# 22. Traffic and transport

This chapter provides a summary of the construction traffic impact assessment undertaken for the Project. A full copy of the report is included in Appendix O.

## 22.1 Methodology

The traffic impact assessment assessed the traffic implications brought about by the construction of the pipeline on roadway traffic and road closures. The following steps were followed in the preparation of the traffic and transport assessment.

- Review of existing information including:
  - Identification of roads potentially affected by the Project from aerial photography and other mapping information;
  - Review of information on local traffic flow data from GMC and WSC and traffic count data for the state road network from the RTA[8];
  - Assessment of the level of service for traffic flows on existing roads referring to *Austroads Guide to Traffic Engineering Practice Part 2 – Roadway Capacity*;
  - Assessment of the level of safety for local roads, referring to crash data provided by local government authorities and the RTA; and
  - Review existing public transport, pedestrians and cyclists facilities.
- Assess traffic impact of the Project by:
  - Undertaking a traffic impact assessment, with reference to *RTA's Guide to Traffic Generating Developments (Version 2.2, October 2002)*. The traffic impact assessment process outlined in the guidelines outlines the key issues that need to be addressed in determining the impact on traffic of the proposed development. The key issues and performance criteria adopted for the assessment is detailed in Table 22.1;
  - Estimating the construction traffic generated by the Project based on information provided for the haulage of various construction materials and for construction staff movements;
  - Estimating the distribution of project generated traffic on local roads based on assumptions about the origins and destination of trips;
  - Assess the levels of service of roads and intersections impacted by the project traffic based on RTA and Austroads guidelines; and
  - Assess the safety of roads and intersections impacted by the project traffic based on relevant Austroads guidelines.

[8] Roads and Traffic Authority Traffic Volume Data for the Southern Region 2005

**Table 22.1 Key issues and Performance Criteria**

| Issue | Performance Measure | Criteria Adopted |
|---|---|---|
| Operating performance of roads and key access intersections | Level of Service (LOS) | Major Roads: LOS C can be considered the minimum standard in a rural context during weekday peak hour flows, although LOS D is considered satisfactory in circumstances involving recreational peak hours (weekends). |
| Safety and efficiency of access between the site and adjacent road network | Casualty crashes per kilometre per year | Network class average – Rural Areas:<br>◗ Road Class 4R – 0.40 casualty crashes per km per year<br>◗ Road Class 3R – 0.37 casualty crashes per km per year<br>◗ Road Class 2R – 0.16 casualty crashes per km per year |

## 22.2 Existing Environment

### 22.2.1 Road Network

Figure 22.1 shows the road network in the vicinity of the proposed pipeline route. The pipeline route crosses a total of 68 State, local and unnamed roads, including the Hume Highway and the Illawarra Highway.

The classification of roads along the existing road network can be used as an indication of the functional role each road plays with respect to the volume of traffic they should appropriately carry. The RTA has developed a set of road hierarchy classifications. Table 22.2 provides typical nominal volumes expressed in terms of average annual daily traffic (AADT) serviced by various classes of roads.

**Table 22.2 Functional Classification of Roads**

| Type of Road | Traffic Volume (vpd [1]) | Peak Hour Volume (vph [2]) |
|---|---|---|
| Arterial Road | >15,000 | 1,500 – 5,600 |
| Sub-Arterial Road | 5,000 – 20,000 | 500 – 2,000 |
| Collector Road | 2,000 – 10,000 | 200 – 1,000 |
| Local Road | <2,000 | 0 – 200 |

[1] vpd = vehicles per day

vph = vehicles per hour

The RTA has jurisdiction over State Roads. The pipeline project area crosses a number of State Roads controlled by the RTA which are listed in Table 22.3 below.

**Table 22.3 RTA Roads to be crossed by the proposed Pipeline**

| Road ID | RTA Road ID | Road Name | Classification |
|---|---|---|---|
| Road 22/23 | SH2 | Hume Highway | Arterial Road |
| Road 6 | SH25 | Illawarra Highway | Arterial Road |
| Road 71 | MR54 | Crookwell Road | Arterial Road |
| Road 3 | MR372 | Sheepwash Road | Arterial Road |

The Hume Highway is one of Australia's major inter-city highways linking Sydney and Melbourne and is 880 km in length. It is part of the Auslink National Network and is a vital link for road freight transporting goods to and from Melbourne and Sydney as well as serving Albury-Wodonga, Canberra and Goulburn. The Hume Highway also links a number of other Highways including the Illawarra Highway which is also located in the Project area. The Hume Highway consists of a two-lane divided dual carriageway for the entire Project area.

The Illawarra Highway connects the Princes Highway to the Hume Highway and services the area between Wollongong and the NSW Southern Highlands including Albion Park, Bowral, Robertson and Moss Vale. The road consists of a two lane single carriageway for most of its length.

Crookwell Road is a sealed two-way single carriageway connecting Goulburn and Crookwell in the GMC area. The road services the rural communities to the north west of Goulburn including Crookwell, Cottawalla, Pejar and Kingsdale.

Sheepwash Road is a sealed two-way single carriageway connecting Bowral (via Kangaloon Road) in the north and Fitzroy Falls (at the intersection of Nowra Road) in the south. Sheepwash Road crosses the Illawarra Highway approximately 5 km to the south of the Wingecarribee Water Treatment Plant.

Aside from the pipeline crossing points with RTA roads, the pipeline corridor may also intersect the local Council roads listed in Table 22.4.

**Table 22.4 Local council roads to be crossed by the proposed Pipeline**

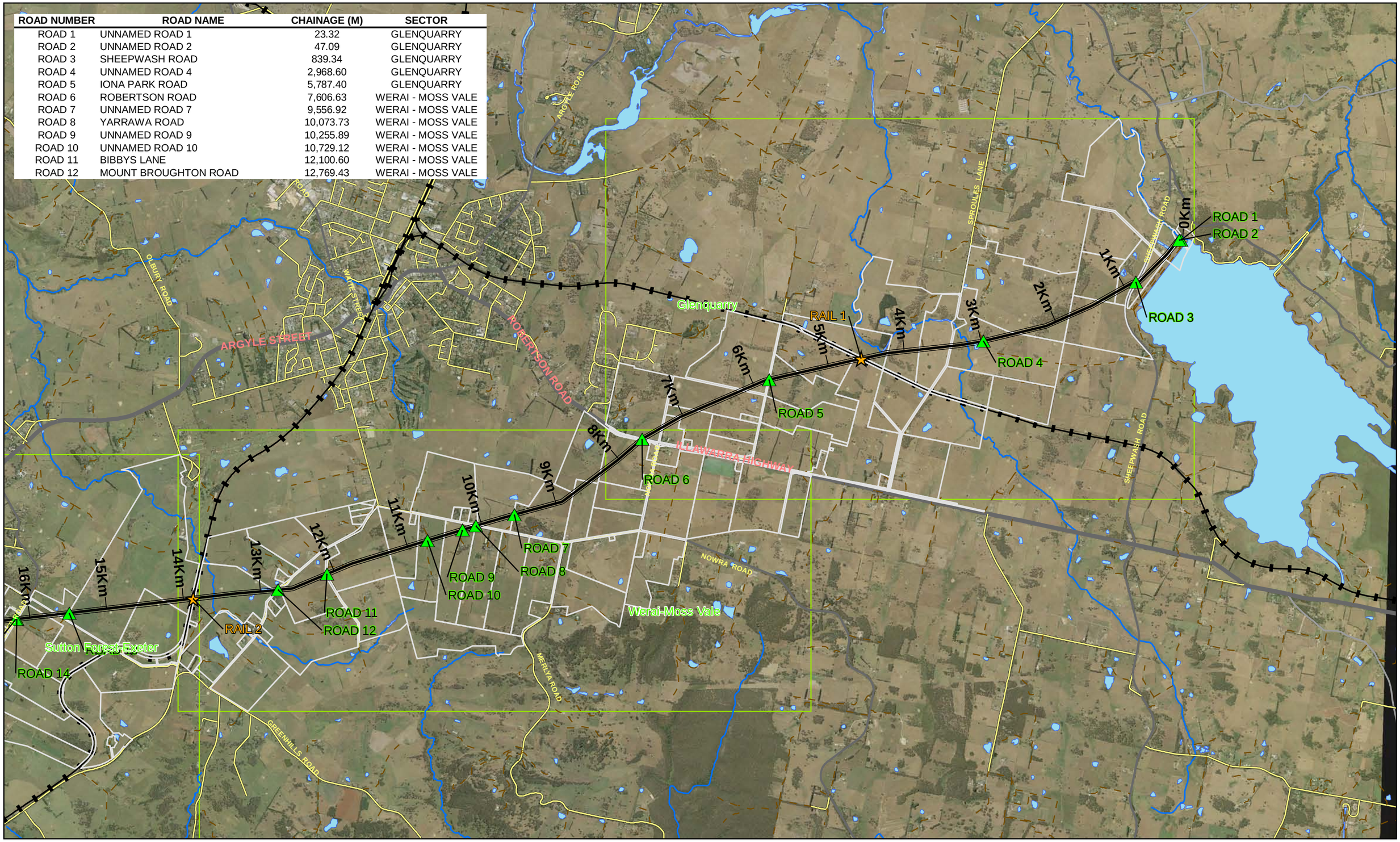
| Road ID | Road Name | Classification |
|---|---|---|
| ***Council: Wingecarribee Shire Council*** | | |
| Road 3 | Sheepwash Road | Arterial Road |
| Road 5 | Iona Park Road | Local Road |
| Road 8 | Yarrawa Road | Local Road |
| Road 11 | Bibbys Lane | Local Road |
| Road 12 | Mount Broughton Road | Local Road |
| Road 15 | Exeter Road | Arterial Road |
| Road 18 | Old Argyle Road | Local Road |
| Road 19 | Sallys Corner Road | Sub Arterial Road |

