

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

OPERATING MANUAL FOR:

FORTROSE STREET-SUNSET ROAD 410MM DIA RISING SEWER MAIN
CATHODIC PROTECTION SYSTEM

CLIENT:

DEPARTMENT OF WATER SUPPLY AND SEWERAGE
SEWERAGE OPERATIONS BRANCH

23 APRIL 1994

MANUAL CONTENTS

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(1.0) INTRODUCTION

Steel when buried or immersed has a tendency to corrode (rust) as the oxidised form is more stable than the metal.

Because of this, precautions must be taken to stop or minimise 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 practicable to expect a perfect coating during construction and coating damage will also occur with time. Because of this, corrosion may occur at imperfections.

(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 low 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 and is generally measured against a standard reference electrode, which permits a reproducible potential at which corrosion does not occur to be quoted.

(3.0) MAINS DETAILS

Size: Dia 410mm dia. mild steel cement lined sewer rising mains.

Coating: Fibreglass enamel wrapped.

Length: 3175 M

Location: From Fortrose Street Pump Station, Kenmore to Centenary Bridge.

Construction

Drawings: Not available.

(4.0) CATHODIC PROTECTION DETAILS

4.1 Type of Cathodic Protection: Impressed Current

4.2 Rectifier: Standard 32 Volt, 10 Amp direct current output enclosed in a stainless steel switchboard. Rectifier has a 240VAC supply from Sunset street sewerage pump station. Rectifier is located outside Sunset St. pump station. UBD 32 M5.

4.3 Cathode: The cathode point is located in Kingfisher Park on the 410 dia sewer main where a coupon type test point has been installed. The cathode is the point where the cabling from the rectifier is attached to the structure under cathodic protection.

4.4 Anodes: Two silicon iron anodes were installed approximately 165 metres from the trunk mains in a vertical bed 5 metres deep. The anodes were first backfilled with a cokebreeze surround to improve anode ground resistance. The anode location is identified by a marker pit and label.

4.5 Testpoints: Testpoints are installed on cathodically protected structures to enable testing to confirm that full cathodic protection of the structure is maintained. On these mains 6 testpoints have been installed. For further details see CP details layout drg. 486/7/8-HH1C0001E.

4.6 Associated Drawings:

486/6/25-AA1C0021E	Std Rectifier Wiring Diagram
486/1/22-C0023E	Silicone Iron Anode details.
486/6/25-AA1C0026E	Installation details conduit and rectifier.
486/6/25-AA1C0024E	Vertical groundbed details.
No number	Maintenance Details.
486/7/8-HH1C0001E	410 dia MSCL sewer rising main CP details. Sheets 1 & 2.

4.7 Associated Standards:

-AS 2832.1 1985 Pipes,Cables,Ducts, Guide to Cathodic Protection. Part 1.
-AS 3000 1991 Australian Wiring Rules

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.

NOTE: Details of above testing have not been included in this manual but are available upon request.

(6.0) CONCLUSION

Full cathodic protection has been achieved on this section of the trunk mains.

The cathodic protection system is to be 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. Monthly, Six monthly and sixty monthly maintenance procedures are detailed as attached below.

(7.1) **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.

(7.2) **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.

(7.3) 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:

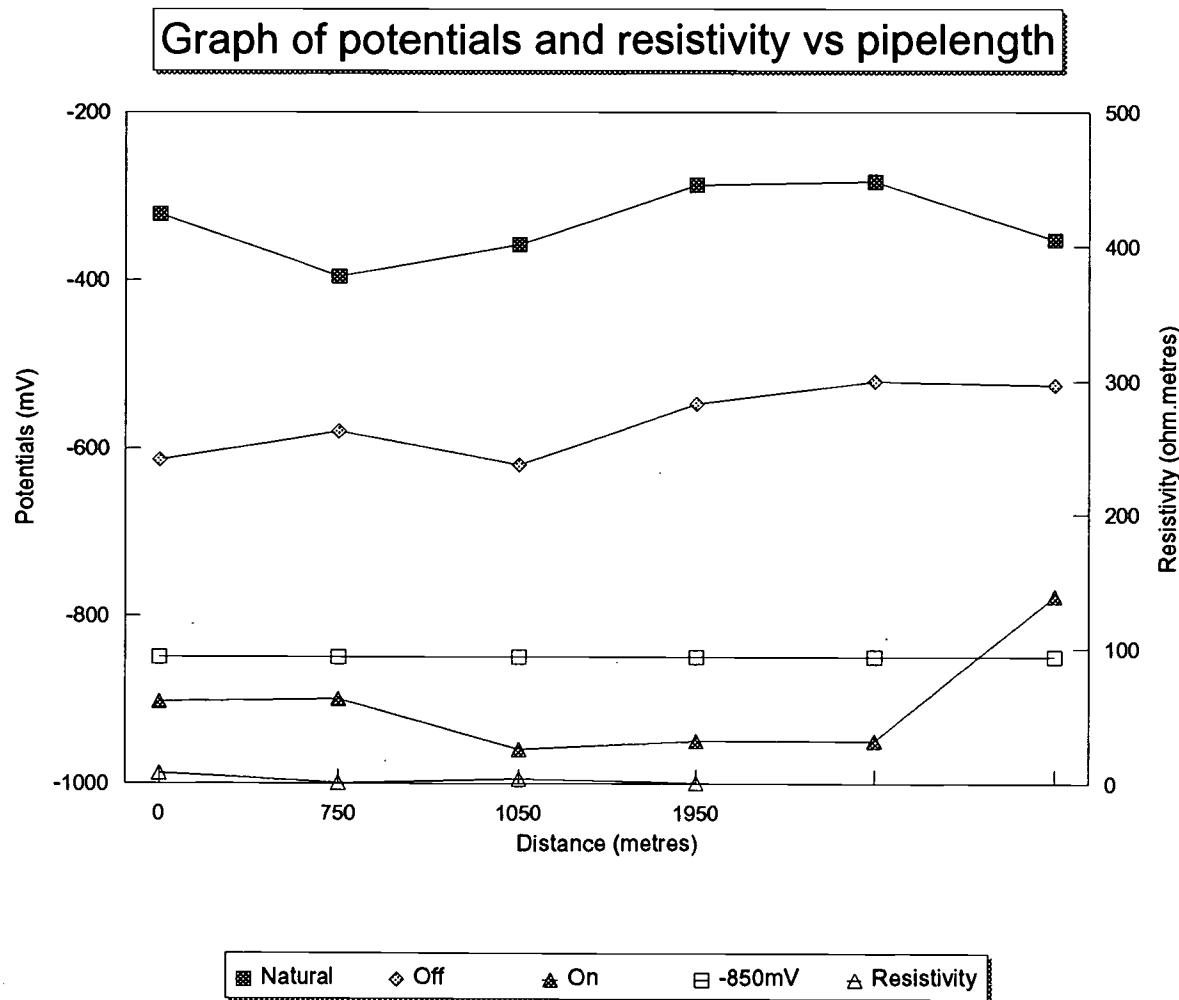
- 1/ Identify system.
- 2/ Check system for operation.
- 3/ Record voltmeter.
- 4/ Record ammeter.
- 5/ Record "on" potentials for all test points.
- 6/ Record "instant off" potentials for all test points.
- 7/ Record "off" potentials for all test points.
- 8/ Perform loop resistance and record.
- 9/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

Brisbane City Council
 Dept. W.S.& S.
 Metropolitan Division
 Eagle Farm Pumping Station
 Date: 3rd January 1995
 Electrical Workshop

System: Fortrose Street 410mm dia. rising sewer trunk mains.
Cathodic Protection System reference potential and earth resistivity graph.

Test Point number	Distances to T.P. (metres)	Potentials to CuSO ₄			Resistivities at 2 metres (ohm.metres)
		Natural	Off	On	
		(mV)	(mV)	(mV)	
1	0	-321	-614	-903	7.54
2	750	-395	-580	-900	0.63
3	1050	-357	-620	-960	3.27
4	1950	-286	-547	-950	0.13
5	2225	-283	-520	-950	
6	3175	-352	-525	-777	

Rectifier at test point No.4 . Unit operating at 3 volts 0.75 amps



Rectifier located at test point 4

POTSUNSE.WK4

Brisbane City Council
Dept. W.S.& S.
Metropolitan Division
Eagle Farm Pump Station

Cathodic Protection System Loop Resistance

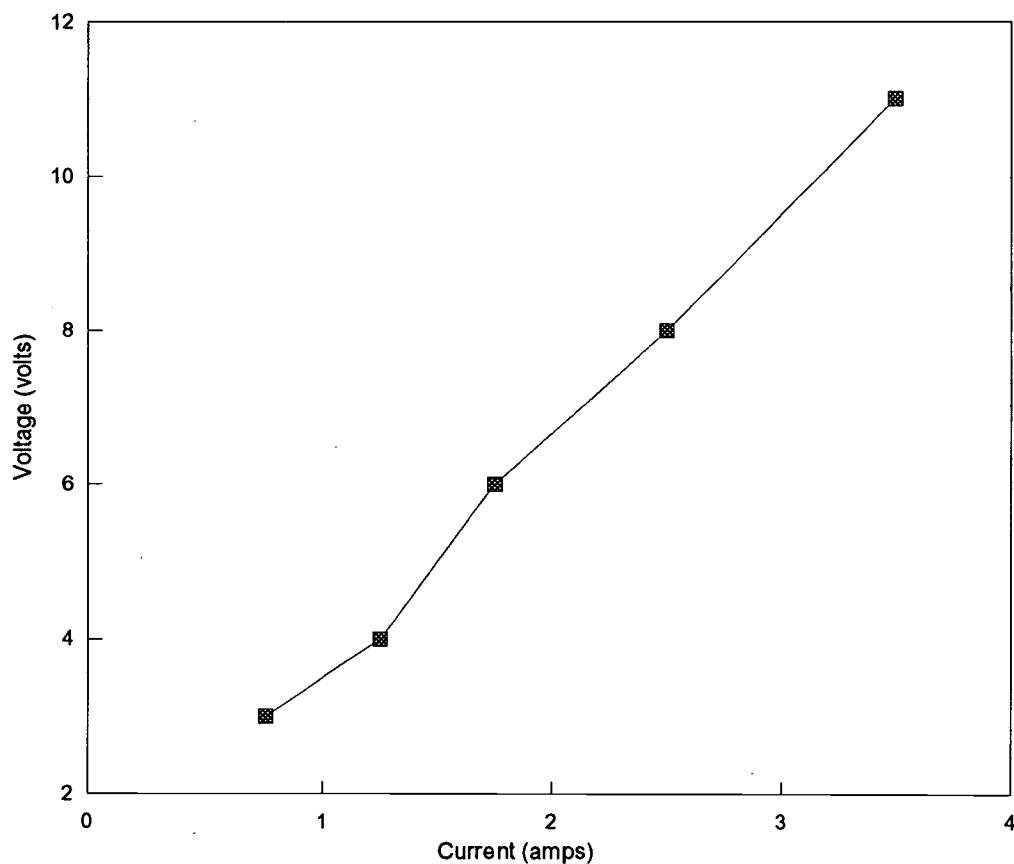
Date: 23 April 1994

Cathodic Protection System: Fortrose Street rising sewer mains.

System Operating Volts: 3 System Operating amps 0.75

Test Voltage: (volts)	Test Current: (amps)
3	0.75
4	1.25
6	1.75
8	2.5
11	3.5

Loop Resistance (ohms)
2.857143

Graph of System voltage vs current.

LOOPSUNS.WK4



THE SOUTH EAST QUEENSLAND
ELECTRICITY BOARD

TECHNICAL SERVICES DIVISION

TEST & INVESTIGATIONS GROUP

COMPRISING: TESTS & INVESTIGATIONS MANAGER

PH. 223 5315

CABLE & SAFETY TESTS SECTION

PH. 223 5369

FIELD INVESTIGATIONS SECTION

PH. 223 5433

FIELD TESTS SECTION

PH. 223 5449

EQUIPMENT TESTS SECTION

PH. 223 5416

Ref. No.: _____

Building One
Blinzinger Road
BANYO QLD 4014

Date: 26/10/95

FAX No. : (07) 267 6228

No. of pages following: _____

ATT'N:

KERRY MCGOVERN

LOCATION:

BRISBANE WATER ENG. SERVICES

FAX No.:

07 3403 1898

FROM.:

DARRYL RINGUET

REMARKS:

AS DISCUSSED I HAVE NO OBJECTIONS TO THE CP

SYSTEMS AT BLUNDER RD TO BEATTY RD, AND ALSO THE CP SYSTEM

AT FORTROSE ST KENMORE. THERE APPEARS TO BE NO SIGNIFICANT

INTERFERENCE TO SEQEB STRUCTURES AS SHOWN ON YOUR TEST

RESULTS.

D Ringuet

Electrical Mechanical Water Meters

5 Bunya Street Eagle Farm Q 4009

Ph. (07) 3403 1849

Fx. (07) 3403 1898

Brisbane Water Engineering Services

Fax transmission

to:Darryl Ringuet

company/location:SEQEB

fax no:2676228

from:Kerry Mc Govern

unit: Electrical Engineering Unit

ph no:34031838

fax no:(07) 3403 1839

date:26 Oct 1995

no of pages: (including this page)Two

re:Fortrose St sewerage rising mains Kenmore cathodic protection

message:

Please find a copy of interference test results for interference mitigation conducted on Monday 23 October 1995 by Murry Mc Cormick and Bob Bell.

Could you please reply by fax or letter of your acceptance of above testing for our records.

Regards,


Kerry Mc Govern
Electrical Supervisor

Brisbane Water Engineering Services

CP Form No. 28

Electrical Engineering Unit**Cathodic Protection Bleed Point Details Form**Project FORTROSE ST., RISING MAINDate 23.10.95Bleed Location FORTROSE ST., KENMORECPB No. H7FOREIGN STRUCTURE OWNER: SEQEBF.S. LOCATION: FORTROSE ST, KENMOREF.S. IDENTIFICATION: POLE N° 39173**REFERENCE POTENTIALS TO F.S. PRIOR TO BLEED CONNECTION:**REFERENCE TYPE: CuSO₄POTENTIAL OFF: -309 mV ON: -224 mV SW: +85 mVBLEED TYPE: GALVANICBLEED MATERIAL: ZINCBLEED WEIGHT: TOTAL - 1.3kg (2 x 650g)BLEED O/C POTENTIAL: 694 mVBLEED CURRENT OFF: 49 mA ON: 49 mA**REFERENCE POTENTIALS AFTER CONNECTION TO FOREIGN STRUCTURE:**

Bond Off (Rectifier Off)			Bleed On			Resultant Swing
Bleed Off	Bleed On	Swing	Bond Off	Bond On	Swing	
<u>-336</u>	<u>-613</u>	<u>-277</u>	<u>-613</u>	<u>-603</u>	<u>+10</u>	<u>-267</u>

FOREIGN STRUCTURE OWNER AGREEABLE WITH MITIGATION? (Y/N) YESIDENTIFICATION TAG INSTALLED? (Y/N) YES**COMMENTS:**TEST CARRIED OUT MAXIMUM REGISTERED OUTPUT.RECTIFIER SET AT 14.5 V at 4A.TEST WITNESSED BY BOB BELLINSTALLED / TESTED BY M.M.CORMICK

LAST TRANSMISSION REPORT

2680839
E/F ELEC W/SHOP

Tr.No.	Type	Doc.R.	Destination ID	Date/Time	Durat.	Page	Result
0048	TX	ADF	61 7 2676228	26/10 '95 10:36	01:48	02	OK

Brisbane Water Engineering Services

CP Form No. 28

Electrical Engineering Unit**Cathodic Protection Bleed Point Details Form**Project FORTROSE ST., RISING MAINDate 23.10.95Bleed Location FORTROSE ST., KENMORECPB No. 47FOREIGN STRUCTURE OWNER: SEQEBF.S. LOCATION: FORTROSE ST, KENMOREF.S. IDENTIFICATION: POLE N° 39173**REFERENCE POTENTIALS TO F.S. PRIOR TO BLEED CONNECTION:**REFERENCE TYPE: CuSO₄POTENTIAL OFF: -309 mV ON: -224 mV SW: +85 mVBLEED TYPE: GALVANICBLEED MATERIAL: ZINCBLEED WEIGHT: TOTAL - 1.3Kg (2x650g)BLEED O/C POTENTIAL: 694 mVBLEED CURRENT OFF: 49 mA ON: 49 mA**REFERENCE POTENTIALS AFTER CONNECTION TO FOREIGN STRUCTURE:**

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Bleed Off	Bleed On	Swing	Bond Off	Bond On	Swing	
<u>-336</u>	<u>-613</u>	<u>-277</u>	<u>-613</u>	<u>-603</u>	<u>+10</u>	<u>-267</u>

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MEMORANDUM

To	File No.
From	Date 30/08/94
Subject FORTROSE STREET RISING MAIN NATURAL POTENTIALS	

COUPON, PIPE 3 900MM LOCKBAR.

Zn TO PIPE	+ 793 mV
Zn TO PRO COUPON	+ 445 mV
Zn TO UNPRO COUPON	+ 520 mV
CuSO ₄ TO PIPE	- 385 mV
CuSO ₄ TO PRO COUPON	- 684 mV
CuSO ₄ TO UNPRO COUPON	- 609 mV
Zn TO CuSO ₄	- 1129 mV

TEST POINT N°1

Zn TO PIPE	+ 735 mV
CuSO ₄ TO PIPE	- 321 mV
Zn TO CuSO ₄	- 1054 mV

TEST POINT N°2

Zn TO PIPE	+ 733 mV
CuSO ₄ TO PIPE	- 395 mV
Zn TO CuSO ₄	- 1127 mV

TEST POINT N°3

Zn TO PIPE	+ 712 mV
CuSO ₄ TO PIPE	- 357 mV
Zn TO CuSO ₄	- 1067 mV

TEST POINT N°5

CuSO ₄ TO PIPE	- 283 mV
---------------------------	----------

TEST POINT N°7

Zn TO PIPE	+ 496 mV
CuSO ₄ TO PIPE	- 352 mV
Zn TO CuSO ₄	- 1084 mV

MEMORANDUM

To	File No.
From	Date 16/02/98
Subject FORTROSE STREET RISING MAIN NATURAL POTENTIALS	

COUPON, RISING MAIN

Zn TO PIPE	+499 mV
Zn TO PRO COUPON	+349 mV
Zn TO UNPRO COUPON	+259 mV
CuSO ₄ TO PIPE	-286 mV
CuSO ₄ TO PRO COUPON	-437 mV
CuSO ₄ TO UNPRO COUPON	-527 mV
Zn TO CuSO ₄	-787 mV

SOIL RESISTIVITY

$$3M \quad (0.01 \times 1) \quad 2\pi \alpha R = 0.126 \Omega m$$

$$5M \quad (0.01 \times 22) \quad 2\pi \alpha R = 6.912 \Omega m$$

COUPON, PIPE N°2 1060 MM MSCL

Zn TO PIPE	+716 mV
Zn TO PRO COUPON	+416 mV
Zn TO UNPRO COUPON	+469 mV
CuSO ₄ TO PIPE	-401 mV
CuSO ₄ TO PRO COUPON	-704 mV
CuSO ₄ TO UNPRO COUPON	-649 mV
Zn TO CuSO ₄	-118 mV

BRISBANE CITY COUNCIL
MEMORANDUM

ST FILE

ICERAY

To	File No.	6-10-94.
From	Date	14/05/94
Subject FORTROSE STREET RISING MAIN FORTROSE STREET PUMPING STATION VALVE		

RECTIFIER SET AT 10V 4A

TEST POINT N° 1

Zn TO PIPE + 532 mV on + 725 mV off

CuSO₄ TO PIPE - 588 mV on - 364 mV offZn TO CuSO₄ - 1120 mV on - 1090 mV off

VALVE PIT

CuSO₄ TO PIPE - 561 mV on - 392 mV off

BOLT N° 12 EACH SIDE 24 TOTAL

BOLT LENGTH: - 95.6 mm

BOLT WIDTH: - THREAD 22.1 mm SHANK 22.5 mm

FLANGE CLEARANCE 1.4 mm

FLANGE HOLE Ø 24.35 mm

FLANGE / FLANGE WIDTH 53.05 mm

BRISBANE CITY COUNCIL
EAGLE FARM PUMP STATION
CORROSION SECTION

STANDARD CATHODIC PROTECTION TEST POINT DATA GATHERING

DATE: 30-03-94
TEST POINT TYPE: B

LOCATION: FORTROSE ST P/STN
MAINS SIZE: 40 MM

POTENTIAL TESTING

CATHODE TO CATHODE RETURN (RESISTANCE): 0.1 Ω
ZINC REFERENCE TO PIPE: +735 mV
CuSO₄ REFERENCE TO PIPE: -321 mV
ZINC TO CuSO₄: -1054 mV

EARTH TESTING

PIN SPACING: 2M MEGGER READING: 6x 0.1 RESISTIVITY: $\rho_{\text{soil}} = 7.54 \Omega \text{m}$

PIN SPACING: 5M MEGGER READING: 79x 0.01 RESISTIVITY: $\rho_{\text{soil}} = 24.82 \Omega \text{m}$

SACRIFICIAL ANODE
(IF INSTALLED)

ANODE TYPE:
ANODE SIZE:
ANODE TO PIPE POTENTIAL:
ZINC REF TO PIPE:
(ANODE CONNECTED)

CuSO₄ REF TO PIPE:
(ANODE CONNECTED)

SACRIFICIAL ANODE CURRENT:

BLEED RESISTOR SIZE:
(IF INSTALLED)

INSTALLED BY: M. MCCORMICK

COMMENTS: NO POSTS INSTALLED DUE
TO LACK OF STOCK

1 COPY TO FILE
1 COPY TO T.O.

~~TEST POINT N°2~~

BRISBANE CITY COUNCIL
EAGLE FARM PUMP STATION
CORROSION SECTION

STANDARD CATHODIC PROTECTION TEST POINT DATA GATHERING

DATE: 30-03-94
TEST POINT TYPE: B

LOCATION: MOGGILL RD
MAINS SIZE: 410 MM

POTENTIAL TESTING

CATHODE TO CATHODE RETURN (RESISTANCE): 0.15Ω
ZINC REFERENCE TO PIPE: +733 mV
CuSO₄ REFERENCE TO PIPE: -395 mV
ZINC TO CuSO₄: -1127 mV

EARTH TESTING

PIN SPACING: 2M MEGGER READING: 5x0.01 RESISTIVITY: $\sigma_{TDR} = 0.628 \Omega\text{m}$

PIN SPACING: 5M MEGGER READING: 28x0.01 RESISTIVITY: $\sigma_{TDR} = 8.796 \Omega\text{m}$

SACRIFICIAL ANODE
(IF INSTALLED)

ANODE TYPE:
ANODE SIZE:
ANODE TO PIPE POTENTIAL:
ZINC REF TO PIPE:
(ANODE CONNECTED)

CuSO₄ REF TO PIPE:
(ANODE CONNECTED)

SACRIFICIAL ANODE CURRENT:

BLEED RESISTOR SIZE:
(IF INSTALLED)

INSTALLED BY: M. MCCORMICK

COMMENTS: NO POSTS INSTALLED DUE TO
LACK OF STOCK

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1 COPY TO T.O.

BRISBANE CITY COUNCIL
EAGLE FARM PUMP STATION
CORROSION SECTION

STANDARD CATHODIC PROTECTION TEST POINT DATA GATHERING

DATE: 30-03-94
TEST POINT TYPE: B

LOCATION: ROWENA ST
MAINS SIZE: 410MM

POTENTIAL TESTING

CATHODE TO CATHODE RETURN (RESISTANCE): 0.15Ω
ZINC REFERENCE TO PIPE: +712 mV
CuSO₄ REFERENCE TO PIPE: -357 mV
ZINC TO CuSO₄: -1067mV

EARTH TESTING

PIN SPACING: 2M MEGGER READING: 26x0.01 RESISTIVITY: 27ΩmR = 3.267ΩM

PIN SPACING: 5M MEGGER READING: 20x0.1 RESISTIVITY: 27ΩmR = 62.832ΩM

SACRIFICIAL ANODE
(IF INSTALLED)

ANODE TYPE:
ANODE SIZE:
ANODE TO PIPE POTENTIAL:
ZINC REF TO PIPE:
(ANODE CONNECTED)
CuSO₄ REF TO PIPE:
(ANODE CONNECTED)

SACRIFICIAL ANODE CURRENT:

BLEED RESISTOR SIZE:
(IF INSTALLED)

INSTALLED BY: M. McCORMICK

COMMENTS: NO POST INSTALLED DUE TO
LACK OF STOCK.

