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GEOCRES No. 30M5-112

DIST. 4 REGION

W.P. No. 159-75-05

CONT. No. 78-104

W. O. No.

STR. SITE No. 10-140A

HWY. No. 403/Q.E.W

LOCATION Hwy 403/Ford Dr./
Q.E.W. Int.

No. of Pages -

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT.

REMARKS:

Regional Structural Design Office
West Building, Downsview

Soil Mechanics Section
Engineering Materials Office
West Bldg., Downsview

Mr. W. Lin
Regional Structural Design Engineer

1978 02 06

Re: Joshua Creek
Culvert Extension
N-N & N-W Ramps, Hwy. 403
M.P. 159-75-05, Site 10-140A
District #4

We have reviewed the preliminary bridge Plan Drawing P1 dated January 1978 and have the following comments:

1. Any obstruction to the free flow of water at or near the culvert entrance should be avoided.

2. A 3-foot thick blanket of approved impermeable material (clay) should be placed as a sealer behind the 2 foot rip-rap, at inlet to culvert.

3. A 8-foot thick blanket of granula 'A' material should be placed as a filter behind the 2 foot rip-rap, around outlet to culvert.

4. Only granular 'B' material should be used for backfill purposes.

5. Any surficial organic material should be subexcavated prior to placing the bedding material for the culvert.

V. Korlu
Project Engineer

For: M. Devata
Supervising Engineer

MD/VK/eh

cc: Files

ENGINEERING MATERIALS OFFICE
SOIL MECHANICS SECTION

WP ~~159-75-05~~ 125-66-20 DIST 4

HWY 403 STR SITE 10-140A

Extension to Joshuas Creek Arch Structure
and Proposed Stream Realignment

DISTRIBUTION

G.C.E. Burkhardt (3)
R.D. Gunter
M.R. Ernesaks
D.E. Thrasher (2)

C. Grebski
G.A. Wrong
B.J. Giroux
R.S. Pillar

R. Hore

R. Fitzgibbon)
J. Anderson) cover only
G. Sloan)

Files ✓

GEOCRES 30M05-112 DATE JUL 12 1977

FOUNDATION INVESTIGATION REPORT

For

Extension to Joshuas Creek Arch Structure
and Proposed Stream Realignment
QEW/403/Ford Drive Interchange
W.P. ~~159-75-05~~, Site 10-140A
District 4, Hamilton

125-66-20

INTRODUCTION

This report contains the results of a foundation investigation performed by the Soil Mechanics Section at the site of the above mentioned project. Fieldwork was carried out during June 17 to June 21, 1977, using 3¼" hollow stem, continuous flight augers and BXL coring techniques to advance 4 boreholes to depths ranging from 10 to 17 feet below ground surface.

SITE DESCRIPTION AND GEOLOGY

The site is immediately west of QEW, about ¼ mile south of the Ford Drive underpass, in the Regional Municipality of Halton, Town of Oakville.

Runoff from QEW drains into Joshuas Creek through catch-basins and grass covered ditches. In this area the creek meanders southeasterly in a steep-sided valley (slopes about 1:1), 15 to 25 feet deep, and appears to have eroded at least 10 feet into the bedrock, as evidenced by outcrops on the north valley sides. The sides of the creek in the vicinity of QEW are protected from erosion with gabion walls. The surrounding land is wooded, with a house, stable and kennel located at the top of the south valley embankment.

The creek bed is strewn with gravel and cobbles. Water flow through the creek during the fieldwork was estimated to be less than one cubic foot per minute.

SUBSURFACE CONDITIONS

General

Borings were put down adjacent to the existing Joshuas Creek within the Ministry's property limits because of property restrictions as discussed in the Appendix. The locations of the borings are shown in Dwg. No. 1597505-A. In the area investigated, shale bedrock was found to exist under a layer of cobbles and gravels of variable thickness, up to 4 feet thick at certain locations. The shale bedrock was investigated to a maximum depth of 16½ feet. In the vicinity of the existing structure, an isolated pocket of silty clay about 2 feet thick was found sandwiched between the cobble layer and the shale bedrock at a depth of 2 feet below the ground surface. A description of the soil types and bedrock is given below.

Cobbles and Gravel

Some of this material appears to have been transported to the site by Joshuas Creek and some derived from erosion of the valley sides. The thickness of this material is extremely variable, ranging from a few scattered cobbles up to 4 feet thick in places. While gravel was found in the waterway as well as on the flood plains on either side of the creek, cobbles were found mainly in the creekbed.

Silty Clay

This material was encountered in one isolated location in the vicinity of the existing structure. It has a thickness of up to 2 feet and is sandwiched between the cobble-gravel layer and shale bedrock, at a depth of 2 feet below ground surface.

Shale Bedrock

Bedrock is a shale with frequent horizontal limestone beds. The shale layers are more predominant and they consitute up to 85% of the bedrock. The shale is soft and fissile, with a fine texture and closely spaced horizontal bedding. The limestone layers are randomly spaced and are generally 2 to 8 inches thick, and pitted with calcite vugs. The upper 2 feet of the shale is badly weathered.

Rock Quality Designation (RQD) is used to judge the engineering quality of the bedrock. According to the low values of RQD recorded here, which generally vary from 20% to 50%, the quality of the shale bedrock is considered to be generally poor.

A detailed description of the bedrock given by Mr. B. Glassford, Geologist for M.T.C., is enclosed in the Appendix.

GROUNDWATER CONDITIONS

Groundwater level is controlled by the creek water level. For construction purposes, the groundwater level can be assumed equal to the prevailing water level in the creek.

DISCUSSION AND RECOMMENDATIONS

General

It is proposed to extend the existing barrel arch, concrete structure and realign the Joshuas Creek at this site, as part of the new interchange complex connecting QEW to Hwy. 403 Link. The design proposal submitted to us calls for an extension similar to the existing structure and for the realignment of the creek to extend for a distance of about 400 feet to the west. Recommendations pertaining to these proposals are as follows:

Structure Foundations

The culvert extension together with the associated wing walls can be supported on spread footings founded within the shale bedrock at the same elevation as the existing footings (elevation 390.5). For design purposes an allowable bearing pressure up to 7.5 tsf can be assumed. As the shale is considered susceptible to frost action, a 4 foot earth cover or equivalent insulation should be provided to the base of the foundation.

In the immediate vicinity of the existing structure, the shale bedrock may have been exposed and deteriorated during construction of the existing structure. In view of this, it is recommended that the footing base for the proposed extension be inspected to determine the existence of any badly weathered material prior to construction of the footing. If badly deteriorated material is found, it should be subexcavated and immediately brought up to the footing formation level with mass concrete. The shale in this area is very susceptible to softening by moisture, therefore the footing base should be covered with a 3 inch working slab of lean concrete immediately after excavation and inspection.

Dewatering will be required during construction of the foundations. One method of achieving this is by constructing an impervious earth dyke enclosing the footing area and diverting the creek temporarily during construction.

