Appendix Q
Greenhouse Gas Assessment

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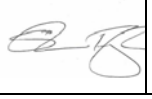
1	18/05/2010	Revision 1	A Maddock	A Sprigg		D Chubb	

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Glossary of Terms

Cess drain	A surface drain that is located at formation level at the side of tracks to remove water.
Chainage	The chainage at a location along a rail line is the distance of that point in relation to Sydney (NSW only) based on 0.000 kilometres being located at the end of Central No. 1 Platform.
Concept design	Initial functional layout of a concept, such as for the proposed duplication, to provide a level of understanding to later establish detailed design parameters.
Crossover	Railway infrastructure which provides a train the ability to cross between two adjacent tracks.
Culvert	A totally enclosed drain under a road or railway.
Cut	An excavation for constructing below the natural ground level.
Detailed design stage	The stage at which the project design is detailed on the basis of an approved concept design.
Duplication	Construction of an additional track adjacent to an existing single track.
Emission	The release of material into the surroundings (for example, gas, noise, water).
Fill	Earth used to construct an embankment.
Greenhouse gases	Gases that accumulate within the earth's atmosphere (eg primarily carbon dioxide and methane) and contribute to global climatic change/global warming (ie the 'greenhouse effect').
Hunter 8 Alliance	Hunter 8 Alliance, which has been formed to deliver a new third track and ancillary infrastructure between Maitland and Minimbah.
Mitigation	Reduction in severity.
Option	A concept design alternative developed for consideration.
Overbridge	Where a road or pedestrian footway is situated over the railway line.
Plant	Construction machinery, vehicles or equipment needed to carry out mechanical or construction activities.
Proponent	Australian Rail Track Corporation (ARTC).
Site compound	Area enclosing construction machinery, stockpiles and site offices usually adjacent to construction sites.
Spoil	Excess of rock and/or earth material resulting from construction activities.
Train paths	A train path is a dedicated route between two locations, which is often scheduled.

Turnout	The intersection and mechanisms for the meeting of two tracks.
Underbridge	Where a road or pedestrian underpass is situated under the railway line.
Up Main	Primary (main) rail line that trains traverse when they are heading toward Sydney (usually positioned on the right when your back is to Sydney).

Executive Summary

The Hunter 8 Alliance on behalf of the Australian Rail Track Corporation (ARTC) is proposing to upgrade approximately 30 kilometres of the Main Northern Railway between the Maitland Junction and Minimbah Bank (near Belford). The Project would widen the existing rail formation to accommodate a third track.

Construction of the third track would include major earthworks, drainage, minor structures, new over and under bridges, modification to existing station platforms, signalling and relocation of existing services.

A greenhouse gas assessment was undertaken to estimate the construction related emissions associated with on-site fuel consumption, electricity imported to the project site, energy used for the transportation of major construction materials to site and waste from site, and the disposal of waste and wastewater.

Greenhouse gas emissions associated with these emission sources were approximately 18,000 t CO_2-e for the construction period. On-site fuel consumption in plant, vehicles and generators accounted for 99% of these emissions.

The use of biodiesel from sustainable feedstocks may reduce greenhouse gas emissions associated with the consumption of fuel during construction activities. An assessment of the life cycle greenhouse gas emission of any biodiesel sourced for the project should be undertaken to determine the extent of any emissions reduction.

1. Introduction

This greenhouse gas (GHG) assessment has been undertaken by the Hunter 8 Alliance on behalf of the Australian Rail Track Corporation (ARTC) for the Maitland to Minimbah Third Track Project (referred to as 'the Project'). This report has been prepared to assess the greenhouse gas emissions associated with onsite fuel consumption, the transportation of major construction materials to site and the disposal of waste and wastewater.

1.1 Background

ARTC was created by the Commonwealth and State Governments in 1998 to provide a single body responsible for the National Interstate Rail Network. ARTC is a Commonwealth Government corporation and currently has responsibility for the management of over 10,000 route kilometres of standard gauge interstate rail track in South Australia, Victoria, Western Australia and New South Wales (NSW), as well as the Hunter Valley Rail Network and other regional rail links in NSW.

The Hunter Valley Rail Network extends from the Port of Newcastle to Ulan and Narrabri in the west. It is used by passenger services, freight, wheat and coal services. The majority of trains carry coal from mines located across the Hunter Valley to either Carrington (Port Waratah) or Kooragang Island ports at Newcastle for loading onto ships for export.

Due to the forecast increase in coal throughput at the Port of Newcastle to 190 million tonnes per annum (mtpa) by 2012, a number of rail infrastructure improvements to the Hunter Valley Rail Network have been proposed by ARTC. One of the key improvement projects included in the ARTC ten-year strategic plan is a proposed third track adjacent to the existing Main Northern Railway between Maitland and Whittingham, known as the Maitland to Whittingham Third Track Project.

The Maitland to Whittingham Third Track Project is divided into two stages. Stage 1 consists of the construction of the third track between Minimbah and Whittingham. Project Approval for this project was granted by the Minister of Planning on 26 May 2009 and construction commenced in July 2009.

Stage 2 consists of the construction of the third track between Maitland and Minimbah, known as the Maitland to Minimbah Third Track Project. Stage 2 is the subject of this greenhouse gas assessment and is referred to as 'the Project'.

The purpose of the Project is to increase rail reliability and future capacity between the Hunter Valley and the Port of Newcastle. In addition to providing increased track capacity, the Project aims to improve operational performance along the route. These improved efficiencies would be created through:

- Reduced impacts on coal traffic due to track maintenance activities.
- Reduced loss of freight train paths due to shadow effects from passenger services.
- Reduced loss of available train paths due to train breakdowns.

The Project would also bring benefits to the local and broader community by generating up to 650 full time jobs during construction, creating opportunities for local and regional goods and service providers, and providing greater security for existing coal industry jobs.

1.2 Description of the Project

The Hunter 8 Alliance, on behalf of the ARTC, is proposing to construct a third track adjacent to the existing Main Northern Railway between Maitland and Minimbah. The proposed third track would commence in Farley approximately 2 kilometres west of Maitland Station at approximate chainage 194.500 kilometres and would run adjacent to the Main Northern Railway for approximately 30 kilometres concluding at Minimbah at approximate chainage 224.200 kilometres.

The proposed third track would be predominantly located on the Up side of the Main Northern Railway. Approximately 3 kilometres of track, from chainages 210.170 kilometres to 211.180 kilometres and 214.060 kilometres to 216.000 kilometres, would be located on the Down side.

The Project would involve the construction of approximately 30 kilometres of new rail track as well as construction and/ or modification of major infrastructure along the Main Northern Railway. A summary of the major elements of the Project is provided in Table 1.1.

Table 1.1 Major Project Elements

Project Elements	
Earthworks	Major cut and fill earthworks along the route. Other minor earthworks.
Track	Approximately 30 km of new track including turnouts and junctions. Relocation of turnouts from Minimbah and Branxton to Belford. Upgrade of maintenance siding turnouts at Branxton. Track reconditioning of existing Up Main at Greta and Branxton Stations and of the Branxton crossovers.
Drainage	Central and cess track drainage. Amendments to 53 culverts for cross drainage. Re-alignment of Sawyers Creek. Other drainage works around new structures.
Bridges	A new rail underbridge at Stony Creek and Wollombi Road, Farley. Closure of the stock crossing at Farley. Demolition of the existing rail overbridge at Old North Road, Allandale. A new rail underbridge at Allandale Road, Allandale. A new rail underbridge for an unnamed tributary of Anvil Creek (chainage 207.776 km).

Project Elements	
	Demolition and replacement of the existing rail underbridge at an unnamed tributary of Anvil Creek, Greta (chainage 209.989 km). A new rail underbridge at Sawyers Creek, Greta. Modification of the existing rail overbridge at Bridge Street, Branxton. A new rail underbridge at Black Creek, Belford. A new rail underbridge at Jump Up Creek, Belford.
Station Modifications	Modifications to Lochinvar Railway Station. Modifications to Greta Railway Station. Modifications to Branxton Railway Station.

1.3 Investigation Area

The investigation area for this greenhouse gas assessment is a linear corridor which follows the route of the Main Northern Railway between chainages 194.500 kilometres and 224.200 kilometres and is shown in Figure 1.1.

The investigation area captures the footprint of disturbance for the third track and other associated works, including construction compounds, haul roads and spoil disposal areas.

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0 95 190 380 570 760

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Australian Geodetic Datum 1966
Grid: Integrated Survey Grid, Zone 56-1

N

LEGEND

- Existing Railway
- Watercourse
- Cadastre
- Construction Impact Zone
- Investigation Area
- Watercourse Area
- National Park

Maitland to Minimbah Third Track Greenhouse Gas

Job Number 22-14471
Revision A
Date May 2010

Investigation Area

Figure 1.1a

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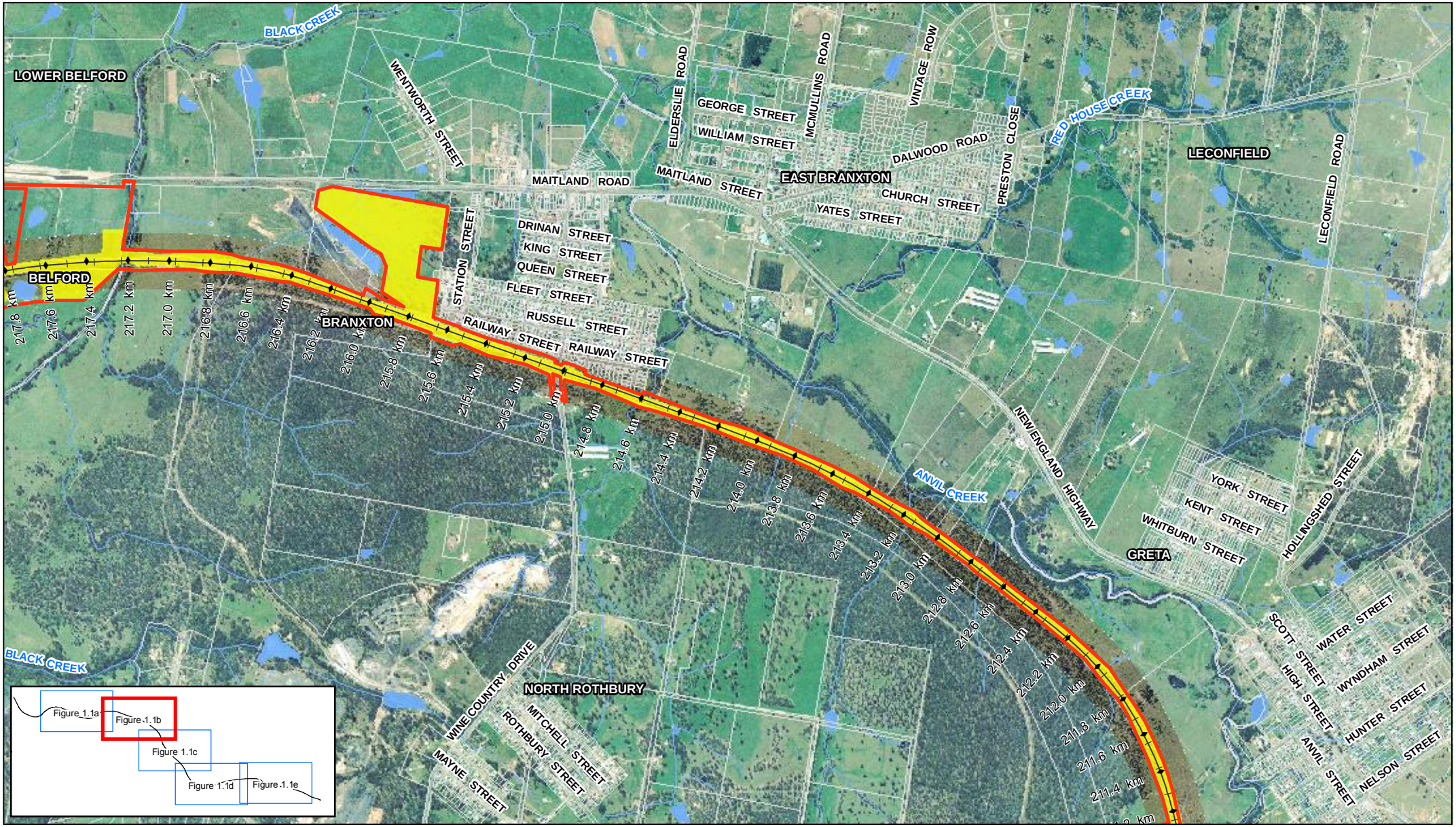
Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 T 61 2 4979 9999 F 61 2 4979 9988 E ntlmail@ghd.com.au W www.ghd.com.au

Data Source: Geoscience Australia: Topography - 2002; Department of Lands: Aerial - 2005; Fugro: Aerial - 2008; Department of Lands: Cadastre - 2004. Created by: fmackay, tmorton



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Metres

Map Projection: Transverse Mercator
Horizontal Datum: Australian Geodetic Datum 1966
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Maitland to Minimbah Third Track
Greenhouse Gas

Job Number 22-14471
Revision A
Date May 2010

Investigation Area

Figure 1.1b

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Data Source: Geoscience Australia: Topography - 2002; Department of Lands: Aerial - 2005; Fugro: Aerial - 2008; Department of Lands: Cadastre - 2004. Created by: fmackay, tmorton

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0 95 190 380 570 760

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Australian Geodetic Datum 1966
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Maitland to Minimbah Third Track Greenhouse Gas

Job Number	22-14471
Revision	A
Date	May 2010

Investigation Area

Figure 1.1c

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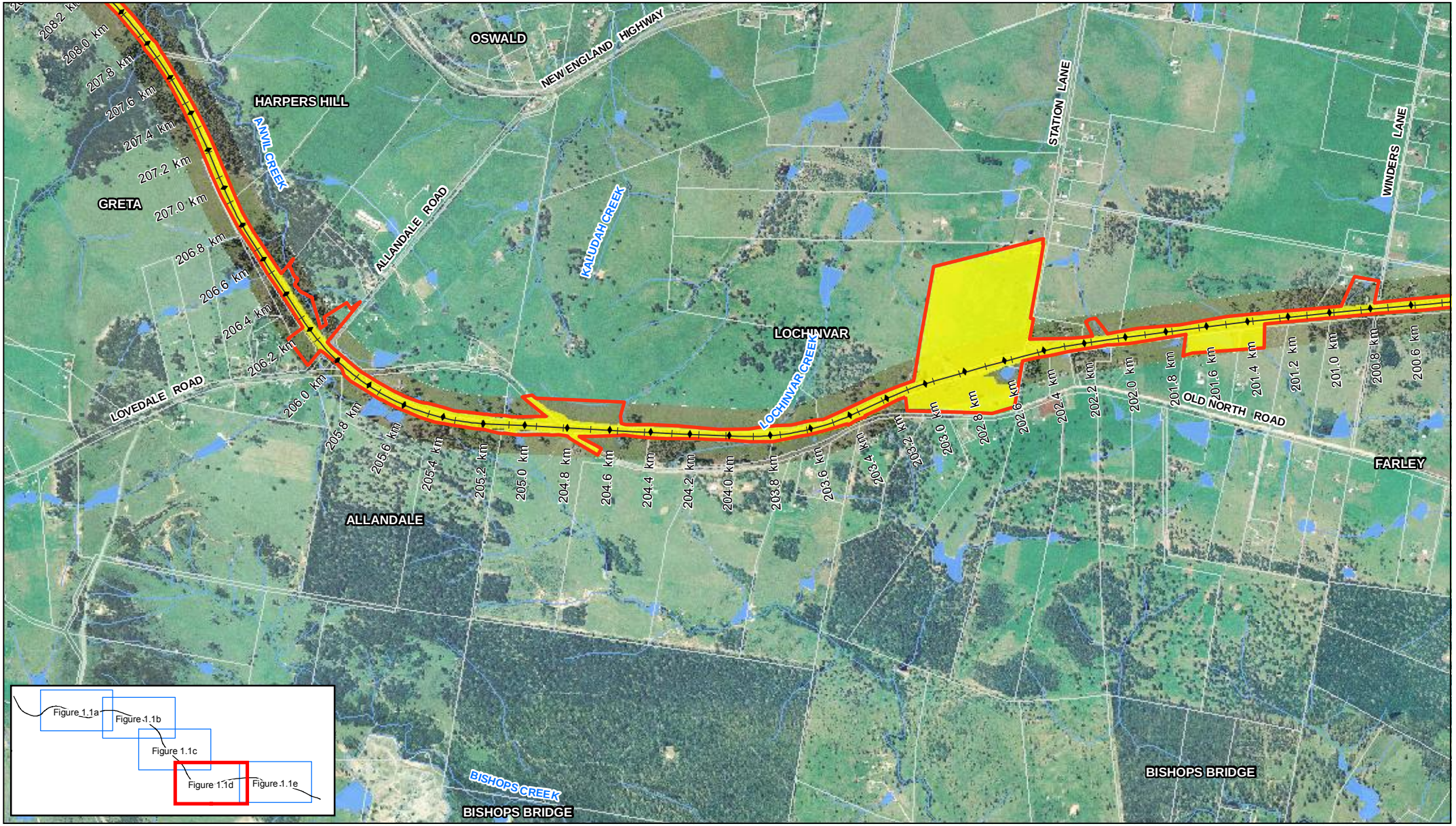
Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 **T** 61 2 4979 9999 **F** 61 2 4979 9988 **E** ntlmail@ghd.com.au **W** www.ghd.com.au

Data Source: Geoscience Australia: Topography - 2002; Department of Lands: Aerial - 2005; Fugro: Aerial - 2008; Department of Lands: Cadastre - 2004. Created by: fmackay, tmorton



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0 95 190 380 570 760

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Australian Geodetic Datum 1966
Grid: Integrated Survey Grid, Zone 56-1

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LEGEND

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- National Park

Hunter ALLIANCE

Maitland to Minimbah Third Track
Greenhouse Gas

Job Number 22-14471
Revision A
Date May 2010

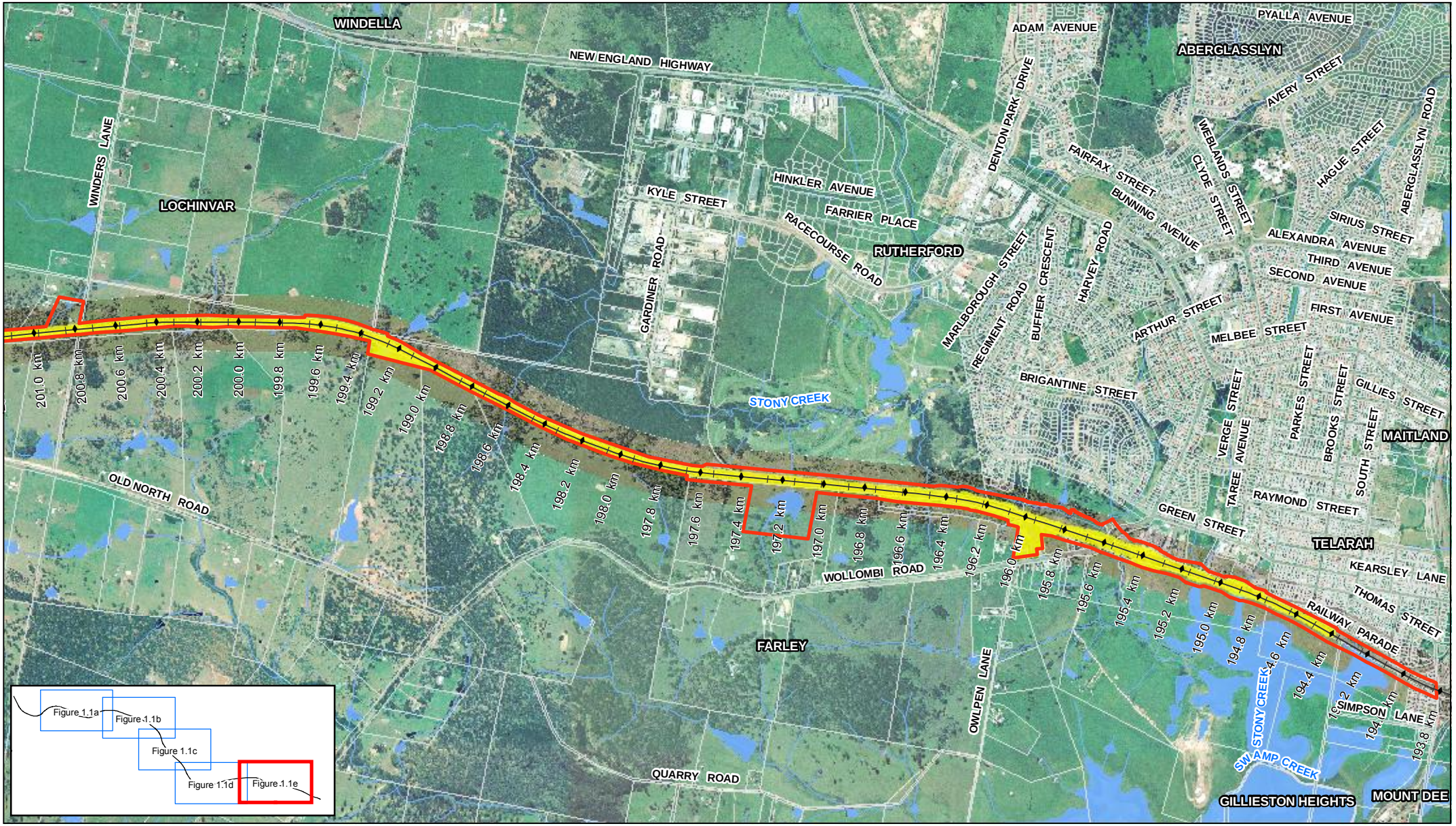
Investigation Area

Figure 1.1d

G:\22\14471\GIS\Maps\Deliverables\EA\Greenhouse Gas\GG_Investigation_Area_20091204_A.mxd

Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 **T** 61 2 4979 9999 **F** 61 2 4979 9988 **E** ntlmail@ghd.com.au **W** www.ghd.com.au

Data Source: Geoscience Australia: Topography - 2002; Department of Lands: Aerial - 2005; Fugro: Aerial - 2008; Department of Lands: Cadastre - 2004. Created by: fmackay, tmorton



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Map Projection: Transverse Mercator
Horizontal Datum: Australian Geodetic Datum 1966
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Maitland to Minimbah Third Track Greenhouse Gas

Job Number 22-14471
Revision A
Date May 2010

Investigation Area

Figure 1.1e

G:\22\14471\GIS\Maps\Deliverables\EA\Greenhouse Gas\GG_Investigation_Area_20091204_A.mxd

Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 **T** 61 2 4979 9999 **F** 61 2 4979 9988 **E** ntlmail@ghd.com.au **W** www.ghd.com.au

Data Source: Geoscience Australia: Topography - 2002; Department of Lands: Aerial - 2005; Fugro: Aerial - 2008; Department of Lands: Cadastre - 2004. Created by: fmackay, tmorton

1.4 Objectives and Purpose of this Report

The objective of this greenhouse gas assessment is to:

- Quantify the greenhouse gas emissions associated with on-site fuel use, electricity, transportation and waste disposal from the construction of the Project.
- Identify potential greenhouse gas mitigation opportunities.

2. Methodology

The scope and methodology for conducting the assessment has been based on the Department of Planning's Draft Guidelines *Energy and Greenhouse in EIA,* August 2002 (the 'Guidelines'). The Guidelines set out a systematic approach to the assessment of the energy and greenhouse impacts associated with a Project.

Further to the Guidelines, the greenhouse gas assessment was prepared in accordance with the general principles of:

- The Greenhouse Gas Protocol, A Corporate Accounting and Reporting Standard developed by the World Business Council for Sustainable Development (GHG Protocol).
- The Commonwealth Department of Climate Change (DCC) National Greenhouse Accounts (NGA) Factors, June 2009.

These are considered to represent current good practice in Australian greenhouse gas accounting.

2.1 Level of Assessment Required

The Department of Planning's Draft Guidelines *Energy and Greenhouse in EIA* (Guidelines) indicate two possible levels of assessment:

1. Level 1 Assessment – A simplified assessment based on a limited number of energy sources and methane generation potential.
2. Level 2 Assessment – A more detailed assessment including all Scope 1 and 2 emissions and 'upstream' and 'downstream' emissions.

A Level 1 Assessment has been stipulated for the Project by the Department of Planning.

2.2 Boundary of the Assessment

2.2.1 System Boundary

The boundary for a Level 1 Assessment includes:

- Energy used on the site.
- Electricity energy generated off site.
- Energy used for transport.
- Methane generated either on-site or off site.

The assessment was restricted to the construction phase of the project. Details of changes to the operational emissions (for example from changes in locomotive fuel consumption and electricity consumption from changes in signalling and associated facilities) as a result of the project were not available at the time of the assessment. It is anticipated that any change in the operational emissions are likely to be minor.

2.2.2 Greenhouse Gases Considered

The greenhouse gases considered in this assessment are:

- Carbon dioxide.
- Nitrous oxide.
- Methane.

The development is unlikely to store, generate or use any perfluorocarbons and sulphur hexafluoride and uses negligible quantities of hydrofluorocarbons for refrigeration and air conditioning during construction. These gases have therefore been excluded from the assessment.

2.3 Emission Scopes

Emissions have been separated into Scopes 1, 2 and 3, in accordance with the Greenhouse Gas Protocol. These scopes are defined as follows:

- Scope 1 emissions are greenhouse gas emissions created directly by a person or business from sources that are owned or controlled by that person or business.
- Scope 2 emissions are greenhouse gas emissions created as a result of the generation of electricity, heating, cooling or steam that is purchased and consumed by a person or business. These are indirect emissions as they arise from sources that are not owned or controlled by the person or business who consumes the electricity.
- Scope 3 emissions are greenhouse gas emissions that are generated in the wider economy as a consequence of a person's or business's activities. These are indirect emissions as they arise from sources that are not owned or controlled by that person or business but they exclude Scope 2.

Scope 1 emissions are produced by the combustion of fuels such as diesel at the development site, and by vehicles and plant equipment which the Proponent owns and has operational control over. Note that only the direct combustion of the fuels is considered as Scope 1. Scope 2 emissions arise from the consumption of electricity at the development site, in plant equipment that is owned and operated by the Proponent. Emissions arising from the extraction, processing and transportation and distribution of fuels and electricity are classified as Scope 3, since these activities are not within the operational control of the end user.

All other emissions associated with the Proposal are defined as Scope 3, since they are produced outside the development site, and the Proponent does not have operational control of the facilities from which they originate. The Proponent does not own or operate any of the vehicles that transport raw materials to the site. As such, the emissions resulting from the combustion of fuels for this transportation are classified as Scope 3.

2.4 Data Collection and Calculation Procedures

Quantities of fuel, materials and wastes were estimated by the Hunter 8 Alliance based on concept design quantities and recorded data from Stage 1 of the Project.

Emission factors that are used in the greenhouse footprint calculations are outlined in Appendix A. Where possible, factors have been sourced from the *National Greenhouse Accounts (NGA) Factors, June 2009*. If factors have been sourced elsewhere then source references have been provided in Section 2.5 and Appendix A.

When data was unavailable, assumptions and approximations were made in order to obtain a reasonable estimate of activity levels or emission factors. For example, emissions factors for transportation were not readily available, and these were estimated based on the best available information. Recognised standards, such as the World Business Council Greenhouse Gas Protocol, were used to assist in these estimations whenever appropriate. All assumptions are detailed in Section 2.5.

All energy consumption and emissions data has been converted into quantities of carbon dioxide equivalent for each life cycle stage of the Project, as shown in Appendix A. The emission values for each life cycle stage have been summed to reach an estimate of the total greenhouse gas emissions over the entire life cycle.

2.5 Exclusions and Assumptions

2.5.1 Exclusions

Exclusions from the GHG assessment are:

- Emissions associated with transportation of minor construction items and materials. These emissions were considered minor compared to the overall emissions.
- Emissions associated with the transportation of vegetation removed from the site. It was assumed that vegetation would be mulched and re-used on site. The transportation of vegetation from the site for re-use in the local region is considered to be minor and therefore was excluded.

The discrepancies in the total emissions inventory due to the exclusions and limitations of the assessment are anticipated to be minor.

2.5.2 Assumptions

Assumptions used in estimating the activity levels and associated greenhouse gas emissions for the Project are listed in Table 2.1.

Table 2.1 Greenhouse Gas Assessment Assumptions for the Project

Parameter measured	Assumptions
On-site fuel consumption	
Diesel consumption in plant and vehicles	Quantity of diesel estimated as 5800 kL, based on 49 kL/week for plant, 24.1 kL/week for small road vehicles and 0.65 kL/week for large road vehicles and a construction length of 78 weeks. The construction length was estimated as the time between the start of the abutments earthworks for the overbridges and the completion of the earthworks, drainage, retaining and capping works for the main works. This period was considered to cover the construction works relevant for diesel

Parameter measured	Assumptions
	consumption in plant and vehicles. The estimate was rounded upwards to two significant figures to provide a conservative estimate for the GHG assessment. As per the methodology described in Section 2.4 Emission Factors (EF) were sourced from the DCC NGA Factors (June 2009) for diesel (Scopes 1 and 3, Tables 4 and 38).
Diesel consumption in generators	Quantity of diesel estimated as 150 kL, based on 1.5 kL/week and a project length of 94 weeks. The construction length was estimated as the time between the start of the overbridges construction program and the completion of the main works construction program. This length is greater than the project length for diesel consumption in plant and vehicles as it was assumed the enabling and establishment works would require electricity provided by diesel generators. The estimate was rounded upwards to two significant figures to provide a conservative estimate for the GHG assessment. As per the methodology described in Section 2.4 Emission Factors (EF) were sourced from the DCC NGA Factors (June 2009) for diesel (Scopes 1 and 3, Tables 3 and 38).
Petrol consumption in vehicles	Quantity of diesel estimated as 180 kL, based on 1.9 kL/week and a project length of 94 weeks. The construction length was estimated as the time between the start of the overbridges construction program and the completion of the main works construction program. This length is greater than the project length for diesel consumption in plant and vehicles as it was assumed the enabling and establishment works would require the use of small vehicles. The estimate was rounded upwards to two significant figures to provide a conservative estimate for the GHG assessment. As per the methodology described in Section 2.4 Emission Factors (EF) were sourced from the DCC NGA Factors (June 2009) for diesel (Scopes 1 and 3, Tables 4 and 38).
Transportation of materials to site and waste from site	
Bridge girders	It was assumed that the precast bridge girders would be sourced from manufacturers in Redhead, NSW and transported by rigid truck.
Concrete	It was assumed that the concrete would be sourced from manufacturers in Maitland, New South Wales (NSW) and transported by rigid truck.
Construction waste to landfill	It was assumed that waste would be transported to the Singleton Council Waste Depot and transported by rigid truck.
Fabricated steel	It was assumed that the fabricated steel would be sourced from manufacturers in Gundagai, NSW and transported by rigid truck. It was assumed that the pre-fabricated steel would be sourced from manufacturers in Port Kembla.
Formwork	It was assumed that the formwork would be sourced from manufacturers in Grafton, NSW and transported by rigid truck.

Parameter measured	Assumptions
Recyclable materials to recycling facility	It was assumed that recycling would be transported to the recycling facilities in Thornton, NSW and transported by rigid truck.
Reinforcement	It was assumed that the reinforcement would be sourced from manufacturers in Newcastle, NSW and transported by rigid truck.
Wastewater to treatment plant	It was assumed that wastewater would be transported to the Morpeth wastewater treatment plant and transported by tanker.
Methane Generation	
Disposal of waste in landfill	Quantity of construction and demolition waste estimated as 180 t based on extrapolation of the waste generated for Stage 1 over a four month period. Quantity was rounded upwards to two significant figures to obtain a conservative estimate for the GHG assessment. EF sourced from Table 42 of the DCC NGA Factors (June 2009) for construction and demolition waste.
Disposal of liquid waste	Quantity of wastewater estimated as 290 kL based on the wastewater generated for Stage 1 over a three month period. Quantity was rounded upwards to two significant figures to obtain a conservative estimate for the GHG assessment. The total emissions from the treatment of the wastewater at the Morpeth wastewater treatment plant were estimated using the methodology outlined in the DCC NGA Factors June 2009. The default values were used in the calculations.

Unless otherwise stated, road distances have been estimated using the website http://maps.google.com.au and rigid truck EF sourced from SimaPro and is based on Australian data for rigid trucks. Distances are based on the manufacturing or extraction location.

3. Summary of Results

Construction related GHG emissions were calculated based on Scope 1, 2 and 3 emissions.

The Level 1 greenhouse gas assessment indicated construction emissions of 18,000 tonnes of CO_2-e over the construction period. Scope 1, 2 and 3 emissions are summarised in Table 3.1. The total emissions inventory is given in Appendix A.

Table 3.1 Summary of Scope 1, 2 and 3 Emissions for the Project

Scope	Quantity (t CO_2-e)
1	16,500
2	0
3	1,500
Total	**18,000**

Note that diesel generators are proposed to provide electricity for the site compounds and hence there is no electricity imported to any of the project sites for construction activities.

The total annual greenhouse gas emissions for NSW reported in the DCC State and Territory Greenhouse Gas Inventories 2006 were 160 Mt/a. The estimated Level 1 emissions associated with the construction of the Project are 0.01% of the total greenhouse gas emissions for NSW.

Emissions for construction were also categorised as energy used on site, transportation of raw materials to site and waste from site, and methane generation activities, in line with the requirements of a Level 1 assessment.

Energy used on site was estimated to contribute 99% of all Level 1 emissions associated with the Project, transportation 1%, and methane generated off site through the disposal of waste and wastewater was less than 1%.

The Level 1 emissions inventory for construction is given in Appendix A.

4. Mitigation Measures

Mitigation of greenhouse gas emissions should follow a hierarchical approach:

- Avoid emissions source.
- Reduce consumption.
- Improve energy efficiency.
- Replace with low emissions alternative.
- Offset.

Diesel consumption by construction plant and equipment is estimated to contribute 96.2% of the total Level 1 emissions and petrol consumption in vehicles is estimated to contribute 2.6%.

The consumption of fuel is a necessary requirement of the Project, however, a reduction in the quantity of fuel consumed may be achievable through optimisation of construction activities and logistics. Optimisation of these activities may reduce the number of vehicles and/or trips required. This optimisation should be undertaken during the detailed project design and planning stage.

A small reduction in fuel consumption may be achieved through the use of more efficient plant and vehicles. Newer vehicle and plant models are typically more fuel efficient than the older models. The use of more recent vehicles and plant models would need to be part of a wider fuel management strategy that incorporates project planning, logistics, driver education and maintenance as any fuel reduction due to more efficient models may be outweighed by poor management in other areas.

The most significant greenhouse gas mitigation option for fuel related emissions is likely to be the use of biodiesel. Biodiesel blends (diesel that has a percentage of the fuel replaced with biodiesel) may reduce greenhouse gas emissions due to fuel consumption, however, this is dependent on a number of factors including the origin of the biodiesel feedstock.

When sourced from appropriate feedstocks, the reduction in emissions is approximately equivalent to the percentage of biodiesel in the blend (for example diesel with 20% biodiesel with reduce greenhouse gas emissions by approximately 20%). Calculations to determine the reduction in GHG emissions when using biodiesel should consider the entire life cycle of the fuel.

There are a number of other factors that require consideration prior to the use of biodiesel for the Project. There is significant debate over the suitability and/or the percentage of biodiesel that can be used in vehicles and plant. Biodiesel may not be suitable for some vehicles without major modifications. Plant operators are also concerned that vehicle and plant warranties may be void if biodiesel or biodiesel blends are used in vehicles. In Australia, the issue of plant and vehicle warranty, in general terms, has yet to be resolved between vehicle and plant operators and the major vehicle and plant manufacturers.

Hunter 8 would examine opportunities for the use of biodiesel and use where possible on the project.

5. Conclusions

A Level 1 greenhouse gas assessment was undertaken in accordance the Department of Planning's Draft Guidelines *Energy and Greenhouse in EIA,* August 2002. The scope of the assessment included on-site fuel consumption, electricity imported to the project site, energy used for the transportation of major construction materials to site and waste from site, and the disposal of waste and wastewater during construction of the Project.