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BRISBANE CITY COUNCIL
EAGLE FARM PUMP STATION
CORROSION SECTION

COUPON TYPE CATHODIC PROTECTION
TEST POINT DATA GATHERING

DATE: 30-03-94
 MAINS SIZE: 410 MM
 TEST POINT TYPE: COUPON

LOCATION: RECTIFIER, SUNRISE RD
 TYPE:

INITIAL POTENTIAL TESTING
 (BOTH COUPONS DISCONNECTED)

ZINC TO PIPE:	+499 mV
ZINC TO PROTECTED COUPON:	+349 mV
ZINC TO UNPROTECTED COUPON:	+259 mV
CuSO ₄ TO PIPE:	-286 mV
CuSO ₄ TO PROTECTED COUPON:	-437 mV
CuSO ₄ TO UNPROTECTED COUPON:	-527 mV
CuSO ₄ TO ZINC :	-787 mV
PIPE CATHODE TO PIPE CATHODE RETURN (RESISTANCE):	0.1Ω
COUPON CATHODE TO COUPON CATHODE RETURN(RESISTANCE):	0.1Ω

CONNECTION OF TEST POINT

1. PIPE CATHODE IS CONNECTED TO IMPRESSED CURRENT RECTIFIER OR SACRIFICIAL ANODE.
2. PIPE CATHODE RETURN IS CONENCTED VIA TERMINAL STRIP TO PROTECTED COUPON CATHODE.
3. BETWEEN COUPON CATHODE RETURN AND REFERENCES AS SET OUT BELOW.

POTENTIAL TESTING IN SERVICE

AFTER CP SYSTEM HAS POLARIZED CARRY OUT POTENTIAL TESTING AS DETAILED BELOW.

A) WITH SYSTEM ON (STATE IF CuSO₄ IS ON SURFACE OR AJACENT PIPE)

WHILE COUPON IS CONNECTED TO PIPE CATHODE RETURN:
 PROTECTED COUPON TO ZINC:
 PROTECTED COUPON TO CuSO₄:
 UNPROTECTED COUPON TO ZINC:
 UNPROTECTED COUPON TO CuSO₄:

WHILE COUPON IS DISCONNECTED TO PIPE CATHODE RETURN:
 PROTECTED COUPON TO ZINC:
 PROTECFED COUPON TO CuSO₄:
 UNPROTECTED COUPON TO ZINC:
 UNPROTECTED COUPON TO CuSO₄:

WITH C.P. SYSTEM INTERRUPTING

USE CHART RECORDER TO OBTAIN INSTANTANEOUS OFF POTENTIALS.
WITH PROTECTED COUPON DISCONNECTED.

PIPE CATHODE RETURN TO ZINC ON:
PIPE CATHODE RETURN TO CuSO₄:

RECONNECT SYSTEM AS ABOVE
TURN OFF INTERRUPTOR AND MEASURE COUPON (PROTECTED) CURRENT AND
DIRECTION:

BRISBANE CITY COUNCIL
EAGLE FARM PUMP STATION
CORROSION SECTION

STANDARD CATHODIC PROTECTION TEST POINT DATA GATHERING

DATE: 29-03-93
TEST POINT TYPE: B

LOCATION: EXPOSED PIPE, SUNRISE RD
MAINS SIZE: 410 MM

POTENTIAL TESTING

CATHODE TO CATHODE RETURN (RESISTANCE): 0.1Ω
ZINC REFERENCE TO PIPE: N.A.
CuSO₄ REFERENCE TO PIPE: -283 mV
ZINC TO CuSO₄: N/A

EARTH TESTING N.A.

PIN SPACING: MEGGER READING: RESISTIVITY:

PIN SPACING: MEGGER READING: RESISTIVITY:

SACRIFICIAL ANODE
(IF INSTALLED)

ANODE TYPE:
ANODE SIZE:
ANODE TO PIPE POTENTIAL:
ZINC REF TO PIPE:
(ANODE CONNECTED)
CuSO₄ REF TO PIPE:
(ANODE CONNECTED)

SACRIFICIAL ANODE CURRENT:

BLEED RESISTOR SIZE:
(IF INSTALLED)

INSTALLED BY: MURRAY MCCORMICK

COMMENTS: EXPOSED PIPE LOCATED IN HORSE PADDOCK
APPROX 300 m TO 400m FROM RD NEAR RIVER
BEWARE OF ELECTRIC FENCE.
NEXT TO APPROX. 32 SUNSET.

1 COPY TO FILE
1 COPY TO T.O.

BRISBANE CITY COUNCIL
EAGLE FARM PUMP STATION
CORROSION SECTION

STANDARD CATHODIC PROTECTION TEST POINT DATA GATHERING

DATE: 30-03-94
TEST POINT TYPE: B

LOCATION: CENTENARY BRIDGE
MAINS SIZE: 410MM

POTENTIAL TESTING

CATHODE TO CATHODE RETURN (RESISTANCE): 0.1Ω
ZINC REFERENCE TO PIPE: + 496 mV
CuSO₄ REFERENCE TO PIPE: - 352mV
ZINC TO CuSO₄: - 1084 mV

EARTH TESTING NOT POSSIBLE DUE TO TERRAIN

PIN SPACING: 2M MEGGER READING: 0Ω RESISTIVITY: 2TΩR

PIN SPACING: 5M MEGGER READING: 0Ω RESISTIVITY: 2TΩR

SACRIFICIAL ANODE
(IF INSTALLED)

ANODE TYPE:
ANODE SIZE:
ANODE TO PIPE POTENTIAL:
ZINC REF TO PIPE:
(ANODE CONNECTED)

CuSO₄ REF TO PIPE:
(ANODE CONNECTED)

SACRIFICIAL ANODE CURRENT:

BLEED RESISTOR SIZE:
(IF INSTALLED)

INSTALLED BY: M. MCCORMICK

COMMENTS: NO POST INSTALLED DUE
TO LACK OF STOCK

1 COPY TO FILE
1 COPY TO T.O.

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

ELECTRICAL WORKSHOP.

INSULATED JOINT TESTING DETAILS:

DATE 19-10-94

DESCRIPTION Fortrose St. Centenary Bridge

MAINS DETAILS:- 410-mm

LOCATIONS:-

SIZE:- 410-mm

MATERIAL:- m Steel

COATING:-

NUMBER:-

IN GROUND TESTING

BOLT TO FLANGE RESISTANCE:- 200Ω

NUMBER OF BOLT:-

FLANGE TO FLANGE RESISTANCE:- 75Ω

INSULATION CHECKER MODEL 702:- OR

POTENTIAL DIFFERENCE TO REFERENCE CELL N/A

PROTECTED SIDE:-

UNPROTECTED SIDE:-

ABOVE TESTING

BOLT TO FLANGE RESISTANCE:-

NUMBER OF BOLTS:-

FLANGE TO FLANGE RESISTANCE:-

COMMENTS

TESTED BY

Dept. W.S.& S.

Metropolitan Division

Eagle Farm Pump Station

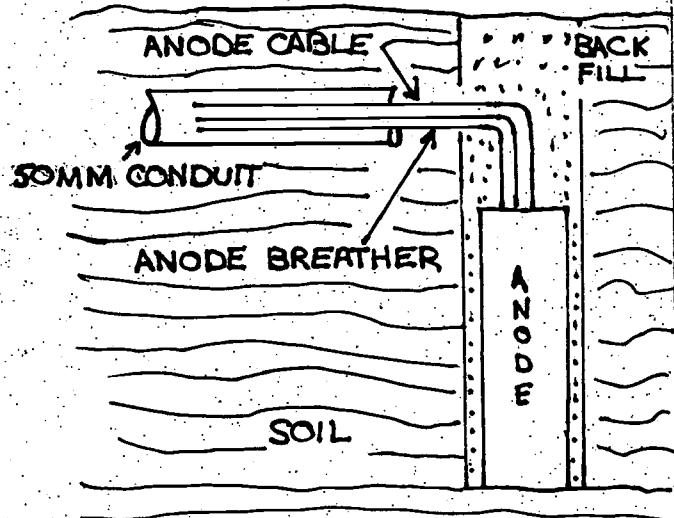
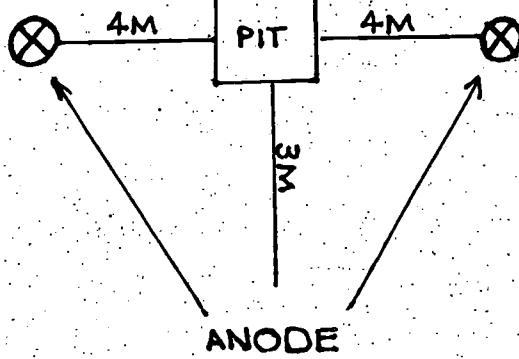
Electrical Workshop

Cathodic Protection Anode Bed Testing

Date:	1ST FEBRUARY 1994	Structure:	FORTROSE STREET RISING MAIN
Anode material:	SILICON IRON	Anode size/weight:	
Packaging:	2M x 800MM CANISTER	Burial:	VERTICAL
Depth:	4.3 M	Resistivity:	3M (4×0.01) Ωm = $0.755 \Omega \text{m}$ 5M (4×0.01) Ωm = $1.257 \Omega \text{m}$
Test Point type:	400X400 INGROUND PIT	Signage:	O.K.
Resistance to ground:			
Anode 1 $0.01 = 0.04 \Omega$	Anode 2 $4 \times 0.01 = 0.04 \Omega$	Anode 3	Anode 4
Tested by: M. McCormick		Murray McCormick	Anode 5

Locality Plan:

RECTIFIER



Brisbane City Council

Dept of Water Supply and Sewerage

Eagle Farm Pump Station

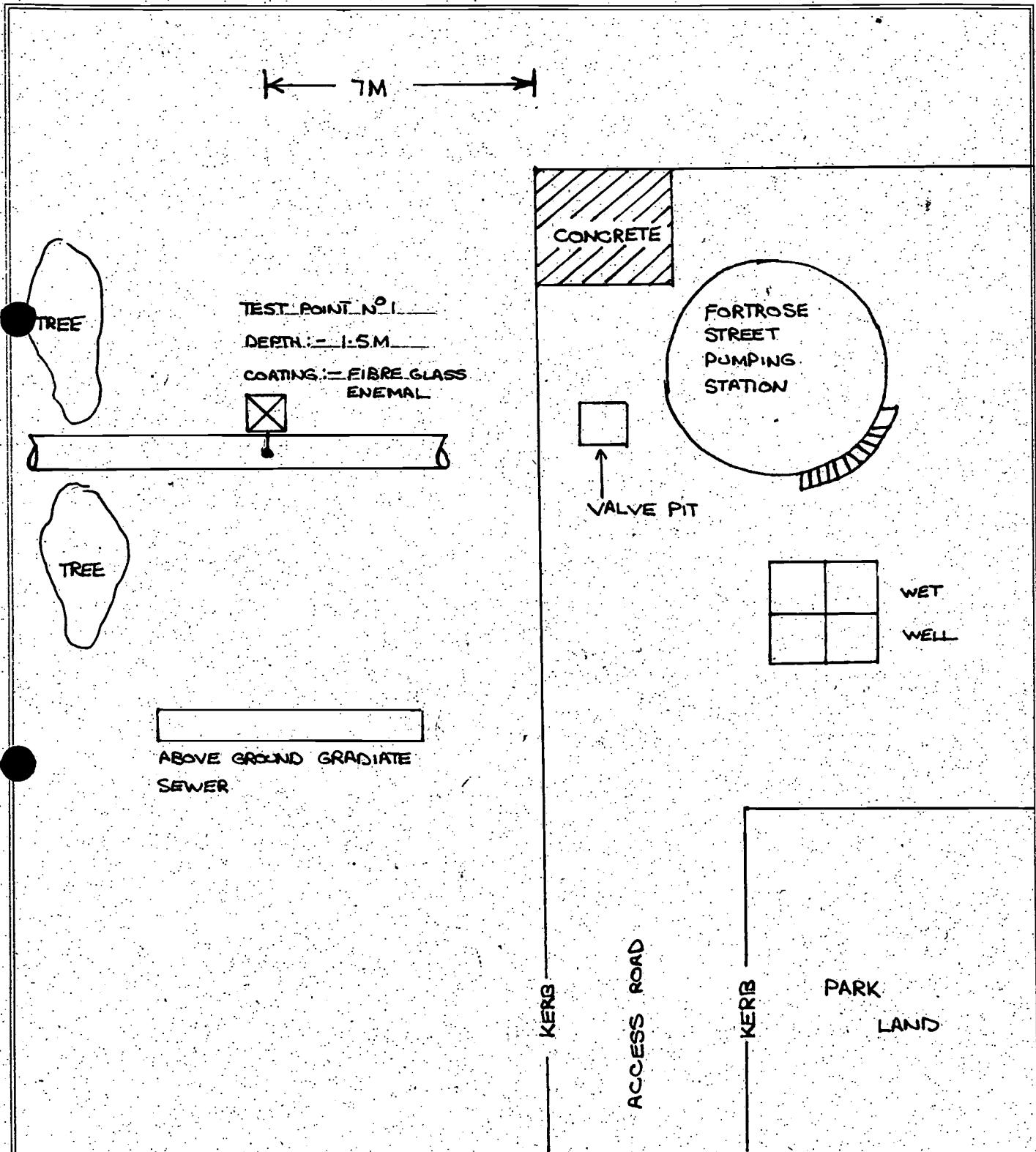
Electrical Workshop

Date:

17-03-94

Site Plan for:

FORTROSE STREET RISING MAIN
TEST POINT N°1



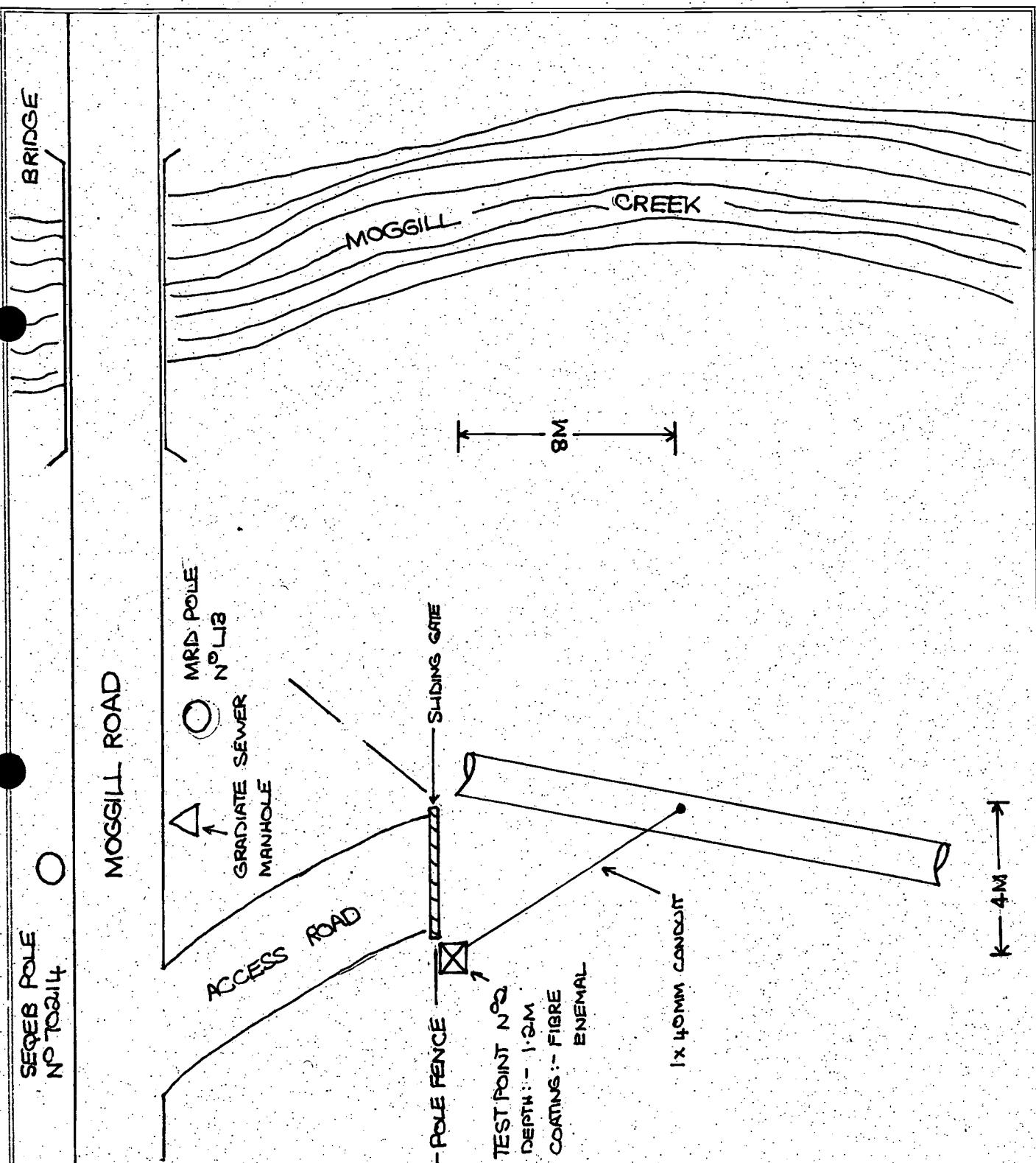
Brisbane City Council

Dept of Water Supply and Sewerage

Eagle Farm Pump Station

Electrical Workshop

Date: 21-03-94

Site Plan for:
FORTROSE ST RISING MAIN
TEST POINT N°2

Brisbane City Council

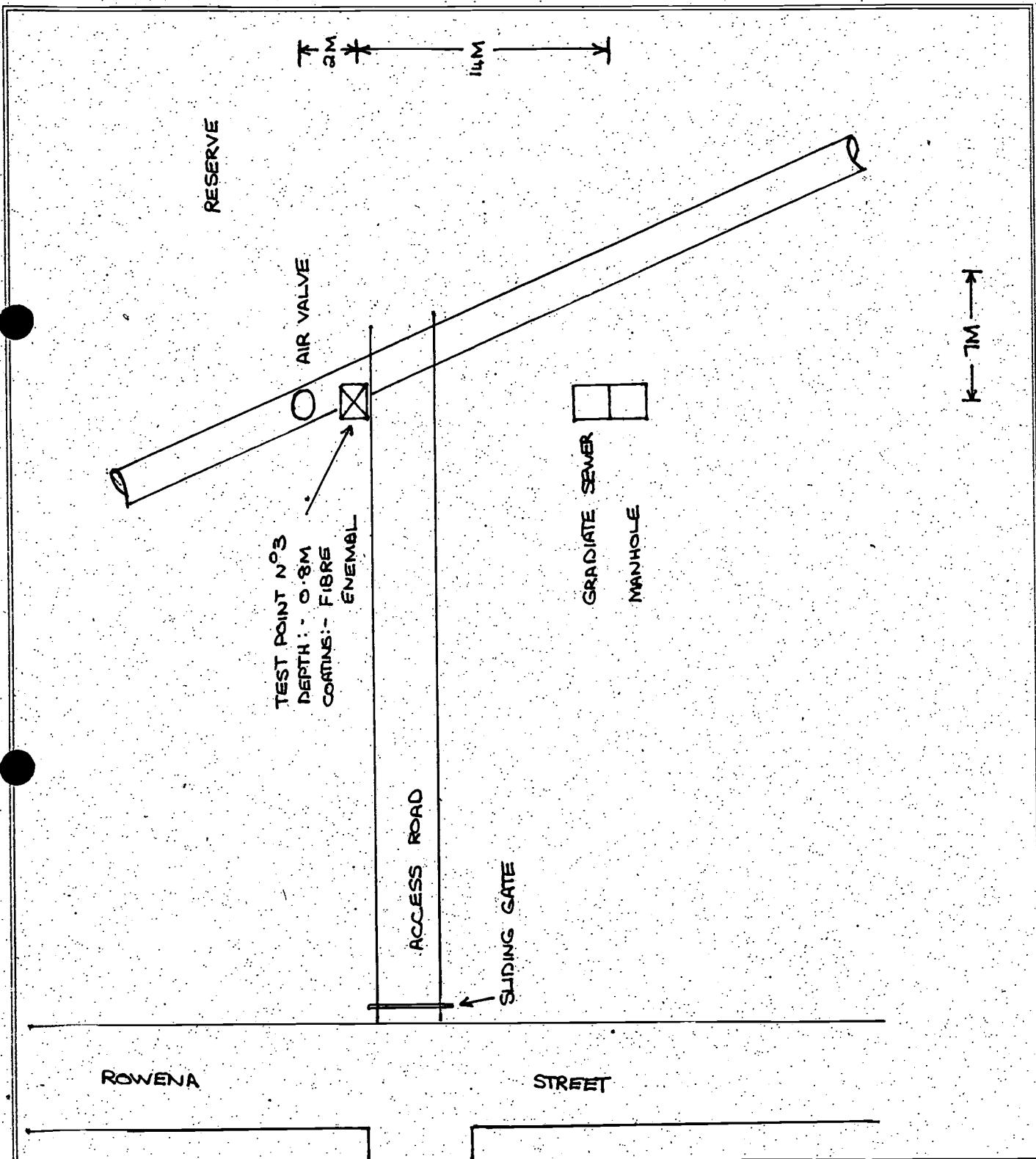
Dept of Water Supply and Sewerage

Eagle Farm Pump Station

Electrical Workshop

Date: 21-03-94

Site Plan for: FORTROSE STREET RISING MAIN
TEST POINT N°3



Brisbane Water Engineering Services

CP Form No. 28

Electrical Engineering Unit

Cathodic Protection Bleed Point Details Form

Project Fortrose St.....

Date 9-10-95.....

Bleed Location Fortrose St. No.....

CPB No.

FOREIGN STRUCTURE OWNER: BCC Water Main

F.S. LOCATION: House No.

F.S. IDENTIFICATION:

REFERENCE POTENTIALS TO F.S. PRIOR TO BLEED CONNECTION:REFERENCE TYPE: CuSO₄

POTENTIAL OFF: -295 ON: -280 SW: +15

BLEED TYPE: Zn

BLEED MATERIAL:

BLEED WEIGHT:

BLEED O/C POTENTIAL:

BLEED CURRENT OFF: 15ma ON: 15ma

REFERENCE POTENTIALS AFTER CONNECTION TO FOREIGN STRUCTURE:

Bond Off (Rectifier Off)			Bleed On			Resultant Swing
Bleed Off	Bleed On	Swing	Bond Off	Bond On	Swing	
-295	-400	-5	-400	-390	+10	+5

FOREIGN STRUCTURE OWNER AGREEABLE WITH MITIGATION? (Y/N)

IDENTIFICATION TAG INSTALLED? (Y/N)

COMMENTS:

INSTALLED / TESTED BY P. SMITH

Brisbane Water Engineering Services

CP Form No. 28

Electrical Engineering Unit

Cathodic Protection Bleed Point Details FormProject Fortrose St.Date 9-10-95Bleed Location Fortrose St. Segel 39173.CPB No. C.P.B.47FOREIGN STRUCTURE OWNER: SegelF.S. LOCATION: Fortrose St SegelF.S. IDENTIFICATION: Pol no 39173.**REFERENCE POTENTIALS TO F.S. PRIOR TO BLEED CONNECTION:**REFERENCE TYPE: Zn. Cus04POTENTIAL OFF: -269 ON: -256 SW: +13BLEED TYPE: Zn

BLEED MATERIAL: _____

BLEED WEIGHT: _____

BLEED O/C POTENTIAL: 710 mvBLEED CURRENT OFF: 5ma ON: 5ma**REFERENCE POTENTIALS AFTER CONNECTION TO FOREIGN STRUCTURE:**

Bond Off (Rectifier Off)			Bleed On			Resultant Swing
Bleed Off	Bleed On	Swing	Bond Off	Bond On	Swing	
<u>-258</u>	<u>-355</u>	<u>-97</u>	<u>-355</u>	<u>-366</u>	<u>+10</u>	<u>-87</u>

FOREIGN STRUCTURE OWNER AGREEABLE WITH MITIGATION? (Y/N) _____

IDENTIFICATION TAG INSTALLED? (Y/N) YesCOMMENTS:INSTALLED / TESTED BY P. Smyth

BRISBANE CITY COUNCIL
DEPARTMENT OF WATER SUPPLY AND SEWERAGE
MECHANICAL AND ELECTRICAL SECTION

INTERFERENCE SURVEY RESULTS

JOB DESCRIPTION:- Fortrose St.
Anode Area
in Park.

UNIT READING:- 4V 1.4a.

Cusor

	READING	TEST POINT I.D.	LOCATION	SWING
ON	-486		in Park.	
OFF	-509		Shade Frame.	+23 *
ON	-447		In Park	
OFF	-455		Kids SLide -	+8
ON	-614		In Park	
OFF	-614		Main Roads Sine	-
ON	-360		Storm Water.	-
OFF	-360		Gard Rail	-
ON	-570		In Park OFF SunSet Rd	
OFF	-440		Light Pole 485	-130
ON	-608		In Park OFF SunSet Rd	
OFF	-644		Light Pole 466	-164
ON	-22		House 105 OFF SunSet	
OFF	-22		Rd Water Mains.	-
ON	-618		Segre 105 SunSet	
OFF	-462		Rd no 380414	-156
ON	-560		Segre 105 SunSet.	
OFF	-460		Rd no 380414	-100
ON	-377		Sine Pole SunSet +	
OFF	-377		twilight.	-
ON	-545		Bcc Sine in Park	-
OFF	-545			
ON	-610		Light Pole	
OFF	-418		twilight. corner	-192

* See Interference Sheet 1

COMPILED BY: P. SMYTH

BRISBANE CITY COUNCIL
DEPARTMENT OF WATER SUPPLY AND SEWERAGE
MECHANICAL AND ELECTRICAL SECTION

INTERFERENCE SURVEY RESULTS

JOB DESCRIPTION:- Fortrose St.
anode area
in Park

UNIT READING:- 4.v..... 1.6a.

