

LUCAS ENGINEERING AND CONSTRUCTION PTY LTD

EXISTING ROAD CONDITION

AUDIT ON PUBLIC ROADS

OLD MAITLAND ROAD CH 5198 TO CH 4850 AND
OLD PUNT ROAD CH 4550 TO CH 1760 TO BE
TRAVERSED BY CONSTRUCTION TRAFFIC ON THE
HP PIPELINE CONSTRUCTION FOR THE HEXHAM
TO NEWCASTLE GAS STORAGE FACILITY (NGSF).

PREPARED JOINTLY BY ACCREDITED ROAD SAFETY AUDITORS FROM:

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JANUARY, 2014

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- Site Photographs Numbers 1 to 61 *taken 11/12/2013*

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- Detail Survey of Proposed Gas Main Route with Long Section Old Punt Road Hexham / Tomago. Sheets 1 to 19 prepared by Monteith and Powys for AGL Energy Limited, June 2011.

Appendix 3:

- Table 4.3 from RTA MR Form 76.
- Tables 6.1 and 6.3 from Country Road Board Tech. Bulletin No. 31.
- Vehicle Classification System Austroads January 1994.

1.0 INTRODUCTION

1.1 Purpose

Condition 21 of the Part 3A Project Approval Conditions issued by the Department of Planning and Infrastructure (NSW) for the H P Pipeline Construction requires a Pre-Construction Road Inspection Report as follows:-

“Prior to the commencement of construction of the project, the Proponent shall commission a suitably qualified road infrastructure specialist to assess the condition of all public roads proposed to be traversed by construction traffic associated with the project (including over-mass or over-dimensional vehicles) in consultation with Council and the RMS, and to identify any upgrade requirements to accommodate project traffic for the duration of construction (including culvert, bridge and drainage design; intersection treatments; vehicle turning requirements; and site access), having regard to peak traffic volumes. The Pre-Construction Road Inspection Report shall be submitted to the Director-General prior to the commencement of construction works, clearly identifying recommendations made by the Council and the RMS and how these have been addressed. The Proponent shall ensure that all upgrade measures identified in the report are implemented to meet the reasonable requirements of Council and the RMS, prior to the commencement of construction”

There are ‘no over-mass or over-dimensional vehicles’ traversing any public roads.

This existing road condition audit and assessment of the impact of construction traffic on the haul road network of public roads was commissioned by Lucas Engineering and Construction Pty Ltd.

1.2 Description of the Project

The public roads required to be traversed for the deliveries of steel pipes are Pacific Highway SH10, Old Maitland Road and Old Punt Road. These roads are shown marked up in red on the attached Newcastle Gas Storage Facility Project Layout Plan prepared by AGL Energy Limited.

Steel pipes for the DN 400 high pressure gas pipeline have been transported in 18 metre and 12 metre lengths from Newcastle Port to the storage area in Kennington Drive by tri-axle semi-trailer. The route is Industrial Drive MR 316, Pacific Highway SH10 (Maitland Road) to Hexham and north over the Hunter River Bridge to the intersection at Old Punt Road and thence south in Old Punt Road to Kennington Drive. The estimated number of semi-trailer loads and delivery dates to Areas 1, 2, 3 and 4 are as follows:-

151°41'0"E

151°41'30"E

151°42'0"E

151°42'30"E

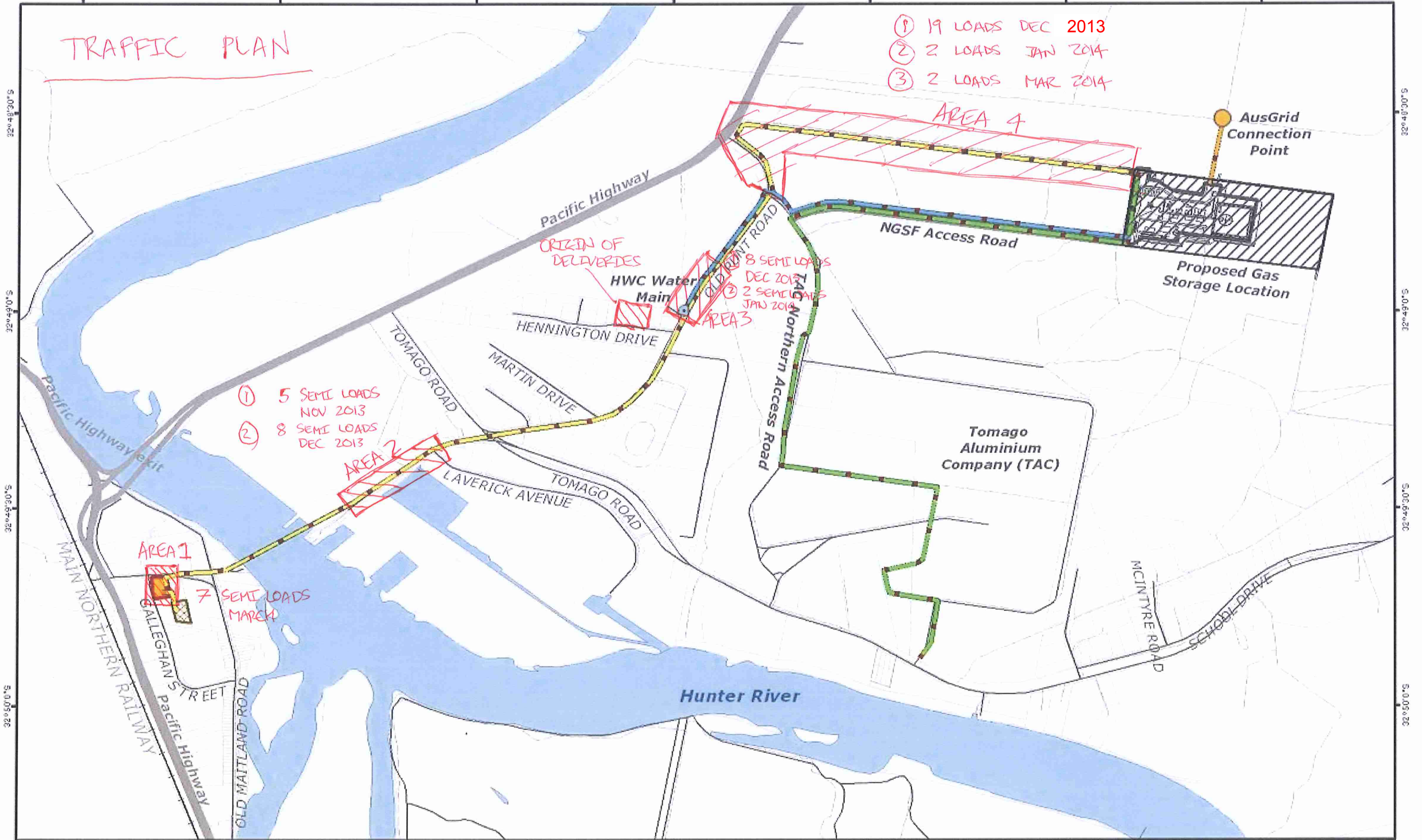
151°43'0"E

151°43'30"E

151°44'0"E

TRAFFIC PLAN

- ① 19 LOADS DEC 2013
- ② 2 LOADS JAN 2014
- ③ 2 LOADS MAR 2014



- ① 5 SEMI LOADS NOV 2013
- ② 8 SEMI LOADS DEC 2013

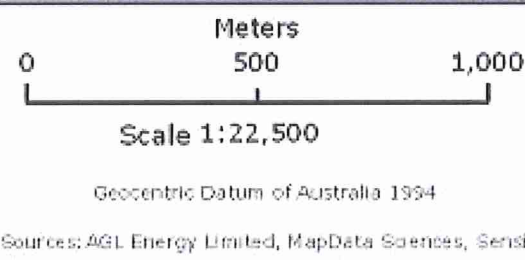
- AREA 1
- 7 SEMI LOADS MARCH

- ① 8 SEMI LOADS DEC 2013
- ② 2 SEMI LOADS JAN 2014



Author: Upstream Gas
 Date: 22/06/2011
 Ref: 2676

Newcastle Gas Storage Facility Project Layout



Legend

Water Pipeline	NGSF Preferred Pipeline Route	Hexham Receiving Station Site	Highway
Low Pressure Pipe Option 1	Electricity Connection	Jemena Gate Station	Roads
		Proposed gas plant site	Vehicular track
		NGSF Access Road	Railways
		HWC Water Main	Cadastre
		AusGrid Connection Point	Waterbody

Disclaimer: While AGL has taken great care and attention to ensure the accuracy of the data represented on this map, no liability shall be accepted for any errors or omissions. No part of this map may be reproduced without prior permission of AGL.

1.2 (Continued)

Area	Number of Semi-Trailer Loads	Delivery Date
1	7	March, 2014
2	5	November, 2013
	8	December, 2013
3	8	December, 2013
	2	January, 2014
3	19	December, 2013
	2	January, 2014
	2	March 2014
TOTAL	53	

The **haulage routes** from the *origin of deliveries* at *Kennington Drive* to *Construction Areas 2, 3 and 4* are as follows:-

Area 1 -	<i>North</i> along Old Punt Road, left turn into Pacific Highway, <i>south</i> in Pacific Highway <i>across</i> the Hunter River bridge and left turn from Pacific Highway into Old Maitland Road.
Area 2 -	<i>South</i> along Old Punt Road.
Area 3 -	<i>North</i> along Old Punt Road.
Area 4 -	<i>North</i> along Old Punt Road and the gravel NGSF access road.

1.3 Audit Team

The team comprised the following personnel:-

Craig McLaren, BE, Grad Dip (Transport), M.I.T.E. Aust., M.A.I.T.P.M.

Nominated Road Safety Auditor who has undertaken IMEA Road Safety Accreditation course and is an accredited Level 3 auditor and has successfully completed the NSW Transport Training Course programme Road Safety Auditing for Leaders 2013. Director of McLaren Traffic Engineering with over 25 years experience as a senior traffic engineer Experience in traffic impact assessment, local area traffic management studies, parking studies, road safety audits, accident analysis and geometric design. Craig is the Lead Auditor for this audit.

Lyle Marshall, BE, M.Eng. Sc, Dip Env Stud, F.I.H. & T., C.P. Eng., NPER(Civil) M.I.E. Aust., M.A.I.T.P.M.

Lyle Marshall is the principal of Lyle Marshall and Associates, has undertaken the IPWEA training programme for Road Safety Auditors and is an accredited Level 2 auditor, has completed the NSW Transport Training Course Programme "Road Safety Auditing for Leaders" September 2013 and has over 45 years experience in road design for urban and rural projects, traffic engineering, pavement design, transportation planning, accident investigation, road safety and road condition audits, bridge design and construction.

1.4 Documents Reviewed

The following documents were reviewed for the preparation of this 'condition assessment of the public haulage roads':-

1. Condition 21 imposed by the Department of Planning and Infrastructure (NSW).
2. Newcastle Gas Storage Facility – High Pressure Gas Pipeline. Scope of Work for Pipeline Construction prepared by Worley Parsons, March 2013.
3. Detail Survey of Proposed Gas Main Route with Long Section Old Punt Road Hexham / Tomago Sheets 1 to 19 Rev 5 CAD File Ref No. 10/256 prepared by Monteith and Powys, 2/6/2011.
4. Traffic Volumes from RMS Traffic Data.
5. Traffic Volumes from Port Stephens Shire Council.

Austrroads / NSW Transport / Australian Standards Reference Documents:

6. AS1742.2-2009 Manual of Uniform Traffic Control Devices Part 2 : Traffic Control devices for general use.
7. NSW Transport Roads and Traffic Authority Guidelines for Road Safety Audit Practices – 2011.
8. Austrroads Guide to Pavement Technology Part 2 Pavement Structural Design.
9. Austrroads Guide to Pavement Technology Part 3 Pavement Surfacing.
10. Austrroads Guide to Pavement Technology Part 5 – Pavement Evaluation and Treatment Design.
11. Austrroads Guide to Pavement Technology Part 7 : Pavement Maintenance.

1.5 Commencement Meeting

This comprised a 'briefing overview' of the *gas pipeline project* by Paul Shields in the office of Lucas Engineering and Construction Pty Ltd at Hexham followed by an *inspection* of Old Punt Road and the *NGSF gravel access road* to the *gas storage location* including **Areas 2, 3 and 4** on *Wednesday 11th December 2013*.

1.5 (Continued)

The pipeline excavation is carried out underground by a rotary drilling rig at a number of sites along the pipeline route. The steel pipe sections are butt welded above ground to form a long length of pipeline and the pipeline is pulled through the drill hole. The drilling rig was located at Area 1 and had commenced drilling for the pipeline on 11/12/13. The drilling rig will progressively be located to the other sites. The pipeline along the final 1760 metres parallel to the gravel access track to the NGSF storage facility is being welded above ground and will be lowered into an excavated trench and backfilled.

2.0 ROUTE INSPECTION

2.1 Old Maitland Road.

ADT Traffic Volume (Source RMS Newcastle)

The ADT traffic volumes in each direction 20 metres north of Pacific Highway during the school holidays from 12/4/06 to 2/5/06 were:-

Northbound : 1340
Southbound : 1379

After conclusion of the *commencement briefing and inspection*, the Road Condition Audit commenced at about 12:30pm with a 'walkover' of Old Maitland Road and the eastern and western signalized intersections at Pacific Highway. There is a *right-turn ban* from *Pacific Highway westbound* into *Old Maitland Road* at the *western intersection* **Photos P3 and P5**. Traffic at this intersection can turn right into Pacific Highway from Old Maitland Road. There is a *right-turn lane* into Old Maitland Road at the eastern intersection, **Photo P10**. The exit from Old Maitland Road is *left turn only*, **Photo P12**.

There was '*crocodile cracking*' (refer **Figure A2-CR**) over a small area in the *left-turn lane* in Old Maitland Road *north* of the Stop Line at Pacific Highway where the truck is shown in **Photo P7**. This lane is *not part* of the route used by semi-trailers for pipe deliveries to **Area 1** and *no treatment* is proposed.

The *right-turn entry* from Old Maitland Road into the driveway to Storage **Area 1** behind Building No. 235, **Photo P9** can be made by a semi-trailer from near the *western edge* of the pavement in Old Maitland Road. The pavement is *wider* at this location as shown in **Photo P8**.

A semi-trailer exiting and turning *left* from the *driveway or lane* into Old Maitland Road will have to *cross the road centerline*. In **Austrroads Guide to Engineering Practice Part 5**, the *design vehicle for the turn* from the *driveway or lane* into Old Maitland Road would be a *single unit truck*. Where a larger vehicle has to cross the centerline, if *frequency* of the occurrence is *low*, traffic volumes are relatively *low* in Old Maitland Road and *sight distance* at the **50 Km/hr** signposted Speed Limit *complies* with 'stopping sight distance' it is considered acceptable that the inconvenience and risk to other traffic would be *minimal*.

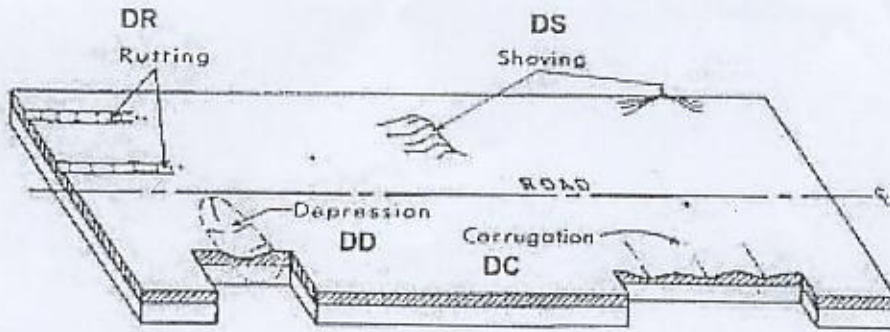


FIGURE A1- DEFORMATION DEFECTS IN FLEXIBLE PAVEMENTS

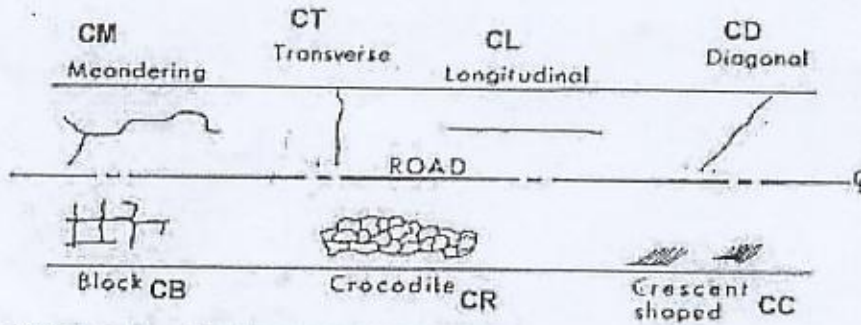


FIGURE A2- CRACKING OF FLEXIBLE PAVEMENTS

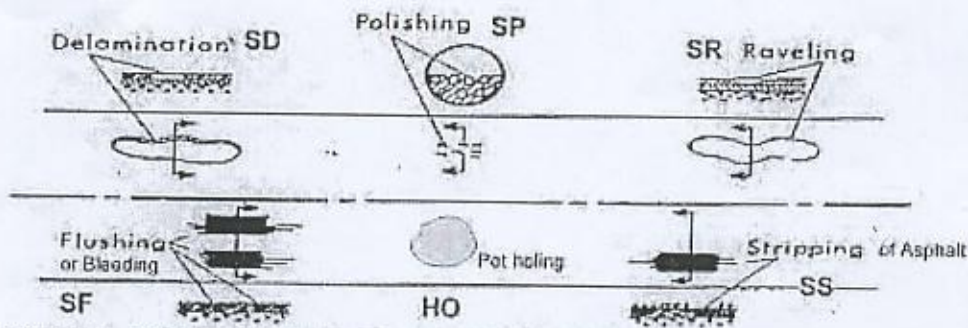


FIGURE A3- SURFACE DISTRESS OF FLEXIBLE PAVEMENTS

DEFECT

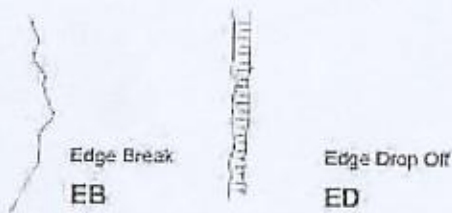


FIGURE A4- EDGE DEFECTS

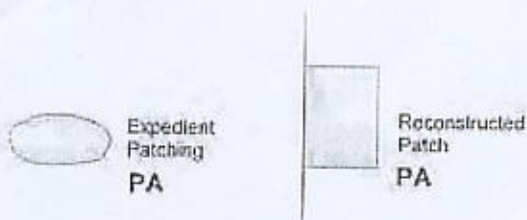


FIGURE A5- PATCHING

2.2 Old Punt Road

ADT Traffic Volume

North of Kennington Drive and South of Northern Access Road to Smelter.

