



20th January 1998.

OPERATING MANUAL FOR:

OXLEY TO SUNNYBANK TRUNK MAIN
AMPLIFICATION STAGE ONE

CATHODIC PROTECTION SYSTEM

CLIENT:

BRISBANE WATER

MANUAL CONTENTS

- (1.0) Introduction
- (2.0) Corrosion and Cathodic Protection
- (3.0) Mains Details
- (4.0) Cathodic Protection
- (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) Performed Testing
- (6.0) Conclusion
- (7.0) Maintenance

DRAWINGS

486/6/25-AA1C0021E Standard Rectifier Wiring Diagram
486/4/6-W10100 to 26 Construction Drawings
(No Number) Monthly Maintenance Program

(1.0) INTRODUCTION

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

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

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

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

(2.0) CORROSION AND CATHODIC PROTECTION

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

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

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

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

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

(3.0) MAINS DETAILS

Size: Dia 1220 mm mild steel cement lined.

Coating: Medium density fusion bonded Polyethylene

Length: 3.300 km

Location: Cnr Boundry Rd and Blunder Rd. to King Avenue and Inala Avenue. This main connects to the Blunder to Beatty Rd trunk main at the cnr. Boundry and Blunder Rds.

Construction 486/4/6/-410100

Drawings:

(4.0) CATHODIC PROTECTION DETAILS

- (4.1) Type of Cathodic Protection: Impressed Current.
- (4.2) Rectifier: Special 32 Volt, 10 amp direct current output enclosed in a stainless steel switchboard. Rectifier has a 240V supply from the nearby Oxley Archerfield. Submersible Sewerage Pumping Station .
- (4.3) Cathode: The cathode point is located on the trunk main at test point 3 near Air Valve No 1267 approximately 100 meters north of the sewerage pump station. 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 80 metres west from the trunk mains in a vertical bed. The anodes were firstly packaged with cokebreeze thereby improving anode – ground resistance. The anodes are identified by a marker post 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 seven test points have been installed. Making seventeen all told. For details see dwgs. no. 486/6/6-PE1C0024E
486/4/6-W10100
- (4.6) Associated Drawings:

Cathodic Protection Details	-	2/14.213
Cathodic Protection Test Point Details	-	486/1/22-AA1T0001E
Standard Rectifier Wiring Diagram	-	486/6/25-AA1C0021E
Vertical Ground bed Details	-	486/6/25-AA1C0024E
- (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:

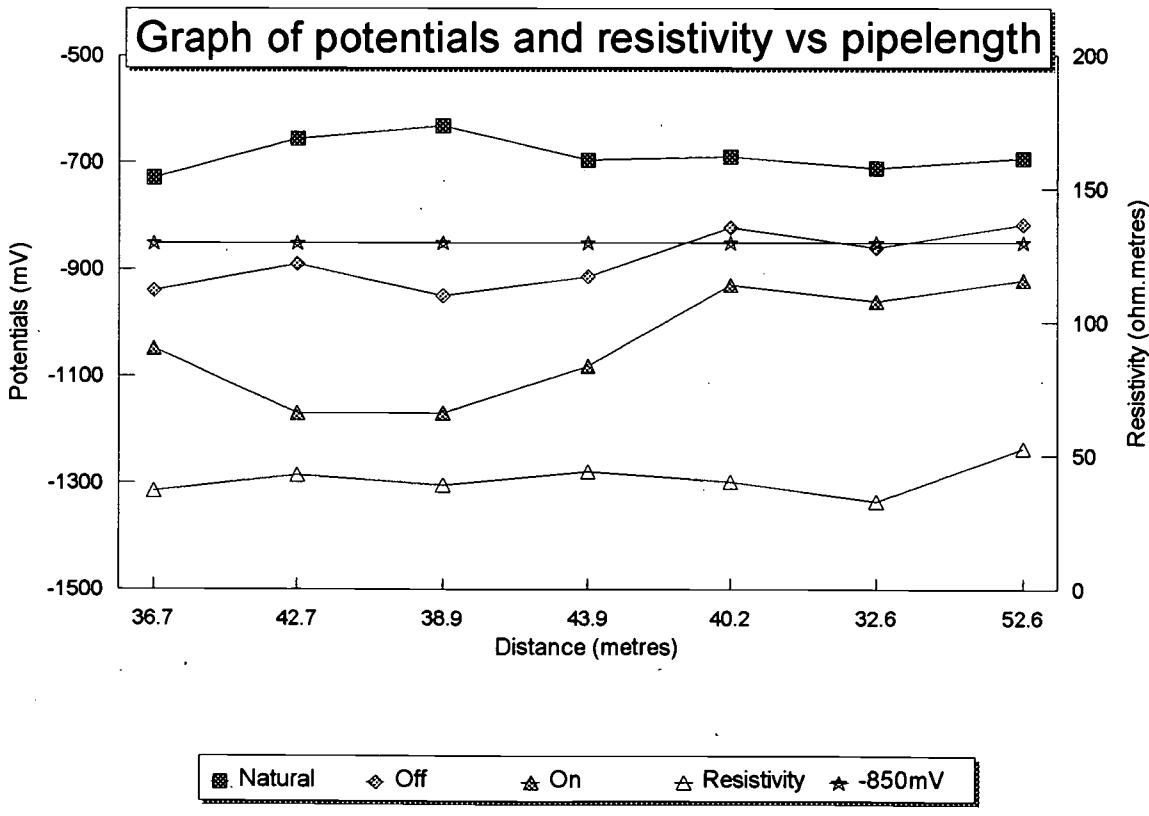
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- 9/ Check and record anode string currents.
- 10/ Load test rectifier for 10 minutes.
- 11/ Check all switchboard and testpoint terminals for tightness.
- 12/ Check all switchboard and testpoints are labelled and I.D. tags attached.
- 13/ Check plans 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 to reregister system, if applicable.

Brisbane Water Engineering Services

CP Form No. 23

Electrical Engineering Unit**Cathodic Protection System Potential Recording Form**Project OXXLEY TO SUNNYBANK STAGE ONE Date 22 Nd MAY 1998

Test Point number	Distances to T.P. (metres)	Potentials to CuSO4			Resistivities at 2 metres (ohm.metres)
		Natural (mV)	Off (mV)	On (mV)	
1	0	-729	-939	-1049	36.7
2	500	-657	-890	-1170	42.7
3	1000	-633	-950	-1170	38.9
4	1600	-697	-914	-1082	43.9
5	2200	-690	-821	-929	40.2
6	2800	-712	-860	-960	32.6
7	3300	-694	-817	-921	52.6
8					
9					
10					
11					
12					
13					
14					





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DRAWINGS:

486/6/25-AA1C0021E Standard Rectifier Wiring Diagram
486/4/6-W10100 to 26 Construction Drawings

(No Number) Monthly Maintenance Program

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Size: Dia. 1220 mm mild steel cement lined

Coating: Medium density fusion bonded Polyethylene

Length: 3.300 km

Location: Cnr Boundary Rd and Blunder Rd. to King Avenue and Inala Avenue. This main connects to the Blunder to Beatty Rd trunk main at the cnr: Boundary and Blunder Rds.

Construction: 486/4/6/-410100

Drawings:

- (4.1) Type of Cathodic Protection: Impressed Current.
- (4.2) Rectifier: Special 32 Volt, 10 amp direct current output enclosed in a stainless steel switchboard.. Rectifier has a 240V supply from the nearby Oxley Archerfield.. Submersible Sewerage Pumping Station..
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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.

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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.

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.

CPS 6 Monthly Maintenance Details.

Required:

- 1/ Notify plant operator and/or sign entry logs where necessary.
- 2/ Have appropriate keying..
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- 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.
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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)
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Eight hours per site.

Procedure:

- 1/ Identify system.
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- 3/ Record voltmeter.
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- 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 to reregister system, if applicable.

Brisbane Water Engineering Services
Electrical Engineering Unit:

Cathodic Protection Interference Survey Results Form

Project Oxley to Sunnybank Stg 1 Unit Reading 1V off 0.25A Date 20-1-98

Instrument used IN 1L TO CUSO₄ Cell

	Reading	Test Point I.D.	Location	Swing
On	-398	Light Pole	Light Pole @ TP4	00
Off	-398			
On	-804	Fence	Fence @ TP3	00
Off	-804			
On	-568	Fence	Fence @ TP3	00
Off	-568		Next. door.	
On	-246	water Meter	water Meter	00
Off	-246		185 Boundary	
On	-430	Sign	Macdonalds. Ipswich Side Rd.	00
Off	-430			
On	-480	Garden Tap.	+ Earth Macdonalds	00
Off	-480			
On	-614	Mac Sign	Ipswich Rd. opp Harvey Norman	00
Off	-614			
On	-445	Fence	Harvey Norman & Ipswich Rd.	00
Off	-445			
On	-022	Sign	Caltex Garage Blunder Boundary Rds	00
Off	-022			
On	-473	water Supply	Caltex Garage Blunder Boundary Rds	00
Off	-473			
On	-442	Light Pole	No 517640 Blunder Rd.	00
Off	-442			
On	-359	Fence	Belsham's Blunder Rd	00
Off	-359			
On	-429	Light Pole	517653 Blunder Rd.	00
Off	-429			
On	-387	Trans Pole	24774 MEN. ALBAN ST	00
Off	-387			
On	-235	water Meter	16 ALBAN ST	00
Off	235			

TESTED BY J.J.

Brisbane Water Engineering Services

Ph: 34031838 Fx: 34031839

Electrical Engineering Unit

5 Bunya Street

Eagle Farm Q 4009

Cathodic Protection System Loop Resistance

Date: 20 January 1998

Cathodic Protection System:

insert contract name here

System Operating Volts:

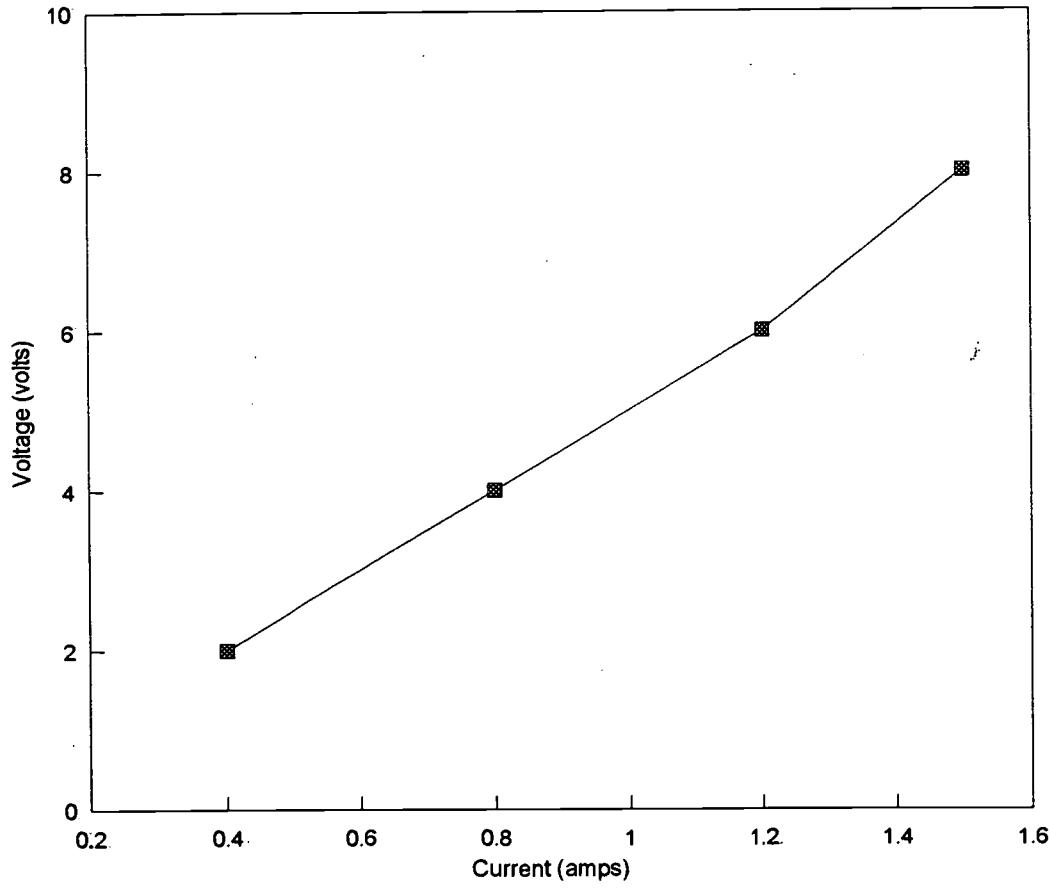
1

System Operating amps

0.25

Test Voltage: (volts)	Test Current: (amps)
2	0.4
4	0.8
6	1.2
8	1.5

Loop Resistance (ohms)
5

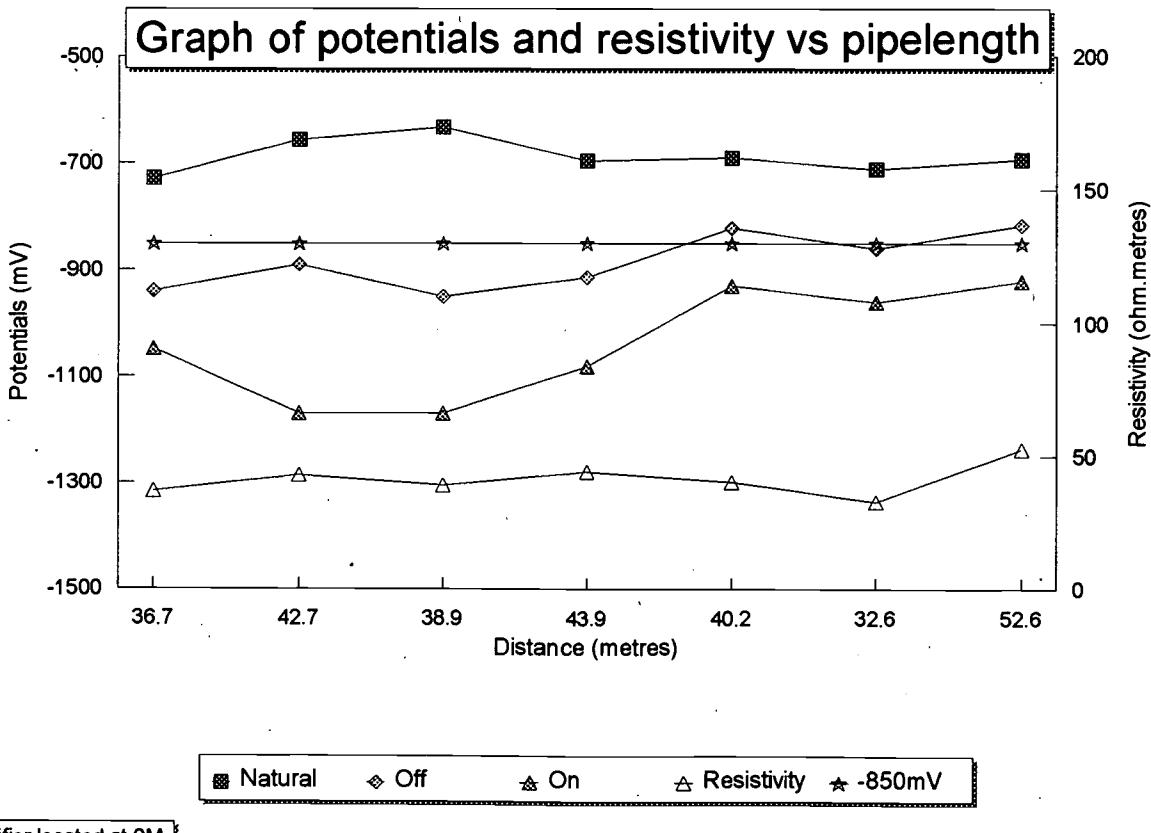
Graph of System voltage vs current.

Brisbane Water Engineering Services

CP Form No. 23

Electrical Engineering Unit**Cathodic Protection System Potential Recording Form**Project OXXLEY TO SUNNYBANK STAGE ONE Date 22 Nd MAY 1998

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	-729	-939	-1049	36.7
2	500	-657	-890	-1170	42.7
3	1000	-633	-950	-1170	38.9
4	1600	-697	-914	-1082	43.9
5	2200	-690	-821	-929	40.2
6	2800	-712	-860	-960	32.6
7	3300	-694	-817	-921	52.6
8					
9					
10					
11					
12					
13					
14					



BRISBANE WATER ENGINEERING SERVICES

Electrical Engineering Unit

Date: 20 January 1998

TP Test ResultsOxley to Sunnybank Sect 1 Trunk Main

			Natural	ON	OFF
TP1	Boundary Rd	Cus04 to Pipe	-935	-942	-891
		Cus04 to Zn	-1049	-1065	-1064
		Zn to Pipe	115	126	143
TP 1	Blunder Rd	Cus04 to Pipe	-825	-981	-942
		Cus04 to Zn	-1069	-1051	-1050
		Zn to Pipe	-336	69	178
	Beaty Rd	Cus04 to Pipe	-1005	-986	-918
		Cus04 to Zn	-943	-943	-942
		Zn to Pipe	57	-38	68
TP2	Blunder Rd	Cus04 to Pipe	-819	-1079	-967
		Cus04 to Zn	-1057	-1080	-1089
		Zn to Pipe	234	2	113
TP3	Blunder Rd	Cus04 to Pipe	-707	-936	-915
		Cus04 to Zn	-1118	-1119	-1120
		Zn to Pipe	413	186	293
TP4	Blunder Rd	Cus04 to Pipe	-697	-914	-822
		Cus04 to Zn	-1173	-1257	-1212
		Zn to Pipe	476	355	407
TP5	Blunder Rd	Cus04 to Pipe	-690	-938	-867
		Cus04 to Zn	-1114	-1111	-1111
		Zn to Pipe	425	182	295
TP6	Main Ave	Cus04 to Pipe	-712	-943	-830
		Cus04 to Zn	-1073	-1082	-1082
		Zn to Pipe	364	125	236
TP7	Inala Ave	Cus04 to Pipe	-694	-917	-814
		Cus04 to Zn	-1176	-1179	-1179
		Zn to Pipe	482	255	364

Tested by J Taylor

Brisbane Water Engineering Services

CP Form No.18

Electrical Engineering Unit

Standard Cathodic Protection Test Point Data Gathering FormProject: Oxley - Sunnybank T/mDate 20-11-97TP Location 19.8 N16TP No. 1Mains Size 1220TP Type B by 3**POTENTIAL TESTING**

CATHODE TO CATHODE RETURN (RESISTANCE)

0.1 Ω

ZINC REFERENCE TO PIPE

1.5CuSo₄ REFERENCE TO PIPE-93.5ZINC TO CuSo₄-104.9**EARTH TESTING**

TEST NO. 1

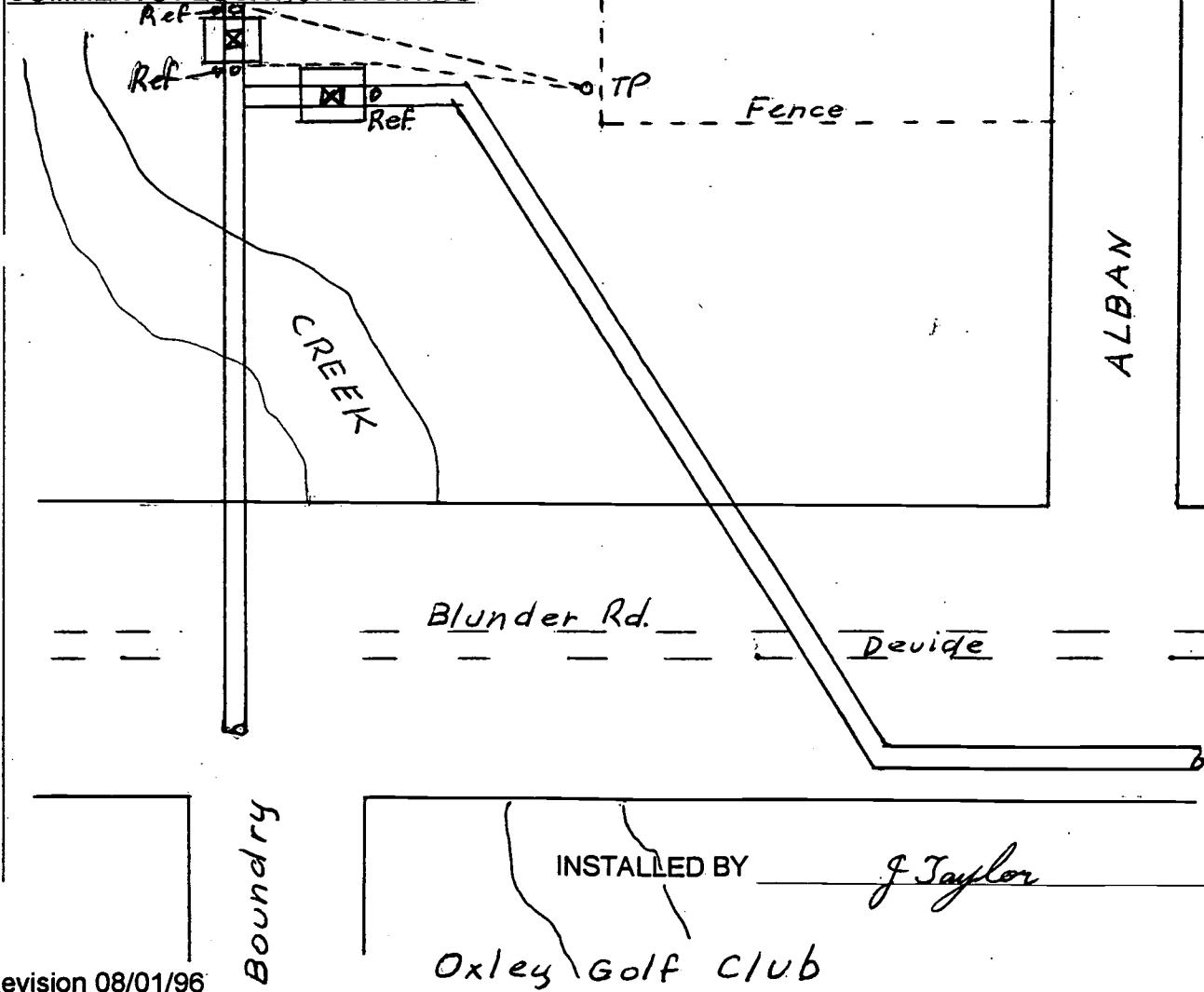
PIN SPACING

2 m

RESISTIVITY

36.7 Ωm

MEGGER READING

COMMENTS / LOCATION DRAWING

Revision 08/01/96

Brisbane Water Engineering Services

CP Form No.18

Electrical Engineering Unit:

Standard Cathodic Protection Test Point Data Gathering Form

Project: OXLEY TO SUNNYBANK.....