Stream Realignment

Due to property access problems, the borings for the proposed realignment could only be located within the Ministry's property limits, at a distance from the relocated Joshuas Creek. Further field investigations will therefore be required in order to obtain the pertinent subsurface data for the design and construction of the creek realignment. The additional fieldworks will be carried out when the property access problems are resolved. The following recommendations are provided for preliminary studies only.

The excavation of the proposed creek realignment will be to a maximum depth of about 7 to 8 feet. It is estimated from the available data that most of the excavation will be carried out in the shale bedrock.

In most places temporary slopes (during construction) can be maintained at 1:1, and final slopes at 1½:1 for long term stability and for maintenance considerations. At one location however, the realigned Joshuas Creek is within close proximity of the toe of a high existing embankment. Further fieldwork will be required in order to assess the overall stability of the geometry resulting from excavation for the creek realignment. For preliminary studies, it can be assumed that the slope in this particular area will be stable with a 2:1 slope.

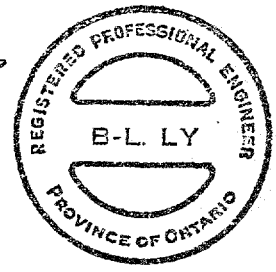
MISCELLANEOUS

The fieldwork was carried out under the supervision of Mr. J. White.
The equipment was owned and operated by Johnston Drilling Company Ltd.

This report was prepared by Mr. J. White and reviewed by Mr. B. Ly

James R. White

J. White
Student Technician



B. Ly

B. Ly
Senior Engineer

JW/BL/kr
July, 1977

FOUNDATION REQUEST

In memoranda dated May 17, 1977 and June 2, 1977, Mr. G.C.E. Burkhardt, Head, Structural Section, requested the Soil Mechanics Section to prepare a Foundation Investigation Report for the Extension to the Joshuas Creek Arch Structure and proposed Realignment of Joshuas Creek, respectively.

PROPERTY RESTRICTIONS

The realigned Joshuas Creek will be located within the Sachau Property south of the existing Joshuas Creek alignment. In our preparation for the fieldwork, this Section contacted the owners to request permission to enter their property in order to carry out the fieldwork. This Section was subsequently advised by the owners' attorney that the requested permission would not be granted. When this Section consulted with the Region regarding access to the site we were advised by them that at this stage all Ministry personnel should stay clear of the Sachau property. Because of this, all borings were put down within the Ministry's property limits which were outlined by the Region. This Section brought it to the Region's attention that further field investigations would be required and that these investigations would be carried out when the property access problems are resolved.

Ontario Communications

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

125-66-20

RECORD OF BOREHOLE No 17

W P ~~159-75-05~~ LOCATION Co-ords. N 15,803,222; E 953,842 ORIGINATED BY JRW

DIST 4 HWY 403 BOREHOLE TYPE Hollow Stem Augering - BXL Core COMPILED BY JRW

DATUM Geodetic DATE June 17, 1977 CHECKED BY R.S

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES 'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE)	PLASTIC LIMIT Wp / NATURAL MOISTURE CONTENT W / LIQUID LIM. WL — WATER CONTENT (%)	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
393.7	Creek Bottom										
391.7	Cobbles and gravel										
2.0											
389.7	Silty clay some sand		1	AS	-		390				
			2	AS	-						
			3	SS	109						
4.0	Bedrock										
	80% Shale-Soft & weathered		4	RC	Rec 60%						RQD 50%
	Frequent laminations of limestone		5	RC	Rec 75%		380				RQD 20%
	Up to 8" thick										
376.8			6	RC	Rec 80%						RQD 20%
16.9	End of Borehole										

+3, x5 : Numbers refer to Sensitivity

20
15 ◇ 5 (%) STRAIN AT FAILURE
10

125-66-20

RECORD OF BOREHOLE No 18

W P ~~150-75-05~~ LOCATION Co-ords. N 15,803,247; E 953,804 ORIGINATED BY JRW

DIST 4 HWY 403 BOREHOLE TYPE Hollow Stem Augering - BX Coring COMPILED BY JRW

DATUM Geodetic DATE June 17 & 20, 1977 CHECKED BY RFS

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE)	PLASTIC LIMIT W_P / NATURAL MOISTURE CONTENT W / LIQUID LIMIT W_L — WATER CONTENT (%)	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES						GR SA SI CL
395.2	Creek Bottom										
393.4	Cobbles & gravel										
1.8	Bedrock		1	RC	60%						RQD 50%
	85% Shale-Soft & weathered Frequent laminations of lime-		2	RC	50%		390				RQD 35%
			3	RC	Rec 95%						
385.3	stone up to 8" thick										RQD 80%
9.9	End of Borehole										

$+^3$, $\times^5$: Numbers refer to Sensitivity

20 / 15 ⊙ 5 / 10 (%) STRAIN AT FAILURE

125-66-20

RECORD OF BOREHOLE No 19

W P ~~159-75-85~~ LOCATION Co-ords. N 15,803,500; E 953,533 ORIGINATED BY JRW

DIST 4 HWY 403 BOREHOLE TYPE Solid Stem & Hollow Stem Augering COMPILED BY JRW

DATUM Geodetic DATE June 21, 1977 CHECKED BY KS

SOIL PROFILE ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES 'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE)	PLASTIC LIMIT Wp / NATURAL MOISTURE CONTENT W / LIQUID LIMIT WL — WATER CONTENT (%)	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
399.0	Creek Bottom										
397.5	Cobbles & gravel										
1.5	Bedrock Soft weathered shale with Frequent Limestone laminations		No sampling				390				
389.2											
9.8	End of Borehole Note: Stratigraphy inferred from augering.										

$+^3$, $\times^5$: Numbers refer to Sensitivity

20 / 15 ◇ 5 / 10 (%) STRAIN AT FAILURE

126-65-20

RECORD OF BOREHOLE No 20

W P 159-75-05 LOCATION Co-ords. N 15,803,245; E 953,727 ORIGINATED BY JRW

DIST 4 HWY 403 BOREHOLE TYPE Hollow Stem Augering COMPILED BY JRW

DATUM Geodetic DATE June 21, 1977 CHECKED BY [illegible]

ELEV / DEPTH	SOIL PROFILE DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES 'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE)	PLASTIC LIMIT Wp / NATURAL MOISTURE CONTENT W / LIQUID LIMIT WL — WATER CONTENT (%)	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
395.6	Creek Bottom										
0.0 392.1	Cobbles & gravel										
3.5 386.1	Bedrock Soft weathered shale with frequent limestone laminations		No sampling				390				
9.5	End of Borehole Note: Stratigraphy inferred from augering										

+3, ×5 : Numbers refer to Sensitivity

20
15 ◇ 5 (%) STRAIN AT FAILURE
10

Ministry of Transportation and Communications
Ontario

DIAMOND DRILL RECORD

HOLE NO. ____ SHEET NO. ____

125-66-20

PROPERTY ~~W.P. 150-75-05~~
LOCATION QEW and Ford Drive
Joshuas Creek
LATITUDE
DEPARTURE
BEARING

