PART C
Euchareena Road Resource Recovery Centre

C.1 Project Description – Euchareena Road RRC

C.1.1 Introduction

This Section describes the site and proposed facilities and infrastructure for the Euchareena Road Site. The main activities that would be undertaken at the Euchareena Road Site would be:

- Receipt and landfilling of baled mixed residual waste generated from the municipal and C&I sector;
- Receipt and landfilling of consolidated C&I and C&D dry mixed waste;
- Receipt, shredding and processing (enclosed tunnel composting) of food/garden organics from the municipal and C&I sector;
- Progressive closure and remediation of the landfill site.

C.1.2 Site Description

The Euchareena Road RRC is proposed to be constructed on land, located approximately 44 km from Ophir Road RRC via the completed Northern Distributor Road (due for completion before the Project commencement) and 5 km northeast of Molong, as shown on Figure C.1-2. The Euchareena Road Site covers an area of 192.6 hectares and is located on Lot 10, DP 1034198, Parish of Copper Hill, County of Wellington. The Euchareena Road Site is bounded to the north by Shades Creek Road and to the east by Euchareena Road and is owned by Orange City Council.

The land on which the centre would be constructed is referred to throughout this Environmental Assessment as the 'Euchareena Road Site'. Figure C.1-1 displays the dimensions of the Euchareena Road Site.

The Euchareena Road Site was purchased by the Proponent on 31 January 2002 and was initially classified as 'Community Land' under the *Local Government Act 1993.* The land has since been reclassified as 'Operational Land', following resolution by Cabonne Council.

C.1.3 Project Site Layout and Design

Figure C.1-3 displays the conceptual Euchareena Road Site layout incorporating the following components. The reasons for locating each component in the area(s) nominated on Figure C.1-3 are incorporated for each component.

- **A site entrance and site access road** - the site entrance would be positioned at the point with optimum sight distance to both the north and south. The site access road would follow an alignment with optimum gradients. Both the site entrance and access road would be designed to meet requirements of the RTA (1999) Road Design Guide.
- **A landfill area** - the landfill area would be located where geotechnical testing has demonstrated there is a considerable thickness of low permeability clay.
- **An internal road network** - the internal road network would be positioned to minimise disturbance and provide direct access, wherever possible, between all site components.

- **A visual amenity bund and vegetation screens** - the northern visual bund would shield views of the Euchareena Road Site activities from Shades Creek Road. The proposed vegetation screens would, in time, provide further shielding of Euchareena Road Site activities.
- **A stock movement corridor** - the proposed stock movement corridor would provide a north-south access across the Euchareena Road (eastern) side of the Euchareena Road Site to enable local landholders to safely move stock and farm equipment outside the Euchareena Road reserve.
- **Two retained woodland areas and rehabilitation corridor** - the two woodland areas are recognised to have considerable ecological value given the ongoing removal of similar vegetation, this area will be further enhanced with plantings of whitebox. In addition, a rehabilitation corridor would be provided to ultimately join the two existing woodland areas and improve nature conservation across the site. Furthermore, diverse native flowering flora would be planted in other regions to increase the biodiversity and availability of nectar for foraging bees.
- **Areas planned for ongoing agricultural use** - areas not required for project-related activities or their ecological values would continue to be available for agricultural purposes.