Date: 18-10-97

TP Location: BLUNDER Rd.....

TP No: 2.....

Mains Size: 1220 DIA. MSCL
1 meter under Road.

TP Type: B.....

POTENTIAL TESTING

CATHODE TO CATHODE RETURN (RESISTANCE)

0.4 Ω

ZINC REFERENCE TO PIPE

+490

CuSo₄ REFERENCE TO PIPE

680

ZINC TO CuSo₄

1170

EARTH TESTINGTEST NO. 1

RESISTIVITY 42.7 Ω m

PIN SPACING 2 m

MEGGER READING 3.4

TEST NO. 2

RESISTIVITY

PIN SPACING

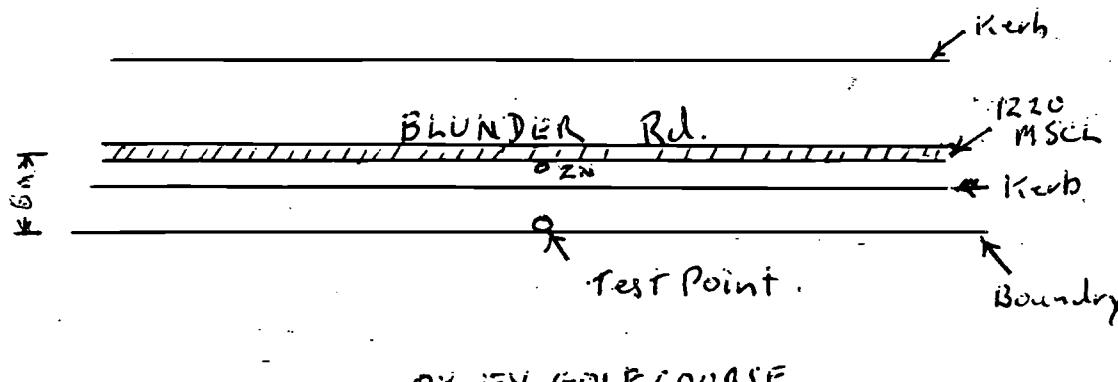
MEGGER READING

TEST NO. 3

RESISTIVITY

PIN SPACING

MEGGER READING

COMMENTS / LOCATION DRAWING

INSTALLED BY P. SMYNT

Revision 09/28/95

Brisbane Water Engineering Services

CP Form No.18

Electrical Engineering Unit:

Standard Cathodic Protection Test Point Data Gathering Form

Project ... OXLEY To SUNNYBANK

Date ... 18-10-97

TP Location ... BLUNDER Rd

TP No. 3

Mains Size 12.20 DIA. MSCL

TP Type ... B

1 meter under road

POTENTIAL TESTING

CATHODE TO CATHODE RETURN (RESISTANCE)

3 Ω

ZINC REFERENCE TO PIPE

+580

CuSo₄ REFERENCE TO PIPE

-590

ZINC TO CuSo₄

1170

EARTH TESTINGTEST NO. 1

PIN SPACING: 2 m

RESISTIVITY 38.9 Ω cm

MEGGER READING: 3.1

TEST NO. 2

PIN SPACING

RESISTIVITY

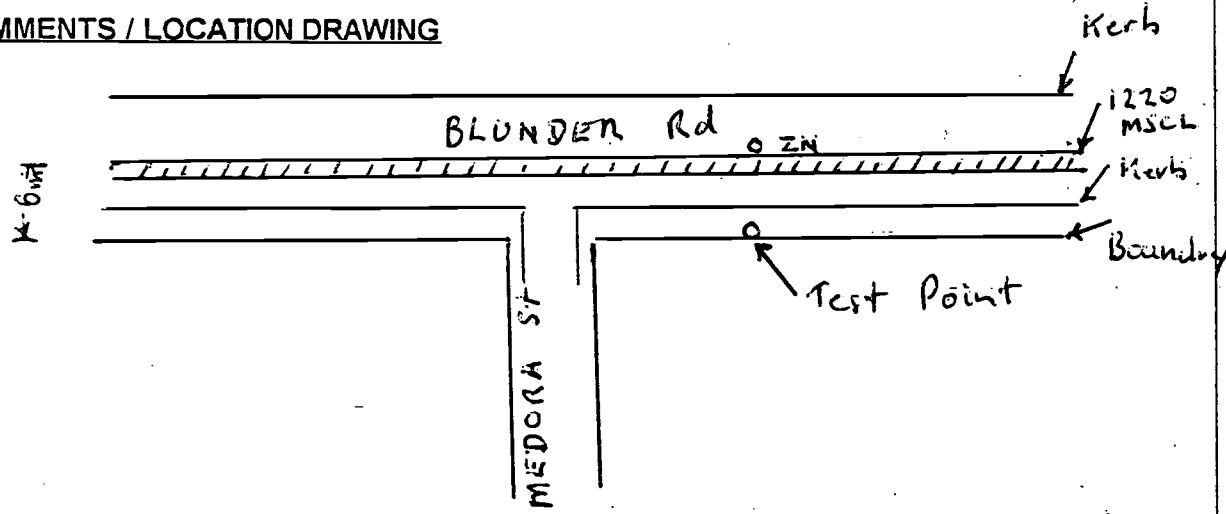
MEGGER READING

TEST NO. 3

PIN SPACING

RESISTIVITY

MEGGER READING

COMMENTS / LOCATION DRAWING

INSTALLED BY P. Smyth

Revision 09/28/95

Electrical Engineering Unit

Standard Cathodic Protection Test Point Data Gathering Form

Project OXLEY TO Sunnybank Sec 1 Date ... 27-10-97

TP Location TP No. 4

Mains Size 12.20 DIA MSCL TP Type

POTENTIAL TESTING

CATHODE TO CATHODE RETURN (RESISTANCE)

• 2 Ω

ZINC REFERENCE TO PIPE

- 697

CuSo₄ REFERENCE TO PIPE

- 522

ZINC TO CuSo₄

867

EARTH TESTING

TEST NO. 1

PIN SPACING

2

RESISTIVITY 43.9 Ωm

MEGGER READING

3.5

TEST NO. 2

PIN SPACING

.....

RESISTIVITY

MEGGER READING

.....

TEST NO. 3

PIN SPACING

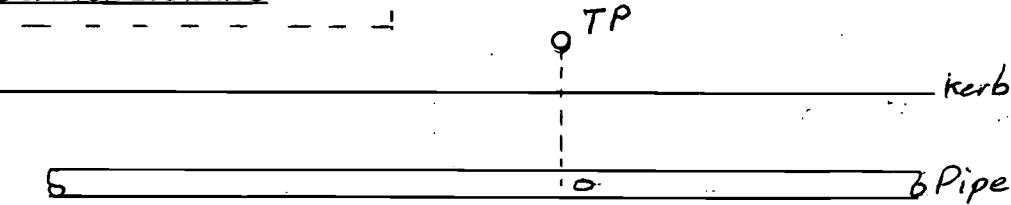
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RESISTIVITY

MEGGER READING

.....

COMMENTS / LOCATION DRAWING



Dividing Paving & kerbs

Blunder Rd.

Kerb

INSTALLED BY P. SMYTH

Brisbane Water Engineering Services

CP Form No. 21

Electrical Engineering Unit**Insulated Joint Testing Details Form**Project OXLEY TO SUNNYBANK SECTION 1. Date 16-3-98**DESCRIPTION**

MAINS DETAILS:

LOCATIONS:

SIZE:

MATERIAL:

COATING:

VALVE No.

KING AVE.1220mmSTEELMEDIUM DENSITY FUSION BONDED POLYETHYLENE COATED
V1093**IN GROUND TESTING**

BOLT TO FLANGE RESISTANCE:

NUMBER OF BOLT:

FLANGE TO FLANGE RESISTANCE:

INSULATION CHECKER MODEL 702:

POTENTIAL DIFFERENCE TO REFERENCE CELL:

PROTECTED SIDE:

UNPROTECTED SIDE:

ABOVE TESTING

BOLT TO FLANGE RESISTANCE:

NUMBER OF BOLTS:

FLANGE TO FLANGE RESISTANCE:

11.4mΩ 149kΩ 119kΩ 167kΩ 21kΩ 8mΩ 15kΩ
 3.2mΩ 65kΩ 78kΩ 142Ω 4mΩ 8mΩ 6mΩ
 270kΩ 1.2mΩ 38kΩ 2.8mΩ 131kΩ 1.3mΩ 6mΩ
179kΩ 72kΩ 30kΩ 2.9mΩ 5mΩ 6mΩ 1mΩ

COMMENTS / LOCATION DRAWINGTESTED BY R.D. IUES

Brisbane Water Engineering Services

CP Form No. 21

Electrical Engineering Unit**Insulated Joint Testing Details Form**Project OXLEY TO SUNNYBANK SECTION 1.Date 16-3-98**DESCRIPTION**

MAINS DETAILS:

LOCATIONS:

SIZE:

MATERIAL:

COATING:

VALVE No.

BOUNDARY ROAD VALVE PIT.1220mmSTEELMEEDIUM DENSITY FUSION BONDED POLYETHYLENE COATEDV1091 PIPE 3**IN GROUND TESTING**

BOLT TO FLANGE RESISTANCE:

NUMBER OF BOLT:

FLANGE TO FLANGE RESISTANCE:

INSULATION CHECKER MODEL 702:

POTENTIAL DIFFERENCE TO REFERENCE CELL:

PROTECTED SIDE:

UNPROTECTED SIDE:

ABOVE TESTING1.5MΩ 10KΩ 160mΩ 2.3mΩ 6KΩ 3.8KΩ 9mΩ 6KΩ1.5MΩ 7mΩ 21mΩ 7mΩ 36mΩ 15mΩ 216mΩ 6mΩ26KΩ 2.6mΩ 39KΩ 6mΩ 2.2mΩ 1.5mΩ 13mΩ 1.4mΩ

BOLT TO FLANGE RESISTANCE:

1.3mΩ 1.5mΩ 1.3mΩ 10KΩ 2.1mΩ 154mΩ 72mΩ 13mΩ

NUMBER OF BOLTS:

32

FLANGE TO FLANGE RESISTANCE:

1.1mΩ**COMMENTS / LOCATION DRAWING**TESTED BY R.A. Ives

Brisbane Water Engineering Services

CP Form No. 21

Electrical Engineering Unit**Insulated Joint Testing Details Form**

Project ...OXLEY... TO ...SUNNYBANK SECTION 1 Date ...16-3-98.....

DESCRIPTION

MAINS DETAILS:

LOCATIONS:

SIZE:

MATERIAL:

COATING:

VALVE No.

BOUNDARY ROAD VALVE PIT1220 mmSTEELMEDIUM DENSITY FUSION BONDED POLYETHYLENE COATEDV1091 PIPE 4**IN GROUND TESTING**

BOLT TO FLANGE RESISTANCE:

NUMBER OF BOLT:

FLANGE TO FLANGE RESISTANCE:

INSULATION CHECKER MODEL 702:

POTENTIAL DIFFERENCE TO REFERENCE CELL:

PROTECTED SIDE:

UNPROTECTED SIDE:

ABOVE TESTING

BOLT TO FLANGE RESISTANCE:

NUMBER OF BOLTS:

FLANGE TO FLANGE RESISTANCE:

2.5 MΩ 4.5 MΩ 6.1Ω 1.2 kΩ 1.5 kΩ 36 mΩ 8.6Ω 4.7Ω
 6.5 MΩ 4.5 MΩ 1.8 kΩ 2.5 kΩ 1.4 kΩ 1.5 kΩ 10 mΩ 3.7Ω
 3 MΩ 1.5 MΩ 3.7 kΩ 8.4 MΩ 4.4 kΩ 5 mΩ 2.5 kΩ 6.6Ω
3.9 MΩ 6.7Ω 4.6 kΩ 1.2 kΩ 0.9 kΩ 8.2Ω 2.5 kΩ 4.4 kΩ

COMMENTS / LOCATION DRAWING

TESTED BY

Brisbane Water Engineering Services

CP Form No. 21

Electrical Engineering Unit**Insulated Joint Testing Details Form**Project ...Oxley To Sunnybank Section 1.Date ...16.3.98.....**DESCRIPTION**

MAINS DETAILS:

BOUNDARY ROAD 2nd VALVE PT.

LOCATIONS:

SIZE:

1220 mm

MATERIAL:

STEEL

COATING:

MEDIUM DENSITY FUSION BONDED POLY(ETHYLENE) COATED

VALVE No.

V1092**IN GROUND TESTING**

BOLT TO FLANGE RESISTANCE:

NUMBER OF BOLT:

FLANGE TO FLANGE RESISTANCE:

INSULATION CHECKER MODEL 702:

POTENTIAL DIFFERENCE TO REFERENCE CELL:

PROTECTED SIDE:

UNPROTECTED SIDE:

ABOVE TESTING0.7mJ2 1.5mJ2 1.6mJ2 1.9.8mJ2 1.5mJ2 2.0mJ2 1.6mJ2 5.3mJ20.3K2 0.9mJ2 0.82mJ2 1.4mJ2 1.1mJ2 1.3mJ2 0.6mJ2 2.4mJ20.55mJ2 1.3mJ2 0.8K2 0.8K2 1.4mJ2 1.0mJ2 0.6mJ2 2.2mJ2BOLT TO FLANGE RESISTANCE: 20mJ2 1.5mJ2 2.5mJ2 7K2 1.8mJ2 1.2mJ2 5mJ2 1.9mJ2NUMBER OF BOLTS: 32FLANGE TO FLANGE RESISTANCE: 1.2mJ2**COMMENTS / LOCATION DRAWING**TESTED BYR/A :1ve3.....

Brisbane Water Engineering Services

CP Form No.18

Electrical Engineering Unit

Standard Cathodic Protection Test Point Data Gathering Form

Project ... Oxley To Sunnybank Sect 1 Date ... 27-10-97

TP Location

TP No. 5

Mains Size 1220 Dia mm

TP Type

POTENTIAL TESTING

CATHODE TO CATHODE RETURN (RESISTANCE)

• 2

ZINC REFERENCE TO PIPE

+425

CuSo₄ REFERENCE TO PIPE

-690

ZINC TO CuSo₄

-114

EARTH TESTINGTEST NO 1

PIN SPACING

2

RESISTIVITY

40.19

MEGGER READING

3.2

TEST NO 2

PIN SPACING

RESISTIVITY

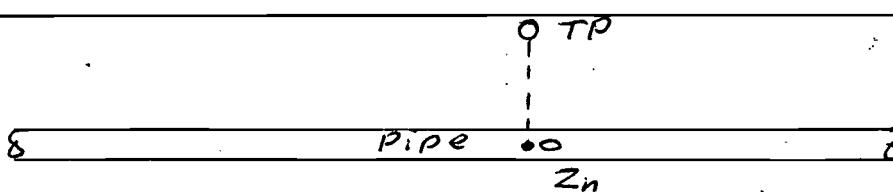
MEGGER READING

TEST NO 3

PIN SPACING

RESISTIVITY

MEGGER READING

COMMENTS / LOCATION DRAWING

Bitumen Sect. Blunder rd.

INSTALLED BY P Smyth

Electrical Engineering Unit

Standard Cathodic Protection Test Point Data Gathering Form

Project OXLEY TO SUNNYBANK Sec 1 Date 21-10-97

TP Location Oleander TP No 6

Mains Size 1220 DIA M.S.C.L TP Type B

POTENTIAL TESTING

CATHODE TO CATHODE RETURN (RESISTANCE)	0.2 Ω
ZINC REFERENCE TO PIPE	-263
CuSo ₄ REFERENCE TO PIPE	-871
ZINC TO CuSo ₄	-618

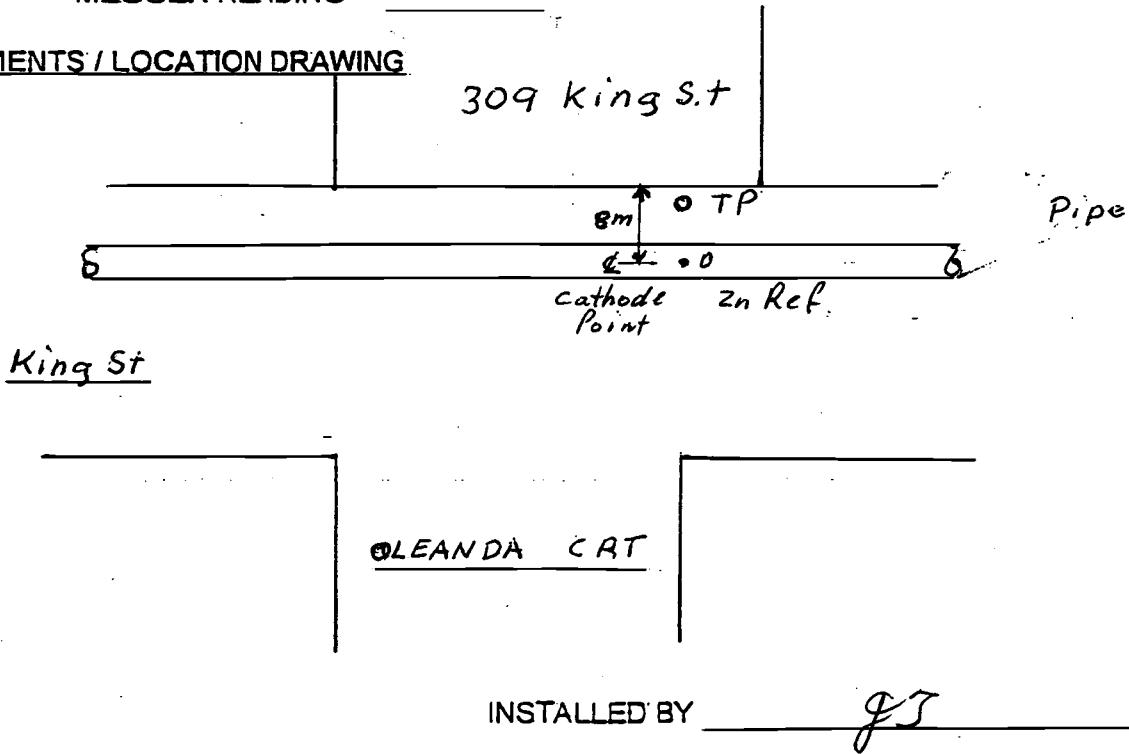
EARTH TESTING

TEST NO. 1
PIN SPACING 2 RESISTIVITY 32.6
MEGGER READING 2.6

TEST NO. 2
PIN SPACING _____ RESISTIVITY _____
MEGGER READING _____

TEST NO. 3
PIN SPACING _____ RESISTIVITY _____
MEGGER READING _____

COMMENTS / LOCATION DRAWING



Brisbane Water Engineering Services

CP Form No.18

Electrical Engineering Unit

Standard Cathodic Protection Test Point Data Gathering Form

Project: OXLEY to Sunnybank Section 1 Date: 27-10-97

TP Location Cnr King & Inala av TP No: 7

Mains Size: 1220 DIA MSCL TP Type: B by 2

POTENTIAL TESTING

CATHODE TO CATHODE RETURN (RESISTANCE)