| Road ID | Road Name | Classification |
|---|---|---|
| Road 20 | Middle Road | Local Road |
| ***Council: Goulburn Mulwaree Council*** | | |
| Road 40 | Inverary Road | Sub Arterial Road |
| Road 45 | Wollumbi Road | Local Road |
| Road 47 | Red Hills Road | Local Road |
| Road 51 | Red Hills Road | Local Road |
| Road 54 | Brayton Road | Sub Arterial Road |
| Road 59 | Carrick Road | Sub Arterial Road |
| Road 62 | Towrang Road | Sub Arterial Road |
| Road 64 | Murrays Flat Road | Local Road |
| Road 68 | Taralga Road | Arterial Road |
| Road 70 | Middle Arm Road | Sub Arterial Road |
| Road 72 | Chinamans Lane | Local Road Road |
| Road 73 | Clinton Street | Sub Arterial Road |

Several other unnamed roads have been identified and assigned a Road ID. These roads are generally single lane unsealed track roads used for vehicular access.

In addition to being directly impacted by the pipeline crossings, the roads listed above, as well as the unnamed roads and tracks would be used to access the Project site for deliveries and construction.

| ROAD NUMBER | ROAD NAME | CHAINAGE (M) | SECTOR |
|---|---|---|---|
| ROAD 1 | UNNAMED ROAD 1 | 23.32 | GLENQUARRY |
| ROAD 2 | UNNAMED ROAD 2 | 47.09 | GLENQUARRY |
| ROAD 3 | SHEEPWASH ROAD | 839.34 | GLENQUARRY |
| ROAD 4 | UNNAMED ROAD 4 | 2,968.60 | GLENQUARRY |
| ROAD 5 | IONA PARK ROAD | 5,787.40 | GLENQUARRY |
| ROAD 6 | ROBERTSON ROAD | 7,606.63 | WERAI - MOSS VALE |
| ROAD 7 | UNNAMED ROAD 7 | 9,556.92 | WERAI - MOSS VALE |
| ROAD 8 | YARRAWA ROAD | 10,073.73 | WERAI - MOSS VALE |
| ROAD 9 | UNNAMED ROAD 9 | 10,255.89 | WERAI - MOSS VALE |
| ROAD 10 | UNNAMED ROAD 10 | 10,729.12 | WERAI - MOSS VALE |
| ROAD 11 | BIBBYS LANE | 12,100.60 | WERAI - MOSS VALE |
| ROAD 12 | MOUNT BROUGHTON ROAD | 12,769.43 | WERAI - MOSS VALE |

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0 500 1,000 1,500 2,000

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 55

N

LEGEND

- Proposed Route (29/11/2009)
- Properties Intersected By Corridor
- Pipeline Road Intersections
- Pipeline Railway Intersection
- River/Creek
- Railways
- PrimaryRoad
- ArterialRoad
- SubArterialRoad
- LocalRoad
- Track-Vehicular
- UrbanServiceLane
- GMC / WSC LGA Boundary
- Sector boundary
- HydroArea

CLIENTS | PEOPLE | PERFORMANCE

Goulburn Mulwaree Council
Highlands Source Project

# Road network in the vicinity of the proposed pipeline Sector: Werai - Glenquarry

| | |
|---|---|
| Job Number | 23-13312 |
| Revision | 0 |
| Date | 12 FEB 2010 |

Figure 22.1A

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Data Source: NSW Lands Dept: roadsegments, railways,hydroarea, hydroline - 2007; GMC: aerial imagery - 2008; GMC/WSC: Cadastral data - 2009. Created by: ccharalambou

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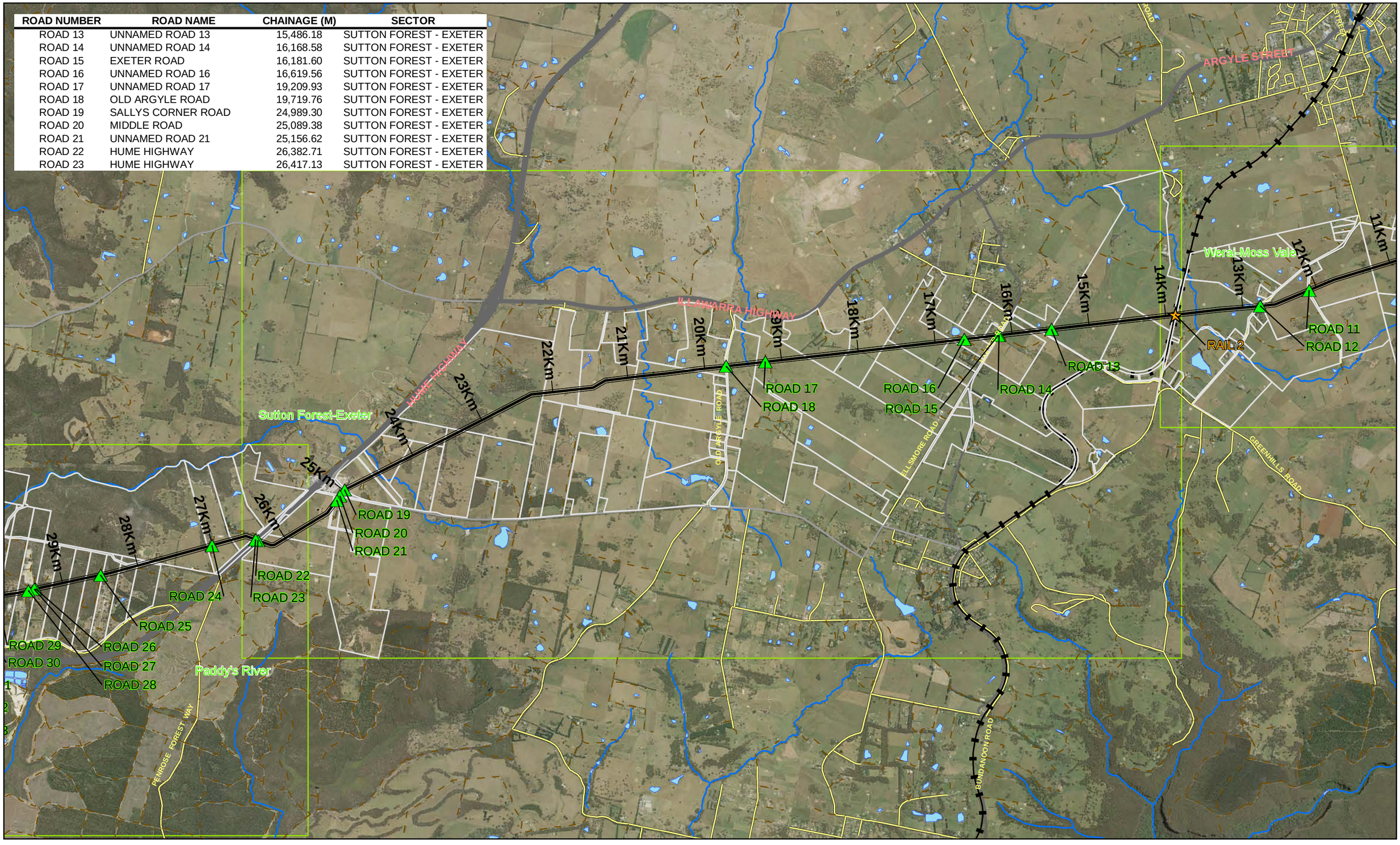
| ROAD NUMBER | ROAD NAME | CHAINAGE (M) | SECTOR |
|---|---|---|---|
| ROAD 13 | UNNAMED ROAD 13 | 15,486.18 | SUTTON FOREST - EXETER |
| ROAD 14 | UNNAMED ROAD 14 | 16,168.58 | SUTTON FOREST - EXETER |
| ROAD 15 | EXETER ROAD | 16,181.60 | SUTTON FOREST - EXETER |
| ROAD 16 | UNNAMED ROAD 16 | 16,619.56 | SUTTON FOREST - EXETER |
| ROAD 17 | UNNAMED ROAD 17 | 19,209.93 | SUTTON FOREST - EXETER |
| ROAD 18 | OLD ARGYLE ROAD | 19,719.76 | SUTTON FOREST - EXETER |
| ROAD 19 | SALLYS CORNER ROAD | 24,989.30 | SUTTON FOREST - EXETER |
| ROAD 20 | MIDDLE ROAD | 25,089.38 | SUTTON FOREST - EXETER |
| ROAD 21 | UNNAMED ROAD 21 | 25,156.62 | SUTTON FOREST - EXETER |
| ROAD 22 | HUME HIGHWAY | 26,382.71 | SUTTON FOREST - EXETER |
| ROAD 23 | HUME HIGHWAY | 26,417.13 | SUTTON FOREST - EXETER |