	READING	TEST POINT I.D.	LOCATION	SWING
ON	-438		Marland St.	
OFF	-450		Road Gard Rails	+12
ON	-187		Marland St. mch	
OFF	-133		Seach transformer	-54
ON	-308		Marland	
OFF	-255		Seach Pole 23358	-53
ON	-384		Marland	
OFF	-310		Light Pole	-74
ON				
OFF				
ON				
OFF				
ON				
OFF				
ON				
OFF				
ON				
OFF				
ON				
OFF				
ON				
OFF				
ON				
OFF				

COMPILED BY: P. Smyth

BRISBANE CITY COUNCIL
DEPARTMENT OF WATER SUPPLY AND SEWERAGE
MECHANICAL AND ELECTRICAL SECTION

INTERFERENCE SURVEY RESULTSJOB DESCRIPTION:- Fortrose St.

UNIT READING:- 2.v 500.mv

Fortrose & Moggill Rd.

	READING	TEST POINT I.D.	LOCATION	SWING
ON	-331	Fortrose	Segreb Pole	
OFF	-340		391713	+9
ON	-349	Fortrose	Water Cox	
OFF	-358		Z0 Fortrose	+9
ON	-339	Fortrose	Water Cox	
OFF	-349		18 Fortrose	+10
ON	-380	Moggill	Segreb Pole	
OFF	-380		70215	-
ON	-209	Moggill	Segreb Pole	
OFF	-209		70213	-
ON	-253	Moggill	Segreb Pole	
OFF	-253		43009	-
ON	-329	Moggill	Segreb Pole	
OFF	-340		70211	+11
ON	-236	Sunset Rd.	Segreb Pole	
OFF	-236		46906	-
ON	-209	Sunset Rd	Segreb Pole	
OFF	-213		41729	+4
ON	-312	Sunset Rd	Segreb Pole	
OFF	-312		429158	-
ON	-160	Sunset Rd	Segreb Pole	
OFF	-160		46635	-
ON				
OFF				

COMPILED BY: Blyth

BRISBANE CITY COUNCIL
DEPARTMENT OF WATER SUPPLY AND SEWERAGE
MECHANICAL AND ELECTRICAL SECTION

INTERFERENCE SURVEY RESULTS

JOB DESCRIPTION - Fortrose St.

UNIT READING: -2v..... 500mA

	READING	TEST POINT I.D.	LOCATION	SWING
ON	-477	Ridge Crest.	Steel Light Pole	—
OFF	-477		4315	—
ON	-390	Ridge Crest.	Steel Light Pole	—
OFF	-390		4316	—
ON	-348	Ridgecrest	Sequel Pole	—
OFF	-348		46242	—
ON	-410	Tourmaline	Steel Light Pole	—
OFF	-410		46484	—
ON				
OFF				
ON				
OFF				
ON				
OFF				
ON				
OFF				
ON				
OFF				
ON				
OFF				
ON				
OFF				

COMPILED BY: Blyth

BRISBANE CITY COUNCIL
DEPARTMENT OF WATER SUPPLY AND SEWERAGE
MECHANICAL AND ELECTRICAL SECTION

INTERFERENCE SURVEY RESULTS

JOB DESCRIPTION:- Fortrose St.

UNIT READING:- 8V 2.75a

	READING	TEST POINT I.D.	LOCATION	SWING
ON	-404	Gem Rd	Steel Light Pole	
OFF	-410		8406	+6
ON	-425	Gem Rd	Segelb Pole	
OFF	-430		41079	+5
ON	-340	Gem Rd	Segelb Pole	
OFF	-348		25364	+8
ON	-335	Gem Rd	Segelb Pole	
OFF	-346		5097	+10
ON	-386	Gem Rd.	Segelb Pole	
OFF	-391		48573	+5
ON				
OFF				
ON				
OFF				
ON				
OFF				
ON				
OFF				
ON				
OFF				
ON				
OFF				

COMPILED BY: *Alfie*

BRISBANE CITY COUNCIL
DEPARTMENT OF WATER SUPPLY AND SEWERAGE
MECHANICAL AND ELECTRICAL SECTION

INTERFERENCE SURVEY RESULTS

JOB DESCRIPTION:- Fortrose St.

UNIT READING:- 8V 2.75a

	READING	TEST POINT I.D.	LOCATION	SWING
ON	-359	Fortrose	Water Cox	
OFF	-364		12 Fortrose	+5
ON	-308	Mangung	Mangung St.	
OFF	-314		New Pole Lt 0974	+6
ON	-353	Mossill Rd	Segelb	
OFF	-358		Pole 64024	+5
ON	-488	Mossill Rd	Segelb	
OFF	-491		Pole 70209	+3
ON	-389	Tour Maline	Steel Light Pole	
OFF	-397		178	+8
ON	-344	Tour Maline	Steel Light Pole	
OFF	-353		10	+10
ON	-347	Tour Maline	Steel Light Pole	
OFF	-357		Lt 487	+10
ON	-295	Tour Maline	Steel Light Pole	
OFF	-305		Lt 486	+10
ON	-446	Ridge Crest	Steel Light Pole	
OFF	-451		4313	+11
ON	-404	Ridge Crest	Steel Light Pole	
OFF	-414		4314	+16
ON				
OFF				

COMPILED BY: P.SMYTH.

INTERRUPTER: - ~~20 SECS OFF~~
~~10 SECS ON~~

BRISBANE CITY COUNCIL
DEPARTMENT OF WATER SUPPLY AND SEWERAGE
MECHANICAL AND ELECTRICAL SECTION

INTERFERENCE SURVEY RESULTS

JOB DESCRIPTION:- Fortrose St.
anode area.

UNIT READING:- 2V 500 ma

COMPILED BY: *[Signature]*

Brisbane City Council

Dept of Water Supply and Sewerage

Eagle Farm Pump Station

Electrical Workshop

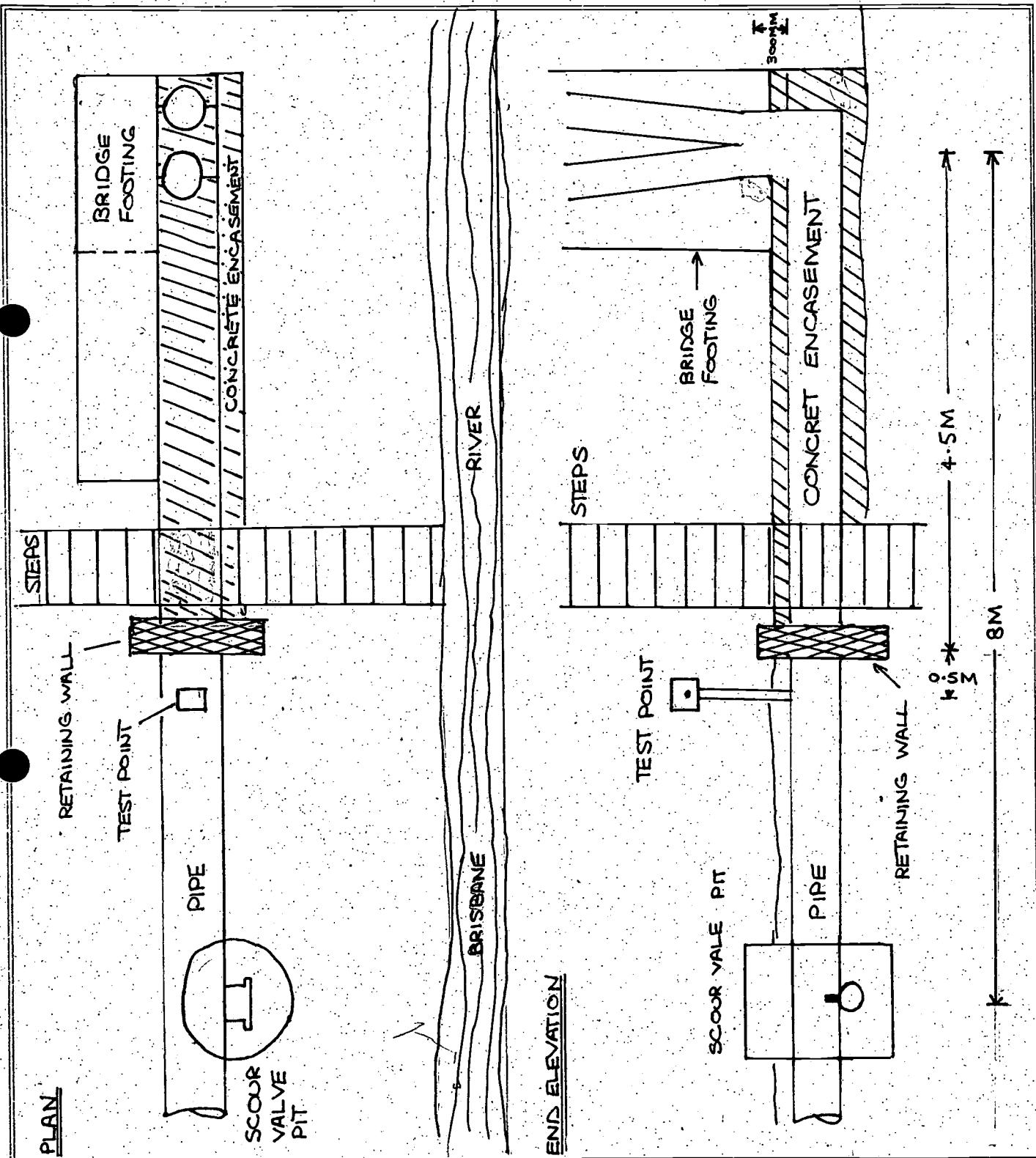
Date:

21-03-94

Site Plan for:

FORTROSE STREET RISING MAIN

TEST POINT N° 7



Brisbane City Council

Dept of Water Supply and Sewerage

Eagle Farm Pump Station

Electrical Workshop

Date: 10-09-94

Site Plan for: FORTROSE STREET RISING MAIN

PLAN

PUMP STATION

32MM
CONDUIT
A.C.
SUPPLY32 40 40 32 32
00 00 040 40 32 32 25
00 00 0

PIT

OXYGEN

NOTE:- ALL CONDUITS FROM
RECTIFIER PLYMTHS
GO TO CABLE PIT
UNLESS SO MARKED

100MM
CONDUIT TO
CATHODES AND
ANODES

END ELEVATION

PUMP STATION

CONDUITS
32 40 40 32 3232MM
CONDUIT
AC
SUPPLY

CONDUITS

40 40 32 32 25

PIT

100MM conduit

OXYGEN

Brisbane City Council

Dept of Water Supply and Sewerage

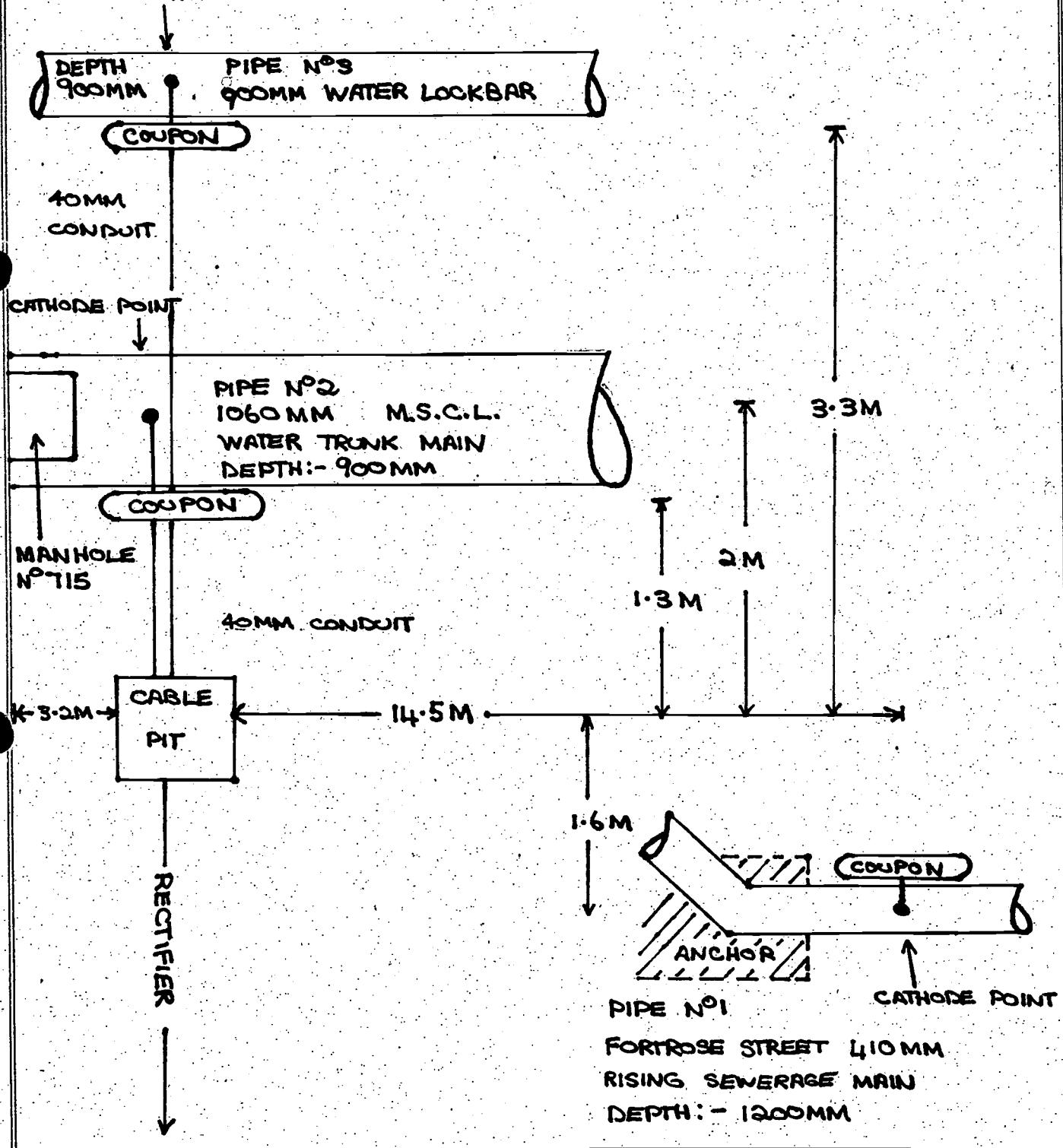
Eagle Farm Pump Station

Electrical Workshop

Date: 16-02-94

Site Plan for: FORTROSE STREET RISING MAIN

CATHODE POINT



Brisbane City Council

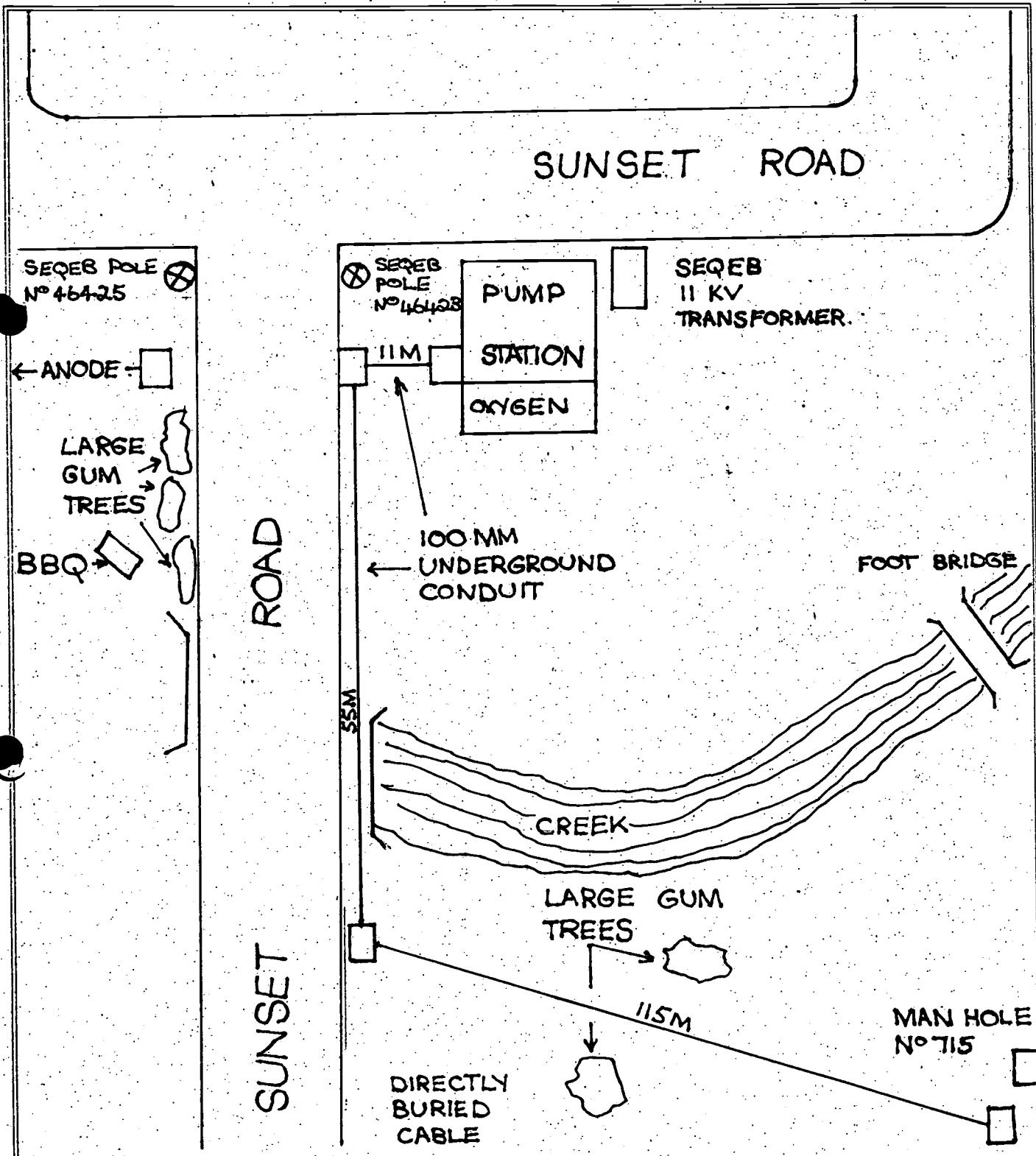
Dept of Water Supply and Sewerage

Eagle Farm Pump Station

Electrical Workshop

Date: 2-02-94

Site Plan for: FORTROSE STREET RISING MAIN



Brisbane City Council

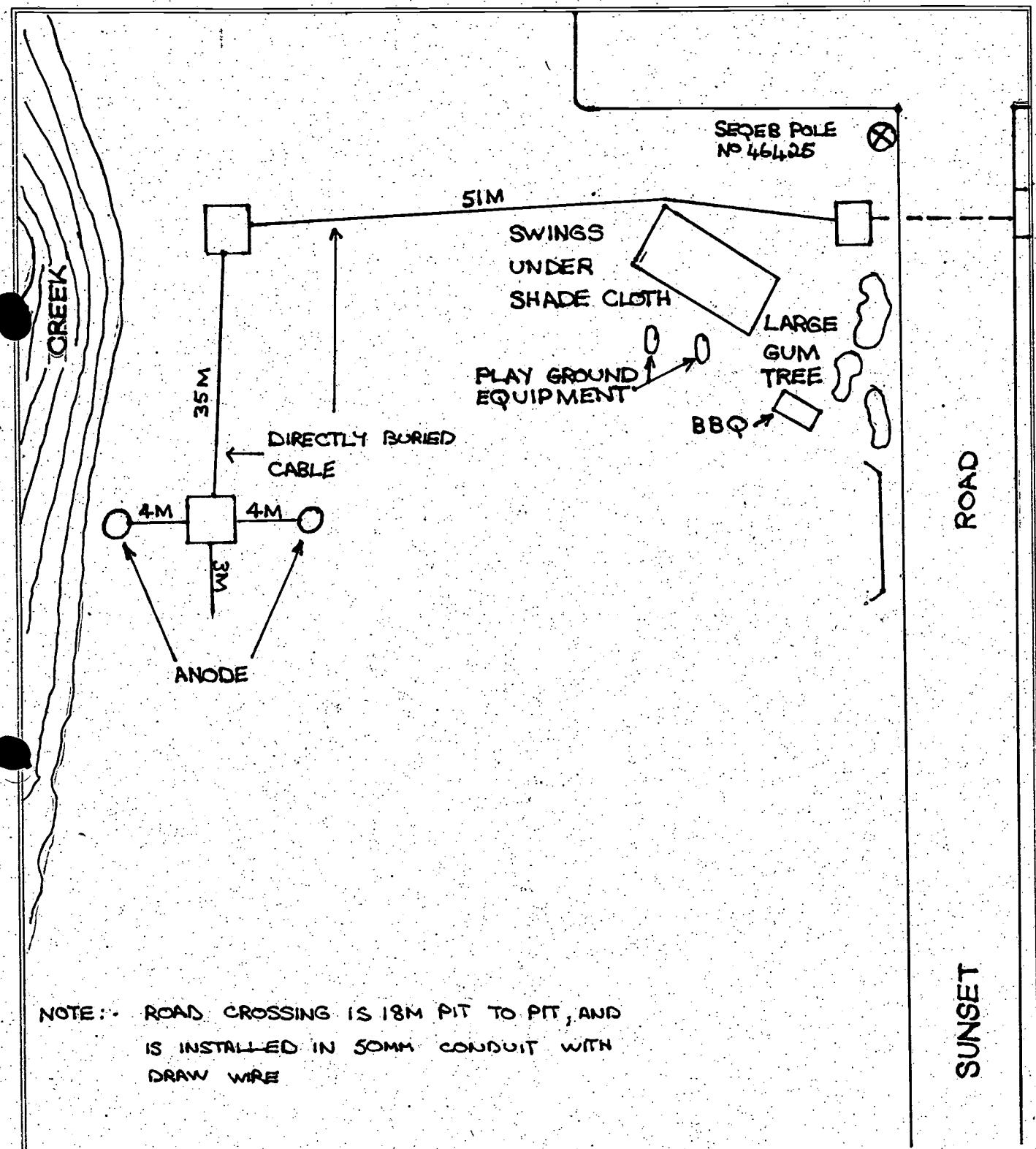
Dept of Water Supply and Sewerage

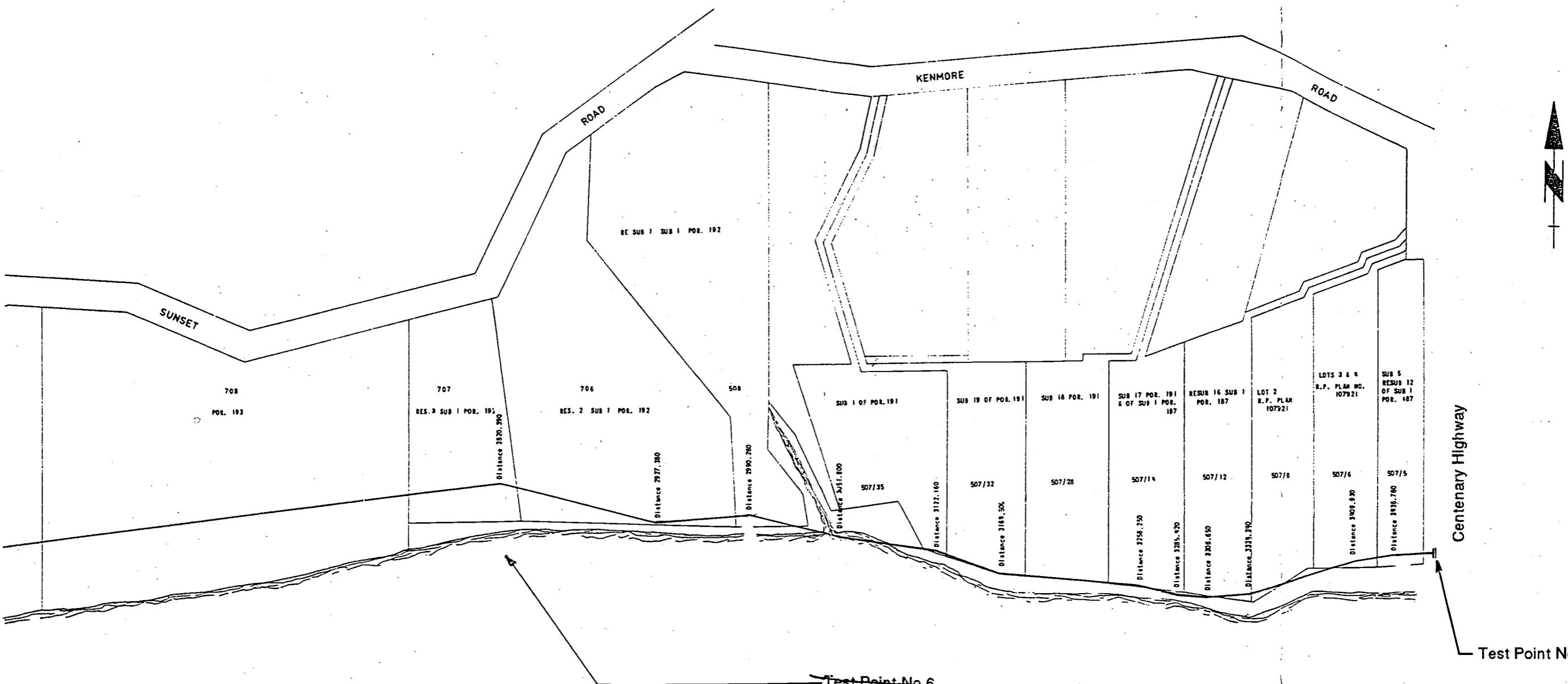
Eagle Farm Pump Station

Electrical Workshop

Date: 2-02-94

Site Plan for: FORTROSE STREET RISING MAIN





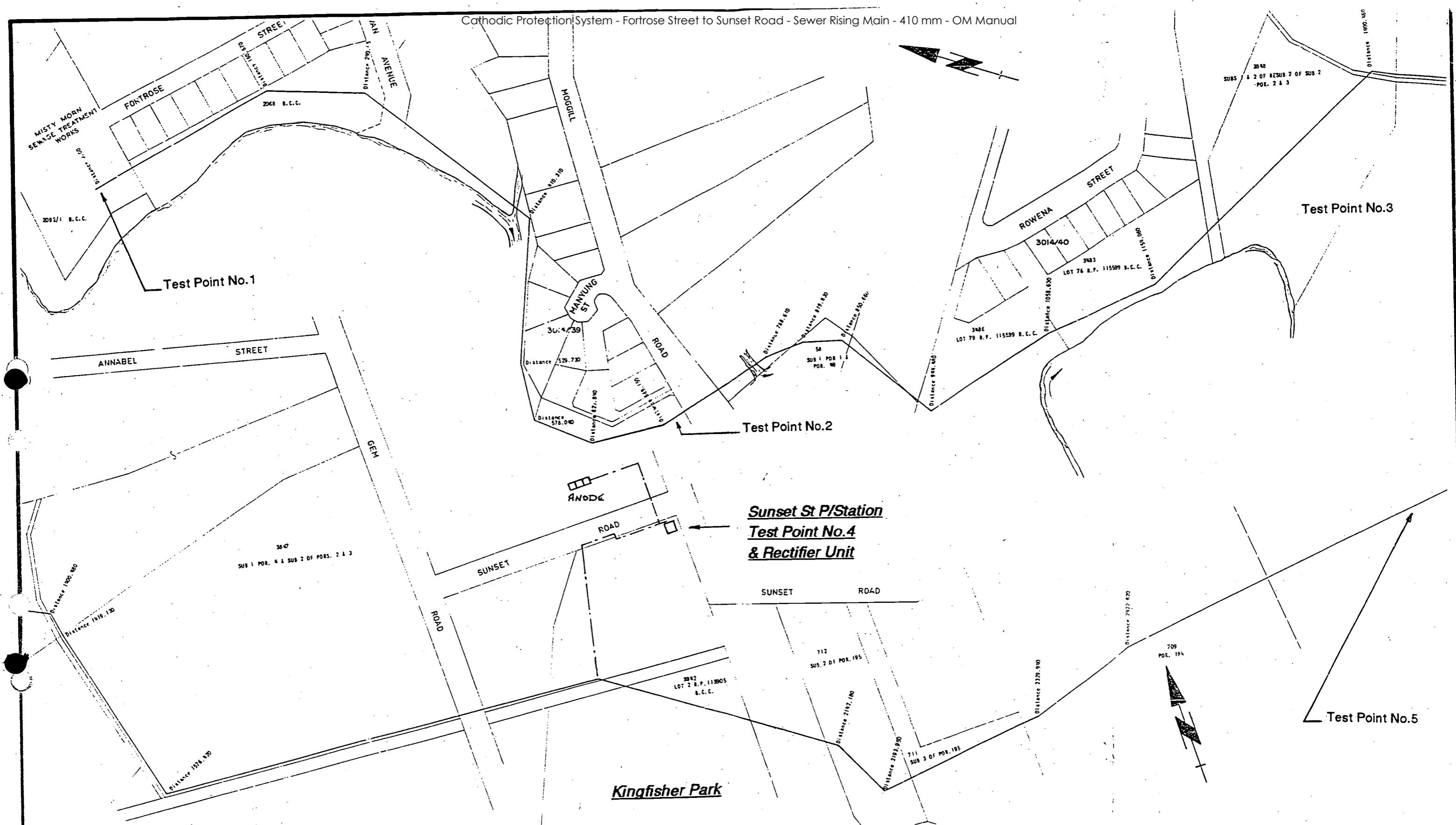
Test Point No.6
NOT INSTALLED.
24/12/99.

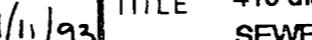
		MANAGER	DIRECTOR OF PLANNING & DESIGN	DESIGN	J.S.	5/11/93	PROJECT SUNSET Rd C.P. SYSTEM Fortrose St to Centenary Hwy	TITLE 410 dia MSCL SEWERAGE RISING MAIN CATHODIC PROTECTION DETAILS	SCALE NTS	No 2 OF 2 SHEETS	DRAWING NO 486/7/8 - HH1C0002E	AMEND O
		DATE	DATE	DRAWN	J.S.	5/11/93						
	DIRECTOR OF CONSTRUCTION	DIRECTOR OF M. & E. SERVICES	DIRECTOR OF SEW. OPERATIONS/W.S. DISTRIBUTION	CHK'D.	J.M	9/11/93						
				ENGINEER IN CHARGE								
NO DATE	AMENDMENT	INITIALS DATE	DATE	DATE	SUPERVISING ENGINEER	<i>M.Johns</i>	A.H.DATUM					



BRISBANE CITY COUNCIL
DEPARTMENT OF WATER SUPPLY & SEWERAGE
PLANNING & DESIGN BRANCH

Brisbane City



		MANAGER	DIRECTOR OF PLANNING & DESIGN	DESIGN	J.S.	5/11/93	PROJECT	SUNSET Rd C.P. SYSTEM		Brisbane City	1	DEPARTMENT OF WATER SUPPLY & SEWERAGE	PLANNING & DESIGN BRANCH
		DATE	DATE	DRAWN	J.S.	5/11/93	Fortrose St to Centenary Hwy						
	DIRECTOR OF CONSTRUCTION	DIRECTOR OF M. & E. SERVICES	DIRECTOR OF SEW. OPERATIONS/W.S. DISTRIBUTION	CHK'D.	J.W.M	9/11/93	TITLE	410 dia MSCL SEWERAGE RISING MAIN CATHODIC PROTECTION DETAILS	SCALE	NTS	Nº 1	OF 2	SHEETS
				ENGINEER IN CHARGE					DRAWING N°	486/7/8 - HH1C0001E			AMEND
				SUPERVISING ENGINEER			A.H.DATUM						O
NO DATE	AMENDMENT	INITIALS	DATE	DATE	DATE								

Brisbane Water Engineering Services**Electrical Engineering Unit****Fortrose St. Rising Main****Cathodic Protection Pipe Camp Form**

Fortrose St. Rising Main Pipecamp							Normal 8.5 Volts DC 2 Amps							Tested at 16 Volts 4 Amps						
Waypoint	South	East	Description	Swing	Fault	Normal	On	Off	estimated	calculated	reading	reading	percent	loss	Location					
247	27 30 42.2	152 55 38.3	TP1	1000		-1114	-804													
248	27 30 45.2	152 55 39.3	Fault 1	225					-1158	-933										
249	27 30 43.6	152 55 40.2	exposed pipe	1000		-1228	-809													
250	27 30 33.7	152 55 33.7	TP2	1600		-1228	-819													
251	27 31 04.7	152 55 34.4	TP3	1400		-1383	-869													
254	27 30 59.9	152 55 36.9	Fault 2	40					-1500	-1240										
255	27 31 04.5	152 55 34.9	Fault 3	180					-1550	-1219										
256	27 31 10.9	152 55 42.1	Scour																	
			Air Valve	1650		-1795	-1005													
283	27 31 16.4	152 55 44.8	Fault 4	60					-1665	-1605										
285	27 31 18.0	152 55 45.4	Fault 5	280					-1692	-1412										
287	27 31 19.8	152 55 45.3	Fault 6	240					-1735	-1495										
288	27 31 19.8	152 55 45.5	Fault 7	180					-1787	-1607										
289	27 31 24.6	152 55 59.0	Cathode point	1800		-1854	-1016													
290	27 31 28.4	152 56 02.8	Man Hole																	
291	27 31 30.7	152 56 04.1	Fault 8	60					-1727	-1667										
292	27 31 28.9	152 56 11.4	Man Hole																	
293	27 31 30.2	152 56 17.4	Man Hole																	
294	27 31 30.5	152 56 17.5	Fault 9	80																
295	27 31 30.6	152 56 19.6	Man Hole																	
296	27 31 30.6	152 56 21.0	Exposed pipe	1600		-1530	-950													
			TP 5			-1334	-1005													

[439d]

BRISBANE CITY COUNCIL

DEPARTMENT OF WATER SUPPLY AND SEWERAGE

MECHANICAL AND ELECTRICAL BRANCH

ELECTROLYSIS SECTION

EAGLE FARM PUMPING STATION

OPERATING MANUAL FOR:

FORTROSE STREET 410MM DIA RISING SEWER MAIN

CATHODIC PROTECTION SYSTEM

CLIENT:

DEPARTMENT OF WATER SUPPLY AND SEWERAGE
SEWERAGE OPERATIONS BRANCH

23 APRIL 1994

MANUAL CONTENTS

- 1.0 Introduction**
- 2.0 Corrosion and Cathodic Protection**
- 3.0 Mains Details**
- 4.0 Cathodic Protection Details**
 - 4.1 Type of System**
 - 4.2 Rectifier**
 - 4.3 Cathode**
 - 4.4 Anodes**
 - 4.5 Test Points**
 - 4.6 Associated Drawings**
 - 4.7 Associated Standards**
 - 4.8 Government Regulations**
- 5.0 Testing Performed**
- 6.0 Conclusion**
- 7.0 Maintenance**
 - 7.1 Monthly maintenance procedure.**
 - 7.2 Six monthly maintenance procedure.**
 - 7.3 Sixty monthly maintenance procedure.**

(1.0) INTRODUCTION

Steel when buried or immersed has a tendency to corrode (rust) as the oxidised form is more stable than the metal.

Because of this, precautions must be taken to stop or minimise 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 practicable to expect a perfect coating during construction and coating damage will also occur with time. Because of this, corrosion may occur at imperfections.

(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 low 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 and is generally measured against a standard reference electrode, which permits a reproducible potential at which corrosion does not occur to be quoted.

(3.0) MAINS DETAILS

Size: Dia 410mm dia. mild steel cement lined sewer rising mains.

Coating: Fibreglass enamel wrapped.

Length: 3175 M.

Location: From Fortrose street pump station, Kenmore to Centenary Bridge.

Construction
Drawings: Not available.

(4.0) CATHODIC PROTECTION DETAILS

4.1 Type of Cathodic Protection: Impressed Current

4.2 Rectifier: Standard 32 Volt, 10 Amp direct current output enclosed in a stainless steel switchboard. Rectifier has a 240VAC supply from Sunset street sewerage pump station. Rectifier is located outside Sunset St. pump station. UBD 32 M5.

4.3 Cathode: The cathode point is located in Kingfisher Park on the 410 dia sewer main where a coupon type test point has been installed. The cathode is the point where the cabling from the rectifier is attached to the structure under cathodic protection.

4.4 Anodes: Two silicon iron anodes were installed approximately 165 metres from the trunk mains in a vertical bed 5 metres deep. The anodes were first backfilled with a cokebreeze surround to improve anode ground resistance. The anode location is identified by a marker pit and label.

4.5 Testpoints: Testpoints are installed on cathodically protected structures to enable testing to confirm that full cathodic protection of the structure is maintained. On these mains 6 testpoints have been installed. For further details see CP details layout drg. 486/7/8-HH1C0001E.

4.6 Associated Drawings:

486/6/25-AA1C0021E Std Rectifier Wiring Diagram

486/1/22-C0023E Silicone Iron Anode details.

486/6/25-AA1C0026E Installation details conduit and rectifier.

486/6/25-AA1C0024E Vertical groundbed details.

No number Maintenance Details.

486/7/8-HH1C0001E 410 dia MSCL sewer rising main CP details. Sheets 1 & 2.

4.7 Associated Standards:

-AS 2832.1 1985 Pipes,Cables,Ducts, Guide to Cathodic Protection. Part 1.

-AS 3000 1991 Australian Wiring Rules

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.

NOTE: Details of above testing have not been included in this manual but are available upon request.

(6.0) CONCLUSION

Full cathodic protection has been achieved on this section of the trunk mains.

The cathodic protection system is to be 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. Monthly, Six monthly and sixty monthly maintenance procedures are detailed as attached below.

(7.1) **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.

(7.2) **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.

13th October 1992
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:

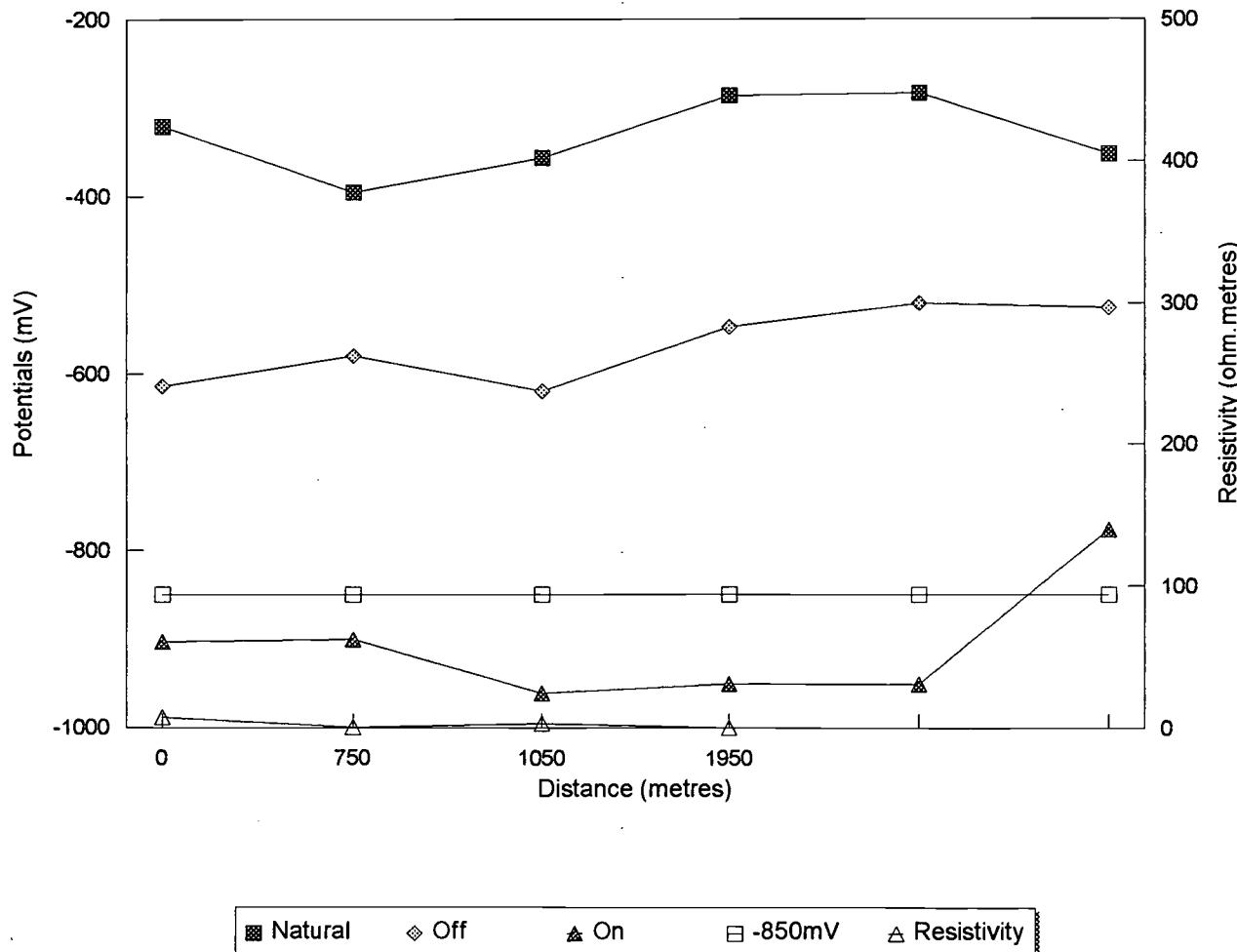
One tradesperson electrical, one laborer, one vehicle.
Eight hours per site.

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/ Pipcamp structure if applicable.
- 17/ Apply for "continue to operate" permit if applicable.

Brisbane City Council**Dept. W.S.& S.****Metropolitan Division****Eagle Farm Pumping Station****Date: 3rd January 1995****Electrical Workshop****System: Fortrose Street 410mm dia. rising sewer trunk mains.****Cathodic Protection System reference potential and earth resistivity graph.**

Test Point number	Distances to T.P. (metres)	Potentials to CuSO ₄			Resistivities at 2 metres (ohm.metres)
		Natural (mV)	Off (mV)	On (mV)	
1	0	-321	-614	-903	7.54
2	750	-395	-580	-900	0.63
3	1050	-357	-620	-960	3.27
4	1950	-286	-547	-950	0.13
5	2225	-283	-520	-950	
6	3175	-352	-525	-777	

Rectifier at test point No.4 . Unit operating at 3 volts 0.75 amps**Graph of potentials and resistivity vs pipelength****Rectifier located at test point 4**

Brisbane City Council
Dept. W.S. & S.
Metropolitan Division
Eagle Farm Pump Station

Cathodic Protection System Loop Resistance

Date: 23 April 1994

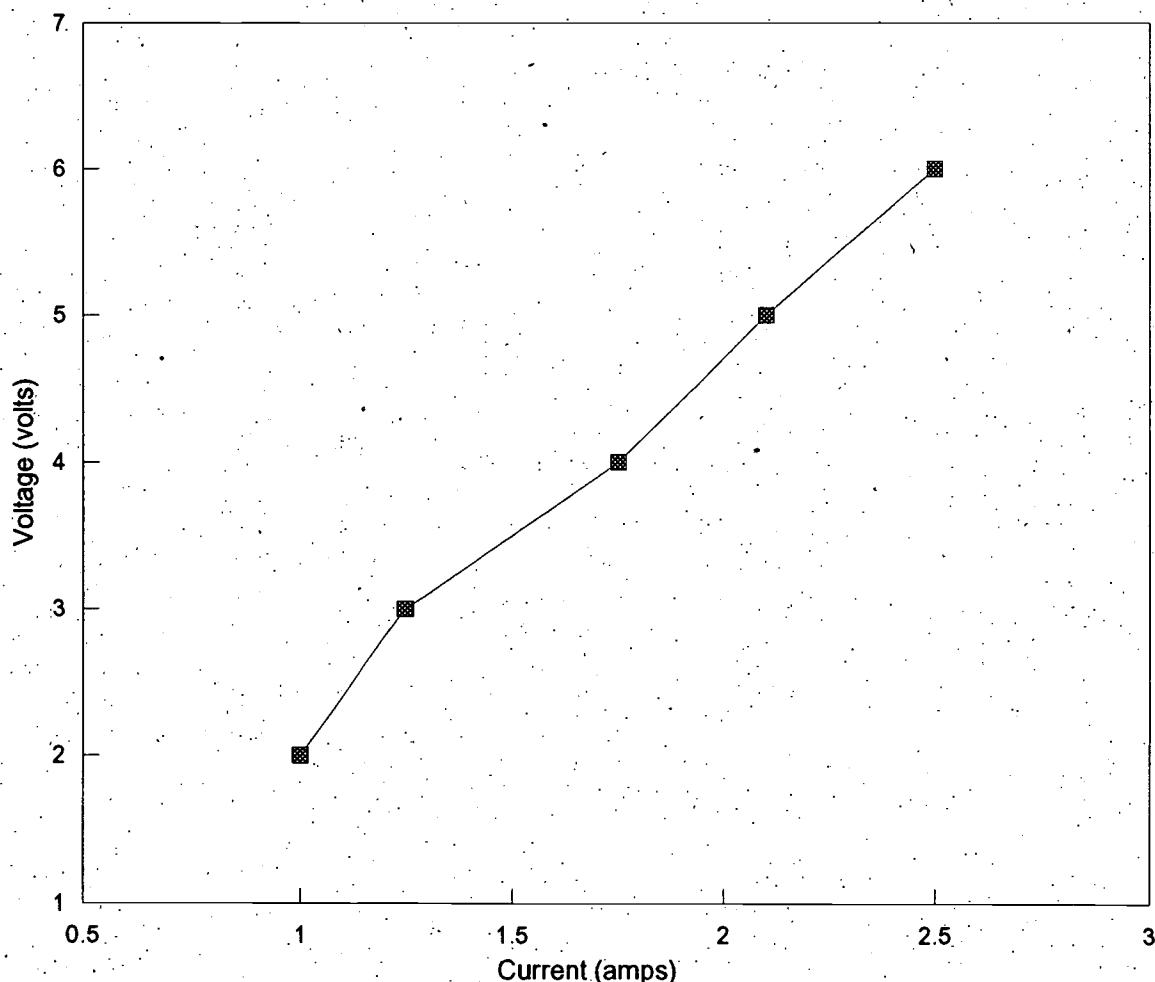
Cathodic Protection System: Fortrose Street rising sewer mains.

System Operating Volts: 10 System Operating amps: 4.1

Test Voltage: (volts)	Test Current: (amps)
2	1
3	1.25
4	1.75
5	2.1
6	2.5

Loop Resistance (ohms)
2.666667

Graph of System voltage vs current.





THE SOUTH EAST QUEENSLAND
ELECTRICITY BOARD

TECHNICAL SERVICES DIVISION

TEST & INVESTIGATIONS GROUP

COMPRISED: TESTS & INVESTIGATIONS MANAGER

PH. 223 5315

CABLE & SAFETY TESTS SECTION

PH. 223 5369

FIELD INVESTIGATIONS SECTION

PH. 223 5433

FIELD TESTS SECTION

PH. 223 5449

EQUIPMENT TESTS SECTION

PH. 223 5416

Ref. No.: _____

Building One
Blinzinger Road
BANYO QLD 4014

Date: 26/10/95

FAX NO. : (07) 267 6228

No. of pages following: _____

ATTN:

KERRY MCGOVERN

LOCATION:

BRISBANE WATER ENG. SERVICES

FAX No.:

07 3403 1898

FROM.:

DARRYL RINGUET

REMARKS:

AS DISCUSSED I HAVE NO OBJECTIONS TO THE CP

SYSTEMS AT BLUNDER RD TO BEATTY RD, AND ALSO THE CP SYSTEM

AT FORTROSE ST KENMORE. THERE APPEARS TO BE NO SIGNIFICANT

INTERFERENCE TO SEQEB STRUCTURES AS SHOWN ON YOUR TEST

RESULTS.