ZINC REFERENCE TO PIPE

CuSo₄ REFERENCE TO PIPEZINC TO CuSo₄**EARTH TESTING**TEST NO. 1

PIN SPACING

2 m

RESISTIVITY

52.6 SLPm

MEGGER READING:

4.4

TEST NO. 2

PIN SPACING

RESISTIVITY

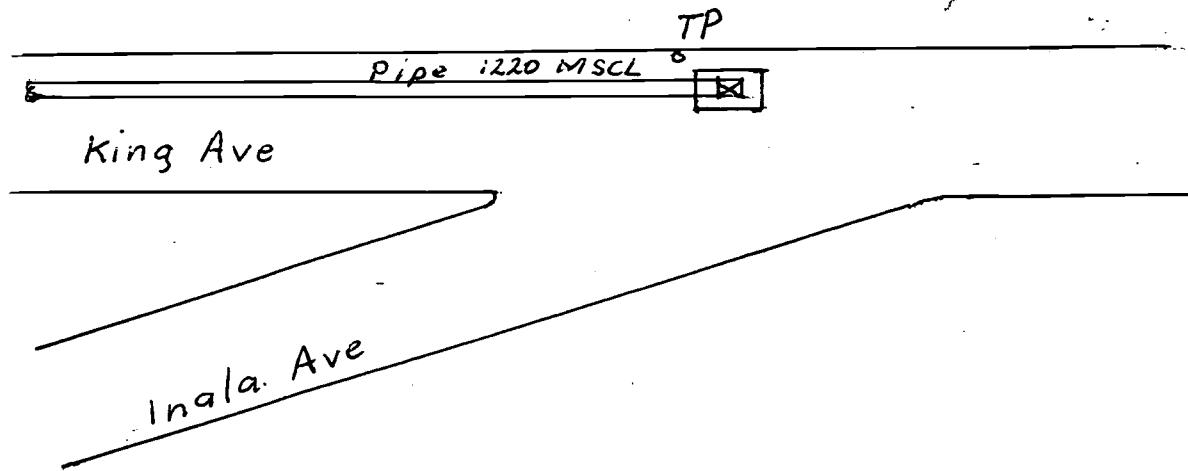
MEGGER READING:

TEST NO. 3

PIN SPACING

RESISTIVITY

MEGGER READING:

COMMENTS / LOCATION DRAWING

INSTALLED BY P SMYTH

Revision 09/28/95

Electrical Engineering Unit

Insulated Joint Testing Details Form

Project: OXLEY TO SUNNYBANK

Date 18-10-97

DESCRIPTION

MAINS DETAILS:

1220 DIA MSCL

LOCATIONS:

198 NB 218 PS 219 BB

SIZE:

1220 MSCL

MATERIAL:

STEEL

COATING:

Fusion Bonded Polyethylene Medium

VALVE No.:

IN GROUND TESTING

BOLT TO FLANGE RESISTANCE:

NUMBER OF BOLT:

FLANGE TO FLANGE RESISTANCE:

INSULATION CHECKER MODEL 702:

POTENTIAL DIFFERENCE TO REFERENCE CELL:

PROTECTED SIDE:

UNPROTECTED SIDE:

ABOVE TESTING

BOLT TO FLANGE RESISTANCE:

NUMBER OF BOLTS:

32.

FLANGE TO FLANGE RESISTANCE:

COMMENTS / LOCATION DRAWING

TESTED BY P. SMYTH

DRAWING LIST - SECTION 1

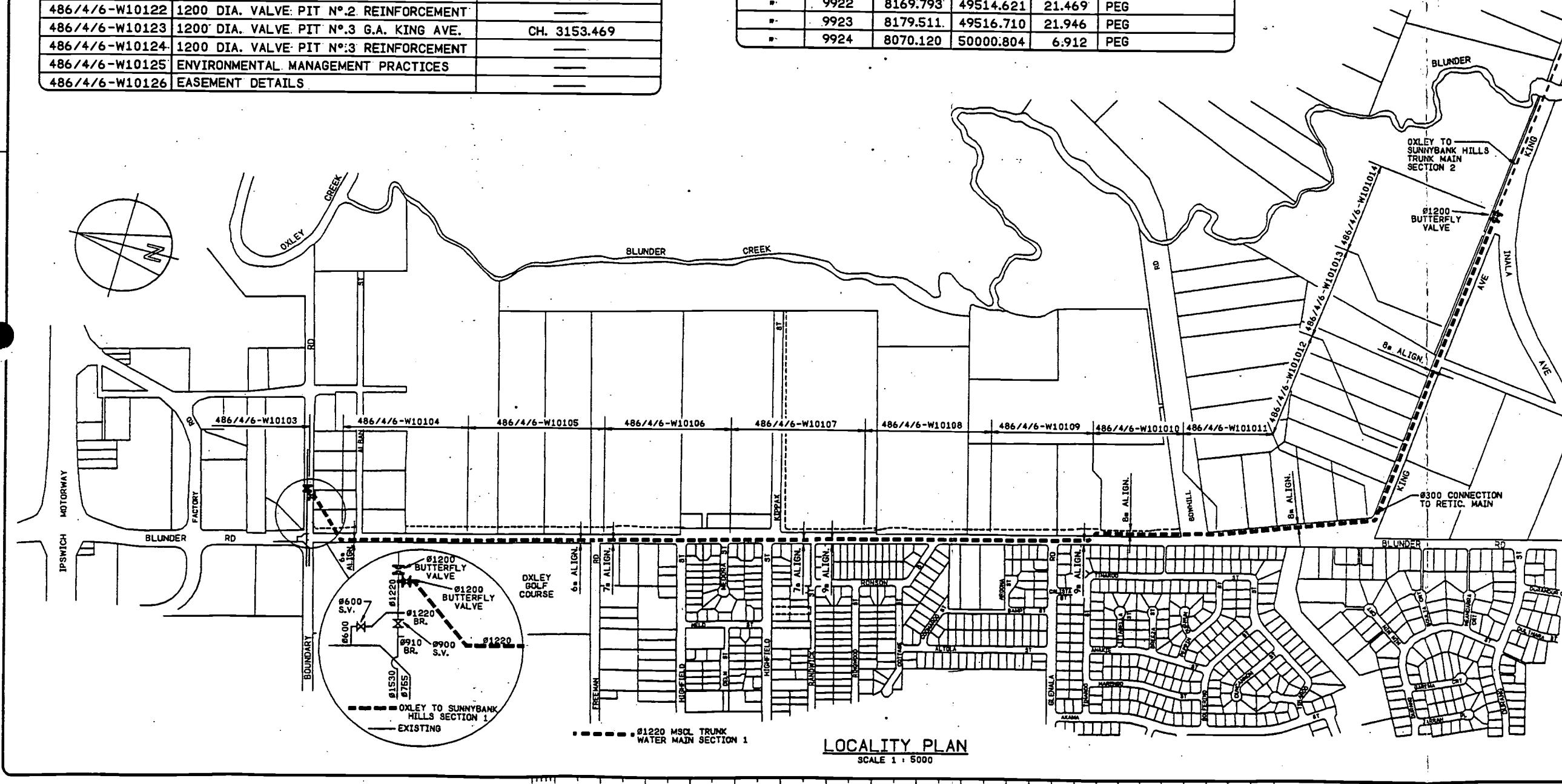
DRAWING NUMBER	DRAWING TITLE	PIPE CHAINAGE
486/4/6-W10100	COVER SHEET	—
486/4/6-W10101	LOCALITY PLAN	CH. 0.000 - 3153.234
486/4/6-W10102	PROJECT NOTES	—
486/4/6-W10103	PLAN AND LONGITUDINAL SECTION	CH. 0.000 - 141.160
486/4/6-W10104	PLAN AND LONGITUDINAL SECTION	CH. 141.160 - 429.046
486/4/6-W10105	PLAN AND LONGITUDINAL SECTION	CH. 429.046 - 721.676
486/4/6-W10106	PLAN AND LONGITUDINAL SECTION	CH. 721.676 - 1003.360
486/4/6-W10107	PLAN AND LONGITUDINAL SECTION	CH. 1003.360 - 1297.522
486/4/6-W10108	PLAN AND LONGITUDINAL SECTION	CH. 1297.522 - 1578.946
486/4/6-W10109	PLAN AND LONGITUDINAL SECTION	CH. 1578.946 - 1815.243
486/4/6-W10110	PLAN AND LONGITUDINAL SECTION	CH. 1815.243 - 2106.048
486/4/6-W10111	PLAN AND LONGITUDINAL SECTION	CH. 2106.048 - 2399.307
486/4/6-W10112	PLAN AND LONGITUDINAL SECTION	CH. 2399.307 - 2596.556
486/4/6-W10113	PLAN AND LONGITUDINAL SECTION	CH. 2596.556 - 2869.528
486/4/6-W10114	PLAN AND LONGITUDINAL SECTION	CH. 2869.528 - 3153.234
486/4/6-W10115	PIPE LIST	—
486/4/6-W10116	ANCHOR BLOCK AND TRENCH DETAILS	—
486/4/6-W10117	AIR VALVE AND GENERAL DETAILS	—
486/4/6-W10118	SCOUR PIT DETAILS	—
486/4/6-W10119	1200 DIA. VALVE PIT N°.1 G.A. BOUNDARY RD.	EXISTING MAIN
486/4/6-W10120	1200 DIA. VALVE PIT N°.1 REINFORCEMENT	—
486/4/6-W10121	1200 DIA. VALVE PIT N°.2 G.A. BOUNDARY RD.	CH. 3.285
486/4/6-W10122	1200 DIA. VALVE PIT N°.2 REINFORCEMENT	—
486/4/6-W10123	1200 DIA. VALVE PIT N°.3 G.A. KING AVE.	CH. 3153.469
486/4/6-W10124	1200 DIA. VALVE PIT N°.3 REINFORCEMENT	—
486/4/6-W10125	ENVIRONMENTAL MANAGEMENT PRACTICES	—
486/4/6-W10126	EASEMENT DETAILS	—

CONTROL POINTS DATA

FILENAME	POINT NO.	EASTING	NORTHING	SURFACE LEVEL	DESCRIPTION
S1987R	9956	8064.904	50134.835	3.941	DUMPY PEG
▪	9957	8043.043	50097.276	4.121	SCREW IN CONC. WALL
▪	9958	8115.618	50143.263	4.591	G.I NAIL IN POST
M333	9901	7990.460	50224.087	4.737	SCREW IN CONC.
▪	9902	8110.165	49719.308	16.543	STAR PICKET
▪	9903	8194.033	49310.943	33.032	SCREW IN CONC.
▪	9904	8210.840	49237.967	35.012	ALIGNMENT SPIKE
▪	9905	8228.883	49153.919	34.480	SCREW IN CONC.
▪	9909	8019.532	50145.571	4.143	SCREW IN CONC.
▪	9910	8029.610	50094.540	4.444	PEG
▪	9911	8041.212	50035.791	5.003	STAR PICKET
▪	9912	8059.682	49951.196	7.776	PEG
▪	9913	8080.320	49856.675	12.226	STAR PICKET
▪	9914	8095.280	49787.885	14.688	PEG
▪	9915	8133.218	49617.044	18.824	PEG
▪	9916	8156.930	49511.856	21.015	NAIL IN CONC.
▪	9917	8122.912	49721.707	17.623	PEG
▪	9918	8133.151	49723.634	18.142	PEG
▪	9919	8145.211	49619.464	19.941	PEG
▪	9920	8155.391	49621.518	20.395	PEG
▪	9921	8181.228	49403.499	27.115	PEG
▪	9922	8169.793	49514.621	21.469	PEG
▪	9923	8179.511	49516.710	21.946	PEG
▪	9924	8070.120	50000.804	6.912	PEG

CONTROL POINTS DATA

FILENAME	POINT NO.	EASTING	NORTHING	SURFACE LEVEL	DESCRIPTION
M333	9928	8463.652	48216.012	22.995	PEG
▪	9931	8494.989	47885.533	11.600	ORIG. SCREW/CON.
▪	9932	8514.635	47997.057	8.150	PEG
▪	9933	8551.977	47846.463	16.055	ORIG. PEG
▪	9935	8540.263	47817.177	18.076	PEG
▪	9936	8555.257	47805.566	19.316	PEG
▪	9949	8131.599	49543.374	19.411	NO DISCRIPTION
▪	9950	8178.320	49337.204	31.386	NAIL IN CONC.
▪	9951	8209.351	49317.008	32.639	NAIL IN CONC.
▪	9952	8254.466	49038.257	25.423	SCREW IN CONC.
▪	9953	8267.422	49086.321	31.334	DUMPY PEG
▪	9954	8259.833	48970.709	18.800	HILTI IN CONC.
▪	9955	8289.722	48908.724	13.921	G.I. NAIL IN BITUMEN
S1884R	9200	8638.167	47815.573	18.470	PEG
▪	9201	8895.465	47773.303	9.708	SCREW/KERB
▪	9202	9092.605	47740.354	19.016	P.S.M. #32582
▪	9203	9259.469	47706.380	12.071	SCREW/TRAFFIC IS.



FOR NOTES REFER DRAWING NUMBER 486/4/6-W10102
SCALE OF METRES
1 : 5000

NO	DATE	AMENDMENT	INITIALS
DIRECTOR OF PD & PS			
ENGINEER IN CHARGE			
SUPERVISING ENGINEER		RPEQ NO. 23/2	DATE 15/6/97

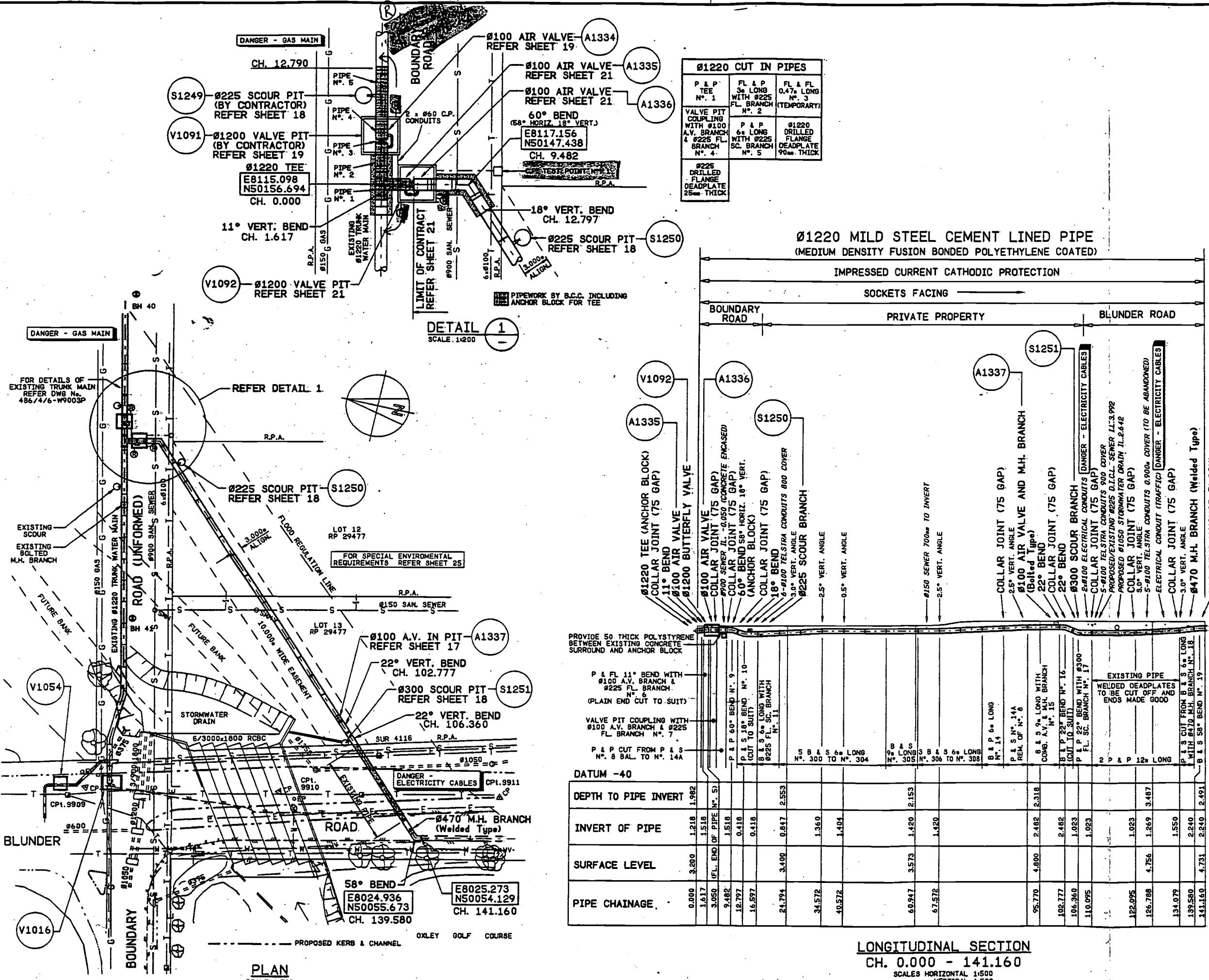
NAME	DATE
DESIGN	G.S. AUG '96
DRAWN	S.J.G. AUG '96
CHECKED	B.O.B. SEPT '96
APPROVED	MAR '97
JOB FILE	(3)705/5(572)
CADD FILE	46W10101
SURVEY NO.	FELD BOOK
SURVEYED	A.H. DATUM



PROJECT MAJOR DISTRIBUTION MAINS LOGAN CITY TRUNK MAIN AMPLIFICATION

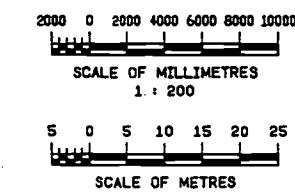
TITLE OXLEY TO SUNNYBANK HILLS SECTION 1 1220 DIA. MSCL WATER MAIN LOCALITY PLAN

SCALE AS SHOWN N 1 OF 26 SHEETS
DRAWING NO. 486/4/6-W10101 AMEND. 0



LEGEND

O	=====	O	STORMWATER
E	-----	E	ELECTRICITY
S	-----	S	SAN SEWER
T	-----	T	TELSTRA
G	-----	G	GAS
W	-----	W	WATER
R.P.A.			REAL PROPERTY ALIGNMENT



FOR NOTES REFER DRAWING
NUMBER 4B6/4/6-W10102

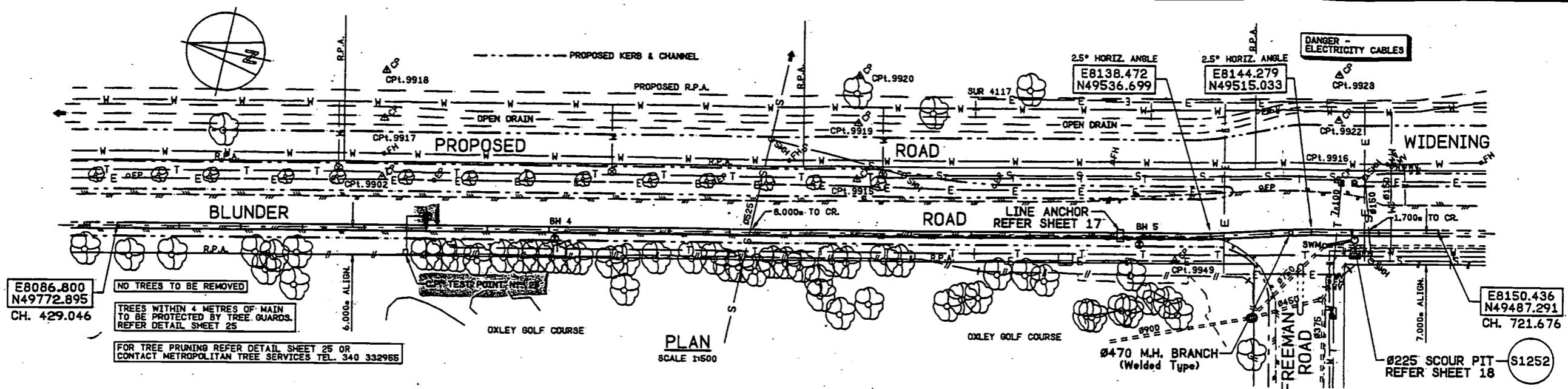
DIRECTOR OF P.D. & P.B.	DATE	
ENGINEER IN CHARGE	H. Brownley	
SUPERVISING ENGINEER	R.P.E.Q. NO.	DATE
	2372	7/19/97
NAME	DATE	
DESIGN	G.S.	AUG '96
DRAWN	B.O.B.	NOV '96
CHECKED	T.A.B.	APR '97
JOB FILE	(3)705/5(572)	
CADD FILE	46W10103	
SURVEY NO.	M333	FELD BOOK
SURVEYOR	J. M. DAVIS	

Brisbane Water  Professional Services — Engineering

PROJECT
MAJOR DISTRIBUTION MAINS
LOGAN CITY TRUNK MAIN
AMPLIFICATION

TITLE
OXLEY TO SUNNYBANK HILLS
SECTION 1
1220 DIA. MSCL WATER MAIN
PLAN & LONGITUDINAL SECTION

SCALE AS SHOWN	N ^o 3 OF 26 SHEETS
DRAWING N ^o	AMEND.
486/4/6-W10103	0



01220 MILD STEEL CEMENT LINED PIPE (MEDIUM DENSITY FUSION BONDED POLYETHYLENE COATED)

IMPRESSED CURRENT CATHODIC PROTECTION

OCKETS FACING —

BLUNDER ROAD

5525 SANITARY SEWER - \$000. TO CR.

— 0.5° VERT. ANGLE

— LINE ANCHOR (REFER SHEET 17)

— 0.5° VERT. ANGLE

— 2.5° HORIZ. ANGLE

ELECTRICAL CONDUIT (TRAFFIC)

DANGER -
ELECTRICITY CABLE

— 1.5° VERT. ANGLE

Ø470 M.H. BRANCH
(Welded Type)

— 2.5° HORIZ. ANGLE

7.5#100 TELESTR CONDUITS

COLLAR JOINT (75 GAP)

Ø225 SCOUR BRANCH

ELECTRICAL CONDUIT (TRAFFIC)

DANGER -
ELECTRICITY CABLE

Ø150 SANITARY SEWER - 1.700, TO CR.