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 55

N

LEGEND

- Proposed Route (29/11/2009)
- Properties Intersected By Corridor
- Pipeline Road Intersections
- Pipeline Railway Intersection
- River/Creek
- Railways
- PrimaryRoad
- ArterialRoad
- SubArterialRoad
- LocalRoad
- Track-Vehicular
- UrbanServiceLane
- GMC / WSC LGA Boundary
- Sector boundary
- HydroArea

CLIENTS | PEOPLE | PERFORMANCE

Goulburn Mulwaree Council
Highlands Source Project

# Road network in the vicinity of the proposed pipeline Sector: Sutton Forest-Exeter

| | |
|---|---|
| Job Number | 23-13312 |
| Revision | 0 |
| Date | 12 FEB 2010 |

Figure 22.1B

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Data Source: NSW Lands Dept: roadsegments, railways,hydroarea, hydroline - 2007; GMC: aerial imagery - 2008; GMC/WSC: Cadastral data - 2009. Created by: ccharalambou

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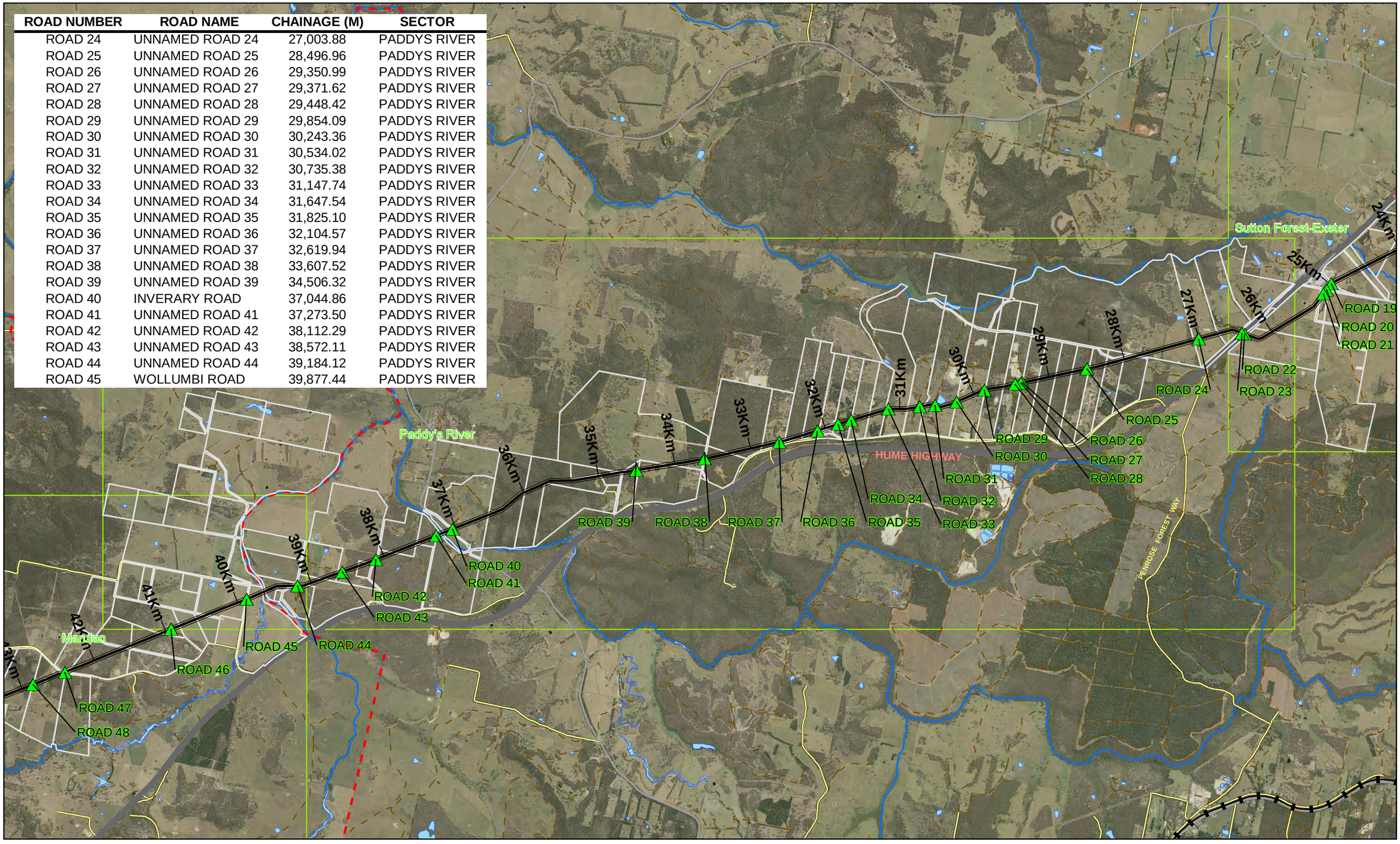
| ROAD NUMBER | ROAD NAME | CHAINAGE (M) | SECTOR |
|---|---|---|---|
| ROAD 24 | UNNAMED ROAD 24 | 27,003.88 | PADDYS RIVER |
| ROAD 25 | UNNAMED ROAD 25 | 28,496.96 | PADDYS RIVER |
| ROAD 26 | UNNAMED ROAD 26 | 29,350.99 | PADDYS RIVER |
| ROAD 27 | UNNAMED ROAD 27 | 29,371.62 | PADDYS RIVER |
| ROAD 28 | UNNAMED ROAD 28 | 29,448.42 | PADDYS RIVER |
| ROAD 29 | UNNAMED ROAD 29 | 29,854.09 | PADDYS RIVER |
| ROAD 30 | UNNAMED ROAD 30 | 30,243.36 | PADDYS RIVER |
| ROAD 31 | UNNAMED ROAD 31 | 30,534.02 | PADDYS RIVER |
| ROAD 32 | UNNAMED ROAD 32 | 30,735.38 | PADDYS RIVER |
| ROAD 33 | UNNAMED ROAD 33 | 31,147.74 | PADDYS RIVER |
| ROAD 34 | UNNAMED ROAD 34 | 31,647.54 | PADDYS RIVER |
| ROAD 35 | UNNAMED ROAD 35 | 31,825.10 | PADDYS RIVER |
| ROAD 36 | UNNAMED ROAD 36 | 32,104.57 | PADDYS RIVER |
| ROAD 37 | UNNAMED ROAD 37 | 32,619.94 | PADDYS RIVER |
| ROAD 38 | UNNAMED ROAD 38 | 33,607.52 | PADDYS RIVER |
| ROAD 39 | UNNAMED ROAD 39 | 34,506.32 | PADDYS RIVER |
| ROAD 40 | INVERARY ROAD | 37,044.86 | PADDYS RIVER |
| ROAD 41 | UNNAMED ROAD 41 | 37,273.50 | PADDYS RIVER |
| ROAD 42 | UNNAMED ROAD 42 | 38,112.29 | PADDYS RIVER |
| ROAD 43 | UNNAMED ROAD 43 | 38,572.11 | PADDYS RIVER |
| ROAD 44 | UNNAMED ROAD 44 | 39,184.12 | PADDYS RIVER |
| ROAD 45 | WOLLUMBI ROAD | 39,877.44 | PADDYS RIVER |

