



**THURBER** ENGINEERING LTD.



## MEMORANDUM

To: Christopher Schueler, P.Eng.  
AECOM

Date: March 9, 2017

From: Sydney Pang, P.Eng.  
Alastair Gorman, P.Eng.  
(Reviewed by P.K. Chatterji, P.Eng.)

File: 19-4406-20

### PRELIMINARY FOUNDATION ASSESSMENT SAWERS CREEK BRIDGE (SITE 26-040) GEOCRES NO. 31D-650

## 1 INTRODUCTION

This memorandum presents a brief summary of a geotechnical assessment of the Sawers Creek Bridge which carries Highway 28 over Sawers Creek in the Municipality of Peterborough. It also presents preliminary geotechnical recommendations for use in assessment of the existing foundations at the site. It is noted that the proposed rehabilitation alternatives are not yet defined.

The recommendations provided in this memorandum are for planning, structure evaluation and preliminary design purposes only. Additional investigation and analysis may be required in any subsequent detail design phase of the project.

The following reference numbers apply to this site:

- Current W.P. 4019-13-01
- Site No. 26-040
- Historic GEOCRES No. Not Applicable
- Historic W.P. 91-72-11

## 2 SITE DESCRIPTION

The site is located on Highway 28 at approximately 1.8 km north of the intersection between Highway 28 and Centre Road in the Township of Douro, County of Peterborough. Based on the description in Section 6.3.3 of the RFP, the existing bridge, constructed in 1964, is a single span reinforced cast-in-place concrete rigid frame box structure of 7.4 m in length with no approach slabs. The overall deck width is 10.9 m with an asphalt riding surface of 10.3 m carrying one lane of traffic in each direction of Highway 28. The pavement lies directly above the structure. The structure was last rehabilitated in 1997 which generally included concrete deck patching, waterproofing, paving and new concrete parapet walls.



The mapping in the Physiography of Southern Ontario by Chapman and Putnam shows that the site lies within the physiographic region known as the Peterborough Drumlin Field. As indicated by the name, this area is characterized by a large number of drumlins within a rolling till plain. The rolling nature of the terrain in the general vicinity of the site is consistent with this mapping.

Locally, however, the site lies in a wide wetland bordering Sawers Creek as it flows westward from Buckley Lake to the Otonabee River.

### **3 SUBSURFACE CONDITIONS**

No foundation information was found in the GEOCREST library for this bridge site. There is existing geotechnical information for the upper 1.2 m depth as part of a pavement investigation for the 1976 rehabilitation. This information indicates that the pavement structure overlies a sand till. However, offset boreholes close to the bridge show soft, organic soils extending to depths in the order of 4 m below original ground level.

### **4 SITE OBSERVATIONS**

Foundation engineering staff from Thurber visited the site to observe conditions related to the general geotechnical performance.

There were no obvious signs of settlement or distress at the structure.

The approach embankments appeared to be stable with no obvious signs of instability. There was some indication of erosion behind the wingwall at the southeast abutment.

Pavement distress in the form of transverse and longitudinal cracks was noted. There was no visible settlement at the approaches, except for a shallow depression located on the highway shoulder near the northwest quadrant.

Photographs of the structure and the approaches are attached in Appendix B.

### **5 EXISTING FOUNDATIONS**

A historic geomatics drawing dated January 1991 and a General Arrangement (GA) drawing dated January 1997 indicate that the existing bridge is a concrete rigid frame box structure with cantilevered wingwalls at all four corners. The box structure has an overall width of 11.7 m (in the direction of the creek) and an overall length of about 7.4 m (in the direction of the highway).

According to the 1991 geomatics drawing, the base of the box is at approximate Elevation 228 m, or 4.4 m depth below the highway grade. The creek water level was reportedly at Elevation 230.2 m in May 1991. The GA drawing does not show the founding elevation and stratum.

There is no information from these drawings or any other source available to us at this time that would indicate the nature of the founding stratum.

## **6 ASSESSMENT OF EXISTING FOUNDATIONS**

There is no site-specific foundation information on which to base an assessment of the structure foundations. Shallow pavement boreholes advanced in 1975 reveal the presence of sand till immediately below the pavement structure. However, there is no information on the relative density of these soils. Organic soils and alluvial sands were reportedly encountered in the immediate vicinity of the structure at ground surface.