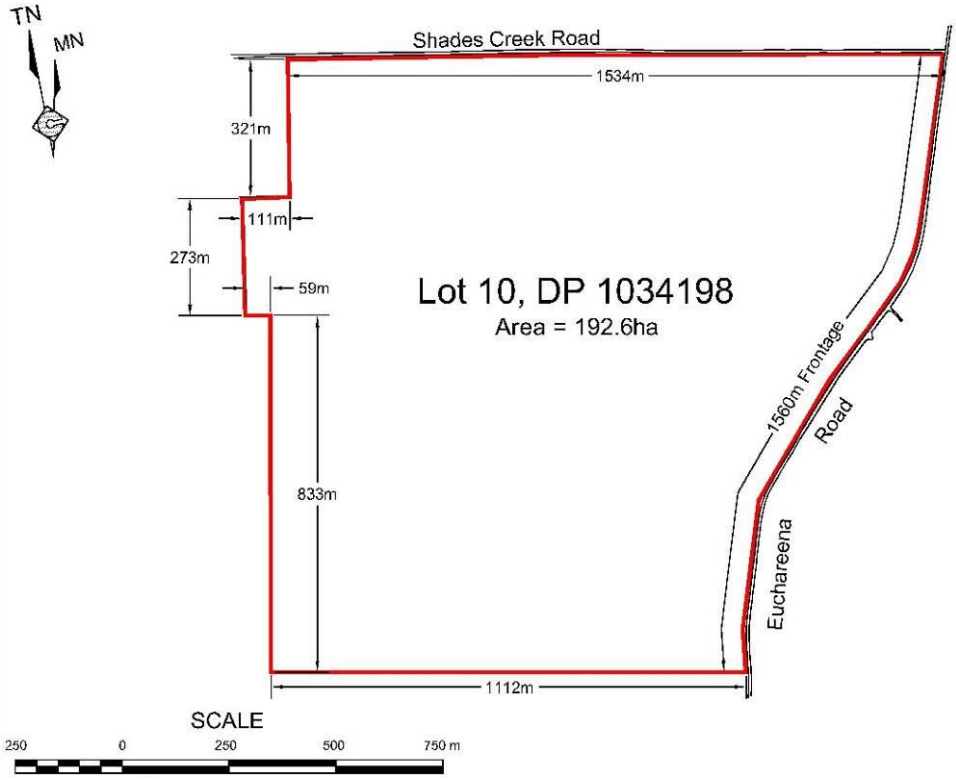


Figure C.1-1 The Euchareena Road Site

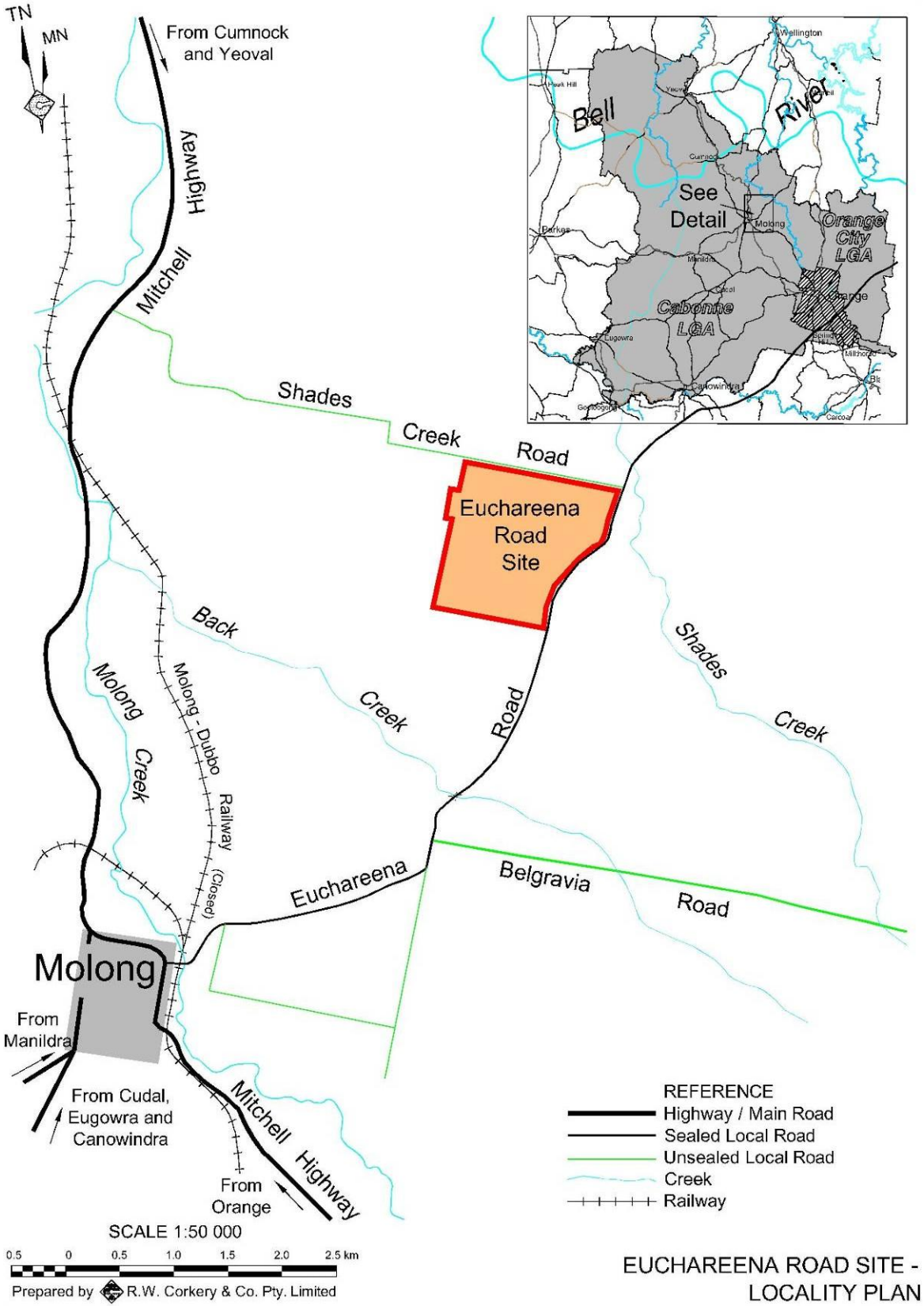


Figure C.1-2 Euchareena Road Site location

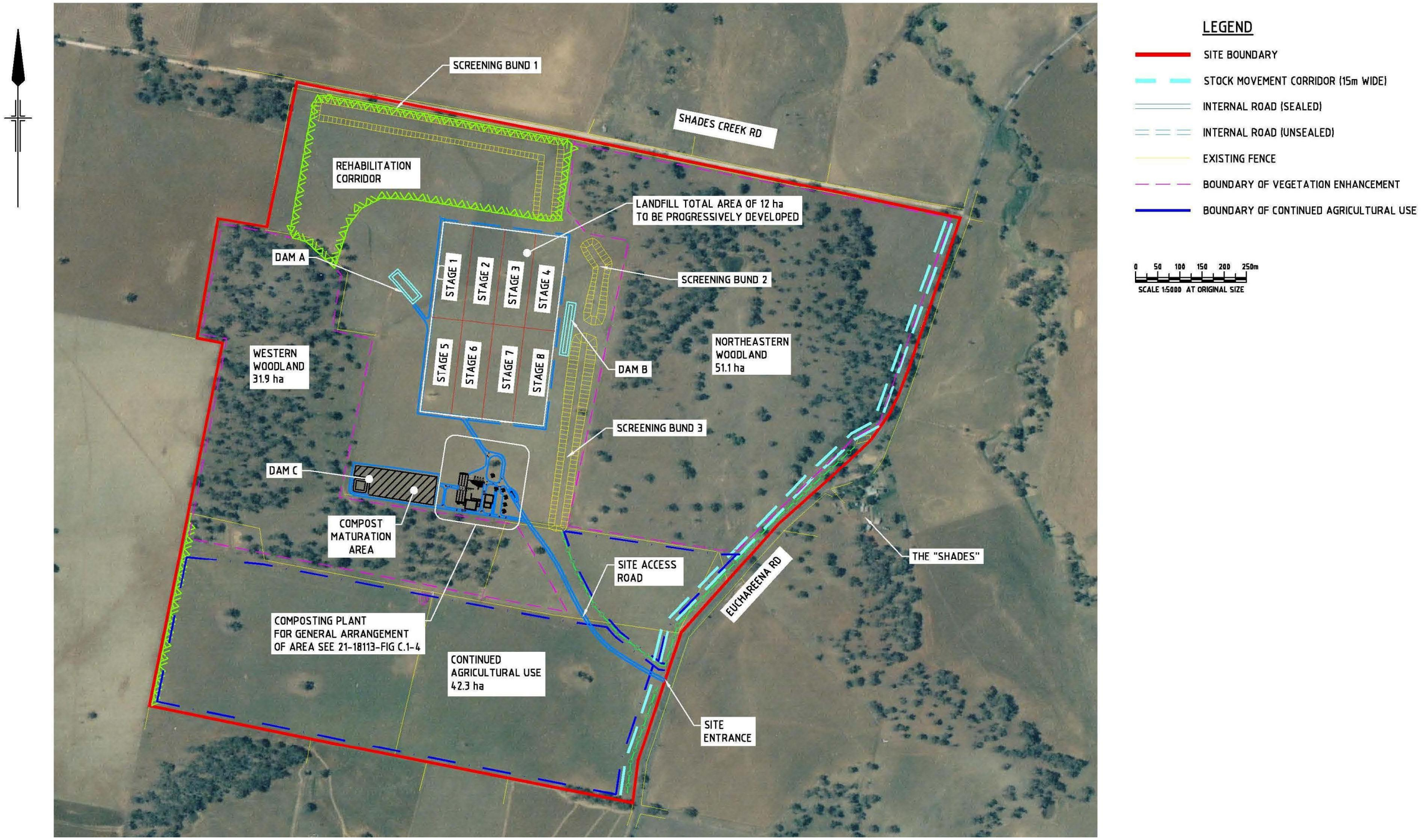


Figure C.1-3 Euchareena Road RRC conceptual site layout

C.1.4 Gatehouse, Weighbridge and Amenities

The gatehouse would comprise a small building measuring approximately 3 m wide by 9 m long, providing an office/service window for the gate staff, a kitchenette and amenities. Staff would not need to leave the building during the hours when vehicles are travelling across the weighbridge

A car park would be provided near the office for both the site workforce and visitors. The site weighbridge would be located adjacent to the site office. The weighbridge would be used by all traffic entering the facility with the weighbridge office