



☐ Electrical ☐ Mechanical ☐ Water Meters
25 Bunya Street Eagle Farm Q 4009
Ph. (07) 3403 1849
Fx. (07) 3403 1898

1st June 2000

OPERATING MANUAL FOR:

THE WOODS FOREST LAKE
LEYBURN CRES. SUBMERSIBLE PUMP STATION
SP 283

CLIENT:

BRISBANE WATER
SEWERAGE UTILITY SERVICES

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486/6/25-AA1C0023E	Standard Rectifier Wiring Diagram
(No Number)	Monthly Maintenance Program

(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 an 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) **PUMP DETAILS**

Size: 2 X 15.0 Kw submersible pumps.(Flygt)

Coating: Enamel coated.

Length: NA

Location: Leyburn Crescent Forest Lake
UBD 217 Q10

Construction

Drawings:

486/6/25-AA1C0023E

Cathodic Protection Rectifier Unit.

(4.0) **CATHODIC PROTECTION DETAILS**

- (4.1) Type of Cathodic Protection: Impressed Current.
- (4.2) Rectifier: Standard 24 Volt, 5.0 amp direct current output enclosed in a PVC board inside the stainless steel switchboard. Rectifier has a 240V supply from the stainless steel switch board distribution panel.
- (4.3) Cathode: The cathode point is located on the pump motor. One reference anode is also fitted to the motor on the side. The cathode point is where the cabling from the rectifier is attached to the structure under cathodic protection.
- (4.4) Anodes: One silicone iron anode is suspended from the roof of the well .
- (4.5) Test Points: Test points are installed on cathodically protected structures to enable testing to ensure full protection of the pumps. On these pumps test points have been brought out to the cathodic protection switch board.
- (4.6) Associated Drawings:
Standard Rectifier Wiring Diagram - 486/6/25-AA1C0023E
- (4.7) Associated Standards:
AS 3000 1986 Australia Wiring Rules
AS 2832.1 1985 Pipes, Cables, Ducts, Guide to Cathodic Protection,
Part One.
- (4.8) 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 these pumps.

(7.0) **MAINTENANCE**

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

1 st. June 2000
Electrical Engineering Unit.
Cathodic Protection

CPS Monthly Maintenance Details.

Required:

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

Labour:

One trades person, 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.

1 st. June 2000.
Electrical Engineering Unit.
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 trades person electrical, one labourer, 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.

1st June 2000.
Electrical Engineering Unit.
Cathodic Protection

CPS 60 Monthly Maintenance Details.

Required:

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- 7/ Cleaning equipment.
- 8/ Gatic cover lifters.
- 9/ Rectifier load bank.

Labour:

One trades person electrical, one labourer, one vehicle.
Eight hours per site.

Procedure:

- 1/ Identify system.
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- 9/ Check and record anode string currents.
- 10/ Load test rectifier for 10 minutes.
- 11/ Check all switchboard and test point terminals for tightness.
- 12/ Check all switchboard and test points 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 to re-register system if applicable

Leyburn Crescent Submersible Pump Station.

CPS Non 191

Date 01/06/2000.

Unit set at 3.0 volts 0.09amps.

Potentials to copper sulphate reference cell.

Natural (mV)	On (mV)	Off (mV)
-631	-1081	-964

Interference Testing.

	On	Off	Swing
Rebar	-457 mV	-450 mV	-7 mV
Fence	-522 mV	-523 mV	+1 mV
Water pipe	-173 mV	-125 mV	-48 mV

Insulated Joints.

The two insulated joints were tested and the resistance between bolt to flange and flange to flange were all greater than 20 meg ohms.

Tested by J. Taylor.

Brisbane Water Engineering Services

Ph. 34031838 Fx. 34031839

Electrical Engineering Unit5 Bunya Street
Eagle Farm Q 4009Cathodic Protection System Loop Resistance

