APPENDIX

GENERAL STRUCTURAL FILL RECOMMENDATIONS

1. **GENERAL DESCRIPTION**

   This item of work includes clearing and grubbing, preparation of land to be filled, filling, spreading, compaction, and control of the fill, and subsidiary work necessary to complete the grading of areas to be filled to conform with the lines, grades, and slopes as shown on the grading plans. The body of the report shall be reviewed for additional recommendations regarding the project grading.

2. **CLEARING, GRUBBING, AND PREPARING AREAS TO BE FILLED**

   A. All timber, logs, trees, brush, and other rubbish shall be removed, stockpiled, chipped, or otherwise disposed of so as to leave the work areas that have been disturbed with a neat and finished appearance free from unsightly debris.

   B. All vegetable matter, manure, waste/debris piles and other unsuitable material, shall be removed from the surface upon which the fill is to be placed. Subexcavate existing fill as discussed in the body of the report.

   C. Where fills are made on hillsides or slopes, the slope of the original ground upon which the fill is to be placed shall be plowed or scarified, moisture conditioned, and compacted to at least 90 percent per ASTM D1557, **unless stated otherwise in the body of the report.** Where the slope ratio of the original ground is steeper than 5 horizontal to 1 vertical, the fill shall be benched into the bank or hillside as the fill is placed and compacted in horizontal layers. The body of the report shall be reviewed for any additional requirements regarding the placement of fills on slopes.

   D. Prior to placing fill in any area, grading shall be performed as required to provide for drainage. Ditching or filling around the area shall be performed to intercept or divert surface water away from the project site.

E. After the foundation for the fill has been cleared and plowed or scarified, it shall be disced or bladed until it is uniform and free from large clods, brought to the proper moisture content, and compacted to a depth of 6 inches and to at least 90 percent of maximum density in accordance with ASTM D1557, **unless specified otherwise in this report**.

3. **MATERIALS**

Materials for the fills shall consist of approved soil as discussed in the body of the report. If other additional fill soil is needed, an engineer from Shaw Engineering (SHAW) shall be notified at least ten working days in advance as to the source of the fill soil and a five gallon sample of the proposed fill shall be delivered to an approved materials testing laboratory for qualification tests to determine its suitability. The costs for qualification tests are the Contractor's responsibility. Any proposed fill soil should be reviewed and approved by an engineer from SHAW prior to importing the soil to the site. The soil used shall be free from vegetable matter, and other deleterious substances and the body of this report shall be reviewed for additional requirements for using imported soil as structural fill.

4. **PLACING, SPREADING, AND COMPACTING FILL MATERIAL**

A. The fill material shall be placed in layers not to exceed 12 inches in loose thickness. Each layer shall be spread evenly and shall be thoroughly mixed during spreading to ensure uniformity of the material in each layer. Layer placement shall be so controlled that no ponding of water can occur on any working surface.

B. When the moisture content of the fill material is below that required to achieve the specified density, water shall be added to each layer by sprinkling; the soil shall be disced or otherwise manipulated to assure uniform distribution of moisture until the moisture content is satisfactory.

C. When the moisture content of the fill material is greater than that required, the fill material shall be aerated by scarifying until the moisture content is satisfactory.

D. After each layer has been placed, mixed, and spread evenly, it shall be thoroughly compacted to at least 95 percent of maximum density in accordance with ASTM D1557, unless specified otherwise in this report. Compaction shall be by means of tamping, sheepsfoot rollers, vibratory smooth drum rollers or other equipment suitable for the type of soil to be compacted. Compaction shall be accomplished while the fill soil is at the required moisture content. Compaction of each layer shall be continuous over its entire area, and the compaction equipment shall make sufficient trips to ensure that the desired density has been obtained.

E. Field density tests shall be made by an engineer from SHAW, his representative or an approved testing laboratory after the compacting of each layer of fill. No additional layers of fill shall be spread until the field density tests indicate that the specified density has been obtained. If the percent compaction is not satisfactory, the Contractor will be required to adjust the soil moisture content, increase the weight of the compaction equipment and/or the number of passes, and/or decrease the lift thickness as required to achieve the specified density.

5. **OBSERVATION**

Continuous observation by an Engineer from SHAW, his representative or an approved testing laboratory shall be made during filling and compacting operations. The Project Owner or Contractor shall give at least 48 hours notice prior to such operations to allow scheduling of the work.

