16-75

FOUNDATION REPORT

CLIFFSIDE STRUCTURES

I-80

ELKO COUNTY

JULY 1975

PROJECT NO. I-080-5(4)388
E.A. NO. 70071

ENGINEERING GEOLOGY & FOUNDATION SECTION
MATERIALS & TESTING DIVISION

STATE OF NEVADA
DEPARTMENT OF HIGHWAYS

MEMORANDUM

August 19, 1975

To Rod McGinnis

From Bert Replogle

Subject: E.A. 70071, I-80, Elko County, Cliffside Structures. ABUTMENTS.

This memorandum is intended as an appendix to the Cliffside Structures Foundation Report dated July, 1975.

Abutments at GW 781+32,
GW 783+95,
GE 786+50;

Abutments at the above locations may be supported in the fill on spread footings with design loads up to and including 2.0 T.S.F. providing 95% relative compaction is attained in the fill below the footing.

All fills at the above stations are anticipated to settle less than 1" and settlement will occur simultaneously with the fill emplacement. The abutments may be emplaced in the fill immediately after fill emplacement.

ABUTMENT AT GE 786+50:

The westerly portion of this proposed abutment may be supported in the fill on spread footing with design loads up to and including 2.0 T.S.F. providing 95% relative compaction is attained in the fill below the footing. This abutment may be emplaced in the fill immediately after fill emplacement because fill settlement is expected to be less than 1" and to occur simultaneously with fill emplacement.

Most of the easterly portion of this proposed abutment is anticipated to be emplaced upon bedrock and or upon natural ground. A design load of 2.0 T.S.F. is again recommended. Where the natural ground is excavated for the footing it is anticipated that some soil disturbance will occur and this should be recompacted to 95% relative density. The soil is gravelly and non plastic.

Bert Replogle
Engineer Geologist

BR:bb

FOUNDATION REPORT

CLIFFSIDE STRUCTURES

I-80

ELKO COUNTY

JULY, 1975

PROJECT NO. I-080-5(4)388

E. A. NO. 70071

ENGINEERING GEOLOGY AND FOUNDATION SECTION

MATERIALS AND TESTING DIVISION

INTRODUCTION

During June, 1975 the Engineering Geology and Foundation Section conducted a field investigation for the two proposed structures at Cliffside, Nevada on I-80. The investigation was conducted with four machine auger borings utilizing a Mobile B-61 drill and 8" hollow stem augers. Additionally, geophysical work was performed consisting of two electrical resistivity surveys and four seismograph surveys.

LOCATION

This project receives it's name, "Cliffside", from a Western Pacific Railroad siding located about 15 miles west of the Nevada-Utah state line.

TOPOGRAPHY AND VEGETATION

The subject site lies at the eastern base of the Toana mountain range and the topography is very rugged and difficult of access. The ground has been eroded deeply into north trending gullies and ridges usually up to 200 feet apart and the relief is predominantly 50 to 75 feet.

Only about 20% of the ground is covered by vegetation which consists mostly of sagebrush and "cheat" grass and there is very little overburden.

GROUND WATER

Ground water here would not be encountered for several hundred foot depth. It is likely that the native surface material in this area would absorb and drain rain or snowmelt water at a rapid rate. To the

right of Station "GE" 783 is a low area where water will collect. This is adjacent to a proposed pier and should be filled and drainage provided. About 500 cu. yds. would be involved.

GENERAL GEOLOGY

Three distinct geological units are present at Cliffside.

1. Recent Alluvium:

   This material is slightly compact coarse sand and pebbles. It is found in the gully bottoms only and is believed to be 5 to 10 ft. deep. It is estimated that only 5% of the area is covered by recent alluvium.

2. Older Alluvium:

   This material is dense and very dense cobbles, gravel and sandy fines. It is found above the gully floors and is estimated to cover 90% of the area. It is well exposed in the W.P.R.R. cut and in old gravel pits in the immediate vicinity and consistently is composed of large gravel, cobbles and lesser amounts of sand and nonplastic fines. This alluvium overlies bedrock and is generally 0 to 30 ft. thick.

3. Granodiorite Bedrock:

   This bedrock is exposed over less than 5% of the project site. It underlies the alluvium mentioned above, (both Recent and Older Alluvium). Granodiorite is a granite-type bedrock but a softer rock than granite. It is sometimes referred to as "soft granite" and is composed mostly of feldspar minerals with Biotite mica and quartz in lesser amounts. All four machine auger borings penetrated to and into this Granodiorite. It drilled fairly

easily with the machine auger but in all four borings could not be penetrated with a standard split spoon sampler driven by the 140# hammer. Also it is evidently not sufficiently competent to cut a core with a wet rotary diamond coring bit, judging by such an attempt at the bottom of drill hole #1. The rock cuttings recovered from this coring attempt were fresh and unweathered.