There is no documented record of the foundations having experienced any movement and the approach embankments appear to be performing well. Accordingly, it can be surmised that the existing foundations can safely carry the imposed loads. It is considered that the observed erosion behind the wingwall at the southeast abutment and the shallow depression on the highway shoulder at the northwest quadrant are localized conditions that are not anticipated to significantly alter the future performance of the structure. In order to avoid the propagation of erosion, it is recommended that the affected areas be reinstated as part of the rehabilitation works.

The RFP document suggested that the required minimum rehabilitation work is expected to consist of concrete deck repairs and substructure repairs to soffit, wingwalls, ballast walls and abutment walls. Accordingly, there should not be any appreciable increase in the loading on the foundations. Provided there is no increase in the applied loads, it can be assumed that the foundations will continue to perform satisfactorily.

As per an MTO internal memorandum titled "Bridge Office Bulletin: Design and Evaluation of Foundations" dated August 20, 2013, MTO guidelines for bridge rehabilitation do not require foundation elements to be evaluated, provided that the rehabilitation treatment does not increase loading by more than 10% from the original design. Assuming these guidelines are applicable to this site, it is anticipated that additional site investigation and field testing would not be required to support the preparation of foundation design recommendations, unless replacement/extension of the structure is anticipated or there would be an increase in loading in excess of 10% of the original foundation design loadings.

## **7 EXCAVATION AND ROADWAY PROTECTION**

If the selected rehabilitation strategy requires excavations adjacent to the structure, it is recommended that site investigation and field testing be carried out through the approach embankments in order to characterize the soils and to select parameters for geotechnical design, including roadway protection. The number and depth of boreholes can be determined after the rehabilitation strategy has been selected.

## **8 CLOSURE**

Factual subsurface information for foundation purposes is not available for this site. Visual observations during our 2014 site visit, structure inspection records from 2012 and pavement investigation information from 1976 have been used in preparation of this memorandum.



**THURBER**



This memorandum was prepared by Dr. Sydney Pang, P.Eng. and reviewed by Mr. Alastair Gorman, P.Eng. and Dr. P.K. Chatterji, P.Eng., a Designated Principal Contact for MTO Foundations Projects.



**THURBER**  
THURBER ENGINEERING LTD.

**60** YEARS



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Senior Foundation Engineer



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Project Manager, Senior Foundation Engineer



P.K. Chatterji, P.Eng.  
Review Principal, Designated MTO Contact

Attachments



Appendix A  
Historic Drawings

METRIC  
DIMENSIONS ARE IN METRES  
AND/OR MILLIMETRES  
UNLESS OTHERWISE SHOWN

DIST 43  
CONT No 97-56  
WP No 337-85-00



SAWERS CREEK BRIDGE  
(HWY. 134)  
GENERAL ARRANGEMENT

SHEET  
116

GENERAL NOTES :

CLASS OF CONCRETE

CLASS OF CONCRETE..... 30 MPa

CLEAR COVER TO REINFORCING STEEL

CLEAR COVER TO REINFORCING STEEL SHALL BE 70 ± 20 mm UNLESS OTHERWISE NOTED.

REINFORCING STEEL

REINFORCING STEEL SHALL BE GRADE 400 UNLESS OTHERWISE SPECIFIED. BAR MARKS WITH SUFFIX 'C' DENOTES COATED BARS.

CONSTRUCTION NOTES

- SAWCUTS IN CONCRETE, WHEREVER DESIGNATED, SHALL BE 25mm DEEP OR TO THE FIRST LAYER OF REINFORCING STEEL, WHICHEVER IS LESS.
- THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS OF THE EXISTING WORK AND DETAILS ON SITE AND REPORT ANY DISCREPANCIES TO THE CONTRACT ADMINISTRATOR BEFORE PROCEEDING WITH THE WORK.
- THE CONTRACTOR SHALL CHECK ALL RELEVANT DIMENSIONS AND ELEVATIONS OF EXISTING WORK. DIMENSIONS AND ELEVATIONS SHALL BE ADJUSTED AS REQUIRED TO SUIT THE PROPOSED WORK.

