Brisbane City

Brisbane Water

29th January 1999.

OPERATING MANUAL FOR:

CASTLEMAINE PERKINS PTY LTD.
455 diameter TRADE WASTE MAIN
MILTON QLD.

CATHODIC PROTECTION SYSTEM

CLIENT:

CASTLEMAINE PERKINS PTY LTD.

MANUAL CONTENTS

DRAWINGS

(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 455 mm mild steel cement lined.
Coating:	Medium density fusion bonded Polyethylene
Length:	750 metres.
Location:	From the insulated joint in the flow meter pit, which is adjacent to the pump Station at the Milton Brewery,along Paten and Cribb Streets to Coronation Drive. This main connects to the Brisbane Water Rising Main at Coronation Drive Milton.
Construction Drawings:	947–3. (John Lynch & Associates Pty Ltd.) 947–4.

(4.0) CATHODIC PROTECTION DETAILS

(4.1) Type of Cathodic Protection: Impressed Current.

(4.2) Rectifier: 32 Volt, 10 amp direct current output enclosed in a stainless steel switchboard. Rectifier has a 240V supply from the nearby Energex Pole No.25043. In Railway Tce .Milton.

(4.3) Cathode: The cathode point is located on the trade waste main at test point 2 in Cribb Street,17.6metres from the corner with Railway Tce. 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 silicone iron anodes were installed approximately 4 metres west from the rectifier in a vertical bed. The anodes were backfilled with cokebreeze thereby improving anode – ground resistance. 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 three test points have been installed. Test point No.1 is a standard column type test point. Test point No.2 Is in the rectifier and test point No.3 is in a pit.

(4.6) Associated Drawings:

Vertical ground bed details.	– 486/5/8 LL 00 2
Cathodic Protection Test Point Details	– 486/1/22–AA1T0001E
Standard Rectifier Wiring Diagram	– 486/6/25–AA1C0021E

(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) Soil Resistance Testing.

(4) Current Drain Survey.

(5) Pipe Coating Anomaly Survey.

(6) Rectifier Loop Resistance.

(7) Foreign Structure Interference Survey and Mitigation.

(8) 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 Electricity Regulator Department of Minerals and Energy 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.

20 th January 1998,
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 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.

20 th January 1998,
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 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.

20 th January 1998,
Electrical Engineering Unit
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 to reregister system, if applicable.

Brisbane Water Engineering Services

Electrical Engineering Unit

Ph. 34031838 Fx. 34031839
5 Bunya Street
Eagle Farm Q 4009

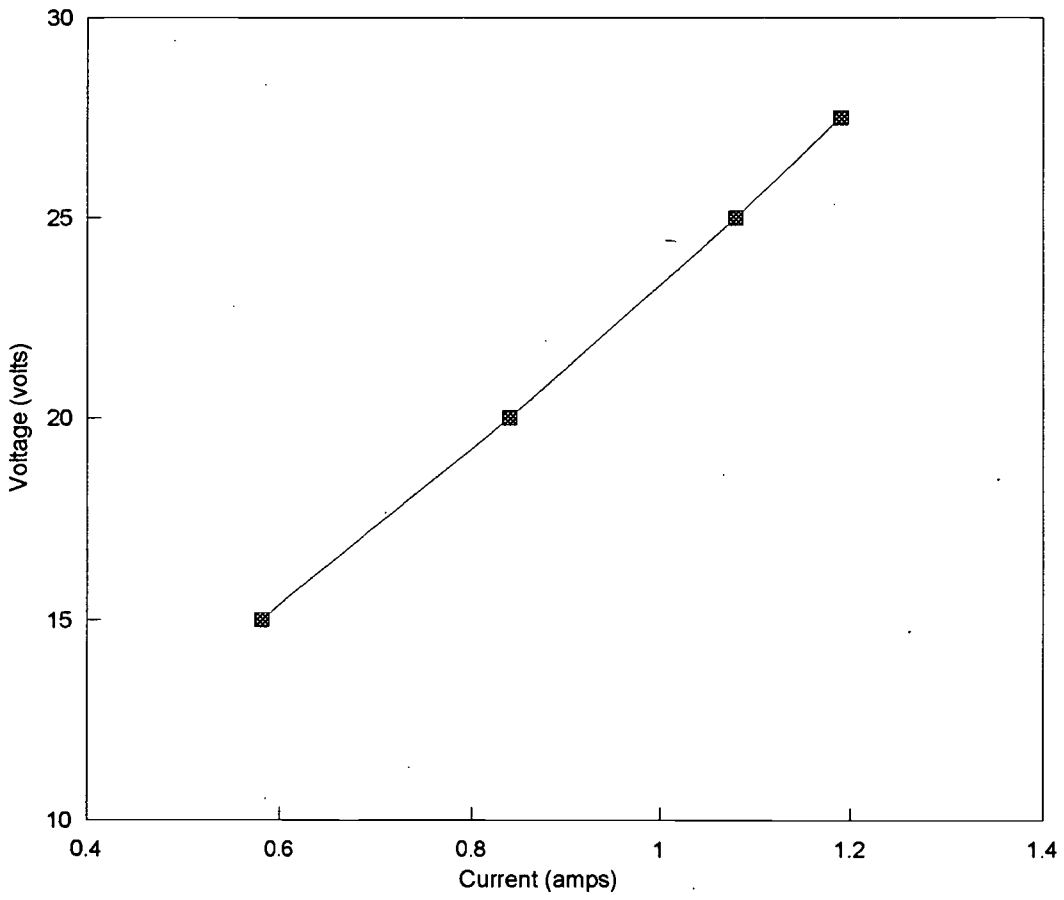
Cathodic Protection System Loop Resistance