Greenhouse gas emissions were estimated as 18,000 t CO_2-e for the construction period. These included 16,500 t CO_2-e Scope 1 emissions and 1500 t CO_2-e Scope 3 emissions. There were zero Scope 2 emissions as electricity is not proposed to be imported to the site, with all electricity generated during construction using diesel generators. On-site diesel and petrol consumption is estimated to contribute 99% of Level 1 emissions.

Greenhouse gas emissions from fuel consumption may be mitigated though a number of measures including optimisation of the construction program and logistics to reduce fuel consumption and the use of recent model plant and vehicles instead of less fuel efficient models. The most significant mitigation measure related to fuel consumption is likely to be the use of biodiesel. Consideration should be given to the full life cycle greenhouse gas emissions of the fuel to determine if a reduction in greenhouse gas emissions will occur.

6. References

Department of Climate Change, 2009, *National Greenhouse Accounts (NGA) Factors*, http://www.climatechange.gov.au/en/publications/greenhouse-acctg/national-greenhouse-factors.aspx.

New South Wales Department of Infrastructure, Planning and Natural Resources and Department of Energy, Utilities and Sustainability, 2002, *Energy and Greenhouse in EIA.*

World Business Council for Sustainable Development and World Resource Institute, 2004, *The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard*, revised edition.

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Appendix A

Level 1 Greenhouse Gas Emissions Inventory

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Level 1 Greenhouse Gas Assessment Inventory

Component	Value (Q)	Units	Scope 1 EF	Scope 2 EF	Scope 3 EF	Total EF	Units	Source	Method	Scope 1 Emissions (t CO_2-e)	Scope 2 Emissions (t CO_2-e)	Scope 3 Emissions (t CO_2-e)	Total Emissions (t CO_2-e)	Proportion of Total Inventory
Onsite fuel consumption														
Diesel consumption in plant and vehicles	5,800	kL	2.7	0	0.2	2.9	t CO_2-e/kL	DCC NGA Factors June 2009	Q x EF	15,649	0	1,187	16,836	93.8%
Petrol consumption in vehicles	180	kL	2.4	0	0.2	2.6	t CO_2-e/kL	DCC NGA Factors June 2009	Q x EF	428	0	33	461	2.6%
Diesel consumption in generators	150	kL	2.7	0	0.2	2.9	t CO_2-e/kL	DCC NGA Factors June 2009	Q x EF	402	0	31	433	2.4%
Total on-site fuel consumption emissions										**16,480**	**0**	**1,250**	**17,730**	**98.8%**

Component	Value (Q)	Units	Scope 1 EF	Scope 2 EF	Scope 3 EF	Total EF	Units	Source	Method	Scope 1 Emissions (t CO_2-e)	Scope 2 Emissions (t CO_2-e)	Scope 3 Emissions (t CO_2-e)	Total Emissions (t CO_2-e)	Proportion of Total Inventory
Transportation of Materials and Waste														
Bridge girders	5,600	t	0	0	15	15	kg CO_2-e/t	Materials Delivery Worksheet	Q x EF / 1000	0	0	85	85	0.5%
Concrete	8,400	t	0	0	4	4	kg CO_2-e/t	Materials Delivery Worksheet	Q x EF / 1000	0	0	33	33	0.2%
Construction waste to landfill	180	t	0	0	7	7	kg CO_2-e/t	Materials Delivery Worksheet	Q x EF / 1000	0	0	1	1	0.0%
Fabricated steel	60	t	0	0	212	212	kg CO_2-e/t	Materials Delivery Worksheet	Q x EF / 1000	0	0	13	13	0.1%
Formwork	120	t	0	0	119	119	kg CO_2-e/t	Materials Delivery Worksheet	Q x EF / 1000	0	0	14	14	0.1%
Liquid waste to Hunter Water	290	t	0	0	6	6	kg CO_2-e/t	Materials Delivery Worksheet	Q x EF / 1000	0	0	2	2	0.0%
Recycling waste	1,260	kg	0	0	7	7	kg CO_2-e/t	Materials Delivery Worksheet	Q x EF / 1000000	0	0	0	0	0.0%
Reinforcement	500	t	0	0	15	15	kg CO_2-e/t	Materials Delivery Worksheet	Q x EF / 1000	0	0	7	7	0.0%
Total transportation emissions										**0**	**0**	**155**	**155**	**0.9%**

Component	Value (Q)	Units	Scope 1 EF	Scope 2 EF	Scope 3 EF	Total EF	Units	Source	Method	Scope 1 Emissions (t CO_2-e)	Scope 2 Emissions (t CO_2-e)	Scope 3 Emissions (t CO_2-e)	Total Emissions (t CO_2-e)	Proportion of Total Inventory
Methane generation														
Disposal of waste in landfill	180	t	0.0	0.0	0.3	0.3	t CO2-e/t	DCC NGA Factors June 2009	Q x EF	0	0	54	54	0.3%
Disposal of liquid waste	290	kL	Refer to Table 2.1					DCC NGA Factors June 2009	NA	0	0	1	1	0.0%
Total methane generation emissions										**0**	**0**	**55**	**55**	**0.3%**
Total Level 1 emissions for construction period										***16,480***	***0***	***1,460***	***17,940***	