

26TH NOVEMBER, 1993

**BRISBANE CITY COUNCIL  
DEPARTMENT OF WATER SUPPLY AND SEWERAGE  
MECHANICAL AND ELECTRICAL BRANCH  
ELECTROLYSIS SECTION  
EAGLE FARM PUMPING STATION**

**OPERATING MANUAL FOR:**

**KARAWATHA WATER PUMPING STATION:- EXTERNAL PIPEWORK CATHODIC  
PROTECTION SYSTEM.**

**CLIENT:**

**DEPARTMENT OF WATER SUPPLY AND SEWERAGE  
WATER MAINTENANCE SECTION**

## MANUAL CONTENTS

- (1.0) Introduction
- (2.0) Corrosion and Cathodic Protection
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- (4.3) Cathode
- (4.4) Anodes
- (4.5) Test Points
- (4.6) Associated Standards
- (4.7) Government Regulations
- (5.0) Performed Testing
- (6.0) Conclusion
- (7.0) Maintenance

## DRAWINGS

(No Number)	(included)	Monthly Maintenance Program.
486/6/7-TB1C0082E	(included)	External Pipework Rectifier/distribution sw/bd.
486/6/7-TB1C0081E	(included)	External pipework layout.
486/617-6/68.051		Pipework layout and pipe list.
486/617-6/68.050		General arrangement building and pipework.
CW01/250		Electrical equipment and conduit layout.
CW52/171		Suction and discharge connections.
Drawing No. 4	(included)	General CP layout.

## (1.0) **INTRODUCTION**

Steel when immersed or covered in water has a tendency to corrode (or rust) as the oxidized form is more stable than the metal.

Because of this, precaution must be taken to stop or minimize the corrosion reaction to an acceptable level consistent with the design life of the structure. This is normally achieved by the use of protective coatings which control the corrosion reaction by isolating the steel from its surrounding environment.

However, it is not practical to achieve a perfect coating and coating damage will always occur with time. Because of this, corrosion may occur at imperfections in the paint coating, causing further deterioration in the coating as well as loss of metal.

As a result of this, the coating defects must be rectified by periodic maintenance or an additional method of protection used to prevent this deterioration and corrosion occurring. This additional protection is achieved by the cathodic protection system.

## (2.0) **CORROSION AND CATHODIC PROTECTION**

Corrosion is an electrochemical process in that it is accompanied by a flow of electrical current.

Corrosion occurs on the surface of metals at active areas known as anodes, which are electrically continuous with less active or passive areas known as cathodes. The electric current flows from the anode through the electrolyte to the cathode, with the circuit being completed by the electrical continuity between the cathode and anode. In practice anodes and cathodes are generally part of the same metallic surface and individual anodic areas may be small.

In applying cathodic protection and external current is applied to the surface so that the entire surface to be protected acts as a cathode. This involves the use of an auxiliary anode and when the current flow from this anode is sufficient, no part of the structure acts as an anode.

An external source of direct current such as a transformer rectifier is used in conjunction with an anode consisting of material with a very slow corrosion rate.

While it is the flow of current which achieves the cathodic protection of the surface it is impractical to measure these currents over individual anodic areas to determine when cathodic protection has been achieved. However, with the flow of cathodic protection current, the structure becomes more negative with respect to the surrounding electrolyte. Because of this, it is possible to state values of metal/electrolyte potential at which corrosion does not occur. This metal/electrolyte potential is generally measured against a standard reference electrode which allows a reproducible potential at which corrosion does not occur to be quoted.

**(3.0) MAINS DETAILS**

**Size:** Dia 750 – Dia 450 mild steel cement lined.

**Coating:** Low density fusion banded polyethylene outer coating.

**Length:** 60 metres.

**Location:** Karawatha Reservoir Karawatha 4117. UBD 54 H6

**(4.0) CATHODIC PROTECTION DETAILS**

- (4.1) Type of Cathodic Protection: Impressed Current.
- (4.2) Rectifier: Standard 32V Volt, 15 amp direct current output enclosed in a stainless steel switchboard. Rectifier has a 240V supply from the main switchboard, non essential section.  
Rectifier is located on the wall near the aux. generator.
- (4.3) Cathode: There are two cathode points which are located on the pump station side of the suction and discharge valve pits. The cathode point is where the cabling from the rectifier is attached to the structure under cathodic protection.
- (4.4) Anodes: Two 1500 X 75mm diameter silicone iron anodes were installed as per attached sketch. The anodes were installed approximately 3 metres from the mains in a vertical bed. The anodes are identified by a marker pit and label.
- (4.5) Test Points: Test points are installed on cathodically protected structures to enable testing to ensure full protection of the mains. On these mains eight test points have been installed. Refer to drawing list.
- (4.6) Associated Standards:  
AS 3000 1986 Australia Wiring Rules  
AS 2832.1 1985 Pipes, Cables, Ducts, Guide to Cathodic Protection, Part One.
- (4.7) Government Regulations:  
Queensland Electricity Acts and Regulations.

**(5.0) PERFORMED TESTING**

- (1) Natural Potential Survey.
- (2) Testing of Insulated Flanges, Joints.
- (3) Current Drain Survey.
- (4) Rectifier Loop Resistance.
- (5) Foreign Structure Interference Survey and Mitigation.
- (6) Final Potential Survey and Commissioning.

**(6.0) CONCLUSION**

Full Cathodic protection has been achieved on this section of trunk mains. The cathodic protection system is registered with the Queensland Electricity Commission and has approval to operate.

**(7.0) MAINTENANCE**

The cathodic protection system is maintained on a monthly basis after commissioning. These checks involve testing rectifier operation and recording of pipe to soil potentials.

26th November 1992  
Electrical Workshop  
Cathodic Protection

**CPS Monthly Maintenance Details.**

**Required:**

- 1/ Notify plant operator and/or sign entry logs where necessary.
- 2/ Have appropriate keying.

**Labour:**

One tradesperson, one vehicle. 20 minutes per site.

**Procedure:**

- 1/ Identify installation.
- 2/ Check system for operation.
- 3/ Record voltmeter.
- 4/ Record ammeter.
- 5/ Comments.
- 6/ Log entry.