WORK DESCRIPTION :

- A** REMOVE ASPHALT PAVEMENT AND WATERPROOFING FROM DECK. REMOVE DETERIORATED AND DELAMINATED CONCRETE FROM DECK PATCH, WATERPROOF AND REPAVE.
- B** REPLACE EXISTING CONCRETE POSTS, STEEL RAILINGS AND CURBS WITH CONCRETE PARAPET WALLS AND RAIL.
- C** PATCH REMOVAL AREA WITH CONCRETE

LIST OF DRAWINGS

- 26-40/R1-1 GENERAL ARRANGEMENT.
- 26-40/R1-2 PARAPET WALL WITH RAILING PERFORMANCE LEVEL 2
- 26-40/R1-3 RAILING FOR PARAPET WALL.
- 26-40/R1-4 QUANTITIES - STRUCTURE

REFERENCE DRAWINGS

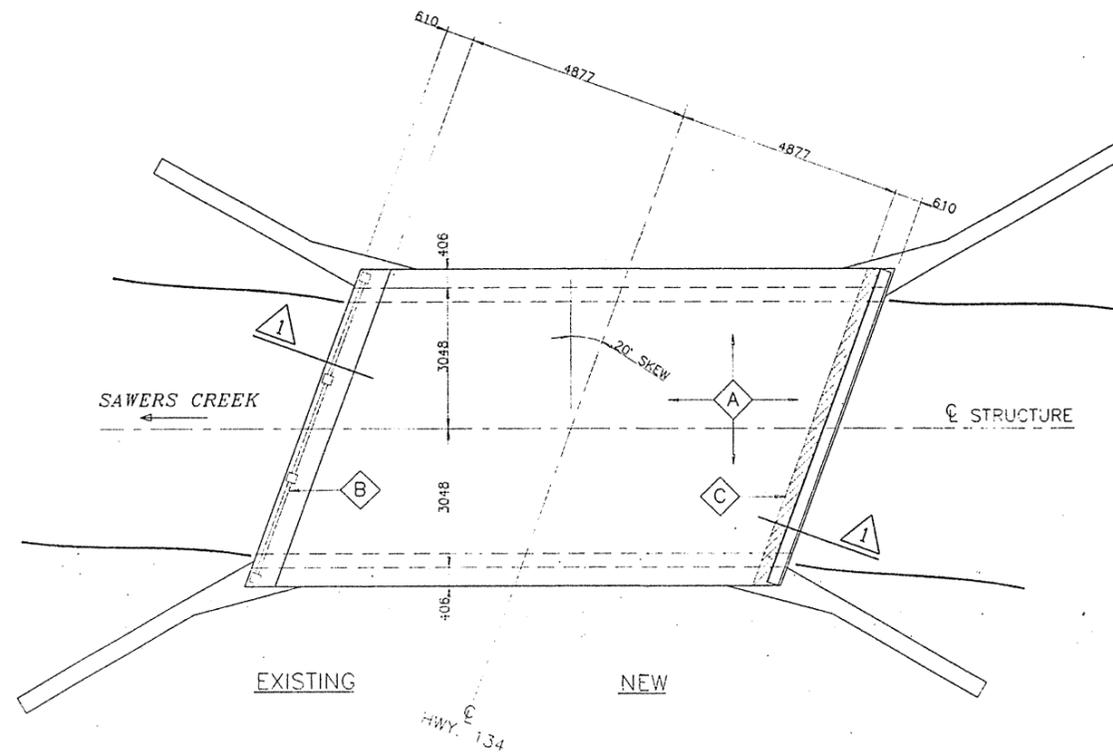
- 260-40-1-A TO -4-A

REFERENCE DRAWINGS

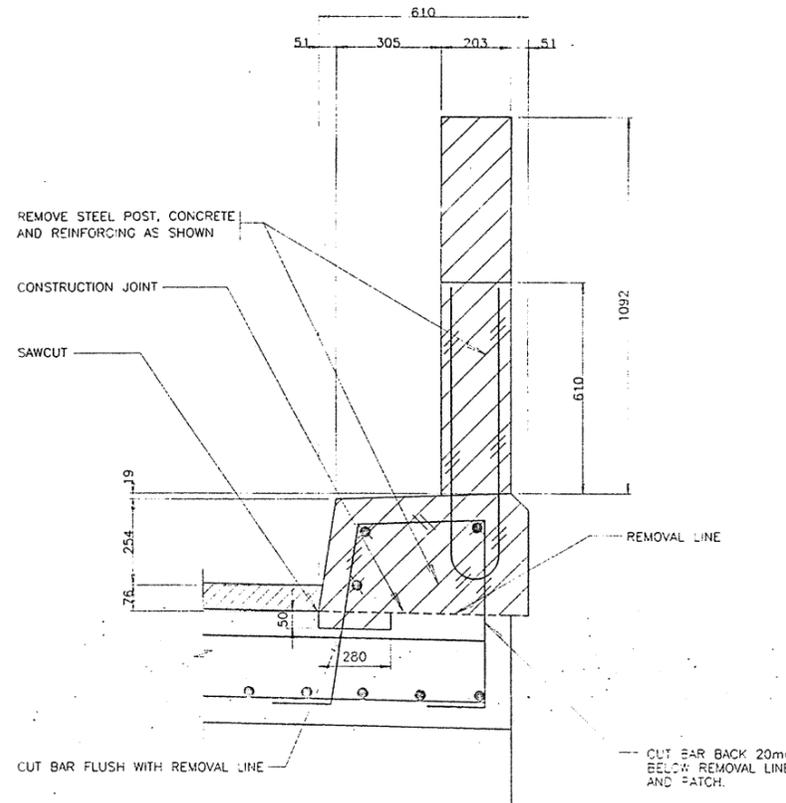
- 260-40-1-A TO -4-A

APPLICABLE STANDARD DRAWINGS

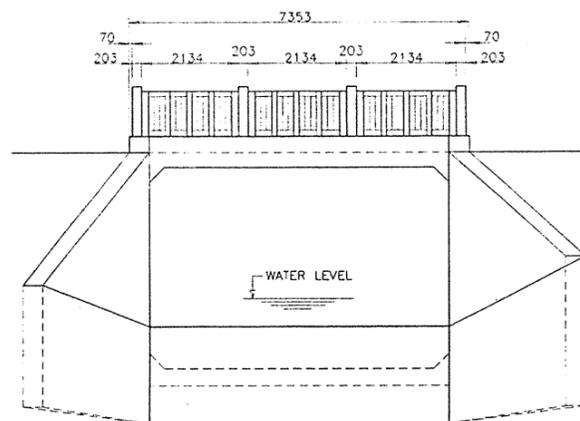
- O.P.S.D. 3906.02 BRIDGE DECK WATERPROOFING
- O.P.S.D. 4010.00 G/RAIL AND CHANEL ANCHORAGE.