supervised during opening hours to ensure all weights are recorded and screening undertaken, if required. Alternatively, an electronic card system may be utilised.

An amenities building would be located near the composting building, which would be used by most site staff. Also contained within this building would be an education centre for community and school groups.

Fuel storage (diesel only) would be located near the landfill area, off the access road. This would likely be a double skin diesel tank. A maintenance shed would be located to the north of the amenities building.

C.1.5 Enclosed Tunnel Composting Plant

The proposed enclosed tunnel composting plant would process food/garden organics and biosolids, to produce a high quality compost product that complies with Australian Standard AS 4454-1999 and Biosolid Guidelines Grade A for unrestricted use (contamination, pathogen level, vector attraction). This would be achieved through tunnel composting. Figure C.1-4 and Figure C.1-5 show a conceptual layout and elevation view of the enclosed tunnel composting plant. Final designs would be produced during the detailed design phase of the project.

The plant would include the following three processing units.

- Mechanical pre-treatment of food and garden organics and other organic solid wastes including physical contamination removal, shredding, mixing and homogenisation for subsequent composting of the raw material mix;
- Composting, using forced aeration and recirculation of liquids, for approximately 28 days, to produce a pasteurised and composted product; and
- Raw compost refinement and grading in accordance with market requirements for end product marketing and sale.