D. Ringuet

Brisbane Water Engineering Services

CP Form No. 28

Electrical Engineering Unit

Cathodic Protection Bleed Point Details FormProject FORTROSE ST., RISING MAINDate 23.10.95Bleed Location FORTROSE ST., KENMORECPB No. M7FOREIGN STRUCTURE OWNER: SEQ EF.S. LOCATION: FORTROSE ST, KENMOREF.S. IDENTIFICATION: POLE N° 39173**REFERENCE POTENTIALS TO F.S. PRIOR TO BLEED CONNECTION:**REFERENCE TYPE: CuSO₄POTENTIAL OFF: -309 mV ON: -224 mV SW: +85 mVBLEED TYPE: GALVANICBLEED MATERIAL: ZINCBLEED WEIGHT: TOTAL = 1.5kg (2 x 650g)BLEED O/C POTENTIAL: 694 mVBLEED CURRENT OFF: 49 mA ON: 49 mA**REFERENCE POTENTIALS AFTER CONNECTION TO FOREIGN STRUCTURE:**

Bond Off (Rectifier Off)			Bleed On			Resultant Swing
Bleed Off	Bleed On	Swing	Bond Off	Bond On	Swing	
<u>-336</u>	<u>-613</u>	<u>-277</u>	<u>-613</u>	<u>-603</u>	<u>+10</u>	<u>-367</u>

FOREIGN STRUCTURE OWNER AGREEABLE WITH MITIGATION? (Y/N) YESIDENTIFICATION TAG INSTALLED? (Y/N) YES**COMMENTS:**TEST CARRIED OUT MAXIMUM REGISTERED OUTPUT.RECTIFIER SET AT 14.5 V at 4A.TEST WITNESSED BY BOB BELLINSTALLED / TESTED BY M.M.CORMICK

Revision 10/26/95

MEMORANDUM

To	File No:
From	Date
Subject: FORTROSE STREET RISING MAIN ON POTENTIALS - NON POLARIZED	

RECTIFIER SET AT 10V 4.1A

POTENTIAL TO CuSO_4 -1012 mV

LOOP RESISTANCE	1 V	500 m Ω
	2 V	1 A
	3 V	1.25 A
	4 V	1.75 A
	5 V	2.1 A
	6 V	2.5 A

ANODE CURRENT

COUPON, RISING MAIN

Zn TO PIPE	+40 mV on	+666 mV off
Zn TO PRO coupon	+427 mV on	+427 mV off
Zn TO UNPRO coupon	+358 mV on	+358 mV off
CuSO_4 TO PIPE	-1018 mV on	-404 mV off
CuSO_4 TO PRO coupon	-632 mV on	-632 mV off
CuSO_4 TO UNPRO coupon	-702 mV on	-702 mV off
Zn TO CuSO_4	-1061 mV on	-1061 mV off

1060 MM WATER SUPPLY MAIN

CuSO_4 TO PIPE	-446 mV on	-414 mV off
-------------------------	------------	-------------

700 MM LOCKBAR

CuSO_4 TO PIPE	-367 mV on	-365 mV off
-------------------------	------------	-------------

MEMORANDUM

To	File No.
From	Date 5/04/94
Subject: FORTROSE STREET RISING MAIN OIL POTENTIALS - NON POLARIZED	

TEST POINT N°1

Zn TO PIPE	+ 493 mVon	+ 687 mVoff
CuSO ₄ TO PIPE	- 572 mVon	- 345 mVoff
Zn TO CuSO ₄	- 1070 mVon	- 1046 mVoff

TEST POINT N°2

Zn TO PIPE	+ 126 mVon	+ 670 mVoff
CuSO ₄ TO PIPE	- 994 mVon	- 441 mVoff
Zn TO CuSO ₄	- 1128 mVon	- 1112 mVoff

TEST POINT N°3

Zn TO PIPE	+ 148 mVon	+ 671 mVoff
CuSO ₄ TO PIPE	- 918 mVon	- 403 mVoff
Zn TO CuSO ₄	- 1064 mVon	- 1071 mVoff

TEST POINT N°5

CuSO ₄ TO PIPE	- 954 mVon	- 470 mVoff
---------------------------	------------	-------------

TEST POINT N°7

Zn TO PIPE	+ 464 mVon	+ 736 mVoff
CuSO ₄ TO PIPE	- 736 mVon	- 463 mVoff
Zn TO CuSO ₄	- 1196 mVon	- 1192 mVoff

MEMORANDUM

To	File No.
From	Date 16/10/98
Subject: FORTROSE STREET RISING MAIN NATURAL POTENTIALS	

Coupon, RISING MAIN

Zn TO PIPE	+499 mV
Zn TO PRO coupon	+349 mV
Zn TO UNPRO coupon	-259 mV
CuSO ₄ TO PIPE	-286 mV
CuSO ₄ TO PRO coupon	-437 mV
CuSO ₄ TO UNPRO coupon	-527 mV
Zn TO CuSO ₄	-787 mV

SOIL RESISTIVITY

2M (0.01x1)	$\Delta t_{10K} = 0.126 \mu\text{m}$
5M (0.01x2)	$\Delta t_{10K} = 6.912 \mu\text{m}$

Coupon, PIPE N°2 1060 MM. MSCL

Zn TO PIPE	+716 mV
Zn TO PRO coupon	+416 mV
Zn TO UNPRO coupon	-469 mV
CuSO ₄ TO PIPE	-401 mV
CuSO ₄ TO PRO coupon	-704 mV
CuSO ₄ TO UNPRO coupon	-649 mV
Zn TO CuSO ₄	-11.8 mV

To	File No.
From	Date 30/03/12
Subject: FORTROSE STREET RISING MAIN NATURAL POTENTIALS	

COUPON, PIPE 3, 900MM, LOCKBAR,

Zn TO PIPE + 793 mV
Zn TO PRO coupon + 445 mV
Zn TO VINYLIC COUPON + 520 mV
CuSO₄ TO PIPE - 385 mV
CuSO₄ TO PRO COUPON - 634 mV
CuSO₄ TO VINYLIC COUPON - 609 mV
Zn TO CuSO₄ - 1129 mV

TEST POINT N°1

Zn TO PIPE + 735 mV
CuSO₄ TO PIPE - 321 mV
Zn TO CuSO₄ - 1054 mV

TEST POINT N°2

Zn TO PIPE + 733 mV
CuSO₄ TO PIPE - 395 mV
Zn TO CuSO₄ - 1127 mV

TEST POINT N°3

Zn TO PIPE + 712 mV
CuSO₄ TO PIPE - 357 mV
Zn TO CuSO₄ - 1067 mV

TEST POINT N°5

CuSO₄ TO PIPE - 283 mV

TEST POINT N°7

Zn TO PIPE + 496 mV
CuSO₄ TO PIPE - 350 mV
Zn TO CuSO₄ - 1084 mV

BRISBANE CITY COUNCIL
EAGLE FARM PUMP STATION
CORROSION SECTION

STANDARD CATHODIC PROTECTION TEST POINT DATA GATHERING

DATE: 30-03-94
TEST POINT TYPE: 6

LOCATION: FORTROSE ST P/STN
MAINS SIZE: 410 MM

POTENTIAL TESTING

CATHODE TO CATHODE RETURN (RESISTANCE): 0.15Ω
ZINC REFERENCE TO PIPE: +735 mV
CuSO₄ REFERENCE TO PIPE: -321 mV
ZINC TO CuSO₄: -1054 mV

EARTH TESTING

PIN SPACING: 2M MEGGER READING: 6x 0.1 RESISTIVITY: 27ΩR = 7.54 ΩM
PIN SPACING: 5M MEGGER READING: 79x 0.01 RESISTIVITY: 27ΩR = 24.82 ΩM

SACRIFICIAL ANODE
(IF INSTALLED)

ANODE TYPE:
ANODE SIZE:
ANODE TO PIPE POTENTIAL:
ZINC REF TO PIPE:
(ANODE CONNECTED)

CuSO₄ REF TO PIPE:
(ANODE CONNECTED)

SACRIFICIAL ANODE CURRENT:

BLEED RESISTOR SIZE:
(IF INSTALLED)

INSTALLED BY: M. McCormick

COMMENTS: NO POSTS INSTALLED DUE
TO LACK OF STOCK

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1 COPY TO T.O.

BRISBANE CITY COUNCIL
EAGLE FARM PUMP STATION
CORROSION SECTION

STANDARD CATHODIC PROTECTION TEST POINT DATA GATHERING

DATE: 30-03-94
TEST POINT TYPE: S

LOCATION: MOSSILL RD
MAINS SIZE: 410 MM

POTENTIAL TESTING

CATHODE TO CATHODE RETURN (RESISTANCE): 0.152
ZINC REFERENCE TO PIPE: + 753 mV
CuSO₄ REFERENCE TO PIPE: - 395 mV
ZINC TO CuSO₄: - 1127 mV

EARTH TESTING

PIN SPACING: 2M MEGGER READING: 5x0.01 RESISTIVITY: $\sigma_{\text{soil}} = 0.628 \Omega \text{m}$

PIN SPACING: 5M MEGGER READING: 28x0.01 RESISTIVITY: $\sigma_{\text{soil}} = 8.796 \Omega \text{m}$

SACRIFICIAL ANODE
(IF INSTALLED)

ANODE TYPE:
ANODE SIZE:
ANODE TO PIPE POTENTIAL:
ZINC REF TO PIPE:
(ANODE CONNECTED)
CuSO₄ REF TO PIPE:
(ANODE CONNECTED)

SACRIFICIAL ANODE CURRENT:

BLEED RESISTOR SIZE:
(IF INSTALLED)

INSTALLED BY: M. McCormick

COMMENTS: NO FEET INSTALLED DUE TO
LACK OF STOCK

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BRISBANE CITY COUNCIL
EAGLE FARM PUMP STATION
CORROSION SECTION

STANDARD CATHODIC PROTECTION TEST POINT DATA GATHERING

DATE: 30-03-94
TEST POINT TYPE: B

LOCATION: ROWENA ST
MAINS SIZE: 410MM

POTENTIAL TESTING

CATHODE TO CATHODE RETURN (RESISTANCE): 0.15Ω
ZINC REFERENCE TO PIPE: +712 mV
CuSO₄ REFERENCE TO PIPE: -357 mV
ZINC TO CuSO₄: -1067mV

EARTH TESTING

PIN SPACING: 2M MEGGER READING: 26x0.01 RESISTIVITY: 27ΩM = 3.267ΩM

PIN SPACING: 5M MEGGER READING: 20x0.1 RESISTIVITY: 27ΩM = 62.832ΩM

SACRIFICIAL ANODE
(IF INSTALLED)

ANODE TYPE:
ANODE SIZE:
ANODE TO PIPE POTENTIAL:
ZINC REF TO PIPE:
(ANODE CONNECTED)
CuSO₄ REF TO PIPE:
(ANODE CONNECTED)

SACRIFICIAL ANODE CURRENT:

BLEED RESISTOR SIZE:
(IF INSTALLED)

INSTALLED BY: M. MCCORMICK

COMMENTS: NO POST INSTALLED DUE TO
LACK OF STOCK.

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BRISBANE CITY COUNCIL
EAGLE FARM PUMP STATION
CORROSION SECTION

COUPON TYPE CATHODIC PROTECTION
TEST POINT DATA GATHERING

DATE: 30-03-94
MAINS SIZE: 410 MM
TEST POINT TYPE: COUPON

LOCATION: RECTIFIER, SUNRISE RD
TYPE:

INITIAL POTENTIAL TESTING
(BOTH COUPONS DISCONNECTED)

ZINC TO PIPE:	+499 mV
ZINC TO PROTECTED COUPON:	+349 mV
ZINC TO UNPROTECTED COUPON:	+259 mV
CuSO ₄ TO PIPE:	-286 mV
CuSO ₄ TO PROTECTED COUPON:	-437 mV
CuSO ₄ TO UNPROTECTED COUPON:	-527 mV
CuSO ₄ TO ZINC :	-787 mV
PIPE CATHODE TO PIPE CATHODE RETURN (RESISTANCE):	0.1Ω
COUPON CATHODE TO COUPON CATHODE RETURN(RESISTANCE):	0.1Ω

CONNECTION OF TEST POINT

1. PIPE CATHODE IS CONNECTED TO IMPRESSED CURRENT RECTIFIER OR SACRIFICIAL ANODE.
2. PIPE CATHODE RETURN IS CONENCTED VIA TERMINAL STRIP TO PROTECTED COUPON CATHODE.
3. BETWEEN COUPON CATHODE RETURN AND REFERENCES AS SET OUT BELOW.

POTENTIAL TESTING IN SERVICE

AFTER CP SYSTEM HAS POLARIZED CARRY OUT POTENTIAL TESTING AS DETAILED BELOW.

A) WITH SYSTEM ON (STATE IF CuSO₄ IS ON SURFACE OR AJACENT PIPE)

WHILE COUPON IS CONNECTED TO PIPE CATHODE RETURN:
PROTECTED COUPON TO ZINC:
PROTECTED COUPON TO CuSO₄:
UNPROTECTED COUPON TO ZINC:
UNPROTECTED COUPON TO CuSO₄:

WHILE COUPON IS DISCONNECTED TO PIPE CATHODE RETURN:
PROTECTED COUPON TO ZINC:
PROTECFED COUPON TO CuSO₄:
UNPROTECTED COUPON TO ZINC:
UNPROTECTED COUPON TO CuSO₄:

WITH C.P. SYSTEM INTERRUPTING

USE CHART RECORDER TO OBTAIN INSTANTANEOUS OFF POTENTIALS.
WITH PROTECTED COUPON DISCONNECTED.

PIPE CATHODE RETURN TO ZINC ON:
PIPE CATHODE RETURN TO CuSO₄:

RECONNECT SYSTEM AS ABOVE
TURN OFF INTERRUPTOR AND MEASURE COUPON (PROTECTED) CURRENT AND
DIRECTION:

BRISBANE CITY COUNCIL
EAGLE FARM PUMP STATION
CORROSION SECTION

STANDARD CATHODIC PROTECTION TEST POINT DATA GATHERING

DATE: 29-03-93
 TEST POINT TYPE: B.

LOCATION: EXPOSED PIPE, SUNRISE RD
 MAINS SIZE: 410 MM

POTENTIAL TESTING

CATHODE TO CATHODE RETURN (RESISTANCE): 0.15Ω
 ZINC REFERENCE TO PIPE: N.A.
 CuSO_4 REFERENCE TO PIPE: -283 mV
 ZINC TO CuSO_4 : N/A

EARTH TESTING N.A.

PIN SPACING:	MEGGER READING:	RESISTIVITY:
PIN SPACING:	MEGGER READING:	RESISTIVITY:

SACRIFICIAL ANODE
(IF INSTALLED)

ANODE TYPE:
 ANODE SIZE:
 ANODE TO PIPE POTENTIAL:
 ZINC REF TO PIPE:
 (ANODE CONNECTED)
 CuSO_4 REF TO PIPE:
 (ANODE CONNECTED)

SACRIFICIAL ANODE CURRENT:

BLEED RESISTOR SIZE:
 (IF INSTALLED)

INSTALLED BY: MURRY MCCORMICK

COMMENTS: EXPOSED PIPE LOCATED IN HORSE PADDOCK
 APPROX 300m TO 400m FROM RD NEAR RIVER
 BEWARE OF ELECTRIC FENCE

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BRISBANE CITY COUNCIL
EAGLE FARM PUMP STATION
CORROSION SECTION

STANDARD CATHODIC PROTECTION TEST POINT DATA GATHERING

DATE: 30-03-94
TEST POINT TYPE: B

LOCATION: CENTENARY BRIDGE
MAINS SIZE: 410MM

POTENTIAL TESTING

CATHODE TO CATHODE RETURN (RESISTANCE): 0.1Ω
ZINC REFERENCE TO PIPE: +496mV
CuSO₄ REFERENCE TO PIPE: -352mV
ZINC TO CuSO₄: -1084mV

EARTH TESTING NOT POSSIBLE DUE TO TERRAIN

PIN SPACING: 2M MEGGER READING: RESISTIVITY: 2TΩM

PIN SPACING: 5M MEGGER READING: RESISTIVITY: 2TΩM

SACRIFICIAL ANODE
(IF INSTALLED)

ANODE TYPE:
ANODE SIZE:
ANODE TO PIPE POTENTIAL:
ZINC REF TO PIPE:
(ANODE CONNECTED)

CuSO₄ REF TO PIPE:
(ANODE CONNECTED)

SACRIFICIAL ANODE CURRENT:

BLEED RESISTOR SIZE:
(IF INSTALLED)

INSTALLED BY: M. MCCORMICK

COMMENTS: NO POST INSTALLED DUE
TO LACK OF STOCK

1 COPY TO FILE
1 COPY TO T.O.

Brisbane City Council

Dept of Water Supply and Sewerage

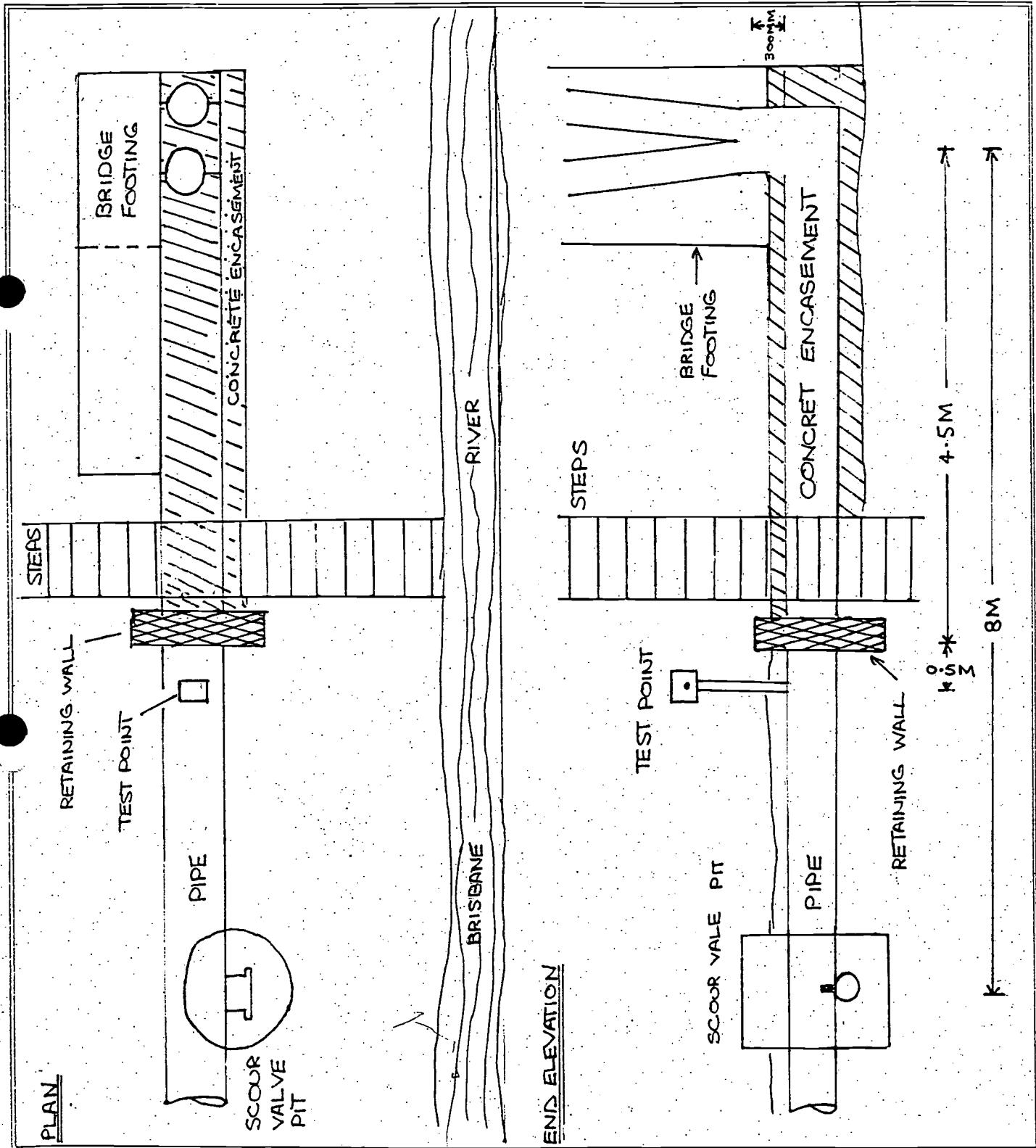
Eagle Farm Pump Station

Electrical Workshop

Date:

21-03-94

Site Plan for:

FORTROSE STREET RISING MAIN
TEST POINT N° 7

Brisbane City Council

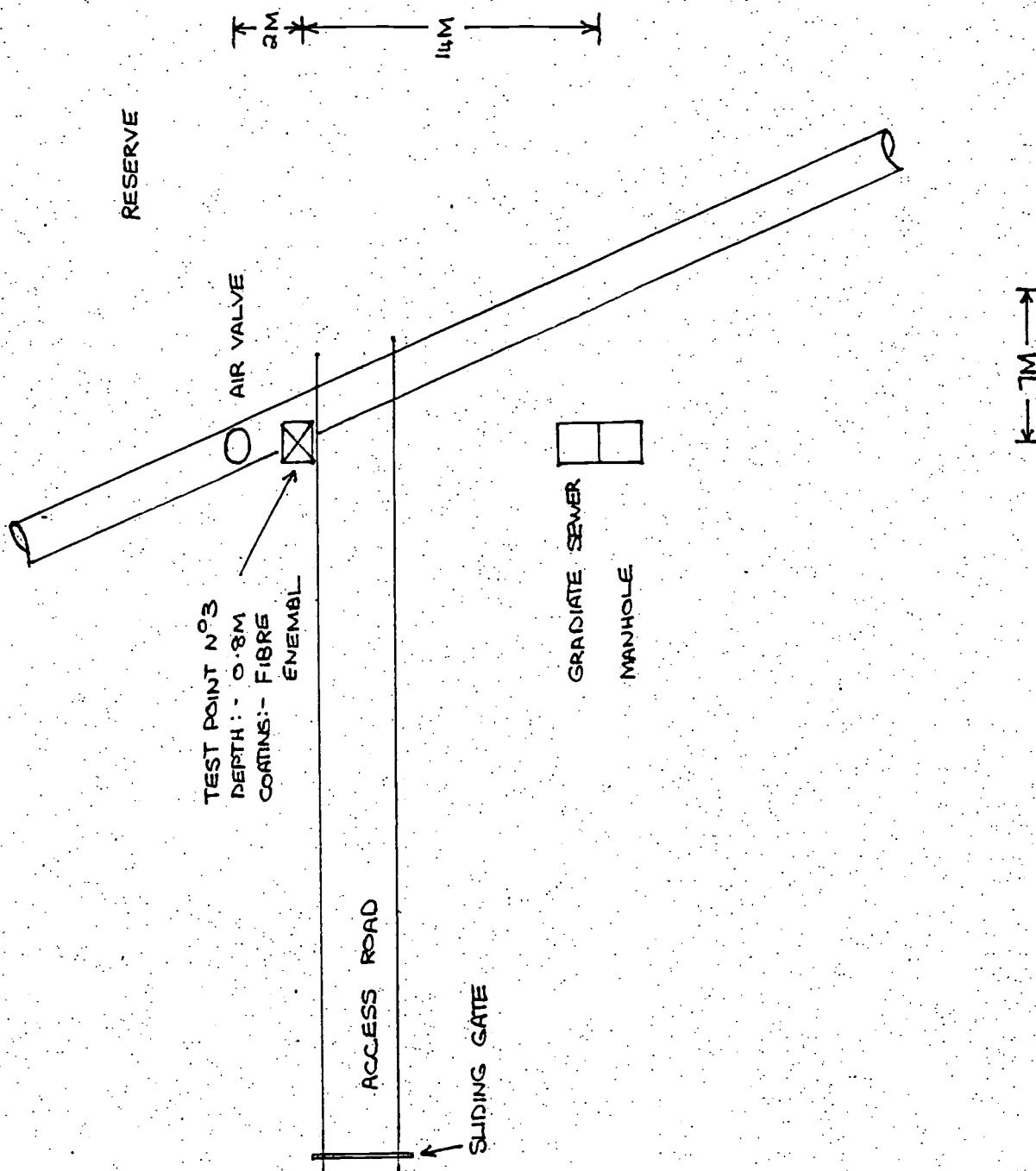
Dept of Water Supply and Sewerage

Eagle Farm Pump Station

Electrical Workshop

Date: 21-03-94

Site Plan for: FORTROSE STREET RISING MAIN
TEST POINT N°3



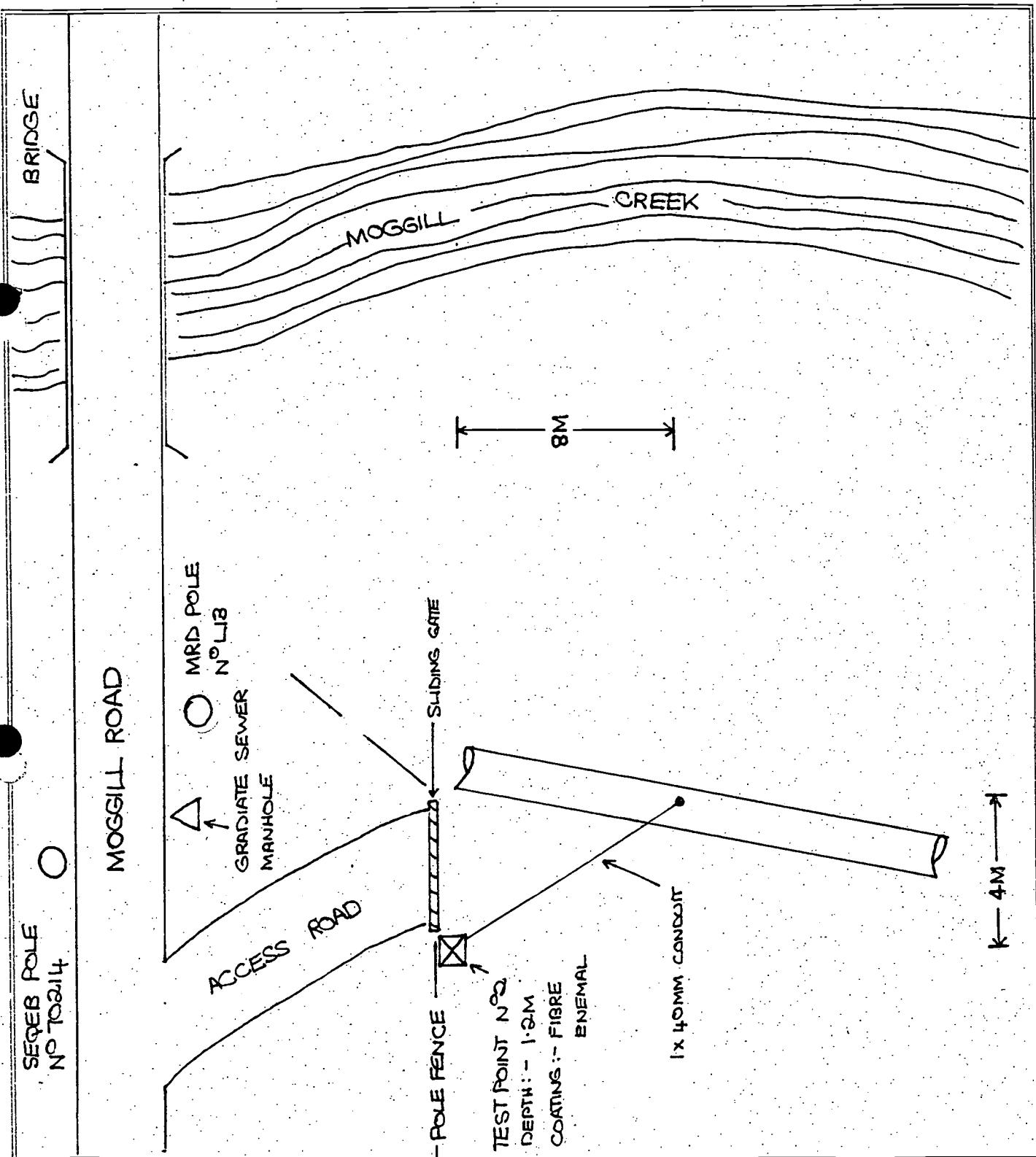
Brisbane City Council

Dept of Water Supply and Sewerage

Eagle Farm Pump Station

Electrical Workshop

Date: 21-08-94

Site Plan for: FORTROSE ST RISING MAIN
TEST POINT N°2

Brisbane City Council

Dept of Water Supply and Sewerage

Eagle Farm Pump Station

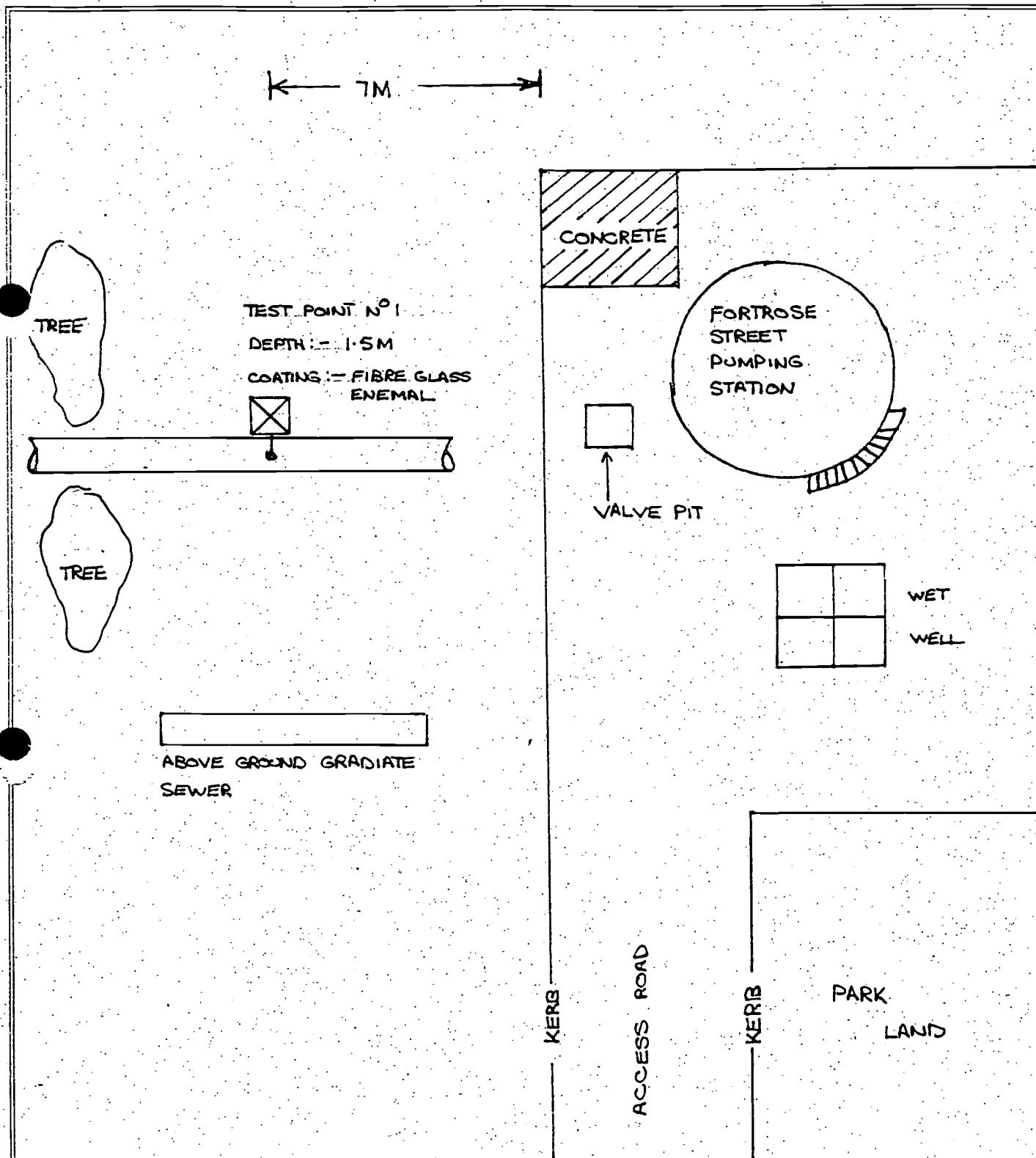
Electrical Workshop

Date:

17-03-94

Site Plan for:

FORTROSE STREET RISING MAIN
TEST POINT N°1



Brisbane City Council

Dept of Water Supply and Sewerage

Eagle Farm Pump Station

Electrical Workshop

Date: 10-02-94

Site Plan for: FORTROSE STREET RISING MAIN

PLAN

PUMP STATION

32MM
CONDUIT
A.C.
SUPPLY

OXYGEN

32 40 40 32 32
00000

40 40 32 32 25
00000

PIT

100MM
CONDUIT TO
CATHODES AND
ANODES

NOTE:- ALL CONDUITS FROM
RECTIFIER PLYMTHS
GO TO CABLE PIT
UNLESS SO MARKED

END ELEVATION

PUMP STATION

OXYGEN

CONDUITS
32 40 40 32 32

32MM
CONDUIT
AC
SUPPLY

CONDUITS

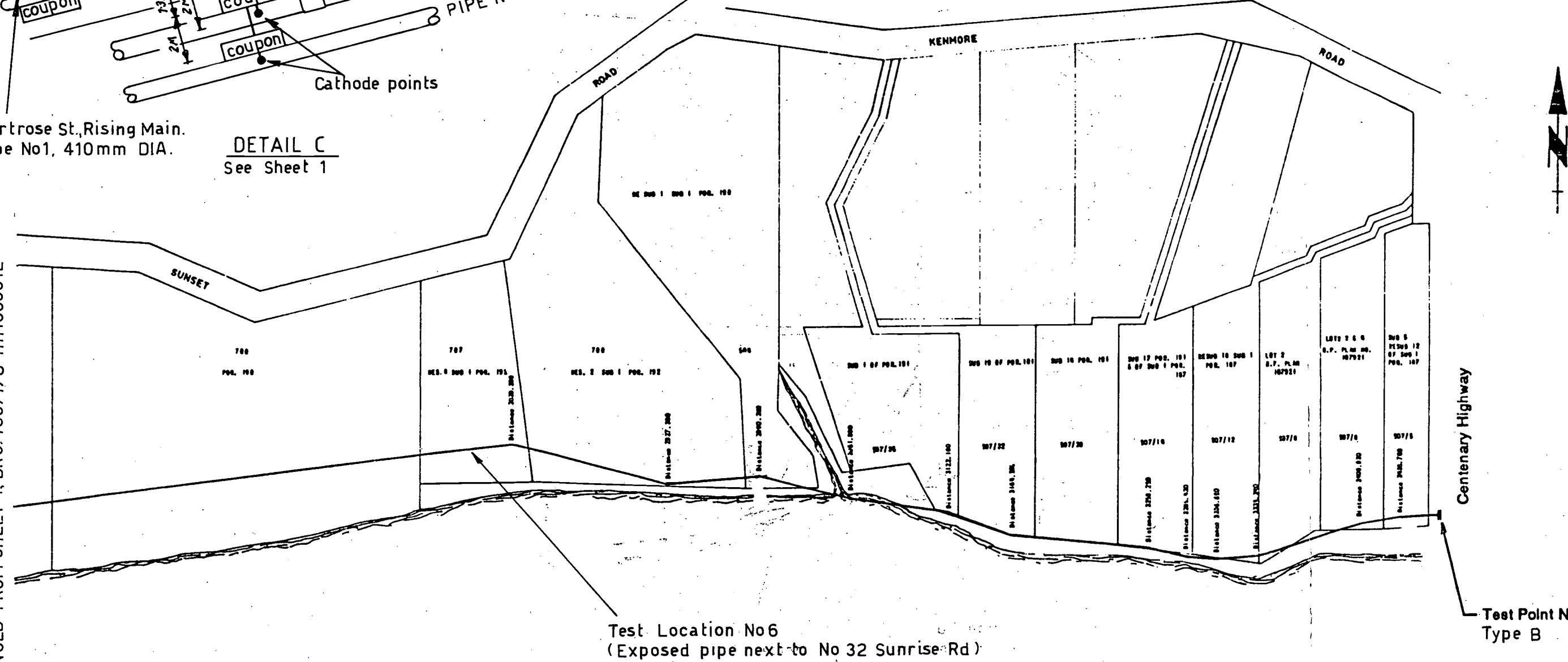
40 40 32 32 25

PIT

100MM CONDUIT

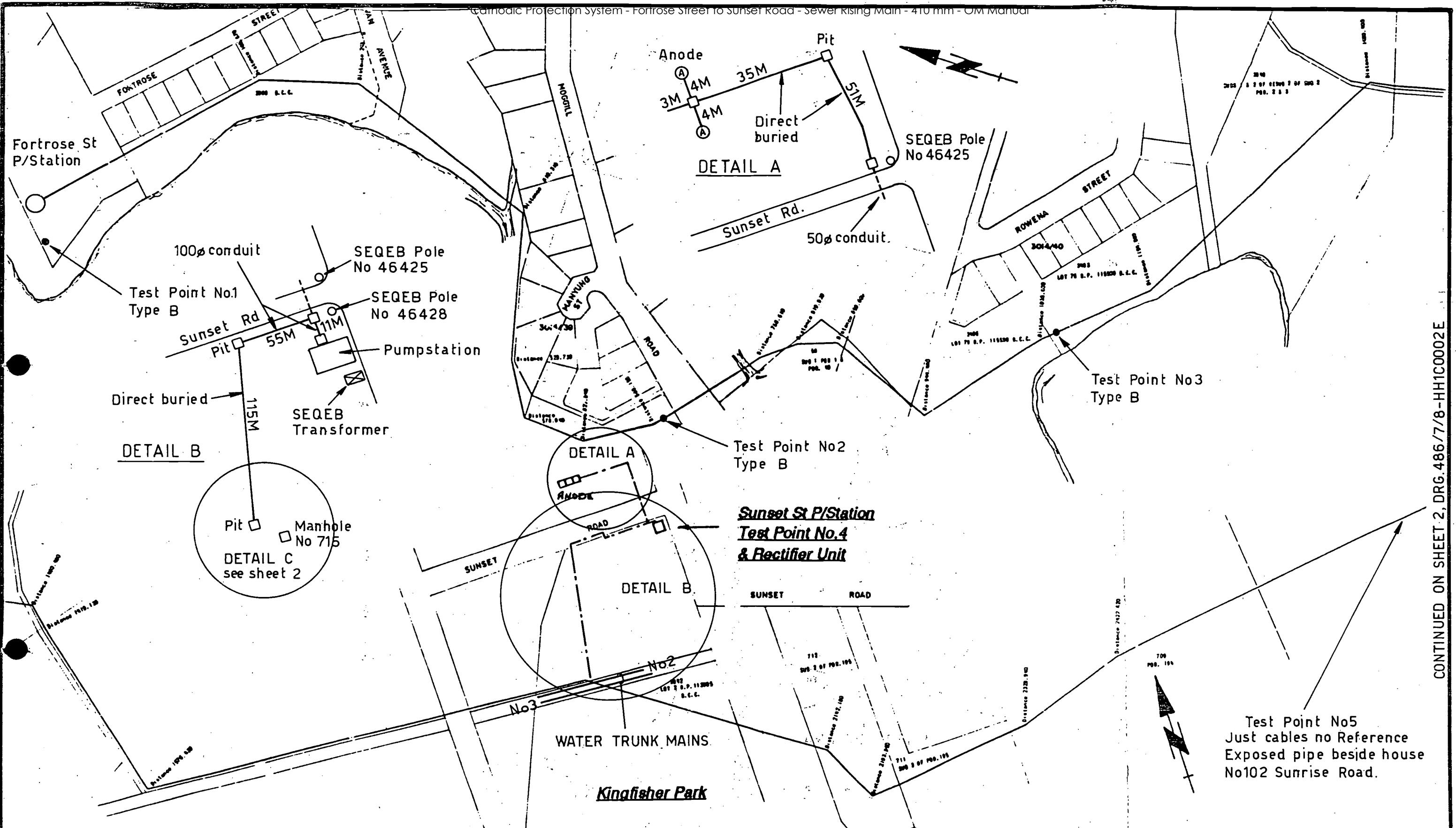
Fortrose St., Rising Main.
Pipe No1, 410mm DIA.

DETAIL C
See Sheet 1



CONTINUED FROM SHEET 1, DRG.486/7/8-HH1C0001E

		MANAGER	DIRECTOR OF PLANNING & DESIGN	DESIGN	J.S.	5/11/93	PROJECT	SUNSET Bd C.P. SYSTEM	BRISBANE CITY COUNCIL
		DATE	DATE	DRAWN	J.S.	5/11/93		Fortrose St to Centenary Hwy	DEPARTMENT OF WATER SUPPLY & SEWERAGE
		DIRECTOR OF CONSTRUCTION	DIRECTOR OF M. & E. SERVICES	CHK'D.	Jm	9/11/93	TITLE	410 dia. MSCL SEWERAGE RISING MAIN CATHODIC PROTECTION DETAILS	PLANNING & DESIGN BRANCH
			DIRECTOR OF SEW. OPERATIONS/W.S. DISTRIBUTION	ENGINEER IN CHARGE				Brisbane City	
A 4-94	DETAIL/T. POINTS ADDED	R.L.		SUPERVISING ENGINEER	M.J.G.		SCALE	NT8	N° 2 OF 2 SHEETS
NO DATE	AMENDMENT	INITIALS	DATE				DRAWING N°	486/7/8 - HH1C0002E	AMEND. A
A.C.E.P. 21/07/2015 Page 84 of 111									



			MANAGER	DIRECTOR OF PLANNING & DESIGN	DESIGN	J.S.	5/11/93	PROJECT	SUNSET Rd C.P. SYSTEM	
			DATE	DATE	DRAWN	J.S.	5/11/93		Fortrose St to Centenary Hwy	
			DIRECTOR OF CONSTRUCTION	DIRECTOR OF M. & E. SERVICES	CHK'D.	J.M.	9/11/93	TITLE	410 dia. MSCL SEWERAGE RISING MAIN CATHODIC PROTECTION DETAILS	
					ENGINEER IN CHARGE					
A 4-94	DETAILS/T POINTS ADDED	R.L.	SUPERVISING ENGINEER					SCALE	NTS	N° 1 OF 2 SHEETS
NO DATE	AMENDMENT	INITIALS DATE						DRAWING N°		AMEND. A
486/7/8 - HH1C0001E										

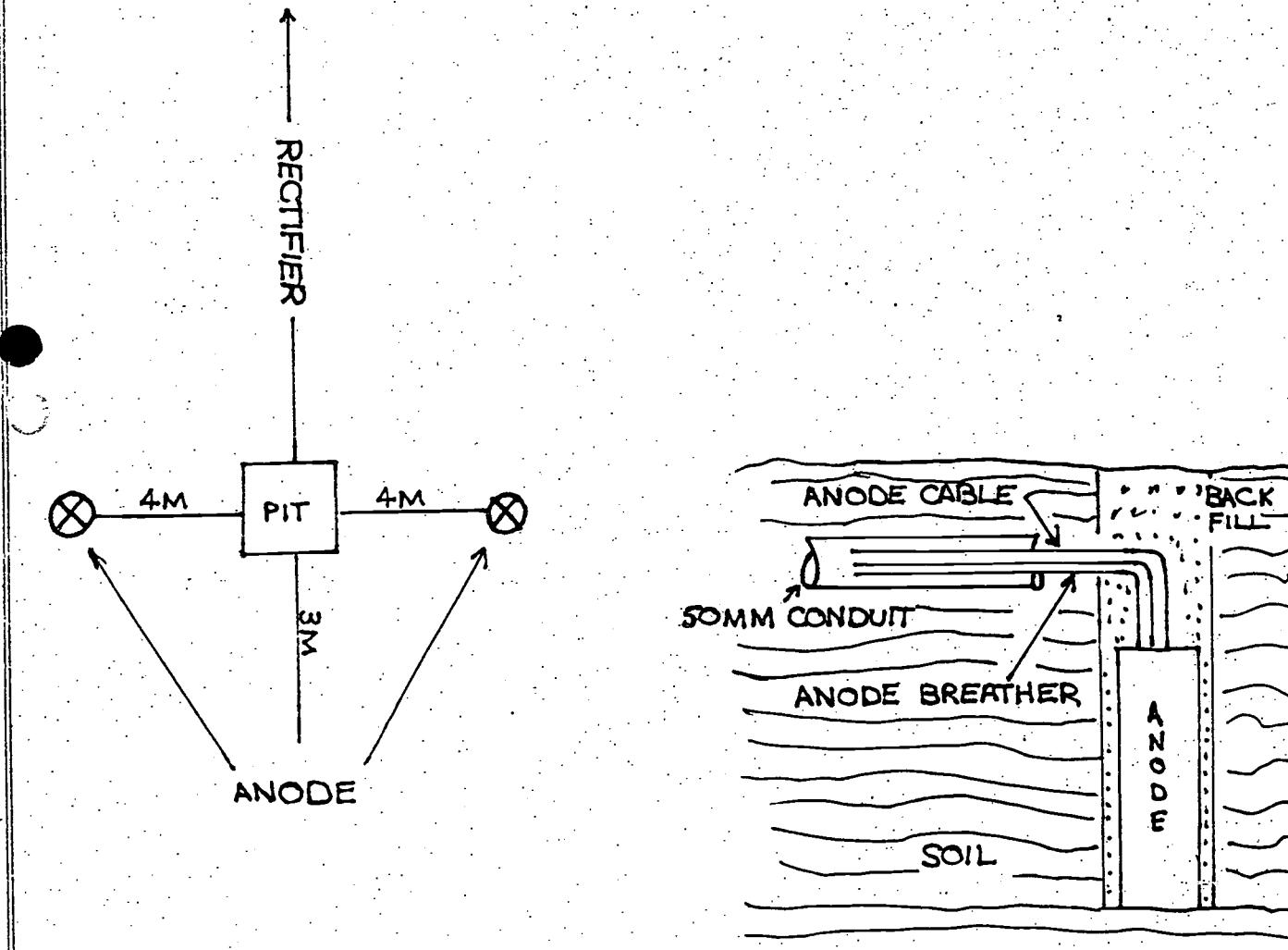
BRISBANE CITY COUNCIL
DEPARTMENT OF WATER SUPPLY & SEWERAGE
PLANNING & DESIGN BRANCH
Brisbane City

A.C.T.C. 21/07/2010

Electrical Workshop

Cathodic Protection Anode Bed Testing

Date:	1ST FEBRUARY 1994			Structure:	FORTROSE STREET RISING MAIN
Anode material:	SILICON IRON			Anode size/weight:	
Packaging:	2M X 300MM CANISTER			Burial:	VERTICAL
Depth:	4.3 M			Resistivity:	3M (4×0.01) Ωm = $0.755 \Omega m$ 5M (4×0.01) Ωm = $1.257 \Omega m$
Test Point type:	400X400 INGROUND PIT			Signage:	O.K.
Resistance to ground:					
Anode 1	Anode 2	Anode 3	Anode 4		
$0.01 = 0.04 \Omega$	$4 \times 0.01 = 0.04 \Omega$				
Tested by: M. M CORMICK			Anode 5		
Locality Plan:					



Brisbane City Council

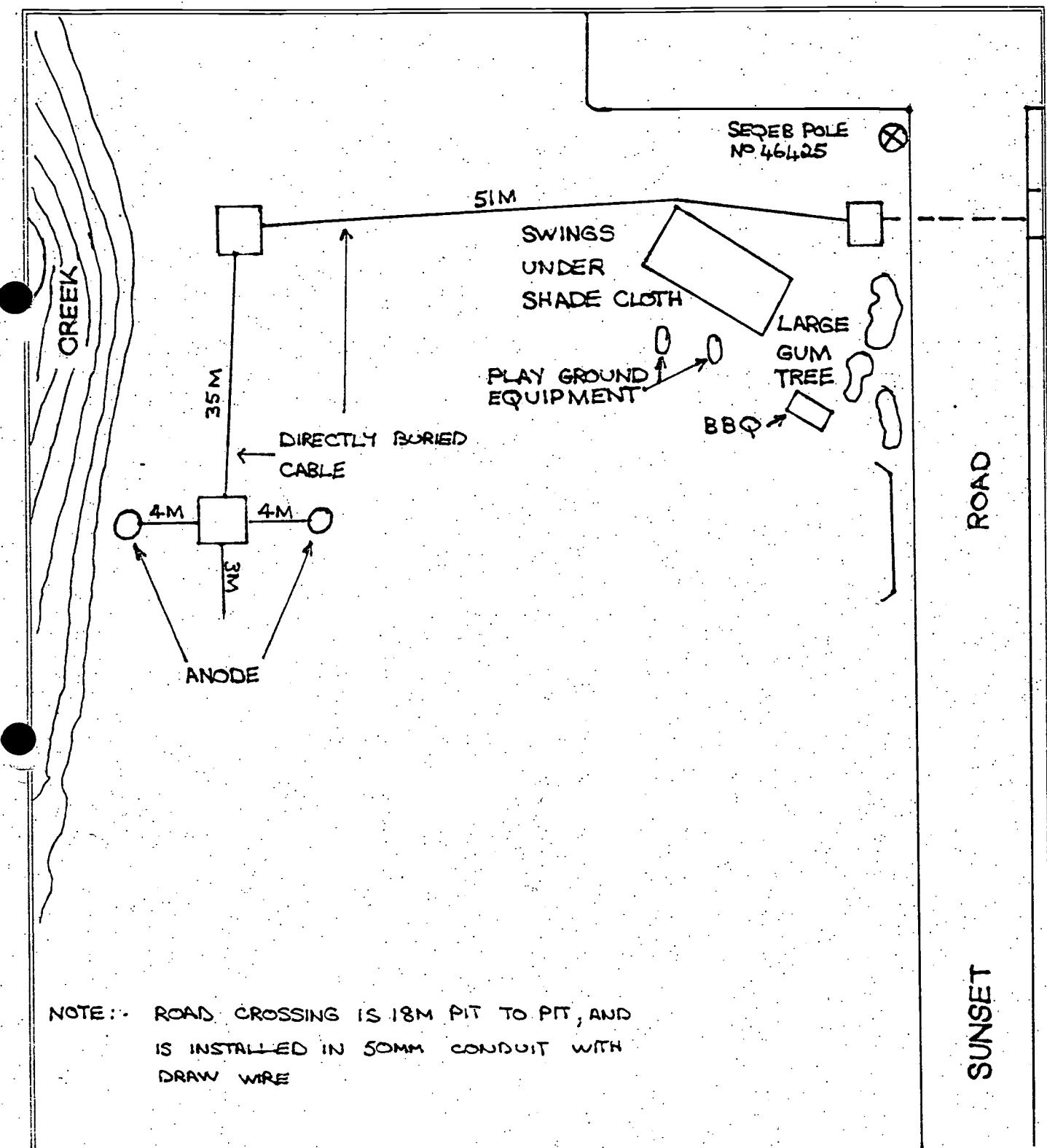
Dept of Water Supply and Sewerage

Eagle Farm Pump Station

Electrical Workshop

Date: 2-02-94

Site Plan for: FORTROSE STREET RISING MAIN



Brisbane City Council

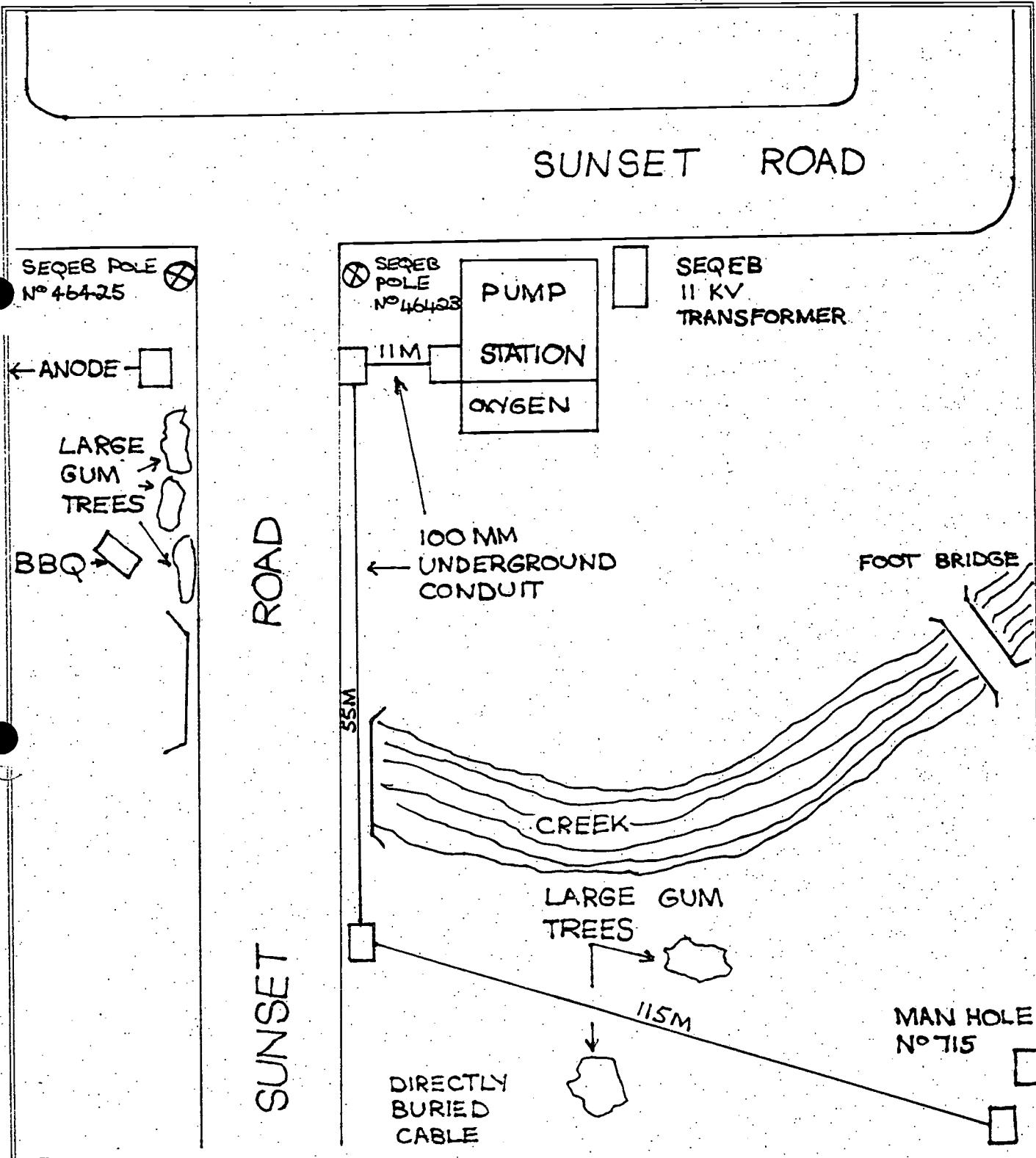
Dept of Water Supply and Sewerage

Eagle Farm Pump Station

Electrical Workshop

Date: 2-02-94

Site Plan for: FORTROSE STREET RISING MAIN



Brisbane City Council

Dept of Water Supply and Sewerage

Eagle Farm Pump Station

Electrical Workshop

Date: 16-02-94

Site Plan for: FORTROSE STREET RISING MAIN

CATHODE POINT

DEPTH
900MM

PIPE N°S
900MM WATER LOCKBAR

COUPON

40MM
CONDUIT.

