

**MORRISON HERSHFIELD LIMITED**

**Argyle Street Bridge  
Caledonia, Ontario**

**UNDERWATER INSPECTION**

**November, 2002**

MIE Project No. 796

Underwater Inspection  
Argyle Street Bridge  
Caledonia

## 1.0 Introduction

The existing Argyle Street Bridge in Caledonia was constructed in 1927 to convey highway and pedestrian traffic on Highway 6 across the Grand River until a more recent structure was constructed diverting the highway around the town. It is comprised of nine spans, each approximately 22 metres long with eight piers in the river and both abutments on the river banks above the normal water surface. The Ministry of Transportation has initiated a preliminary engineering program for the rehabilitation or the replacement of the structure. MIE Consulting Engineers Ltd. Was retained to carry out an underwater inspection of the submerged elements and to sound the river bottom in the vicinity of the piers as a component of that program.

The underwater inspection was carried out on November 14, 2002 by a team consisting of a senior engineer and two technicians, all qualified divers. At the time of the inspection, the weather was clear but overcast with a flow in the river of approximately 32 m<sup>3</sup>/sec as measured at York, about three kilometres downstream of the site. This resulted in a flow velocity through the structure of about 1.5 m/sec.

Due to the heavy rains a few days prior to the inspection, the water in the river was particularly turbid reducing underwater visibility to a few centimetres resulting in a tactile examination of the submerged concrete surfaces where they could be accessed.

The bases of all piers were found to be encased in rip-rap, generally to above the water surface and extending out from the up to about four metres. At the three exceptions (Piers 2, 7, and 8) the rip-rap at the upstream face has been displaced exposing the pier bases.

The river bed in the vicinity of the bridge appears to be coarse gravel with some small cobbles and rocks (rubble). Although no clear indication of active erosion was observed, the water depth upstream of Piers 7 and 8 is deeper than observed at any other location which may represent a deeper channel.

## 2.0 Observations

### North Abutment

The north abutment is situated on the river bank, well above the current water surface.

### Pier No. 1

The submerged portion of Pier No. 1 is encapsulated in rip-rap to above the water surface and not accessible for inspection. Above the rip-rap, the concrete appears to be in reasonably good condition and is probably indicative of the condition of the obscured portion of the pier.

### Pier No. 2

The base of Pier No. 2 is protected with rip-rap to above the water surface except for a small portion at its upstream extremity where the rip-rap has probably been displaced. Here the base of the pier is exposed and appears to be in good condition as determined by a tactile examination.

### Piers No. 3 and 4

The base of Piers No. 3 and 4 are both encapsulated in rip-rap to above the water surface.

### Pier No. 5

The rip-rap around the base of Pier No. 5 extends to above the water surface except for a short section at the upstream face where the top of the base is exposed. A tactile examination of the concrete surfaces at this location did not reveal any deficiencies.

### Pier No. 6

The base of Pier No. 6 is encapsulated in rip-rap to above the water surface.

### Pier No. 7

The rip-rap around the base of Pier No. 7 extends to above the water surface over about two thirds of the downstream portion. Upstream of this, it gradually drops away to expose the gravel

river bottom at the upstream face. A tactile examination of the exposed concrete surfaces in this area did not reveal any deficiencies.

#### Pier No. 8

The rip-rap around Pier No. 8 extends to above the water surface generally throughout. The exception is at the upstream face where it drops abruptly to the gravel bottom. A tactile examination of the exposed concrete in this location did not reveal any deficiencies.

### **3.0 Sounding**

The river bed upstream and downstream of each pier and between them was sounded using a survey rod to measure the water depth at each location. These measurements were then related to the elevation of the grate over the scupper drain on the upstream side of the bridge midway between Piers 5 and 6. The elevation of the grate was determined by Callon Dietz Incorporated to be 191.369 resulting in a water surface elevation of 185.54 at the time of the inspection.

The river bed throughout the width of the structure is relatively flat with no significant depression observed. Near the south bank, in the vicinity of Piers 7 and 8 the river is slightly deeper, by about 25 centimetres, than observed elsewhere.

