide interpretive programs in the area's schools. 4. Develop a nature/interpretive center.	1. Install an aquatic wildlife exhibit at the Marina office. 2. Exhibits to interpret water temperature, weather conditions, and Bear Lake water usage. 3. Partner to create a Bear Lake area website.

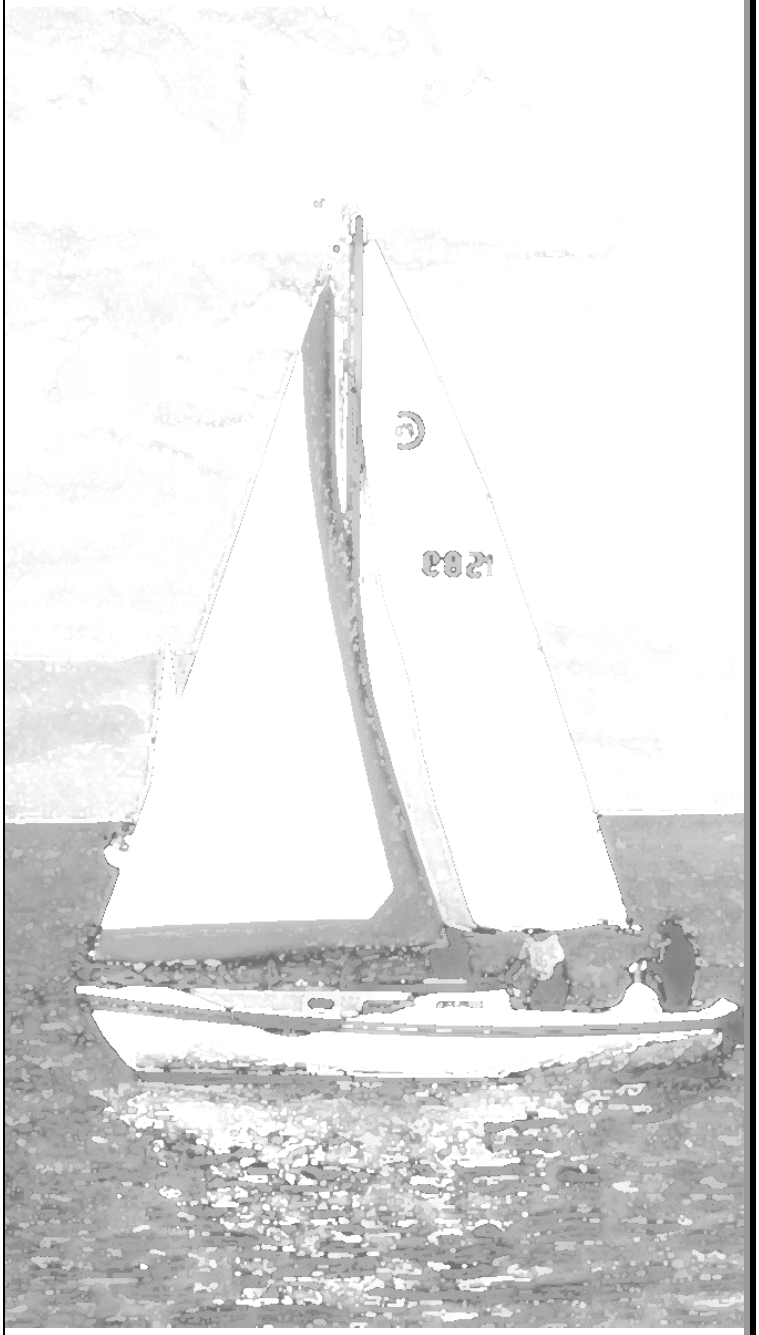
Conclusion

This plan is a blueprint to help implement the planning team's recommendations. As such, it outlines the initial steps to be taken in concert with park visitors, local communities and other interested users to: properly develop facilities to meet diverse visitor needs; ensure adequate staffing and funding; protect the natural resources of the Park; enhance the Park's impact on the community, and the state and local economies; and educate visitors and community members about the Park and its resources.

The recommendations contained in this plan conform to the team's mission of providing visitors a wide variety of safe and satisfying water-based and shoreline recreation experiences. The plan's recommendations effectively address the current needs for facility development, resource protection, park operations, land management, and cooperative efforts. However, it is crucial that adequate funding be received to implement these goals and accommodate visitor needs.

The plan's success is dependent upon the continued support of stakeholders. Stakeholders must continue their efforts to support park improvements, preserve park resources, interact with local communities and strive to meet the expectations of park visitors in the midst of a rapidly growing community of recreation-oriented citizens. The recommendations contained within this plan were based upon an open and collaborative process. It is imperative that this collaborative spirit continues as the plan's components are implemented.

It is also imperative that the document be reviewed on a regular basis to ensure its viability, relevance and usefulness. This document has sufficient flexibility to be amended in response to changing resource conditions, visitor needs and expectations, community needs and agency priorities. Such amendments may occur under the auspices of the Division of Parks and Recreation. Any such changes will include input from park visitors, local citizens, community leaders, park management or other stakeholders with interests relevant to the operation and maintenance of the Park.



