GEOTECHNICAL INVESTIGATION

DWR – Proposed Loa Fish Hatchery Programming

January 17, 2024

SUNRISE ENGINEERING

SUNRISE ENGINEERING
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January 17, 2024

Jon Vance
State of Utah DFCM
4110 State Office Building
Salt Lake City, Utah 84114

Subject: Geotechnical Investigation
Utah Division of Wildlife Resources (UDWR) – Loa Fish Hatchery Programming
Loa, Utah

Mr. Vance,

Enclosed herein is the report for a geotechnical investigation for the above referenced project. This report presents the results of the geotechnical subsurface exploration, engineering analysis, and recommendations for design and construction of the proposed Loa Fish Hatchery Improvements Project in Loa, Utah.

We appreciate the opportunity to provide geotechnical services to you for this project. Should you have any questions about the report, or if we may be of further service in any way, please let us know.

Sincerely,
SUNRISE ENGINEERING, INC.

Prepared by:

Dao Yang, P.E.
Project Engineer/Hydrogeologist

Reviewed by:

Derek Anderson, P.E.
Environmental Division Manager

GEOTECHNICAL INVESTIGATION

UDWR – PROPOSED LOA FISH HATCHERY PROGRAMMING

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1 INTRODUCTION

Sunrise Engineering, Inc. (Sunrise) has completed a geotechnical investigation for a proposed fish hatchery improvements project in Loa, Utah. The proposed project site covers portions of Sections 24 and 25, Township 27 South, Range 2 East, Salt Lake Base and Meridian (SLBM), as shown in **Figure 1**. This report presents a summary of the geotechnical investigation.

1.1 Objectives

The objectives of the geotechnical investigation were to:

- Evaluate subsurface soil/rock and groundwater conditions within the project area, and
- Provide appropriate foundation and earthwork recommendations at the project site.

1.2 Scope of Work

The following tasks have been completed:

- Collect and review available geologic and soil data within the project area
- Excavate seven test pits (TP-1 through T-7) at various locations on-site
- Analyze collected geotechnical data
- Provide recommendations for design and construction of the proposed structure

2 PROPOSED CONSTRUCTION

The purpose of the project is to upgrade the existing old hatchery for fish enhancement. The proposed project components, as depicted in **Figure 2**, include the following:

- Demolition of existing old buildings and dilapidated raceways
- Installation of a new spring collection system to improve the existing spring water collection system
- Construction of new raceways in two areas: a 124-foot by 86-foot area and a 500-foot by 146-foot area
- Construction of a shop/office building, two replacement houses, one feed building, a new disinfection station, a degasser, and a wastewater treatment facility

3 SITE INVESTIGATION

3.1 General Geology

The project site is located in Dry Valley. According to Biek and others (2015), the project site is underlain by the Quaternary modern stream alluvium (Qal1) (Holocene) and young and middle fan alluvium, undivided, (Qafy) (Holocene to upper Pleistocene), as shown in **Figure 3**. The modern stream alluvium consists of sorted sand, silt, clay, and pebble to boulder gravel deposited in active, main-stem stream channels and floodplains of creeks; locally includes minor stream-terrace alluvium as much as 10 feet above current stream levels; typically incised into older alluvial and fan deposits; and is probably less than 20 feet thick. The young and middle fan alluvium formation consists of poorly to moderately sorted, non-stratified, boulder- to clay-size sediment containing subangular to subrounded clasts deposited at the mouths of streams and washes; forms both active depositional surfaces and low-level inactive surfaces incised by small streams that are undivided; deposited primarily as debris flows and debris floods, and has a thickness of a few tens of feet.

Figure 3 also indicates that Dry Valley is a graben formed by two buried normal faults. The site is located at the edge of the valley, and one of the buried faults runs beneath the site. The Brian Spring may be associated with the fault.

3.2 Test Pit Excavation and Subsurface Conditions

Fieldwork was conducted on May 23, 2019, seven test pits were excavated using a track hoe provided and operated by Jackson Excavation. Test Pit locations are shown in **Figure 2**. **Table 1** summarizes the soil and groundwater conditions at the test pit locations.

Table 1. Soil and Groundwater Conditions at Test Pit Locations

Test Pit #	Description	Total Depth	Groundwater
1	0-4': fill material consisting of gravel with sand and fines; 4-8': cemented gravel, cobbles and boulders; and refusal occurred at 8'.	8'	2'
2	0-2': topsoil; 2-6': silty sand (SM); 6-7': clay; and 7-15': silty.	15'	No groundwater
3	0-5': gravelly fill; 5-10': clay (CL); and 10-13': silt (ML). Spring water encountered at 10' and artesian flow after test pit was backfilled.	13'	10'
4	0-2': topsoil; 2-15': sandy silt (SM).	15'	No groundwater
5	0-2': topsoil; 2-6': silt (ML); 6-10': clay (CL); and 10-15': sandy silt (SM).	15'	10'
6	0-1': topsoil; 1-5': sandy silt (SM); 5-9': clay (CL) with LL=38, PL=15 and PI=17; and 9-15': silt (ML).	15'	No groundwater
7	0-2': topsoil; 2-3': sandy silt (SM); 3-7': clay (CL); and 7-16': silt (ML).	16'	No groundwater

Selected soil samples were delivered to a geotechnical laboratory for analyses of gradation and Atterberg limits. Only one of the samples is plastic (TP-6@7') with a plasticity index of 17. All the other samples are non-plastic. The geotechnical laboratory report is provided in **Appendix A**.

3.3 Geologic Hazards

3.3.1 Active Fault and Surface Fault Rupture

An active fault is a fault displaying evidence of greater than four inches of displacement along one or more of its traces during Holocene time (about 10,000 years ago to present).

The buried fault that runs beneath the site is not an active fault. According to the U.S. Geological Survey (USGS) (2019), there are no active faults within a 5-mile radius of the project site, as shown in **Figure 4**. Therefore, a fault study is not required.

3.3.2 Landslide/Rock Fall

Landslide or landslip is a geological phenomenon which includes a wide range of ground movement such as rock falls, deep failure of slopes, and shallow debris flows which can occur in offshore, coastal and onshore environments. Although the action of gravity is the primary driving force for a landslide to occur, there are other contributing factors affecting the original slope stability. Typically, pre-conditional factors build up specific sub-surface conditions that make the area/slope prone to failure, whereas the actual landslide often requires a trigger before being released.

According to Giroud and Shaw (2007), the project area has a very low susceptibility potential for landslides.

Based on the topographic information in **Figure 1**, the site is very flat; however, the land to the west has a topographic slope of approximately 26%. The relatively steep slope is well vegetated, and no loose rock was observed during the fieldwork conducted on May 23, 2019. Therefore, rock fall hazard is not of concern at the project site.

3.3.3 Floodplain

A floodplain is flat or nearly flat land adjacent to a stream or river that experiences occasional or periodic flooding. It includes the floodway, which consists of the stream channel and adjacent areas that carry flood flows, and the flood fringe, which are areas covered by the flood that do not experience a strong current. A 100-year flood is calculated to be the level of flood water expected to be equaled or exceeded every 100 years on average. The 100-year flood is more accurately referred to as the 1% flood, since it is a flood that has a 1% chance of being equaled or exceeded in any single year. Based on the expected flood water level, a predicted area of inundation can be mapped.

The Federal Emergency Management Agency (FEMA) website was searched for Flood Insurance Rate Maps (FIRMs) covering the project area. The project site is not mapped (FEMA, 2019). According to Six County Association of Governments (2009), the project site is not within a 100-year flood hazard zone (**Appendix B**).

3.3.4 Avalanche Path

An avalanche is a rapid flow of snow down a slope, from either natural triggers or human activity. Typically occurring in mountainous terrain, an avalanche can mix air and water with the descending snow. Powerful avalanches have the capability to entrain ice, rocks, trees, and other material on the slope. Avalanches are primarily composed of flowing snow, and are distinct from mudslides, rock slides, and serac collapses on an icefall. In mountainous terrain, avalanches are among the most serious objective hazards to life and property, with their destructive capability resulting from their potential to carry an enormous mass of snow rapidly over large distances.

According to the Utah Avalanche Center (2019), no avalanche has been recorded since 1910 in the Loa area. Therefore, the site is not within an avalanche path.

3.5.5 Liquefaction

Liquefaction is a process by which soils below the water table temporarily lose strength and behave as a viscous liquid rather than a solid. The types of soils most susceptible are clay-free deposits of sand and silts, and occasionally gravel. When seismic waves, primarily shear waves, pass through saturated granular layers, they distort the granular structure and cause loosely packed groups of particles to collapse. These collapses increase the pore-water pressure between the soil grains if drainage cannot occur. If the pore-water pressure rises to a level approaching the weight of the overlying soil, the effective stresses between soil grains drops to zero and the granular layer temporarily behaves as a viscous liquid rather than a solid. The liquefaction potential of a soil depends primarily on the looseness of the soil, the amount of cementing or clay between particles, and the amount of drainage restriction.

Since the subsurface soils are generally fine-grained material (mostly silt and clay), the liquefaction potential at the site may be low should a strong earthquake occur.

4 DESIGN RECOMMENDATIONS

4.1 Site Preparation

Topsoil, manmade fills (where encountered) and soils loosened by construction activities should be removed from the building pad, pavement areas, and concrete flatwork areas prior to foundation excavation and placement of site grading fills. Following stripping, the subgrade should be proof-rolled to a firm, non-yielding condition or 90% of maximum dry density (ASTM D1557). Soft areas detected during the proof-rolling operation should be removed and replaced with structural fill. If the soft soil extends more than 1.5 feet deep, stabilization may be required. The use of stabilization should be approved by the geotechnical engineer and would likely consist of over-excavating the area by at least 1.5 feet, placing a geofabric (such as Mirafi 600X)) or a geogrid (such as Tensar BX-1100) at the bottom of the excavation over which a stabilizing fill consisting of angular coarse gravel with cobbles is placed up to the design subgrade. Vegetation and other deleterious materials should be removed from the site.

The stripped soils will be unsuitable as structural fill but may be stockpiled for later use in landscaped areas.

4.2 Excavation and Site Grading

Earthwork will be required to level the construction site. Shallow temporary construction excavations not exceeding 4 feet in depth may be constructed with near-vertical side slopes. Temporary cut slopes may be constructed at side slopes of 1.5:1.0 (horizontal: vertical). It is the responsibility of the contractor to provide safe working conditions in connection with below grade excavations.

4.3 Fill Material

All fill material should be inorganic soils free of vegetation and debris. Fill material should meet the requirements based on the intended use, as summarized in **Table 2**. Compaction requirements are provided in **Table 3**.

Table 2. Fill Material Requirements

Fill Type	Application	Requirements		
		Gradation		Plasticity
		Size	Percent finer by weight	
Structural Fill	Under foundations, concrete slabs or other structural areas	4 inch No. 4 sieve No. 200 sieve	100 35-65 15-35	Liquid limit 20 max Plasticity Index 6 max
Site Grading Fill	Fill in non-structural areas and below pavements	4 inch No. 200 sieve	100 <50	Liquid limit 40 max Plasticity Index 10 max
Pipe Zone Backfill	Within utility pipe zone	3/4 inch 3/8 inch No. 4 sieve No. 16 sieve No. 200 sieve	100 78-92 55-67 28-38 7-11	Non-plastic
Trench Backfill	Utility trench backfill above pipe zone	6 inch No. 200 sieve	100 <50	Liquid limit 30 max Plasticity Index 6 max
Aggregate Base Course	Access Road and Parking Area	2 inch 1½ inch 3/4 inch 3/8 inch No. 4 sieve No. 40 sieve No. 200 sieve	100 85-100 70-85 55-75 40-65 15-30 4-10	Non-plastic

Pea gravel or other similar non-cementitious, poorly-graded materials should not be used as fill or backfill without prior approval from the geotechnical engineer.

Table 3. Compaction Requirements

Item	Description
Fill Lift Thickness	8 inches or less in loose thickness
Compaction	• 95% of the material's maximum dry density (MDD) per ASTM D1557 below footings, floor slabs and road areas as well as areas with 5 feet or more fill. • 90% of material's MDD per ASTM D1557 in other areas of fill and backfill.
Moisture Content	• near optimum water content (within ±2% of optimum at the time of placement and compaction).

Fill should be tested frequently for moisture content and compaction during placement. Should the results of the in-place density tests indicate the specified moisture or compaction limits have not been met, the area represented by the test should be reworked and retested as required until the specified compaction is achieved. This may require adjustment of the moisture content.