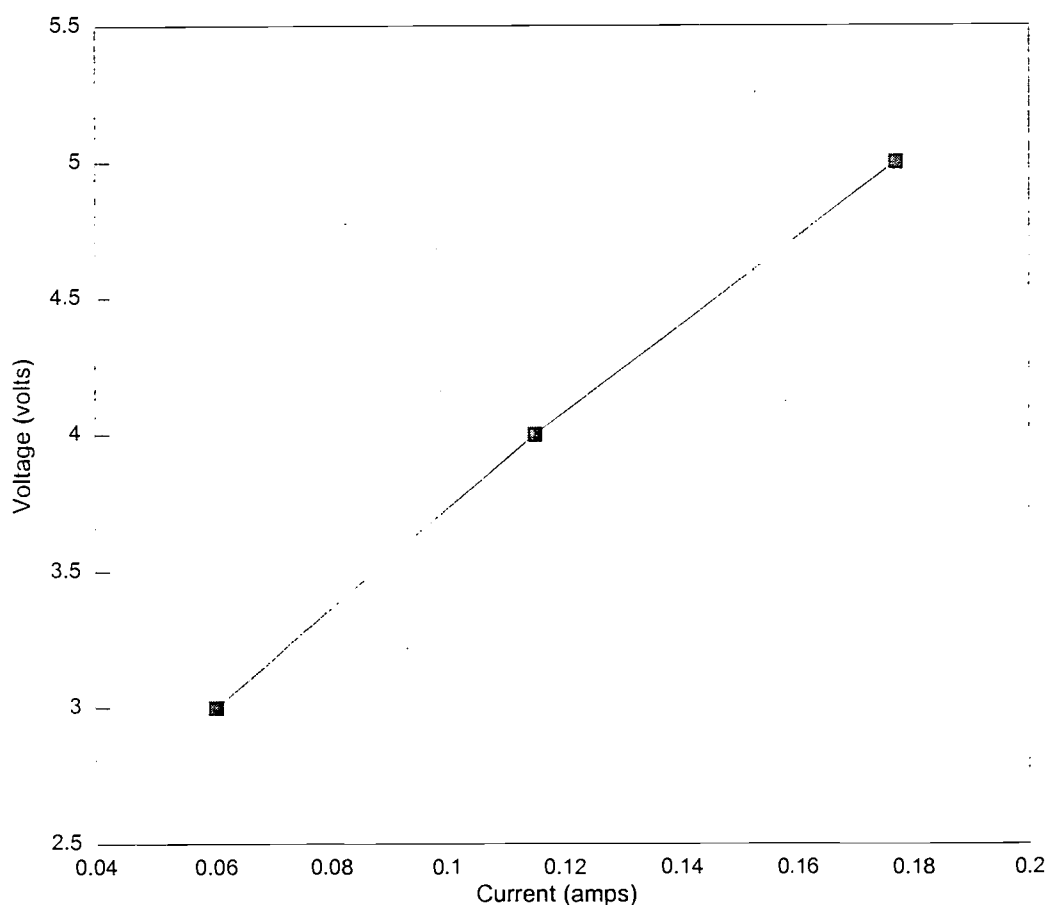
Date: 01st JUNE 2000

Cathodic Protection System: SP 283 Leyburn Cres. Forest Lake.(The Woods)

System Operating Volts 3 System Operating amps 0.09

Test Voltage:		Test Current:	
(volts)		(amps)	
3		0.06	
4		0.115	
5		0.177	

Loop Resistance (ohms)
28.24859

Graph of System voltage vs current.



TRANSFORMER OUTPUT CURRENT & VOLTAGE
TO SUIT APPLICATION PROVIDING SUITABLE
RESOLUTION & CONTROL

AMMETER & VOLTMETER TO PROVIDE
SUITABLE RESOLUTION FOR SYSTEM

* POSITIVE WIRING TO BE RED
- NEGATIVE WIRING TO BE BLACK
L.V. AC WIRING TO BE 4mm2 BLUE/WHITE
DC WIRING TO BE 4mm2
240V AC WIRING TO BE 1.5mm2-BROWN/BLACK
REFERENCE WIRING TO BE 1.5mm2-GRAY

LEGEND

K1 - 240V RELAY
K2,K3 - 24V DC RELAYS
R1 - SHUNT RESISTOR (SIZED TO PRODUCE A 1V
DROP AT FULL LOAD)
R2,R3 - VOLTAGE DIVIDER (SIZED TO PRODUCE A VOLTAGE
OF 1V ACROSS R2 AT MAX. OUTPUT VOLTAGE)
+VE AND -VE DC FUSES TO BE SIZED APPROX.
5AMPS ABOVE NORMAL OUTPUT CURRENT

BRISBANE
CITY COUNCIL
DEPARTMENT OF WATER
SUPPLY & SEWERAGE
MECHANICAL & ELECTRICAL SERVICES

PROJECT	STANDARD CATHODIC PROTECTION SUBMERSIBLE PUMP STATION
TITLE	RECTIFIER UNIT WITH DATA LOGGING FACILITIES WIRING DIAGRAM

DRAWN	NAME P.L.	DATE 19.10.93	SUPER ENG.	NAME M.J.	DATE 11.11.93	SCALE	SIZE A3
DESIGN	J.S.	15.10.93	SENIOR ENG.				
CHECKED	J.S.	22.10.93	ELECT. ENG.				
DRAWING No. 486/6/25-AA1C0023E						ACAD122 FILE No. A625C23	AMEND B

FTX/DCU - / + 1Vdc
FTX/DNU - / 0-50mA



□ Electrical □ Mechanical □ Water Meters
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486/6/25-AA1C0023E	Standard Rectifier Wiring Diagram
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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.