26th November 1993  
Electrical Workshop  
Cathodic Protection

**CPS 6 Monthly Maintenance Details.**

**Required:**

- 1/ Notify plant operator and/or sign entry logs where necessary.
- 2/ Have appropriate keying.
- 3/ Set of tools. (Electricians)
- 4/ Multimeter.
- 5/ DC clampmeter.
- 6/ Copper sulphate reference cell and leads.
- 7/ Cleaning equipment.
- 8/ Gatic cover lifters.

**Labour:**

One tradesperson electrical, one laborer, one vehicle.  
Two hours per site.

**Procedure:**

- 1/ Identify system.
- 2/ Check system for operation.
- 3/ Record voltmeter.
- 4/ Record ammeter.
- 5/ Record "on" potentials for all test points.
- 6/ Record "instant off" potentials for all test points.
- 7/ Record "off" potentials for all test points.
- 8/ Perform loop resistance and record.
- 9/ Check and record anode string currents.
- 10/ Comments.
- 11/ Log entry.

26th November 1993  
Electrical Workshop  
Cathodic Protection

**CPS 60 Monthly Maintenance Details.**

**Required:**

- 1/ Notify plant operator and/or sign entry logs where necessary.
- 2/ Have appropriate keying.
- 3/ Set of tools. (Electricians)
- 4/ Multimeter.
- 5/ DC clampmeter.
- 6/ Copper sulphate reference cell and leads.
- 7/ Cleaning equipment.
- 8/ Gatic cover lifters.
- 9/ Rectifier load bank.
- 10/ PCS2000 Detection Equipment.

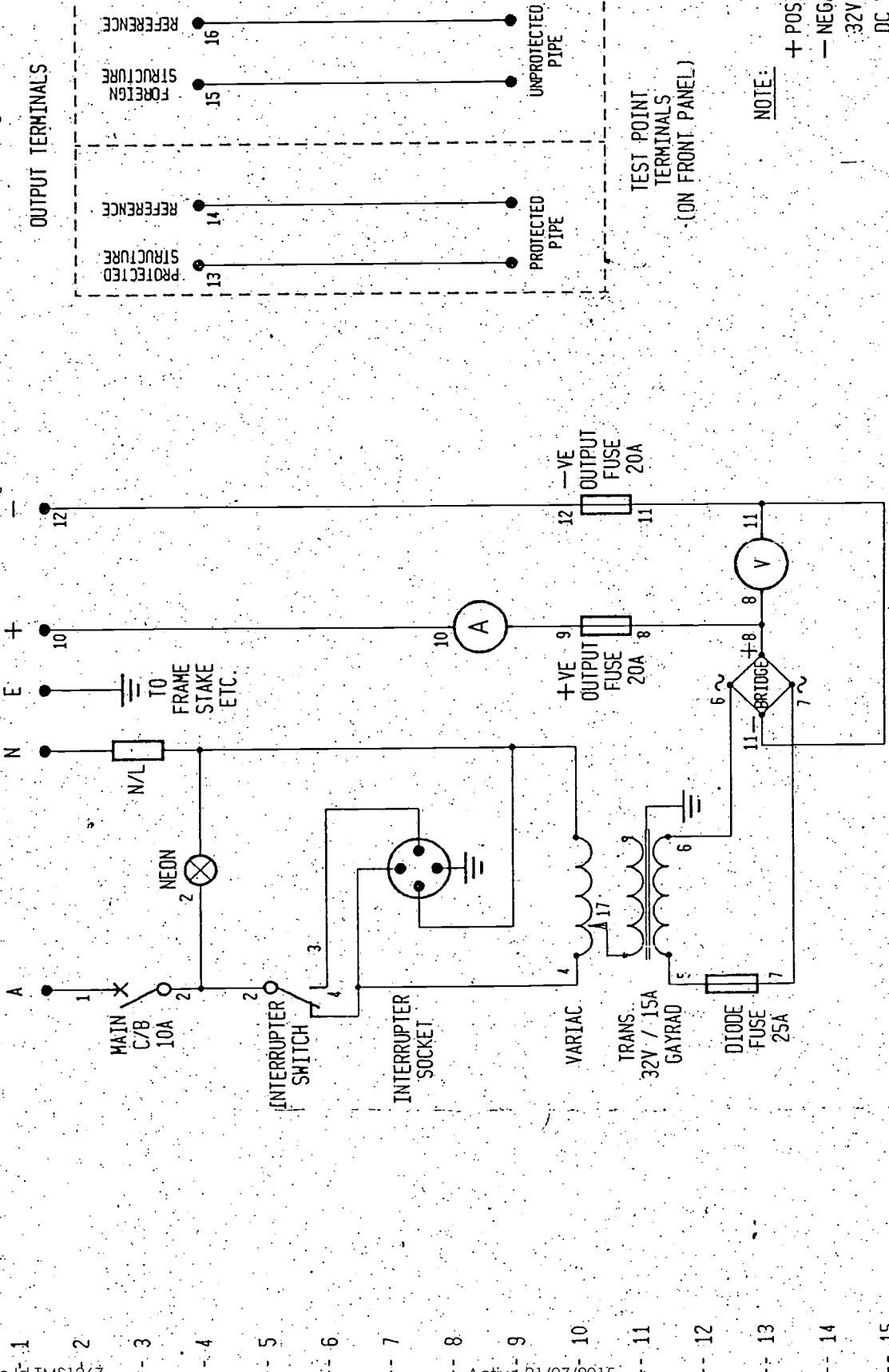
**Labour:**

One tradesperson electrical, one laborer, one vehicle.  
Eight hours per site.

**Procedure:**

- 1/ Identify system.
- 2/ Check system for operation.
- 3/ Record voltmeter.
- 4/ Record ammeter.
- 5/ Record "on" potentials for all test points.
- 6/ Record "instant off" potentials for all test points.
- 7/ Record "off" potentials for all test points.
- 8/ Perform loop resistance and record.
- 9/ Check and record anode string currents.
- 10/ Load test rectifier for 10 minutes.
- 11/ Check all switchboard and testpoint terminals for tightness.
- 12/ Check all switchboard and testpoints are labelled and I.D. tags attached.
- 13/ Check plans are correctly drawn and modify if necessary.
- 14/ Remove and inspect anodes.
- 15/ Recheck all interference (CPS) bleeds.
- 16/ Pipecamp structure if applicable.
- 17/ Apply for "continue to operate" permit if applicable.