Soundings, generally, were obtained over a distance of 15 metres upstream and downstream of each pier and approximately on the centre line of the piers. Between the piers the soundings were obtained approximately at the upstream and downstream face of the piers. The observed water depths have been converted to river bed elevations which are presented on the appended drawings.

Wherever possible, measurements were obtained at the specified distance from the piers but in most cases the rip-rap to above the water surface extended to about three metres from the pier faces.

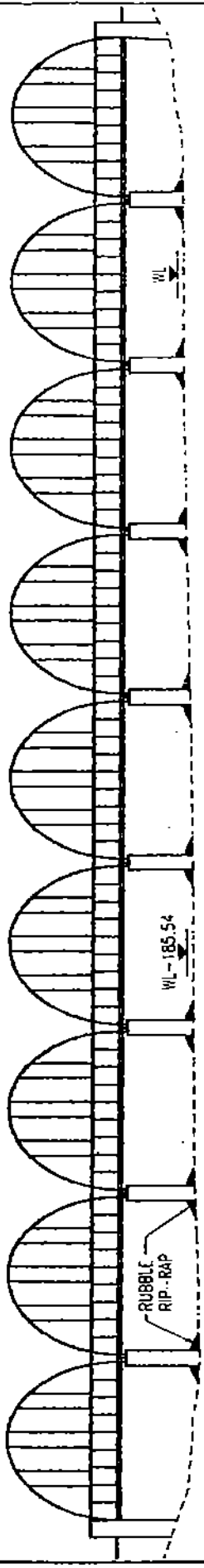
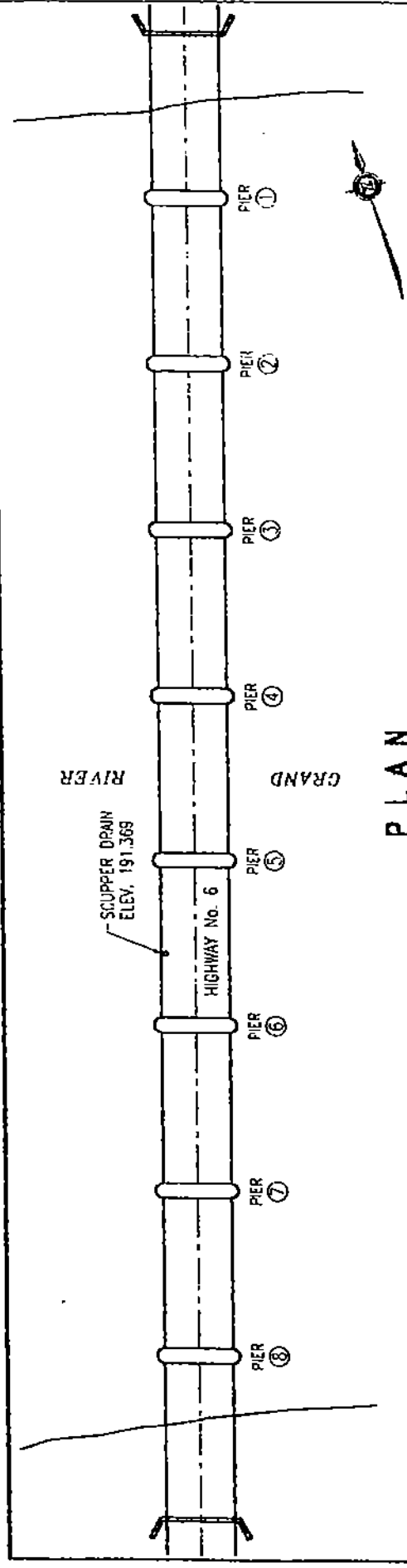
### **4.0 Conclusions**

Rip-rap has been installed around the base of all the piers and this material, generally, obscures the concrete faces below the water surface. In the few instances where the concrete is exposed a

tactile examination did not reveal any significant problems. Since all piers appear to be in reasonably good condition above the rip-rap it can be assumed they will be in equally good condition below.