CATHODE POINT

PIPE N°2
1060 MM M.S.C.L.
WATER TRUNK MAIN
DEPTH:- 900MM

COUPON

MANHOLE
N°715

40MM CONDUIT

CABLE
PIT

RECTIFIER

14.5M

1.6M

PIPE N°1

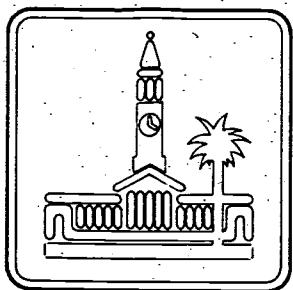
FORTROSE STREET 410 MM
RISING SEWERAGE MAIN
DEPTH: - 1200MM

3.3M

2M

1.3M

CATHODE POINT



Brisbane City

BRISBANE CITY COUNCIL

EAGLE FARM PUMPING STATION
CNR KINGSFORD SMITH DRIVE & VIOLET STREET
EAGLE FARM QLD.G.P.O. BOX 1434
BRISBANE QLD. 4001TELEX CIVICS AA41910
FACSIMILE 2680847

To SEW. DESIGN.	Attention ASHLEY NETTO	Fax.No. (7) 4793.
Date 12/1/94	No. of Pages 1	From KERRY m'GOVERN
RE: SEWER MAINS LOCATIONS.		

COULD YOU PLEASE ADVISE US ASAP
IN REGARDS TO SEWER LOCATIONS IN
AREAS WE ARE TRENCHING AND
GRUNDELL MATTING (BOARING UNDER GROUND).

LOCATION 1 BOUNDARY RD ROCKLEA

UBD 41 L8 AS INDICATED IN
FOLLOWING BI-MAP PRINT.

LOCATION 2 SUNSET ST KENMORE

UBD 32 M6 95 AS INDICATED IN
FOLLOWING BI-MAP PRINT.

REGARDS,
KERRY m'GOVERN,

Date:
4-JAN-94

Time:
12:57:33

Username:
ELHEW

Job number:
Local

Map scale:
1:1500

Location:
497892 6850075

Themes:

CADASTRE
BOYS_FEDERAL_ELECT
STREETS
WATER_RETIC
STORM_WATER_MAINT

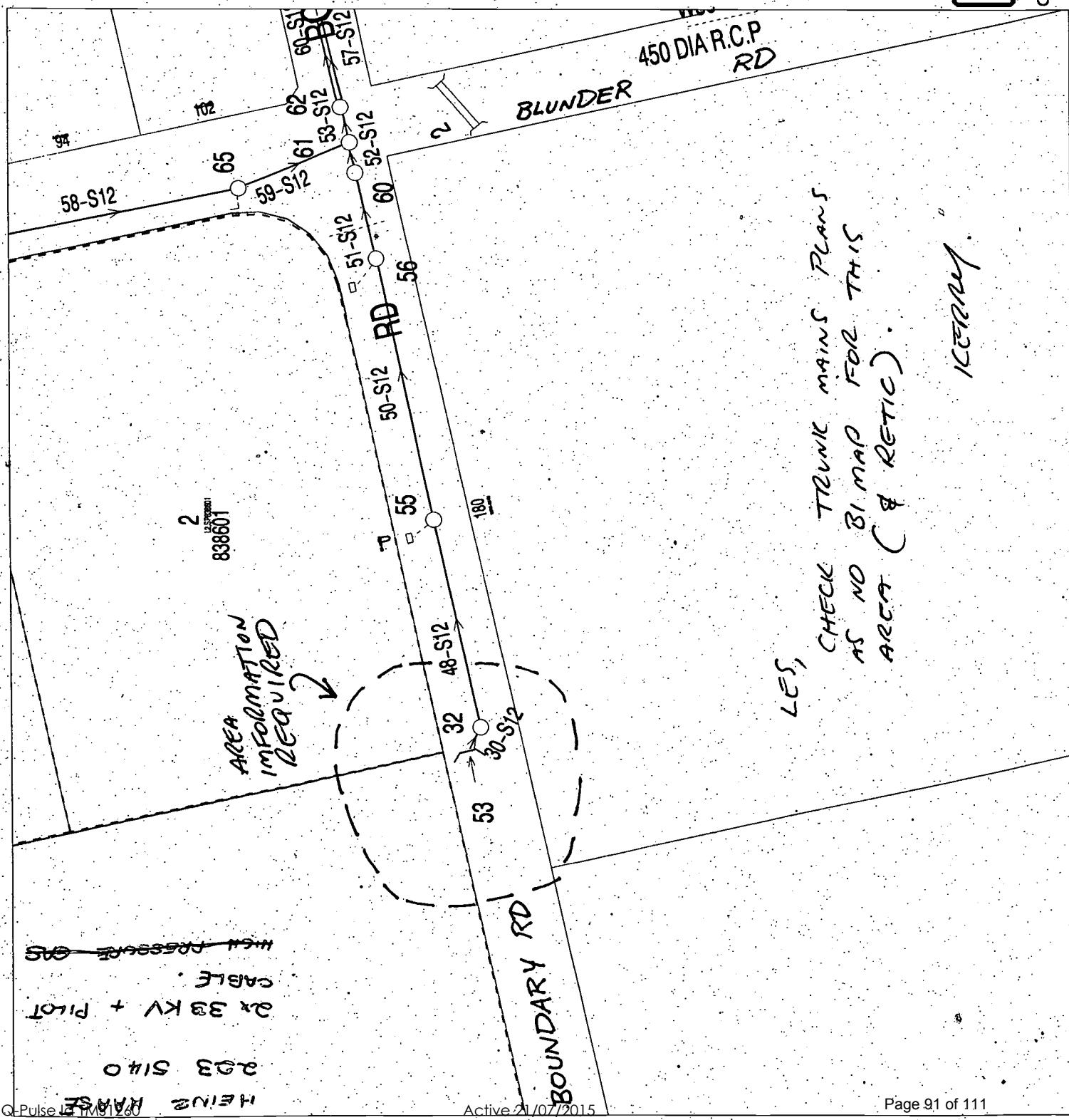
Warnings:

While every endeavour has been made to ensure that the material here produced is as accurate as possible in what it conveys, the Council takes no responsibility for any errors therein, nor for any acts or omissions that may occur due to its use.
WARNING property missing from CADASTRAL database
Water Reticulation may not be available in this area.

UBD 41 L8



Copyright Brisbane City Council, 1993



Date: 5-JAN-94

Time:
12.29.37

Username: ELHEW
Job number:

Map scale:

Location:

Themes:

STREETS
WATER_RETIC
STORM_WATER_MAINT
STORM_WATER

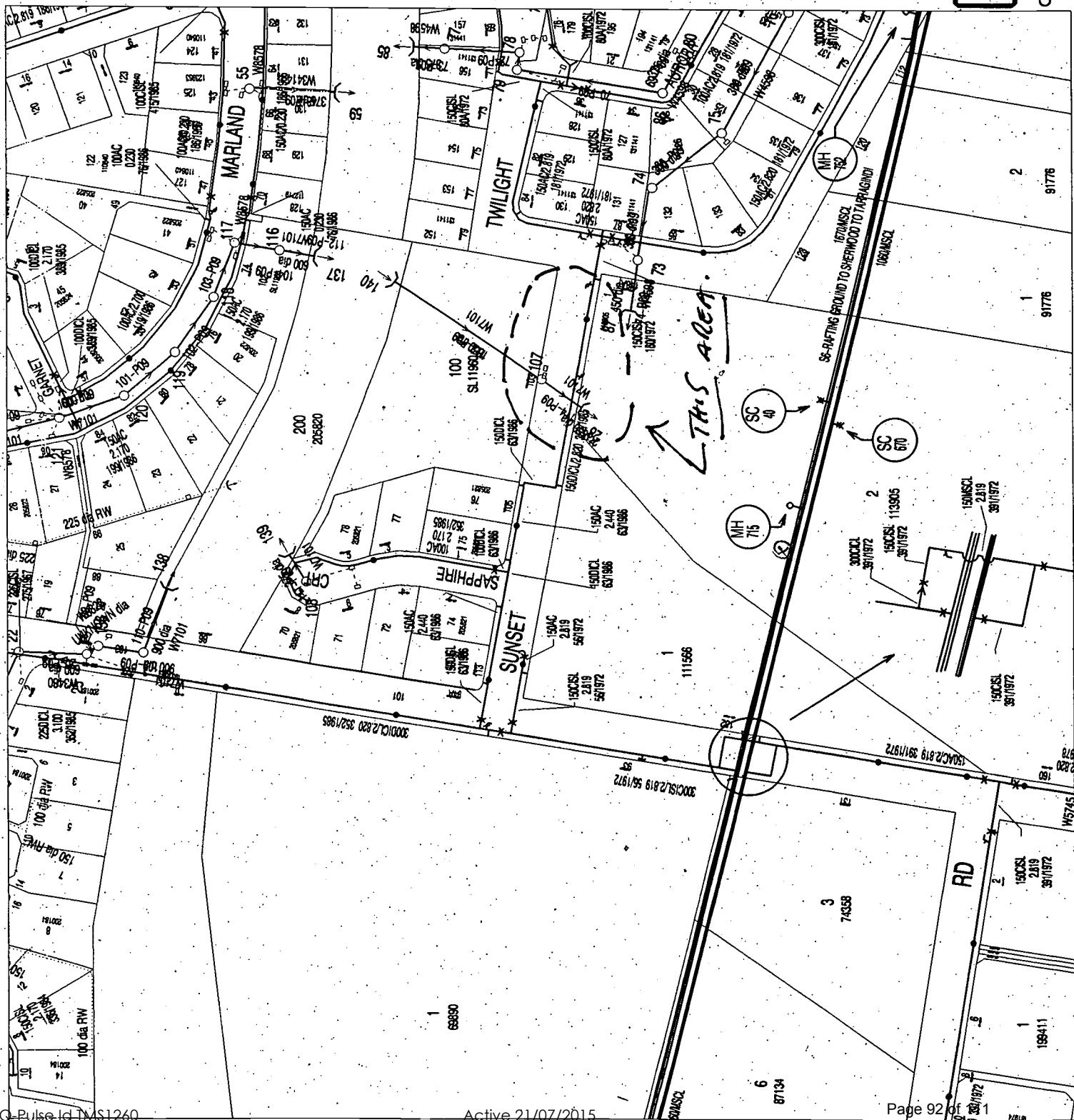
Warnings:

Water Reclamation may not be available in this area.

UBD 32 M6.

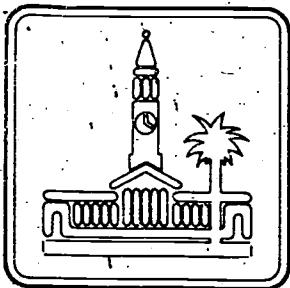


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8782684.

BRISBANE CITY COUNCIL



Brisbane City

EAGLE FARM PUMPING STATION
CNR KINGSFORD SMITH DRIVE & VIOLET STREET
EAGLE FARM QLD.

G.P.O. BOX 1434
BRISBANE QLD. 4001

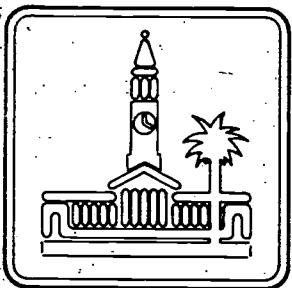
TELEX CIVICS AA41910
FACSIMILE 2680847

To SEQEB	Attention KEV WALKER	Fax.No. 379 9495
Date 5/1/94	No. of Pages TWO	From KERRY mc GOVERN
RE: SERVICES CHECKS BOUNDARY RD.		

COULD YOU PLEASE ADVISE US. IF THERE
ARE ANY U/G CABLE LOCATIONS IN
THE AREA MARKED ON FOLLOWING
SHEET.

REQUIRED ASAP.

REGARDS,
KERRY mc GOVERN.



Brisbane City

BRISBANE CITY COUNCIL

EAGLE FARM PUMPING STATION
CNR KINGSFORD SMITH DRIVE & VIOLET STREET
EAGLE FARM QLD.

G.P.O. BOX 1434
BRISBANE QLD. 4001

TELEX CIVICS AA41910
FACSIMILE 2680847

To TELECOM	Attention JACIE MORROW.	Fax.No. 8379702.
Date 5/1/93.	No. of Pages THREE..	From KERRY m' GOVERN
RE: V/G TELECOM CABLES.		

COULD YOU PLEASE ADVISE US IF THERE ARE ANY UNDERGROUND CABLE LOCATIONS IN THE FOLLOWING AREAS,

- ① SUNSET RD KENMORE
- ② BOUNDARY RD DARRA

AS INDICATED IN FOLLOWING LOCALITY PLANS.

REGARDS

KERRY m' GOVERN.

BRISBANE CITY COUNCIL
MEMORANDUM

To	Jane Wallis Sport and Recreation Officer	File No.	None
From	Kerry Mc Govern, Electrical L/Hand	Date	11th Jan 94
Subject		Cathodic Protection System Kingfisher Park Kenmore.	

The Mechanical and Electrical Branch is proposing to install a cathodic protection system on the Fortrose to Sunset St. rising sewer mains at Kenmore.

The purpose of this installation is to reduce corrosion and thereby failure of this valuable asset. The switchboard shall be installed in Sunset St. Sewerage Pump Station with cabling installed on both sides of Sunset St. as shown on attached plan.

The Department of Recreation and Health, Parks and Gardens has been advised of above works and has no objections to the installation.

Could you please send any comments to myself as soon as possible so installation work can proceed.

Regards,


Kerry Mc Govern
(7840) PH 2680840
(7847) FX. 2680847

BRISBANE CITY COUNCIL
MEMORANDUM

To Barry Gunner Oxley Ck. Supervisor	File No. <i>none</i>
From Kerry Mc Govern, Electrical L/Hand	Date Jan 94 <i>2/2/94</i> <i>1 / 1</i>
Cathodic Protection System Subject Kingfisher Park Kenmore.	

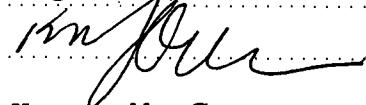
The Mechanical and Electrical Branch is proposing to install a cathodic protection system on the Fortrose to Sunset St. rising sewer mains at Kenmore.

The purpose of this installation is to reduce corrosion and thereby failure of this valuable asset. The switchboard shall be installed outside Sunset St. Sewerage Pump Station with cabling installed on both sides of Sunset St. as shown on attached plan.

We will require a 240 volt AC supply for our transformer rectifier from the pump station which will be installed by our staff.

As we will be commencing installation shortly could you please send any comments as soon as possible so installation work can proceed.

Regards



Kerry Mc Govern
(7840)

BRISBANE CITY COUNCIL
MEMORANDUM

To	Alderman Robert Mills Alderman Pullenvale	File No. None
From	Kerry Mc Govern, Electrical L/Hand	Date 11th Jan 94
Subject Cathodic Protection System Kingfisher Park Kenmore.		

The Mechanical and Electrical Branch is proposing to install a cathodic protection system on the Fortrose to Sunset St. rising sewer mains at Kenmore.

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Regards,



Kerry Mc Govern
(2680840) Ph.
(2680847) Fx.

**DESIGN FORM**

Job No. Page

Job By

Section Date / /

JAMIE SEV OPS
RE TEST POINT INSTALLATION
ALLOW APPROX 1M EGD
PRIOR INSTALLATION

CONTACT WIS. WATER
EXCAVATING NEAR.
TRUNK MAINS.

**Brisbane City Council
DEPARTMENT OF WATER SUPPLY AND SEWERAGE
MECHANICAL AND ELECTRICAL SERVICES BRANCH**

JS:sunset

TO: Kerry McGovern
Cathodic Protection.

FROM: Jeff Say, Technical Officer
Mechanical and Electrical Services Branch.

SUBJECT: Sunset St System - Fortrose St Rising Main.
Sunset St to Centenary Bridge

DATE: 4 November 1993

Installation of Cathodic Protection on the Fortrose St Rising Main has Programmed for implementation this financial year. The Rising Main is welded mild steel, 410 dia and is Enamel Coated Type B.

The rectifier unit shall be installed within the Sunset Rd Pump Station and the anode and cathode connections are within parkland adjacent to Sunset Road.

Due to the close proximity of the 66" and 36" water trunk mains to the rising main within the park and the distance to the rectifier unit, it is our intentions to install cathode connections and coupon type references on each of the three mains. These connections shall run to the rectifier unit and shall provide possible interference bleeds and testing facilities.

Scope of Work

To satisfactorily install a Cathodic Protection System on the above Rising Main the following the activities are required :

1. Insulation of main at Fortrose St (if required)
2. Insulation of main at Centenary Bridge (if required)

3. Installation of Test Points at the following locations :

- a) Fortrose St Pump Station
- b) Moggill Rd
- c) Reserve off Rowena St
- d) Sunset Rd on exposed pipe
- e) Sunset Rd on exposed pipe
- f) Centenary Bridge

4. Installation of Rectifier unit / Anode bed.

Details of Installation

1. Install rectifier unit within the Sunset Rd Pump Station and install associated anodes, coupon type references and cathode connections the Rising Main, 66" T/Main and 36" Lock Bar Trunk Main. Install a standard rectifier within the pump station including the coupon connections for the rising main. Terminate the connections from the two trunk mains in a separate cubicle adjacent to the rectifier unit.

Note :

If possible allow room adjacent to the rectifier unit for two additional future rectifier units, one for each trunk main. The installed coupon / cathode connections would be relocated into these units at that time.

- 2. Install test points in conjunction with Sewer Maintenance.
- 3. Check current drains at Fortrose St P/Station and Centenary Bridge to determine if insulation is required.
- 4. Test and commission system.

Regards,

**Jeff Say
Technical Officer**

Face Sheet

File fortrose

Date : 9/11/93

Cathodic Protection – Sewerage Rising Main.

Location : Sunset St C.P. System
Suburb : Kenmore
Between : Fortrose St & Centenary Bridge
UBD Reference : Map 32 – K4 , N9

Rising Main Details

Length :	3.5 Km
Size :	410 Dia
Material :	Mild Steel
Coating :	Enamel Coated Type B
Useful Life :	?

Work Schedule

Plan schedule – June 93	
Design :	Sept 93
Construct:	Dec 93
Commission :	Feb 94

Cathodic Protection Drawing No. : 486/7/8-HH1C0001E 486/7/8-HH1C0002E

Rising Main Drawing Series : 3014/36 to 3014/46

Pump Station Details : 3014/88

Details:

	Capital Projects	Eagle Farm
Charge Code :	STLA5020 21700100	STLA5020 21700104
Cost Estimate :	\$30,000	Supplied to: Sewer Operations

Correspondence:

		Sent	Reply Recieved	Test Performed
QEC	Permit to install	21/10/93	P 1144 4/11/93	
	Authority to Operate			
Foreign Structure Owner	S.E.Q.E.B.	21/10/93		
	Telecom	21/10/93		
	Gas Corporation	21/10/93	No structures	Not required
Parks	Anode Location	21/10/93	Approved by Parks	
SEQEB	Application for supply	N/A		
	Approval to conduit			

DEPARTMENT OF RECREATION AND HEALTH
Parks and Gardens Branch

MEMORANDUM

RMT

TO: Supervising Engineer
Capital Projects Section
Department of Water Supply and Sewerage

REFERENCE: DMES\DOCS\TECHOFFS\JEFF\036

DATE: 29 October 1993

SUBJECT: Installation of Buried Cathodic Protection
Cables and Anodes - Kingfisher Park, Kenmore

I refer to your memorandum of 30 March 1993, in which requested approval to install buried cathodic protection cables and anodes in Kingfisher Park, Kenmore.

I wish to advise that approval has been granted, subject to the following conditions:

- (1) The area to be left in a clean and tidy condition and restored to the satisfaction of Dan Edwards, Parks Supervisor West.
- (2) Contact Dan Edwards on telephone number 377 8930 prior to the commencement of the work.

If you have any queries or wish to provide additional information then please do not hesitate to contact Dan Edwards.


Keith Foster
ACTING PARKS DISTRICT OFFICER WEST



BRISBANE CITY COUNCIL

DESIGN FORM

Job

SUNSET ST C.P. SYSTEM

Job No. Page

Section

By

Date / /

1/ LENGTH OF MAIN - 3500 M

DIAM OF MAIN - 410 MM

COATING - ENAMEL COATED TYPE B

CALCULATIONS

1/ ANODE RESISTANCE

SOIL RESISTIVITY - 19 ΩM

$$R = \frac{P}{2\pi L} \left(\ln \frac{8L}{d} - 1 \right)$$

Refer to AS 2832.1

$$= \frac{19}{2\pi L} \left(\ln \frac{8L}{3} - 1 \right)$$

= 4.5 Ω (PER 1 ANODE)

∴ FOR 2 ANODES - 2.25 Ω

3 ANODES - 1.50 Ω

2/ REQUIRED I

ALLOW 0.1 mA/m²

$$d = 3500$$

$$\phi = 410$$

$$A_{rod} = 4508$$

$$\therefore I_{req} = 450 \text{ mA}$$

3/ VOLTAGE DROP.

FOR 315M (ANODE + CATHODE CABLES)

@ SAY 10 AMPS

FOR 25mm² - $R = .734 \Omega/\text{km}$

→ 2.3 VOLTS

FOR 2 ANODES (ANODE RESISTANCE)

→ 22.5 VOLTS.

Cable Schedule

Sunset Rd C.P. System

file:cablesun

Description	Cable Size	Type	Core	Color	Length
Anode Cable No 1	25	PVC/PVC		Red	130
Anode Cable No 2	25	PVC/PVC		Red	130
Cathode Connection	25	PVC/PVC		Black	185
Cathode Ref Return Reference	4	Multi Core 4 Core	1.1 1.2 1.3 1.4	Black	185
Coupon - Ref Return	4				
Coupon - Bleed	4				
Cathode Connection	36" L/Bar T/M	PVC/PVC		Black	185
Cathode Ref Return Reference	4	Multi Core 4 Core	2.1 2.2 2.3 2.4	Black	185
Coupon - Ref Return	4				
Coupon - Bleed	4				
Cathode Connection	66" T/Main	PVC/PVC		Black	185
Cathode Ref Return Reference	4	Multi Core 4 Core	3.1 3.2 3.3 3.4	Black	185
Coupon - Ref Return	4				
Coupon - Bleed	4				

102
SL11960
2381m

70

200
205820 MAIN ROADS

300DCL

101 32m

800m

72

827m

800m

150AC

205821

CAT

78
205821

w69L

77

w69L

800m

SAPPHIRE

100AC

75

205821

SUNSET

150AC

150CISL

150DCL

150AC

1

111566

1.2140Ha.