Date 22nd January 1999
Cathodic Protection System: Castlemaine Perkins Trade Waste Main.
System Operating Volts 22 System Operating amp 1

Test Voltage: (volts)		Test Current: (amps)	
15		0.58	
20		0.84	
25		1.08	
27.5		1.19	

Loop Resistance (ohms)
23.14815

Graph of System voltage vs current.



Brisbane Water Engineering Services

Electrical Engineering Unit

Potential Readings for tradewaste main.

Project Castlemain Perkins

Date 22-01-1999.

Natural Potentials to Cu/CuSo4 Reference.

Test Point No1	-444mv
Test Point No2	-454mv
Test Point No3	-554mv

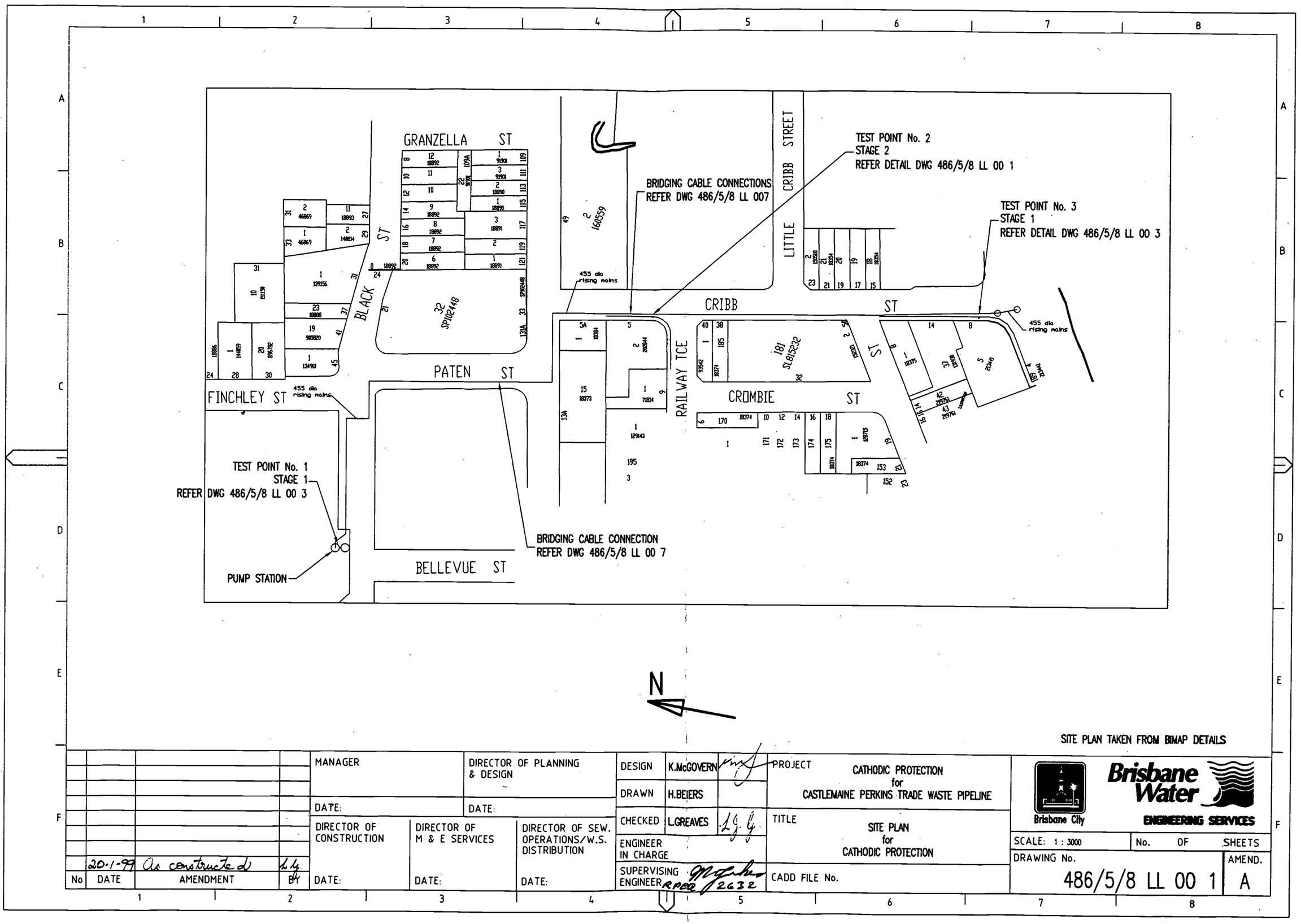
Soil Restivity at 1 metre.

Test Point No1	19.4 ohmmeters
Test Point No2	7.1 ohmmeters
Test Point No3	15.7 ohmmeters

Pipe Potentials as found.