The sounding survey did not identify any signs of significant erosion although at most piers the water depth immediately upstream, where stream bed erosion is anticipated, the water is slightly deeper. If the structure is to be retained that the rip-rap be replaced at the upstream end of the piers where it has been displaced.

## **DRAWINGS**

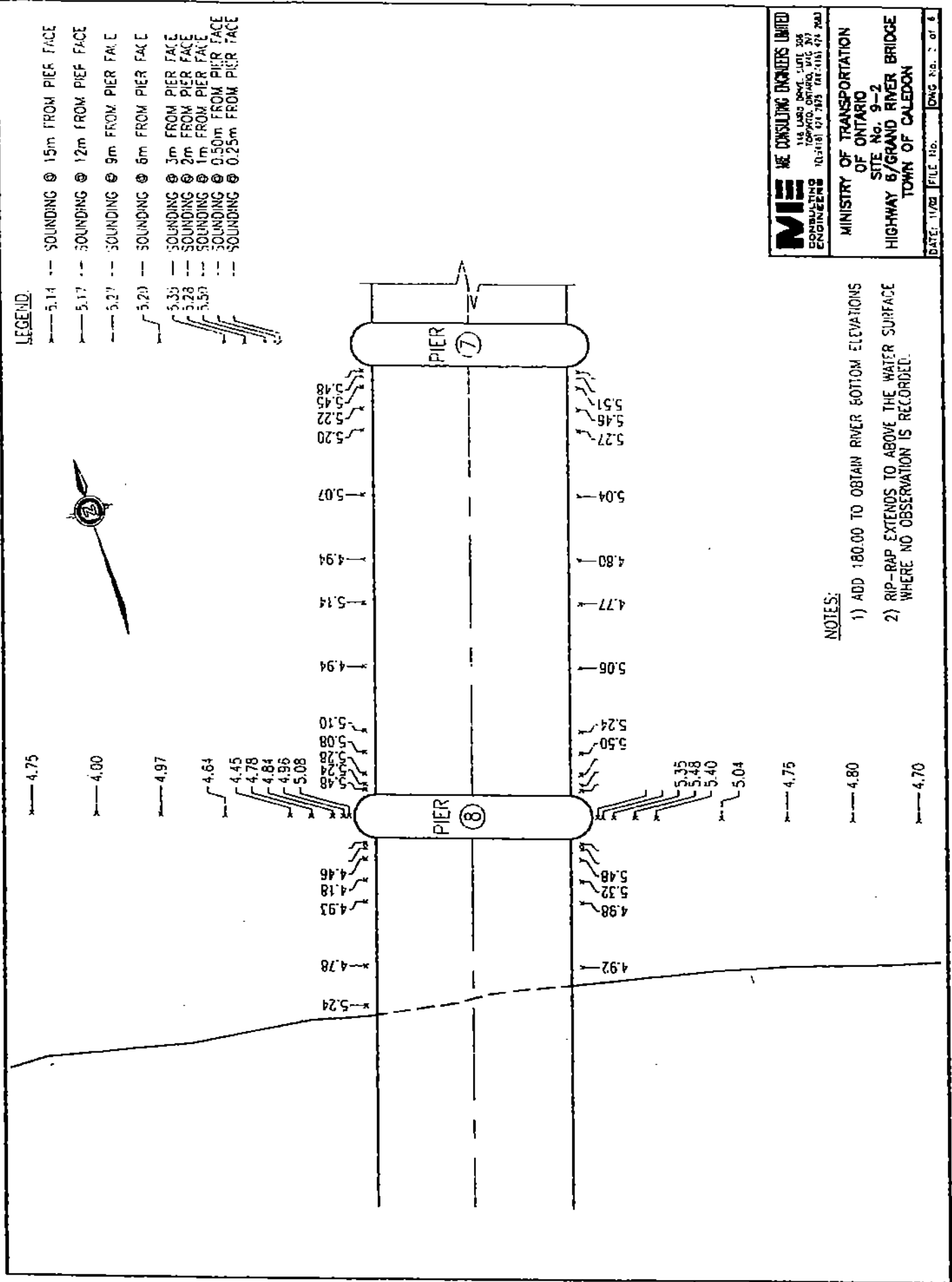


**ELEVATION**

**MIE** MIE CONSULTING ENGINEERS LIMITED  
116 LAMB DRIVE, SUITE 300  
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MINISTRY OF TRANSPORTATION  
OF ONTARIO  
SITE No. 9-2  
HIGHWAY 6/GRAND RIVER BRIDGE  
TOWN OF CALEDON