Count 25/09/12 to 05/10/12 - *Source RMS Newcastle.*

Northbound : 1014
Southbound : 938

ADT Counts	July 2009	September 2011	Source Port Stephens Shire Council
Two-Way Volume	1655	1838	
% H.V.	17%	17%	

Composition of Traffic:

The Pacific Highway, Tomago Road **MR 302** and Old Punt Road *north* of **MR 302** are **B Double Routes**. Hence, the *road and intersection alignment* is *approved* for B Doubles. There is a *right-turn ban* on the right-turn from Tomago Road to the *north* into Pacific Highway and hence *all traffic to the north has to turn right* into Old Punt Road at the **roundabout**. The types of large articulated trucks **Classes 9** and **10** and **rigid trucks** travelling along Old Punt Road on 11/12/13 are shown in **Photos P20, P22, P34, P35** and **P36**. The *types of articulated vehicles* travelling *westerly* in the *northern access road* from the smelter to the Pacific Highway are shown in **Photos P43, P45** and **P47**.

Reconstruction of Road Pavement in Old Punt Road:

It is understood from discussion with a Council officer that *substantial reconstruction was undertaken* between Tomago Road and north to Pacific Highway in the *last 20 years*. Old Punt Road carries *substantial truck traffic* and the *Port Stephens Shire Council Pavement Design Specification for Commercial/Industrial Roads* requires a *design traffic loading over a 30 year design life for a flexible pavement of 10⁷ ESA's* (Equivalent Standard Axles loads).

Recently Completed Reconstruction:

A short length of Old Punt Road north from the intersection of Laverick Avenue has been reconstructed to provide a thicker flexible pavement and been resurfaced with asphalt by Port Stephens Shire Council. A Council project engineer advised that the existing pavement was very old and relatively thin.

Visual Assessment of Pavement Condition:

The road pavement is generally in *sound structural condition* between Tomago Road and *north* to the *intersection* with the Pacific Highway. **Photographs P15** to **P43** show the *road pavement, shoulders, pavement line marking* and *signage* at *T-intersections* and the *roundabout*. There are one or two localized areas where *crocodile cracks* are present e.g., **Photo P58**.

2.2 (Continued)

The section of Old Punt Road from the car park and Forgacs buildings north of the Hunter River to Laverick Avenue Ch 3925 to Ch 4300 is a private road owned by Forgacs Marine Engineering. The gas pipeline is in an easement located on the western side of the private road.

The private road to the southern end of the concrete barriers marking the edge of Area No. 2 is shown in **Photos P53 and P54**.

Line marking

The line marking and pavement arrows in Old Punt Road from the intersection at Pacific Highway south to the roundabout at Tomago Road are faded in a number of locations. It is considered that line marking would be carried out periodically as part of Councils maintenance programme.

Signage:

The *signage complies* with the requirements of **AS 1742.2 – 2009** at all *tee intersections* and the *roundabout*.

Trucks *turn into* and *out of* Old Punt Road to the **NGSF** gravel track at **Ch 1760**. Dust is carried *onto the road pavement* in Old Punt Road.

3.0 IMPACT OF PIPELINE CONSTRUCTION TRAFFIC ON DAMAGE TO ROAD PAVEMENT ON PUBLIC ROADS.

The damage to a road pavement by the passage of a heavy vehicle depends on its gross weight, the number of axles, the type of axle grouping and the loading applied through each axle group.

Based upon Table 6.1 in Appendix 3 a tri-axle semi trailer is equivalent to 3.2 ESA's fully laden and 1.0 unladen. These loads are approximate but adequate for this assessment.

3.1 Pacific Highway

The estimated design traffic loading per lane on this 4 lane highway with turning lanes at signalized intersections would be at least 10^7 ESA's over its design life.

The deliveries of all steel pipes from the Port of Newcastle require 53 semi-trailer movements north bound to the intersection of Old Punt Road and 53 empty truck movements southbound on the return journey.

Based upon the following assumptions:-

1. The traffic volume is evenly distributed over 4 lanes.
2. The approximate number of ESA's per HV is 1.0 on a State Highway.
3. The percentage of HV is 5%.
4. Pavement design life of 30 years.
5. A growth rate of 3.0% pa over 26 years at station 5.001.
6. A growth rate of 1.1% pa over 20 years at station 5.052.
7. Approximate ESA's per HV on State Highway = 1.0.
The estimated number of ESA's per lane in each direction at Stations 5.001 and 5.052 in 2013 were as follows:-

Station 5.001 1 km north of Hunter River Bridge

AADT 2010 = 40354

AADT1984 = 18683

Average annual growth rate compound 3%

Estimated AADT 2014 = 46348

Average AADT 1984 – 2014 = 32016

Average AADT / Lane = 8004

Total Traffic Volume over 30 years / lane = 87,643,000

Number of HV / lane = 4.382×10^6

Number ESA's = 4.382×10^6

Impact of additional 53 loaded semi-trailers north bound 0.004%.

The pavement damage caused by pipeline construction traffic is negligible. This conclusion also applies to the Pacific Highway at Station 5.052 south of the New England Highway at Hexham.

3.2 Old Punt Road North of Kennington Drive

ADT 2012 :	Northbound	1014	51.9%	HV's
	Southbound	<u>938</u>	48.1%	
	Total	1952		

ADT 2011	1838	17%
ADT 2009	1655	17%

Annual average compound growth rate over 3 years = 5.5%
Design life 30 years 1992 to 2022.

ADT 1992 – 669
ADT 2022 – 3334
Average ADT over 30 years = 2001
Average ADT / lane = 1000
ADT / lane over 30 years = 10,950,000
Number HV's = $.17 \times 10,950,000$
= 1,861,500

From Table 6.3 in Tech Bulletin 31
Number of ESA's / HV on Industrial roads = 1.5
Number of ESA's = $1,861,500 \times 1.5$
= 2.79225×10^6

Number of loaded semi-trailers northbound = 33
Number of ESA's = $33 \times 3.2 = 106$

Number of empty semi-trailers southbound = 33
Number of ESA's = $33 \times 1.0 = 33$

Percentage increase northbound = .004%
Percentage increase southbound = .001%
Hence the impact on the pavement damage in Old Punt Road north and south of Kennington Drive is negligible.

It may be concluded that the impact is lower south of Kennington Drive, because the number of loaded semi-trailers is only 13.

4.0 SUGGESTED TREATMENTS

4.1 Old Maitland Road

'Truck crossing' or 'entering' signs **W5-22B** be installed on the western side of Old Maitland Road opposite the driveway to the rear of No. 235 facing north and south.

Responsible Authority:

Lucas Engineering and Construction Pty Ltd with Newcastle City Council approval of the signs.

4.2 Old Punt Road

Erect truck crossing or entering signs **W5-22B** on the southern side of Old Punt Road opposite the entrance to the NGSF gravel access track. The signs are to face east and west.

Responsible Authority

Lucas Engineering and Construction Pty Ltd with Port Stephens Shire Council approval.

5.0 COMPLETION MEETING

This comprised a phone discussion of a draft version of this report between Craig M^CLaren and Dean Engelbrecht from Lucas Engineering and Construction Pty Ltd on 14 January 2014.

The content of the report related to road conditions, traffic safety and risk was accepted by Lucas Engineering and Construction Pty Ltd.

6.0 FORMAL STATEMENT

The auditors have carried out a joint inspection of the public roads traversed by construction traffic for the gas pipeline from Hexham to the Newcastle Gas storage Facility (NGSF).

The auditors attended a briefing overview of the gas pipeline project by Paul Shields, had a number of discussions with Dean Engelbrecht and reviewed the information supplied by Lucas Engineering and Construction that is listed in **Appendix 2** and have referred where necessary to **Austroads / NSW Transport / Australian Standards** reference documents listed in Section 1.4

The audit has been carried out for the purposes specified in the Brief. The findings and suggested treatment are put forward for consideration and implementation by Lucas Engineering and Construction in Consultation with RMS Newcastle, Newcastle City Council and Port Stephens Shire Council.



.....
Craig McLaren (RSA-02-0263)
Lead Auditor



Lyle Marshall (RSA-02-0288)
Level 2 Auditor

14 JANUARY 2014

APPENDICES

APPENDIX 1



PHOTO P1 View South in Old Maitland Road from Driveway at No. 235.



PHOTO P2 View South in Old Maitland Road to Traffic Signals at Pacific Highway.



PHOTO P3 View West Along Pacific Highway at Old Maitland Road. No Right Turn into Old Maitland Road.



PHOTO P4 View West Along Pacific Highway at Old Maitland Road..



PHOTO P5 View East along Pacific Highway at Old Maitland Road.



PHOTO P6 View East Along Pacific Highway at Old Maitland Road.



PHOTO P7 View of Old Maitland Road from Pacific Highway



PHOTO P8 View North Along Old Maitland at Junction from Driveway to No. 235.



PHOTO P9 View of Entrance Road to Jemena Gas from Old Maitland Road. Building No. 235 on Right.



PHOTO P10 View west along Pacific Highway from Old Northern Road (Eastern Intersection).



PHOTO P11 View West along Old Maitland Road from bend near Pacific Highway (Eastern Intersection).



PHOTO P12 View south to Pacific Highway from Old Northern Road. Left Turn Exit Only. Eastern Intersection



PHOTO P13 View East along Pacific Highway from Old Maitland Road. Right Turn Entry to Old Maitland Road. Eastern Intersection



PHOTO P14 View South in Old Punt Road to Roundabout in Tomago Road.



PHOTO P15 View south from Old Punt Road to Roundabout at Tomago Road.



PHOTO P16 View of Southern leg of Roundabout at Tomago Road from Central Island.



PHOTO P17 View of Northern leg of Roundabout at Tomago Road from Central Island



PHOTO P18 View of Southern leg of Roundabout at Tomago Road from Central Island.



PHOTO P19 View of Northern leg of Roundabout at Tomago Road from central Island.



PHOTO P20 Long articulated vehicle in Old Punt Road from Foresight Avenue.



PHOTO P21 View North in Old Punt Road towards T Intersection at Foresight Avenue.



PHOTO P22 View South in Old Punt Road from T Intersection at Foresight Avenue..



PHOTO P23 View North in Old Punt Road towards T Junction at Martin Drive.



PHOTO P24 View East from Martin Drive to Old Punt Road



PHOTO P25 View South in Old Punt Road from T Junction at Martin Drive



PHOTO P26 View North in Old Punt Road from Martin Drive.



PHOTO P27 View North in Old Punt Road from point South of Industrial Estate Road.



PHOTO P28 View East along Industrial Estate Road..



PHOTO P29 View South along Old Punt Road from Point north of access to Industrial Estate..



PHOTO P30 View North along Old Punt Road towards Kennington Dr. from point north of access to Industrial Estate.



Photo P33 View east in Kennington Drive towards Old Punt Road. B Doubles use Kennington Drive.



Photo P34 View south in Old Punt Road from point south of Kennington Drive



Photo P35 Example of Articulated Vehicle in Old Punt Road.



PHOTO P36 Example of Truck and Dog-Trailer using Old Punt Road.



PHOTO P37 View of Upstream Headwall in twin 1050 Dia. RCP Culvert at Ch 2100



PHOTO P38 View north along Old Punt Road towards T Junction with Northern Access Road to Tomago Shelter.



PHOTO P39 View north in Old Punt Road. Power Pole in Clear Zone.



PHOTO P40 B Double in Old Punt Road between northern access road to Smelter and Pacific Highway.



PHOTO P41 View south/east in Old Punt Road towards T Junction with Smelter northern access road.



PHOTO P42 View west in Old Punt Road, NGSF Gravel access track (Junction) to Gas Storage Facility on right. Advance T Junction sign on left.



PHOTO P43 **Articulated Vehicle in Tomago Smelter Northern Access Road.**



PHOTO P44 **Stone Platform for Site 3 being prepared.**



PHOTO P45 View south in Old Punt Road from Channelised Junction at Smelter access road.



PHOTO P46 Give Way sign for Wildlife Crossing, Smelter road near Junction with Old Punt Road.



PHOTO P47 B Double carrying aluminium rounds from Smelter.



PHOTO P48 View East Along Smelter road towards Tomago Shelter.



PHOTO P49 View west along Smelter access road towards channelised Junction with Old Punt Road.



PHOTO P50 Truck/Trailer unloading stone ballast at Site 3.



PHOTO P51 View South in Old Punt Road to Road Construction Site.



PHOTO P52 Section of Reconstructed Old Punt Road. Asphalt Surfacing required for Completion.



PHOTO P53 View South in Old Punt Road to the Junction with Laverick Avenue



PHOTO P54 View South Along Old Punt Road South of Laverick Ave. Pipe Storage Behind Tric Lok Barriers on Right.



PHOTO P55 View North Along Old Punt Road. Laverick Ave on Right. Old Punt Road Reconstruction Ends.



PHOTO P56 View East Along Laverick Ave from Junction at Old Punt Road.



PHOTO P57 View South Along Old Punt Road Towards Hunter River from Laverick Avenue. Pipe Storage Area on Right of Concrete Barrier.



PHOTO P58 Entrance to NGSF Gravel Track from Old Punt Road. Suggest install trucks W5-22 B (crossina or Enterina).



PHOTO P59 View west along Old Punt Road towards Traffic Signal Controlled Intersection at Pacific Highway



PHOTO P60 View east along Old Punt Road from access to NGSF gravel track.

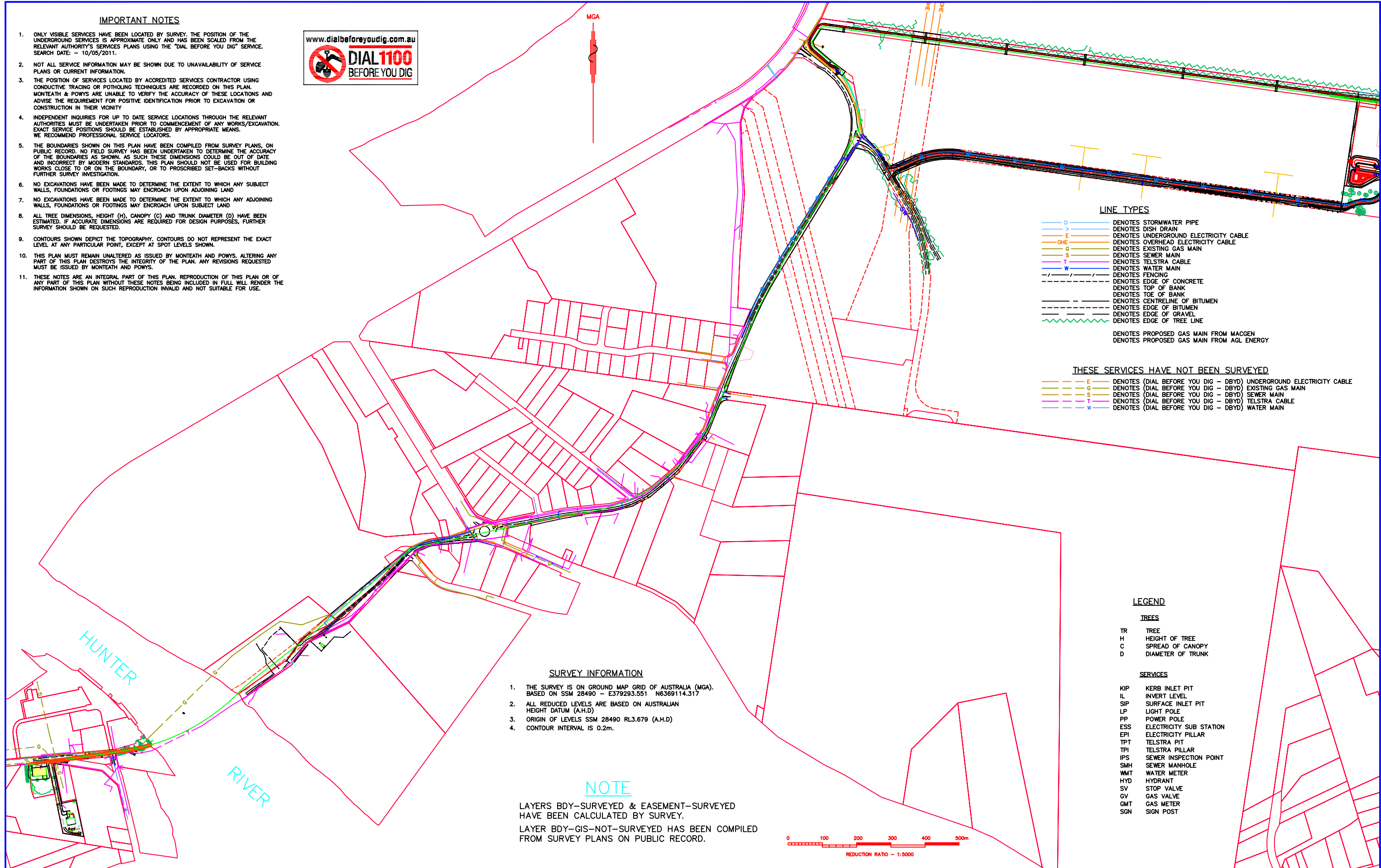


PHOTO P61 View south from gravel track to Old Punt Road.

APPENDIX 2

IMPORTANT NOTES

- ONLY VISIBLE SERVICES HAVE BEEN LOCATED BY SURVEY. THE POSITION OF THE UNDERGROUND SERVICES IS APPROXIMATE ONLY AND HAS BEEN SCALED FROM THE RELEVANT AUTHORITY'S SERVICES PLANS USING THE "DIAL BEFORE YOU DIG" SERVICE. SEARCH DATE: - 10/09/2011.
- NOT ALL SERVICE INFORMATION MAY BE SHOWN DUE TO UNAVAILABILITY OF SERVICE PLANS OR CURRENT INFORMATION.
- THE POSITION OF SERVICES LOCATED BY ACCREDITED SERVICES CONTRACTOR USING CONDUCTIVE TRACING OR POTHOLING TECHNIQUES ARE RECORDED ON THIS PLAN. MONTEATH & POWYS ARE UNABLE TO VERIFY THE ACCURACY OF THESE LOCATIONS AND ADVISE THE REQUIREMENT FOR POSITIVE IDENTIFICATION PRIOR TO EXCAVATION OR CONSTRUCTION IN THEIR VICINITY.
- INDEPENDENT INQUIRIES FOR UP TO DATE SERVICE LOCATIONS THROUGH THE RELEVANT AUTHORITIES MUST BE UNDERTAKEN PRIOR TO COMMENCEMENT OF ANY WORKS/EXCAVATION. EXACT SERVICE POSITIONS SHOULD BE ESTABLISHED BY APPROPRIATE MEANS. WE RECOMMEND PROFESSIONAL SERVICE LOCATORS.
- THE BOUNDARIES SHOWN ON THIS PLAN HAVE BEEN COMPILED FROM SURVEY PLANS ON PUBLIC RECORD. NO FIELD SURVEY HAS BEEN UNDERTAKEN TO DETERMINE THE ACCURACY OF THE BOUNDARIES AS SHOWN. AS SUCH THESE DIMENSIONS COULD BE OUT OF DATE AND INCORRECT BY MODERN STANDARDS. THIS PLAN SHOULD NOT BE USED FOR BUILDING WORKS CLOSE TO OR ON THE BOUNDARY, OR TO PROSCRIBED SET-BACKS WITHOUT FURTHER SURVEY INVESTIGATION.
- NO EXCAVATIONS HAVE BEEN MADE TO DETERMINE THE EXTENT TO WHICH ANY SUBJECT WALLS, FOUNDATIONS OR FOOTINGS MAY ENCRUCH UPON ADJOINING LAND.
- NO EXCAVATIONS HAVE BEEN MADE TO DETERMINE THE EXTENT TO WHICH ANY ADJOINING WALLS, FOUNDATIONS OR FOOTINGS MAY ENCRUCH UPON SUBJECT LAND.
- ALL TREE DIMENSIONS, HEIGHT (H), CANOPY (C) AND TRUNK DIAMETER (D) HAVE BEEN ESTIMATED. IF ACCURATE DIMENSIONS ARE REQUIRED FOR DESIGN PURPOSES, FURTHER SURVEY SHOULD BE REQUESTED.
- CONTOURS SHOWN DEPICT THE TOPOGRAPHY. CONTOURS DO NOT REPRESENT THE EXACT LEVEL AT ANY PARTICULAR POINT, EXCEPT AT SPOT LEVELS SHOWN.
- THIS PLAN MUST REMAIN UNALTERED AS ISSUED BY MONTEATH AND POWYS. ALTERING ANY PART OF THIS PLAN DESTROYS THE INTEGRITY OF THE PLAN. ANY REVISIONS REQUESTED MUST BE ISSUED BY MONTEATH AND POWYS.
- THESE NOTES ARE AN INTEGRAL PART OF THIS PLAN. REPRODUCTION OF THIS PLAN OR OF ANY PART OF THIS PLAN WITHOUT THESE NOTES BEING INCLUDED IN FULL WILL RENDER THE INFORMATION SHOWN ON SUCH REPRODUCTION INVALID AND NOT SUITABLE FOR USE.