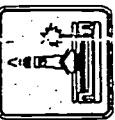
## OUTPUT TERMINALS



NOTE:

+ POSITIVE TO BE RED

- NEGATIVE TO BE BLACK

32V AC WIRING TO BE 4mm<sup>2</sup>DC WIRING TO BE 4mm<sup>2</sup>240V WIRING TO BE 1.5mm<sup>2</sup>Brisbane City Council  
Department of Water Supply  
& Sewerage

Mechanical &amp; Electrical Services

Scale: 1:200

Drawing No.: JE02/104

Amend. A

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Mechanical &amp; Electrical Services

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Mechanical &amp; Electrical Services

Scale: 1:200

To	File No.
From	Date 3/02/93
Subject KARAWATHA PUMPING STATION NATURAL POTENTIALS - EXTERNAL PIPEWORK	

SUCTION

PROTECTED

CATHODE TO CATHODE RETURN	0.15V
CATHODE RETURN TO ZN REF N° RI-1	267 mV
RI-2	447 mV
RI-3	504 mV
CATHODE RETURN TO CuSO <sub>4</sub>	-649 mV
CuSO <sub>4</sub> TO ZN REF N° RI-1	-923 mV
RI-2	-1096 mV
RI-3	-1160 mV

UNPROTECTED

CATHODE TO CATHODE RETURN	0.25V
CATHODE RETURN TO ZN REF N° R3-1	180 mV
CATHODE RETURN TO CuSO <sub>4</sub>	-590 mV
CuSO <sub>4</sub> TO ZN REF R3-1	-777 mV

DELIVERY

PROTECTED

CATHODE TO CATHODE RETURN	0.15V
CATHODE RETURN TO ZN REF R2-1	480 mV
R2-2	190 mV
(NOT SURROUNDED BY CONCRETE OR SOIL) R2-3	-669 mV
CATHODE RETURN TO CuSO <sub>4</sub>	-639 mV
CuSO <sub>4</sub> TO ZN REF N° R2-1	-1124 mV
R2-2	-156 mV
R2-3	34 mV

BRISBANE CITY COUNCIL

**MEMORANDUM**

To	File No.
From	Date 3/02/93
Subject: KARAWATHA PUMPING STATION NATURAL POTENTIALS - EXTERNAL PIPEWORK	

DELIVERY CONT.UNPROTECTED

CATHODE TO CATHODE RETURN	0.2mV
CATHODE RETURN TO ZN REF. NO R4-3	27 mV
CATHODE RETURN TO CuSO <sub>4</sub>	-670 mV
CuSO <sub>4</sub> TO ZN REF. R4-3	-642 mV

To	File No.
From	Date 14/02/93
Subject KARAWATHA PUMPING STATION ON POTENTIALS (UNPOLARIZED) - EXTERNAL PIPEWORK	

RECTIFIER SET AT 7 V 500mA

SUCTION

PROTECTED

CATHODE RETURN TO ZN REF. RI-1	98 mV
RI-2	430 mV
RI-3	336 mV
CATHODE RETURN TO CuSO <sub>4</sub>	-81.1 mV
CuSO <sub>4</sub> TO ZN REF. RI-1	-907 mV
RI-2	-1239 mV
RI-3	-1138 mV

UNPROTECTED

CATHODE RETURN TO ZN REF. N° R3-1	175 mV
CATHODE RETURN TO CuSO <sub>4</sub>	-585 mV
CuSO <sub>4</sub> TO ZN REF. N° R3-1	-756 mV

DELIVERY

PROTECTED

CATHODE RETURN TO ZN REF. R2-1	120 mV
R2-2	-120 mV
R2-3	-160 mV
CATHODE RETURN TO CuSO <sub>4</sub>	-1125 mV
CuSO <sub>4</sub> TO ZN REF. R2-1	-1226 mV
R2-2	-125 mV
R2-3	54 mV

**MEMORANDUM**

To	File No.
From	Date 4/02/93
Subject KARAWATHA PUMPING STATION	
DN. POTENTIALS (UNPOLARIZED) - EXTERNAL PIPEWORK	

DELIVERY CONT

UNPROTECTED

CATHODE RETURN TO ZN. REF. N° R4-3 ..... -317 mV  
CATHODE RETURN TO CuSO<sub>4</sub> ..... -1200 mV  
CuSO<sub>4</sub> TO ZN. REF. N° R4-3 ..... -882 mV

LOOP RESISTANCE:- 5V ..... 400 mA  
7V ..... 500 mA  
9V ..... 750 mA  
11V ..... 900 mA  
13V ..... 1.1 A

ANODE CURRENT N°1 ..... 240 mA  
N°2 ..... 320 mA

INTERFERENCE TESTING

CuSO<sub>4</sub> TO SERVB. EARTH (POLE N° 411.633)  
-434 mV on  
-343 mV off

**MEMORANDUM**

To	File No.
From	Date 12/02/93
Subject KARAWATHA PUMP STATION EXTERNAL PIPEWORK : SH. POTENTIALS. POLARIZED	

RECTIFIER SET AT 7V 500 mA

CATHODE RETURN (C1) TO CuSO<sub>4</sub>

- |              |          |
|--------------|----------|
| 1) VALVE PIT | -2800 mV |
| 2) PIPE N°1  | -2180 mV |
| 3) PIPE N°2  | -2100 mV |
| 4) PIPE N°3  | -2190 mV |

CATHODE RETURN (C2) TO CuSO<sub>4</sub>

- |              |          |
|--------------|----------|
| 1) VALVE PIT | -2450 mV |
| 2) PIPE N°1  | -2680 mV |
| 3) PIPE N°2  | -2650 mV |
| 4) PIPE N°3  | -2530 mV |

CATHODE RETURN (C4) TO CuSO<sub>4</sub>

- 882 mV on  
-754 mV off

INTERFERENCE TESTING - CuSO<sub>4</sub> TO

- |            |            |             |
|------------|------------|-------------|
| FENCE WIRE | -312 mV on | -450 mV off |
| FENCE POST | -309 mV on | -420 mV off |
| WATER TAP  | -42 mV on  | -50 mV off  |

KARAWATHA TRUNK MAIN (EITHER SIDE OF QEC EASEMENT)

- |                              |                               |
|------------------------------|-------------------------------|
| 1) 368 mV on Zn              | 434 mV off Zn                 |
| -883 mV on CuSO <sub>4</sub> | -307 mV off CuSO <sub>4</sub> |