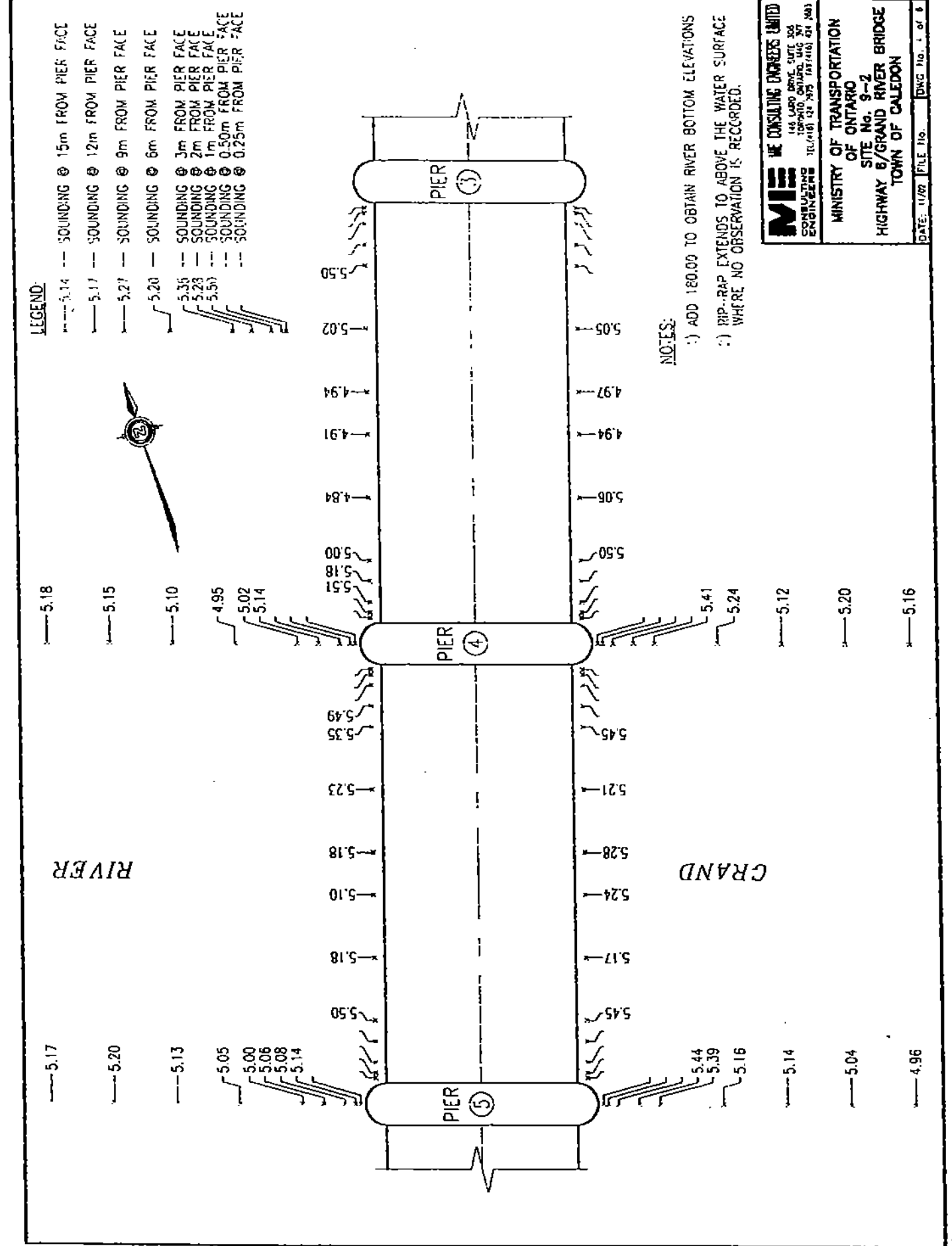