DIP
90°

TOTAL FOOTAGE

ELEV. COLLAR
DATUM
DATE STARTED
DATE COMPLETED
DRILLED BY
LOGGED BY

FOOTAGE FROM	FOOTAGE TO	FORMATION	SAMPLE NUMBER	% Shale		REMARKS
		HOLE #17				
5'0"	5'6"	Shale, soft, dark grey, fine texture, fissile.		80%		RQD 5%
5'6"	6'2"	Limestone, soft, light grey, fine texture.				RQD 90%
6'2"	16'8"	Shale and limestone beds, broken and missing core				RQD 5%
		8" limestone at 13' pitted with calcite vugs				
		6" limestone at 12' pitted with calcite vugs				
		4" limestone at 15'6" pitted with calcite vugs				
		HOLE #18				
1'8"	9'7"	Shale, soft, dark grey, fine texture, fissile, broken and ground core throughout entire length of core.		85%		RQD 10%
		5" limestone at 2'6" pitted with calcite vugs				
		2" limestone at 3'0"				
		3" limestone at 5'0"				
		3" limestone at 5'8"				
		8" limestone at 8'10"				

DATE OF EXAMINATION June 28, 1977

B. K. Glassford

08-MT-113

ABBREVIATIONS & SYMBOLS USED IN THIS REPORT

PENETRATION RESISTANCE

'N' STANDARD PENETRATION RESISTANCE :- THE NUMBER OF BLOWS REQUIRED TO ADVANCE A STANDARD SPLIT SPOON SAMPLER 12 INCHES INTO THE SUBSOIL, DRIVEN BY MEANS OF A 140 POUND HAMMER FALLING FREELY A DISTANCE OF 30 INCHES.

DYNAMIC PENETRATION RESISTANCE :- THE NUMBER OF BLOWS REQUIRED TO ADVANCE A 2 INCH, 60 DEGREE CONE, FITTED TO THE END OF DRILL RODS, 12 INCHES INTO THE SUBSOIL. THE DRIVING ENERGY BEING 350 FOOT POUNDS PER BLOW.

DESCRIPTION OF SOIL

THE CONSISTENCY OF COHESIVE SOILS AND THE RELATIVE DENSITY OR DENSENESS OF COHESIONLESS SOILS ARE DESCRIBED IN THE FOLLOWING TERMS :-

CONSISTENCY	c LB./SQ FT
VERY SOFT	0 - 250
SOFT	250 - 500
FIRM	500 - 1000
STIFF	1000 - 2000
VERY STIFF	2000 - 4000
HARD	> 4000

DENSENESS	'N' BLOWS / FT.
VERY LOOSE	0 - 4
LOOSE	4 - 10
COMPACT	10 - 30
DENSE	30 - 50
VERY DENSE	> 50

TERMS TO BE USED IN DESCRIBING SOILS :-

TRACE < 10 % , SOME 10 - 25 % , WITH 25 - 40 % , > 40 % SILTY, SANDY, GRAVELLY, CLAYEY ETC.

TYPE OF SAMPLE

S.S	SPLIT SPOON	T.W.	THINWALL OPEN
W.S.	WASHED SAMPLE	T.P.	THINWALL PISTON
S.T.	SLOTTED TUBE SAMPLE	O.S	OESTERBERG SAMPLE
A.S.	AUGER SAMPLE	F.S	FOIL SAMPLE
C.S	CHUNK SAMPLE	R.C.	ROCK CORE

P.H SAMPLE ADVANCED HYDRAULICALLY

P.M SAMPLE ADVANCED MANUALLY

SOIL TESTS

U	UNCONFINED COMPRESSION	L.V.	LABORATORY VANE
UU	UNCONSOLIDATED UNDRAINED TRIAXIAL	F.V.	FIELD VANE
CIU	CONSOLIDATED ISOTROPIC UNDRAINED TRIAXIAL	C	CONSOLIDATION
CID	" " DRAINED "	S	SENSITIVITY
CAU	" ANISOTROPIC UNDRAINED "		
CAD	" " DRAINED "		

ABBREVIATIONS & SYMBOLS USED IN THIS REPORT

SOIL PROPERTIES

γ	UNIT WEIGHT OF SOIL (BULK DENSITY)
γ_s	UNIT WEIGHT OF SOLID PARTICLES
γ_w	UNIT WEIGHT OF WATER
γ_d	UNIT DRY WEIGHT OF SOIL (DRY DENSITY)
γ'	UNIT WEIGHT OF SUBMERGED SOIL
G	SPECIFIC GRAVITY OF SOLID PARTICLES $G = \frac{\gamma_s}{\gamma_w}$
e	VOID RATIO
n	POROSITY
w	WATER CONTENT
S_r	DEGREE OF SATURATION
w_L	LIQUID LIMIT
w_P	PLASTIC LIMIT
I_P	PLASTICITY INDEX
w_S	SHRINKAGE LIMIT
I_L	LIQUIDITY INDEX $= \frac{w - w_P}{I_P}$
I_C	CONSISTENCY INDEX $= \frac{w_L - w}{I_P}$
e_{max}	VOID RATIO IN LOOSEST STATE
e_{min}	VOID RATIO IN DENSEST STATE
I_D	DENSITY INDEX $= \frac{e_{max} - e}{e_{max} - e_{min}}$
	RELATIVE DENSITY D_r IS ALSO USED
h	HYDRAULIC HEAD OR POTENTIAL
q	RATE OF DISCHARGE
v	VELOCITY OF FLOW
i	HYDRAULIC GRADIENT
k	COEFFICIENT OF PERMEABILITY
j	SEEPAGE FORCE PER UNIT VOLUME
m_v	COEFFICIENT OF VOLUME CHANGE $= \frac{-\Delta e}{(1+e)\Delta \sigma'}$
c_v	COEFFICIENT OF CONSOLIDATION
C_c	COMPRESSION INDEX $= \frac{\Delta e}{\Delta \log_{10} \sigma'}$
T_v	TIME FACTOR $= \frac{c_v t}{d^2}$ (d, DRAINAGE PATH)
U	DEGREE OF CONSOLIDATION
τ_f	SHEAR STRENGTH
c'	EFFECTIVE COHESION INTERCEPT — IN TERMS OF EFFECTIVE STRESS $\tau_f = c' + \sigma' \tan \phi'$
ϕ'	EFFECTIVE ANGLE OF SHEARING RESISTANCE, OR FRICTION — IN TERMS OF EFFECTIVE STRESS $\tau_f = c' + \sigma' \tan \phi'$
c_u	APPARENT COHESION — IN TERMS OF TOTAL STRESS $\tau_f = c_u + \sigma \tan \phi$
ϕ_u	APPARENT ANGLE OF SHEARING RESISTANCE, OR FRICTION — IN TERMS OF TOTAL STRESS $\tau_f = c_u + \sigma \tan \phi$
μ	COEFFICIENT OF FRICTION
S_t	SENSITIVITY

