

STATE OF NEVADA  
DEPARTMENT OF TRANSPORTATION  
MATERIALS AND TESTING DIVISION

FOUNDATION REPORT

CHEYENNE AVENUE INTERCHANGE I-1216  
&  
CRAIG ROAD INTERCHANGE I-1219

E. A. 71592-1

December 19, 1988

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Highway Engineer IV

## Introduction

This report discusses the geology and foundation recommendations for two proposed bridges at the intersections of Craig Road and Cheyenne Avenue with the West Leg of US 95 in Las Vegas. Only information concerning the bridge structures is addressed.

## Investigative Scope

During October, 1988 the Geotechnical Section of the Materials and Testing Division conducted subsurface investigations at the proposed structure locations mentioned above. A total of six borings were completed to augment geologic information gathered from existing geologic maps and reports listed in the Reference. Soil samples were obtained and visually classified from each boring utilizing standard penetration testing procedures. In addition, selected soil samples were transported back to NDOT headquarters laboratory facilities for further physical testing. Results from these tests are presented on the enclosed Summary of Test Results sheets for each project site. Finally, complete boring logs and boring location maps have also been included within.

## Geology

### A. Cheyenne Avenue Diamond Interchange Site

Existing maps (3) indicate that this site is located upon alluvial material, Pliocene to Pleistocene in age, which is described by Matti et al as older alluvium (Qoa) of the Red Rock Fan. However, after reviewing the geologic information obtained from the boring logs and physical testing. I believe this material is better classified by unit

QT<sub>g</sub> described as consolidated sediments by Matti et al. Three 29 feet deep (approximately) borings completed near the abutment and pier areas encountered dense granular roadway fill to depths up to 4 feet below existing ground surface. Beneath the roadway fill all borings generally encountered clayey sands and gravels. In general, soils encountered in the center pier and eastern abutment areas were dense to very dense in nature. However, boring CH-2 (completed near the western abutment area) encountered medium dense clayey sands from 3.0 to 6.1 feet and 12.7 to 15.5 feet, and a stiff sandy clay from 15.5 to 20.5 feet. This boring terminated in very dense caliche found from 24.3 feet to 28.15 feet below surface elevation (2316.0 feet). No groundwater was encountered in any of the borings. A minor lost circulation zone was found at 21.5 feet in boring CH-1.

B. Craig Avenue Diamond Interchange Site

This site is located on alluvial material, Pliocene to Pleistocene in age, which is described by Matti et al as older alluvium (Qoa) derived from the Red Rock Fan. Once again after reviewing the boring logs and physical test results, I feel the material on this site is better classified as unit QT<sub>g</sub> which is described by Matti et al as consolidated sediments. Three borings from 26.5 to 30.0 feet deep were completed near the abutment and center pier areas. In general all borings mainly encountered sandy silty clays and clayey sands. Occasionally, these units have a substantial gravel content. Borings completed near the eastern abutment and center pier areas encountered soils that were generally medium dense to very dense in nature. However, boring CG-3 completed near the western abutment location encountered soils that were substantially less dense. Standard penetration tests generally classified the existing soils to be soft to medium stiff in consistency. No groundwater was encountered in any of the borings. Very dense caliche was encountered in all borings; however, all

layers were logged at least 13.0 feet below ground surface.

### Faults

There is no evidence of a fault trending through either of the structure sites from information gathered from existing maps and reports or from subsurface investigations. The nearest fault shown on maps (1) is a north-south trending feature located approximately 0.5 and 0.75 miles, respectively from Cheyenne Avenue and Craig Road sites. This fault is one of a family of north-south trending structures found throughout the Plio-Pleistocene basin fill of the Las Vegas Valley. Primary origin of these structures is somewhat controversial (1). Regardless of the primary cause of these structures it is known that these structures are currently subsiding due to dewatering of aquifers by pumping operations in the Las Vegas Valley. Fortunately, these vertical displacements have been shown to manifest themselves by warping and extension over wide lateral zones rather than rupturing adjacent surface sediments (4).