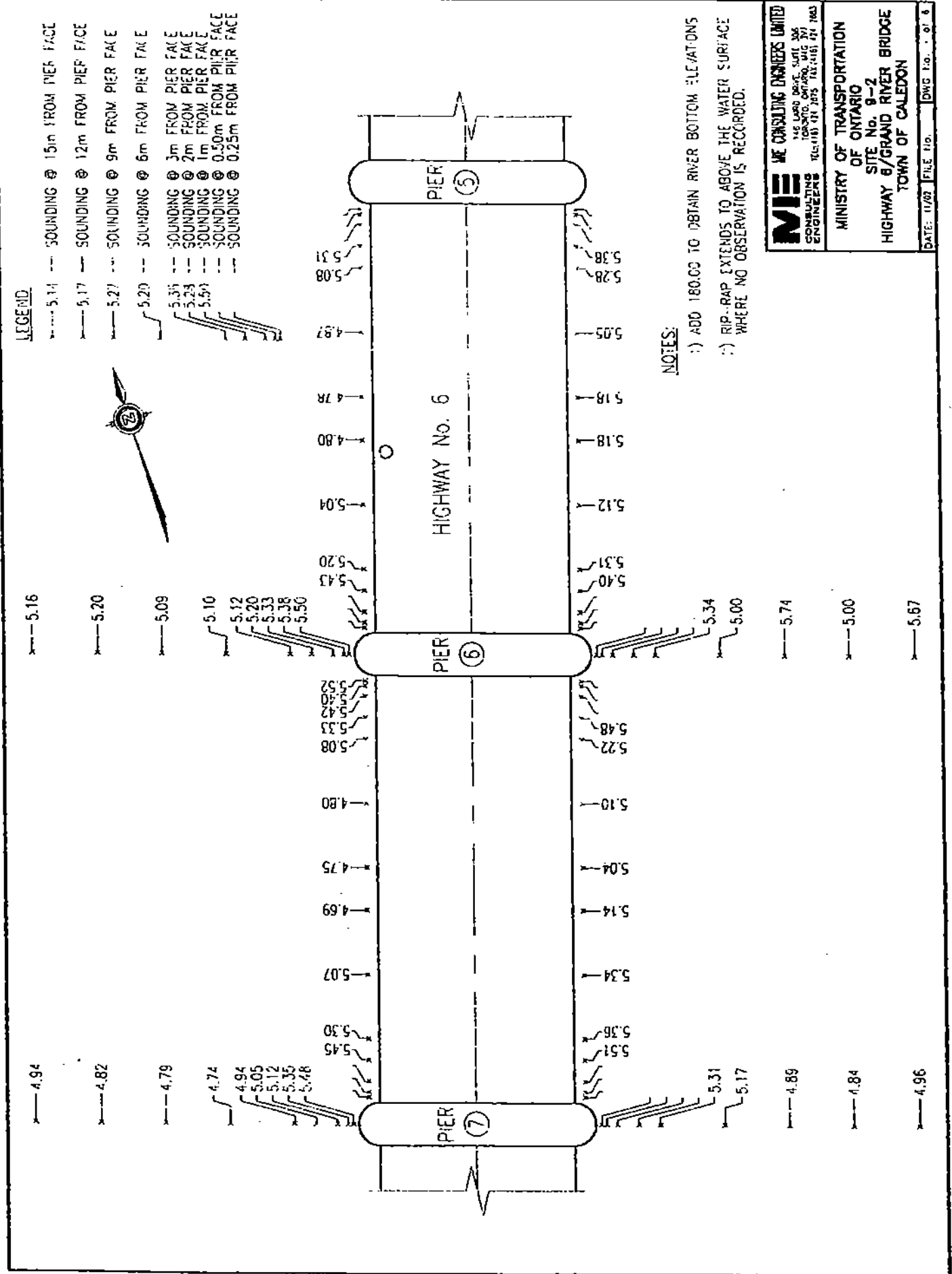
DATE: 11/92 FILE No. DWG No. 1 of 6



