GEOLOGY OF THE SITE
THE STRUCTURE SITES ARE LOCATED ON THE GLACIATED, MODERATELY DISSECTED MISSISSIPPI VALLEY PLAIN, IN AN AREA WHERE SHALLOW GLACIAL DERIVED SOILS OVERLIE SHALE BEDROCK, OF MISSISSIPPIAN AGE.

EXPLORATION
THE EXPLORATION CONSISTED OF TWO DRIVE SAMPLE-CORE BORINGS AND SIXTEEN DRIVE ROD PENETRATION TESTS, MADE BETWEEN SEPTEMBER 23 AND 30, 1968.

INVESTIGATIONAL FINDINGS
BORINGS DISCLOSED STIFF TO VERY STIFF CLAYS OVERLYING BEDROCK SURFACE, ENCOUNTERED AT 10-FOOT DEPTHS, ELEVATIONS 905 AND 896 FEET. THE BORINGS WERE TERMINATED AT 25-FOOT DEPTHS, ELEVATIONS 890 AND 881 FEET, AFTER PENETRATING 15 FEET OF BEDROCK.

THE ROD SOUNDINGS ENCOUNTERED RAPID INCREASE IN PENETRATION RESISTANCE WITH INCREASE IN DEPTH, AND WERE TERMINATED DUE TO REFUSAL OR NEAR-REFUSAL TO PENETRATION AT 7 TO 13-FOOT DEPTHS, ELEVATIONS 909 TO 893 FEET, CONSIDERED TO BE ON BEDROCK SURFACE, AS REVEALED BY THE BORINGS.

NO FREE WATER WAS ENCOUNTERED IN ANY OF THE ROD SOUNDING HOLES.

IF IT IS THE INTENTION TO FOUND SUBSTRUCTURE UNITS ON BEDROCK, IT IS CONSIDERED ADVISABLE THAT THE OPEN EXCAVATIONS BE INSPECTED IN THE FIELD, IN ORDER TO INSURE THAT THE EXCAVATIONS HAVE BEEN EXTENDED TO ROCK THROUGHOUT THE ENTIRE FOUNDING AREA. IT IS FURTHER SUGGESTED THAT THE AREA OF THE FOOTING CONTACT NOT BE SUBJECTED TO PROLONGED ATMOSPHERIC EXPOSURE, AND THAT THE EXCAVATIONS BE WELL DRAINED AT ALL TIMES.

UNCONFINED COMPRESSION TESTS ON SIMILAR SHALE BEDROCK INDICATE A CRUSHING STRENGTH ON THE ORDER OF 100 TONS PER SQUARE FOOT.

LEGEND

- Auger Boring Location - Plan View.
- Press and / or Drive Sample and / or Core Boring Location - Plan View.
- Drive Rod Penetration Resistance Sounding Location - Plan View.
- Capped Pile
- Footing
- Footing on Pile
- TR — Top of Rock
- Horizontal Bar on Boring Log Indicates the Depth the Sample Was Taken.
- X/Y — Figures Beside the Boring Log in Profile Indicate the Number of Blows for Standard Penetration Test.
  X = Number of Blows for First 6 inches.
  Y = Number of Blows for Second 6 inches.
- Drive Rod Penetration Resistance Sounding Log - Profile
- Casing
- Resistance "R" < 10,000 lbs.
- Resistance "R" > 10,000 lbs.
- Z — Indicates Final Measurement of Penetration, in Inches.
- W — Indicates Free Water Elevation.
- Indicates Static Water Elevation.

SYMBOLS OF ROCK TYPES

- Coal
- Weathered Indurated Clay
- Indurated Clay
- Weathered Shale
- Shale
- Weathered Sandstone
- Sandstone
- Leached Dolomite
- Dolomite
- Leached Limestone
- Limestone

GENERAL INFORMATION

Drive Rod Penetration Sounding Tests

Drive rod penetration resistance tests constitute driving a 1.315-inch diameter steel rod, with a 45° cone point, into the ground, using a 122-pound drop-hammer with a free fall of five feet. At one or two-foot depth intervals, a measurement is taken to determine the amount of penetration achieved in three hammer drops. This reading is converted to an empirical value for capacity "R", in thousands of pounds (which is a measure of both the point resistance and frictional resistance on the rod), by using charts prepared by the Ohio Department of Highways, Bureau of Bridges, on the basis of correlation study of rod penetration with past performance of pile driving. For interpretation, a graph is prepared by plotting the value "R" against the depth at which the reading was taken, and connecting the plotted points. The curve so obtained reflects the density of subsurface materials in a manner that can be readily compared with data from similar tests at other locations on the structure site. From this comparison, the overall uniformity of subsurface condition may be evaluated.