All outcrops of Granodiorite here exhibit a fairly massive appearance with jointing at least a foot apart and much of it up to 2 feet apart. The attitude of the jointing was measured at several locations because jointing can sometimes contribute to rock sliding if unfavorably oriented and adjacent to a steep hillside or construction cut. Jointing attitudes are not consistent and no especially unfavorable joint attitudes were observed.

Any bedrock surface steeper than 3 to 1, (below the alluvium) could be a potential foundation failure surface. It is believed all bedrock surfaces are substantially more gentle than 3 to 1 under proposed pier sites.

FOUNDATION CONDITIONS AT PROPOSED PIERS

"GW" 782+17: A drill hole was not performed here because this site is adjacent to the steep railroad cut, in gravel. Drill hole #2 is the nearest hole, about 30 feet, to the S. W. This pier site is underlain by dense gravel and cobbles which are well exposed in the railroad cut a few feet to the N. W. Depth to bedrock is about 13 feet here, or elevation 5441.0, as evidenced by results in drill hole #2 and seismograph results at "GW" 782+50 ℄. It is believed the bedrock surface is fairly gentle beneath the soil here but further to the west it may be as steep as 1 1/2

to 1. It is requested that the proposed fill west of "GW" 732+17 be emplaced before installation of the structure deck. This would provide additonal safety against foundation failure.

"GW" 782+97: Granodiorite bedrock outcrops here just a few feet to the right at elevation 5441.0. Electrical resistivity at "GW" 783+00, 12 ft. Lt. indicated this bedrock is still extant there at the same elevation.

No drilling was performed here because of the steep terrain and the rock outcrop.

"GE" 783+52: This site is fairly close to the railraod track and near a steep railroad fill shoulder, therefore a boring was put at "GE" 783+36, (B-6). This boring penetrated 2 feet of railroad fill, 8 feet of Recent Alluvium and 4 feet of Granodiorite bedrock. The railroad fill proved to be slightly compact unweathered and decomposed Granodiorite. Abundant Granodiorite rock up to 10" size is in evidence elsewhere in this railroad fill. The fill was emplaced during 1927 according to Mr. Ted Merritt, Western Pacific Railroad District Engineer, and he says it has been very stable and maintenance free. The recent alluvium below the railroad fill is slightly compact.

"GE" 784+97: The very steep terrain and proximity to railroad tracks precluded a drill hole here. The site is underlain by dense gravel and cobbles which are well exposed in the railroad cut. Depth to bedrock is about 20 feet or at elevation 5433.0 as evidenced by seismograph and outcrops.

CONCLUSIONS AND RECOMMENDATIONS

1. The geological and topographical conditions at Cliffside are believed to favor spread footings as the most feasible and economical

support for the four proposed piers.

2. The proposed piers at "GW" 782+17 and at "GE" 784+97 are recommended to be founded in the dense gravels. The footings should be designed for a load of not more than 3 1/2 tons per sq. foot. To insure against foundation failure, the footing should be set at a sufficiently low elevation so that the slope on a line drawn from the bottom edge of the footing to the base of the railroad cut is at least as gentle as 3 to 1. This elevation would be 5448.0 or lower for the pier at "GW" 782+17 and 5446.0 or lower for the pier at "GE" 784+97.