LINE TYPES

D	DENOTES STORMWATER PIPE
>	DENOTES DISH DRAIN
E	DENOTES UNDERGROUND ELECTRICITY CABLE
OHE	DENOTES OVERHEAD ELECTRICITY CABLE
G	DENOTES EXISTING GAS MAIN
S	DENOTES SEWER MAIN
T	DENOTES TELSTRA CABLE
W	DENOTES WATER MAIN
- - - - -	DENOTES FENCING
- - - - -	DENOTES EDGE OF CONCRETE
- - - - -	DENOTES TOP OF BANK
- - - - -	DENOTES TOE OF BANK
- - - - -	DENOTES CENTRELINE OF BITUMEN
- - - - -	DENOTES EDGE OF BITUMEN
- - - - -	DENOTES EDGE OF GRAVEL
- - - - -	DENOTES EDGE OF TREE LINE
- - - - -	DENOTES PROPOSED GAS MAIN FROM MACGEN
- - - - -	DENOTES PROPOSED GAS MAIN FROM AGL ENERGY

THESE SERVICES HAVE NOT BEEN SURVEYED

E	DENOTES (DIAL BEFORE YOU DIG - DBYD) UNDERGROUND ELECTRICITY CABLE
G	DENOTES (DIAL BEFORE YOU DIG - DBYD) EXISTING GAS MAIN
S	DENOTES (DIAL BEFORE YOU DIG - DBYD) SEWER MAIN
T	DENOTES (DIAL BEFORE YOU DIG - DBYD) TELSTRA CABLE
W	DENOTES (DIAL BEFORE YOU DIG - DBYD) WATER MAIN

- SURVEY INFORMATION**
- THE SURVEY IS ON GROUND MAP GRID OF AUSTRALIA (MGA). BASED ON SSM 28490 - E379293.551 N6369114.317
 - ALL REDUCED LEVELS ARE BASED ON AUSTRALIAN HEIGHT DATUM (A.H.D)
 - ORIGIN OF LEVELS SSM 28490 RL3.679 (A.H.D)
 - CONTOUR INTERVAL IS 0.2m.

NOTE

LAYERS BDY-SURVEYED & EASEMENT-SURVEYED HAVE BEEN CALCULATED BY SURVEY.

LAYER BDY-GIS-NOT-SURVEYED HAS BEEN COMPILED FROM SURVEY PLANS ON PUBLIC RECORD.



LEGEND

TREES

TR	TREE
H	HEIGHT OF TREE
C	SPREAD OF CANOPY
D	DIAMETER OF TRUNK

SERVICES

KIP	KERB INLET PIT
IL	INVERT LEVEL
SIP	SURFACE INLET PIT
LP	LIGHT POLE
PP	POWER POLE
ESS	ELECTRICITY SUB STATION
EPI	ELECTRICITY PILLAR
TPT	TELSTRA PIT
TPI	TELSTRA PILLAR
IPS	SEWER INSPECTION POINT
SMH	SEWER MANHOLE
WMT	WATER METER
HYD	HYDRANT
SV	STOP VALVE
GV	GAS VALVE
GMT	GAS METER
SGN	SIGN POST

REVISIONS	No	REVISION	SVY	DFT	CHK	DATE
	5	HORIZONTAL ROUTE AMENDED - NEW LONGITUDINAL SECTION ADDED	MAK	BJB		08/06/13
	4	GAS MAINS DEPTHS CHANGED FOR NCC TO 2m ON NCC SIDE OF RIVER	MAK	BJB		20/10/11
	3	PROPOSED GAS PIPELINE ROUTE ADDED TO SECTIONS	BJB	MLG	BJB	27/09/11
	2	REVISED GAS PIPELINE ROUTE AND SECTIONS	BJB	MAK	BJB	19/09/11
	1	UNDERGROUND SERVICES ADDED TO LONGITUDINAL SECTION, SOUTH SIDE OF RIVER	BJB	BJC	BJB	31/08/11

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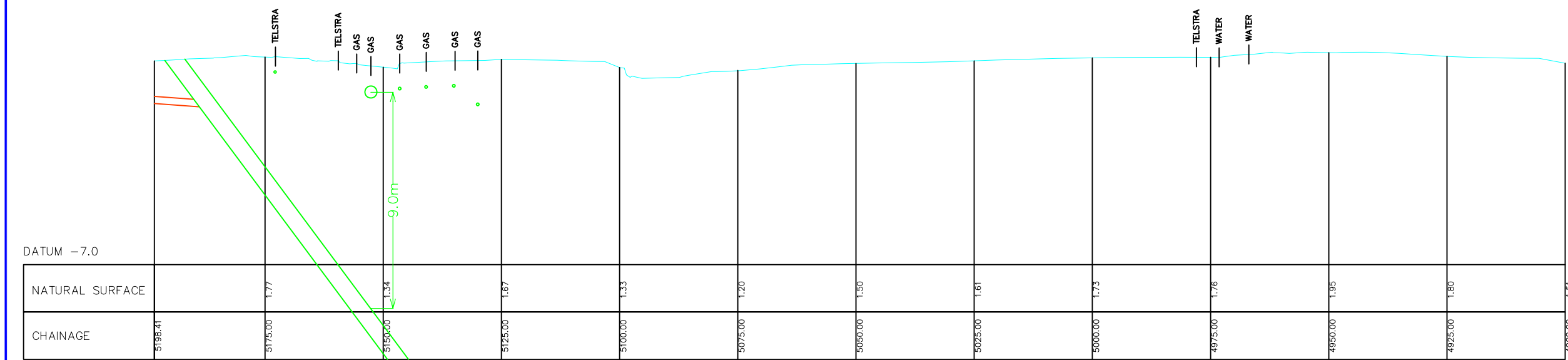
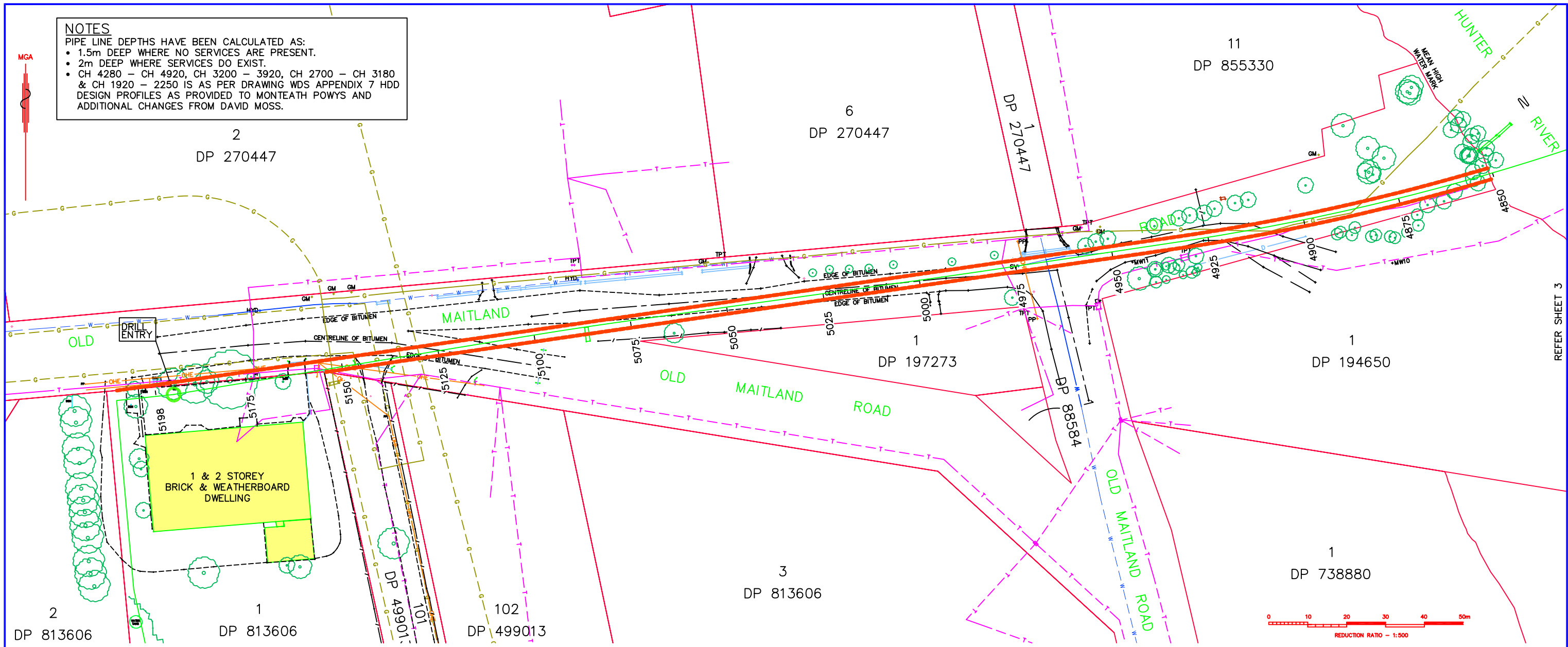
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Surveyed DS	Drafted MAK	Checked BJB	Client AGL ENERGY LIMITED	Sheet No. 1/19
REGISTERED SURVEYOR Scale @A1 : 1:5000 @A3 : 1:10000 DO NOT SCALE			Title DETAIL SURVEY OF PROPOSED GAS MAIN ROUTE WITH LONGSECTION OLD PUNT ROAD HEXHAM / TOMAGO	Revision 5
A1		CAD File: Lucas Alignment Rev 3	Revised: 10/256	Date: 02/06/2011

Last Edit: 8/9/2014

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 & CH 1920 - 2250 IS AS PER DRAWING WDS APPENDIX 7 HDD
 DESIGN PROFILES AS PROVIDED TO MONTEATH POWYS AND
 ADDITIONAL CHANGES FROM DAVID MOSS.



HORIZONTAL SCALE - 1:500
 VERTICAL SCALE - 1:100

LEGEND: -2.40 DENOTES DEPTH FROM SURFACE LEVEL TO TOP OF SERVICE.
 # DENOTES LOCATION SCALED FROM SERVICE AUTHORITY DIAGRAM.

TELSTRA DEPTHS APPROXIMATED FROM PIT INVERTS ONLY.
 OTHER SERVICES NOT SHOWN ON OBDY MAY BE IN THIS AREA.

NOTE: UNDERGROUND SERVICE DEPTHS ARE APPROXIMATE ONLY AND HAVE NOT BEEN POTHOLED. BEFORE ANY WORKS TAKE PLACE ON SITE THESE DEPTHS SHOULD BE CONFIRMED.

REVISIONS	No	REVISION	SVY	DFT	CHK	DATE
5		HORIZONTAL ROUTE AMENDED - NEW LONGITUDINAL SECTION ADDED	MAK	BJB		08/06/13
4		GAS MAINS DEPTHS CHANGED FOR NCC TO 2m ON NCC SIDE OF RIVER	MAK	BJB		20/10/11
3		PROPOSED GAS PIPELINE ROUTE ADDED TO SECTIONS	BJB	MLG	BJB	27/09/11
2		REVISED GAS PIPELINE ROUTE AND SECTIONS	BJB	MAK	BJB	19/09/11
1		UNDERGROUND SERVICES ADDED TO LONGITUDINAL SECTION, SOUTH SIDE OF RIVER	BJB	BJC	BJB	31/08/11

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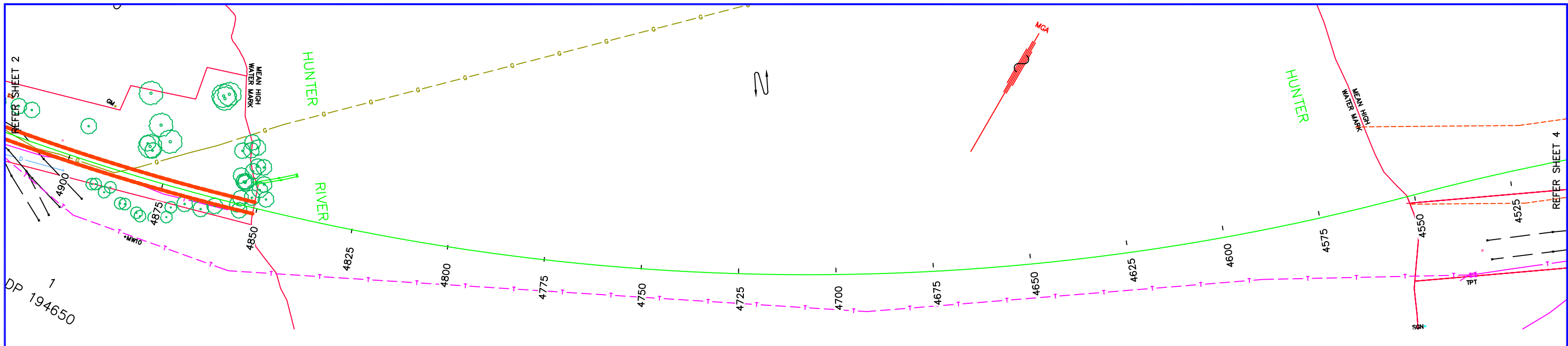
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REGISTERED SURVEYOR Scale @A1 : 1:500 @A3 : 1:1000 DO NOT SCALE			Title DETAIL SURVEY OF PROPOSED GAS MAIN ROUTE WITH LONGSECTION OLD PUNT ROAD HEXHAM / TOMAGO	Revision 5
A1			CAD File: Lucas Alignment Rev 3 No: 10/256 Date: 02/06/2011	

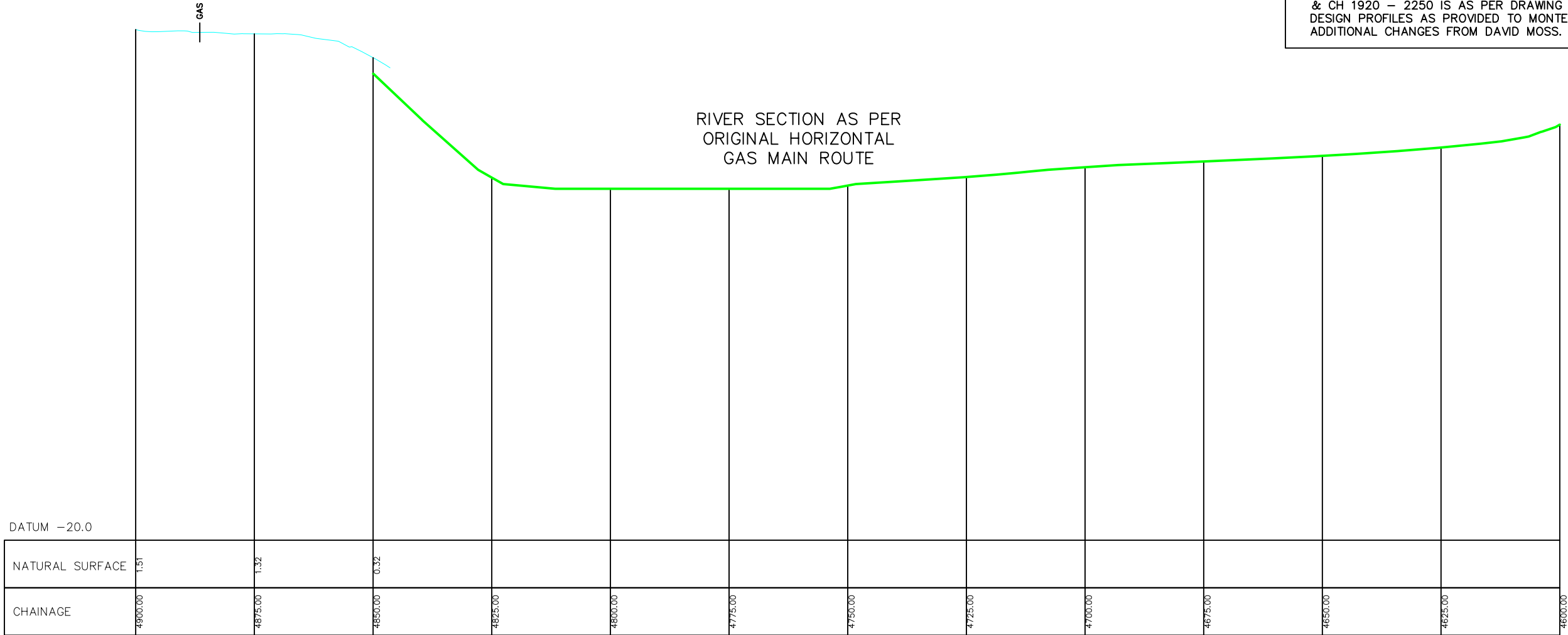
REFER SHEET 3

LAH/ER/801/2014



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RIVER SECTION AS PER ORIGINAL HORIZONTAL GAS MAIN ROUTE



DATUM -20.0

NATURAL SURFACE	1:51	1:32	0:32															
CHAINAGE	4900.00	4875.00	4850.00	4825.00	4800.00	4775.00	4750.00	4725.00	4700.00	4675.00	4650.00	4625.00	4600.00	4575.00	4550.00	4525.00		

HORIZONTAL SCALE - 1:500
 VERTICAL SCALE - 1:100

LEGEND: -2.40 DENOTES DEPTH FROM SURFACE LEVEL TO TOP OF SERVICE.
 # DENOTES LOCATION SCALED FROM SERVICE AUTHORITY DIAGRAM.