GENERAL

π	= 3.1416
e	BASE OF NATURAL LOGARITHMS 2.7183
$\log_e a$ OR $\ln a$	NATURAL LOGARITHM OF a
$\log_{10} a$ OR $\log a$	LOGARITHM OF a TO BASE 10
t	TIME
g	ACCELERATION DUE TO GRAVITY
V	VOLUME
W	WEIGHT
M	MOMENT
F	FACTOR OF SAFETY

STRESS AND STRAIN

u	PORE PRESSURE
σ	NORMAL STRESS
σ'	NORMAL EFFECTIVE STRESS ($\bar{\sigma}$ IS ALSO USED)
τ	SHEAR STRESS
ε	LINEAR STRAIN
γ	SHEAR STRAIN
ν	POISSON'S RATIO (μ IS ALSO USED)
E	MODULUS OF LINEAR DEFORMATION (YOUNGS MODULUS)
G	MODULUS OF SHEAR DEFORMATION
K	MODULUS OF COMPRESSIBILITY
η	COEFFICIENT OF VISCOSITY

EARTH PRESSURE

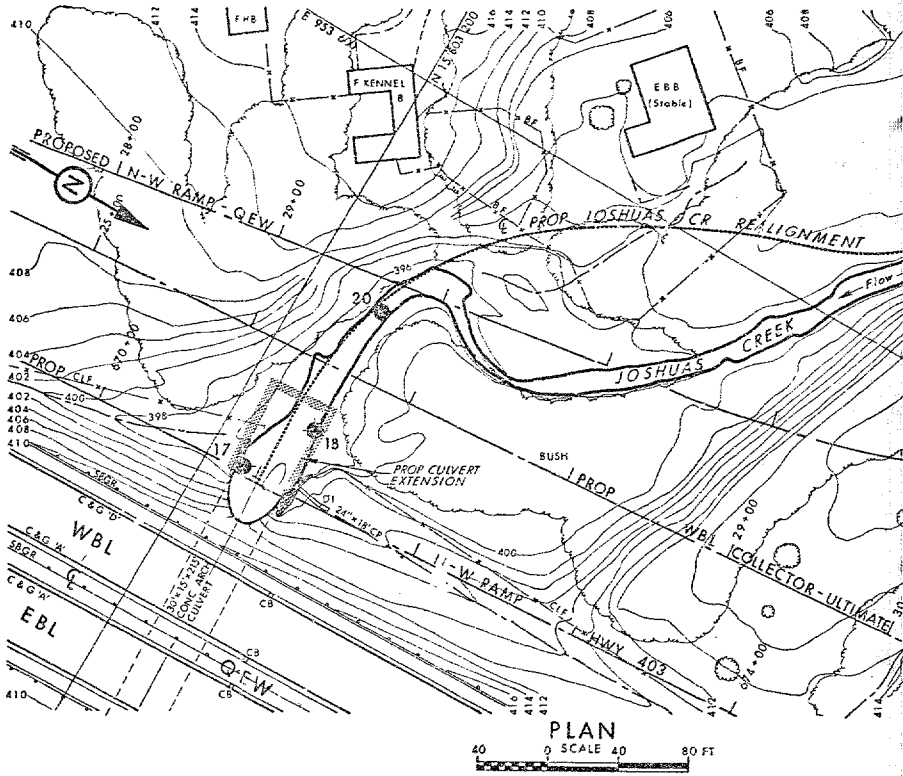
d	DISTANCE FROM TOP OF WALL TO POINT OF APPLICATION OF PRESSURE
δ	ANGLE OF WALL FRICTION
K	DIMENSIONLESS COEFFICIENT TO BE USED WITH VARIOUS SUFFIXES IN EXPRESSIONS REFERRING TO NORMAL STRESS ON WALLS
K_o	COEFFICIENT OF EARTH PRESSURE AT REST

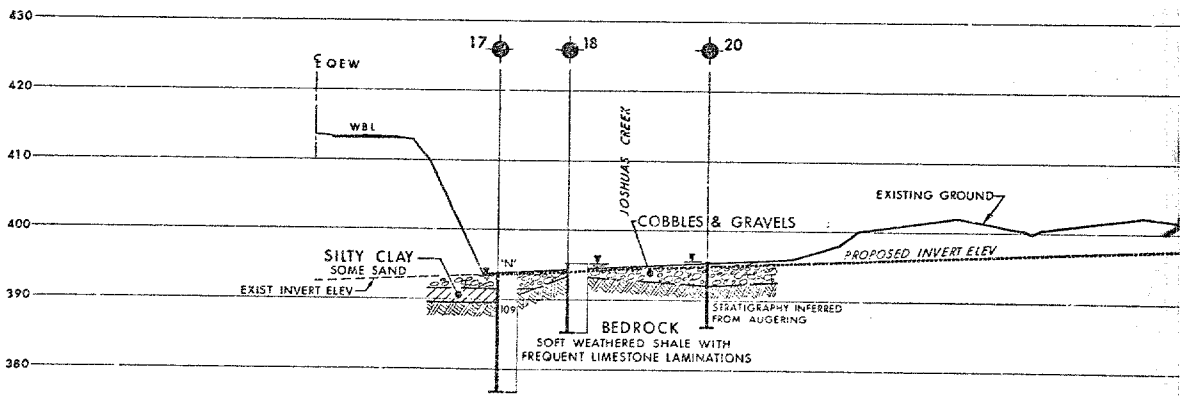
FOUNDATIONS

B	BREADTH OF FOUNDATION
L	LENGTH OF FOUNDATION
D	DEPTH OF FOUNDATION BENEATH GROUND
N	DIMENSIONLESS COEFFICIENT USED WITH A SUFFIX APPLYING TO SPECIFIC GRAVITY, DEPTH AND COHESION ETC IN THE FORMULA FOR BEARING CAPACITY
k_s	MODULUS OF SUBGRADE REACTION