		VsPortable CuCuSo4 off (mv)	Pipe off (mv)	Pipe on (mv)	Calculated Vs Portable CuCuSo4 off (mv)	on (mv)
TP No1 Ref.	initial	32	-660	-915	-628	-883
	polarised	32	-766	-934	-734	-902
TP No2 Ref.	initial	32	-840	-996	-808	-964
	polarised	32	-947	-1062	-915	-1030
TP No3 Ref.	initial	25	-840	-1130	-815	-1105
	polarised	25	-860	-1190	-835	-1165

Instrument used was Fluke meter BWES No. IN 14



SITE PLAN TAKEN FROM BIMAP DETAILS

No	DATE	AMENDMENT	BY
	20-1-99	As constructed	L.G.

MANAGER — DATE:
DIRECTOR OF PLANNING & DESIGN — DATE:
DIRECTOR OF CONSTRUCTION — DATE:
DIRECTOR OF M & E SERVICES — DATE:
DIRECTOR OF SEW. OPERATIONS/W.S. DISTRIBUTION — DATE:

DESIGN	K.McGOVERN	
DRAWN	H.BEIERS	
CHECKED	L.GREAVES	L.G.
ENGINEER IN CHARGE		
SUPERVISING ENGINEER	RPEQ 2632	

PROJECT: CATHODIC PROTECTION for CASTLEMAINE PERKINS TRADE WASTE PIPELINE

TITLE: SITE PLAN for CATHODIC PROTECTION

CADD FILE No.

Brisbane City — Brisbane Water — ENGINEERING SERVICES

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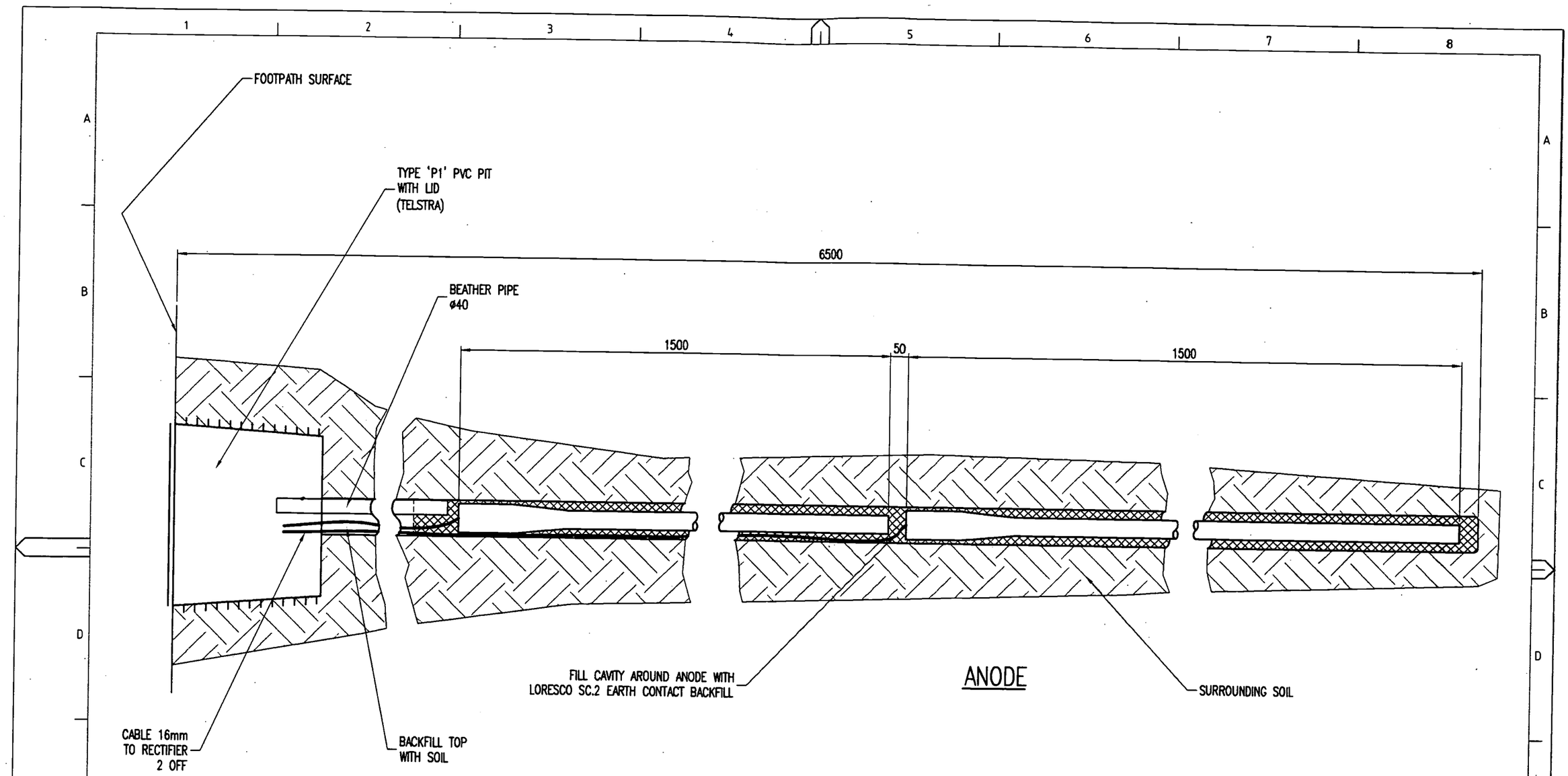