TELSTRA DEPTHS APPROXIMATED FROM PIT INVERTS ONLY.
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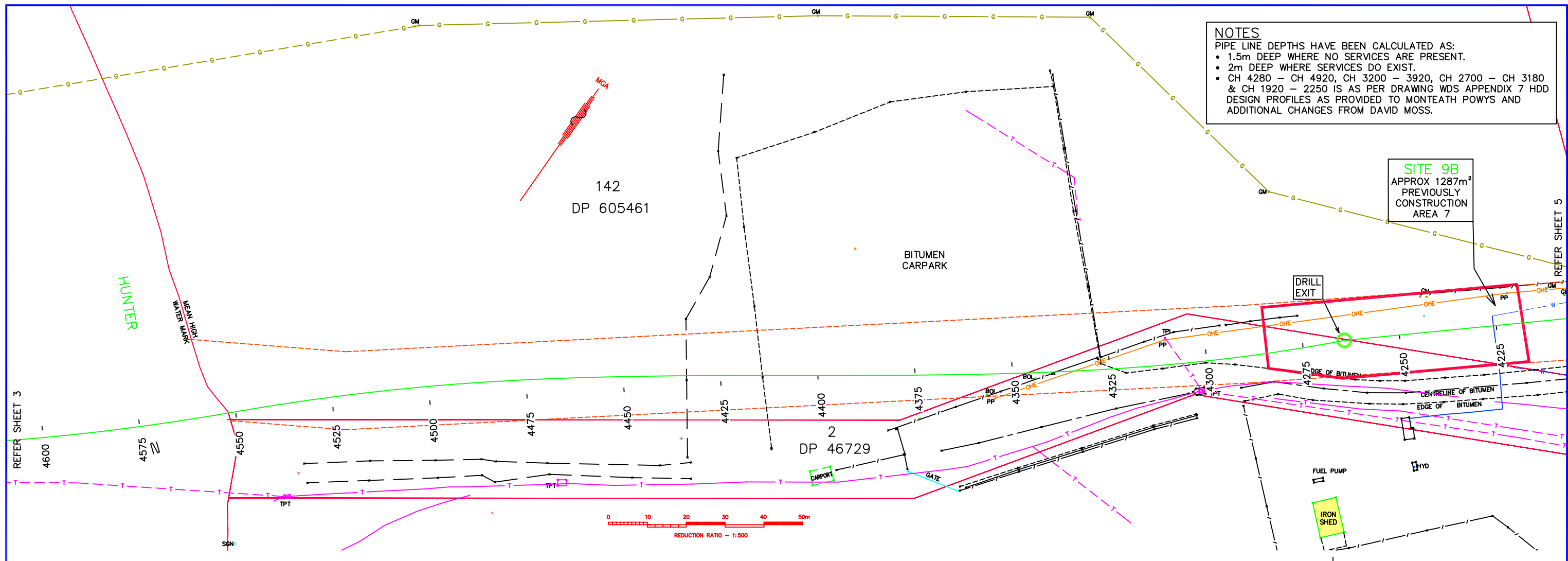
REVISIONS	No	REVISION	SVY	DFT	CHK	DATE	DESCRIPTION
	5	HORIZONTAL ROUTE AMENDED - NEW LONGITUDINAL SECTION ADDED	MAK	BJB		08/06/13	
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	2	REVISED GAS PIPELINE ROUTE AND SECTIONS	BJB	MAK	BJB	19/09/11	
	1	UNDERGROUND SERVICES ADDED TO LONGITUDINAL SECTION, SOUTH SIDE OF RIVER	BJB	BJC	BJB	31/08/11	

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REGISTERED SURVEYOR Scale @A1 : 1:500 @A3 : 1:1000 DO NOT SCALE			Title DETAIL SURVEY OF PROPOSED GAS MAIN ROUTE WITH LONGSECTION OLD PUNT ROAD HEXHAM / TOMAGO	Revision 5
A1		CAD File: Lucas Alignment Rev 3	Drawn: 10/256	Date: 02/06/2011

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SITE 9B
 APPROX 1287m²
 PREVIOUSLY
 CONSTRUCTION
 AREA 7



RIVER SECTION AS PER ORIGINAL HORIZONTAL GAS MAIN ROUTE

HORIZONTAL SCALE - 1:500
 VERTICAL SCALE - 1:100

DATUM -16.0

NATURAL SURFACE			0.38	0.84	1.41	1.41	1.23	1.80	1.86	1.78	1.82	1.78	1.61
CHAINAGE	4600.00	4575.00	4550.00	4525.00	4500.00	4475.00	4450.00	4425.00	4400.00	4375.00	4350.00	4325.00	4300.00

REVISIONS	No	REVISION	SVY	DFT	CHK	DATE
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1		UNDERGROUND SERVICES ADDED TO LONGITUDINAL SECTION, SOUTH SIDE OF RIVER	BJB	BJC	BJB	31/08/11

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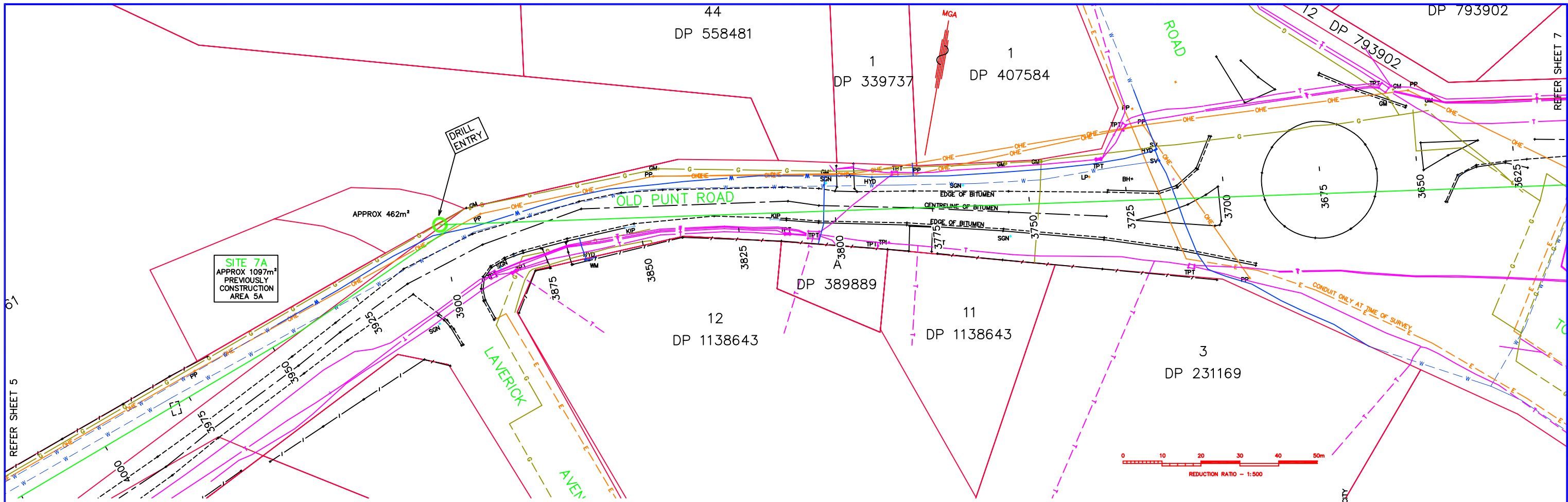
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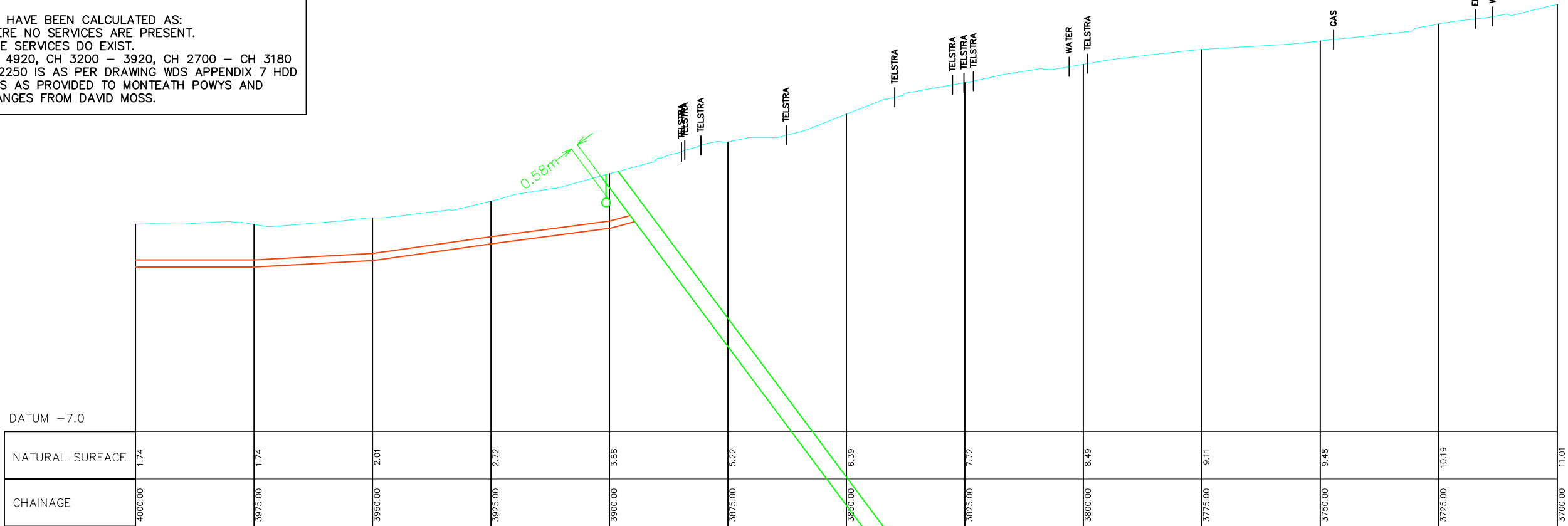
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REGISTERED SURVEYOR Scale @A1 : 1:500 @A3 : 1:1000 DO NOT SCALE			Title DETAIL SURVEY OF PROPOSED GAS MAIN ROUTE WITH LONGSECTION OLD PUNT ROAD HEXHAM / TOMAGO	Revision 5
A1		CAD File: Lucas Alignment Rev 3	No: 10/256	Date: 02/06/2011

Last Edn: 8/01/2014



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DATUM -7.0
 HORIZONTAL SCALE - 1:500
 VERTICAL SCALE - 1:100

REVISIONS	No	REVISION	SVY	DFT	CHK	DATE
5		HORIZONTAL ROUTE AMENDED - NEW LONGITUDINAL SECTION ADDED	MAK	BJB		08/06/13
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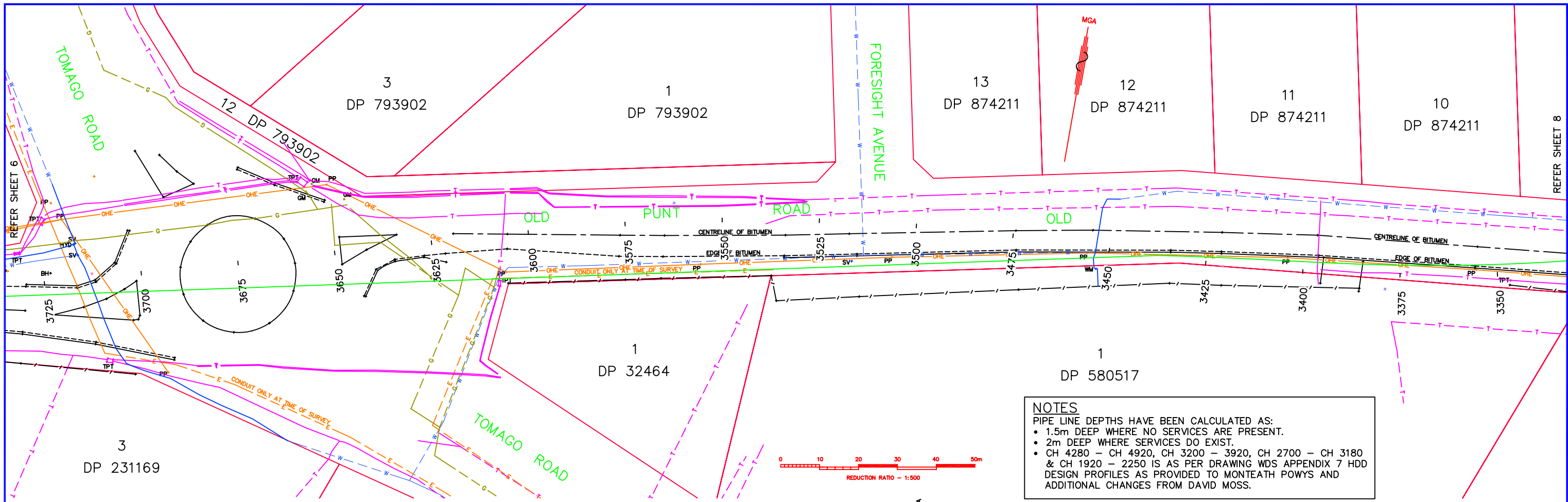
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CHAINAGE	3700.00	3675.00	3650.00	3625.00	3600.00	3575.00	3550.00	3525.00	3500.00	3475.00	3450.00	3425.00	3400.00
NATURAL SURFACE	11.01	11.30	11.09	10.81						11.36	10.95	10.74	10.34

DATUM -7.0
 HORIZONTAL SCALE - 1:500
 VERTICAL SCALE - 1:100

REVISIONS	No	REVISION	SVY	DFT	CHK	DATE	CONDITIONS OF USE.
5		HORIZONTAL ROUTE AMENDED - NEW LONGITUDINAL SECTION ADDED	MAK	BJB		08/06/13	COPYRIGHT NOTICE THIS DOCUMENT REMAINS THE PROPERTY OF MONTEATH & POWYS PTY LTD. CONDITIONS OF USE. THIS DOCUMENT MAY ONLY BE USED BY THE CLIENT FOR THE PURPOSE FOR WHICH IT WAS COMMISSIONED. USE OF THE DOCUMENT FOR ANY OTHER PURPOSE IS NOT PERMITTED UNLESS PRIOR WRITTEN APPROVAL HAS BEEN OBTAINED FROM MONTEATH & POWYS PTY LTD.
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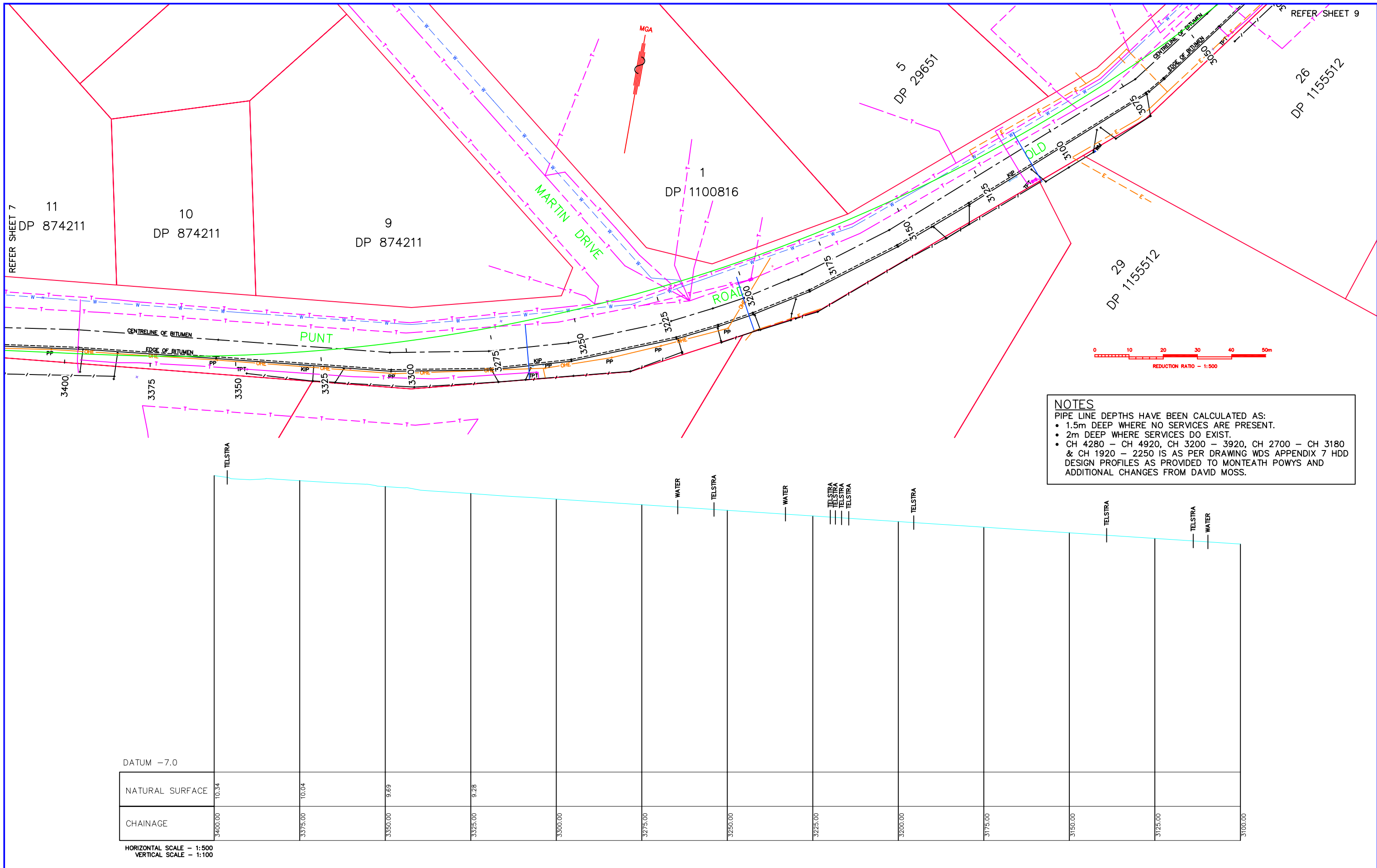
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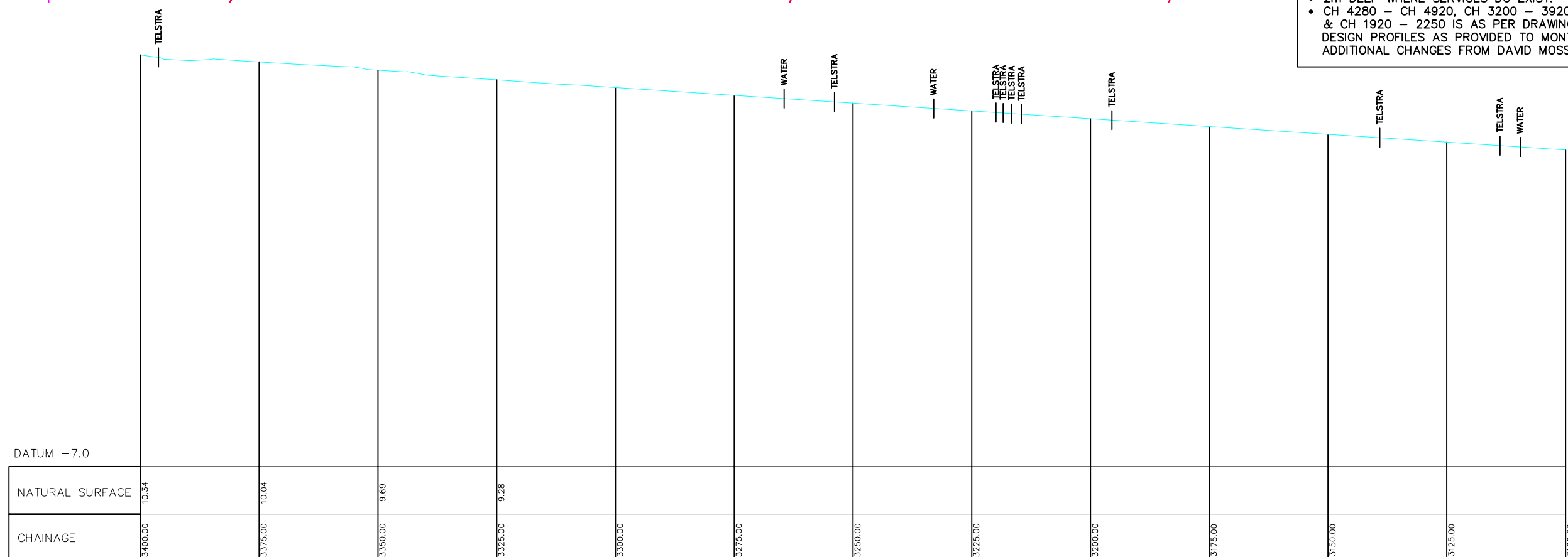
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REGISTERED SURVEYOR Scale @A1 : 1:500 @A3 : 1:1000 DO NOT SCALE			Title DETAIL SURVEY OF PROPOSED GAS MAIN ROUTE WITH LONGSECTION OLD PUNT ROAD HEXHAM / TOMAGO	Revision 5
A1			CAD File: Lucas Alignment Rev: 10/256	Date: 02/06/2011