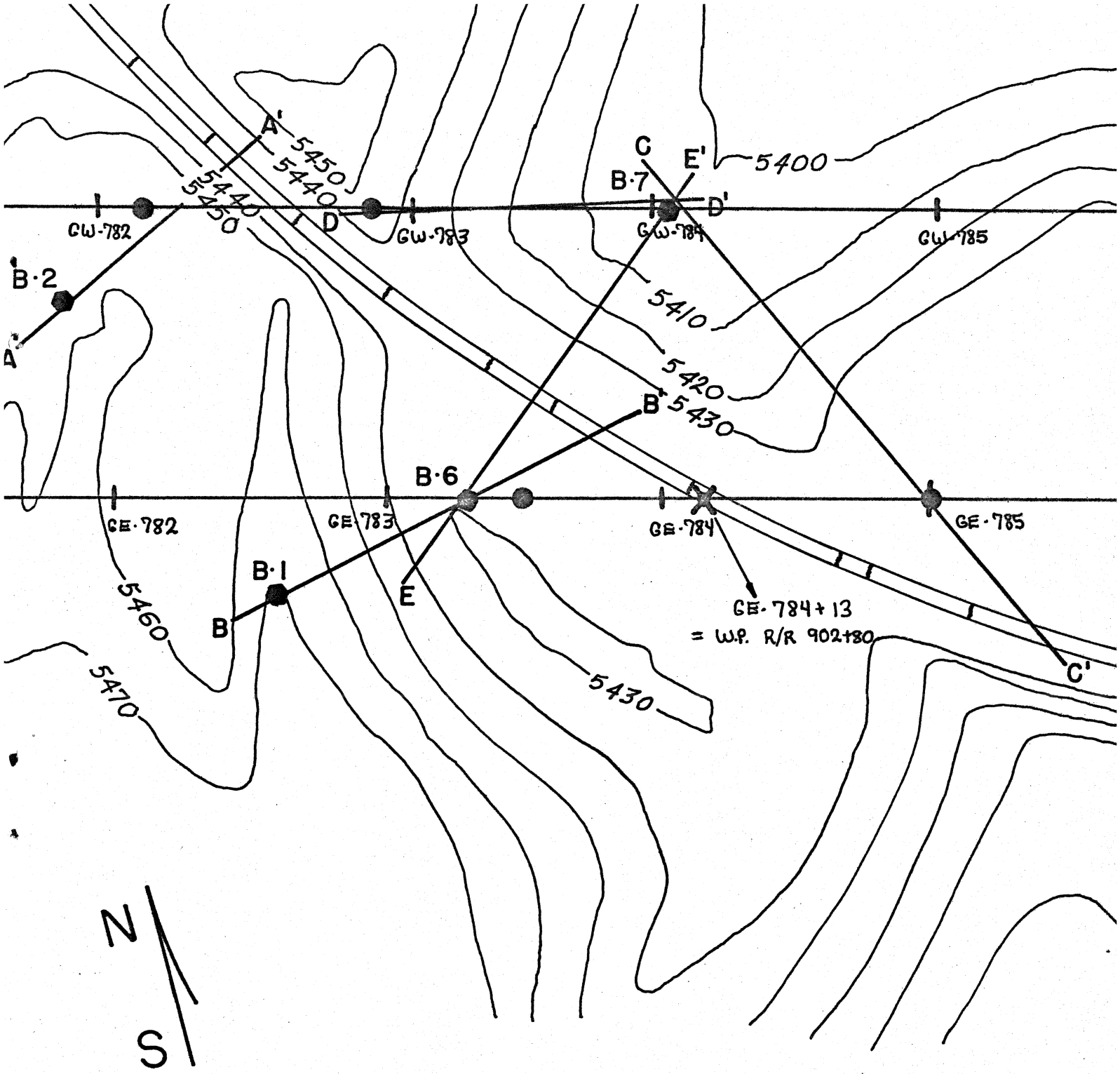
3. The proposed pier at "GE" 783+50 may be founded in Recent Alluvium or in railroad fill depending upon design depth. In either event the design load should not exceed 2 tons per sq. foot. After excavation for construction of the footing the foundation should be compacted to at least 95% of maximum dry density, (standard proctor test). The adjacent low ground should be filled, and drainage provided. The footing depth should be at elevation 5432.0 or lower.

4. The proposed pier at "GW" 782+97 will be founded on bedrock. This bedrock is believed to comprise a northward trending ridge and not a broad, flat expanse of rock. The footing here should be designed for not more than 4 tons per sq. foot and should be at elevation 5439.0 or lower.

5. The proposed fill west of pier site "GW" 782+17 must be emplaced before installation of the proposed west bound structure deck.