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1 st. June 2000
Electrical Engineering Unit.
Cathodic Protection

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1 st. June 2000.
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Cathodic Protection

CPS 6 Monthly Maintenance Details.

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1st June 2000.
Electrical Engineering Unit.
Cathodic Protection

CPS 60 Monthly Maintenance Details.

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Leyburn Crescent Submersible Pump Station.

CPS Non 191

Date 01/06/2000.

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Tested by J. Taylor.

Brisbane Water Engineering Services

Ph. 34031838 Fx. 34031839

Electrical Engineering Unit5 Bunya Street
Eagle Farm Q 4009Cathodic Protection System Loop Resistance

Date: 01st JUNE 2000

Cathodic Protection System:

SP 283 Leyburn Cres. Forest Lake.(The Woods)

System Operating Volts

3

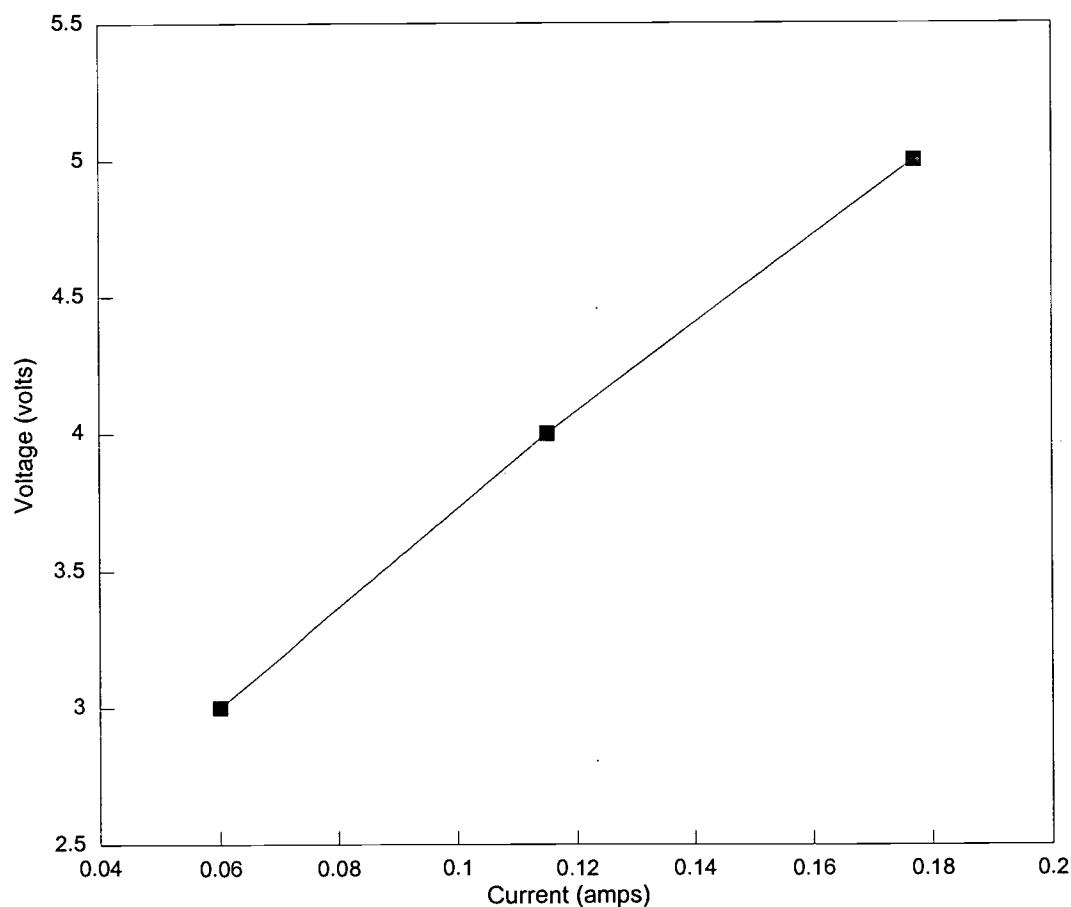
System Operating amps

0.09

Test Voltage:		Test Current:	
(volts)		(amps)	
3		0.06	
4		0.115	
5		0.177	

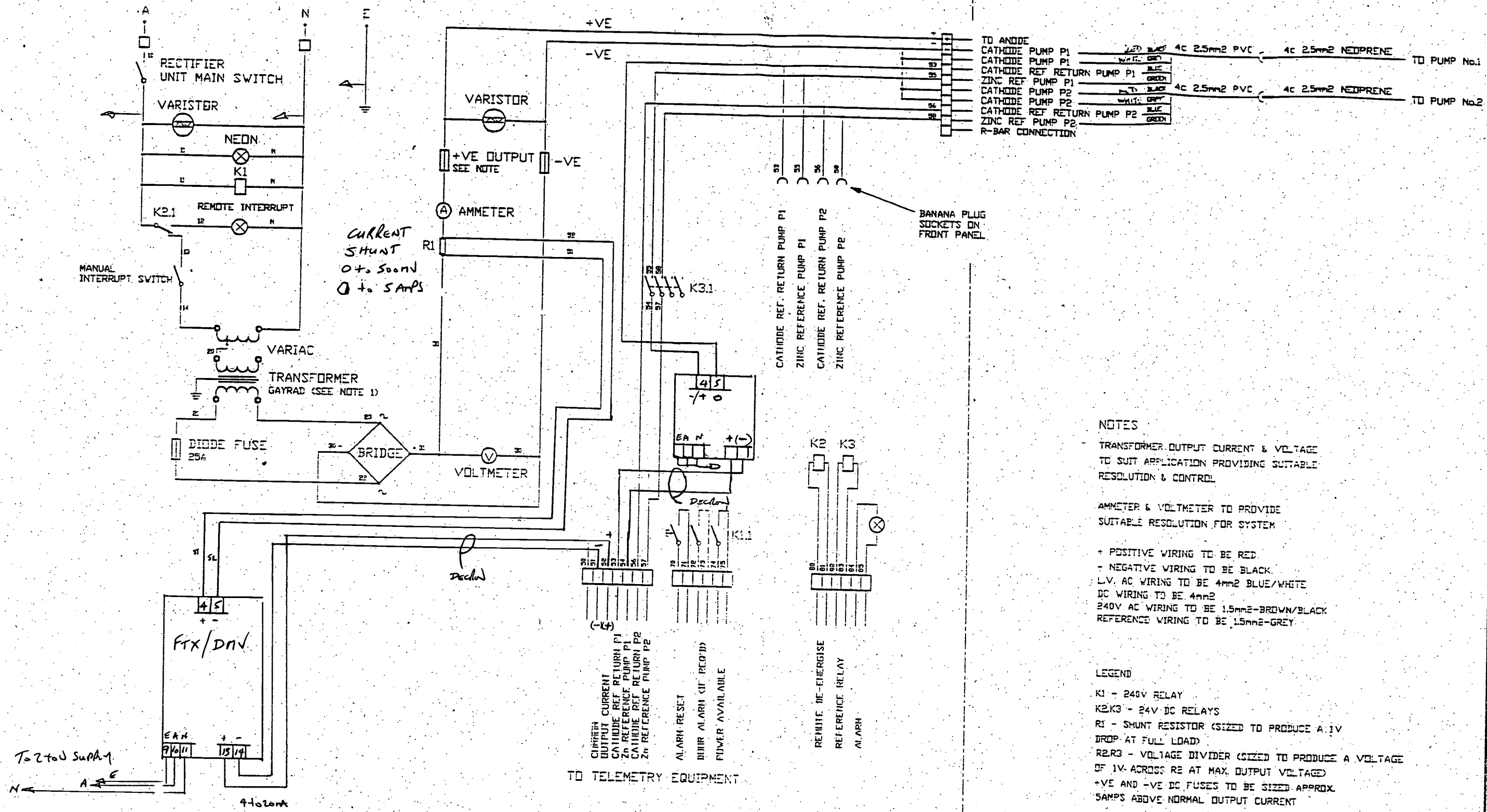
Loop Resistance (ohms)

28.24859

Graph of System voltage vs current.

RECTIFIER UNIT

FIELD



NO.	BY	DATE	REVISION	CHECK	APPR
B	R.L.	15.1.95	WIRE NUMBERS ADDED		
A	R.L.	22.12.94	CIRCUIT CHANGES		
D	R.L.	25.8.93	ISSUED FOR CONSTRUCTION		



BRISBANE CITY COUNCIL
DEPARTMENT OF WATER SUPPLY & SEWERAGE
MECHANICAL & ELECTRICAL SERVICES

PROJECT STANDARD CATHODIC PROTECTION SUBMERSIBLE PUMP STATION
TITLE RECTIFIER UNIT WITH DATA LOGGING FACILITIES WIRING DIAGRAM

DRAWN	NAME	DATE	SUPER ENG.	NAME	DATE	SCALE	SIZE
DESIGN	J.S.	15.10.93	SENIOR ENG.				A3
CHECKED	J.S.	22.10.93	ELECT. ENG.				
DRAWING NO.	486/6/25-AA1C0023E						AMEND
	A625023						B

FRX/DCU - /+11dc
FRX/DNU - /0-50mA