6. **SEASONAL LIMITS**

No fill material shall be placed, spread, or rolled during unfavorable weather conditions. During periods of unfavorable weather conditions, the surface of the fill may require being sealed by rolling with a smooth drum roller to help prevent excessive moisture from entering or leaving the fill. When the work is interrupted by precipitation or freezing temperatures, fill operations shall not be resumed until the field density tests indicate that the moisture content and density of the previously placed fill are satisfactory.

Western Environmental Testing Laboratory
Report Comments

Shaw Engineering - 1409665

General Comments

None

Specific Comments

None

Per method recommendation (section 4.4), Samples analyzed by methods EPA 300.0 and EPA 300.1 have been filtered prior to analysis.

Report Legend

B	--	Blank contamination; Analyte detected above the method reporting limit in an associated blank
HT	--	Sample analyzed beyond the accepted holding time
J	--	The reported value is between the laboratory method detection limit and the laboratory practical quantitation limit
M	--	Reported value is estimated; The sample matrix interfered with the analysis
N	--	There was insufficient sample available to perform a spike and/or duplicate on this analytical batch.
NC	--	Not calculated due to matrix interference
Q	--	Reported value is estimated; The value failed to meet QC criteria for either precision or accuracy
S	--	Surrogate recovery was outside of laboratory acceptance limits due to matrix interference. The associated blank and LCS surrogate recovery was within acceptance limits
SC	--	Spike recovery not calculated. Sample concentration >4X the spike amount; therefore, the spike could not be adequately recovered

SPARKS
475 E. Greg Street, Suite 119
Sparks, Nevada 89431
tel (775) 355-0202
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EPA LAB ID: NV00925 - ELAP No: 2523

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3230 Polaris Ave. Suite 4
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Western Environmental Testing Laboratory
Analytical Report

Shaw Engineering
20 Vine Street
Reno, NV 89503
Attn: Dennis Keely
Phone: (775) 329-5559 **Fax:** (775) 329-5406

Date Printed: 10/3/2014
OrderID: *1409665*

PO\Project: *14026.10D / TMWA Sutro #2*

Customer Sample ID: TP-1@ 4.5' to 6.0' **Collect Date/Time:** 9/23/2014
WETLAB Sample ID: 1409665-001 **Receive Date:** 9/24/2014 08:50

Analyte	Method	Results	Units	DF	RL	Analyzed	LabID
General Chemistry							
Redox Potential	SM 2580B	360	mV	1		10/1/2014	NV00925
Paste pH	SW846 9045B	8.27	pH Units	1		9/25/2014	NV00925
Resistivity	SM 2510B	1700	ohms.cm	1	1.0	10/2/2014	NV00925
Anions by Ion Chromatography							
Chloride	EPA 300.0	ND	mg/kg	15	15	9/26/2014	NV00925
Sulfate	EPA 300.0	ND	mg/kg	15	15	9/26/2014	NV00925
Sample Preparation							
Saturated Paste Preparation	CSTPM S:1.0	Complete		1		9/24/2014	NV00925
3:1 DI Water Extraction	WL 3.0	Complete		1		9/24/2014	NV00925

Customer Sample ID: TP-2@ 1.5' to 3.8' **Collect Date/Time:** 9/23/2014
WETLAB Sample ID: 1409665-002 **Receive Date:** 9/24/2014 08:50

Analyte	Method	Results	Units	DF	RL	Analyzed	LabID
General Chemistry							
Redox Potential	SM 2580B	390	mV	1		10/1/2014	NV00925
Paste pH	SW846 9045B	6.92	pH Units	1		9/25/2014	NV00925
Resistivity	SM 2510B	570	ohms.cm	1	1.0	10/2/2014	NV00925
Anions by Ion Chromatography							
Chloride	EPA 300.0	38	mg/kg	15	15	9/26/2014	NV00925
Sulfate	EPA 300.0	49	mg/kg	15	15	9/26/2014	NV00925
Sample Preparation							
Saturated Paste Preparation	CSTPM S:1.0	Complete		1		9/24/2014	NV00925
3:1 DI Water Extraction	WL 3.0	Complete		1		9/24/2014	NV00925