3.0° VERT. ANGLE

Ø150 WATER MAIN - 1.100, TO CR.

3.0° VERT. ANGLE

S1252

LEGEND

		STORMWATER
		ELECTRICITY
		SAN SEWER
		TELSTRA
		GAS
		WATER
		REAL PROPERTY ALIGNMENT
		BOREHOLE
		B.H.10

A scale bar with markings at 0, 5, 10, 15, 20, and 25. Below it is the text "SCALE OF METRES" and "1 : 500".

FOR NOTES REFER DRAWING
NUMBER 486/4/6-W10102

NO DATE		AMENDMENT	INITIALS
DIRECTOR OF P.D. & P.B.			DATE
ENGINEER IN CHARGE		<i>L. Johnson</i>	DATE <i>8/5/97</i>
SUPERVISING ENGINEER		R.P.E.C. NO. <i>2372</i>	DATE <i>7/15/97</i>
		NAME	DATE
DESIGN	G.S.	AUG '96	
DRAWN	B.O.B.	OCT '96	
CHECKED	T.A.B.	JAN '97	
JOB FILE		(3)705/S(572)	
CADD FILE		46W10105	
SURVEY NO.		M333	FIELD BOOK
SURVEYED		G.MELDEN	A.H. DATUM



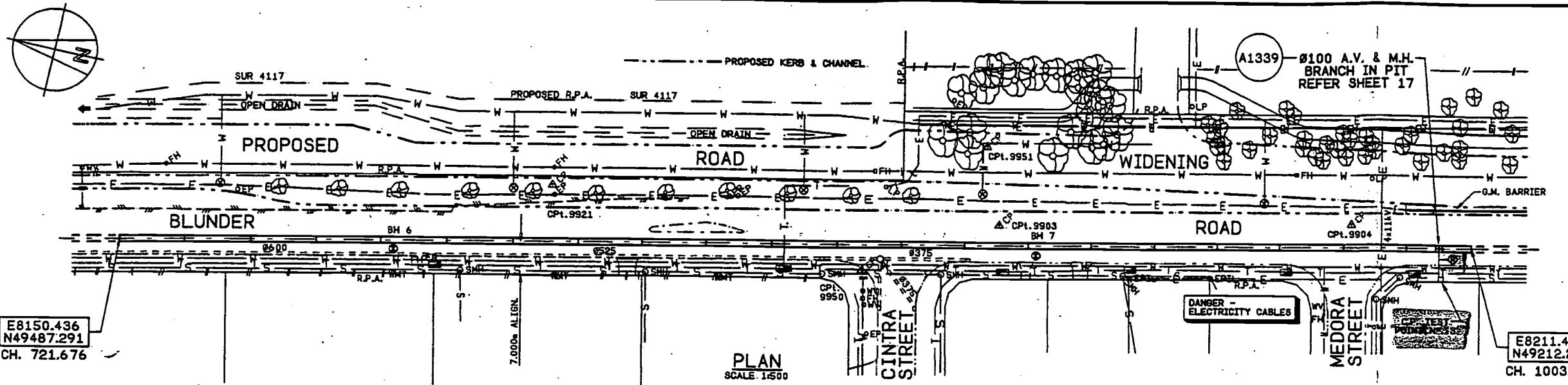
PROJECT
MAJOR DISTRIBUTION MAINS
LOGAN CITY TRUNK MAIN
AMPLIFICATION

TITLE
OXLEY TO SUNNYBANK HILLS
SECTION 1
1220 DIA. MSCL WATER MAIN
PLAN & LONGITUDINAL SECTION

SCALE AS SHOWN	N 5 OF 26 SHEET
DRAWING NO.	AMEN
486/4/6-W10105	0

LONGITUDINAL SECTION

CONTOURS SECTION
CH. 429.046 - 721.676
SCALES HORIZONTAL 1:600



Ø1220 MILD STEEL CEMENT LINED PIPE (MEDIUM DENSITY FUSION BONDED POLYETHYLENE COATED)

IMRESSED CURRENT CATHODIC PROTECTION

SOCKETS FACING —————→ .

BLUNDER ROAD

A133

4-11KV ELECTRICAL CONDUITS

DANGER - ELECTRICITY CABLES

LEGEND

O = = = = = O STORMWATER
 E ————— E ELECTRICITY
 S ————— S SAN SEWER
 T ————— T TELSTRA
 G ————— G GAS
 W ————— W WATER
 R.P.A. REAL PROPERTY ALIGNMENT
 BH.10 BOREHOLE

FOR NOTES REFER DRAWING
NUMBER 486/4/6-W10102

NO DATE	AMENDMENT	INITIALS
DIRECTOR OF P.D. & P.S.		DATE
ENGINEER IN CHARGE	<i>R. J. Denaway</i>	DATE <i>8/1977</i>
SUPERVISING ENGINEER	R.P.E.Q. NO. <i>2477</i>	DATE <i>7/1977</i>



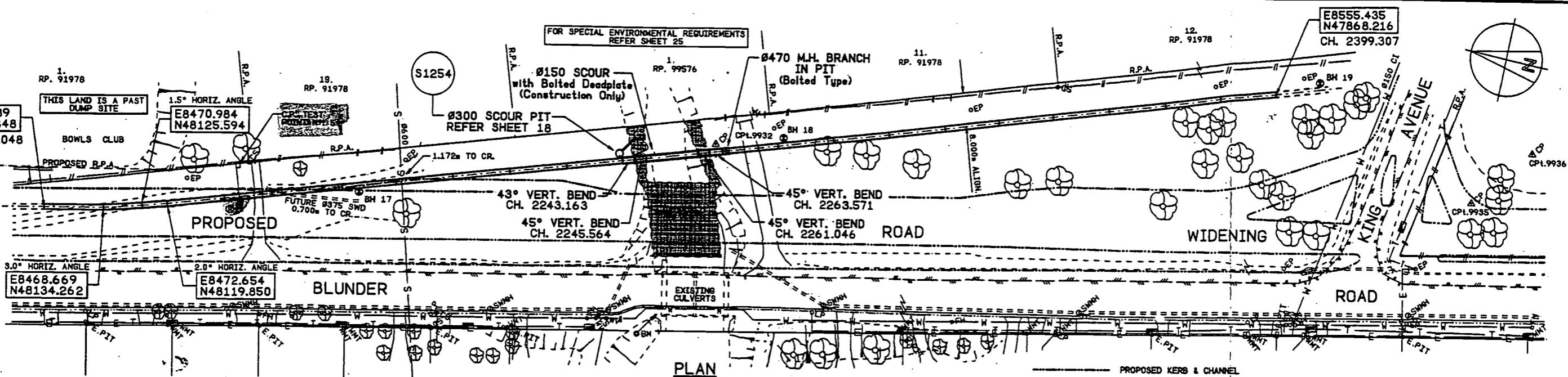
PROJECT
MAJOR DISTRIBUTION MAINS
LOGAN CITY TRUNK MAIN
AMPLIFICATION

TITLE
OXLEY TO SUNNYBANK HILLS
SECTION 1
1220 DIA. MSCL WATER MAIN
PLAN & LONGITUDINAL SECTION

SCALE AS SHOWN	N° 6 OF 26 SHEETS
DRAWING N°	AMEND.
486/4/6-W10106	0

DATUM -25			
DEPTH TO PIPE INVERT	18.558	3.360	
INVERT OF PIPE	19.962		
SURFACE LEVEL			
PIPE CHAINAGE			
721.676	21.918		
735.037		19.962	
	748.426		21.075
	759.866	24.013	21.753
	779.218		22.260
	799.218	26.407	24.142
			2.265
	857.604	30.193	27.924
			2.272
	869.103		28.649
	882.505		29.584
	899.044	32.685	30.407
			2.278
	936.194		31.904
	949.624		32.284
	958.813	31.149	32.471
			2.278
	976.490		32.749
	995.194	35.180	32.918
			2.362

LONGITUDINAL SECTION
CH. 721.676 - 1003.360
SCALE HORIZONTAL 1:500



LEGEND

O - - - - -	STORMWATER
E - - - - -	ELECTRICITY
S - - - - -	SAN SEWER
T - - - - -	TELSTRA
G - - - - -	GAS
W - - - - -	WATER
R.P.A. - - - - -	REAL PROPERTY ALIGNMENT
● BH.10	BOREHOLE

5 0 5 10 15 20 25
SCALE OF METRES
1 : 500

FOR NOTES REFER DRAWING NUMBER 486/4/6-W10102

NO DATE	AMENDMENT	INITIALS
DIRECTOR OF PD & PB		DATE
ENGINEER IN CHARGE	<i>L. Huntley</i>	DATE 01/07/97
SUPERVISING ENGINEER	<i>L. Huntley</i>	DATE 23/07/97
NAME	DATE	
DESIGN	G.S.	AUG '96
DRAWN	B.D.B.	OCT '96
CHECKED	T.A.B.	FEB '97
JOB FILE	(3)705/5(572)	
CADD FILE	46W10111	
SURVEY NO	M333	FIELD BOOK 8296
SURVEYED	G.SHEDDEN	A.H. DATUM



PROJECT MAJOR DISTRIBUTION MAINS LOGAN CITY TRUNK MAIN AMPLIFICATION

TITLE OXLEY TO SUNNYBANK HILLS SECTION 1 1220 DIA. MSCL WATER MAIN PLAN & LONGITUDINAL SECTION

SCALE AS SHOWN N° 11 OF 26 SHEETS
DRAWING N° 486/4/6-W10111 AMEND 0

DATUM -25

DEPTH TO PIPE INVERT

2106.048 17.398 14.453 2.955

0.5° VERT. ANGLE

3.0° HORIZ. ANGLE

1.5° HORIZ. ANGLE

0.5° VERT. ANGLE

FUTURE 6375 STORMWATER - 0.700m TO CR.

3.0° VERT. ANGLE

3.0° SANITARY SEWER - 1.172 TO CR.

0.5° VERT. ANGLE

0.5° VERT. ANGLE

FUTURE PAVEMENT LEVEL

0300 SCOUR BRANCH

43° BEND

COLLAR JOINT (75 GAP)

45° BEND

0150 SCOUR BRANCH (Construction Only)

COLLAR JOINT (75 GAP)

45° BEND

0470 M.H. BRANCH IN PIT (Bolted Type)

COLLAR JOINT (75 GAP)

45° BEND

0470 M.H. BRANCH IN PIT (Bolted Type)

1.0° VERT. ANGLE

0.5° VERT. ANGLE

1.5° VERT. ANGLE

2.0° VERT. ANGLE

3.0° VERT. ANGLE

1.0° VERT. ANGLE

INVERT OF PIPE

2118.415 13.120 5.689 3.288 2.490 - S & P 43° BEND N°. 187

2128.419 12.712 5.778 3.288 2.490 - S & P 43° BEND N°. 188

2134.400 12.267 5.813 3.288 2.490 - S & P 43° BEND N°. 189

2147.798 11.262 5.894 3.288 2.490 - S & P 43° BEND N°. 190

2155.662 13.939 10.212 6.113 2.012 - S & P 43° BEND N°. 191

2174.458 7.910 6.036 3.288 2.490 - S & P 43° BEND N°. 192

2195.899 9.713 6.174 2.939 3.288 2.490 - S & P 43° BEND N°. 193

2226.977 8.125 6.113 2.012 3.288 2.490 - S & P 43° BEND N°. 194

2245.564 5.778 3.288 2.490 - S & P 43° BEND N°. 195

2246.306 5.813 3.288 2.490 - S & P 43° BEND N°. 196

2261.046 5.813 3.288 2.490 - S & P 43° BEND N°. 197

2263.571 5.813 3.288 2.490 - S & P 43° BEND N°. 198

2286.432 8.018 6.006 2.012 3.288 2.490 - S & P 43° BEND N°. 199

2292.020 6.053 7.813 2.014 3.288 2.490 - S & P 43° BEND N°. 200

2305.442 6.615 7.813 2.014 3.288 2.490 - S & P 43° BEND N°. 201

2318.855 7.421 6.006 2.012 3.288 2.490 - S & P 43° BEND N°. 202

2326.668 9.827 7.813 2.014 3.288 2.490 - S & P 43° BEND N°. 203

2345.690 10.800 8.779 2.021 3.288 2.490 - S & P 43° BEND N°. 204

2359.114 9.325 7.813 2.014 3.288 2.490 - S & P 43° BEND N°. 205

2366.905 11.879 9.844 2.035 3.288 2.490 - S & P 43° BEND N°. 206

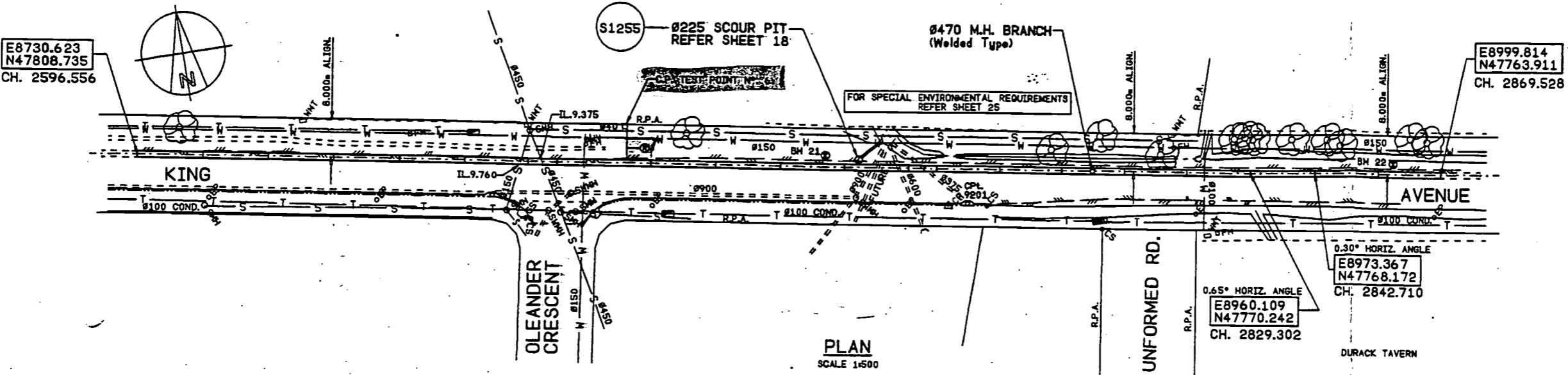
2372.520 10.218 7.813 2.014 3.288 2.490 - S & P 43° BEND N°. 207

2385.889 11.542 7.813 2.014 3.288 2.490 - S & P 43° BEND N°. 208

2399.307 14.382 12.214 2.168 3.288 2.490 - S & P 43° BEND N°. 209

LONGITUDINAL SECTION
CH. 2106.048 - 2399.307SCALES HORIZONTAL 1:500
VERTICAL 1:500

Active 21/07/2015



Ø1220 MILD STEEL CEMENT LINED PIPE (MEDIUM DENSITY FUSION BONDED POLYETHYLENE COATED)

IMRESSED CURRENT CATHODIC PROTECTION

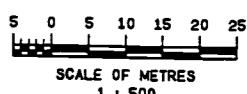
SOCKETS FACING

SOCKETS FACING

KING AVENUE

LEGEND

 == = = = = = = = 	STORMWATER
— E — E —	ELECTRICITY
— S — S —	SAN SEWER
— T — T —	TELSTRA
— G — G —	GAS
— W — W —	WATER
<u>R.P.A.</u>	REAL PROPERTY ALIGNMENT
 BH.10	BOREHOLE



FOR NOTES REFER DRAWING
NUMBER 486/4/6-W10102

NUMBER 1007470 410102		
NO DATE	AMENDMENT	INITIALS
DIRECTOR OF P.D. & P.S.		DATE
ENGINEER IN CHARGE	<i>H. Greenway</i>	DATE <i>8/17/77</i>
SUPERVISING	RPTG. NO.	DATE