4.4 Permanent Slopes

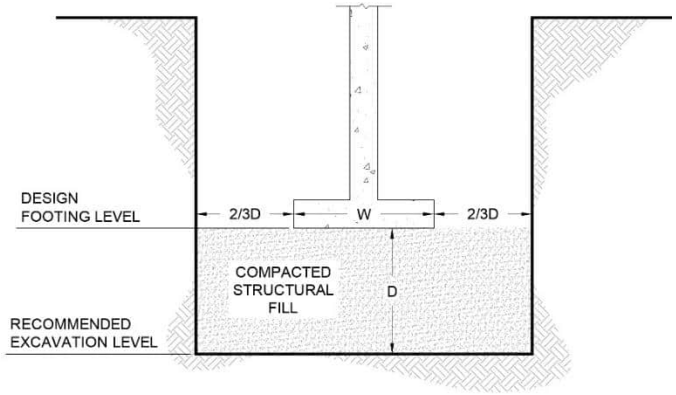
All final cut and fill slopes, if any, shall be graded to at least 2.0:1.0 (horizontal: vertical) or retained.

4.5 Foundations

4.5.1 Footings

4.5.1.1 Buildings

Based on the onsite soil conditions, it is recommended that buildings be constructed on spread footings. Footings should not be installed on loose or disturbed soils, undocumented fill, topsoil, construction debris, frozen soil, or within ponded water. If unsuitable soils are encountered, they should be over-excavated and replaced with structural fill. Structural fill placed below footings should extend laterally beyond the edges of the foundation. Structural fill, with a minimum thickness of 1-foot, should be placed beneath the footing. The minimum over-excavation and backfill procedure is shown in the following diagram:

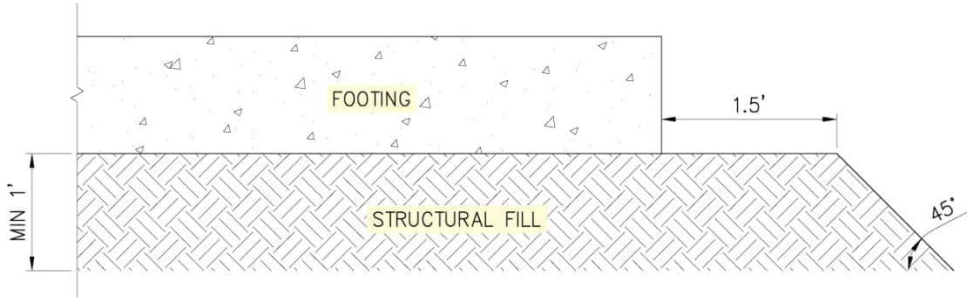


OVEREXCAVATION / BACKFILL

If the exposed soils on which the footings are to be founded become loose or disturbed, they should be re-compacted before concrete is placed.

4.5.1.2 Raceways

Based on the onsite soil conditions, it is recommended that raceways be constructed on a mat footing foundation. Footings should not be installed on loose or disturbed soil, undocumented fill, topsoil, construction debris, frozen soil, or within ponded water. If unsuitable soils are encountered, they should be over-excavated and replaced with structural fill. Structural fill placed below footings should extend laterally beyond the edges of the foundation a distance of 1.5 feet and then 1 foot for every foot of depth below the foundation (see the following diagram).



If the exposed soils on which the footings are to be founded become loose or disturbed, they should be re-compacted before concrete is placed.

4.5.2 Design Criteria

Based on the available data and in compliance with applicable building codes, the recommended design parameters for footings are summarized in **Table 4**.

Table 4. Design Criteria

Bearing Capacity	
Spread/Mat Foundation	1,000 pounds per square foot (psf)
Isolated Column	1,000 psf
Increase above value for short, transient loads	30%
Density of Structural Fill	125 pounds per cubic foot (pcf)
Modulus for Structural Fill	150 psi/in
Subgrade Soil Density	100 pcf
Subgrade Modulus	50 psi/in

4.5.3 Settlement

Structures at the site should be designed for a settlement of 1 inch and a differential settlement of ½ inch.

4.5.4 Slabs on Grade

The design requirements for slabs on grade are provided in **Table 5**.

Table 5. Design Recommendations for Slabs on Grade

Item	Description
Support for slabs on grade	A minimum of 4 inches of crushed gravel underlain by a minimum of 12 inches of reworked native soil or structural fill that is properly placed and compacted.
Modulus of subgrade reaction	100 psi/in (silty sand and gravel)

4.5.5 Lateral Pressure

Excavation walls and retaining walls will be subjected to horizontal loads from the lateral earth pressure of backfill. When the granular fill is lightly compacted, drained, and the surface of the soil slope behind the wall is horizontal, the backfill may be considered equivalent to a fluid with a density of 35 pounds per cubic foot (pcf) for active pressure and 55 pcf for static pressure.

4.5.6 Lateral Resistance

Resistance to lateral loads at the bottom of the footings can be calculated based on a coefficient of friction of 0.3. Passive resistance provided by properly placed and compacted granular structural fill above the water table may be considered equivalent to a fluid with a density of 250 pcf. These are ultimate frictional and passive pressure values and should be used with appropriate safety factors in design. Note that fill against the sides of footings should be placed and compacted to at least 90% of maximum dry density as indicated in Section 4.3 (Structural Fill).

4.5.7 Drainage

Drainage design should provide for rapid removal of water from foundation soils and pavement materials, both during and after construction. Drainage design should provide for intercepting water and directing it away from cut and fill slopes.

4.5.8 Soil Corrosivity

Two soil samples were collected from Test Pits TP-2 and TP-7. The samples were delivered under proper chain-of-custody protocols to a chemical laboratory for analysis of sulfate, pH and resistivity. The laboratory results for the samples are summarized in **Table 6** and provided in **Appendix C**.

Table 6. Chemical Laboratory Results

Test Pit	Depth (ft)	Sulfate (mg/kg)	Resistivity (ohm-cm)	pH
TP-2	3	51	154,000	8.2
TP-7	4	21	343,000	8.4

Based on the laboratory results presented in **Table 4**, the sulfate concentration is considered negligible. Therefore, Type I or II Portland Cement is recommended for the proposed project.

Based on the laboratory results presented in **Table 4**, the resistivity results range from 154,000 to 343,000 ohm-cm and the pH values are between 8.2 and 8.4, indicating an unlikely corrosion potential (Hubbell, Inc., 2003).

4.5.9 Pavement

The pavement recommendations in this section are based on light trucks as the traffic load. Under the assumption that the CBR value is 5 for the onsite native subgrade and 78 for road base, and EAL = 5,000 for light trucks, the following pavement recommendations are given: a 3-inch-thick asphalt concrete surface over an 8-inch-thick aggregate base course underlain by 12-inches of reworked subgrade or structural fill in fill areas.

4.6 Seismic Lateral Earth Force

4.6.1 Site Class

Based on the data collected from the test pits, well logs (**Appendix E**), and geologic information at the site, the project site may be classified as Site Class E (soft soil) according to International Code Council, Inc. (2021).

4.6.2 Seismic Lateral Earth Force

Seismic activity can generate increased lateral earth pressures acting on the foundation walls of structures. The increase is influenced by horizontal ground acceleration. Based on the simplified Mononobe-Okabe procedure with the yielding walls approach for a vertical wall with horizontal backfill, the additional lateral pressures due to earthquake motions at the site may be estimated as follows:

$$\Delta P_{ae} = 9.95H^2 \text{ for the walls}$$

Where ΔP_{ae} = seismic lateral pressures in pounds per linear foot (plf) acting at a distance of 0.6*H from the base of the wall, where H is the height of retained soil in feet.

4.6.3 Other Seismic Parameter Values

Based on ASCE/SEI 7-22, other seismic parameter values that may be useful for structural design at the project site are provided as follows:

Parameter	Value (g)
S_s	0.51
S_1	0.13
S_{MS}	0.77
S_{DS}	0.51
S_{D1}	0.36
S_{M1}	0.53
PGA_M	0.29

5 LIMITATIONS

The analyses and recommendations presented in this report are based on the data obtained from the test pits at the indicated locations (**Figure 2**). This report does not reflect variations which may occur at other areas or across the project site. The nature and extent of such variations may not become evident until construction. If variations appear evident, it will be necessary to reevaluate the recommendations of this report.

This report has been prepared for the exclusive use and specific application to the project discussed and has been prepared in accordance with currently accepted geotechnical engineering practices. No warranties, either expressed or implied, are provided. In the event that any changes in the nature, design, or location of the project as outlined in this report are planned, the recommendations contained in this report shall be considered invalid unless the changes are reviewed, and the conclusions of this report modified or verified in writing by the geotechnical engineer.

6 REFERENCES

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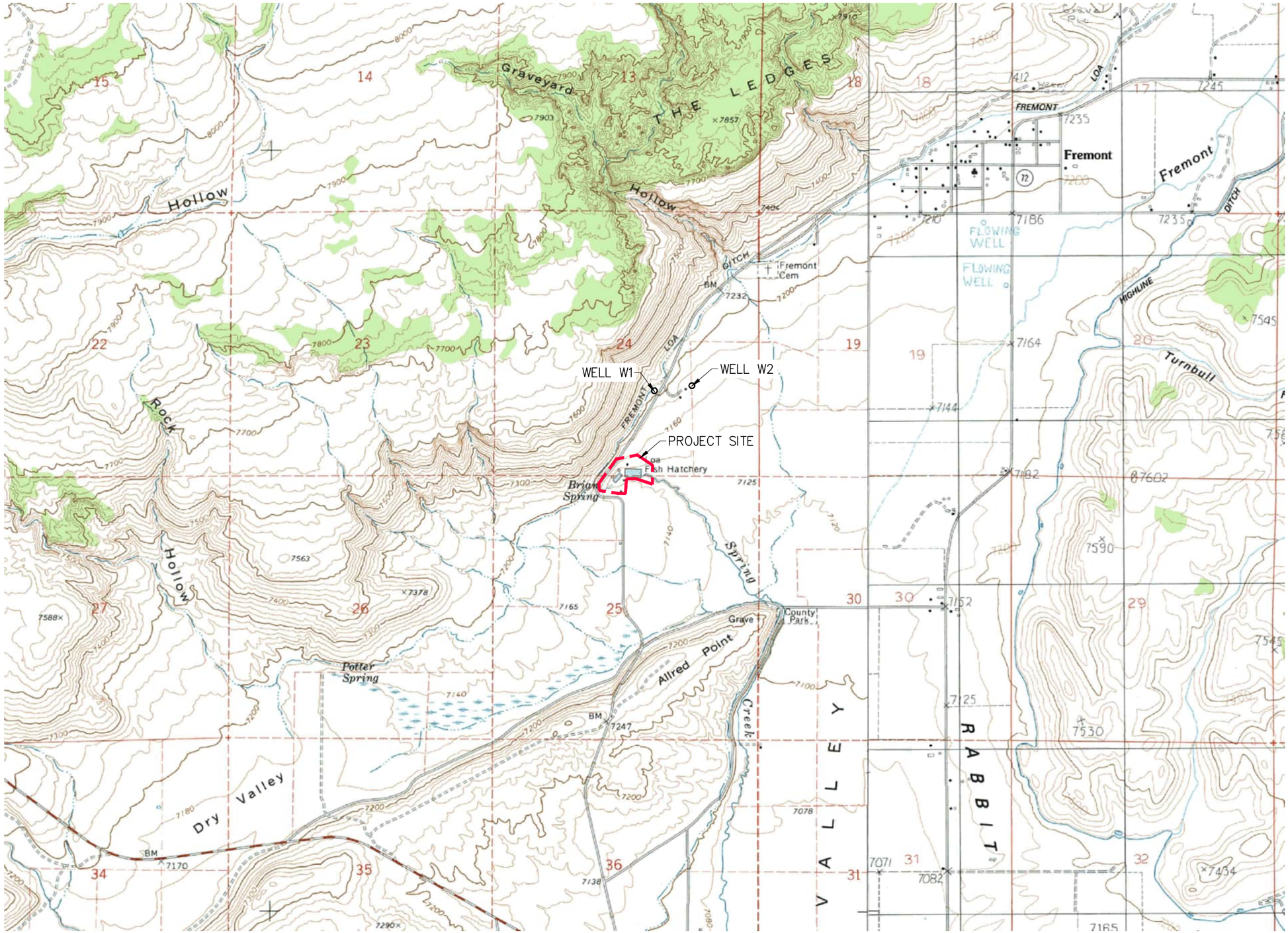
Figures

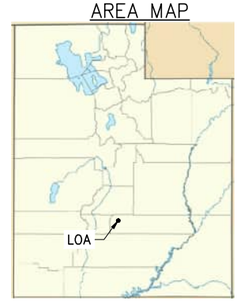


NORTH

SCALE

1000' 0 1000'