DF=Dilution Factor, RL=Reporting Limit, ND=Not Detected or <RL

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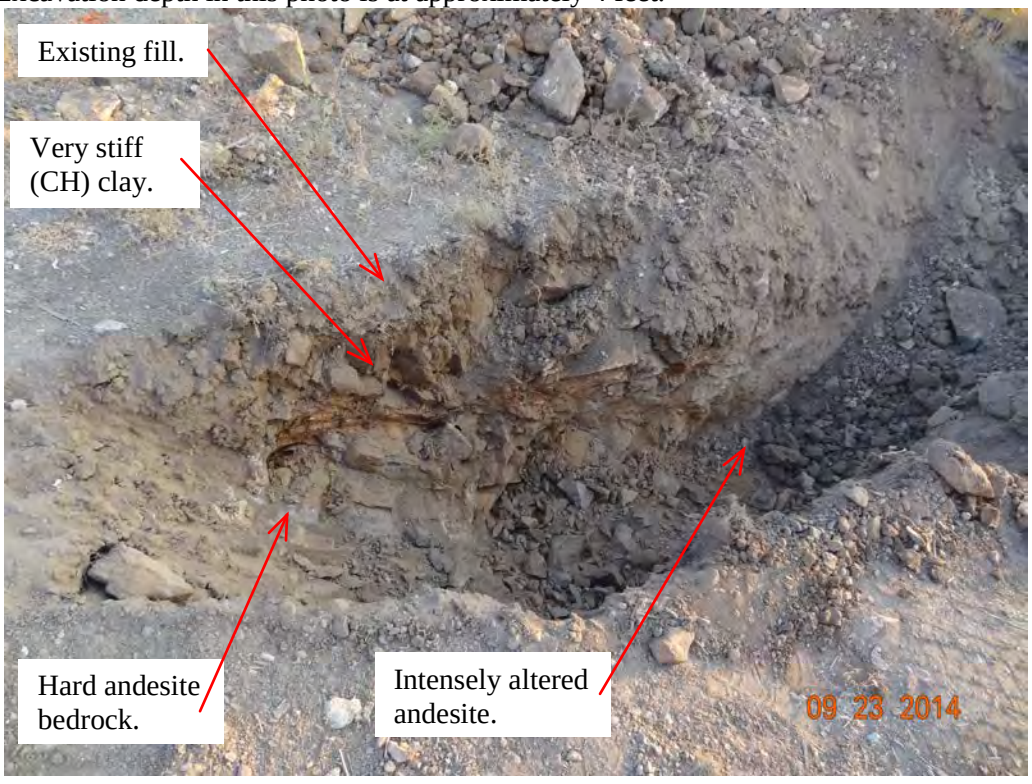
Field resistivity testing in the approximate east-west alignment. White painted lath with white ribbons are the approximate building corners.

Test pit TP-1. Looking at soft to hard, andesite bedrock that is moderately to intensely hydrothermally altered. Excavation depth in this photo is at approximately 4 feet.

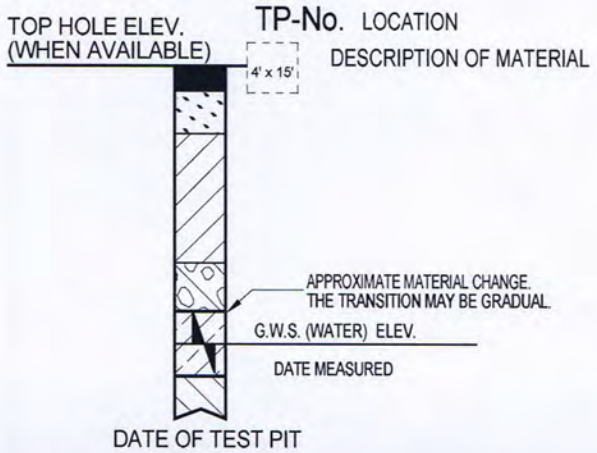


Looking westerly at test pit TP-1 location just north of the proposed building.

Looking southwesterly at test pit TP-2.

LEGEND OF EXCAVATING, SAMPLING AND TESTING

TEST PIT



Note:
The Log of Test Pits and Log of Borings show subsurface conditions at the dates and locations indicated, and it is not warranted that they are representative of subsurface conditions at other locations. The passage of time, changed climatic conditions and seasonal effects may result in conditions that differ from those depicted by the logs. The stratification lines represent the approximate boundary between soil types or relative densities and the transition may be gradual.