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HORIZONTAL SCALE – 1:500
 VERTICAL SCALE – 1:100

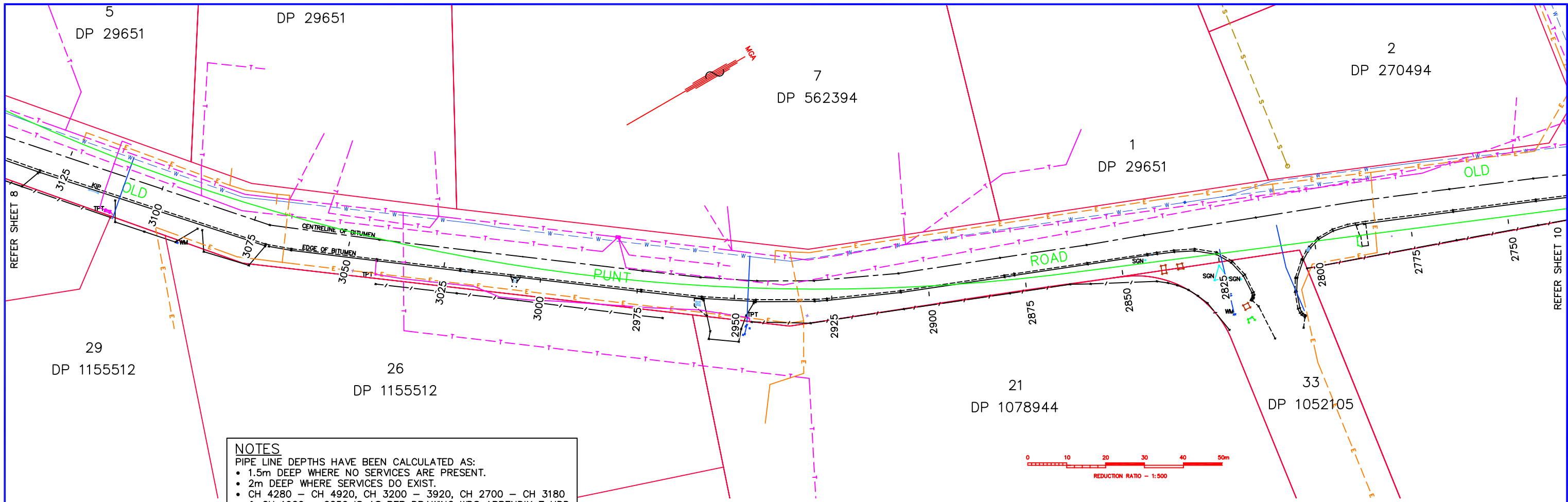
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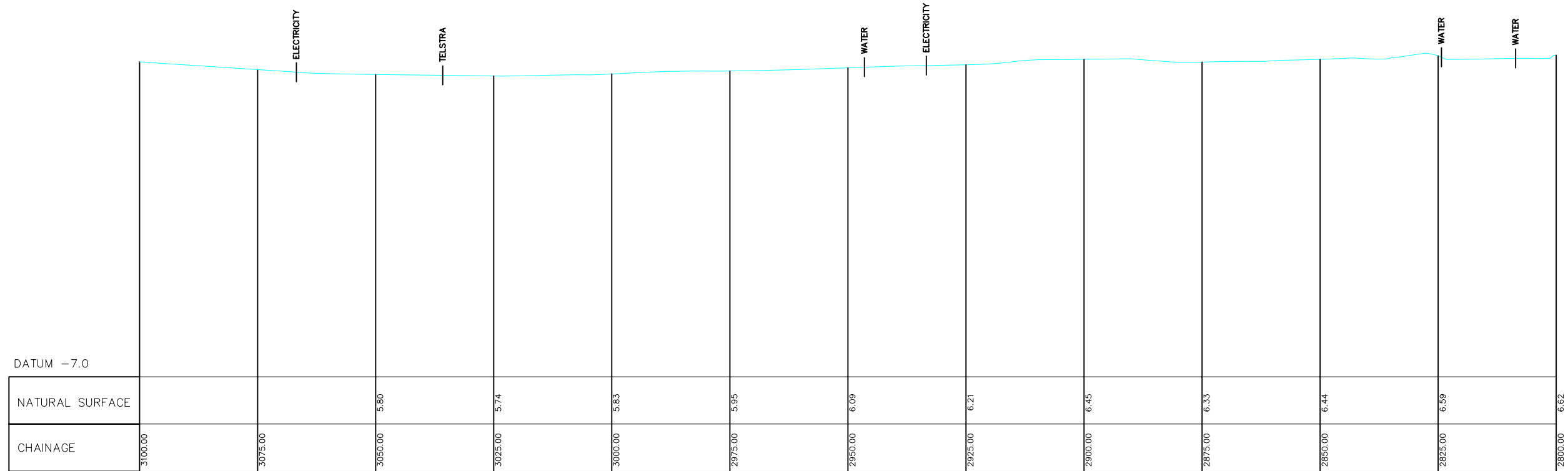
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REGISTERED SURVEYOR			Title DETAIL SURVEY OF PROPOSED GAS MAIN ROUTE WITH LONGSECTION OLD PUNT ROAD HEXHAM / TOMAGO	Revision 5
Scale @A1 : 1:500 @A3 : 1:1000	Original Size	A1	CAD File: Lucas Alignment Rev 3	Date: 02/06/2011



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HORIZONTAL SCALE - 1:500
 VERTICAL SCALE - 1:100

REVISIONS	No	REVISION	SVY	DFT	CHK	DATE	CONDITIONS OF USE.
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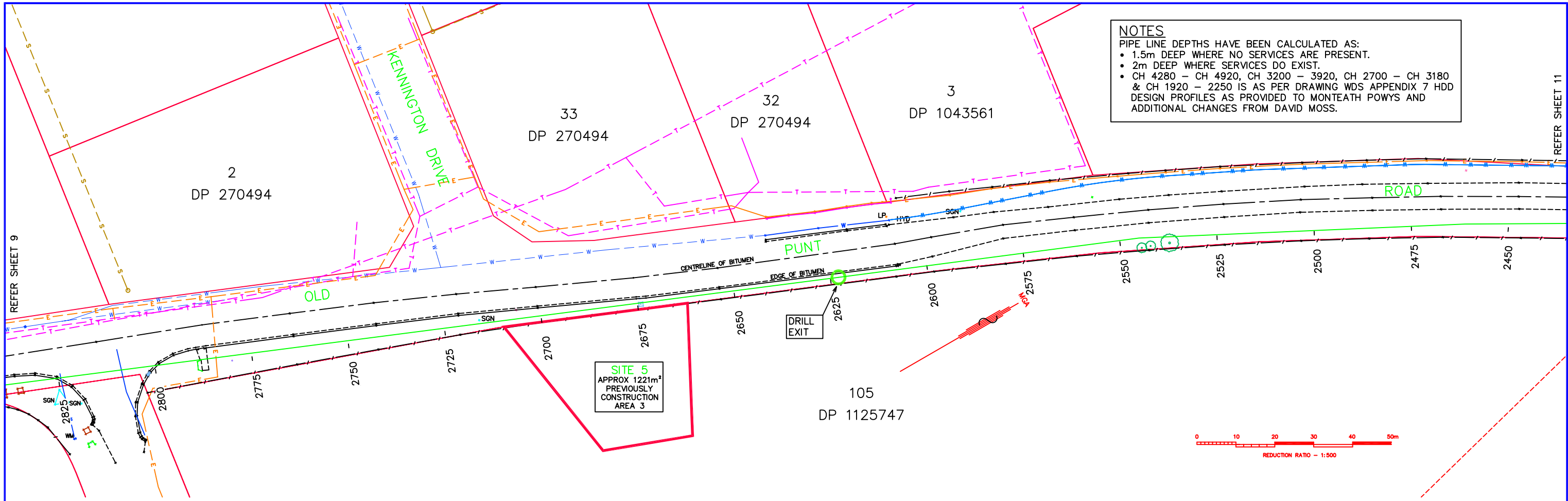
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 PROJECT MANAGEMENT

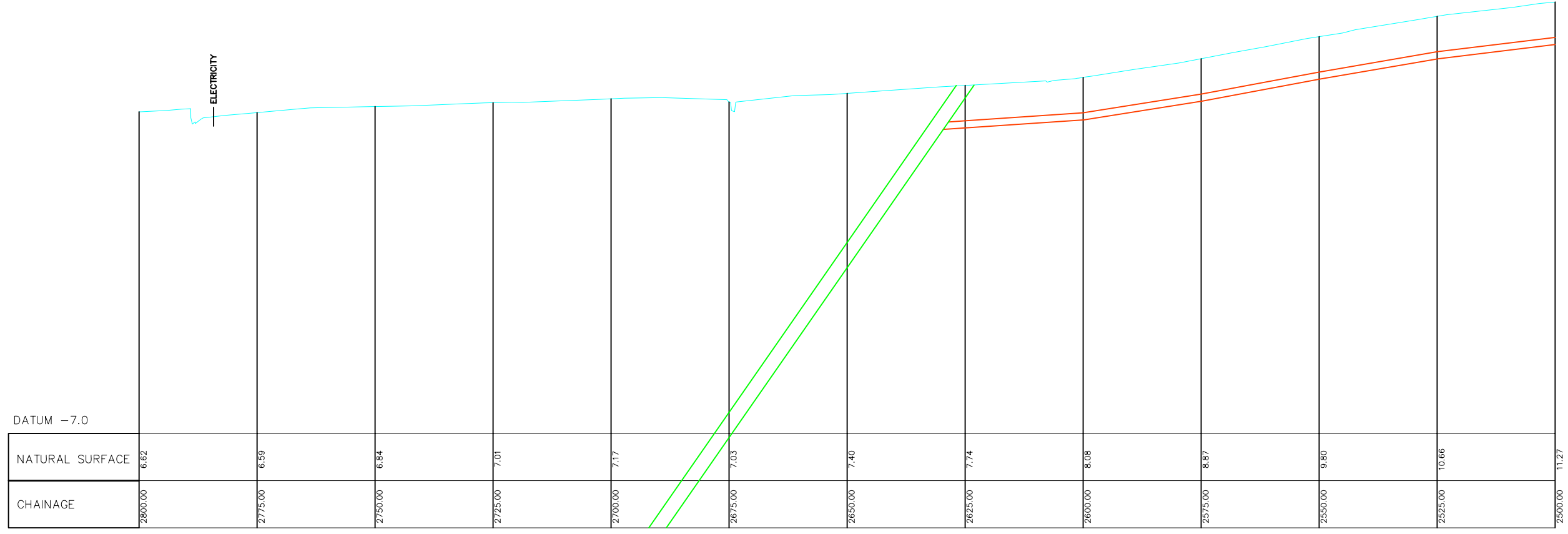
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Surveyed DS	Drafted MAK	Checked BJB	Client AGL ENERGY LIMITED	Sheet No. 9/19
REGISTERED SURVEYOR Scale @A1 : 1:500 @A3 : 1:1000 DO NOT SCALE			Title DETAIL SURVEY OF PROPOSED GAS MAIN ROUTE WITH LONGSECTION OLD PUNT ROAD HEXHAM / TOMAGO	Revision 5
A1		CAD File: Lucas Alignment Rev 3	Drawn: 10/256	Date: 02/06/2011

Laser 8/01/2014



NOTES
 PIPE LINE DEPTHS HAVE BEEN CALCULATED AS:
 • 1.5m DEEP WHERE NO SERVICES ARE PRESENT.
 • 2m DEEP WHERE SERVICES DO EXIST.
 • CH 4280 - CH 4920, CH 3200 - 3920, CH 2700 - CH 3180 & CH 1920 - 2250 IS AS PER DRAWING WDS APPENDIX 7 HDD DESIGN PROFILES AS PROVIDED TO MONTEATH POWYS AND ADDITIONAL CHANGES FROM DAVID MOSS.



DATUM -7.0
 HORIZONTAL SCALE - 1:500
 VERTICAL SCALE - 1:100

REVISIONS	No	REVISION	SVY	DFT	CHK	DATE	CONDITIONS OF USE.
5		HORIZONTAL ROUTE AMENDED - NEW LONGITUDINAL SECTION ADDED	MAK	BJB		08/06/13	COPYRIGHT NOTICE THIS DOCUMENT REMAINS THE PROPERTY OF MONTEATH & POWYS PTY LTD. CONDITIONS OF USE. THIS DOCUMENT MAY ONLY BE USED BY THE CLIENT FOR THE PURPOSE FOR WHICH IT WAS COMMISSIONED. USE OF THE DOCUMENT FOR ANY OTHER PURPOSE IS NOT PERMITTED UNLESS PRIOR WRITTEN APPROVAL HAS BEEN OBTAINED FROM MONTEATH & POWYS PTY LTD.
4		GAS MAINS DEPTHS CHANGED FOR NCC TO 2m ON NCC SIDE OF RIVER	MAK	BJB		20/10/11	
3		PROPOSED GAS PIPELINE ROUTE ADDED TO SECTIONS	BJB	MLG	BJB	27/09/11	
2		REVISED GAS PIPELINE ROUTE AND SECTIONS	BJB	MAK	BJB	19/09/11	
1		UNDERGROUND SERVICES ADDED TO LONGITUDINAL SECTION, SOUTH SIDE OF RIVER	BJB	BJC	BJB	31/08/11	

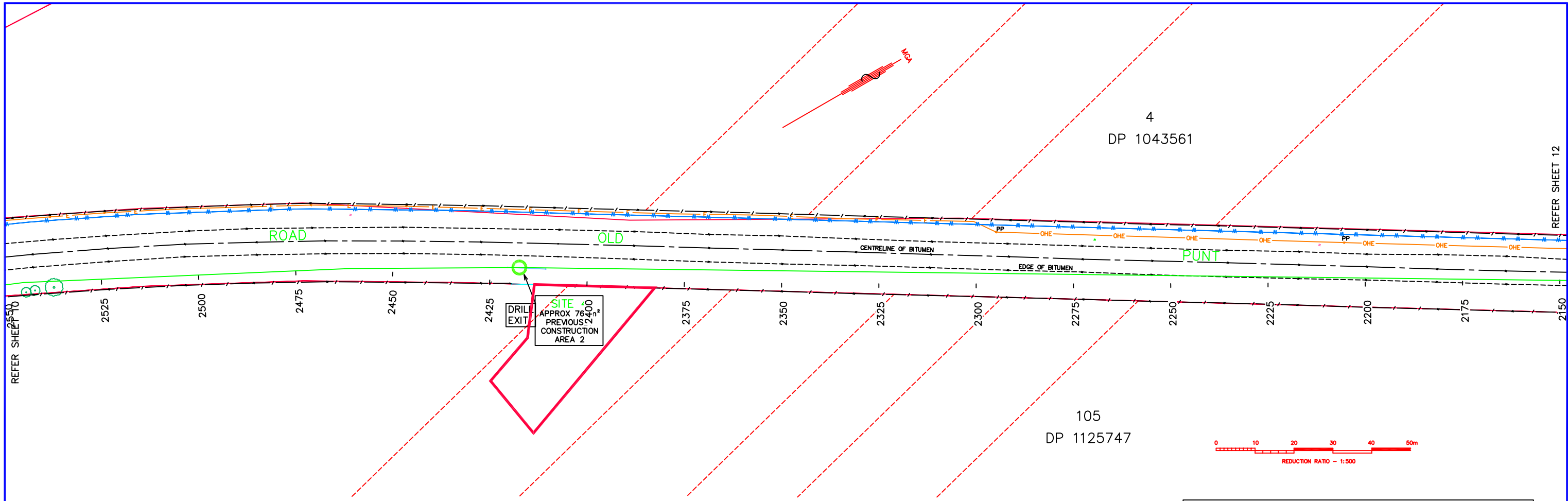
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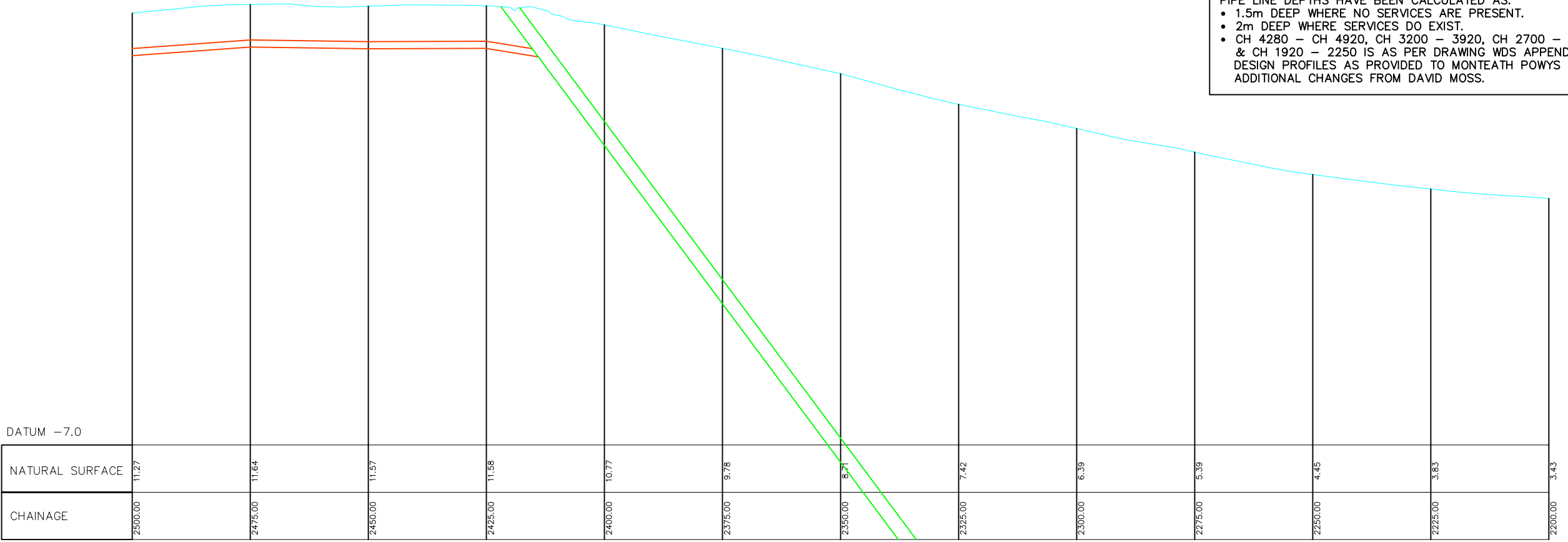
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Surveyed DS	Drafted MAK	Checked BJB	Client AGL ENERGY LIMITED	Sheet No. 10/19
REGISTERED SURVEYOR Scale @A1 : 1:500 @A3 : 1:1000 DO NOT SCALE			Title DETAIL SURVEY OF PROPOSED GAS MAIN ROUTE WITH LONGSECTION OLD PUNT ROAD HEXHAM / TOMAGO	Revision 5
A1		CAD File: Lucas Alignment Rev No: 10/256	Date: 02/06/2011	