SLOPES

H	VERTICAL HEIGHT OF SLOPE
D	DEPTH BELOW TOE OF SLOPE TO HARD STRATUM
β	ANGLE OF SLOPE TO HORIZONTAL





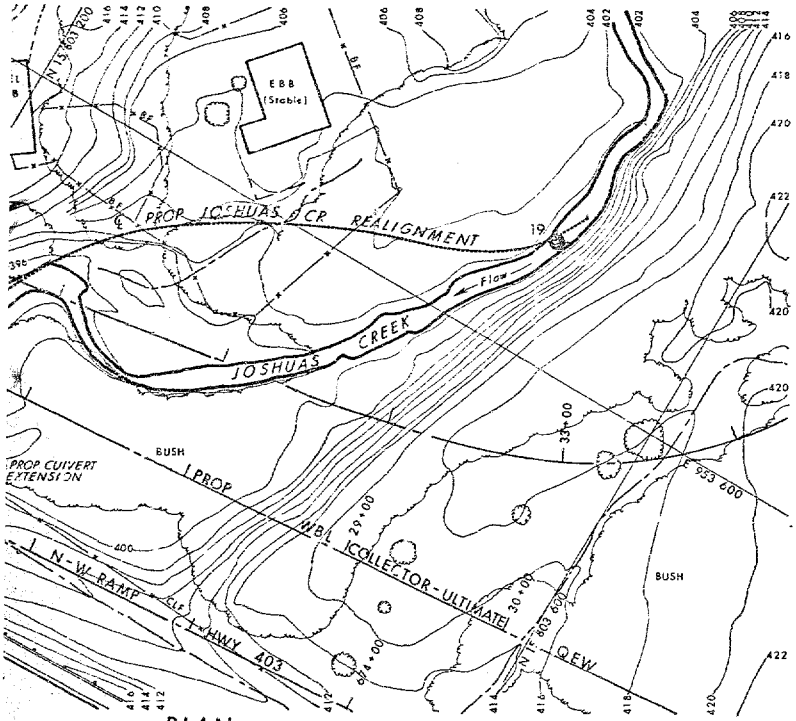
℄ PROFILE - PROPOSED JOSHUAS CREEK REALIGNMENT

HOR 40 0 SCALE 40 80 FT
VERT 10 0 10 20 FT

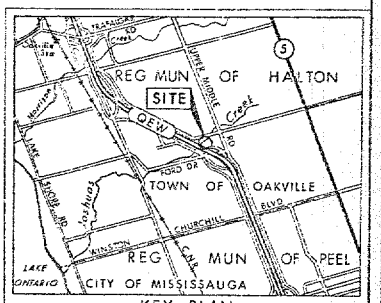
CONT No 125-66-20
WP No ~~159-75-05~~

PROP CULVERT EXTENSION & JOSHUAS CR REALIGNMENT
BORE HOLE LOCATIONS & SOIL STRATA

SHEET



PLAN
40 0 SCALE 40 80 FT

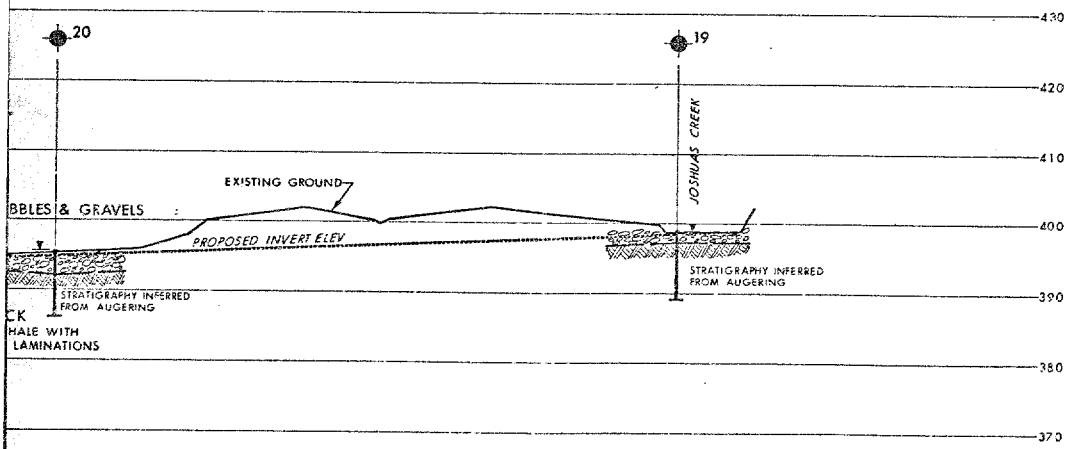


KEY PLAN
1 0.5 0 1 2 Miles

LEGEND

- Bore Hole
- Dynamic Cone Penetration Test (Cone)
- Bore Hole & Cone
- 'N' Blows/ft (Std Pen Test 350 ft lbs energy)
- CONE Blows/ft (60° Cone, 350 ft lbs energy)
- WL at time of investigation June 1977

No	ELEVATION	CO ORDINATES NORTH	EAST
17	393.7	15 803 222	953 842
18	395.2	15 803 247	953 804
19	399.0	15 803 500	953 533
20	395.6	15 803 245	953 727



-NOTE-
The boundaries between soil strata have been established only at Bore Hole locations. Between Bore Holes the boundaries are assumed from geological evidence.

PROPOSED JOSHUAS CREEK REALIGNMENT

HOR 40 0 SCALE 40 80 FT
VERT 10 0 10 20 FT

REF No B-82-QEW-2 Sept 1976

REVISIONS			
DATE	BY	DESCRIPTION	

HWY No 403 DIST 4
DRAWN R.V. CHECKED DATE July 15, 1977 SITE 10-140A
CHECKED DWG 51597505-A

Ministry of Transportation and Communications
Ontario

Memorandum

To: Mr. W. Lin
Design Engineer
Central Section, Structural Office
West Building, Downsview

From: Soil Mechanics Section
Engineering Materials Office
Room 315, Central Building

Attention:

Date: 78 05 31

Our File Ref.

In Reply to

Subject: Re: Joshua Creek Structure Extension
W.P. 125-66-20, Site 10-140A
Q.E.W., District 4, Hamilton

In response to your memorandum of 1978 03 29 we have reviewed the final drawings for the above structure and have the following comments to make.

At the time of the original fieldwork in June, 1977, the scope of the foundation investigation did not include the extension of Joshua Creek Culvert on the east side of the Q.E.W. A site visit made on 1978 05 25 by Mr. B. Ly of this office revealed the following condition on the east side of the Q.E.W. based on visual observations. The depth of the parent overburden is 3 to 4 feet consisting of up to 1 foot of topsoil overlying a 2 to 3 foot deposit of silty clay overlying weathered bedrock. On the north bank bedrock is exposed 3 to 4 feet above the floor of the existing concrete culvert (Reference Photo 1), whereas on the south bank weathered shale bedrock is exposed about 1 foot above the floor of the culvert (Reference Photo 2). The bedrock may be described as soft weathered shale with frequent limestone laminations. Immediately downstream of the concrete arch structure the creek widens slightly (Reference Photo 3 & 4) and it is not expected that excessive rock excavation will be required to construct the footings. Further observations indicate that the creek bed is strewn with gravel and cobbles.

For the extension to the west side the recommendations given in our report under Structure Foundations for Extension to Joshua Creek Arch Structure and Proposed Stream Realignment (W.P. 125-66-20) are equally applicable.

Furthermore, it is important to note, as discussed in the foundation report, that in the immediate vicinity of the structure the shale bedrock may have been exposed and deteriorated during construction of the existing structure. In view of this it is recommended that the footing base for the proposed extensions be inspected to determine the existence of any badly weathered material prior to construction of the footing. Any badly weathered material should be excavated and brought up to the

cont'd.....

footing founding level by means of mass concrete. In addition, the shale in this area is very susceptible to softening by moisture. Therefore, the footing base should be covered with a 3 inch thick working slab of lean concrete immediately after excavation and inspection.

