Stephen Richardson

From: Brian Hanley [bhanley@manildra.com.au]
Sent: Tuesday, 7 September 2010 2:46 PM
To: Stephen Richardson
Subject: FW: Manildra Bomaderry Pipeline Lateral - Gas Pipeline Licence Application Procedures

Regards

Brian Hanley

From: Peter Lansdown [mailto:Peter.Lansdown@dwe.nsw.gov.au]
Sent: Friday, 12 February 2010 2:41 PM
To: Alex_Horn@URSCorp.com; peter.lansdown@industry.nsw.gov.au
Cc: Brian Hanley; Tom geczy
Subject: RE: Manildra Bomaderry Pipeline Lateral - Gas Pipeline Licence Application Procedures

Alex,

In response to your queries, my intension next Thursday will be to take you through the various stages of the pipeline licensing process – from initial application through to ongoing operations and maintenance.

Briefly, they are as follows:

Application:

1. The initial step is for you to advertise your intent to apply in accordance with s.13(3) of the Act
2. You also need to provide notice to prescribed authorities under s.13(4) – the only prescribed authority is the RTA c.13A(1) of the Regulation
3. The details of what is to be included in the application are covered in s.13 of the Act and c.9 & 10 of the Reg but we can discuss in our meeting.
4. The application fee is also payable upon application

Grant of Licence:

1. Before the licence can be granted we must receive details of agreements, or "all reasonable attempts to reach agreement, for each and every parcel of land affected by the licence. We will cover that in more detail on Thursday.
2. Note that we will not recommend that the Minister grant the licence until after the Minister for Planning has determined your project approval. However, s.75V(1)(g) of the EP&A Act imposes requirements on the Minister for Energy.
3. Once the licence is granted, you will be able to commence construction but you will be subject to any pre-construction conditions imposed by the Department of Planning.

Consent for commencement of operations

1. You will need to provide information to us so that we can help the Minister form his opinion that the pipeline can be "operated with safety" s.25(1) of the Act.
2. This information is not specified but will include documentation to support your assertion that the pipeline has been designed, constructed and tested in accordance with AS2885.1 and the other relevant parts cross referenced in that part.
3. We will be also seeking copies of independent audits of the Construction EMP conducted during the construction phase and a draft Safety and Operating Plan developed to conform to Division 3 of the Regulation and AS2885.3 (you should be aware that Part 3 is currently under review and is likely to go to public comment in the near future)

Ongoing operation and maintenance:

1. Again, Division 3 of the Regulation covers the ongoing requirements in relation to the SAOP and audits. There is also an annual performance reporting requirement, details of which can be found on our web-site.

We confirm our availability for 2:00pm Thursday 18 February as originally discussed.

We look forward to going through our requirements in more detail at that meeting.

Regards

Peter

Peter Lansdown | Manager Supply and Networks Performance | Energy Branch | Minerals and Energy Division
Industry and Investment NSW | 227 Elizabeth Street | Sydney | NSW 2000

T: (02) 8281 7739 | F: (02) 8281 7452 | M: 0437 895 319
E: peter.lansdown@industry.nsw.gov.au | www.industry.nsw.gov.au

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From: Alex_Horn@URSCorp.com [mailto:Alex_Horn@URSCorp.com]
Sent: Thursday, 11 February 2010 6:08 PM
To: peter.lansdown@industry.nsw.gov.au
Cc: brian.hanley@manildra.com.au; tom.geczy@bigpond.com
Subject: Manildra Bomaderry Pipeline Lateral - Gas Pipeline Licence Application Procedures

Peter,
Thank you for the invitation to meet with the NSW Dept of Industry and Investment at L17, 227 Elizabeth St, Sydney at 2pm Thursday, 18 February 2010.
URS is assisting Shoalhaven Starches to apply for a Gas Pipeline Licence.
URS confirm, as part of the Pipelines Act 1968 and Regulations, Shoalhaven Starches will present a Gas Pipeline Licence Application.
The following tasks have been identified as part of the Licence Application process, as previously discussed:
1. Landowner identification and consultation, to commence negotiations to obtain Easements over affected property
2. Completion of AS 2885.1 Risk Assessment to identify and mitigate risk along the preferred pipeline route
3. Pipeline design criteria which accommodate SEPP (Infrastructure) 2007 Subdivision 1 Section 53 and 54, including accommodation for future potential land development activities
4. Assessment of environmental constraints to avoid unnecessary impacts e.g.) Sensitive coastal locations, Acid Sulphate Soil zones, Heritage issues etc.
5. Consultation with energy distributors (petroleum fuel, gas) affected by the proposed pipeline development
The aim of the proposed meeting is ensure URS' understanding of the Pipeline Application process is thorough and complete, and any gaps in the submission are identified for future action.
Please confirm you availability and any comments on the above, by return email.
Cheers,
Alex Horn
Principal Engineer
URS Australia
L3, 116 Miller St
North Sydney NSW 2060
Ph 02 8925 5778
Fax 02 8925 5555
Mob 0428 421 967
Web www.ap.urscorp.com

From: ARRIGHI Peter <Peter_ARRIGHI@rta.nsw.gov.au>
To: "anna.bradley@planning.nsw.gov.au" <anna.bradley@planning.nsw.gov.au>
Date: 18/10/2010 3:25 pm
Subject: Shoalhaven Starches Pipeline project - Princes Highway Road Crossing

Anna,

Sorry for the tardiness of this reply with regards to the proposed gas pipeline for Southern Starches.

The RTA is really only concerned about the Princes Highway crossing.All other roads impacted by this proposal are the responsibility of Shoalhaven City Council.

Please find below a general set of conditions that the RTA in Southern Region would ask Southern Starches (or sub contractors working Southern Starches behalf) to comply with prior to granting access to the road reserve.

Generally, the RTA does not allow longitudinal or transverse utilities within the road reserve as this may, over time ,compromise the function of the pavement.Therefore, any option that does not impact on the RTA asset would be preferable.If this is not possible then the following general conditions would apply.Other more site specific conditions may be added depending on infrastructure design etc

1. All areas within road reserve that are disturbed by your work are to be restored to their original condition upon completion of the work and all restoration work is to be carried out to the satisfaction of the Roads and Traffic Authority.
2. Any infrastructure should be designed with the aim of making it maintenance free for it's design life.

3. Longitudinal trenching is to be at a minimum 0f 0.6m whilst in the road reserve and a s close to the road boundary as possible and never within 3.0 metres of the road formation or drainage structures.
4. No transverse trenching of any RTA maintained road will be permitted without exhausting every other option.Geotechnical reports may be required to ascertain why an underbore is not possible.
5. The pits for any bores will be located outside the road reserve, wherever possible. Where this is not practical then they are to be no closer than three metres from the road pavement for both exit and entry holes. The depth will be not less than 1.2m below road surface level to the top of the pipe or concrete.
6. All buried pipes must be maintenance free e.g. sleaved.
7. Where concrete bedding or concrete encasement of the conduit is required, ensure that the concrete has achieved its required early design strength.
8. A road occupancy licence (copy attached) will be required for this work. You will also need to have for this particular work proposal a Traffic Control Plan developed by an accredited person in the design of TCP's. This TCP will need to be kept on site at all times and be made available for surveillance by the Authority's representative.
9. Southern Starches will advise the Police and local authorities of any proposed disruption to traffic.
10. You may need to consult with the Workcover Authority in regards to their requirements for this work.
11. Southern Starches (and it's contractors) are to be fully responsible for matters regarding:
    * Public Liability Insurance (must be in the amount of not less than $20 million and should be affected and extended to cover the interest of the RTA or its agent by any contractor engaged in the construction or maintenance of the work).
    * Occupational Health & Safety matters
    * Environmental control and restoration

    * Traffic management.

If you require any other information please give me a call.

Regards

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Data isn't information.
Information isn't knowledge.
Knowledge isn't wisdom.
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Peter Arrighi
Asset Officer
Roads and Traffic Authority
Southern Regional Office, Wollongong
Ph: (02) 42212546 Mob: 0438534152
Email: peter_arrighi@rta.nsw.gov.au<mailto:peter_arrighi@rta.nsw.gov.au>
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RTA

29-01-2010

Bethany Bell
URS Australia Pty Ltd
Level 3, 116 Miller Street
NORTH SYDNEY NSW 2060

Dear Bethany

Proposal to construct gas pipeline – Bolong Road, Bomaderry.

I refer to your correspondence dated 22nd January 2010, your reference J:\JOBS\43167736\4 Comms\Letter to RTA 22-01-2010.doc, which has established that the work to be carried out is for the construction of a new gas pipeline fro Manildra Starches in Bomaderry.

This area is a Regional Road which is under the care and control of Shoalhaven City Council and you will need to communicate with them in regards to this matter.

The Roads and Traffic Authority has no objections to this work.

If you have any further enquires please contact Peter Arrighi on (02) 4221 2546.

Yours sincerely

Peter Meers
Regional Asset Manager

Roads and Traffic Authority

Level 4, 90 Crown St, Wollongong NSW 2500
PO Box 477 Wollongong NSW 2520 DX 5178 Wollongong
www.rta.nsw.gov.au | 13 17 82

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29-01-2010

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Level 3, 116 Miller Street
NORTH SYDNEY NSW 2060

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Yours sincerely

Peter Meers
Regional Asset Manager

Shoalhaven City Council

Development & Environmental Services Group

City Administrative Centre
Bridge Road (PO Box 42), Nowra NSW Australia 2541
Phone: (02) 4429 3432
Fax: 044 293 178
DX 5323 Nowra

FACSIMILE

TO:	Brian Hanley Manildra	FROM:	John Britton
		Council Ref:	1564E (D10/38095)
Fax No:	4421 7760	Page 1 of	3
Date:	19 February 2010	Original to Follow:	No

Brian

It is suggested you ask Steve Richardson to meet with Strategic Planning Group – Cinamon Dunsford and Scott Wells.

John Britton
Major Project Part 3A Coordinator

Shoalhaven City Council

City Administrative Centre
Bridge Road, Nowra NSW Australia 2541
Phone: (02) 4429 3111 • Fax: (02) 4422 1816 • DX 5323 Nowra
Address all correspondence to
The General Manager, PO Box 42, Nowra NSW Australia 2541

COUNCIL REFERENCE: 1564E (D10/35875)
CONTACT PERSON: John Britton
YOUR REF:

17 February 2010

URS Australia Pty Ltd
Level 3
116 Miller Street
NORTH SYDNEY NSW 2060

Attention: Ms B Bell

Dear Madam

Manildra Starches – Proposal to Construct Gas Pipeline - Bomaderry

I refer to your letter of 22 January 2010, seeking some preliminary comments as you prepare an application to the Department of Planning to have this project declared a Major Project under Part 3A of the Environmental Planning and Assessment Act 1979.

The following comments at this stage are based on the preliminary route map provided. As the Part 3A application proceeds, Council will make further detailed comments as requested by the Department of Planning.

a) Future Urban Expansion north of Bomaderry
The proposal needs to consider the expansion of Nowra Bomaderry as per the State Government endorsed Nowra Bomaderry Structure Plan (NBSP) (including preferred road network layout) and the draft Shoalhaven Local Environmental Plan 2009. The applicant should seek to avoid areas that are identified for future development and future road upgrades. In particular, the connection point and the first section of the proposed gas line runs along the edge of a future long term living area which is proposed to be rezoned in the future for residential development. A copy of the NBSP map can be viewed at http://shoalhaven.nsw.gov.au/council/pubdocs/planningdocs/nbsp/adopteandendorsedstructureplanmap2008.pdf

b) Options for Gas Pipeline Route
A proposal that relies on Council's roads to accommodate the pipeline, particularly when Manildra could utilise their own land east of the railway line for a considerable proportion of the required link back to the eastern gas pipeline, is not supported.

The use of Manildra owned land would;

- Avoid impacts on future development and future road upgrades and avoids the need for very costly relocation of gas pipeline in the future when roads need to be upgraded to implement the Nowra Bomaderry Structure Plan, a cost likely to be imposed on the local community and Council.
- Avoids the need for agreement with Council in terms of access to Council roads reserves for on-going inspections and maintenance.
- Provides greater buffer between the pipeline and the built environment for increased safety, including protection of existing and future development areas.

Investigation is recommended to connect to the Main Gas Pipeline easement in the vicinity of Devitts Lane.

While utilising their own land to the east for the pipeline as suggested above is likely to require approximately a 20% increase in pipeline length, it is considered that the cost of providing this additional length of pipeline may be significantly less than the future cost (to Council and community) of relocating the gas pipeline where required to accommodate future development of land and roads in the future years. It is suggested that if Manildra wish to continue with their current proposal (to use lands other than their own) that they would need to provide an economic and social justification case to the Department and Council to demonstrate that their proposal is least cost to the community.

Should you wish to have further information about the planned urban expansion or the route options please contact John Britton, Part 3A Coordinator on 4429 3432.

Yours faithfully

Tim Fletcher
Director Development & Environmental Services

SHOALHAVEN CITY COUNCIL

SUBMISSION TO THE NSW DEPARTMENT OF PLANNING
PART 3A, ENVIRONMENTAL PLANNING & ASSESSMENT ACT, 1979

KEY ISSUES SUBMISSION

CONCEPT PLAN MP10_0144
MAJOR PROJECT APPLICATION MP 10_0108

PROPERTY: Land within the Shoalhaven local government area. The pipeline is proposed to run east - south east from the existing Eastern Gas Pipeline at Prestells Lane Meroo Meadow to a boundary of the Shoalhaven Starches site at Railway Road, Bomaderry via the existing public road network and private land.

APPLICANT: Shoalhaven Starches Pty Ltd

OWNER: Shoalhaven Starches Pty Ltd, Local and State road authorities and other private landowners

DEPARTMENT OF PLANNING REFERENCE:
MP10_0144 (Concept) and MP10_0108 (Project)

COUNCIL REFERENCE: 3A10/1005

Introduction

Council has reviewed the proponents Preliminary Environmental Assessment Report (PEAR) (Cowman Stoddart Pty Ltd – June 2010) and the Department's draft Director General's Requirements. Council has held meetings with the proponent earlier in 2010 about the proposed project. The proponent has included Council's letter of 19 April 2010 in the PEAR Annexure 1.

Strategic Planning Matters

For the lands and roads within the section between the Eastern Gas Pipeline, Prestells Lane and joining at Meroo Road there are future strategic planning impacts that require consideration by the proponent. The strategic planning is included in the adopted Nowra Bomaderry Structure Plan and the Shoalhaven Local Environment Plan 1985. Future rezoning and development of land south west of Prestells Lane and Council's requirement has been identified in Council's April 2010 letter. Additional pipeline technical information for pipe depth and protection has been provided by Council to the proponent by email dated 1 July 2010. Council understands that the Roads and Traffic Authority (RTA) may consider future state road upgrades to the Princes Highway and consultation with the RTA is included in the draft DGRs.

Works within the local road reserves
The existing local road formations and standards of construction within the pipeline route vary. They serve both residential and rural zoned areas and areas with variable building densities. There is existing public and private infrastructure within the existing road reserves that must be considered. The proponent will need to provide plans showing the location of the proposed pipeline for the length of the project including all property boundaries, easements required and road reserves. The plan will need to identify all service providers affected and section details.

The PEAR is deficient in Clause 7.2.13 – Services and Utilities, because there is no reference in Table 8 to Council's Shoalhaven Water infrastructure for water supply and sewer. It is noted the proponent is required to consult with Shoalhaven City Council and in this regard Shoalhaven Water should also be directly consulted.

Water and sewer
Council's Shoalhaven Water is the water and sewer authority. All works within 1.2m of Shoalhaven Water assets (including Water Service lines) will require approval by Shoalhaven Water. Shoalhaven Water advises that the minimum horizontal and vertical clearances are to be maintained, therefore works that are required to protect or relocate such services are to be approved by Shoalhaven Water prior to works being undertaken at the developer's expense.

The applicant will be required to submit plans for Shoalhaven Water's determination for the whole extent of the works, the plans are to show all existing Shoalhaven Water infrastructure that may be impacted upon by the proposed gas main.
No gas main service will be permitted to be located within any of Council's Easement for Water Supply and Easement for Drainage of Sewerage.

The applicant will be required to make written application for a Certificate of Compliance, under section 305 of the *Water Management Act 2000*, to Shoalhaven Water prior to works commencing.

Conclusion
Council welcomes future consultation by the proponent as they develop the Environmental Assessment Report, as the majority of the pipeline route affects the local road system.

T Fletcher
Director
Development and Environmental Services Group
22 October 2010

ANNEXURE 3

Government Agency

Review of Environmental Assessment

ANNEXURE 3

ANNEXURE 3

GOVERNMENT AGENCY REVIEW OF ENVIONRONMENTAL ASSESSMENT

DEPARTMENT OF PLANNING & INFRASTRUCTURE (DPI)

Issues raised BY DPI	*Section Addressed*	*Annexure Addressed*
General Project Description		
– The revised EA must describe what is proposed to occur to the existing pipeline which currently supplies gas to the site via the ActewAGL pipeline, ie. would it be decommissioned and remain in situ or would it be removed? The revised EA should describe how this process would be managed. – The revised EA must include a series of aerial photographs depicting the pipeline route and showing all parcels of land it would traverse (including cadastre information).	Section 1.2 and Section 3.2.8 of this EA.	**Annexure 5** includes aerial photography depicting pipeline route including cadastral boundaries.
Design		
– The EA should be revised to commit to under-boring in accordance with the standards and guidelines of the relevant agencies in order to minimise the potential impacts on infrastructure and the environment.	The EA has been modified to require directional drilling underboring of watercourses (Section 3.2.2 and 7.4.1.1 of the EA).	
Hazards and Risk		
– The Preliminary Hazards Analysis has quantified risk via a risk matrix from the pipeline to the adjacent land uses and proposed several control measures, including concrete casing where necessary, to mitigate the risks. – However, it is not clear whether stress corrosion or fatigue failures due to pressure cycling have been taken into account. The EA needs to be revised to address these issues and outline the proposed control measures during design and operation.		The PHA included in **Annexure 14** has been modified to address this issue.

Department of Planning & Infrastructure (DPI)

Issues raised BY DPI	*Section Addressed*	*Annexure Addressed*
Noise and Vibration		
– Section 7.3.5 (Volume 1) of the EA should be amended so that individual officers at the Department are not mentioned by name. The Department is a collective government organisation and should be referenced accordingly. (DoPI 19/3/12)	Section 7.3.5 has been modified accordingly.	**Annexure 16** includes a revised Construction Noise & Vibration Management Plan prepared by Day Design Pty Ltd. The relevant section of this report has also been modified accordingly.
– The noise assessment predicts the level of noise for each item of plant and equipment to be used during construction individually and compares each noise source to the relevant criteria in OEH's *Interim Construction Noise Guideline* (ICNG). In order to ensure that the highest potential level of noise is presented, all items of plant and equipment should be added together and remodelled collectively. (DoPI 24/11/11)	This issue is addressed in Sections 7.3.3.2 and 7.3.5 of this EA.	**Annexure 16** includes a revised Construction Noise & Vibration Management Plan prepared by Day Design Pty Ltd addressing these issues.
– The Department recognises that it is unlikely that all plant and equipment would be operated concurrently. However, in order to ensure a highly conservative assessment of the likely noise impacts of the project, the EA should predict the 'worst case scenario' during construction and operation with all items of plant and equipment added together and modelled collectively. Therefore, the Department requests that the EA be amended accordingly (ie. include combined construction noise predictions and totals in Tables 17 – 20, Volume 1 and Tables 6.2 – 6.5, Annexure 16, Volume 2). (DoPI 19/3/12)	This issue is addressed in Sections 7.3.3.2 and 7.3.5 of this EA.	
– The EA predicts a number of exceedances of the relevant ICNG criteria (and in some cases emissions could be up to a level where there could be strong community reaction). The EA proposes a number of source controls to mitigate these impacts (e.g. exhaust silencers and use of low noise machinery) but does not quantify how effective these measures would be at attenuating noise. When the noise emissions are remodelled, it should take into account these measures. (DoPI 24/11/11)	This issue is addressed in Sections 7.3.3.4 and 7.3.5 of this EA.	

Department of Planning & Infrastructure (DPI)

Issues raised BY DPI	*Section Addressed*	*Annexure Addressed*
– If there are still exceedances of the relevant ICNG criteria once the construction noise levels have been remodelled, the company should consider what other reasonable and feasible noise management and mitigation measures it could implement to further reduce construction noise and/or what community consultation activities it would carry out to reduce these impacts on surrounding receivers. (DoPI 24/11/11)	This issue is addressed in Sections 7.3.3.4 and 7.3.5 of this EA.	**Annexure 16** includes a revised Construction Noise & Vibration Management Plan prepared by Day Design Pty Ltd addressing these issues.
– The EA predicts a number of exceedances of the relevant *Interim Construction Noise Guideline* (ICNG) criteria. Not only is it predicted that there would be large scale exceedances of the applicable construction noise criteria, but levels identified as resulting in strong community reaction have also been predicted to occur. The EA proposes a number of source controls to mitigate these impacts (eg. exhaust silencers and use of low noise machinery) but does not quantify how effective these measures would be at attenuating noise. The Department needs to be satisfied that these proposed measures are capable of achieving an acceptable acoustic environment for local residents. Therefore, the final noise levels, predicted after the implementation of all reasonable and feasible noise measures, need to be quantified. The Department recognises that the proposed construction activities would be short-term with each receiver expected to be subjected to noise impacts for less than one week. However, if there are still exceedances of the relevant ICNG criteria once the construction noise levels have been remodelled, the company should consider what other reasonable and feasible noise management and mitigation measures it could implement to further reduce construction noise impacts on surrounding receivers. (DoPI 19/3/12)	This issue is addressed in Sections 7.3.3.4 and 7.3.5 of this EA.	
– The noise assessment indicates that no rock hammering equipment would be used during construction whereas the geotechnical report states that a 20 tonne excavator equipped with rock bucket, rock hammer or ripping tyne would be used to penetrate highly weathered (Class V) sandstone during construction. The revised EA must clarify whether or not rock hammering equipment would be used during construction, and, if so, the noise impacts of this must be assessed. (DoPI 24/11/11)	This issue is addressed in Section 3 of the revised CNMP and Section 7.3.3.2 of this EA.	

Department of Planning & Infrastructure (DPI)

Issues raised BY DPI	*Section Addressed*	*Annexure Addressed*
– Finally, the revised EA should clarify whether the proposed pressure reduction facility would generate noise and, if so, the noise impacts of this must be assessed. (DoPI 24/11/11).	This issue is addressed in Section 7.3.3.5 of this EA.	
Soil, Water and Contamination		
– It is unclear to the Department whether the company would under-bore at creek crossings located along the pipeline route. The EA should be revised to commit to underboring at these points during construction in order to minimise impacts on waterways during construction.	The EA has been modified to require directional drilling underboring watercourses. (Section 3.2.3 and Section 7.4.1.1 of this EA.)	
– It is unclear to the Department what the impact of underboring will be on local groundwater. The EA should be revised to include this information. Additionally, the EA requires more information on how groundwater inflows would be managed during construction (particularly during trenching and underboring), including the protocol to be followed if found to be contaminated.	This issue is discussed in Section 7.4.1.3 of the EA.	This issue is discussed in **Annexure 10b** of the EA.
Air Quality		
– The Department notes that gas would be vented from the proposed pressure reduction facility during emergencies and for routine maintenance. The Department wishes to clarify whether or not any significant air or greenhouse gas emissions would result from this activity. If so, the revised EA should include a quantification of these emissions including impacts on local air quality and nearby sensitive receivers.	This issue is addressed in Section 7.5.5 of the EA.	This issue is addressed in Section 4.1 of the Air Quality Impact Assessment included in **Annexure 17** of the EA.

NSW OFFICE OF WATER (OoW)

Issues raised by OOW	*Section Addressed*	*Annexure Addressed*
The NSW Office of Water recommends the following key issues are addressed in the Environmental Assessment prior to public exhibition.		
Watercourse Crossings		
The draft Environmental Assessment (EA) indicates the proposed pipeline will not cross any major watercourses but will cross a minimum of three intermittent / minor waterways and a fourth crossing may be required (Section 6.1.4 and Section 7.4.1.1). It should be noted that intermittent / minor streams are "rivers" as defined under the Water Management Act. The NSW Office of Water has identified that the draft EA does not specify that directional drilling (underboring) is to be used at each waterway crossing. Section 3.2.3 of the draft EA states the dry creek beds could be open cut during construction or alternatively horizontal boring could be used. Section 7.4.1.1 indicates the selection of waterway crossing technique is subject to the final CEMP. The technical reports, however recommend underboring. For example, Annexure 9 recommends that underboring of drainage channels and creek crossings be considered and indicates that trenching near creek crossings will be problematic (see pages 1 and 27). Annexure 12 also states the recommended method of waterway crossing is by underbore (see page 33). On the 7 September 2011, the Office of Water met with Cowman Stoddart Pty Ltd. At this meeting it was proposed to directional drill under the watercourses. The Office of Water supported using directional drilling and advised that the EA should detail the drilling entry and exit points. The Office of Water does not support the use of trenching for waterway crossings. *Depth of Pipeline at Watercourse Crossings* The draft EA provides inconsistent information on the depth of burial of the proposed pipeline below the creek bed, for example: • Section 3.2.3 of the draft EA states the pipeline will be buried to a minimum depth of 2000 mm below the creek (page 24) • Section 7.4.1.1 states "adequate cover is required over the gas pipeline with the depth of burial 1.2 m below the creek bed and approximately 2.2 and 3.2 m below the natural surface level.	The EA has been modified to require directional drilling underboring of watercourses. (Section 3.2.3 and Section 7.4.1.1 of this EA).	

NSW Office of Water (OoW)

Issues raised by OOW	*Section Addressed*	*Annexure Addressed*
At the meeting on 7 September 2011, the Office of Water advised that the depth of the underbore beneath the watercourses needs to be well below any potential scour in the creek beds so that the pipeline does not become exposed. Annexure 2 lists that consideration needs to be given to ensuring the pipeline is situated below potential scour depth of bed of watercourse and indicates this is addressed in Section 7.4.1.1 of the EA and Annexure 12. The requested scour calculations have not been provided in the EA. *Watercourse Mitigation Measures* A geomorphic assessment of all watercourses needs to be undertaken and a monitoring program provided to assist in the environmental assessment and objective of ensuring that the geomorphic stability of the creeks is maintained. *Figures* The EA needs to include figures which clearly show the pipeline route and the creeks proposed to be crossed. The figures included in the draft EA are fairly faint and do not clearly show the watercourses. It is recommended Annexure 54 (Aerial photographs depicting the preferred route) include the names of the watercourses proposed to be crossed.	This matter is addressed in Section 7.4.1.1 of the EA.	A geomorphic assessment is included in Section 3.6 and 3.10 of **Annexure 13**. The figure in **Annexure 5** includes the location of the watercourses discussed in the EA.
Rehabilitation, Maintenance and Monitoring		
The EA needs to include a specific section on the rehabilitation, maintenance and monitoring of watercourses and riparian land, for the period prior to and following construction of works. The monitoring program should include monitoring and maintenance of any bank stabilisation and stream bank, bed and floodplain rehabilitation undertaken as part of this proposal and continue until all crossing sites are identified as stable by an independent suitably qualified certifier.	This matter has been addressed in Section 7.4.1.1 of the EA.	

NSW Office of Water (OOW)

Issues raised by OOW	*Section Addressed*	*Annexure Addressed*
Wetlands		
The draft EA indicates there are no SEPP 14 wetlands located within the vicinity of the proposed pipeline route (Section 5.3.1, page 51) and Section 7.6.1 states the route does not cross any natural wetland (page 132). Section 4.1 of the Flora and Fauna Assessment Report (Annexure 7, page 4) refers to the pipeline section across Manildra land at Bolong Road and notes *"in the far north-western corner there is a low-lying wet area that supports various native wetland plants"*. Further details are required as to whether the pipeline route proposes to cross this "low-lying wet area" and if this area is a wetland and whether it is proposed to use HDD at this location.	These issues have been addressed in Section 7.6.4 of the EA.	The Flora & Fauna Assessment held in **Annexure 8** has been modified to address this issue.
Water Licence		
Section 5.2.11 of the draft EA indicates no extraction of water is likely (page 51) but if it is relevant licences will be sought. The EA needs to address if a water supply is required for the project and provide details on the source of the water supply, the volumes required etc and whether it is proposed to use groundwater or surface water as a water supply source during construction. This information is required to determine if a licence is required from the Office of Water and if so, the applicant needs to apply for a licence from Office of Water prior to the construction phase commencing.	Section 5.2.11 of this EA has been modified to address water supply requirements for the project.	
Groundwater		
On 1 July 2011, the Water Sharing Plan (WSP) for the Greater Metropolitan Region Groundwater Sources which covers the project area commenced. Upon commencement of the Water Sharing Plan, the licensing provisions of the *Water Management Act 2000* (WMA 2000) also came into effect in the plan area. Information on the WSP can be found at the following link: http//www.water.nsw.gov.au/Water-management/Water-sharing-plans/plans commenced/default.aspx.		

NSW Office of Water (OOW)

Issues raised by OOW	*Section Addressed*	*Annexure Addressed*
Section 7.4.2.2 indicates the depth of excavation for the proposed pipeline varies from about 1 m to 2.4 m and Section 7.4.1.3 of the draft EA indicates significant groundwater inflows are generally not expected within 1.5 m of the ground surface in the majority of the project area.		
The draft EA notes groundwater seepages or inflows were generally observed between 0.5 m and 2.5 m at specific locations (see section 7.4.2.1, page 122) and Section 7.4.1.3 states that where groundwater inflows are encountered they should be able to be controlled by pumping from sumps. The EA needs to quantify the likely volumes of groundwater to be extracted to assess potential impacts and the need for any licensing.	This issue has been addressed in Section 7.4.1.3 of the EA.	This issue has been addressed in **Annexure 10b** of the EA.
Groundwater Dependent Ecosystems An assessment needs to be undertaken at the local scale of any Groundwater Dependent Ecosystems (GDEs) in the surrounding area and identify any potential impacts on GDEs as a result of the proposal. This assessment needs to be provided as part of the EA.	This issue has been addressed in Section 7.6.4 of this EA.	The Flora & Fauna Assessment (**Annexure 8**) has been modified to address this issue
Table 29 – Draft Statement of Commitments		
Watercourse Crossings: It is noted Draft Statement of Commitment 3.7 (SOC) is to prepare specific water crossing construction method statement. It is recommended a SOC is included that the creek crossings are to be directionally drilled: • With entry and exit points sufficiently setback to allow for desired Category 2 riparian objectives to be met and • Which caters for designed scour depth and a safety margin. *1. Ecological Management:* A SOC needs to be included that local native plant species must be used to rehabilitate native riparian vegetation disturbed by the project.	SOC 3.7 (Table 29) has been modified to reflect this requirement. SOC 10.6 (Table 29) has bee included to address this issue.	

NSW Office of Water (OOW)

Issues raised by OOW	*Section Addressed*	*Annexure Addressed*
3. Surface and Groundwater Management: A SOC needs to be included that the Office of Water is to be consulted if groundwater dewatering is necessary during construction to determine if an approval is required. The Office of Water recommends a commitment be included that each watercourse crossing be assessed to determine whether the soils are sodic or non-sodic within flood liable land. The soil properties (such as sodicity) at watercourse crossings need to be assessed to determine appropriate crossing methodologies and rehabilitation measures. The investigation should be undertaken before construction commences.	SOC 3.10 (Table 29) has been included to address this issue.	
10. Rehabilitation: A SOC needs to be included that local native plant species must be used to rehabilitate native riparian vegetation disturbed by the project. Post construction rehabilitation should include the rehabilitation of watercourse crossings and the rehabilitation phase should continue until all watercourse crossing sites are identified as stable by an independently suitably qualified certifier. Any trench areas should be maintained until they are certified as stable.	SOC 10.5 and 10.6 (Table 29) have been included to address these issues.	
Waterway Monitoring Draft Statement of Commitment (10.7) includes *'conduct ongoing monitoring and maintenance of disturbed areas'*. The monitoring program would need to be undertaken to assess the outcomes of the works undertaken including areas of potential erosion and ground instability associated with the construction impact. The monitoring program should include monitoring and maintenance of any bank stabilisation and stream bed and bank rehabilitation. The rehabilitation will need to be monitored until all crossing sites are identified as stable by an independent suitably qualified certifier. Monitoring should also be undertaken for the rehabilitation of native riparian vegetation where native riparian vegetation has been removed as part of the project and rehabilitated following construction. The Office of Water recommends a maintenance period of 5 years after final planting. The rehabilitation of other non native vegetation in riparian areas should be maintained until it is established and the area has been certified as stable by a suitably qualified independent certifier.	SOC 10.9 (Table 29) has been modified to address this issue.	

NSW OFFICE OF ENVIRONMENTAL & HEALTH (OEH)

Issues raised by OEH	Section Addressed	Annexure Addressed
OEH has reviewed the draft EA provided for the project and has found that it is generally adequate for public exhibition. OEH does however note that the noise impact assessment contained in the draft EA does not contain any details in relation to potential noise impacts from the operation of the proposed gas pressure reduction facility that is to be built as part of the project. It is recommended that any publicly exhibited EA contain such details to allow for the assessment of any potential noise impacts from this component of the project to be undertaken.	Section 7.3.3.5 of this EA addresses this issue.	Section 6.5 of the revised CNVMP (**Annexure 16**) addresses this issue.

RAILCORP

Issues raised by Railcorp	Section Addressed	Annexure Addressed
Rail Corporation New South Wales (RailCorp) has reviewed the proposal and outlines a series of conditions that should be imposed on any consent.	These conditions recommended by RailCorp have been incorporated in the SOC (SOC 13.1 – 13.6) and included in Table 29 of the EA.	

ROADS AND TRAFFIC AUTHORITY (RTA)

Issues raised by RTA	Section Addressed	Annexure Addressed
The RTA's main concern is to negate or at least minimise the damage to road pavements, shoulders and drainage lines. The RTA policy in Southern Region is to insist that all under bores be at least 1.2 metres below the road surface, the deeper the better. Exit and entry pits for the bores should be as far as possible and not within three metres of the pavement. Exceptions can, but rarely are, made to these two conditions.	**Figure 6** of the EA confirms typical depth of road crossing of 1.2 metres satisfies RTA requirement in this regard.	

NSW GOVERNMENT | Planning & Infrastructure

Contact: Andrew Hartcher
Phone: 02 9228 6503
Fax: 02 9228 6466
Email: andrew.hartcher@planning.nsw.gov.au

Our ref: 10/07456

Mr Brian Hanley
Manager - Energy & Sustainability
Shoalhaven Starches Pty Ltd
PO Box 123
NOWRA NSW 2541

Dear Mr Hanley

Environmental Assessment Adequacy Review
Shoalhaven Starches Gas Pipeline Project
MP 10_0108 (Project Application) and MP 10_0144 (Concept Plan)

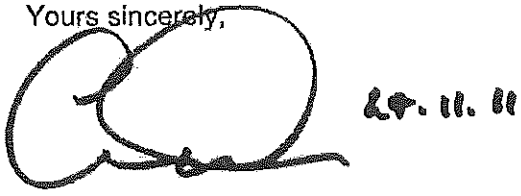
The Department has reviewed the Environmental Assessment (EA) for the abovementioned project, in consultation with relevant government agencies, and considers it to be inadequate for public exhibition.

You are requested to submit a revised EA that addresses the issues identified in Attachment 1 and considers the issues in Attachment 2, particularly the issues raised by the Office of Environment and Heritage, the NSW Office of Water, the Roads and Traffic Authority and RailCorp.

Furthermore, from the documentation submitted to date, it is unclear if landowners consent has been provided by the landowners that are located along the gas pipeline route. This matter must be addressed before there applications can be progressed.

Should you have any further enquiries about this matter please contact Andrew Hartcher on the details listed above.

Yours sincerely,



Chris Wilson
Executive Director
Major Projects Assessment
as delegate of the Director-General

ATTACHMENT 1
DEPARTMENT OF PLANNING AND INFRASTRUCTURE'S EA COMMENTS

General Project Description

- The revised EA must describe what is proposed to occur to the existing pipeline which currently supplies gas to the site via the Actew/AGL pipeline. i.e. would it be decommissioned and remain in situ or would it be removed? The revised EA should describe how this process would be managed.
- The revised EA must include a series of aerial photographs depicting the pipeline route and showing all parcels of land it would traverse (including cadastre information).

Design

- The EA should be revised to commit to under-boring in accordance with the standards and guidelines of the relevant government agencies in order to minimise the potential impacts on infrastructure and the environment.

Hazards and Risk

- The Preliminary Hazards Analysis has quantified risks via a risk matrix from the pipeline to the adjacent land uses and proposed several control measures, including concrete casing where necessary, to mitigate the risks.
- However, it is not clear whether stress corrosion or fatigue failures due to pressure cycling have been taken into account. The EA needs to be revised to address these issues and outline the proposed control measures during design and operation.

Noise and Vibration

- The noise assessment predicts the level of noise for each item of plant and equipment to be used during construction individually and compares each noise source to the relevant criteria in OEH's *Interim Construction Noise Guideline* (ICNG). In order to ensure that the highest potential level of noise is presented, all items of plant and equipment should be added together and remodelled collectively.
- The EA predicts a number of exceedances of the relevant ICNG criteria (and in some cases emissions could be up to a level where there could be strong community reaction). The EA proposes a number of source controls to mitigate these impacts (e.g. exhaust silencers and use of low noise machinery) but does not quantify how effective these measures would be at attenuating noise. When the noise emissions are remodelled, it should take into account these measures.
- If there are still exceedances of the relevant ICNG criteria once the construction noise levels have been remodelled, the company should consider what other reasonable and feasible noise management and mitigation measures it could implement to further reduce construction noise and/or what community consultation activities it would carry out to reduce these impacts on surrounding receivers.
- The noise assessment indicates that no rock hammering equipment would be used during construction whereas the geotechnical report states that a 20 tonne excavator equipped with rock bucket, rock hammer or ripping tyne would be used to penetrate highly weathered (Class V) sandstone during construction. The revised EA must clarify whether or not rock hammering equipment would be used during construction and, if so, the noise impacts of this must be assessed.
- Finally, the revised EA should clarify whether the proposed pressure reduction facility would generate noise and, if so, the noise impacts of this must be assessed.

Soil, Water and Contamination

- It is unclear to the Department whether the company would under-bore at creek crossings located along the pipeline route. The EA should be revised to commit to under boring at these points during construction in order to minimise impacts on waterways during construction.
- It is unclear to the Department what the impact of under-boring will be on local groundwater. The EA should be revised to include this information. Additionally, the EA requires more information on how groundwater inflows would be managed during construction (particularly during trenching and under-boring), including the protocol to be followed if found to be contaminated.

Air Quality

- The Department notes that gas would be vented from the proposed pressure reduction facility during emergencies and for routine maintenance. The Department wishes to clarify whether or not any significant air or greenhouse gas emissions would result from this activity. If so, the revised EA should include a quantification of these emissions including impacts on local air quality and nearby sensitive receivers.

NSW GOVERNMENT | Planning & Infrastructure

Contact: Andrew Hartcher
Phone: 02 9228 6503
Fax: 02 9228 6466
Email: andrew.hartcher@planning.nsw.gov.au

Our ref: 10/07456

Mr Brian Hanley
Manager - Energy & Sustainability
Shoalhaven Starches Pty Ltd
PO Box 123
NOWRA NSW 2541

Dear Mr Hanley

Environmental Assessment - Adequacy Round 2
Shoalhaven Starches Gas Pipeline Project
MP 10_0108 (Project Application) and MP 10_0144 (Concept Plan)

The Department has reviewed the revised Environmental Assessment (EA) for the abovementioned project, in consultation with relevant government agencies.

As discussed with Mr. Stephen Richardson of Cowman Stoddart Pty Ltd, the Department considers that the EA will be adequate for public exhibition, subject to the issues in Attachment 1 being addressed.

In relation to landowners consent, we confirm from our discussions that the Department requires that you provide evidence of having obtained landowners consent from all landowners located along the gas pipeline route, prior to determination. The Department understands that you are in the process of obtaining this consent and requests that you provide this as soon as possible.

A determination on the project cannot be legally made until the landowners consent has been provided. Consent from each landowner must be provided in the form of a signature on the project application form or an official signed letter.

Should you have any further enquiries about this matter please contact Andrew Hartcher on the details listed above.

Yours sincerely,

C. Ritchie 19/3/12

Chris Ritchie
Manager - Industry
Mining & Industry Projects
as delegate of the Director-General

ATTACHMENT 1
DEPARTMENT OF PLANNING AND INFRASTRUCTURE'S EA COMMENTS

General

- Section 7.3.5 (Volume 1) of the EA should be amended so that individual officers at the Department are not mentioned by name. The Department is a collective government organisation and should be referenced accordingly.

Noise and Vibration

- The Department recognises that it is unlikely that all plant and equipment would be operated concurrently.
- However, in order to ensure a highly conservative assessment of the likely noise impacts of the project, the EA should predict the 'worst case scenario' during construction and operation with all items of plant and equipment added together and modelled collectively.
- Therefore, the Department requests that the EA be amended accordingly (i.e. include combined construction noise predictions and totals in Tables 17 - 20, Volume 1 and Tables 6.2 – 6.5, Annexure 16, Volume 3).
- The EA predicts a number of exceedances of the relevant *Interim Construction Noise Guideline* (ICNG) criteria. Not only is it predicted that there would be large scale exceedances of the applicable construction noise criteria, but levels identified as resulting in strong community reaction have also been predicted to occur.
- The EA proposes a number of source controls to mitigate these impacts (e.g. exhaust silencers and use of low noise machinery) but does not quantify how effective these measures would be at attenuating noise.
- The Department needs to be satisfied that these proposed measures are capable of achieving an acceptable acoustic environment for local residents. Therefore, the final noise levels, predicted after the implementation of all reasonable and feasible noise measures, need to be quantified.
- The Department recognises that the proposed construction activities would be short-term with each receiver expected to be subjected to noise impacts for less than one week.
- However, if there are still exceedances of the relevant ICNG criteria once the construction noise levels have been remodelled, the company should consider what other reasonable and feasible noise management and mitigation measures it could implement to further reduce construction noise impacts on surrounding receivers.

Hazards

- The revised EA does not appear to have addressed the Department's hazards and risk comments in its original letter dated 24 November 2011.
- While the Department considers that the EA is generally adequate for exhibition. It is important to note that the Department would like these matters addressed during the remainder of the assessment process (e.g. at the response to submission stage).

ATTACHMENT 2
GOVERNMENT AGENCY EA COMMENTS

NSW GOVERNMENT | **Office of Water**

Mining and Industry Projects
Department of Planning and Infrastructure
GPO Box 39
SYDNEY NSW 2001

Attention: David Mooney

c: Janne Grose
t: 02 4729 8262
f: 02 4729 8141
e: Janne.Grose@water.nsw.gov.au

Our ref : ER21654
Your ref: MP10_0169 &MP10_0170

16 November 2011

Dear David

Concept Plan (MP10_0169) and Project Application (MP10_0170) - Shoalhaven Starches Gas Pipeline – Test of Adequacy

Thank you for your letter of 17 October 2011 seeking comment from the NSW Office of Water on the Test of Adequacy (ToA) for the above major project proposal.

The Office of Water recommends the key issues, as outlined in **Attachment A**, are addressed in the environmental assessment prior to public exhibition.

Contact Details

Should you have any queries in relation to this matter please contact Janne Grose on telephone (02) 4729 8262.

Yours sincerely

Mark Mignanelli
Manager Major Projects and Assessment

NSW Office of Water Comments

Concept Plan and Project Application – Shoalhaven Starches Gas Pipeline - Test of Adequacy

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Watercourse Crossings

The draft Environmental Assessment (EA) indicates the proposed pipeline will not cross any major watercourses but will cross a minimum of three intermittent / minor waterways and a fourth crossing may be required (Section 6.1.4 and Section 7.4.1.1). It should be noted that intermittent / minor streams are "rivers" as defined under the Water Management Act.

The NSW Office of Water has identified that the draft EA does not specify that directional drilling (underboring) is to be used at each waterway crossing. Section 3.2.3 of the draft EA states the dry creek beds could be open cut during construction or alternatively horizontal boring could be used. Section 7.4.1.1 indicates the selection of waterway crossing technique is subject to the final CEMP. The technical reports, however recommend underboring. For example, Annexure 9 recommends that underboring of drainage channels and creek crossings be considered and indicates that trenching near creek crossings will be problematic (see pages 1 and 27). Annexure 12 also states the recommended method of waterway crossing is by underbore (see page 33).

On the 7 September 2011, the Office of Water met with Cowmann Stoddart Pty Ltd. At this meeting it was proposed to directional drill under the watercourses. The Office of Water supported using directional drilling and advised that the EA should detail the drilling entry and exit points.

The Office of Water does not support the use of trenching for waterway crossings.

Depth of pipeline at watercourse crossings

The draft EA provides inconsistent information on the depth of burial of the proposed pipeline below the creek bed, for example:

- Section 3.2.3 of the draft EA states the pipeline will be buried to a minimum depth of 2000 mm below the creek (page 24)

- Section 7.4.1.1 states "adequate cover is required over the gas pipeline with the depth of burial 1.2 m below the creek bed and approximately 2.2 and 3.2 m below the natural surface level.

At the meeting on 7 September 2011, the Office of Water advised that the depth of the underbore beneath the watercourses needs to be well below any potential scour in the creek beds so that the pipeline does not become exposed. Annexure 2 lists that consideration needs to be given to ensuring the pipeline is situated below potential scour depth of bed of watercourse and indicates this is addressed in Section 7.4.1.1 of the EA and Annexure 12. The requested scour calculations have not been provided in the EA.

Watercourse Mitigation Measures
A geomorphic assessment of all watercourses needs to be undertaken and a monitoring program provided to assist in the environmental assessment and objective of ensuring that the geomorphic stability of the creeks is maintained.

Figures
The EA needs to include figures which clearly show the pipeline route and the creeks proposed to be crossed. The figures included in the draft EA are fairly faint and do not clearly show the watercourses.

It is recommended Annexure 4 (Aerial photographs depicting the preferred route) include the names of the watercourses proposed to be crossed.

Rehabilitation, maintenance and monitoring
The EA needs to include a specific section on the rehabilitation, maintenance and monitoring of watercourses and riparian land, for the period prior to and following construction of works.

The monitoring program should include monitoring and maintenance of any bank stabilisation and stream bank, bed and floodplain rehabilitation undertaken as part of this proposal and continue until all crossing sites are identified as stable by an independent suitably qualified certifier.

Wetlands
The draft EA indicates there are no SEPP 14 wetlands located within the vicinity of the proposed pipeline route (Section 5.3.1, page 51) and Section 7.6.1 states the route does not cross any natural wetland (page 132). Section 4.1 of the Flora and Fauna Assessment Report (Annexure 7, page 4)) refers to the pipeline section across Manildra land at Bolong Road and notes "in the far north-western corner there is a low-lying wet area that supports various native wetland plants". Further details are required as to whether the pipeline route proposes to cross this "low-lying wet area" and if this area is a wetland and whether it is proposed to use HDD at this location.

Water licence
Section 5.2.11 of the draft EA indicates no extraction of water is likely (page 51) but if it is relevant licences will be sought. The EA needs to address if a water supply is required for the project and provide details on the source of the water supply, the volumes required etc and whether it is proposed to use groundwater or surface water as a water supply source during construction.

This information is required to determine if a licence is required from the Office of Water and if so, the applicant needs to apply for a licence from Office of Water prior to the construction phase commencing.

Groundwater
On 1 July 2011, the Water Sharing Plan (WSP) for *the Greater Metropolitan Region Groundwater Sources* which covers the project area commenced. Upon commencement of the Water Sharing Plan, the licensing provisions of the *Water Management Act 2000* (WMA 2000) also came into effect in the plan area. Information on the WSP can be found at the following link: http://www.water.nsw.gov.au/Water-management/Water-sharing-plans/plans_commenced/default.aspx.

Section 7.4.2.2 indicates the depth of excavation for the proposed pipeline varies from about 1m to 2.4 m and Section 7.4.1.3 of the draft EA indicates significant groundwater inflows are generally not expected within 1.5m of the ground surface in the majority of the project area.

The draft EA notes groundwater seepages or inflows were generally observed between 0.5 m and 2.5 m at specific locations (see section 7.4.2.1, page 122) and Section 7.4.1.3 states that where groundwater inflows are encountered they should be able to be controlled by pumping from sumps. The EA needs to quantify the likely volumes of groundwater to be extracted to assess potential impacts and the need for any licensing.

Groundwater Dependent Ecosystems
An assessment needs to be undertaken at the local scale of any Groundwater Dependent Ecosystems (GDEs) in the surrounding area and identify any potential impacts on GDEs as a result of the proposal. This assessment needs to be provided as part of the EA.

Table 29 - Draft Statement of Commitments

Watercourse Crossings:
It is noted Draft Statement of Commitment 3.7 (SOC) is to prepare specific water crossing construction method statement. It is recommended a SOC is included that the creek crossings are to be directionally drilled:

- With entry and exit points sufficiently setback to allow for desired Category 2 riparian objectives to be met and
- Which caters for designed scour depth and a safety margin.

1. Ecological Management:
A SOC needs to be included that local native plant species must be used to rehabilitate native riparian vegetation disturbed by the project.

3 Surface and Groundwater management :
A SOC needs to be included that the Office of Water is to be consulted if groundwater dewatering is necessary during construction to determine if an approval is required

The Office of Water recommends a commitment be included that each watercourse crossing be assessed to determine whether the soils are sodic or non-sodic within flood liable land. The soil properties (such as sodicity) at watercourse crossings need to be assessed to determine appropriate crossing methodologies and rehabilitation measures. The investigations should be undertaken before construction commences.

10 Rehabilitation:
A SOC needs to be included that local native plant species must be used to rehabilitate native riparian vegetation disturbed by the project.

Post construction rehabilitation should include the rehabilitation of watercourse crossings and the rehabilitation phase should continue until all watercourse crossing sites are identified as stable by an independent suitably qualified certifier. Any trench areas should be maintained until they are certified as stable.

Waterway Monitoring
Draft Statement of Commitment (10.7) includes 'conduct ongoing monitoring and maintenance of disturbed lands'. The monitoring program would need to be undertaken to

assess the outcomes of the works undertaken including areas of potential erosion and ground instability associated with the construction impact. The monitoring program should include monitoring and maintenance of any bank stabilisation and stream bed and bank rehabilitation. The rehabilitation will need to be monitored until all crossing sites are identified as stable by an independent suitably qualified certifier.

Monitoring should also be undertaken for the rehabilitation of native riparian vegetation where native riparian vegetation has been removed as part of the project and rehabilitated following construction. The Office of Water recommends a maintenance period of 5 years after final planting. The rehabilitation of other non native vegetation in riparian areas should be maintained until it is established and the area has been certified as stable by a suitably qualified independent certifier.

End Attachment A
16 November 2011

NSW GOVERNMENT | Office of Environment & Heritage

Your reference: 10/07456
Our reference: DOC11/48507
Contact: Stefan Press, (02) 6229 7002

Ms Felicity Greenway
Team Leader – Industry
Mining & Industry Projects
Department of Planning & Infrastructure
GPO Box 39
SYDNEY NSW 2001

03 November 2011

Dear Ms Greenway

RE: Concept Plan Application 10_0169 & Project Application 10_0170
Shoalhaven Starches Gas Pipeline Project
Draft Environmental Assessment - Adequacy review

I refer to your letter of 21 October 2011 and the abovementioned Concept Plan Application and Project Application and accompanying draft Environmental Assessment (EA) for the proposed Shoalhaven Starches Gas Pipeline Project ("the project).

You requested the Office of Environment & Heritage (OEH) review the draft Environmental Assessment and provide comments on its adequacy for public exhibition. OEH has reviewed the draft EA provided for the project and has found that it is generally adequate for public exhibition.

OEH does however note that the noise impact assessment contained in the draft EA does not contain any details in relation to potential noise impacts from the operation of the proposed gas pressure reduction facility that is to be built as part of the project. It is recommended that any publicly exhibited EA contain such details to allow for the assessment of any potential noise impacts from this component of the project to be undertaken.

OEH expects to undertake a detailed review of the EA during the exhibition period and may make a submission including, where appropriate, recommendations for conditions of approval. OEH cannot exclude the possibility that issues might be identified in any detailed review, that are additional to the issue raised in these preliminary comments.

OEH requests that 2 hard copies and 1 electronic copy of the final EA be provided for review during the exhibition period. These documents should be lodged with OEH's Queanbeyan office.

PO Box 622, Queanbeyan NSW 2620
11 Farrer Place, Queanbeyan NSW
Tel: (02) 6229 7002 Fax: (02) 6229 7006
ABN 30 841 387 271
www.environment.nsw.gov.au

If you have any questions, or wish to discuss this matter further please contact me or Stefan Press on 6229 7002.

Yours sincerely

JULIAN THOMPSON
Unit Head – South East Region
Environment Protection and Regulation Group

Stephen Richardson

From: Peter_ARRIGHI@rta.nsw.gov.au
Sent: Wednesday, 26 October 2011 1:21 PM
To: David.Mooney@planning.nsw.gov.au
Subject: Shoalhaven Starches Gas Pipeline Project (your ref:10/07456)

Hello David,

The Concept Plan and Project Applications for the Shoalhaven Starches Gas Pipeline Project have just landed on my desk (via our Land Use Section).I have been asked to make some comments from an RTA Asset Management perspective prior to your final design.

The only part of your project that affects Asset Management is the proposed under bore of the Princes Highway.The under bore of Bolong Road is a matter for Shoalhaven City Council.

Asset Management's main concern on projects like this is to negate or at least minimize the damage to road pavements, shoulders and drainage lines.The RTA policy in Southern Region is to insist that all under bores be at least 1.2 metres below the road surface,the deeper the better.Exit and entry pits for the bores should be as far as possible and not within three metres of the pavement.Exceptions can, but rarely are, made to these two conditions.

When you get to final design stage you will have to submit some project details and drawings so that the RTA can respond appropriately.That response will include other more general conditions that will need to be agreed to before any Road Occupancy License is issued.

Please feel free to give me a call if you have any questions.

regards

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Data isn't information.
Information isn't knowledge.
Knowledge isn't wisdom.
==========

Peter Arrighi

Asset Officer
Roads and Traffic Authority
Southern Regional Office, Wollongong
Ph: (02) 42212546 Mob: 0438534152
Email: peter_arrighi@rta.nsw.gov.au
==========

Please consider the environment before printing this email

RailCorp Property
PO Box K349
Haymarket NSW 1238
Tel: (02) 8922 4062 Fax: (02) 8922 4890
Email: kelly.mckellar@railcorp.nsw.gov.au

27 October 2011

The Department of Planning & Infrastructure
GPO Box 39
Sydney NSW 2001

ATTENTION: David Mooney

Dear Sir/Madam,

Shoalhaven Starches Gas Pipeline Project, Bomaderry
Concept Plan Application (MP 10_0169) & Project Application (MP 10_0170)

I refer to the Department of Planning & Infrastructure's letter dated 17 October 2011 regarding the proposed development at the above address.

Rail Corporation New South Wales (RailCorp) has reviewed the proposal and advises that at present there is not enough information provided to undertake an assessment of the crossings possible impacts on the rail corridor. The Contamination and Geotechnical Assessment provided makes reference to the project needing to comply with our Guidelines for Minor Underbores that is a supplement to SPC 207 however RailCorp will need these requirements to be provided in detail to undertake a full assessment of the project in so far as it may relate to the crossing on RailCorp land.

RailCorp's preliminary review of the information provided identified the following issues and asks that they be addressed in the conditions for this proposed development.

1. Property & Title Search and Survey

In order to protect RailCorp's facilities, it is important that the Applicant accurately defines and locates the property boundaries between the development and RailCorp's facilities, and defines the location of the proposed works/development in relation to RailCorp's facilities. This requires the Applicant to undertake a full Property & Title search and physical surveys and to provide the information to RailCorp. This information is critical to the assessment by RailCorp of all aspects of the development proposal. It is therefore requested that the Department of Planning & Infrastructure include the following condition of consent:

- *The Applicant shall provide an accurate survey locating the development with respect to the rail boundary and rail infrastructure. This work is to be undertaken by a registered surveyor, to the satisfaction of RailCorp's representative.*

NSW | Transport RailCorp

2. Services Searches

It is imperative that the Applicant identifies the existence of any existing RailCorp services (such as pipes and cables) and structures within their development area by initiating the appropriate service searches. Where RailCorp services exist within the development site, the Applicant must enter into discussion, and reach agreement with RailCorp regarding the accommodation of the services.

In addition, where physical intrusion into the corridor is required (e.g. stormwater connections, rock anchors) there may be conflict with existing RailCorp services in the corridor. It is imperative that the Applicant identifies the existence of any RailCorp services and structures within the area of the corridor affected. It is therefore requested that the Department of Planning & Infrastructure include the following condition of consent:

- *Prior to the issue of a Construction Certificate the applicant shall undertake a services search to establish the existence and location of any rail services. Persons performing the service search shall use equipment that will not have any impact on rail services and signaling. Should rail services be identified within the subject development site the Applicant must discuss with the Rail Authority as to whether these services are to be relocated or incorporated within the development site.*

3. Stray Currents and Electrolysis from Rail Operations

Stray currents as a result of rail operations may impact on the structure of the development. Electric currents on overhead wiring pass through the train's motor and return to the power substation via the rail tracks. Occasionally, these currents may stray from the tracks and into the ground. Depending on the type and condition of the ground, these may be passed to the nearest conductive material (concrete reinforcement, piling, conduits, pipework and earthing rods) accelerating corrosion of metals and leading to concrete cancer. Therefore, the Applicant should consider this possible impact, and engage an expert consultant when designing its buildings. It is requested that the Department of Planning & Infrastructure include the following condition of consent:

- *Prior to the issue of a Construction Certificate the Applicant is to engage an Electrolysis Expert to prepare a report on the Electrolysis Risk to the development from stray currents. The Applicant must incorporate in the development all the measures recommended in the report to control that risk. A copy of the report is to be provided to the Principal Certifying Authority with the application for a Construction Certificate.*

4. Track Possessions and Power Outages

The Developer appears to need track possessions (the stopping of trains running on adjacent tracks) and/or power outages (shutting of power to RailCorp's facilities) to be able to undertake the proposed construction and installation work. This will require the Developer to enter into a Deed with RailCorp, enabling his work to be planned and to

proceed in a safe and controlled manner. In this regard the Developer should be referred to the Rail Corridor Management Group (RCMG) for further details.

5. Demolition, Excavation and Construction Impacts

During demolition, excavation and construction, there is a need to ensure that there will be no adverse impact on the integrity of RailCorp's facilities, or the operation of the network. It is requested that the Department of Planning & Infrastructure include the following condition of consent:.

- *Prior to the issue of a Construction Certificate a Risk Assessment/Management Plan and detailed Safe Work Method Statements (SWMS) for the proposed works are to be submitted to the RailCorp for review and comment on the impacts on rail corridor. The Principle Certifying Authority shall not issue the Construction Certificate until written confirmation has been received from the RailCorp confirming that this condition has been satisfied.*

- *No metal ladders, tapes and plant/machinery, or conductive material are to be used within 6 horizontal metres of any live electrical equipment. This applies to the train pantographs and 1500V catenary, contact and pull-off wires of the adjacent tracks, and to any high voltage aerial supplies within or adjacent to the rail corridor.*

6. Maintenance of Development

Maintenance activities must not impact adversely on RailCorp's facilities or operations. It is requested that the Department of Planning & Infrastructure include the following condition of consent:

- *The developer must provide a plan of how future maintenance of the development facing the rail corridor is to be undertaken. The maintenance plan is to be submitted to RailCorp prior to the issuing of the Occupancy Certificate. The Principle Certifying Authority shall not issue an Occupation Certificate until written confirmation has been received from RailCorp advising that the maintenance plan has been prepared to its satisfaction.*

7. Requirement for the Applicant to enter into a Deed with RailCorp

The proposed development has the potential to impact the safety, integrity and operation of RailCorp's network. It is requested that the Department of Planning & Infrastructure include the following condition of consent:

- *The developer is required to enter into an agreement with RailCorp defining the controls to be implemented in managing the access required and/or the potential impacts of the development on RailCorp, and the involvement of RailCorp staff in ensuring appropriate the appropriate safety and technical standards are complied with throughout the development.*

ANNEXURE 4

ANNEXURE 4

Shoalhaven City Council's Letter

dated 19th April 2010

Shoalhaven City Council

City Administrative Centre
Bridge Road, Nowra NSW Australia 2541
Phone: (02) 4429 3111 • Fax: (02) 4422 1816 • DX 5323 Nowra
Address all correspondence to
The General Manager, PO Box 42, Nowra NSW Australia 2541

COUNCIL REFERENCE: 1564E (D10/79900)
CONTACT PERSON: John Britton
YOUR REF:

19 April 2010

Manildra Group
PO Box 123
NOWRA NSW 2541

Attention: Mr B Hanley

Dear Brian

Shoalhaven Starches Proposal to Construct a Gas Pipeline - Bomaderry

I refer to your letter dated 6 April 2010 that was in response to Council's letter to URS Australia Pty Ltd dated 17 February 2010. The project involves the construction of a gas pipeline between connection point to the Eastern Gas Pipeline off Pestells Lane and the Shoalhaven Starches Plant at Bolong Road Bomaderry. The proposed route is predominately along the public road system. A meeting was held on 14 April 2010 to clarify a number of issues that have been expressed in the two letters.

Council accepts the justification you have stated in your letter dated 6 April 2010 for proposing the preferred route. You advised at the meeting that the pipeline would be located about 1200mm deep and the pipe wall will be 8.9mm for the entire length and be in accordance with the pipeline standards especially in respect of safety and proximity to dwellings and other urban developments. You have also advised that where the pipeline crosses the RTA roads and the railway reserve that you have obtained the requirements of both government agencies.

The issue that Council particularly raises is in respect of works in Pestells Lane near the connection point to the Eastern Gas Pipeline. The land south-west of the lane is intended to be rezoned and developed as part of the Nowra-Bomaderry Structure Plan, expected over a 25-30 year period. It is preferred that the new gas pipeline be located on the northern side of the lane rather than the southern side so that as the land is redeveloped the gas pipeline will not impede potential road widening. In understanding a number of possible constraints within the existing road reserve of the lane, including width and future works, the detail of pipeline placement can be a matter for further discussion as construction investigations within the laneway road reserve take place.

The details concerning the pipeline location in the various formed and unformed road reserves along the preferred pipeline route can also be a matter for further discussion as the development plans and details are prepared.

In summary, Council has no objections in principle to the proposed route of the new gas pipeline.

It is understood that the planning process will be under Part 3A of the *Environmental Planning and Assessment Act 1979* and be administered by the Department of Planning.

In respect of licensing or other arrangements within Council's road reserves, Section 149 of the *Roads Act 1993* provides that Council may charge a license fee. This has been the case for similar infrastructure and is subject to the approval of the Director General of Planning. I am unable to advise at this stage if Council will recommend a license to the Director General as this matter may be subject to a Council resolution, once the Part 3A application is publically exhibited.

If you need further information about this matter, please contact John Britton, Development & Environmental Services Group on (02) 4429 3432. Please quote Council's reference 1564E.

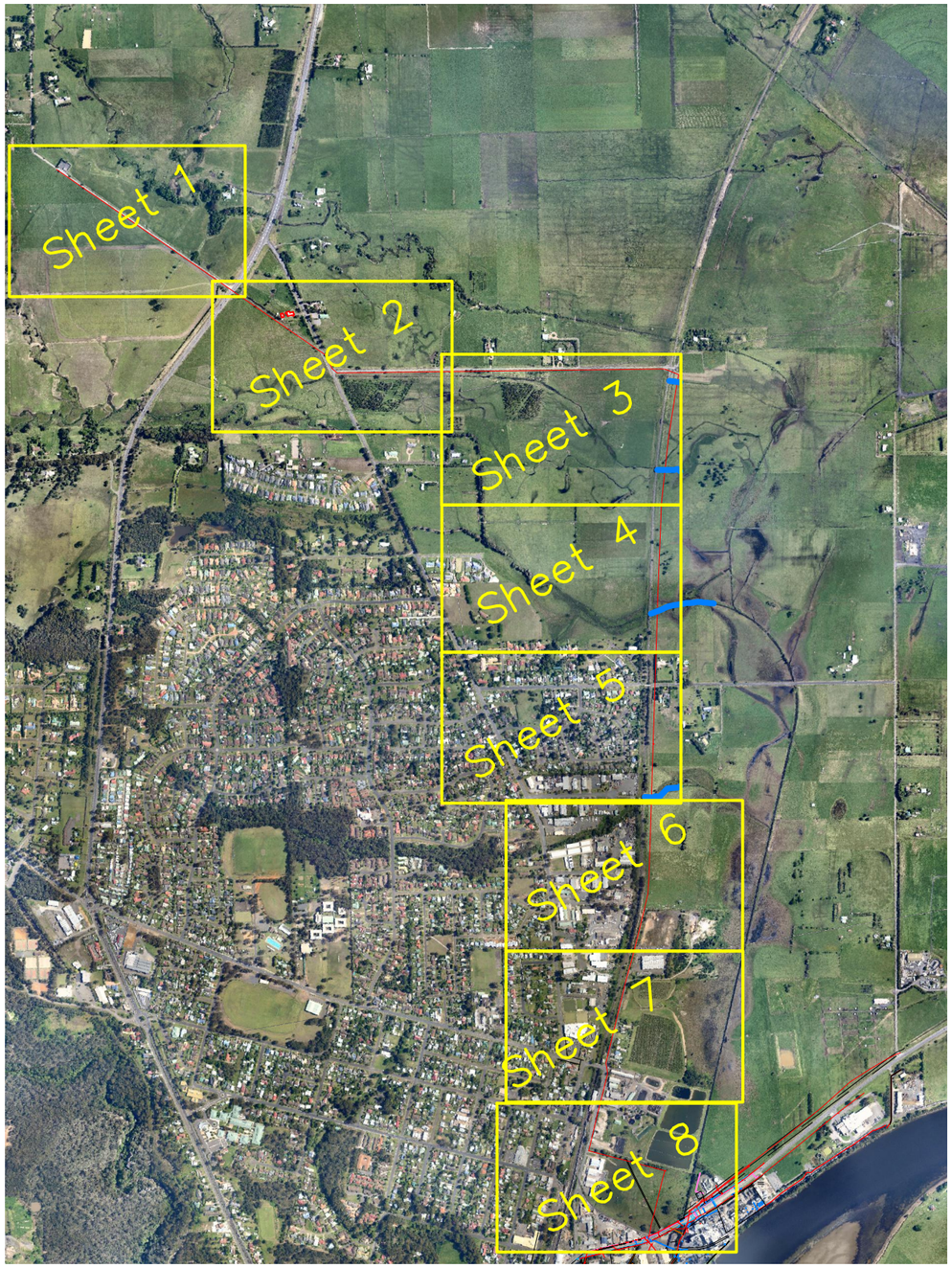
Yours faithfully

Tim Fletcher
Director Development & Environmental Services

ANNEXURE 5

ANNEXURE 5

Detailed Plans
and
Aerial Photographs
depicting
Preferred Pipeline Route



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ORIGIN:

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consultants@allenprice.com.au www.allenprice.com.au

PLAN OF PROPOSED GAS LINE ROUTE FROM EXISTING GAS MAIN TO THE BOLONG ROAD FACTORY – KEY MAP FOR SHOALHAVEN STARCHES

REF. No. 24710–03

sheet 9 of 9

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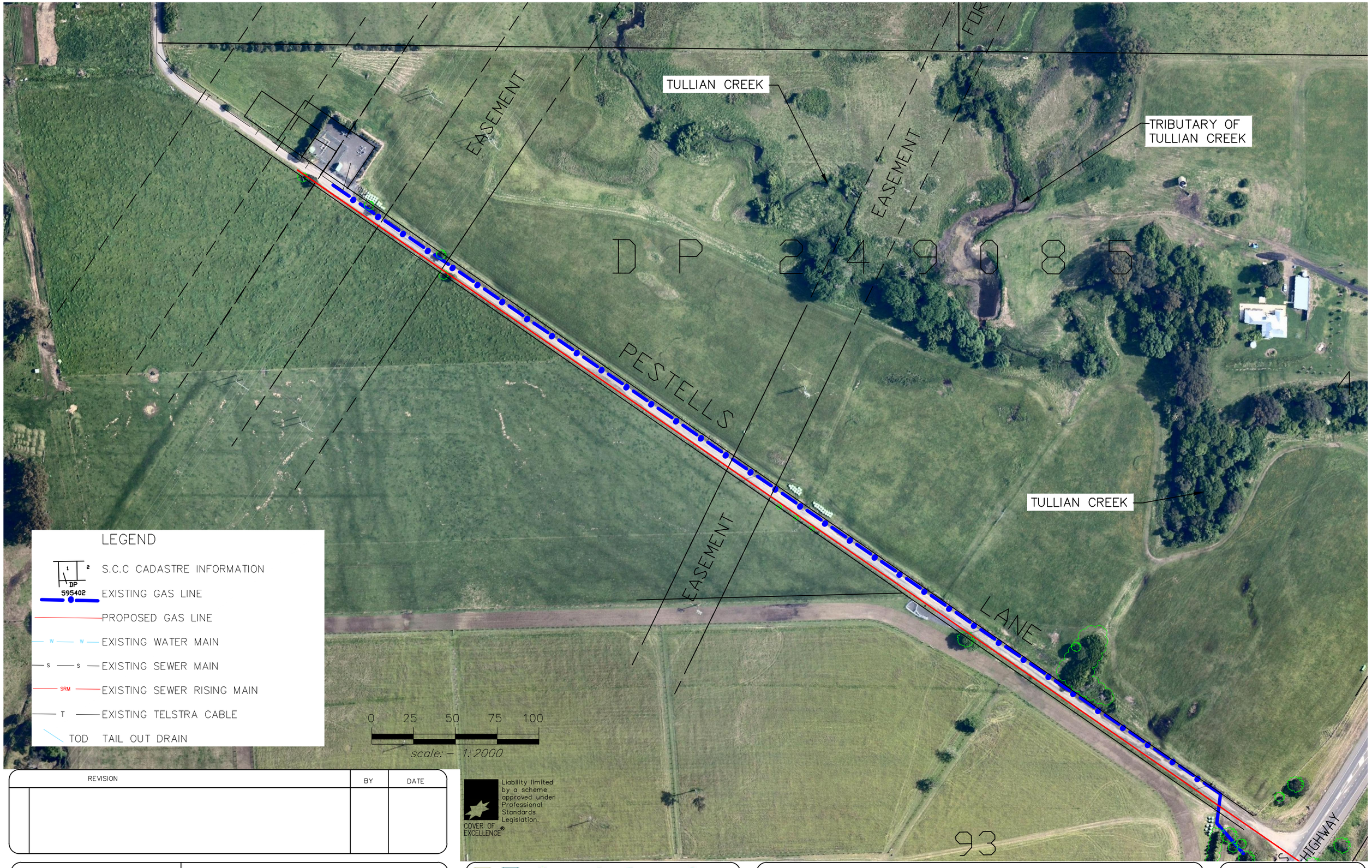

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PLAN OF PROPOSED GAS LINE ROUTE FROM EXISTING GAS MAIN TO THE BOLONG ROAD FACTORY (PESTELLS LANE) FOR SHOALHAVEN STARCHES

REF. No. 24710–03
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REVISION 00

PRINCES HIGHWAY

DP 242085

PERELLS LANE

MEROO ROAD

DP 1018637

11

FLETCHERS EASEMENT FOR WATER

LANE

E, E,

D P

27

PROPOSED EASEMENT FOR TRANSMISSION LINE

ROAD

DP 1018370

LEGEND

- S.C.C CADASTRE INFORMATION (DP 595402)
- EXISTING GAS LINE
- PROPOSED GAS LINE
- EXISTING WATER MAIN
- EXISTING SEWER MAIN
- EXISTING SEWER RISING MAIN
- EXISTING TELSTRA CABLE
- TOD TAIL OUT DRAIN

0 25 50 75 100

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PLAN OF PROPOSED GAS LINE ROUTE FROM EXISTING GAS MAIN TO THE BOLONG ROAD FACTORY FOR SHOALHAVEN STARCHES

REF. No. 24710–03

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REVISION 00

LEGEND

- S.C.C CADASTRE INFORMATION
- EXISTING GAS LINE
- PROPOSED GAS LINE
- EXISTING WATER MAIN
- EXISTING SEWER MAIN
- EXISTING SEWER RISING MAIN
- EXISTING TELSTRA CABLE
- TOD TAIL OUT DRAIN

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PLAN OF PROPOSED GAS LINE ROUTE FROM EXISTING GAS MAIN TO THE BOLONG ROAD FACTORY FOR SHOALHAVEN STARCHES

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REF. No. 24710—03
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REVISION 01

LEGEND

- S.C.C CADASTRE INFORMATION (DP 595402)
- EXISTING GAS LINE
- PROPOSED GAS LINE
- EXISTING WATER MAIN
- EXISTING SEWER MAIN
- EXISTING SEWER RISING MAIN
- EXISTING TELSTRA CABLE
- TOD TAIL OUT DRAIN

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PLAN OF PROPOSED GAS LINE ROUTE FROM EXISTING GAS MAIN TO THE BOLONG ROAD FACTORY FOR SHOALHAVEN STARCHES

REF. No. 24710–03

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REVISION 01

LEGEND

- S.C.C CADASTRE INFORMATION (DP 595402)
- EXISTING GAS LINE
- PROPOSED GAS LINE
- EXISTING WATER MAIN
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- EXISTING SEWER RISING MAIN
- EXISTING TELSTRA CABLE
- TOD TAIL OUT DRAIN

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REVISION 00

LEGEND

- S.C.C CADASTRE INFORMATION
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REVISION 00

LEGEND

- S.C.C CADASTRE INFORMATION
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- EXISTING WATER MAIN
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PLAN OF PROPOSED GAS LINE ROUTE FROM EXISTING GAS MAIN TO THE BOLONG ROAD FACTORY FOR SHOALHAVEN STARCHES

REF. No. 24710–03
sheet 8 of 9
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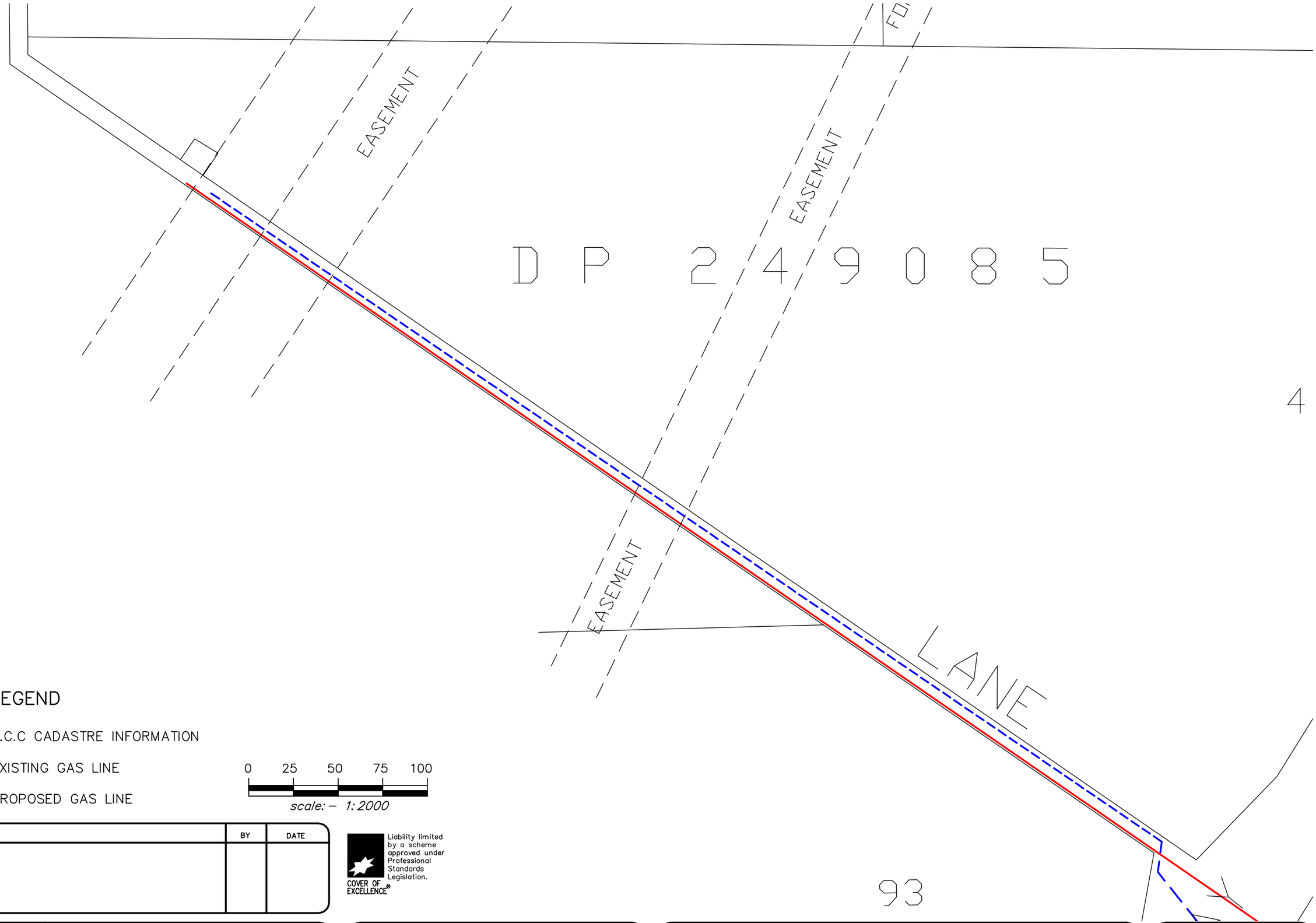

LEGEND

S.C.C CADASTRE INFORMATION

EXISTING GAS LINE

PROPOSED GAS LINE

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PLAN OF PROPOSED GAS LINE ROUTE
FROM EXISTING GAS MAIN TO THE BOLONG
ROAD FACTORY
FOR THE MANILDRA GROUP

REF. No. 24710–03
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REVISION

PESTELLS LANE

DP 249085

10

DP 1018637

11

FLETCHERS

E. E.

EASEMENT FOR WATER

D P

: 1 0 0 7

27

ROAD

PROPOSED EASEMENT FOR TRANSMISSION LINE

D P 1 0 1 8 3 7 0

LEGEND

S.C.C CADASTRE INFORMATION

EXISTING GAS LINE

PROPOSED GAS LINE

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scale: – 1:2000

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PLAN OF PROPOSED GAS LINE ROUTE FROM EXISTING GAS MAIN TO THE BOLONG ROAD FACTORY FOR THE MANILDRA GROUP

REF. No. 24710–03

sheet 2 of 9

REVISION

SUPPLY

8

E. E.

LANE

PROPOSED GAS LINE
TO BE WITHIN OLD
ROAD RESERVE

130

D P 1 0 1 2 7 0 3

FOR OVERHEAD POWER LINES

EASEMENT

0

DP 116740

PROPOSED EASEMENT

PROPOSED GAS LINE
TO BE WITHIN OLD
ROAD RESERVE

LEGEND

DP 595402 — S.C.C CADASTRE INFORMATION

EXISTING GAS LINE

PROPOSED GAS LINE

0 25 50 75 100

scale: — 1: 2000

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PLAN OF PROPOSED GAS LINE ROUTE FROM EXISTING GAS MAIN TO THE BOLONG ROAD FACTORY FOR THE MANILDRA GROUP

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REVISION

EASEMENT FOR TRANSMISSION LINE (DP 118747)

EASEMENT FOR TRANSMISSION LINE

D P 808905

3 DP 547204

12

WATER

D P 708513

3

D

EASEMENT

PROPOSED GAS LINE TO BE WITHIN OLD ROAD RESERVE

13

1

LEGEND

S.C.C CADASTRE INFORMATION (DP 595402)

EXISTING GAS LINE

PROPOSED GAS LINE

0 25 50 75 100

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REVISION	BY	DATE

RATIO: 1:2000

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REF. No. 24710–03
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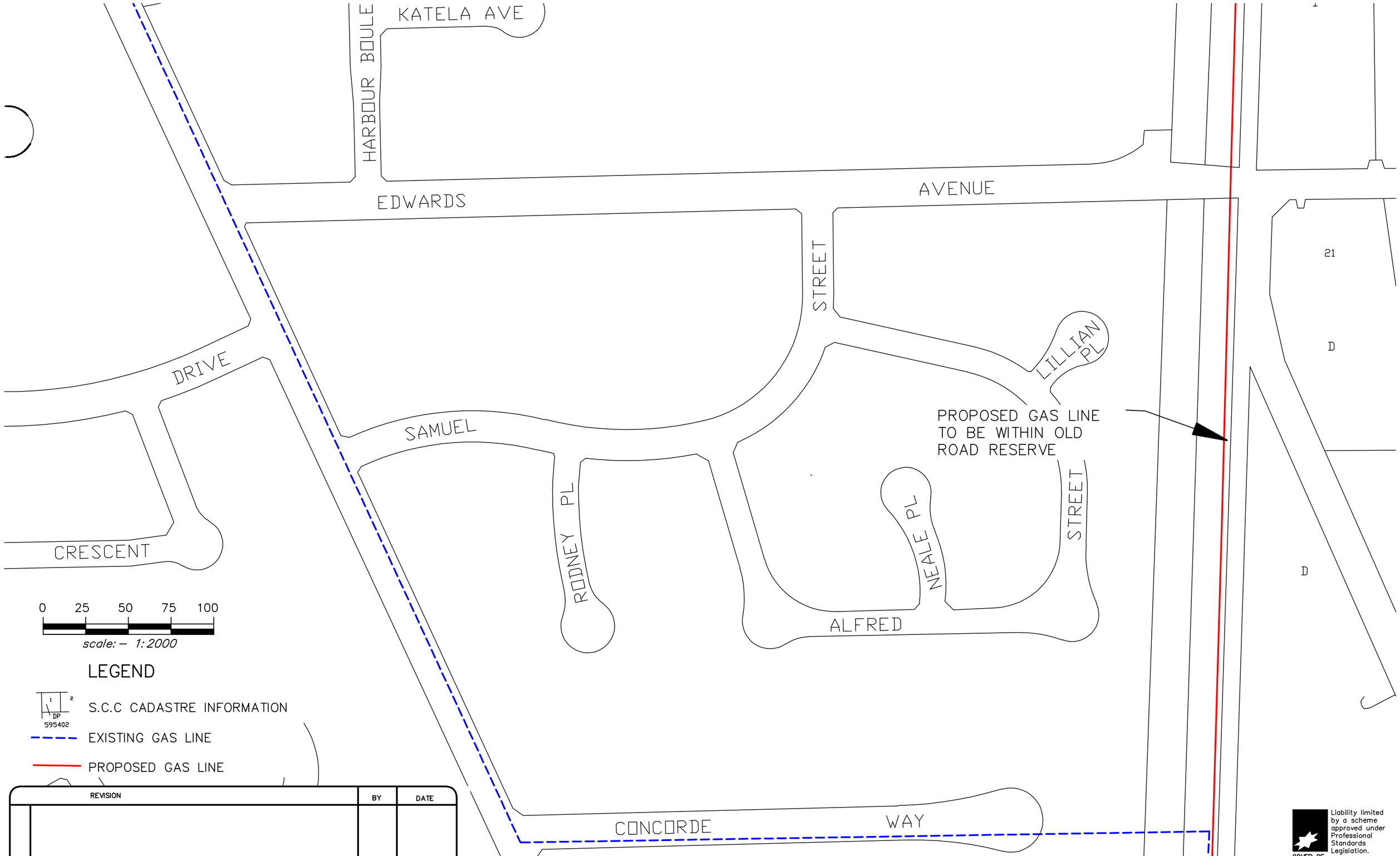
REVISION



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S.C.C CADASTRE INFORMATION

EXISTING GAS LINE

PROPOSED GAS LINE

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PLAN OF PROPOSED GAS LINE ROUTE FROM EXISTING GAS MAIN TO THE BOLONG ROAD FACTORY FOR THE MANILDRA GROUP

REF. No. 24710–03

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REVISION

CLOSE

VICTA WAY

PEACE ST STREET

GESHAM WAY

MEADOW

PROPOSED GAS LINE
TO BE WITHIN OLD
ROAD RESERVE

1 DP 595402

LEGEND

S.C.C CADASTRE INFORMATION

EXISTING GAS LINE

PROPOSED GAS LINE

REVISION	BY	DATE

0 25 50 75 100

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RATIO: 1:2000

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REF. No. 24710–03
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REVISION

CRESCENT

MULGEN

WAY

MEROO

STREET

RAILWAY

STREET

1 DP 538290 2

1 DP 203965

K DP 389887

J DP 385161 H

C DP 382525 B

A 2 F

15 DP 259169 14

1 DP 790410 2

12 DP 259169 11

D P 259169 16

7 7

DRAIN

EASEMENT

SEWAGE

EASEMENT

D.E.

D.E.

(DP 1182492)

0 25 50 75 100

scale:– 1:2000

LEGEND

S.C.C CADASTRE INFORMATION

EXISTING GAS LINE

PROPOSED GAS LINE

REVISION	BY	DATE

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DATUM:

ORIGIN:

DATE OF PLAN: JANUARY 2011

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REF. No. 24710–03

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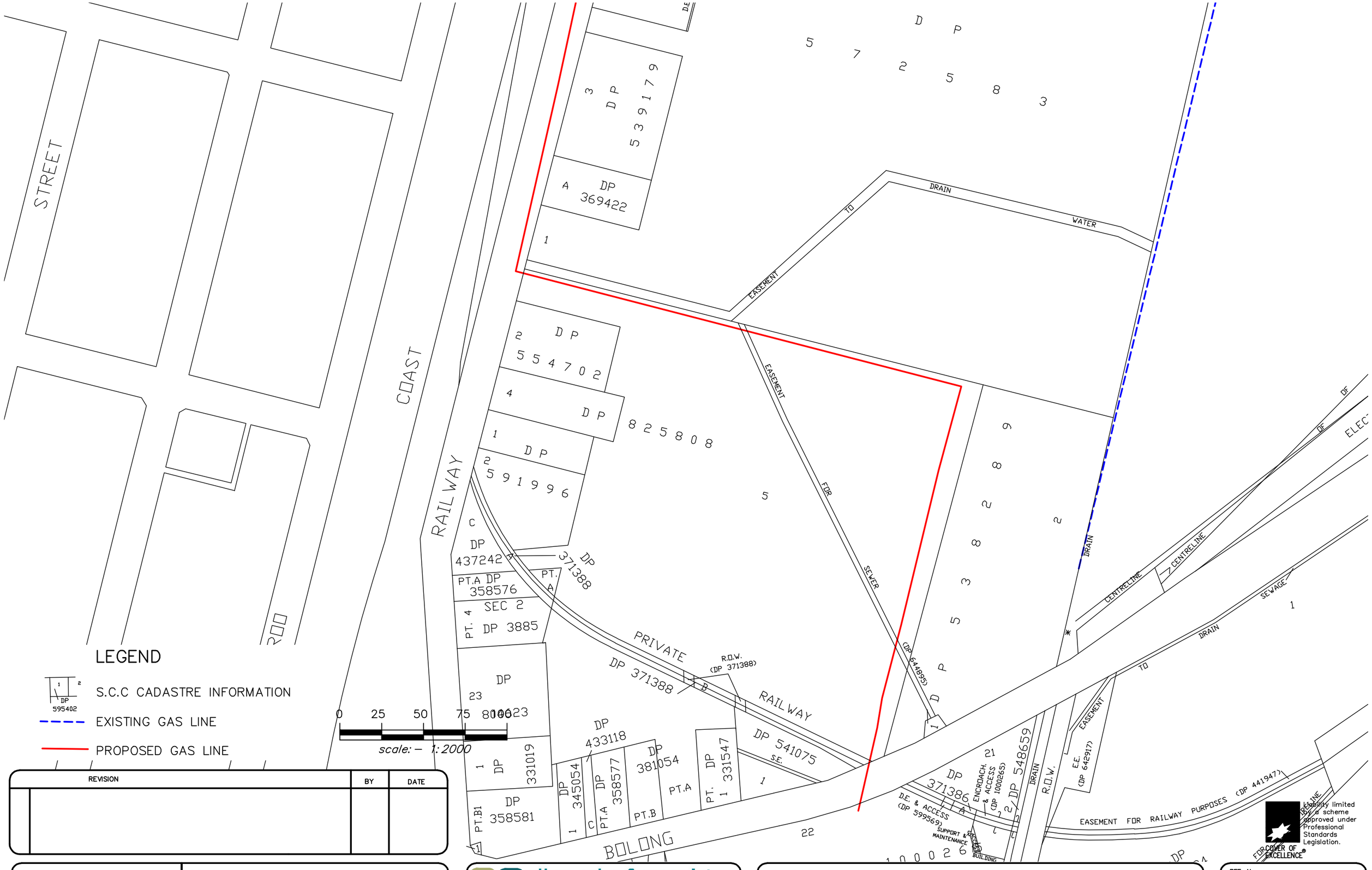

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- S.C.C CADASTRE INFORMATION
- EXISTING GAS LINE
- PROPOSED GAS LINE

REVISION	BY	DATE

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REF. No. 24710–03
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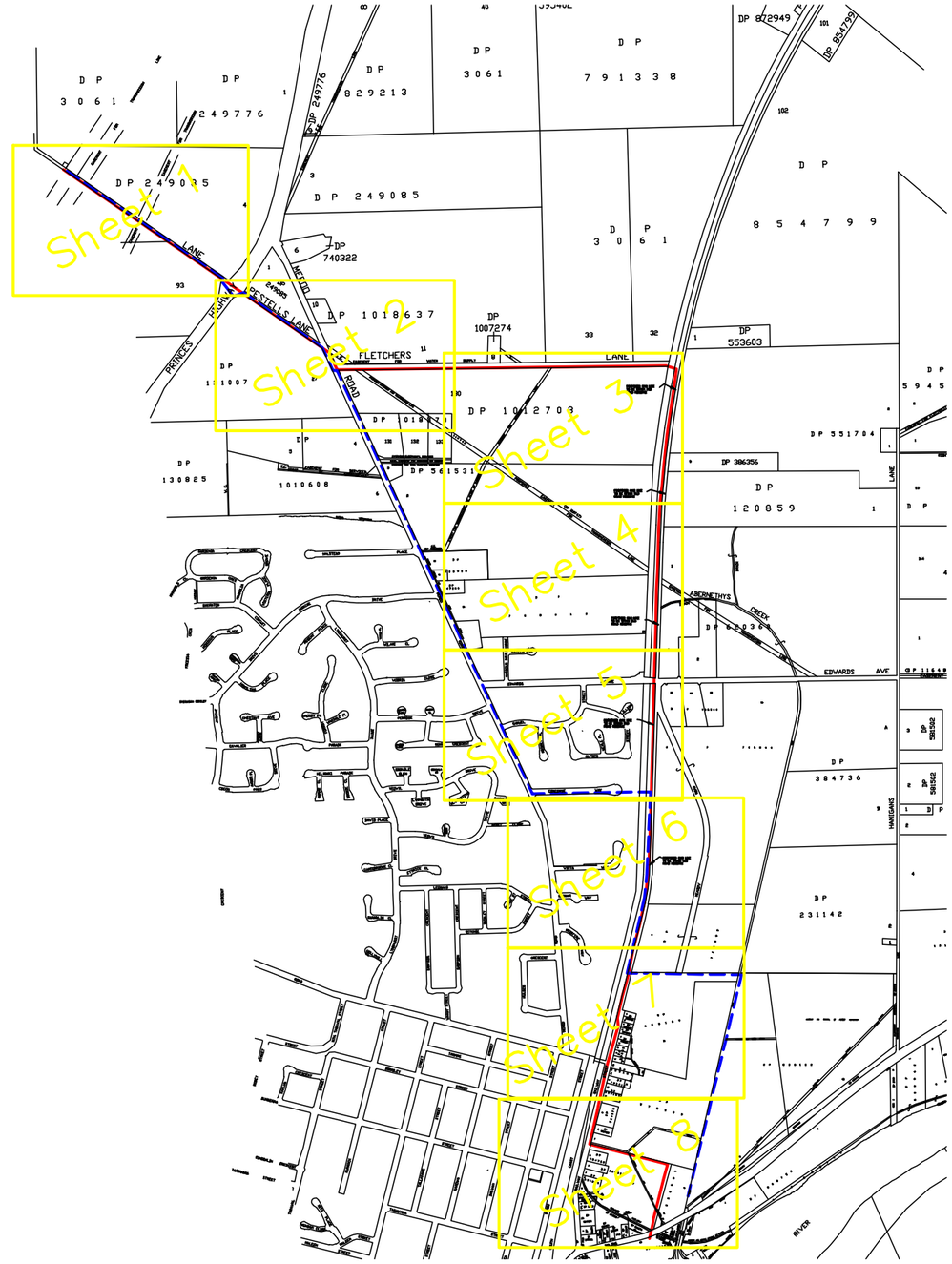

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S.C.C CADASTRE INFORMATION

EXISTING GAS LINE

PROPOSED GAS LINE

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PLAN OF PROPOSED GAS LINE ROUTE FROM EXISTING GAS MAIN TO THE BOLONG ROAD FACTORY – KEY MAP FOR THE MANILDRA GROUP

REF. No. 24710–03

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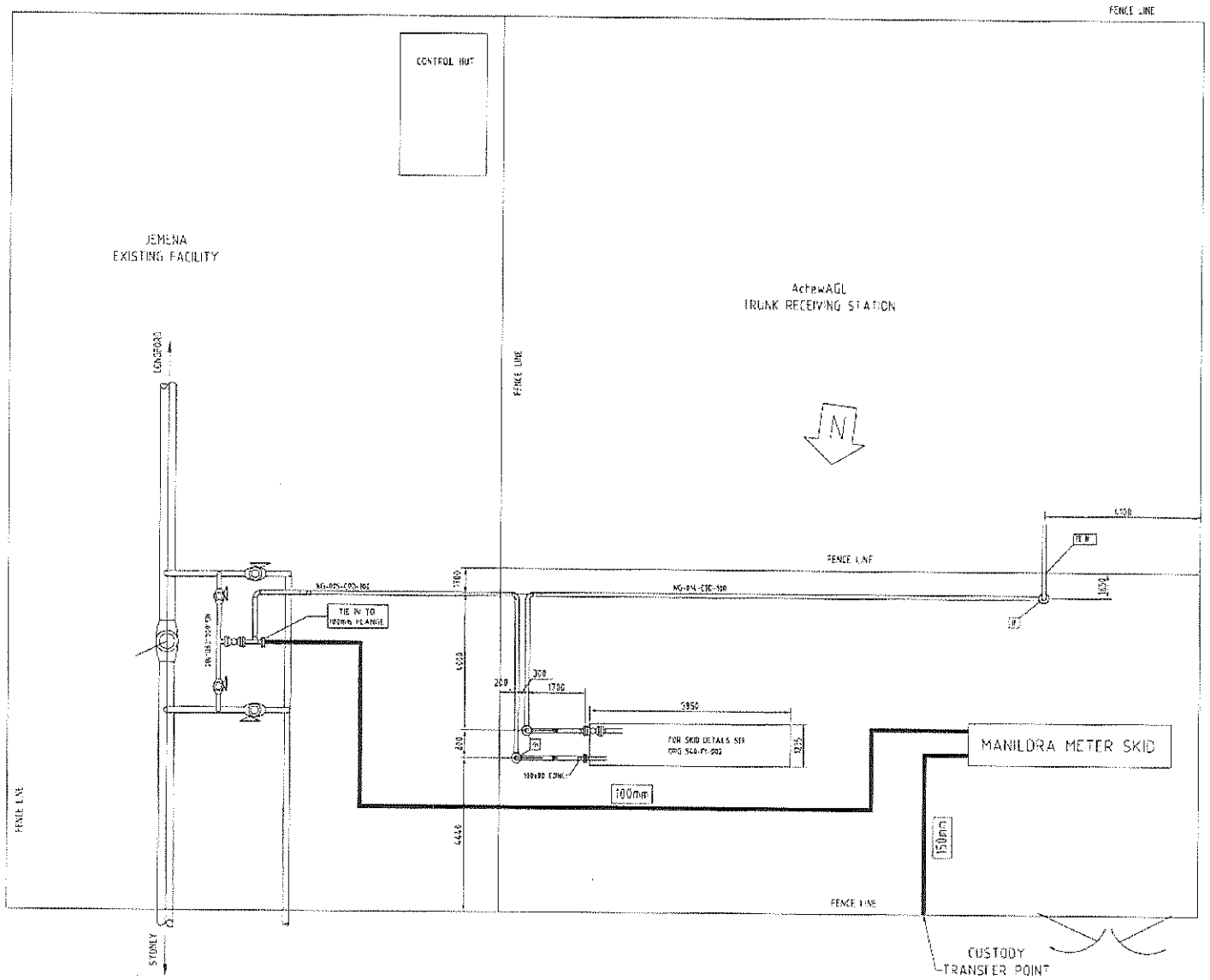
REVISION

ANNEXURE 6

Plan Details
of the
Meter Station

ANNEXURE 6



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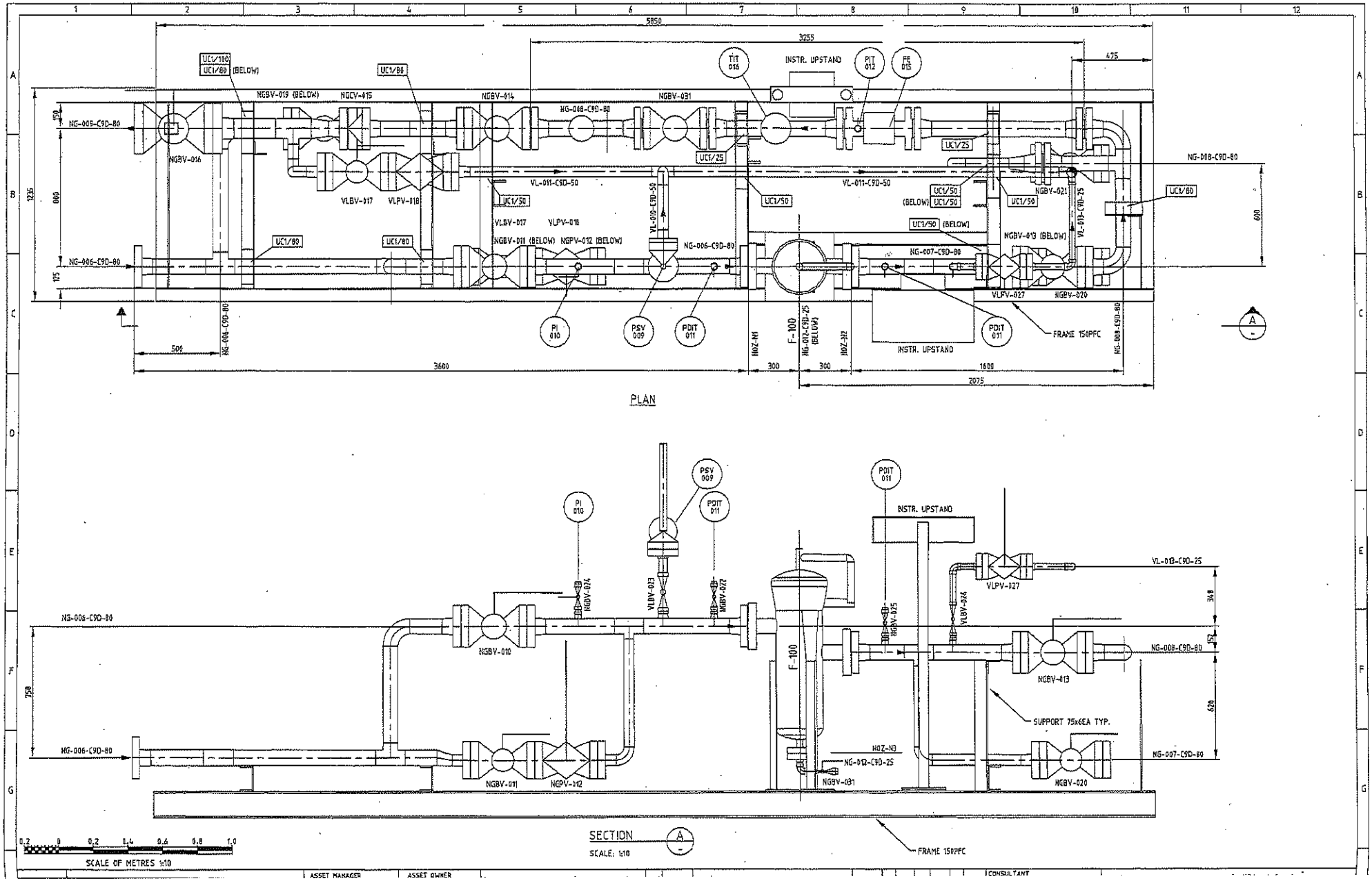
CONSULTANT

BOMADERRY METER STATION
MANILDRA METER SKID
FEASIBILITY STUDY
PIPING

DRAWN	John Baldon		
DESIGN		SCALE	A1
CHECKED	Mark Wells	SUPERSEDES	
APPROVED		DRAWING NUMBER	REV
DATE		MANILDRA FEASIBILITY 2	B

TYPICAL METER SKID LAYOUT AND ELEVATIONS

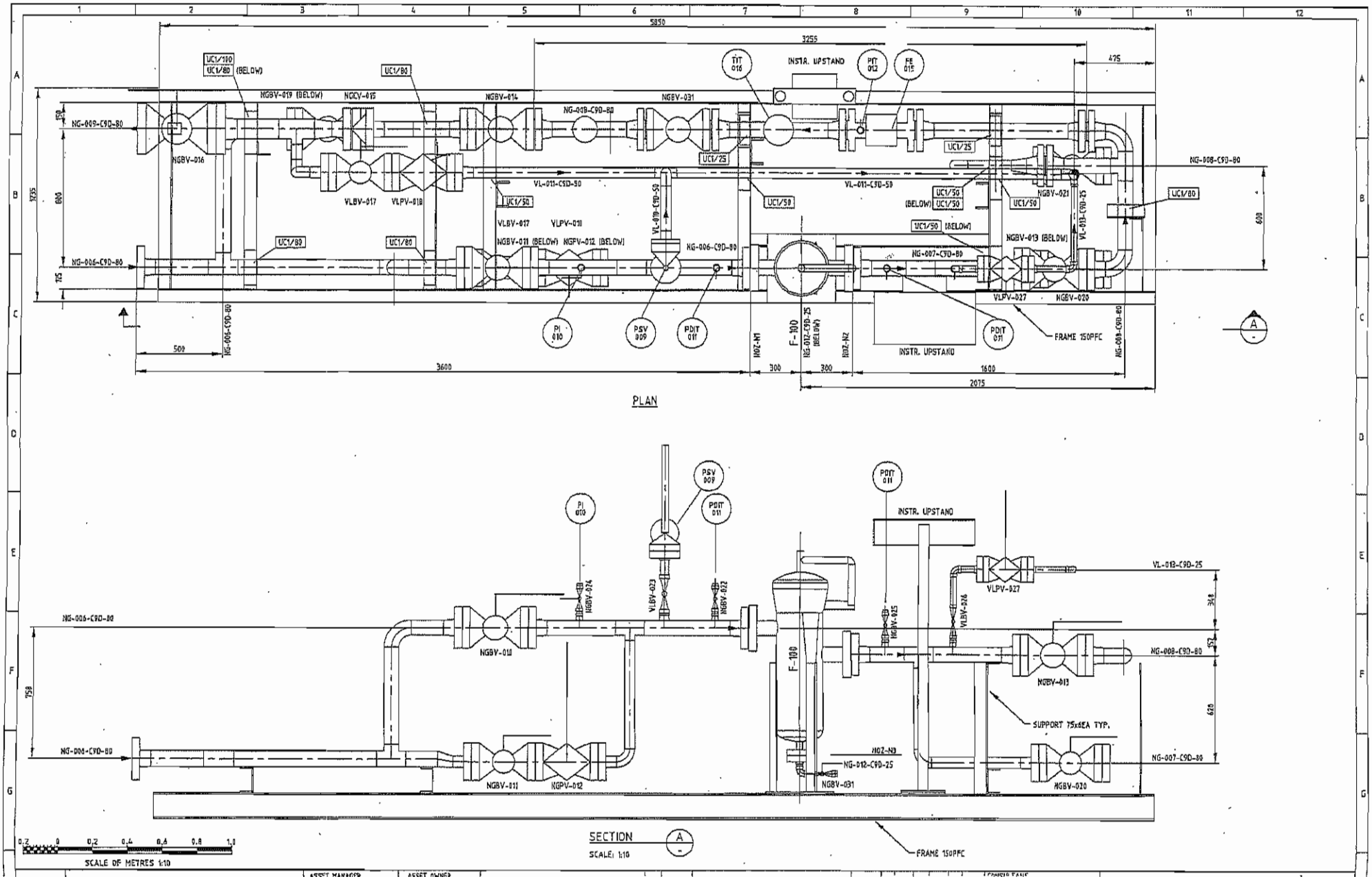


ANNEXURE 7

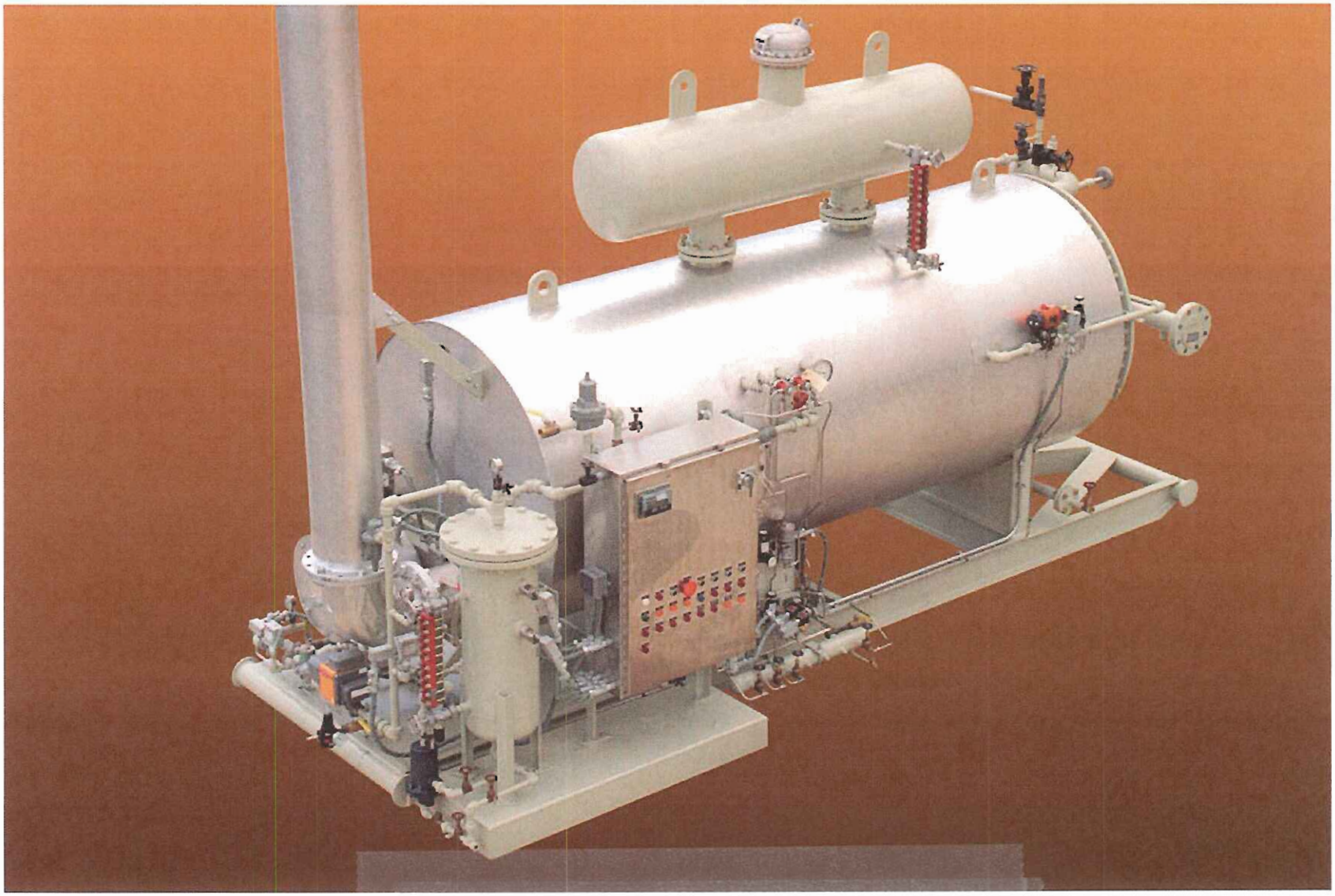
Plan Details
of the
Pressure Reduction Facility

ANNEXURE 7

TYPICAL PRESSURE REDUCTION FACILITY LAYOUT AND ELEVATIONS



INDICATIVE WATER BATH HEATER (Typical)



Dimensions
:Support platform and access stairs
- 4m high x 4m x 6m (above flood plain)
Water bath - 2.5m high x 3m x 5m above platform.
Stack is 6m high.

ANNEXURE 8

ANNEXURE 8

Flora and Fauna Assessment

prepared by

Kevin Mills & Associates

FLORA AND FAUNA ASSESSMENT
PROPOSED NATURAL GAS PIPELINE
SHOALHAVEN STARCHES FACTORY
BOMADERRY, CITY OF SHOALHAVEN

a report prepared by

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CONTENTS

1. INTRODUCTION

Kevin Mills & Associates was engaged to assess the impact of a proposed natural gas pipeline to service the Shoalhaven Starches Factory at Bomaderry. The preparation of this report was commissioned by Cowman Stoddart Pty Ltd of Nowra on behalf of Shoalhaven Starches Pty Ltd, which is part of the Manildra Group. The Company is developing a Part 3A application under the *Environment Protection & Assessment Act 1979* for the development of the proposed pipeline.

The purpose of this investigation and report is to assess the impact of the proposed pipeline route on flora and fauna. In particular, the report contains:

- a description of the vegetation and fauna habitats affected by the proposal;
- lists of the flora and fauna species observed during the inspections; AND
- an assessment of the potential impact of the proposal on flora and fauna, including species, populations and communities listed under the New South Wales *Threatened Species Conservation Act 1995*.

In preparing the report, consideration was given to the Director-General's requirements from the Department of Planning and Infrastructure issued under Part 3A of the Act and dated 8 November 2011. Under the issue of Biodiversity, the Department requires consideration of the following:

- "measures taken to avoid impacts on biodiversity;
- accurate estimates of any proposed vegetation clearing;
- a detailed assessment of the potential impacts of the project on any terrestrial or aquatic threatened species, populations, ecological communities or their habitats, regionally significant remnant vegetation and/or vegetation corridors; and
- measures to ensure the project maintains or improves the biodiversity values of the region in the medium to long term."

2. THE STUDY AREA

The route of the pipeline is from a connection to the main natural gas pipeline to the southwest of Meroo Meadow, extending roughly in a south-easterly direction to the Shoalhaven Starches Factory in Bolong Road at Bomaderry; see **Figure 1**. Part of the route (red on **Figure 1**) follows an existing gas pipeline to the Shoalhaven Starches Factory at Bomaderry (blue line on **Figure 1**). The pipeline route primarily follows road reserves, containing formed and unformed roads. The route is divided into seven sections to facilitate descriptions of the vegetation and the habitats present. The total length of the route is approximately 5.5 kilometres.

The route sections are as follows:

A.	Pestells Lane (formed road)	650 metres	south side of road easement
B.	Pestells Lane (unformed road)	500 metres	south side of road easement
C.	Meroo Road	100 metres	east side of road
D.	Fletchers Lane	1100 metres	south side of road
E.	East of railway line (road reserve)	2100 metres	within old road reserve
F.	Along Railway Street	600 metres	urban streetscape
G.	Across Manildra land at Bolong Road	600 metres	across paddock

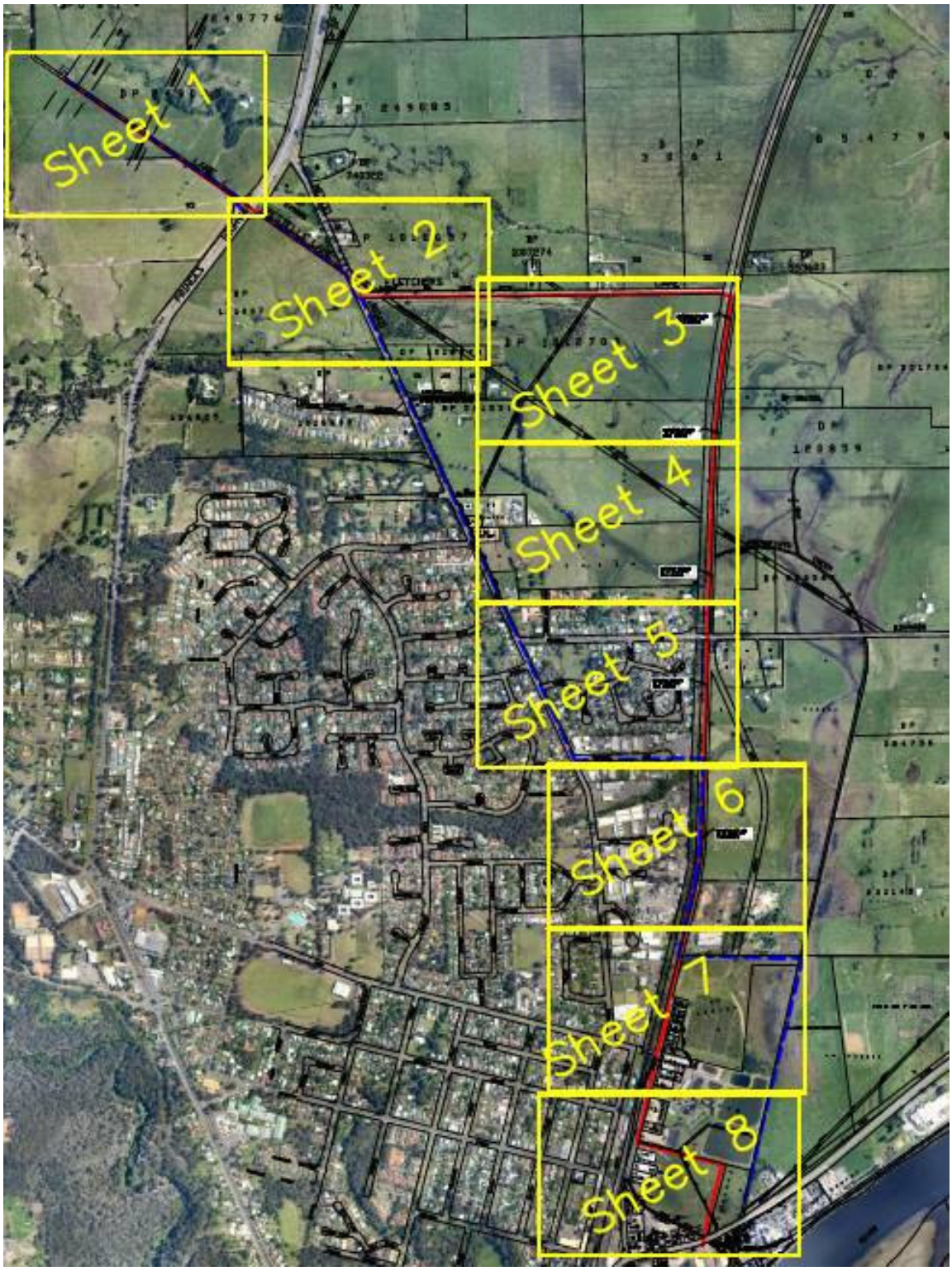

Figure 1. Natural Gas Pipeline Route.

(Red line – proposed new pipeline route; blue line – existing gas pipeline.)

3. SITE INSPECTIONS AND SURVEYS

The route of the proposed gas pipeline was inspected on 9 March 2011. Prior to this, a similar route was surveyed some years earlier and the site off Bolong Road opposite the factory was surveyed for a packing and railway siding. That area also had a targeted survey for the Green and Golden Bell Frog in 2008.

The route is mainly along road side verges and across farmland, and also along some urban streets. Any areas likely to support native vegetation were targeted in the surveys. A list of plant species was compiled, including both native and exotic (introduced) species. Fauna species were also recorded during the surveys. Surveys were diurnal, except for a targeted frog survey in 2008 on the site off Bolong Road.

The species names in this report are based on the *Flora of New South Wales* (Harden 1992-2002), *Weeds of the South-east* by Richardson, Richardson and Shepherd (2006), the Australian Museum's *The Mammals of Australia* (Strahan 1995), *Australian Bats* (Churchill 1998), *The Taxonomy and Species of Birds of Australia and its Territories* (Christidis & Boles 2008) and *Reptiles and Amphibians of Australia* (Cogger 1992).

4. THE VEGETATION

4.1 Vegetation of the Pipeline Route

The pipeline route is divided into seven sections for the purposes of describing the vegetation; these are described below.

A. Pestells Land (formed roadway)

The route along Pestells Lane west of the highway is about 650 metres in length. The lane is a gravel road with narrow grassed verges on both sides. The grassland is dominated by Kikuyu Grass *Pennisetum clandenstinum*, with various pasture weeds such as Fire Weed *Senecio madagscariensis,* Paddy's Lucerne *Sida rhombifolia* and Spear Thistle *Cirsium vulgare*. Along with a few planted trees in one section, there are an occasional Black Wattle *Acacia mearnsii*.

B. ***Pestells Land (unformed roadway)***

This section to the east of the highway of about 500 metres in length is dominated by ungrazed and densely growing Kikuyu Grass *Pennisetum clandenstinum.* The only trees are a few planted Silky Oaks *Grevillea robusta* and an occasional Black Wattle *Acacia mearnsii*.

C. Meroo Road

This short section along Meroo Road between Pestells Lane (unformed) and Fletchers Lane is about 100 metres long. As with most of the surrounding land, the roadsides are dominated by thickly growing Kikuyu Grass *Pennisetum clandenstinum*.

D. Fletchers Lane

The Fletchers Lane route is about 1100 metres in length and contains a gravel road. The road verges, as elsewhere, are covered in a dense sward of Kikuyu Grass *Pennisetum clandenstinum*, with various other exotics, such as Paspalum *Paspalum dilatatum*, Paddy's Lucerne *Sida rhombifolia* and Flatweed *Hypochaeris radicata*. In a few low-lying places in the east, there are patches of the native wetland plant Tall Sedge *Carex appressa*. There are occasional small trees of Swamp Oak *Casuarina glauca* and Forest Red Gum *Eucalyptus tereticornis*, and various planted trees in front of the houses in the lane.

E. East of Railway Easement (old road reserve)

The route to the east of the railway line easement extends north to south for about 2100 metres. The area is mainly grazed Kikuyu Grass *Pennisetum clandenstinum* paddocks, with many other exotics. On some low-lying land, there are a few small trees of Prickly-leaved Paperbark *Melaleuca styphelioides* in the vicinity of the route, otherwise trees are absent.

F. Along Railway Street

The route along this street is about 600 metres in length and is along an urban street verge. In the far north, where the road is unformed, there is a band of native plants along the edge of the railway easement/road reserve. Many of the native plants listed in **Appendix 1** were found in this small area. In the south, planted trees occur here and there along the roadside, and the grass is mostly mown. The planted trees include *Jacaranda Jacaranda mimosifolia*, Sweet Pittosporum *Pittosporum undulatum*, Crape Myrtle *Lagerstroemia indica* and Bottlebrush *Callistemon* sp.

G. Across Manildra land at Bolong Road

This section of about 600 metres is across old grazing land and has been investigated in the past for other company facilities (KMA 2008). The paddock is largely covered in exotic grassland and other herbaceous plants. The site is dominated by Kikuyu Grass *Pennisetum clandestinum* and other introduced species such as White Clover *Trifolium repens*, Mouse-eared Chickweed *Cerastium glomeratum*, Paddy's Lucerne *Sida rhombifolia*, Fireweed *Senecio madagascariensis*, Spear Thistle *Cirsium vulgare* and Blackberry *Rubus fruticosus*. There are a few trees in the far southern part of the site and near Abynathys Creek on the eastern edge of the site, these are mostly Black Wattle *Acacia mearnsii*. In the far north-western corner there is a low-lying wet area that supports various native wetland plants.

4.2 Plant Species Recorded

The plant species recorded along the proposed pipeline route are listed in **Appendix 1**. Native plants are very uncommon along the vast majority of the route of the gas pipeline; the land being almost entirely cleared of its original vegetation and covered in exotic grasses and other herbaceous species..

5. FAUNA AND FAUNA HABITAT

There is very little native habitat along the proposed route of the gas pipeline; natural habitat is completely absent from the area. The fauna species that have been recorded in the Bomaderry area been listed in **Appendix 2**. These species were recorded in the area during this and previous surveys by the consultant. The species are generally those associated with farmland and urban settings.

The habitat along the route is almost entirely exotic grassland, mostly dominated by the introduced Kikuyu Grass *Pennisetum clandestinum*. Most of the trees, which are not particularly common, are also introduced. Wetlands occur nearby in some places, but the route does not cross any natural wetland. No forest or other natural vegetation community is affected by the proposed route of the pipeline.

6. THREATENED SPECIES, POPULATIONS AND COMMUNITIES

6.1 Threatened Species

Threatened species are listed on schedules under the New South Wales *Threatened Species Conservation Act 1995* (TSC Act)). Under the TSC Act, species of plants and animals are listed either as “critically endangered”, “endangered”, "vulnerable" and "presumed extinct”; “endangered populations” can also be listed. Species are also listed in a similar way under the *Fisheries Management Act 1994*.

Information on the occurrence of threatened species in New South Wales can be obtained from the NSW Wildlife Atlas, which is maintained by the National Parks and Wildlife Service (NPWS). The Wildlife Atlas was scanned for threatened species previously recorded in the local area, within about 10 kilometres of the Shoalhaven Starches factory; these species have been listed below, in **Table 1**, together with each species' classification under the TSC Act, and a summary assessment of their potential to occur along the pipeline route.

No threatened species were recorded during the various local surveys by the consultants over several years. Based on an assessment of the habitat preferences and habitat requirements of the threatened species known to occur in the local area, no threatened species are expected to occur in the study area; see **Table 1**. No species listed under the *Fisheries Management Act 1994* occur in the local area.

Five threatened plant species have been recorded in the local area, within about 10 kilometres of the study area. None of the species was recorded in the surveys along the pipeline route and none are expected to occur there given the highly modified nature of the area. Five threatened mammals have previously been recorded in the local area; these are mostly old records. No threatened mammal species are expected to occur in this area, other than the Grey-headed Flying-fox. Fourteen (14) threatened bird species have been recorded in the local area. One or two, such as the Square-tailed Kite and Osprey, could occur in the vicinity of Shoalhaven Starches' land, for example on the Shoalhaven River or along Broughton Creek. However, because of the absence of suitable habitat, no threatened bird species is likely to occur on the pipeline route. The absence of forest and woodland precludes most of the species ever occurring in the area. Two threatened frog species have been recorded in the local area although the record of one of the species, the Giant Burrowing Frog, was based on scant evidence and has never been confirmed. There is no habitat for this frog in the area. The potential for the other species, the Green and Golden Bell Frog, to occur on the subject land was assessed previously because of the presence of a wet area near Bolong Road (see **Appendix 3**); the species was not recorded.

Table 1
Threatened species known to occur in the local area

Species	TSC Act[+]	Potential to occur on the Shoalhaven Starches site.
Plants		
Eucalyptus langleyi	V	*Eucalyptus langleyi* does not occur on this site. It occurs on sandstone, not soils as in the study area or in such disturbed country.
Hibbertia sp. nov. ('Menai')	E	Occurs around Bomaderry Creek on sandstone; does not occur in the highly modified areas along the pipeline route.
Pterostylis gibbosa	E	*Pterostylis gibbosa* occurs on the Berry Siltstone. There are no areas of potential habitat for this small terrestrial orchid in the study area.
Triplarina nowraensis	E	*Triplarina nowraensis* does not occur in this area. There is no habitat for this species, which occurs on moist sandstone sites.
Zieria baeuerlenii	E	*Zieria baeuerlenii* does not occur in this area. It is restricted to the Bomaderry Creek area.
Mammals		
Brush-tailed Rock-wallaby *Petrogale penicillata*	V	Brush-tailed Rock-wallabies occur on large rock outcrops with a network of rock ledges. The species does not occur at Bomaderry.
Koala *Phascolarctos cinereus*	V	There is no habitat for Koalas in this area. Koalas occur in forest and woodland containing their preferred feed tree species.
Long-nosed Potoroo *Potorous tridactylus*	V	Potoroos inhabit eucalypt forest and heath with good ground cover. There is no habitat for potoroos in this area.
Spotted-tailed Quoll *Dasyurus maculatus*	V	Quolls would not occur in this area. They occur in a wide range of habitats, but always in bushland. There is no habitat for quolls in the area.
Yellow-bellied Glider *Petaurus australis*	V	Yellow-bellied Gliders occur in forest containing their preferred feed tree species. There is no suitable habitat in this area.
Birds		
Australasian Bittern *Botaurus poiciloptilus*	V	Australasian Bitterns and Black Bitterns would not occur along the route as suitable habitat is missing. The species could occur nearby as there is freshwater wetlands, reeds and a creek near Bolong Road.
Black Bittern *Ixobrychus flavicollis*	V	
Blue-billed Duck *Oxyura australis*	V	There is no habitat in the study area for Blue-billed Ducks and Freckled Ducks. Blue-billed Ducks occur on deep permanent

Freckled Duck *Burhinus magnirostris*	V	swamps and lakes with dense aquatic flora, while Freckled Ducks occur in large freshwater wetlands with dense vegetation.
Powerful Owl *Ninox strenua* Masked Owl *Tyto novaehollandiae* Sooty Owl *Tyto tenebricosa*	V V V	There is no habitat in this area for threatened owls. Powerful Owls and Masked Owls occur in forest and woodland, usually mature forest containing a good population of arboreal mammals for prey. Sooty Owls occur in rainforest and tall wet eucalypt forest. None of these species would occur in this area.
Glossy Black-Cockatoo *Calyptorhynchus lathami*	V	Glossy Black-Cockatoos would not occur in this area; there is no suitable habitat. They occur in or near dense stands of Black She-oaks *Allocasuarina littoralis*.
Bush Stone-curlew *Burhinus grallarius*	E	Bush Stone-curlews occur in lightly timbered, grassy open forest and woodland. There is no habitat for the species in this area.
Olive Whistler *Pachycephala olivacea* Regent Honeyeater *Xanthomyza phrygia* Turquoise Parrots *Neophema pulchella*	V E	Olive Whistlers, Regent Honeyeaters and Turquoise Parrots would not occur in this area. They are birds of forest and woodland and are very rare locally; they do not occur in open paddocks without trees.
Osprey *Pandion haliaetus* Square-tailed Kite *Lophoictinia isura*	V V	Neither species would occur on this site, but it is feasible that they could be seen flying overhead on rare occasions. Ospreys occur in coastal areas and along the lower reaches of rivers. Square-tailed Kites occur in forest and woodland in coastal and sub-coastal areas.
Frogs		
Giant Burrowing Frog *Heleioporus australiacus*	V	Giant Burrowing Frogs would not occur in this area; there is no suitable habitat. Locally they are associated with streams, swamps and soaks on sandstone (e.g. Bomaderry Creek).
Green and Golden Bell Frog *Litoria aurea*	E	Bell Frogs inhabit still, shallow and unpolluted ponds and wetlands, ephemeral and permanent, supporting reeds. The ponds must be free of Plague Minnow and other predatory fish. There is no local records of the frog and the survey on the site of Bolong Road, the only place that has ponds that could be suitable for the frog, did not find the species.

[+] V = vulnerable, E = endangered, - = not listed.

6.2 *Endangered Populations*

Endangered populations are listed in Schedule 1, Part 2 in the TSC Act. No endangered populations have been declared in this area. The listed endangered population of Nowra Mallee Ash *Eucalyptus langleyi* occurs on sandstone at Bomaderry Creek, well to the west of the study area.

6.3 Endangered Ecological Communities

Endangered ecological communities are listed in Schedule 1, Part 3 of the TSC Act. There are no endangered ecological communities in study area.

7. IMPACT OF THE PROPOSED PIPELINE

7.1 Assessment under Part 3A

Guidelines for Threatened Species Assessment

Guidelines that identify matters relevant to the assessment of potential impact on threatened species, populations or ecological communities of proposed development under Part 3A of the *Environmental Planning and Assessment Act 1979* (NSW) have been prepared by the Department of Environment and Conservation (now Department of Environment and Climate Change) and the Department of Primary Industries (DEC July 2005).

The *Guidelines for Threatened Species Assessment* identify the following objectives in regard to conserving threatened species, etc.:

1 "Maintain or improve biodiversity values (i.e. there is no net impact on threatened species or native vegetation).
2 Conserve biological diversity and promote ecologically sustainable development.
3 Protect areas of high conservation value (including areas of critical habitat).
4 Prevent the extinction of threatened species.
5 Protect the long-term viability of local populations of a species, population nor ecological community.
6 Protect aspects of the environment that are matters of national environmental significance."

Note that matters of national environmental significance (NES) are those matters listed under the *Environment Protection & Biodiversity Conversation Act 1999* (Commonwealth); these matters are not listed under state legislation, although there is considerable overlap in the species and communities that area listed.

The *Guidelines* outline a broad five-step process for assessing impacts on threatened species. Note that 'threatened species' refers here to species, populations and communities listed as threatened under the *Threatened Species Conservation Act 1995* (NSW) or the *Fisheries Management Act 1994* (NSW).

As this project is being assessed under Part 3A of the *EP&A* Act, this investigation and report follow the *Guidelines* where relevant.

Step 1 – Preliminary Assessment

"The main purpose of a preliminary assessment is to determine the likelihood of the study area and subject site supporting threatened species" (*Guidelines*, page 2). As noted in the *Guidelines*, this step is

primarily a 'desktop' study, using existing information, literature and data bases to identify relevant threatened species. The *Guidelines* state that the following matters should be included in the preliminary assessment:

- a description of the location and nature of the proposed development;
- a description of dominant vegetation types;'
- a description of habitat features;
- a list of threatened species that are known or likely to occur within the study area;
- an assessment of which of the threatened species that are known or likely to occur are likely to be directly or indirectly affected by the proposal provides a list of factors for consideration in identifying adverse impacts. This list is not necessarily exhaustive and is not development-specific." (*Guidelines*, page 3)

Step 2 – Field Survey and Assessment

As noted in the *Guidelines*, "the required intensity and extent of survey will vary greatly depending upon the species likely to be present, size of the development area, the level of biological and habitat diversity on the site, and the type and complexity of vegetation on the site." (*Guidelines*, page 3)

The *Guidelines* point out the need "to ensure that a reliable assessment of the presence or absence of threatened species can be made" (*Guidelines*, page 3). It is also noted that consideration needs to be given to the relevance of climatic or seasonal conditions for the target species.

Where relevant, the survey methods set out in the document titled *Threatened Species Survey & Assessment: Guidelines for Developments and Activities* (DECC 2004) should be followed. As noted above, the level of the survey will very much depend upon site conditions.

The outcome of Step 2 should be that adequate field surveys are undertaken for all target species identified in Step 1 such that confident statements can be made regarding the potential for the presence of the species on the subject site. In some instances, the precautionary principle should be adopted and the presence of a species assumed for the purposes of impact assessment.

Step 3 – Evaluation of Impact

This step involves identifying the potential magnitude and extent of the impact, if any, the development will have on each of the target species.

The *Guidelines* suggest that "impacts will be more significant if:

- areas of high conservation value are affected;
- individual animals and/or plants and/or subpopulations that are likely to be affected by the proposal play an important role in maintaining the long-term viability of the species, population or ecological community;
- habitat features that are likely to be affected by the proposal play an important role in maintaining the long-term viability of the species, population or ecological community;
- the duration of impacts are long-term;
- the impacts are permanent and irreversible." (*Guidelines* page 4)

Step 4 – Avoid, mitigate and then offset

Where there is a potential to impact on threatened species, this should be addressed through, firstly, avoiding the impact; this may mean making some changes to the proposed development. If avoidance is not possible, then some form of mitigation may be required. Finally, if neither avoidance nor mitigation are possible, then some form of offset or compensation will be required. This could entail the rehabilitation of similar habitat nearby.

Step 5 – Key thresholds

The *Guidelines* state that "the development application needs to contain a justification of the preferred option based on:

- whether or not the proposal, including actions to avoid or mitigate impacts or compensate to prevent unavoidable impacts will maintain or improve biodiversity values.
- whether or not the proposal is likely to reduce the long-term viability of a local population of the species, population or ecological community.
- whether or not the proposal is likely to accelerate the extinction of the species, population or ecological community or place it at risk of extinction.
- whether or not the proposal will adversely affect critical habitat." (*Guidelines* page 4)

Appendix 3 to the *Guidelines* contains more detail for identifying potential impacts on threatened species.

The assessment process under the *TSC Act 1995* commonly known as the 'seven part test' is not used for Part 3A matters. The matters to be considered in the assessment of a Part 3A development are determined by the Minister for Planning for each development (i.e. the Director-General's Requirements). These guidelines were set out earlier in this report, at Section 1.

The following discussion addresses the five steps as set out above from the Part 3A *Guidelines*.

Step 1 – Preliminary Assessment

The *Guidelines* state that certain matters should be included in the preliminary assessment. These are primarily concerned with descriptions of the development, the vegetation types, habitats, the threatened species known and likely to occur in the area and those threatened species that may be impacted by the proposed development. Descriptions of the project area and its environment, and the survey methods employed in the study are provided in earlier sections of this report. For detailed descriptions of the proposed development, reference should be made to the other documents accompanying this application.

Step 2 – Field Survey and Assessment

Field surveys were undertaken in the study area most recently in March 2011; earlier surveys have been undertaken on parts of this area and on nearby sites over several years. These surveys included general flora and fauna surveys, where all species were identified and documented, including plant communities and habitats. The assessment of the survey results, particularly in regard to the presence of threatened species, etc. is provided in the report. All known or potential threatened species and communities are discussed above.

Step 3 – Evaluation of Impact

The impact of the proposed development is assessed below under several key headings.

Threatened Plant Species

The surveys of the study area did not find any threatened plant species and none are expected to be found in the area because of the lack of any suitable habitat for such species. In our view, threatened plants could not occur in the highly modified landscape through which the pipeline is located.

Threatened Animal Species

As with threatened plant species, the habitat along the proposed pipeline route could not support any threatened animal species, the habitats found there are far too modified and do not contain critical habitat components for any of the locally recorded species. In our view, threatened fauna is most unlikely to occur in the highly modified landscape through which the pipeline is located.

Endangered Ecological Communities

The nearby wetlands are part of listed endangered ecological communities, for example east of the sewerage works. The pipeline route does not impinge upon any of these wetlands. There is no forest or woodland listed communities on or near the pipeline route.

General Impact on Flora and Fauna

There are no stands of natural vegetation along the pipeline route, although one small linear strip of native plants grows at the far northern end of Railway Street. Otherwise, native plants are very scattered and low in abundance along the route. There are no natural habitats along the route. The impact upon native flora and fauna is negligible.

Step 4 – Avoid, mitigate and then offset

There is very little likelihood of impacting upon threatened species, etc. As assessed above. No such species etc. are known or expected to occur along he route of the pipeline. No mitigation or offset measures are required in this case.

Step 5 – Key thresholds

There are no impacts on threatened species, etc. and therefore no measures are required to maintain or improve biodiversity values. The proposal is not likely to reduce the long-term viability of a local population of the species, population or ecological community. Nor is the proposal likely to accelerate the extinction of the species, population or ecological community or place it at risk of extinction. No critical habitat occurs in or near the study area.

7.2 Director-General's Requirements

The Director-General's Requirements from the Department of Planning regarding the issue of biodiversity and this project, dated 8 November 2010, are considered below.

measures taken to avoid impacts on biodiversity

The route of the pipeline was chosen to traverse road verges and road reserves, none of which contain natural plant communities. There are only scattered native plants and some minor areas of modified animal habitat along this route. Biodiversity is very low in these areas; native animals that are present are those that are associated with farmland and urban settings and native plants and mainly scattered and growing amongst the dominant exotic flora.

accurate estimates of any proposed vegetation clearing

The vegetation to be cleared is exotic; there are no natural plant communities along the route.

a detailed assessment of the potential impacts of the project on any terrestrial or aquatic threatened species, populations, ecological communities or their habitats, regionally significant remnant vegetation and/or vegetation corridors

The potential to impact upon threatened species is set out above; it is concluded that the proposed gas pipeline could not have a significant impact upon such species. The surveys along the pipeline route did not locate any regionally significant species or community, remnant native vegetation, animal habitat or habitat corridor.

measures to ensure the project maintains or improves the biodiversity values of the region in the medium to long term

It is concluded that the pipeline project could not have a detrimental impact upon biodiversity values. A few minor recommendations are set out below to ensure that there are no detrimental impacts on the nearby environment of native plants and animals.

7.3 Adequacy Review – Office of Water Comments

The matters raised in the response from the Office of Water to the Department of Planning and Infrastructure dated 16 November 2011 are discussed below.

The wetland vegetation near Bolong Road

As noted above, this area as supporting some native wetland vegetation amongst the paddock weeds. The area seems to remain wet for much of the time so these species can survive here. It is a wetland by definition, namely "an area where water sits for long enough to influence the plants that grow there".

The area is, we believe, an unnatural wetland because of changes in natural topography to the north and west, causing water to remain in the area. Additionally, council machinery traversed the area some time ago and created holes that now often contain water.

The question is whether this "wetland" is of any value. We undertook targeted surveys for threatened frogs and found none. The vegetation community is not natural and we conclude that the wetland is not of particular value and does not need to be avoided by the pipeline.

Groundwater Dependent Ecosystems

The *NSW State Groundwater Dependent Ecosystems Policy* (Dept. of Land and Water and Conservation 2002) states "groundwater is the water beneath the earth's surface that has filtered down to the zone where the earth or rocks are fully saturated. … The top of this saturated zone is called the watertable." The *Policy* continues: "Groundwater dependent ecosystems ... therefore, are ecosystems which have their species composition and their natural ecological processes determined by groundwater [as defined above]."

The Office of Water in their response is presumably referring to natural or semi-natural dependent communities that may occur along the route and that are of habitat value. We have dealt with the whole proposed route and found no natural communities along the route of the pipeline. The wetland area noted above is probably dependent upon a high watertable, although the height of the watertable is variable. The wetland is an artificial community and of little value to local native plants and animals and not important to rare or threatened species or communities.

8 CONCLUSION

The proposed gas pipeline is assessed in this report under the *Guidelines* for Part 3A developments (DECC 2005) and the Director-General's Requirements for this project as provided for under the Part 3A application to the Department of Planning.

The proposed natural gas pipeline from Meroo Meadow to the Shoalhaven Starches Factory in Bolong Road, Bomaderry will not have a significant impact upon native flora and fauna. There are no areas of high biodiversity value on the route or immediately adjacent to the route. The proposal is not likely to have an adverse impact on species, populations and ecological communities listed under the New South

Wales *Threatened Species Conservation Act 1995*; no threatened species, populations or ecological communities are known or likely to occur on the pipeline route. Nor was any regionally significant vegetation, habitat or species located along the route of the pipeline.

Recommendations

(i) Care is required when constructing the pipeline across low-lying areas to ensure that the movement of soil is minimised. A soil and water management plan should be prepared to facilitate good on-site management of erosion, etc. during construction.

(ii) If street trees are removed from along Railway Street, or elsewhere, they should be replaced. The species to be used should be determined through consultation with Shoalhaven City Council and the local residents.

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Appendix 1

List of Plant Species

Taxonomic Name	Common Name
Native plant species	
Acacia binervata	Two-veined Hickory
Acacia falcata	Sickle Wattle
Acacia longifolia	Golden Wattle
Acacia maidenii	Maiden's Wattle
Acacia mearnsii	Black Wattle
Acacia suaveolens	Sweet Wattle
Acacia terminalis	Sunshine Wattle
Acacia ulicifolia	Prickly Moses
Allocasuarina littoralis	Black Sheoak
Aristida ramosa	Three-awned Speargrass
Billardiera scandens	Apple Berry
Bossiaea obcordata	Spiny Bossiaea
Breynia oblongifolia	Coffee Bush
Carex appressa	Tall Sedge
Casuarina glauca	Swamp Oak
Cheilanthes sieberi	Mulga Fern
Commelina cyanea	Wandering Sailor
Cotula australis	Common Cotula
Cynodon dactylon	Couch Grass
Dianella caerulea	Flax-lily
Dichelachne micrantha	Short-hair Plume-grass
Echinopogon caespitosus	Tufted Hedgehog Grass
Epilobium billardierianum	Willowherb
Eragrostis leptostachya	Paddock Love-grass
Eucalyptus sclerophylla	Hard-leaved Scribbly Gum
Glochidion ferdinandi	Cheese Tree
Glycine clandestina	Twining Glycine
Hakea sericea	Silky Hakea
Hibbertia diffusa	Wedge Guinea Flower
Hypolepis muelleri	Harsh Ground Fern
Imperata cylindrica	Blady Grass
Kunzea ambigua	White Kunzea
Leucopogon juniperinus	Juniper Beard-heath
Lomandra confertifolia	Mat-rush
Lomandra longifolia	Spiny-headed Mat-rush
Lomandra multiflora	Many-flowered Mat-rush
Lomandra obliqua	Twisted Mat-rush
Melaleuca styphelioides	Prickly-leaved Paperbark
Persicaria decipiens	Slender Knotweed
Persoonia linearis	Narrow-leaved Geebung
Pimelea linifolia	Slender Rice-flower
Pittosporum undulatum	Sweet Pittosporum

List of Plant Species cont...

Taxonomic Name	Common Name
Native plant species cont...	
Poranthera microphylla	Small Poranthera
Pratia purpurascens	Lobelia Pratia
Pteridium esculentum	Bracken
Senecio hispidulus	Rough Fireweed
Smilax glyciphylla	Thornless Sarsaparilla
Stackhousia monogyna	Creamy Stackhousia
Themeda australis	Kangaroo Grass
Introduced plant species	
Acacia melanoxylon	Blackwood
Andropogon virginicus	Whiskey Grass
Araujia hortorum	Moth Vine
Aster subulatus	Bushy Starwort
Avena sp.	Oats
Bidens pilosa	Cobbler's Pegs
Briza maxima	Large Quaking Grass
Briza minor	Lesser Quaking Grass
Bromus cartharticus	Prairie Grass
Capsella bursa-pastoris	Shepherd's Purse
Chenopodium album	Fat Hen
Cinnamomum camphora	Camphor Laurel
Cirsium vulgare	Spear Thistle
Conyza bonariensis	Tall Fleabane
Cyperus eragrostis	Umbrella Sedge
Echinochloa crus-galli	Barnyard Grass
Foeniculum vulgare	Fennell
Grevillea robusta	Silky Oak
Hakea salicifolia	Willow-leaved Hakea
Holcus lanatus	Yorkshire Fog
Hypochaeris radicata	Flatweed
Lantana camara	Lantana
Lepidium sp.	Peppercress
Ligustrum lucidum	Large-leaved Privet
Ligustrum sinense	Small-leaved Privet
Lycium ferocissimum	African Boxthorn
Melinis repens	Red Natal Grass
Modiola caroliniana	Red-flowered Mallow
Paspalum dilatatum	Paspalum
Paspalum urvillei	Vasey Grass
Pennisetum clandestinum	Kikuyu Grass
Phalaris aquatica	Phalaris
Phytolacca octandra	Inkweed
Pinus radiata	Radiata Pine

List of Plant Species cont...

Taxonomic Name	Common Name
Introduced plant species cont...	
Plantago lanceolata	Ribbed Plantain
Romulea rosea	Onion Grass
Rubus fruticosus sp. agg.	Blackberry
Rumex crispus	Curled Dock
Salvia verbenaca	Wild Sage
Senecio madagascariensis	Fireweed
Setaria ? gracilis	Slender Pigeon Grass
Sida rhombifolia	Paddy's Lucerne
Sonchus oleraceus	Common Sowthistle
Sporobolus africanus	Parramatta Grass
Stellaria media	Chickweed
Tagetes minuta	Stinking Roger
Trifolium repens	White Clover
Verbascum virgatum	Twiggy Mullein
Verbena bonariensis	Purpletop
Vicia sativa	Vetch

Appendix 2

Fauna Species Recorded on and around the Shoalhaven Starches land, Bomaderry

Species	Taxonomic Name
Mammals	
Brown Hare*	*Lepus capensis*
Cattle*	*Bos taurus*
Short-beaked Echidna	*Tachyglossus aculeatus*
Birds	
Australian Magpie	*Gymnorhina tibicen*
Australian Pelican	*Pelecanus conspicillatus*
Australian Raven	*Corvus coronoides*
Australian White Ibis	*Threskiornis molucca*
Australian Wood Duck	*Chenonetta jubata*
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*
Black-shouldered Kite	*Elanus axillaris*
Brown Songlark	*Cincloramphus cruralis*
Cattle Egret*	*Ardea ibis*
Chestnut Teal	*Anas castanea*
Common Myna*	*Acridotheres tristis*
Common Starling*	*Sturnus vulgaris*
Crested Pigeon	*Ocyphaps lophotes*
Darter	*Anhinga melanogaster*
Dollarbird	*Eurystomus orientalis*
European Goldfinch	*Carduelis carduelis*
Fairy Martin	*Hirundo ariel*
Galah	*Cacatua roseicapilla*
Golden-headed Cisticola	*Cisticola exilis*
Great Cormorant	*Phalacrocorax carbo*
Great Egret	*Ardea alba*
Grey Butcherbird	*Cracticus torquatus*
Grey Fantail	*Rhipidura fuliginosa*
Grey Shrike-thrush	*Colluricincla harmonica*
Grey Teal	*Anans gracilis*
House Sparrow*	*Passer domesticus*
Laughing Kookaburra	*Dacelo novaeguineae*
Little Pied Cormorant	*Phalacrocorax melanoleucos*
Magpie-lark	*Grallina cyanoleuca*
Masked Lapwing	*Vanellus miles*
Nankeen Kestrel	*Falco cenchroides*
Olive-backed Oriole	*Oriolus sagittatus*
Rainbow Lorikeet	*Trichoglossus haematodus*
Red Wattlebird	*Anthochaera carunculata*
Red-whiskered Bulbul*	*Pycnonotus jocosus*
Richard's Pipit	*Anthus novaeseelandiae*
Rock Dove*	*Columba livia*

Fauna Species Recorded on and around the Shoalhaven Starches land, Bomaderry cont...

Species	Taxonomic Name
Birds cont...	
Royal Spoonbill	*Platalea regia*
Sacred Kingfisher	*Todiramphus sanctus*
Silver Gull	*Larus novaehollandiae*
Spotted Turtle-Dove*	*Streptopelia chinensis*
Straw-necked Ibis	*Threskiornis spinicollis*
Superb Fairy-wren	*Malurus cyaneus*
Welcome Swallow	*Hirundo neoxena*
White-bellied Sea-Eagle	*Haliaeetus leucogaster*
White-faced Heron	*Egretta novaehollandiae*
White-headed Pigeon	*Columba leucomela*
White-necked Heron	*Ardea pacifica*
Willie Wagtail	*Rhipidura leucophrys*
Yellow Thornbill	*Acanthiza nana*
Yellow-billed Spoonbill	*Platalea flavipes*
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*
Frogs	
Common Eastern Froglet	*Crinia signifera*
Peron's Tree Frog	*Litoria peronii*
Ratchet Frog	*Litoria fallax*
Striped Marsh Frog	*Limnodynastes peronii*
Retiles	
Delicate Skink	*Lampropholis delicata*

*Introduced species.

Appendix 3

Letter report regarding the Green and Golden Bell Frog

KMA

KEVIN MILLS & ASSOCIATES
ECOLOGICAL AND ENVIRONMENTAL CONSULTANTS
ABN 346 816 238 93

- Flora and Fauna Assessment
- Impact Statements
- Environmental Management and Planning

114 North Curramore Road
JAMBEROO NSW 2533
Ph: (02) 4236 0620
Mobile: 0419 248 094

Mr Steve Richardson
Cowman Stoddart Pty Limited
PO Box 738
NOWRA NSW 2541

14 November 2008

Dear Steve

Survey of Frog Habitat, Nowra Starches Site

We have now carried out a further frog survey on the site containing the pond in the far north-western corner of the subject land at Bomaderry. The results are set out below, along with the previous results.

Background Investigation
As we have previously noted, the NSW Wildlife Atlas indicates the distribution of Bell Frog records on the Shoalhaven River floodplain. This species has been recorded in the Coomonderry Swamp area, north of the river, at Culburra towards the coast south of the river and in the swamps along the southern edge of the floodplain, well south of the river. There are no records north of the river west of Mount Coolangatta, even though there are several swamps and back channels in that area. Given the high profile of this species locally, it would be seem likely that if this species was in that area (e.g. at the sewage treatment plant) then there would be some record of it.

16 October 2008 – daytime survey
The site was visited for 30 minutes in the late afternoon and searched for signs of basking frogs and frog calls. The weather was sunny and there was no wind. The only frog heard calling was the Common Eastern Froglet *Crinia signifera*; three or more frogs were calling form the edges of the pond. No Green and Golden Bell Frogs or other frogs were observed.

27 October 2008 – evening visit
The site was visited for 90 minutes before and after dusk. The survey entailed searches of the area (during daylight and at night), listening for the calls of the frogs and playback of the call of the Green and Golden Bell Frog.

The weather conditions at the time of the survey were as follows. The night was warm, 26°C at 7.30 pm (EDST), with a 60-80% dark cloud cover; rain is predicted in the near future. The temperature was still 26°C at 8.15pm.

The frogs heard or observed on the subject land are listed below:

Crinia signifera	Common Eastern Froglet	calling
Litoria fallax	Ratchet Frog	calling, observed
Limnodynastes peronii	Striped Marsh Frog	calling

The frogs heard or observed on the subject land are listed below:

Litoria peronii	Peron's Tree Frog	calling
Litoria fallax	Ratchet Frog	calling

14 November 2008

The site was visited for 120 minutes before and after dusk. The survey entailed searches of the area (during daylight and at night), listening for the calls of the frogs and playback of the call of the Green and Golden Bell Frog.

The weather conditions at the time of the survey were as follows. The night was warm, 20°C at 7.30 pm, 25°C at 8.30 pm (EDST), with a complete cloud cover; storms about one hour before the visit were experienced across the district.

The frogs heard or observed on the subject land are listed below:

Litoria fallax	Ratchet Frog	calling

Do not hesitate to contact us if you require any additional information.

Yours sincerely
KEVIN MILLS & ASSOCIATES
Dr Kevin Mills
Managing Director

Appendix 4

Photographs of the Pipeline Route

Photograph 1. Looking west along Pestells Lane (route section A).

Photograph 2. Looking west along the unformed section of Pestells Lane (route section B).

Photograph 3. Looking east along Fletchers Lane (route section D).

Photograph 4. Looking south along the route to the east of the railway (route section E).

ANNEXURE 9

Aboriginal Heritage Assessment

prepared by

Kayandel Archaeological Services

ANNEXURE 9

SHOALHAVEN STARCHES
GAS PIPELINE SCHEME

Bomaderry, NSW

Shoalhaven Council LGA

Aboriginal and Historic Heritage Assessment

Final Report

Prepared on behalf of Manildra Group

June 2011

Author: Caroline Hubschmann

KAYANDEL
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EXECUTIVE SUMMARY

Kayandel Archaeological Services (KAS) was commissioned by the Manildra Group (MG) to undertake a Heritage Assessment for the Proposed Gas Pipeline from Pestells Lane, Bomaderry to Shoalhaven Starches Factory, Bolong Road, Bomaderry.

Field Survey

The archaeological field survey was conducted by Lance Syme and Caroline Hubschmann of KAS on Friday 11 March 2011. The survey was conducted utilising standard pedestrian survey techniques. Aboriginal community representatives that assisted in completing the survey and assessment were Graham Connolly of Jerrinja Consultants, as well as Graeme Smith of the Nowra Local Aboriginal Land Council and Lionel Mongta, a Yuin Traditional Owner.

No items were identified in completing the survey that could be identified as being of historic or archaeological significance.

The proposed gas pipeline link from the MG factory at Pestells Lane, Bomaderry to Shoalhaven Starches Factory, Bolong Road, Bomaderry, has low to moderate potential for intact sub-surface archaeological deposits to be present.

As a result of the findings of this report it is recommended that:

1. All sections of the present study area are free from archaeological constraints and do not required further archaeological assessment.

In addition it is recommended that:

2. Should Aboriginal objects be found during the proposed works in those areas not previously sanctioned by an Aboriginal Heritage Impact Permit (AHIP), work must stop and the DECCW contacted to inspect the artefacts.
3. Otherwise there are no archaeological constraints on the proposed development with regard to Aboriginal archaeological sites.

Responses received from Aboriginal stakeholders involved in the project have indicated their agreement with the recommendations stated above with the exception of Lionel Mongta, a Yuin Traditional Owner, who expressed a preference for a representative to be present to monitor the initial ground disturbance. This was not deemed necessary by Graham Connolly of Jerringa Consultants.

This archaeological assessment and the management recommendations contained herein will be independently reviewed by the Environment Protection and Regulatory Division of the NSW Department of Environment, Climate Change and Water (DECCW) and the relevant Aboriginal community.

The DECCW and the Aboriginal community will make consideration of the findings of the consultant's report and the recommendations in relation to the management of heritage places. Formal approval for all actions outlined should be sought from the relevant authority prior to the completion of any works. At no time should automatic approval of the management recommendations stated above be assumed.

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PLATES

1 INTRODUCTION

Kayandel Archaeological Services (KAS) was commissioned by the Manildra Group (MG) to undertake a Heritage Assessment for the Proposed Gas Pipeline from Pestells Lane, Bomaderry to Shoalhaven Starches Factory, Bolong Road, Bomaderry (

Figure **1**).

1.1 Study Area

The study area is situated in the town of Bomaderry, located to the north of Nowra in the Shoalhaven City Council district area of New South Wales.

The proposed gas pipeline route commences along Pestells Lane, approximately 1km north-west of the intersection with Princess Hwy, adjacent to the existing pressure reduction station. It terminates at the Shoalhaven Starches factory on Bolong Road (

Figure **2**). The distance over which the gas pipeline is proposed to traverse is approximately 5.5 km. The study area is irregular in shape and consists of a series of linear areas along road verges and paddocks (

Figure **3** and

Figure **4**).

For clarity in completing this assessment the Study area has been divided into the following identified elements (Figure 5):

1. Pestells Lane area
2. Fletchers Lane
3. South Coast Railway area/ Railway Street
4. Bolong Road area

1.1.1 Pestells Lane area

Pestells Lane is a narrow, unsealed all weather gravel road, used infrequently and only by local residents. It has high grassy verges on either side and it terminates at Princess Hwy. The Pestells Lane area also includes an area of high vegetation located (and upon which a horse is adjisted) on the south-east side of Princess Hwy, terminating at the intersection with Fletchers Lane.

1.1.2 Fletchers Lane

Fletchers Lane begins at the intersection with Pestells Lane and terminates as it intersects with the South Coast Railway to the east. It is an unsealed all weather gravel surface used almost exclusively by local residents. Houses are located to the north of the road while the area to the south is open grassland.

1.1.3 South Coast Railway area/ Railway Street

The South Coast Railway/ Railway Street area comprises two distinct areas: the northern part of the railway line which is surrounded by open fields, and the southern part which runs adjacent to Railway Street and is located within a built-up urban area.

1.1.4 Bolong Road area

The Bolong Road area of the proposed gas pipeline also comprises two distinct areas. The first runs perpendicular from Railway Street (heading south east) on the southern side of two large water reservoirs; the second is perpendicular to Bolong Road (adjacent to the Shoalhaven Starches Factory) and runs north-east, connecting at 90o to the area from Railway Street.

1.2 Proposed Works

Manildra Group proposes to construct a gas pipeline from its factory, Shoalhaven Starches on Bolong Road, to link up with the Eastern Gas pipeline at Pestells Lane, Meroo Meadow. The gas pipeline will be approximately 5.5 km in length and will, in parts, run adjacent to the existing pipeline.

The proposal may include different levels of subsurface disturbances including excavation of soil deposits, removal of gravel and altering the existing landscape.

1.3 Study Objectives

This study is being conducted to:

Identify and determine if the area of proposed gas pipeline area has any sites or items that may be of significance to the local indigenous community and/or of historic heritage value;

Identify existing and potential Aboriginal and Historical heritage sites within the study area;

Determine the level of significance of identified historical heritage sites as set out in NSW Heritage Act 1977;

Determine the level of significance of identified Aboriginal heritage sites as set out in the National Parks and Wildlife Act 1974;

Address the significance of archaeological deposits and/or relics in accordance with the appropriate guidelines;

Present a clear methodology for dealing with the archaeological potential while progressing with the proposed development.

1.4 Study Limitations

The study area was limited by two factors: access to private land and areas of poor visibility. Several paddock areas within the study area that required that permission be obtained prior to entering, and the survey was able to be conducted once permission had been granted.

The other limiting factor was the visibility of the ground surface within the study area. The paddocks provided poor visibility with thick grass coverage over most of the survey area. This limited the effectiveness of the survey in these areas. Areas of exposed roadway provided better visibility but areas adjacent to the roads and the railway are of poor visibility due to high grass and debris.

1.5 Personnel

The production of this report relied upon a collaborative process involving a number of KAS staff. Project management was overseen by Glenys Moore. Background research including the archaeological and environmental context was conducted by Lance Syme and Iain Watt. Archaeological survey was undertaken by Lance Syme and Caroline Hubschmann. Site data was compiled by Caroline Hubschmann, with GIS being carried out by Lance Syme. The report was written by Caroline Hubschmann, with technical input from Lance Syme. The report was reviewed and edited by Glenys Moore. Management recommendations were developed by Lance Syme in conjunction with the indigenous community groups and their representative.

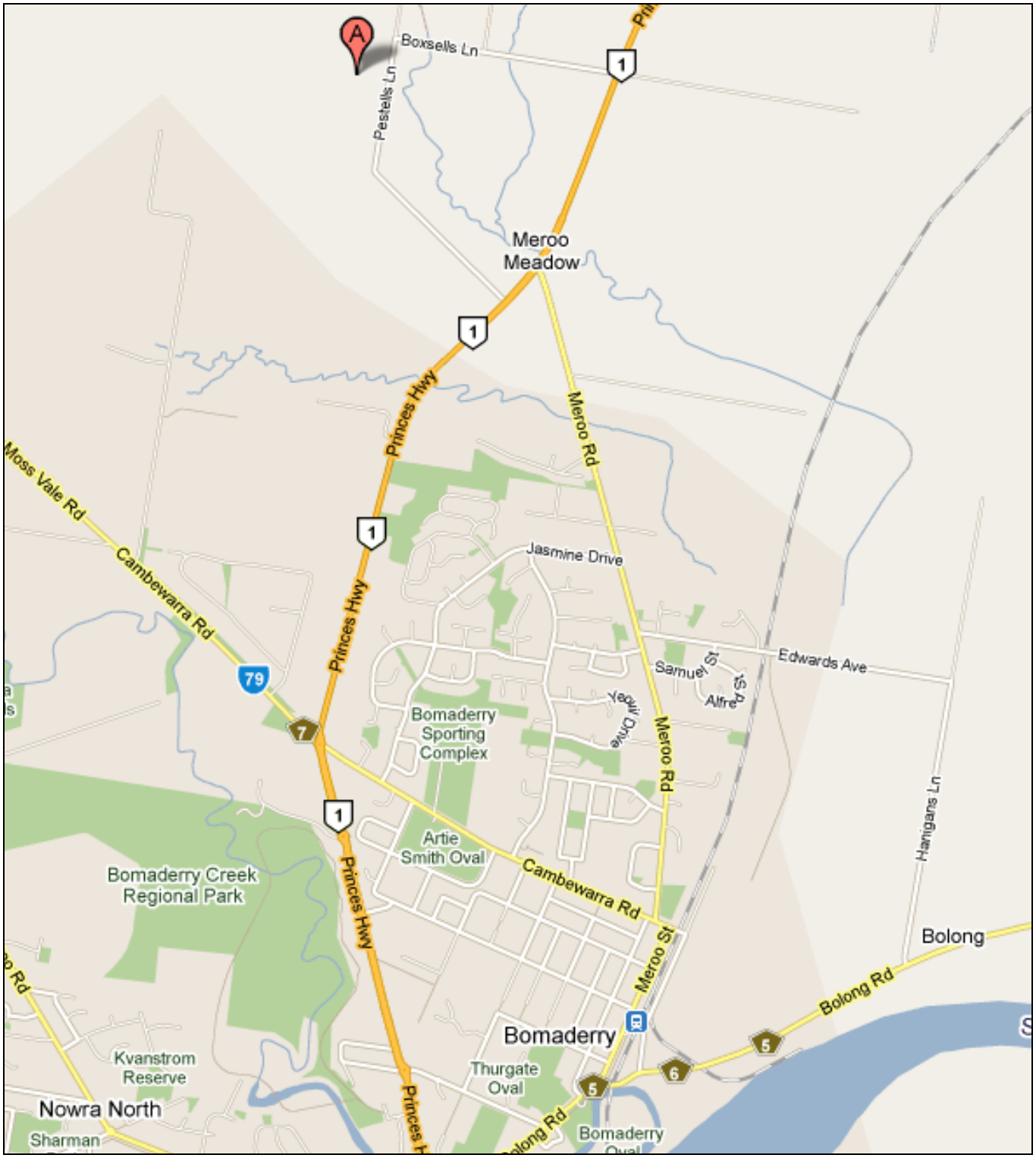

Figure 1. Locality of Survey Area in Bomaderry, NSW.

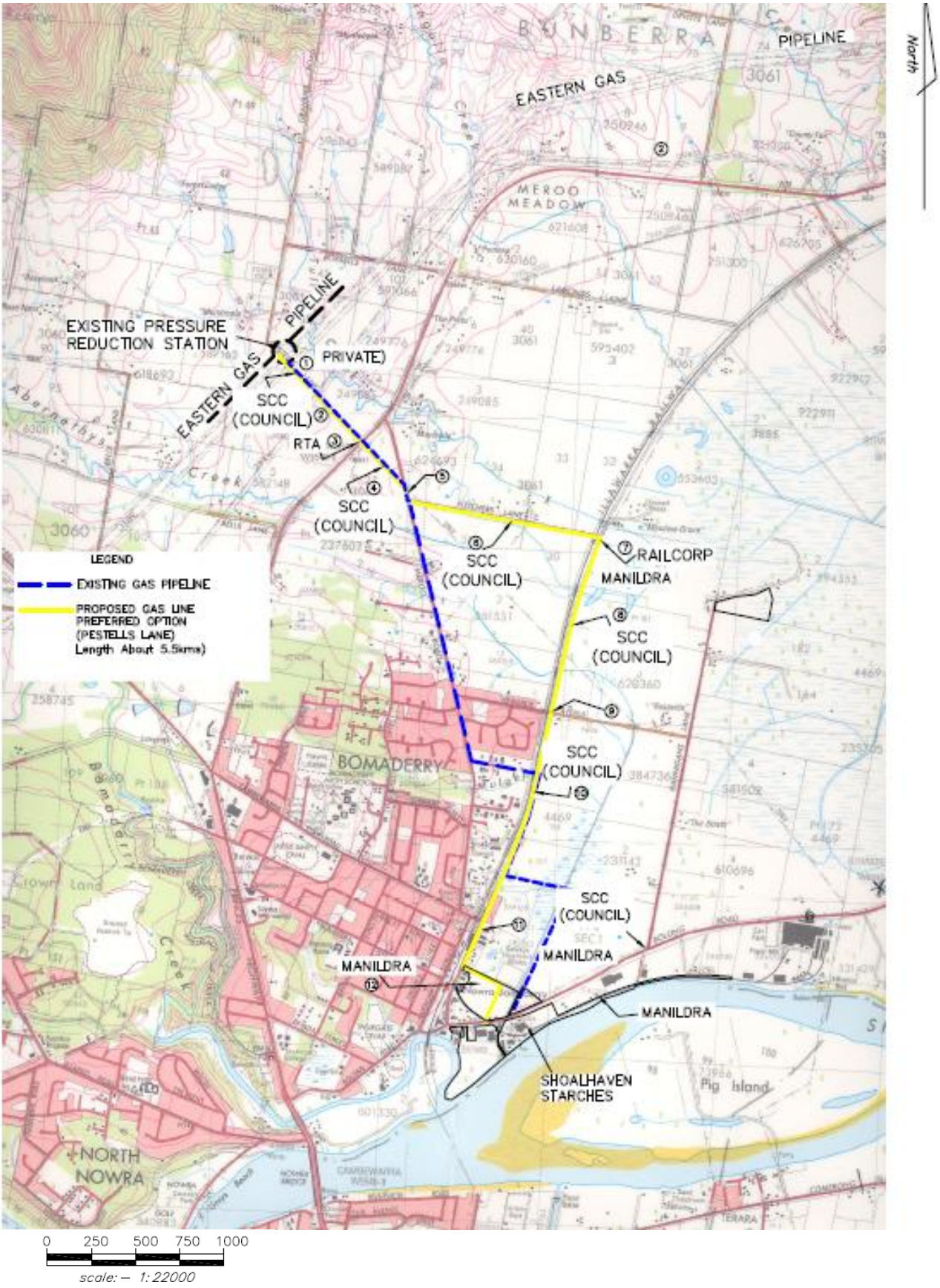

Figure 2. Route of gas pipeline – Pestells Lane to Bolong Road.

Figure 3. Route of gas pipeline – Pestells Lane to South Coast Railway.

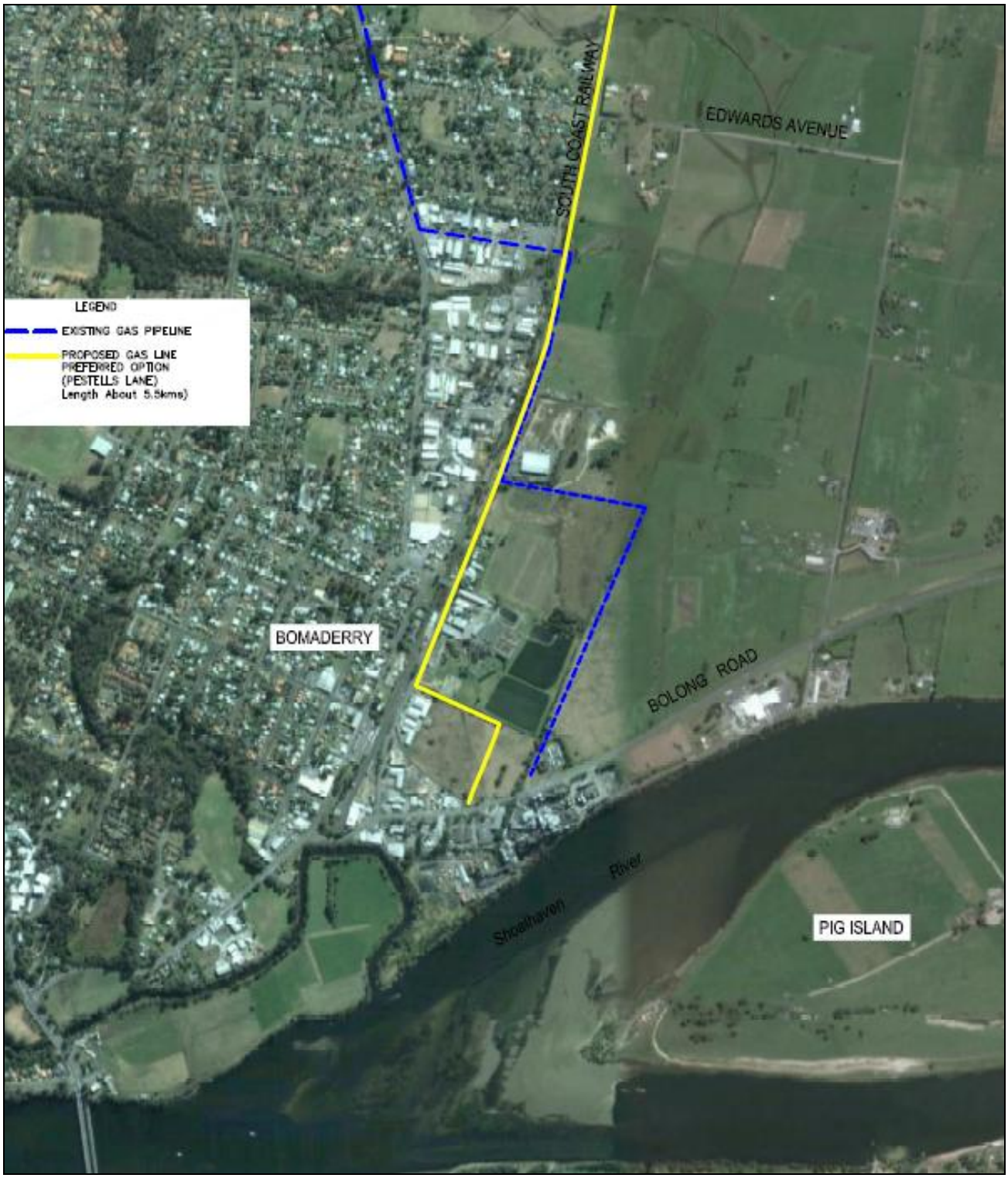

Figure 4. Route of gas pipeline – South Coast Railway/ Railway Road to Bolong Road.

Figure 5. Survey area divisions

2 METHODOLOGY

The assessment reported here involved the completion of an archaeological pedestrian field survey in order to assess the potential that the survey area contains Aboriginal cultural remains. The assessment is also concerned with identifying how, if at all, the proposed works as specified in Section 1.2 will affect Aboriginal cultural heritage in the survey area. A breakdown of the various tasks that have been undertaken to achieve the objectives of the consultancy brief is provided below.

2.1 Background Research

In order to ensure that an appropriate level of knowledge regarding potential historic and archaeological items which may be encountered during the survey were understood and identified, the following tasks were undertaken prior to the field survey:

- Published archaeological texts were consulted to develop a regional archaeological context for the study area;
- A search of the Aboriginal Heritage Information Management System (AHIMS), maintained by the Department of Environment, Climate Change and Water (DECCW), was conducted to determine whether any sites or areas of sensitivity had previously been recorded within or near the study area;
- A search of the AHIMS report catalogue was conducted to identify previous archaeological studies that had been carried out in the area. These reports were able to provide information on the local archaeological context(s) and assisted with the development of predictions for site location within the study area; and
- Enquiries were made to identify any Aboriginal history, ethnography, environmental and climate information relevant to the general area.

2.2 Field Survey

The archaeological field survey was conducted by Lance Syme and Caroline Hubschmann of KAS on Friday, 11 March 2011. The survey was conducted utilising standard pedestrian survey techniques. Aboriginal community representatives that assisted in completing the survey and assessment were Graham Connolly of Jerrinja Consultants, as well as Graeme Smith of Nowra Local Aboriginal Land Council and Lionel Mongta, a Yuin traditional owner.

3 PARTNERSHIP WITH INDIGENOUS COMMUNITIES

The Department of Environment Climate Change and Water (DECCW) recognises and values Aboriginal cultural heritage. Evidence of Aboriginal occupation are present as objects throughout the NSW landscape, and live in the memories, stories and associations of Aboriginal people in their traditional land or Country. Aboriginal cultural heritage is an essential part of Aboriginal people's cultural identity, connection and sense of belonging to Country. DECCW recognises that Aboriginal people who hold cultural knowledge should be provided an opportunity to inform DECCW of the cultural significance of objects or places, and have an input into the management of their cultural heritage (DECCW 2010, iii, 1).

- In recognising the rights and interests of Aboriginal people in their cultural heritage DECCW (2010:2) acknowledges that Aboriginal people:
- Are the primary source of information about the value of their heritage and how this is best protected and conserved;
- Must have an active role in any Aboriginal cultural heritage planning process;
- Must have early input into the assessment of cultural significance of their heritage and its management so that they can continue to fulfil their obligations towards their heritage; and
- Must control the way in which cultural knowledge and other information relating specifically to their heritage is used, as this may be an integral aspect of its heritage value (DECCW 2010, 2).

DECCW (2010) sets out a process for identifying Aboriginal parties who may have information on the cultural significance of objects or places, and providing Aboriginal people with opportunities to comment on the methods used to identify and assess objects or places, and opportunities to contribute to the development of management options and recommendations (DECCW 2010, 7). The process must be followed if an application is made to DECCW under Part 6 of the National Parks and Wildlife Act, 1974, as amended.

3.1 Community Notification and Registration

The Manildra Group released a statement seeking to identify and invite Aboriginal groups and/or people who hold cultural knowledge relevant to determining the significance of Aboriginal object(s) and/or place(s) within the area to register an interest for further consultation (See Section 16). The purpose of community consultation with Aboriginal people is to assist Manildra Group in the preparation of an application for an AHIP and to assist the Director General of DECCW in his or her consideration and determination of the application and may also be used in the assessment of impact and determination of approval of the project under Part 3A of the Environmental Planning & Assessment Act 1979 (See Section 11).

The date for which comments regarding the proposed activities were to be received was 4 March 2011. As at the close of business on 9th March 2011, responses had been received from Jerringa LALC, Nowra LALC and Lionel Mongta, see **Error! Reference source not found.**, below.

Stakeholder Group	Representative and Field Participant
Jerringa Consultants	Graham Connolly
Nowra LALC	Graeme Smith
Yuin	Lionel Mongta, Yuin traditional owner

Table 1. Stakeholder participants.

3.1.1 Review of Draft Report

All registered Aboriginal Parties (RAPs) were provided links to the draft final archaeological report, and/or paper copies of the report where requested. Comments on the final archaeological draft report were actively sought. All reasonable care has been taken to incorporate the recommendations of the RAPs involved (as can be seen in Recommendations: section 9 and appendices) However, comments were not provided by all RAPs.

The following steps were taken;

On the 3rd of May 2011 a link to the draft report was emailed to Nowra Local Aboriginal Land Council (Stan) and Jerringa Consultants (Graham). That same day a hard copy was printed for Lionel Mongta and sent via express post. 0n the 12th of May emails were sent to Nowra LALC and Jerringa consultants requesting confirmation email of receipt of report for review and Lionel Mongta called but not contacted. On the 25th May a receipt email had still not been received so another email was sent to Nowra and Jerringa reminding of timeframe for review and comments on report. On the 26th May Lionel Mongta was called every 2 hours to remind of timeframe for review of report- but each time the rang out. No message was left as there was no answer machine on phone. Lionel Mongta was called again on the morning of the 31st may and again there was no answer. That same day Graham Connolly (Jerringa Consultants) was called. He said he agreed with the objectives in the report and that he was busy until 4pm but would put his assent in an email that afternoon when he finished. Stan from Nowra LALC was then called. The phone went to answer machine- left a message for Stan requesting a call back re Shoalhaven project comments. On the afternoon of the 31st May Lionel Mongta was called. He requested that our phone conversation be transcribed as his final comments. They are as follows; "Because of the long grass and the heavy rain, it was too hard to see the ground. A representative should be there when the trenches are dug, when they start digging into the ground to see what's there." Nowra LALC was again called but there was no answer.

3.2 Community Requests and Outcomes

The stakeholders identified in Table 1 participated on the survey conducted in 11 March 2011 and contributed the following comments after review of this report;

Jerringa Consultants- Graham Connolly of Jerringa Consultants expressed agreement with the recommendations outlined in the report.

Yuin Traditional Owner- Lionel Mongta expressed a preference for a representative to be present during initial ground disturbance due to the low ground visibility during the survey.

Nowra Local Aboriginal Land Council- Nowra Local Aboriginal Land Council were not able to be contacted to provide comments.

4 ENVIRONEMTNAL CONTEXT

The natural environment of an area influences not only the availability of local resources such as food and raw materials for artefacts but also determines the likely presence and/or absence of various archaeological site types which may be encountered during a field investigation.

Resource distribution and availability (such as the presence of drinking water, plant and animal foods, raw materials of stone, wood and vegetable fibre used for tool production and maintenance) is strongly influenced by the nature of soils, the composition of vegetation cover and the climactic characteristics of a given region.

The location of different site-types (such as rock-shelters, middens, open campsites, axe grinding grooves, engravings etc) are strongly influenced by factors such as these along with a range of other associated features which are specific to different land systems and bedrock geology.

Detailing the environmental context of a study region is an integral procedure that is necessary for modelling potential past Aboriginal land-use practices and/or predicting site distribution patterns within any given landscape. The information that is outlined below is considered to be pertinent to the assessment of site potential and site visibility within the specific contexts of the current study.

4.1 Climate

In the summer the Shoalhaven region has an average minimum temperature of 16.1oC and an average maximum temperature of 25.8oC. In the winter the average minimum is 6.2oC, while the maximum is 15.8oC. The average annual rainfall is 1,143.1mm and the average number of days per year that experience rainfall is 130.4 (Australian Bureau of Meteorology).

The microclimate of an area is also influenced by factors such as rain shadows, aspect and topography, prevailing wind direction and frost hollows. These influences would seem particularly present in the terrain of the study area, resulting in frosts and localised temperatures and conditions often dependant on elevation. Whist the area may be cold this would not have provided a barrier to regular and prolonged occupation of the area by Aboriginal population in the past.

4.2 Topography and geology

The study area is located in on the extensive floodplain of the Shoalhaven River, in the coastal lowlands of the South Coast of NSW. It is located wholly within the Sydney Basin

Bioregion and the topography is characterised by the level and gently-sloping levee flats of the Shoalhaven River.

The geological basin of this bioregion consists of Permian and Triassic sandstones and shales that overlie older basement rocks of the Lachlan Fold Belt (DECCW website 2011). Much of the geology of the region including the uplift and folding of the sedimentary layers occurred during the formation of the Great Dividing Range.

In the context of this report, the study area itself is low-lying, poorly drained and often subject to standing water.

4.3 Landforms

The landforms commonly found throughout the study area are wide valleys and small hills. Native vegetation has largely been cleared and has been replaced with introduced grasses for grazing and agricultural crops. In the recent past a rainforest may have been present close to the Shoalhaven River (Antill 1982, 8), while wetland or meadow vegetation may have also been present in the poorly drained and swampy areas.

4.4 Geology and soil

The geology of the study area consists of Quarternary alluvium. Adjacent areas comprise undifferentiated siltstone of the Permian era, as well as shale and sandstone of the Berry Formation. The soils of the region generally consist of recent silt and alluvial deposits that overly clay at depth.

4.5 Existing Condition of the Study Area

Extensive impacts have occurred to the locality and the study areas from nearly two centuries of non-Aboriginal occupation. The areas of open grassland are regions where the native vegetation has been cleared for use in grazing and crops and have been subject to extensive farming use (**Error! Reference source not found.**). Much of the survey area was also adjacent to existing roads, including Pestells Lane, Fletchers Lane, Railway Street and Bolong Road (**Error! Reference source not found.**). These areas experience high traffic; those in urban areas are flanked by concrete while the rural roads have grassy verges (Plate 3).

Plate 1. Southern end of Pestell's Lane Area. Currently used to agist a horse.

In the Bolong Road area, the proposed gas pipeline traverses adjacent to the existing railway line as it crosses Bolong Road, as well as adjacent to two large water reservoirs (Plate 4). These areas are also subject to high activity.

Plate 2. Pestell's Lane.

Plate 3. Fletchers Lane.

Plate 4. The existing rail line as it crosses Bolong Road.

4.6 Disturbance

The majority of the study area has been subject to previous disturbance in the form road construction, use and maintenance, the installation of services such as telecommunications, water and electricity, and industrial activity. Areas within the survey boundaries are also used for grazing and farming.

4.7 Visibility

A number of factors need to be considered when assessing the visibility of a survey area. These include the time of day, the aspect of the sun, vegetative cover, weather conditions, soil matrix and obstacles. On the day of the survey the weather was warm but overcast. The survey was conducted over the course of the day and the vegetative cover was varied.

Visibility along Pestells Lane is low, with high grassy verges on either side of the road (Plate 5). On the southern side of Princess Hwy the survey area is rural grassland, where visibility is negligible. Like Pestells Lane, Fletcher's Lane is an unsealed all weather gravel surface with grassy verges on either side. Visibility is poor. Much of the South Coast Railway area comprises rural grasslands (**Error! Reference source not found.**) where visibility is poor. Along Railway Street the survey area is within an urban built up area where visibility is hampered by obstacles such as pavement, construction and buildings (Plate 7 and Plate 8). There are grassy verges in the Bolong Road area which has also been impacted by earthmoving works, road construction, drainage works and other essential services. Visibility here is poor.

Plate 5. Poor level of visibility adjacent Pestell's Lane.

Plate 6. Poor level of visibility adjacent to the South Coast Railway area.

Plate 7. Urban obstacles of Bolong Road area.

Plate 8. Construction in the Bolong Road survey area.

5 REGIONAL CONTEXT

5.1 Regional Context

The study area is situated in the town of Bomaderry, located to the north of Nowra in the Shoalhaven City Council district area of New South Wales.

5.1.1 The Sydney Basin Bioregion

It forms part of the Sydney Basin Bioregion, which extends from north of Bateman's Bay to Nelson's Bay on the central coast, and as far west as Mudgee (Figure 6). The Sydney Basin Bioregion is varied; in addition to the activity area it encompasses Sydney, Wollongong, Nowra, Newcastle, Cessnock, Musswellbrook, Katoomba and Mt Victoria. Major portions of the catchments of the Hawkesbury-Nepean, Hunter and Shoalhaven river systems and all of the smaller catchments of Lake Macquarie, Lake Illawarra, Hacking, Georges and Parramatta Rivers are located within this bioregion (DECCW website, 2011).

5.1.2 The Ettrema sub-bioregion

The study area also lies within the smaller Ettrema sub-bioregion which is characterised by low hills, deeply incised streams and low-lying escarpment. The alternating shale and sandstones facilitate the creation of rock and soil benches with shallow sand that is often saturated. The red-brown clays loam on basalt. The vegetation of the sub-bioregion displays a prominent contour pattern. The exposed rock has lichens, mosses and low heath patches, while the woodlands comprise red bloodwood, black ash, tall heath and sedgeland, all from the soil benches. Messmate and brown barrel grow on better quality soils, while rainforest elements and turpentine plumwood, coachwood, lilly pilly and mountain pepper, are present in the gullies (DECCW website, 2011).

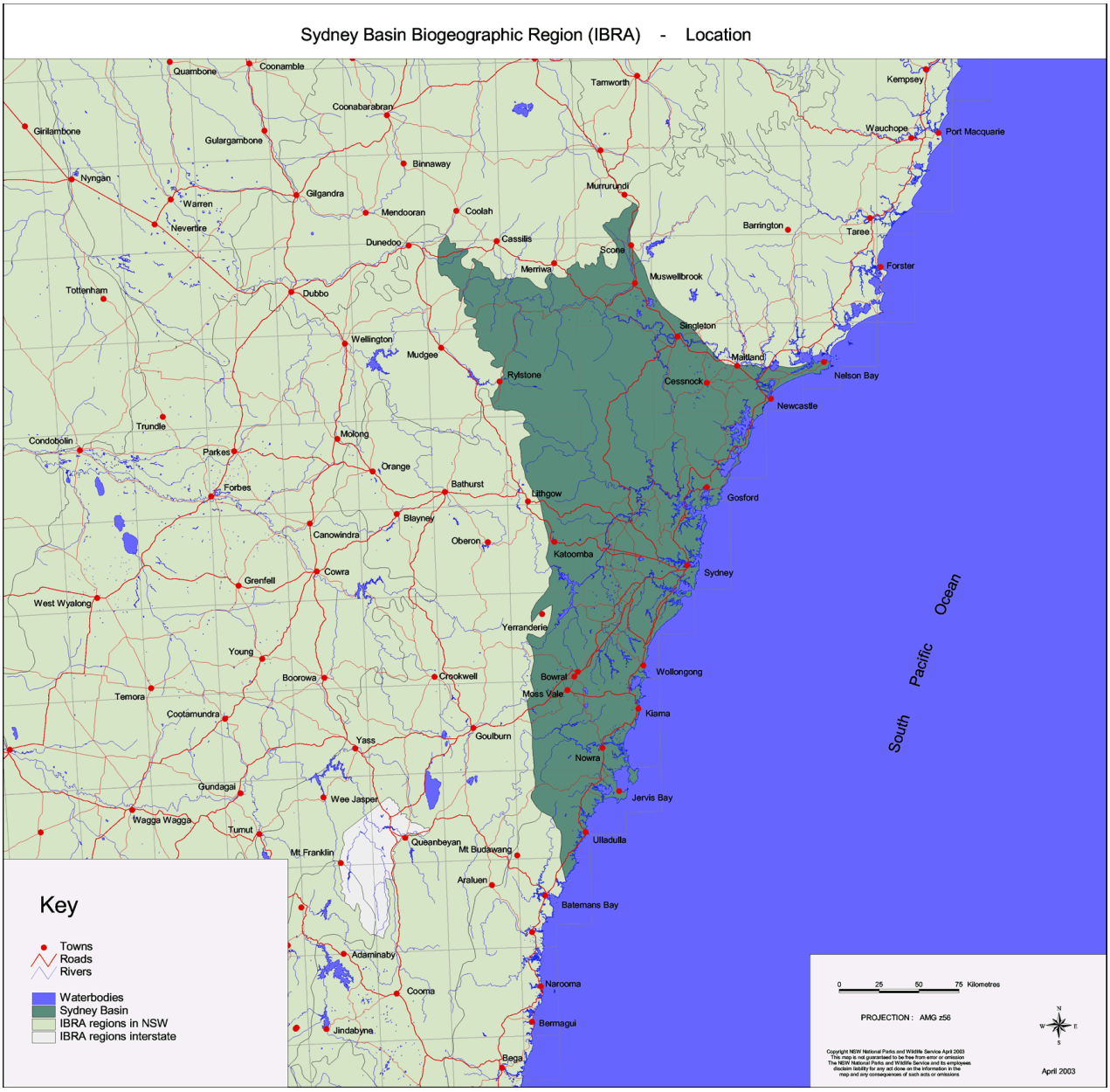

Figure 6. Extent of the Sydney Basin Bioregion.

6 ARCHAEOLOGICAL CONTEXT

6.1 Heritage Register Searches

A search of the DECCW Aboriginal Heritage Information Management System (AHIMS) was undertaken on 28 March 2011 (See Section 13). The study area is located within Zone 56, between AGM coordinates 272104-292104 east and 6132683-6152683 north (with a 100m buffer zone).

This search revealed 110 Aboriginal sites within the vicinity of the survey area (Figure 7). No Aboriginal Sites were found within the survey area but 52-5-0557, an artefact site, is located within 100m of the Bolong Road section of the survey area. Another artefact site, 52-6-0423, is located within 1km of the Pestells Lane section of the survey area. Table 2 below lists these objects by site type frequency.

Site Type	Number of sites	%
Isolated Find	5	4.6
Stone Arrangement	1	0.9
Burial(s)	1	0.9
Shelter with Deposit	18	16.3
Natural/Mythological Ritual area	1	0.9
Axe Grinding Groove	8	7.3
Shelter with Art	9	8.1
Open Camp Site	9	8.1
Modified Tree	3	2.8
Shelter with Art and Deposit	4	3.7
Potential Archaeological Deposit (PAD)	3	2.8
Midden	1	0.9
Multiple: Axe Grinding Groove, Shelter with Deposit, Art with Deposit	1	0.9
Bora with Ceremonial Tree	1	0.9
Unclassified	45	40.9
Total	110	100

Table 2. Aboriginal Sites located in the vicinity of the survey area.

From the AHIMS search results it can be seen that, apart from the unclassified site types, the most common sites in the region are Shelters with Deposits (18, 16.3%), then Shelters with Art and Open Camp Sites (both 9 each, 8.1%), Axe Grinding Grooves (8, 7.3%), Isolated Finds (5, 4.6%), Shelter with Art and Deposit (4, 3.7%), and three (2.8%) Modified Trees and Potential Archaeological Deposits (PADs).

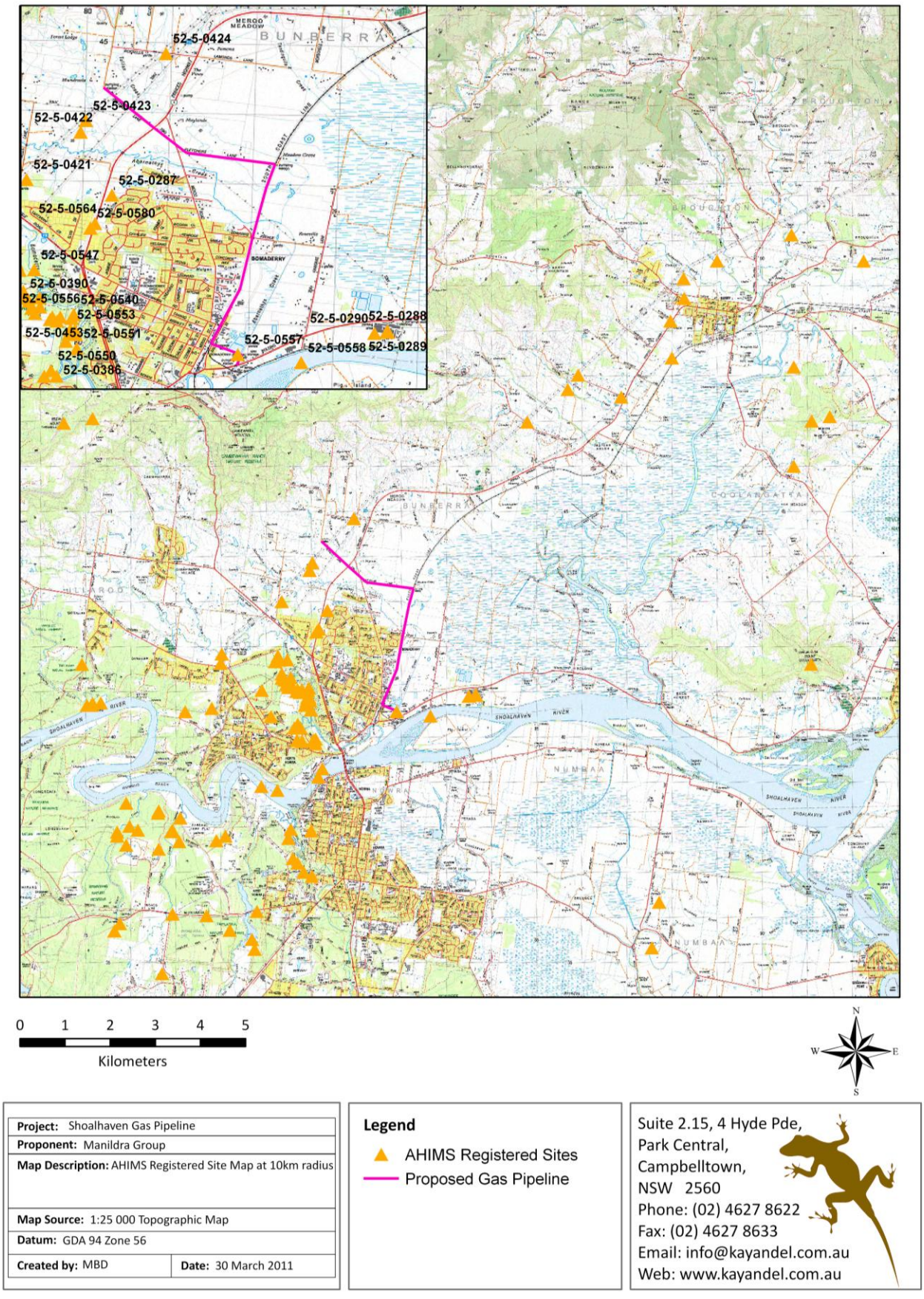

Figure 7. Location of Aboriginal Sites within the vicinity of the survey area, as identified by AHIMS.

A Stone Arrangement, Burial and Midden are also present, as well as sites with multiple activities including a Shelter with Deposit including Art and Age Grinding Grooves, and a Bora with Ceremonial Tree.

As a result of the predominately linear nature of the project and on the basis of essential environmental, topographic and landforms features required for certain Site Types (i.e. escarpments, large sandstone slabs and mature trees), site types such as Shelters with Art, Scarred Trees, Axe Grinding Groove and Shelters with Deposit are not expected to be indentified in this survey. This accounts for 35% of the available data from AHIMS.

The affect of this is also borne out by 38.1% of the AHIMS data coming from closed context sites, for example rock shelters (Table 3).

Site Context	Number	%
Closed site	42	38.1
Open site	68	61.9
Total	110	100

Table 3. Site Context

It should be noted that the distribution of sites in the AHIMS database is a reflection of site surveys for development or independent research studies. Therefore the distribution of sites from AHIMS may not be a true reflection of the existing Aboriginal sites in the area.

6.2 Previous Archaeological Research

Archaeological research, including surveys and excavations, has been conducted in the vicinity of the survey area for both commercial and academic purposes. Three studies in particular have involved the present survey area (Navin 1992, Kuskie 2002 and Kuskie 2008).

In 1992 Navin surveyed proposed extensions to the Associated Pulp and Paper Mill's (APPM) Shoalhaven Paper Mill, located on the northern side of the Shoalhaven River. The site, located near Pig (Burraga) Island, is approximately 1.5 km east of Shoalhaven Starches and the survey included 22.5 hectares adjacent to the AAPM Paper Mill and 55 hectares north of Bolong Road.

Two artefacts were uncovered during Navin's study including a ground edge hatchet (APPM Isolated Find 1, DECC #52-5-288 and #52-5-289) and a broken alluvial pebble (APPM Isolated Find 2, DECC #52-5-290). Both items were composed of fine-grained volcanic alluvial pebble and both were interpreted as not being found in situ. Navin assessed these items as reflecting the generally low archaeological sensitivity of the area, with the possible use of the elevated river banks as access corridors (Navin 1992).

In 2002 Cowman Stoddart Pty. Ltd., on behalf of the Manildra Group, commissioned South East Archaeology to undertake an archaeological assessment of the Aboriginal heritage within areas affected by the proposed extensions to the Shoalhaven Starches Environmental Farm (Kuskie 2002, 1). The survey area comprised an evaporation plant and proposed employee car park located adjacent to the Starches factory, and an irrigation area on land located approximately 3.5 km to the north-east.

No Aboriginal heritage had previously been reported in the vicinity of the survey area and no items were found during the survey. Kuskie (2002, 6-15) assessed that there were two reasons for the lack of Aboriginal heritage: (1) impacts from recent European land use and (2) generally low utilisation of the area by Aborigines in the past. As such, the area has been interpreted as having a low potential for the presence of Aboriginal heritage, particularly in situ evidence and that which is important for scientific purposes.

In 2007 Southeast Archaeology was engaged by the Manildra Group to undertake an Aboriginal Heritage Impact Assessment of the proposed Ethanol Plant upgrade at Shoalhaven Starches, Bomaderry. The survey area included the Shoalhaven Starches Factory located on the southern side of Bolong Road and immediately north of the Shoalhaven River, and additional facilities located on the northern side of Bolong Road, east of Railway Street (Kuskie 2008, 5). The study revealed that no Aboriginal heritage sites are listed in the study area, on any heritage instruments or registers, except for the two artefacts identified in Navin's 1992 study, which are located in the immediate vicinity of the eastern end of the pipeline routes north of the existing Paper Mill. The registered Aboriginal stakeholders did not identify any other cultural values and any impact of the proposal on Aboriginal heritage is interpreted as very low (Kuskie 2008, 18-19).

Additional surveys undertaken in the vicinity of the low-lying terrain of the coastal plain east of Nowra have similarly produced little or no evidence of Aboriginal activity, including studies undertaken by Kuskie (1995) of a property bordering Worrigee Swamp in East Nowra, and Paton (1990) who surveyed a proposed residential division in the same area, both of which revealed nothing. Similarly to his other surveys, Kuskie (1995) suggests that low intensity of Aboriginal use and recent land-use practices are the likely reasons for this situation. A small artefact scatter and an isolated artefact were identified by Corkhill (1986) along the margins of Brundee Swamp, south of Shoalhaven River, interpreted as being close to remnant landscape features associated with the Holocene embayment infill.

6.3 General model of Aboriginal Occupation

In 2006 Clarke and Kuskie undertook the fourth stage of the Lower Shoalhaven River Valley Aboriginal Cultural Heritage and Mapping Project for DECC. As a result, a spatial model designed to predict Aboriginal site occurrence was developed using key environmental

variables (Clarke and Kuskie 2006). In consultation with the Aboriginal community, the model was tested on public land and eight artefact scatters and four rock shelters with artefacts were identified in the vicinity of Nowra. Recommendations were also made for further archaeological surveys and the predictive model was refined following a field assessments.

With reference to prior research by Boot (2002), Clarke and Kuskie (2006) presented a predictive model for the region which identified two major resource zones in the Shoalhaven Region: (1) Primary resource zones, being terrain in close proximity to the major Shoalhaven and Crookhaven Rivers, and (2) Secondary resource zones, being terrain in close proximity to high order creeks and wetlands and their associated flats, slopes and rivers. The Primary resource zone is more likely to contain evidence for occupation, resource gathering and transitory movement. Occupation is likely to have been more regular and for longer periods than in Secondary resource zones, which was likely sporadic and of relatively short duration. Occupation in areas not identifiable as Primary and Secondary resource zones (areas distant from wetlands ad higher order creeks) was likely transitory, of short duration and involved hunting and gathering.

Clarke and Kuskie (2006) also determined that although a variety of Aboriginal heritage sites occur in the Shoalhaven Region, artefact scatters are the most common. Stone artefact evidence is also common across the entire region, with grinding grooves and rockshelters also occurring frequently.

The various models of past Aboriginal occupation which have been developed for the region indicate that, as in virtually all other regions, sources of permanent or seasonally reliable water were not just a focus of past Aboriginal occupation but were a necessity for occupation to occur. Therefore, it is expected that the greatest evidence of occupation would be found in association with reliable water sources such as creeks (and rivers where they occur).

Whilst the presence of water has been identified as having been the over-riding factor in determining levels of past Aboriginal occupation in the southern tablelands region, the presence of suitable landforms for occupation to occur was also extremely important. Basically, landform determines the type of archaeological evidence, which will be found or, in many instances, whether any evidence at all can be expected to occur.

6.4 Local Aboriginal Culture

After excavating a rockshelter on Burrell Lake, Lampert (1971) established that Aboriginal occupation of the South Coast of NSW occurred from at least 20,000 years ago. A date of 17,000 BP (Flood 1980) was yielded from a site at Bass Point, while 18,810 +160 was recovered from Bullee Brook 2 (#58-1-378), near Sassafras (Boot 1994). This evidence demonstrates that local Aboriginal

people were utilising the coastal zone from at least 20,000 years ago, and the coastal ranges from at least 18,000 years ago.

6.4.1 Pre-contact

In his 1974 book Aboriginal Tribes of Australia, Tindale (1974) identifies the Shoalhaven River as the boundary between the Wodi Wodi people and the Wandandian people. The Wandandian territory is described as extending south from the Shoalhaven River to the Ulladulla area, and inland to the Shoalhaven River north of Braidwood (Tindale 1974 in Kuskie 1995, 7). The Wandandian people spoke the Dharawal language which, according to Eades (1976 in Kuskie 1995, 7), occurred in the Shoalhaven District and north across the Illawarra to Port Hacking. Tindale (1974) describes the territory of the Wodi Wodi as extending north from the Shoalhaven River to Wollongong and inland to Moss Vale.

It must be noted, however, that these 'tribal' boundaries are not supported by ethno-historical records which refer to the Shoalhaven Aboriginal people as a single group (Navin 1991, 6). Indeed, these records make no distinction between the cultural or language differences of peoples living on either side of the Shoalhaven River, who are described as speaking the Gurungada language (Capell 1963,S36 in Navin 1991, 6).

In Boot's (1994) ethno-historical study of the south coast region, a list of flora utilised by the inhabitants includes kangaroo apple, native cranberry, honeysuckle, pigface, macrozamia, cabbage tree, fruit and yams. Numerous fish species were also utilised including bream, trumpeter, whiting, salmon and shark, as well as eel, whales, seals, marine worms and shellfish such as oysters and mussels. Larger animals such as possum, kangaroo, wombat, goanna and birds were hunted and honey gathered.

Boot (1984) also identifies the material culture of the region, listing huts, canoes, spears, gunyas, shell-barbed spears, fishing spears, bark/wood shields, spear throwers, clubs, boomerangs, hatchets, fish-traps, stone heat retainers, kangaroo teeth adornments, pierced nose adornments, bark drawings, possum skin cloaks, shell fish hooks and grass tree resin. Due to their fragility few of these items survive in the archaeological record but stone, bone and shell materials are represented.

6.4.2 Post-contact

On the South Coast contact between Aborigines and European settlers had a marked and detrimental impact on the local population. Disease, vegetation clearance, relocation, destruction of traditional resources and massacres characterised this early contact period.

After 1770 when the Shoalhaven region was sighted by Captain Cook, it was frequented by non-Aboriginal people. Even though there is limited historical documentation of the Aboriginal people of the region between 1840 and 1900 (Cane 1988, 30), disease and social fragmentation resulted in a rapid population decline (Berry 1834; 1838, 608).

The early 19th Century was a period of hostility, exploitation and relocation. At this time a number of Aborigines living in the Coolangatta area were moved to Orient Point and by the 1840s the local Aboriginal population had been reduced to small groups living along the coast or subsisting by living on the fringes of the non-Aboriginal settlements such as Coolangatta Estate that were, by this stage, permanent. Aboriginal camps and reserves such as those at Orient Point, Wreck Bay, Currambene Creek and Ulladulla (Cane 1988).

By the beginning of the 20th Century the Aborigines Protection Board established the Roseby Park Aboriginal Reserve, Crown Land which encompassed 67 acres (Kelly 1978; Sullivan 1981). Aboriginal sites in the area were threatened during developments in the 1950s and 1960s. In 1978 the Jerringa Tribal Council submitted a claim over the Orient Point area and in the mid 1980s land was granted.

At preset the Jerrinja Local Aboriginal Land Council and the Nowra Local Aboriginal Land Council are the caretakers of the Aboriginal heritage in the Shoalhaven region.

7 ARCHAEOLOGICAL SURVEY

7.1 Survey coverage and visibility variables

The effectiveness of an archaeological field survey is heavily reliant upon the obtrusiveness of the Aboriginal site being looked for and the incidence and quality of ground surface exposure. Visibility variables have been estimated for all areas where a comprehensive survey was carried out in the study area. This data provides a measurement with which to gauge and compare the effectiveness of the survey and the level of sampling conducted. They may also be utilised to determine the numbers and types of sites that may not have been identified by the survey.

Ground surface visibility is a measure of the bare ground visible to the archaeologist during the field survey. There are two variables used to assess ground surface visibility.

- The frequency of exposures encountered by the archaeologist; and
- The quality of visibility within those exposures.

The major factors affecting the quality of ground surface visibility within an area of exposure are the extent of vegetation and ground litter, the depth and origin of the exposure, the extent of recent sedimentary deposition and the level of visual interference from surface gravels. Two variables of ground surface visibility were estimated during the survey. These being:

- A percentage estimate of the total area of ground inspected which contained useable exposures of bare ground; and
- A percentage estimate of the average levels of ground surface visibility within those exposures. This is a net estimate and accounts for all visual and physical variables that have affected the visibility including the archaeological potential of any sediment or rock exposed.

Various Aboriginal site types exhibit different levels of prominence within the landscape. This is an important factor to consider when assessing the impact on visibility levels. Sites present upon or within rock exposures, such as grinding grooves, engravings and rock shelters, are more likely to be encountered than sites which are located on or within sedimentary contexts with little or no ground surface relief.

If you compare the obtrusive nature of a shelter site against the unobtrusive nature of a rock platform, the shelter sites will be located and inspected on 10 out of 10 occasions. Rock platforms on the other hand have their gross visual presence affected by factors such as obscuring ground litter, flood debris and sedimentation.

Whilst these visibility factors may not affect the gross visual presence of the shelter site, they can impinge upon the finer visual presence within the rock shelter and inhibit the ability of the recorder to locate stone artefacts etc.

Another factor affecting visibility is the presence of small rocks, pebbles and gravels in the exposure. If these particular raw materials are also suitable for stone artefact manufacture it may make stone artefact identification more onerous and difficult.

Due consideration should also be given to the natural occurrence of sandstone platforms suitable for grinding grooves or engravings in addition to the presence of remnant established trees. Both of these are central in identifying survey effectiveness and site patterning.

Table 4 provides a summary of the extent to which discrete landforms within each element of the study area were examined, including the exposure incidence and average ground visibility present within each landform. Within the proposed Gas Pipeline route a total of 100% of the ground surface area was inspected during the field survey.

	Pestells Lane	Fletchers Lane	South Coast Railway area/ Railway Street	Bolong Road
Survey mode	Pedestrian	Pedestrian	Pedestrian	Pedestrian
Length (km)	1.309	1.117	2.691	0.4718
Landform	Flat	Flat	Gentle slope, south to north	Flat
Main exposure type	Road Side/Road base	Nil	Road Side/Road base	Road Side/Road base/ Railway
Exposure incidence (%)	5	0	25	35
Average exposure visibility (%)	20	0	40	40

Table 4. Survey coverage data.

7.2 Survey methodology

The archaeological field survey was conducted by Lance Syme and Caroline Hubschmann of KAS on Friday 11 March 2011. The survey was conducted utilising standard pedestrian survey techniques and much of the inspection involved visual reconnaissance. Aboriginal community representatives that assisted in completing the survey and assessment were Graham Connolly of Jerrinja Consultants, as well as Graeme Smith of the Nowra Local Aboriginal Land Council and Lionel Mongta, a Yuin Traditional owner.

The level and methodology of the survey is considered satisfactory to present an effective assessment of any Aboriginal heritage resources potentially present in the study area. As such the survey provides a valid basis for determining the probable impacts of the proposal and formulating

recommendations for the management of the identified and potential Aboriginal heritage resources.

7.3 Survey results

No Aboriginal objects or evidence of Aboriginal material culture or occupation was found or identified during the pedestrian survey of the study area.

8 PRINCIPAL FINDINGS AND CONCLUSIONS

8.1 Survey Areas

The four areas surveyed are Pestells Lane area, Fletchers Lane area, South Coast Railway/Railway Street area and Bolong Road area.

8.1.1 Pestells Lane

Visual inspection was made of the area of the proposed gas pipeline along Pestells Lane. This area comprises two landform types; the first is an unsealed all weather gravel road and adjacent grassy verges that is used infrequently and only by local residents; the second is a grassy open paddock subjected to animal grazing. Dense verge and pasture grasses limit visibility considerably.

The potential for stone artefacts to be present in the survey area is assessed as very low, and the potential for the existence of all other forms of Aboriginal Heritage as negligible.

No evidence of Aboriginal occupation of the study area was identified during the completion of this area of the field survey. Additionally, no locations where identified that meet the criteria for identification as Potential Archaeological Deposits.

8.1.2 Fletchers Lane

Visual inspection was made of the area of the proposed gas pipeline along Fletchers Lane. The survey area is an unsealed all weather gravel surface with private residences located to the north and private farmland to the south. The verges of Fletchers Lane have been impacted greatly by introduced grasses, and road construction and use.

The high levels of recent land use impacts in this area has also reduced the potential for virtually all forms of Aboriginal cultural heritage to be negligible, and stone artefacts very low.

No evidence of Aboriginal occupation of the study area was identified during the completion of this area of the field survey. Additionally, no locations where identified that meet the criteria for identification as Potential Archaeological Deposits.

8.1.3 South Coast Railway area/Railway Street

Visual inspection was made of the area of the proposed gas pipeline along the South Coast Railway and Railway Street. The survey region can be divided into two areas; the first is the Southern Coast Railway as it traverses open paddocks, and the second is the same railway line as it runs adjacent to Railway Street. In the open areas dense pasture grasses limited visibility considerably, while earthworks, road construction and use, railway construction and use, drainage works and other construction activities highly impacted the survey area in the urban environment. The visibility of the verges is also limited by introduced grasses.

No evidence of Aboriginal occupation of the study area was identified during the completion of this area of the field survey. Additionally, no locations where identified that meet the criteria for identification as Potential Archaeological Deposits.

8.1.4 Bolong Road area

Visual inspection was made of the area of the proposed gas pipeline in the Bolong Road area. This area is highly industrialised and adjacent to Bolong Road, a highly utilised transport corridor. Dense verge grasses limit visibility considerably, while continuous industrial activity, earthworks, construction and the implementation and use of essential services such as pipelines, telecommunications cables and electricity, impact highly the survey area.

No evidence of Aboriginal occupation of the study area was identified during the completion of this area of the field survey. Additionally, no locations where identified that meet the criteria for identification as Potential Archaeological Deposits.

8.2 Conclusions

All four areas have been highly impacted by constant and considerable use and visibility is assessed as low to negligible. Considering the formation history of this low-lying floodplain, the survey area exists within an environmental context that does not appear conducive to Aboriginal occupation. Indeed, with Aboriginal activity in the area likely to involve the exploitation of swamps and marshlands which is poorly conducive for the preservation of identifiable cultural heritage, the likelihood for the presence of Aboriginal heritage evidence is low. The potential for stone artefacts to be present in the survey area is assessed as very low, and the potential for the existence of all other forms of Aboriginal Heritage as negligible.

No mature native trees of sufficient age to host Aboriginal cultural modification are located within any of the survey areas and there are no rock outcrops present which have the potential to host evidence of rock shelters or grinding grooves. Additionally, suitable sources of stone for lithic acquisition are absent.

No evidence of Aboriginal cultural heritage or values were uncovered in the study area during this investigation. The topographical nature of the local environment and its land use history reduces the likelihood for such identifications. The presence low density artefact scatters consistent with background discard cannot be dismissed even in areas with considerable land use impact; however, their potential to be found in situ or informative for scientific research is low.

The results of the survey are consistent with other investigations within or near the current survey area which reveal little or no evidence of Aboriginal activity. In 1992 Navin concluded that the archaeological potential of the area in the vicinity of the Shoalhaven River is generally low, a supposition supported by this investigation. Navin suggests the Shoalhaven River may have acted as an access corridor in the past and although no material evidence was found during that or later surveys, this is a possibility. Indeed, Aboriginal people may have occasionally visited the study area

but the resulting artefactual evidence is unlikely to be sufficient to contribute to our understanding of local indigenous land use.

These conclusions have been drawn from the research conducted during the compilation of this report and the pedestrian inspection of the survey area. The consultant is satisfied that the provided recommendations made below will ensure that the Aboriginal archaeological resource and the potential resource will not be adversely affected without prior consideration.

9 MANAGEMENT RECOMMENDATIONS

The following recommendations are based on:

- The legal requirements of the National Parks and Wildlife Act 1974 whereby it is illegal to damage, deface or destroy an Aboriginal object without first obtaining the written consent of the Director General of National Parks & Wildlife Service;
- The requirements of the Code of Practice for Archaeological Investigation of Aboriginal objects in NSW (DECCW 2010); and
- The findings of the heritage study presented in this report.

It is recommended that:

1. All sections of the present study area, as shown in Figure 5 are free from archaeological constraints and do not required further archaeological assessment.

In addition it is recommended that:

2. Should Aboriginal objects be found during the proposed works in those areas not previously sanctioned by an Aboriginal Heritage Impact Permit (AHIP), work must stop and the DECCW contacted to inspect the artefacts.
3. Otherwise there are no archaeological constraints on the proposed development with regard to Aboriginal archaeological sites.

9.1.1 Community Recommendations

Lionel Mongta, a Yuin Traditional Owner, expressed a preference for a representative to be present to monitor the initial ground disturbance. This was not deemed necessary by Graham Connolly of Jerringa Consultants and all management recommendations were agreed to.

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11 STATUTORY OBLIGATIONS

The following overview of the legal framework is provided solely for information purposes for the client, it should not be interpreted as legal advice. KAS will not be liable for any of actions taken by any person, body or group as a result of this general overview, and recommend that specific legal advice be obtained from a qualified legal practitioner prior to any action being taken as a result of this general overview.

11.1 Introduction

The acknowledgement that history is fundamental to a society's self determination has led to legally enforced protection for significant heritage resources. Numerous statutory bodies are involved in establishing obligations and protocols for investigating, assessing and managing heritage resources. These bodies govern national, state and local resources and may overlap.

11.2 Commonwealth Legislation

11.2.1 Environment Protection & Biodiversity Conservation Act 1999 (EPBC Act)

This Act was introduced in July, 1999. Pursuant to s25 of the EPBC Act, any action that has or is likely to have a significant impact on a matter of National Environmental Significance may only progress with the approval of the Federal Minister for the Environment and Heritage.

The definition of an action (at s523):

a) a project; and

b) a development; and

c) an undertaking; and

d) an activity or series of activities; and

e) an alteration of any of the things mentioned in paragraph (a), (b), (c) or (d).

Where an exception to the above applies, an action will also require approval if:-

- It is undertaken on Commonwealth land and will have or is likely to have a significant impact.
- It is undertaken outside Commonwealth land and will have or is likely to have a significant impact on the environment on Commonwealth land; and
- It is undertaken by the Commonwealth and will have or is likely to have significant impact.

The National Heritage List records places with outstanding natural and cultural heritage values that contribute to Australia's national identity. The Commonwealth Heritage List will comprise natural, Aboriginal and historic places owned or managed by the Commonwealth. Legislation introduced in 2004 offers greater legal protection than that of the EPBC Act.

They are:

I. Environment and Heritage Legislation Amendment Act (No. 1) 2003;

II. Australian Heritage Council Act 2003;

III. Australian Heritage Council (Consequential and Transitional Provisions) Act 2003.

Approval under the EPBC Act is required if an action as defined under the EPBC Act will or is likely to have a significant impact on the National Heritage values of a National Heritage place and/or any other National Environmental Significance matter. This action must be referred to the Federal Minister for the Environment and Heritage. It is the Minister's role to decide whether the action will or is likely to have a significant impact on a matter of national environmental significance.

11.2.2 Native Title Act 1993

The Native Title Act recognises and protects native title, and provides that native title cannot be extinguished contrary to the Act. The National Native Title Tribunal (NNTT) is a Commonwealth agency constituted by the Native Title Act and decides the merits of claims made under that Act.

The National Native Title Tribunal maintains the following registers:-

I. National Native Title Register;

II. Register of Native Title Claimants;

III. Unregistered Claimant Applications; and

IV. Register of Indigenous Land Use Agreements.

A search of the Native Title registers identifies possible traditional owners that may not have representation on Local Aboriginal Land Councils (LALCs) or other Aboriginal groups.

11.3 State Legislation

11.3.1 National Parks & Wildlife Act 1974 (no. 80)

Pursuant to Section 90., this Act affords automatic statutory protection to "Aboriginal objects" where:

> *it is an offence to destroy, deface or damage, or knowingly cause or permit the destruction or defacement of or damage to, an Aboriginal object or place, without first obtaining the consent of the Director-General of the National Parks and Wildlife Service.*

The Act defines an "Aboriginal object" as:

> *any deposit, object or material evidence (not being a handicraft made for sale) relating to Aboriginal habitation of the area that comprises New South Wales, being habitation before and concurrent with (or both) the occupation of that area by persons of non-Aboriginal extraction, and includes Aboriginal remains.*

The Act defines an "Aboriginal place" as:

> *Any place declared to be an Aboriginal place under section 84 of the Act.*

An Aboriginal place may or may not contain physical Aboriginal objects.

Under Section 90 of the National Parks and Wildlife Act 1974, it is an offence to knowingly destroy, deface, damage or desecrate, or cause or permit the destruction, defacement, damage or desecration of an Aboriginal object or Aboriginal place, without the prior written consent from the Director-General of the Department of Environment, Climate Change and Water (DECCW). In order to obtain such consent, a Section 90 Consent Application must be submitted and approved by the DECCW Director-General.

In considering whether to issue a S. 90 Consent, DECCW will take into account:

- The significance of the Aboriginal object(s) or place(s) subject to the proposed impacts;
- The significance of the Aboriginal object(s) or place(s) subject to the proposed impacts;
- The effect of proposed impacts and the mitigation measures proposed;
- The alternatives to the proposed impacts;
- The conservation outcomes that will be achieved if impact is permitted; and
- The outcomes of the Aboriginal community consultation regarding the proposed impact and conservation outcomes.

It is also an offence, Under Section 86 of the Act, to disturb or excavate land for the purpose of discovering an Aboriginal object, or disturb or move an Aboriginal object on any land, without first obtaining a permit (Preliminary Research Permit, Excavation Permit, Collection Permit or Rock Art Recording Permit) under Section 87 of the Act.

In issuing a Section 87 Permit, DECCW will take into account:

- The views of the Aboriginal community about the proposed activity;
- The objectives and justifications for the proposed activity;
- The appropriateness of the methodology to achieve the objectives of the proposed activity; and
- The knowledge, skills, and experience of the nominated person (s) to adequately undertake the proposed activity.

Under Section 91 of the Act, it is a requirement to notify the DECCW Director-General of the location of an Aboriginal object. Identified Aboriginal items and sites are registered with the NSW DECCW on the Aboriginal Heritage Information Management System (AHIMS).

The National Parks and Wildlife Act 1974 also requires that reasonable precautions are taken and due diligence is exercised to determine whether an action would, or would be likely to, impact on an Aboriginal object or Aboriginal place. Without being able to demonstrate due diligence, a

person risks prosecution if Aboriginal objects or Aboriginal places are impacted upon and a Heritage Impact Permit has not been issued.

11.4 Local Statutory Obligations

11.4.1 Environmental Planning & Assessment Act 1979

The Environmental Planning and Assessment Act 1979 requires that; environmental impacts are considered prior to land development. This includes impacts on Aboriginal cultural heritage items and places. The Act also requires that Local Governments prepare Local Environmental Plans (LEPs) in accordance with the Act to provide guidance on the level of environmental assessment required.

The planning instruments make provision for the control of development in the vicinity of heritage items and to conserve and promote heritage values.

11.4.2 Local Government Cultural Heritage Management Plans

Heritage management plans are aimed at encouraging local government to take responsibility for Aboriginal heritage (in consultation with Aboriginal communities and NPWS) and non-Aboriginal heritage (in consultation with the NSW Heritage Office) within its planning and development approvals framework. Heritage studies further aim to ensure that Aboriginal sites are integrated as constraint in the planning and development process. It aims to ensure that appropriate management regimes are developed for heritage so as to provide for the protection of Aboriginal sites in LEPs and DCPs. Heritage plans must provide for the establishment of an Aboriginal Liaison committee, produce an inventory of known/recorded sites and a predictive model which identifies different land systems within the study area and specify the types of sites likely to be found on/within these landforms, and produce a planning instrument detailing strategies for appropriate protection of Aboriginal and non-Aboriginal heritage. Consideration must be given to the range of management options including monitoring of site condition in terms of natural and biological impacts (including humans, animals and insects), development works, and subsidence effects (via mining etc.).

11.4.3 Archaeological Zoning Plans

Cultural heritage management plans often incorporate an archaeological zoning plan (AZP). An AZP assists in visualising areas of archaeological sensitivity and potential and can help in developing management policies for individual sites, a precinct, a proposed subdivision or even a larger piece of land such as an LGA. They are appropriate for areas with a high likelihood of significant archaeological remains being preserved. An AZP does not include comprehensive site specific research – their intent is to identify whether archaeological features are, or are likely to be, present, not necessarily to access significance. An AZP divides the subject area into units of archaeological potential rated as:

High:	known archaeological sites or features
Medium:	potential archaeological sites or features
Low:	archaeologically sterile sites or features

12 ABORIGINAL SITE TYPE GLOSSARY

Artefact Scatters

Artefact scatters are defined by the presence of two or more stone artefacts in close association (i.e. within fifty metres of each other). An artefact scatter may consist solely of surface material exposed by erosion, or may contain sub-surface deposit of varying depth. Associated features may include hearths or stone-lined fireplaces, and heat treatment pits.

Artefact scatters may represent:

- Camp sites: involving short or long-term habitation, manufacture and maintenance of stone or wooden tools, raw material management, tool storage and food preparation and consumption;
- Hunting or gathering activities;
- Activities spatially separated from camp sites (e.g. Tool manufacture or maintenance); or
- Transient movement through the landscape.

The detection of artefact scatters depends upon conditions of surface visibility, including vegetation cover, ground disturbance and recent sediment deposition. Unfavourable conditions obscure artefact scatters and prevent their detection during surface surveys.

Bora Grounds

Bora grounds are a ceremonial site associated with initiations. They are usually comprise two circular depressions in the earth, and may be edged with stone. Bora grounds generally occur on soft sediments in river valleys, although they may also be located on high, rocky ground in association with stone arrangements.

Burials

Human remains were often placed in hollow trees, caves or sand deposits and may have been marked by carved or scarred trees. Burials have been identified eroding out of sand deposits or creek banks, or when disturbed by development. The probability of detecting burials during archaeological fieldwork is extremely low.

Culturally Modified Trees

Culturally modified trees include scarred and carved trees. Scarred trees are caused by the removal of bark for use in manufacturing canoes, containers, shields or shelters. Scarred trees are only likely to be present on mature trees remaining from original vegetation. Carved trees are caused by the removal of bark to create a working surface on which engravings are incised. Carved trees were used as markers for ceremonial and symbolic purposes, including burials.

Although, carved trees were relatively common in NSW in the early 20th century, vegetation removal and bushfires have rendered this site type extremely rare.

Fish Traps

Fish traps comprised arrangements of stone, branches and/or wickerwork placed in watercourses, estuaries and along coasts to trap or permit the easier capture of sea-life.

Grinding Grooves

Grinding grooves are elongated narrow depressions in soft rocks (particularly sedimentary), generally associated with watercourses, that are created by the shaping and sharpening of ground-edge implements. Grinding grooves have been identified in the study area.

Isolated Finds

Isolated finds occur where only one artefact is visible in a survey area. These finds are not found in associated with evidence for prehistoric activity or occupation. Isolated finds occur anywhere and may represent loss, deliberate discard or abandonment of an artefact, or may be the remains of a dispersed artefact scatter. Numerous isolated finds have been recorded within the study area.

Middens

Shell middens comprise deposits of shell remaining from consumption and are common in coastal regions and along watercourses. Middens vary in size, preservation and content, although they often contain artefacts made from stone, bone or shell, charcoal, and the remains of terrestrial or aquatic fauna that formed an additional component of Aboriginal diet. Middens can provide significant information on land-use patterns, diet, chronology of occupation and environmental conditions.

Mythological/Traditional Sites

Mythological and traditional sites of significance to Aboriginal people may occur in any location, although they are often associated with natural landscape features. They include sites associated with dreaming stories, massacre sites, traditional camp sites and contact sites. Consultation with the local Aboriginal community is essential for identifying these sites.

Rock Shelters with Art and/or Occupation Deposit

Rock shelters occur where geological formations suitable for habitation or use are present, such as rock overhangs, shelters or caves. Rock shelter sites generally contain artefacts, food remains and/or rock art and may include sites with areas of potential archaeological deposit, where evidence of rock-art or human occupation is expected but not visible. The geological composition of the study area greatly increases the likelihood for rock shelters to occur

Stone Arrangements

Stone arrangements include lines, circles, mounds, or other patterns of stone arranged by Aboriginal people. These may be associated with Bora grounds, ceremonial sites, mythological or sacred sites. Stone arrangements are more likely to occur on hill tops and ridge crests that contain stone outcrops or surface stone, where impact from recent land use practices has been minimal.

Stone Quarries

A stone quarry is a place at which stone resource exploitation has occurred. Quarry sites are only located where the exposed stone material is suitable for use either for ceremonial purposes (e.g. ochre) or artefact manufacture.

13 AHIMS SITE RESULTS

Environment, Climate Change & Water

AHIMS Web Services (AWS)
Cover Letter

Your Ref Number : Shoalhaven

Kayandel Archaeological Services
Suite 2.15, 4 Hyde Parade
Campbelltown New South Wales 2560

Date: 28 March 2011

Attention: Lance Syme

Dear Sir or Madam:

AHIMS Web Service search for the following area at Datum :GDA, Zone : 56, Eastings : 274506 - 292506, Northings : 6134480 - 6152480 with a Buffer of 50 meters. Additional Info : conducted by Lance Syme on 28 March 2011

A search of the DECCW AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

110	**Aboriginal sites are recorded in or near the above location.**
0	**Aboriginal places have been declared in or near the above location. ***

If your search shows Aboriginal sites or places what should you do?

- You must do an extensive search if AHIMS has shown that there are Aboriginal sites or places recorded in the search area.
- If you are checking AHIMS as a part of your due diligence, refer to the next steps of the Due Diligence Code of practice.
- You can get further information about Aboriginal places by looking at the gazettal notice that declared it. Aboriginal places gazetted after 2001 are available on the NSW Government Gazette (http://www.nsw.gov.au/gazette) website. Gazettal notices published prior to 2001 can be obtained from DECCW's Aboriginal Heritage Information Unit upon request

Important information about your AHIMS search

- AHIMS records information about Aboriginal sites that have been provided to DECCW and Aboriginal places that have been declared by the Minister;
- Information recorded on AHIMS may vary in its accuracy and may not be up to date .Location details are recorded as grid references and it is important to note that there may be errors or omissions in these recordings,
- Some parts of New South Wales have not been investigated in detail and there may be fewer records of Aboriginal sites in those areas. These areas may contain Aboriginal sites which are not recorded on AHIMS.
- Aboriginal objects are protected under the National Parks and Wildlife Act 1974 even if they are not recorded as a site on AHIMS.
- This search can form part of your due diligence and remains valid for 12 months.

PO BOX 1967 Hurstville NSW 2220
43 BridgeStreet HURSTVILLE NSW 2220
Tel: (02)9585 6094. Fax: (02)9585 6094

ABN 30 841 387 271
Email: ahims@environment.nsw.gov.au
Web: www.environment.nsw.gov.au

Environment, Climate Change & Water

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref Number : Shoalhaven

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	SiteFeatures	SiteTypes	Reports
52-5-0289	Appm Isolated Find 1;	AGD	56	283660	6140920	Open site	Artefact	Isolated Find	98121,98629
	Contact	Recorders	Kerry Navin					Permits	
52-5-0089	Nowra;	AGD	56	276610	6138307	Closed site	Artefact	Shelter with Deposit	2048
	Contact	Recorders						Permits	
52-5-0121	Mt Coolangattta;	AGD	56	291087	6141614	Open site	Aboriginal Ceremony and Dreaming	Natural Mythological (Ritual)	98121
	Contact	Recorders	ASRSYS					Permits	
52-5-0029	Nowra;	AGD	56	279500	6137750	Closed site	Artefact	Shelter with Deposit	
	Contact	Recorders						Permits	
52-5-0030	Nowra;	AGD	56	279550	6137950	Open site	Grinding Groove	Axe Grinding Groove	
	Contact	Recorders	ASRSYS					Permits	
52-5-0034	Nowra;Hidden Valley;	AGD	56	279700	6137200	Closed site	Art (Pigment or Engraved)	Shelter with Art	
	Contact	Recorders						Permits	
52-5-0042	Brundee;	AGD	56	287717	6136333	Open site	Artefact	Open Camp Site	
	Contact	Recorders						Permits	
52-5-0008	Cambewarra;	AGD	56	274516	6146955	Open site	Grinding Groove	Axe Grinding Groove	
	Contact	Recorders						Permits	
52-5-0302	Tapitallee Ck 1;	AGD	56	278000	6141630	Open site	Artefact	Open Camp Site	
	Contact	Recorders	Matthew Barber					Permits	
52-5-0305	EGP 3-26;Cabbage Tree Creek;Eastern Gas Pipline;	AGD	56	276620	6137510	Closed site	Artefact	Shelter with Deposit	
	Contact	Recorders	Kerry Navin					Permits	
52-5-0306	EGP 3-27;Humbug Reach shoalhaven;Eastern Gas Pipline;	AGD	56	276620	6138360	Open site	Artefact	Open Camp Site	
	Contact	Recorders	Kerry Navin					Permits	
52-5-0307	EGP 3-28;Cram Rd Shoalhaven;Eastern Gas Pipline;	AGD	56	277210	6140560	Open site	Artefact	Open Camp Site	
	Contact	Recorders	Kerry Navin					Permits	
52-5-0308	EGP 3-29;Connolly's Ck;Eastern Gas Pipline;	AGD	56	289000	6150550	Open site	Artefact	Open Camp Site	
	Contact	Recorders	Kerry Navin					Permits	
52-2-0890	Bengalee Creek 3;	AGD	56	275030	6140700	Closed site	Artefact,Art (Pigment or Engraved)	Shelter with Art,Shelter with Deposit	
	Contact	Recorders						Permits	
52-2-0891	Bengalee Creek 2;	AGD	56	275130	6140700	Closed site	Art (Pigment or Engraved)	Shelter with Art	
	Contact	Recorders						Permits	
52-5-0389	Shelter Cave	AGD	56	279900	6140800	Open site	Habitation Structure		98511
	Contact	Recorders	Terry Barratt					Permits	
52-5-0395	DUKE 8	AGD	56	292250	6150550	Open site	Artefact		
	Contact	Recorders	Stuart Huys					Permits	

Report generated by AHIMS Web Service on 28/03/2011 for Lance Syme for Datum : GDA, Zone : 56, Eastings : 274506 - 292506, Northings : 6134480 - 6152480 with a Buffer of 50 meters. Additional Info : Archaeological Assessment. Number of Aboriginal sites and Aboriginal objects found is 110

Environment, Climate Change & Water

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref Number : Shoalhaven

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	SiteFeatures	SiteTypes	Reports
52-5-0419	NO.LC6	AGD	56	284790	6146980	Open site	Artefact		
	Contact	Recorders	Mr.Sam Wickman					Permits	
52-5-0425	NO.LC5	AGD	56	285920	6148020	Open site	Artefact		
	Contact	Recorders	Mr.Sam Wickman					Permits	
52-5-0466	Bamarang Gas 1 (BG1)	AGD	56	276931	6136067	Open site	Artefact		99979
	Contact T Russell	Recorders	Navin Officer Heritage Consultants Pty Ltd					Permits	
52-5-0468	Bamarang Gas 3 (BG3)	AGD	56	278799	6136129	Open site	Modified Tree (Carved or Scarred)		99979
	Contact T Russell	Recorders	Navin Officer Heritage Consultants Pty Ltd					Permits	
52-5-0460	TR2/A	AGD	56	278750	6135290	Open site	Artefact		
	Contact T Russell	Recorders	Mr.Edward Clarke					Permits	
52-5-0538	BCP 001 Mosquito Shelter	AGD	56	279793	6141045	Closed site	Artefact		
	Contact	Recorders	Kelleher Nightingale Consulting Pty Ltd					Permits	
52-5-0543	BCRP 007 Stone Circle Site	AGD	56	279551	6141181	Open site	Artefact		
	Contact	Recorders	Kelleher Nightingale Consulting Pty Ltd					Permits	
52-5-0548	BCRP 016 Scar Tree Site	AGD	56	279111	6140447	Open site	Modified Tree (Carved or Scarred)		
	Contact	Recorders	Kelleher Nightingale Consulting Pty Ltd					Permits	
52-5-0552	BCRP 020 Spotted Gum	AGD	56	279868	6140699	Closed site	Artefact		
	Contact	Recorders	Kelleher Nightingale Consulting Pty Ltd					Permits	
52-5-0554	BCRP 023 Charcoal Oval Art	AGD	56	279757	6140987	Open site	Artefact		
	Contact	Recorders	Kelleher Nightingale Consulting Pty Ltd					Permits	
52-5-0558	BCRP 027 Feather Termination Shelter	AGD	56	282646	6140460	Closed site	Artefact		
	Contact	Recorders	Kelleher Nightingale Consulting Pty Ltd					Permits	
52-5-0564	G2BA1	GDA	56	280171	6142391	Open site	Artefact		
	Contact	Recorders	Mr.Kelvin Officer					Permits	
52-5-0579	PASA 41	GDA	56	288273	6149723	Open site	Potential Archaeological Deposit (PAD)		
	Contact	Recorders	Mr.Kelvin Officer					Permits	
52-5-0467	Bamarang Gas 2 (BG2)	AGD	56	277684	6136035	Open site	Artefact		99979
	Contact T Russell	Recorders	Navin Officer Heritage Consultants Pty Ltd					Permits	
52-5-0033	Nowra;Bundanon Punt;	AGD	56	280022	6136911	Closed site	Grinding Groove,Artefact,Art (Pigment or Engraved)	Axe Grinding Groove,Shelter with Art,Shelter with Deposit	
	Contact	Recorders						Permits 879	
52-5-0528	TA1/A	AGD	56	274920	6141610	Open site	Artefact		
	Contact	Recorders	Mr.Edward Clarke					Permits	
52-5-0541	BCRP 005 Leaning Cliff-Line Site	GDA	56	279983	6140798	Closed site	Artefact		

Report generated by AHIMS Web Service on 28/03/2011 for Lance Syme for Datum : GDA, Zone : 56, Eastings : 274506 - 292506, Northings : 6134480 - 6152480 with a Buffer of 50 meters. Additional Info : Archaeological Assessment. Number of Aboriginal sites and Aboriginal objects found is 110

Environment, Climate Change & Water

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref Number : Shoalhaven

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	SiteFeatures	SiteTypes	Reports
	Contact	Recorders	Kelleher Nightingale Consulting Pty Ltd					Permits	
52-5-0549	BCRP 017 Stained Flake	AGD	56	279626	6140197	Closed site	Artefact		
	Contact	Recorders	Kelleher Nightingale Consulting Pty Ltd					Permits	
52-5-0087	Nowra;	AGD	56	280161	6139109	Closed site	Artefact	Shelter with Deposit	2048
	Contact	Recorders						Permits	
52-5-0110	Nowra;	AGD	56	279837	6136999	Closed site	Art (Pigment or Engraved)	Shelter with Art	2048
	Contact	Recorders						Permits	
52-5-0025	Nowra;	AGD	56	277900	6137700	Closed site	Artefact,Art (Pigment or Engraved)	Shelter with Art,Shelter with Deposit	
	Contact	Recorders	ASRSYS					Permits	
52-5-0028	Nowra;	AGD	56	278900	6138900	Closed site	Artefact,Art (Pigment or Engraved)	Shelter with Art,Shelter with Deposit	
	Contact	Recorders						Permits	
52-2-0892	Bengalee Creek 1;	AGD	56	275160	6140740	Closed site	Artefact	Shelter with Deposit	
	Contact	Recorders						Permits	
52-5-0410	test pitting area 6	AGD	56	290650	6151130	Open site	Artefact		
	Contact	Recorders	Stuart Huys					Permits	
52-5-0380	Woodside Park 1	AGD	56	290700	6148200	Open site	Artefact		98646
	Contact	Recorders	Navin Officer Heritage Consultants Pty Ltd					Permits	
52-5-0545	BCRP 013 West Cambewarra	AGD	56	279206	6141669	Open site	Artefact		
	Contact	Recorders	Kelleher Nightingale Consulting Pty Ltd					Permits	
52-5-0555	BCRP 024 One Silcrete Flake	AGD	56	279675	6141006	Open site	Artefact		
	Contact	Recorders	Kelleher Nightingale Consulting Pty Ltd					Permits	
52-5-0290	Appm Isolated Find 2;	AGD	56	283500	6140900	Open site	Artefact	Isolated Find	98629
	Contact	Recorders	Kerry Navin					Permits	
52-5-0191	Moeyan -13 Grinding Groves;Moeyan Hill;	AGD	56	291500	6147100	Open site	Grinding Groove	Axe Grinding Groove	98121
	Contact	Recorders						Permits	
52-5-0022	Nowra;	AGD	56	277080	6137676	Closed site	Art (Pigment or Engraved)	Shelter with Art	
	Contact	Recorders	ASRSYS					Permits	
52-5-0026	Nowra;	AGD	56	278100	6137800	Closed site	Art (Pigment or Engraved)	Shelter with Art	
	Contact	Recorders	ASRSYS					Permits	
52-5-0035	Nowra (Bomaderry)	AGD	56	280053	6139930	Closed site	Artefact	Shelter with Deposit	531,98511
	Contact	Recorders						Permits	
52-5-0017	Wogamia;	AGD	56	275900	6138530	Closed site	Art (Pigment or Engraved)	Shelter with Art	