AREA MAP



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UTAH DIVISION OF WILDLIFE RESOURCES

LOA FISH HATCHERY PROGRAMMING

GEOTECHNICAL INVESTIGATION

SITE VICINITY MAP

SEI NO.	DESIGNED	DRAWN	CHECKED	SHEET NO.	
S06837	DQY	DQY	DSA	01 of 04	FIG. 1

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APPROXIMATE PROJECT BOUNDARY

APPROXIMATE PROJECT BOUNDARY

REPLACE HOUSE

EXIST. HOUSE

DISN STAT 50' X 40'

SPRING COLLECTION

4'-6"

TP-4

150'-0"

136'-0"

150'-0"

136'-0"

150'-0"

136'

TP-5

TP-3

RACEWAY BUILDING 'AA' 500' X 146'

HATCHERY 'A' 124' X 86'

TP-7

TP-6

TP-2

DEGASSER

TP-1

FEED 50' X 40'

SHOP/OFFICE 100' X 60'

WASTE WATER TREATMENT

EXIST. HOUSE

REPLACE HOUSE

NORTH

SCALE

40' 0 40'

AREA MAP

LOA

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SITE MAP

SEI NO.	DESIGNED	DRAWN	CHECKED	SHEET NO.	
S06837	DQY	DQY	DSA	02 of 04	FIG. 2

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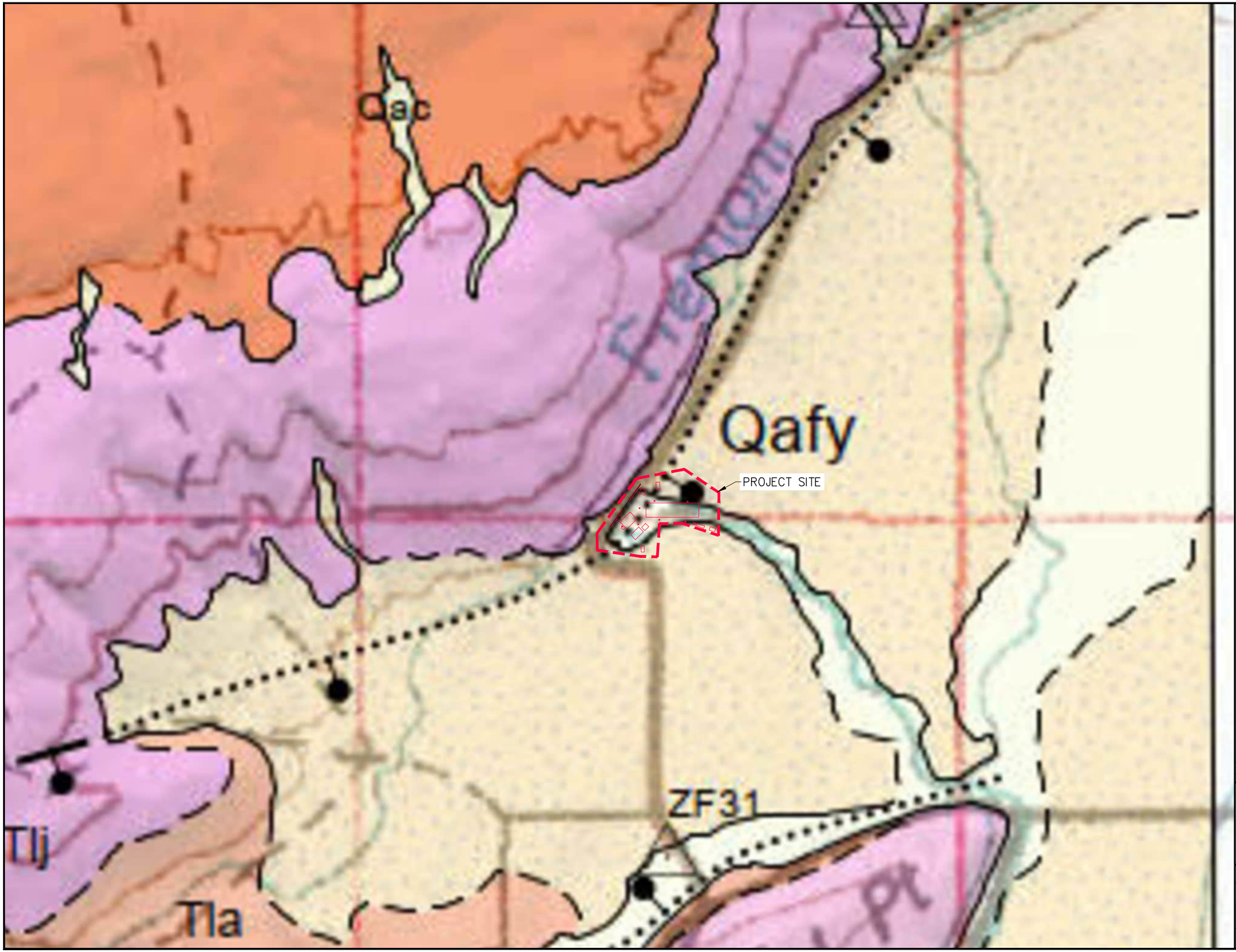
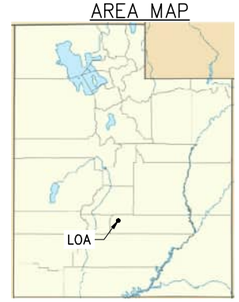


NORTH

SCALE

400' 0 400'

AREA MAP



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LOA FISH HATCHERY PROGRAMMING
GEOTECHNICAL INVESTIGATION
GEOLOGIC MAP

SEI NO.	DESIGNED	DRAWN	CHECKED	SHEET NO.	
S06837	DQY	DQY	DSA	03 of 04	FIG. 3

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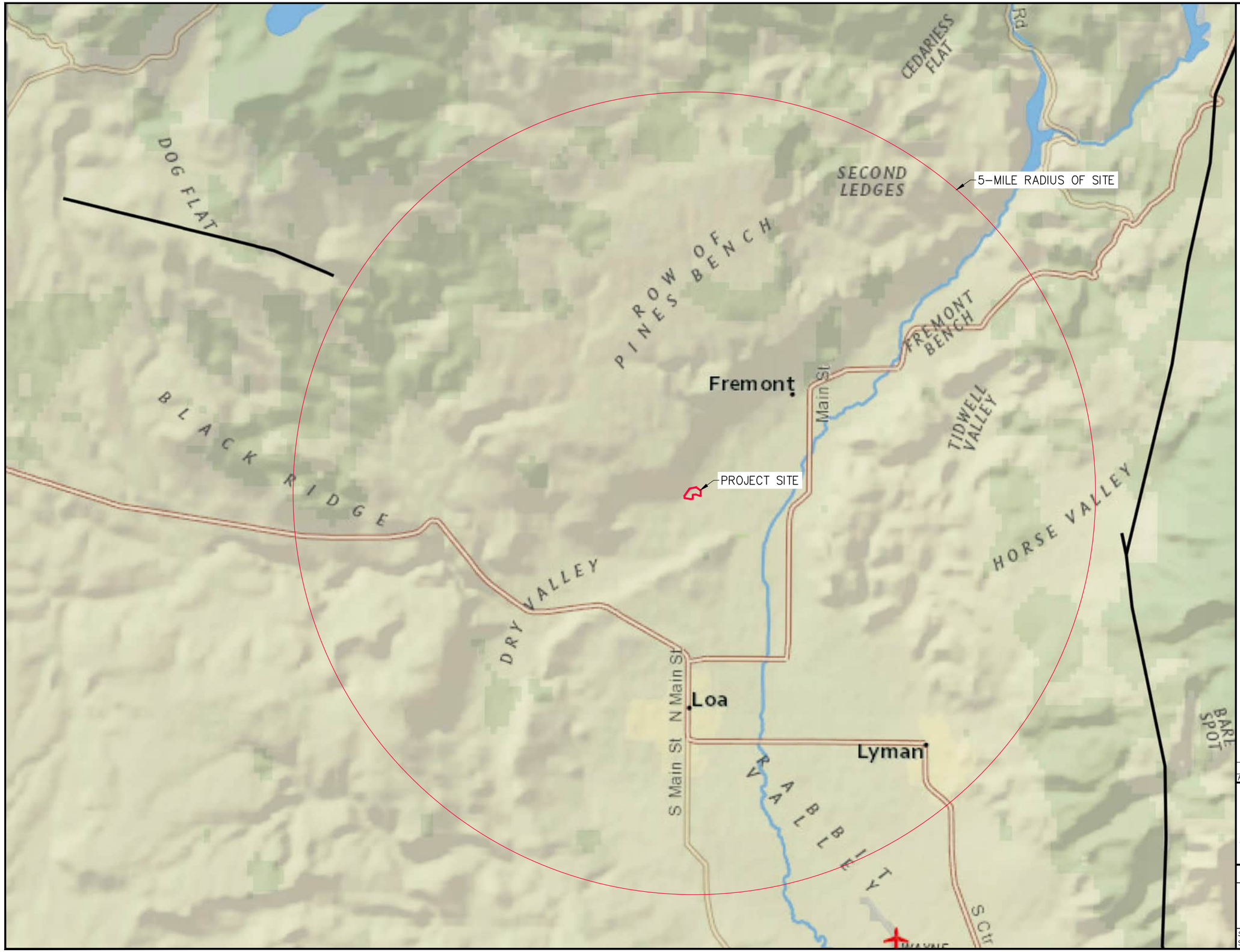


NORTH

SCALE

3000' 0 3000'

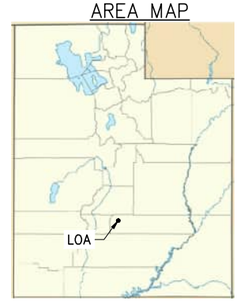
QUATERNARY FAULT LEGEND

Undifferentiated Quaternary (< 130,000 years), well constrained location

Undifferentiated Quaternary (< 130,000 years), moderately constrained location

Undifferentiated Quaternary (< 130,000 years), inferred location

AREA MAP



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LOA FISH HATCHERY PROGRAMMING

GEOTECHNICAL INVESTIGATION

QUATERNARY FAULT MAP

SEI NO.	DESIGNED	DRAWN	CHECKED	SHEET NO.	
S06837	DQY	DQY	DSA	04 of 04	FIG. 4

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Appendix A

Geotechnical Laboratory Results

REPORT OF SIEVE ANALYSIS AND ATTEBERG LIMITS

CLIENT: Sunrise Engineering
Attn: Dao Yang
6875 South 900 East
Midvale, Utah 84047

PROJECT: Loa Fish Hatchery

REPORT: 000567-007
DATE: June 7, 2019
LAB NUMBER: 882-1

SAMPLE SOURCE: Native
METHOD OF TEST: ASTM C136/ C117/ D4318

RESULTS

ID	TP-2@4'	TP-3@10'	TP-4@8'	TP-5@5'	TP-6@7'	TP-7@10'
Classification	SM	ML	SM	ML	CL	ML
Liquid Limit					38	
Plastic Limit					15	
Plastic Index					17	
U.S. Standard Sieve Number						
1 1/2"			100			
1"			88			
3/4"			83			
1/2"	100		76			
3/8"	99		72			
#4	96		65			
#8	93		58			
#16	90	100	51	100	100	100
#50	85	99	36	99	97	98
#100	78	98	27	98	94	95
#200	69.0	93.3	19.2	93..5	87.3	87.9