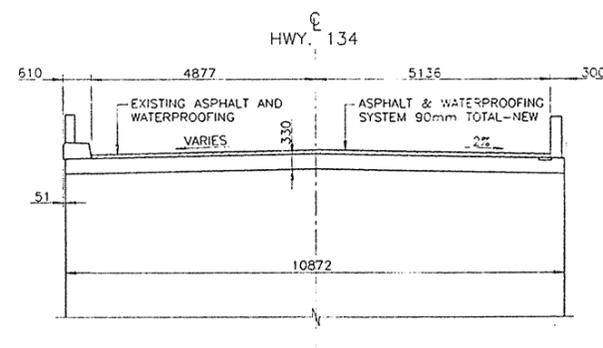
PLAN  
SCALE 1:75



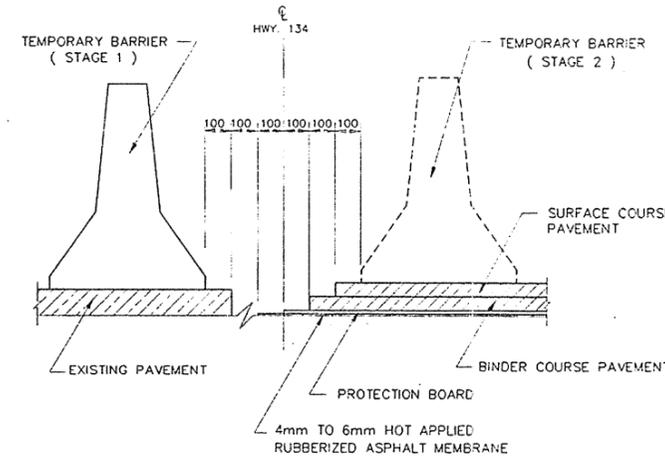
CURB & RAILING REMOVALS  
SCALE 1:10



UPSTREAM ELEVATION  
SCALE 1:75



SECTION 1  
SCALE 1:75