ANODE

				MANAGER	DIRECTOR OF PLANNING & DESIGN	DESIGN	K.McGOVERN		PROJECT	CATHODIC PROTECTION for CASTLEMAINE PERKINS TRADE WASTE PIPELINE
				DATE:	DATE:	DRAWN	H.BEIERS			
				DIRECTOR OF CONSTRUCTION	DIRECTOR OF M & E SERVICES / DIRECTOR OF SEW. OPERATIONS/W.S. DISTRIBUTION	CHECKED	L.GREAVES		TITLE	ANODE INSTALLATION for CATHODIC PROTECTION
						ENGINEER IN CHARGE				
	20-1-99	As constructed	LG	DATE:	DATE: / DATE:	SUPERVISING ENGINEER	RPEQ 2632		CADD FILE No.	
No	DATE	AMENDMENT	BY							

Brisbane City — Brisbane Water — ENGINEERING SERVICES

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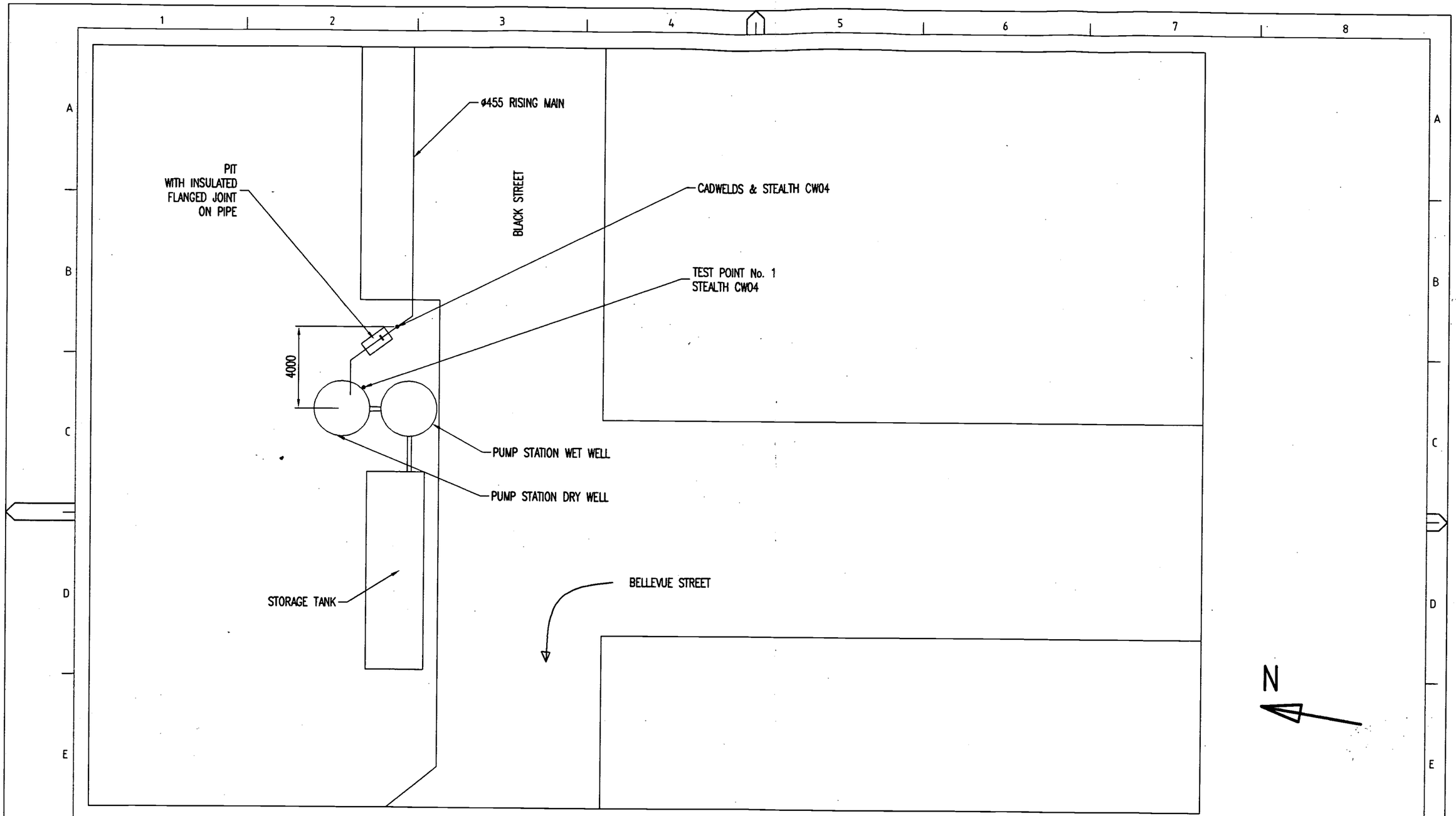

No	DATE	AMENDMENT	BY
	20-1-99	As constructed	LG

MANAGER — DATE:
DIRECTOR OF PLANNING & DESIGN — DATE:
DIRECTOR OF CONSTRUCTION — DATE:
DIRECTOR OF M & E SERVICES — DATE:
DIRECTOR OF SEW. OPERATIONS/W.S. DISTRIBUTION — DATE:

DESIGN: K.McGOVERN
DRAWN: H.BEIERS
CHECKED: L.GREAVES LG
ENGINEER IN CHARGE:
SUPERVISING ENGINEER: M Gribbon RPEQ 2632

PROJECT: CATHODIC PROTECTION for CASTLEMAINE PERKINS TRADE WASTE PIPELINE

TITLE: TEST POINT No. 1 for CATHODIC PROTECTION

CADD FILE No.