Last Edit: 8/01/2014



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DATUM -7.0
 HORIZONTAL SCALE - 1:500
 VERTICAL SCALE - 1:100

REVISIONS	No	REVISION	SVY	DFT	CHK	DATE	CONDITIONS OF USE.
5		HORIZONTAL ROUTE AMENDED - NEW LONGITUDINAL SECTION ADDED	MAK	BJB		08/06/13	COPYRIGHT NOTICE THIS DOCUMENT REMAINS THE PROPERTY OF MONTEATH & POWYS PTY LTD. CONDITIONS OF USE. THIS DOCUMENT MAY ONLY BE USED BY THE CLIENT FOR THE PURPOSE FOR WHICH IT WAS COMMISSIONED. USE OF THE DOCUMENT FOR ANY OTHER PURPOSE IS NOT PERMITTED UNLESS PRIOR WRITTEN APPROVAL HAS BEEN OBTAINED FROM MONTEATH & POWYS PTY LTD.
4		GAS MAINS DEPTHS CHANGED FOR NCC TO 2m ON NCC SIDE OF RIVER	MAK	BJB		20/10/11	
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2		REVISED GAS PIPELINE ROUTE AND SECTIONS	BJB	MAK	BJB	19/09/11	
1		UNDERGROUND SERVICES ADDED TO LONGITUDINAL SECTION, SOUTH SIDE OF RIVER	BJB	BJC	BJB	31/08/11	

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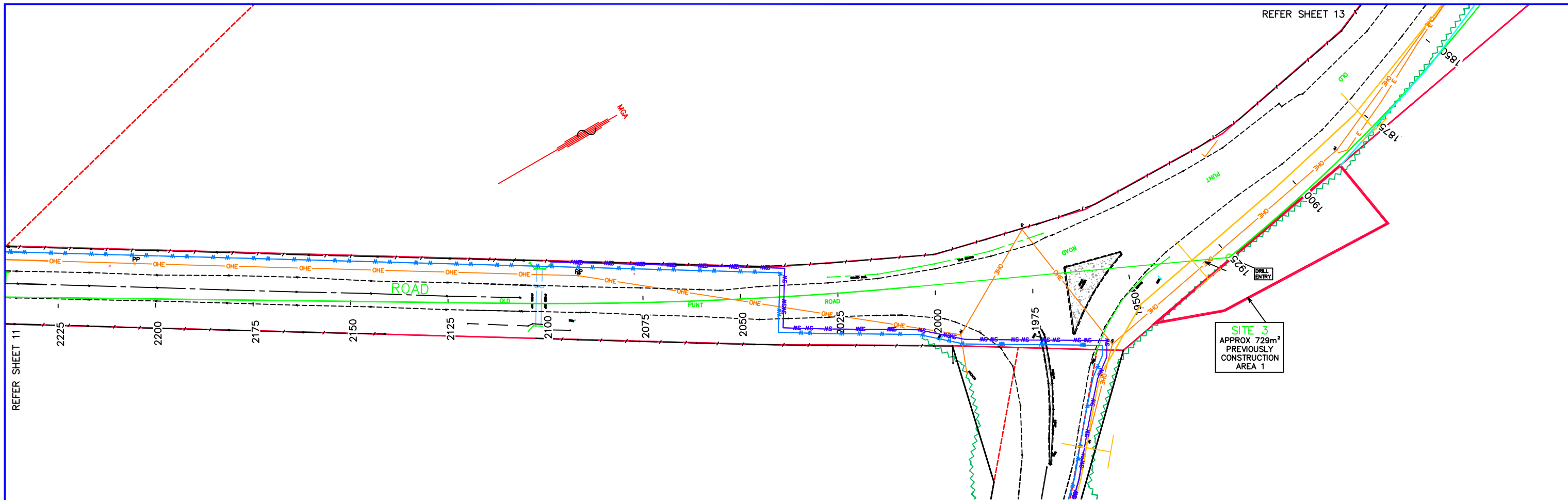
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Surveyed DS	Drafted MAK	Checked BJB	Client AGL ENERGY LIMITED	Sheet No. 11/19
REGISTERED SURVEYOR Scale @A1 : 1:500 @A3 : 1:1000 DO NOT SCALE			Title DETAIL SURVEY OF PROPOSED GAS MAIN ROUTE WITH LONGSECTION OLD PUNT ROAD HEXHAM / TOMAGO	Revision 5
A1		CAD File: Lucas Alignment Rev No: 10/256	Date: 02/06/2011	

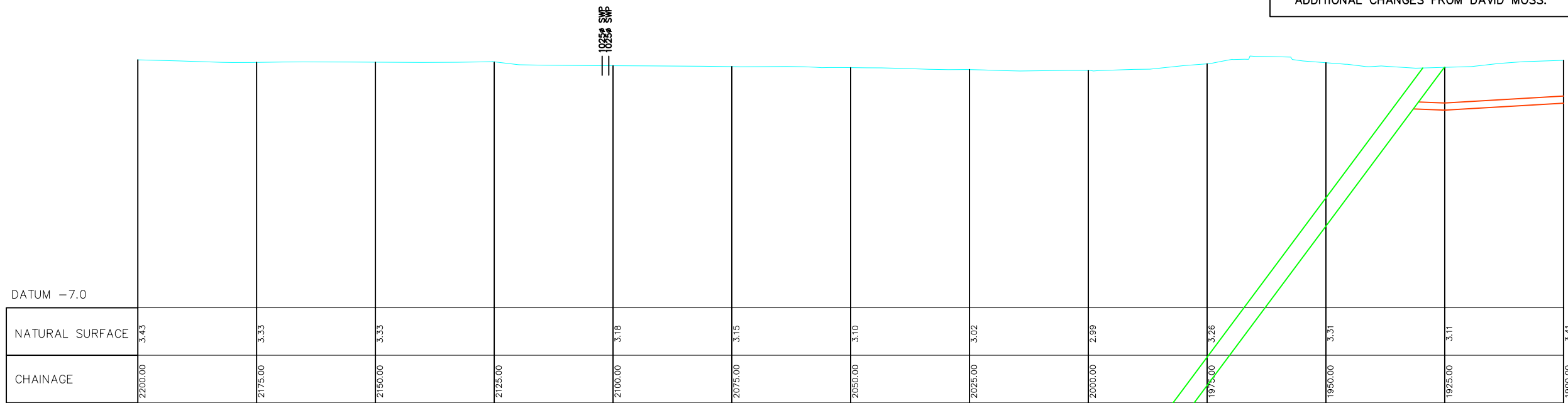
REFER SHEET 10

REFER SHEET 12

LAST EDR 8/01/2014



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DATUM -7.0
 HORIZONTAL SCALE - 1:500
 VERTICAL SCALE - 1:100

REVISIONS	No	REVISION	SVY	DFT	CHK	DATE	CONDITIONS OF USE.
5		HORIZONTAL ROUTE AMENDED - NEW LONGITUDINAL SECTION ADDED	MAK	BJB		08/06/13	COPYRIGHT NOTICE THIS DOCUMENT REMAINS THE PROPERTY OF MONTEATH & POWYS PTY LTD. CONDITIONS OF USE. THIS DOCUMENT MAY ONLY BE USED BY THE CLIENT FOR THE PURPOSE FOR WHICH IT WAS COMMISSIONED. USE OF THE DOCUMENT FOR ANY OTHER PURPOSE IS NOT PERMITTED UNLESS PRIOR WRITTEN APPROVAL HAS BEEN OBTAINED FROM MONTEATH & POWYS PTY LTD.
4		GAS MAINS DEPTHS CHANGED FOR NCC TO 2m ON NCC SIDE OF RIVER	MAK	BJB		20/10/11	
3		PROPOSED GAS PIPELINE ROUTE ADDED TO SECTIONS	BJB	MLG	BJB	27/09/11	
2		REVISED GAS PIPELINE ROUTE AND SECTIONS	BJB	MAK	BJB	19/09/11	
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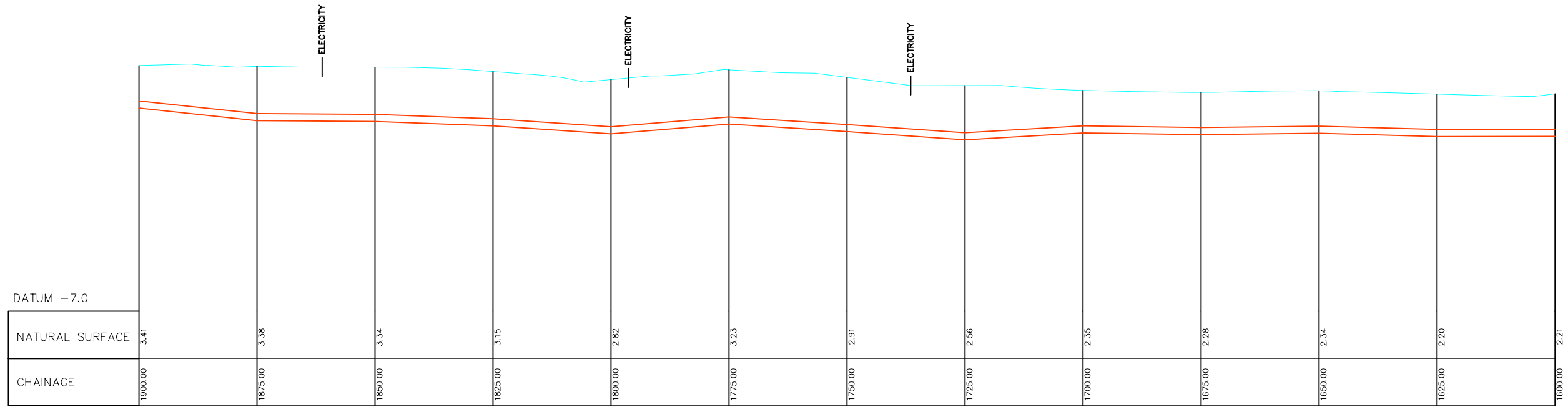
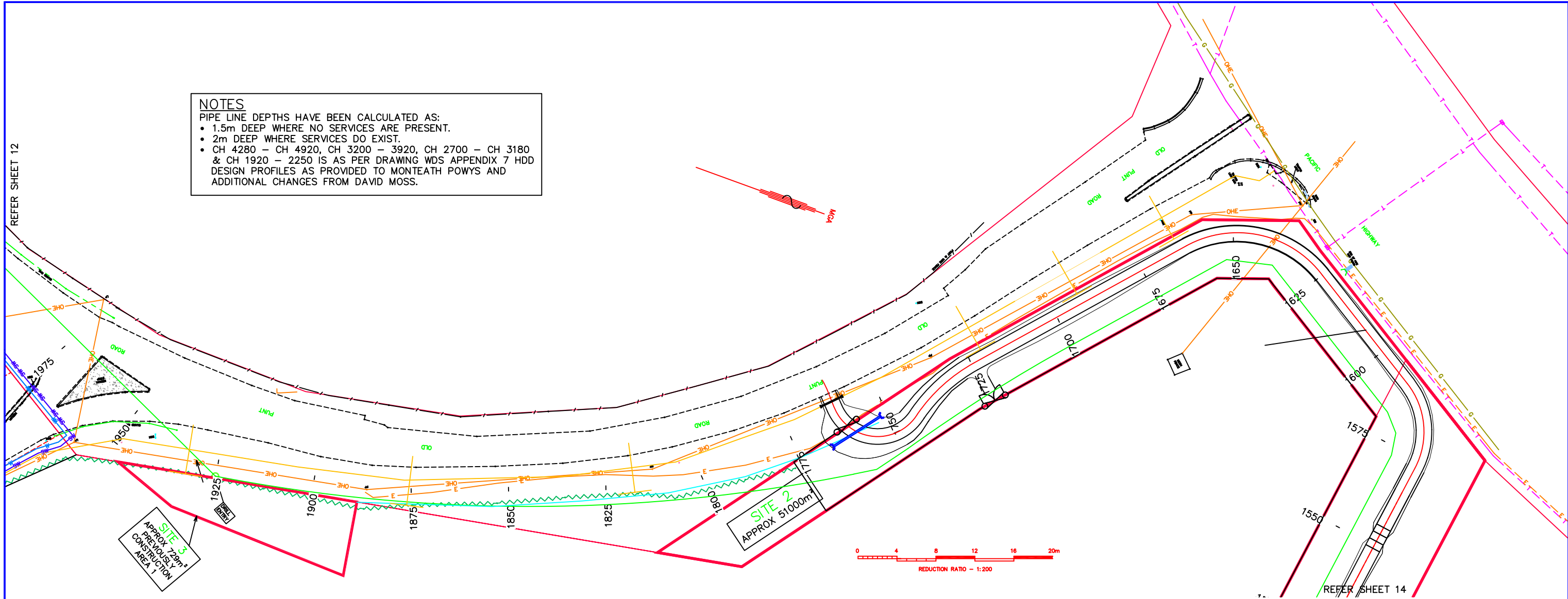
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Surveyed CT/BJB/PW	Drafted MAK/AJM	Checked BJB	Client AGL ENERGY LIMITED	Sheet No. 12/19
REGISTERED SURVEYOR Scale @A1 : 1:500 @A3 : 1:1000 DO NOT SCALE			Title DETAIL SURVEY OF PROPOSED GAS MAIN ROUTE WITH LONGSECTION OLD PUNT ROAD HEXHAM / TOMAGO	Revision 5
A1		CAD File: Lucas Alignment Rev 3	Drawn: 10/256	Date: 02/06/2011

Last Edit: 8/07/2014

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 & CH 1920 - 2250 IS AS PER DRAWING WDS APPENDIX 7 HDD
 DESIGN PROFILES AS PROVIDED TO MONTEATH POWYS AND
 ADDITIONAL CHANGES FROM DAVID MOSS.



DATUM -7.0
 HORIZONTAL SCALE - 1:500
 VERTICAL SCALE - 1:100

REVISIONS	No	REVISION	SVY	DFT	CHK	DATE	CONDITIONS OF USE.
5		HORIZONTAL ROUTE AMENDED - NEW LONGITUDINAL SECTION ADDED	MAK	BJB		08/06/13	COPYRIGHT NOTICE THIS DOCUMENT REMAINS THE PROPERTY OF MONTEATH & POWYS PTY LTD. CONDITIONS OF USE. THIS DOCUMENT MAY ONLY BE USED BY THE CLIENT FOR THE PURPOSE FOR WHICH IT WAS COMMISSIONED. USE OF THE DOCUMENT FOR ANY OTHER PURPOSE IS NOT PERMITTED UNLESS PRIOR WRITTEN APPROVAL HAS BEEN OBTAINED FROM MONTEATH & POWYS PTY LTD.
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2		REVISED GAS PIPELINE ROUTE AND SECTIONS	BJB	MAK	BJB	19/09/11	
1		UNDERGROUND SERVICES ADDED TO LONGITUDINAL SECTION, SOUTH SIDE OF RIVER	BJB	BJC	BJB	31/08/11	