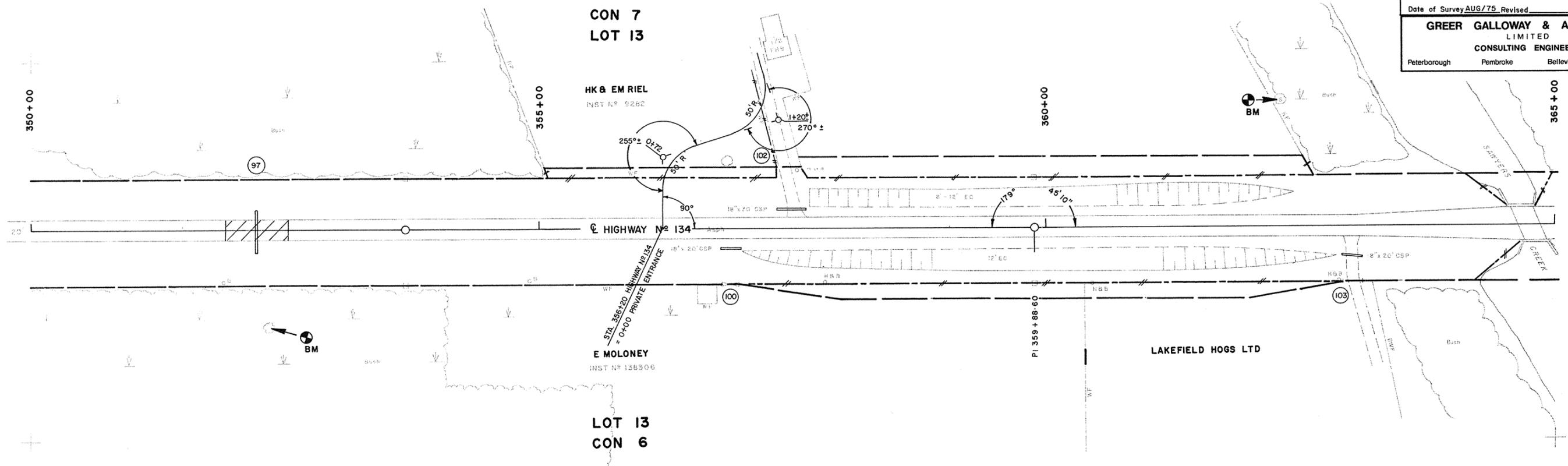


STAGING FOR WATERPROOFING SYSTEM AND PAVING  
N.T.S.

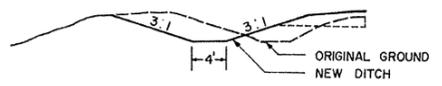
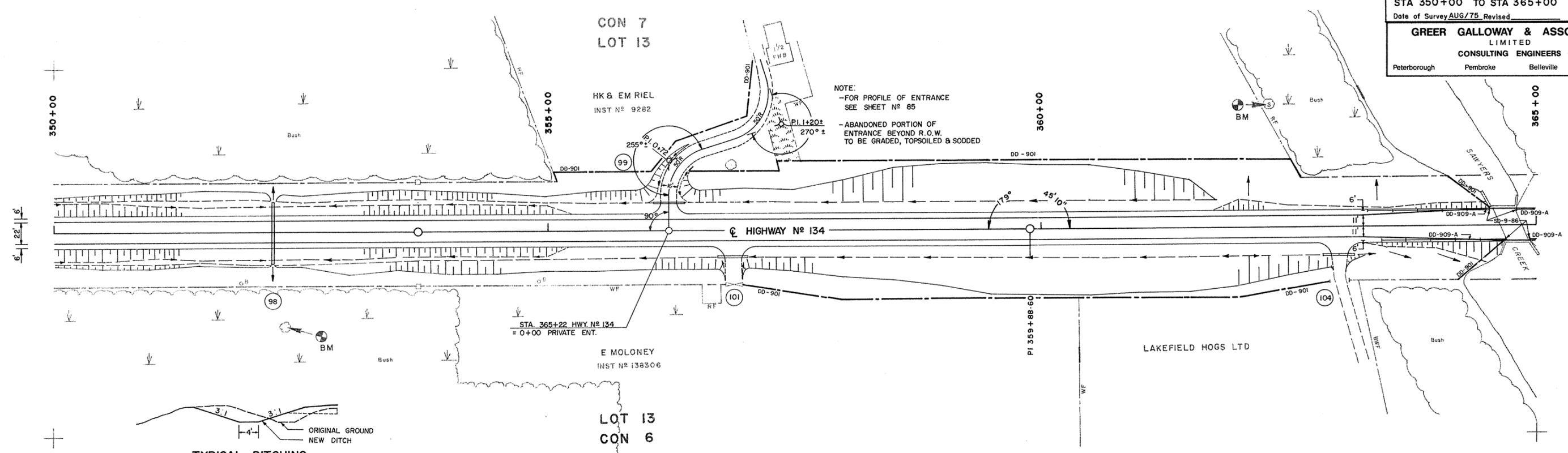
DRAWING NOT TO BE SCALED  
100 mm ON ORIGINAL DRAWING