### Foundation Recommendations

Spread footing supports are recommended for each structure. Preliminary plans indicate that abutments for both structures will be supported by spread footings in engineered embankment fills. This is acceptable for loadings up to 2 tons/ft<sup>2</sup> provided that the embankments are compacted to 95% relative density. In addition, a minimum waiting period of at least 30 days between final embankment construction and initial excavation of abutment footings is recommended to avoid differential settlement problems between abutments and center pier spread footings. Calculations have indicated that allowable loadings up to 7.5 and 5.4 tons/ft<sup>2</sup> can be supported by original ground at the center pier locations on the Cheyenne Avenue & Craig Road sites, respectively. Settlements of approximately 0.75 inches can be expected at both sites for a known applied load of 3.4 tons/ft<sup>2</sup> (supplied by Bridge

Division). Calculations were made assuming a minimum center pier footing embedment equal to 3 feet and a 13 foot square concrete footing. Embankment settlements were calculated assuming a 25 foot high embankment with fill unit weight equal to 110#/ft<sup>3</sup>. It is possible that continual dewatering of aquifers in this area could cause differential settlement problems in the future. However, considering the geologic conditions found at each site and the general mechanics of the existing compaction faults located in the Las Vegas Basin this chance seems most improbable.

Attachments

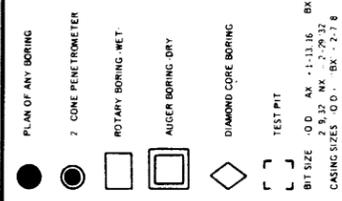
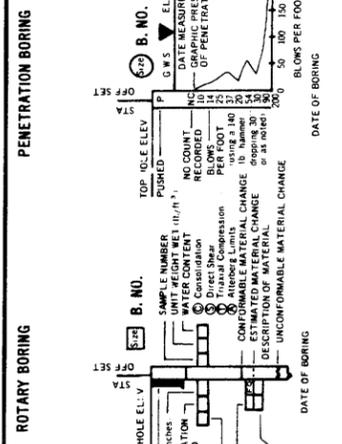
E71592-020

## References

1. Bell, John W., "Bulletin 95 - Subsidence in Las Vegas Valley", Nevada Bureau of Mines and Geology, Reno, Nevada, 1981
2. Converse Davis Dixon Associates, "Alluvial Material Evaluation -- Rainbow Boulevard Between Vegas Drive and Smoke Ranch Road, Las Vegas, Nevada", Las Vegas, Nevada, 1976
3. Matti, Jonathan C. et al, "Map 3Dg -- Geologic Map of Las Vegas NW Quadrangle:", Nevada Bureau of Mines and Geology, Reno, Nevada 1987
4. Varnum, Nick C., "Open File Report 87-7 - Results of Leveling Across Fault Scarps in the Las Vegas Valley, Nevada", Reno, Nevada, 1987

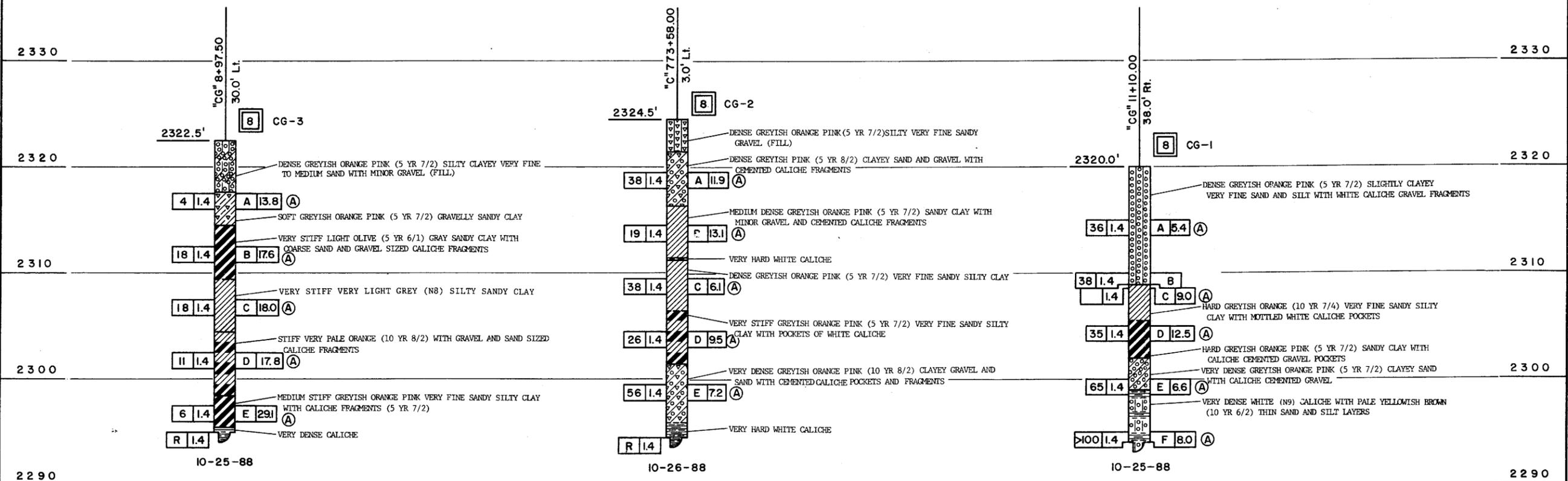
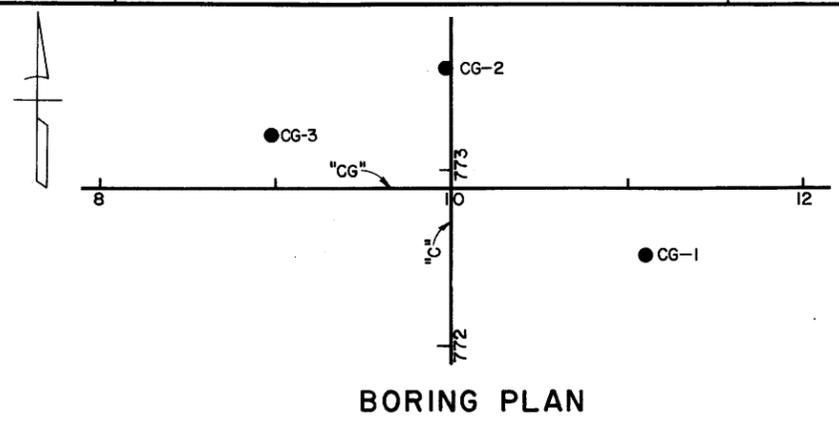
FED. RD. REG. NO.	STATE	PROJECT NO.	COUNTY	SHEET NO.
9	NEVADA		CLARK	BL-

NOTE: FOUNDATION REPORT AVAILABLE FOR CONTRACTORS STUDY IN DISTRICT OFFICE AND MATERIALS & TESTING DIVISION



STANDARD PENETRATION CLASSIFICATION	
CLAYEY SOIL	GRANULAR SOIL
BLOWS/FT. • CONSISTENCY	BLOWS/FT. • DENSITY
0-1 VERY SOFT	0-4 VERY LOOSE
2-4 SOFT	5-10 LOOSE
5-10 MEDIUM STIFF	11-20 MEDIUM DENSE
15-30 STIFF	25-50 DENSE
35-50 VERY STIFF	55-75 VERY DENSE
55-60 HARD	75-100 OVER DENSE

THE UNIFIED SOIL CLASSIFICATION SYSTEM	
LETTERSYM	DESCRIPTION
ML	INORGANIC SILT AND VERY FINE SAND
CL	CLAYEY SILT AND VERY FINE SAND
OL	LOW PLASTICITY SILT AND CLAY
MH	MEDIUM PLASTICITY SILT AND CLAY
CH	HIGH PLASTICITY SILT AND CLAY
OH	ORGANIC SILT AND CLAY
PT	PEAT AND OTHER HIGHLY ORGANIC SOILS
CE	CALICHE



NEVADA DEPARTMENT OF TRANSPORTATION  
MATERIALS AND TESTING DIVISION  
Geotechnical Section