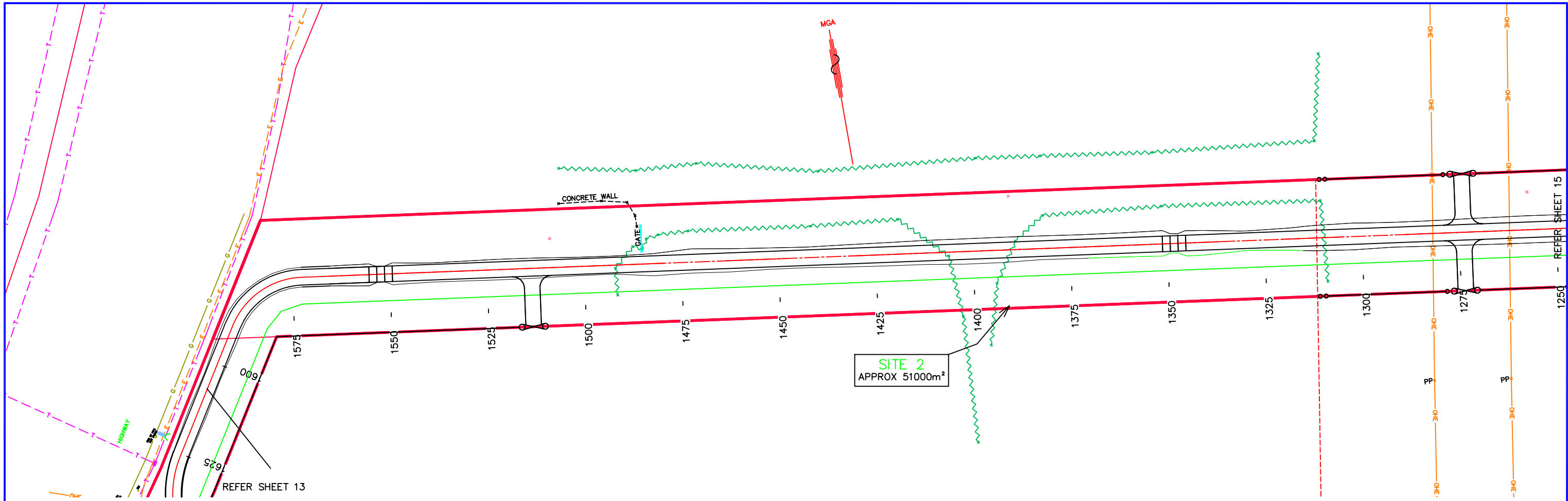
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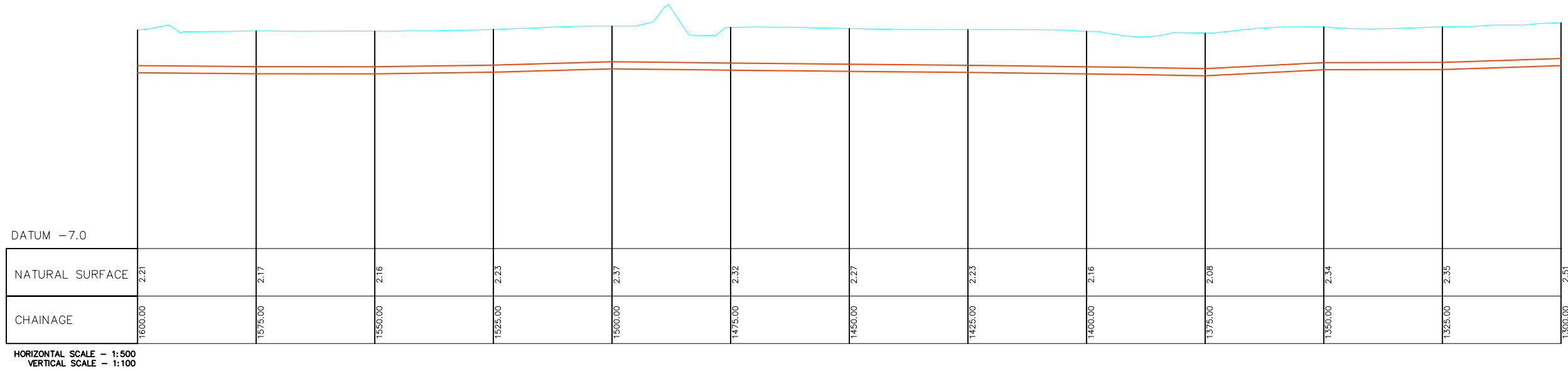
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Surveyed CT/BJB/PW	Drafted MAK/AJM	Checked BJB	Client AGL ENERGY LIMITED	Sheet No. 13/19
REGISTERED SURVEYOR Scale @A1: 1:500 @A3: 1:1000			Title DETAIL SURVEY OF PROPOSED GAS MAIN ROUTE WITH LONGSECTION OLD PUNT ROAD HEXHAM / TOMAGO	Revision 5
DO NOT SCALE		A1	CAD File: Lucas Alignment Rev 3 No: 10/256	Date: 02/06/2011

Last Edit: 8/01/2014



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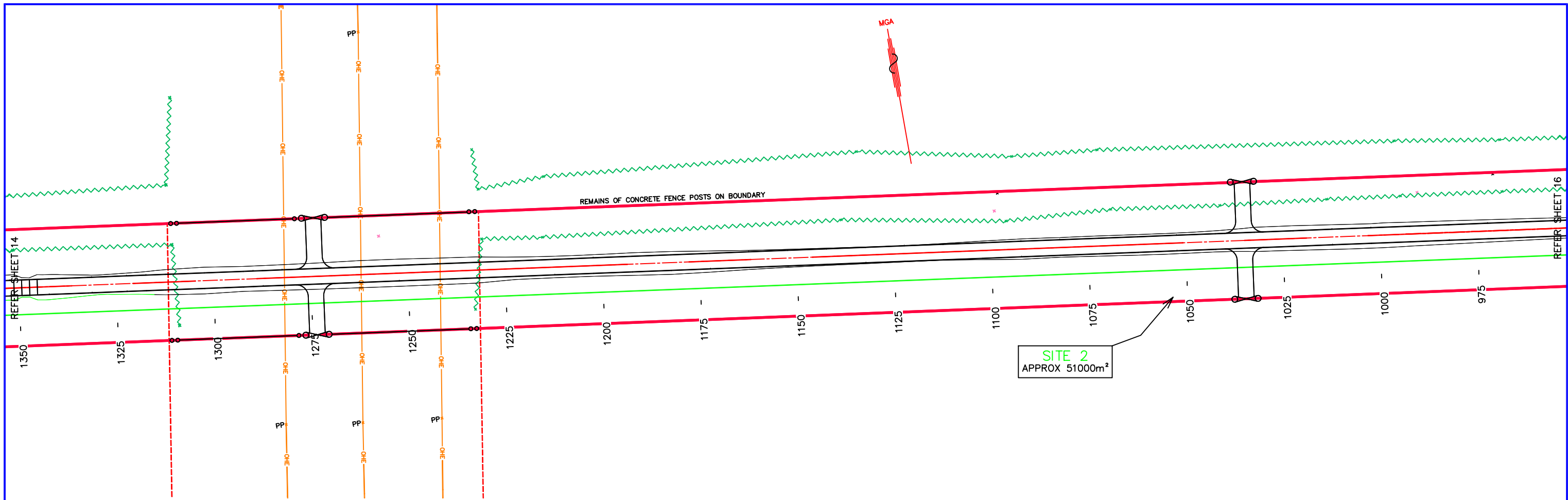
REVISIONS	No	REVISION	SVY	DFT	CHK	DATE
5		HORIZONTAL ROUTE AMENDED - NEW LONGITUDINAL SECTION ADDED	MAK	BJB		08/06/13
4		GAS MAINS DEPTHS CHANGED FOR NCC TO 2m ON NCC SIDE OF RIVER	MAK	BJB		20/10/11
3		PROPOSED GAS PIPELINE ROUTE ADDED TO SECTIONS	BJB	MLG	BJB	27/09/11
2		REVISED GAS PIPELINE ROUTE AND SECTIONS	BJB	MAK	BJB	19/09/11
1		UNDERGROUND SERVICES ADDED TO LONGITUDINAL SECTION, SOUTH SIDE OF RIVER	BJB	BJC	BJB	31/08/11

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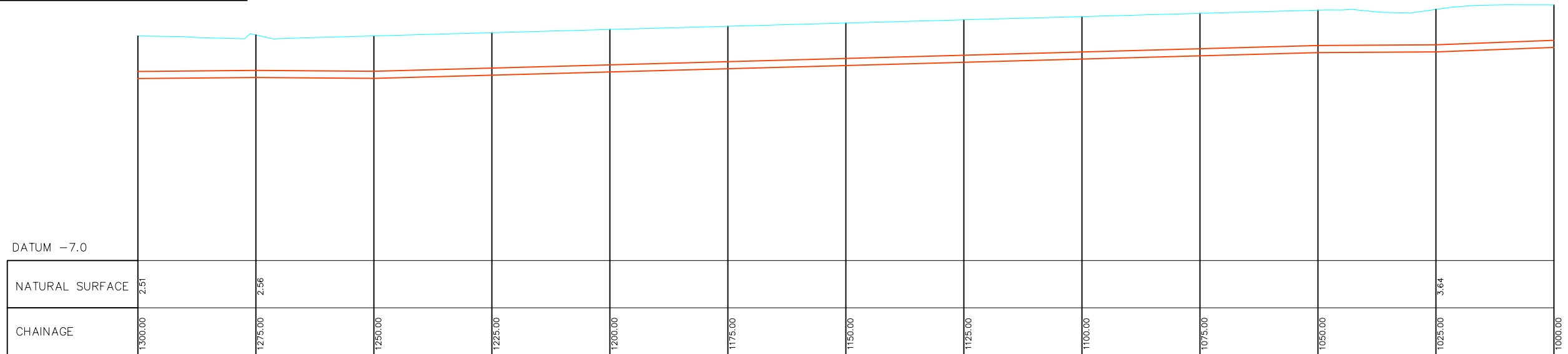
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Surveyed CT/BJB/PW	Drafted MAK/AJM	Checked BJB	Client AGL ENERGY LIMITED
REGISTERED SURVEYOR Scale @A1: 1:500 @A3: 1:1000 DO NOT SCALE			Title DETAIL SURVEY OF PROPOSED GAS MAIN ROUTE WITH LONGSECTION OLD PUNT ROAD HEXHAM / TOMAGO
A1		CAD File: Lucas Alignment Rev No: 10/256	Date: 02/06/2011
			Sheet No. 14/19 Revision 5

Last Edit: 8/01/2014



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DATUM -7.0

CHAINAGE	NATURAL SURFACE	PROPOSED GAS MAIN ROUTE
1300.00	2.51	
1275.00	2.56	
1250.00		
1225.00		
1200.00		
1175.00		
1150.00		
1125.00		
1100.00		
1075.00		
1050.00		
1025.00	3.64	
1000.00		

HORIZONTAL SCALE - 1:500
 VERTICAL SCALE - 1:100

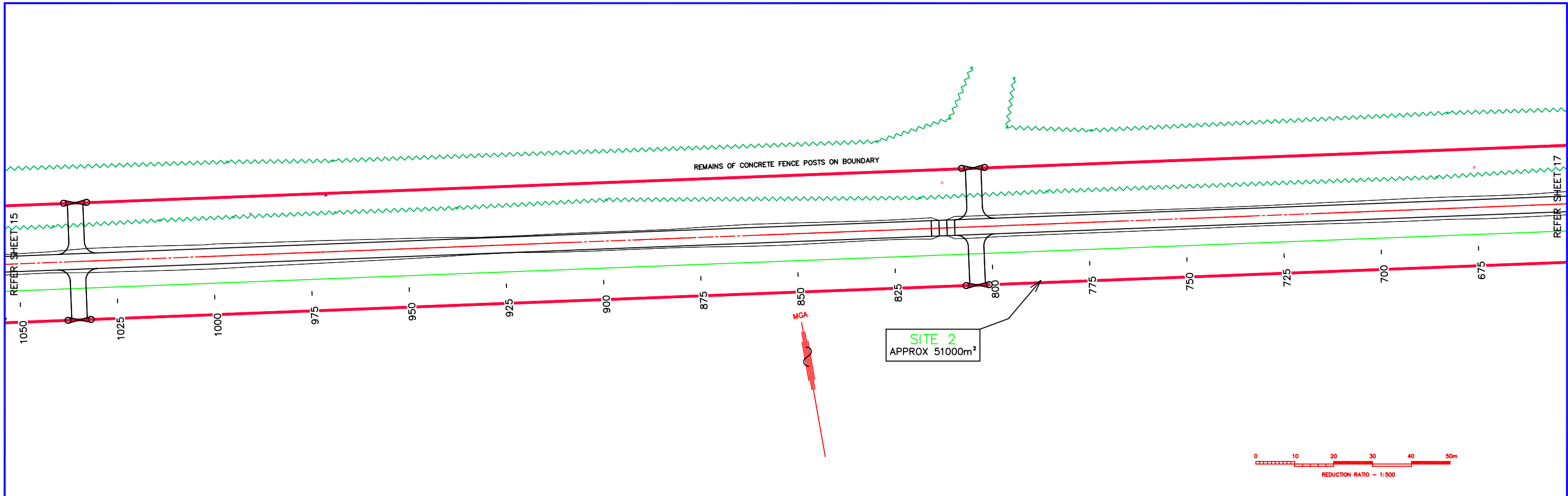
REVISIONS	No	REVISION	SVY	DFT	CHK	DATE	DESCRIPTION
	5	HORIZONTAL ROUTE AMENDED - NEW LONGITUDINAL SECTION ADDED	MAK	BJB		08/06/13	
	4	GAS MAINS DEPTHS CHANGED FOR NCC TO 2m ON NCC SIDE OF RIVER	MAK	BJB		20/10/11	
	3	PROPOSED GAS PIPELINE ROUTE ADDED TO SECTIONS	BJB	MLG	BJB	27/09/11	
	2	REVISED GAS PIPELINE ROUTE AND SECTIONS	BJB	MAK	BJB	19/09/11	
	1	UNDERGROUND SERVICES ADDED TO LONGITUDINAL SECTION, SOUTH SIDE OF RIVER	BJB	BJC	BJB	31/08/11	

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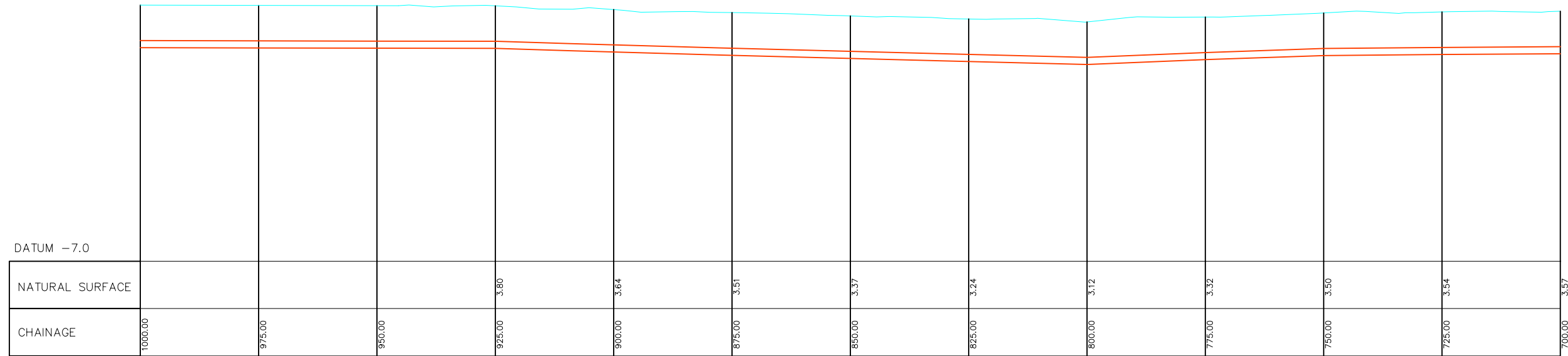
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REGISTERED SURVEYOR Scale @A1: 1:500 @A3: 1:1000 DO NOT SCALE			Title DETAIL SURVEY OF PROPOSED GAS MAIN ROUTE WITH LONGSECTION OLD PUNT ROAD HEXHAM / TOMAGO	Revision 5
A1		CAD File: Lucas Alignment Rev 3	Drawn: 10/256	Date: 02/06/2011

Last Edit: 8/01/2014



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DATUM -7.0
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 VERTICAL SCALE - 1:100

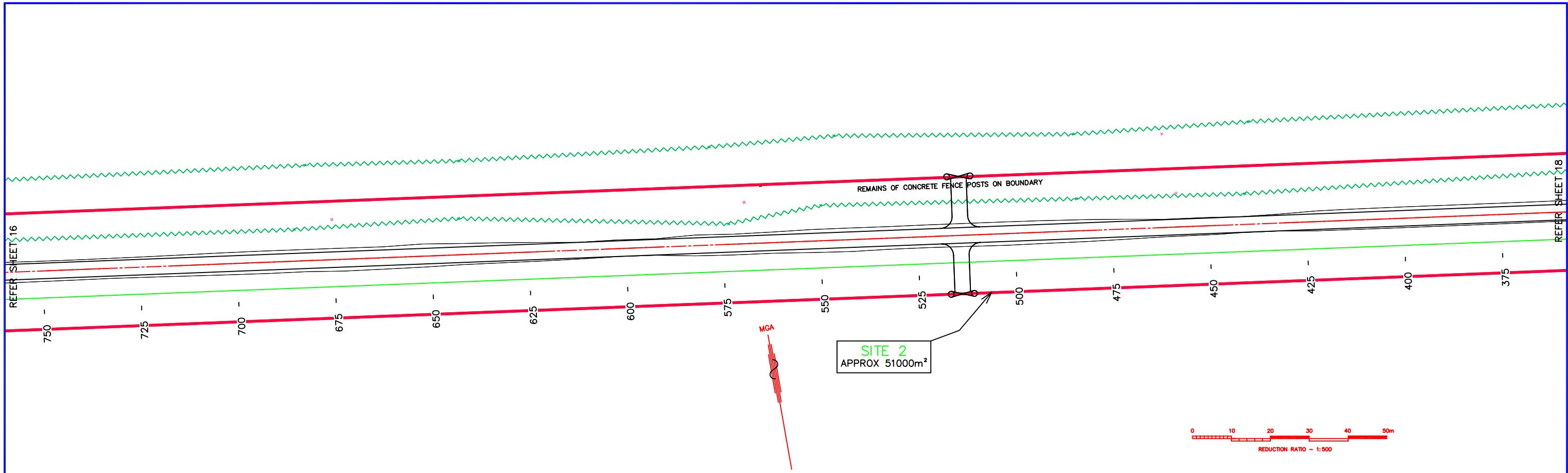
REVISIONS	No	REVISION	SVY	DFT	CHK	DATE
5		HORIZONTAL ROUTE AMENDED - NEW LONGITUDINAL SECTION ADDED	MAK	BJB		08/06/13
4		GAS MAINS DEPTHS CHANGED FOR NCC TO 2m ON NCC SIDE OF RIVER	MAK	BJB		20/10/11
3		PROPOSED GAS PIPELINE ROUTE ADDED TO SECTIONS	BJB	MLG	BJB	27/09/11
2		REVISED GAS PIPELINE ROUTE AND SECTIONS	BJB	MAK	BJB	19/09/11
1		UNDERGROUND SERVICES ADDED TO LONGITUDINAL SECTION, SOUTH SIDE OF RIVER	BJB	BJC	BJB	31/08/11