LONGITUDINAL SECTION-

CONSTITUTIONAL SECTION
CH. 2596.556 - 2869.528

SCALES HORIZONTAL 1:500
VERTICAL 1:500

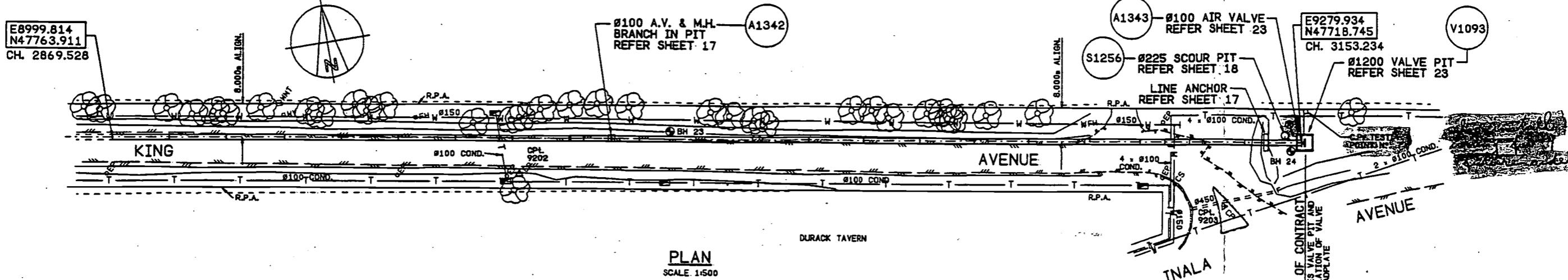
PROJECT
MAJOR DISTRIBUTION MAINS
LOGAN CITY TRUNK MAIN
AMPLIFICATION

TITLE OXLEY TO SUNNYBANK HTL 8

OXLEY TO SUNNYBANK HILLS
SECTION 1
1220 DIA. MSCL WATER MAIN
PLAN & LONGITUDINAL SECTION

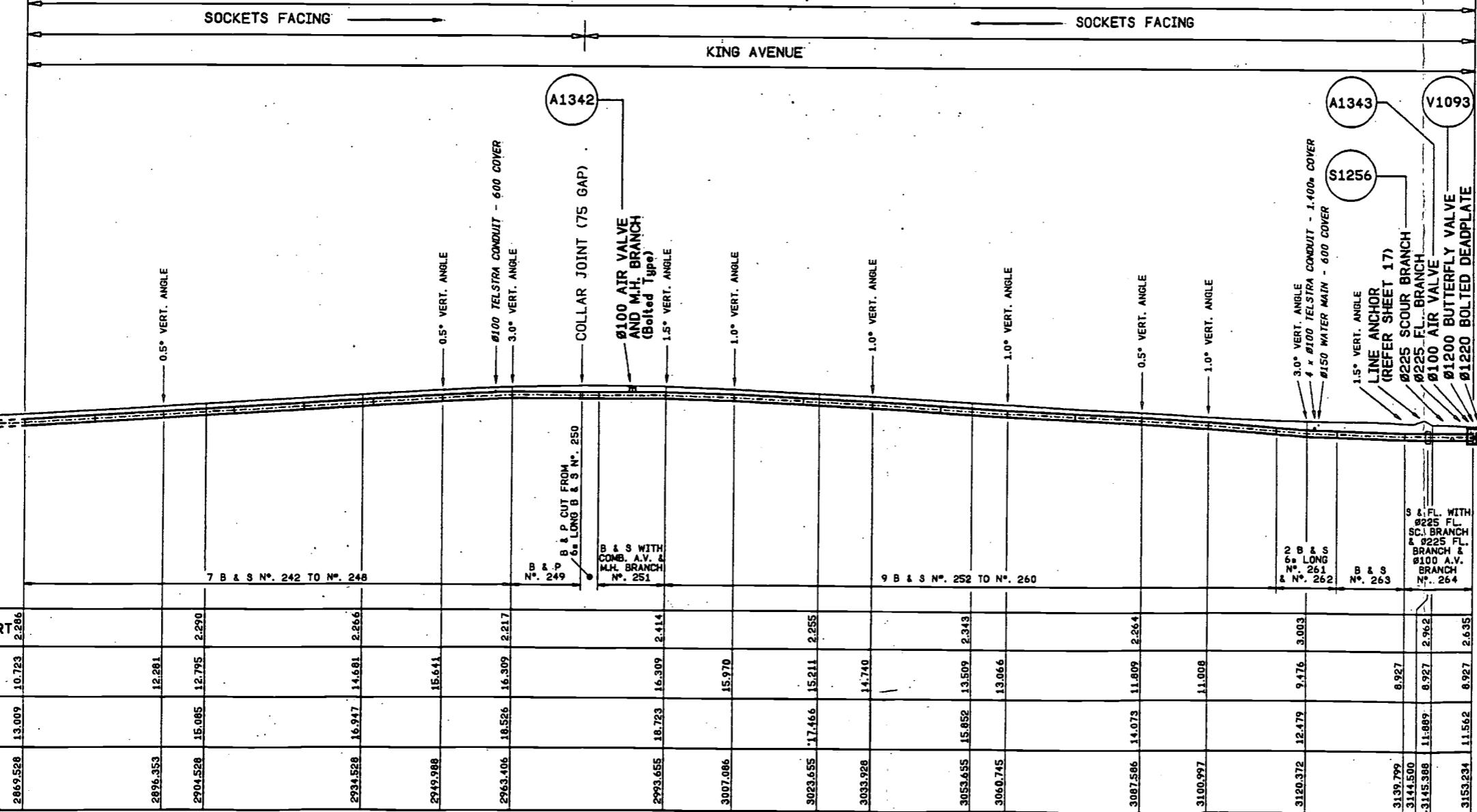
SCALE AS SHOWN N° 13 OF 26 SHE

DRAWING N° 486/4/6-W10113 AMEN



01220 MILD STEEL CEMENT LINED PIPE (MEDIUM DENSITY FUSION BONDED POLYETHYLENE COATED)

IMPRINTED CURRENT CATHODIC PROTECTION



LONGITUDINAL SECTION

CH. 2869.528 - 3153.234

SCALES HORIZONTAL 1:500
VERTICAL 1:500

LEGEND

O - - - - -	STORMWATER
E - - - - -	ELECTRICITY
S - - - - -	SAN SEWER
T - - - - -	TELSTRA
G - - - - -	GAS
W - - - - -	WATER
R.P.A. - - - - -	REAL PROPERTY ALIGNMENT
BH.10	BOREHOLE

5 0 5 10 15 20 25
SCALE OF METRES
1 : 500

FOR NOTES REFER DRAWING NUMBER 486/4/6-W10102

NO DATE	AMENDMENT	INITIALS
DIRECTOR OF P.D. & P.B.		
ENGINEER IN CHARGE		
SUPERVISING ENGINEER	Specified	DATE 8/5/97
NAME	DATE	
DESIGN	G.S.	AUG '96
DRAWN	S.S.G.	FEB '97
CHECKED	T.A.B.	FEB '97
JOB FILE	(3)705/6(572)	
CADD FILE	46W10114	
SURVEY NO.	S1884R	FIELD BOOK 8708/1
SURVEYED	R.BOXALL	A.H. DATUM

NAME	DATE	
DESIGN	G.S.	AUG '96
DRAWN	S.S.G.	FEB '97
CHECKED	T.A.B.	FEB '97
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CADD FILE	46W10114	
SURVEY NO.	S1884R	FIELD BOOK 8708/1
SURVEYED	R.BOXALL	A.H. DATUM



20th January 1997.

OPERATING MANUAL FOR:

OXLEY TO SUNNYBANK TRUNK MAIN
AMPLIFICATION STAGE ONE

CATHODIC PROTECTION SYSTEM

CLIENT:

BRISBANE WATER

MANUAL CONTENTS

- (1.0) Introduction
- (2.0) Corrosion and Cathodic Protection
- (3.0) Mains Details
- (4.0) Cathodic Protection
- (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) Performed Testing
- (6.0) Conclusion
- (7.0) Maintenance

DRAWINGS

486/6/25-AA1C0021E Standard Rectifier Wiring Diagram
486/4/6-W10100 to 26 Construction Drawings

(No Number) Monthly Maintenance Program

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.

Size: Dia: 1220 mm mild steel cement lined.

Coating: Medium density fusion bonded Polyethylene

Length: 3.300 km

Location: Cnr Boundary Rd and Blunder Rd. to King Avenue and Inala Avenue. This main connects to the Blunder to Beatty Rd trunk main at the cnr. Boundary and Blunder Rds..

Construction: 486/4/6/-410100

Drawings:

- (4.1) Type of Cathodic Protection: Impressed Current.
- (4.2) Rectifier: Special 32 Volt, 10 amp direct current output enclosed in a stainless steel switchboard. Rectifier has a 240V supply from the nearby Oxley Archerfield Submersible Sewerage Pumping Station.
- (4.3) Cathode: The cathode point is located on the trunk main at test point 3 near Air Valve No 1267 approximately 100 meters north of the sewerage pump station. 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 80 metres west from the trunk mains in a vertical bed. The anodes were firstly packaged with cokebreeze thereby improving anode - ground resistance. The anodes are identified by a marker post 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 seven test points have been installed. Making seventeen all told. For details see dwgs. no. 486/6/6-PE1C0024E
486/4/6-W10100
- (4.6) Associated Drawings:
- | | | |
|--|---|--------------------|
| Cathodic Protection Details | - | 2/14/213 |
| Cathodic Protection Test Point Details | - | 486/1/22-AA1T0001E |
| Standard Rectifier Wiring Diagram | - | 486/6/25-AA1C0021E |
| Vertical Ground bed Details | - | 486/6/25-AA1C0024E |
- (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.

- (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.

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.

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/ Pipcamp structure if applicable.
- 17/ Apply to reregister system, if applicable.

Electrical Engineering Unit:

Cathodic Protection Interference Survey Results Form:

Project Oxley to Sunnybank Stg 1 Unit Reading 1V off 0.25A Date 20-1-98

Instrument used IN 1L TO CUSO₄ Cell

	Reading:	Test Point I.D.	Location	Swing
On	-398	Light Pole	Light Pole @ TP4	00
Off	-398			
On	-804	Fence	Fence @ TP3	00
Off	-804			
On	-568	Fence	Fence @ TP3	00
Off	-568		Next. door.	00
On	-246	water meter	water Meter	00
Off	-246		185 Boundary	
On	-430	Sign	Macdonald's, Ipswich Side Rd.	00
Off	-430			
On	-480	Garden Tap	+ Earth Macdonalds	00
Off	-480			
On	-614	Mac Sign	Ipswich Rd. opp. Harvey Norman	00
Off	-614			
On	-445	Fence	Harvey Norman & Ipswich Rd.	00
Off	-445			
On	-022	Sign	Caltex Garage Blunder Boundary Rds	00
Off	-022			
On	-473	water Supply	Caltex Garage Blunder Boundary Rds	00
Off	-473			
On	-442	Light Pole	No 517640 Blunder Rd.	00
Off	-442			
On	-359	Fence	Belsham's Blunder Rd	00
Off	-359			
On	-429	Light Pole	517653 Blunder Rd.	00
Off	-429			
On	-387	Trans Pole	24774 MEN. ALBAN ST	00
Off	-387			
On	-235	water Meter	16 ALBAN ST	00
Off	235			

TESTED BY J.J.

Brisbane Water Engineering Services

Electrical Engineering Unit

Ph: 34031838 Fx. 34031839

5 Bunya Street
Eagle Farm Q.4009Cathodic Protection System Loop Resistance

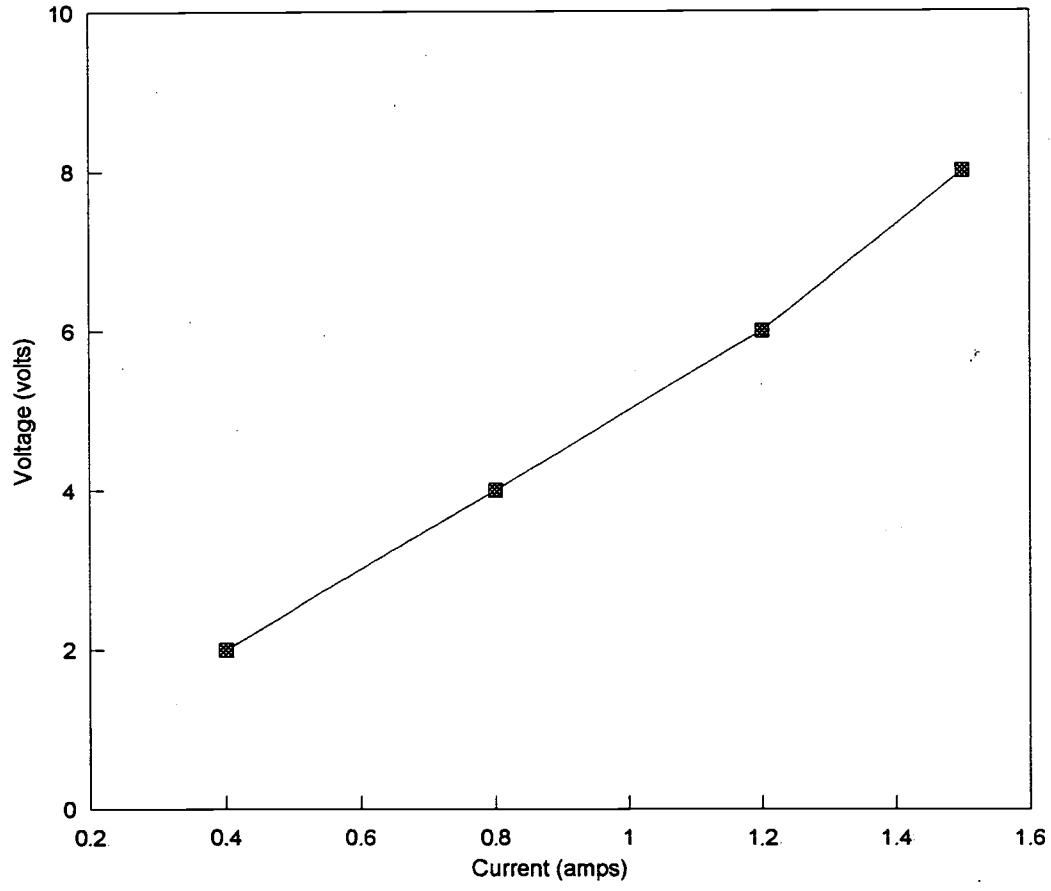
Date: 20 January 1998

Cathodic Protection System: insert contract name here

System Operating Volts: 1 System Operating amps: 0.25

Test Voltage: (volts)	Test Current: (amps)
2	0.4
4	0.8
6	1.2
8	1.5

Loop Resistance (ohms)
5

Graph of System voltage vs current.

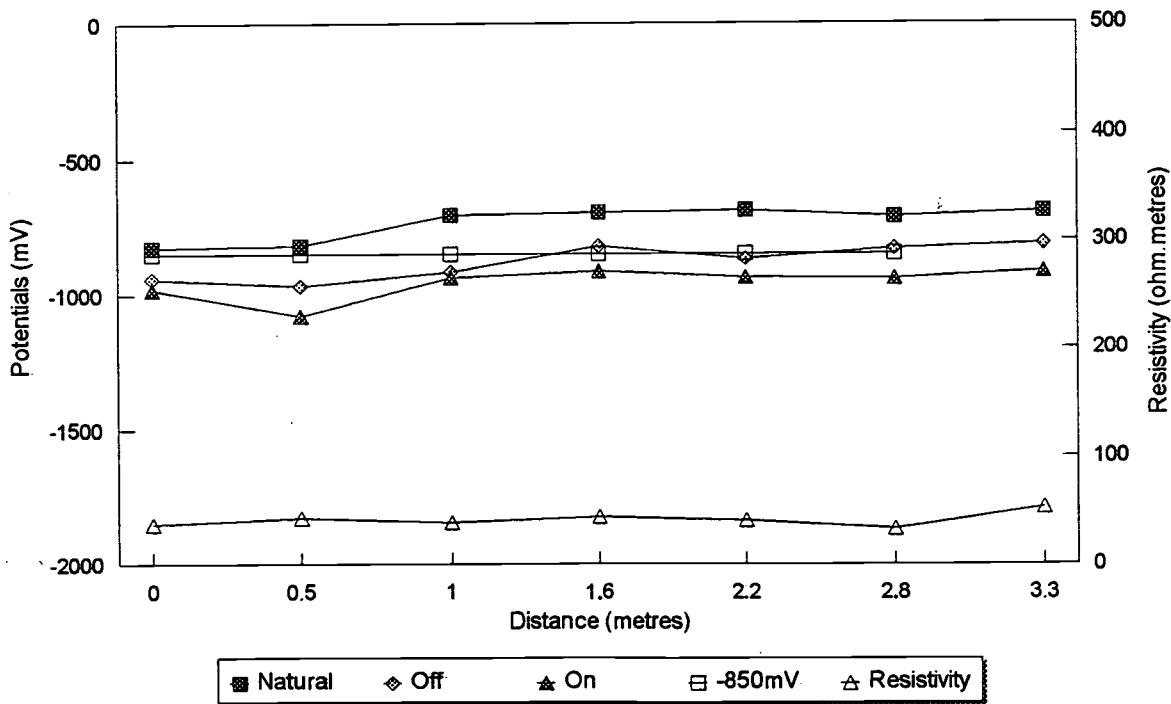
Brisbane Water Engineering Services

CP Form No. 23

Electrical Engineering Unit:

Cathodic Protection System Potential Recording FormProject: Oxley to Sunnybank sec.1Date 20 th January 1998

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	-825	-942	-981	36.7
2	0.5	-819	-967	-1079	42.7
3	1	-707	-915	-936	38.9
4	1.6	-697	-822	-914	43.9
5	2.2	-690	-867	-938	40.2
6	2.8	-712	-830	-943	32.6
7	3.3	-694	-814	-917	52.6

Graph of potentials and resistivity vs pipelength

Rectifier located at oxley archerfield p. stn.

BRISBANE WATER ENGINEERING SERVICES

Electrical Engineering Unit

Date: 20 January 1998

TP Test ResultsOxley to Sunnybank Sect 1 Trunk Main

			Natural	ON	OFF
TP1	Boundary Rd	Cus04 to Pipe	-935	-942	-891
		Cus04 to Zn	-1049	-1065	-1064
		Zn to Pipe	115	126	143
TP 1	Blunder Rd	Cus04 to Pipe	-825	-981	-942
		Cus04 to Zn	-1069	-1051	-1050
		Zn to Pipe	-336	69	178
	Beaty Rd.	Cus04 to Pipe	-1005	-986	-918
		Cus04 to Zn	-943	-943	-942
		Zn to Pipe	57	-38	68
TP2	Blunder Rd	Cus04 to Pipe	-819	-1079	-967
		Cus04 to Zn	-1057	-1080	-1089
		Zn to Pipe	234	2	113
TP3	Blunder Rd	Cus04 to Pipe	-707	-936	-915
		Cus04 to Zn	-1118	-1119	-1120
		Zn to Pipe	413	186	293
TP4	Blunder Rd	Cus04 to Pipe	-697	-914	-822
		Cus04 to Zn	-1173	-1257	-1212
		Zn to Pipe	476	355	407
TP5	Blunder Rd	Cus04 to Pipe	-690	-938	-867
		Cus04 to Zn	-1114	-1111	-1111
		Zn to Pipe	425	182	295
TP6	Main Ave	Cus04 to Pipe	-712	-943	-830
		Cus04 to Zn	-1073	-1082	-1082
		Zn to Pipe	364	125	236
TP7	Inala Ave	Cus04 to Pipe	-694	-917	-814
		Cus04 to Zn	-1176	-1179	-1179
		Zn to Pipe	482	255	364

Tested by J Taylor

Brisbane Water Engineering Services

CP Form No.18

Electrical Engineering Unit

Standard Cathodic Protection Test Point Data Gathering FormProject Oxley - Sunnybank T/m.Date 20-11-97TP Location 19.8 N16TP No. 1Mains Size 1220TP Type B by 3**POTENTIAL TESTING**

CATHODE TO CATHODE RETURN (RESISTANCE)

0.1 Ω

ZINC REFERENCE TO PIPE

115CuSo₄ REFERENCE TO PIPE-935ZINC TO CuSo₄-1049**EARTH TESTING**

TEST NO. 1

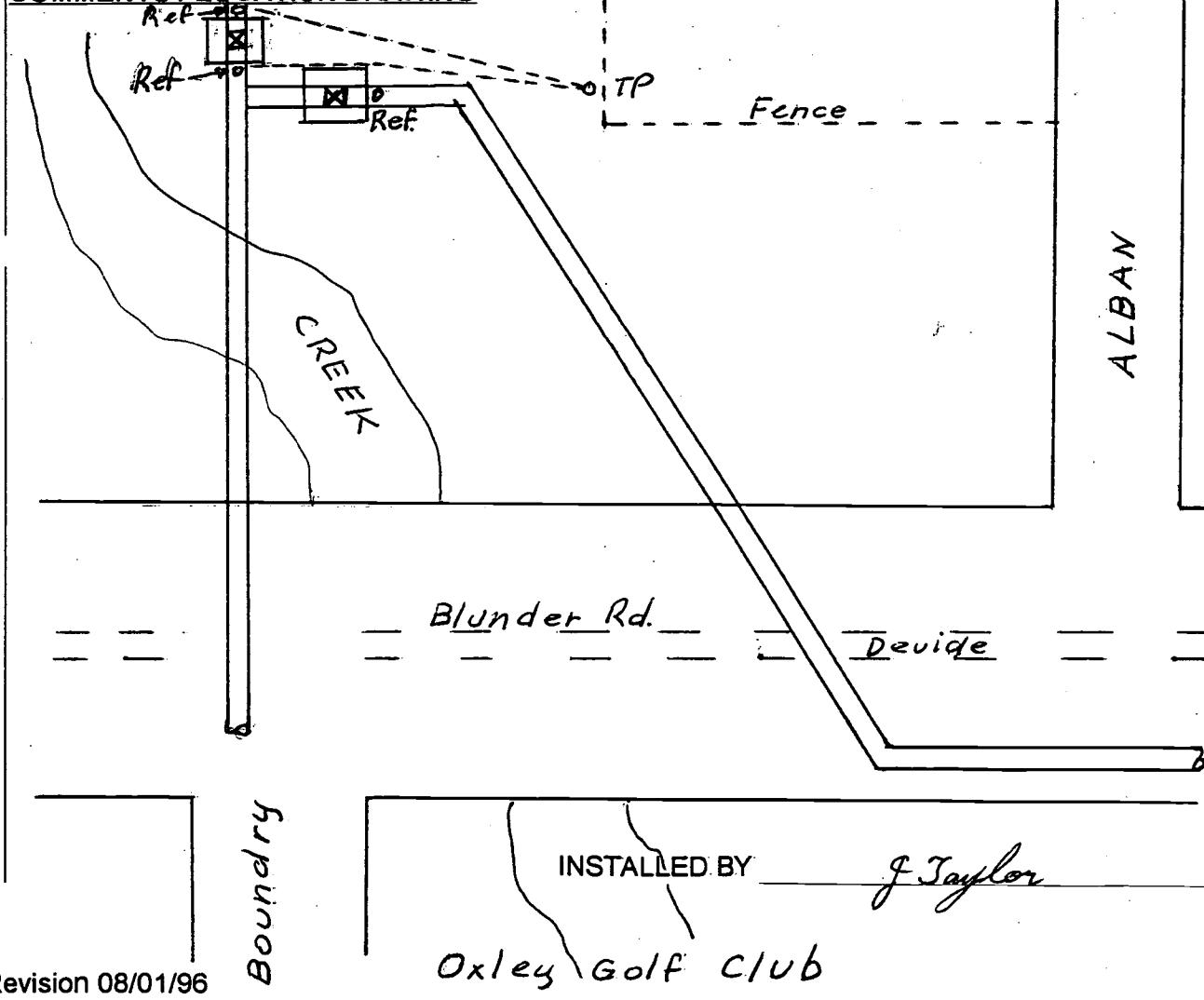
PIN SPACING

2 m

RESISTIVITY

36.7 Ωm

MEGGER READING

COMMENTS / LOCATION DRAWING

Revision 08/01/96

Brisbane Water Engineering Services

CP Form No.18

Electrical Engineering Unit:

Standard Cathodic Protection Test Point Data Gathering Form

Project: OXLEY TO SUNNYBANK.....