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DATE: 11/92 FILE No. DWG No. 2 of 6

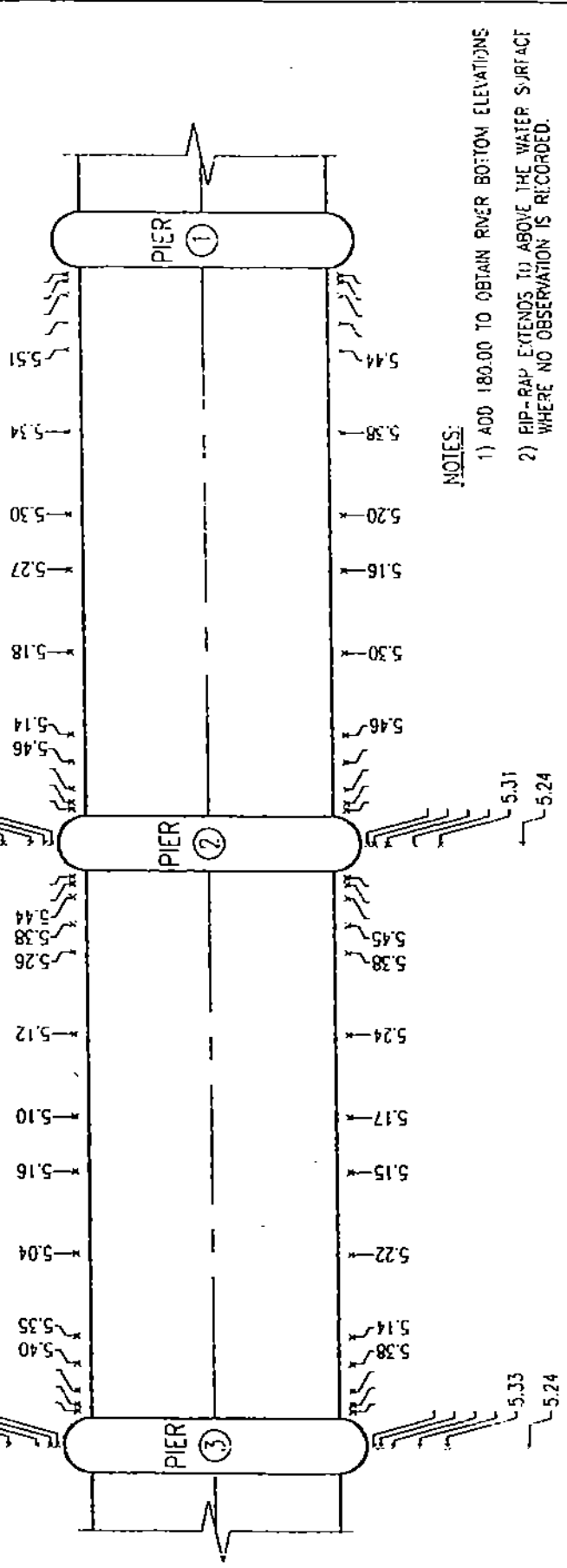


**LEGEND**

- 5.14 --- SOUNDING @ 15m FROM PIER FACE
- 5.17 --- SOUNDING @ 12m FROM PIER FACE
- 5.21 --- SOUNDING @ 9m FROM PIER FACE
- 5.20 --- SOUNDING @ 6m FROM PIER FACE
- 5.35 --- SOUNDING @ 3m FROM PIER FACE
- 5.28 --- SOUNDING @ 2m FROM PIER FACE
- 5.50 --- SOUNDING @ 1m FROM PIER FACE
- SOUNDING @ 0.50m FROM PIER FACE
- SOUNDING @ 0.25m FROM PIER FACE

- 5.19
- 5.14
- 5.21

- 5.14
- 5.14
- 5.12
- 5.08
- 5.04
- 5.31



**NOTES:**

- 1) ADD 180.00 TO OBTAIN RIVER BOTTOM ELEVATIONS
- 2) RIP-RAP EXTENDS TO ABOVE THE WATER SURFACE WHERE NO OBSERVATION IS RECORDED.