### CRAIG ROAD INTERCHANGE

#### LOG OF TEST BORINGS

BRIDGE NO. I-1219	MILE POST	E.A. NO. 71592	SHEET 01 OF 01
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Boring No.	Total Depth (ft.)	Station or Location	Sample No.	Sample Depth (ft.)	Sample Size (in.)	N (Blows / Foot)	Soil Group	Unit Dry Wt. (lb/ft. <sup>3</sup> )	Unit Wet Wt. (lb/ft. <sup>3</sup> )	Water Content %	% Minus 200	Atterberg Limits			Other Tests Performed
												PI	LL	PL	
CG-1	26.0	"CG" 11+10 38' Rt	A	5.0-6.5		36	SM			5.4	44.5	8	24		
			C	11.1-11.5		38	CL			9.0	61.7	22	39		
			D	15.0-16.5		35	CH			12.5	62.3	41	62		
			E	20.0-21.5		65	SC			6.6	31.1	23	40		
			F	25.0-26.0		100	CA/SM			8.0	32.2	14	36		
CG-2	30.0	"C" 773+58 3' LF	A	5.0-6.5		38	GC/SC			11.9	33.2	13	34		Chemical Analysis on composite sample from 0.0 to 5.0
			B	10.0-11.5		19	CL			13.1	54.5	19	36		
			C	15.0-16.5		38	CL			6.1	49.4	12	26		
			D	20.0-21.5		26	CL/CH			9.5	53.4	29	50		
			E	25.0-26.5		56	GC/SC			7.2	36.5	27	46		
CG-3	27.5	"CG" 8+97.5 30' LF	A	5.0-6.5		4	GC/CL			13.8	39.6	25	42		
			B	10.0-11.5		18	CH			17.6	70.8	39	58		
			C	15.0-16.5		18	CL			18.0	80.0	26	45		
			D	20.0-21.5		11	CL/CH			17.8	50.8	26	49		
			E	25.0-26.0		6	CH			29.1	67.2	67	108		

NOTATION

OU = Unconfined Compression

S = Direct Shear

C = Consolidation

T = Triaxial Compression

δ = Angle of Side Friction

PI = Plasticity Index

LL = Liquid Limit

PL = Plastic Limit

# CULVERT & CHEMICAL EVALUATION

EA. NO. 71592 DATE 10/26/88 INSPECTED BY Salazar

JOB DISCRIPTION Craig Rd Interchange US 95 county Clark

SAMPLE NO. CG-2 chem STATION C" 713+58 DISTANCE FROM 3' LF

SAMPLE TYPE: PIPE  CHEM  BOTH

## STRUCTURE TYPE

CMP  BCCMP  ALUMINUM  STRUCT. PLATE

SPIRAL CMP  SPIRAL BCCMP  PIPE  PIPE ARCH

DIAMETER  IN. LENGTH  FT. GAGE

HEADWALL  WINGWALLS  APRON  OTHER Bridge footing

## PIPE CONDITION

- 1- APPROACHING ORIGINAL CONDITION
- 2- SUPERFICIAL RUST, CRACKED COATING
- 3- MODERATE RUST & PITTING, SOME LOSS OF BITUMINOUS COATING
- 4- HEAVY RUST, DEEP PITTING, LIGHT PERFORATION
- 5- UNSOUND AREAS, EXTENSIVE PERFORATION

## ENVIROMENT

### STREAM FLOW

- INTERMITTENT
- FREQUENT
- STANDING WATER
- CONTINUOUS

### STREAM BED

- LEDGE
- GRAVEL
- SANDY
- CLAY
- BEDROCK

## CHEMICAL ANALYSES

SOLUBLE SALT

CO<sub>3</sub> & HCO<sub>3</sub>

CHLORIDE

SULPHATE

P.P.M.