We have no further comments to make at this time.

M Maclean

M. MacLean
Project Engineer

For: M. Devata
Supervising Engineer

MM/MD/gs

cc: G.C.E. Burkhardt
R.D. Gunter
M.R. Ernesaks
D.E. Thrasher

G.A. Wrong
B.J. Giroux
R.S. Pillar

R. Hore

Files ✓

Photographs
W.P. 125-66-20
Joshua Creek Culvert Extension
East Side

Photo 1 North Bank

Photo 2 South Bank

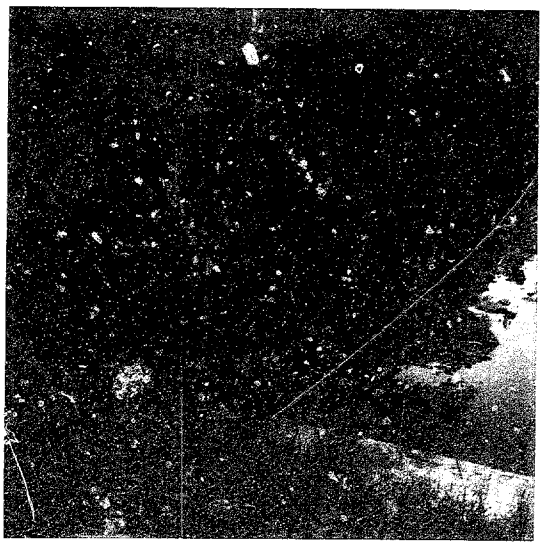


Photo 3 Looking Downstream
along North Bank

Photo 4 Looking Downstream
along South Bank

Ministry of Transportation and Communications
Ontario

Memorandum

To: Mr. C. Mirza,
Head,
Soil Mechanics Section,
West Building, Downsview

Attention:

From: G.C.E. Burkhardt,
Structural Section,
Central Region

Date: 1977-05-17

Our File Ref.

In Reply to

Subject: RE: Q.E.W./403/Ford Drive Interchange,
Extension to Joshua Creek Culvert,
Site 10-140A, W.P. 159-75-05

As part of the Q.E.W./403/Ford Drive Interchange the structure over Joshua Creek, Site 10-140A, will be extended. Originally the Halton Conservation Authority indicated that a new structure on a new alignment was required at this location. They have now given us permission to extend the existing culvert, which will be a large cost saving, to replacing the structure.

The boreholes taken by your office were on the re-alignment proposal and after discussions with your staff, it was agreed that new holes will probably be required for the extension scheme.

Could you please provide a Foundation Investigation Report of sufficient scope to facilitate the extension of the existing arch structure.

The existing design has spread footings extending 4 feet below ground level. Its proposed to extend the culvert with basically the same design with additional wingwall skewed along the streambed.

The structure extension is scheduled to be issued for design on July 13, 1977.

Should additional clarification and/or details be required, please do not hesitate to call this office.

R. A. Jeffries

RJ:gj
Attach.

R.A. Jeffries,
Structural Planning Supervisor,
for:
G.C.E. Burkhardt,
Head, Structural Section

c.c. W. Roters
J. Anderson
R. Fitzgibbon

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MAY 17 1977
SOIL MECHANICS
MINISTRY OF TRANSPORTATION & COMMUNICATIONS

GEOCRES No. 30 M 5 - 112

DIST 4 REGION CENTRAL

W.P. No. 125 - 86 - 20

CONT. No. 78 - 104

W. O. No.

STR. SITE No. 11 - 146 A

HWY. No. 403

LOCATION: EXTENSION TO JOSHUAS CREEK ARCH STRUCTURE AND PROPOSED STREAM REALIGNMENT

SHEET NO. 3 OF 3 SHEETS

REMARKS:

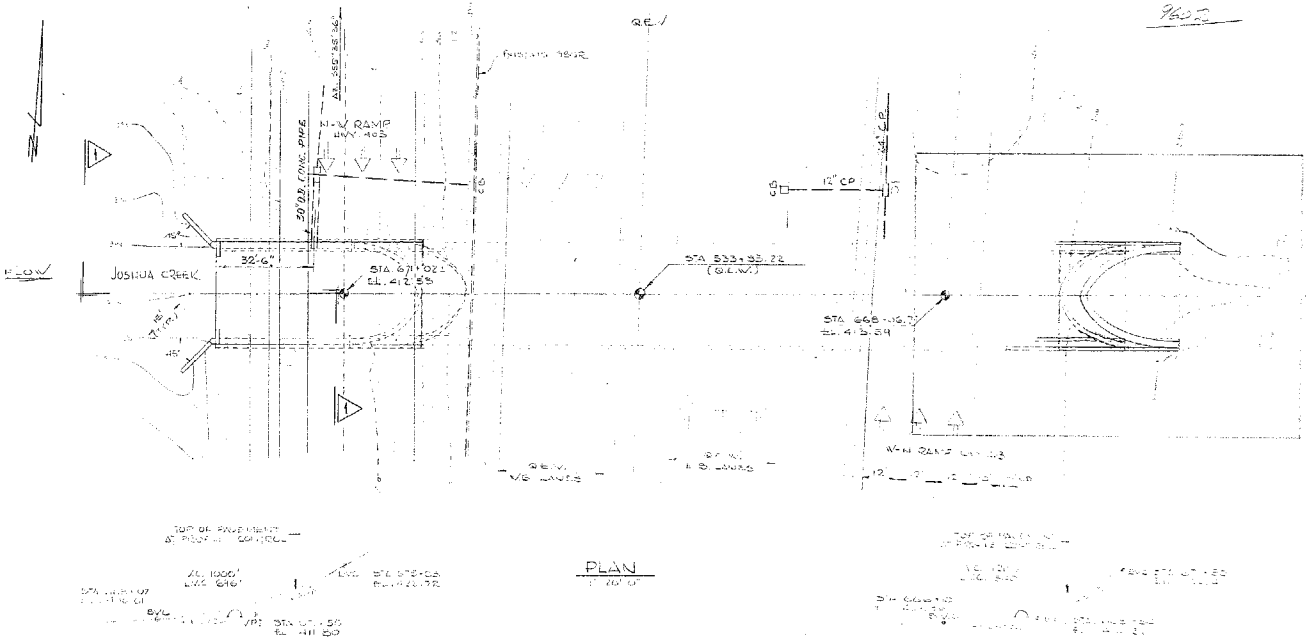
MINISTRY OF TRANSPORTATION AND COMMUNICATIONS ONTARIO 3115 DEBRIS 6/75

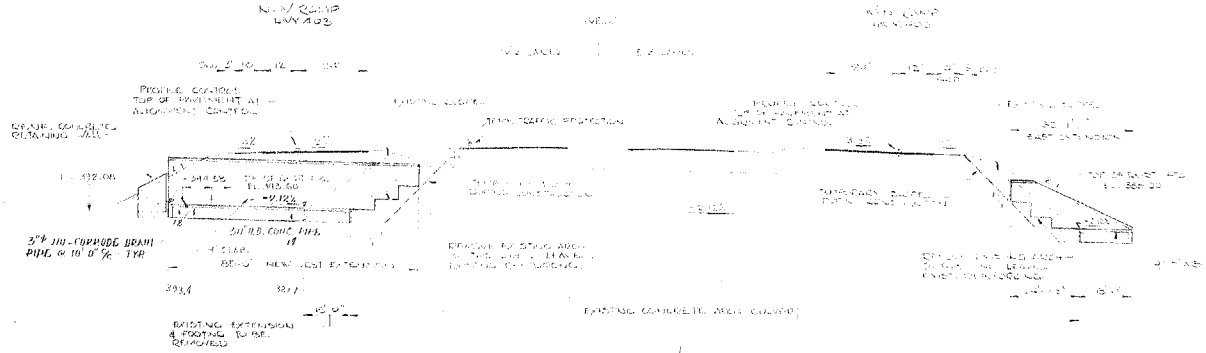
30M5-112

DIST. 4
CONT No
WP No 125-66-20

JOSHUA CREEK
STRUCTURE EXTENSION
GENERAL PLAN

SHEET





CONCRETE QUANTITIES

CONCRETE QUANTITY BELOW FOR THE APPROPRIATE CONCRETE LUMP SUM TENDER ITEM:

1. CONCRETE IN ARCH (4000 P.S.I.) ——— cu yds.
   CONCRETE IN RET. WALLS (3000 P.S.I.) ——— cu yd.

GENERAL NOTES:

CLASS OF CONCRETE

ARCH ——— 4000 P.S.I.
FOOTINGS & RET. WALLS — 3000 P.S.I.

CLEAR COVER TO REINF. STEEL

FOOTINGS & RET. WALLS — 3"
ARCH EXTRADOS - 3"
INTRADOS - 2"

REINF. STEEL SHALL BE C.S.A. G30 SERIES GRADE 60.

CONSTRUCTION NOTES

BACKFILL OPERATIONS SHALL PROGRESS SIMULTANEOUSLY ON BOTH SIDES OF THE ARCH AXIS. THE DIFFERENCE IN WORKING LEVELS OF BACKFILL BETWEEN EITHER SIDE SHALL AT NO TIME EXCEED 1-0"

LIST OF DRAWINGS

FOR REDUCED PLAN
USE SCALE BELOW
10 11 12 13
← 3 INCHES ON ORIGINAL PLAN →

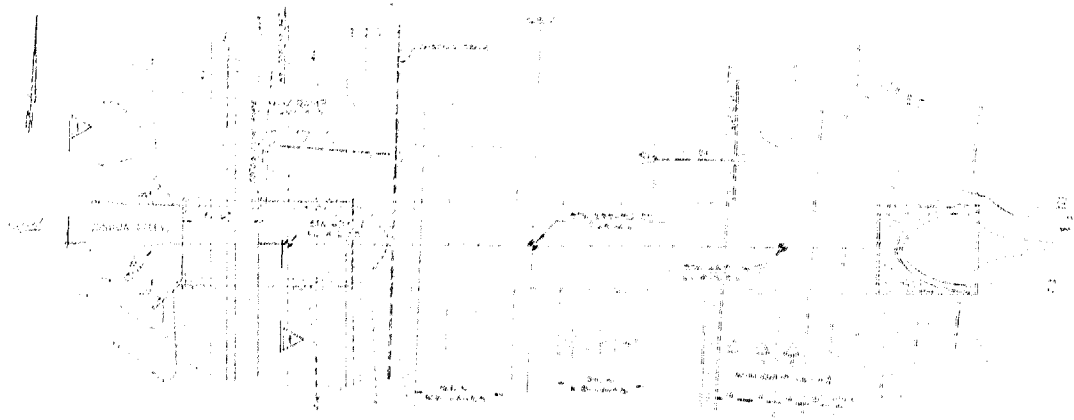
REVISIONS		
DATE	BY	DESCRIPTION

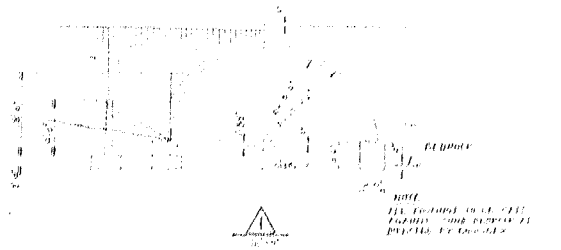
DESIGN	CHECK	LOADING MS 20-44	DATE MAR/78
DRAWING W.V	CHECK	SITE No 10-140 A	DWG 1