**MEMORANDUM**

To	File No.
From	Date 12/02/93
Subject	KARAWATHA PUMPING STATION EXTERNAL PIPEWORK ON POTENTIALS POLARIZED

KARAWATHA TRUNK MAIN CON'T

- 2) a) 161 mV on Zn 178 mV off Zn  
-1110 mV on CuSO<sub>4</sub> -1093 mV off CuSO<sub>4</sub>  
b) 161 mV on Zn 178 mV off Zn  
-1112 mV on CuSO<sub>4</sub> -1095 mV off CuSO<sub>4</sub>

NOTE:- Because of readings between CuSO<sub>4</sub> & CATHODE RETURN C1 & C2, being in excess of -2 VITS, I have adjusted rectifier to send 3V at 200mA

To	File No.
From	Date 23/02/93
Subject KARAWATHA PUMPING STATION EXTERNAL PIPEWORK - ON POTENTIALS (POLARIZED)	

RECTIFIER SET AT 3V 200 mA

$\text{CuSO}_4$  TO CATH RET (PROTECTED C1) -1912 mV

CATH RET TO ZN REF N° RI-1 -867 mV on 414 mV off  
RI-2 147 mV on 163 mV off  
RI-3 -195 mV on -102 mV off

$\text{CuSO}_4$  TO CATH RET (UNPROTECTED C3) -725 mV

CATH RET TO ZN REF R3-1 130 mV on 133 mV off

$\text{CuSO}_4$  TO CATH RET (PROTECTED C2) -1608 mV

CATH RET TO ZN REF R2-1 -390 mV on 27 mV off  
R2-2 680 mV on 660 mV off  
R2-3 -1752 mV on -1133 mV off

$\text{CuSO}_4$  TO CATH RET (UNPROTECTED C4) -817 mV

CATH RET TO ZN REF N° RH-3 392 mV on 235 mV off

NOTE:- R2-2, R2-3 ARE QUESTIONABLE DUE TO THEIR INSTALLATION

To	File No.
From	Date 25/02/93
Subject KARAWATHA PUMPING STATION EXTERNAL PIPEWORK - ON POTENTIALS (POLARIZED)	

RECTIFIER SET AT 4V 20 mA

CuSO<sub>4</sub> TO CATH RET (C2) -104.7 mV on -96.7 mV off

CATH RET TO ZN REF N° R2-1 -95 mV on 154 mV off

R2-2 -83 mV on -49 mV off

R2-3 -109.0 mV on -97.0 mV off

CATH RET (C4) TO CuSO<sub>4</sub> -77.4 mV on -71.6 mV off

CATHODE RETURN C1 WITH 370Ω RESISTOR IN CIRCUIT

CuSO<sub>4</sub> TO CATH RET (C1) -118.2 mV on -116.3 mV off

CATH RET TO ZN REF N° R1-1 -144 mV on -141 mV off

R1-2 240 mV on 241 mV off

R1-3 20 mV on 22 mV off

CATH RET (C3) TO CuSO<sub>4</sub> -74.2 mV on -74.1 mV off

NOTE:- 1.  $P = I^2R$

2. DISREGARD R2-2 + R2-3 READINGS DUE TO  
THEIR INSTALLATION

BRISBANE CITY COUNCIL

**MEMORANDUM**

To:	File No.:
From:	Date: 4/02/93
Subject: KARAWATHA PUMPING STATION COUPON REFERENCES	

REF. RI-1		
ZN TO PIPE	-530 mV	
ZN TO PROTECTED COUPON	-527 mV	
ZN TO UNPROTECTED COUPON	345 mV	
CuSO <sub>4</sub> TO PIPE	-659 mV	
CuSO <sub>4</sub> TO PROTECTED COUPON	-652 mV	
CuSO <sub>4</sub> TO UNPROTECTED COUPON	141 mV	
CuSO <sub>4</sub> TO ZN	-214 mV	
PIPE CATHODE TO PIPE CATHODE RETURN	0.1 Ω	
COUPON CATHODE TO PIPE CATHODE RETURN	0.1 Ω	

REF. RPT-1		
ZN TO PIPE	310 mV	
ZN TO PROTECTED COUPON	310 mV	
ZN TO UNPROTECTED COUPON	556 mV	
CuSO <sub>4</sub> TO PIPE	-4.7 mV	
CuSO <sub>4</sub> TO PROTECTED COUPON	-4.7 mV	
CuSO <sub>4</sub> TO UNPROTECTED COUPON	235 mV	
CuSO <sub>4</sub> TO ZN	-320 mV	
PIPE CATHODE TO PIPE CATHODE RETURN	0.1 Ω	
COUPON CATHODE TO PIPE CATHODE RETURN	2.1 Ω	

**MEMORANDUM**

To	File No.
From	Date 4/02/93
Subject KARAWATHA PUMPING STATION COUPON REFERENCES	

Ra-1

Zn TO PIPE	40 mV
Zn TO PROTECTED COUPON	40 mV
Zn TO UNPROTECTED COUPON	495 mV
CuSO <sub>4</sub> TO PIPE	-1116 mV
CuSO <sub>4</sub> TO PROTECTED COUPON	-1116 mV
CuSO <sub>4</sub> TO UNPROTECTED COUPON	-665 mV
CuSO <sub>4</sub> TO Zn	-1159 mV
PIPE CATHODE TO PIPE CATHODE RETURN	0.1 Ω
COUPON CATHODE TO PIPE CATHODE RETURN	1.6 Ω

**DEPARTMENT OF WATER SUPPLY AND SEWERAGE**  
**MECHANICAL AND ELECTRICAL BRANCH**  
**METROPOLITAN DIVISION**  
**EAGLE FARM PUMPING STATION**

**ELECTRICAL WORKSHOP**

**INSULATED JOINT TESTING DETAILS:**

DATE 16 - 10 - 91

**DESCRIPTION**

MAINS DETAILS:-

LOCATIONS:-

SIZE:-

MATERIAL:-

COATING:-

NUMBER:-

450 mm MAINS  
KARAWATHA Pump STATION  
OUT GOING MAINS.