Date: 18-10-97

TP Location: BLUNDER Rd.....

TP No.: 2.....

Mains Size: 1220 DIA MSCL.....

TP Type: B.....

1 meter under road.

POTENTIAL TESTING

CATHODE TO CATHODE RETURN (RESISTANCE)

~4 Ω

ZINC REFERENCE TO PIPE

+4.90

CuSo₄ REFERENCE TO PIPE

6.80

ZINC TO CuSo₄

11.70

EARTH TESTINGTEST NO. 1

PIN SPACING

2 m

RESISTIVITY

42.7 Ω m

MEGGER READING

3.4

TEST NO. 2

PIN SPACING

RESISTIVITY

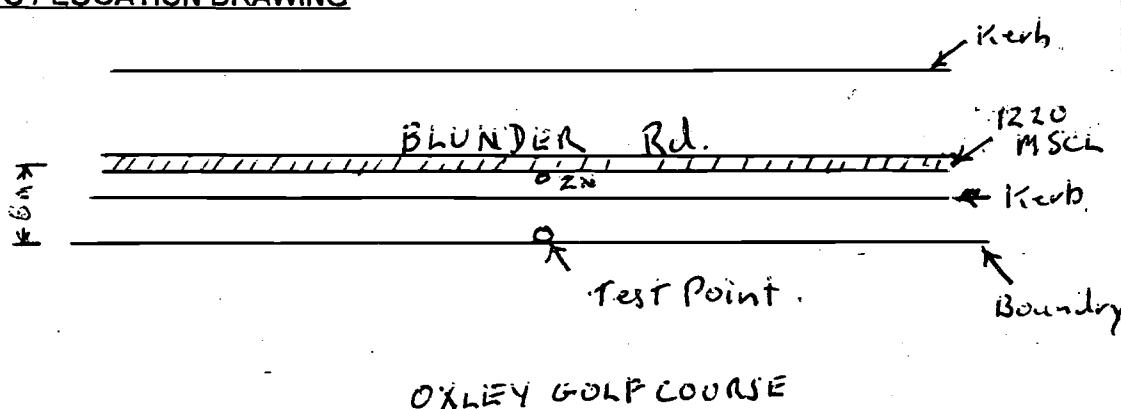
MEGGER READING

TEST NO. 3

PIN SPACING

RESISTIVITY

MEGGER READING

COMMENTS / LOCATION DRAWING

OXLEY GOLF COURSE

INSTALLED BY P. SMYTH

Revision 09/28/95

Brisbane Water Engineering Services

CP Form No.18

Electrical Engineering Unit

Standard Cathodic Protection Test Point Data Gathering Form

Project ... OXLEY TO SUNNYBANK

Date ... 18-10-97

TP Location ... BLUNDER Rd

TP No. ... 3

Mains Size 12.20 DIA. MSCL

TP Type ... B

1 meter under road

POTENTIAL TESTING

CATHODE TO CATHODE RETURN (RESISTANCE)

3 Ρ

ZINC REFERENCE TO PIPE

+580

CuSo₄ REFERENCE TO PIPE

-590

ZINC TO CuSo₄

1170

EARTH TESTING**TEST NO. 1**

PIN SPACING

2 m

RESISTIVITY 38.9 Ρ pm

MEGGER READING

3.1

TEST NO. 2

PIN SPACING

RESISTIVITY

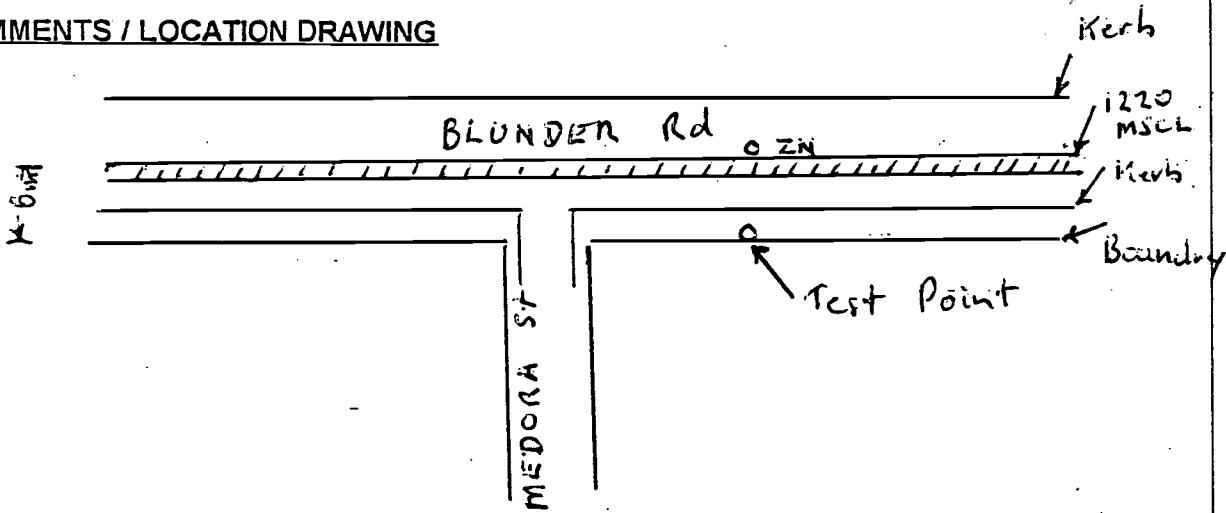
MEGGER READING

TEST NO. 3

PIN SPACING

RESISTIVITY

MEGGER READING

COMMENTS / LOCATION DRAWING

INSTALLED BY P. Smyth

Revision 09/28/95

Electrical Engineering Unit

Standard Cathodic Protection Test Point Data Gathering Form

Project OXLEY TO Sunnybank Sec 1 Date 27-10-97

TP Location TP No. 4

Mains Size 12.20 DIA MSCL TP Type

POTENTIAL TESTING

CATHODE TO CATHODE RETURN (RESISTANCE)

•2 Ω

ZINC REFERENCE TO PIPE

-697

CuSo₄ REFERENCE TO PIPE

-522

ZINC TO CuSo₄

867

EARTH TESTING

TEST NO. 1

PIN SPACING

2

RESISTIVITY 43.9 S/Pm

MEGGER READING

3.5

TEST NO 2

PIN SPACING

RESISTIVITY _____

MEGGER READING

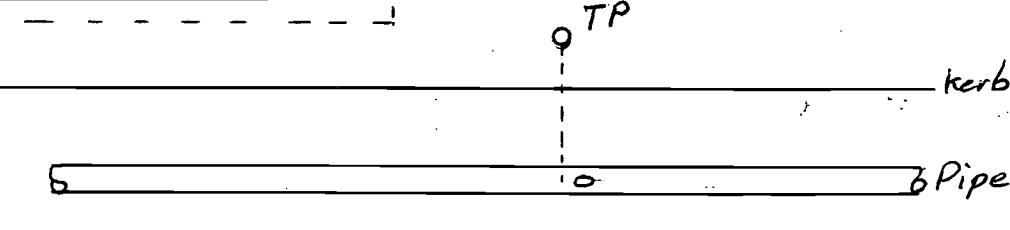
TEST NO 3

PIN SPACING

RESISTIVITY _____

MEGGER READING

COMMENTS / LOCATION DRAWING



Blunder Rd.

Kerb

INSTALLED BY P. SMYTH

Brisbane Water Engineering Services

CP Form No.18

Electrical Engineering Unit**Standard Cathodic Protection Test Point Data Gathering Form**

Project...Oxley To Sunnybank Sect 1 Date...27-10-97

TP Location TP No. 5

Mains Size.....1220 DIA.msc..... TP Type.....

POTENTIAL TESTING

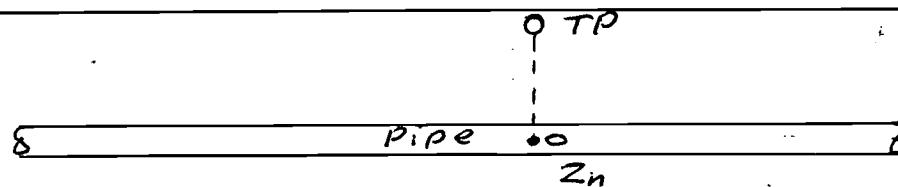
CATHODE TO CATHODE RETURN (RESISTANCE) • 2
 ZINC REFERENCE TO PIPE +425
 CuSo₄ REFERENCE TO PIPE -690
 ZINC TO CuSo₄ -1114

EARTH TESTING

TEST NO. 1 RESISTIVITY 40.19
 PIN SPACING 2
 MEGGER READING 3.2

TEST NO 2 RESISTIVITY _____
 PIN SPACING _____
 MEGGER READING _____

TEST NO 3 RESISTIVITY _____
 PIN SPACING _____
 MEGGER READING _____

COMMENTS / LOCATION DRAWING

Bitumen Sect. Blunder rd.

INSTALLED BY P Smyth

Electrical Engineering Unit

Standard Cathodic Protection Test Point Data Gathering Form

Project OXLEY.....T.O. SUNNYBANK.....Sec 1 Date 21-10-97

TP Location Oleander TP No 6

Mains Size 1220 DIA M.S.C.L TP Type B

POTENTIAL TESTING

CATHODE TO CATHODE RETURN (RESISTANCE)	0.2 Ω
ZINC REFERENCE TO PIPE	-263
CuSo ₄ REFERENCE TO PIPE	-871
ZINC TO CuSo ₄	-618

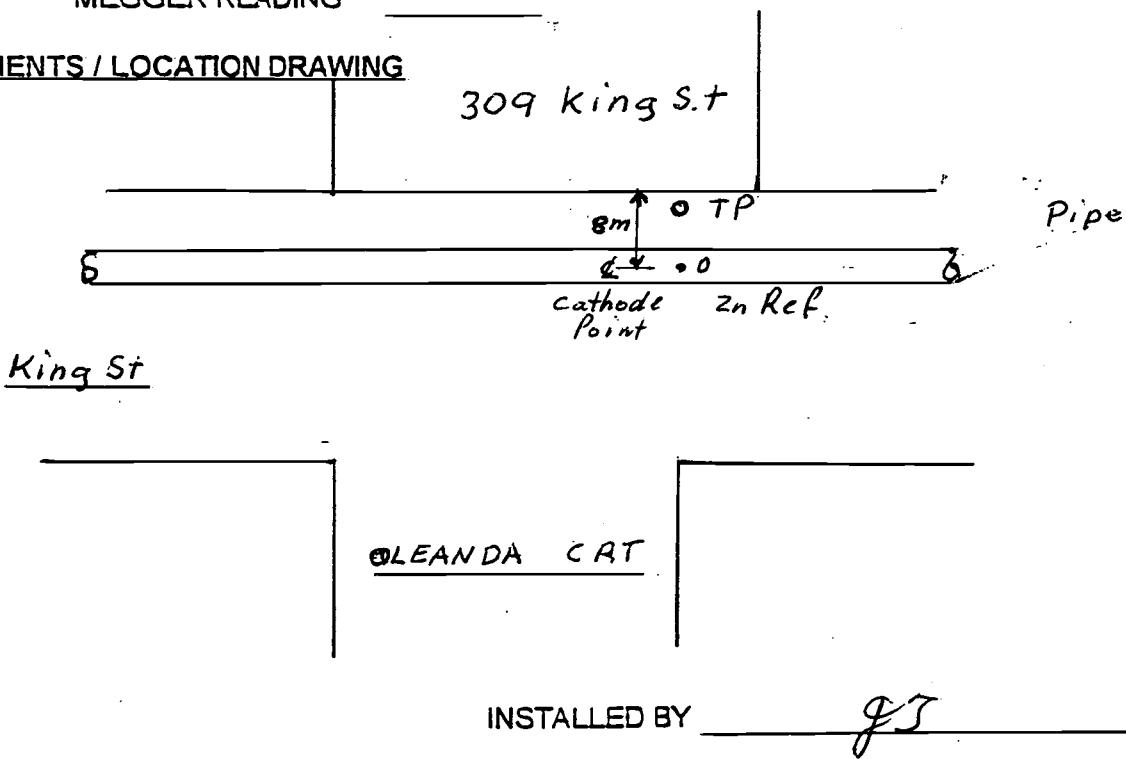
EARTH TESTING

TEST NO. 1
PIN SPACING 2 RESISTIVITY 32.6
MEGGER READING 2.6

TEST NO. 2
PIN SPACING _____ RESISTIVITY _____
MEGGER READING _____

TEST NO. 3
PIN SPACING _____ RESISTIVITY _____
MEGGER READING _____

COMMENTS / LOCATION DRAWING



Brisbane Water Engineering Services

CP Form No.18

Electrical Engineering Unit

Standard Cathodic Protection Test Point Data Gathering Form

Project: OXLEY to Sunnybank Section 1 Date: 27-10-97

TP Location: Cnr King & Inala Av TP No: 7

Mains Size: 1220 DIA MSCL TP Type: B by 2

POTENTIAL TESTING:

CATHODE TO CATHODE RETURN (RESISTANCE)

ZINC REFERENCE TO PIPE

CuSo₄ REFERENCE TO PIPEZINC TO CuSo₄**EARTH TESTING:**TEST NO. 1

PIN SPACING:

2 m

RESISTIVITY

52.6 SC Pm

MEGGER READING:

6.4

TEST NO. 2

PIN SPACING:

RESISTIVITY

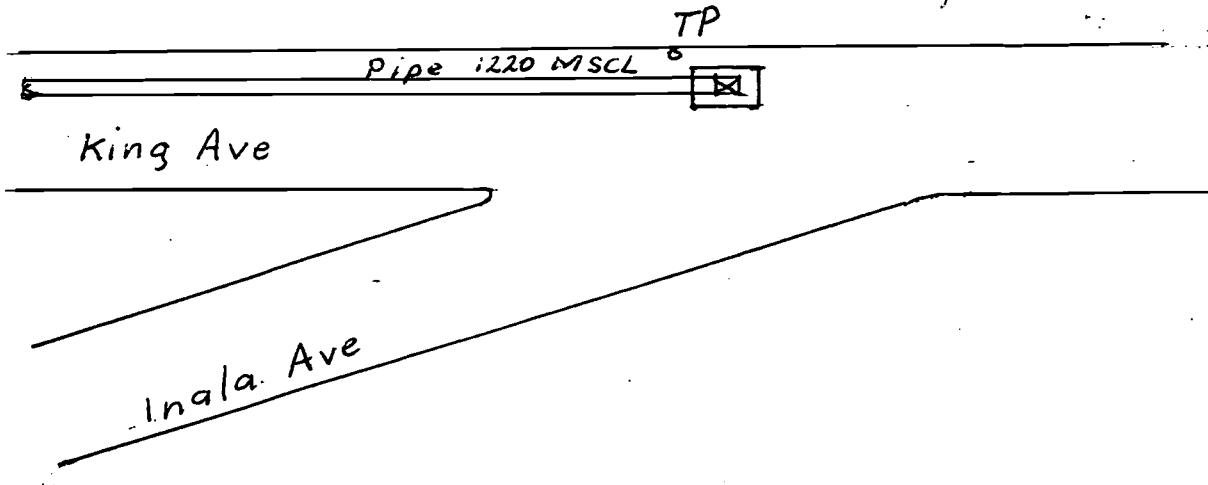
MEGGER READING:

TEST NO. 3

PIN SPACING:

RESISTIVITY

MEGGER READING:

COMMENTS / LOCATION DRAWING

INSTALLED BY P SMYTH

Revision 09/28/95

Electrical Engineering Unit:**Insulated Joint Testing Details Form**

Project OXLEY.....TO.....SUNNYBANK

Date18-10-97.....

DESCRIPTION

MAINS DETAILS:

1220 Dia MSCL

LOCATIONS:

198 m6 218 P5 219 B6

SIZE:

1220 MSCL

MATERIAL:

STEEL

COATING:

Fusion Bonded Polyethylene Medium

VALVE No.:

IN GROUND TESTING

BOLT TO FLANGE RESISTANCE:

NUMBER OF BOLT:

FLANGE TO FLANGE RESISTANCE:

INSULATION CHECKER MODEL 702:

POTENTIAL DIFFERENCE TO REFERENCE CELL:

PROTECTED SIDE:

UNPROTECTED SIDE:

ABOVE TESTING

BOLT TO FLANGE RESISTANCE:

NUMBER OF BOLTS:

32.

FLANGE TO FLANGE RESISTANCE:

COMMENTS / LOCATION DRAWING

TESTED BYP. SMYTH.....