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Environment, Climate Change & Water

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref Number : Shoalhaven

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	SiteFeatures	SiteTypes	Reports
	Contact	Recorders						Permits	
52-5-0396	TEST PITTING AREA 4	AGD	56	288260	6150160	Open site	Artefact		
	Contact	Recorders	Stuart Huys					Permits	
52-5-0424	NO.LC4	AGD	56	280950	6144840	Open site	Artefact		
	Contact	Recorders	Mr.Sam Wickman					Permits	
52-5-0454	BC1/B	AGD	56	279450	6141160	Closed site	Artefact		
	Contact T Russell	Recorders	Mr.Edward Clarke					Permits	
52-5-0455	BC1/F	AGD	56	279970	6140860	Closed site	Artefact		
	Contact T Russell	Recorders	Mr.Edward Clarke					Permits	
52-5-0539	BCRP 002 The black caves	AGD	56	279701	6141045	Open site	Artefact		
	Contact	Recorders	Kelleher Nightingale Consulting Pty Ltd					Permits	
52-5-0542	BCRP 006 Pipeline Shelter	AGD	56	279545	6141313	Closed site	Artefact		
	Contact	Recorders	Kelleher Nightingale Consulting Pty Ltd					Permits	
52-5-0544	BCRP 012 Pitt Street Narang	AGD	56	278907	6141032	Open site	Artefact		
	Contact	Recorders	Kelleher Nightingale Consulting Pty Ltd					Permits	
52-5-0547	BCRP 015 West Cambewarra	AGD	56	279472	6141712	Open site	Artefact		
	Contact	Recorders	Kelleher Nightingale Consulting Pty Ltd					Permits	
52-4-0261	BCRP 018 The largest shelter (duplicate of 52-5-0550)	AGD	56	279704	6140277	Closed site	Artefact		
	Contact	Recorders	Kelleher Nightingale Consulting Pty Ltd					Permits	
52-5-0370	Test Pitting Area 3	AGD	56	285690	6147700	Open site	Artefact	Open Camp Site	
	Contact	Recorders						Permits	
52-5-0262	Bomaderry Ck 5;Bomaderry Creek Nowra;	AGD	56	279420	6141260	Closed site	Artefact	Shelter with Deposit	2254,98511
	Contact	Recorders	Kerry Navin					Permits	
52-5-0263	Bomaderry Ck 4;Bomaderry Creek Nowra;	AGD	56	279350	6141400	Closed site	Artefact	Shelter with Deposit	2254,98511
	Contact	Recorders	Kerry Navin					Permits	
52-5-0192	Moeyan-A Rock Shelter;Moeyan Hill;	AGD	56	291100	6147000	Closed site	Artefact	Shelter with Deposit	98121
	Contact	Recorders						Permits	
52-5-0091	Wogamia;	AGD	56	275975	6138019	Closed site	Artefact	Shelter with Deposit	2048
	Contact	Recorders						Permits	
52-5-0095	Jindy Andy;	AGD	56	287554	6135324	Open site	Earth Mound,Shell,Artefact	Midden	2048
	Contact	Recorders						Permits	
52-5-0036	Bomaderry;	AGD	56	279800	6139900	Closed site	Art (Pigment or Engraved),Artefact	Shelter with Art,Shelter with Deposit	98511
	Contact	Recorders						Permits	
52-5-0303	Tapitallee Ck 2;	AGD	56	278020	6141840	Open site	Artefact	Open Camp Site	
	Contact	Recorders	Matthew Barber					Permits	

Report generated by AHIMS Web Service on 28/03/2011 for Lance Syme for Datum : GDA, Zone : 56, Eastings : 274506 - 292506, Northings : 6134480 - 6152480 with a Buffer of 50 meters. Additional Info : Archaeological Assessment. Number of Aboriginal sites and Aboriginal objects found is 110

Environment, Climate Change & Water

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref Number : Shoalhaven

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	SiteFeatures	SiteTypes	Reports
52-2-1874	Cabbage Tree Lane 1;	AGD	56	276700	6134750	Open site	Artefact	Isolated Find	
	Contact	Recorders	Mr.Peter Kuskie					Permits	
52-5-0386	Big Bend	AGD	56	279770	6140200	Open site	Art (Pigment or Engraved)		98511
	Contact	Recorders	Terry Barratt					Permits	
52-5-0387	Big Bend 2	AGD	56	280100	6139950	Open site	Habitation Structure		98511
	Contact	Recorders	Terry Barratt					Permits	
52-5-0388	Big Bend 3	AGD	56	280100	6139850	Open site	Habitation Structure		98511
	Contact	Recorders	Terry Barratt					Permits	
52-5-0459	TR3/A	AGD	56	278200	6135710	Open site	Artefact		
	Contact T Russell	Recorders	Mr.Edward Clarke					Permits	
52-5-0556	BCRP 025 Trenched Drip-line	AGD	56	279496	6141091	Open site	Artefact		
	Contact	Recorders	Kelleher Nightingale Consulting Pty Ltd					Permits	
52-5-0557	BCRP 026 Rock Fall Canyon Shelter	AGD	56	281896	6140560	Closed site	Artefact		
	Contact	Recorders	Kelleher Nightingale Consulting Pty Ltd					Permits	
52-5-0565	G2BA2	GDA	56	286875	6147535	Open site	Artefact		
	Contact	Recorders	Mr.Kelvin Officer					Permits	
52-5-0371	Duke 1	AGD	56	275760	6135860	Open site	Artefact	Isolated Find	
	Contact	Recorders						Permits	
52-5-0351	ISOLATED ARTEFACT BERRY 1	AGD	56	288000	6148400	Open site	Artefact	Isolated Find	
	Contact	Recorders						Permits	
52-5-0288	Appm Shoalhaven,IF1;	AGD	56	283650	6140940	Open site	Artefact	Isolated Find	98121
	Contact	Recorders	Kerry Navin					Permits	
52-5-0084	Nowra;	AGD	56	279687	6139923	Open site	Grinding Groove	Axe Grinding Groove	2048,98511
	Contact	Recorders						Permits	
52-5-0086	Nowra;	AGD	56	280249	6139294	Closed site	Artefact	Shelter with Deposit	2048
	Contact	Recorders						Permits	
52-5-0088	Nowra;	AGD	56	279252	6138817	Closed site	Artefact	Shelter with Deposit	2048
	Contact	Recorders						Permits	
52-5-0018	Wogamia;Mundamia Ck;	AGD	56	276160	6137932	Open site	Modified Tree (Carved or Scarred)	Scarred Tree	
	Contact	Recorders						Permits	
52-5-0422	NO.LC2	AGD	56	279970	6143690	Open site	Artefact		
	Contact	Recorders	Mr.Sam Wickman					Permits	
52-5-0453	BC1/E	AGD	56	279930	6141030	Closed site	Artefact		
	Contact T Russell	Recorders	Mr.Edward Clarke					Permits	
52-5-0551	BCRP 019 Boulder Shelter	AGD	56	280000	6140599	Closed site	Artefact		

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Environment, Climate Change & Water

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref Number : Shoalhaven

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	SiteFeatures	SiteTypes	Reports
	Contact	Recorders	Kelleher Nightingale Consulting Pty Ltd					Permits	
52-5-0368	Duke 2	AGD	56	275640	6135700	Closed site	Artefact	Shelter with Deposit	
	Contact	Recorders						Permits	
52-5-0287	Abernethys Creek 1;	AGD	56	280360	6142800	Open site	Artefact	Open Camp Site	
	Contact	Recorders	Mr.Kelvin Officer					Permits	
52-5-0010	Cambewarra;	AGD	56	275154	6147059	Open site	Grinding Groove	Axe Grinding Groove	
	Contact	Recorders						Permits	
52-5-0019	Wogamia;	AGD	56	275900	6137600	Open site	Stone Arrangement	Stone Arrangement	
	Contact	Recorders						Permits	
52-5-0020	Wogamia;Mundamia Creek;SR6;	AGD	56	275700	6137800	Closed site	Art (Pigment or Engraved)	Shelter with Art	
	Contact	Recorders	Fred McCarthy					Permits	
52-2-0889	Bengalee Creek 4;	AGD	56	275340	6140750	Closed site	Artefact	Shelter with Deposit	
	Contact	Recorders						Permits	
52-2-1797	West Cambewarra Rd.;Bomaderry Creek;	AGD	56	279300	6141700	Open site	Grinding Groove	Axe Grinding Groove	98511
	Contact	Recorders						Permits	
52-5-0423	NO.LC3	AGD	56	280030	6143860	Open site	Artefact		
	Contact	Recorders	Mr.Sam Wickman					Permits	
52-5-0456	BA5/B	AGD	56	275700	6137890	Closed site	Artefact		
	Contact T Russell	Recorders	Mr.Edward Clarke					Permits	
52-5-0461	TR1/A	AGD	56	278690	6135510	Open site	Artefact		
	Contact T Russell	Recorders	Mr.Edward Clarke					Permits	
52-5-0540	BCRP 003 The blue metal site	AGD	56	279952	6141083	Open site	Artefact		
	Contact	Recorders	Kelleher Nightingale Consulting Pty Ltd					Permits	
52-5-0546	BCRP 014 West Cambewarra	AGD	56	279266	6141794	Open site	Artefact		
	Contact	Recorders	Kelleher Nightingale Consulting Pty Ltd					Permits	
52-5-0550	BCRP 018 The largest Shelter	AGD	56	279704	6140277	Open site	Artefact		
	Contact	Recorders	Kelleher Nightingale Consulting Pty Ltd					Permits	
52-5-0553	BCRP 022-30 Metres West of Shelter Cave	AGD	56	279917	6140870	Closed site	Artefact		
	Contact	Recorders	Kelleher Nightingale Consulting Pty Ltd					Permits	
52-5-0578	PASA 40	GDA	56	287969	6149219	Open site	Potential Archaeological Deposit (PAD)		
	Contact	Recorders	Mr.Kelvin Officer					Permits	
52-5-0580	PASA 42	GDA	56	280118	6142323	Open site	Potential Archaeological Deposit (PAD)		
	Contact	Recorders	Mr.Kelvin Officer					Permits	
52-5-0372	Duke 7	AGD	56	277800	6140630	Open site	Artefact	Open Camp Site	
	Contact	Recorders						Permits	

Report generated by AHIMS Web Service on 28/03/2011 for Lance Syme for Datum : GDA, Zone : 56, Eastings : 274506 - 292506, Northings : 6134480 - 6152480 with a Buffer of 50 meters. Additional Info : Archaeological Assessment. Number of Aboriginal sites and Aboriginal objects found is 110

Environment, Climate Change & Water

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref Number : Shoalhaven

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	SiteFeatures	SiteTypes	Reports
52-5-0258	Cabbage Tree Flat;	AGD	56	277100	6138200	Open site	Burial	Burial/s	1961
	Contact	**Recorders**	Denise Donlon					**Permits**	
52-5-0090	Nowra;	AGD	56	280002	6137917	Closed site	Artefact	Shelter with Deposit	2048
	Contact	**Recorders**						**Permits**	
52-5-0135	Farmeadow;	AGD	56	290700	6146000	Open site	Modified Tree (Carved or Scarred),Ceremonial Ring (Stone or Earth)	Bora/Ceremonial,Carved Tree	98121
	Contact	**Recorders**						**Permits**	
52-5-0023	Nowra;	AGD	56	276900	6137900	Open site	Grinding Groove	Axe Grinding Groove	
	Contact	**Recorders**						**Permits**	
52-5-0024	Nowra;	AGD	56	276930	6137930	Open site	Grinding Groove	Axe Grinding Groove	
	Contact	**Recorders**						**Permits**	
52-5-0032	Nowra;	AGD	56	279600	6137300	Closed site	Art (Pigment or Engraved)	Shelter with Art	2092,102111
	Contact	**Recorders**	ASRSYS					**Permits**	
52-5-0390	Bomaderry Site	AGD	56	279350	6141300	Open site	Artefact		2254,98511
	Contact	**Recorders**	Terry Barratt					**Permits**	
52-5-0421	NO.LC1	AGD	56	279350	6143000	Open site	Artefact		
	Contact	**Recorders**	Mr.Sam Wickman					**Permits**	

Report generated by AHIMS Web Service on 28/03/2011 for Lance Syme for Datum : GDA, Zone : 56, Eastings : 274506 - 292506, Northings : 6134480 - 6152480 with a Buffer of 50 meters. Additional Info : Archaeological Assessment. Number of Aboriginal sites and Aboriginal objects found is 110

14 CORRESPONDANCE – NTSCORP

ntscorp

abn: 71 088 971 209
w: www.ntscorp.com.au

10 February 2011
ref: deccw 10-02-11/ps

Mr Lance Syme
Kayandel Archaeological Services
FAX : 02 4627 8633

Dear Mr Syme

PROPOSED GAS LINE - BOMADERRY

I refer to your letter dated 9 February 2011.

In accordance with NTSCORP's privacy obligations we have forwarded your correspondence to any individuals, groups and organisations, whom NTSCORP is aware assert traditional interests within, or hold cultural knowledge about the relevant area.

Please note, our privacy guidelines restrict us from providing proponents with contact details of traditional owners. To assist proponents with following the Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010, recipients of our correspondence have been invited to register their interest in the project with you directly.

Please be aware that NTSCORP cannot make a guarantee or undertaking that the recipients of our correspondence represent the entirety of traditional owners for the relevant area.

In order for NTSCORP to undertake the abovementioned process to notify relevant Aboriginal individuals, groups, and organisations and to allow time for interested parties to register their interest with you, a time frame of twentyone (21) days is required.

Yours faithfully

Peter Schultz
Senior Land Tenure/Notifications Officer
NTSCORP

Head Office
Level 1, 44-70 Rosehill Street, Redfern NSW 2016
PO Box 2105 Strawberry Hills NSW 2012
p: + 61 2 9310 3188
f: + 61 2 9310 4177
freecall: 1800 111 844

Regional Office (Coffs Harbour)
Suite 2, 133 West High Street, Coffs Harbour NSW 2450
PO Box 156 Coffs Harbour NSW 2450
p: + 61 2 6651 4588
f: + 61 2 6651 7954

C:\Documents and Settings\pschultz\Desktop\deccw response Dec 2010.doc

15 CORRESPONDENCE – JERRINGA LOCAL ABORIGINAL LAND COUNCIL

Jerringa Traditional Owners Aboriginal Corporation

Lot 4, Roseby Park
ORIENT POINT NSW 2540
E: statewide@contractor.net
T: 02-4447-3813 M: 0421457 090

21 February, 2011

Kayandel Archeological Services
Suite2/154 Hyde Parade
Park Central
CAMPBELLTOWN NSW 2560
Tel: 4627 8622
E: info@kayandel.co.au

EXPRESSION OF INTEREST - Bomaderry Aboriginal Cultural Heritage Project

Assessment for Proposed Gas Line from Pestells Lane, Bomaderry to Shoalhaven Starches Factory, Bolong Road, Bomaderry for Manildra Group

Jerringa Traditional Owners Aboriginal Corporation holds extensive knowledge and experience relevant to determining cultural significance of Aboriginal objects/places including heritage evidence/cultural heritage values, assessment of potential impacts and the formulation of recommendations for the management of evidence.

In particular Jerringa has prepared numerous applications for Aboriginal Heritage Impact Permit (AHIP) including the Eastern Gas Pipeline Project a number of RTA archeological services including subdivisions and sewerage lines over the past 30 years. In each of these proposals the client dealt directly with Jerringa .

Graham Connolly is the President of the above corporation. If you require further information please contact him on Mobile 0421 457 090

Yours sincerely,

Graham Connolly

16 CORRESPONDENCE – ABORIGINAL STAKEHOLDER CONSULTATION NOTICE

Aboriginal Stakeholder Consultation – Manildra Group, Proposed Gas Line from Pestells Lane, Bomaderry to Shoalhaven Starches Factory, Bolong Road, Bomaderry

Manildra Group (MG) owns and operates the Shoalhaven Starches factory complex located on Bolong Rd, Bomaderry. MG proposes to construct a gas pipeline from its factory to link up with the Eastern Gas pipeline at Pestells Lane, Meroo Meadow (approx 5.5 kms in length). The proposal may include different levels of subsurface disturbances including excavation of soil deposits, removal of gravel and altering the existing landscape.

As part of this process, Manildra Group is seeking to identify and invite Aboriginal groups and/or people who hold cultural knowledge relevant to determining the significance of Aboriginal object(s) and/or place(s) within the area to register an interest for further consultation. The purpose of community consultation with Aboriginal people is to assist Manildra Group in the preparation of an application for an AHIP and to assist the Director General of DECCW in his or her consideration and determination of the application and may also be used in the assessment of impact and determination of approval of the project under Part 3A of the Environmental Planning & Assessment Act 1979.

To register your interest, please contact:

The Project Manager
Project ID: 250-2010
Manildra Group
C/o Kayandel Archaeological Services
Suite 215, 4 Hyde Parade, Park Central, Campbelltown 2560
Ph: (02) 4627 8622 Fax: (02) 4627 8633 info@kayandel.com.au

The closing date for registration is close of business 4 March 2011
Registrations received after this date may not be included in the consultation process.

17 CONSULTATION LOG

Date			
24/2/11		Tried calling DECCW re: no response to agency letter send 9/2/11 – left a message, also send a fax.	KK
25/2/11	10AM	Tried calling DECCW was on hold for 15 minutes to be advised they are busy to leave a message someone will call me back.	KK
25/2/11	1.30	Dimitry from DECCW return my call, they have been under staff, letter will be posted today should receive it early next week.	KK
25/2/11	3.10PM	Phone call Mary Mongta from Lionel Mongta re: agency letter they received she would like to register herself and Mr Lionel Mongta. Advised will inform project manager, they will contact her. She doesn't have an email address.	KK
4/3/11	1025am	Rang Nowra LALC spoke to Stan (who has only been there 4 days) re: no reply to agency letter sent, he checked the emails confirm they received it, and is going to reply.	KK
8/3/ 11	10.00am	Spoke to Lionel Mongta about doing survey on Wed. He was out on a job and said he would call me after work but that he was available for Wed.	JS
8/3/11	All day	Tried calling NOWRA approx every 30 minutes. No answer. Left a message on the first call-10am.	JS
8/3/11	4.30pm	Spoke to Lionel regarding survey and told him it would be postponed for the meantime.	JS
9/3/11	11.30am	Spoke Stan from Nowra regarding the new survey time- Friday. He said he would have a site officer available and I would call back with a meeting place and time when I had one.	JS
9/3/11	1.40pm	Spoke to Graham Connolly from Jerringa Consultant regarding the new survey time- Friday. He said he was available and I would call back with a meeting place and time when I had one.	JS
9/3/11	1.55pm	Spoke Lionel Mongta regarding the new survey time- Friday. He said he was available and would bring his wife just for company. I would call back with a meeting place and time when I had one.	JS
10/3/11	9.45am	Spoke to Graham Connolly from Jerringa with time and place for survey- Bombaderry McDonalds at 9am on the 11/3/11.	JS
10/3/11	1.20pm	Spoke to Stan from Nowra with time and place for survey- Bombaderry McDonalds at 9am on the 11/3/11.	JS
10/3/11	2.10pm	Spoke to Lionel Montgta with time and place for survey- Bombaderry McDonalds at 9am on the 11/3/11.	JS
11/3/11	12.30pm	Stan Jared from Nowra LALC rang, he has being speaking with Jane re Shoalhaven he will have site officer Graham Smith onsite at 9am tomorrow morning.	KK
03/05/201	1.40pm	Link to Shoalhaven report emailed to Nowra Local Aboriginal Land Council(Stan)	JS

1		and Jerrinja Consultants (Graham)	
03/05/2011	1.40pm	Hard copy being prepared by Kristen to send to Lionel Mongta	JS
3/5/2011	4.30pm	Expressed post Report to Lionel Mongta – express post number: 062504949094	KK
12/05/11	9.40am	Sent emails to Nowra and Jerrinja requesting confirmation email of receipt of report for review.	JS
25/05/2011	8.20am	Sent emails to Nowra and Jerrinja reminding of timeframe for review and comments on report.	JS
26/05/2011		Called Lionel Mongta every 2 hours to remind of timeframe for review of report- rang out-no answer machine on phone.. He does not have email.	JS
31/5/11	9.30	Called Lionel Mongta to advise him that period for review of report is up today- rang out-no answer machine on phone. He does not have email.	JS
31/5/2011	9.40	Rang Jerrinja, spoke to Graham re review. He said he agreed with the objectives in the report and that he had a class until 4pm today but would put his assent in an email this afternoon when he finished.	JS
31/5/2011	9.45am	Rang Nowra- went to answer machine- left a message for Stan requesting a call back re Shoalhaven project comments.	JS
31/5/2011	1.10pm	Rang Lionel Mongta- He requested that our phone conversation be transcribed as his final comments. They are as follows "Because of the long grass and the heavy rain, it was too hard to see on the ground. A representative should be there when the trenches are dug, when they start digging into the ground to see whats there."	JS
31/5/2011	1.30pm	Rang Nowra- no answer	JS

ANNEXURE 10a

ANNEXURE 10a

Acid Sulfate Soil, Contamination and Geotechnical Investigation

prepared by

Coffey Environments Pty Ltd

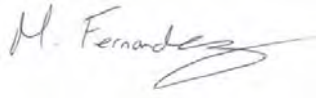
coffey environments
SPECIALISTS IN ENVIRONMENTAL, SOCIAL AND SAFETY PERFORMANCE

ACID SULFATE SOIL, CONTAMINATION AND GEOTECHNICAL INVESTIGATION PROPOSED GAS PIPELINE BOMADERRY NSW

Prepared for:

MANILDRA GROUP PTY LTD
Bolong Road,
Bomaderry NSW

Report Date: 29 July 2011
Project Ref: ENAUWOLL04006AA-R01

Written/Submitted by:	Reviewed/Approved by:	Reviewed/Approved by:
		
Chris Appelkamp Project Engineering Geologist	Scott Morrison Associate Geotechnical Engineer	Manuel Fernandez Senior Associate Environmental Engineer

Coffey Environments Australia Pty Ltd ABN 65 140 765 902
118 Auburn Street Wollongong NSW 2500 Australia

coffey environments
SPECIALISTS IN ENVIRONMENTAL, SOCIAL AND SAFETY PERFORMANCE

29 July 2011

MANILDRA GROUP PTY LTD
Bolong Road,
Bomaderry NSW

Attention: Brian Hanley

Dear Brian,

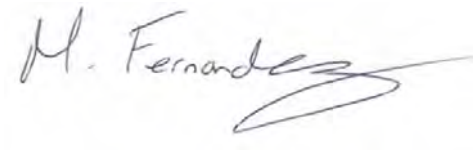
RE: ACID SULFATE SOIL, CONTAMINATION AND GEOTECHNICAL INVESTIGATION
PROPOSED GAS PIPELINE
BOMADERRY NSW

We are pleased to present our report on the Acid Sulfate Soil, Contamination, Geotechnical and Groundwater Assessment for the above site.

We draw your attention to the attached sheets titled "Important Information about your Coffey Report" and “Important Information about your Coffey Environmental Report”. These sheets should be read in conjunction with this report.

Thank you for your commission for this work and we look forward to the opportunity of being of assistance again in the future. If you require further information or clarification regarding any aspect of this report, please do not hesitate to contact the undersigned.

For and on behalf of Coffey Environments Pty Ltd



Manuel Fernandez
Senior Associate Environmental Engineer

Coffey Environments Australia Pty Ltd ABN 65 140 765 902
118 Auburn Street Wollongong NSW 2500 Australia

RECORD OF DISTRIBUTION

No. of copies	Report File Name	Report Status	Date	Prepared for:	Initials
1	ENAUWOLL04006AA-R01.pdf	FINAL	22 July 2011	Manildra Group Pty Ltd	JMF
1	ENAUWOLL04006AA-R01.pdf	FINAL	22 July 2011	Coffey Environments Pty Ltd	

CONTENTS

CONTENTS

CONTENTS

LIST OF ATTACHMENTS

LIST OF ATTACHMENTS

ABBREVIATIONS

AEC	**Area of Environmental Concern**
AHD	**Australian Height Datum**
ANZECC	**Australian and New Zealand Environment and Conservation Council**
ASS	**Acid Sulfate Soils**
ASSMP	**Acid Sulfate Soils Management Plan**
C6-C36	**Hydrocarbon chainlength fraction**
BH	**Borehole**
BTEX	**Benzene, Toluene, Ethylbenzene and Xylenes**
LOR	**Limit of Reporting**
µg/L	**micrograms per litre**
mg/kg	**milligrams per kilogram**
mg/L	**milligrams per litre**
NATA	**National Association of Testing Authorities**
NEHF	**National Environmental Health Forum**
NEPM	**National Environment Protection Measure**
NSW EPA	**Environment Protection Authority of New South Wales**
OEH	**Office of Environment and Heritage**
OCP	**Organochlorine Pesticide**
OPP	**Organophosphorous Pesticide**
PAH	**Polycyclic Aromatic Hydrocarbon**
PCB	**Polychlorinated Biphenyl**
PID	**Photoionisation Detector**
Ppm	**parts per million**

ABBREVIATIONS

QA	**Quality Assurance**
QC	**Quality Control**
RL	**Reduced Level**
RPD	**Relative Percent Difference**
S_{CR}	**Chromium Reducible Sulfur**
SOP	**Standard Operating Procedures**
TPH	**Total Petroleum Hydrocarbon**
UST	**Underground Storage Tank**
VOC	**Volatile Organic Compound**

EXECUTIVE SUMMARY

Coffey Environments Australia Pty Ltd (Coffey) was commissioned by Manildra Group Pty Ltd (Manildra) to carry out an Acid Sulfate Soil (ASS), Contamination, Geotechnical and Groundwater Assessment for the proposed gas pipeline (pipeline) which will be used to transfer high pressure gas between the Manildra Starches Plant located near the corner of Railway Street and Bolong Road, Bomaderry and the Eastern Gas Pipeline transfer station located in Pestells Lane, Bomaderry NSW. The work was completed generally in accordance with the relevant sections of our proposal ENAUWOLL04006AA-P01, dated the 5 August 2010 and additional works agreed by Mr Brian Hanley of Manildra.

Based on drawings provided to Coffey, we understand that the depth of excavation/drilling required for the proposed pipeline construction varies from about 1m to 2.4m.

The overall objectives of this assessment were to assess the proposed pipeline route in relation to acid sulfate soils, contamination, geotechnical and groundwater issues. To meet these objectives, the scope of work included the review of site history, a site walkover, logging and sampling from boreholes and test pits, chemical and acid sulfate soil analysis, data interpretation and reporting.

Geotechnical and Groundwater Issues

When trenching at this site, standard hydraulic excavation equipment should be suitable except for localised areas of the site where highly weathered (Class V) sandstone was encountered within 1m of the ground surface. These locations will require use of a larger excavator (eg.20 tonne) equipped with a rock bucket, rock hammer or ripping tyne to penetrate.

Significant groundwater inflows are generally not expected within 1.5m of the ground surface in the majority of the project area. Shallow inflows may occur at geographical low points such as those located in Lot 5 DP825808 and Lot 2 DP825808 and between Railway Street and Fletchers Lane where groundwater inflows are expected in excavations within 1.50m below ground surface level.

Trenches up to 0.6m deep may be able to be excavated with near vertical sides provided surcharge loads are kept clear of the crest and workers are not required to enter the unsupported excavation. If deeper excavations are required then shoring boxes should be used.

The materials used for backfilling of the trenches should be materials capable of providing uniform basal, wall and cover support for the service pipes. In general this material should comprise a granular soil such as a uniform sand or fine gravel sourced from an alluvial quarry or crushed rock quarry source.

The proposed pipeline route crosses several creeks and drainage channels and at these locations we suggest trenching may be problematic for several reasons as discussed in section 11.3.2. To avoid trenching through these areas, it is recommended that underboring of drainage channels and creek crossings be considered.

Contamination Issues

The results of the assessment identified some potentially contaminating activities and associated areas of environmental concern and contaminants of concern along the proposed pipeline route. The areas of environmental concern were assessed as having a low to moderate likelihood of contamination being present.

EXECUTIVE SUMMARY

Evidence of contamination was generally not recorded across the assessment area except for one sample where asbestos was detected within an elongated fill mound on the road verge of Fletchers Lane. The presence of asbestos in this area would need be taken into consideration in the earthworks component of the pipeline construction to adequately manage potential risks to human health and appropriate management and disposal of excavated soils. Due to the proximity of the adjacent treatment plant, we recommend that any trench dewatering from trenching in Lots 2 and 5 be adequately tested and managed with due regard to potential contaminants.

If any evidence of potential contamination is identified during the pipeline construction such as soils with odours, staining, wastes, drums etc. then Coffey Environments should be contacted to make an assessment of these soils for contamination.

Acid Sulfate Soil Issues

Some sections of the proposed pipeline extend through areas mapped as having a low probability of acid sulfate soil occurrence. Field observations generally correlated well with the acid sulfate soil risk map. Based on the results of this assessment it is considered that ASS are likely to be encountered along the lower lying parts of the pipeline route located in Lot 2 and Lot 5 and in the vicinity of creek crossings at CTP09 and CTP12. Acid sulfate soils may also be encountered sporadically up to the intersection with Fletchers Lane and could be located in old paleochanels. It is unlikely that acid sulfate soils would be intersected in the pipeline construction based on the proposed excavation depths along the majority of Railway Street and Fletchers and Pestells Lane. We recommend that the previous Acid Sulfate Soil Management Plan (Report Ref: ENVIWOLL00187AB-R02, dated 26 March 2009) prepared for the proposed packing plant (lot 2 and 5) be extended to incorporate other sections of the proposed pipeline where acid sulfate soils could be intersected.

1 INTRODUCTION

1.1 Background

Coffey Environments Australia Pty Ltd (Coffey) was commissioned by Manildra Group Pty Ltd (Manildra) to carry out an Acid Sulfate Soil (ASS), Contamination, Geotechnical and Groundwater Assessment for the proposed gas pipeline (pipeline) which will be used to transfer high pressure gas between the Manildra Starches Plant located near the corner of Railway Street and Bolong Road, Bomaderry and the Eastern Gas Pipeline transfer station located in Pestells Lane, Bomaderry NSW. The work was completed generally in accordance with the relevant sections of our proposal ENAUWOLL04006AA-P01, dated the 5 August 2010 and additional works agreed by Mr Brian Hanley of Manildra. This report presents the results of the investigation works.

The general site locality with the proposed pipeline route is shown in Figure 1.

The proposed pipeline route is shown within the road reserve and unpaved road reserves adjacent to the railway corridor.

Based on drawings provided to Coffey, we understand that the depth of excavation/drilling required for the proposed pipeline construction varies from about 1m to 2.4m as follows:

- 2.4m below the top of rails at a railway crossing;
- 1.5m below the base of the curb and guttering at a road crossing (including the Princes Highway); and
- 1.2m below ground surface in other areas.

We further understand that Manildra has requested Cowman Stoddart Pty Ltd (Cowman Stoddart) to prepare an Environmental Assessment (EA) for the development, which has been requested by the Director General of planning. The information from this assessment will be used in the EA submission.

1.2 Objectives

The overall objectives of this assessment were to assess the proposed pipeline route in relation to ASS, contamination, geotechnical and groundwater issues.

Specific objectives of the assessment were to assess and provide advice on:

- General subsurface conditions at the site;
- Presence of groundwater;
- Contamination issues related to past/present activities;
- Excavation conditions;
- Construction issues including pipeline trench support, collapse potential and backfill requirements;
- Batter slopes and the requirement for retention and shoring; and
- The potential for ASS to be present in the area of the proposed works within the anticipated depth of disturbance.

1.3 Scope of Works

To meet the project objectives, Coffey carried out the following scope of work:

- A site history and desk study to identify potential contaminating activities/sources, Areas of Environmental Concern (AEC) and Contaminants of Concern (COC) including: a review of previous Coffey reports, review of online Council planning records, review of selected aerial photographs, interviewing available people familiar with the history of the route, review of published geological and topographic maps, review of NSW Office of Environment and Heritage (OEH) public records for the site, identification of nearby registered groundwater bores and collation of this information;
- Review of ASS Risk maps of the area to check the probability of ASS occurrence;
- A site visit by a project engineering geologist to observe the general area and site conditions;
- A site visit to scan the testing locations for buried metallic services using an underground services locator. During this visit we also met with relevant utility/asset owners (e.g. Telstra and Jemena) and both private and public landholders to confirm access and suitability of the proposed test locations;
- Fieldwork involving logging the subsurface conditions and collecting soil samples from twenty-one (21) test pits and 5 boreholes which were excavated to a maximum depth of 2.6m using an 8 tonne backhoe, a 5 tonne track mounted excavator or a Mustang bob cat equipped with a 200mm diameter solid steel flight auger. The test pits and boreholes were used for assessing the general site and subsurface conditions and observing groundwater conditions;
- Engagement of Donnelley Civil who were used to prepare a traffic management plan and provide traffic management controls when excavating test pits and drilling boreholes within the Roads and Traffic Authority (RTA) and Shoalhaven City Council (SCC) owned road reserves which included the Princes Highway, Pestells Lane, Fletchers Lane and Railway Street;
- Engagement of a Rail Protection (P02) officer for the purpose of accessing the rail corridor between Fletchers Lane and Railway Street;
- Selection and submitting of soil samples for laboratory analysis which included:
    - 16 samples for Total Petroleum Hydrocarbons (TPH), Benzene, Toluene, Ethylbenzene, Xylenes (BTEX), Polycyclic Aromatic Hydrocarbons (PAH), Organochlorine pesticides (OCP) and Polychlorinated biphenyl's (PCB), heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc) and asbestos ;
    - To meet the quality assurance quality control requirements of environmental sampling we analysed two duplicate soil samples and one trip spike and trip blank samples.
- Measuring the pH from 33 selected soil samples for ASS purposes;

- Carrying out screening tests using hydrogen peroxide on 33 selected soil samples to check for the potential presence of ASS;
- Based on the field screening results, twelve (12) soil samples were selected for analysis using the Chromium Reducible Sulfur method (S_{cr}) to check the presence/absence of ASS;
- Preparation of a combined report outlining the works carried out and results of the field and laboratory investigations in relation to the objectives outlines in Section 1.2 above.

2 SITE LANDUSE AND DESCRIPTION

2.1 Site Location and Landuse

As indicated in Figure 1, the proposed pipeline route is generally located within SCC owned road corridors and Manildra owned land within the township of Bomaderry, NSW. The proposed pipeline route passes through:

- Zone 4(e) 'Industrial Restricted' which is Lot 5 DP825808 and Lot 2 DP825808 located to the north of Bolong Road opposite the Shoalhaven Starches Plant which is owned by Manildra and is currently can be described as an alluvial floodplain used for cattle grazing;
- Railway Street which is owned by SCC is generally divided into two zonings:
    - Zone 4(a)' General Industrial' and includes industry such as an unused railway yard, smash repairs and mechanics, auto electrician, sheet metal fabricators and several industrial warehouses which are leased; and
    - Zone 1(g) 'Rural Flood Liable' which is mainly farmland and is currently used for cattle grazing.
- Land which is Zoned 1(g) extends from the northern end of Railway Street north to Fletchers Lane and is currently used for cattle grazing. The pipeline route is to be located within an SCC owned access corridor. A survey of the proposed route has been conducted by Allen Price and Associates and indicates the access corridor is approximately 6m wide and follows the eastern fence line of the south coast railway corridor, north towards the rail level crossing located at the eastern end of Fletchers Lane. The extent and width of the access track is not clearly marked and is only accessed through private property;
- Zone 5(b) 'Special Use Railway' is Railcorp owned land and is proposed to be crossed near the rail level crossing at the eastern end of Fletchers Lane;
- Zone 1 (a) 'Rural (Agricultural Production)' is located to the north and south of Fletchers Lane. Fletchers Lane is an unsealed roadway owned and maintained by SCC. The pipeline is proposed to be located within the southern road shoulder of this laneway;

- Zone 1 (b) 'Rural (Arterial and Main Road Protection)' which extends approximately 50m either side of the Princes Highway. The pipeline is proposed to be located within the south western road shoulder of Pestells Lane which is an unsealed road owned by SCC and is influenced by Zone 1(b) and Zone 1 (a). Pestells lane crosses the RTA owned Princes Highway which is a sealed high speed main road linking the township of Berry in the north to Nowra in the south.

2.2 Topography and Drainage

Reference to the Berry 1:25,000 Topographic Map indicates that the study area is at an elevation between RL <10m and RL 30m above Australian Height Datum (AHD) and can be divided into two topographical settings:

- East of the South Coast Rail Line - Level to gently undulating floodplain with some minor ephemeral watercourses, flood channels and ponds; and
- West of the South Coast Rail Line – Moderately to gently undulating rises to low hills with relatively shallow soil profiles and underlain by Nowra Sandstone. Sandstone outcrops are evident in the rail cuttings near Cambewarra Road and Edwards Avenue.

Water runoff collected to west of the South Coast Rail Line is generally diverted into nearby farm land and then channelled through ephemeral creeks such as Tullian, Abernethys and Mulgen Creeks in a south east direction towards the Shoalhaven River.

2.3 Local Geology, Hydrogeology and Groundwater Use

The investigation area is generally elevated at between about RL6.0m (AHD) and RL 10.0m (AHD). Where ground elevations are less than about RL 10.0m (AHD) such as in the south eastern portion of the site, reference to the 1:250,000 Wollongong Geological Series Sheet (S1 56-9, First Edition) prepared by the NSW Department of Mines (1952) indicates that this portion of the assessment area is likely to be underlain by Quaternary Alluvium, gravel, swamp deposits and sand dunes.

Where ground elevations are greater than about RL 10.0m (AHD), such as in the north western portion of the site at Pestells Lane and also where there are some isolated rises (hills) in Railway Street and Edwards Avenue, the Geological Series Sheet indicates that this portion of the assessment area is likely to be underlain by Undifferentiated siltstone, shale and sandstone from the Berry Formation which is categorised under the Shoalhaven Rock Group.

A survey of groundwater bores within a 500 metre radius of the proposed pipeline alignment which are registered with the NSW Office of Water indicated that there are seven registered bores. There are three bores registered as monitoring bores located within 500 m of the study area to the south east within the Manildra Plant. These bores were installed to depths of between 4.0m and 6.0m. The work summary sheets for 5 of the 7 registered groundwater bores including a plan showing their approximate locations are presented in Appendix A.

Based on observations made of the site, surrounding topography and the nearby Shoalhaven River, groundwater is generally expected to be encountered within the pipeline alignment as follows:

- Areas east of the South Coast Railway Line: within 3m of the ground surface and in some areas (eg. CTP8, CTP9, CTP12) within about 1m of the ground surface.
- Areas west of the South Coast Railway Line: Depths to groundwater may be variable for parts of the alignment located to the west of the South Coast Rail Line or for locally elevated areas primarily due to the presence of lower permeability residual clay soils and relatively shallow bedrock which may result in a perched water table or an aquifer within the bedrock profile, or a much deeper groundwater level. Groundwater is likely to flow in an east to south easterly direction (particularly for areas closer to the Shoalhaven River).

Reference can be made to the engineering logs of the test pits and boreholes for information on groundwater inflows and levels. We note that groundwater levels are transient and can change with time based on climatic and other factors. In general, shallower groundwater levels would be expected in topographic low points (eg. near watercourses) or in areas of low relief (eg. within the near level floodplain areas at this site).