**IN GROUND TESTING**

BOLT TO FLANGE RESISTANCE:-

NUMBER OF BOLT:-

FLANGE TO FLANGE RESISTANCE:-

INSULATION CHECKER MODEL 702:-

POTENTIAL DIFFERENCE TO REFERENCE CELL

PROTECTED SIDE:-

UNPROTECTED SIDE:-

**ABOVE TESTING**

BOLT TO FLANGE RESISTANCE:- all > 200 Ω

NUMBER OF BOLTS:- as per sketch

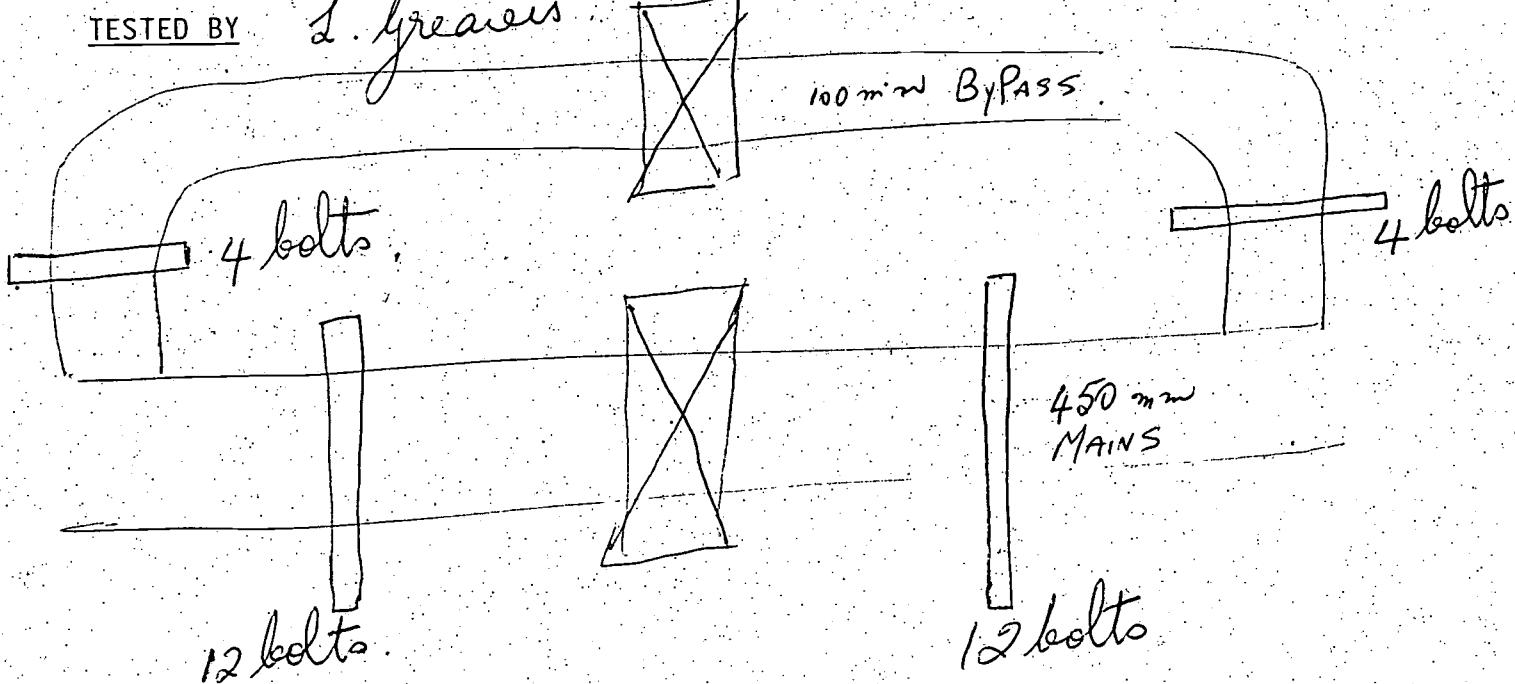
FLANGE TO FLANGE RESISTANCE:- all > 200 Ω

**COMMENTS**

Asked for silicone between flanges

TESTED BY

L. greaves



**DEPARTMENT OF WATER SUPPLY AND SEWERAGE**  
**MECHANICAL AND ELECTRICAL BRANCH**  
**METROPOLITAN DIVISION**  
**EAGLE FARM PUMPING STATION**

**ELECTRICAL WORKSHOP**

**INSULATED JOINT TESTING DETAILS:**

DATE 17-11-92

**DESCRIPTION**

MAINS DETAILS:- VALVE P.T N°1  
 LOCATIONS:- KARAWATHA PUMP STATION  
 SIZE:- 755 MM  
 MATERIAL:-  
 COATING:-  
 NUMBER:-

