FOUNDATION REPORT
FOR
PEQUOP INTERCHANGE
AND
SILVER ZONE WESTERN PACIFIC RAILROAD OVERPASS
NEAR
OASIS, NEVADA

For

State of Nevada
Department of Highways

December, 1966

PREPARED BY

CLAIR A. HILL & ASSOCIATES
FOUNDATION ENGINEERING & TESTING LABORATORY
1525 COURT STREET REDDING, CALIFORNIA

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CLAIR A. HILL & ASSOCIATES
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C-1005.35

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FOUNDATION ENGINEERING & TESTING LABORATORY
1525 COURT STREET - P.O. BOX 2088
REDDING, CALIFORNIA-96001
916 - 243 - 5831

December 1, 1966

Mr. John E. Bawden
Highway Engineer
State of Nevada
Department of Highways
Carson City, Nevada

C-1005.35

Attention: W. H. Shewan
Assistant Bridge Engineer

Gentlemen:

The attached report includes the foundation design recommendations for the Pequop Interchange, I-1159 E & W and the Silver Zone Western Pacific Railroad Overpass, G-927 E & W.

The original tracings of the log of test boring sheets are being forwarded to you under separate cover.

We wish to thank you for the privilege of conducting this study and trust we may be of similar service in the future.

Respectfully submitted,

CLAIR A. HILL & ASSOCIATES

Clair A. Hill

Clair A. Hill, President
Registered Engineer #1138

Tom Cordova

Tom Cordova, Geological Engineer
Registered Engineer #1806

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C-1005.35

FOUNDATION REPORT
FOR
PEQUOP INTERCHANGE, I-1159 E & W
AND
SILVER ZONE WESTERN PACIFIC RAILROAD OVERPASS, G-927 E & W

For
State of Nevada
Department of Highways

INTRODUCTION:

A soils and foundation invesitgation was conducted at the site of the above named structures during early November 1966. The structures are located on the proposed routing of Interstate Highway 80 near Oasis, Nevada.

The field investigation consisted of drilling test holes and obtaining samples to adequately define the soil and rock bearing characteristics as they relate to safe, economical substructure design.

The studies were made under the terms of an engineering agreement between the Nevada Highway Department and the consulting engineering firm of Clair A. Hill and Associates of Redding, California.

GENERAL GEOLOGY AND SOILS:

The Pequop Interchange, located on the east flank of the Pequop Mountains, is underlain at shallow depths (see log of test borings sheet No. 1) by sedimentary "bedrock" consisting of sandstone and shale of Paleozoic Age. A thin mantle of soil (colluvium) masks the sedimentary rock at the structure sites.

A long north-south trending intermontane basin (Antelope Valley) separates the Pequop Interchange and Pequop Mountains from the Silver Zone (Toano Pass) Western Pacific Railroad Overpass and the Toano Mountain Range.

The Silver Zone W.P.R.R. Overpass is underlain by poorly consolidated sandstone which was deposited in Lake Bonneville during the Pleistocene Period. This poorly consolidated sediment has been classified for soil mechanic purposes as very dense silty sand. Thin lenses of gravel and small cobbles are erratically distributed throughout the sediment and their frequency of occurrence and distribution can be seen in the 25 $\pm$ foot Western Pacific Railroad cut-section at the site.

No groundwater was encountered in the borings at either the Pequop Interchange, or Silver Zone W.P.R.R. Overpass site.

FOUNDATION RECOMMENDATIONS:

1. Pequop Interchange, I-1159 E & W

Five borings were made at this site, all of which encountered suitable material for foundation support by means of spread footings.

A thin mantle (5 to 10 feet) of soil covers the Paleozoic Age "bedrock" at this structure site, and it is recommended that Piers 1 and 2 of both the eastbound and westbound structures be supported by spread footings founded upon the "bedrock" which consists of sandy clay-shale and sandstone.

It is recommended that the abutments of both structures be supported by means of either cast-in-place pipe, or mandrel driven shell piles.

Such piles should consist of 12-3/4-inch diameter pipe piles or straight or step-tapered shell piles having minimum tip diameters of 8 inches and butt diameters of $15\frac{1}{2}$ to 16 inches. Such piles may be designed for loads to 45.0 tons per pile.

The following tabular summary lists estimated pile tip elevations at abutments and recommended base of footing block elevations at piers:

Support Designation	Support Station	Estimated Pile Tip or Recommended Base of Footing Block Elevation	Safe Allowable Design Load
Abutment No. 1 EB	"OE" 138+76	6290.0	45 tons/pile
Pier No. 1 EB	"OE" 139+21	6290.0	6.0 tons/sq. ft.
Pier No. 2 EB	"OE" 139+79	6290.0	7.0 tons/sq. ft.
Abutment No. 2 EB	"OE" 140+24	6293.0	45 tons/pile
Abutment No. 1 WB	"OW" 144+51	6277.0	45 tons/pile
Pier No. 1 WB	"OW" 144+96	6276.0	4.5 tons/sq. ft.
Pier No. 2 WB	"OW" 145+54	6275.0	6.0 tons/sq. ft.
Abutment No. 2 WB	"OW" 145+99	6272.0	45 tons/pile

Piles at abutments should be driven through pilot holes made through approach fills to the original ground, and cobbles or boulders should be kept out of that portion of the fill through which piles are to be driven and pilot holes are to be drilled.

Pile load tests are not considered necessary since all piles will acquire excellent end bearing from the shale and sandstone "bedrock".

2. Silver Zone W.P.R.R. Overpass, G-927 E & W

Seven borings were made at the site of the Silver Zone W.P.R.R. Overpass; all encountered soils which will provide excellent foundation support for spread footings.

It is recommended that the abutments and piers of both the eastbound and westbound overpass be supported by spread footings founded at the following elevations and safe allowable design loads:

Support Designation	Support Station	Recommended Base of Footing Block Elevation	Safe Allowable Design Loads
Abutment No. 1 EB	"OE" 667+00	5855.0	7.0 tons/sq. ft.
Pier No. 1 EB	"OE" 667+56	5827.0	7.0 tons/sq. ft.
Pier No. 2 EB	"OE" 668+44	5827.0	7.0 tons/sq. ft.
Abutment No. 2 EB	"OE" 669+00	5851.0	7.0 tons/sq. ft.
Abutment No. 1 WB	"OW" 668+50	5847.5	7.0 tons/sq. ft.
Pier No. 1 WB	"OW" 669+16	5827.0	7.0 tons/sq. ft.
Pier No. 2 WB	"OW" 670+04	5827.0	7.0 tons/sq. ft.
Abutment No. 2 WB	"OW" 670+70	5844.0	7.0 tons/sq. ft.

Abutment footings founded at the recommended elevations will necessitate stem walls being approximately 7.0^{+}_{-} feet at all abutment locations. If the design engineer so chooses, after making an economic evaluation, the use of "floating" or "stub" abutments may be utilized as abutment support. The footings for the abutments may then be founded in the approach fills and designed

for safe allowable loads to 2.5 tons per square foot. The "floating abutment" design is based on the assumption that approach fills are constructed with a good quality material compacted to at least 95 percent of maximum relative density in accordance with A.A.S.H.O. specifications. The front and lowermost edge of the footings should be a minimum horizontal distance of 5.0 feet from the front slope of the approach fills.

In the event the "floating abutment" design is used, the upper 1.5 to 2.0 feet of original in-place soil should be scarified and compacted to at least 95 percent of relative density in the abutment areas of both the eastbound and westbound structures. This thin mantle of soil which overlies the very dense, poorly consolidated sandstone at the site has a consistency of very loose and must be thoroughly compacted and densified prior to using a "floating abutment" design.

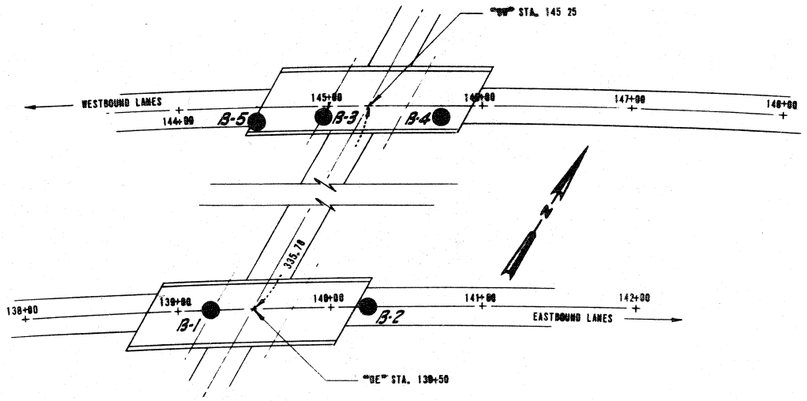
Suitable foundation material for the approach fills exist at both the Pequop Interchange and the Silver Zone W.P.R.R. Overpass, and approach fills may be constructed to plan grades without the use of special treatment such as stripping, or surcharge at abutment areas.

Should additional questions arise with regard to the soils or foundation conditions at either of the subject sites, please call on us for further assistance.

Respectfully submitted,
CLAIR A. HILL & ASSOCIATES

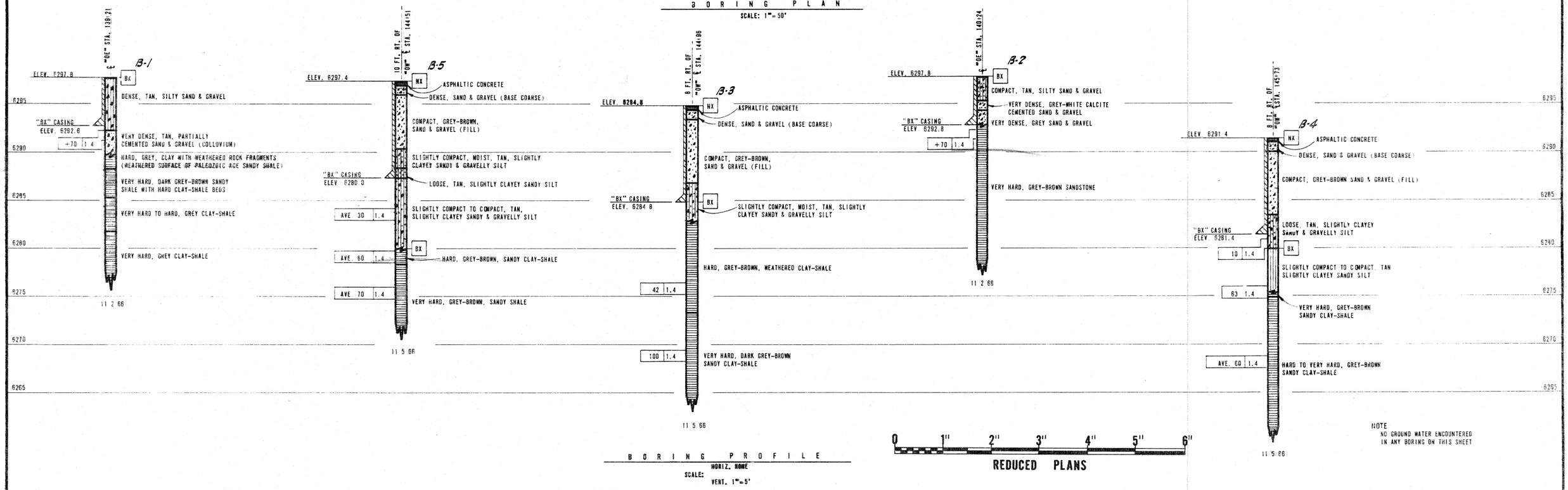
Clair A. Hill, President
Registered Engineer #1138

Tom Cordova, Geological Engineer
Registered Engineer #1806



B O R I N G P L A N

SCALE: 1"= 50'



B O R I N G P R O F I L E

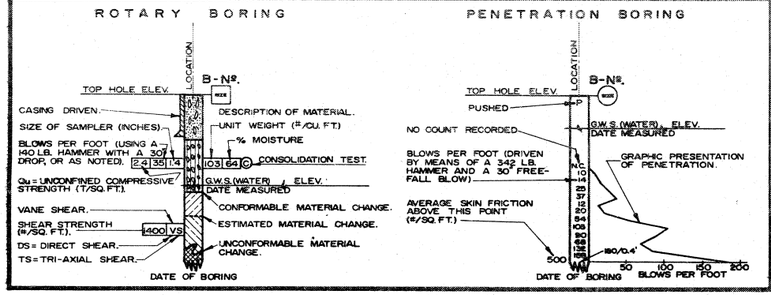
SCALE: HORIZ. NONE
VERT. 1"=5'

0 1" 2" 3" 4" 5" 6"

REDUCED PLANS

NOTE
NO GROUND WATER ENCOUNTERED IN ANY BORING ON THIS SHEET

LEGEND OF DRILLING, SAMPLING & TESTING OPERATIONS



- PLAN OF ANY BORING
- PENETROMETER (FLUSH-COUPLED)
- 2 ⅛" CONE PENETROMETER
- SAMPLER BORING (DRY)
- ROTARY BORING (WET)
- AUGER BORING (DRY)
- JET BORING
- DIAMOND CORE BORING.
- TEST PIT.

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 ½".

THE UNIFIED SOIL CLASSIFICATION SYSTEM

MAJ. DIV.		LETTER	SYMBOL	NAME
COARSE MATERIAL — 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-SILT MIXTURES.
FINE GRAINED SOIL — 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 OF 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.

ROCK CLASSIFICATION

SYMBOL	NAME
	IGNEOUS ROCK
	SEDIMENTARY ROCK
	METAMORPHIC ROCK

NOTE:
CLASSIFICATION OF EARTH MATERIAL SHOWN ON THIS SHEET IS BASED UPON FIELD INSPECTION UNLESS NOTED OTHERWISE.

SOIL CONSISTENCY CLASSIFICATION

CONSISTENCY		* BLOWS PER FT.
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 FT (140 LB. HAMMER, 30" FREE-FALL BLOW USING A 2" O.D. x 1⅜" I.D. SAMPLER).

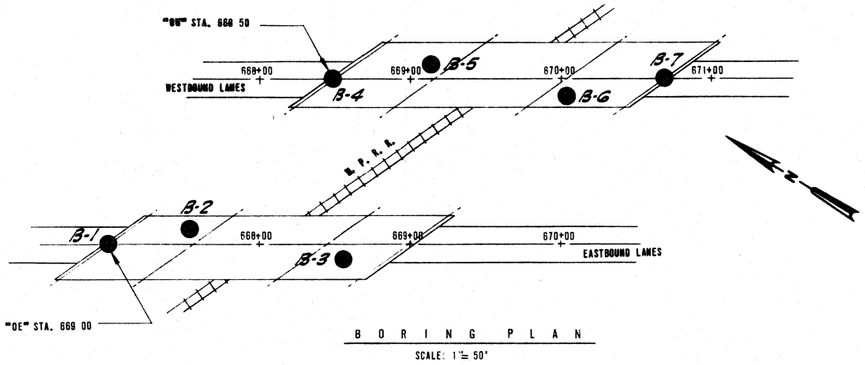
DWN. R.L.B.
CHK. C.A.H.
DATE: DEC. 1966

Clair A. Hill
REG. CIVIL ENG. NO. 11581
Tom Plum
ENGINEERING GEOLOGIST

CLAIR A. HILL & ASSOCIATES
FOUNDATION ENGINEERING & TESTING LABORATORY
1525 COURT STREET REDDING, CALIFORNIA

LOG OF TEST BORINGS
STATE OF NEVADA
PEQUOP INTERCHANGE
I-1159 E & W
OASIS NEVADA C-1005,35

DWG. NO. B-1



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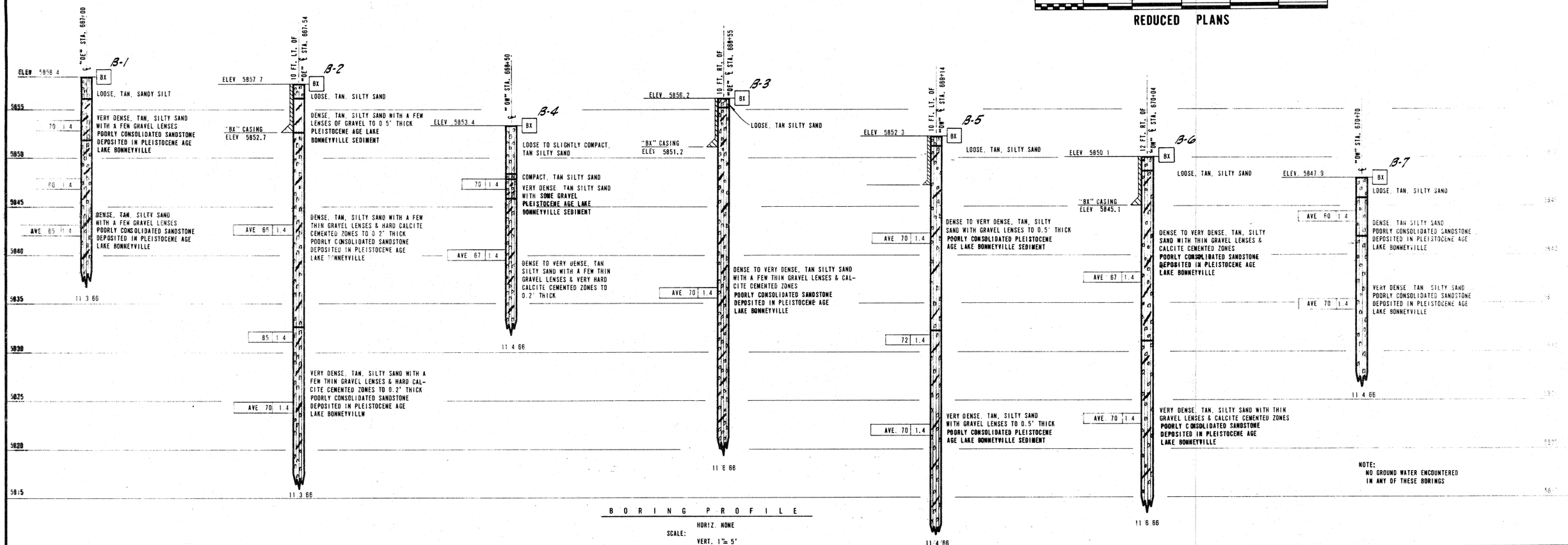
REDUCED PLANS



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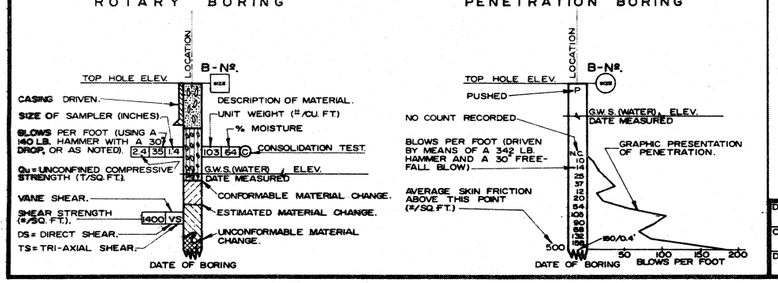

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ENGINEERING GEOLOGIST

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L O G O F T E S T B O R I N G S

STATE OF NEVADA

S I L V E R Z O N E W. P. R. R. O V E R P A S S

G-927E & G-927W

OASIS NEVADA

DWG.-NO. B-2

C-1005.35