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Maps

Map 2: Bear Lake and Vicinity (showing the various management areas of Bear Lake State Park)

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Map 2: Bear lake State Park Management Units
Legend:
Ownership
BLM
STATE
PRIVATE
STATE PARK
0 0.25 0.5 1 1.5 2
Miles
Map produced by Utah State Parks and Recreation for planning purposes only. October 6, 2005
North Eden
Rainbow Cove
Cisco Beach
Bear Lake Marina
Garden City
South Eden
First Point
Southwest Undeveloped Area
Rendezvous Beach Rec. Area
Laketown

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Appendices

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Appendix A

Public Comments on Draft Resource Management Plan

In October 2005, this Plan was released to the public for review and comment. During October and November 2005, the Plan was made available to the general public by placing an electronic version on the Utah Division of State Parks and Recreation website. Hardcopies were made available to the public at Bear Lake State Park, the Garden City offices, and the Department of Natural Resources building in Salt Lake City. Comments were accepted by e-mail or in writing to the Division's planning section. The following is a summary of comments received in response to the Draft Plan. Each comment is summarized below and is followed by the Division's corresponding response.

Comment: Deep Water Marina Expansion (one comment)
The comment asked if the drawing of the marina expansion was preliminary in nature, and offered some design elements to consider for the expansion. The suggestions are listed below.

> I would suggest that consideration be given to overlapping the breakwater entrances for 2 reasons:
>
> A. *As we all are aware, there is a silting problem immediately in front of the entrance to the existing marina due to the natural current & circulation of the water coming from the north. If the northern side of the new north jetty overlapped the southern most jetty, it might prevent silt build up at the mouth of the new marina expansion.*
>
> B. *An overlapping of the mouth of the jettys might serve to act as a traffic calming device since power boats trying to enter the marina would have to make a couple of turns to get in rather than just hotshotting it full bore and blasting into the marina as a lot of power boats do today. This would improve safety when entering and leaving the marina.*
>
> *I would also suggest exploring the location of the new crane platform. It appears to be even further inland than the existing crane platform at the marina. I understand efforts will be made to make this a deep water facility, but I think the crane platform should be put on the SE corner of the new south jetty to allow more water depth should for some reason the water level fall much below its present level in the future.*

Response:
The representation of the possible marina expansion shown in this RMP is very conceptual in nature. The drawing does not necessarily represent the final design of the expansion. The RMP is meant to identify issues, and the means to deal with those issues. While suggested facility development is part of the Plan, final design of those facilities will occur outside of the Plan. The recommendations from this comment have been shared with the Division of Utah State Parks and Recreation Development Section to consider when the actual design of the expansion is developed.

Comment: Thanks! (one comment)
This comment thanks the Division for allowing the public to participate in the resource management planning process, and for keeping the public aware of progress of the plan.

Response:
The Division's goal is to involve the public in all aspects of the RMP process, through membership on the planning team, public meetings to identify issues, and by soliciting comments on draft plans.

Comment: Possible Expansion of Park (one comment)
The comment, from a Division employee, states, *State Parks should consider the possibility for the future expansion of recreation estate/opportunities of Bear Lake State Park through MOU/MOA with other state, federal, and local agencies. These opportunities should include property not located directly adjacent to the shoreline of Bear Lake.*

Response:
The area around Bear Lake is developing rapidly. Open space is filling in with residential development, mostly for second or vacation homes. The demand for recreation facilities is continuing to increase. The Division will consider expansion possibilities for Bear Lake State Park, if they enhance recreational opportunities for visitors, protect critical lands and resources, and have public support.

Appendix B

Aquatic and Terrestrial Wildlife Utilizing The Bear Lake State Park Parcels

Bryce Nielson, 2004

Introduction

This paper will discuss in general terms the wildlife present, typical utilization, habitat preferences, and general planning considerations at six parcels owned and managed by the Utah Division of State Parks and Recreation.

Stateline/North Eden

This small parcel is bordered by Idaho State Parks property to the north and private property (Steven Nebeker) to the south. It consists primarily of a sandy beach berm and some sage and grass mixture. The value of the adjacent littoral zone for Bear Lake fishes is limited since there is no rock or gravel substrate. The upland area has cottontail and possibly pygmy rabbits, Uinta Mountain ground squirrels, chipmunks and mule deer. Amphibians may include the tiger salamander and the chorus frog. Reptiles may include the wandering garter snake, Valley garter snake, Great basin Rattlesnake and the northern sagebrush lizard. The site if frequented, depending on time of year, by raptors, Bald and Golden Eagles, Osprey, gulls, magpies, and neotropical and resident small bird species.