**IN GROUND TESTING**

BOLT TO FLANGE RESISTANCE:-

NUMBER OF BOLT:-

FLANGE TO FLANGE RESISTANCE:-

INSULATION CHECKER MODEL 702:-

POTENTIAL DIFFERENCE TO REFERENCE CELL

PROTECTED SIDE:-

UNPROTECTED SIDE:-

**ABOVE TESTING**

BOLT TO FLANGE RESISTANCE:-

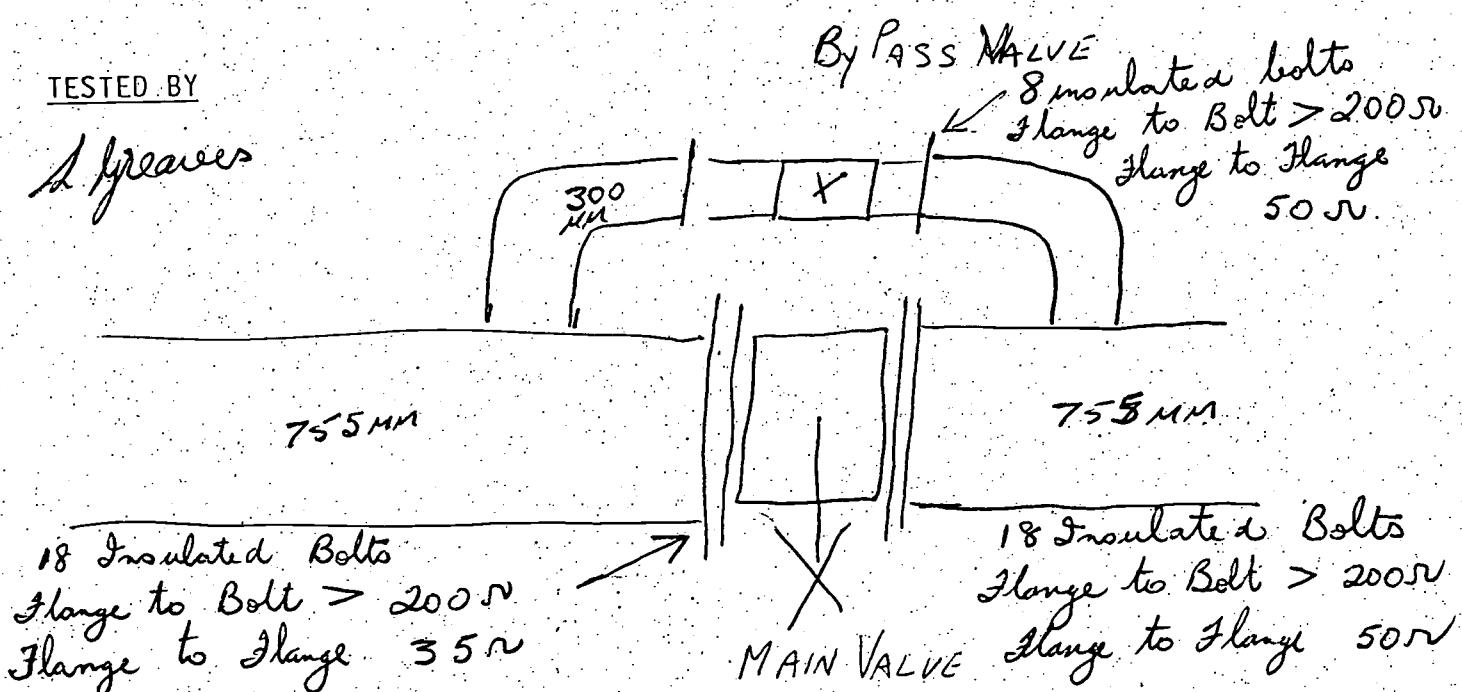
NUMBER OF BOLTS:-

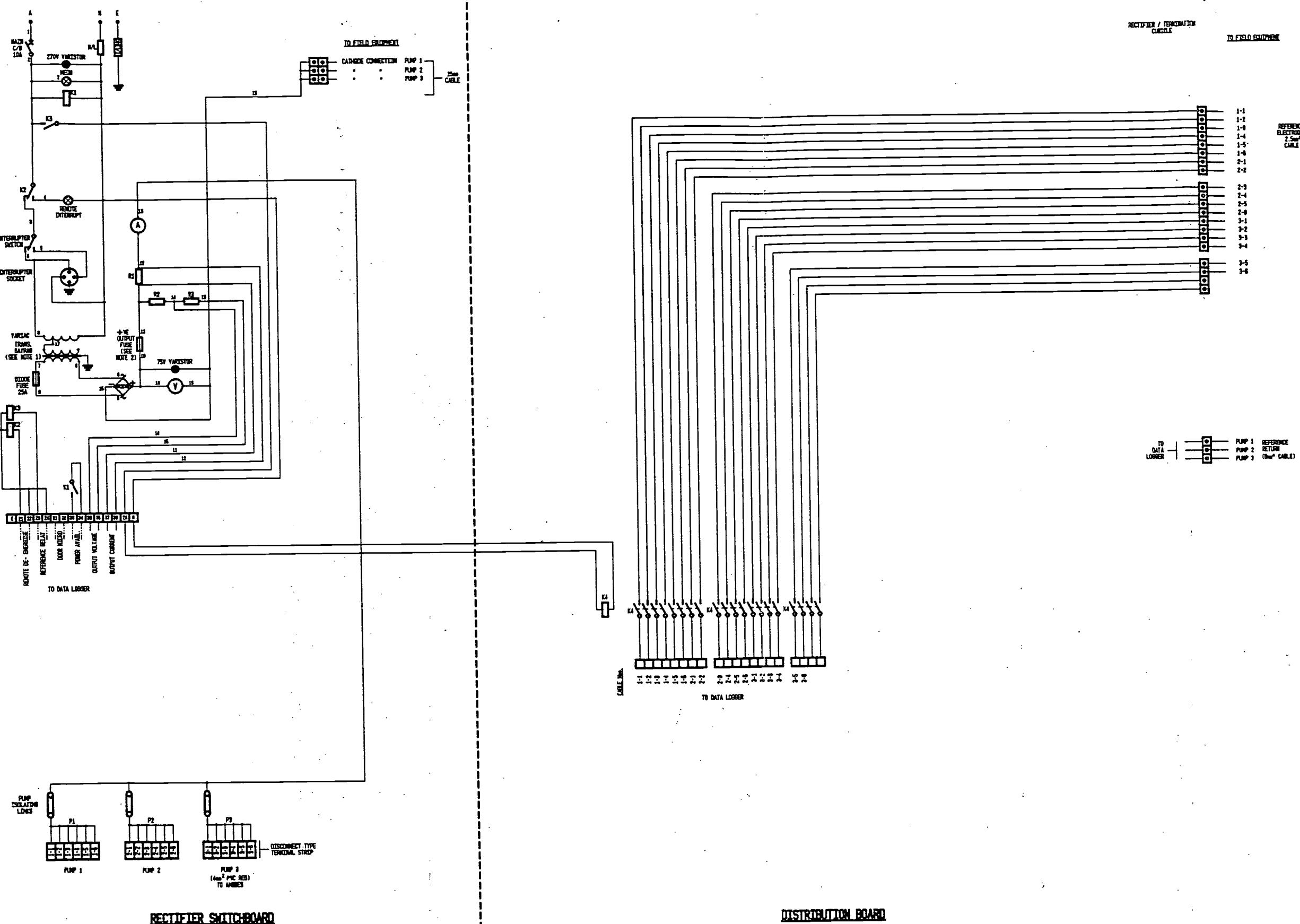
FLANGE TO FLANGE RESISTANCE:-

**COMMENTS**

**TESTED BY**

A Greaves





## LEGEND:

K1, K2 - 24W RELAYS  
R1, R2 - 24V DC RELAYS

R3 - SHUNT RESISTOR (SIZED TO PRODUCE A 25mV DROP AT FULL LOAD)  
R2, R3 - VOLTAGE DIVIDER (SIZED TO PRODUCE A VOLTAGE OF 1mV ACROSS R3 AT MAX. OUTPUT VOLTAGE)