152

150DCL

100
SL11960

7998m

ANODE BED
19 uL M @ 5M

40m

90m

PARK

70m

SUNSET ST
P/ STATION

93

300CISL

COPOLY TYPE Reference
ELECTRODES ON
EACH MAIN.

300CICL

150AC

150CISL

150CISL

150MSCL

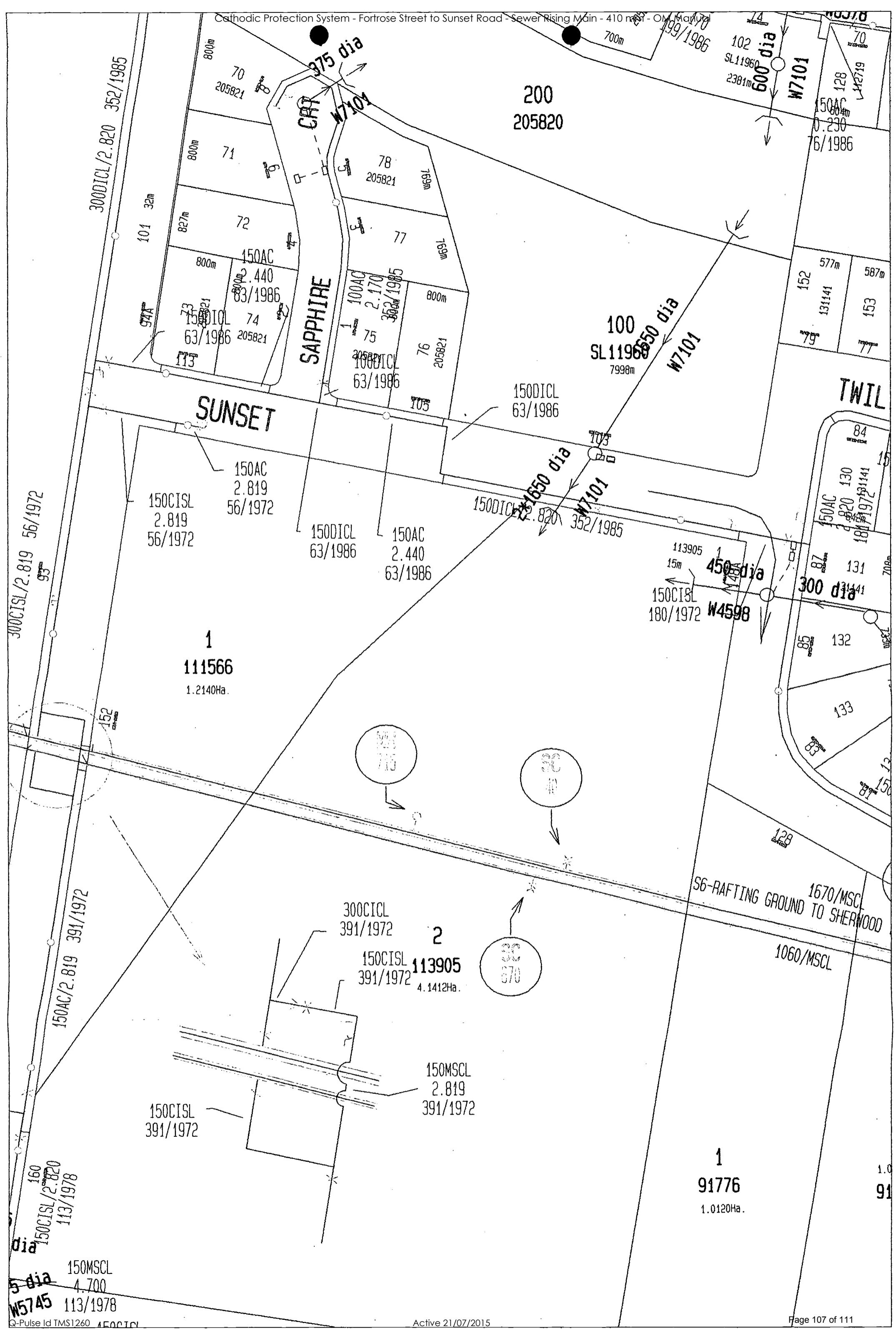
1060/MSCL

S6-RAFTING GROUND TO SHERWOOD
1670/MSCL

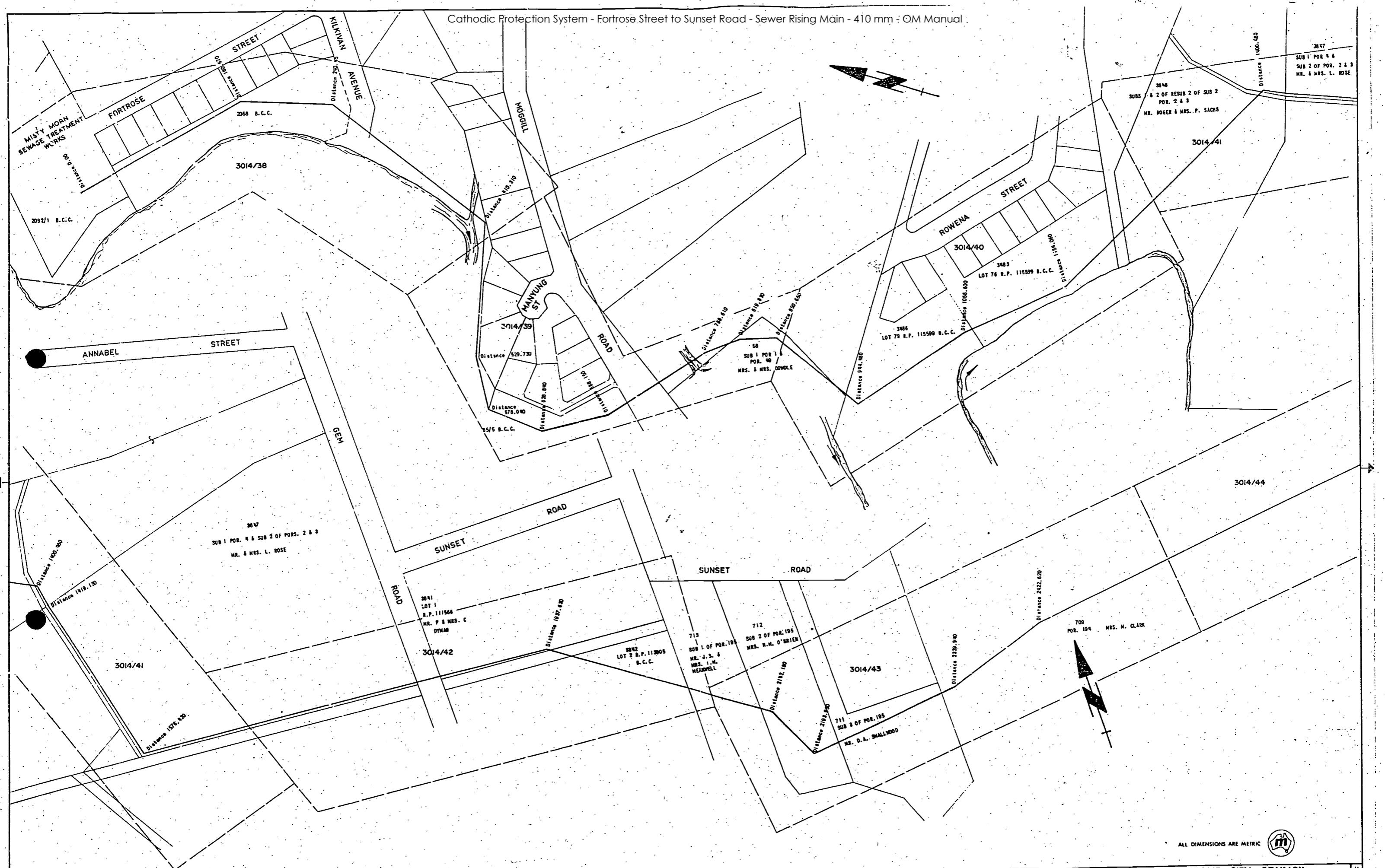
91776

1.0120Ha.

KINGFISHER PARK



Cathodic Protection System - Fortrose Street to Sunset Road - Sewer Rising Main - 410 mm - OM Manual



ALL DIMENSIONS ARE METRIC



BRISBANE CITY COUNCIL
DEPT. OF WATER SUPPLY & SEWERAGE

MISTY MORN SEWAGE TREATMENT WORKS BY-PASS
410 DIA. RISING MAIN STAGE 1

FORTROSE ST. KENMORE - TO CENTENARY BRIDGE
LOCALITY PLAN & KEY TO DRAWINGS

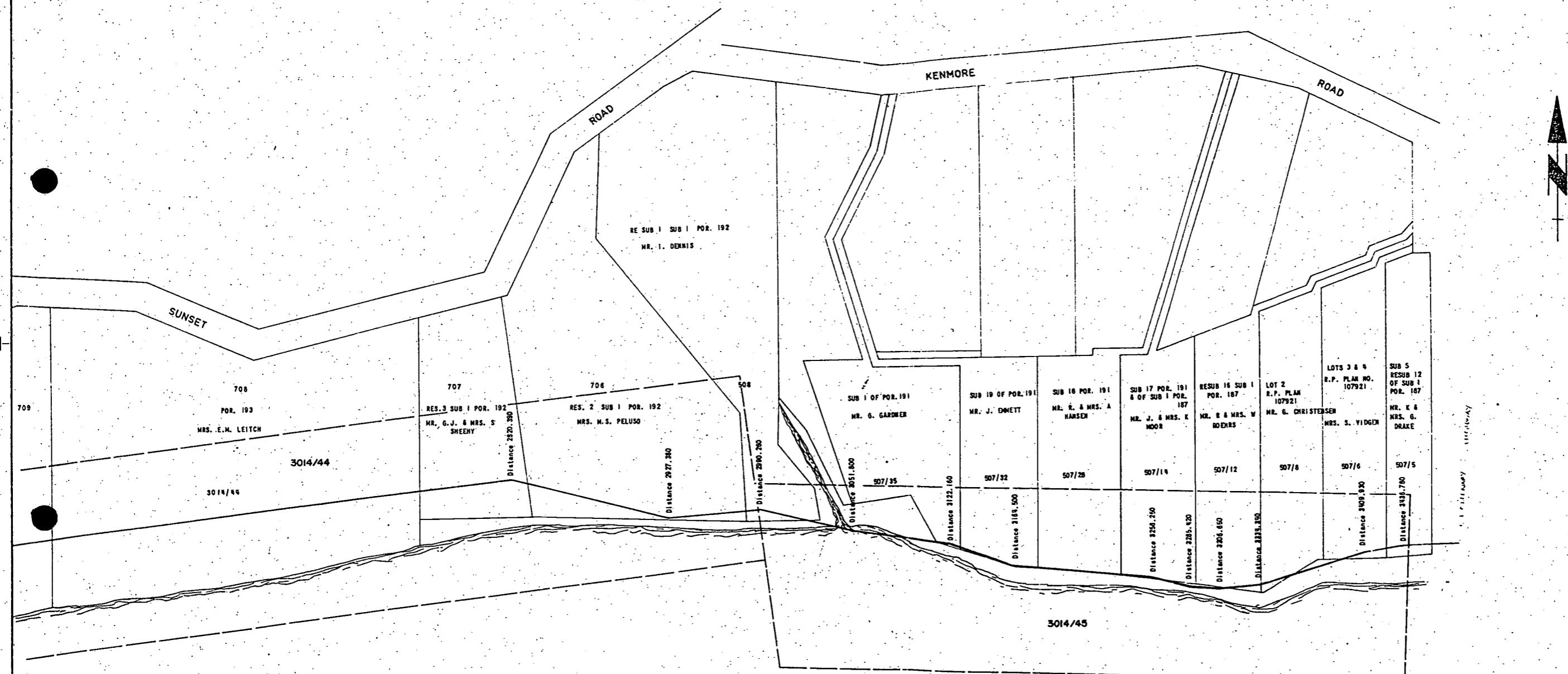
SCALE 1 : 1200 NO. 1 OF SHEETS DWG NO. 3014/36

SHEET NO.	DESCRIPTION	DWG. NO.	SHEET NO.	DESCRIPTION	DWG. NO.	AREA IN HECTARES		DETAILS		VOTE NO.	W.O. NO.	CHIEF ENGR. & MANAGER	ENGINEER FOR DESIGN	DESIGN	A.G.B.	Jan. 76	ENGINEER IN CHARGE	REFERENCES	AMENDMENTS	
						NO. OF ASSESSMENTS		LENGTH OF LINE												
1	LOCALITY PLAN & KEY TO DETAIL PLANS		4	LONGITUDINAL SECTIONS LINE NOS.		100	300	HEADWORKS					CONSTRUCTION ENGINEER	TRACED			ASST. ENG.			
2	LONGITUDINAL SECTIONS LINE NOS.		5	LONGITUDINAL SECTIONS LINE NOS.		150	375	INTERNAL RETIC.					MECH. & ELECT. ENGINEER	CHECKED			LEVEL BOOK 8161 A			
3	LONGITUDINAL SECTIONS LINE NOS.		6	LONGITUDINAL SECTIONS LINE NOS.		225	450	SUB. PLAN NO.					A.H. DATUM				FIELD BOOK 4042 D			
								NAME OF ESTATE									SURVEYED J. GIBSON			
								NAME OF SUBDIVIDER												

Active 21/07/2015

Pulse Id TMS1260

Page 108 of 111

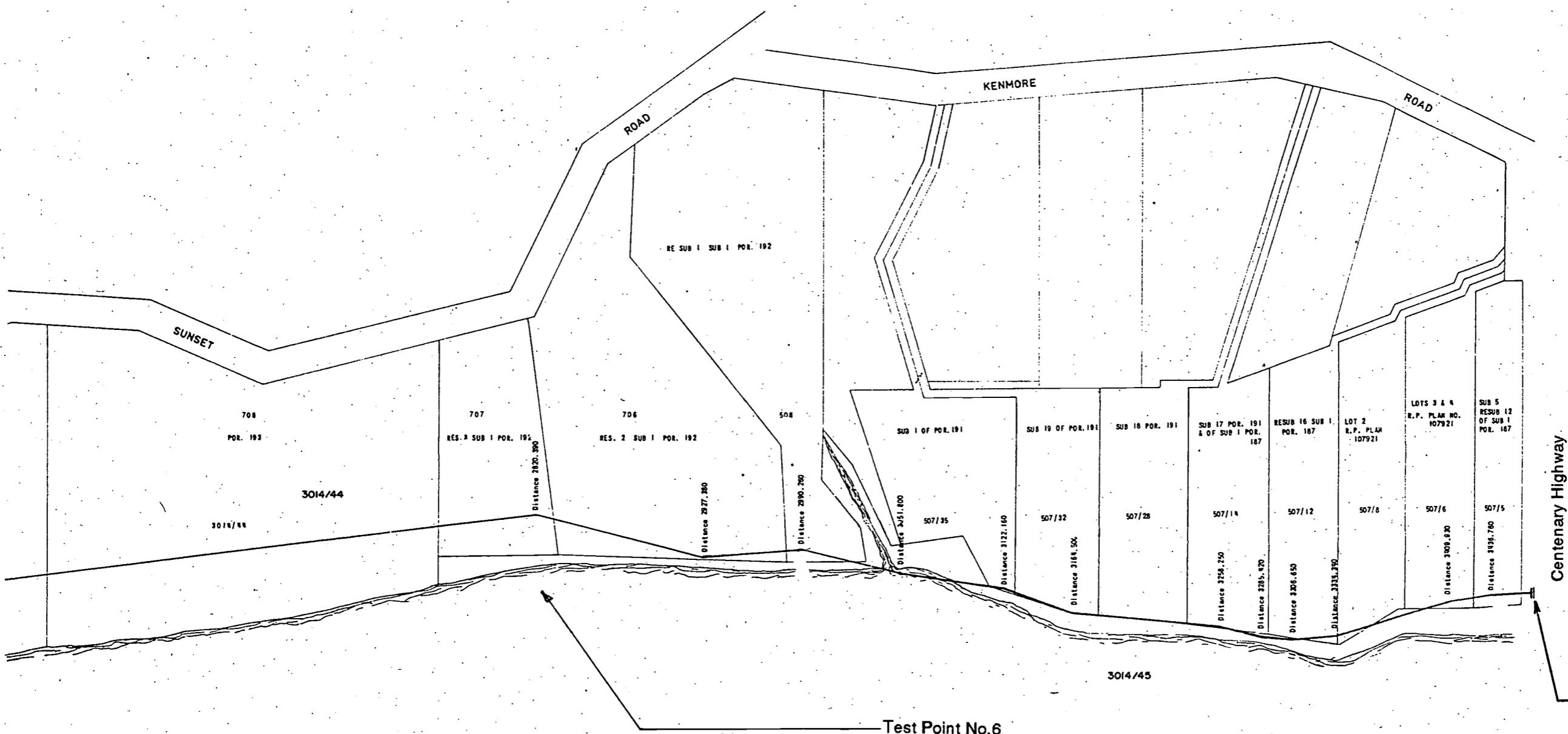


ALL DIMENSIONS ARE METRIC

BRISBANE CITY COUNCIL
DEPT. OF WATER SUPPLY & SEWERAGE

MISTY MORN SEWAGE TREATMENT WORKS BY-PASS									
410 DIA. RISING MAIN STAGE I									
FORTROSE ST. KENMORE - TO CENTENARY BRIDGE									
LOCALITY PLAN & KEY TO DRAWINGS									
SCALE 1 : 1200	NO. 2 OF SHEETS	DWG. NO. 3014/37							

SHEET NO.	DESCRIPTION	DWG. NO.	SHEET NO.	DESCRIPTION	DWG. NO.	AREA IN HECTARES	DETAILS			CHIEF ENGINEER & MANAGER	ENGINEER FOR DESIGN	DESIGN	A.G.B.	Jen. %	ENGINEER IN CHARGE	REFERENCES	AMENDMENTS		INITIALS		
							NO. OF ASSESSMENTS	DETAILS	CHARGE NO.								DATE				
1	LOCALITY PLAN & KEY TO DETAIL PLANS		4	LONGITUDINAL SECTIONS LINE NOS.			NO. OF ASSESSMENTS	DETAILS	CHARGE NO.	W.O. NO.	PROL AREA NO.										H.
							LENGTH OF LINE	HEADWORKS													G.
							100	300													F.
							150	375													E.
							225	450													D.
							DET. NO. 107921	DET. NO. 107921													C.
							DET. NO. 107921	DET. NO. 107921													B.
							DET. NO. 107921	DET. NO. 107921													A.
2	LONGITUDINAL SECTIONS LINE NOS.		5	LONGITUDINAL SECTIONS LINE NOS.																	
3	LONGITUDINAL SECTIONS LINE NOS.		6	LONGITUDINAL SECTIONS LINE NOS.																	

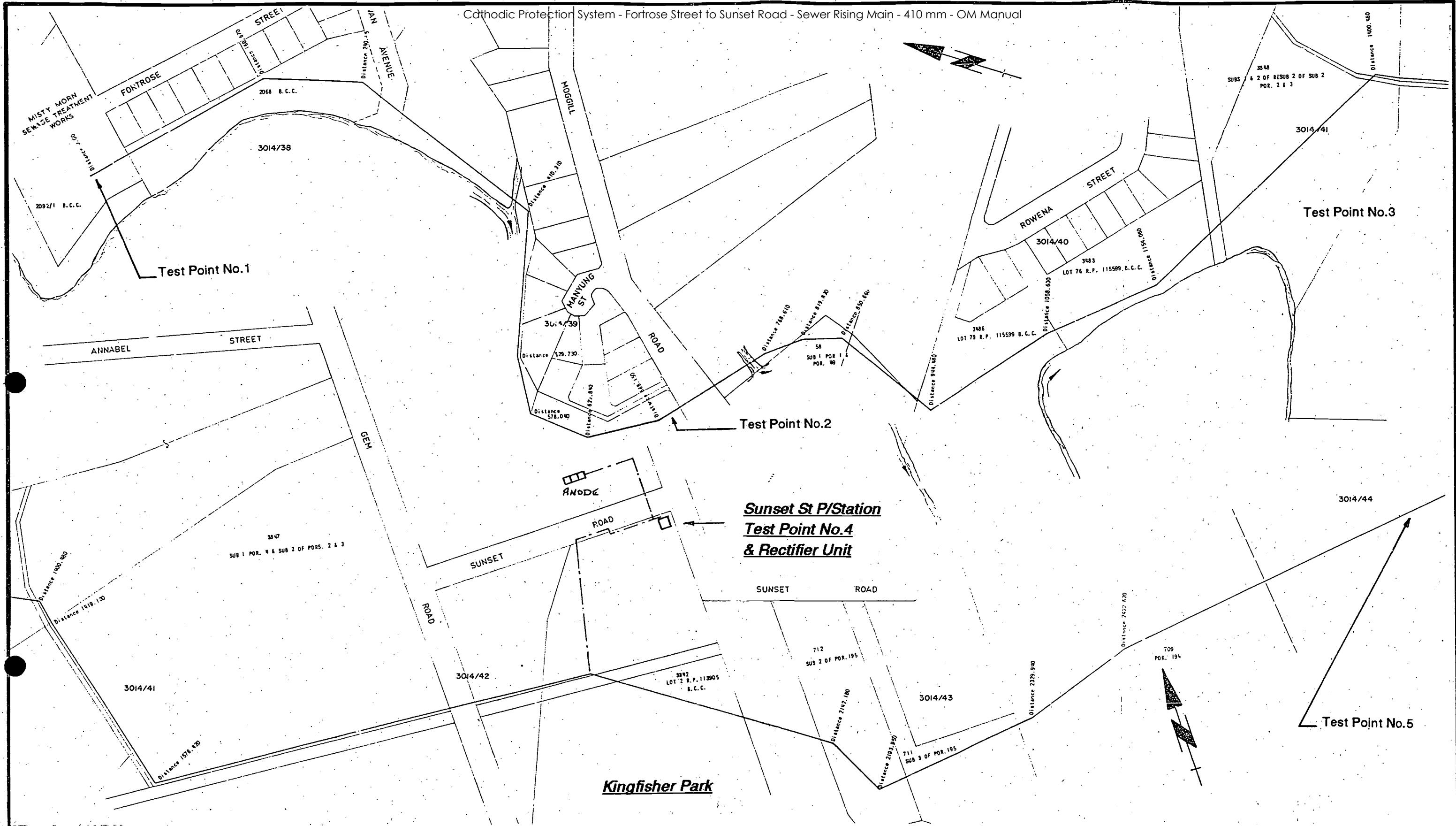


Test Point No.7

Test Point No.6

		MANAGER DATE	DIRECTOR OF PLANNING & DESIGN DATE	DESIGN J.S. 5/11/93	PROJECT SUNSET Rd C.P. SYSTEM Fortrose St to CENTENARY HWY	 Brisbane City	BRISBANE CITY COUNCIL DEPARTMENT OF WATER SUPPLY & SEWERAGE PLANNING & DESIGN BRANCH
		DIRECTOR OF CONSTRUCTION DATE	DIRECTOR OF M. & E. SERVICES DATE	DIRECTOR OF SEW. OPERATIONS / W.S. DISTRIBUTION DATE	DRAWN J.S. 5/11/93		
				CHK'D. ENGINEER IN CHARGE SUPERVISING ENGINEER A.H.DATUM	TITLE 410 dia MSCL SEWERAGE RISING MAIN CATHODIC PROTECTION DETAILS	SCALE NTS	NO 2 OF 2 SHEETS
NO DATE	AMENDMENT	INITIALS	DATE	DATE	DATE	DRAWING NO 486/7/8 - HH1C0002E	AMEND. O

Q-Pulse ID IM31260
Page 110 of 111



NO	DATE	MANAGER	DIRECTOR OF PLANNING & DESIGN	DESIGN	J.S.	5/11/93	PROJECT	SUNSET Rd C.P. SYSTEM	BRISBANE CITY COUNCIL
		DATE	DATE	DRAWN	J.S.	5/11/93	Fortrose St to CENTENARY HWY	DEPARTMENT OF WATER SUPPLY & SEWERAGE	
		DIRECTOR OF CONSTRUCTION	DIRECTOR OF M. & E. SERVICES	CHK'D.			TITLE	410 dia MSCL	PLANNING & DESIGN BRANCH
			DIRECTOR OF SEW. OPERATIONS / W.S. DISTRIBUTION	ENGINEER IN CHARGE			SEWERAGE RISING MAIN	Brisbane City	
				SUPERVISING ENGINEER			CATHODIC PROTECTION DETAILS		
	AMENDMENT	INITIALS	DATE				A.H.DATUM	SCALE NTS	NO 1 OF 2 SHEETS
								DRAWING NO.	AMEND. O
								486/7/8 - HH1C0001E	