Brisbane City — Brisbane Water ENGINEERING SERVICES

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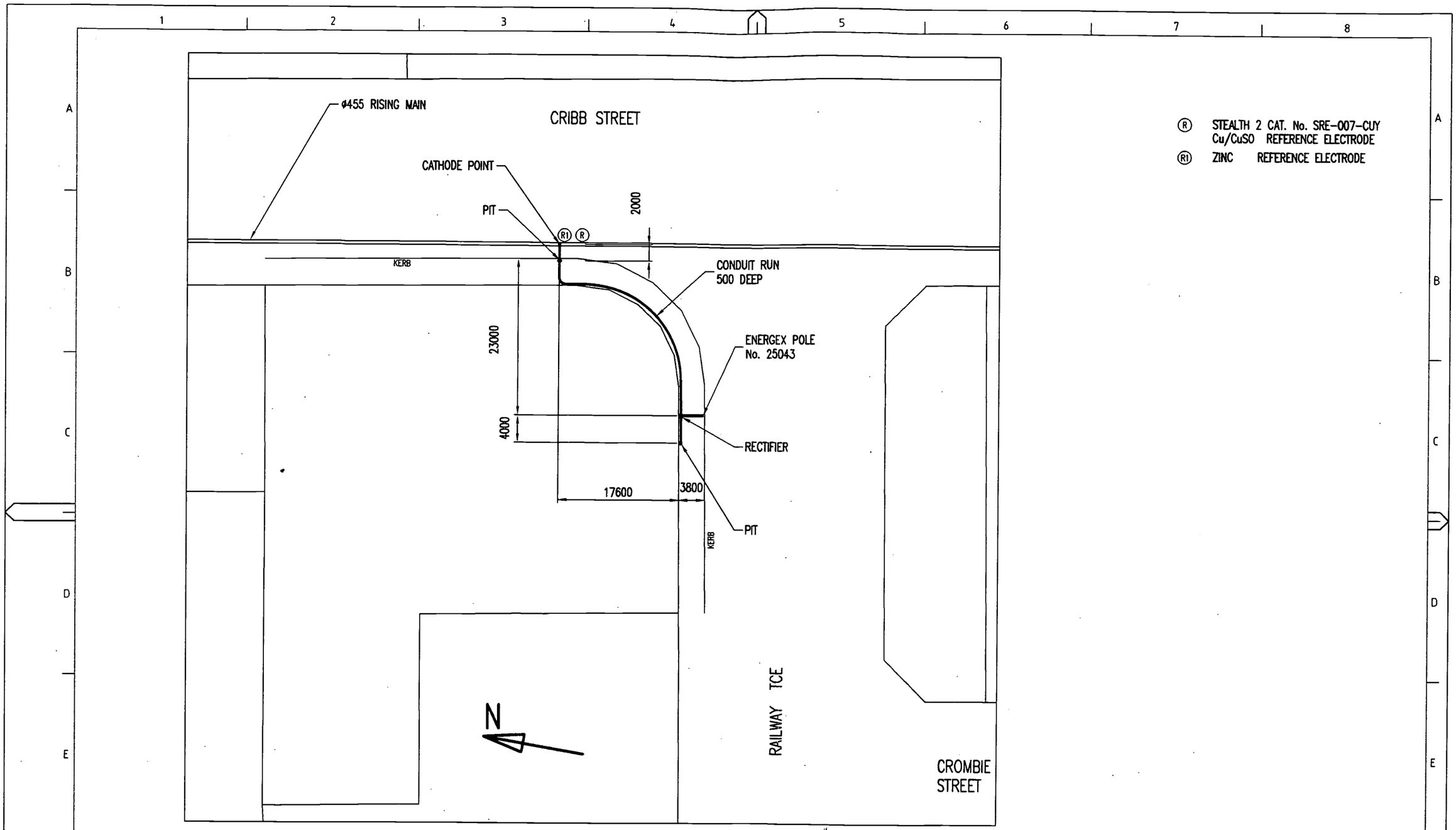

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	20-1-99	As constructed	Lfy

MANAGER — DATE:

DIRECTOR OF PLANNING & DESIGN — DATE:

DIRECTOR OF CONSTRUCTION — DATE:

DIRECTOR OF M & E SERVICES — DATE:

DIRECTOR OF SEW. OPERATIONS/W.S. DISTRIBUTION — DATE:

DESIGN	K.McGOVERN	
DRAWN	H.BEIERS	
CHECKED	L.GREAVES	L.J.G.
ENGINEER IN CHARGE		
SUPERVISING ENGINEER		RPEQ 2632

PROJECT: CATHODIC PROTECTION for CASTLEMAINE PERKINS TRADE WASTE PIPELINE

TITLE: TEST POINT No. 2 & RECTIFIER for CATHODIC PROTECTION

CADD FILE No.