Bert Replogle

Bert Replogle
Engineering Geologist

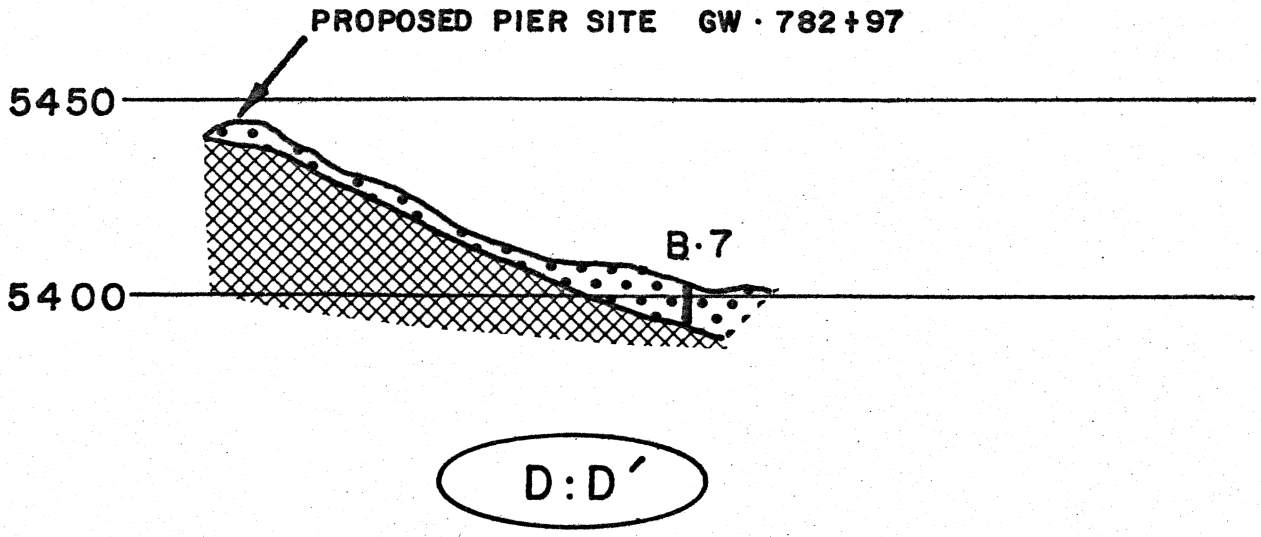


PROPOSED

PROJECT SITE

● PIER SITE

⬢ BORING



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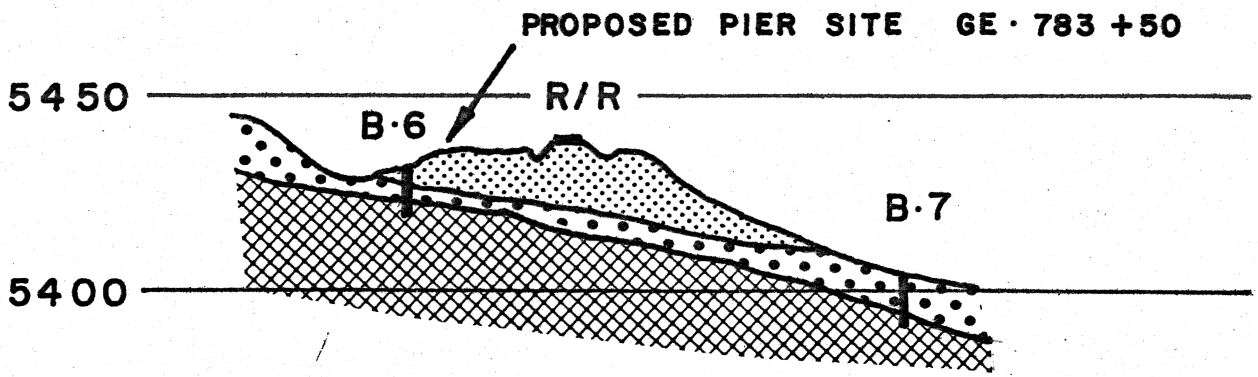