Rainbow Cove, Cisco Beach and South Eden

This parcel is the most diverse and valuable in terms of wildlife and habitat of any of the Bear Lake State Park property. It is bounded on both ends by natural deltas, North and South Edens, which provide excellent sagebrush habitat bordering agricultural activities. At the north end of Rainbow Cove, part of a fluctuating wetland complex exists. When the lake level is normal, water percolates through the beach berm and creates a natural wetland with the typical emergent vegetation and associated bird and wetland species. During low water the site dries and provides minimal habitat value. All of the aforementioned terrestrial exist is this parcel also. The east north/south fault line of Bear Lake creates Cisco Beach. This area and the bedrock talus material that has eroded into the lake are extremely important to the endemic fish species. The Bonneville cisco, Bear Lake whitefish and Bonneville whitefish all utilize this site for spawning. The Bear Lake sculpin is dependent to the flat rocks in the area for egg attachment. The Utah sucker also utilizes this habitat for spawning especially near the thermal springs and methane gas vents common along the beach littoral zone. Speckled dace, red-sided shiners and Utah chub also inhabit this area. During spring and fall migration of pisciorvous birds, including common loons, terns, mergansers, gills, goldeneye and others frequent this area to feed of fish congregations.

First and Second Points

These two small rocky points provide similar habitat for the aquatic complex when the lake is at typical levels. At low levels, the majority of the rock is dewatered. The value of this parcel is the sage and cedar hills that rise to the east from the lakeshore. This area is extremely important for deer winter range and refuge. It is not grazed by domestic livestock and provides a diversity of habitat for many common terrestrial species of wildlife.

Rendezvous Beach/Big Spring Creek

Rendezvous Beach has intensive recreation impacts and wildlife is limited during the summer. After the visitors leave, the area is repopulated with many bird species including owls, raptors and cavity nesting birds which are attracted to the old growth cottonwoods. The beach area provides little habitat for fish however the entrance of Big Spring Creek into the lake creates nutrient and detritus inflows, which are beneficial to wildlife. It has been interesting to observe a number of hibernaculum's that are utilized by various snake species, garter and green along the creek riparian corridor. This largely undeveloped riparian zone along Big Spring Creek hosts a myriad of different terrestrial animals (beaver, raccoon, skunks, red fox, coyote), birds, waterfowl, amphibians and reptiles. Although stream flows are problematic, when flowing it provides spawning and rearing habitat for Bear Lake cutthroat trout, Utah sucker, red-sided shiners, yellow perch, longnose dace, green sunfish and carp. It also harbors freshwater mussels of which little is known. This area has been impacted by agricultural and livestock which has resulted in eroding banks and stream siltation. Utah Wildlife Resources and the adjacent property owner are addressing these problems presently and this natural riparian area will be improved.

South Side

This strip of land presently has value as winter range for mule deer. It is frequented by other terrestrial animals and birds. Its true value will be as an open space corridor between the highway/lake and the eventual recreational property development above and to the south of it.

Bear Lake State Marina

The marina provides a unique aquatic habitat on Bear Lake. The riprapped outside provides the same habitat and function for the endemic fish species as does Cisco Beach. The inside of the marina provides protection from the scouring wave action of Bear Lake. It is like a pond with rooted macrophytes that provide cover and rearing habitat for cutthroat trout, Utah chub, yellow perch, and carp. The inside of the marina is perfect spawning habitat for Utah suckers. This fish assemblage provides food from western grebes, white pelicans, ospreys and gulls. The marina is like it own little unique ecosystem.

Summary

There is a diverse number of habitat types and resulting wildlife in Bear lake State Park parcels. As a management plan is developed for these areas, opportunities exist to incorporate and enhance the wildlife and habitat values that exist there.

Appendix C


BEAR LAKE DEEP WATER MARINA EXPANSION
BEAR LAKE STATE PARK GARDEN CITY UTAH
BEAR LAKE MARINA EXPANSION
CONCEPT LAYOUT
C-101
SHEET 1 OF 2
TO GARDEN CITY
HIGHWAY 89
PAVILION
RESTROOMS
NEW SOUTH JETTY
DEEP WATER MARINA EXPANSION
EXISTING MARINA
EXPANDED NORTH (SHARED) JETTY
MARINA EXPANSION WILL USE EXISTING ENTRANCE
CRANE PAD 35t CRANE
FUEL DOCK
WIRE DOWN LANES
DAY USE PARKING
BOAT RAMP
BOAT PREP LANES
DAY USE SHELTER
TOE OF SLOPE / UNDERWATER LEDGE
BEAR LAKE
NORTH
SCALE 1"=80'
BOAT SLIPS
300 ADDITIONAL 30' X 15' DEEP WATER SLIPS (CONCEPT LAYOUT ONLY - ACTUAL MAKEUP OF SLIP SIZES AND NUMBERS TO BE DETERMINED)
PARKING SPACES:
A - EXPANDED NORTH (SHARED) JETTY
160 ADDITIONAL 9' X 18' PARKING SPACES
B - NEW SOUTH JETTY
160 ADDITIONAL 9' X 18' PARKING SPACES
C - DAY USE AREA (WEST OF RAMP)
96 ADDITIONAL 9' X 18' PARKING SPACES
96 ADDITIONAL 12' X 82' TRAILER PARKING SPACES
LANDSCAPE (SOD AND XERISCAPE)
CONCRETE
King Engineering, Inc.

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NATURAL RESOURCES
Division of Parks & Recreation