Drive Sample Borings - Drive-Press Sample Borings

Drive sample borings are made by means of a rotary-type drill rig, employing a 2" O.D., 1-3/8" I.D. sampler, at 2-1/2 and / or 5-foot depth intervals, driven by means of a 140 - pound drop-hammer with a free fall of 30 inches. The number of blows required to drive the sampler 12 inches is considered the standard penetration test.

Drive-press sample borings are made by means of a rotary-type drill rig, employing a 2" O.D., 1-3/8" I.D. drive sampler, and 3" O.D. thin-wall press sampler. The press sampler is advanced by continuous uniform pressure, applied by the drill rig.

The boring log sheets show a graphic plot of the information obtained, including depth and elevation of the sample, number of blows for the standard penetration tests in two 6-inch increments, depth of press samples, field sample number, sample description - based on laboratory tests and the Casagrande AC classification system-and gradation, plasticity, and moisture content determinations. Results of strength and consolidation testing, if performed, appear on separate enclosures.

At depths where materials are bouldery or gravelly to the extent that the sampler can not be driven, a wash sample is procured for visual classification, in order to determine the general character of the material. These samples are not considered sufficiently representative to warrant laboratory testing.

Particle Size Definitions

Boulders	Cobbles	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	8"	3"	2.0mm (No. 10 sieve)	0.42mm (No. 40 sieve)	0.074mm (No. 200 sieve)	0.005mm

LOG OF BORING

Date Started 9-26-68 | Sampler Type SS | Dia. 1 3/8" | Water Elev. —
Date Completed 9-26-68 | Casing: Length — | Dia. —
Boring No. B-2 | Station & Offset 1117+21, 60' Lt. (Rear Abutment) | Surface Elev. 915.4'

Elev.	Depth	Std. Pen. (N)	Rec. ft.	Loss ft.	Description	Sample No.	Physical Characteristics: % Agg.	% C.S.	% F.S.	% Silt	% Clay	L.L.	P.I.	W.C.	SHTL Class.
915.4	0														
	2														
	4														
910.4	6	7/11			Brownish-Gray Silt and Clay	1	0	3	3	40	54	39	14	19	A-6a
	8														
905.4	10				TOP OF WEATHERED ROCK										
904.8		50* (0.6')			Brownish-Gray Weathered Clay Shale	2	43	2	3	21	31	36	11	14	Visual
	12				TOP OF ROCK										
	14		1.9	2.5	Clay Stone, weathered, gray-brown, soft, moist, shaly in part. Core Loss 58%.										
900.4	16														
	18		4.5	0.5											
	20				Shale, dark-gray, very platy and fissile, clayey in part. Core Loss 7%.										
	22		4.8	0.2											
890.4	24				BOTTOM OF BORING										

*Refusal

LOG OF BORING

Date Started 9-26-68 | Sampler Type SS | Dia. 1 3/8" | Water Elev. —
Date Completed 9-26-68 | Casing: Length — | Dia. —
Boring No. B-23 | Station & Offset 1120+79, 81' Rt. (Forward Pier) | Surface Elev. 906.2'

Elev.	Depth	Std. Pen. (N)	Rec. ft.	Loss ft.	Description	Sample No.	Physical Characteristics: % Agg.	% C.S.	% F.S.	% Silt	% Clay	L.L.	P.I.	W.C.	SHTL Class.
906.2	0														
	2														
	4														
901.2	6	5/9			Brownish-Gray Gravelly Clay	1	22	3	9	34	32	32	14	19	A-6a
	8														
896.2	10				TOP OF WEATHERED ROCK										
		50* (0.9')			Brownish-Gray Weathered Clay Shale	2	24	0	1	41	34	35	12	12	Visual
893.2	12														
	14		1.9	2.9	TOP OF ROCK										
	16														
	18		4.1	0.9	Shale, dark-gray, weathered at the top, clayey in part, silty and hard toward bottom of unit. Core Loss 8%.										
	20														
	22		5.0	0.0											
881.2	24				BOTTOM OF BORING										

*Refusal

NOTE: Information shown by this subsurface investigation was obtained solely for the use in establishing design controls for the project. The State of Ohio does not guarantee the accuracy of this data and it is not to be construed as a part of the plans governing construction of the project.

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STRUCTURE FOUNDATION INVESTIGATION
BRIDGE NO. CUY-480-2071 L/R
OVER GRANGER ROAD
SEC. CUY-480-19.43

CHECKED BY	REVIEWED BY	DATE
L.N.L.	R.D.R.	10/30/68