2.4 Acid Sulfate Soil Occurrence

ASS is naturally occurring soil and sediment containing iron sulfides which when exposed to oxygen can generate sulfuric acid.

A copy of the relevant section of the Burrier/Berry 1:25,000 Acid Sulfate Soil Risk Map (1997) edition 2, prepared by the Department of Land and Water Conservation (DLWC), is presented in Figure 2.

Reference to the map indicates the following:

- The Southern portions of the pipeline route (south of Edward Street) and the northern section (westwards from Meroo Road) are generally located in areas mapped as no known occurrence of ASS;
- The southern most portion of pipeline and the central section that travels north from Edwards Street and then west along Fletchers Lane to the intersection of Fletchers Lane and Meroo Road are generally located in an areas mapped as having a low probability of ASS occurrence, being described as elevated alluvial plains and levees. One small area in the vicinity of CTP9 is also mapped as having a low probability of ASS occurrence. ASS, if present is considered to be sporadic in occurrence within 1m to greater than 3m of the ground surface.

3 PREVIOUS REPORTS

Numerous geotechnical investigations have been carried out across parts of the Manildra Group (Shoalhaven Starches) lands and nearby areas by Coffey and others over the last 10 to 15 years.

Coffey carried out a preliminary environmental site assessment and geotechnical investigation (Report Ref: ENVIUNAN00111AA, dated 25 June 2008) for various proposed structures at the Manildra Starches Plant and nearby areas, including a proposed packaging plant which was to be developed on the piece of vacant land at lot 5 DP825808 and Lot 2 DP825808 and through which this proposed gas pipeline is shown to intersect.

The scope of work included, a site history assessment with targeted sampling and testing of soil and groundwater. Site history information suggested that this parcel of land was predominantly vacant and used for grazing. A sewer line runs through Lot 5 and anecdotal evidence suggested that a few years ago the pipe burst and sewage had leaked. Several test pits and boreholes were carried out at this site in relatively close proximity to the proposed alignment of the gas pipeline including CTP1, CTP10, CTP12, CTP13, CTP16, CTP27 and CBH20. These test pits and boreholes encountered various subsurface conditions including firm to stiff or very stiff alluvial soils, with zones of soft fine grained soils within these units. Groundwater inflows were generally encountered in this area at between 1 and 1.6m below ground surface level. Evidence of contamination was not identified at the locations where the pipeline is proposed.

Elevated concentrations of zinc and lead were noted in groundwater sampled from one well within Lots 2 and 5 above drinking water and/or protection of freshwater aquatic ecosystem trigger values. The source of the metals was not known and could be associated with background concentrations.

Acid Sulfate Soils were encountered within this parcel of land, typically in the northern and eastern parts of this area which are typically the lower lying parts. The estuarine and alluvial soils encountered were typically dark grey and black clayey silts to sandy clays.

Field screening results generally recorded pH values greater than 4. After oxidation with H_2O_2, some samples recorded pH values below 3 which suggests the potential presence of unoxidised sulfides. The results also suggested that not all of the acidity is sulfuric, but sufficient sulphuric acidity is present to designate these soils as Actual ASS.

An ASS Management plan (ASSMP) was subsequently developed for Lots 2 and 5 (Report Ref: ENVIWOLL00187AB-R02, dated 26 March 2009).

4 SITE HISTORY AND OBSERVATIONS

Information on the site history was obtained from:

- Review of selected aerial photographs;
- Review of previous Coffey Reports conducted within close proximity to the area;
- Interviews with available people familiar with the history and operations of the site; and
- Collation of the above.

The site history information is presented in Appendix A and a summary is provided below.

4.1 Summary of Site History

In general, historical information suggested that properties along Railway Street have been a mixture of residential and commercial/industrial landuses whilst the majority of other areas along the proposed pipeline route have generally been vacant for rural landuse and mainly used for grazing.

Aerial photographs indicate that since 1961, Lot 5 DP825808 and Lot 2 DP825808 appeared to be vacant and grassed. The amount of ground disturbance and density of industrial building surrounding Railway Street appears to have significantly increased in the late 1970's and early 1980's. The remainder of the proposed pipeline route to the north appears to have remained predominantly vacant/rural land.

A sewage treatment plant has been located on the eastern side of Railway Street since about 1975. A rail line has existed to the west of Railway Street including structures associated with former rail activities.

A search of the NSW OEH website did not show any listings of sites within the Bomaderry area.

Two phone interviews were conducted on the 18 July 2011 with Steve Thompson and Ron Arthur, who are responsible for rural properties located between Railway Street and Fletchers lane, Bomaderry. The interview was aimed at identifying potential areas of concern as a result of contaminating activities or events which may not have been recorded by the OEH database but may have had the potential to have an impact on the proposed pipeline route.

Steve Thompson indicated that he was not aware of any contaminating activities or large events occurring in the study area besides common agricultural practices.

Ron Arthur who has lived in the area for the last 20 years indicated that he has mechanically sprayed the weeds in his paddocks using the chemical Bromide in the past. He also indicated that the old rail yard located to the south of Cambewarra Road on the western side of Railway Street was known to have stored railway sleepers treated with copper arsenic in the past.

4.2 Site Observations

A project engineering geologist made observations before the initial phase of fieldwork on the 7 March and 26 April 2011 during a site walkover. Additional observations were made during the several phases of fieldwork which took place. The site features are shown in Photo Plate 1 to Photo Plate 4 and selected aerial photographs which are included in Appendix B.

4.2.1 Lot 5 DP825808 and Lot 2 DP825808

The southernmost portion of the investigation area comprises Lot 5 DP825808 and Lot 2 DP825808, which is the parcel of land located on the northern side of Bolong Road, directly across the road from the existing Manildra Starches Plant

Lot 5 DP825808 and Lot 2 DP825808 are part of a vacant grass covered area used to keep horses. Some ponding of water was noted at the time of fieldwork as a result of heavy rainfall events which preceded the fieldwork in Railway Street on the 16 June 2011. The ground surface in these paddocks was noted to be spongy and soft under foot and the ground slope appeared to fall at about 3^0 towards the south east.

Industrial premises were located to the west of this area along Railway Street and included Bomaderry Sheet Metal, Langford Auto Repairs, JJ Kiteley (Sheet metal), Bomaderry Smash repairs, Shoalhaven Glass and Mirrors, and All Breeds dog and cat grooming. A sewer pumping station is located just outside the southern part of this area near Bolong road. This area has a 3m wide easement for a sewer line from Bolong Road to the adjacent sewage treatment plant to the north.

The existing road pavements in Railway Street were noted to be quite deteriorated with some potholing observed.

An formr Railway Yard/depot which is located approximately 100m south west of the intersection between Railway Street and Cambewarra Road was observed to have some old paint cans, bricks, rusty wire and random domestic waste such as rusty cans and plastic bags around its outskirts. This structure is located within 20m of the proposed pipeline alignment. Evidence of groundwater monitoring wells were noted opposite this area.

No other obvious evidence of waste materials or stressed vegetation was noted in along this section of the proposed pipeline alignment.

4.2.2 Railway Street to Pestells Lane

The pipeline route follows the SCC owned road easement to Fletchers Lane and then diverts along the southern shoulders of Fletchers Lane and Pestells Lane to the Jemena owned High Pressure Gas Transfer Station. The ground surface level varies between about RL 4m (AHD) near Abernethy's Creek to about RL 28m (AHD) at the Gas Transfer Station.

The section of proposed pipeline that travels along a road easement between Railway Street and Fletchers Lane, crosses Rural Land which is currently used for cattle grazing. Ponding of water was noted at several locations along this section of the route, with the ground surf generally being spongy underfoot. A four wheel drive vehicle was able to travel through this area with some minor diverts to better ground which included a cobble rock crossing over Abernethy's Creek.

Fletchers Lane is in part un-surfaced and does have some noticeable pot holes in the order of 500mm wide and 300mm deep along its length. Generally the laneway was elevated in the order of 500mm above the surrounding rural land and therefore did not have any significant ponding of water observed on its surface at the time of our investigation. Some filling up to 400mm high was observed near the rail level crossing at the eastern end of Fletchers Lane (Site 1) and along the southern road shoulder near the intersection of Fletchers Lane and Meroo Road (Site 2). The fill observed at site 2 was assessed to be in the order of 108m^3 with dimensions in the order of 3m wide, 0.3m high and 90m long. The volume of fill in this area may however considerably differ as the road shoulder was covered in dense grass and also contained a significant amount of graded/cut road surface material.

Pestells lane is an unsurfaced rural laneway that is used to service the gas pipeline transfer station and several paddocks which appear to be currently used for cattle grazing. At the time of our investigation the laneway was in the process of being maintained with a large grader and roller. The shoulders of the laneway were mounded up with the cut material to form a road shoulder which was about 400mm above the existing road surface. No ponding of water was observed along the laneway, however several of the adjacent paddocks did comprise some minor gully erosion and water was observed ponding on the ground surface in these areas.

4.2.3 ASS Indicators

Obvious visual evidence of ASS such as scald areas, iron leaching or jarosite staining were not noted on the surface of the areas forming this assessment.

5 POTENTIAL AREAS OF ENVIRONMENTAL CONCERN (AEC) AND CONTAMINATS OF CONCERN (COC)

Based on the site history information and site observations potential Areas of Environmental Concern (AECs) and Contaminats of Concern (COCs) were identified. These are summarised in the following table.

Table 1: Summary of Potentially Contaminating Activities, AECs, Likelihood of Contamination and COCs

AEC	Potentially Contaminating Activity	Sub Component / Description	Potential Areas of Environmental Concern	Likelihood of Contamination*	Potential Chemicals of Concern
AEC 1	**Storage and use of fuels and chemicals**	Storage and use of fuels and chemicals associated with operations in the former rail yard/depot.	Areas adjacent to the former rail yard/depot. Typically contamination associated with these container storage areas is in near surface soils. *(Soil and groundwater media potentially affected)*	Moderate likelihood of contamination from potential storage of various chemicals/liquids including possible spillages and presence of former underground storage tanks.	TPH, BTEX, PAH, VHC
AEC 1	**Fill of unknown origin and quality**	Fill soils imported to the site as part of landfilling activities to raise site levels	The filling history of the areas covered by this assessment is unknown. Extensive filling is not expected based on the site history information. Some relatively shallow fill soils are anticipated and along Railway Street to raise site levels for pavements Some fill soils were noted in parts of Railway Street and Fletchers Lane. Other areas are not expected to have significant amounts of fill soils. *(Soil media potentially affected)*	Generally a low likelihood of contamination across the majority of areas.	TPH, BTEX, PAH, OCP, OPP, PCB, heavy metals and asbestos.
AEC 3	**Potential leaks from Sewer Line and Nearby Sewage Treatment Plant**	-	The central and northern parts of Lots 2 and 5. *(Soil and groundwater media potentially affected)*	Moderate likelihood of contamination as anecdotal evidence suggested a leak had occurred from a sewer line which runs through the central part of the packing plant. The integrity of adjacent sewage treatment works infrastructure is also not known.	TPH, faecal coliforms, pathogens, nutrients, heavy metals and (potentially asbestos from ruptured pipe)
AEC 4	**Potential application of pesticides and fertilisers**	Possible use of pesticides in areas where current or previous agricultural activities take place.	Based on anecdotal evidence and a review of historical aerial photographs, and the history of the general area, application of pesticides and fertilisers could have occurred in all parts of the areas covered by this assessment.	Low likelihood of contamination	OCP, OPP, heavy metals

Notes:

* *It is important to note that this is not an assessment of the financial risk associated with the AEC in the event contamination is detected, but a qualitative assessment of the probability of contamination being detected at the potential AEC based on the site history study and field observations.*

TPH	*Total Petroleum Hydrocarbons*	*Heavy Metals*	*arsenic, cadmium, chromium, copper, lead, nickel, mercury, zinc*
BTEX	*Benzene, Toluene, Ethylbenzene, Xylene*	*OCP*	*Organochlorine Pesticides*
PAH	*Polycyclic Aromatic Hydrocarbons*	*OPP*	*Organophosphorous Pesticides*
PCB	*Polychlorinated Biphenyl*	*VHC*	*Volatile Halogenated Compounds*

6 SAMPLING AND ANALYSIS PLAN

6.1 Contamination Assessment

"Contamination" of land, as defined in the Contaminated Land Management Act (1997), *means the presence in, on or under the land of a substance at a concentration above the concentration at which the substance is normally present in, on or under (respectively) land in the same locality, being a presence that presents a risk of harm to human health or any other aspect of the environment.*

The site sampling and analysis plan was designed to target soil contamination at the site at selected locations along the pipeline route. The NSW EPA (1995) Sampling Design Guidelines provides guidance on the number of sampling locations required to assess a site with respect to contamination for characterising a site based on detecting a circular hotspot (and also subject to results of site history and identified AECs).

For this linear pipeline route assessment, observations of the subsurface materials was carried out from 26 test locations spaced at approximately 200m intervals (subject to access), targeting various landforms and potential AECs. Information previously collected by Coffey from Lots 2 and Lot 5 was used to supplement this assessment. Sampling locations comprised of five (5) boreholes (CBH01 to CBH05) seventeen (17) surface samples (SS01 to SS17) and twenty one (21) test pits (CTP05 to CTP26). Contamination samples were collected from twenty six (26) locations being SS01 – SS17 and CTP18 to CTP26. The boreholes and test pits were used to gain a preliminary appreciation of the likely subsurface conditions along the proposed pipeline alignment using a targeted sampling approach. A summary of the test locations is provided in Table 3 below:

Table 2: Summary of Sampling Locations

Area	No. of Locations	Location Identification
Railway Street	10	CBH01 to CBH05 and SS01 to SS05
Rural Land (Railway Street to Fletchers Lane)	24	CTP06 to CTP17 and SS06 to SS17
Fletchers Lane and Pestells Lane	19	CTP18 to CTP26 and SS30 – SS39

Following receipt of initial results additional soil sampling was carried out from a low elongated fill mound located in the vicinity of test pit CTP21 where asbestos was detected. An additional 10 surface samples (SS30-SS39) were collected from this mound at approximately 10m intervals to further assess the potential extent of the impact.

For this preliminary assessment a direct assessment of groundwater quality was not carried out.

6.2 Acid Sulfate Soils

The ASSMAC (1998) guidelines provide guidance on the number of sampling locations for assessing sites with respect to ASS. The guidelines suggest a sampling frequency of about 1 location for every 75m to 100m for linear projects.

Based on the results of the desk study, it was considered that a sample location spacing of about 200m was sufficient to gain a preliminary appreciation of the potential for ASS to exist along Pipeline route as this area was mapped as a low probability of ASS occurrence in the upper 1-3m and the anticipated depth of disturbance is about 1.2m.

Soil samples were typically collected at 0.5m intervals within natural soils in the upper 2.5m, or at major changes in soil stratigraphy (whichever was more frequent). Samples were initially screened for ASS using hydrogen peroxide and following the results of the screening, samples were selected for additional testing using the Chromium Reducible Sulfer (Scr%) method.

6.3 Quality Assurance/Quality Control Plan

A quality assurance/quality control plan was designed to achieve the predetermined data quality objectives (DQOs) and to demonstrate accuracy, precision, comparability, representativeness and completeness of the data generated and the procedures for assessing the DQOs are met. The plan was based on the seven step process described in the NSW DECC (2006) Guidelines for the NSW Site Auditor Scheme (2nd Edit.) The results of the laboratory quality control are discussed in Section 10.2.1 .

7 ASSESSMENT CRITERIA

7.1 Soil Vapour Criteria

For the purposes of this report the generalised soil vapour criteria presented in Table 4 have been used as a guide to the potential for hydrocarbon contamination. These criteria have been developed by Coffey Environments based on our experience (where monitoring for volatile organic compounds has occurred) to assist in the assessment of hydrocarbon contamination levels in soil. It is important to note that these generalised criteria are only a guide and that the PID has a different response to different chemicals.

Table 3: Generalised Soil Vapour Criteria

PID reading as ppm isobutylene	Generalised soil gas content description relating to petroleum hydrocarbon contamination
<20 ppm	NEGLIGIBLE
20 to 60 ppm	LOW
60 - 300 ppm	MODERATE
>300 ppm	SIGNIFICANT

7.2 Soil Investigation Levels (SILs)

The laboratory results have been compared to the following references:

- NSW DEC (2006) Guidelines for the NSW Site Auditor Scheme 2nd Ed. and the National Environment Protection (Assessment of Contamination) Measure (NEPM) (NEHF F Commercial/Industrial); and
- NSW EPA (1994), Guidelines for Assessing Service Station Sites.

The NSW DEC (2006) Guidelines for the NSW Site Auditor Scheme and the NEPM summarises the National Environmental Health Forum (NEHF) investigation levels[1] for protection of human health for different landuses and also provides guidelines for provisional phytotoxicity investigation levels (referred to as environmental investigation levels in the NEPM) for a range of contaminants in soils. The site landuse is intended for ongoing industrial use; therefore the results have been compared to NEHF F criteria for commercial/industrial landuse. Phytotoxicity criteria for the protection of plants are generally not applicable for commercial/industrial sites.

NSW EPA (2006) Guidelines do not provide threshold levels for volatile petroleum hydrocarbon compounds. NSW EPA (1994) Guidelines for Assessing Service Station Sites provide an indication of acceptable cleanup levels for petroleum hydrocarbons compounds at service station sites to be reused for sensitive land-uses. The EPA has advised that these guidelines should also be used for less sensitive land-uses. For semi-volatile petroleum hydrocarbons (C16 – C35 and >C35) investigation levels are provided in the NSW EPA (2006) Guidelines, however, these are based on the NEPM health-based criteria, which require the laboratory analysis to unequivocally differentiate between aromatic and aliphatic compounds. If this cannot be done, the C10 – C40 criteria in the service station guidelines should be applied. For this investigation, we have adopted the service station guidelines for all petroleum hydrocarbon fractions.

There are currently no national or DECC endorsed guidelines relating to human health of environmental investigation of material containing asbestos on sites. NSW DEC (2006) advice that until such guidelines become available, auditors must exercise their professional judgement when assessing if a site is suitable for a specific use in the light of evidence that asbestos may be a contaminant of concern. NSW DEC (2006) states that NSW Health will provide advice to auditors on a case-by-case basis where appropriate. The NSW DEC previously provided interim advice that “no asbestos in the soil at the surface is permitted”. Enhealth (2005) ‘Guidelines for Asbestos in the Non-Occupational Environment’, provides some guidance on assessing and managing asbestos in soil although does not provide a threshold concentration or investigation level for asbestos. For this site we have adopted non-detect as an investigation level for asbestos.

The adopted Soil Investigation Levels (SILs) are summarised in Table 4.

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[1] In Imray and Langley (1994). Health Based Soil Investigation Levels. (In: The Health Risk Assessment and management of Contaminated Sites - Proceedings of the Third National Workshop on the Health Risk Assessment and Management of Contaminated Sites. Contaminated Sites Monograph Series No.5, 1996. South Australian Department of Health and Family Services/Commonwealth EPA.

Table 4: Soil Investigation Levels

Contaminant	Human Health Investigation Level (HIL) (mg/kg)
Arsenic	500[1]
Cadmium	100[1]
Chromium (III)	600,000[1]
Copper	5,000[1]
Nickel	3,000[1]
Lead	1,500[1]
Zinc	35,000[1]
Mercury	75[1]
Benzene	1[2]
Toluene	130[2]
Ethylbenzene	50[2]
Total Xylene	25[2]
Benzo(a)pyrene	5[1]
Total PAHs	100[1]
Aldrin + Dieldrin	50[1]
Chlordane	250[1]
DDT + DDD + DDE	1,000[1]
Heptachlor	50[1]
Total PCB	50[1]
Asbestos	ND[3]

Notes:

1. NSW DEC (2006) Guidelines for the NSW Site Auditor Scheme (2nd Edit.) and NEPC (1999) National Environmental Protection (Assessment of Site Contamination) Measure (NEPM) NEHF F
2. NSW EPA (1994) Guidelines for Assessing Service Station Sites, Table 3
3. On the advice of the NSW Department of Health, the NSW EPA have advised NSW Site Auditors (Site Auditors Meeting 1st March 2000) that "no asbestos in the soil at the surface is permitted". The phrase 'at the surface' has not been defined.

7.3 Acid Sulfate Soil Action Levels

In order to assess the significance of the ASS potential, the laboratory results were compared to action levels in the Acid Sulfate Soil Manual (1998) prepared by the Acid Sulfate Soil Management Advisory Committee (ASSMAC 1998).

The ASSMAC action criteria triggers the need to prepare a management plan and obtain development consent. The action criteria are based on oxidisable sulfur concentrations for three differing soil textures. The manual provides different action levels depending on the amount of ASS that is to be disturbed. As the exact volume of ASS to be disturbed by the project is not known, the action criteria for a project that will disturb greater than 1000 tonnes of ASS materials has been adopted as a conservative criteria at this stage. The action criteria provided in the ASSMAC manual are summarised in Table 5 below.

Table 5: ASSMAC (1998) Acid Sulfate Soil Action Criteria*

Soil Texture Category	Approximate Clay Content (%)	Action Criteria*	
		Sulfur Trail Percent Oxidisable Sulfur	Acid Trail
		(S_{POS} or S_{CR}) (%)	TAA, TPA or TSA (mol H^+/tonne)
Coarse	<5%	0.03	18
Medium	5% to 40%	0.03	18
Fine	>40%	0.03	18

Notes:
* - Action criteria where greater than 1000 tonnes of ASS is to be disturbed
S_{POS} Peroxide oxidisable sulphur
S_{CR} Chromium reducible sulphur
TAA Total Actual Acidity
TPA Total Potential Acidity
TSA Total Sulfidic Acidity

8 FIELD INVESTIGATIONS

The subsurface investigations comprised in total five (5) boreholes (CBH01 to CBH05), seventeen (17) surface samples (SS01 to SS17) and twenty one (21) test pits (CTP05 to CTP26) at the approximate locations shown in Figures 1, Figure 1A and Figure 1B. The geographical position of each location was recorded using a handheld GPS unit which is generally accurate to within about 3m depending on weather and the presence/absence of other forms of noise such as tall trees or buildings. The co-ordinates of each location were recorded in UTM (easting and northing) format to the World Grid System (WGS84) datum. It was not within the scope of work to survey the locations using a registered surveyor.

The test pits were approximately positioned 200m apart and as close as possible to the proposed pipeline route. Test pits CTP26 to CTP18 were excavated on the 4 May 2011 using a 7 tonne Cat extendahoe which was hired from Donnelley Civil. These test pits were excavated to a maximum depth of 3 metres using a 450mm diameter steel toothed bucket that was able to dig a 3m deep pit that was in the order of 2m long and 0.45m in approximately 15mins depending on the consistency and density of the materials being encountered.

Test pits CTP17 to CTP06 were excavated on the 21 and 22 June 2011, using a 5 tonne Hyundai track mounted excavator and were positioned up to 20m east of the proposed pipeline alignment into private property due to the presence of high pressure gas and rising sewer mains in the SCC access corridor. The test pits were excavated to a maximum depth of 2.50m using a 450mm wide steel toothed bucket.

The majority of the test pits were terminated on steady progress in hard residual or alluvial soils except for CTP07 and CTP11 which were terminated on very slow progress near bucket refusal on highly weathered sandstone at between 1.7m and 2.0m depth below ground surface level.

Surface Samples (SS06 to SS17) were taken during a site walkover which included scanning for underground services on the 9 June 2011. These locations were positioned as close as possible to the proposed pipeline route between Railway Street and Fletchers lane.

An additional 10 surface samples (SS30-SS39) were collected from an elongated fill mound off Fletchers Lane at approximately 10m intervals.

The five boreholes were located in Railway Street and were chosen over test pits due to there being a relatively large number of services present within the narrow road verges and beneath the road pavements. Prior to the commencement of drilling the boreholes locations were pot holed using a trailer mounted vacuum/suction rig, to a depth of about 1m to check for the absence/presence of any underground services which may not have been identified during our Dial Before You Dig Services search and desktop study. Following the pot holing, the boreholes were drilled to a maximum depth of 2.60m using a Mustang Bob Cat equipped with a 200mm diameter solid flight auger.

Boreholes CBH01 and CBH04 were terminated in firm alluvial/residual soil, on steady progress with the hardened steel V-bit attached to the end of the 200mm diameter solid steel flight auger. Boreholes CBH02, CBH03 and CBH05 were terminated on very slow progress/near refusal in highly weathered Sandstone described as fine to medium grained and generally iron stained orange/brown.

The fieldwork was carried out between March 2011 and July 2011 in the full time presence of a project engineering geologist from our Wollongong Office.

Engineering logs of the Boreholes and Test Pits are presented in Appendix C.

8.1 Soil Sampling

8.1.1 Contamination Assessment

During test pitting, environmental samples were collected with a new pair of nitrile gloves, either from the test pit walls after removal of the smeared surface, or from soil in the centre of the excavator bucket, which had not come into contact with the bucket. Surface Soil samples (SS01 – SS17) were collected using a hand trowel to firstly loosen the topsoil and then whilst wearing a new pair of nitrile gloves a portion of soil was collected for testing. Soil samples were generally collected within the fill materials at the surface, where there was visual or olfactory evidence of contamination or at major changes in stratigraphy. The soil was placed into clean 250mL glass jars, which were sealed with Teflon lined caps, labelled and placed directly into ice-cooled chests for transport to the laboratory.

8.1.2 Acid Sulfate Soil Assessment

During drilling and test pitting, acid sulfate soil samples were collected with a new pair of nitrile gloves either from the centre of the soil mass which had not come into contact with the excavator bucket.

Soil samples were generally collected of natural soils for the purposes of acid sulfate soil screening and analysis. They were wrapped tightly in low-density polyethylene plastic film to expel air and were subsequently placed into labelled plastic bags. Each plastic bag was then placed immediately into an ice-cooled chest for transport to Coffey's Wollongong laboratory. Once at Coffey's Wollongong laboratory, the soil samples were placed into a freezer and stored at a temperature below $0^{o}C$.

8.2 Soil Vapour

Soil vapour tests were carried out using a Mini Rae 2000 Photoionisation Detector (PID) fitted with a 10.6eV lamp and calibrated with isobutylene gas at a concentration of 100ppm. This instrument allows rapid, semi quantitative analysis of ionisable volatile organic compounds in the soil.

Soil vapour testing was carried out at surface sample locations SS01 to SS17 and test pit locations CTP18 to CTP26 at depths up to 0.3m below existing ground surface level. Soil vapour tests were not carried out in the remaining boreholes as they were primarily geotechnical boreholes.

These Soil samples were collected in duplicate into tightly sealed plastic bags. The headspace air above each sample was measured with a Mini Rae 2000 photoionisation detector (PID) fitted with a 10.6eV lamp and calibrated with isobutylene gas at a concentration of 100ppm. This instrument allows rapid, semi quantitative analysis of ionisable volatile organic compounds in the soil. The results of the soil vapour testing are presented in Appendix D.

8.3 Laboratory Analysis

8.3.1 Acid Sulfate Soil Screening

Thirty (30) soil samples were sent to SGS environmental for ASS screening tests, generally as described in the Acid Sulfate Soil Management Advisory Committee (ASSMAC, 1998) Acid Sulfate Soils Manual and the QLD Department of Natural Resources, Mines & Energy (2004) Acid Sulfate Soils – Laboratory Methods Guidelines. Initially the pH of the soil was tested in a 1:5 solution of distilled water and then also tested following reaction with 30% hydrogen peroxide. Based on the screening results, 12 soil samples were selected for analysis using the Chromium reducible sulfur method (S_{CR}) by at the SGS laboratory.

The ASS laboratory reports are presented in Appendix F.

8.3.2 Chemical Testing

Laboratory analysis of the primary and intra duplicate samples was undertaken by the primary laboratory SGS Environmental Services (SGS) located in Alexandria NSW, a laboratory which is NATA accredited for the tests performed.

The soil samples were tested for those chemicals of concern as indicated in Table 4 of Section 7.2.

The laboratory results are discussed in Section 10.3 and the laboratory reports are presented in Appendix E.

8.4 Field Quality Control Procedures

The field quality control consisted of the following:

- Sampling was performed generally in accordance with the procedures outlined in Coffey Environments Standard Operating Procedures, which is based on industry accepted protocols for environmental sampling;
- Calibration of field instruments in accordance with manufactures instructions;
- Collection and analysis of two blind coded intra-laboratory duplicate soil samples for SS03 0.0-0.1m and CTP26 0.4-0.5m designated QA11 and QA01 respectively. The suite of potential chemicals of concern are listed in Table 6 below;
- Collection of one rinsate sample sample (R01) from the steel trowel used to collect the surface samples to check the effectiveness of equipment decontamination;
- Samples were transported in ice-cooled chests to the primary laboratory SGS Environmental Pty Ltd (SGS) in Sydney which is a NATA accredited laboratory for the analysis performed. The samples were transported between our office and the SGS laboratory under chain of custody conditions. Copies of the chain of custodies are included in Appendix G.

Table 6: Summary of Duplicate Soil Samples

Primary Sample ID	Duplicate Soil Sample ID	Duplicate Type		Analysis							
		Intra Laboratory	Inter Laboratory	BTEX	Heavy Metals	PCB	OCP	OPP	PAH	TPH	Asbestos
CBH3/0.0-0.1m	QA11	✓	-	✓	✓	✓	✓	✓	✓	✓	✓
CTP26/0.0-0.1m	QA01	✓	-	✓	✓	✓	✓	✓	✓	✓	✓
Total		**2**	**0**								
Total Primary Samples Analysed				**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**

9 LABORATORY ANALYTICAL PROGRAMME

9.1 Contamination Assessment

Samples were selected for analysis mainly based on geological origin/fill type of the material, field screening, observations and site location.

The following is a summary of the primary sample analysis:

- 16 soil samples for BTEX;
- 16 soil samples for heavy metals;
- 16 soil samples for OCP;
- 16 soil samples for PCB; and
- 26 soil samples for asbestos.

Original laboratory sheets and analytical procedures are included in Appendix E.

9.2 Acid Sulfate Soils

Samples were selected for analysis mainly based on geological origin type of the material, ASS screening, observations and site location.

Eight (30) samples were selected for acid sulfate screening analysis using the pH_F #/ pH_{Fox}# method of analysis.

Forty one (12) samples were selected for analysis using chromium reducible sulphur method (which includes total actual acidity and potassium chloride extractable sulphur).

10 RESULTS OF FIELD AND LABORATORY INVESTIGATIONS

10.1 Subsurface Conditions

The generalised subsurface conditions encountered across the site from the test pits and boreholes are summarised below:

PAVEMENT (Asphalt or Concrete) ASPHALT: Dark grey asphalt pavement about 0.1m in thickness and associated with Railway Street, Meroo Road and the Princes Highway.

FILL Clayey Sandy GRAVEL to Sandy Gravelly CLAY - typically comprised crushed roadbase or stripped natural gravelly clay soils, predominantly taken from the laneway surface and pushed to the side of the road to form a shoulder. Typically to depths between about 0.0m - 0.6m.

TOPSOIL Sandy CLAY/ CLAY: low to high plasticity, brown, with some silt and roots. Encountered in most test pits (CTP07 to CTP26) to depths beneath ground surface ranging from 0.0m to 0.5m.

ALLUVAL/ ESTUARINE CLAY: High plasticity, dark grey/black with some silt and fine grained sand and trace roots. Encountered only at test pits CTP09 and CTP12.

ALLUVIAL Alluvial soils were found 19 out of the 26 locations across the site. Where encountered, this unit comprised Sandy CLAY/ Clayey SAND/ CLAY: Medium to high plasticity, brown, orange-brown, with some silt and trace roots. Sand fraction is generally fine to medium grained. The top of this unit was encountered between 0.15m and 0.80m below ground surface level. The consistency of the soil in this unit ranged from soft to hard.

RESIDUAL SOIL Sandy CLAY/Clayey SILT: medium plasticity, iron stained orange/brown with some fine to coarse grained angular sandstone gravel and a trace of roots. The top of this unit was encountered (CBH02 to CTP11 with the exception of CTP10) between 0.0m and 1.60m below ground surface level. The consistency of these soils are generally very stiff to hard.

EXTREMELY WEATHERED MATERIAL Sandy Clayey GRAVEL/ Sandy Gravelly CLAY/ CLAY: Fine to coarse grained, orange brown with some pale yellow/brown pockets and some cobbles. The top of this unit was encountered between 0.8m and 1.60m below ground surface level. The consistency of this unit was generally hard.

HIGHLY WEATERED SANDSTONE (Class V) Fine to medium grained, iron stained orange/brown. Sandstone was encountered at locations CBH02, CBH03, CBH05 and CTP07 and CTP11. The top of this unit was encountered between 0.5m and 1.80m below ground surface level and the type of equipment that encountered ‘very slow progress’ is noted on the relevant engineering log. The sandstone was assessed to be of low to medium strength.

No unusual odours or oily sheens were noted in soils during the drilling or test pitting at the site.

Apart from the fill, the subsurface conditions encountered are consistent with the published geological information.

Groundwater seepages or inflows were generally observed between 0.5m and 2.5m at locations CBH01, CBH04, CTP08, CTP09, CTP10, CTP12, CTP16 and CTP20.

10.2 Contamination Assessment Results

10.2.1 Quality Assurance/Quality Control

We have assessed the field and laboratory quality control data in the form of Relative Percent Differences (RPDs) of field and laboratory duplicates. A data validation report was prepared by Coffey Environments as part of the quality assurance programme and is included in Appendix G.

The QA/QC results indicate that the laboratory data is generally useable and adequately represents concentrations of contaminants at the sampling locations.

Apart from the above, the results are considered representative of the sample locations at the time of sampling.

Data Quality Indicators (DQI) (completeness, comparability, representativeness, precision and accuracy) for both field and laboratory procedures have been checked. Based on the assessment it is considered that the data collected for this assessment is adequate and meets the objectives of the QA/QC plan.

10.2.2 Soil Vapour

Results of the soil gas headspace measurements are presented in Appendix D.

The soil samples from borehole soil gas vapour tests recorded negligible to low PID readings ranging between 0.0 and 9.5ppm. This is generally consistent with field observations and the laboratory-tested soil samples.

10.2.3 Comparison of Result to Soil Investigation Levels

The laboratory test results for soil are summarised in Table LR1 and LR2. The original laboratory reports are presented in Appendix E.

Of the samples tested no exceedences were recorded above the adopted SILs except for sample CTP21 (0.1-0.2m) which recorded chrysotile asbestos.

10.3 Acid Sulfate Soil Test Results

10.3.1 Acid Sulfate Soil Screening

The results of the acid sulfate soil screening tests are presented in Appendix F.

A field pH below 4 can indicate that actual acid sulfate soils are present (i.e. soils in which oxidation of iron sulfides has occurred and have produced acid). Generally a pH drop below 3 following oxidation with hydrogen peroxide indicates the probable presence of unoxidised sulfides in the samples, and for the purposes of the screening test, is taken as an indication of the probable presence of potential acid sulfate soils.

The screening results indicated the following:

- All samples screened recorded pH values greater than 4 and less than 6.7; and
- The rate of reaction observed for each soil sample on contact with hydrogen peroxide was generally slight with only CTP19 (2.0-2.1m), CTP21(0.5-0.6m) and CTP21(1.0-1.1m) elevated to very vigorous with gas evolution and heat generation, commonly >80 degrees.

10.3.2 Comparison of Acid Sulfate Soil Laboratory Results to Action Criteria

The ASS laboratory results are summarised in Table F1, which are compared to action criteria provided in the ASSMAC manual. Original laboratory reports are presented in Appendix F.

Several samples recorded exceedences above the action criteria and these are highlighted in the tables.

Exceedances of TAA were recorded in several samples. Based on a review of the S_{KCL} results it appears that the majority of the TAA exceedances are not attributed to sulfuric acidity except for CTP14/1.5-1.7m and therefore these soils are not expected to be ASS.

An oxidisable sulphur concentration exceeding the action criteria of 0.03% was recorded at CP09/0.5-0.7m.

11 DISCUSSION AND RECOMMENDATIONS

11.1 Geotechnical Issues

11.1.1 Excavation Conditions

The investigation of the proposed gas pipeline route comprised test pits and boreholes which were terminated at depths between 0.55m and 3.0m below existing ground surface level to assess the subsurface conditions.

We understand that the depth of excavation for the proposed pipeline construction varies from about 1m to 2.4m as follows:

- 2.4m below the top of rails at a railway crossing;
- 1.5m below the base of the curb and guttering at a road crossing (including the Princes Highway); and
- 1.2m below ground surface in other areas.

The site model presented in section 10.1 and the test pit/borehole logs presented in Appendix C generally indicate the following units may be encountered within excavations for trenches at this site:

- soft to hard fine grained (clays) and/or
- medium dense to very dense coarse grained soils (sands and gravels), and/or
- weathered sandstone rock (eg. refer to CBH03 and several other locations).

At Lot 5 DP825808 and Lot 2 DP825808 and test pit locations CTP09 and CTP12, soft Clay/sandy Clay soils were encountered to a depth of 1.50m below existing ground surface level. The clay soil was categorised as Alluvial or Estuarine and best described as high plasticity, brown to dark grey/black with some silt and trace roots. The soil in these areas was observed to have a field moisture content greater than its plastic limit and an undrained shear strength of around 20kPa. At CTP09 the soft clay soil was underlain by medium dense, wet clayey sand and at CTP12 the soft clay was underlain by stiff wet clay.

The majority of the soil strength material encountered at this site should be able to be excavated using a hydraulic excavator.

The highly weathered sandstone (Class V) which was encountered near the level of ‘very slow progress’ at the test locations will require use of a larger excavator (eg.20 tonne) equipped with a rock bucket, rock hammer or ripping tyne to penetrate. Where the rock strength becomes low strength or better or if ironstone bands are encountered within the weathered rock, productivity for trenching is expected to be slower and a rock hammer or rock saw is may to be required.

11.2 Anticipated Groundwater Levels and Impact on Earthworks

Significant groundwater inflows are generally not expected within 1.5m of the ground surface in the majority of the project area. Shallow inflows may occur at geographical low points such as those located in Lot 5 DP825808 and Lot 2 DP825808 and between Railway Street and Fletchers Lane where groundwater inflows are expected in excavations within 1.50m below ground surface level.

Groundwater inflows are not expected to pose a major constraint to excavations for the proposed pipeline route however the following needs to be considered:

- Excavation and pipe laying methods should be employed that take into account the management of groundwater inflows. This may include such measures as avoiding excavations being open for prolonged periods; and
- Potentially aggressive nature of the groundwater and the need to design accordingly to minimise the deterioration of buried steel and concrete components.

Where groundwater inflows are encountered they should be able to be controlled by pumping from sumps.

Care should be taken to manage the impact of construction machinery and earthworks at this site. The majority of the soils will be prone to softening upon exposure to rainwater or groundwater. Trafficking of the site for construction machinery may be difficult in some areas following periods of wet weather.

11.3 Batter Slopes and Excavation Support

11.3.1 General

Trenches up to 0.6m deep may be able to be excavated with near vertical sides provided surcharge loads are kept clear of the crest and workers are not required to enter the unsupported excavation. Shoring boxes should be used in excavations deeper than 0.6m where workers have to enter excavations that are not battered in accordance with the recommendations in Table 7, below. Appropriate safety procedures should be implemented for all excavations in accordance with relevant OH&S legislation.

Where excavations are not to be supported by shoring or retaining structures, unsupported batters should be constructed to slopes not steeper than the batter slopes given in Table 7.