**MIE** MIE CONSULTING ENGINEERS LIMITED  
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DATE: 11/92 FILE No. DWG No. 5 of 6

- 5.14
- 5.18
- 5.29

- 5.24
- 5.33
- 5.48

- 5.35
- 5.40
- 5.38
- 5.14

- 5.38
- 5.33
- 5.24

- 5.38
- 5.44
- 5.38
- 5.26
- 5.44

- 5.31
- 5.24

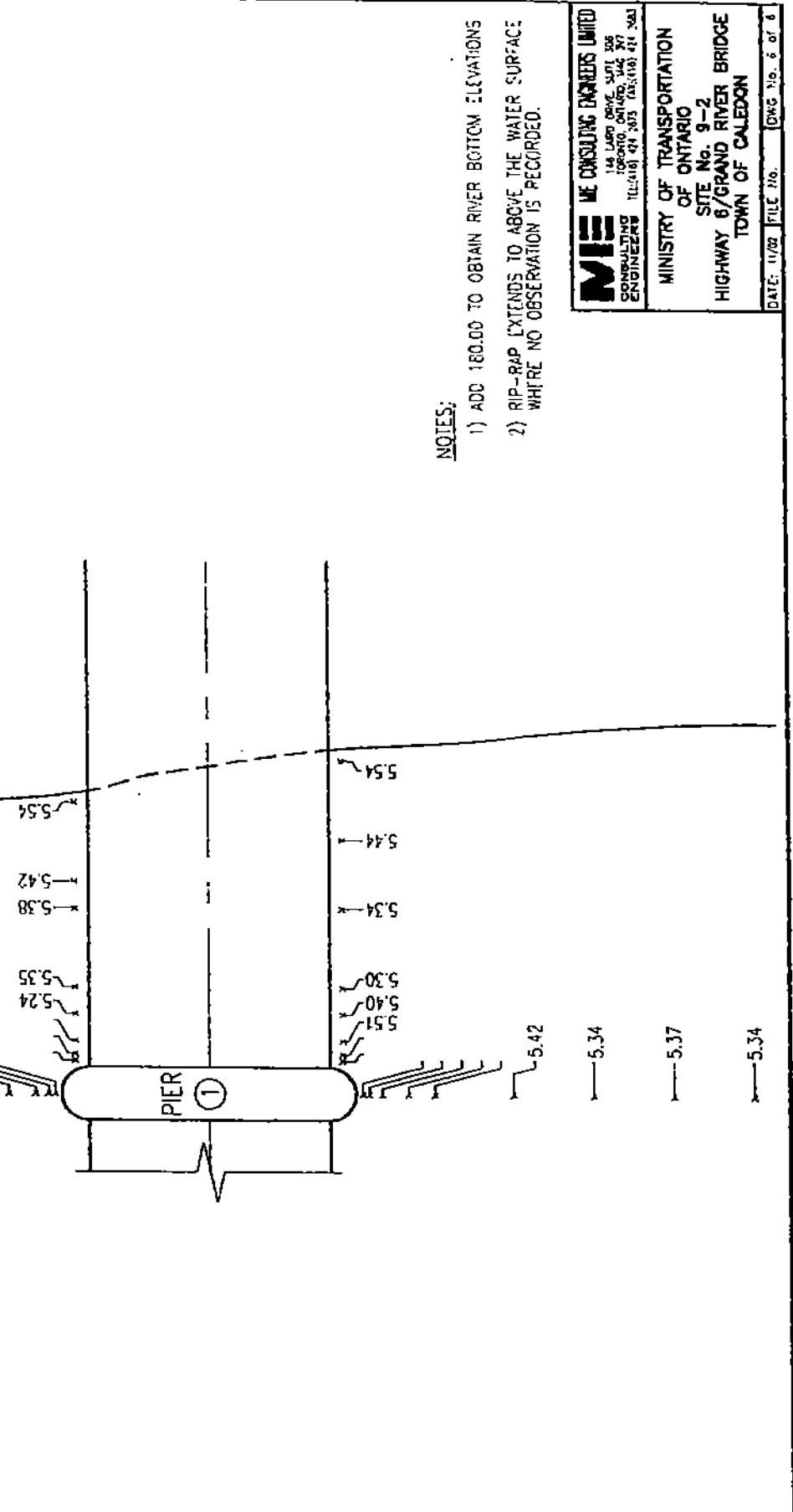
- 5.17
- 5.14
- 5.03

**LEGEND**

- 5.14 --- SOUNDING @ 15m FROM PIER FACE
- 5.17 --- SOUNDING @ 12m FROM PIER FACE
- 5.27 --- SOUNDING @ 9m FROM PIER FACE
- 5.20 --- SOUNDING @ 6m FROM PIER FACE
- 5.35 --- SOUNDING @ 3m FROM PIER FACE
- 5.28 --- SOUNDING @ 2m FROM PIER FACE