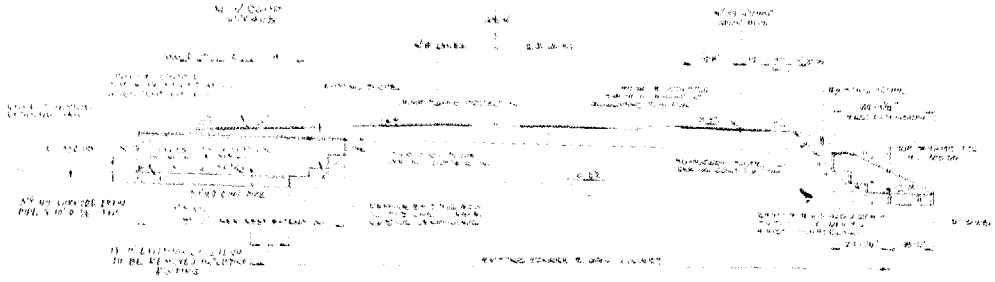
30M5-112

CONT No
WP No 25 06 20

SHEET





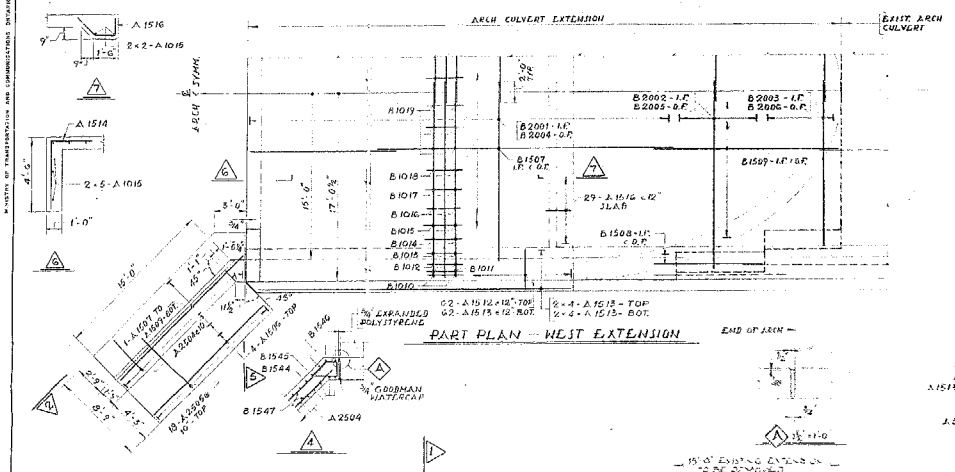


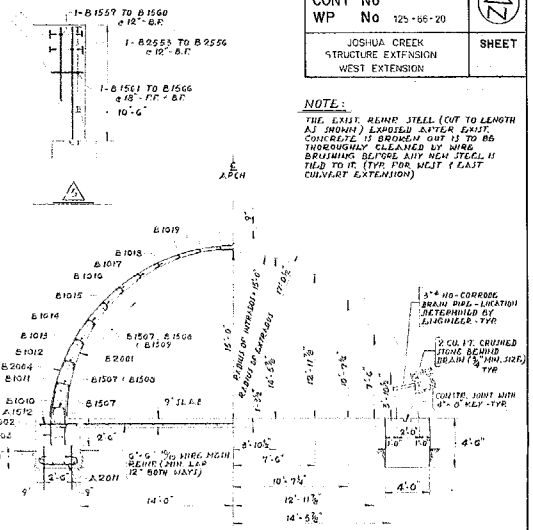
APR 18 1978

FOR REDUCED PLAN

30M5-112

CONT No	
WP No 125-86-20	
JOSHUA CREEK STRUCTURE EXTENSION WEST EXTENSION	SHEET





NOTE:
THE EXIST. REINF. STEEL (CUT TO LENGTH AS SHOWN) EXPOSED AFTER EXIST. CONCRETE IS BROKEN OUT IS TO BE THOROUGHLY CLEANED BY WIRE BRUSHING BEFORE ANY NEW STEEL IS TIED TO IT. (TYP. FOR WEST & EAST CULVERT EXTENSION)

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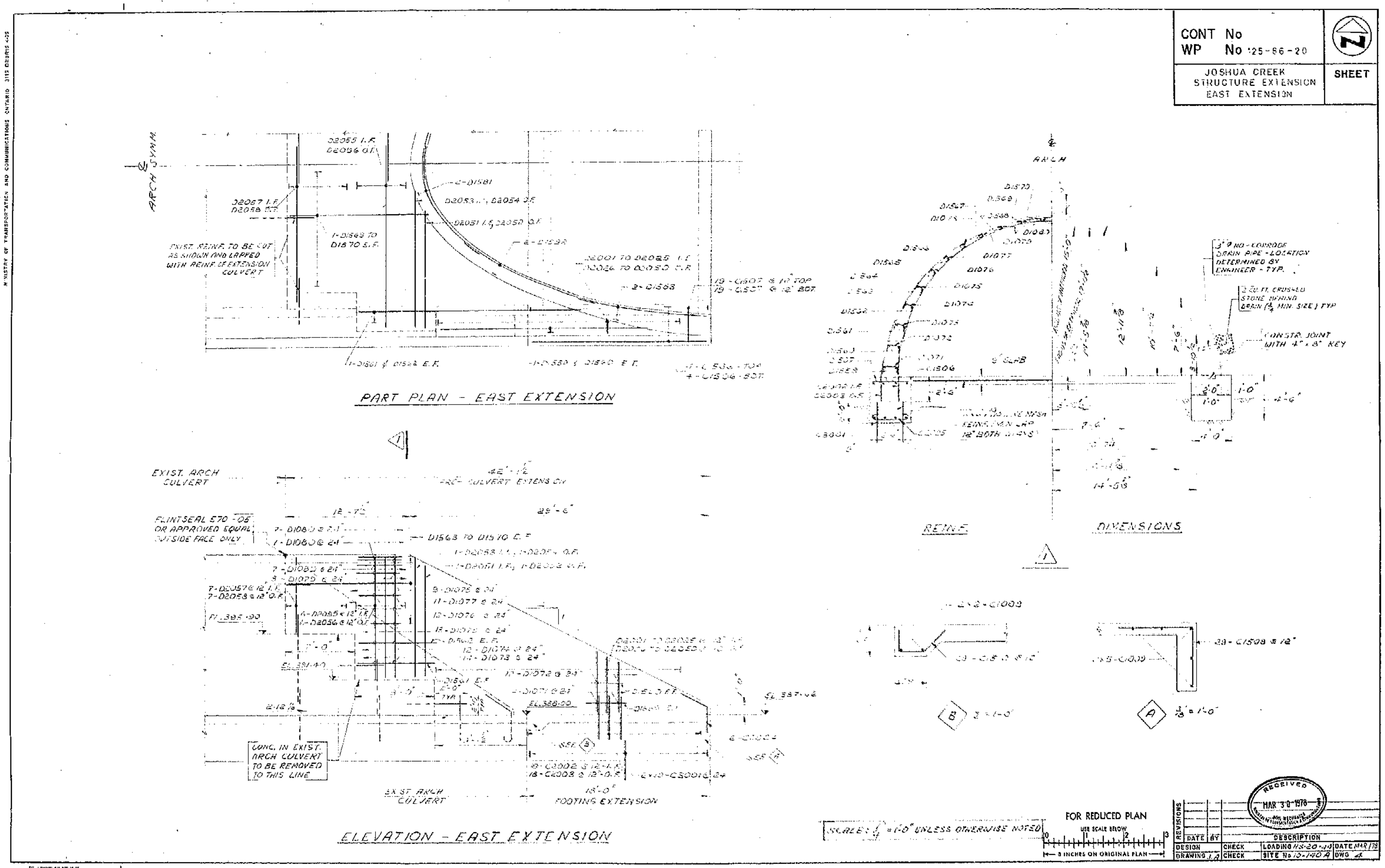
REVISIONS			
NO.	DATE	BY	DESCRIPTION
DESIGN		CHECK	LOADING HS 20-44 DATE MAR/78
DRAWING A.A.		CHECK	SITE No 10-140A DWG. 3



CONT No
WP No 125-66-20
JOSHUA CREEK
STRUCTURE EXTENSION
EAST EXTENSION
SHEET
PART PLAN - EAST EXTENSION
ELEVATION - EAST EXTENSION
REINF.
DIMENSIONS
EXIST. ARCH CULVERT
FLINTSEAL 570-05 OR APPROVED EQUAL OUTSIDE FACE ONLY
CONC. IN EXIST. ARCH CULVERT TO BE REMOVED TO THIS LINE
EXIST. ARCH CULVERT
FOOTING EXTENSION
EXIST. REINF. TO BE CUT AS SHOWN AND LAPPED WITH REINF. OF EXTENSION CULVERT
CONSTR. JOINT WITH 4" x 8" KEY
SCALE: 1/4" = 1'-0" UNLESS OTHERWISE NOTED
FOR REDUCED PLAN
USE SCALE BELOW
3 INCHES ON ORIGINAL PLAN
REVISIONS
DATE
BY
DESCRIPTION
DESIGN
CHECK
LOADING HS-20-44
DRAWING
SITE No 15-140A
DWG 4
RECEIVED
MAR 30 1978