REVISIONS		DESCRIPTION				
NO.	DATE	BY	CHK	APP	DESCRIPTION	

DESIGN	H.K.	CHK	O.I.	CODE	OHBC'91	LOAD	OHBD	DATE	JAN, 1997
DRAWN	M.M.H	CHK	T.M.N	SITE	26-40	STRUCT	SCHEME	R1	DWG 1

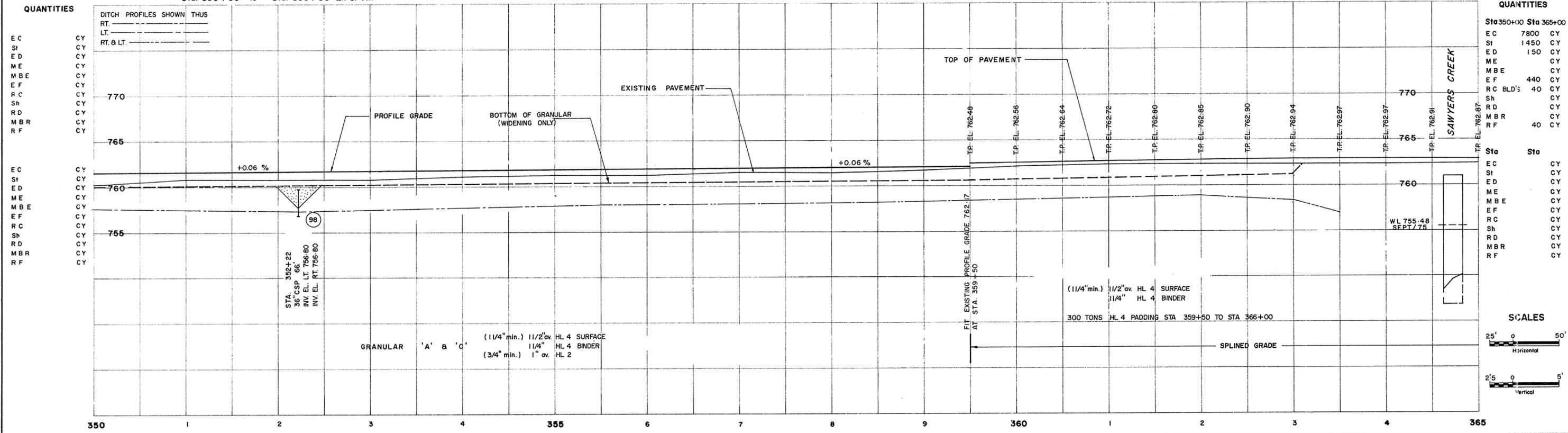


QUANTITIES		SIDE ELEVATIONS ROW RT & LT. PLOTTED THUS: ROW RIGHT ——— ROW LEFT - - - - -		QUANTITIES	
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SI	CY	350+00	352+25	SI	CY
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ME	CY			ME	CY
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MBR	CY			MBR	CY
RF	CY			RF	CY
EC	CY	350+00			



TYPICAL DITCHING

Sta. 350+00 to Sta. 355+00 Lt. & Rt.









Appendix B  
Site Photographs



**Photo 1 View Looking North Showing Culvert Inlet Area**



**Photo 2 View Looking South Showing Culvert Outlet Area**



**Photo 3 View Looking South Showing Highway Embankment**



**Photo 4 View Looking North Showing Pavement Distress Near Culvert**