- 5.50 --- SOUNDING @ 1m FROM PIER FACE
- SOUNDING @ 0.50m FROM PIER FACE
- SOUNDING @ 0.25m FROM PIER FACE

- 5.14
- 5.17
- 5.27

- 5.20
- 5.35
- 5.28
- 5.50



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DATE: 11/92 FILE No. DWG No. 6 of 6

- 5.34
- 5.37
- 5.34

- 5.24
- 5.35
- 5.38
- 5.42
- 5.54

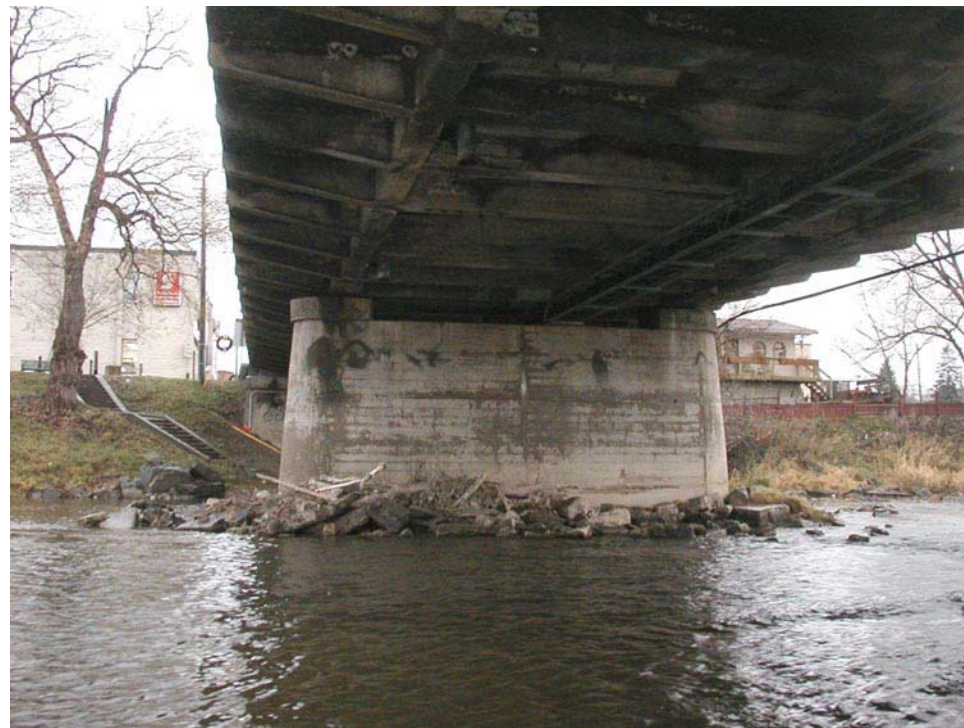
- 5.30
- 5.40
- 5.51

- 5.34
- 5.44
- 5.54

- 5.42

## PHOTOGRAPHS





Pier No. 1, south face



Pier No. 3, south face



Pier No. 2, south face



Pier No. 4, south face



Pier No. 5, north face



Pier No. 7, north face



Pier No. 6, south face



Pier No. 8, south face