E·E′

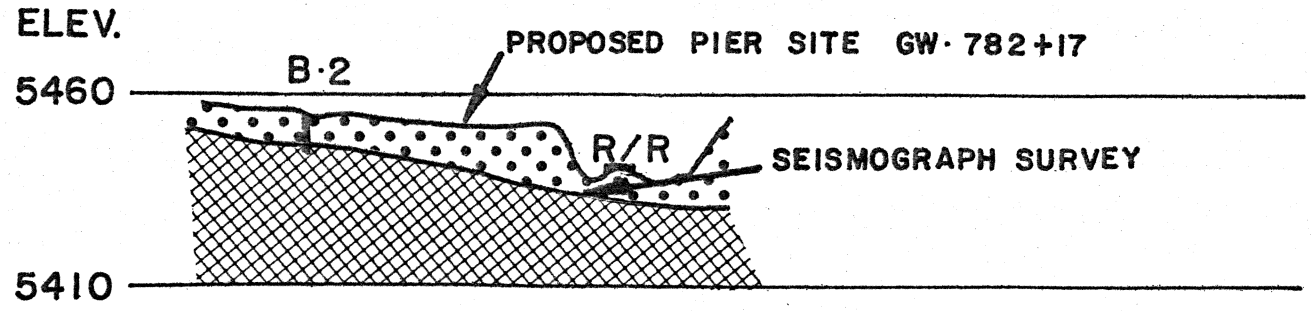
70071
CLIFFSIDE
CROSS SECTIONS

BED ROCK

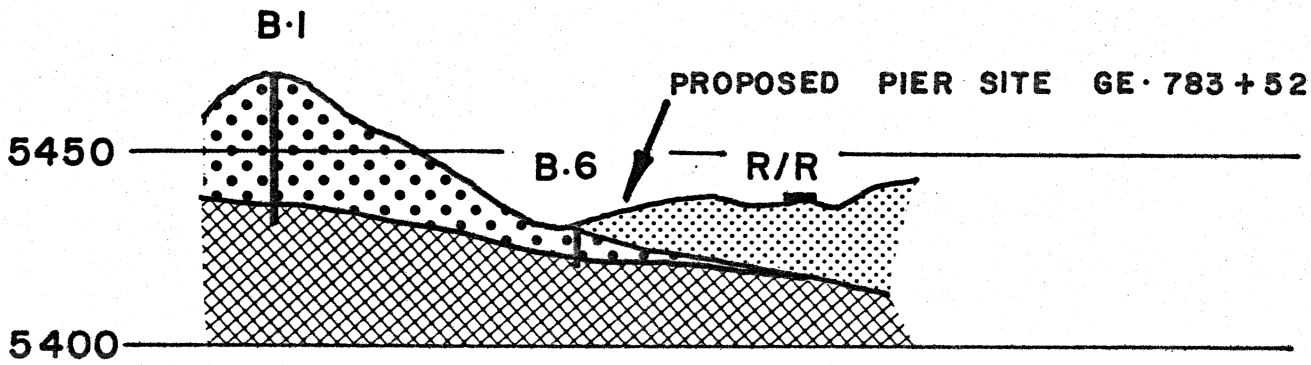
SILTY GRAVEL

R/R FILL

SCALE : 1" = 50' HORZ. AND VERT.



A·A′



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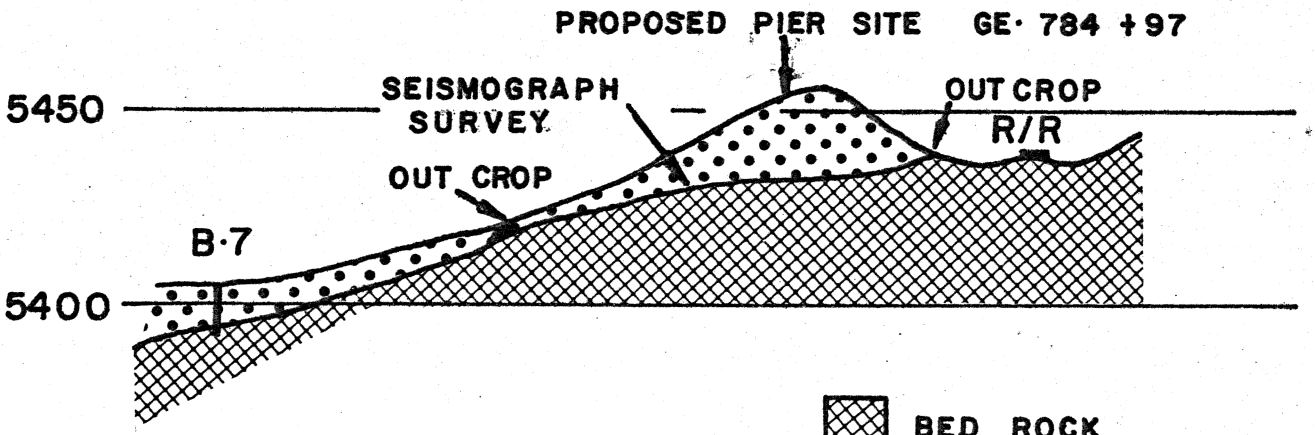