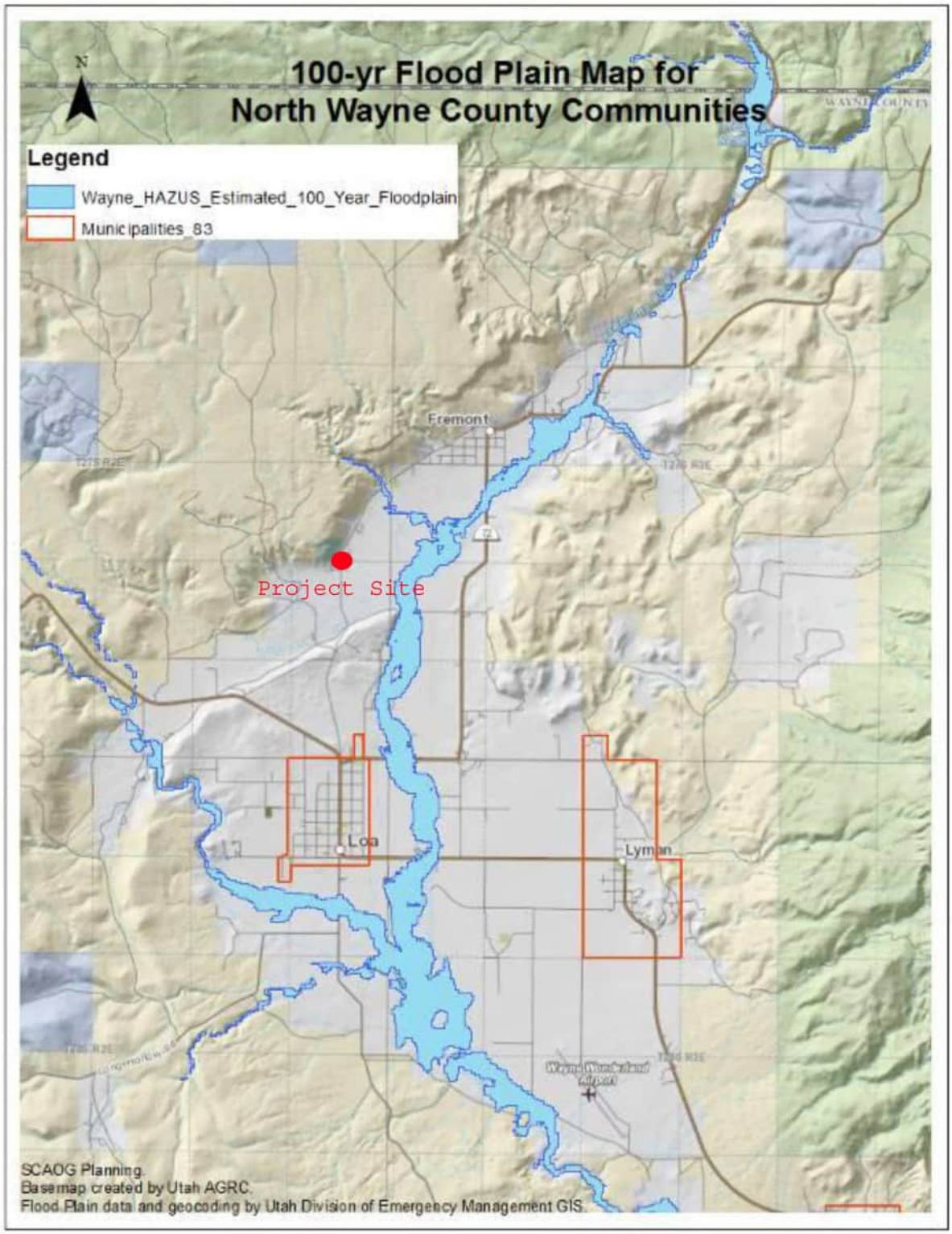
Respectfully submitted,
Utah Testing and Engineering

Ryan Brown

TEST RESULTS APPLY ONLY TO THE SPECIFIC SAMPLES TESTED, REPORTS MAY NOT BE
REPRODUCED EXCEPT IN FULL WITHOUT WRITTEN PERMISSION BY UTAH TESTING AND ENGINEERING.

Appendix B

Floodplain Information


100-yr Flood Plain Map for
North Wayne County Communities
N
Legend
Wayne_HAZUS_Estimated_100_Year_Floodplain
Municipalities_83
Fremont
Project Site
Loa
Lyman
SCAOG Planning.
Basemap created by Utah AGRC.
Flood Plain data and geocoding by Utah Division of Emergency Management GIS.

Appendix C

Chemical Laboratory Results

CHEMTECH-FORD
LABORATORIES

6/6/2019

Work Order: 19E1380
Project: DWR

Sunrise Engineering Inc.
Attn: Dao Yang
12227 S. Business Park Dr #220
Draper, UT 84020

Client Service Contact: 801.262.7299

The analyses presented on this report were performed in accordance with the National Environmental Laboratory Accreditation Program (NELAP) unless noted in the comments, flags, or case narrative. If the report is to be used for regulatory compliance, it should be presented in its entirety, and not be altered.

NELAP ACCREDITED TNI LABORATORY

Approved By:

Mark Broadhead, Project Manager

Chemtech-Ford Laboratories
Serving the Intermountain West Since 1953

9632 South 500 West
Sandy, UT 84070
O:(801) 262-7299 F: (866) 792-0093
www.ChemtechFord.com

Certificate of Analysis

Sunrise Engineering Inc.
Dao Yang
12227 S. Business Park Dr #220
Draper, UT 84020

PO#:
Receipt: **5/23/19 16:20 @ 10.0** °C
Date Reported: 6/6/2019
Project Name: **DWR**

Sample ID: **TP-2**

Matrix: **Solid**
Lab ID: **19E1380-01**
Date Sampled: **5/23/19 10:15**
Sampled By: **Dao Yang**

	Result	Units	Minimum Reporting Limit	Method	Preparation Date/Time	Analysis Date/Time	Flag(s)
Inorganic							
pH	8.2	pH Units	0.1	EPA 9045D	5/23/19	5/23/19	
Sulfate, Soluble (IC)	51	mg/kg dry	11	EPA 300.0	5/29/19	5/29/19	
Total Solids	91.4	%	0.1	SM 2540G	5/30/19	5/31/19	
Resistivity	1540	ohm m	10.0	EPA 120.1M	6/4/19	6/4/19	

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12227 S. Business Park Dr #220
Draper, UT 84020

PO#:
Receipt: **5/23/19 16:20 @ 10.0** °C
Date Reported: 6/6/2019
Project Name: **DWR**

Sample ID: **TP-7**

Matrix: **Solid**
Lab ID: **19E1380-02**
Date Sampled: **5/23/19 12:55**
Sampled By: **Dao Yang**

	Result	Units	Minimum Reporting Limit	Method	Preparation Date/Time	Analysis Date/Time	Flag(s)
Inorganic							
pH	8.4	pH Units	0.1	EPA 9045D	5/23/19	5/23/19	
Sulfate, Soluble (IC)	21	mg/kg dry	14	EPA 300.0	5/29/19	5/29/19	
Total Solids	72.6	%	0.1	SM 2540G	5/30/19	5/31/19	
Resistivity	3430	ohm m	10.0	EPA 120.1M	6/4/19	6/4/19	

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Certificate of Analysis

Sunrise Engineering Inc.
Dao Yang
12227 S. Business Park Dr #220
Draper, UT 84020

PO#:
Receipt: **5/23/19 16:20 @ 10.0** °C
Date Reported: 6/6/2019
Project Name: **DWR**

Report Footnotes

Abbreviations

ND = Not detected at the corresponding Minimum Reporting Limit (MRL).
1 mg/L = one milligram per liter or 1 mg/kg = one milligram per kilogram = 1 part per million.
1 ug/L = one microgram per liter or 1 ug/kg = one microgram per kilogram = 1 part per billion.
1 ng/L = one nanogram per liter or 1 ng/kg = one nanogram per kilogram = 1 part per trillion.

CHEMTECH - FORD ANALYTICAL LABORATORY

CHAIN OF CUSTODY

COMPANY: Sunrise Engineering

ADDRESS:

CITY/STATE/ZIP:

PHONE #: FAX:

CONTACT: Dao Yang PROJECT: DWR

EMAIL:

BILLING ADDRESS:

BILLING CITY/STATE/ZIP:

PURCHASE ORDER #:

CHEMTECH-FORD LABORATORIES

TURNAROUND REQUIRED:*

** Expedited turnaround subject to additional charge*

E1300

Lab Use Only	CLIENT SAMPLE INFORMATION					TESTS REQUESTED																Bacteria			
	LOCATION / IDENTIFICATION	DATE	TIME	MATRIX	Field: Residual Chlorine	Sulfate	Resistivity	pH														Total Coliform + E. coli (Present/Absent)	Total Coliform + E. coli (Enumerated)	HPC (Plate Count)	E. Coli Only
01	1. TP-2	5/23/19	1015	Soil		✓	✓	✓																	
02	2. TP-7	5/23/19	1255	Soil		✓	✓	✓																	
	3.																								
	4.																								
	5.																								
	6.																								
	7.																								
	8.																								
	9.																								
	10.																								

Sampled by: [print] Dao Yang Sampled by: [signature]

ON ICE NOT ON ICE Temp (C°): 10.0

Special Instructions:

Samples received outside the EPA recommended temperature range of 0-6 C° may be rejected.

Relinquished by: [signature]	Date/Time	Received by: [signature]	Date/Time
	5/23/19 1620		5.23.19 16:20
Relinquished by: [signature]	Date/Time	Received by: [signature]	Date/Time
Relinquished by: [signature]	Date/Time	Received by: [signature]	Date/Time

CHEMTECH-FORD
9632 South 500 West
801.262.7299 PHONE
866.792.0093 FAX

Payment Terms are net 30 days OAC. 1.5% interest charge per month (18% per annum). Client agress to pay collection costs and attorney's fees

CHEMTECH FORD LABORATORIES

Sample Receipt

CHEMTECH-FORD LABORATORIES

Work Order # E1380

Delivery Method:

- ☐ UPS
- ☐ USPS
- ☐ FedEx
- ☐ Chemtech Courier
- ☒ Walk-in
- ☐ Customer Courier

Receiving Temperature 10.0 °C

Sample #	Container	Chemtech Lot # or Preservative	Number of Subsamples	Preserved by Client/Third Party	Preserved in Receiving/Laboratory	Filtered in Field by Client	Misc Volume (oz/mL)	Comments
01,02	G						40z	

Sample Condition (check if *yes*)

- ☐ Custody Seals
- ☒ Containers Intact
- ☒ COC/Labels Agree
- ☒ Preservation Confirmed
- ☒ Received on Ice
- ☒ Correct Containers(s)
- ☒ Sufficent Sample Volume
- ☐ Headspace Present (VOC)
- ☐ Temperature Blank
- ☒ Received within Holding Time

Plastic Containers

A- Plastic Unpreserved
B- Miscellaneous Plastic
C- Cyanide Qt (NaOH)
E- Coliform/Ecoli/HPC
F- Sulfide Qt (Zn Acetate)
L- Mercury 1631
M- Metals Pint (HNO3)
N- Nutrient Pint (H2SO4)
R- Radiological (HNO3)
S- Sludge Cups/Tubs
Q- Plastic Bag

Glass Containers

D- 625 (Na2S2O3)
G- Glass Unpreserved
H- HAAs (NH4Cl)
J- 508/515/525 (Na2SO3)
K- 515.3 Herbicides
O- Oil & Grease (HCl)
P- Phenols (H2SO4)
T- TOC/TOX (H3PO4)
U- 531 (MCAA, Na2S2O3)
V- 524/THMs (Ascorbic Acid)
W- 8260 VOC (1:1 HCl)
X- Vial Unpreserved
Y- 624/504 (Na2S2O3)
Z- Miscellaneous Glass

Appendix D

Well Logs

WELL DRILLER'S REPORT
State of Utah
Division of Water Rights

For additional space, use "Additional Well Data Form" and attach

W1 (1/2)

Well Identification

Water Right: 95-5188

RECEIVED

WIN: 430998

FEB 11 2008

WATER RIGHTS
SALT LAKE

Owner *Note any changes*

Cassell J. and Maxine E. Lindquist
35 N 1100 W
Lehi, UT 84043

Contact Person/Engineer: _____

Well Location *Note any changes*

N 1720 W 2080 from the SE corner of section 24, Township 27S, Range 2E, SL B&M

Location Description: (address, proximity to buildings, landmarks, ground elevation,local well #)

Drillers Activity Start Date: 1-08-08 Completion Date: 1-20-08

Check all that apply: ☒ New ☐ Repair ☐ Deepen ☐ Clean ☐ Replace ☐ Public Nature of Use: _____

If a replacement well, provide location of new well. _____ feet north/south and _____ feet east/west of the existing well.

DEPTH (feet) FROM	TO	BOREHOLE DIAMETER (in)	DRILLING METHOD	DRILLING FLUID
0	90'	9"	MUD Rotary	Bentonite Slurry
90	250	5"	air Rotary	Water + foam

Well Log

DEPTH (feet) FROM	TO	WATER	PERMEABLE High	PERMEABLE Low	UNCONSOLIDATED CLAY	SILT	SAND	GRAVEL	COBBLES	BOULDER	OTHER	CONSOLIDATED ROCK TYPE	COLOR	DESCRIPTION AND REMARKS (e.g., relative %, grain size, sorting, angularity, bedding, grain composition density, plasticity, shape, cementation, consistancy, water bearing, odor, fracturing, minerology, texture,degree of weathering, hardness, water quality, etc.)
0	40				X	X			X	X				Granit Boulders
40	90'													
90'	250'	X	X									Volcanic	Red	

Static Water Level

Date 1-21-08 Water Level 90' feet Flowing? ☐ Yes ☒ No

Method of Water Level Measurement Drill Pipe If Flowing, Capped Pressure _____ PSI

Point to Which Water Level Measurement was Referenced _____ Elevation _____

Height of Water Level reference point above ground surface _____ feet Temperature _____ degrees ☐ C ☐ F

Well Log

Construction Information

DEPTH (feet) FROM	TO	CASING: CASING TYPE AND MATERIAL/GRADE	WALL THICK (in)	NOMINAL DIAM. (in)	DEPTH (feet) FROM	TO	☒SCREEN ☒PERFORATIONS ☒OPEN BOTTOM: SCREEN SLOT SIZE OR PERF SIZE (in)	SCREEN DIAM. OR PERF LENGTH (in)	SCREEN TYPE OR NUMBER PERF (per round/interval)
0	90'	~~X~~ NEW STEEL	.256	5"	100	250	1/4"	ROUND HOLE	3 SLOTS/2 foot
70'	250'	NEW P.V.C-SCH 40		4"					
								P.V.C. SCREEN	
							BOTTOM 10'		

Well Head Configuration: WATER TIGHT CAP — Access Port Provided? ☒Yes ☐No

Casing Joint Type: STEEL is WELDED P.V.C. THREADED — Perforator Used: DRILL

Was a Surface Seal Installed? ☒Yes ☐No — Depth of Surface Seal: 40 feet — Drive Shoe? ☐Yes ☐No

Surface Seal Material Placement Method: POURED

Was a temporary surface casing used? ☐Yes ☒No If yes, depth of casing: _____ feet diameter: _____ inches

DEPTH (feet) FROM	TO	SURFACE SEAL / INTERVAL SEAL / FILTER PACK / PACKER INFORMATION: SEAL MATERIAL, FILTER PACK and PACKER TYPE and DESCRIPTION	Quantity of Material Used (if applicable)	GROUT DENSITY (lbs./gal., # bag mix, gal./sack etc.)
0	40'	Neat Cement GROUT	19 BAGS	6 GAL/BAG
40'	90'	1/4" GRAVEL	3/4 TON	

Well Development and Well Yield Test Information

DATE	METHOD	YIELD	Units Check One GPM	Units Check One CFS	DRAWDOWN (ft)	TIME PUMPED (hrs & min)
1-21-08	AIR PURGED	350	X			

Pump (Permanent)

Pump Description: NONE SET — Horsepower: _____ Pump Intake Depth: _____ feet

Approximate Maximum Pumping Rate: _____ Well Disinfected upon Completion? ☐Yes ☐No

Comments

Description of construction activity, additional materials used, problems encountered, extraordinary Circumstances, abandonment procedures. *Use additional well data form for more space.*

LOST MUD CIRCULATION at 90'

Well Driller Statement

This well was drilled and constructed under my supervision, according to applicable rules and regulations, and this report is complete and correct to the best of my knowledge and belief.

Name STEWART DRILLING (Person, Firm, or Corporation - Print or Type) — License No. 760

Signature Todd Stewart (Licensed Well Driller) — Date 2-6-08

W2

PAGE (Leave Blank)

Report No. 1677
Filed Oct. 28, 1940
Rec. By Mail R.E.C.
Ret'd

sted on well record
sted by counties
pied 11-29-40
cam. & returned
cam. for filing
nal Copy checked
atted & No. Assigned
ndexed
ngr. tied well
ngr. set BM
Well No.

Report of Well and Tunnel Driller
STATE OF UTAH

(Separate report shall be filed for each well or tunnel)

GENERAL INFORMATION:

Report of well or tunnel driller is hereby made and filed with the State Engineer, in accordance with Sections 100-3-22, Revised Statutes of Utah 1933, as amended by Session Laws of 1935. (This report shall be filed with the State Engineer within 30 days after the completion or abandonment of well or tunnel. Failure to file such report constitutes a misdemeanor.)

1. Name and address of person, ~~company or corporation boring or~~ drilling well ~~or tunnel~~ (Strike words not needed)
C. W. Anderson, Fountain Green, Utah

2. Name and address of owner of well ~~or tunnel~~ W. G. Taylor (Strike words not needed)
Fremont, Utah

3. Source of supply is in Wayne County County; ..... (Leave blank) drainage area; ..... (Leave blank) artesian basin

4. The number of approved application to appropriate water is 13847

5. Location of well ~~or mouth of tunnel~~ is situated at a point (#1) 1841 ft. N. 1345 ft. W. of SE Corn. Sec. 24, T. 27 S., R. 2 E., SLB&M.
(Describe by course and distance with reference to U. S. Government Survey Corner — Copy description from well owners' approved application)

6. Date on which work on well ~~or tunnel~~ was begun Sept. 29 - 1940 (Strike words not needed)

7. Date on which work on well ~~or tunnel~~ was completed ~~or abandoned~~ Oct. 23, 1940 (Strike words not needed)

8. Maximum quantity of water flowing, ~~pumped or dipped~~ on completion of well ~~or tunnel~~ in sec. ft. ....; or in gals. per minute 48; Date Oct. 23, 1940 (Strike words not needed)

DETAIL OF COLLECTING WORKS:

9. WELL: It is a drilled, ~~dug~~, flowing ~~or pump~~ well. Temperature of water 50 °F. (Strike words not needed)

(a) Total depth of well ~~is~~ was 307 ft. below ground surface.

(b) If flowing well, give water pressure (hydrostatic head) above ground surface 4½ ft.

(c) If pump well, give depth from ground surface to water surface before pumping ....; during pumping ....

(d) Size and kind of casing 93½ ft. 8" Oil well, 70½ ft. 5½ Oil well (If only partially cased, give details)

(e) Depth to water bearing stratum 112 to 157 (If more than one stratum, give depth to each)

(f) If casing is perforated, give depth from ground surface to perforations
8" casing used as controll for well (5½ casing perforated from 112 - 157

(g) Log of well 0 - 1 top soil; 1 - 21 clay, Surface water at 21 feet; 21-73 clay; 73-90 Sand & gravel, minor flow; 90 - 112 clay; 112 - 157 sand gravel flow; 157 - 307 Cement Sand. No water pressure, 170 to 307 plugged back.

(h) Well was equipped with cap, ~~valve, or~~ to control flow. (Strike words not needed)

(Over)

UDWR – Loa Fish Hatchery Programing

Additional Geotechnical Investigation

January 23, 2025

SUNRISE ENGINEERING

SUNRISE ENGINEERING
Salt Lake City Office
6875 South 900 East, Midvale, Utah 84047 | TEL 801.523.0100 | FAX 801.523.0990

January 23, 2025

Jon Vance
State of Utah DFCM
4110 State Office Building
Salt Lake City, Utah 84114

Subject: Additional Geotechnical Investigation
Utah Division of Wildlife Resources (UDWR) – Loa Fish Hatchery Programming
Loa, Utah

Mr. Vance,

Enclosed herein is the report for a geotechnical investigation for the above referenced project. This report presents the results of the geotechnical subsurface exploration, engineering analysis, and recommendations for design and construction of the proposed Loa Fish Hatchery Improvements Project in Loa, Utah.

We appreciate the opportunity to provide geotechnical services to you for this project. Should you have any questions about the report, or if we may be of further service in any way, please let us know.

Sincerely,
SUNRISE ENGINEERING, LLC

Prepared by:

Dao Yang, P.E.
Project Engineer/Hydrogeologist

Reviewed by:

Derek Anderson, P.E.
Principal Engineer

ADDITIONAL GEOTECHNICAL INVESTIGATION

UDWR –LOA FISH HATCHERY PROGRAMMING

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1 INTRODUCTION

Sunrise Engineering, LLC (Sunrise) completed a geotechnical investigation for a fish hatchery improvements project in Loa, Utah in 2019. At that time, seven test pits (PTP-1 through PTP-7) were excavated. However, certain areas were not accessible due to the presence of aboveground structures and no test pits were excavated in those areas. Structures have since been removed from the inaccessible areas and design plans have been changed. As a result, an additional geotechnical investigation was required and completed. This additional geotechnical investigation was specifically performed for a proposed dewatering storage tank and dewatering building. There are two potential areas identified (northern and southern areas) for construction of the tank and building. The project site covers portions of Sections 24 and 25, Township 27 South, Range 2 East, Salt Lake Base and Meridian (SLBM), as shown in **Figure 1**. This report presents a summary of the additional geotechnical investigation.

1.1 Objectives

The objectives of the geotechnical investigation were to:

- Evaluate subsurface soil/rock and groundwater conditions within the project area, and
- Provide appropriate foundation and earthwork recommendations at the project site.

1.2 Scope of Work

The following tasks have been completed for this additional geotechnical investigation:

- Excavated additional four test pits (TP-1 through T-4) at two general areas (northern and southern).
- Analyzed collected geotechnical data.
- Provided recommendations for the design and construction of the dewatering storage tank and building.

2 PROPOSED CONSTRUCTION

As stated above, the purpose of this additional geotechnical investigation is to investigate the subsurface soil and groundwater conditions at the proposed dewatering tank and building locations. There are two potential sites for the tank and building. Test pits TP-1 and TP-2 were excavated at the northern site while test pits TP-3 and TP-4 were excavated at the southern site. The test pit locations are shown in **Figure 2**.

3 SITE INVESTIGATION

3.1 General Geology

The geologic conditions have remained unchanged since the original geotechnical investigation was completed in 2019.

3.2 Test Pit Excavation and Subsurface Conditions

Additional fieldwork was conducted on January 10, 2025, and four additional test pits (TP-1 through TP-4) were excavated using a Bobcat track hoe. Test Pit locations are shown in **Figure 2**. The seven test pits (PTP-1 through PTP-7) excavated in 2019 were also plotted in **Figure 2**. **Table 1** summarizes the soil and groundwater conditions at the test pit locations.

Table 1: Soil and Groundwater Conditions at Test Pit Locations

Test Pit #	Description	Total Depth	Groundwater
TP-1	0-2': topsoil; 2-4': silty sand with gravel (SM); and 4-6': caliche-cemented silty sand (SM).	6'	No groundwater
TP-2	0-2': topsoil; 2-4': clayey sand with gravel (SC) with LL=28 & PI=7; and 4-6': caliche-cemented silty sand (SM).	6'	No groundwater
TP-3	0-2': topsoil; 2-3': clay; 3-5': clayey sand with gravel (SC) with LL=37 & PI=14; and 5-7.5': volcanic-rock gravel with sand and fines (GM).	7.5'	No groundwater
TP-4	0-2': fill consisting compacted gravelly material (GM); 2-4': clay; 4-6': clayey sand with gravel (SC); and 6-8': blue sandy silt with gravel (ML).	8'	6'
PTP-1	0-4': fill material consisting of gravel with sand and fines; 4-8': cemented gravel, cobbles and boulders; and refusal occurred at 8'.	8'	2'
PTP-2	0-2': topsoil; 2-6': silty sand (SM); 6-7': clay; and 7-15': silty.	15'	No groundwater
PTP-3	0-5': gravelly fill; 5-10': clay (CL); and 10-13': silt (ML). Spring water encountered at 10' and artesian flow after test pit was backfilled.	13'	10'
PTP-4	0-2': topsoil; 2-15': sandy silt (SM).	15'	No groundwater
PTP-5	0-2': topsoil; 2-6': silt (ML); 6-10': clay (CL); and 10-15': sandy silt (SM).	15'	10'
PTP-6	0-1': topsoil; 1-5': sandy silt (SM); 5-9': clay (CL) with LL=38 & PI=17; and 9-15': silt (ML).	15'	No groundwater
PTP-7	0-2': topsoil; 2-3': sandy silt (SM); 3-7': clay (CL); and 7-16': silt (ML).	16'	No groundwater

Selected soil samples were delivered to a geotechnical laboratory for analyses of gradation, Atterberg limits and moisture content. The geotechnical laboratory report is provided in **Appendix A**.

3.3 Geologic Hazards

The geologic hazard conditions have remained unchanged at the site since the original geotechnical investigation was completed in 2019.

4 DESIGN RECOMMENDATIONS

4.1 Site Preparation

Topsoil, manmade fills (where encountered) and soils loosened by construction activities should be removed from the building pad, pavement areas, and concrete flatwork areas prior to foundation excavation and placement of site grading fills. Following stripping, the subgrade should be proof-rolled to a firm, non-yielding condition or 90% of maximum dry density (ASTM D1557). Soft areas detected during the proof-

rolling operation should be removed and replaced with structural fill. If soft soils extend more than 1.5 feet deep, stabilization may be required. The use of stabilization should be approved by the geotechnical engineer and would likely consist of over-excavating the area by at least 1.5 feet, placing a geofabric (such as Mirafi 600X)) or a geogrid (such as Tensar BX-1100) at the bottom of the excavation over which a stabilizing fill consisting of angular coarse gravel with cobbles is placed up to the design subgrade. Vegetation and other deleterious materials should be removed from the site. The stripped soils will be unsuitable as structural fill but may be stockpiled for later use in landscaped areas.

4.2 Excavation and Site Grading

Earthwork will be required to level the construction site. Shallow temporary construction excavations not exceeding 4 feet in depth may be constructed with near-vertical side slopes. Temporary cut slopes may be constructed at side slopes of 1.5:1.0 (horizontal: vertical). It is the responsibility of the contractor to provide safe working conditions in connection with below grade excavations.

4.3 Fill Material

All fill material should be inorganic soils free of vegetation and debris. Fill material should meet the requirements based on the intended use, as summarized in **Table 2**. Compaction requirements are provided in **Table 3**.

Table 2: Fill Material Requirements

Fill Type	Application	Requirements		
		Gradation		Plasticity
		Size	Percent finer by weight	
Structural Fill	Under foundations, concrete slabs or other structural areas	4 inch No. 4 sieve No. 200 sieve	100 35-65 <20	Liquid limit 20 max Plasticity Index 6 max
Site Grading Fill	Fill in non-structural areas and below pavements	4 inch No. 200 sieve	100 <50	Liquid limit 40 max Plasticity Index 10 max
Pipe Zone Backfill	Within utility pipe zone	3/4 inch 3/8 inch No. 4 sieve No. 16 sieve No. 200 sieve	100 78-92 55-67 28-38 7-11	Non-plastic
Trench Backfill	Utility trench backfill above pipe zone	6 inch No. 200 sieve	100 <50	Liquid limit 30 max Plasticity Index 6 max
Aggregate Base Course	Access Road and Parking Area	2 inch 1½ inch 3/4 inch 3/8 inch No. 4 sieve No. 40 sieve No. 200 sieve	100 85-100 70-85 55-75 40-65 15-30 4-10	Non-plastic

Pea gravel or other similar non-cementitious, poorly-graded materials should not be used as fill or backfill without prior approval from the geotechnical engineer.

Table 3: Compaction Requirements

Item	Description
Fill Lift Thickness	8 inches or less in loose thickness
Compaction	• 95% of the material's maximum dry density (MDD) per ASTM D1557 below footings, floor slabs and road areas as well as areas with 5 feet or more fill. • 90% of material's MDD per ASTM D1557 in other areas of fill and backfill.
Moisture Content	• near optimum water content (within ±2% of optimum at the time of placement and compaction).

Fill should be tested frequently for moisture content and compaction during placement. Should the results of the in-place density tests indicate the specified moisture or compaction limits have not been met, the area represented by the test should be reworked and retested as required until the specified compaction is achieved. This may require adjustment of the moisture content.

4.4 Permanent Slopes

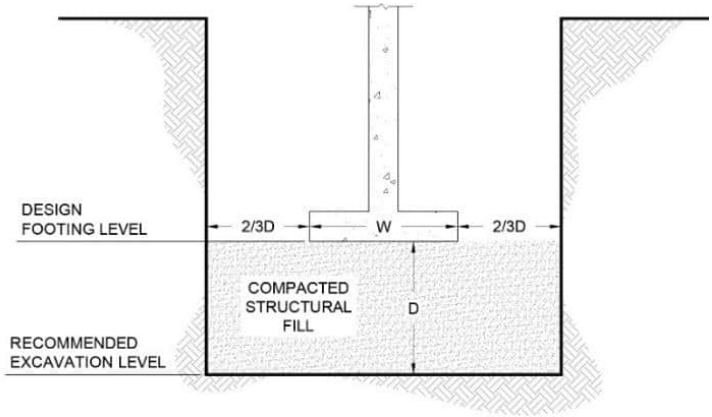
All final cut and fill slopes, if any, shall be graded to at least 2.0:1.0 (horizontal: vertical) or retained.

4.5 Foundations

4.5.1 Footings

4.5.1.1 Dewatering Building

Based on the onsite soil conditions, it is recommended that buildings be constructed on spread footings. Footings should not be installed on loose or disturbed soils, undocumented fill, topsoil, construction debris, frozen soil, or within ponded water. If unsuitable soils are encountered, they should be over-excavated and replaced with structural fill. Structural fill placed below footings should extend laterally beyond the edges of the foundation. Structural fill, with a minimum thickness of **1-foot**, should be placed beneath the footing. The minimum over-excavation and backfill procedure is shown in the following diagram:

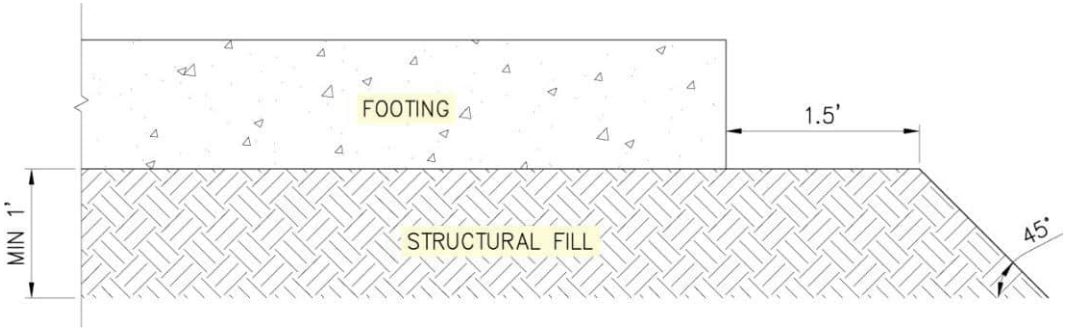


OVEREXCAVATION / BACKFILL

If the exposed soils on which the footings are to be founded become loose or disturbed, they should be re-compacted before concrete is placed.

4.5.1.2 Dewatering Storage Tank

Based on the onsite soil conditions, it is recommended that the tank be constructed on a mat footing foundation. Footings should not be installed on loose or disturbed soil, undocumented fill, topsoil, construction debris, frozen soil, or within ponded water. If unsuitable soils are encountered, they should be over-excavated and replaced with structural fill. Structural fill, with a minimum thickness of **1-foot**, should be placed beneath the footing. Structural fill placed below footings should extend laterally beyond the edges of the foundation a distance of 1.5 feet and then 1 foot for every foot of depth below the foundation (see the following diagram).



If the exposed soils on which the footings are to be founded become loose or disturbed, they should be re-compacted before concrete is placed.

4.5.2 Design Criteria

Based on the available data and in compliance with applicable building codes, the recommended design parameters for footings are summarized in **Tables 4** and **5**.

Table 4: Design Criteria for Northern Area (TP-1 and TP-2)

Bearing Capacity (Net Allowable Bearing Pressure)	For Dewatering Tank and Dewatering Building
Continuous (wall) footings/Mat Footing	2,000 pounds per square foot (psf)
Isolated columns	2,000 psf
Increase above value for short, transient loads by	30%
Exterior footing frost depth	30 inches
Total allowable settlement	< 1 inch
Estimated differential settlement	<½ inch
Coefficient of subgrade reaction, k_1[1]	100 pounds per cubic inch (pci)
Coefficient of structural fill reaction, k_1[1]	300 pounds per cubic inch (pci)
Density of subgrade	150 pcf
Density of structural fill	130 pcf
Note 1: This value is representative of a 1-foot by 1-foot footing and should be scaled appropriately for a larger foundation. The coefficient decreases as the width of the foundation increases. The following equations may be used to scale the coefficient of subgrade reaction: $k = \frac{k_1}{B}$ for clayey subgrade $k = k_1(\frac{B+1}{2B})^2$ for structural fill Where, k = scaled coefficient of subgrade reaction and B = foundation width.	

Table 5: Design Criteria for Southern Area (TP-3 and TP-4)

Bearing Capacity (Net Allowable Bearing Pressure)	For Dewatering Tank and Dewatering Building
Continuous (wall) footings/Mat Footing	1,500 pounds per square foot (psf)
Isolated columns	1,500 psf
Increase above value for short, transient loads by	30%
Exterior footing frost depth	30 inches
Total allowable settlement	< 1 inch
Estimated differential settlement	<½ inch
Coefficient of subgrade reaction, k_1[1]	100 pounds per cubic inch (pci)
Coefficient of structural fill reaction, k_1[1]	300 pounds per cubic inch (pci)
Density of subgrade	100 pcf
Density of structural fill	130 pcf
Note 2: This value is representative of a 1-foot by 1-foot footing and should be scaled appropriately for a larger foundation. The coefficient decreases as the width of the foundation increases. The following equations may be used to scale the coefficient of subgrade reaction: $k = \frac{k_1}{B}$ for clayey subgrade $k = k_1(\frac{B+1}{2B})^2$ for structural fill Where, k = scaled coefficient of subgrade reaction and B = foundation width.	

4.5.3 Slabs on Grade

The design requirements for slabs on grade are provided in **Table 6**.

Table 6: Design Recommendations for Slabs on Grade

Item	Description
Support for slabs on grade	A minimum of 4 inches of crushed gravel underlain by a minimum of 12 inches of structural fill that is properly placed and compacted.
Modulus of subgrade reaction	150 psi/in in Northern Area (see Note 1 in **Table 4**) 100 psi/in in Southern Area (see Note 2 in **Table 5**)
Modulus of structural fill reaction	300 psi/in (see Note 1 in **Table 4**)

4.5.4 Lateral Pressure

Excavation walls and retaining walls will be subjected to horizontal loads from the lateral earth pressure of backfill. When granular fill is lightly compacted, drained, and the surface of the soil slope behind the wall is horizontal, the backfill may be considered equivalent to a fluid with a density of 35 pounds per cubic foot (pcf) for active pressure and 55 pcf for static (at-rest) pressure.

4.5.5 Lateral Resistance

Resistance to lateral loads at the bottom of the footings can be calculated based on a coefficient of friction of 0.3. Passive resistance provided by properly placed and compacted granular structural fill above the water table may be considered equivalent to a fluid with a density of 250 pcf. Below the water table, this granular

soil should be considered equivalent to a fluid with a density of 150 pcf. Note that fill against the sides of footings should be placed and compacted to at least 90% of the maximum dry density as indicated in Section 4.3 (Fill Material).

4.5.6 Drainage

Drainage design should provide for rapid removal of water from foundation soils and pavement materials, both during and after construction. Drainage design should provide for intercepting water and directing it away from cut and fill slopes.

4.5.7 Cement Type

During the additional subsurface investigation, two soil samples were collected at approximately 3 feet below grade from test pits TP-1 and TP-4. The samples were delivered under proper chain-of-custody protocols to a laboratory for sulfate analysis. The laboratory results for the samples indicate the sulfate concentrations range from 217 mg/kg of dry soil for the sample collected at TP-4 to 1,060 mg/kg of dry soil for the sample collected at TP-1 (**Appendix B**). Based on the laboratory results, cement would be subject moderate sulfate exposure levels. Therefore, Cement Type II is recommended for project construction.

4.6 Pavement

4.6.1 Traffic

The AASHTO pavement design method requires that all traffic be converted into equivalent single-axle loads (ESALs), which is the number of 18,000 lbf single axles (with dual tires) on pavements of specified strength that would produce the same amount of traffic damage over the design life of the pavement. It is assumed that roads at the facility will have a single lane in each direction.

Based on the information provided to Sunrise, the design ESALs for the next 20 years are summarized in **Table 7**.

Table 7: Traffic Data Analysis

Traffic Data Summary						
Time-frame	Site	Vehicle Class				
		Class 2	Class 3	Class 4	Class 5	Class 6
Weekly	Loa Fish Hatchery	100	5		26	2
Traffic for Each Direction		104000	5200		27040	2080
LEF		0.003	0.285		1.692	2.703
					Total Traffic Load	**53,200**

4.6.2 Subbase Preparation

All topsoil, or any soil containing organic materials, must be removed from locations where pavement will be applied. To evaluate stability, the subbase shall be proof rolled with a loaded dump truck or tested with a nuclear density gauge. Any unsuitable soil shall be removed and replaced with structural fill in accordance

with Section 4.3. Any areas of fill or disturbed areas shall be compacted to 95% of the maximum dry density per ASTM D1557. A geotechnical engineer shall observe unsuitable subbase remediation. Subbase below drive areas shall be compacted to a minimum of 95% of the maximum dry density per ASTM D1557 to minimize settlement.

4.6.3 Base Course

The base course should be moisture-conditioned to near optimum moisture content and placed in loose lifts not exceeding 8 inches. Base course materials should be compacted to at least 95% of the maximum dry density determined by ASTM D1557, as described in Section 4.3. Pavement materials and workmanship should conform to UDOT Standard Specifications for Road and Bridge Construction. Base course materials used to support pavement sections should meet the following gradation criteria as summarized in **Table 8**.

Table 8: Base Course Material (UDOT)

Percentage Passing of Total Aggregate (Dry Weight)			
Sieve Size	**1½ Inch Size**	**1 Inch Size**	**¾ Inch Size**
1 inch	--	100	--
¾ inch	81-91	--	100
½ inch	67-77	79-91	--
⅜ inch	--	--	78-92
No. 4	43-53	49-61	55-67
No. 16	23-29	27-35	28-38
No. 200	6-10	7-11	7-11

4.6.4 Flexible Pavement

The following design parameter values were used for flexible pavement design: an average CBR value of 5 for the onsite subgrade, a pavement design life of 20 years at 80% reliability, a standard deviation of 0.35, and Initial and Terminal serviceability indices of 4.2 and 2.5, respectively.

The required flexible pavement should consist of 5-inch-thick asphalt concrete surface over a 10-inch-thick base course underlain by 12 inches of reworked native subgrade or structural fill.

4.6.5 Rigid Pavement

The following design parameter values were used for rigid pavement design: an average *k* value of 125 psi/in for the onsite subgrade, a pavement design life of 20 years at 95% reliability, an overall standard deviation of 0.35, a drainage coefficient of 1.0, a load transfer coefficient of 4.0, a non-reinforced concrete elasticity modulus value of $5x10^6$ psi, a concrete rupture modulus value of 650 psi, and Initial and Terminal serviceability indices of 4.2 and 2.5, respectively.

The required rigid pavement should consist of 5-inch-thick concrete over a 6-inch-thick base course underlain by 12 inches of reworked native subgrade or structural fill.

4.6.6 Drainage and Maintenance

Drainage shall be designed to direct surface water into proper discharge locations. Water shall not be allowed to puddle in low areas of the pavement. Pooling areas could decrease the design life of the pavement and cause cracking or uplifting. Periodic seasonal maintenance should be anticipated by sealing cracks and joints. A storm drainage plan is suggested to convey and detain stormwater.

4.6 Seismic Lateral Earth Force

4.6.1 Site Class

Based on the data collected from the test pits, well logs (**Appendix C**), and geologic information at the site, the project site may be classified as Site Class E (soft soil) according to International Code Council, Inc. (2021).

4.6.2 Seismic Lateral Earth Force

Seismic activity can generate increased lateral earth pressures acting on the foundation walls of structures. The increase is influenced by horizontal ground acceleration. Based on the simplified Mononobe-Okabe procedure with the yielding walls approach for a vertical wall with horizontal backfill, the additional lateral pressures due to earthquake motions at the site may be estimated as follows:

$$\Delta P_{ae} = 9.95H^2 \text{ for the walls}$$

Where ΔP_{ae} = seismic lateral pressures in pounds per linear foot (plf) acting at a distance of 0.6*H from the base of the wall, where H is the height of retained soil in feet.

4.6.3 Other Seismic Parameter Values

Based on ASCE/SEI 7-22, other seismic parameter values that may be useful for structural design at the project site are provided as follows:

Parameter	Value (g)
S_s	0.51
S_1	0.13
S_{MS}	0.77
S_{DS}	0.51
S_{D1}	0.36
S_{M1}	0.53
PGA_M	0.29

5 LIMITATIONS

The analyses and recommendations presented in this report are based on the data obtained from the test pits at the indicated locations (**Figure 2**). This report does not reflect variations which may occur at other areas or across the project site. The nature and extent of such variations may not become evident until

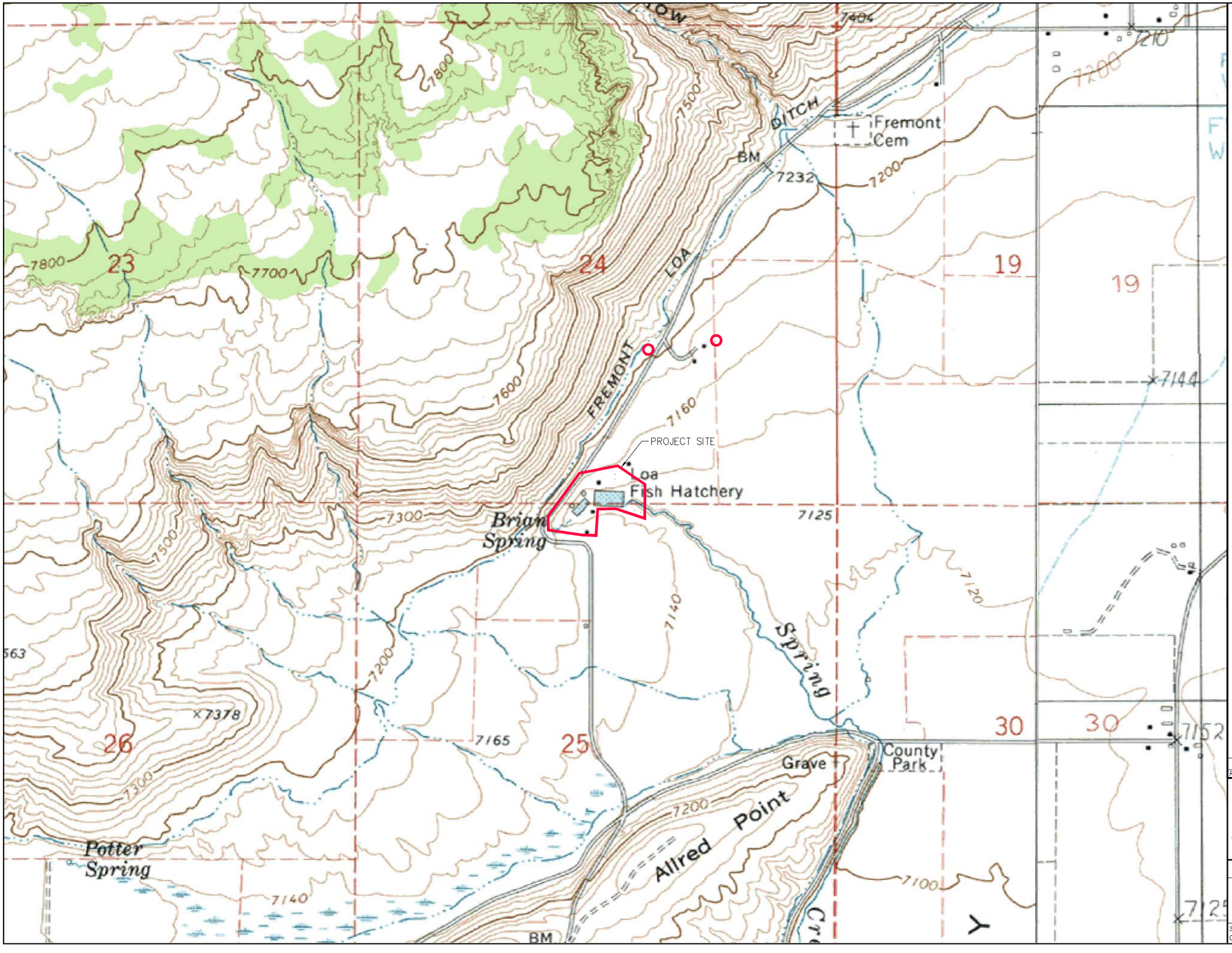
construction. If variations appear evident, it will be necessary to reevaluate the recommendations of this report.

This report has been prepared for the exclusive use and specific application to the project discussed and has been prepared in accordance with currently accepted geotechnical engineering practices. No warranties, either expressed or implied, are provided. In the event that any changes in the nature, design, or location of the project as outlined in this report are planned, the recommendations contained in this report shall be considered invalid unless the changes are reviewed, and the conclusions of this report modified or verified in writing by the geotechnical engineer.

6 REFERENCES

International Code Council (ICC). 2021. *International Building Code*

Figures



NORTH

SCALE

0 500' 1000'

AREA MAP

REV NO.	COMMENT	DATE

FOR REVIEW ONLY NOT FOR CONSTRUCTION DATE

SUNRISE ENGINEERING
6875 SOUTH 900 EAST
SALT LAKE CITY, UTAH 84047
TEL 801.523.0100 FAX 801.523.0990
www.sunrise-eng.com

UTAH DIVISION OF WILDLIFE RESOURCES

LOA FISH HATCHERY PROGRAMMING
ENVIRONMENTAL REPORT
SITE VICINITY MAP

SEI NO.	DESIGNED	DRAWN	CHECKED	SHEET NO.
06837	DQY	DQY	DSA	01 of 05

FIG. 1

P: \UDWR\S09889 Loa Fish Hatchery\Design3D\Fig Loa.dwg Jan 22, 2025 3:25pm dyang

NORTH

SCALE

0 40' 80'

LEGEND

- SITE BOUNDARY
- TEST PIT LOCATION (JAN 2025)
- TEST PIT LOCATION (MAY 2019)

AREA MAP

REV NO.	COMMENT	DATE

FOR REVIEW ONLY
NOT
FOR CONSTRUCTION
DATE

SUNRISE ENGINEERING
6875 SOUTH 900 EAST
SALT LAKE CITY, UTAH 84047
TEL 801.523.0100 FAX 801.523.0990
www.sunrise-eng.com

UTAH DIVISION OF WILDLIFE RESOURCES

LOA FISH HATCHERY PROGRAMMING
ADDITIONAL GEOTECHNICAL INVESTIGATION
SITE MAP

SEI NO.	DESIGNED	DRAWN	CHECKED	SHEET NO.
09889	DQY	DQY	DSA	02 of 02

FIG. 2

P:\UDWR\S09889 Loa Fish Hatchery\Design\3D\Fig Loa.dwg Jan 23, 2025 10:04am dyang

Appendix A

Geotechnical Laboratory Report

REPORT OF SIEVE ANALYSIS AND ATTERBERG LIMITS

CLIENT: Sunrise Engineering
Attn: Dao Yang
6875 South 900 East
Midvale, Utah 84047

PROJECT: Loa Fish Hatchery
S08998

REPORT: 000726-069
DATE: January 19, 2025
LAB NUMBER: 4510-4513

SAMPLE DESCRIPTION: Dark Brown Silt
METHOD OF TESTS: ASTM C136/ C117/ D4318

RESULTS

ID	TP-1	TP-2	TP-3 @ 5'	TP-4 @ 7'
Liquid Limit (LL)	Non-plastic	28	37	Non-plastic
Plastic Limit (PL)	Non-plastic	21	23	Non-plastic
Plasticity Index (PI)	Non-plastic	7	14	Non-plastic
U.S. Standard Sieve Number	**Percent Passing**	**Percent Passing**	**Percent Passing**	**Percent Passing**
1'	100	100	100	100
3/4"	97	100	100	100
1/2"	87	98	95	94
3/8"	81	94	92	94
#4	74	85	81	92
#10	66	73	63	89
#16	61	67	55	88
#40	51	56	43	85
#50	48	52	39	84
#100	40	44	32	81
#200	30.0	33.1	24.3	71.1
Moisture	12.2%	9.6%	16.9%	24.9%

REMARKS:

Respectfully submitted,
Utah Testing and Engineering

Ryan Brown
Operations Manager

TEST RESULTS APPLY ONLY TO THE SPECIFIC SAMPLES TESTED, REPORTS MAY NOT BE
REPRODUCED EXCEPT IN FULL WITHOUT WRITTEN PERMISSION BY UTAH TESTING AND ENGINEERING.

Appendix B

Chemical Laboratory Report

CHEMTECH-FORD
LABORATORIES

1/22/2025

Work Order: 25A0737
Project: 508998

Sunrise Engineering Inc. - Midvale
Attn: Dao Yang
6875 South 900 East
Midvale, UT 84047

Client Service Contact: 801.262.7299

The analyses presented on this report were performed in accordance with the National Environmental Laboratory Accreditation Program (NELAP) unless noted in the comments, flags, or case narrative. If the report is to be used for regulatory compliance, it should be presented in its entirety, and not be altered.

NELAP ACCREDITED TNI LABORATORY

Approved By:

Mark Broadhead, Project Manager

Chemtech-Ford Laboratories
Serving the Intermountain West Since 1953

9632 South 500 West
Sandy, UT 84070
O:(801) 262-7299 F: (866) 792-0093
www.ChemtechFord.com

Certificate of Analysis

Sunrise Engineering Inc. - Midvale
Dao Yang
6875 South 900 East
Midvale, UT 84047

PO#:
Receipt: **1/10/25 16:30 @ 8.1** °C
Date Reported: 1/22/2025
Project Name: **508998**

Sample ID: **TP-1 @ 3'**

Matrix: **Solid**
Lab ID: **25A0737-01**
Date Sampled: **1/10/25 10:35**
Sampled By: **Dao Yang**

	Result	Units	Minimum Reporting Limit	Method	Preparation Date/Time	Analysis Date/Time	Flag(s)
Inorganic							
Sulfate, Soluble (IC)	1060	mg/kg dry	12	EPA 300.0	1/14/25	1/15/25	
Total Solids	86.6	%	0.1	CTF8000	1/13/25	1/13/25	

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Certificate of Analysis

Sunrise Engineering Inc. - Midvale
Dao Yang
6875 South 900 East
Midvale, UT 84047

PO#:
Receipt: **1/10/25 16:30 @ 8.1** °C
Date Reported: 1/22/2025
Project Name: **508998**

Sample ID: **TP-4 @ 4'**

Matrix: **Solid**
Lab ID: **25A0737-02**
Date Sampled: **1/10/25 12:20**
Sampled By: **Dao Yang**

	Result	Units	Minimum Reporting Limit	Method	Preparation Date/Time	Analysis Date/Time	Flag(s)
Inorganic							
Sulfate, Soluble (IC)	217	mg/kg dry	12	EPA 300.0	1/14/25	1/15/25	
Total Solids	86.5	%	0.1	CTF8000	1/13/25	1/13/25	

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Sandy, UT 84070
O:(801) 262-7299 F: (866) 792-0093
www.ChemtechFord.com

Certificate of Analysis

Sunrise Engineering Inc. - Midvale
Dao Yang
6875 South 900 East
Midvale, UT 84047

PO#:
Receipt: **1/10/25 16:30 @ 8.1** °C
Date Reported: 1/22/2025
Project Name: **508998**

Report Footnotes

Abbreviations

ND = Not detected at the corresponding Minimum Reporting Limit (MRL).
1 mg/L = one milligram per liter or 1 mg/kg = one milligram per kilogram = 1 part per million.
1 ug/L = one microgram per liter or 1 ug/kg = one microgram per kilogram = 1 part per billion.
1 ng/L = one nanogram per liter or 1 ng/kg = one nanogram per kilogram = 1 part per trillion.
On calculated parameters, there may be a slight difference between summing the rounded values shown on the report vs the unrounded values used in the calculation.

CHAIN OF CUSTODY - SAMPLE SUBMITTAL FORM

COMPANY: Sunrise Engineering
ADDRESS:
CITY/STATE/ZIP:
PHONE #:
CONTACT: Dao Yang
EMAIL:
PROJECT: 508998
PO Number:
INVOICE EMAIL ADDRESS:

RUSH Due Date*:	QC Level

* Expedited turnaround subject to additional charge

QC levels definition:
QC1: none (default if blank)
QC2: Batch QC, random sample
QC3: 25% surcharge. Narrative plus Batch QC, your sample selected
QC4: 40% surcharge. Add raw data

CHEMTECH-FORD LABORATORIES

Chemtech-Ford, Inc.
9632 South 500 West
Sandy, UT 84070
Phone: 801-262-7299
www.chemtechford.com

Sample condition			
	Custody Seal	✓	Correct Containers
✓	Container Intact	✓	Sufficient Sample Volume
✓	COC/Labels Agree		Headspace Present (VOC)
✓	Received on Ice		Temperature Blank
		✓	Received within Holding Time

Delivery Method			
	UPS		USPS
✓	FedEx		Chemtech-Ford Courier
✓	Walk-in		Customer Courier

25A0737

Lab Use Only	CLIENT SAMPLE INFORMATION				TESTS REQUESTED
	LOCATION / IDENTIFICATION	DATE	TIME	MATRIX	Sr / Ra Ac
-1	1. TP-1 @ 3'	1/10/25	1035	Soil	✓
-2	2. TP-4 @ 4'	1/10/25	1220	Soil	✓
	3.				
	4.				
	5.				
	6.				
	7.				
	8.				
	9.				
	10.				

Bottle type: GH
Lot #: 1352

Sampled by: [print] Dao Yang
Sampled by: [signature]

ON ICE NOT ON ICE Temp (C°): 8.1

Samples received outside the EPA recommended temperature range of 0-6 C° may be rejected.

Special Instructions:

Relinquished by: [signature]	Date/Time	Received by: [signature]	Date/Time
	1/10/25 1830		1/10/25 16:30
Relinquished by: [signature]	Date/Time	Received by: [signature]	Date/Time
Relinquished by: [signature]	Date/Time	Received by: [signature]	Date/Time

Payment Terms are net 30 days OAC. 1.5% interest charge per month (18% per annum). Client agress to pay collection costs and attorney's fees.

Appendix C

Well Logs

WELL DRILLER'S REPORT
State of Utah
Division of Water Rights

For additional space, use "Additional Well Data Form" and attach

W1 (1/2)

Well Identification

Water Right: 95-5188

RECEIVED

WIN: 430998

FEB 11 2008

WATER RIGHTS
SALT LAKE

Owner *Note any changes*

Cassell J. and Maxine E. Lindquist
35 N 1100 W
Lehi, UT 84043

Contact Person/Engineer: _____

Well Location *Note any changes*

N 1720 W 2080 from the SE corner of section 24, Township 27S, Range 2E, SL B&M

Location Description: (address, proximity to buildings, landmarks, ground elevation,local well #)

Drillers Activity Start Date: 1-08-08 Completion Date: 1-20-08

Check all that apply: ☒ New ☐ Repair ☐ Deepen ☐ Clean ☐ Replace ☐ Public Nature of Use: _____

If a replacement well, provide location of new well. _____ feet north/south and _____ feet east/west of the existing well.

DEPTH (feet) FROM	TO	BOREHOLE DIAMETER (in)	DRILLING METHOD	DRILLING FLUID
0	90'	9"	MUD Rotary	Bentonite Slurry
90	250	5"	air Rotary	Water + foam

Well Log

DEPTH (feet) FROM	TO	WATER	PERMEABLE High	PERMEABLE Low	UNCONSOLIDATED CLAY	SILT	SAND	GRAVEL	COBBLES	BOULDER	OTHER	CONSOLIDATED ROCK TYPE	COLOR	DESCRIPTION AND REMARKS (e.g., relative %, grain size, sorting, angularity, bedding, grain composition density, plasticity, shape, cementation, consistancy, water bearing, odor, fracturing, minerology, texture,degree of weathering, hardness, water quality, etc.)
0	40				X	X			X	X				Granit Boulders
40	90'													
90'	250'	X	X									Volcanic	Red	

Static Water Level

Date 1-21-08 Water Level 90' feet Flowing? ☐ Yes ☒ No

Method of Water Level Measurement Drill Pipe If Flowing, Capped Pressure _____ PSI

Point to Which Water Level Measurement was Referenced _____ Elevation _____

Height of Water Level reference point above ground surface _____ feet Temperature _____ degrees ☐ C ☐ F

Well Log

Construction Information

DEPTH (feet) FROM	TO	CASING: CASING TYPE AND MATERIAL/GRADE	WALL THICK (in)	NOMINAL DIAM. (in)	DEPTH (feet) FROM	TO	☒SCREEN ☒PERFORATIONS ☒OPEN BOTTOM: SCREEN SLOT SIZE OR PERF SIZE (in)	SCREEN DIAM. OR PERF LENGTH (in)	SCREEN TYPE OR NUMBER PERF (per round/interval)
0	90'	~~X~~ NEW STEEL	.256	5"	100	250	1/4"	ROUND HOLE	3 SLOTS/2 foot
70'	250'	NEW P.V.C-SCH 40		4"					
								P.V.C. SCREEN	
							BOTTOM 10'		

Well Head Configuration: WATER TIGHT CAP — Access Port Provided? ☒Yes ☐No

Casing Joint Type: STEEL is WELDED P.V.C. THREADED — Perforator Used: DRILL

Was a Surface Seal Installed? ☒Yes ☐No — Depth of Surface Seal: 40 feet — Drive Shoe? ☐Yes ☐No

Surface Seal Material Placement Method: POURED

Was a temporary surface casing used? ☐Yes ☒No If yes, depth of casing: _____ feet diameter: _____ inches

DEPTH (feet) FROM	TO	SURFACE SEAL / INTERVAL SEAL / FILTER PACK / PACKER INFORMATION: SEAL MATERIAL, FILTER PACK and PACKER TYPE and DESCRIPTION	Quantity of Material Used (if applicable)	GROUT DENSITY (lbs./gal., # bag mix, gal./sack etc.)
0	40'	Neat Cement GROUT	19 BAGS	6 GAL/BAG
40'	90'	1/4" GRAVEL	3/4 TON	

Well Development and Well Yield Test Information

DATE	METHOD	YIELD	Units Check One GPM	Units Check One CFS	DRAWDOWN (ft)	TIME PUMPED (hrs & min)
1-21-08	AIR PURGED	350	X			

Pump (Permanent)

Pump Description: NONE SET — Horsepower: _____ Pump Intake Depth: _____ feet

Approximate Maximum Pumping Rate: _____ Well Disinfected upon Completion? ☐Yes ☐No

Comments

Description of construction activity, additional materials used, problems encountered, extraordinary Circumstances, abandonment procedures. *Use additional well data form for more space.*

LOST MUD CIRCULATION at 90'

Well Driller Statement

This well was drilled and constructed under my supervision, according to applicable rules and regulations, and this report is complete and correct to the best of my knowledge and belief.

Name STEWART DRILLING (Person, Firm, or Corporation - Print or Type) — License No. 760

Signature Todd Stewart (Licensed Well Driller) — Date 2-6-08

W2

PAGE (Leave Blank)

Report No. 1677
Filed Oct. 28, 1940
Rec. By Mail R.E.C.
Ret'd

sted on well record
sted by counties
pied 11-29-40
cam. & returned
cam. for filing
nal Copy checked
atted & No. Assigned
ndexed
ngr. tied well
ngr. set BM
Well No.

Report of Well and Tunnel Driller
STATE OF UTAH

(Separate report shall be filed for each well or tunnel)

GENERAL INFORMATION:

Report of well or tunnel driller is hereby made and filed with the State Engineer, in accordance with Sections 100-3-22, Revised Statutes of Utah 1933, as amended by Session Laws of 1935. (This report shall be filed with the State Engineer within 30 days after the completion or abandonment of well or tunnel. Failure to file such report constitutes a misdemeanor.)

1. Name and address of person, ~~company or corporation boring or~~ drilling well ~~or tunnel~~ (Strike words not needed)
C. W. Anderson, Fountain Green, Utah

2. Name and address of owner of well ~~or tunnel~~ W. G. Taylor (Strike words not needed)
Fremont, Utah

3. Source of supply is in Wayne County County; ..... (Leave blank) drainage area; ..... (Leave blank) artesian basin

4. The number of approved application to appropriate water is 13847

5. Location of well ~~or mouth of tunnel~~ is situated at a point (#1) 1841 ft. N. 1345 ft. W. of SE Corn. Sec. 24, T. 27 S., R. 2 E., SLB&M.
(Describe by course and distance with reference to U. S. Government Survey Corner — Copy description from well owners' approved application)

6. Date on which work on well ~~or tunnel~~ was begun Sept. 29 - 1940 (Strike words not needed)

7. Date on which work on well ~~or tunnel~~ was completed ~~or abandoned~~ Oct. 23, 1940 (Strike words not needed)

8. Maximum quantity of water flowing, ~~pumped or dipped~~ on completion of well ~~or tunnel~~ in sec. ft. ....; or in gals. per minute 48; Date Oct. 23, 1940 (Strike words not needed)

DETAIL OF COLLECTING WORKS:

9. WELL: It is a drilled, ~~dug~~, flowing ~~or pump~~ well. Temperature of water 50 °F. (Strike words not needed)

(a) Total depth of well ~~is~~ was 307 ft. below ground surface.

(b) If flowing well, give water pressure (hydrostatic head) above ground surface 4½ ft.

(c) If pump well, give depth from ground surface to water surface before pumping ....; during pumping ....

(d) Size and kind of casing 93½ ft. 8" Oil well, 70½ ft. 5½ Oil well (If only partially cased, give details)

(e) Depth to water bearing stratum 112 to 157 (If more than one stratum, give depth to each)

(f) If casing is perforated, give depth from ground surface to perforations
8" casing used as controll for well (5½ casing perforated from 112 - 157

(g) Log of well 0 - 1 top soil; 1 - 21 clay, Surface water at 21 feet; 21-73 clay; 73-90 Sand & gravel, minor flow; 90 - 112 clay; 112 - 157 sand gravel flow; 157 - 307 Cement Sand. No water pressure, 170 to 307 plugged back.

(h) Well was equipped with cap, ~~valve, or~~ to control flow. (Strike words not needed)

(Over)