DRAWING LIST - SECTION 1

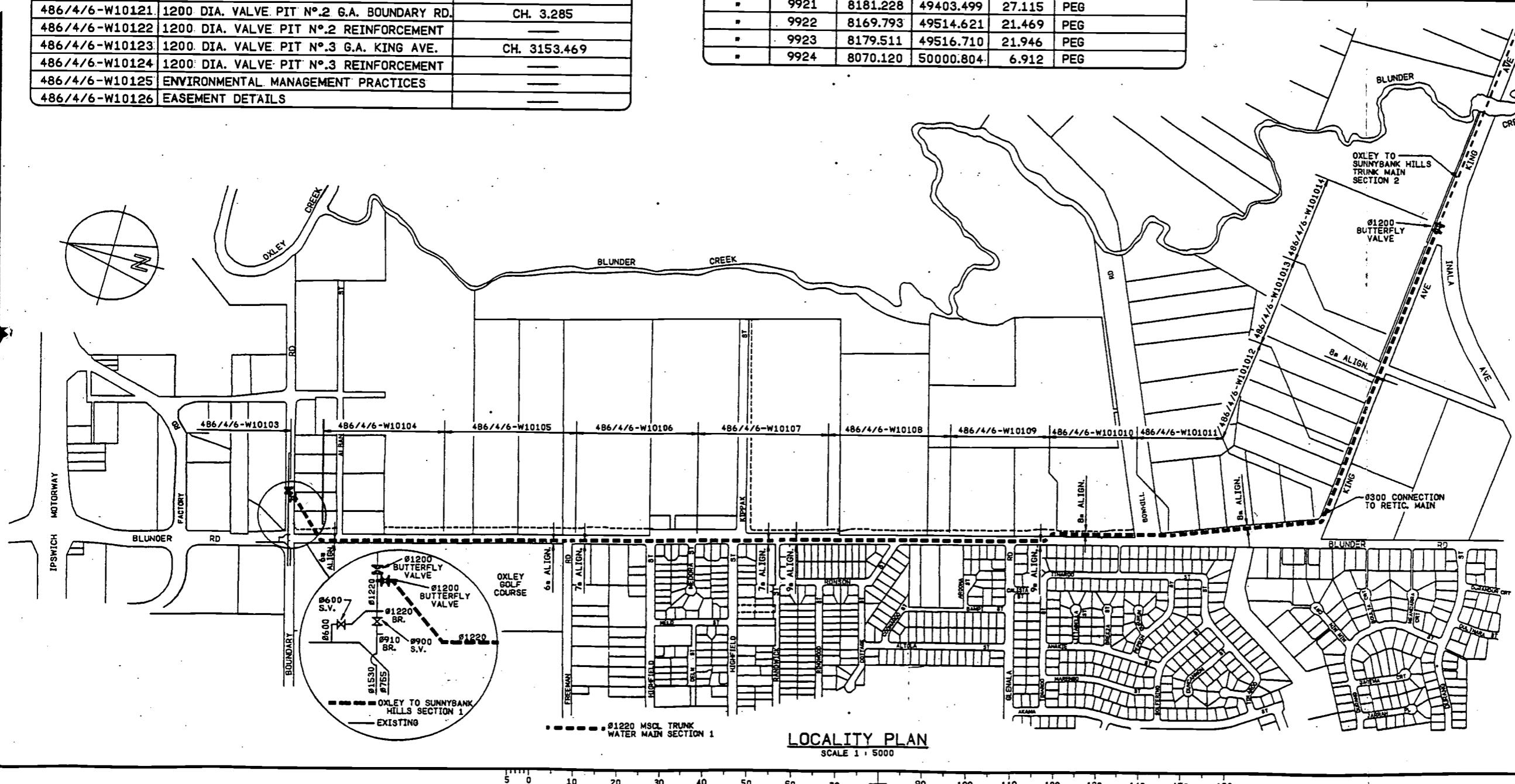
DRAWING NUMBER	DRAWING TITLE	PIPE CHAINAGE
486/4/6-W10100	COVER SHEET	—
486/4/6-W10101	LOCALITY PLAN	CH. 0.000 - 3153.234
486/4/6-W10102	PROJECT NOTES	—
486/4/6-W10103	PLAN AND LONGITUDINAL SECTION	CH. 0.000 - 141.160
486/4/6-W10104	PLAN AND LONGITUDINAL SECTION	CH. 141.160 - 429.046
486/4/6-W10105	PLAN AND LONGITUDINAL SECTION	CH. 429.046 - 721.676
486/4/6-W10106	PLAN AND LONGITUDINAL SECTION	CH. 721.676 - 1003.360
486/4/6-W10107	PLAN AND LONGITUDINAL SECTION	CH. 1003.360 - 1297.522
486/4/6-W10108	PLAN AND LONGITUDINAL SECTION	CH. 1297.522 - 1578.946
486/4/6-W10109	PLAN AND LONGITUDINAL SECTION	CH. 1578.946 - 1815.243
486/4/6-W10110	PLAN AND LONGITUDINAL SECTION	CH. 1815.243 - 2106.048
486/4/6-W10111	PLAN AND LONGITUDINAL SECTION	CH. 2106.048 - 2399.307
486/4/6-W10112	PLAN AND LONGITUDINAL SECTION	CH. 2399.307 - 2596.556
486/4/6-W10113	PLAN AND LONGITUDINAL SECTION	CH. 2596.556 - 2869.528
486/4/6-W10114	PLAN AND LONGITUDINAL SECTION	CH. 2869.528 - 3153.234
486/4/6-W10115	PIPE LIST	—
486/4/6-W10116	ANCHOR BLOCK AND TRENCH DETAILS	—
486/4/6-W10117	AIR VALVE AND GENERAL DETAILS	—
486/4/6-W10118	SCOUR PIT DETAILS	—
486/4/6-W10119	1200 DIA. VALVE PIT N°.1 G.A. BOUNDARY RD.	EXISTING MAIN
486/4/6-W10120	1200 DIA. VALVE PIT N°.1 REINFORCEMENT	—
486/4/6-W10121	1200 DIA. VALVE PIT N°.2 G.A. BOUNDARY RD.	CH. 3.285
486/4/6-W10122	1200 DIA. VALVE PIT N°.2 REINFORCEMENT	—
486/4/6-W10123	1200 DIA. VALVE PIT N°.3 G.A. KING AVE.	CH. 3153.469
486/4/6-W10124	1200 DIA. VALVE PIT N°.3 REINFORCEMENT	—
486/4/6-W10125	ENVIRONMENTAL MANAGEMENT PRACTICES	—
486/4/6-W10126	EASEMENT DETAILS	—

CONTROL POINTS DATA

FILENAME	POINT NO.	EASTING	NORTHING	SURFACE LEVEL	DESCRIPTION
S1987R	9956	8064.904	50134.835	3.941	DUMPY PEG
▪	9957	8043.043	50097.276	4.121	SCREW IN CONC. WALL
▪	9958	8115.618	50143.263	4.591	G.I. NAIL IN POST
M333	9901	7990.460	50224.087	4.737	SCREW IN CONC.
▪	9902	8110.165	49719.308	16.543	STAR PICKET
▪	9903	8194.033	49310.943	33.032	SCREW IN CONC.
▪	9904	8210.840	49237.967	35.012	ALIGNMENT SPIKE
▪	9905	8228.883	49153.919	34.480	SCREW IN CONC.
▪	9909	8019.532	50145.571	4.143	SCREW IN CONC.
▪	9910	8029.610	50094.540	4.444	PEG
▪	9911	8041.212	50035.791	5.003	STAR PICKET
▪	9912	8059.682	49951.196	7.776	PEG
▪	9913	8080.320	49856.675	12.226	STAR PICKET
▪	9914	8095.280	49787.885	14.688	PEG
▪	9915	8133.218	49617.044	18.824	PEG
▪	9916	8156.930	49511.856	21.015	NAIL IN CONC.
▪	9917	8122.912	49721.707	17.623	PEG
▪	9918	8133.151	49723.634	18.142	PEG
▪	9919	8145.211	49619.464	19.941	PEG
▪	9920	8155.391	49621.518	20.395	PEG
▪	9921	8181.228	49403.499	27.115	PEG
▪	9922	8169.793	49514.621	21.469	PEG
▪	9923	8179.511	49516.710	21.946	PEG
▪	9924	8070.120	50000.804	6.912	PEG

CONTROL POINTS DATA

FILENAME	POINT NO.	EASTING	NORTHING	SURFACE LEVEL	DESCRIPTION
M333	9928	8463.652	48216.012	22.995	PEG
▪	9931	8494.989	47885.533	11.600	ORIG. SCREW/CON.
▪	9932	8514.635	47997.057	8.150	PEG
▪	9933	8551.977	47846.463	16.055	ORIG. PEG
▪	9935	8540.263	47817.177	18.076	PEG
▪	9936	8555.257	47805.566	19.316	PEG
▪	9949	8131.599	49543.374	NO DESCRIPTION	
▪	9950	8178.320	49337.204	31.386	NAIL IN CONC.
▪	9951	8209.351	49317.008	32.639	NAIL IN CONC.
▪	9952	8254.466	49038.257	25.423	SCREW IN CONC.
▪	9953	8267.422	49086.321	31.334	DUMPY PEG
▪	9954	8259.833	48970.709	18.800	HILTI IN CONC.
▪	9955	8289.722	48908.724	13.921	G.I. NAIL IN BITUMEN
▪	9956	8303.377	48774.788	18.364	NAIL IN CONC.
▪	9957	8330.245	48651.340	30.122	HILTI IN CONC.
▪	9958	8373.356	48533.081	33.305	HILTI IN CONC.
S1884R	9200	8638.167	47815.573	18.470	PEG
▪	9201	8895.465	47773.303	9.708	SCREW/KER8
▪	9202	9092.605	47740.354	19.016	P.S.M. #32582
▪	9203	9259.469	47706.380	12.071	SCREW/TRAFFIC IS.



FOR NOTES REFER DRAWING NUMBER 486/4/6-W10102
SCALE OF METRES
1 : 5000

NO	DATE	AMENDMENT	INITIALS
DIRECTOR OF PD & PS			
ENGINEER IN CHARGE			
SUPERVISING ENGINEER		R/P/Q/N DATE	
NAME	DATE		
DESIGN	G.S.	AUG '96	
DRAWN	S.J.O.	AUG '96	
CHECKED	B.O.B.	SEPT '96	
		REISSUE DATE	
JOB FILE	(3)705/5(572)		
CADD FILE	46W10101		
SURVEYED	FIELD BOOK		
	A.H. DATUM		

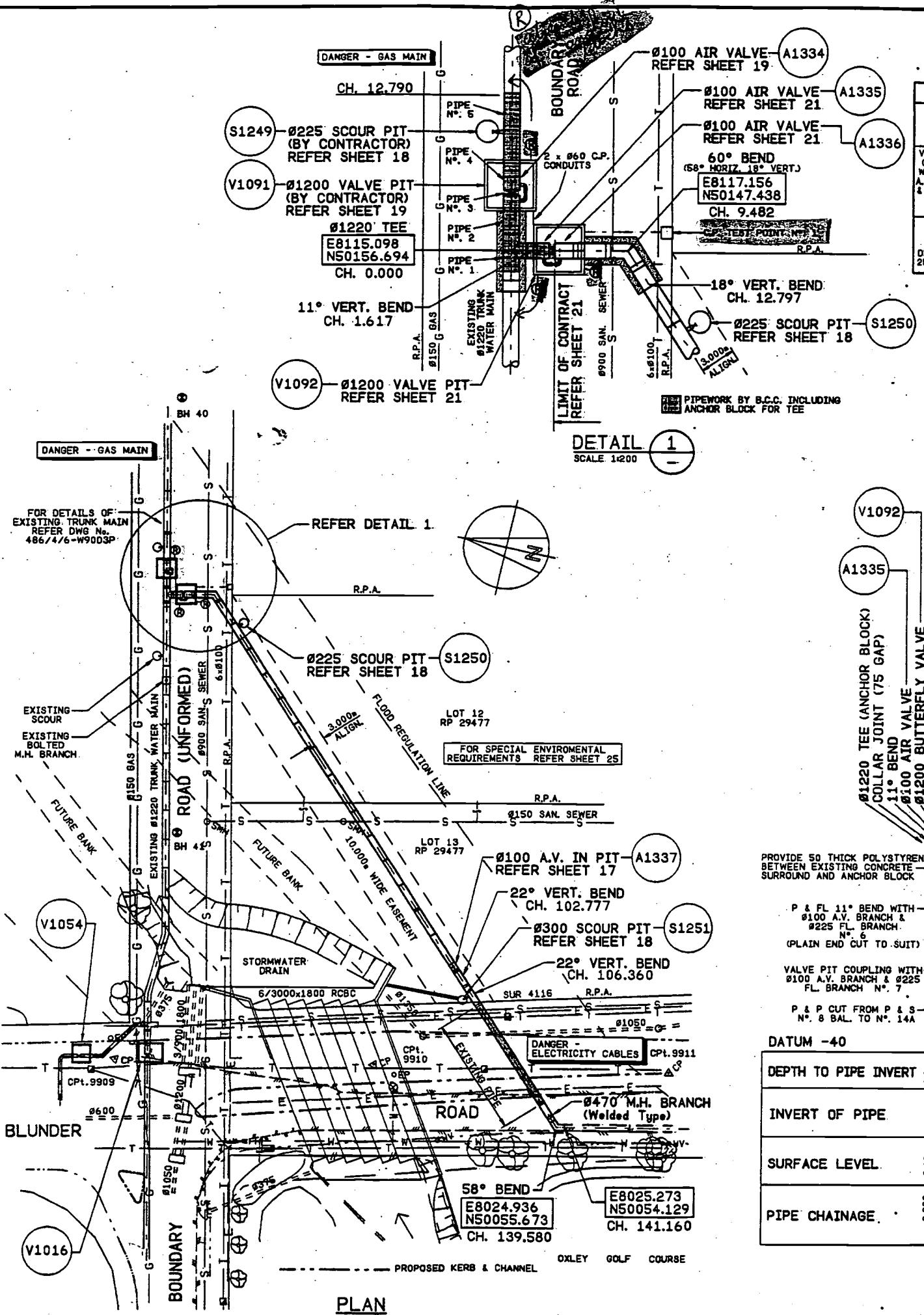
Brisbane Water

PROJECT
MAJOR DISTRIBUTION MAINS LOGAN CITY TRUNK MAIN AMPLIFICATION

TITLE
OXLEY TO SUNNYBANK HILLS SECTION 1 1220 DIA. MSCL WATER MAIN LOCALITY PLAN

SCALE AS SHOWN N° 1 OF 26 SHEETS

DRAWING N° 486/4/6-W10101 AMEND. O



\$1220 CUT IN PIPES		
P & P TEE N°. 1	FL & P 3 ⁶ LONG WITH #225 FL. BRANCH N°. 2	FL & FL 0.478 LONG N°. 3 (TEMPORARY)
ALVE PIT COUPLING WITH #100 V. BRANCH #225 FL. BRANCH N°. 4-	P & P 6 ⁶ LONG WITH #225 SC. BRANCH N°. 5	\$1220 DRILLED FLANGE DEADPLATE 90mm THICK
#225 DRILLED FLANGE EADPLATE 80mm THICK		

Ø1220 MILD STEEL CEMENT LINED PIPE
(MEDIUM DENSITY FUSION BONDED POLYETHYLENE COATED)

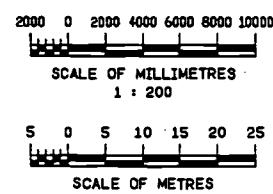
IMPRINTED CURRENT CATHODIC PROTECTION

SOCKETS FACING -

BLUNDER ROAD

LEGEND

○ = = = = = ○ STORMWATER
 E — E ELECTRICITY
 S — S SAN SEWER
 T — T TELSTRA
 G — G GAS
 W — W WATER
 R.P.A. REAL PROPERTY ALIGNMENT
 BH 10 BOREHOLE F



FOR NOTES REFER DRAWING
NUMBER 486/4/6-W10102

NO	DATE	AMENDMENT	INITIALS
DIRECTOR OF P.D. & P.S.			DATE
ENGINEER IN CHARGE	<i>R. H. Kornblum</i>	8/1977	DATE
SUPERVISING ENGINEER	<i>J. A.</i>	R.P.E.I. NO. 2372	DATE 7/5/91
	NAME	DATE	
DESIGN	G.S.	AUG '96	
DRAWN	B.O.B.	NOV '96	
CHECKED	T.A.B.	APR '97	St. Louis City
JOB FILE	(3)705/S(572)		
CADD FILE	46W10103		
SURVEY NO.	M333	FIELD BOOK	8296
SUPERVISED	C. SCHLEIFEN	ALL DATA	



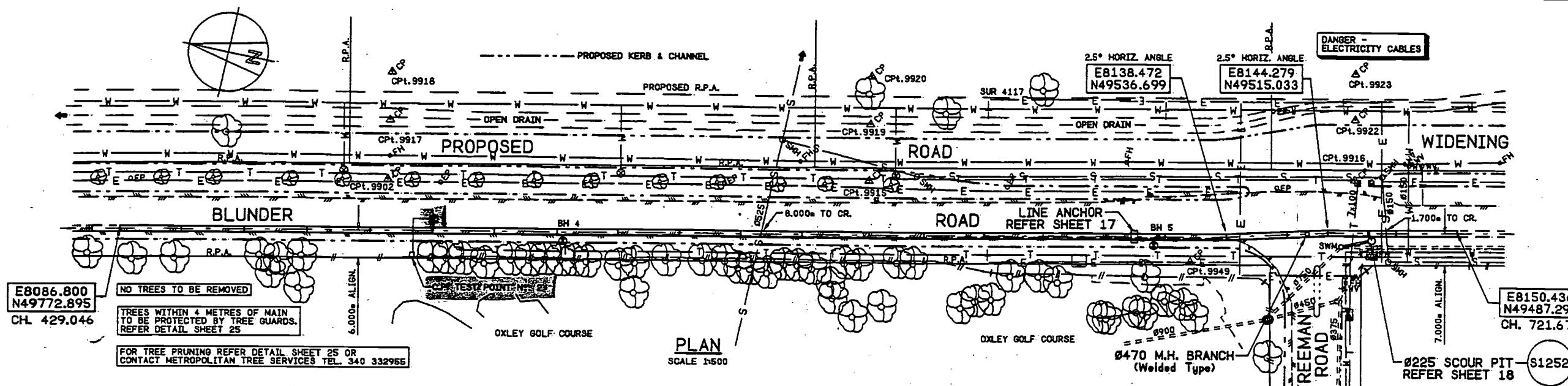
PROJECT
MAJOR DISTRIBUTION MAINS
LOGAN CITY TRUNK MAIN
AMPLIFICATION

TITLE
OXLEY TO SUNNYBANK HILLS
SECTION 1
1220 DIA. MSCL WATER MAIN
PLAN & LONGITUDINAL SECTION

CALE AS SHOWN N° 3 OF 26 SHEETS
DRAWING N° AMEND.
486/4/6-W10103 0

LONGITUDINAL SECTION

CH. 0.000 - 141.160
SCALE HORIZONTAL 1:500
VERTICAL 1:500



Ø1220 MILD STEEL CEMENT LINED PIPE (MEDIUM DENSITY FUSION BONDED POLYETHYLENE COATED)

IMPRINTED CURRENT CATHODIC PROTECTION

BLUNDER ROAD

#525 SANITARY SEWER - \$8,000 TO CR.

DATUM -25

DEPTH TO PIPE INVERT			
INVERT OF PIPE			
SURFACE LEVEL			
PIPE CHAINAGE	429.046	15.123	12.861 2.262
	435.337	15.395	13.124 2.271
	490.173	16.703	14.441 2.262
	525.272	17.457	15.190 2.267
	578.359	18.256	15.994 2.262
	610.137	18.785	16.522 2.263
	643.964		16.968
	654.316	19.423	17.158 2.265
	657.397		17.215
	670.828	19.798	17.555 2.263
	684.259		17.854
	693.259	20.714	17.954 2.260
	708.259		17.954
	718.675	21.766	18.400 3.366

LONGITUDINAL SECTION

~~CH. 429.046 - 721.676~~
SCALES HORIZONTAL 1:500
VERTICAL 1:500

LEGEND

- | | | | |
|--|--------|--|-------------------------|
| | | | STORMWATER |
| | E | | E |
| | S | | S |
| | T | | T |
| | G | | G |
| | W | | W |
| | R.P.A. | | REAL PROPERTY ALIGNMENT |
| | BH.10 | | BOREHOLE |

SCALE OF METRES
1 : 500

FOR NOTES REFER DRAWING
NUMBER 486/4/6-W10102

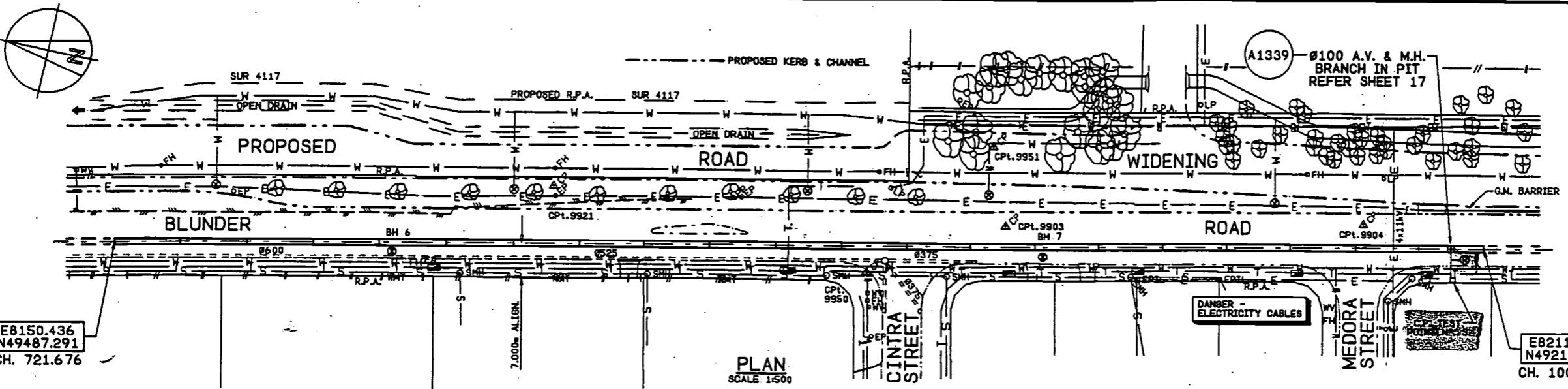
NO.	DATE	AMENDMENT	INITIALS
DIRECTOR OF P.D. & P.S.		DATE	
ENGINEER IN CHARGE <i>L. Brownley</i>		DATE <i>8/15/97</i>	
SUPERVISING ENGINEER <i>la</i>		RFDG. NO. 2372	DATE <i>8/15/97</i>
		NAME	DATE
DESIGN	G.S.	AUG '96	
DRAWN	B.O.B.	OCT '96	
CHECKED	T.A.B.	JAN '97	
JOB FILE		(3)705/5(572)	
CADD FILE		46W10105	
SURVEY NO.		M333	FIELD BOOK
SURVEYED		G.SHELDEN	A.H. DATUM