C·C′

BED ROCK

SILTY GRAVEL

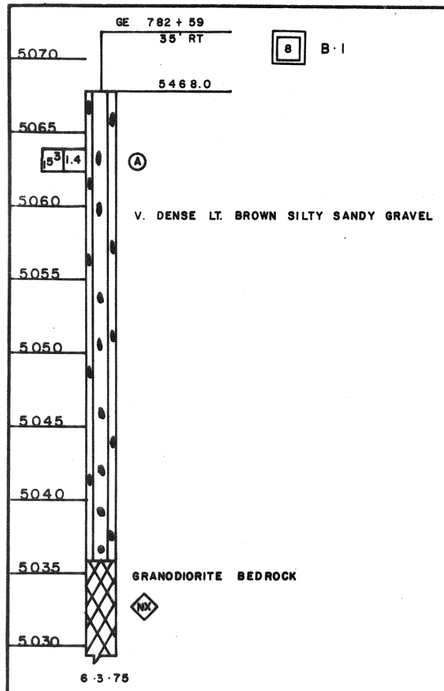
R/R FILL

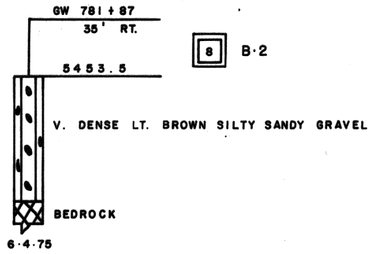
SCALE: 1" = 50' HOR. AND VERT

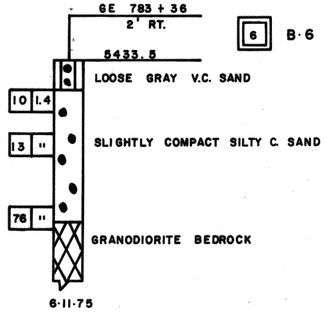
70071
CLIFFSIDE
CROSS SECTIONS

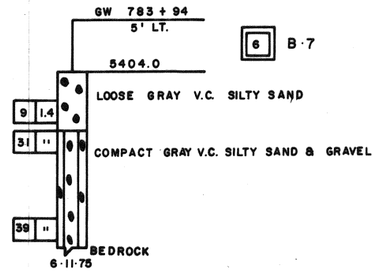
FED. ROAD DEMO. NO.	STATE	PROJECT NO.	MILE POST	SHEET NO.
9	NEVADA			

NOTE:
Foundation Report Available For Contractors Study In District Office & Materials & Testing Div.

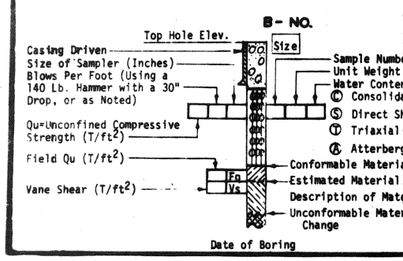




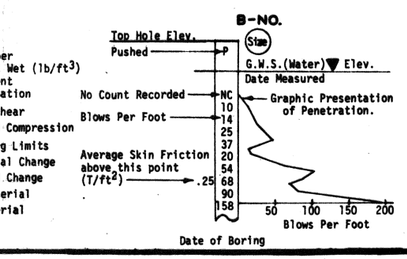




ROTARY BORING



PENETRATION BORING



- PLAN OF ANY BORING
- PENETROMETER (FLUSH-COUPLED)
- 2 " CONE PENETROMETER
- SAMPLER BORING (DRY) (Size)
- ROTARY BORING (WET) (Size)
- AUGER BORING (DRY) (Size)
- JET BORING (Size)
- DIAMOND CORE BORING. (Size)
- 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"=3-1/2".

THE UNIFIED SOIL CLASSIFICATION SYSTEM

MAJ. DIV.		LETTER	SYMBOL	NAME
Coarse Grained 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- Clay Mixtures

MAJ. DIV.		LETTER	SYMBOL	NAME
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 or 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 or 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 1-3/8" I.D. Sampler).