120

50

180

RESISTIVITY 3247

P.H. FACTOR 8.3

REMARKS: \_\_\_\_\_

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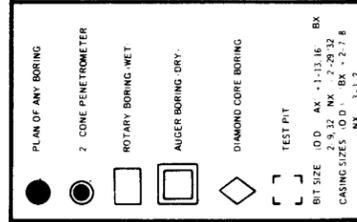
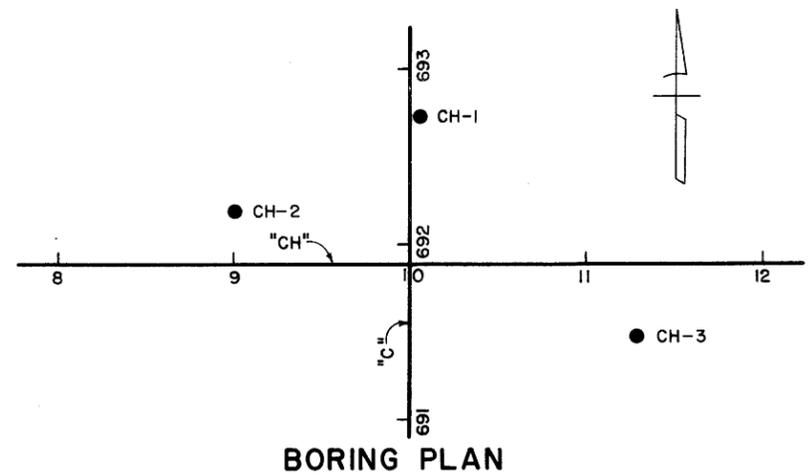
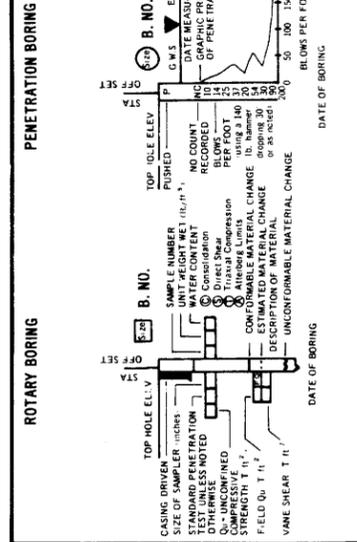
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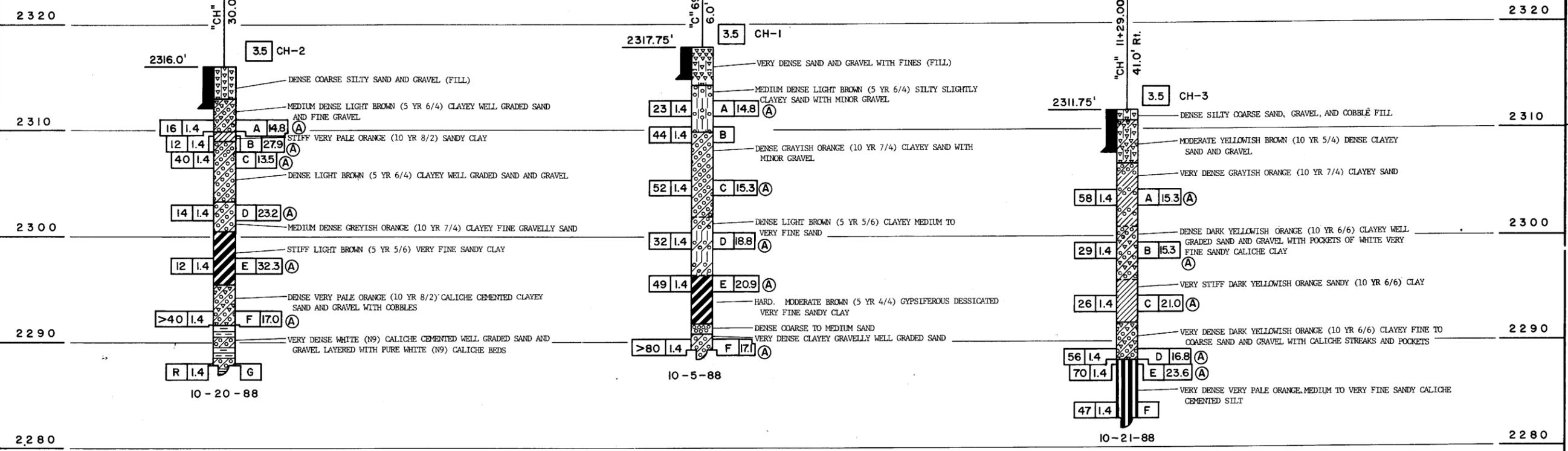
FED. RD. REG. NO.	STATE	PROJECT NO.	COUNTY	SHEET NO.
9	NEVADA		CLARK	BL-

NOTE: FOUNDATION REPORT AVAILABLE FOR CONTRACTORS STUDY IN DISTRICT OFFICE AND MATERIALS & TESTING DIVISION



STANDARD PENETRATION CLASSIFICATION	
CLAYEY SOIL	GRANULAR SOIL
BLOWS/FT. - CONSISTENCY	BLOWS/FT. - DENSITY
VERY SOFT 0-1	VERY LOOSE 0-4
SOFT 2-4	LOOSE 5-10
MEDIUM STIFF 5-8	MEDIUM DENSE 11-24
STIFF 9-15	DENSE 25-50
VERY STIFF 16-30	VERY DENSE OVER 50
HARD 31-60	STANDARD PENETRATION TEST N-100 lb. HAMMER, 30. FREE FALL ON 2' O.D. 1.1, 8.1 D SAMPLER
VERY HARD OVER 60	

THE UNIFIED SOIL CLASSIFICATION SYSTEM	
LETTERS	DESCRIPTION
ML	SANDY SILT
CL	CLAYEY SILT
OL	SILT-CLAY
MH	CLAYEY SILT
CH	CLAY
OH	ORGANIC CLAY
PT	PEAT
CE	CALICHE



NEVADA DEPARTMENT OF TRANSPORTATION  
MATERIALS AND TESTING DIVISION  
Geotechnical Section

**CHEYENNE AVE. INTERCHANGE**

**LOG OF TEST BORINGS**

BRIDGE NO. I-1216	MILE POST	E.A. NO. 71592	SHEET OF
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E.A. No. 71592(1)  
 Diamond Interchange on US 95  
 @ Cheyenne Avenue

NEVADA DEPARTMENT OF TRANSPORTATION  
 ENGINEERING GEOLOGY AND FOUNDATIONS SECTION  
**SUMMARY OF TEST RESULTS**

Boring No.	Total Depth (ft.)	Station or Location	Sample No.	Sample Depth (ft.)	Sample Size (in.)	N (Blows / Foot)	Soil Group	Unit Dry Wt. (lb/ft. <sup>3</sup> )	Unit Wet Wt. (lb/ft. <sup>3</sup> )	Water Content %	% Minus 200	Atterberg Limits			Other Tests Performed
												PI	LL	PL	
CH-1	28.5'	"C" 692+72.5	6' Rt	A	5.0-6.5	23	SM/ML			14.8	43.2	8	24	Chemical Analysis on Samp CH-1-2 fm 7.5-9.0	
				C	12.5-14.0	52	SC			15.3	45.8	23	44		
				D	17.5-19.0	32	SC CL			18.8	40.9	26	48		
				E	21.5-23.0	49	CH			20.9	87.3	42	66		
				F	27.5-28.5	80	SC			17.1	37.0	30	55		
CH-2	28.15'	"CH" 9+00	30' LF	A	5.0-6.1	16	GC/SC			14.8	12.4	11	36		
				B	6.1-6.5	12	CL			27.9	75.7	16	43		
				C	8.0-9.5	40	SC			13.5	28.0	20	40		
				D	13.0-14.5	14	SC			23.2	33.7	24	49		
				E	18.0-19.5	12	CH			32.3	88.1	45	66		
				F	23.0-24.3	> 40	GC/SC			17.0	24.0	33	62		
CH-3	29.0'	"CH" 11+29	41' Rt	A	7.5-9.0	58	SC/CL			15.3	50.0	18	37		
				B	12.5-14.0	29	SC/GC			15.3	17.6	19	43		
				C	17.5-19.0	26	CL			21.0	56.6	24	44		
				D	22.5-23.5	56	GC/SC			16.8	23.5	31	58		
				E	23.5-24.0	70	MH			23.6	61.5	31	68		

NOTATION    QU = Unconfined Compression    S = Direct Shear    C = Consolidation    T = Triaxial Compression  
 δ = Angle of Side Friction    PI = Plasticity Index    LL = Liquid Limit    PL = Plastic Limit

# CULVERT & CHEMICAL EVALUATION

EA. NO. 71592 DATE 10/4/88 INSPECTED BY Salazar

JOB DISCRPTION Cheyenne Intchyo - US 95 county Clark

SAMPLE NO. CH-1-2 STATION "C" 692+725 DISTANCE FROM 6' Pt

SAMPLE TYPE: PIPE  CHEM  BOTH

## STRUCTURE TYPE

CMP  BCCMP  ALUMINUM  STRUCT. PLATE

SPIRAL CMP  SPIRAL BCCMP  PIPE  PIPE ARCH

DIAMETER  IN. LENGTH  FT. GAGE

HEADWALL  WINGWALLS  APRON  OTHER Bridge footing

## PIPE CONDITION

- 1- APPROACHING ORIGINAL CONDITION
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## ENVIROMENT

### STREAM FLOW

- INTERMITTENT
- FREQUENT
- STANDING WATER
- CONTINUOUS

### STREAM BED

- LEDGE
- GRAVEL
- SANDY
- CLAY
- BEDROCK

## CHEMICAL ANALYSES

SOLUBLE SALT

CO<sub>3</sub> & HCO<sub>3</sub>

CHLORIDE

SULPHATE

P.P.M.

30

600

2000

RESISTIVITY 485

P.H. FACTOR 8.7

REMARKS: Chem Analysis only

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\_\_\_\_\_  
\_\_\_\_\_