

**NOTICE OF MEETING
HILLSIDE REVIEW BOARD
CITY OF ST. GEORGE
WASHINGTON COUNTY, UTAH**

Public Notice

Notice is hereby given that the Hillside Review Board of the City of St. George, Washington County, Utah, will hold a meeting at the referenced site on Wednesday, July 10, 2024, commencing on-site at 8:30 a.m.

The agenda for the meeting is as follows:

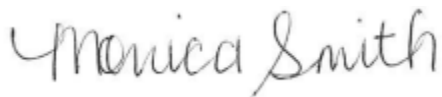
Call to Order

- 1. Consider a request for a Hillside Development Permit to allow disturbance of areas in the 20-30%, 30-40%, and 40% and above slope areas. This application is required in order to replace the water tank on the property. Applicant – St. George Water Department, representative, Rhett Beazer. Case No. 2024-HS-009.**

BACKGROUND AND RECOMMENDATION: The Water Division of St. George City is proposing to replace an existing 2MG water tank which will include a new access road to be constructed to ensure there is no encroachment on the existing BLM property. **Meeting time is approximately 8:30 am at 1023 N Cottonwood Springs Rd.**

- 2. Minutes**

Consider a request to approve the meeting minutes from the May 22, 2024 meeting.



Monica Smith – Development Office Supervisor

REASONABLE ACCOMMODATION: The City of St. George will make efforts to provide reasonable accommodations to disabled members of the public in accessing City programs. Please contact the City Human Resources Office at (435) 627-4674 at least 24 hours in advance if you have special needs.

Item # 1 Meeting Location
1023 N Cottonwood Springs Rd.



HILLSIDE REVIEW BOARD AGENDA REPORT: 07/10/2024

Industrial Water Tank Hillside Development Permit (Case No. 2024-HS-009)		
Request:	Hillside Development Permit to allow disturbance of areas in the 20-30%, 30-40% and 40% and above slope areas. This application is required in order to replace the water tank on the property.	
Applicant:	St. George Water Department	
Representative:	Rhett Beazer	
Location:	West of the intersection of Cottonwood Springs Dr and Dellcorrero.	
General Plan:	IND (Industrial).	
Existing Zoning:	M-1 (Manufacturing).	
Surrounding Zoning:	North	OS (Open Space)
	South	IND (Industrial).
	East	R-1-10 (Single Family Residential)
	West	M-1 (Manufacturing)
Land Area:	Acres 4.74	



BACKGROUND

The Water Division of St. George City is proposing to replace an existing 2MG water tank which will include a new access road to be constructed to ensure there is no encroachment on the existing BLM property.

APPLICABLE ORDINANCE(S) (Selected portions)

10-13A-1: Density and Disturbance Standards

- A. The hillside development overlay zone (HDOZ) limits development densities and provides specific development incentives to transfer underlying zone densities from hillsides (sending areas) to less steep slopes or more safe development areas (receiving areas), within a development.
- B. For those portions of a proposed development with natural slopes twenty percent (20%) or less, development density follows the density and development standards in the underlying zone.
- C. For those portions of a proposed development with natural slopes from twenty-one percent (21%) to thirty percent (30%), development activity shall not disturb more than thirty percent (30%) of the parcel within this slope category.
- D. For those portions of a proposed development with natural slopes from thirty-one percent (31%) to forty percent (40%), development activity shall not disturb more than five percent (5%) of the area within this slope category.
- E. A proposed development may not disturb slopes in excess of forty percent (40%).

10-13A-2: Slope and Slope Areas Determined

- A. Slope shall be determined for each significant portion of development parcel.
- B. *Procedure:* The applicant shall map the location of the natural slope by using the following procedure:
 - 1. *Preparation of Contour Maps:* The applicant shall submit an accurate, current contour map, prepared and certified by a licensed professional engineer or surveyor, which shows all land contours at intervals no greater than five feet (5'), drawn at a one inch equals one hundred feet (1" = 100') scale maximum.
 - 2. *Verification through Field Surveys:* The city engineer, or designee may require the applicant to submit a field survey to verify the accuracy of the contour map.

C. *Determination of Slope Areas:* Using the contour map, natural slopes shall be calculated using points identified as natural slopes of twenty percent (20%), thirty percent (30%), and forty percent (40%), and shall be located on the contour map and connected by a continuous line. That area bounded by said lines and intersecting property lines shall be used for determining project density. Small washes or outcrops, which have slopes distinctly different from surrounding property, and are not part of the contiguous topography, may be excluded from the slope determination.

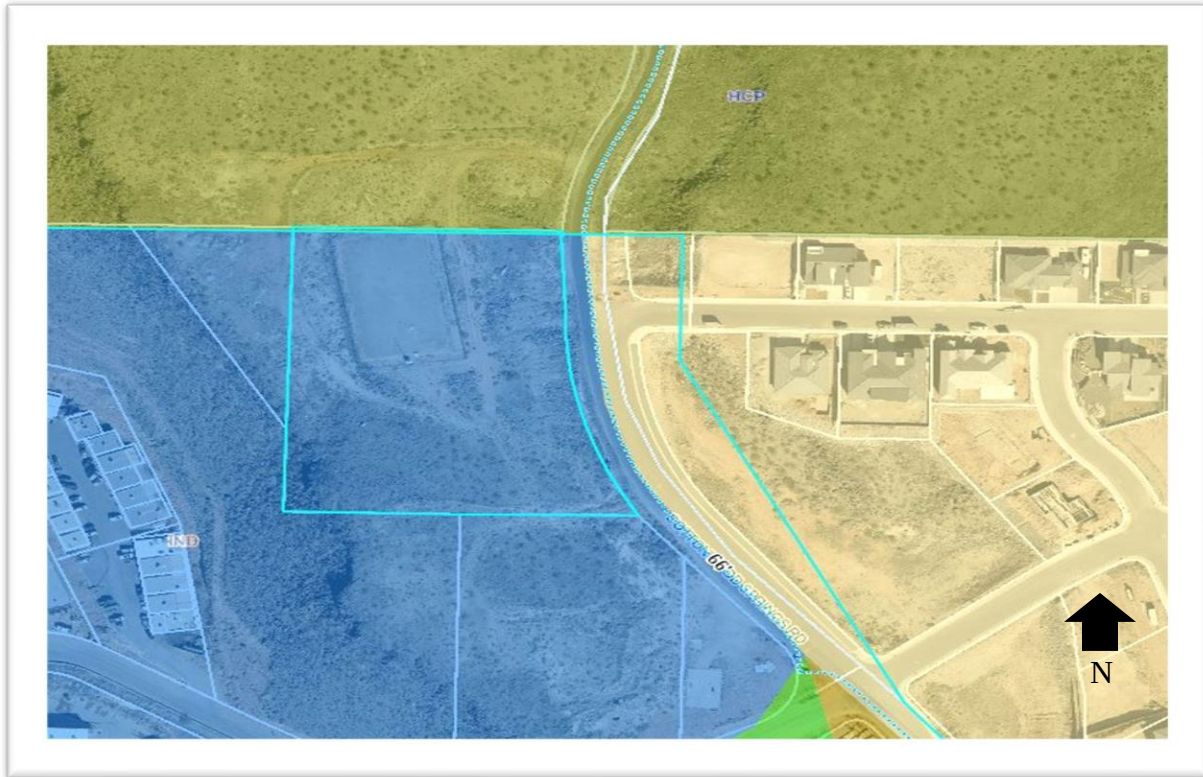
EXHIBITS PROVIDED

1. Exhibit A – Slope Analysis Map
“Exhibit A” in the packet shows the Slope Analysis Map.
2. Exhibit B – Drainage Control Plan.
“Exhibit B” in the packet is for the Drainage Control Plan.
3. Exhibit C – Landscape and Vegetation Plan
“Exhibit C” letter discussing the landscape and vegetation on the property.
4. Exhibit D – Street Design
“Exhibit D” in the packet discusses street design.
5. Exhibit E – Geotechnical Report
“Exhibit E” in the packet is the geotechnical report by Landmark.
6. Exhibit F– Construction Plans
“Exhibit F” in the packet Construction Plans for the proposed tank replacement.

RECOMMENDATION

Section 10-13A-8(B)(1) of the “Hillside Review Board Powers and Duties” states that the hillside board can make recommendations to “adopt, modify or reject a proposal” to the Planning Commission (PC).

General Plan – COM – Commercial



Zoning – M-1-(Manufacturing)



EXHIBIT A
Slope Analysis Map

EXHIBIT B
Drainage Control Plan

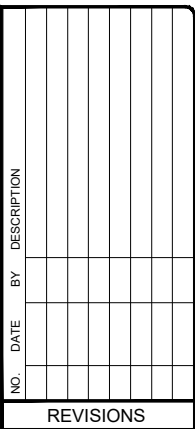
EXHIBIT C
Landscape and Vegetation

EXHIBIT D
Street Design

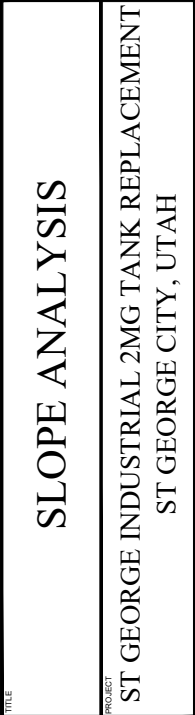
EXHIBIT E
Geo-Tech

EXHIBIT F
Construction Plans

*ST. GEORGE ORDINANCE 10-13A-1
NOTE: THIS SLOPE ANALYSIS USES DATA FROM AN AERIAL
DRONE SURVEY COMPLETED BY ALPHA ENGINEERING
IN NOVEMBER 2022.



PRELIMINARY
NOT FOR CONSTRUCTION



PROJECT #	041-162
NAME	CWL
DATE	JUNE 05, 2024
SCALE	AS NOTED
SHEET	1 1 OF 1
FILE	041-162 Hillside EXH.dwg



43 South 100 East, Suite 100 T 435.628.6500
St George, Utah 84770 F 435.628.6553

alphaengineering.com

June 13, 2024

St. George City
175 East 200 North
St. George, Utah 84770

**Re: St. George Industrial 2 MG Tank Replacement - Hillside Development Permit
Application Checklist – Drainage Control Plan**

To Whom It May Concern,

The St. George Industrial 2MG Tank Replacement site is located west of the intersection of Cottonwood Springs Drive and Dellcorrero Drive (Parcel SG-5-2-20-14412). As the project is a replacement project, no change in storm water runoff is expected.

Sincerely,

A handwritten signature in blue ink that reads "Rhett Beazer".

Rhett Beazer, P.E.
Alpha Engineering Company



43 South 100 East, Suite 100 T 435.628.6500
St George, Utah 84770 F 435.628.6553

alphaengineering.com

June 13, 2024

St. George City
175 East 200 North
St. George, Utah 84770

**Re: St. George Industrial 2 MG Tank Replacement - Hillside Development Permit
Application Checklist - Landscape and Vegetation Plan**

To Whom It May Concern,

The St. George Industrial 2MG Replacement site is located west of the intersection of Cottonwood Springs Drive and Dellcorrero Drive (Parcel SG-5-2-20-14412). Any disturbance to existing landscaping or vegetation on the site during the 2 MG tank replacement will be addressed immediately afterwards. There will be no changes to the types of retention used. There are no existing or proposed sprinklers or any type of irrigation on the parcel. There will be no changes to the projected water usage.

Sincerely,

Rhett Beazer, P.E.
Alpha Engineering Company



43 South 100 East, Suite 100 T 435.628.6500
St George, Utah 84770 F 435.628.6553

alphaengineering.com

June 13, 2024

St. George City
175 East 200 North
St. George, Utah 84770

**Re: St. George Industrial 2 MG Tank Replacement - Hillside Development Permit
Application Checklist – Street Design**

To Whom It May Concern,

The St. George Industrial 2MG Tank Replacement site is located west of the intersection of Cottonwood Springs Drive and Dellcorero Drive (Parcel SG-5-2-20-14412). The proposed plan for the removal and replacement of an existing 2MG tank on the property will not include any changes to the existing adjacent streets, and no public streets will be constructed with the project.

Sincerely,

A handwritten signature in blue ink that reads "Rhett Beazer".

Rhett Beazer, P.E.
Alpha Engineering Company

March 6, 2024

Alpha Engineering
Attn: Glen Carnahan, P.E.
43 South 100 East, Suite 100
St. George, UT 84770

Re: St. George Industrial 2 MG Tank Replacement – Addendum No. 1

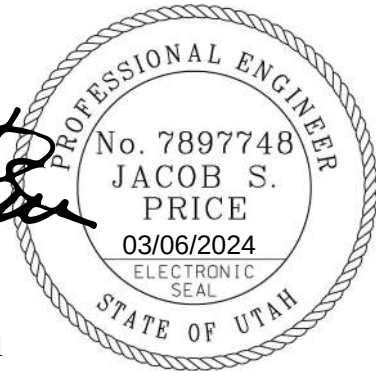
Dear Mr. Carnahan:

Attached please find Addendum No. 1 to our July 14, 2023 geotechnical investigation report for the above-referenced project. For convenience, we have also attached the original report, annotated where affected by this addendum, to this electronic copy of the addendum.

We appreciate the opportunity of providing this service for you. If there are any questions relating to the information contained herein, please call.

Sincerely,

RB&G ENGINEERING, INC.

Jacob S. Price, P.E., Principal

**ST. GEORGE INDUSTRIAL 2 MG TANK REPLACEMENT
WASHINGTON COUNTY, UTAH**

***ADDENDUM NO. 1
(March 6, 2024)
to
Geotechnical Investigation Report
(Report originally issued July 14, 2023)***

The design location of the tank was changed from being generally located within the footprint of the existing tank to being located west of and completely out of the footprint of the existing tank. The design tank bottom also changed and was raised about 20 feet. Additional investigation was performed, and the following changes are made to the Geotechnical Investigation Report issued on July 13, 2023:

1) The first paragraph of Section I. “Introduction” is replaced with the text below, which reflects the change to the design tank location.

This report outlines the results of a geotechnical investigation performed for the proposed St. George Industrial 2 MG Tank Replacement project. The existing rectangular tank is about 130 feet by 220 feet and is located approximately 150 feet west of the intersection of Cottonwood Springs Drive and Dellcorrero Drive in St. George, Washington County, Utah as shown on the Vicinity Map included as Figure 1. We understand that the replacement tank will be located to the west of the existing tank as shown on the Site Plan included as Figure 2, and will be a conventional reinforced concrete tank with an inside diameter of 140 feet and height of about 19 feet. The bottom of the proposed tank will be about 18 feet below the existing ground surface at the center of the tank, with a proposed bottom of cut elevation at about elevation 3108 feet. Excavations 3 to 25 feet deep are anticipated for the construction of the tank.

2) Section 3 “Subsurface Soil and Water Conditions” is replaced with the following, adding Boring 24-03 and updating the location described for Borings 23-01 and 23-02 in relation to the design tank location.

The characteristics of the subsurface material were investigated by drilling three borings to depths between 49.0 and 52.3 feet below the ground surface at the locations shown on Figure 2. Investigation field and laboratory testing procedures are described in the appendix. The boring logs and laboratory test results are also included in the appendix.

The boring numbers include the prefix “23” or “24” on the site plan and logs to indicate the year drilling was completed; however, the prefix will generally be omitted in this report for simplicity.

Boring 1, located about 140 feet east of the proposed tank location, encountered gravel and rock overburden soils to a depth of about 15 feet. HQ core was used to obtain samples of the gravel materials because of the density and hardness. Below the gravel and rock, a 3.5-foot layer of caliche gravel was encountered underlain with about 16 feet of basalt. Interbedded layers of silty sand with gravel and clays were encountered below the basalt to the bottom of the boring (52.3 feet). Interpretation of the subsurface information from Boring 1 between depths of 7 and 18.5 feet should consider that sand and fines within the soil matrix were likely washed out during the coring process.

Boring 2, located on the southeast side of the proposed tank location, encountered basalt down to a depth of about 45 feet. Mudstone and lean clay was encountered below the basalt to the bottom of the boring (49.5 feet).

Boring 3, located near the west side of the proposed tank location, encountered about 3 feet of silty sand with gravel fill underlain by silty sand with gravel overburden soils to a depth of about 13 feet. Basalt was encountered from 13 feet to about 44 feet below the surface. The boring extended about 5 feet below the basalt and encountered layers of silty sand and lean clay in those 5 feet.

The ground surface elevations shown on the logs at the test hole locations are approximate and were estimated from topographic contours on a site exhibit provided by Alpha Engineering. It will be noted from the boring logs that the top of the basalt in the borings located within the tank excavation is between elevations 3121.5 and 3117 feet in Borings 2 and 3, respectively. The bottom of the basalt layer in these borings ranges from elevation 3078 feet in Boring 2 to about 3086 feet

in Boring 3. Boring 1 located east of and outside the excavation encountered basalt from about elevation 3093.5 to 3078 feet..

Laboratory classification tests were performed on two samples of the overburden gravelly soil encountered in Boring 1. The samples tested had 52 to 85% gravel, 10 to 40% sand, and 5 to 8% fines passing a No. 200 sieve. The material passing the No. 40 sieve of one of the samples tested was non-plastic while the other had a liquid limit of 26 and a plasticity index of 5. The samples classify as gravel with clay and sand (GP-GC) and gravel with silt and sand (GP-GM) by the Unified Soil Classification System (USCS). One sample of the overburden from Boring 3 was classified in the lab. It had 23% gravel, 47% sand, and 30 % fines passing a No. 200 sieve. The material passing the No. 40 sieve had a liquid limit of 25 and a plasticity index of 2. This sample classified as silty sand with gravel (SM).

Recovery of core samples within the basalt ranged between 46 and 100%, and RQD values between 0 and 100%, with an average value of 55%, were measured during the field investigations. The unconfined compressive strength of the basalt rock samples tested in the laboratory were between 4,444 and 15,690 psi, with an average of 9,768. These unconfined compressive strengths correlate to rock classifications of moderately strong to very strong².

The rock samples tested in the laboratory had dry unit weights typically between 136.4 and 166.9 pcf. The sample from a depth of 25.3 to 25.8 feet in Boring 3 was the exception with a dry unit weight of 118.9 pcf.

Electrochemical tests were performed on the caliche gravel sample obtained from a depth of 18 feet in Boring 1. The sample had a pH of 8.7, resistivity of 780 ohm-cm, chloride content of 125 mg/kg-dry, and sulfate content of 308 mg/kg-dry.

3) The first four paragraphs of Section 4.1 “Tank Requirements” are replaced with the following to update the discussion of the excavation based on the new tank location and the additional boring.

Preliminary tank design drawings provided to us indicate that the existing materials will be excavated to the foundation levels, the proposed 140-foot inside diameter tank will be constructed,

² Geological Society Engineering Group Working Party, 1977

and fill materials will be placed around the tank up to an elevation about 3 feet below the top of the structure. As shown on Figure 3, the excavations and fills planned for the project will result in a channel around the northwest portion of the tank.

The sandy soils overlying the basalt in Boring 3 classify as OSHA Type B. Temporary excavations up to 20 feet deep in these sand layers should be sloped 1H:1V, or flatter. Permanent excavation slopes within these materials should be sloped 2H:1V, or flatter.

The bedrock encountered within Boring 3 had highly fractured zones within depth of the excavation that may behave like a very dense gravel. The bedrock encountered within the depth of the excavation in Boring 2 was moderately fractured and had significantly higher RQD than Boring 3 and can be excavated at steeper temporary slopes than the highly fractured zones. We recommend that temporary excavations within the highly fractured basalt be no steeper than 1H:1V. Some of the rock within the areas to be excavated had relatively high RQD values and compressive strength. Rock hammer and/or blasting excavation techniques may be required, particularly for excavations on the eastern side of the proposed tank. In areas where hammering or blasting is necessary to excavate the basalt the excavations can be sloped at 0.5H:1V or flatter. We are not aware of any structure near the project site which would be sensitive to the effects of blasting. If blasting is performed, we recommend that the blasting plan be designed to limit the peak particle velocities to 2 ft/sec at the existing roadways and utilities. Higher peak particle velocities may be allowed if the project team verifies that the existing facilities can withstand the blasting loads.

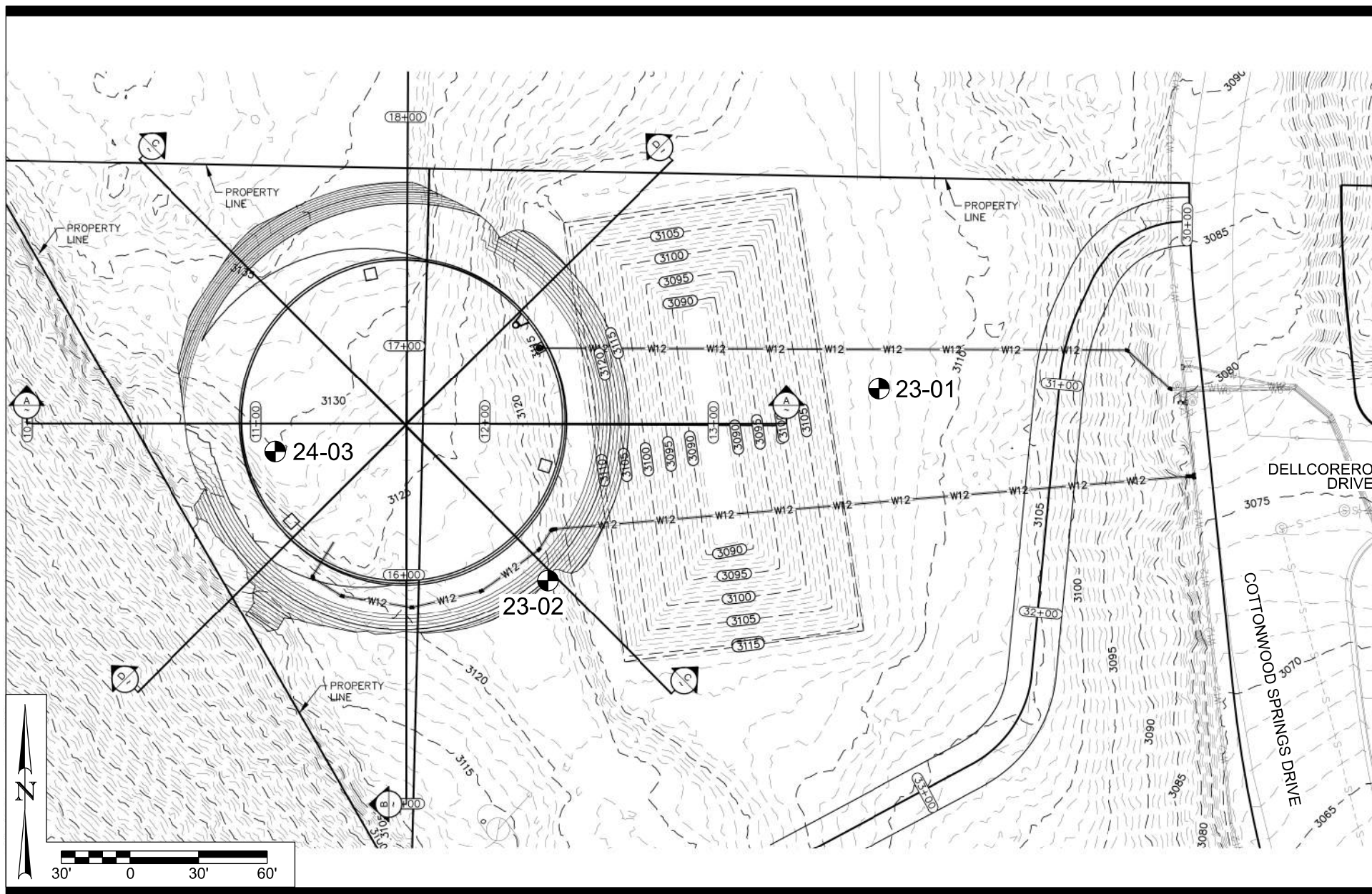
Both borings within the excavation encountered basalt extending at least 20 feet below the base of the planned excavation. It is unlikely that the basalt can be excavated to a smooth surface at the elevation of the bottom of the footings and floor slabs. In order to provide uniform bearing conditions, we recommend that the excavations extend 1 foot below the footings and floor slabs. Structural Fill should be used to establish the bottom of footing and floor slab elevations. The Geotechnical Engineer should be notified if basalt is not present at the bottom of all the excavations for the tank foundations.

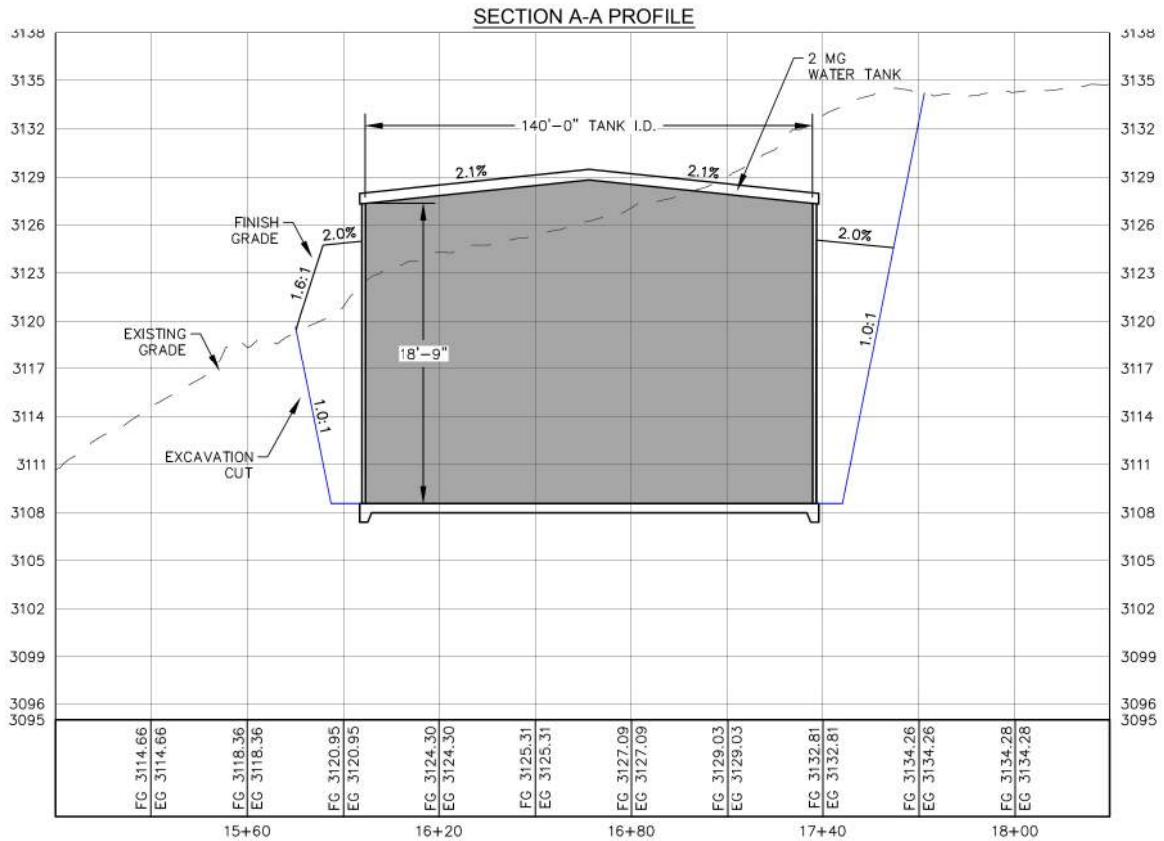
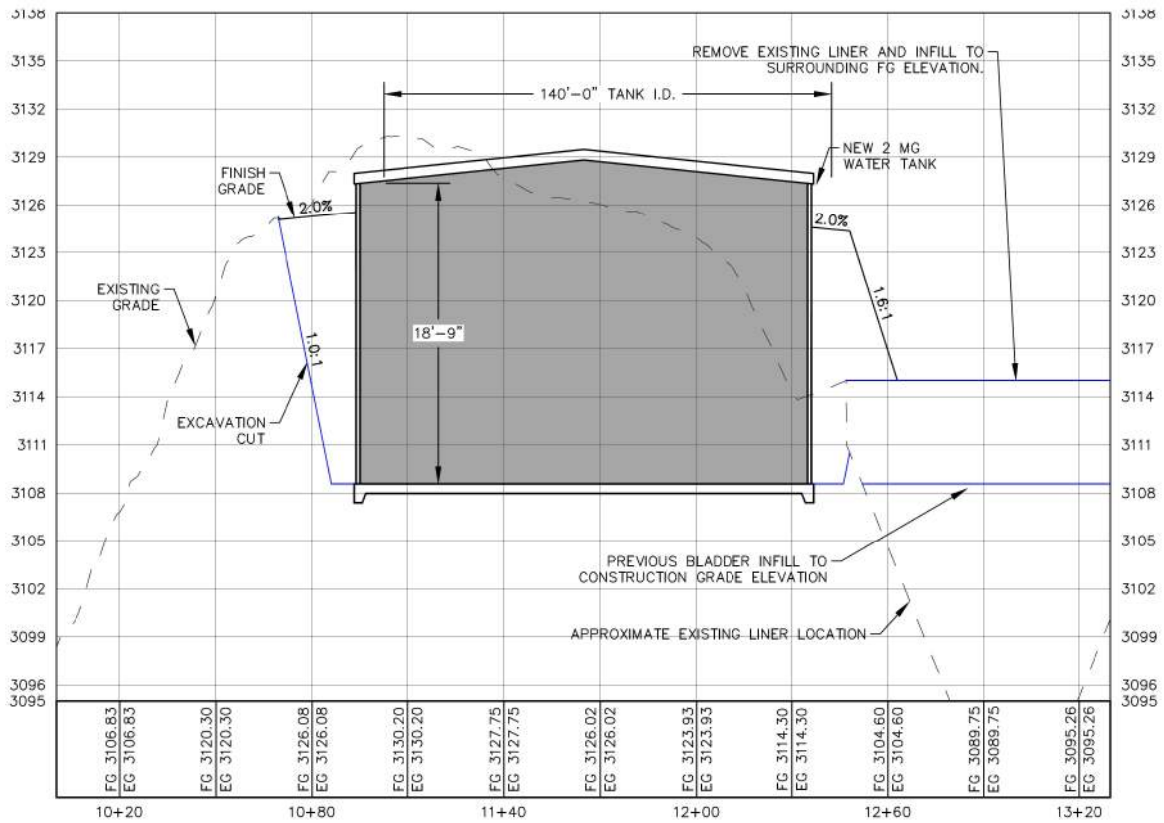
4) Figures 2 and 3 are replaced with the attached updated figures.

5) The attached log for Boring 24-03 and Core Photo Sheets for Boring 24-03 are added to the appendix.

6) The Summary of Test Data is replaced with the attached updated summary that includes testing from Boring 24-03.

END OF ADDENDUM NO. 1





DRILL HOLE LOG

BORING NO. 24-03

PROJECT: ST. GEORGE INDUSTRIAL 2MG TANK REPLACEMENT

SHEET 1 OF 1

CLIENT: ALPHA ENGINEERING

PROJECT NUMBER: 202301-005

LOCATION: APPROX. LAT: 37.12481° N, LONG: 113.55656° W

DATE STARTED: 2/14/24

DRILLING METHOD: 08-CME-55 / HWT CASING ADVANCER TO 15.5', HQ CORE

DATE COMPLETED: 2/15/24

DRILLER: T.K.

GROUND ELEVATION: ~3130'

DEPTH TO WATER - INITIAL: ∇ 39.0'

AFTER 24 HOURS: ∇ N.M.

LOGGED BY: M.N.H., J.B.

Elev. (ft)	Depth (ft)	Lithology	Sample			Material Description	Dry Density (pcf)	Moisture Content (%)	Atter.		Gradation			Other Tests
			Type	Rec. (in)	See Legend				Liquid Limit	Plast. Index	Gravel (%)	Sand (%)	Silt/Clay (%)	
			11	2,2,4,(12)	SM	red, orange & brown, moist, med. dense								
3125	5		14	5,5,4,(19)	SM	lt. brown & red-brown, moist, med. dense		13.6	25	2	23	47	30	
3120	10		14	18,26,22,(99)	SM SM	red to lt. red, moist lt. red, moist, very dense								
3115	15		5	50/5"	-	black, dry								
			36	Core 86,9	-	black, dry								
3110	20		12	Core 100,0	-	black, dry								
			35	Core 73,13	-	black, dry dk. gray, dry	157.3	0.7						UC 9,730 psi
3105	25		28	Core 46,20	-	dk. gray & red-brown, dry	118.9	1.3						UC 4,444 psi
3100	30		28	Core 46,12	-	dk. gray & red-brown, dry								
3095	35		60	Core 100,66	-	dk. gray & red-brown, dry	160.0	0.7						UC 13,270 psi
3090	40		60	Core 100,86	-	dk. gray & red-brown, dry								
3085	45		36	Core 60,0	CL CL	orange, dry orange, very moist	22.1	29	10	0	12	88		
					SM	INTERBEDDED LAYERS OF SILTY SAND & LEAN CLAY	17.3		NP	0	54	46		
3080	50					BOTTOM OF HOLE								

LEGEND:

- 2" OD Split Spoon (SPT)
- 2.5" OD Split Spoon
- 3" OD Split Spoon

- Split Spoon Sample
- Core
- Thin-Walled Tube Sample

- Blow Count per 6" (N₆₀) Value
- T 0.45 Torvane (tsf)
- PP 2.0 Pocket Penetrometer (tsf)
- Core 95,60 With Liners
- Pushed T 0.45 Percent Recovery, R.Q.D.
- PP 2.0 Torvane (tsf)
- PP 2.0 Pocket Penetrometer (tsf)

OTHER TESTS

- UC = Unconfined Compression
- CT = Consolidation
- DS = Direct Shear
- UU = Unconsolidated, Undrained
- CU = Consolidated, Undrained
- Chem. = pH, Resistivity, Sulfate, Chloride, Soluble Salts
- Hyd. = Hydrometer
- DC = Dispersive Clay

RB&G
ENGINEERING, INC.

DH LOG V8-2014-1 STGEORGE 2MG WATERTANK.GPJ US EVAL GDT 3/4/24





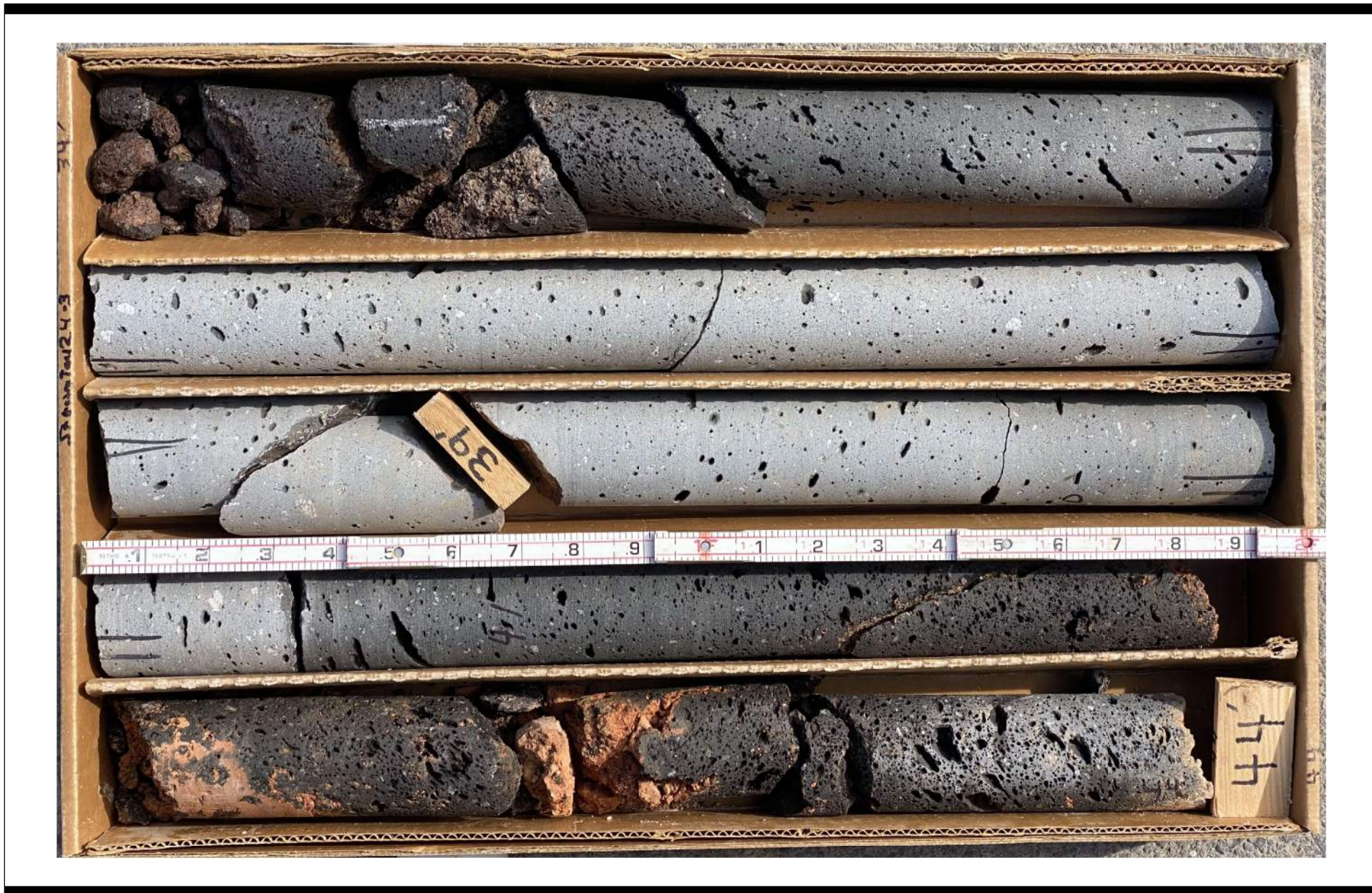




Table 1

SUMMARY OF TEST DATA

PROJECT St. George Industrial 2 MG Water Tank Replacement PROJECT NO. 202301-005

HOLE NO.	DEPTH BELOW GROUND SURFACE (ft)	IN-PLACE		UNCONFINED COMPRESSIVE STRENGTH (psi)	ATTERBERG LIMITS			MECHANICAL ANALYSIS			PERCENT FINER THAN 0.005 mm	UNIFIED SOIL CLASSIFICATION SYSTEM
		DRY UNIT WEIGHT (pcf)	MOISTURE (%)		LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTICITY INDEX (%)	PERCENT GRAVEL	PERCENT SAND	PERCENT SILT & CLAY		
23-01	3-4.5		11.9		26	21	5	52	40	8		GP-GC
	17-18		1.6				NP	85	10	5		GP-GM
	23-24	136.4	0.3	4,970								
	25-25.5	149.8	0.3	10,020								
	33-34	141.1	0.4	5,490								
23-02	16-17	165.3	0.4	15,610								
	26-27	160.5	0.3	8,690								
	37-38	166.9	0.4	15,690								
24-03	5-6.5		13.9		25	23	2	23	47	30		SM
	20.3-20.8	157.3	0.7	9,730								
	25.3-25.8	118.9	1.3	4,444								
	36-36.5	160	0.7	13,270								
	45-45.5		22.1		29	19	10	0	12	88		CL
	47.5-48		17.7				NP	0	54	46		SM

HOLE NO.	DEPTH BELOW GROUND SURFACE (ft)	pH	RESISTIVITY (ohm-cm)	SOLUBLE SOLIDS	CHLORIDE (mg/kg-dry)	SULFATE (mg/kg-dry)
23-01	17-18	8.7	780	0.34	125	308

GEOTECHNICAL INVESTIGATION

ST. GEORGE INDUSTRIAL 2 MG TANK REPLACEMENT

Washington County, Utah

*Prepared for:
Alpha Engineering*

July 2023

RB&G
ENGINEERING, INC.

July 14, 2023

Alpha Engineering
Attn: Glen Carnahan, P.E.
43 South 100 East, Suite 100
St. George, UT 84770

Re: St. George Industrial 2 MG Tank Replacement

Dear Mr. Carnahan:

A Geotechnical Investigation has been completed for the St. George Industrial 2 MG Tank Replacement in Washington County, Utah. The results of this study are summarized in the report transmitted herewith.

We appreciate the opportunity of providing this service for you. If there are any questions relating to the information contained herein, please call.

Sincerely,

RB&G ENGINEERING, INC.




Jacob S. Price, P.E., Principal

GEOTECHNICAL INVESTIGATION

**St. George
Industrial 2 MG Tank
Replacement**

Washington County, Utah

*Prepared for:
Alpha Engineering*

July 2023

RB&G ENGINEERING, INC.

GEOTECHNICAL INVESTIGATION

**ST. GEORGE INDUSTRIAL 2 MG TANK REPLACEMENT
WASHINGTON COUNTY, UTAH**

1 INTRODUCTION

THIS SECTION UPDATED, SEE ADDENDUM NO. 1

This report outlines the results of a geotechnical investigation performed for the proposed St. George Industrial 2 MG Tank Replacement project. The existing rectangular tank is about 130 feet by 220 feet and is located approximately 150 feet west of the intersection of Cottonwood Springs Drive and Dellcorrero Drive in St. George, Washington County, Utah as shown on the Vicinity Map and Site Plan, included as Figures 1 and 2. We understand that the replacement tank will generally be located within the footprint of the existing tank and will be a conventional reinforced concrete tank with a diameter of 142 feet and height of 19 feet. The bottom of the proposed tank will be 26.3 feet below the existing ground surface at the center of the tank, with a proposed bottom of cut elevation at about elevation 3088 feet. Excavations 20 to 37 feet deep are anticipated for the construction of the tank.

The information contained in the report is discussed under the following headings: 1) Introduction, 2) Geological and Existing Site Conditions, 3) Subsurface Soil and Water Conditions, and 4) Site Preparation and Compacted Fill Requirements, and 5) Foundation Considerations and Recommendations.

2 GEOLOGICAL AND EXISTING SITE CONDITIONS

The proposed tank will be constructed within the footprint of the existing rectangular tank. To our knowledge, the deterioration of the tank is not the result of any geotechnical phenomena such as settlement or aggressive soils.

The surficial deposits at the proposed tank location have been mapped as lower Pleistocene age Lava Ridge lava flow and cinder cone (Qbl)¹.

The Qbl deposits are described as “Moderate- to dark-gray to dark-brownish gray basaltic trachyandesite with prominent euhedral plagioclase phenocrysts, common quartz and pyroxene phenocrysts, and small olivine phenocrysts.” The flow “erupted from a group of heavily weathered cinder cones on Lava Ridge about 8 miles (13 km) north of St. George.” The lava flow is estimated to be between 20 and 30 feet thick.

Based upon the results of the investigation, it is anticipated that basalt will be encountered beneath the entire proposed tank footprint at the excavation elevations; however, the thickness and bottom elevation of basalt deposits are generally highly variable since they are formed by lava flows. The lava flows generally traveled within the low areas and drainages, so the bottom of the basalt deposits are indicative of the channels, draws, and canyons that existed prior to the lava flows. After cooling and hardening, the lava flows are often more erosion resistant than adjacent materials, creating high areas in the topography as adjacent materials are eroded away.

The St. George fault, along with the Washington Hollow fault, Hurricane fault, and the Reef Reservoir fault, were mapped in the vicinity of the project site by Biek et. al. The St. George fault is less than a half mile west of the site and runs north to south. The Washington Hollow fault is approximately 2.5 miles east of the site while the Hurricane fault is approximately 13 miles east of the site. The Reef Reservoir fault is 11.5 miles west of the site.

The Reef Reservoir fault is of Tertiary age while the St. George fault is classified as a Class C fault by the USGS, which suggests that there is little evidence of fault deformation within the Quaternary period (last 2.6 million years). Seismic design recommendations are provided in Section 5.2 of this report.

The site generally slopes downwards from west to east at a slope of about 3H:1V (Horizontal:Vertical). The existing tank appears to have been constructed within a bench excavated into the slope. The ground surface slopes upwards on the west side of the tank a vertical distance of about 12 feet to a ridge line. The ground surface slopes steeply (~2H:1V) downwards towards the southwest on the west side of the ridge. Vegetation at the site consists of sparse grasses and brush.

¹ Robert F. Biek, 2010, *Geologic map of the St. George and east part of the Clover Mountains 30' x 60' quadrangles, Washington and Iron Counties, Utah*. M-242dm. UGS. 1:100,000 scale

The water level within the borings was 40 to 50 feet below the ground surface after the borings were drilled, but may have been influenced by water used during drilling. Groundwater is not likely to affect the construction or long term performance of the proposed tank.

No major water conveyance facilities or other water bodies exist in the immediate vicinity which would influence the groundwater level at this site.

Other than the information provided above, no conditions appear to exist at this site which would adversely affect foundation performance.

3 SUBSURFACE SOIL AND WATER CONDITIONS

THIS SECTION UPDATED, SEE ADDENDUM NO. 1

The characteristics of the subsurface material were investigated by drilling two borings to depths between 49.5 and 52.3 feet below the ground surface at the locations shown on Figure 2. Investigation field and laboratory testing procedures are described in the appendix. The boring logs and laboratory test results are also included in the appendix.

The boring numbers include the prefix “23” on the site plan and logs to indicate the year drilling was completed; however, the prefix will generally be omitted in this report for simplicity.

Boring 1, located on the northeast side of the proposed tank location, encountered gravel and rock overburden soils to a depth of about 15 feet. HQ core was used to obtain samples of the gravel materials because of the density and hardness. Below the gravel and rock, a 3.5-foot layer of caliche gravel was encountered underlain with about 16 feet of basalt. Interbedded layers of silty sand with gravel and clays were encountered below the basalt to the bottom of the boring (52.3 feet). Interpretation of the subsurface information from Boring 1 between depths of 7 and 18.5 feet should consider that sand and fines within the soil matrix were likely washed out during the coring process.

Boring 2, located on the southwest side of the proposed tank location, encountered basalt down to a depth of about 45 feet. Mudstone and lean clay was encountered below the basalt to the bottom of the boring (49.5 feet).

The ground surface elevations shown on the logs at the test hole locations are approximate and were estimated from topographic contours on a site exhibit provided by Alpha Engineering. It will

THIS SECTION UPDATED, SEE ADDENDUM NO. 1

be noted from the boring logs that the top of the basalt is between elevations 3093.5 and 3121.5 feet. The bottom of the basalt layer was at about elevation 3078 feet in both borings.

Laboratory classification tests were performed on two samples of the overburden gravelly soil encountered in Boring 1. The samples tested had 52 to 85% gravel, 10 to 40% sand, and 5 to 8% fines passing a No. 200 sieve. The material passing the No. 40 sieve of one of the samples tested was non-plastic while the other had a liquid limit of 26 and a plasticity index of 5. The samples classify as gravel with clay and sand (GP-GC) and gravel with silt and sand (GP-GM) by the Unified Soil Classification System (USCS).

Recovery of core samples within the basalt ranged between 76 and 100%, and RQD values between 36 and 100%, with an average value of 72%, were measured during the field investigations. The relatively high RQD values indicate that the rock contains moderate to few closely spaced fractures and/or joints while the relatively high recovery indicates that the fractures and joints are not large open voids. The unconfined compressive strength of the basalt rock samples tested in the laboratory were between 4,970 and 15,690 psi. These unconfined compressive strengths correlate to rock classifications of moderately strong to very strong². The rock samples tested in the laboratory had dry unit weights between 136.4 and 166.9 pcf.

Electrochemical tests were performed on the caliche gravel sample obtained from a depth of 18 feet in Boring 1. The sample had a pH of 8.7, resistivity of 780 ohm-cm, chloride content of 125 mg/kg-dry, and sulfate content of 308 mg/kg-dry.

4 SITE PREPARATION AND COMPACTED FILL REQUIREMENTS

4.1 TANK REQUIREMENTS

Preliminary tank design drawings provided to us indicate that the existing materials will be excavated to the foundation levels, the proposed 142-foot diameter tank will be constructed, and fill materials will be placed around the tank up to an elevation about 3 feet below the top of the structure. As shown on Figure 3, the excavations and fills planned for the project will result in a channel around the perimeter of the tank.

² Geological Society Engineering Group Working Party, 1977

THIS SECTION UPDATED, SEE ADDENDUM NO. 1

The gravelly soils overlying the basalt classify as OSHA Type B. Temporary excavations up to 20 feet deep in these gravel layers should be sloped 1H:1V, or flatter. Permanent excavation slopes within these materials should be sloped 2H:1V, or flatter.

The bedrock encountered within the excavation was moderately fractured. We recommend that temporary and permanent excavations in the basalt materials be no steeper than 0.25H:1V. Based upon the relatively high RQD values and compressive strength of the rock within the excavation at this site, rock hammer and/or blasting excavation techniques will likely be required. We are not aware of any structure near the project site which would be sensitive to the effects of blasting. If blasting is performed, we recommend that the blasting plan be designed to limit the peak particle velocities to 2 ft/sec at the existing roadways and utilities. Higher peak particle velocities may be allowed if the project team verifies that the existing facilities can withstand the blasting loads.

Both borings encountered basalt extending about 10 feet below the base of the planned excavation. It is unlikely that the basalt can be excavated to a smooth surface at the elevation of the bottom of the footings and floor slabs. In order to provide uniform bearing conditions, we recommend that the excavations extend 1 foot below the footings and floor slabs. Structural Fill should be used to establish the bottom of footing and floor slab elevations. The Geotechnical Engineer should be notified if basalt is not present at the bottom of all the excavations for the tank foundations.

In Boring 1, a layer between elevations 3086.5 and 3086 feet was described as a void or very soft based on observations made during drilling where the drill equipment was advanced rapidly through these depths. There is potential for a soft zone to exist at the base of the excavation. The Geotechnical Engineer may recommend that soft materials at the bottom of the planned excavations be over-excavated and replaced with compacted Structural Fill.

Unless otherwise approved by the Engineer, Structural Fill should be relatively well graded sandy gravel having a maximum size of 2 inches, 70 to 100% passing a $\frac{3}{4}$ -inch sieve, and 5 to 20% passing a No. 200 sieve. The minus No. 40 sieve fraction of the Structural Fill should have a plastic index no greater than 6. Structural fill should be moisture conditioned to within 2% of the optimum moisture content, placed in loose lifts no thicker than 8 inches, and compacted to at least 95% of the maximum laboratory density as determined by ASTM D1557. Each lift of Structural Fill should be tested in accordance with ASTM D6938 (nuclear method) or ASTM D1556 (sand cone method) to verify compaction requirements are achieved.

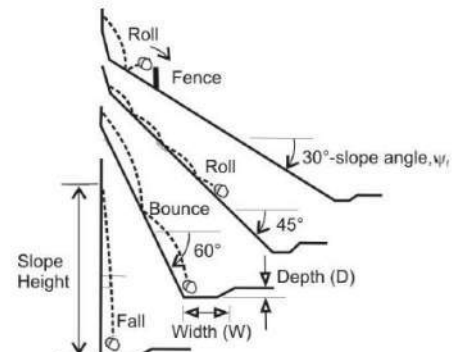
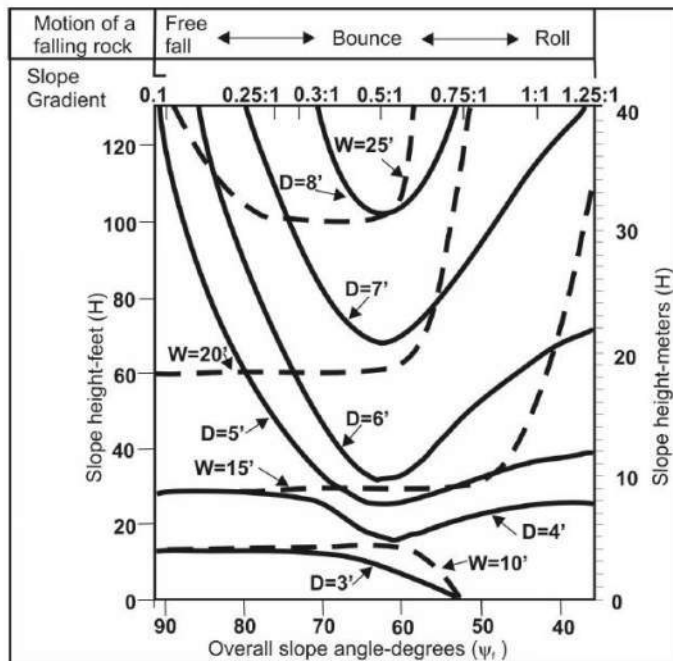
Although not required for foundation performance, we recommend that the designers consider including a drainage system beneath the tank floor slabs which will allow monitoring of tank leakage over time. If a drainage system is included in the design, we recommend that it include an impervious membrane installed over 6 inches of Structural Fill. Six inches of free-draining gravel should be installed on top of the impervious membrane and 2-inch diameter perforated PVC pipes spaced about 15 feet apart should be installed in the center of the free draining gravel. The perforated pipes should be connected to non-perforated PVC pipes which drain to an exit point or a sump.

The free-draining gravel should have a maximum size less than 1 inch and not more than 5% passing a No. 30 sieve. The free-draining material should be densified using at least 4 passes of a smooth drum 5-ton vibratory roller or equivalent. The drainage system meets the requirements for Structural Fill, therefore, the recommended excavation depth beneath the tank footings and floor slabs is the same whether or not a drain system is installed.

Basalt deposits can have large openings as a result of shrinkage during cooling, weathering, and other factors. Depending on the characteristics of the openings, it may not be practical to compact fill materials into the features in a manner that will prevent migration of the fill materials further into the openings over time. Migration of fill materials could result in a void beneath the tank structure. We recommend that the tank designer consult with the project structural engineer to determine a width of opening that the footings and floor slabs can span. It may be necessary to fill any openings with concrete that are wider than allowed by the structural design.

The planned excavation and fill slopes may result in a rockfall hazard at the tank. To protect the tank from rockfall hazards, we recommend construction of a catchment ditch between the slope and the tank. The Modified Richie's design chart³ shown below was used to estimate a catchment ditch size for conceptual design.

³ Whiteside, P.G.D., 1986, "Discussion on Rockfall Protection Measures", Conference on Rock Engineering and Excavation in an Urban Environment, Institution of Mining and Metallurgy, Hong Kong, 490-498.



For an exposed rock slope height of 30 feet and a cut slope of 0.25H:1V (76°) the recommended catchment ditch is 15-foot wide and 4-foot deep.

Following construction of the tank, the structure should be backfilled with compacted Granular Backfill. Granular Backfill can be imported or it can be processed from the basalt and gravelly soils excavated at the site. Unless otherwise approved by the Geotechnical Engineer, Granular Fill within 2 feet of the water tank should have a maximum size not greater than 2 inches, 70 to 100% passing a ¾-inch sieve, and 5 to 30% passing a No. 200 sieve. Granular Backfill should be moisture conditioned to within 2% of the optimum moisture content, placed in loose lifts no more than 12 inches thick, and compacted to at least 90% of the maximum laboratory density as determined by ASTM D1557. At least one density test demonstrating compaction requirements are achieved should be performed for each 10,000 ft² area of each lift. Granular Fill more than 2 feet from the tank walls should meet the requirements provided above except that it can have a maximum size as large as 4 inches.

4.2 ROADWAY REQUIREMENTS

It is our understanding that an unpaved access road will be constructed on the slope east of the tank providing access to Cottonwood Springs Drive as shown on Figure 2. We recommend that the embankment for the roadway be constructed using Granular Fill. In areas where the roadway

will be constructed within an excavation and the native materials at the excavation elevation are gravel, we recommend that the upper 8 inches of the native gravels be scarified, moisture conditioned to within 2% of the optimum moisture content and compacted to at least 90% of the maximum laboratory density.

We recommend that imported roadbase be used as a surface course for the unpaved roadway. Based on Unified Facilities Criteria design guidance contained in *Aggregate Surfaced Roads and Airfields Areas* published by the Department of Defense (2004), we recommend that at least 6 inches of roadbase be used as the surface course for the unpaved roadway. The roadbase should be compacted to at least 95% of the maximum laboratory determined in accordance with ASTM D1557. The surface course should provide adequate strength for use of the road by wheeled vehicles weighing up to 20,000 lbs. and tracked vehicles weighing up to 90,000 lbs, assuming the compacted subgrade will provide a California Bearing Ratio (CBR) of at least 10.

5 FOUNDATION CONSIDERATIONS AND RECOMMENDATIONS

5.1 FOUNDATION TYPES AND BEARING CAPACITIES

The proposed depth of bury for the tank is well below the frost depth, but if any other structures are considered with foundations near the surface then we recommend that they be located at least one foot below finished grade to provide frost protection and confinement of bearing soils. We also recommend that continuous footings be at least 2 feet wide and spot footings be at least 3 feet wide. We recommend that Type II, V, 1L(MS) or 1L(HS) cement be used for concrete at this site.

It is anticipated that the tank walls and roof will be supported using continuous and spot footings. The magnitude of the structural loads is not known as of the preparation of this report; however, it has been assumed that the column loads will not exceed about 200 kips and that wall loads will not exceed about 20 klf.

Assuming the foundation preparation described above is performed, the bearing capacities for the tank footings will be controlled by the strength of the fill beneath the footings. We recommend the following allowable bearing capacities:

Effective Footing Width, B' (ft)	Allowable Bearing Capacity (psf)
1.5	3,600
2	4,400
3	6,000
4	7,600
5	9,200
6	10,800

If the recommendations provided above are followed, we estimate that settlement of any foundation will not exceed one inch and differential settlement will not exceed L/480, which is equivalent to ½ inch over a distance of 20 feet.

A subgrade modulus parameter, k , is often used in design of floor slabs and mat foundations. We recommend a subgrade modulus of 150 pci be used for design of the tank floor at this site.

5.2 SEISMIC CONSIDERATIONS

The site is located at latitude 37.1249 degrees North and longitude 113.5559 degrees West. Based on the results of field and laboratory tests, we have classified the site as Site Class B (Rock) for seismic design. The following design parameters have been calculated for seismic design at this site:

Parameter	Value	Description
S_S :	0.518g	MCE_R ground motion (period 0.2s)
S_1 :	0.168g	MCE_R ground motion (period 1.0s)
F_a :	0.9	Site Class C site amplification factor (period 0.2s)
F_v :	0.8	Site Class C site amplification factor (period 1.0s)
S_{MS} :	0.466	Site-modified spectral acceleration value (period 0.2s)
S_{M1} :	0.134	Site-modified spectral acceleration value (period 1.0s)
S_{DS} :	0.311	Numeric seismic design value at 0.2s SA
S_{D1} :	0.09	Numeric seismic design value at 1.0s SA
T_0 :	0.06 second	Short-period limit of constant-acceleration segment.
T_S :	0.29 second	Long-period limit of constant-acceleration segment.
T_L :	8 seconds	Long-period transition period
PGA :	0.228	MCE_G peak ground acceleration
PGA_M :	0.205	Site-modified peak ground acceleration
F_{PGA} :	0.9	Site Class C site amplification factor for PGA

The allowable soil bearing pressures recommended in Section 4.1 may be increased by one-third where seismic forces are included in the structural loads. If the frictional resistance of the foundations is used to resist seismic forces, we recommend a coefficient of friction of 0.45 be used to calculate the sliding resistance. See Section 5.3 below for recommendations related to resistance provided by passive earth pressures.

5.3 LATERAL EARTH PRESSURES

It is anticipated that the tank will be mostly buried, which will result in lateral earth pressure against the tank walls. We are not aware of other planned earth retaining structures at this site. We recommend that the earth pressures be calculated using the following equation, along with the earth pressure coefficient outlined below:

$$P = \frac{1}{2} \gamma K H^2$$

Where P = total lateral force on wall, plf
 K = earth pressure coefficient
 γ = unit weight of soil (125 pcf)
 H = height of retained soil against wall

The earth pressure coefficient used in designing the walls will depend upon whether the wall is free to move during backfilling operations, or whether the wall is restrained during backfilling. If the wall is free to move during backfilling operations and the backfill material is granular soil, we recommend an active earth pressure coefficient of 0.28 be used in the above equation to calculate the lateral earth pressures. If the walls are restrained from any movement during backfilling (which will likely be the case for the tank walls under static conditions) and the backfill material is granular soil, we recommend an at-rest earth pressure coefficient of 0.45 be used to calculate the lateral earth pressure. We recommend a passive earth pressure coefficient of 3.5 be used where the granular soil is used to restrain lateral movement.

The additional active earth pressure due to ground acceleration equal to two thirds of the MCE may be estimated using a coefficient of 0.10. The seismic ground motion will reduce the available passive resistance. This reduction may be accounted for as an earth pressure acting in the direction opposite the passive resistance, and computed using a coefficient of 0.25. The pressure diagrams for seismic active forces may be roughly approximated as inverted triangles, such that the resultant forces of the seismic components act at heights of approximately $2H/3$ above the base of the wall.

It should be recognized that the pressures calculated by the above equation are earth pressures only and do not include hydrostatic pressures. Where hydrostatic pressures may exist behind a retaining structure, we recommend either the wall be designed to resist hydrostatic pressure, or that a drainage system be placed behind the wall to prevent the development of hydrostatic pressures.

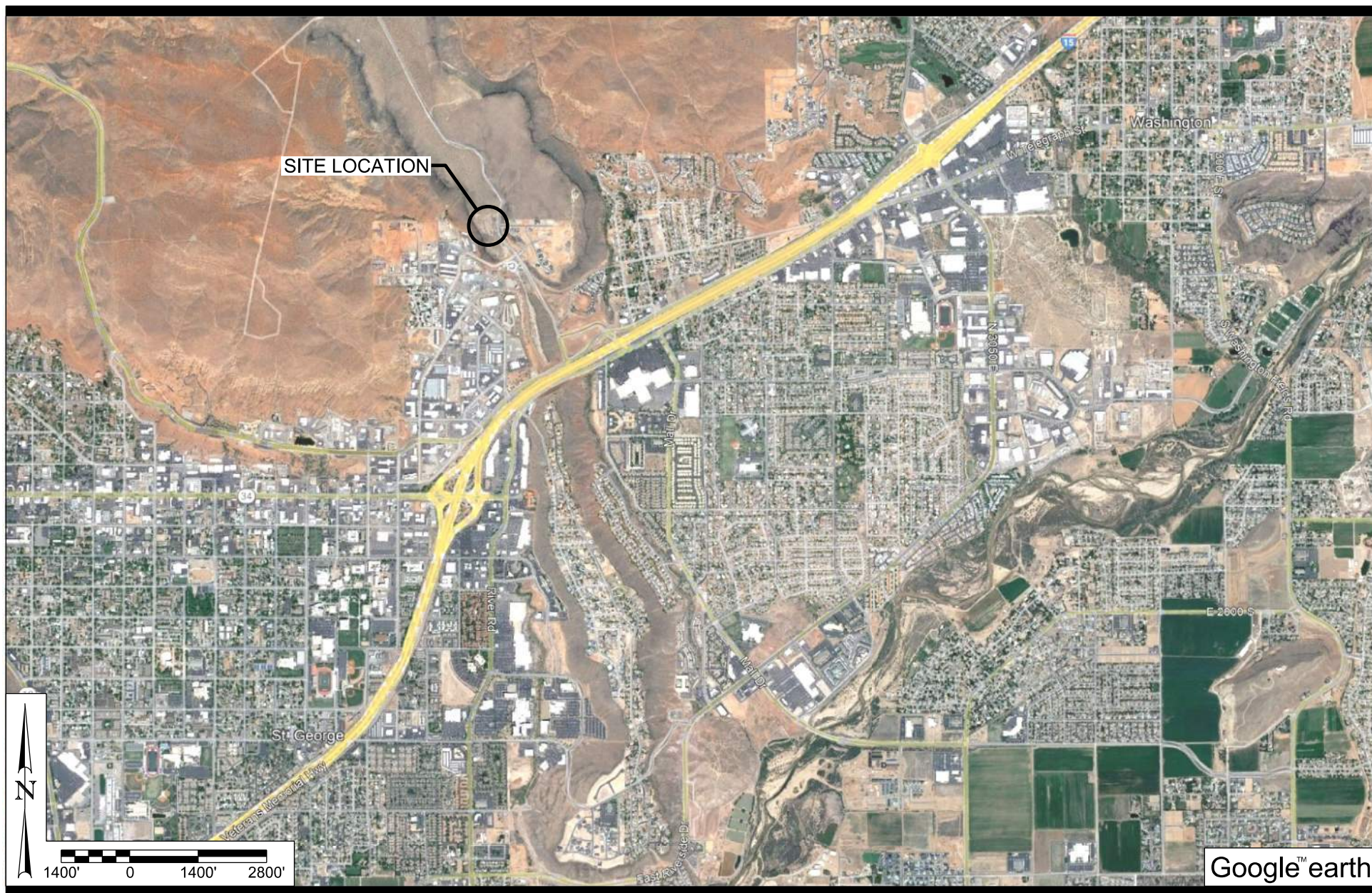
6 LIMITATIONS

The conclusions and recommendations presented in this report are based upon the results of the field and laboratory tests which, in our opinion, define the characteristics of the subsurface material throughout the site in a satisfactory manner. It should be recognized that subsurface materials are inherently heterogeneous and that conditions may exist throughout this site which could not be defined during this investigation. If conditions are encountered during construction which appear to be different than those presented in this report, it is requested that we be advised in order that appropriate action may be taken.

It is recommended that a representative of the Geotechnical Engineer observe the foundation excavations prior to placement of fill or footings. Since the bearing capacity for foundation design is dependent upon adequate compaction of Structural Fill, it is requested that compaction test results be reviewed by the Geotechnical Engineer during construction.

The information contained in this report is provided for the specific location and purpose of the client named herein and is not intended or suitable for reuse by any other person or entity whether for the specified use, or for any other use. Any such unauthorized reuse, by any other party is at that party's sole risk and RB&G Engineering, Inc. does not accept any liability or responsibility for its use.

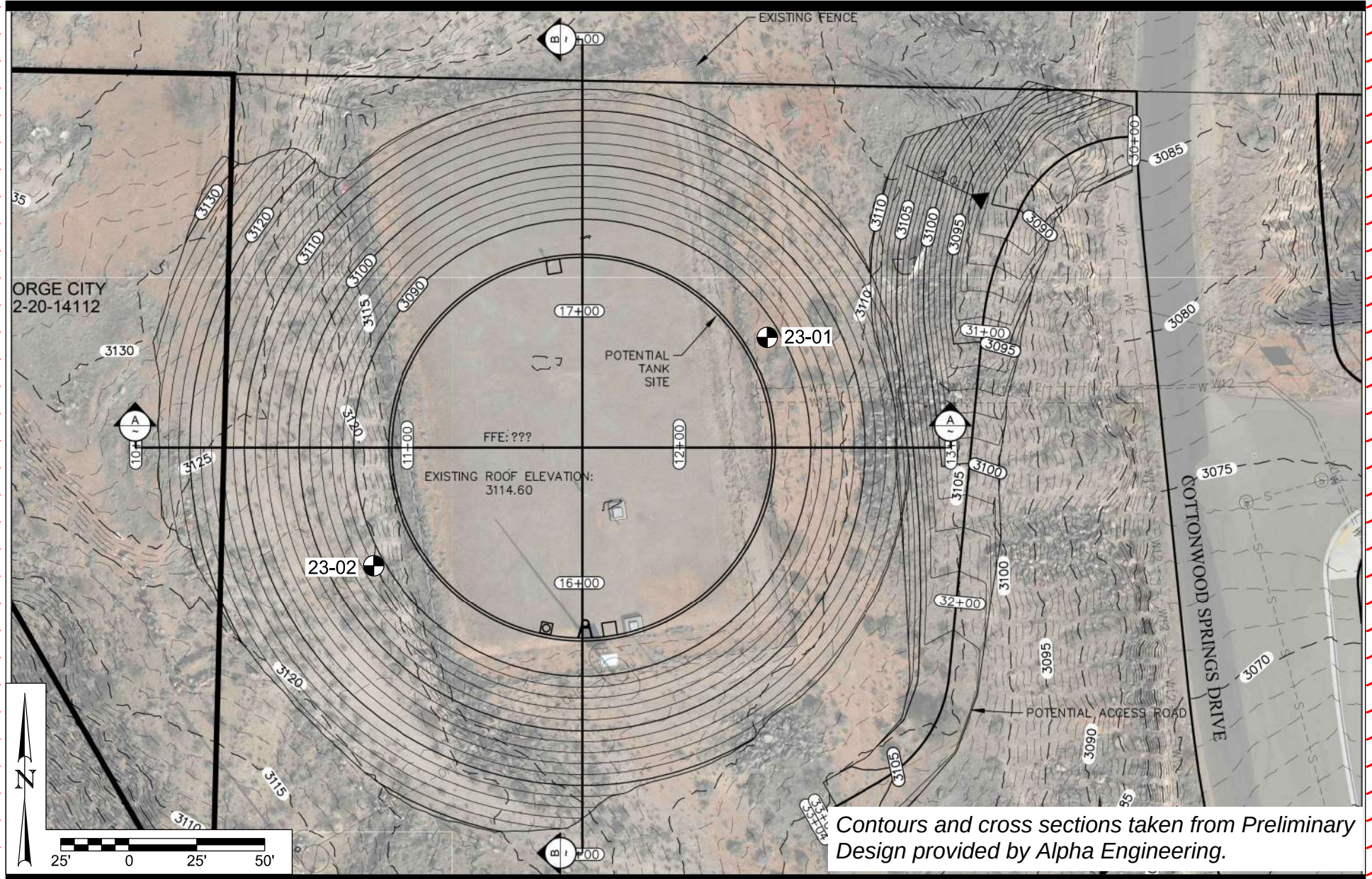
FIGURES



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Figure 1 VICINITY MAP
St. George Industrial 2MG Tank Replacement
St. George, Washington County, Utah

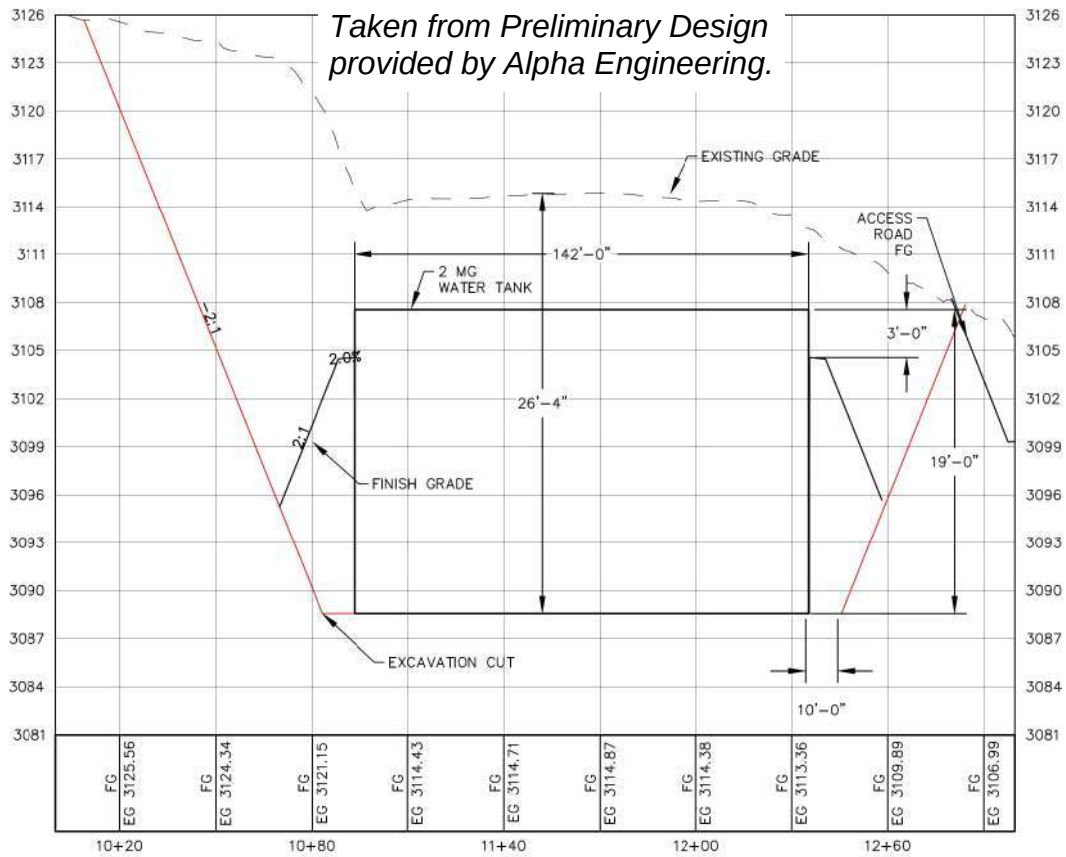
THIS FIGURE UPDATED, SEE ADDENDUM NO. 1



RB&G
ENGINEERING, INC.

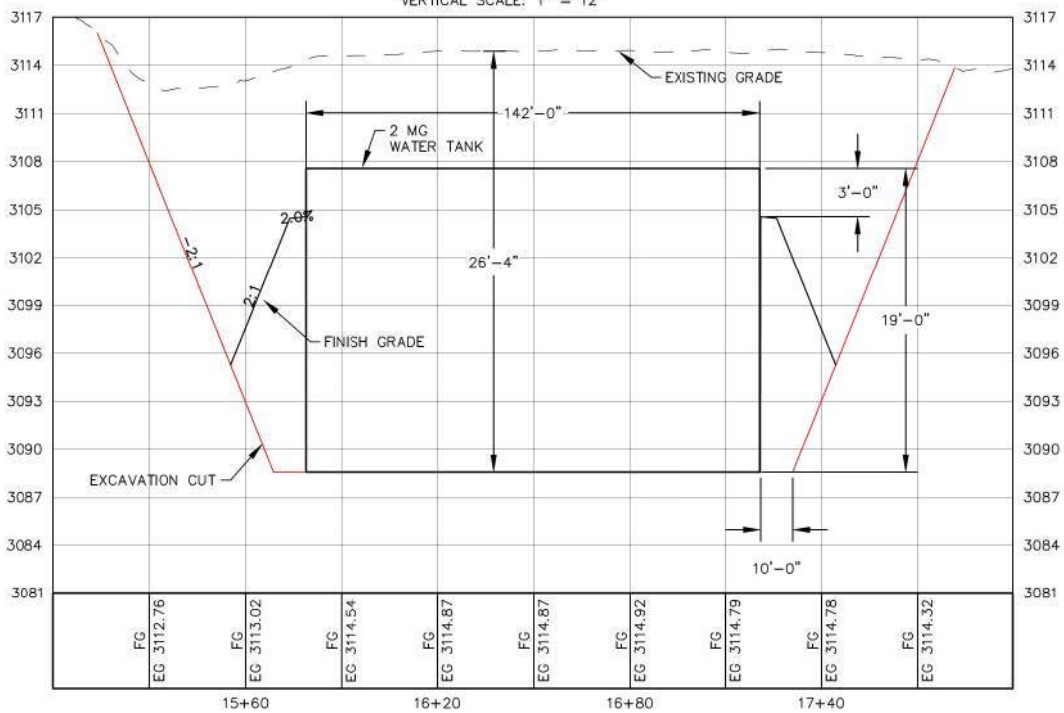
Figure 2 SITE PLAN & TEST HOLE LOCATIONS
St. George Industrial 2MG Tank Replacement
St. George, Washington County, Utah

THIS FIGURE UPDATED, SEE ADDENDUM NO. 1



A-A PROFILE

HORIZONTAL SCALE: 1" = 60'
VERTICAL SCALE: 1" = 12'



B-B PROFILE

HORIZONTAL SCALE: 1" = 60'
VERTICAL SCALE: 1" = 12'

APPENDIX

FIELD AND LABORATORY TESTING PROCEDURES

The subsurface investigation was performed using a CME 55 rotary drill rig. Borings were extended through overburden deposits with a tri-cone rock bit and HWT casing advancer. The borings were extended through bedrock materials using an HQ3 wireline system. Water was used as the drilling fluid.

During the subsurface investigation, sampling was performed at three-foot intervals within overburden deposits. Continuous coring was performed within bedrock deposits. Disturbed samples were obtained by driving a 2-inch split spoon sampling tube through a distance of 18 inches using a 140-pound weight dropped from a height of 30 inches. The number of blows required to drive the sampling spoon through each 6 inches of penetration is shown on the boring logs. The sum of the last two blow counts, which represents the number of blows to drive the sampling spoon through 12 inches, is defined as the standard penetration value. The standard penetration value, corrected for overburden and hammer energy, provides a good indication of the in-place density of sandy material; however, it only provides an indication of the relative stiffness of the cohesive material, since the penetration resistance of materials of this type is a function of the moisture content. Considerable care must be exercised in interpreting the standard penetration value in gravelly-type soils, particularly where the size of the granular particle exceeds the inside diameter of the sampling spoon. If the spoon can be driven through the full 18 inches with reasonable sample recovery, the standard penetration value provides a good indication of the in-place density of gravelly-type material.

It will be noted that the sampling spoon was not driven through the full 18 inches at some sampling locations to the excessive number of blows required to advance the spoon. Where the sampling tube could not be driven through the full 18 inches, the number of blows required to drive the spoon through a given depth of penetration is shown on the boring log.

Continuous core samples were obtained within overburden deposits and in rock at locations shown on the log. The characteristics of the rock, including percent of core recovered and Rock Quality Designation (RQD) were logged in the field by an experienced engineer or geologist during the investigations. The RQD is the percentage of the length of a core run with intact rock pieces that are at least 4 inches long.

Each sample obtained in the field was classified in the laboratory according to the Unified Soil Classification System. The symbol designating the soil type according to this system, is presented

on the boring logs. A description of the Unified Soil Classification System is presented in the appendix, and the meaning of the various symbols, shown on the logs, can be obtained from this figure.

Laboratory tests performed during this investigation to define the characteristics of the subsurface material throughout the proposed site included in-place dry unit weight, natural moisture content, Atterberg Limits, mechanical analyses, consolidation tests, unconfined compressive strength, pH, resistivity, chloride, and sulfate tests. Testing was performed following procedures outlined in the American Society for Testing and Materials (ASTM) standards.

DRILL HOLE LOG

BORING NO. 23-01

PROJECT: ST. GEORGE INDUSTRIAL 2MG TANK REPLACEMENT

SHEET 1 OF 1

CLIENT: ALPHA ENGINEERING

PROJECT NUMBER: 202301-005

LOCATION: APPROX. LAT: 37.12492° N, LONG: 113.55566° W

DATE STARTED: 2/21/23

DRILLING METHOD: 08-CME-55 / HWT CASING ADVANCER TO 7', HQ CORE

DATE COMPLETED: 2/22/23

DRILLER: T.K.

GROUND ELEVATION: ~3112'

DEPTH TO WATER - INITIAL: ∇ 40.0'

AFTER 24 HOURS: ▼ 48.9' 2/23/23

LOGGED BY: M.N.H., J.B.

Elev. (ft)	Depth (ft)	Lithology	Sample			Material Description	Dry Density (pcf)	Moisture Content (%)	Atter.		Gradation			Other Tests
			Type	Rec. (in)	See Legend				USCS (AASHTO)	Liquid Limit	Plast. Index	Gravel (%)	Sand (%)	
3110	5		10	10,37,22,(99+)	SC-SM SC-SM	orange-red-brown, sl. moist SILTY CLAYEY SAND SILTY CLAYEY SAND W/GRAVEL		11.9	26	5	52	40	8	
			8	4,4,5,(19)	GP-GC	orange-red-brown, sl. moist, very dense gray, moist, loose GRAVEL W/CLAY & SAND								
3105	10		7	10,50/4"	GP	gray, sl. moist, very dense								
			14	Core 48,14	GP	gray, avg. hard rock GRAVEL possible cobbles, boulders								
3100	15		12	Core 20,0	GP	gray, avg. hard rock								
			6	50/6"	GM	lt. brown, very moist, very dense SILTY GRAVEL W/SAND slightly plastic fines								
3095	20		28	Core 51,24	GP-GM	pink-brown, avg. hard rock CALICHE GRAVEL W/SILT cemented, basalt fragments	1.6		NP		85	10	5	Chem. SS
			-		-	gray-black, avg. hard rock								
3090	25		60	Core 100,82	-	gray-black, avg. hard rock BASALT CAPROCK vuggy	136.4	0.3						UC 4,970 psi UC 10,020 psi
			-		-	gray-black, avg. hard rock	149.8	0.3						
3085	30		46	Core 76,38	-	red-black, avg. hard rock VOID OR VERY SOFT BASALT SCORIA very highly broken								
			-		-	black, avg. hard rock BASALT vuggy, 0.1' carbonate deposit at bottom of layer								
3080	35		46	Core 76,36	-	black, avg. hard rock BASALT broken	141.1	0.4						UC 5,490 psi
			22	Core 36,0	SM,CL,SC	orange-red-brown INTERBEDDED LAYERS OF SILTY SAND W/GRAVEL, SANDY LEAN CLAY W/GRAVEL & CLAYEY SAND W/GRAVEL								
3075	40		17	16,38,39,(69)	CL SM,SC	orange-red-brown SANDY LEAN CLAY								
			12	30,40,34,(64)	SM	orange-red-brown INTERBEDDED LAYERS OF SILTY SAND W/GRAVEL & CLAYEY SAND W/GRAVEL SILTY SAND W/GRAVEL								
3070	45		18	9,12,18,(25) T 0.36 T 0.49	ML ML,SM,CL	brown SANDY SILT								
			18	25,10,14,(19)	CL	pink-brown INTERBEDDED LAYERS OF SILT, SILTY SAND & LEAN CLAY LEAN CLAY silty sand lenses, 1-1/2" gravel layers								
3065	50		18		CL	lt. brown								
			10	29,50/4"	SM	brown, wet SILTY SAND W/GRAVEL								
3060						BOTTOM OF HOLE								

DH LOG V8-2014-1 STGEORGE 2MG WATERTANK GPJ US EVAL GDT 7/14/23

LEGEND:

- 2" OD Split Spoon (SPT) Split Spoon Sample
- 2.5" OD Split Spoon
- 3" OD Split Spoon

- Core
- Thin-Walled Tube Sample

- Blow Count per 6" (N₆₀) Value
- T 0.45 Torvane (tsf)
- PP 2.0 Pocket Penetrometer (tsf)
- With Liners
- Core 95,60
- Pushed
- T 0.45 Torvane (tsf)
- PP 2.0 Pocket Penetrometer (tsf)
- Percent Recovery, R.Q.D.

OTHER TESTS

- UC = Unconfined Compression
- CT = Consolidation
- DS = Direct Shear
- UU = Unconsolidated, Undrained
- CU = Consolidated, Undrained
- Chem. = pH, Resistivity, Sulfate, Chloride, Soluble Salts
- Hyd. = Hydrometer
- DC = Dispersive Clay

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DRILL HOLE LOG

BORING NO. 23-02

PROJECT: ST. GEORGE INDUSTRIAL 2MG TANK REPLACEMENT

SHEET 1 OF 1

CLIENT: ALPHA ENGINEERING

PROJECT NUMBER: 202301-005

LOCATION: APPROX. LAT: 37.12469° N, LONG: 113.55614° W

DATE STARTED: 2/17/23

DRILLING METHOD: 08-CME-55 / HQ CORE

DATE COMPLETED: 2/17/23

DRILLER: T.K.

GROUND ELEVATION: ~3122'

DEPTH TO WATER - INITIAL: ∇ N.M. **AFTER 24 HOURS:** ▼ 42.8' 2/23/23

LOGGED BY: M.N.H., J.B.

Elev. (ft)	Depth (ft)	Lithology	Sample			Material Description	Dry Density (pcf)	Moisture Content (%)	Atter.		Gradation			Other Tests	
			Type	Rec. (in)	See Legend				USCS (AASHTO)	Liquid Limit	Plast. Index	Gravel (%)	Sand (%)		Silt/Clay (%)
		21.42			50/4"	CL-ML	brown, moist								
3120			49		Core 91,62	-	gray-black, avg. hard rock								
	5														
3115			60		Core 100,78	-	gray-black, avg. hard rock								
	10														
3110			62		Core 104,69	-	gray-black, avg. hard rock								
	15														
3105			59		Core 98,98	-	gray-black, avg. hard rock	165.3	0.4						UC 15,610 psi
	20														
3100			60		Core 100,84	-	gray-black, avg. hard rock								
	25														
3095			60		Core 100,76	-	gray-black, avg. hard rock	160.5	0.3						UC 8,690 psi
	30														
3090			60		Core 100,100	-	gray-black, avg. hard rock								
	35														
3085			60		Core 100,58	-	gray-black, avg. hard rock	166.9	0.4						UC 15,690 psi
	40														
3080			60		Core 100,88	-	gray-black, avg. hard rock								
	45														
3075			36		Core 100,0	-	orange-brown, moist								
							MUDSTONE/CLAYSTONE (LEAN CLAY)								
			13	15,20,30,(42)		CL	orange-brown, moist hard								
							LEAN CLAY W/SAND								
	50						BOTTOM OF HOLE								

DH LOG V8-2014-1 STGEORGE 2MG WATERTANK.GPJ US EVAL GDT 7/14/23



LEGEND:

2" OD Split Spoon (SPT) Split Spoon Sample

2.5" OD Split Spoon

3" OD Split Spoon

Core

Thin-Walled Tube Sample

Blow Count per 6" (N₆₀) Value

T 0.45 Torvane (tsf)

PP 2.0 Pocket Penetrometer (tsf)

Core 95,60 With Liners

Pushed T 0.45 Percent Recovery, R.Q.D.

T 0.45 Torvane (tsf)

PP 2.0 Pocket Penetrometer (tsf)

OTHER TESTS

UC = Unconfined Compression

CT = Consolidation

DS = Direct Shear

UU = Unconsolidated, Undrained

CU = Consolidated, Undrained

Chem. = pH, Resistivity, Sulfate, Chloride, Soluble Salts

Hyd. = Hydrometer

DC = Dispersive Clay













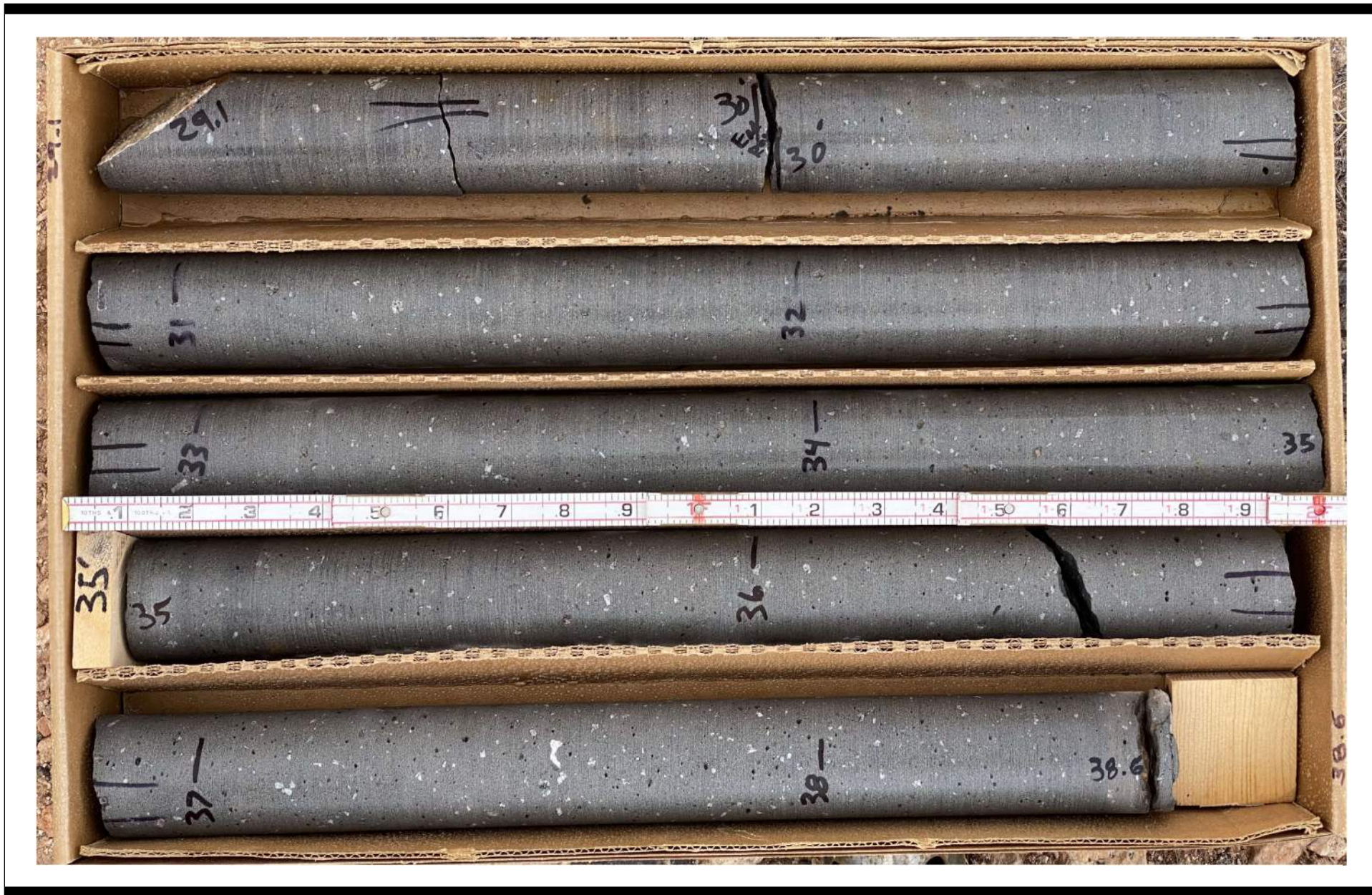
Figure CORE PHOTO SHEET - BORING 23-02, SHEET 2 OF 7

St. George Industrial 2MG Tank Replacement

St. George, Washington County, Utah







RB&G
ENGINEERING, INC.

Figure CORE PHOTO SHEET - BORING 23-02, SHEET 5 OF 7
St. George Industrial 2MG Tank Replacement
St. George, Washington County, Utah





Table 1

SUMMARY OF TEST DATA

PROJECT St. George Industrial 2 MG Water Tank Replacement **PROJECT NO.** 202301-005

HOLE NO.	DEPTH BELOW GROUND SURFACE (ft)	IN-PLACE		UNCONFINED OR UU TRIAXIAL COMPRESSIVE STRENGTH (psi)	ATTERBERG LIMITS			MECHANICAL ANALYSIS			PERCENT FINER THAN 0.005 mm	UNIFIED SOIL CLASSIFICATION SYSTEM
		DRY UNIT WEIGHT (pcf)	MOISTURE (%)		LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTICITY INDEX (%)	PERCENT GRAVEL	PERCENT SAND	PERCENT SILT & CLAY		
23-01	3-4.5		11.9		26	21	5	52	40	8		GP-GC
	17-18		1.6				NP	85	10	5		GP-GM
	23-24	136.4	0.3	4,970								
	25-25.5	149.8	0.3	10,020								
	33-34	141.1	0.4	5,490								
23-02	16-17	165.3	0.4	15,610								
	26-27	160.5	0.3	8,690								
	37-38	166.9	0.4	15,690								

HOLE NO.	DEPTH BELOW GROUND SURFACE (ft)	pH	RESISTIVITY (ohm-cm)	SOLUBLE SOLIDS	CHLORIDE (mg/kg-dry)	SULFATE (mg/kg-dry)
23-01	17-18	8.7	780	0.34	125	308

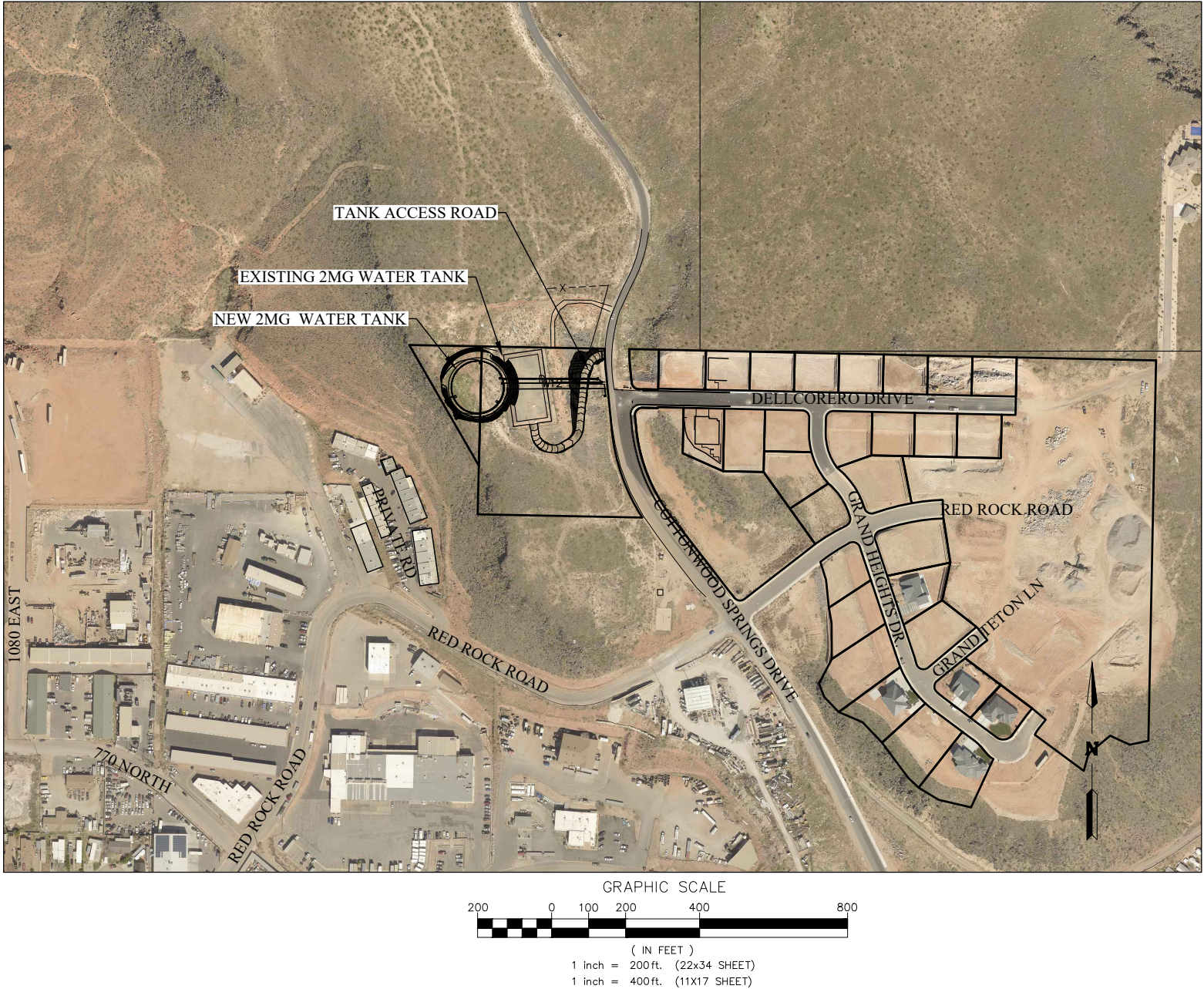
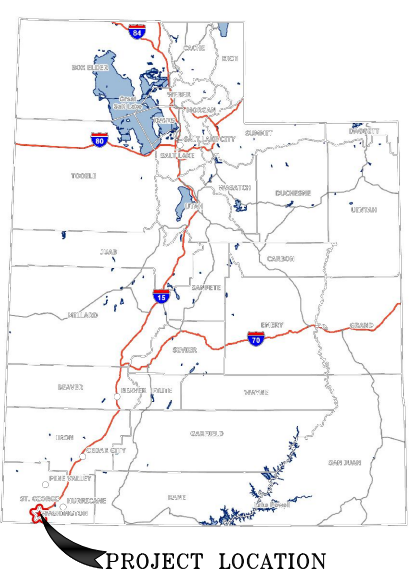
CONSTRUCTION PLANS

FOR THE

ST GEORGE INDUSTRIAL

2MG TANK PROJECT

ST GEORGE CITY, UTAH



SITE NOTES

OWNER/DEVELOPER/APPLICANT
ST GEORGE CITY WATER DEPARTMENT
811 EAST RED HILLS PARKWAY, ST GEORGE, UTAH
PH. (435) 627-4800

PLAN PREPARER
ALPHA ENGINEERING COMPANY
43 SOUTH 100 EAST SUITE 100
PH.(435) 628-6500

PROJECT LOCATION

ADDRESS:
APPROXIMATELY
1023 NORTH COTTON WOOD SPRINGS ROAD, ST GEORGE, UTAH

PLAT:
SECTION 20, TOWNSHIP 42S, RANGE 15W, SLB&M.



NOTICE!

EXISTING UTILITIES ARE SHOWN ON PLANS FOR THE CONVENIENCE OF THE CONTRACTOR ONLY. THE CONTRACTOR IS RESPONSIBLE FOR THE PROTECTION OF ALL UTILITIES. THE ENGINEER BEARS NO RESPONSIBILITY FOR UTILITIES NOT SHOWN OR SHOWN INCORRECTLY.



**Know what's below.
Call before you dig.**

NO.		DATE		BY		DESCRIPTION	
REVISIONS							
PRELIMINARY NOT FOR CONSTRUCTION							
				43 South 100 East, Suite 100 • St. George, Utah 84770 T: 435.628.6500 • F: 435.628.6553 • alphaengineering.com			
COVER SHEET				ST GEORGE INDUSTRIAL 2 MG TANK REPLACEMENT ST GEORGE, UTAH			
PROJECT #		041-162					
NAME		CWL					
DATE		DECEMBER 20, 2023					
SCALE		AS NOTED					
SHEET		C1					
FILE		041-162.MST.dwg					

MASTER INDEX OF SHEETS

GENERAL		TANK (CONTINUED)	
C1	COVER SHEET	T12	TANK DETAILS
C2	NOTES	T13	TANK DETAILS
C3	EXISTING CONDITIONS & DEMOLITION	T14	TANK DETAILS
		T15	TANK DETAILS
		T16	TANK DETAILS
PLAN & PROFILES			
P1	ACCESS ROAD PLAN & PROFILE		
C1	COVER SHEET	DETAILS	
		D1	DETAILS
TANK		D2	DETAILS
T1	TANK SITE PLAN	D3	DETAILS
T2	TANK CONSTRUCTION GRADING PLAN		
T3	TANK FINISH GRADING PLAN	EROSION CONTROL	
T4	TANK FINISH GRADING PLAN		
T5	TANK UNDERLAYMENT & DRAIN SECTION		
T6	TANK UNDERLAYMENT & DRAIN SECTION		
T7	TANK SERVICE LINE SECTIONS		
T8	TANK SITE PLAN		
T9	TANK DETAILS		
T10	TANK DETAILS		
T11	TANK DETAILS		

WATER NOTES

- ALL WATERLINE WORKS MUST BE INSTALLED BY A CONTRACTOR THAT HAS BEEN PRE-QUALIFIED BY THE CITY OF ST. GEORGE WATER DEPARTMENT.
- ALL CONSTRUCTION SHALL CONFORM TO THE "CITY OF ST. GEORGE STANDARD SPECIFICATIONS FOR DESIGN AND CONSTRUCTION", "THE INTERNATIONAL PLUMBING CODE", AND THE "UNIFORM BUILDING CODE" LATEST EDITION AS ADMINISTERED BY THE CITY OF ST. GEORGE.
- CONTRACTOR SHALL POTHOLE ALL PIPELINES AND VERIFY LOCATION AND DEPTH PRIOR TO PROCEEDING WITH ANY BUILDING OR PIPELINE CONSTRUCTION. IF THE IN FIELD CONDITION VARIES FROM DESIGN THE CONTRACTOR IS RESPONSIBLE FOR COSTS DUE TO CHANGES IN CONDITION. CITY MAPS ARE "BEST KNOWLEDGE" AND APPROXIMATE.
- THE POTABLE WATER SUPPLY TO LAWN IRRIGATION SYSTEMS SHALL BE PROTECTED AGAINST BACKFLOW PER THE "INTERNATIONAL PLUMBING CODE (IPC)" SECTION 608.16.5 AND FIRE SPRINKLER SYSTEMS PER (IPC) 608.16.4.
- ALL BACKFLOW ASSEMBLY INSTALLATION AND TEST REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE CITY OF ST. GEORGE BACKFLOW ORDINANCE 9-1-1997-5-6-5.
- 14 GAUGE WIRE SHALL BE TAPED TO ALL WATER LINES FOR LOCATING PURPOSES. THE WIRE SHALL ALSO BE BROUGHT UP AT EACH VALVE BOX AND HYDRANT.
- THRUST RESTRAINT ON THE NEW PIPELINE WILL BE AS SHOWN ON THE DETAILS. USE MEGA-LUG ON THE FITTINGS AND FIELD LOCK GASKETS ON THE REQUIRED LENGTH OF RESTRAINED PIPE.
- ASPHALT REPLACED OVER THE PIPE TRENCHING IS TO MATCH EXISTING PAVEMENT DEPTHS WITH A 6" OVER CUT FROM EDGE OF THE TRENCH ON EACH SIDE OF THE TRENCH.
- CONTRACTORS SHALL CUT OFF AND CAP (BACK AT THE WATER MAIN) ALL EXISTING SERVICE LINES OR UNUSED STUB LINES THAT WILL BE ABANDONED.
- ANY CHANGES MADE IN THE FIELD MUST BE FIRST APPROVED AND DOCUMENTED BY THE CITY OF ST. GEORGE WATER SERVICES REPRESENTATIVE.
- ALL NEW FIRE HYDRANTS SHALL BE INSTALLED AT THE CORRECT HEIGHT. RISERS WILL NOT BE ALLOWED.
- IRRIGATION WATER WORKS MAY REQUIRE ADDITIONAL APPROVALS FROM RESPECTIVE IRRIGATION COMPANIES.

UTILITY NOTES

- ALL UTILITY LINES SHALL CONFORM TO ST. GEORGE CITY CONSTRUCTION STANDARDS. A COPY OF THE CITY STANDARDS SHALL BE ON SITE AT ALL TIMES DURING CONSTRUCTION.
- CONTRACTOR SHALL NOTIFY ST. GEORGE CITY AT LEAST 24 HOURS IN ADVANCE FOR ANY UTILITY CONNECTIONS TO EXISTING UTILITIES.
- NO NEW UNDERGROUND UTILITIES SHALL BE BACKFILLED UNTIL INSPECTED BY OWNER AND/OR ST. GEORGE CITY WATER DEPARTMENT.
- ALL EXISTING UTILITY LOCATIONS SHOWN ARE APPROXIMATE. CONTRACTOR TO BLUE STAKE AND POTHOLE EXISTING UTILITIES PRIOR TO EXCAVATION TO VERIFY LOCATION.
- CONTRACTOR RESPONSIBLE TO RAISE/LOWER ALL EXISTING CLEANOUTS, MANHOLES, & VALVES AND PROVIDE ALL APPURTENANCES AS REQUIRED TO MATCH FINISH GRADE.

GENERAL NOTES (CITY OF ST GEORGE)

- ALL CONSTRUCTION AND MATERIALS SHALL BE IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS; ST. GEORGE CITY "STANDARD SPECIFICATIONS FOR DESIGN AND CONSTRUCTION"; ANY OTHER APPLICABLE STANDARDS ISSUED BY THE CONTROLLING AGENCY; THE UNIFORM BUILDING CODE; AND ALL LOCAL GOVERNMENT CODES AND ORDINANCES APPLICABLE.
- THE CONTRACTOR SHALL TAKE ALL PRECAUTIONARY MEASURES NECESSARY TO PROTECT THE EXISTING IMPROVEMENTS WHICH ARE TO REMAIN IN PLACE, FROM DAMAGE, AND ALL SUCH IMPROVEMENTS OR STRUCTURES DAMAGED BY THE CONTRACTOR'S OPERATIONS SHALL BE REPAIRED OR RECONSTRUCTED SATISFACTORY TO THE OWNER AT THE EXPENSE OF THE CONTRACTOR.
- THE CONTRACTOR SHALL NOT BACK FILL ANY TRENCHES IN WHICH WATERLINES HAVE BEEN UNCOVERED UNTIL THE WATERLINES HAVE BEEN INSPECTED BY THE CITY OF ST. GEORGE. THE CITY SHALL BE NOTIFIED 48 HOURS IN ADVANCE OF CONSTRUCTION IN THE VICINITY OF THE WATERLINES.
- ALL CONSTRUCTION SHALL BE AS SHOWN ON THE PLANS. ANY ALTERATIONS SHALL HAVE THE PRIOR WRITTEN APPROVAL OF THE ENGINEER.
- THE CONTRACTOR SHALL, AT HIS OWN EXPENSE, LOCATE ALL OVERHEAD INTERFERENCES WHICH MAY AFFECT HIS OPERATIONS DURING CONSTRUCTION AND SHALL TAKE ALL NECESSARY PRECAUTIONS TO AVOID DAMAGE TO SAME. THE CONTRACTOR SHALL USE EXTREME CAUTION WHEN WORKING NEAR OVERHEAD OR UNDERGROUND POWER AND/OR TELEPHONE FACILITIES SO AS TO SAFELY PROTECT ALL PERSONNEL AND EQUIPMENT, AND SHALL BE RESPONSIBLE FOR ALL COSTS AND LIABILITY IN CONNECTION THEREWITH.
- AN ENCROACHMENT PERMIT IS REQUIRED FOR ANY WORK WITHIN THE PUBLIC RIGHT OF WAY. AN AIR QUALITY PERMIT IS ALSO REQUIRED IN ORDER TO PERFORM CONSTRUCTION. THE CONTRACTOR SHALL SECURE ALL PERMITS AND INSPECTIONS REQUIRED FOR THIS CONSTRUCTION. CONTACT CLINT HAFEN (435-414-4806).
- THE CONTRACTOR SHALL INSTALL AN INFORMATIONAL SIGN ON SITE BEFORE CONSTRUCTION BEGINS. THIS SIGN WILL HAVE A MINIMUM SIZE, PLACEMENT LOCATION AND CONTENT INFORMATION WITH THE COMPANY NAME, PHONE CONTACT & GRADING PERMIT NUMBER. SIGN REQUIREMENTS ARE AS FOLLOWS:

- THE SIGN SHALL BE INSTALLED PRIOR TO BEGINNING ACTUAL CONSTRUCTION ACTIVITIES AND INITIATING ANY TYPE OF EARTH MOVING OPERATIONS.
- THE SIGN SHALL BE INSTALLED AT A PROMINENT LOCATION ON THE PROPERTY NEAR THE MAIN ENTRANCE OF THE CONSTRUCTION SITE. TRAFFIC VISIBILITY SHALL BE MAINTAINED BY PLACING THE SIGN BACK FROM THE MAIN INGRESS/EGRESS LOCATION AND AT ANY APPLICABLE INTERSECTION FOR PROPER SIGHT- TRIANGLE CLEARANCES.
- THE SIGN MAY BE REMOVED ONCE FINAL STABILIZATION HAS BEEN ACHIEVED ON ALL PORTIONS OF THE SITE FOR WHICH THE PERSON IS RESPONSIBLE AND IS APPROVED BY THE CITY.
- THE SIGN SHALL BE A MINIMUM SIZE OF 4'x4' AND THE FOLLOWING INFORMATION SHALL BE DISPLAYED ON THE SIGN WITH THE DESIGNATED ALPHA AND NUMERIC DIMENSIONS. SIGN BOARDS WRITTEN IN LONGHAND ARE UNACCEPTABLE.

PROJECT NAME	4" UPPERCASE BOLD LETTERS
PERMIT NUMBER	4" BOLD NUMBERS
FOR PROJECT SITE CONCERNS CONTACT	6" UPPERCASE BOLD LETTERS
OFFICE PHONE CONTACT ###-###-####	4" BOLD NUMBERS
CELL PHONE CONTACT ###-###-####	4" BOLD NUMBERS
IF NO RESPONSE PLEASE CONTACT	3" UPPERCASE BOLD LETTERS AND NUMBERS
OFFICE AT ###-###-####	

- THE TEXT HEIGHT SHALL BE A MINIMUM AS SHOWN ON THE TEMPLATE ABOVE AND MUST CONTRAST WITH LETTERING, TYPICALLY BLACK TEXT WITH WHITE BACKGROUND.
 - THE LOWER EDGE OF THE SIGN BOARD MUST BE A MINIMUM OF THREE (3) FEET AND A MAXIMUM OF FIVE (5) FEET ABOVE GRADE. SIGN MAY BE POSTED ON TRAILER IF IT MEETS THESE REQUIREMENTS.
- CONTRACTOR IS RESPONSIBLE TO OBTAIN ALL NECESSARY PERMITS PERTAINING TO STORM WATER. THIS INCLUDES, BUT IS NOT LIMITED TO, NOTICE OF INTENT, NOTICE OF TERMINATION, AND STORM WATER POLLUTION PREVENTION PLAN (SWPPP). THE SWPPP SHALL BE PREPARED AS REQUIRED BY STATE OF UTAH DIVISION OF ENVIRONMENTAL QUALITY REQUIREMENTS. CONTRACTOR SHALL MAINTAIN ALL SUCH PERMITS AND IS REQUIRED TO HAVE SWPPP ON-SITE AT ALL TIMES AS REQUIRED BY ST. GEORGE CITY AND THE STATE OF UTAH DEPARTMENT OF ENVIRONMENTAL QUALITY.

- PROJECTS SHALL SUBMIT A DUST CONTROL PLAN WITH DETAILS ON EQUIPMENT SCHEDULING AND REPORTING OF DUST CONTROL ACTIVITIES. DUST CONTROL REQUIREMENTS ARE AS FOLLOWS:

- APPLY WATER BY MEANS OF TRUCKS, HOSES AND/OR SPRINKLERS AT SUFFICIENT FREQUENCY AND QUANTITY, PRIOR TO CONDUCTING, DURING AND AFTER EARTHMOVING ACTIVITIES.
- PRE-APPLY WATER TO THE DEPTH OF THE PROPOSED CUTS OR EQUIPMENT PENETRATION.
- APPLY WATER AS NECESSARY AND PRIOR TO EXPECTED WIND EVENTS.
- OPERATE HAUL VEHICLES APPROPRIATELY IN ORDER TO MINIMIZE FUGITIVE DUST AND APPLY WATER AS NECESSARY DURING LOADING OPERATIONS.
- WHEN ACTIVE CONSTRUCTION OPERATIONS HAVE CEASED, APPLY WATER AT SUFFICIENT FREQUENCY AND QUANTITY TO DEVELOP A SURFACE CRUST AND PRIOR TO EXPECTED WIND EVENTS.
- INSTALL FENCE BARRIER AND/OR "NO TRESPASSING" SIGNS TO PREVENT ACCESS TO DISTURBED SURFACE.

- THE CONTRACTOR SHALL TAKE ALL NECESSARY PRECAUTIONS TO PROTECT EXISTING PERMANENT SURVEY MONUMENTS. ANY MONUMENTS DISTURBED SHALL BE REPLACED AND ADJUSTED PER AVAILABLE RECORDS BY A PROFESSIONAL LAND SURVEYOR AT CONTRACTORS EXPENSE.

- EXISTING UTILITIES ARE SHOWN ON THE PLANS FOR THE CONVENIENCE OF THE CONTRACTOR ONLY. THE ENGINEER BEARS NO RESPONSIBILITY FOR UTILITIES NOT SHOWN, OR SHOWN INCORRECTLY.

- THE CONTRACTOR SHALL PROVIDE TRAFFIC CONTROL AND MAINTAIN TRAFFIC FLOW WITHIN ALL PUBLIC RIGHTS-OF-WAY UNLESS ARRANGEMENTS ARE MADE AND WRITTEN APPROVAL GRANTED FROM THE CITY OF ST. GEORGE. TRAFFIC CONTROL SHALL CONFORM TO MUTCD STANDARDS.

- CONTRACTOR SHALL POTHOLE ALL CRITICAL UTILITY CROSSINGS AT LEAST 500 FEET PRIOR TO CONSTRUCTION AT THE CROSSING AREA.

- THE CONTRACTOR SHALL BE RESPONSIBLE FOR ENSURING THAT THE INTERIOR OF ALL PIPE BE CLEAR OF DEBRIS INCLUDING SOIL, ROCKS, TRASH, ETC. IT IS RECOMMENDED THAT THE ENDS OF THE PIPE BE COVERED IN CASE OF STORM RUNOFF OR UTILITY BREAKAGE. ANY CLEANING OF THE PIPE INTERIOR SHALL BE AT THE CONTRACTOR'S EXPENSE.

LINETYPE LEGEND

---W---W-	EXISTING WATER LINE	---G---G-	EXISTING GAS LINE
—W—W—	NEW WATER LINE	—G—G—	NEW GAS LINE
⌵	EXISTING WATER VALVE	⊙	EXISTING GAS METER
⌵	NEW WATER VALVE	⊙	NEW GAS METER
⌵	EXISTING FIRE HYDRANT	---T---T-	EXISTING TELEPHONE LINE
⌵	NEW FIRE HYDRANT	—T—T—	NEW TELEPHONE LINE
⊙	EXISTING AIR-VAC VALVE	⊙	EXISTING TELEPHONE PEDESTAL
⊙	NEW AIR-VAC VALVE	⊙	NEW TELEPHONE PEDESTAL
⊙	EXISTING REMOTE AIR-VAC VALVE	---F---F-	EXISTING FIBER OPTIC LINE
⊙	NEW REMOTE AIR-VAC VALVE	—F—F—	NEW FIBER OPTIC LINE
⌵	EXISTING WATER SERVICE	---CA---	EXISTING CABLE LINE
⌵	NEW WATER SERVICE	---CA---	NEW CABLE LINE
⊙	EXISTING WATER MANHOLE	⌵	EXISTING UTILITY BOX
⊙	NEW WATER MANHOLE	⌵	NEW UTILITY BOX
---IRR---	EXISTING IRRIGATION LINE	---CO---	EXISTING UTILITY CONDUIT
---IRR---	NEW IRRIGATION LINE	---CO---	NEW UTILITY CONDUIT
⌵	EXISTING IRRIGATION VALVE	---UGP---	EXISTING UG PRIMARY POWER LINE
⌵	NEW IRRIGATION VALVE	---ABC---	EXISTING 3ø POWER LINE
⌵	EXISTING IRRIGATION SERVICE	---ABC---	NEW 3ø POWER LINE
⌵	NEW IRRIGATION SERVICE	---	EXISTING SECONDARY POWER LINE
⊙	EXISTING IRRIGATION MANHOLE	---	NEW SECONDARY POWER LINE
⊙	NEW IRRIGATION MANHOLE	---OHP---	EXISTING OVERHEAD POWER LINE
---S---S-	EXISTING SEWER LINE	---OHP---	NEW OVERHEAD POWER LINE
---S---S-	NEW SEWER LINE	⌵	EXISTING POWER POLE
⌵	EXISTING SEWER SERVICE	⌵	NEW POWER POLE
⌵	NEW SEWER SERVICE	⌵	EXISTING SITE LIGHT POLE
⊙	EXISTING SEWER MANHOLE	⌵	NEW SITE LIGHT POLE
⊙	NEW SEWER MANHOLE	⌵	EXISTING STREET LIGHT POLE
⊙	EXISTING SEWER CLEANOUT	⌵	NEW STREET LIGHT POLE
⊙	NEW SEWER CLEANOUT	⌵	EXISTING SWITCH BOX
---SD---	EXISTING STORM DRAIN LINE	⌵	NEW SWITCH BOX
---SD---	NEW STORM DRAIN LINE	⌵	EXISTING TRANSFORMER
---D---D-	EXISTING DRAIN LINE	⌵	NEW TRANSFORMER
---D---D-	NEW DRAIN LINE	⌵	EXISTING POWER VAULT
⌵	EXISTING AREA DRAIN INLET BOX	⌵	NEW POWER VAULT
⌵	NEW AREA DRAIN INLET BOX	⌵	EXISTING POWER SERVICE
⌵	EXISTING CURB INLET BOX	⌵	NEW POWER SERVICE
⌵	NEW CURB INLET BOX	⌵	BOREHOLES
⊙	EXISTING STORM DRAIN MANHOLE	⌵	TEST PITS
⊙	NEW STORM DRAIN MANHOLE	⌵	PROPERTY CORNER FND.
⊙	EXISTING STORM DRAIN CLEANOUT	⌵	PROPERTY CORNER SET
⊙	NEW STORM DRAIN CLEANOUT	⌵	OFFSET PROPERTY CORNER

⌵	CLASS 1 MONUMENT
⌵	CLASS 2 MONUMENT
⌵	SECTION CORNER
⌵	QUARTER SECTION LINE
⌵	SECTION LINE
⌵	PROPERTY LINE
⌵	NEW RIGHT OF WAY
⌵	EXISTING RIGHT OF WAY
⌵	PHASING LINE
⌵	PROJECT BOUNDARY
⌵	LOT SETBACK LINE
⌵	EASEMENT LINE
⌵	ROAD CENTER LINE
⌵	EXISTING SITE IMPROVEMENTS
⌵	NEW SITE IMPROVEMENTS
⌵	EXISTING FENCE
⌵	NEW FENCE
⌵	EXISTING WALL
⌵	NEW WALL
⌵	EXISTING BLOCK RETAINING WALL
⌵	NEW BLOCK RETAINING WALL
⌵	EXISTING TREES
⌵	SITE DISTANCE
⌵	SITE TRIANGLE AREA
⌵	GRADE BREAK
⌵	EXISTING GRADE CONTOURS & LABELS
⌵	FINISH GRADE CONTOURS & LABELS
⌵	GRADE SLOPE
⌵	EXISTING GRADE TAG
⌵	FINISH GRADE TAG

EG	EXISTING GRADE
FG	FINISH GRADE
RG	ROUGH GRADE
TBC	TOP BACK OF CURB
RMP	RAMP START/END
BW	BACK OF WALK
FW	FRONT OF WALK
FL	FLOWLINE
INV	PIPE INVERT
LIP	LIP OF GUTTER
CL	CENTER LINE
MON	MONUMENT
ROW	RIGHT OF WAY
EOP	EDGE OF PAVEMENT

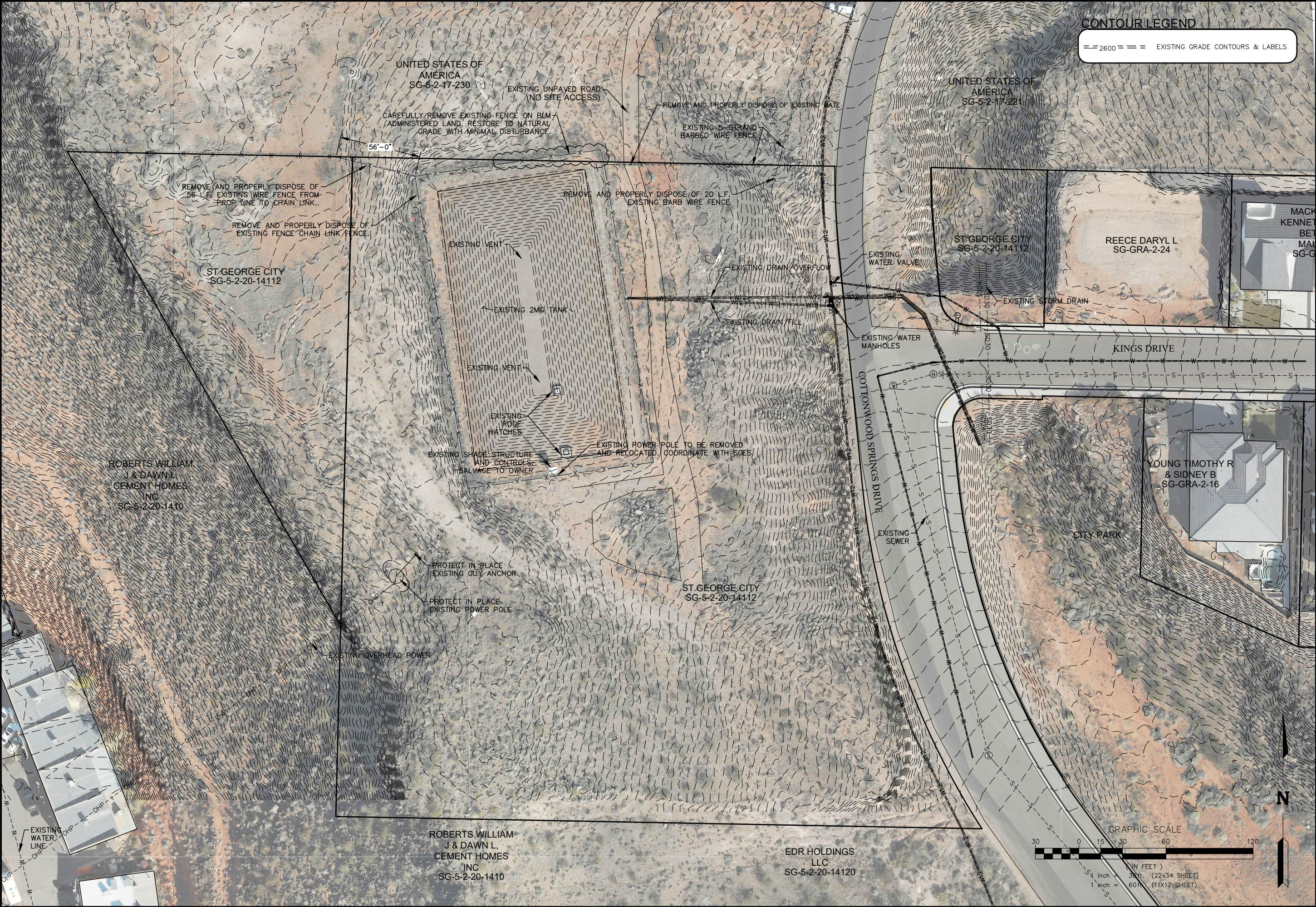
EOR	EDGE OF ROAD
FNC	FENCE LINE
WAL	TOP OF WALL
COR	BUILDING CORNER
FF	FINISH FLOOR
TOP	TOP OF STAIRS
BOT	BOTTOM OF STAIRS
HP	HIGH POINT
LP	LOW POINT
GB	GRADE BREAK
GT	GRADE TRANSITION
TOE	TOE OF SLOPE
RIM	RIM OF STRUCTURE
TG	TOP OF GRATE

NOTES

ST GEORGE INDUSTRIAL 2 MG TANK REPLACEMENT
ST GEORGE, UTAH

PROJECT #	041-162
NAME	CWL
DATE	DECEMBER 20, 2023
SCALE	AS NOTED
SHEET	C2
FILE	041-162 MST.dwg

P:\041-162 St. George Industrial 2 MG Tank Replacement\Drawings\Construction Drawings\041-162 MST.dwg, ECND, 4/12/2024 11:51:45 AM, wlee



CONTOUR LEGEND

2600 EXISTING GRADE CONTOURS & LABELS

NO.	DATE	BY	DESCRIPTION

REVISIONS

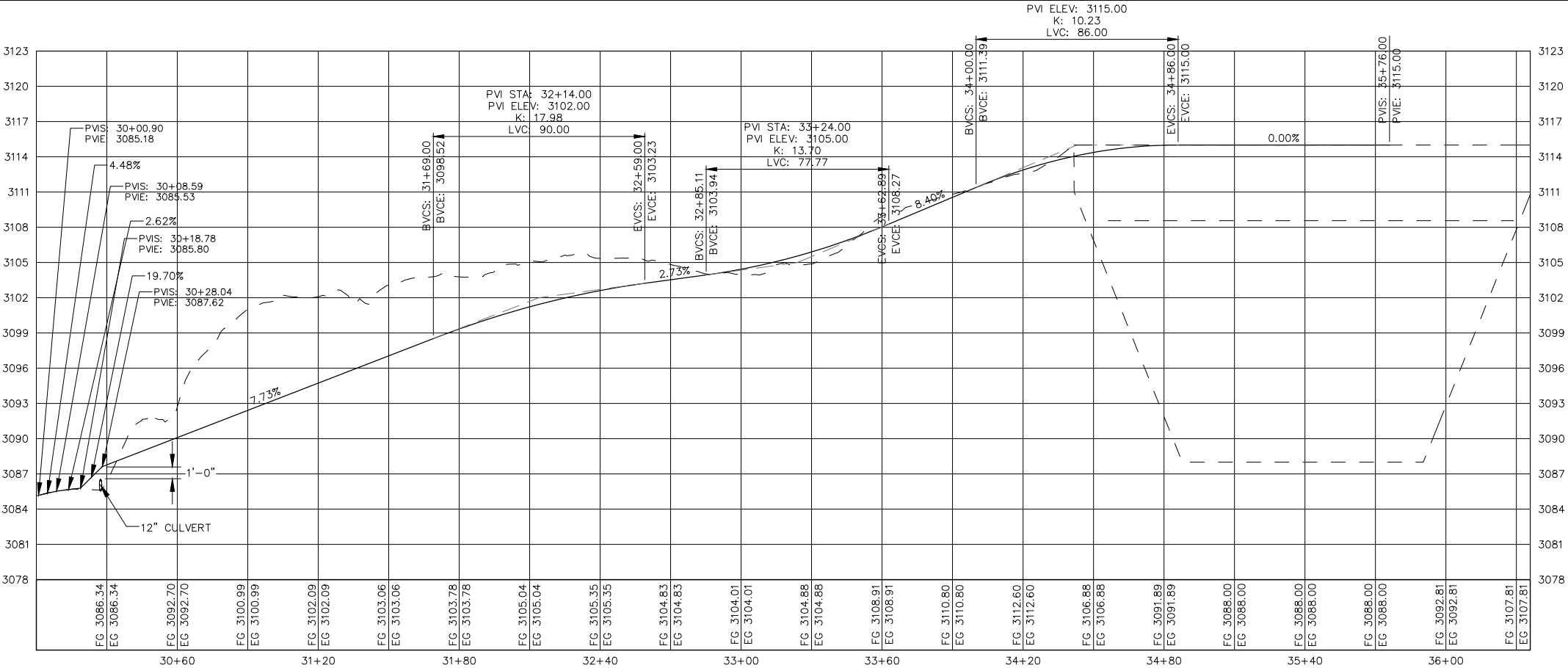
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**ALPHA**
ENGINEERING

43 South 100 East, Suite 100 • St. George, Utah 84770
T: 435.628.6500 • F: 435.628.6553 • alphaengineering.com

EXISTING CONDITIONS & DEMOLITION	
ST GEORGE INDUSTRIAL 2 MG TANK REPLACEMENT	
ST GEORGE, UTAH	
PROJECT #	041-162
NAME	CWL
DATE	DECEMBER 20, 2023
SCALE	AS NOTED
SHEET	C3
FILE	041-162 MST.dwg

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ACCESS ROAD PROFILE
HORIZONTAL SCALE: 1" = 60' (11x17)
VERTICAL SCALE: 1" = 12' (11x17)

NO.	DATE	BY	DESCRIPTION

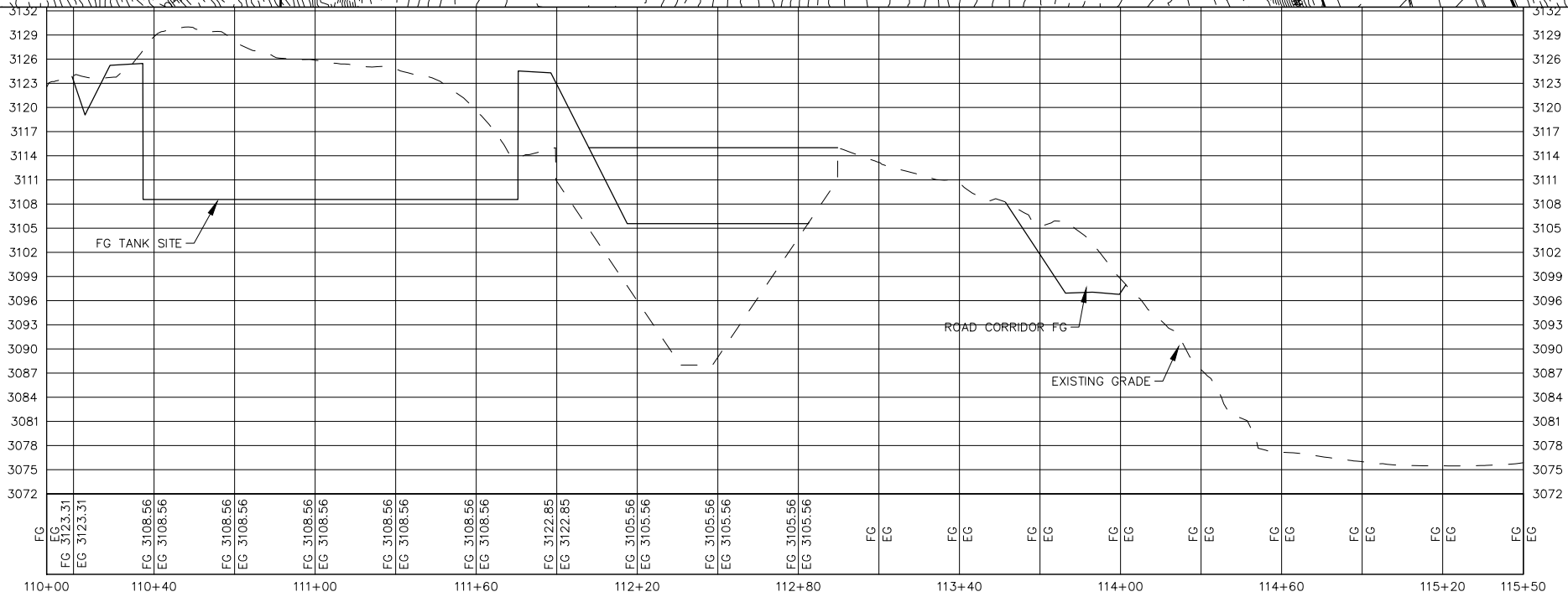
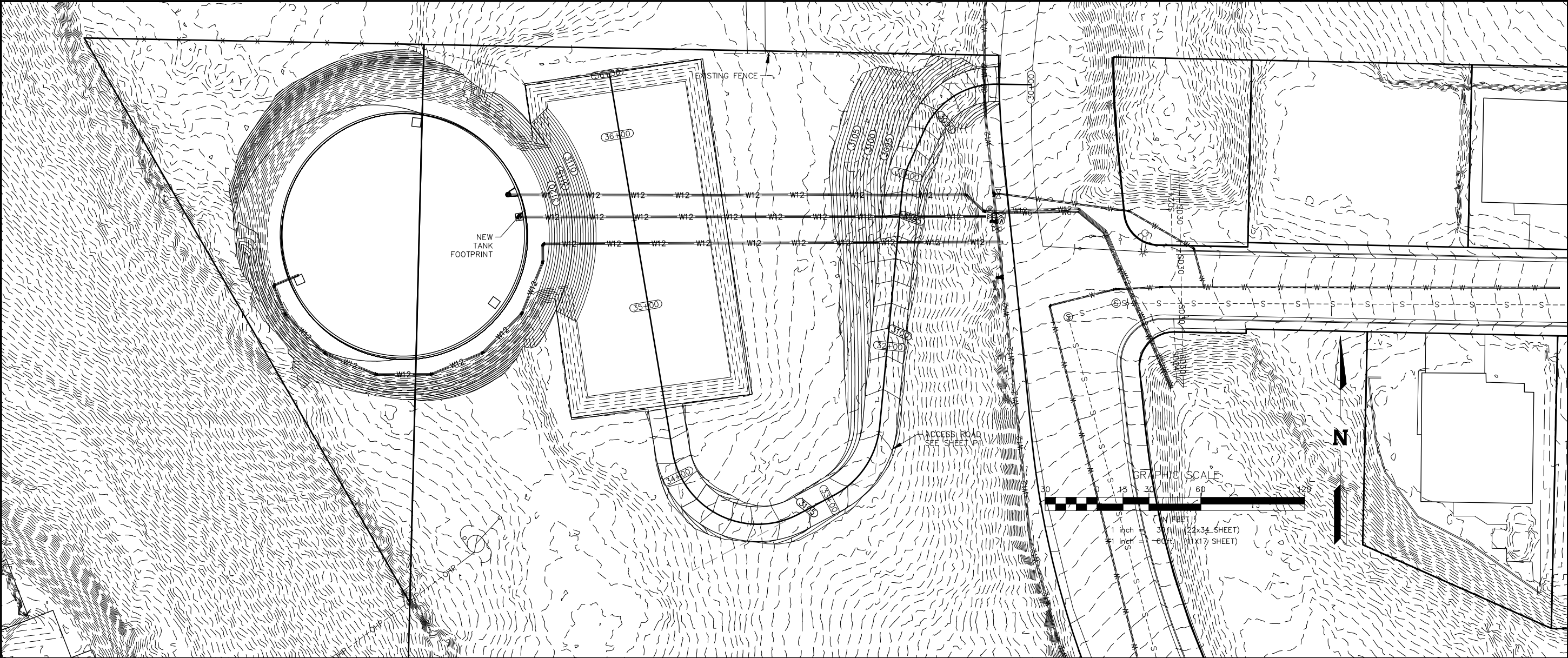
PRELIMINARY
NOT FOR CONSTRUCTION

**ALPHA**
ENGINEERING

43 South 100 East, Suite 100 • St George, Utah 84770
T: 435.628.6500 • F: 435.628.6553 • alphaengineering.com

ACCESS ROAD PLAN & PROFILE	
ST GEORGE INDUSTRIAL 2 MG TANK REPLACEMENT ST GEORGE, UTAH	
PROJECT #	041-162
NAME	CWL
DATE	DECEMBER 20, 2023
SCALE	AS NOTED
SHEET	P1
FILE	P1 OF 3

P:\041-162 St. George Industrial 2 MG Tank Replacement\Drawings\Construction Drawings\041-162_MST.dwg, T-SITE, 4/12/2024 11:52:11 AM, wlee



TMP SECTION PROFILE
HORIZONTAL SCALE: 1" = 60' (11x17)
VERTICAL SCALE: 1" = 20' (11x17)

NO.	DATE	BY	DESCRIPTION

REVISIONS

PRELIMINARY
NOT FOR CONSTRUCTION

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ENGINEERING

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TITLE

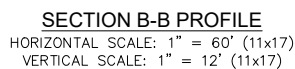
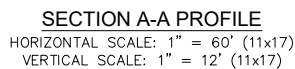
TANK SITE PLAN

PROJECT

ST GEORGE INDUSTRIAL 2 MG TANK REPLACEMENT
ST GEORGE, UTAH

PROJECT #	041-162
NAME	CWL
DATE	DECEMBER 20, 2023
SCALE	AS NOTED

SHEET	T1
FILE	041-162_MST.dwg
	T1 OF 3

[illegible]

REVISIONS

PRELIMINARY
NOT FOR CONSTRUCTION

**ALPHA
ENGINEERING**

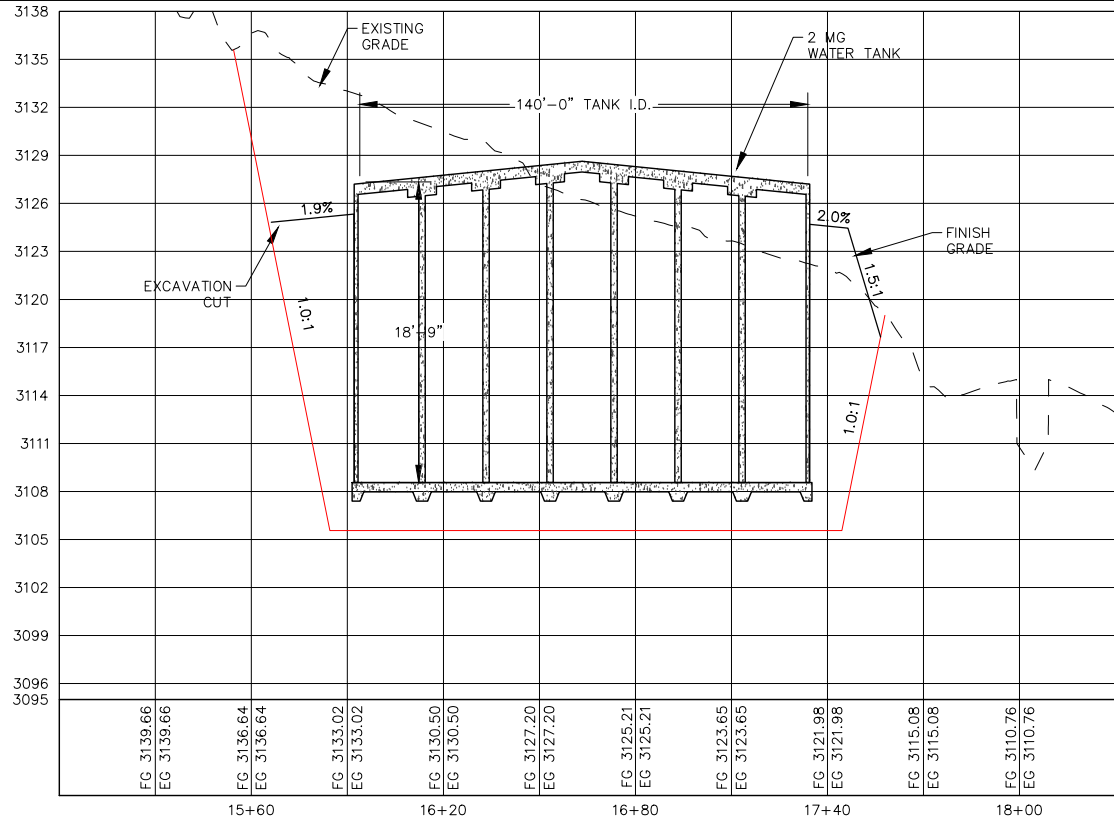
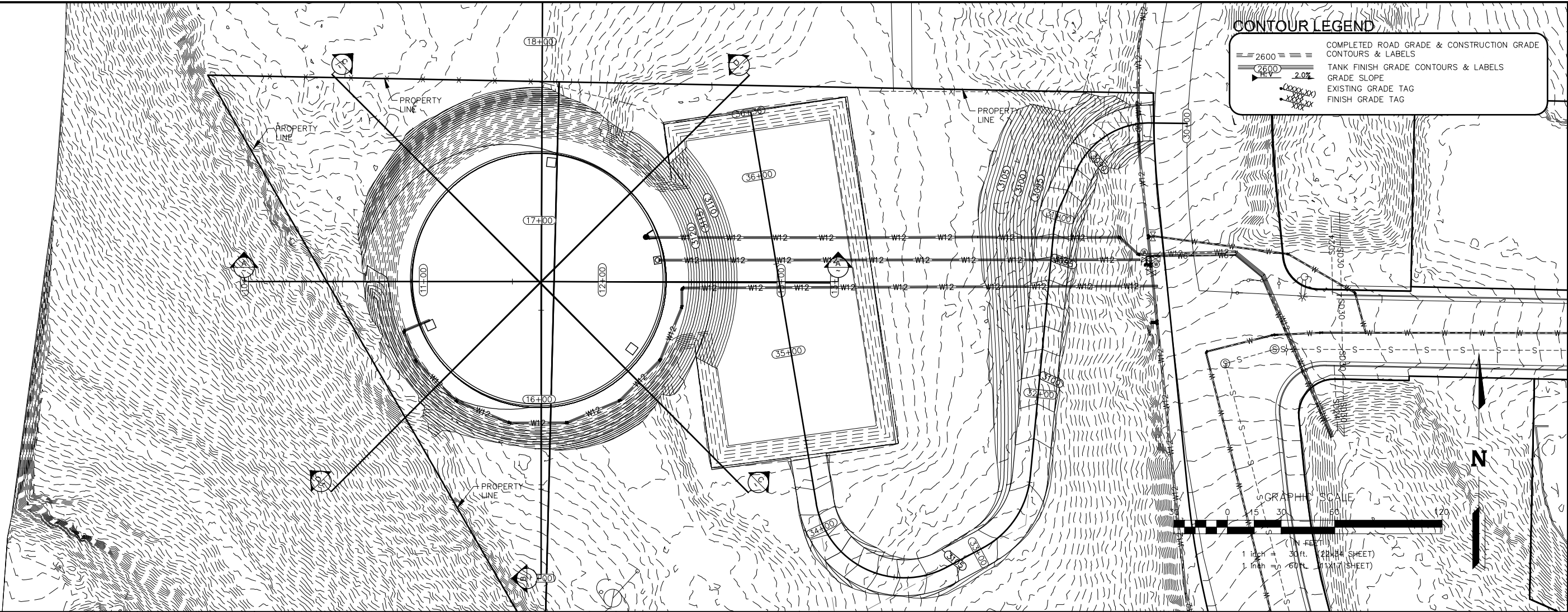
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TANK FINISH GRADING PLAN

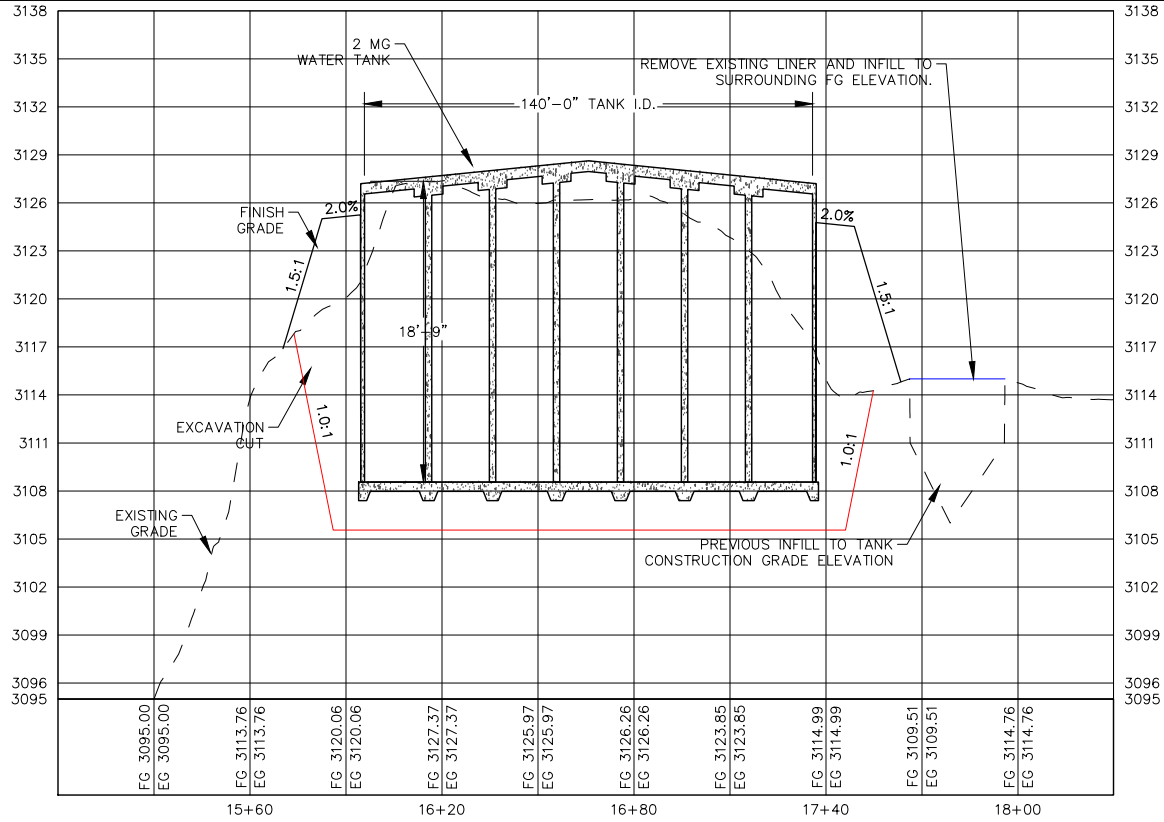
ST GEORGE INDUSTRIAL 2 MG TANK REPLACEMENT
ST GEORGE, UTAH

PROJECT #	041-162
NAME	CWL
DATE	DECEMBER 20, 2023
SCALE	AS NOTED
SHEET	T3 T3 OF 3
FILE	041-162 MST.dwg

P:\041-162 St. George Industrial 2 MG Tank Replacement\Drawings\Construction Drawings\041-162 MST.dwg, T-FGRD CD, 4/12/2024 11:52:48 AM, wlee



SECTION C-C PROFILE
HORIZONTAL SCALE: 1" = 60' (11x17)
VERTICAL SCALE: 1" = 12' (11x17)



SECTION D-D PROFILE
HORIZONTAL SCALE: 1" = 60' (11x17)
VERTICAL SCALE: 1" = 12' (11x17)

NO.	DATE	BY	DESCRIPTION

REVISIONS

PRELIMINARY
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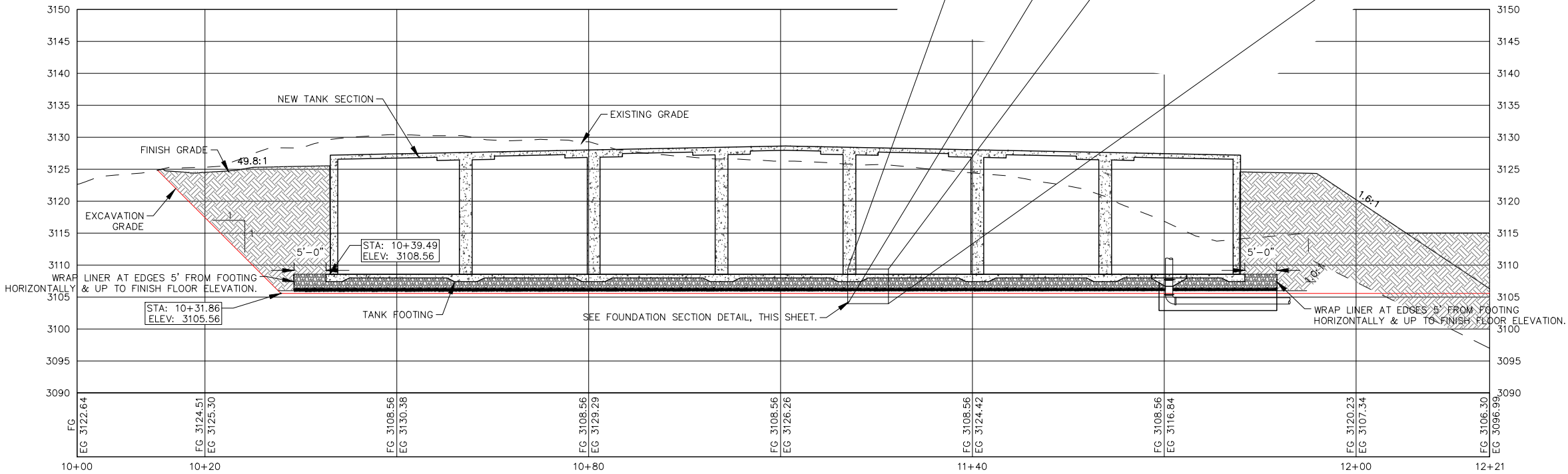
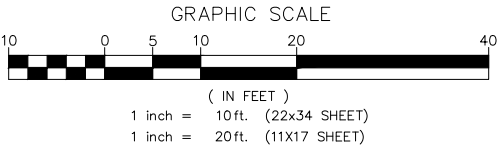
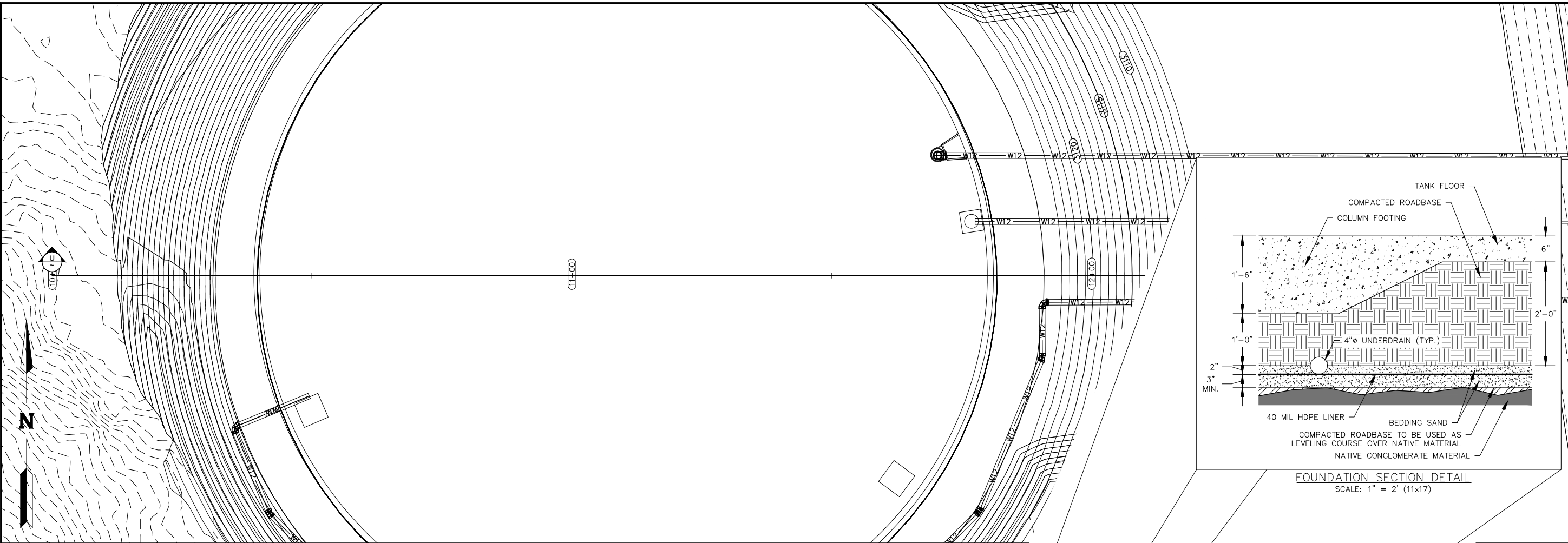
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TANK FINISH GRADING PLAN

ST GEORGE INDUSTRIAL 2 MG TANK REPLACEMENT
ST GEORGE, UTAH

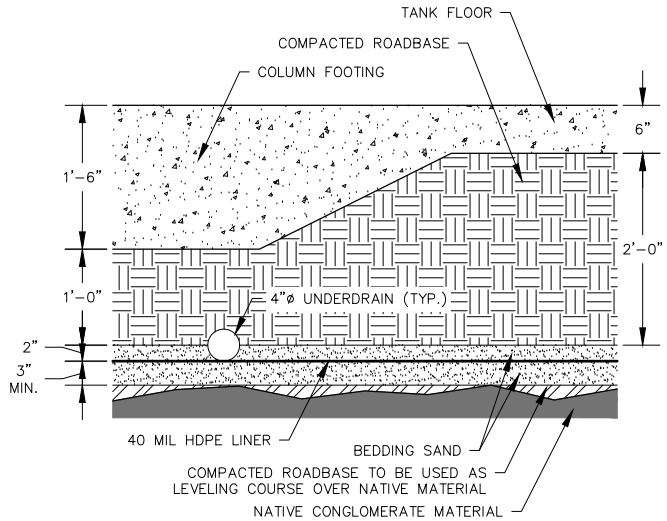
PROJECT #	041-162
NAME	CWL
DATE	DECEMBER 20, 2023
SCALE	AS NOTED
SHEET	T4
FILE	041-162 MST.dwg



UNDERLAYMENT PROFILE

HORIZONTAL SCALE: 1" = 20' (11x17)

VERTICAL SCALE: 1" = 20' (11x17)



FOUNDATION SECTION DETAIL

SCALE: 1" = 2' (11x17)

NO.	DATE	BY	DESCRIPTION

REVISIONS

PRELIMINARY
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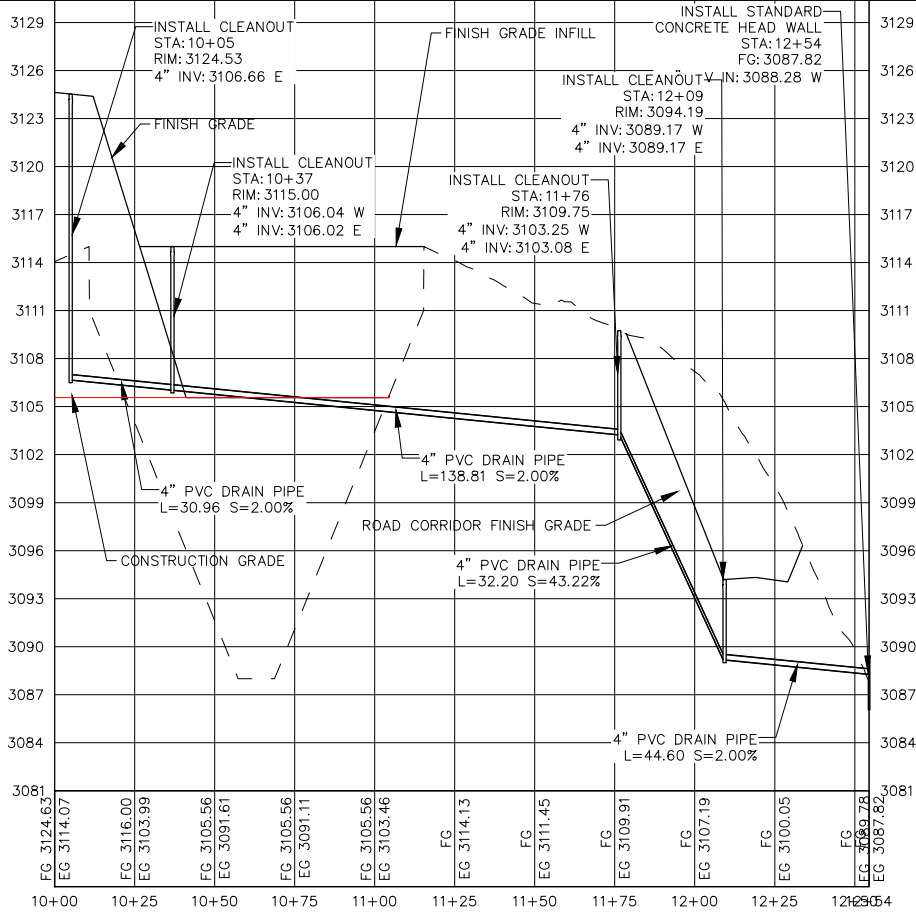
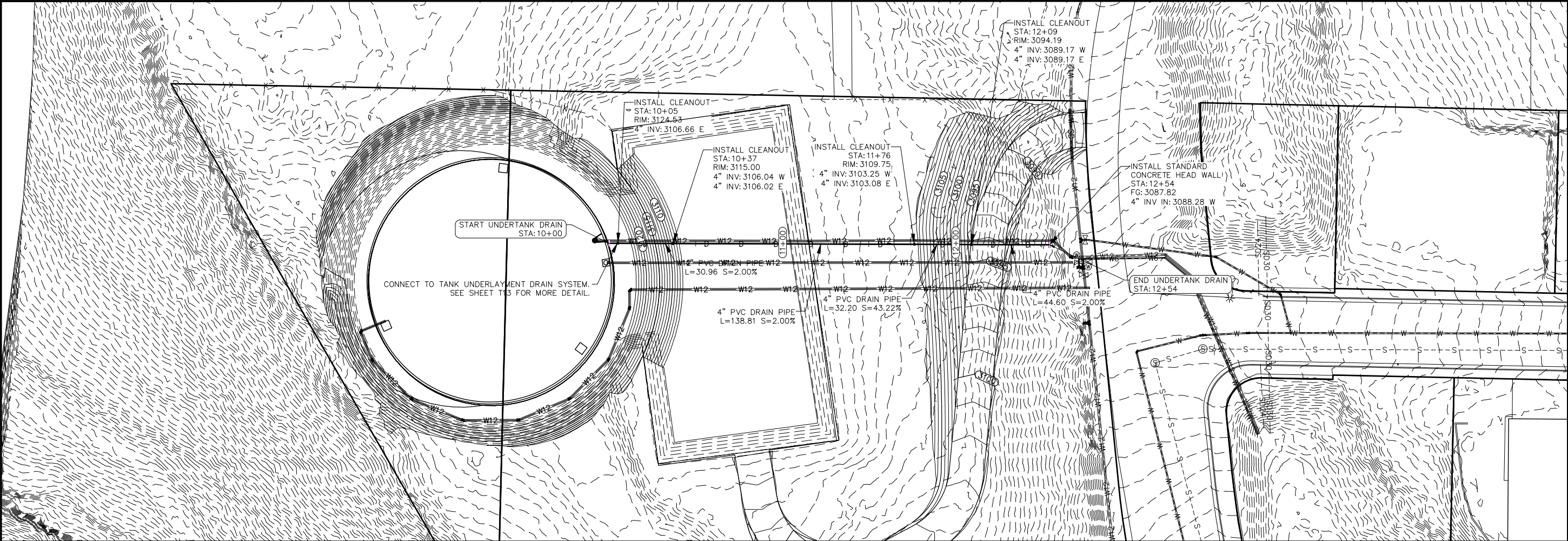
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TANK UNDERLAYMENT & DRAIN
SECTION

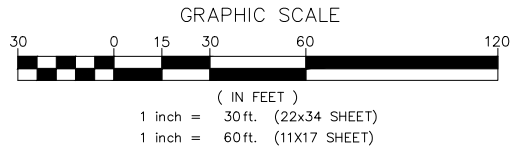
ST GEORGE INDUSTRIAL 2 MG TANK REPLACEMENT
ST GEORGE, UTAH

PROJECT #	041-162
NAME	CWL
DATE	DECEMBER 20, 2023
SCALE	AS NOTED
SHEET	T5
FILE	041-162 MST.dwg

P:\041-162 St. George Industrial 2 MG Tank Replacement\Drawings\Construction Drawings\041-162 MST.dwg, UND TANK DRAIN, 4/12/2024 11:53:09 AM, wlee



UNDERTANK DRAIN PROFILE
HORIZONTAL SCALE: 1" = 60' (11x17)
VERTICAL SCALE: 1" = 12' (11x17)



NO.	DATE	BY	DESCRIPTION

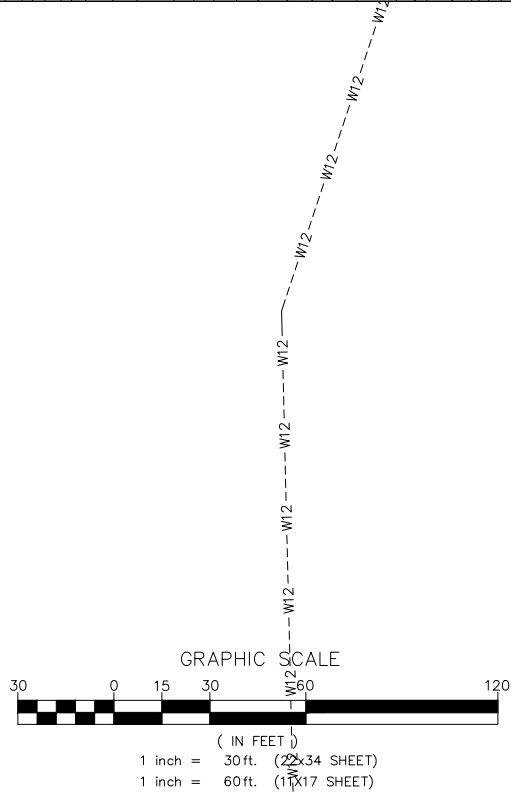
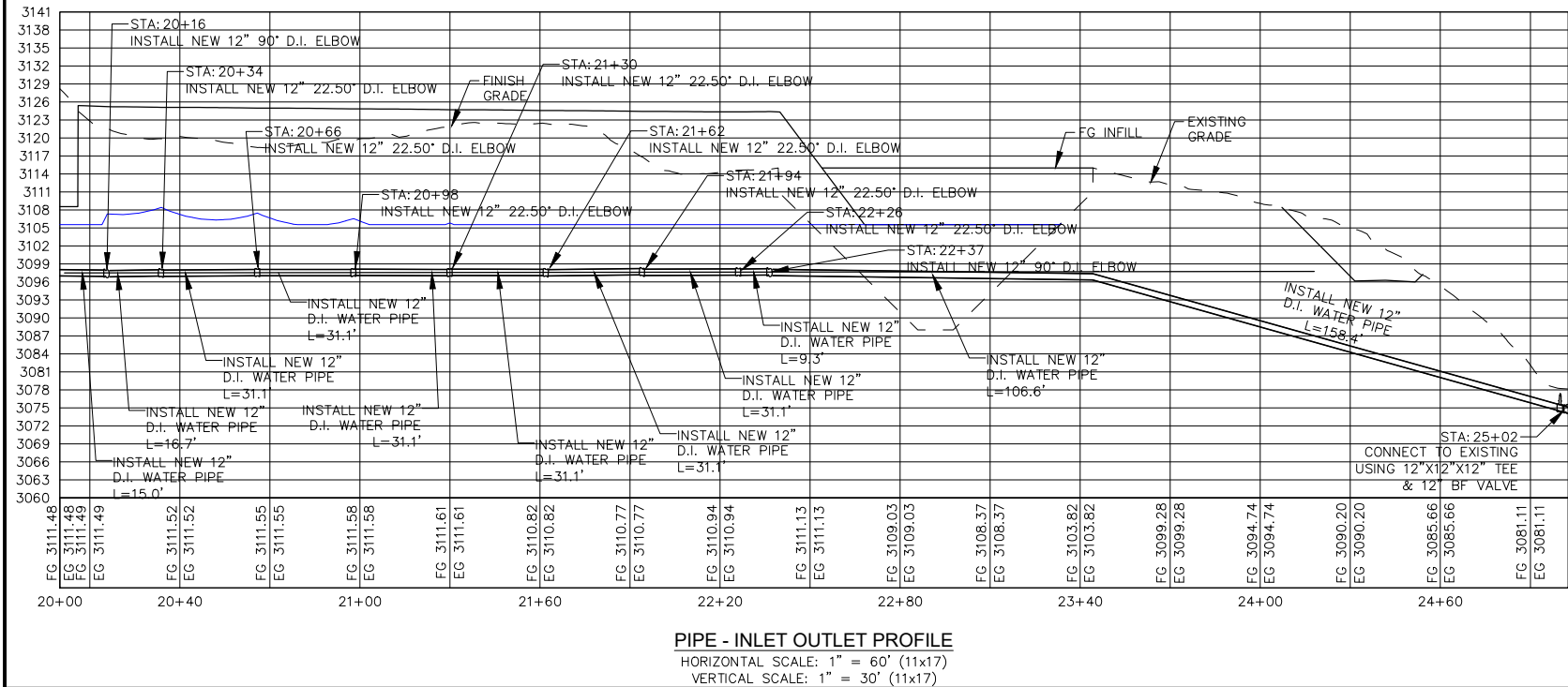
REVISIONS

PRELIMINARY
NOT FOR CONSTRUCTION

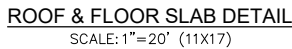
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TITLE	UNDER TANK DRAIN PLAN & PROFILE
PROJECT	ST GEORGE INDUSTRIAL 2 MG TANK REPLACEMENT ST GEORGE, UTAH
PROJECT #	041-162
NAME	CWL
DATE	DECEMBER 20, 2023
SCALE	AS NOTED
SHEET	T6
FILE	041-162 MST.dwg



TANK SERVICE LINE SECTIONS	ST GEORGE INDUSTRIAL 2 MG TANK REPLACEMENT ST GEORGE, UTAH
TITLE	PROJECT
PROJECT # 041-162	
NAME CWL	
DATE DECEMBER 20, 2023	
SCALE AS NOTED	
SHEET T7 T7 OF 3	
FILE 041-162 MST.dwg	



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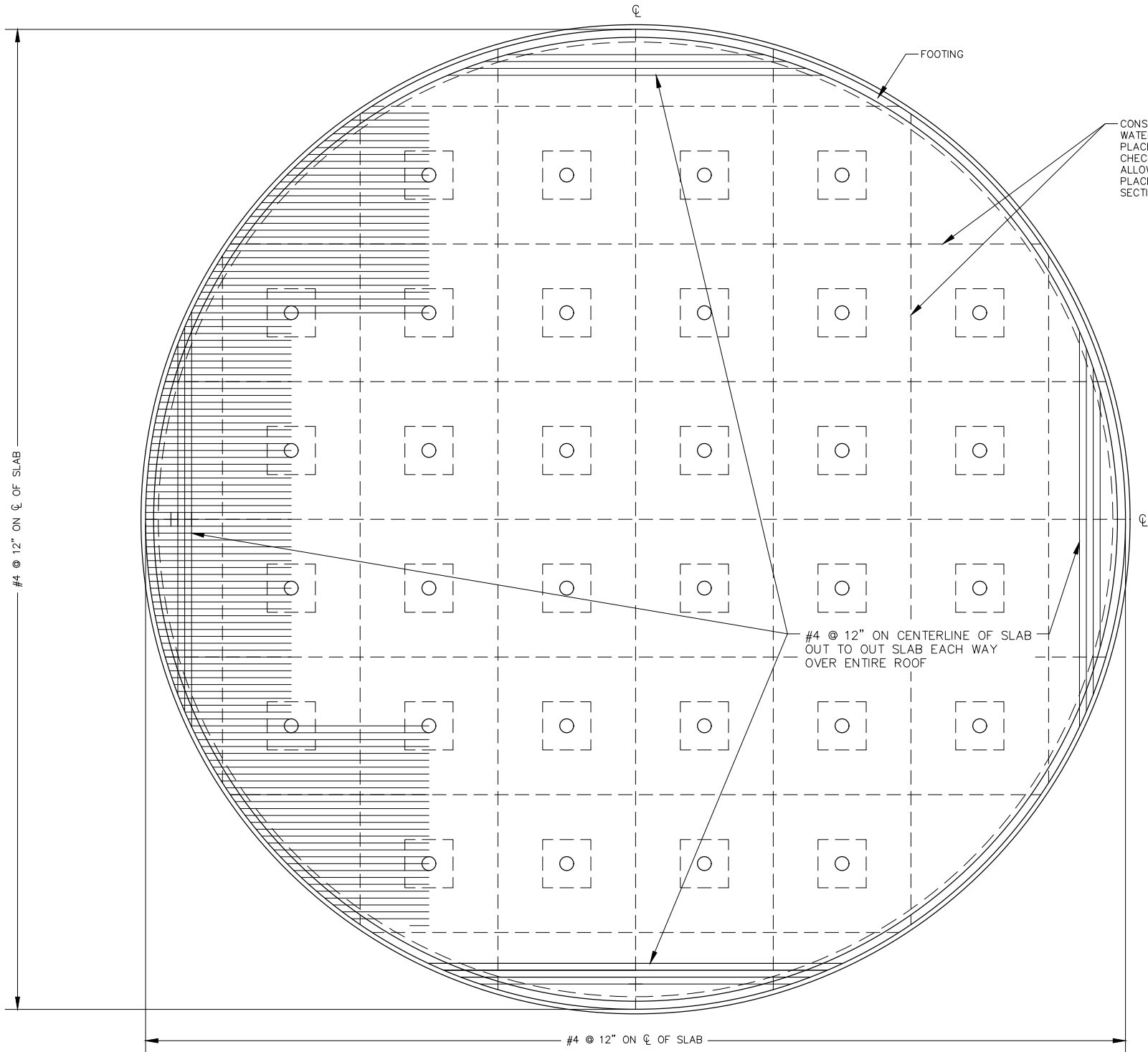
TANK DETAILS

PROJECT
ST GEORGE INDUSTRIAL 2 MG TANK REPLACEMENT
ST GEORGE, UTAH

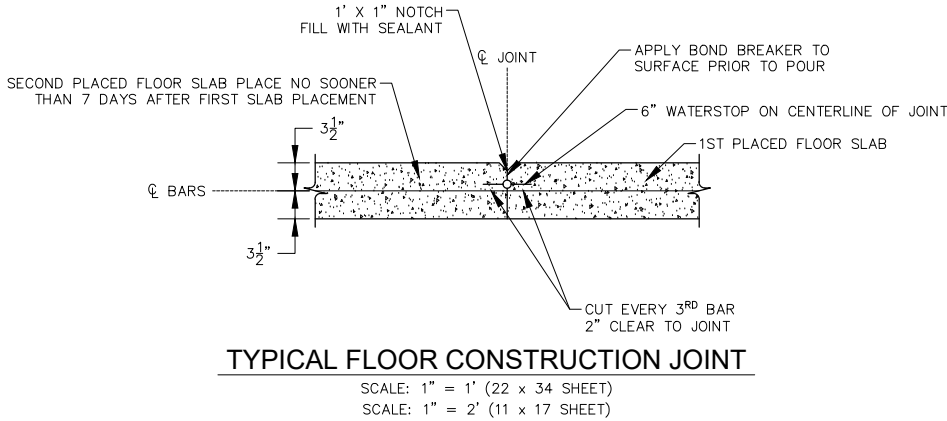
[illegible]

PROJECT #	041-162
NAME	JSB
DATE	DECEMBER 20, 2023
SCALE	AS NOTED
SHEET	T8
FILE	041-162 DET.dwg

P:\041-162 St. George Industrial 2 MG Tank Replacement\Drawings\Construction Drawings\041-162 DET.dwg, T7, 4/12/2024 11:53:36 AM, wlee



FLOOR SLAB DETAIL
SCALE: 1"=20' (11X17)



TYPICAL FLOOR CONSTRUCTION JOINT
SCALE: 1" = 1' (22 x 34 SHEET)
SCALE: 1" = 2' (11 x 17 SHEET)

NO.	DATE	BY	DESCRIPTION

REVISIONS

PRELIMINARY
NOT FOR CONSTRUCTION

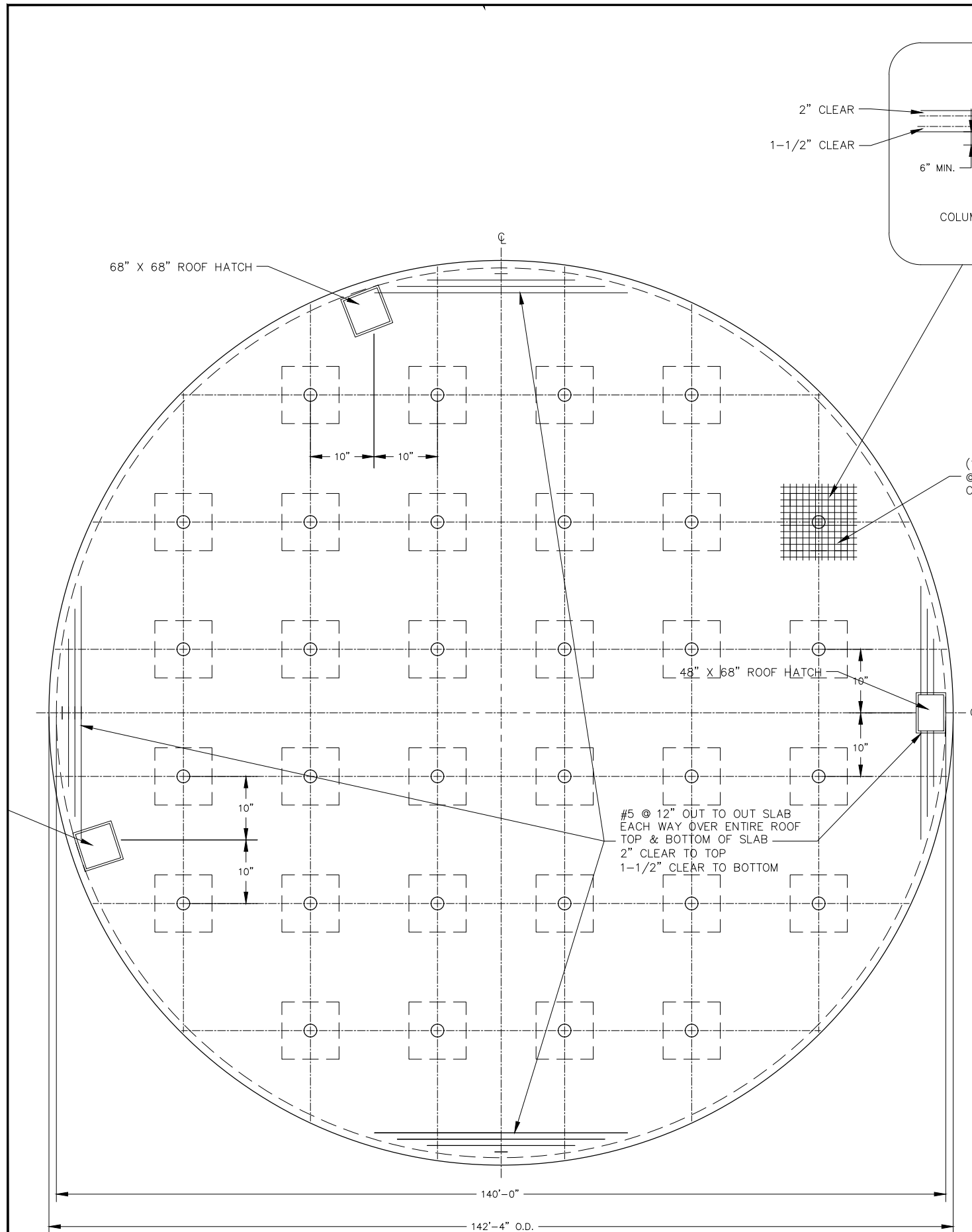
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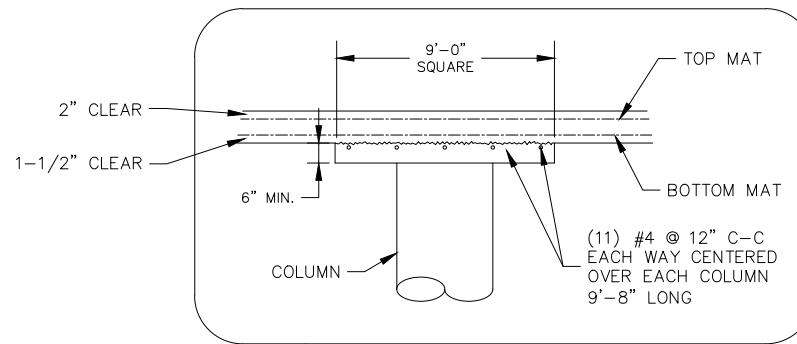
TANK DETAILS

ST GEORGE INDUSTRIAL 2 MG TANK REPLACEMENT
ST GEORGE, UTAH

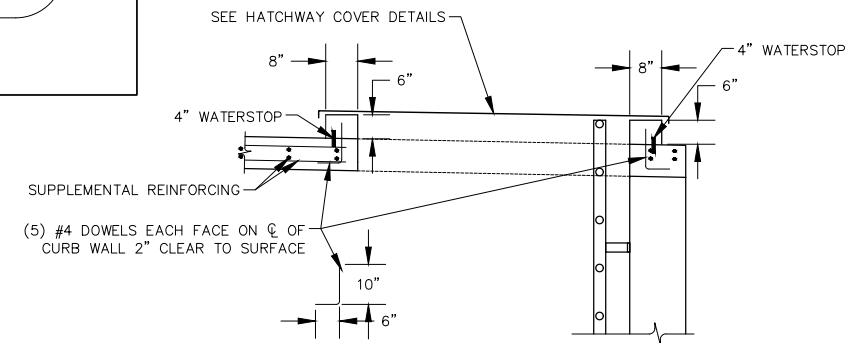
PROJECT #	041-162
NAME	JSB
DATE	DECEMBER 20, 2023
SCALE	AS NOTED
SHEET	T8
FILE	041-162 DET.dwg



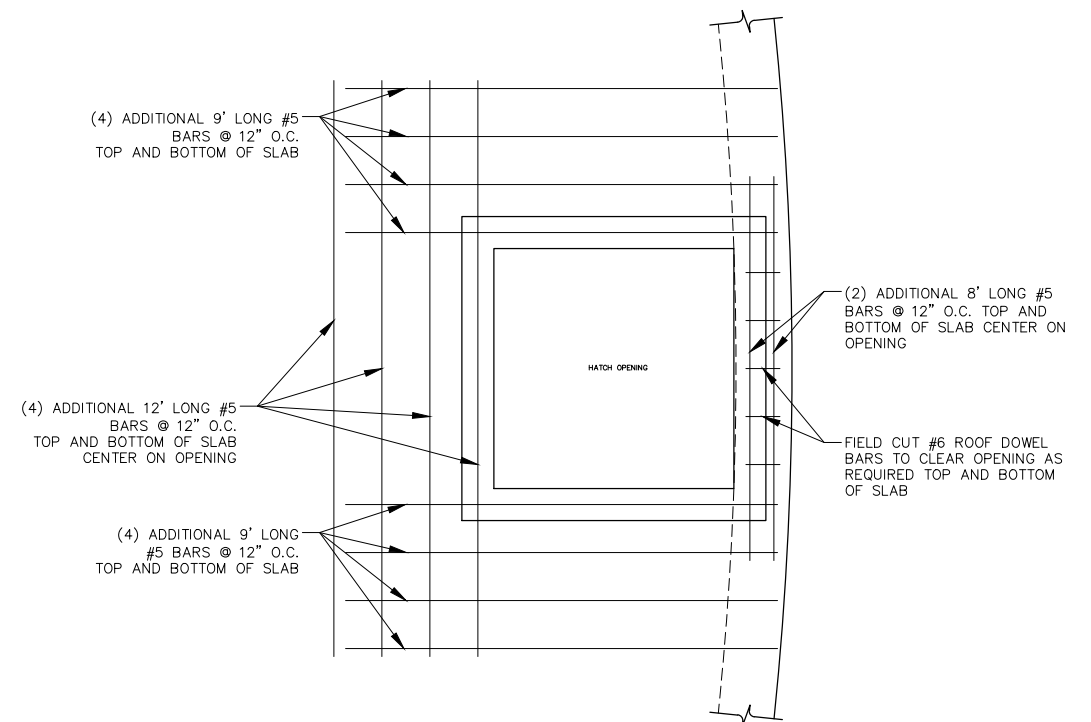
ROOF & SLAB DETAIL
SCALE: 1"=20' (11X17)



COLUMN LAYOUT
SCALE: 1"=4' (11X17)



SECTION VIEW



PLAN VIEW

SUPPLEMENTAL ROOF REINFORCEMENT

SCALE: 1" = 2' (22 x 34 SHEET)
SCALE: 1" = 4' (11 x 17 SHEET)

[illegible]

REVISIONS

PRELIMINARY
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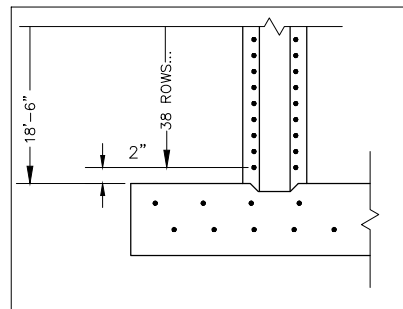


LINK DETAILS

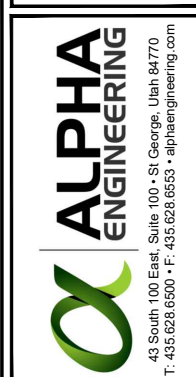
ST GEORGE, UTAH

OBJECT #	041-162
NAME	JSB
DATE	DECEMBER 20, 2023
REMARKS	AS NOTED

9



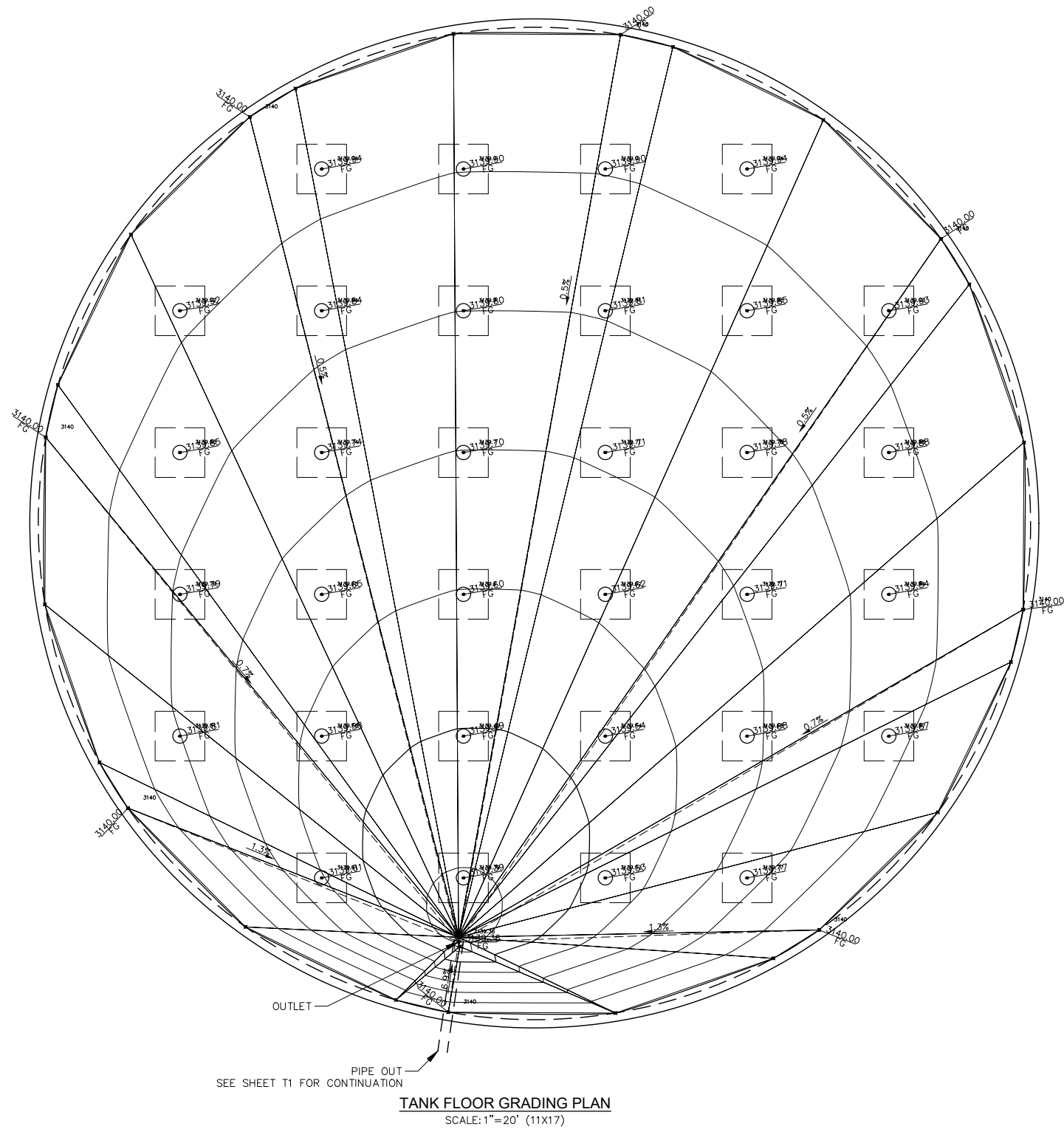
PRELIMINARY
NOT FOR CONSTRUCTION



TANK DETAILS

PROJECT
ST GEORGE INDUSTRIAL 2 MG TANK REPLACEMENT
ST GEORGE, UTAH

PROJECT #	041-162
NAME	JSB
DATE	DECEMBER 20, 2023
SCALE	AS NOTED
SHEET	T10
FILE	041-162 DET.dwg



TANK FLOOR GRADING PLAN
SCALE: 1"=20' (11X17)

LEGEND



24" DIAMETER COLUMN
WITH 7 FT SQ FOOTING



FINISH FLOOR ELEVATION

[illegible]

PRELIMINARY
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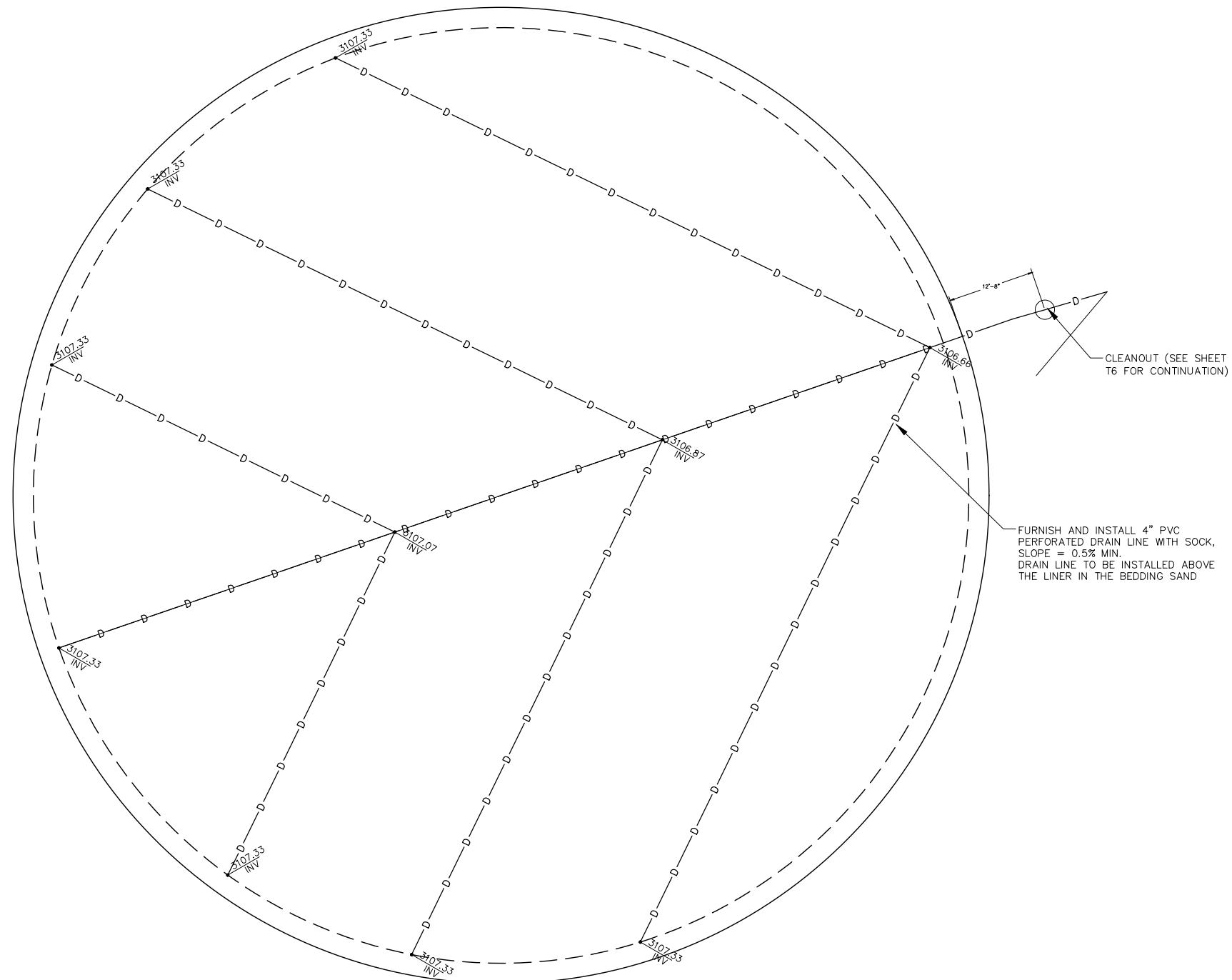
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TANK DETAILS

PROJECT
ST GEORGE INDUSTRIAL 2 MG TANK REPLACEMENT
ST GEORGE, UTAH

PROJECT #	041-162
NAME	JSB
DATE	DECEMBER 20, 2023
SCALE	AS NOTED
SHEET	T11
FILE	041-162 DET.dwg



UNDERDRAIN PIPING VIEW

SCALE: 1" = 10' (11x17)

[illegible]

PRELIMINARY
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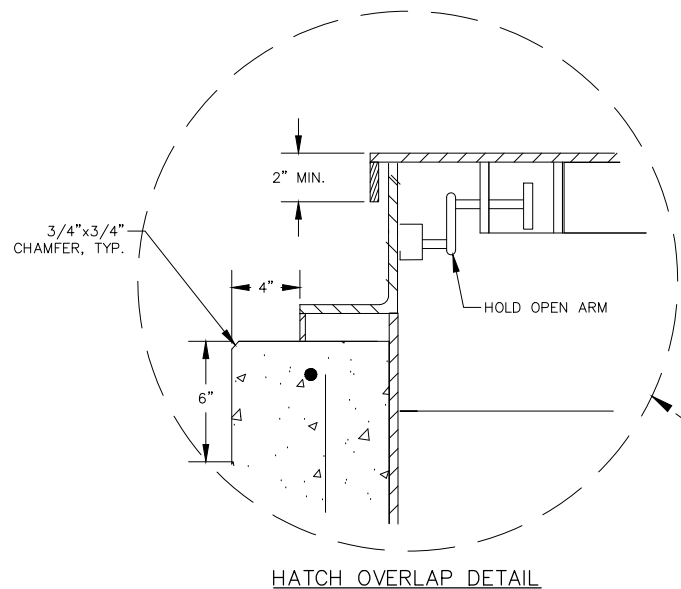
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TANK DETAILS		PROJECT ST GEORGE INDUSTRIAL 2 MG TANK REPLACEMENT ST GEORGE, UTAH	
TITLE		PROJECT	
PROJECT #		041-162	
NAME		JSB	
DATE		DECEMBER 20, 2023	
SCALE		AS NOTED	
SHEET		T13	
FILE		041-162 DET.dwg	
		---- OF 23	

-
- A detailed cross-sectional diagram of the lift assist device installed in a concrete curb. The diagram shows the device's components, including the 'HOLD OPEN ARM' and 'LIFT ASSIST' mechanism, which are embedded within the curb structure. The curb is shown with a height of 8 inches and a width of 60 inches. The device is labeled as 'EJ "FTP-WT" WITH FULLY ENCLOSED CURB CAST INTO CONCRETE'. A dimension of 4-1/4 inches is indicated for the device's height. The diagram also shows the 'RIM SEAL GASKET' and 'LIFT ASSIST' components. The text 'EN IN THE' is partially visible on the left side of the diagram.

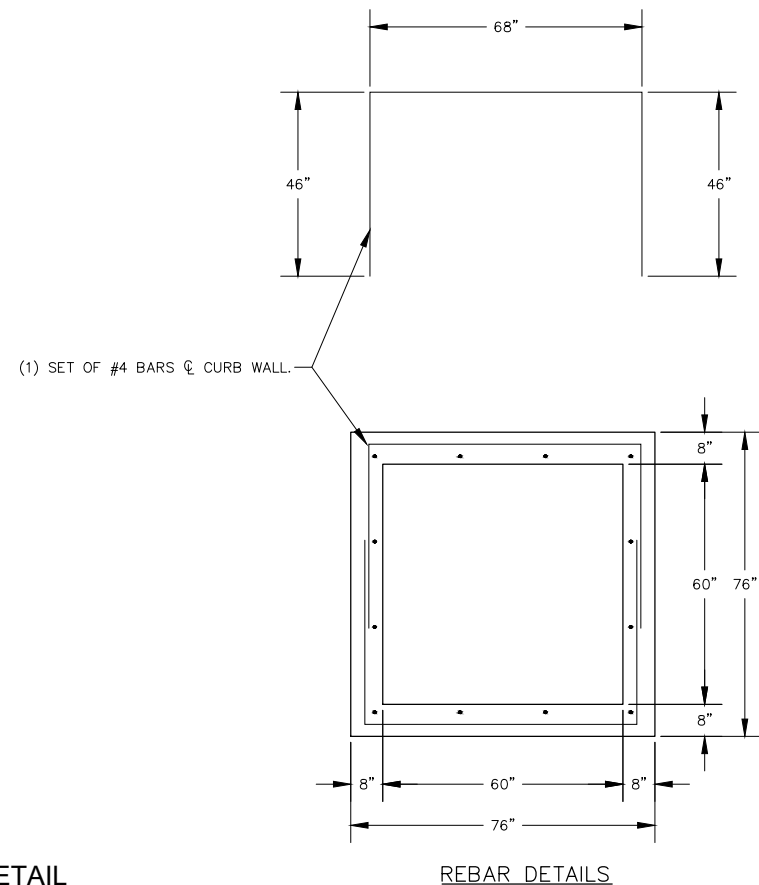
(1) SET OF #4 BARS @ CURB WALL.

REBAR DETAILS



-

1 60" x 60" ACCESS HATCH DETAIL
~ NTS



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SHEET
T15
16 OF 23
FILE
041-162 DET.dwg

PIPE ENCASEMENT TABLE				
COVER "H"	PIPE OUTSIDE DIAMETER			
	5" TO 18"		20" TO 35"	
	"T"	"A"	"T"	"A"
2' MIN.	6"	#4 @ 12"	8"	#5 @ 12"
3'	6"	#4 @ 12"	8"	#5 @ 12"
4'	6"	#4 @ 12"	8"	#5 @ 12"
5'	6"	#4 @ 12"	8"	#5 @ 12"
6'	6"	#4 @ 12"	8"	#5 @ 12"
7'	6"	#4 @ 12"	8"	#5 @ 12"
8'	6"	#4 @ 12"	8"	#5 @ 12"
9'	6"	#4 @ 12"	8"	#5 @ 12"
10'	6"	#4 @ 12"	10"	#5 @ 12"
12'	6"	#4 @ 12"	10"	#5 @ 12"
14'	10"	#4 @ 12"	10"	#5 @ 12"
16'	10"	#4 @ 12"	10"	#5 @ 12"
18'	10"	#4 @ 12"	10"	#5 @ 12"
20'	10"	#4 @ 12"	10"	#5 @ 12"

*EXTEND ENCASEMENT 2' BEYOND TANK FOUNDATIONS.

[illegible]

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TANK DETAILS ST GEORGE INDUSTRIAL 2 MG TANK REPLACEMENT ST GEORGE, UTAH		TITLE	
		PROJECT	
		PROJECT #	
		NAME	
		DATE	
SCALE		AS NOTED	
SHEET		T16	
FILE		041-162 DET.dwg	
		---- OF 23	



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alphaengineering.com

June 20, 2024

St. George City
175 East 200 North
St. George, Utah 84770

**Re: St. George Industrial 2 MG Tank Replacement - Hillside Development Permit
Application Checklist – Earth Moving Plan**

To Whom It May Concern,

The St. George Industrial 2MG Tank Replacement site is located west of the intersection of Cottonwood Springs Drive and Dellcorrero Drive (Parcel SG-5-2-20-14412 and consists of replacing an existing 2MG tank. It is understood that an Earth Moving plan isn't required for the project.

Sincerely,

A handwritten signature in blue ink that reads "Rhett Beazer".

Rhett Beazer, P.E.
Alpha Engineering Company

ST. GEORGE HILLSIDE REVIEW BOARD MINUTES
May 22, 2024, 8:30 A.M.
ON SITE

PRESENT:

Board Member Chair, James Sullivan
Board Member, Kevin Holyoak
Board Member, Jeff Mathis

EXCUSED:

Board Member, Russ Owens
Board Member, Dave Black

STAFF MEMBERS PRESENT:

Assistant Public Works Director, Wes Jenkins
Planner III, Mike Hadley
City Landscape Architect, Mark Goble
Development Office Supervisor, Monica Smith

OTHERS PRESENT:

Applicant, Kevan Webb
Resident, Brayden Oaks
Resident, Morgan Oaks

Link to Call to Order by Chair Sullivan: [00:00:00](#)

HILLSIDE DEVELOPMENT PERMIT:

All Along The Watchtower: Consider a request for a Hillside Development Permit to adjust the location of the ridgeline and ridgeline setback on lot 33 of the South Rim at Foremaster Ridge Phase 2 subdivision on an existing residential home. Applicant – Kevan Webb – **Case No. 2024-HS-008 – ON SITE**

Link to comment by applicant, Kevan Webb, including discussion between Board Members and Mr. Webb: [00:00:54](#)

Link to comment by Board Member Mathis, including discussion between Board Members, Assistant Public Works Director, and Mr. Webb: [00:03:54](#)

Link to comment by Chair Sullivan, including discussion between Board Members, and Assistant Public Works Director, and Mr. Webb: [00:04:38](#)

Link to comment by Chair Sullivan, including discussion between Board Members, Mr. Webb, City Landscape Architect, and the Assistant Public Works Director: [00:05:50](#)

Link to comment by Board Member Mathis, including discussion between Board Members, and Mr. Webb: [00:08:20](#)

Link to question by Board Member Mathis, including discussion between Board Members and Mr. Webb: [00:11:38](#)

1 Link to comment by Board Member Mathis, including discussion between Board
2 Members and Mr. Webb: [00:12:45](#)

3
4 Link to question by Applicant, Kevan Webb, including discussion between Board
5 Members and Mr. Webb: [00:13:41](#)

6
7 Link to question by Board Member Mathis, including discussion between Board
8 Members, Applicant, Kevan Webb, and Assistant Public Works Director: [00:14:38](#)

9
10 Link to comment by Chair Sullivan, including discussion between Board Members and
11 Mr. Webb: [00:16:55](#)

12
13 Link to comment by Chair Sullivan, including discussion between Board Members and
14 Assistant Public Works Director: [00:18:31](#)

15
16 Link to comment by Board Member Mathis, including discussion between Board
17 Members, the Assistant Public Works Director, and Mr. Webb: [00:20:55](#)

18
19 Link to comment by Assistant Public Works Director, including discussion between
20 Board Members, and Mr. Webb: [00:23:27](#)

21
22 Link to comment by Board Member Mathis, including discussion between Board
23 Members, and Mr. Webb: [00:23:50](#)

24
25 Agenda packet [\[Page 3\]](#)

26
27
28 Link to motion: [00:25:33](#)

29
30
31 **MOTION:**

32 A motion was made by Board Member Mathis that we recommend acceptance
33 of the non-conforming retaining wall, the face of the existing non-conforming
34 retaining wall needs to be painted, and smooth out the transition in the
35 southeast corner of the property where there is a near vertical transition
36 between the non-conforming retaining wall and the adjacent property, and
37 either do it with a slope or radius the retaining wall back about 10 feet from
38 the southeast property corner.

39
40 **SECOND:**

41 The motion was seconded by Board Member Holyoak.

42
43
44 **VOTE:**

45 Chair Sullivan called for a vote, as follows:

46
47 Board Member Sullivan - aye
48 Board Member Holyoak - aye
49 Board Member Mathis - aye

50
51 The vote was unanimous and the motion carried
52
53

1 Link to question from Applicant, Kevan Webb, including discussion between Board
2 Members, Assistant Public Works Director, and Mr. Webb: [00:26:40](#)
3
4

5 **APPROVAL OF MINUTES:**

6 Approval of the meeting minutes from the April 3, 2024 meeting.
7

8 Agenda packet [\[Page 11\]](#)
9

10 Link to motion: [00:28:10](#)
11

12 **MOTION:**

13 A motion was made by Board Member Holyoak to approve the minutes.

14 **SECOND:**

15 The motion was seconded by Board Member Mathis.

16 **VOTE:**

17 Chair Sullivan called for a vote, as follows:
18

19 Board Member Sullivan – aye

20 Board Member Holyoak – aye

21 Board Member Mathis - aye
22
23

24 **ADJOURN:**

25 Link to move to adjourn: [00:28:20](#)
26

27 **MOTION:**

28 A motion was made by Chair Sullivan to adjourn.

29 **SECOND:**

30 The motion was seconded by Board Member Mathis.
31
32

33 **VOTE:**

34 Chair Sullivan called for a vote, as follows:
35

36 Board Member Sullivan - aye

37 Board Member Holyoak – aye

38 Board Member Mathis - aye
39

40 The vote was unanimous and the motion carried.
41

42 /s/Monica Smith
43

44 _____
Monica Smith, Secretary