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 55

N

LEGEND

- Proposed Route (29/11/2009)
- Properties Intersected By Corridor
- Pipeline Road Intersections
- Pipeline Railway Intersection
- River/Creek
- Railways
- PrimaryRoad
- ArterialRoad
- SubArterialRoad
- LocalRoad
- Track-Vehicular
- UrbanServiceLane
- GMC / WSC LGA Boundary
- Sector boundary
- HydroArea

CLIENTS | PEOPLE | PERFORMANCE

Goulburn Mulwaree Council
Highlands Source Project

# Road network in the vicinity of the proposed pipeline Sector: Paddys River

| | |
|---|---|
| Job Number | 23-13312 |
| Revision | 0 |
| Date | 12 FEB 2010 |

Figure 22.1C

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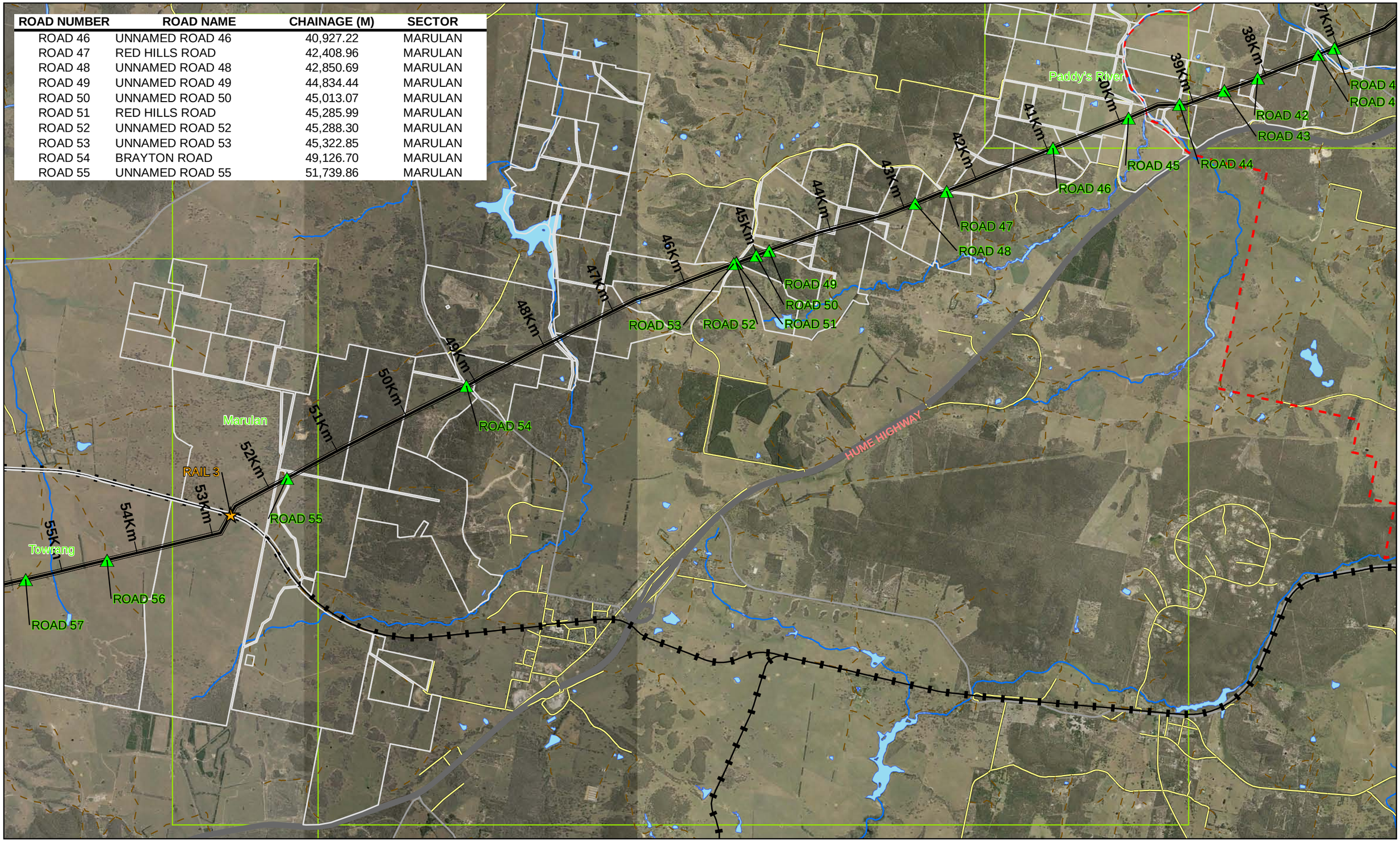
| ROAD NUMBER | ROAD NAME | CHAINAGE (M) | SECTOR |
|---|---|---|---|
| ROAD 46 | UNNAMED ROAD 46 | 40,927.22 | MARULAN |
| ROAD 47 | RED HILLS ROAD | 42,408.96 | MARULAN |
| ROAD 48 | UNNAMED ROAD 48 | 42,850.69 | MARULAN |
| ROAD 49 | UNNAMED ROAD 49 | 44,834.44 | MARULAN |
| ROAD 50 | UNNAMED ROAD 50 | 45,013.07 | MARULAN |
| ROAD 51 | RED HILLS ROAD | 45,285.99 | MARULAN |
| ROAD 52 | UNNAMED ROAD 52 | 45,288.30 | MARULAN |
| ROAD 53 | UNNAMED ROAD 53 | 45,322.85 | MARULAN |
| ROAD 54 | BRAYTON ROAD | 49,126.70 | MARULAN |
| ROAD 55 | UNNAMED ROAD 55 | 51,739.86 | MARULAN |

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 55

N

LEGEND

- Proposed Route (29/11/2009)
- Properties Intersected By Corridor
- Pipeline Road Intersections
- Pipeline Railway Intersection
- River/Creek
- Railways
- PrimaryRoad
- ArterialRoad
- SubArterialRoad
- LocalRoad
- Track-Vehicular
- UrbanServiceLane
- GMC / WSC LGA Boundary
- Sector boundary
- HydroArea

CLIENTS | PEOPLE | PERFORMANCE

Goulburn Mulwaree Council
Highlands Source Project

# Road network in the vicinity of the proposed pipeline Sector: Marulan

| | |
|---|---|
| Job Number | 23-13312 |
| Revision | 0 |
| Date | 12 FEB 2010 |

Figure 22.1D

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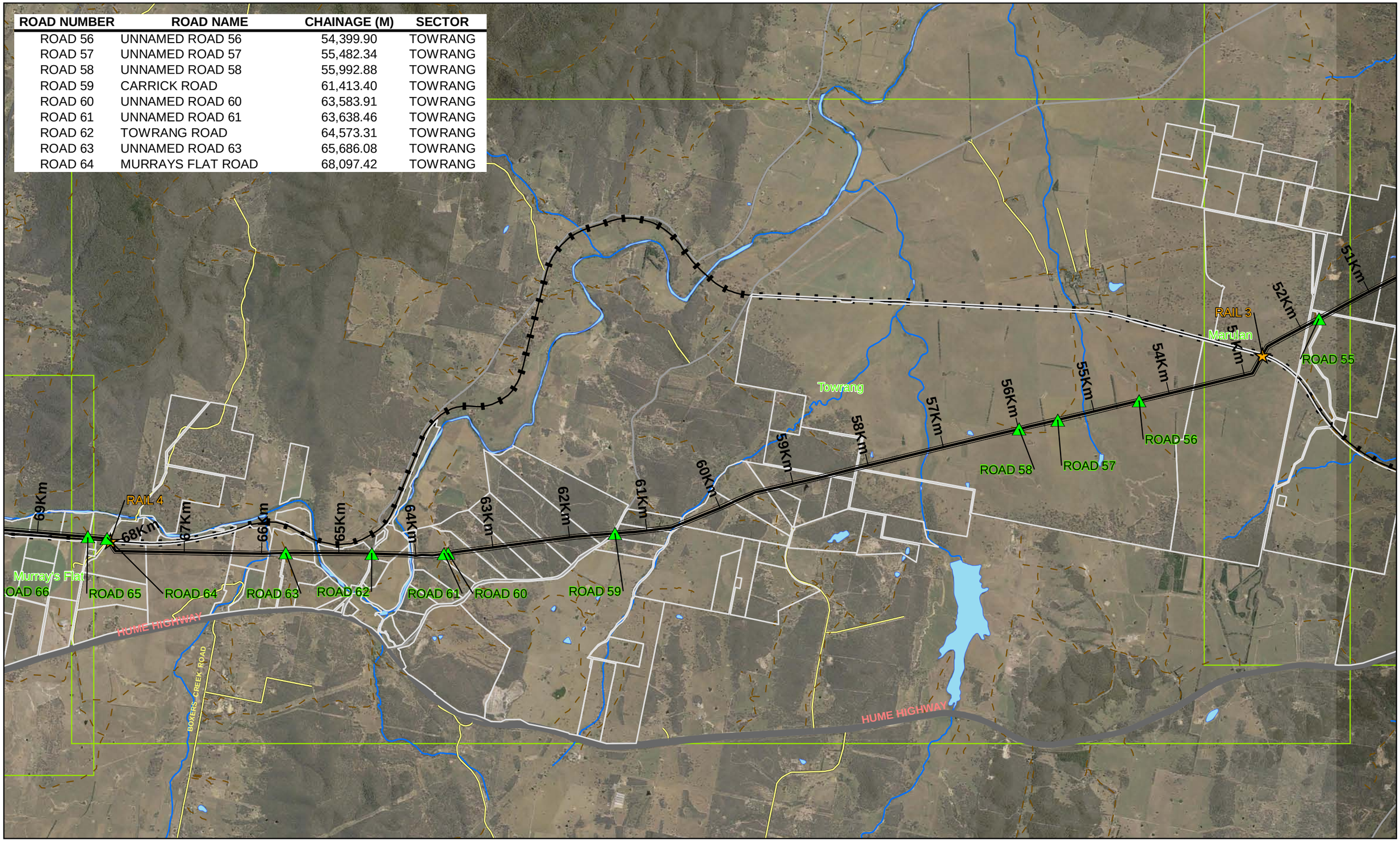
Data Source: NSW Lands Dept: roadsegments, railways,hydroarea, hydroline - 2007; GMC: aerial imagery - 2008; GMC/WSC: Cadastral data - 2009. Created by: ccharalambou

| ROAD NUMBER | ROAD NAME | CHAINAGE (M) | SECTOR |
|---|---|---|---|
| ROAD 56 | UNNAMED ROAD 56 | 54,399.90 | TOWRANG |
| ROAD 57 | UNNAMED ROAD 57 | 55,482.34 | TOWRANG |
| ROAD 58 | UNNAMED ROAD 58 | 55,992.88 | TOWRANG |
| ROAD 59 | CARRICK ROAD | 61,413.40 | TOWRANG |
| ROAD 60 | UNNAMED ROAD 60 | 63,583.91 | TOWRANG |
| ROAD 61 | UNNAMED ROAD 61 | 63,638.46 | TOWRANG |
| ROAD 62 | TOWRANG ROAD | 64,573.31 | TOWRANG |
| ROAD 63 | UNNAMED ROAD 63 | 65,686.08 | TOWRANG |
| ROAD 64 | MURRAYS FLAT ROAD | 68,097.42 | TOWRANG |

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 55

N

LEGEND

- Proposed Route (29/11/2009)
- Properties Intersected By Corridor
- Pipeline Road Intersections
- Pipeline Railway Intersection
- River/Creek
- Railways
- PrimaryRoad
- ArterialRoad
- SubArterialRoad
- LocalRoad
- Track-Vehicular
- UrbanServiceLane
- GMC / WSC LGA Boundary
- Sector boundary
- HydroArea

CLIENTS | PEOPLE | PERFORMANCE

Goulburn Mulwaree Council
Highlands Source Project

# Road network in the vicinity of the proposed pipeline Sector: Towrang

| | |
|---|---|
| Job Number | 23-13312 |
| Revision | 0 |
| Date | 12 FEB 2010 |

Figure 22.1E

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Data Source: NSW Lands Dept: roadsegments, railways,hydroarea, hydroline - 2007; GMC: aerial imagery - 2008; GMC/WSC: Cadastral data - 2009. Created by: ccharalambou

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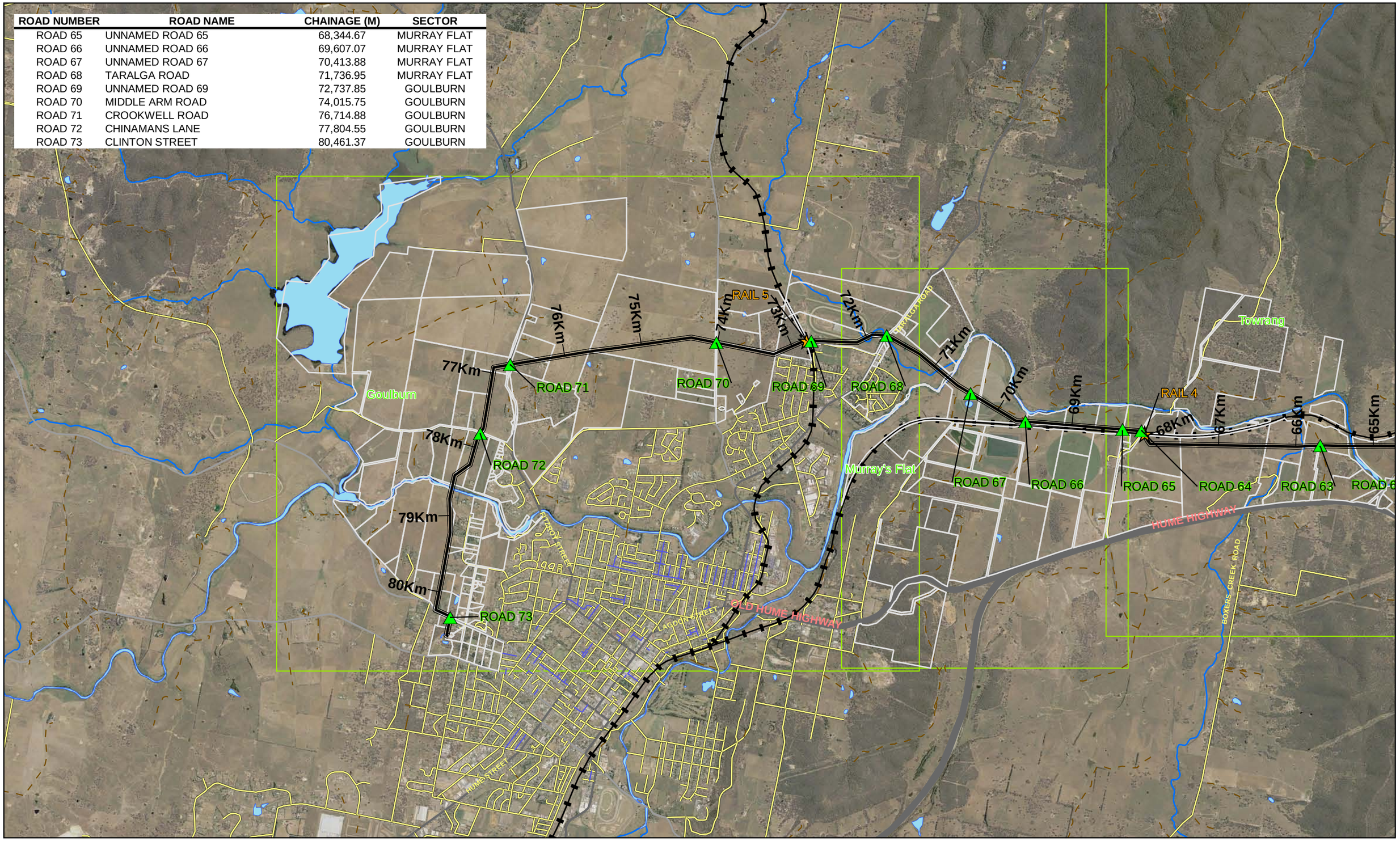
| ROAD NUMBER | ROAD NAME | CHAINAGE (M) | SECTOR |
|---|---|---|---|
| ROAD 65 | UNNAMED ROAD 65 | 68,344.67 | MURRAY FLAT |
| ROAD 66 | UNNAMED ROAD 66 | 69,607.07 | MURRAY FLAT |
| ROAD 67 | UNNAMED ROAD 67 | 70,413.88 | MURRAY FLAT |
| ROAD 68 | TARALGA ROAD | 71,736.95 | MURRAY FLAT |
| ROAD 69 | UNNAMED ROAD 69 | 72,737.85 | GOULBURN |
| ROAD 70 | MIDDLE ARM ROAD | 74,015.75 | GOULBURN |
| ROAD 71 | CROOKWELL ROAD | 76,714.88 | GOULBURN |
| ROAD 72 | CHINAMANS LANE | 77,804.55 | GOULBURN |
| ROAD 73 | CLINTON STREET | 80,461.37 | GOULBURN |

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 55

N

LEGEND

- Proposed Route (29/11/2009)
- Properties Intersected By Corridor
- Pipeline Road Intersections
- Pipeline Railway Intersection
- River/Creek
- Railways
- PrimaryRoad
- ArterialRoad
- SubArterialRoad
- LocalRoad
- Track-Vehicular
- UrbanServiceLane
- GMC / WSC LGA Boundary
- Sector boundary
- HydroArea

CLIENTS | PEOPLE | PERFORMANCE

Goulburn Mulwaree Council
Highlands Source Project

Road network in the vicinity of the proposed pipeline
Sector: Goulburn-Murrays Flat

Figure 22.1F

| | |
|---|---|
| Job Number | 23-13312 |
| Revision | 0 |
| Date | 12 FEB 2010 |

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Data Source: NSW Lands Dept: roadsegments, railways,hydroarea, hydroline - 2007; GMC: aerial imagery - 2008; GMC/WSC: Cadastral data - 2009. Created by: ccharalambou

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### 22.2.2 Traffic flows

***State Roads***

Traffic data was obtained from the RTA. These counts were available for different years and are presented in AADT. It should be noted that for the road sections with multiple count sites, the highest AADT volume is presented in Table 22.5 below so as to represent the worst-case volumes along the road section.

For the purpose of this assessment, the traffic volumes were estimated for 2009 using a growth rate of three per cent per annum. This growth rate was calculated as an indicative average growth rate based on historical traffic data for relevant RTA road sections near the project site. The calculated growth rates varied from 1.8 per cent to 5.3 per cent per annum from 2000 to 2003.

**Table 22.5 AADT Volume on State-Controlled Roads**

| Sector | Road /Street | Road width | Lanes | AADT | Date of Count | Estimated 2009 Volumes (Growth rate at 3% per annum) |
|---|---|---|---|---|---|---|
| Goulburn | Crookwell Road | 7.00 | 2 | 1,700 | 2006 | 1,858 |
| Murrays Flat | Hume Highway | 7.20 | 4 | 20,918 | 2006 | 22,858 |
| Sutton Forest | Hume Highway (south of Illawarra Highway) | 15.6 | 4 | 20,250 | 2003 | 24,180 |
| Glenquarry | Illawarra Highway (west of Sheepwash Road) | 7.40 | 2 | 3,416 | 2003 | 4,079 |
| | Sheepwash Rd (north of Kangaloon Road) | 7.60 | 2 | 4,007 | 2003 | 4,785 |

***Local Council Roads***

Traffic count data for the local roads were also requested from GMC and Wingecarribee Shire Council. Very few of the local roads had traffic count data. A review of the data revealed that the volumes recorded from the previous counts generally indicate very low traffic levels mostly under 1 000 vehicles per day with a few number of count sites registering more than 1 000 vehicles per day (Table 22.6). It is assumed that the majority of the unnamed local roads manifest low traffic levels and can be generally used for access to the pipeline construction area.

**Table 22.6 AADT Volume on Local Council Roads**

| Sector | Road Section | Road width (m) | No of Lanes | AADT | Date of Count | Estimated 2009 Volumes (Growth rate at 3% per annum) |
|---|---|---|---|---|---|---|
| Glenquarry | Iona Park Road (north of Illawarra Hway) | 5.30 | 1 | 115 | 1991 | 196 |
| Werai Moss Vale | Yarrawa Rd (east of Mt Broughton Road) | 5.60 | 2 | 1193 | 2009 | 1,193 |
| | Mt Broughton Road (north of Bibby's Lane) | 7.40 | 2 | 1768 | 1993 | 2,837 |
| | Bibbys Lane | 4.20 | 1 | NDA | | |
| Sutton Forest | Old Argyle Rd (north of Sally's Corner Road) | 5.20 | 2 | 200 | 1995 | 303 |
| | Sally's corner Rd (west of Old Argyle Road) | 7.40 | 2 | 616 | 1995 | 932 |
| | Nowra Road (south of Avoca Fire Station) | 7.40 | 2 | 1242 | 2005 | 1,398 |
| Paddys River | Wollumbi Road | 5.10 | 1 | 18 | 2004 | 21 |
| | Inverary Road (near Canyonleigh Road) | 5.80 | 2 | 25 | 1993 | 40 |
| Marulan | Brayton Road 5km from village | 7.50 | 2 | 266 | 2003 | 318 |
| | Red Hills rd 1 | 6.20 | 2 | 53 | 2003 | 63 |
| | Red Hills (near Nowra Road) | 6.70 | 2 | 47 | 2003 | 56 |
| Murrays Flt | Murrays Flat Rd | 15.6 | 2 | 43 | 2004 | 50 |
| | Towrang Road | 5.60 | 2 | 349 | 2006 | 381 |
| | Carrick Road | 6.70 | 2 | 157 | 2006 | 172 |
| Goulburn | Clinton Street | 7.80 | 2 | NDA | | |
| | Chinaman's lane | 5.70 | 2 | 282 | 2006 | 308 |
| | Middlearm Road | 6.30 | 2 | 747 | 2006 | 816 |
| | Taralga Road | 7.60 | 2 | 1060 | 2005 | 1,193 |

NDA: No data available

### 22.2.3 Existing level of service for two-lane two-way rural roads

It is noted that the majority of the key access routes to the project site are two-lane two-way rural roads (one lane per direction), with the exception of the road sections on the state highways that lead into the major urban centres. The AUSTROADS *Guide to Traffic Engineering Practice - Part 2: Roadway Capacity* (AUSTROADS Guide) defines level of service as a qualitative measure describing operational conditions within a traffic stream. The term Level of Service (LOS) and its characteristics for rural roads is defined in Table 22.7.

**Table 22.7 Level of Service (LOS) for Rural Roads**

| LOS | Description | AADT | Description |
|---|---|---|---|
| A | Free, unrestricted flow | 1,100 | Very good |
| B | Mostly free flow, few disruptions | 2,800 | Very good |
| C | Stable flow | 5,200 | Good |
| D | Mostly stable flow, some delays | 8,000 | Acceptable |
| E | Congested flow, delays common | 14,800 | Bad |
| F | Forced flow | n/a | Bad |

Source: AUSTROADS Guide to Traffic Engineering Practice Part 2: Roadway Capacity

The volume and composition of traffic on a given road determines the level of interaction between vehicles and is measured as its LOS. For a particular roadway capacity, LOS deteriorates with increasing traffic volumes. LOS A, LOS B and LOS C in a rural context are all satisfactory. LOS D can be satisfactory in some circumstances.

The AUSTROADS Guide further indicates that two-lane rural highways have a capacity of 2,800 passenger cars per hour total for both directions of flow (1 400 passenger cars per hour per direction), under ideal conditions where there are no restrictive roadway, terrain or traffic conditions.

In cases where traffic, terrain or geometric data may not be precisely known, the AUSTROADS Guide provides planning guidance on maximum AADT values that two-lane, two-way rural roads can accommodate under various terrain conditions.

Table 22.8 shows the values for various LOS for a rural road in level terrain, with varying ratios of design hour volume to AADT[9].

**Table 22.8 Maximum AADTs for Various Levels of Service on Two-Lane Two-Way Rural Roads on Level Terrain, vehicles per day**

| Ratio of Design Hour Volume to AADT | Level of Service (LoS) | | | | |
|---|---|---|---|---|---|
| | A | B | C | D | E |
| 0.10 | 2,400 | 4,800 | 7,900 | 13,500 | 22,900 |
| 0.11 | 2,200 | 4,400 | 7,200 | 12,200 | 20,800 |

[9] Design hour volumes are usually taken to be the peak hour volumes

| | Level of Service (LoS) | | | | |
|---|---|---|---|---|---|
| 0.12 | 2,000 | 4,000 | 6,600 | 11,200 | 19,000 |
| 0.13 | 1,900 | 3,700 | 6,100 | 10,400 | 17,600 |
| 0.14 | 1,700 | 3,400 | 5,700 | 9,600 | 16,300 |
| 0.15 | 1,600 | 3,200 | 5,300 | 9,000 | 15,200 |

Notes: All values rounded to the nearest 100 vehicles per day. Assumed conditions include 60/40 directional split, 14 % trucks, 4 percent buses. Percentages of length with no overtaking for level terrain is 20%.

Source: AUSTROADS Guide to Traffic Engineering Practice, Part 2: Roadway Capacity, Table 3.9, from TRB Highway Capacity Manual (1985) Table 8.10.

The information provided in Table 22.8 indicates that the capacity of the key roads in the vicinity of the project site study area can theoretically achieve an AADT level of 4,800 vehicles per day at LOS B, or 7,900 vpd at LOS C, and 13,500 vpd at LOS D[10] for a design hour ratio of 10 per cent.

Comparing these values with the existing AADT levels along the key state roads indicates that the roadways have spare capacity and are still be able to accommodate additional traffic.

### 22.2.4 Traffic safety

A review of the crash statistics for the Hume Highway and the Illawarra Highway has been undertaken for the five year period 2003 to 2007. A summary of the crash database is provided in the Traffic and Transport Assessment provided in Appendix O. The data has been summarised in Table 22.9 to identify the types of accidents, location, speed environment, degree of crash and the total number of accidents recorded by year. It should be noted that existing accident rates are merely indicators of safety and provides information to determine if further investigation of the safety potential is required.

Performance standards for traffic safety improvements are not easily defined. However, for the purpose of providing an indicative measure, this assessment considers the casualty rate per kilometre per year.

Table 22.9 shows that the casualty crashes per kilometre per year for the Illawarra Highway exceed the network average for the road class. This would indicate that further safety considerations would need to be in place to ensure that the performance of the road in terms of safety efficiency is not impacted by the additional traffic associated with the proposed pipeline.

**Table 22.9 Performance Measure of State Roads**

| Road | Road Class[1] | Network Class Average Index (2001-2005)[2] Casualty Crashes/km/year | Total Casualty Accidents (2003-2007) | Road Length Assessed (km) | Recorded Index (2003-2007) Casualty Crashes/km/year |
|---|---|---|---|---|---|
| Hume Highway | 4R | 0.40 | 288 | 165 | 0.35 |
| Illawarra Highway | 3R | 0.37 | 104 | 38 | 0.55 |

[10] See Traffic and Transport Assessment Appendix O for a discussion on Level of Service as used in traffic studies.

[1] RTA Road Network Management Hierarchy

[2] RTA Network and Corridor Planning Practice Notes, Table 4.4, p 29

## 22.3 Impact Assessment

The potential for impacts to traffic and transport would mainly occur during the construction period.

### 22.3.1 Construction traffic generated

During the construction period, there would be a range of construction activities that would affect traffic operating conditions on roads in the area.

The main traffic generated through the construction phase would be from equipment and material deliveries, such as:

- Line pipe supply distribution;
- Construction plant and equipment;
- Camps, workshops and facilities;
- Bedding sand;
- Minor construction materials and consumables; and
- Movement of construction personnel, including contractors, site labour force and specialist supervisory personnel.

***Light Vehicle Traffic***

Light vehicle traffic is expected to use the key RTA roads as the primary access. Light vehicle traffic would be generated by:

- Workforce attendance of approximately 120 personnel on an ordinary hour shift;
- Workforce attendance of 50 personnel on night and weekend shifts (where and when necessary);
- Trades vehicles attending the site for light fabrication and equipment servicing;
- Ambulance and emergency services.

Over the full construction period, the peak construction workforce is estimated to be approximately 190 persons (140 on day shift and an estimated 50 on night shift basis). There are expected to be four teams on site concurrently, with each team consisting of approximately 20-30 personnel.

The construction workforce would be accommodated in Goulburn or Moss Vale depending on which end they are working on. The location of site offices would be determined and arranged by the Construction Contractor. Possible locations would include Marulan, Goulburn, Moss Vale or Exeter. Assuming a worst case scenario where all staff may come from a single accommodation camp, it is estimated that 48 light vehicles (96 vehicle movements for both directions) would be utilised to transport the staff.

A further 20 vehicles are expected to use the local road network to transport supervisory workforce and Principal's personnel. These vehicles will generally traverse the construction corridor when on-site.

***Heavy Vehicle Traffic***

Various machinery types would be necessary for construction of the pipeline. Heavy vehicles that would most likely be required at the construction site are as follows:

- Standard 19 m trucks or extendable tri-axle trailers and where permissible, B-Double transports, to transport pipes to the site;
- Tipper trucks, to transport bedding sand on-site and excavated burden over of the rehabilitation zone;
- Cranes to lift the pipe sections (from truck to ground or from ground into position);
- Excavation machinery;
- Pipe-laying bulldozer (side-boom); and,
- Equipment for directional drilling and horizontal boring.

The tipper trucks and the standard trucks are expected to be travelling along the road corridor aside from the vehicles used by the construction personnel. The crane, excavator, pipe-laying bulldozer, drilling and boring machinery would be brought to site but may be stationary in areas where work is being undertaken and transferred between sites along the construction corridor for the duration of the construction.

*Construction plant and equipment* – Construction plant and equipment will be delivered at one end of the pipeline section with intermediate travel being along the pipeline alignment with the intent that the work crew would demobilise them from the other end.

*Pipe supply delivery* – Pipe deliveries for the project would potentially be coming from Sydney, Melbourne, Adelaide or Brisbane. This would be determined once tenders have been awarded for the supply of pipes and the construction of the pipeline and associated works. Pipes would be delivered to laydown areas, to be negotiated directly with landowners. A large percentage of the pipeline would be aligned immediately adjacent to an existing 25 m wide gas pipeline easement. This easement is totally cleared and access would be available on one side of this corridor. It is anticipated that a maximum of six vehicles per day per direction (12 movements for both directions) over a five day week will be associated with line pipe delivery spread over the 83 km length for a period of six months.

*Delivery of backfill material* – It is anticipated that the type of pipeline would require imported sand bedding and surround for the pipeline. Although in some areas the natural materials may be found suitable, the worst case scenario would be that a total of 40 000 $m^3$ of imported backfill material would be required. This translates to approximately 482 $m^3$ per kilometre or 60 small trucks (30 large trucks) per kilometre of pipeline. Assuming a delivery rate of 482 $m^3$ per five day week, this translates to 60 small trucks per day (120 truck movements per day for both directions) or 30 large trucks per day (60 truck movements per day for both directions) across the 83 km pipeline route.

### 22.3.2 Impact of construction traffic on access routes

Table 22.10 summarises the estimated heavy and light vehicle construction traffic generated during the construction phase of the project. The estimated number of total vehicle movements provided is a worst-case scenario. Further information relating the calculation of vehicles movements is provided in the Traffic and Transport Assessment (Appendix O).

**Table 22.10 Estimated total vehicle movements (likely worst-case scenario)**

| Vehicle Movements | Daily (vehicles per day, both directions) | Peak Hour (vehicles per hour, both directions) |
|---|---|---|
| Light vehicle movements by staff and supervisory personnel | 136 | 28 |
| Heavy vehicle movements for pipe delivery | 12 | 12 |
| Heavy vehicle movements for deliveries of backfill material. | 120[a] | 30 |
| Total | 268 | 70 |

[a] If larger trucks (16 cu m. capacity) are used, the number of trucks may be reduced to half.

Table 22.11 and Table 22.12 present the impact of the additional light and heavy traffic movements on the key State roads and Local Council roads and the anticipated level of service assuming worst-case scenario. In totality, this additional volume is unlikely to impact on the existing road network operations as it is expected to have spare capacity beyond this additional volume. As many of the activities would occur at different times, an estimate of the peak heavy vehicle traffic movements was made. This is based on a worst case scenario.

**Table 22.11 Impact of additional traffic movements on the State roads**

| Road Name | Estimated 2009 ADT | Peak Hour Volume[1] | Existing Level of Service[2] | Future ADT[3] | Future Peak Hour Volume[3] | Level of Service |
|---|---|---|---|---|---|---|
| Crookwell Road | 1,858 | 186 | A | 2,126 | 283 | A |
| Hume Highway | 22,858 | 2,290 | B | 23,126 | 2,382 | B |
| Hume Highway (south of Illawarra Highway) | 24,180 | 2,420 | B | 24,416 | 2,510 | B |
| Illawarra Highway (west of Sheepwash Road) | 4,079 | 408 | A | 4,315 | 500 | A |

Notes:

[1] 10% is assumed percentage since data was not available

[2] Based on Capacity of 1,400 vehicles per lane per hour

[3] Assuming worst case scenario where all traffic generated by the pipeline will use the road

**Table 22.12 Impact of constriction traffic movements on the Local Council roads**

| Road Name | Estimated 2009 ADDT | Peak Hour Volume[1] | Existing Level of Service[2] | Construction ADDT[3] | Construction Peak Hour Volume[3] | Construction Level of Service |
|---|---|---|---|---|---|---|
| Chinaman's lane | 308 | 30 | A | 576 | 60 | A |
| Middlearm Road | 816 | 80 | A | 1,084 | 110 | A |
| Taralga Road | 1,193 | 120 | A | 1,461 | 150 | A |
| Murrays Flat Rd | 50 | 5 | A | 318 | 32 | A |
| Towrang Road | 381 | 38 | A | 649 | 65 | A |
| Carrick Road | 172 | 17 | A | 440 | 44 | A |
| Brayton Road 5 km from village | 318 | 32 | A | 586 | 59 | A |
| Red Hills Road 1 | 63 | 6 | A | 331 | 33 | A |
| Red Hills (near Nowra Road) | 56 | 6 | A | 324 | 32 | A |
| Wollumbi Road | 21 | 2 | A | 289 | 29 | A |
| Inverary Road (near Canyonleigh Road) | 40 | 4 | A | 308 | 31 | A |
| Old Argyle Rd (north of Sally's Corner Road) | 303 | 30 | A | 571 | 57 | A |
| Sally's corner Rd (west of Old Argyle Road) | 932 | 93 | A | 1,200 | 120 | A |
| Nowra Road (south of Avoca Fire Station) | 1,398 | 140 | A | 1,666 | 167 | A |
| Yarrawa Rd (east of Mt Broughton Road) | 1,193 | 120 | A | 1,461 | 146 | A |
| Mt Broughton Road (north of Bibby's Lane) | 2,837 | 284 | A | 3,105 | 310 | A |
| Iona Park Road (north of Illawarra Hway) | 196 | 20 | A | 464 | 46 | A |

[1] 10% is assumed percentage since data was not available

[2] Based on Capacity of 1,400 vehicles per lane per hour

[3] Assuming worst case scenario where all traffic generated by the pipeline will use the road

### 22.3.3 Road crossings

The pipeline route would cross road corridors at 68 locations along the pipeline route including the Hume Highway and the Illawarra Highway. Chapter 6; Project Description details the pipeline road crossings and proposed crossing methods.

***State roads***

All RTA controlled roads would be crossed by thrust boring under the road corridor which would cause minimal disruption to traffic. The RTA does not permit the closure of lanes on the Hume Highway between the hours of 6:00am and 7:00pm, and as such, any activity requiring work on the road would have to be done at night. Where thrust boring is used, there is normally a requirement for the bore head to be followed across the road. If this is the case then full traffic control would be required for this activity outside the hours noted above. The impact to traffic on the Hume Highway would therefore be negligible between the hours of 6:00am and 7:00pm while some disturbance to traffic through lane closures and the likely reduction of speed limits would occur during night time thrust boring activities. It is expected that underboring activities would take no longer than three weeks to complete, thus a short term impact to traffic on the Hume Highway could occur.

***Local roads***

It is expected that the majority of local roads would be crossed by open trenching, as this is the most economical and time efficient method. As such, temporary single lane road closures may be required while trenching and pipe laying and reinstatement occurs. It is intended that local roads would be open to traffic outside construction hours. It is proposed that trenching be employed on roads carrying low traffic flows and as such it is expected that minimal delays would be experienced by local road users.

Consultation with Council would occur prior to construction commencing across local roads. A traffic management plan would be developed detailed proposed lane or road closures and traffic management techniques.

### 22.3.4 Impact on road pavement

The RTA must approve a road occupancy license before work can be undertaken within the road reserve of any State controlled roads. This includes the Hume Highway and the Illawarra Highway as well as other State controlled arterial roads. The RTA requires that the pits for bores 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 entry and exit holes. Other RTA specifications include the required depth of underboring and trenching and the required setbacks of the road edge line such that the road surface and underlying sub-grade material is not damaged by the works undertaken. It is therefore expected that minimal disturbance to the road surfaces would occur on State controlled roads.

### 22.3.5 Property access impacts

The pipeline would cross a number of property accesses. Detours would be set up at these locations to ensure that access is maintained. Where possible, all property access crossings would be completed in one day, with any open trenches covered overnight.

### 22.3.6 Impact on railway infrastructure and public transport

***Railway crossings***

The pipeline corridor would cross the Main Southern Railway three times as well as the Goulburn Crookwell Railway and the Moss Vale Unanderra Railway. Construction in the vicinity of the railway line would be undertaken by thrust boring which involves excavating an entry and exit point either side of the railway line and boring under the railway line to install the pipeline. AS 4799-2000 *Installation of underground utility services and pipelines within railway boundaries* (Accessed 21 December 2009) describes the procedures for undertaking railway crossings and other work within the rail corridor.

ARTC have guidelines relating to work undertaken within the rail corridor. The main impact would be from vehicles accessing the rail corridor during construction which could interfere with ARTC maintenance vehicles. Given that the guidelines would be strictly adhered to, the potential impact to the operation of the railway and the railway corridor would be minimal.

***School bus routes***

Access routes for the project may overlap with school bus routes. However, given the relatively low number of school bus services and the relatively short time of operation within the day, it is expected that there would be a minimal impact on the operation of the school bus routes. Any potential impacts would be addressed in detail when traffic management plans for construction are prepared.

***Impact on public transport routes***

The potential impact of the construction traffic on public transport operations would be addressed in detail when traffic management plans for construction are prepared. It is anticipated that construction access routes that coincide with public transport routes would be identified and special traffic management plans would be prepared to mitigate any potential impact on the public transport operation.

### 22.3.7 Operational phase

When the pipeline is operational, occasional access into the pipeline corridor would be required to conduct inspections and maintenance throughout the life of the pipeline. Traffic volumes associated with these activities are expected to be minimal.

However, where maintenance works coincide with road sections and safety requirements necessitate the closure of road lanes or temporary disruption to traffic, a special traffic management plan should be prepared in consultation with the RTA, the police and Councils' traffic management units/committees.

## 22.4 Summary of results

Potential impacts to traffic and transport would occur during the construction period. The volume and intensity of truck movements would increase over varying amounts during the 8 to 10 month construction period. The additional construction traffic due to the project can be adequately accommodated on the Hume Highway, the Illawarra Highway, regional and local Council roads at acceptable levels of service. However, there is likely to be disruption to traffic where the pipeline crosses roads by open trenching resulting in possible single lane closures and temporary speed reductions on some roads. Thrust boring techniques used under State controlled roads is likely to cause minimal impact to traffic during daytime hours; however temporary lane closures and speed reductions may be required during night work undertaken.

The delivery of materials and equipment that would be spread over the construction period can be arranged to minimise impact on the local community. As most of the construction activity will be confined within the pipeline construction corridor, traffic movements within the corridor would need to be managed by the implementation of an appropriate traffic control plan. Arrangements would be made with property owners to ensure access to their properties is possible at all times.

## 22.5 Mitigation and management measures

The following mitigation measures apply to the construction phase of the project. As no impacts would be expected to result from operational traffic, mitigation measures are not required.

- A Traffic Management Plan (TMP) would be developed in consultation with the RTA, the police and the local Councils impacted. The TMP would detail:
  - Construction hours and protocols on State (RTA) controlled roads and local Council roads;
  - Heavy vehicle and construction warning signs to be installed on the Hume Highway and Illawarra Highway warning of trucks entering regional and local roads along the pipeline route developed in consultation with the RTA;
  - Management of construction traffic where traffic flow is affected by the construction pipeline and in particular at locations where the pipeline crosses the road or is located along and within the road reserve;
  - Review of speed restrictions along the affected road network and where necessary, additional signposting of speed limitations;
  - Installation of appropriate traffic control and warning signs for areas identified where potential safety risk issues exist;
  - Management of the transportation of construction materials to maximise vehicle loads to therefore minimise vehicle movements;
  - Installation of specific warning signs at local access roads to the construction corridor to warn existing road users of entering and exiting traffic;
  - Detours to be set up where the pipeline crosses property accesses. Where possible, all property access crossings would be completed in one day, with any open trenches covered overnight if required;
  - Distribution of day warning notices to advise local road users of scheduled construction activities;
  - Early warnings about road or lane closures;
  - Where practical provide details of internal and haulage access roads instead of public roads; and
  - Induction of truck and vehicle operators on the requirements of the TMP.
- Disruption to private property access would be minimised for the duration of the construction works and access would be restored and maintained at each property as soon as practicable as work moves along the pipeline corridor;
- Reinstatement of road surfaces to previous condition would occur where open cut trenching has occurred;
- Damage to roads where vehicles have been entering / exiting the pipeline construction easement would be repaired to the previous condition;

- Consultation with ARTC would be undertaken to ensure the timing of the works within the rail corridor minimises the impact to the use of the active rail lines; and
- Implementation of a community information and awareness program which would be initiated prior to construction commencing and continue throughout the entire construction period to ensure that local residents are fully aware of the construction activities, with particular regard to construction traffic issues. The awareness program shall identify communication protocols for community feedback on issues relating to construction vehicle driver behaviour and construction-related matters.