DWN. R.R.R.
CHK. BR
DATE. 7/16/75

NEVADA HIGHWAY DEPARTMENT — MATERIALS AND TESTING DIVISION

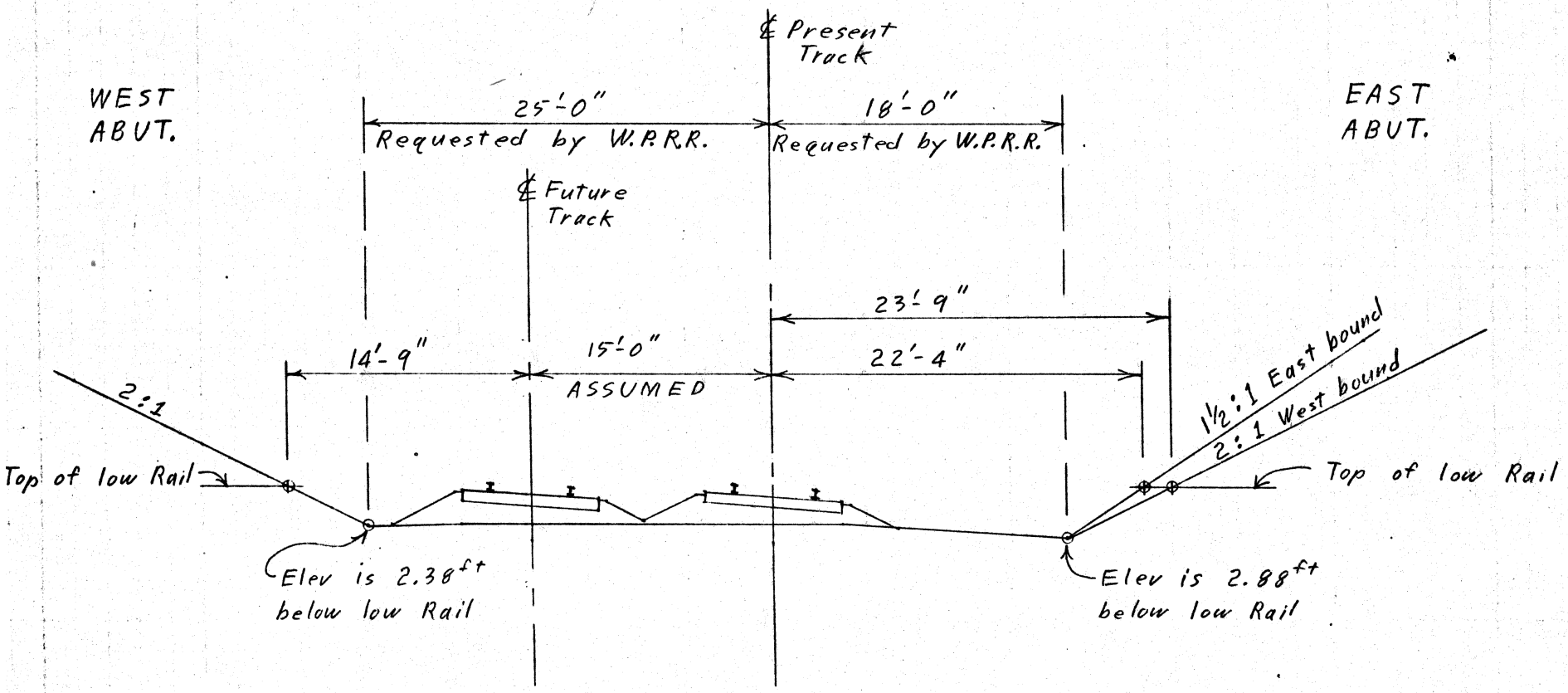
FOUNDATIONS AND ENGINEERING GEOLOGY SECTION