Brisbane City — Brisbane Water ENGINEERING SERVICES

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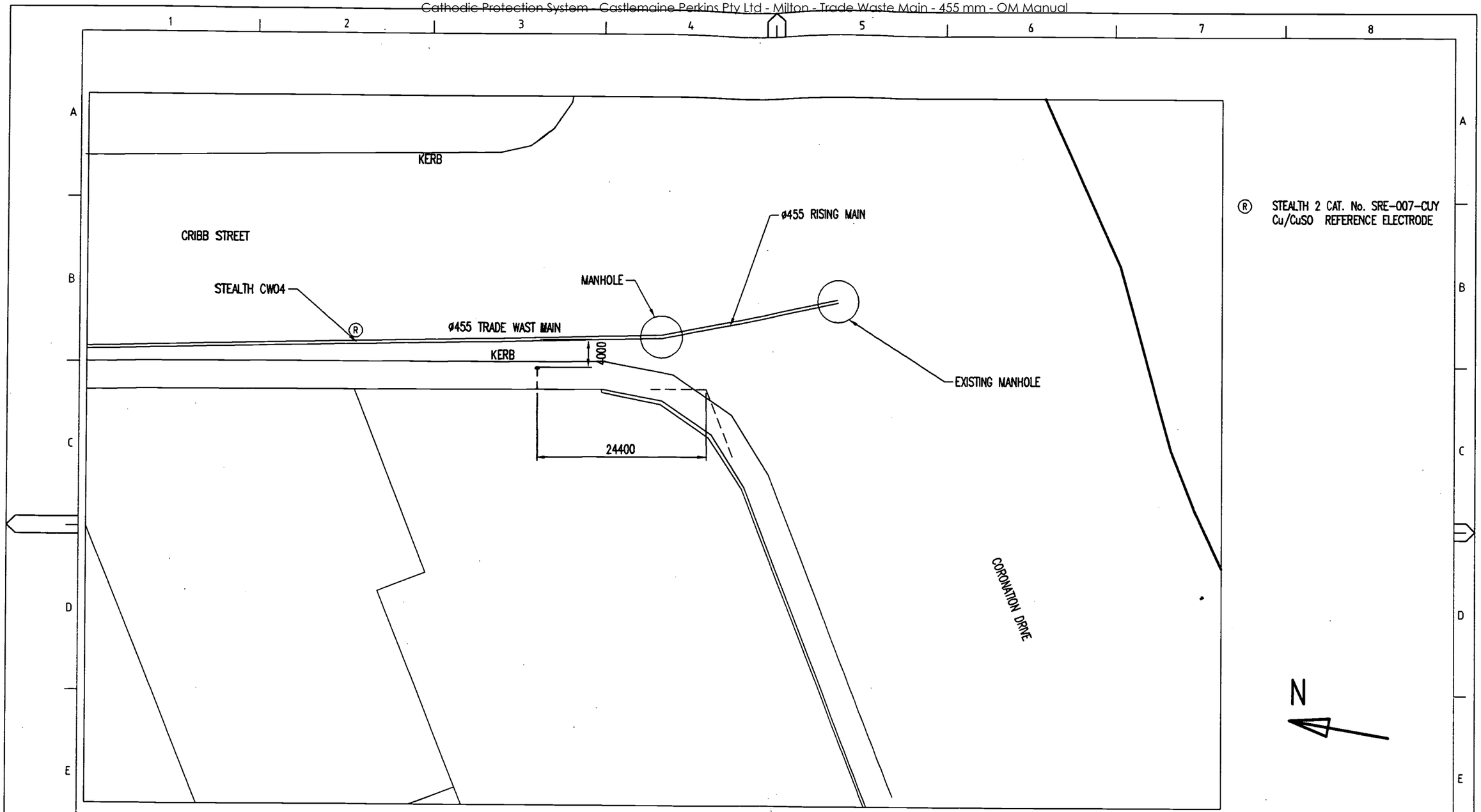

No	DATE	AMENDMENT	BY
	20-1-99	As constructed	LJ

MANAGER — DATE:
DIRECTOR OF PLANNING & DESIGN — DATE:
DIRECTOR OF CONSTRUCTION — DATE:
DIRECTOR OF M & E SERVICES — DATE:
DIRECTOR OF SEW. OPERATIONS/W.S. DISTRIBUTION — DATE:

DESIGN	K.McGOVERN	
DRAWN	H.BEIERS	
CHECKED	L.GREAVES	
ENGINEER IN CHARGE		
SUPERVISING ENGINEER	RPEQ 2632	

PROJECT: CATHODIC PROTECTION for CASTLEMAINE PERKINS TRADE WASTE PIPELINE

TITLE: TEST POINT No. 3 for CATHODIC PROTECTION

Brisbane City — Brisbane Water — ENGINEERING SERVICES

SCALE: 1 : 500 | No. | OF | SHEETS

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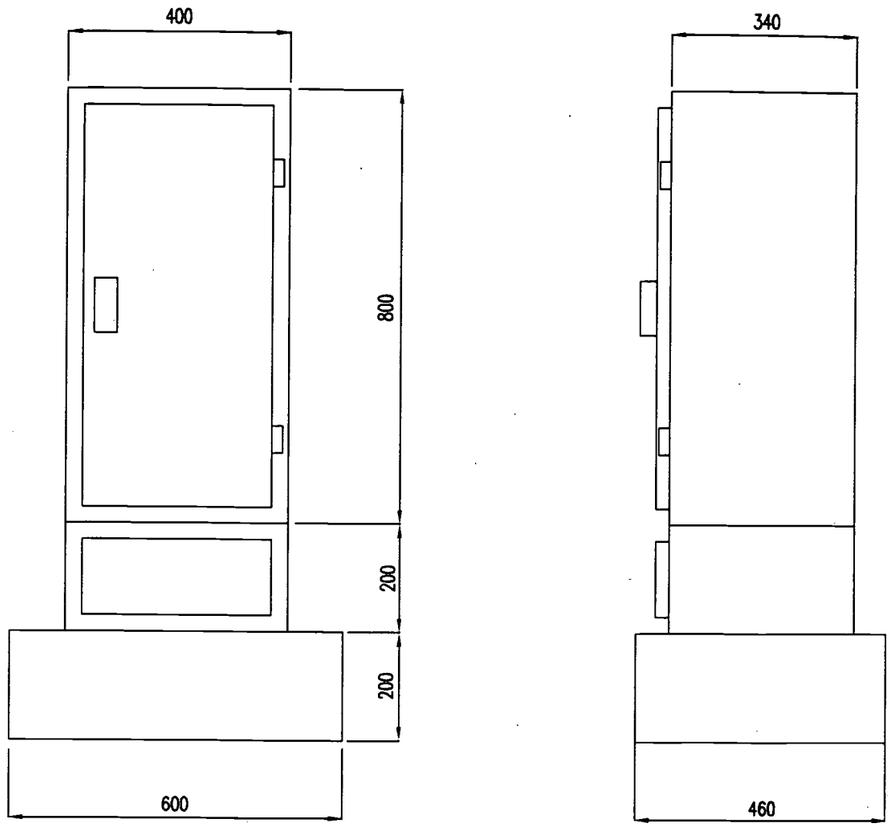

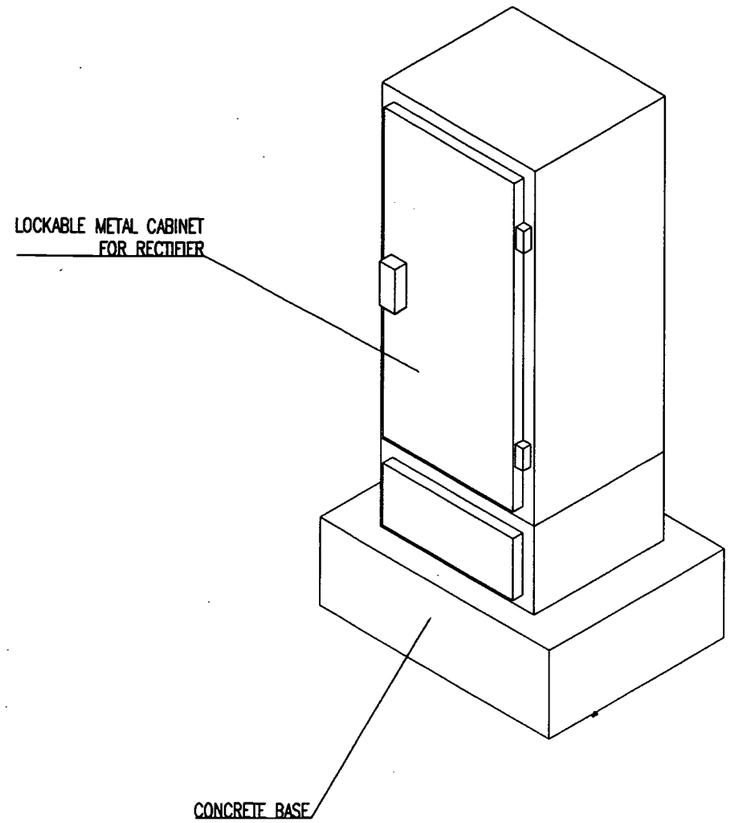

No	DATE	AMENDMENT	BY
	20-1-99	As constructed	L.G.

MANAGER — DATE:
DIRECTOR OF PLANNING & DESIGN — DATE:
DIRECTOR OF CONSTRUCTION — DATE:
DIRECTOR OF M & E SERVICES — DATE:
DIRECTOR OF SEW. OPERATIONS/W.S. DISTRIBUTION — DATE:

DESIGN	K.McGOVERN	
DRAWN	H.BEIERS	
CHECKED	L.GREAVES	
ENGINEER IN CHARGE		
SUPERVISING ENGINEER	RPEQ 2682	

PROJECT: CATHODIC PROTECTION for CASTLEMAINE PERKINS TRADE WASTE PIPELINE

TITLE: RECTIFIER MOUNTING CABINET for CATHODIC PROTECTION

CADD FILE No.

Brisbane City — Brisbane Water — ENGINEERING SERVICES

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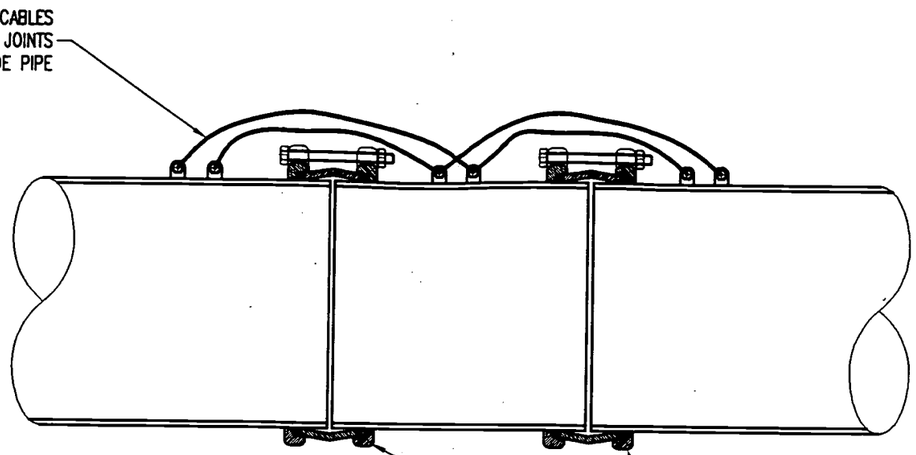

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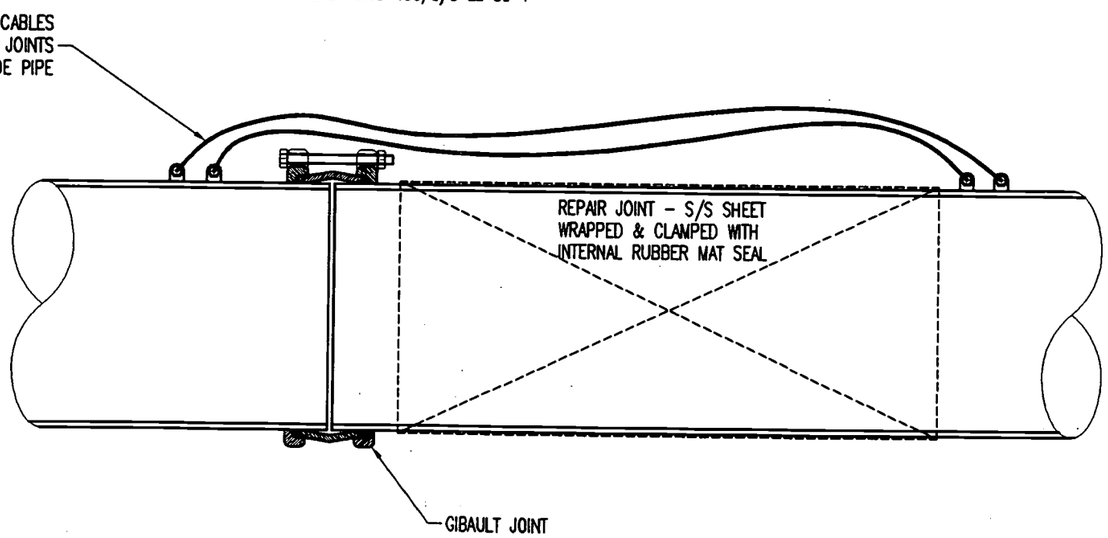

CRIBB STREET

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DIRECTOR OF PLANNING & DESIGN — DATE:

DIRECTOR OF CONSTRUCTION — DATE:

DIRECTOR OF M & E SERVICES — DATE:

DIRECTOR OF SEW. OPERATIONS/W.S. DISTRIBUTION — DATE:

DESIGN	K.McGOVERN	
DRAWN	H.BEIERS	
CHECKED	L.GREAVES	
ENGINEER IN CHARGE		
SUPERVISING ENGINEER	2632	

PROJECT: CATHODIC PROTECTION for CASTLEMAINE PERKINS TRADE WASTE PIPELINE

TITLE: BRIDGING CABLE CONNECTIONS for CATHODIC PROTECTION

CADD FILE No.

Brisbane City — Brisbane Water — ENGINEERING SERVICES

SCALE: 1 : 10 | No. | OF | SHEETS

DRAWING No. 486/5/8 LL 00 7 | AMEND. A

ESTABLISHED · 1878

CASTLEMAINE PERKINS

ACN 009 656 713 ABN 29 009 656 713

185 Milton Road, MILTON Qld 4064

GPO Box 44, BRISBANE Qld 4001

Tel: 3361 7400 Fax: 3368 3792

5 December 2000

TAX INVOICE

TO:

ATTN: LES

Brisbane Water
Brisbane Administration Centre
69 Ann Street
BRISBANE Qld 4000

FOR:

The purchase of decommissioned Cathodic Protection Rectifier.

ITEM	INVOICE AMOUNT
Cathodic Protection Rectifier	$ 500.00
G.S.T.	$ 50.00
Invoice Total:	$ 550.00

PAYMENT TERMS - 30 DAYS

WARREN WEBB
Engineering Manager
Tel: 3361 7312
Tel: Mobile 0419 640 092