ROCK CLASSIFICATION	
SYMBOL	NAME
	IGNEOUS ROCK
	SEDIMENTARY ROCK
	METAMORPHIC ROCK

NOTE:
CLASSIFICATION OF EARTH MATERIALS SHOWN ON THE LOG OF TEST PITS ARE BASED UPON FIELD INSPECTION UNLESS NOTED OTHERWISE.

SOIL CONSISTENCY CLASSIFICATION		
CONSISTENCY		* BLOWS PER FOOT
GRANULAR	COHESIVE	
VERY LOOSE	VERY SOFT	0 TO 5
LOOSE	SOFT	5 TO 10
SLIGHTLY COMPACT	STIFF	10 TO 20
COMPACT	VERY STIFF	20 TO 35
DENSE	HARD	35 TO 70
VERY DENSE	VERY HARD	+70

* (STANDARD PENETRATION TEST) BLOWS PER FOOT (140 LB. HAMMER 30" FREE-FALL BLOW USING 2" O.D. x 1 3/8" I.D. SAMPLER).

SYMBOLS

- FLUSH-COUPLED PENETROMETER
- 2 1/4" CONE PENETROMETER
- SAMPLER BORING (DRY) (SIZE)
- ROTARY BORING (WET)
- AUGER BORING (DRY) (SIZE)
- JET BORING (SIZE)
- DIAMOND CORE BORING. (SIZE)
- TEST PIT (SIZE) W x L = Approximate Width and Length

BIT SIZES (O.D.): "AX" = 1 13/16", "BX" = 2 9/32", "NX" = 2 29/32".
CASING SIZES (O.D.): "BX" = 2 7/8", "NX" = 3 1/2".

THE UNIFIED SOIL CLASSIFICATION SYSTEM

MAJ. DIV.		LETTER	SYMBOL	NAME
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOIL	GW		WELL-GRADED GRAVEL OR GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
		GP		POORLY-GRADED GRAVEL OR GRAVEL-SAND MIXTURES, LITTLE OR NO FINES.
		GM		SILTY GRAVEL, GRAVEL-SAND-SILT MIXTURES.
		GC		CLAYEY GRAVEL, GRAVEL-SAND-CLAY MIXTURES.
	SAND AND SANDY SOIL	SW		WELL-GRADED SAND OR GRAVELLY SAND, LITTLE OR NO FINES.
		SP		POORLY-GRADED SAND OR GRAVELLY SAND, LITTLE OR NO FINES.
		SM		SILTY SAND, SAND-SILT MIXTURES
		SC		CLAYEY SAND, SAND-CLAY MIXTURES

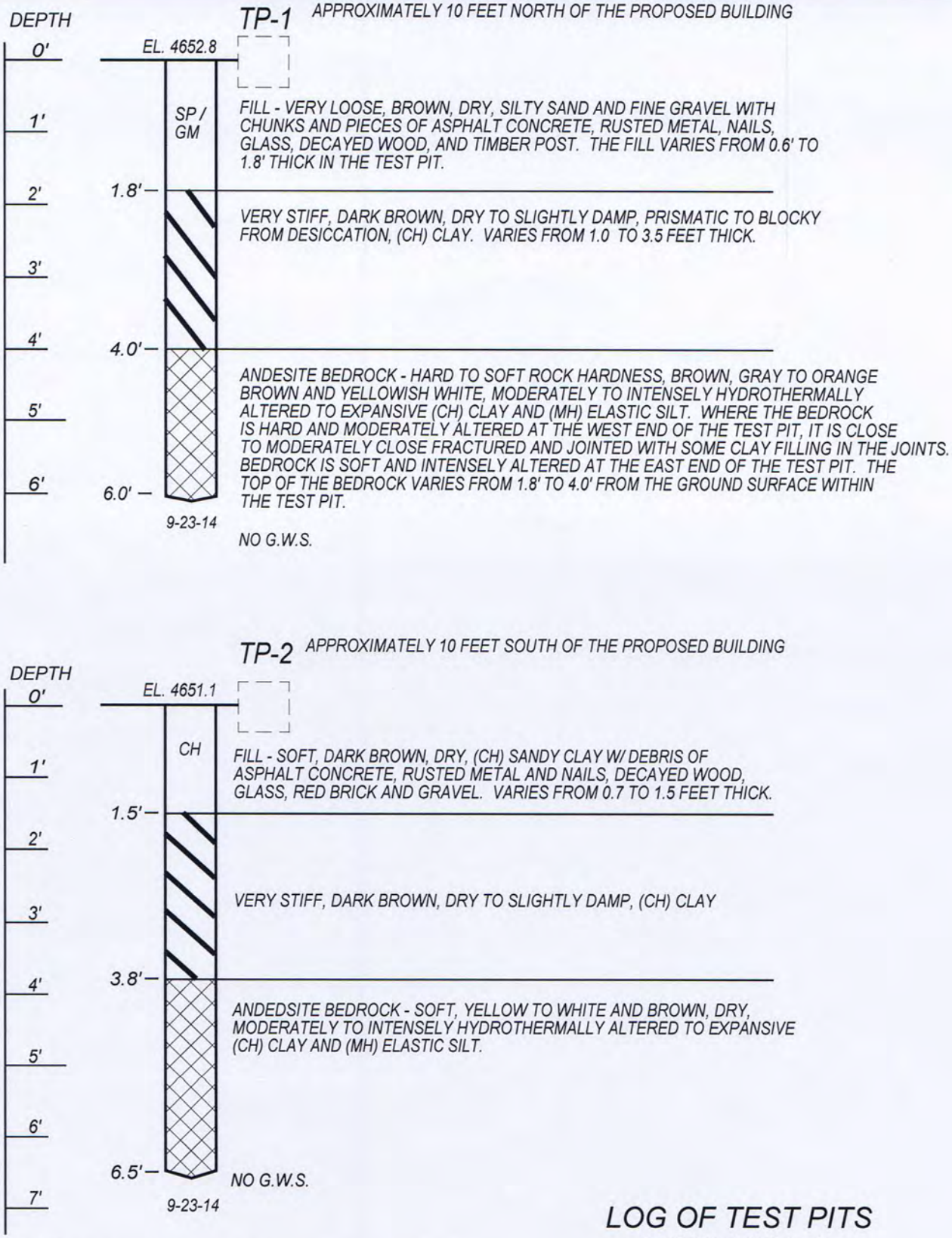
MAJ. DIV.		LETTER	SYMBOL	NAME
FINE GRAINED SOILS	SILTS AND CLAYS, LL<50	ML		INORGANIC SILT AND VERY FINE SAND, ROCK FLOUR, SILTY OR CLAYEY FINE SAND OR CLAYEY SILT WITH SLIGHT PLASTICITY.
		CL		INORGANIC CLAY OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAY, SANDY CLAY SILTY CLAY, LEAN CLAY
		OL		ORGANIC SILT AND ORGANIC SILT-CLAY OR LOW PLASTICITY.
	SILTS AND CLAYS, LL>50	MH		INORGANIC SILT, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS, ELASTIC SILT.
		CH		INORGANIC CLAY OF HIGH PLASTICITY, FAT CLAY
		OH		ORGANIC CLAY OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILT.
HIGHLY ORGANIC SOILS		PT		PEAT AND OTHER HIGHLY ORGANIC SOILS.

SHAW ENGINEERING, LTD.
RENO, NEVADA
LEADERS IN ESSENTIAL ENGINEERING EXPERTISE

Job No: 14026.10D Appr: DK Date: 9-23-14

TRUCKEE MEADOWS WATER AUTHORITY
SUTRO #2 PUMP STATION
RENO, NEVADA

FIGURE
1



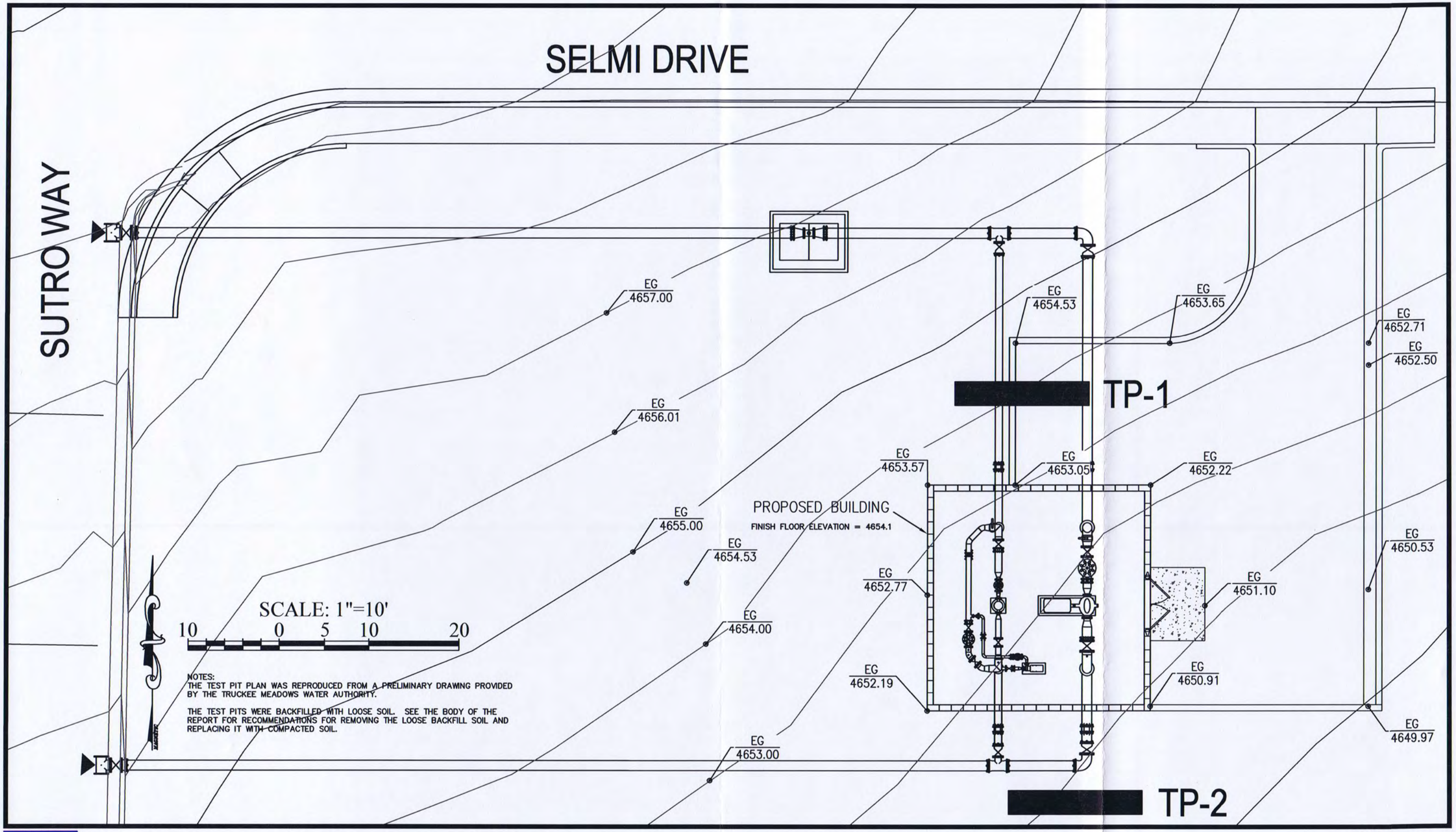
NOTE:
TOP HOLE ELEVATIONS WERE SURVEYED FROM A CONTROL POINT LABELED #102 ON SELMI DRIVE JUST NORTH OF THE SITE. THE REPORTED ELEVATION OF THIS CONTROL POINT IS 4655.77 FEET.

LOG OF TEST PITS

VERTICAL SCALE: 1" = 2'

NOTE:
SEE FIGURE 1 FOR LEGEND OF EXCAVATING, SAMPLING, AND TESTING.

SHAW ENGINEERING, LTD. RENO, NEVADA LEADERS IN ESSENTIAL ENGINEERING EXPERTISE	TRUCKEE MEADOWS WATER AUTHORITY SUTRO #2 PUMP STATION RENO, NEVADA	FIGURE 2
Job No.: 14026.10D Appr.: DK Date.: 9-23-14		



SHAW ENGINEERING

TRUCKEE MEADOWS WATER AUTHORITY
SUTRO #2 PUMP STATION
RENO, NEVADA

TEST PIT PLAN

Figure 3
14026.10D
October 10, 2014