E.A. NO. 70071 PROJECT NO. _____ COUNTY ELKO

I-80 CLIFFSIDE STRUCTURES

DWG. NO. 1

G-928 E/W, Cliffside W. P. R. R. Overpass

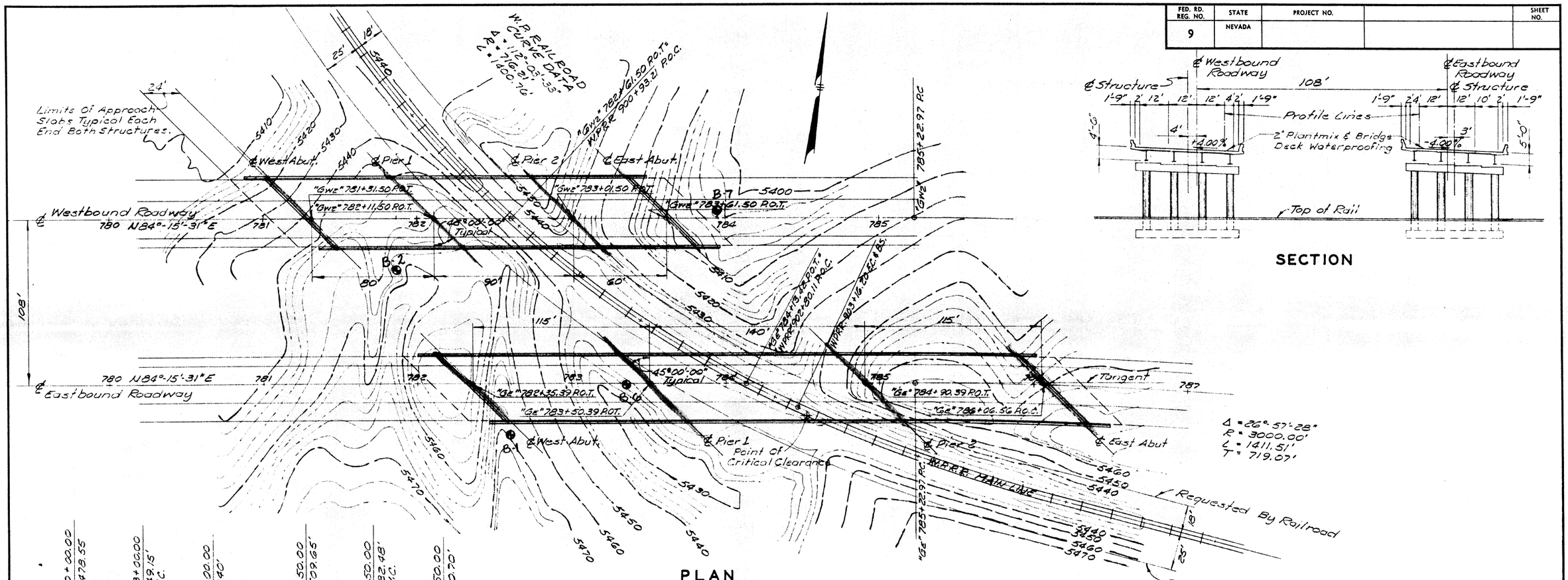


Normal To W. P. R. R.

STATE OF NEVADA
DEPARTMENT OF HIGHWAYS
STRUCTURAL DIVISION

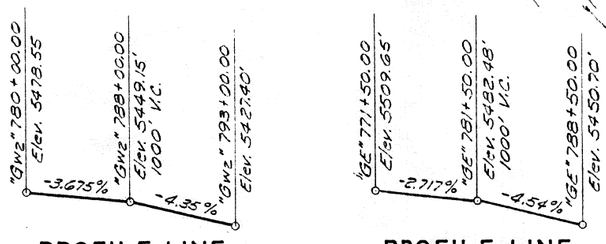
Cont. Job
E. A. No.
Structure No.
Name
Designed by
Checked by
Sheet No.
Date
Date

FED. RD. REG. NO.	STATE	PROJECT NO.		SHEET NO.
9	NEVADA			



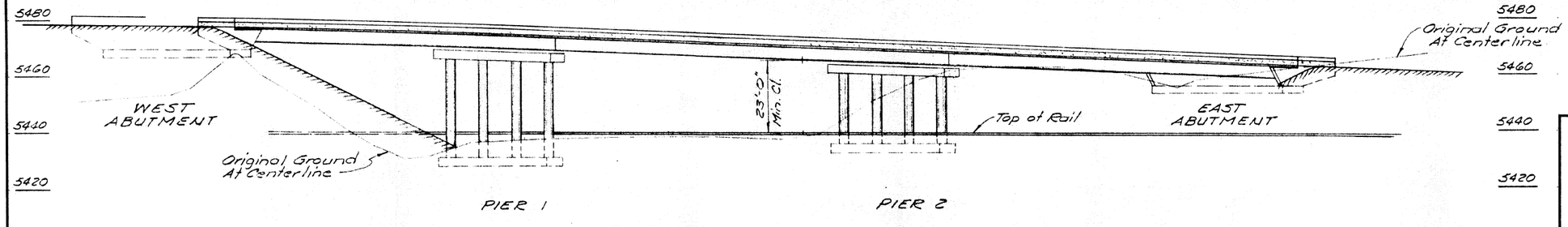
PLAN

SECTION



PROFILE LINE
"GW2" ROADWAY

PROFILE LINE
"GE" ROADWAY



ELEVATION
EASTBOUND STRUCTURE

BRIDGE DEPARTMENT	BY	DATE
DESIGN		
DRAWING	PRESTLEY	
TRACING		
CHECKED BY		
DATE		

PRELIMINARY
SUBJECT TO REVISION
NOV 26 1975

STATE OF NEVADA
DEPARTMENT OF HIGHWAYS

CLIFFSIDE
W.P.R.R. OVERPASS
(G-928 E&W)

6804