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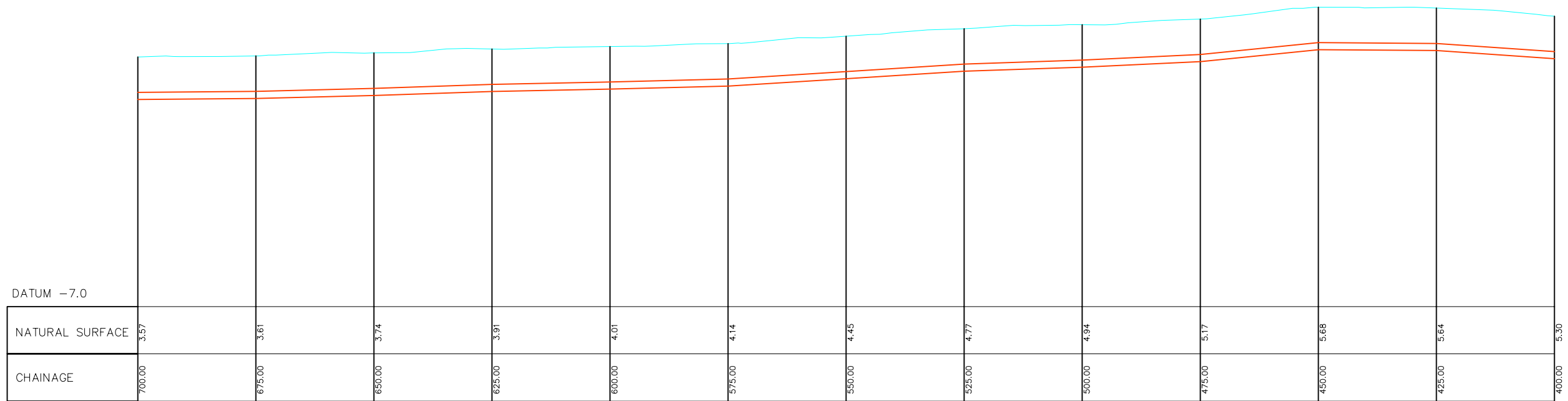
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Surveyed DS	Drafted MAK	Checked BJB	Client AGL ENERGY LIMITED	Sheet No. 16/19
REGISTERED SURVEYOR Scale @A1: 1:500 @A3: 1:1000 DO NOT SCALE			Title DETAIL SURVEY OF PROPOSED GAS MAIN ROUTE WITH LONGSECTION OLD PUNT ROAD HEXHAM / TOMAGO	Revision 5
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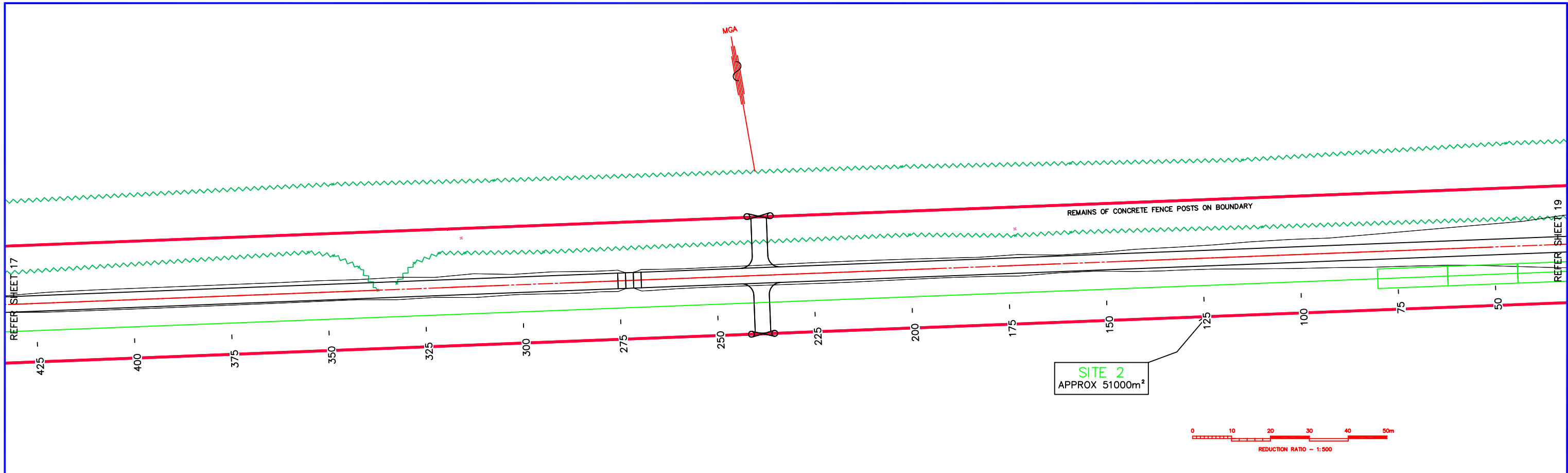
REVISIONS	No	REVISION	SVY	DFT	CHK	DATE
5		HORIZONTAL ROUTE AMENDED - NEW LONGITUDINAL SECTION ADDED	MAK	BJB		08/06/13
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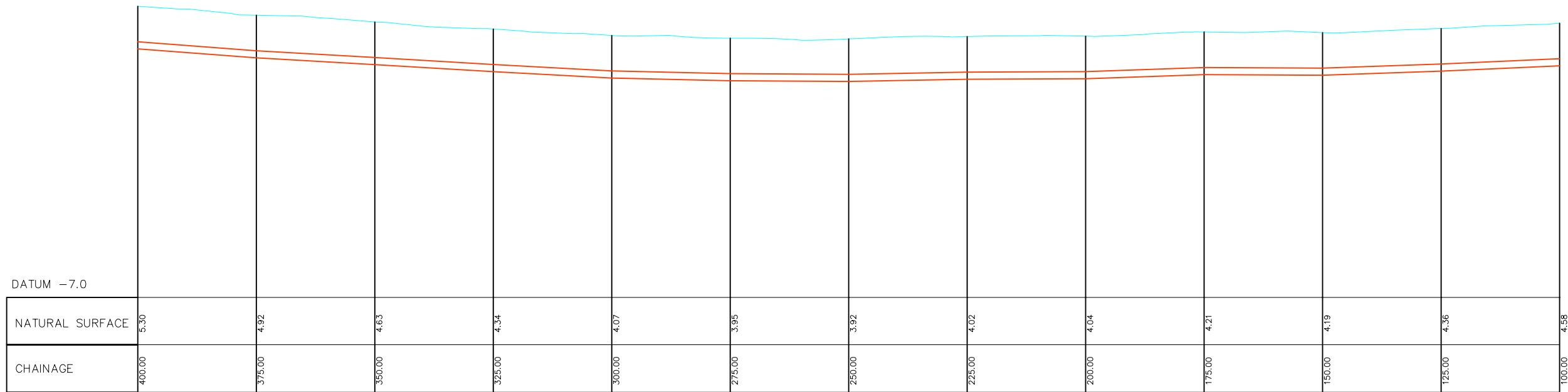
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 VERTICAL SCALE – 1:100

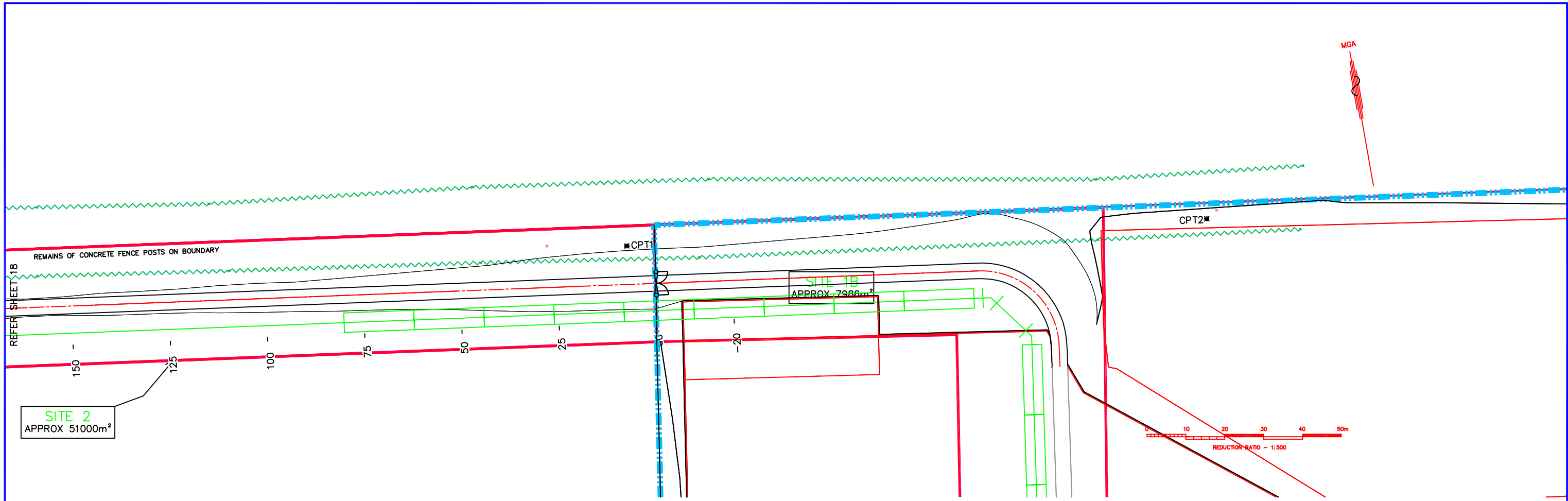
REVISIONS	No	REVISION	SVY	DFT	CHK	DATE
5		HORIZONTAL ROUTE AMENDED - NEW LONGITUDINAL SECTION ADDED	MAK	BJB		08/06/13
4		GAS MAINS DEPTHS CHANGED FOR NCC TO 2m ON NCC SIDE OF RIVER	MAK	BJB		20/10/11
3		PROPOSED GAS PIPELINE ROUTE ADDED TO SECTIONS	BJB	MLG	BJB	27/09/11
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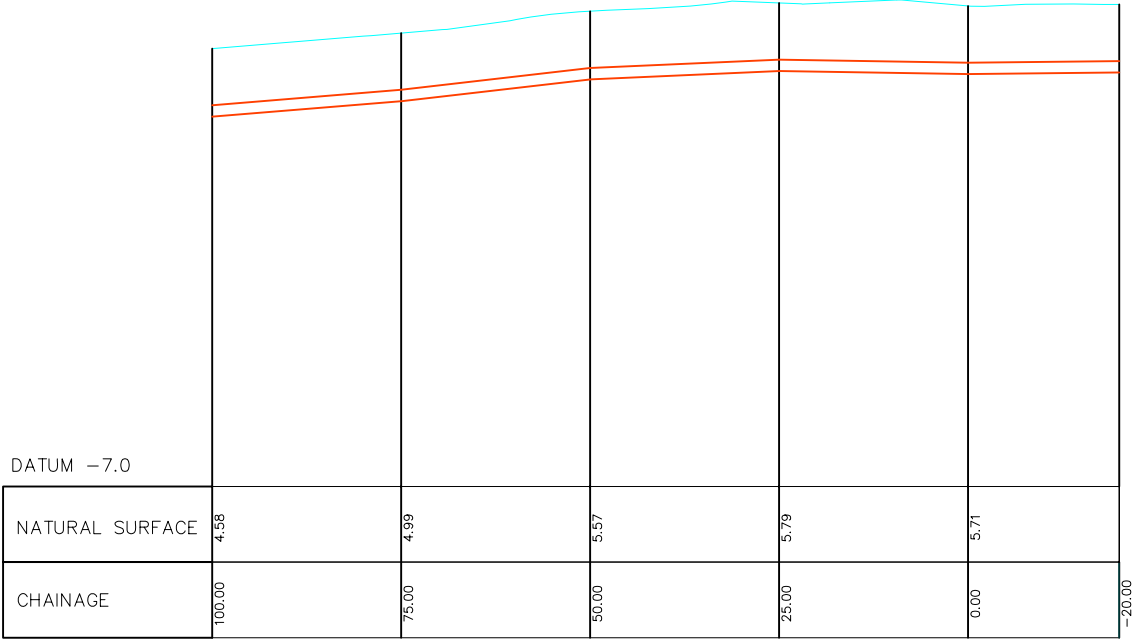
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HORIZONTAL SCALE - 1:500
 VERTICAL SCALE - 1:100

REVISIONS	No	REVISION	SVY	DFT	CHK	DATE	CONDITIONS OF USE.
5		HORIZONTAL ROUTE AMENDED - NEW LONGITUDINAL SECTION ADDED	MAK	BJB		08/06/13	COPYRIGHT NOTICE THIS DOCUMENT REMAINS THE PROPERTY OF MONTEATH & POWYS PTY LTD.
4		GAS MAINS DEPTHS CHANGED FOR NCC TO 2m ON NCC SIDE OF RIVER	MAK	BJB		20/10/11	
3		PROPOSED GAS PIPELINE ROUTE ADDED TO SECTIONS	BJB	MLG	BJB	27/09/11	
2		REVISED GAS PIPELINE ROUTE AND SECTIONS	BJB	MAK	BJB	19/09/11	
1		UNDERGROUND SERVICES ADDED TO LONGITUDINAL SECTION, SOUTH SIDE OF RIVER	BJB	BJC	BJB	31/08/11	

Monteath & Powys Pty Ltd
 ACN 000 861 110

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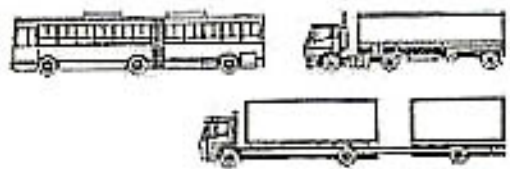


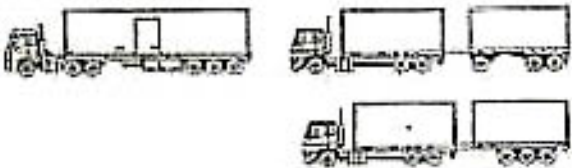
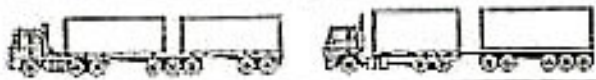


Surveyed DS	Drafted MAK	Checked BJB	Client AGL ENERGY LIMITED	Sheet No. 19/19
REGISTERED SURVEYOR Scale @A1 : 1:500 @A3 : 1:1000 DO NOT SCALE			Title DETAIL SURVEY OF PROPOSED GAS MAIN ROUTE WITH LONGSECTION OLD PUNT ROAD HEXHAM / TOMAGO	Revision 5
A1		CAD File: Lucas Alignment Rev No: 10/256	Date: 02/06/2011	

Laser 8/01/2014

APPENDIX 3

VEHICLE CLASSIFICATION SYSTEM

AUSTROADS : January 1994



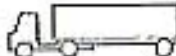
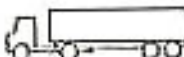
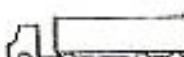
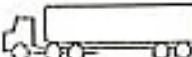
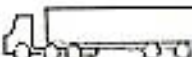
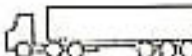
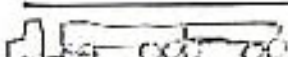
Class	LIGHT VEHICLES
1	SHORT Car, Van, Wagon, 4WD, Utility, Bicycle, Motorcycle 
2	SHORT - TOWING Trailer, Boat, Road 
HEAVY VEHICLES	
3	TWO AXLE TRUCK OR BUS (2 axles) 
4	THREE AXLE TRUCK OR BUS (3 axles, 2 groups) 
5	FOUR AXLE TRUCK (4 axles, 2 groups) 
6	THREE AXLE ARTICULATED (3 axles, 3 groups) 
7	FOUR AXLE ARTICULATED (4 axles, 3 or 4 groups) 
8	FIVE AXLE ARTICULATED (5 axles, 3 to 5 groups) 
9	SIX AXLE ARTICULATED (6 axles, 3 to 5 groups 7+ axles, 3 groups) 
10	8 DOUBLE (7+ axles, 4 groups) 
11	DOUBLE ROAD TRAIN (7+ axles, 5 or 6 groups) 
12	TRIPLE ROAD TRAIN (7+ axles, 7+ groups) 

standard axles. It is for this reason that design traffic includes only commercial vehicles. These are defined as vehicles having either dual wheels on the rear axle or more than two axles. The pavement damage which they cause depends on their axle configurations and loadings.

Table 6.1 gives the number of standard axles that would cause the same pavement damage as common types of commercial vehicles loaded to the legal limit. In practice however many vehicles will not be loaded to this extent.

A set of load factors has been developed from the results of a limited number of weighing surveys to account for the range of loadings and vehicle types on Victorian roads. These load factors which are discussed in Clause 6.5.5 are used to convert commercial vehicle counts to ESAs.

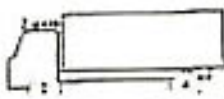
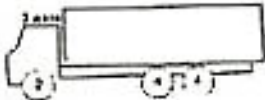

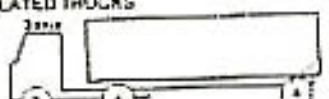
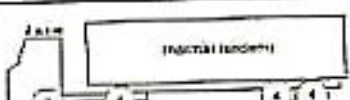
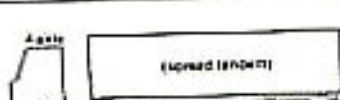
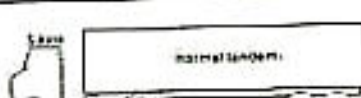
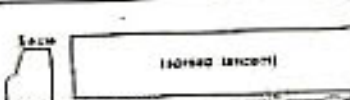

TABLE 6.1
COMMERCIAL VEHICLE CHARACTERISTICS

Vehicle Type	No of Equivalent Standard Axles for maximum legal loading		UNLOADED
	FL	ALL KMS	
 2 axle rigid (Dual Wheels at Rear)	2.2	0.7	
 3 axle rigid	2.5	1.1	
 3 axle articulated	3.3	1.1	
 4 axle articulated	3.6	1.5	
 4 axle articulated (spread tandem)	4.2	1.4	
 5 axle articulated	4.0	2.0	
 5 axle articulated (spread tandem)	4.4	1.9	
 6 axle articulated	3.2	2.1	1.0
*  B Double	4.7	3.1	1.5

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TABLE 4.3

VALUES OF $F2_i$ — NO. OF ESA'S PER COMMERCIAL VEHICLE TYPE

	Type of Vehicle	Road Functional Class	F2
1		1	10
		2	08
		3	07*
		6	07
		7	06
2		1	11
		2	10
		3	11
		6	11
		7	10
3		1	10
		2	13
		3	14
		6	15
		7	16
4		1	16
		2	13
		3	11
		6	10
		7	08
5		1	17
		2	13
		3	15
		6	15
		7	15
6		1	22
		2	17
		3	14
		6	14
		7	11
7		1	18
		2	18
		3	20
		6	19
		7	22
8		1	23
		2	20
		3	18
		6	18
		7	18
9		1	19
		2	20
		3	21*
		6	20*
		7	23*
* 10	3 DOUBLE	3	3.1

* Axle based on a single or less than standard axle

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one direction only, non-directional counts will require adjustment to a one way volume. Generally it can be assumed that 50% of the total volume will travel in each direction, i.e. $F_d = 0.5$, but exceptions to this can occur.

6.5.5 Load Factor

The commercial vehicle count is converted to ESAs by the use of a load factor F_1 . The load factor represents the average damaging effect of commercial vehicles in the traffic stream, e.g. a load factor of 1.2 indicates that the average damaging effect of a commercial vehicle is 1.2 times that of a standard axle.

Selection of an appropriate load factor for the road under consideration relies to a certain extent on the designer's experience and judgement. Table 6.3, which gives upper and lower limits of load factors for various types of roads, should be used as a guide. Generally a mid range figure should be selected, although observation of the commercial vehicle types and loadings encountered on the road will indicate whether a figure near the extremities of the range is more appropriate, e.g. a load factor of 1.6 is appropriate for the Hume Highway.

Generally it can be assumed that the load factor will be the same for each direction of travel, but exceptions to this can occur, e.g. quarry access roads.

TABLE 6.3

LOADS FACTORS - NUMBER OF ESAs PER COMMERCIAL VEHICLE

Type of Road	Approximate Load Factor
<u>Rural Roads</u>	
National Highways and Freeways	1.0 - 1.6
State Highways and Main Roads	0.6 - 1.0
Other Roads	0.4 - 0.6
<u>Urban Roads</u>	
Industrial Roads	1.2 - 1.5
Freeways, Arterials and Main Roads	0.6 - 0.8
Residential Roads	0.2 - 0.4