PROJECT
MAJOR DISTRIBUTION MAINS
LOGAN CITY TRUNK MAIN
AMPLIFICATION

TITLE
OXLEY TO SUNNYBANK HILLS
SECTION 1
1220 DIA. MSCL WATER MAIN
PLAN & LONGITUDINAL SECTION

SCALE AS SHOWN	NO 5 OF 26 SHEETS
DRAWING NO	AMEND.
486/4/6-W10105	0

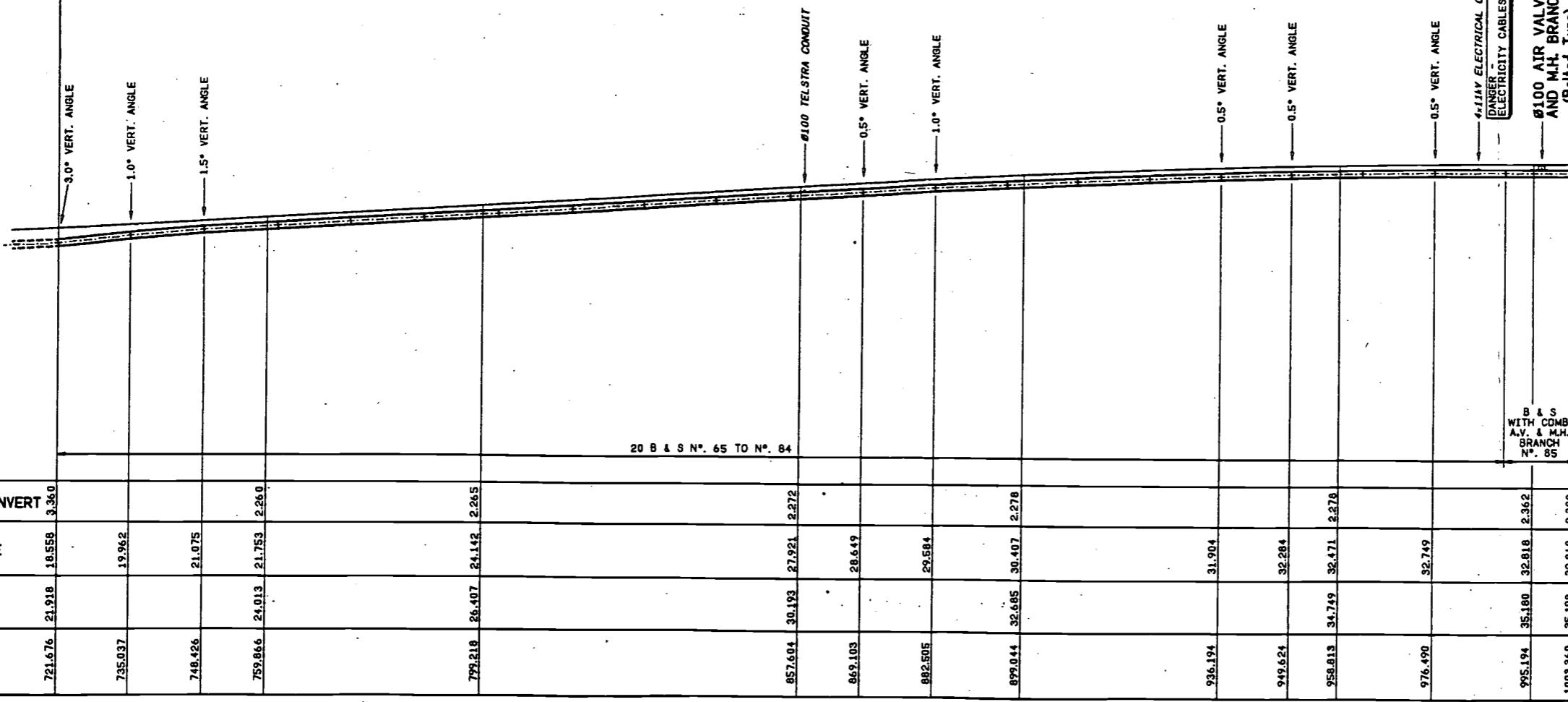


Ø1220 MILD STEEL CEMENT LINED PIPE (MEDIUM DENSITY FUSION BONDED POLYETHYLENE COATED)

IMPRINTED CURRENT CATHODIC PROTECTION

SOCKETS FACING →

BLUNDER ROAD



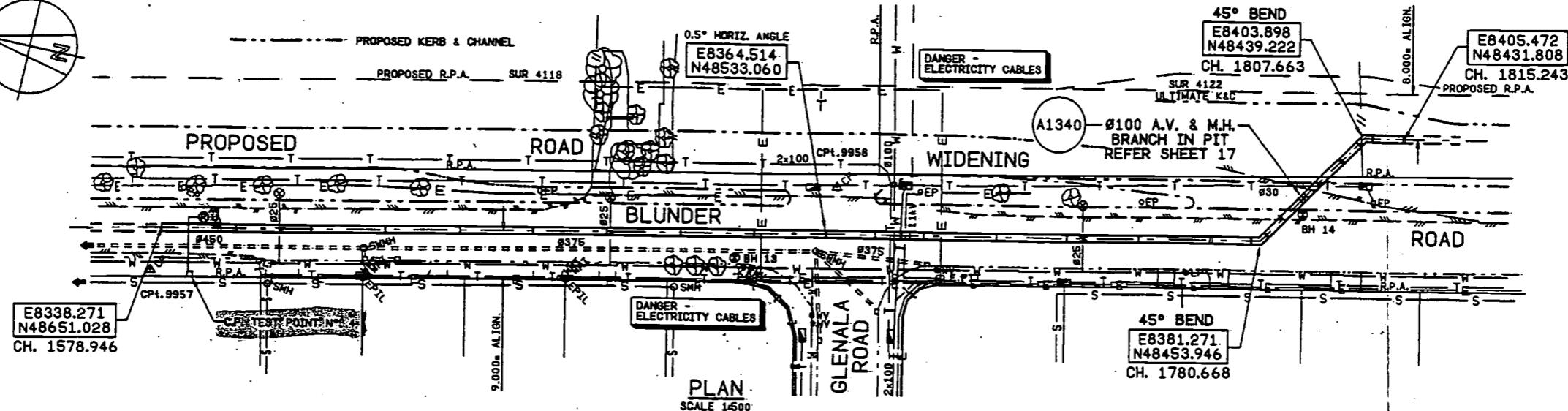
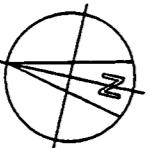
LONGITUDINAL SECTION
CH. 721.676 - 1003.360
SCALES HORIZONTAL 1:500
VERTICAL 1:500

LEGEND	
○	STORMWATER
— E —	ELECTRICITY
— S —	SAN SEWER
— T —	TELSTRA
— G —	GAS
— W —	WATER
— R.P.A. —	REAL PROPERTY ALIGNMENT
● BH.10	BOREHOLE

5 0 5 10 15 20 25
SCALE OF METRES
1 : 500

FOR NOTES REFER DRAWING NUMBER 486/4/6-W10102

NO DATE	AMENDMENT	INITIALS
DIRECTOR OF PD. & P.B.	DATE	
ENGINEER IN CHARGE	DATE	
SUPERVISING ENGINEER	RPEG NO	DATE
NAME	DATE	
DESIGN	G.S.	AUG '96
DRAWN	B.O.B.	OCT '96
CHECKED	T.A.B.	JAN '97
JOB FILE	(3705/5/672)	
CADD FILE	46W10106	
SURVEY NO.	M333	FELD BOOK 8296
SURVEYED	G.SHEDDEN	A.H. DATUM
Brisbane Water		
PROJECT MAJOR DISTRIBUTION MAINS LOGAN CITY TRUNK MAIN AMPLIFICATION		
TITLE OXLEY TO SUNNYBANK HILLS SECTION 1 1220 DIA. MSCL WATER MAIN PLAN & LONGITUDINAL SECTION		
SCALE AS SHOWN	N 6 OF 26 SHEETS	
DRAWING NO.	486/4/6-W10106	AMEND. 0



Ø1220 MILD STEEL CEMENT LINED PIPE (MEDIUM DENSITY FUSION BONDED POLYETHYLENE COATED)

IMRESSED CURRENT CATHODIC PROTECTION

OCKETS FACING -

SOCKETS FACINI

—05 WATER SERVICE

The diagram illustrates two utility poles. The left pole has a sign indicating a vertical angle of 0.6°. The right pole has a sign indicating a horizontal angle of 0.6°. Both signs include hazard warnings for electrical conduits and electricity cables.

— 0.6° VERT. ANGLE

— 0.6° HORIZ. ANGLE

1.0° VERT. ANGLE
ELECTRICAL CONDUIT
DANGER -
ELECTRICITY CABLE

2.0° VERT. ANGLE
ELECTRICAL CONDUIT
DANGER -
ELECTRICITY CABLE

5 0 5 10 15 20 25
SCALE OF METRES
1 : 500

DATUM -25

DEPTH TO PIPE INVERT		2.265
INVERT OF PIPE	27.379	
SURFACE LEVEL		
PIPE CHAINAGE		
1578.946	29.644	27.379
1604.868	30.823	28.554
1605.789		28.597
1619.214		29.110
1649.278	32.395	30.107
1672.930		30.700
1686.363		30.907
1690.020	33.301	30.907
1699.798	33.410	30.907
1717.798		30.907
1731.227		31.326
1734.510	33.617	31.355
1758.096		31.534
1771.539		31.534
1793.264		34.076
1795.683		31.534
1801.675		31.120
1807.663		33.208

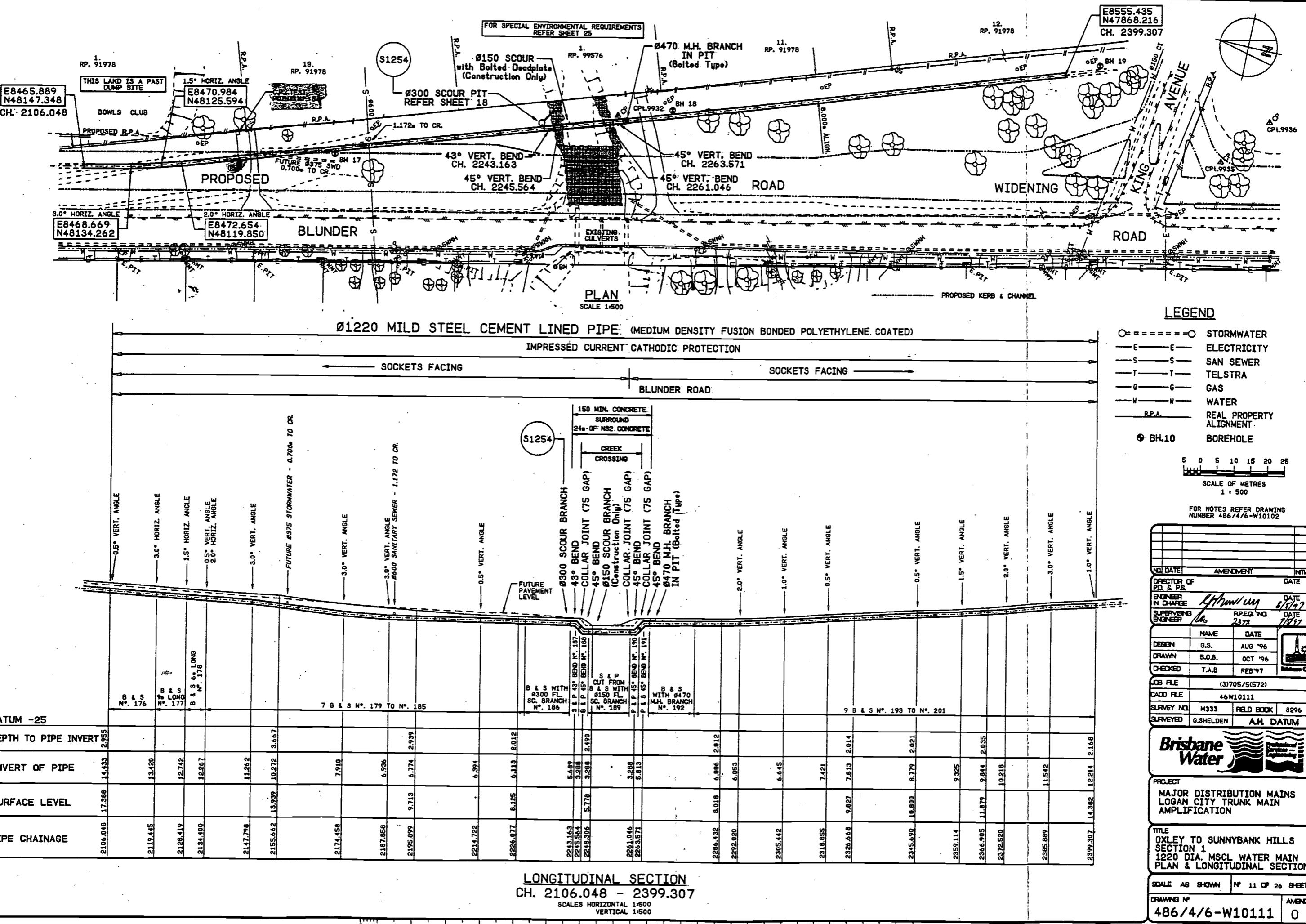
LONGITUDINAL SECTION

CH. 1578.946 - 1815.243

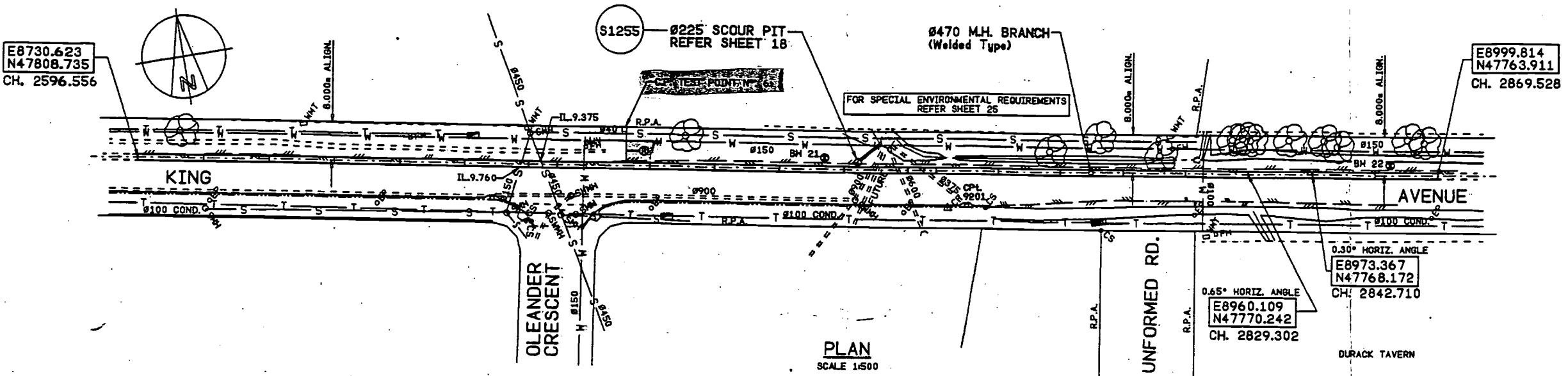
SCALES HORIZONTAL 1:500
VERTICAL 1:500

5 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160

NO DATE	AMENDMENT	INITIAL	
DIRECTOR OF P.D. & P.S.		DATE	
ENGINEER IN CHARGE	<i>M. Bowes</i>	DATE <i>1/1997</i>	
SUPERVISING ENGINEER	<i>R.A.</i>	REQ. NO. 2372	DATE <i>1/1997</i>
	NAME	DATE	
DESIGN	G.S.	AUG '96	
DRAWN	B.O.B.	OCT '96	
CHECKED	T.A.B	JAN '97	
JOB FILE	(S)705/S(572)		
CADD FILE	46W10109		
SURVEY NO.	M333	FELD BOOK 8296	
SURVEYED	G.SHELDEN	A.H. DATUM	
			
PROJECT MAJOR DISTRIBUTION MAINS LOGAN CITY TRUNK MAIN AMPLIFICATION			
TITLE OXLEY TO SUNNYBANK HILLS SECTION 1 1220 DIA. MSCL WATER MAIN PLAN & LONGITUDINAL SECTION			
SCALE AS SHOWN		N 9 OF 26 SHEETS	
DRAWING N° 486/4/6-W10109		AMEND. 0	



NO	DATE	AMENDMENT	INITIALS
DIRECTOR OF PD & PS			
ENGINEER IN CHARGE			
SUPERVISING ENGINEER		RPEQ NO	DATE
NAME	DATE		
DESIGN	G.S.	AUG '96	
DRAWN	B.O.B.	OCT '96	
CHECKED	T.A.B.	FEB '97	
JOB FILE	(3)T05/5(G72)		
CADD FILE	46W10111		
SURVEY NO.	M333	FIELD BOOK	8296
SURVEYED	G.SHEDDEN	A.H. DATUM	
Brisbane Water			
PROJECT			
MAJOR DISTRIBUTION MAINS LOGAN CITY TRUNK MAIN AMPLIFICATION			
TITLE			
OXLEY TO SUNNYBANK HILLS SECTION 1 1220 DIA. MSCL WATER MAIN PLAN & LONGITUDINAL SECTION			
SCALE AS SHOWN	N	11 OF 26 SHEETS	
DRAWING NO	486/4/6-W10111	AMEND	O



Ø1220 MILD STEEL CEMENT LINED PIPE (MEDIUM DENSITY FUSION BONDED POLYETHYLENE COATED)

IMPRINTED CURRENT CATHODIC PROTECTION

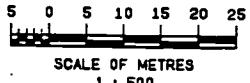
SOCKETS FACING

SOCKETS FACING

KING AVENUE

LEGEND

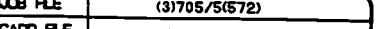
- O = STORMWATER
- E = ELECTRICITY
- S = SAN SEWER
- T = TELSTRA
- G = GAS
- W = WATER
- R.P.A. = REAL PROPERTY ALIGNMENT
- ⊕ BH.10 = BOREHOLE



FOR NOTES REFER DRAWING NUMBER 486/4/6-W10102

NO	DATE	AMENDMENT	INITIALS
DIRECTOR OF P.D. & PS			
ENGINEER IN CHARGE			
SUPERVISING ENGINEER	R.P.E.O. NO.	DATE	
NAME	DATE		
DESIGN	G.S.	AUG '96	
DRAWN	S.S.G.	FEB '97	
CHECKED	T.A.B.	FEB '97	
JOB FILE	(3)705/5(572)		
CADD FILE	46110113		
SURVEY NO.	S1884R	FIELD BOOK	8708/1
SURVEYED	R.BOXALL	A.H. DATUM	

DATE	8/3/97
R.P.E.O. NO.	372
DATE	7/9/97
NAME	
DATE	



PROJECT	MAJOR DISTRIBUTION MAINS LOGAN CITY TRUNK MAIN AMPLIFICATION
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TITLE	OXLEY TO SUNNYBANK HILLS SECTION 1 1220 DIA. MSCL WATER MAIN PLAN & LONGITUDINAL SECTION
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SCALE AS SHOWN	N° 13 OF 26 SHEETS
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DRAWING N°	486/4/6-W10113
AMEND.	0

DATUM -25

DEPTH TO PIPE INVERT

2.265

INVERT OF PIPE

12.736

SURFACE LEVEL

15.001

PIPE CHAINAGE

2596.556

12.736

11.443

2.294

2.265

11.001

10.127

3.349

3.349

2663.589

12.045

8.686

3.349

2677.004

7.966

7.966

2686.556

11.016

7.947

3.069

2715.874

10.151

7.869

2.262

2742.721

9.865

6.538

3.327

2762.156

6.538

6.538

2.517

2775.585

9.749

7.232

2.517

2802.459

7.232

7.232

2.434

2815.893

10.164

7.363

2.801

2829.302

10.631

8.197

2.434

2842.710

11.377

9.062

2.315

2856.117

9.927

10.723

2.286

2869.528

13.009

13.009

2.286

LONGITUDINAL SECTION

CH. 2596.556 - 2869.528

SCALES HORIZONTAL 1:500
VERTICAL 1:500

Active 21/07/2015