NOTE:  
+ POSITIVE TO BE RED  
- NEGATIVE TO BE BLACK  
24V AC VOLUME TO BE  $4\text{A}^2$   
DC VOLUME TO BE  $4\text{A}^2$   
24W VOLUME TO BE  $1.5\text{m}^2$   
REFERENCE VOLUME TO BE  $1.0\text{m}^2$   
TELEMETRY VOLUME TO BE  $1.0\text{m}^2$

- NOTE 1: TRANSFORMER OUTPUT PRODUCES A VOLTAGE SUITABLE FOR APPLICATION, PROGRAMMING & CONTROL.  
LINE TO GND - MAXIMUM VOLTAGE TO BE APPLIED TO ANODES.  
AMMETER & VOLTMETER TO PROVIDE SUITABLE RESOLUTION FOR SYSTEM.
- NOTE 2: D.C. CIRCUIT FUSES TO BE SIZED JUST ABOVE OPERATING CURRENT TO PREVENT OVER PROTECTION FROM OCCURRING.
- NOTE 3: REFER TO DIAL. 486/6/7-PRECOURCE FOR ANODE & REFERENCE ELECTRODE POSITIONS.

B	6.03	AS CONSTRUCTED	J.M.F.
A	11.11	ISSUED FOR APPROVAL	G.L.P.
To	DATE	AMENDMENT / ISSUE TO / ISSUE FOR	INITIALS

APPROVAL & TESTS REPORTER

MANAGER DIRECTOR OF PLANNING & DESIGN

DATE:

DIRECTOR OF CONSTRUCTION DIRECTOR OF E&I SERVICES DIRECTOR OF SEA OPERATIONS / H.S. DISTRIBUTION

DATE: DATE: DATE:

DESIGN J.S. 26.11.93 ENGINEER IN CHARGE

DRAWN G.L.P. 26.11.93 SUPERVISING ENGINEER H.JONES

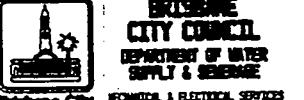
TRACED LEVEL BOOK

CHECKED J.S. 11.12.93 FIELD BOOK

A.H.DARREN SURVEYED

CAD FILE NO. REFERENCES

6700818



PROJECT:

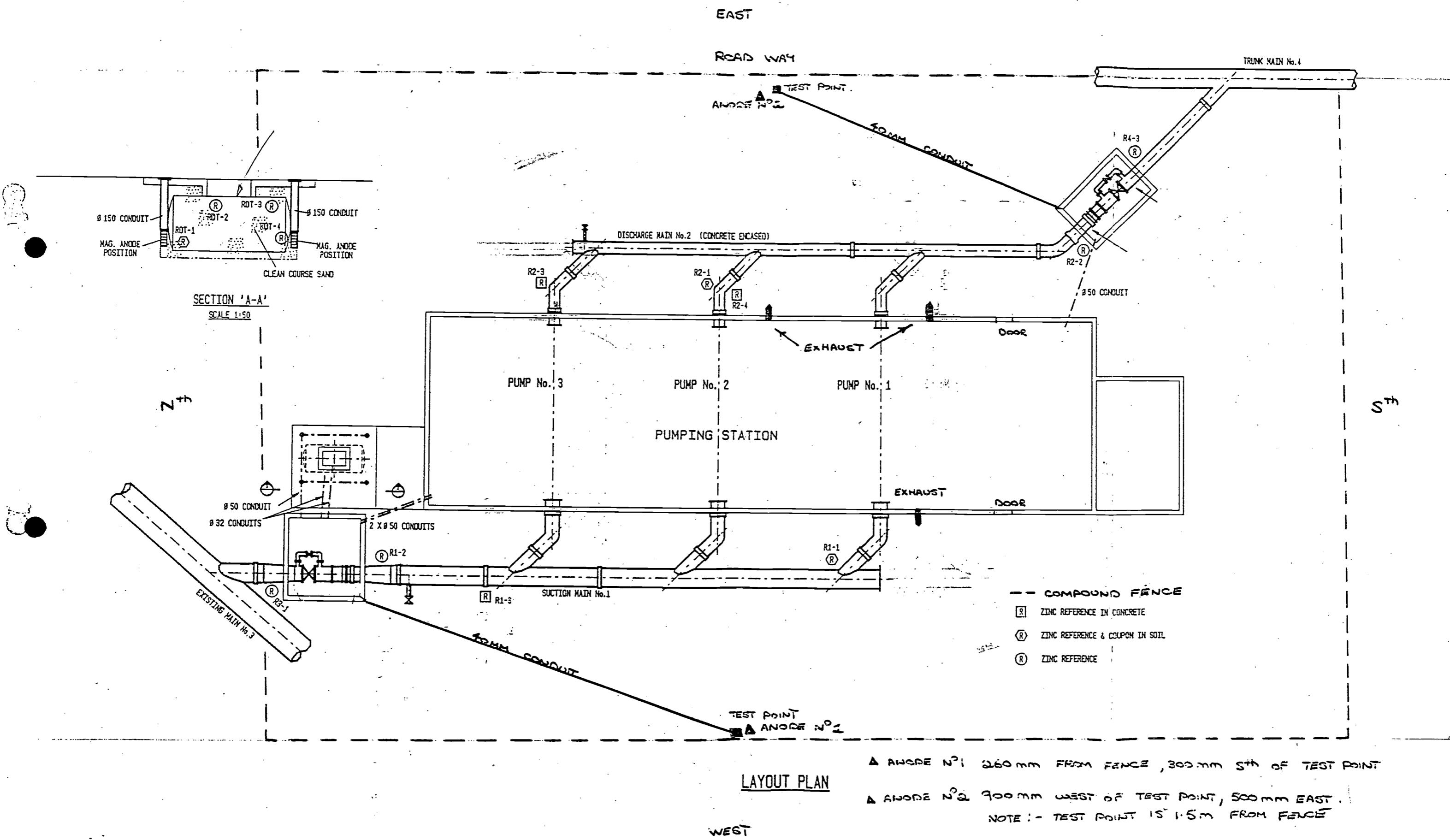
KARAWATHA WATER PUMPING STATION

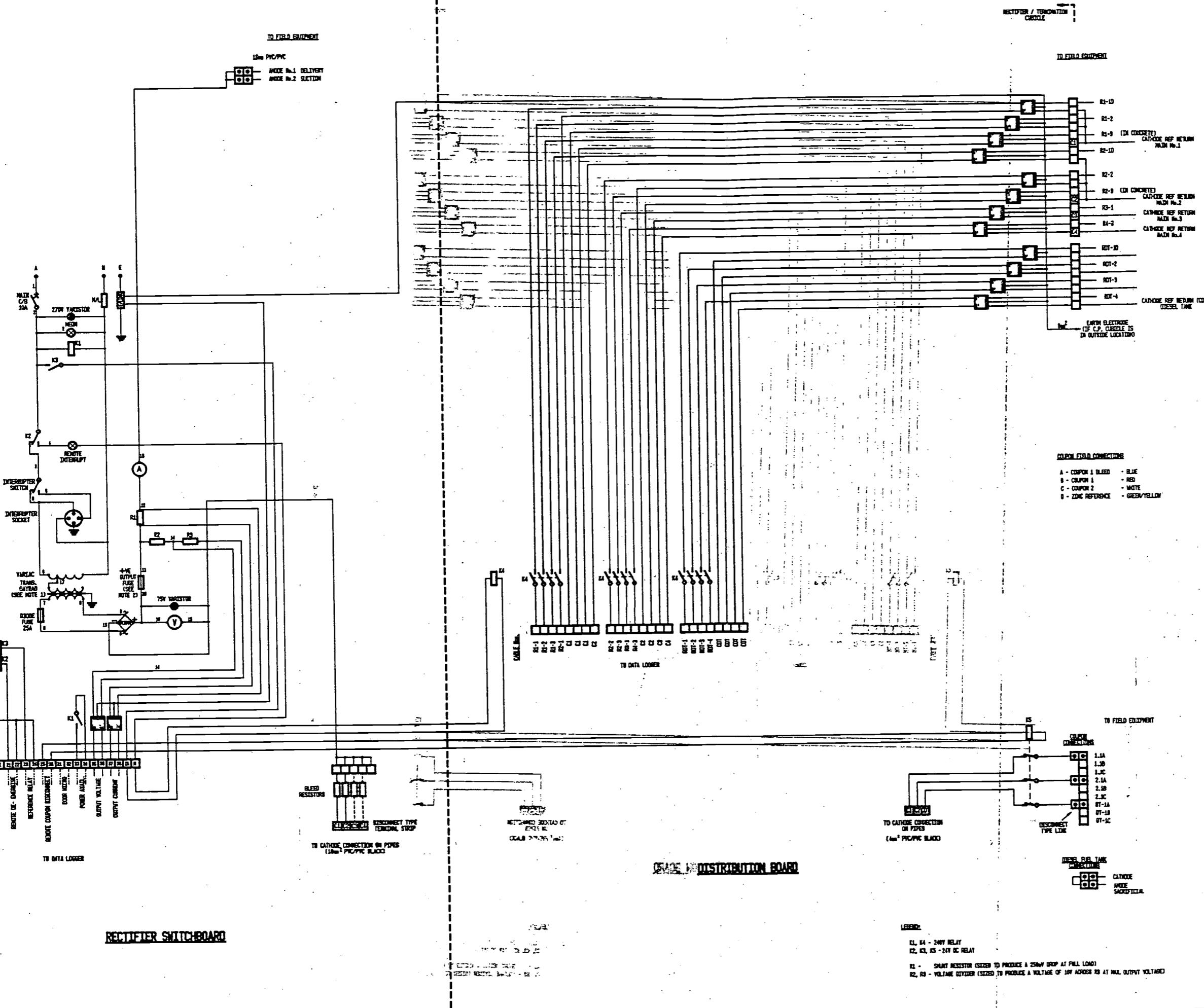
TITLE: CATHODIC PROTECTION INTERNAL PIPEWORK  
RECTIFIER / TERMINATION BOARD WIRING DIAGRAM

SCALE: No. OF SHEETS

DRAWING NO. 486/6/7-TB1C0081E

AMEND. B





- + POSITIVE TO BE RED
- NEGATIVE TO BE BLACK
- 12V AC WIRING TO BE  $4\text{m}^2$
- DC WIRING TO BE  $4\text{m}^2$
- 24V WIRING TO BE  $1.5\text{m}^2$
- REFERENCE WIRING TO BE  $1.0\text{m}^2$
- TELEMETRY WIRING TO BE  $1.0\text{m}^2$

1. TRANSFORMER CURRENT & VOLTAGE TO SUIT APPLICATION PROVIDING SUITABLE RESOLUTION & CONTROL.

1. D.C. INPUT FUSES TO BE SIZED JUST ABOVE OPERATING CURRENT TO PREVENT OVER PROTECTION FROM OCCURRING.

3: REFER TO DIS. 406/6/7-TRIDECRE FOR  
CATHODIC PROTECTION GENERAL LATENT DETAILS.

AS CONSTRUCTED		J.U.P.
NOTIFIED		O.L.P.
ISSUED FOR APPROVAL (XMAS)		O.L.P.
AMENDMENT / ISSUE TO / ISSUE FOR		INITIALS
<b>APPROVAL &amp; ISSUANCE</b>		
		DEPARTMENT OF PLANNING & DESIGN
		DATE:
DIRECTOR OF CONSTRUCTION	DIRECTOR OF H & E SERVICES	DIRECTOR OF H.E. OPERATIONS / V.S. CONSTRUCTION
	DATE:	DATE:
MR J.S.	28.11.82	ENGINEER IN CHARGE
MR O.L.P.	28.11.82	SUPERVISING ENGINEER M.JAMES
ED		
MR J.S.	11.12.82	
FILE NO.	REFERENCES	
67C082C		
	<b>BRISBANE CITY COUNCIL</b> DEPARTMENT OF WATER SUPPLY & SEWERAGE Brisbane City TECHNICAL & ELECTRICAL SERVICES	
KARAMATHA WATER PUMPING STATION		
CATHodic PROTECTION EXTERNAL PIPEWORK RECTIFIER / TERMINATION BOARD KIWI CLASSIFICATION		
DATE:	No.:	OF
498/6/7-TB1C0082E		Sheets
498/6/7-TB1C0082E		Amend: