#2154

DIVISION OF WATER RESOURCES
1636 West North Temple
Suite 310
Salt Lake City, Utah 84116

MEMORANDUM

April 23, 1991

TO: Tom Cox
FROM: Ben Everitt BE
SUBJECT: Echo Water Tank Site

Here are the logs of test pits we dug on 4/18/91, with a geologic hazards checklist. The site is near the toe of an alluvial fan, composed of unconsolidated material eroded from a small tributary to Echo Canyon. The bedrock and source of the alluvium is the Echo Conglomerate (the Pulpit Formation of earlier workers, named after Pulpit Rock which is no longer there). It is an interbedded conglomerate, sandstone and mudstone of Cretaceous age.

The gentle northward dip of the bedrock has produced some large bedding-plane landslides from the south side of the canyon. The deformed sediments in test pits 1 and 2 appear to be ancient landslide; probably the former toe area of the large landslide just up-valley.

The soils are mostly sandy silts (ML), and for this reason I ran collapse tests on two samples from Test Pit 2. Samples were loaded to 2000 psf and then wetted. Both showed very little potential for hydrocompaction. Dry density is 114-115 lb/cu. ft.

The site is in seismic zone 3 of the 1988 UBC Seismic Zone map. Recent studies (Susan Olig, UGMS) indicate a 90% probability of ground acceleration of .15g (on rock) not being exceeded in 50 years. The unconsolidated soil of the site may amplify shaking at this level.

My recommendation is to construct the tank in the area of T.P. #2 or #3, where the landslide material is absent or above the footing elevation. Have a geologist inspect the foundation excavation when it is opened to confirm this geologic interpretation.

TABLE #

SUMMARY OF GEOLOGIC HAZARDS

ECHO WATER TANK SITE

	Hazard Rating*			Further Study Recommended**
	Prob-able	Pos-sible	Un-likely	
Earthquake				
Ground shaking		X		Seismic Zone 3
Surface faulting			X	
Tectonic subsidence			X	
Liquefaction			X	
Slope failure			X	
Flooding (seiche)			X	
Sensitive clays			X	
Slope failure				
Rock fall			X	
Landslide		X		S Geologic inspection
Debris flow		X		of excavation
Avalanche (snow)			X	
Foundation Problems (soils/subsidence)				
Collapsible			X	
Expansive			X	
Erodible (pipable)			X	
Organic			X	
Soluble salts			X	
Karst			X	
Non-engineered fill			X	
Differential settlement		X		
Active sand dunes			X	
Mine subsidence			X	
Hydrologic				
Shallow ground-water			X	
Springs			X	
Ice			X	
Flooding			X	
Streams			X	
Lakes			X	
Canals/ditches			X	
Dam failure			X	

*Hazard Ratings - Probable, evidence is strong that the hazard exists and mitigation measures should be taken. Possible, hazard may exist, but evidence is uncertain, unobserved, or based on theoretical studies and further study is necessary as noted. Unlikely, no evidence was found to indicate that the hazard is present.

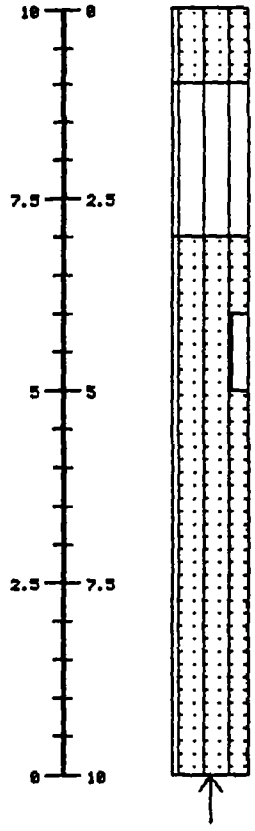
**Further study (S-soil/foundation, G-geotecnical/engineering, H-hydrologic) is recommended to address the hazard (see Conclusions and Recommendations).

LOG OF TEST BORING

PROJECT:ECHO WATER TANK
BORING NO.:T.P. #1
BORING LOCATION:
DRILL METHOD:
CONTRACTOR:
DEPTH TO WATER:

DATE:4/18/91
ELEV.:10

LOGGED BY:BEN
DATE CHECKED:

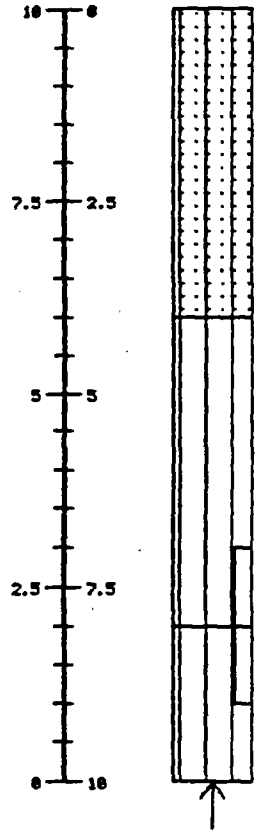


ELEV / DEPTH / SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Description		Recovery
	SM	Organic top soil; drk brn silty sand w/roots & broken glass.		
	ML	Compact tan sandy silt with scattered pebbles & cobbles; roots & carbonate-root casts.		
	ML/SM	Compact tan sandy silt & silty fine sand w/scat. pebbles; inclusions of gry & red silt; bed vert.		12"
		Sample 1-4		

LOG OF TEST BORING

PROJECT:ECHO WATER TANK
BORING NO.:T.P. #2
BORING LOCATION:
DRILL METHOD:
CONTRACTOR:
DEPTH TO WATER:

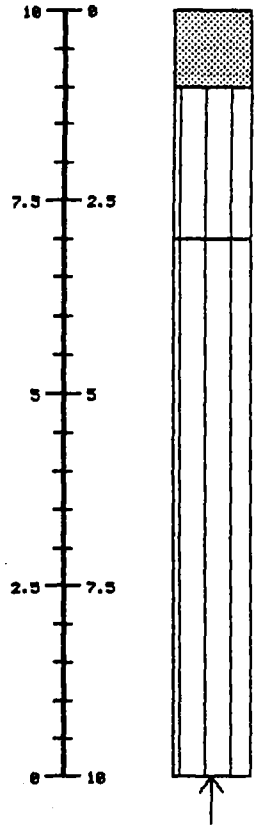
DATE:4/18/91
ELEV.:10
LOGGED BY:BEN
DATE CHECKED:

ELEV / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Description		Recovery
10 — 0		SM	Fill; silty brown sand, roots; little plasticity		
7.5 — 2.5			Steel pipe, 4" diameter, @ 3'		
		ML	Bedded tan, brn, & red sandy silt w/widely scat. pebbles; Bed vert. strike east-west parallel to cnyn		
5 — 5			Thin red clay seam dips SE @ 6'		
			Sample 2-7		12"
2.5 — 7.5		ML	Compact lgt brn silty sand/sandy silt, low plasticity, w/scat. pebbles; no bedding evident		12"
			Sample 2-8		
0 — 10					

LOG OF TEST BORING

PROJECT: ECHO WATER TANK
BORING NO.: T.P. #3
BORING LOCATION:
DRILL METHOD:
CONTRACTOR:
DEPTH TO WATER:

DATE: 4/18/91
ELEV.: 10
LOGGED BY: BEN
DATE CHECKED:



USCS	Description		Recovery
SW	Organic topsoil; drk brn gravelly sand w/roots		
ML	Silty tan sand w/roots		
ML	Lgt brn silty sand, root casts & open root holes; scat. cobbles to 6"; roots to 8'; looks like 6-10' in T.P. #2		

COLLAPSE / SWELL

~~CONSOLIDATION~~ TEST DATA SHEET

PAGE ___ OF ___

JOB ECHO - STATE OF UTAH, DEPT. NATURAL RESOURCES, DWR JOB NO. 5461-029-6061

DATE SAMPLED 4/12/91 BORING NO. TP-2

TEST STARTED 4/19 BY EGL TEST FINISHED 4/23 BY EGL DEPTH 7'

SOIL TYPE BR F: SANDY SILT TRACE CLAY OCC F: GRAVEL TR OCC CO GRAVEL

CONSOLIDOMETER NO. 4 INITIAL SAMPLE HEIGHT 1.000"

MOISTURE & DENSITY DATA	BEFORE TEST	AFTER TEST
WT. OF RING(S)+ SOIL	196.7	203.7
WT. OF RING(S) ONLY	45.8	
WT. OF SOIL (NET)	150.9	157.9
WET DENSITY IN LBS/CU. FT.*	125.5	132.8
WT. OF WET SOIL + DISH NO. 108		171.8
INT. OF DRY SOIL + DISH		150.8
WT. OF LOST MOISTURE		
WT. OF DISH ONLY		14.3
WT. OF DRY SOIL	136.9	
MOISTURE AS % OF DRY WT.	10.3	15.4
DRY DENSITY IN LBS/CU. FT.	113.8	115.1

TEST INSTRUCTIONS

LOAD CYCLE to 1500 PSF ⇒ 4/19 2000

INUNDATE ALLOW Δ H

TRIMMED TO A = 4.582 in²; H = 1.00"

SPECIAL INSTRUCTION AND NOTES

TRIMMED FROM BLOCK SAMPLE

SWELL/COLLAPSE

$H_1 - H_2 / H_1 \times 100$

COLLAPSE = 0.69 % 2000 PSF

DATE	TIME	E-LAPSED TIME IN MINS.	LOAD (PSF)	DIAL READING (.0001 IN.)	CONSOL. UNDER THIS LOAD	TOTAL CONSOL-IDATION
			0	.3363		
4/19/91	0640	0	1500	.3363		
	0714			.3282		
	0738			.3281		
	0831			.3279		
	1215			.3276		
	1216	0	2000	.3276		
	1424			.3260		
	1743			.3257		
	0610			.3256		
4/20/91	0611	0	INUN.	.3256		
	0706			.3199		
	0912			.3194		
	1914			.3189		
4/21	0803			.3188		
	0907			.3188		
4/21/91	0907	0	200	.3188		
4/22	0650			.3256		
	0842			.3256		

~~DATE~~	TIME	E-LAPSED TIME IN MINS.	LOAD (PSF)	DIAL READING (.0001 IN.)	CONSOL. UNDER THIS LOAD	TOTAL CONSOL-IDATION
H_0 1.000						
H_1 .9893						
H_2 .9825						
H_f .9893						

*MULTIPLY WEIGHT OF SOIL IN GRAMS BY 0.832 WHEN ONE STANDARD D & M SAMPLE IS USED.

857.5 (8/65)

CONTINUED ON REVERSE SIDE

Dames & Moore

COLLAPSE / SWELL

~~CONSOLIDATION~~ TEST DATA SHEET

PAGE___OF_____

JOB ECHO - STATE OF UTAH, DEPT. NAT. RESOURCES DWR JOB NO. 5461-029-6061

DATE SAMPLED 4/12/91 BORING NO. TP-2

TEST STARTED 4/19 BY EGL TEST FINISHED 4/23 BY EGL DEPTH 8'

SOIL TYPE LT BR F-SANDY SILT TRACE CLAY, OCC TR FI GVL & V. FI ROOTS

CONSOLIDOMETER NO. 5 INITIAL SAMPLE HEIGHT 1.000 "

MOISTURE & DENSITY DATA	BEFORE TEST	AFTER TEST
WT. OF RING(S)+ SOIL	195.5	205.0
WT. OF RING(S) ONLY	45.3	
WT. OF SOIL (NET)	150.2	159.7
WET DENSITY IN LBS/CU. FT.*	124.9	133.5
WT. OF WET SOIL + DISH NO. 302		176.2
INT. OF DRY SOIL + DISH		154.6
WT. OF LOST MOISTURE		
WT. OF DISH ONLY		17.0
WT. OF DRY SOIL	138.0	
MOISTURE AS % OF DRY WT.	8.8	15.7
DRY DENSITY IN LBS/CU. FT.	114.8	115.4

TEST INSTRUCTIONS

LOAD CYCLE to 1500 PSF ⇒ 2000 4/19

INUNDATE ALLOW ΔH

TRIMMED TO 4.582 in² A; 1" H

SPECIAL INSTRUCTION AND NOTES

TRIMMED FROM BLOCK SAMPLE

SWELL/COLLAPSE

$H_1 - H_2 / H_1 \times 100 =$

COLLAPSE = 0.52 % 2000 PSF

DATE	TIME	E-LAPSED TIME IN MINS.	LOAD (PSF)	DIAL READING (.0001 IN.)	CONSOL. UNDER THIS LOAD	TOTAL CONSOL-IDATION
			0	.3548		
4/19/91	0712	0	1500	.3548		
	0738			.3463		
	0830			.3480		
	1217			.3476		
	1218		2000	.3476		
	1423			.3462		
	1743			.3459		
	0607			.3457		
4/20/91	0609	0	INUN.	.2457		
	0707			.3412		
	0912			.3409		
	1916			.3405		
4/21	0803			.3405		
	0907			.3405		
4/22/91	0907	0	200	.3405		
	0850			.3501		
	0842			.3501		

~~DATE~~ in.	TIME	E-LAPSED TIME IN MINS.	LOAD (PSF)	DIAL READING (.0001 IN.)	CONSOL. UNDER THIS LOAD	TOTAL CONSOL-IDATION
H_o 1.000						
H_1 .9909						
H_2 .9857						
H_f .9953						

*MULTIPLY WEIGHT OF SOIL IN GRAMS BY 0.832 WHEN ONE STANDARD D & M SAMPLE IS USED.

857.5 (8/66)

CONTINUED ON REVERSE SIDE

Dames & Moore