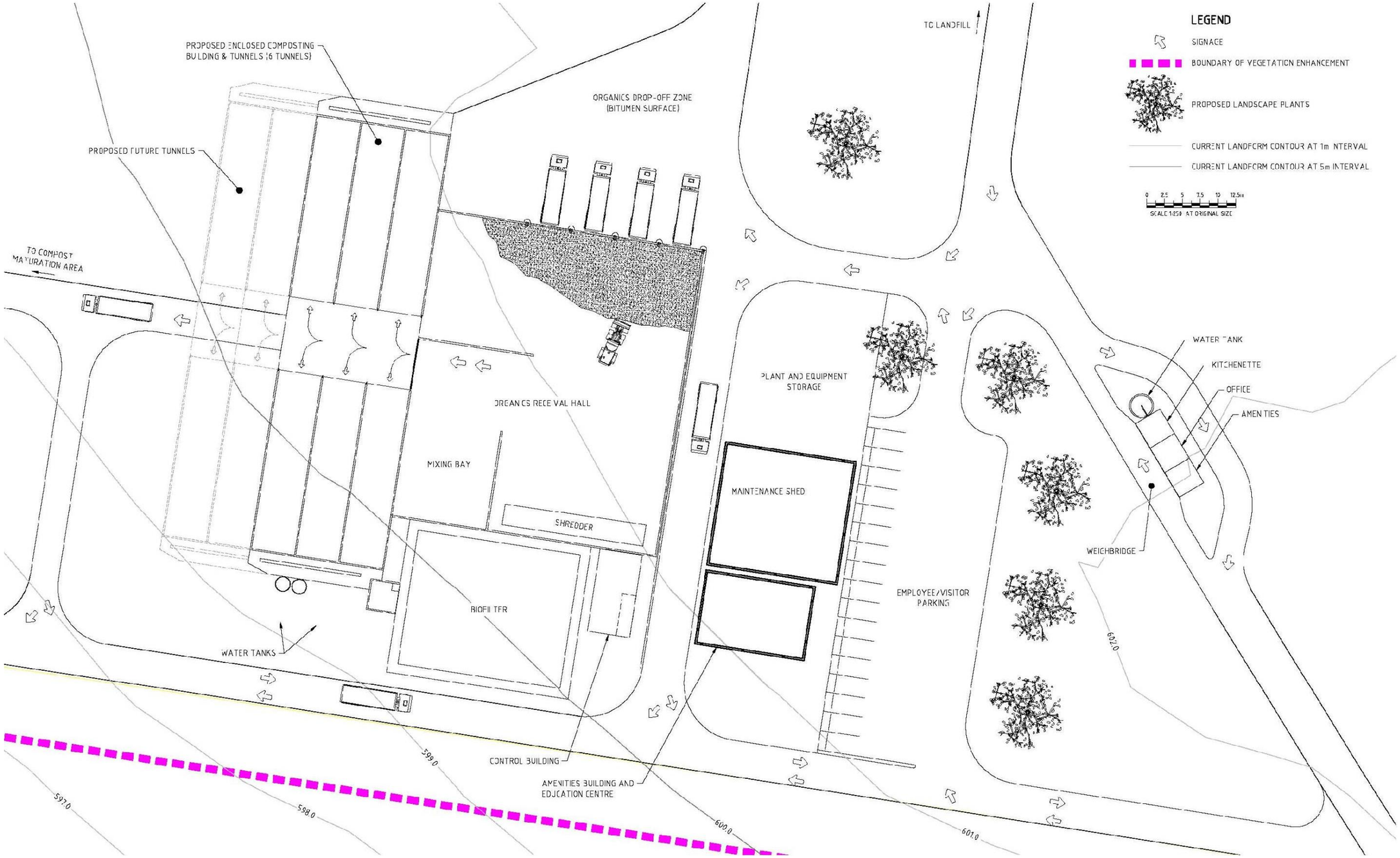


Figure C.1-4 Conceptual enclosed tunnel composting plant (plan)

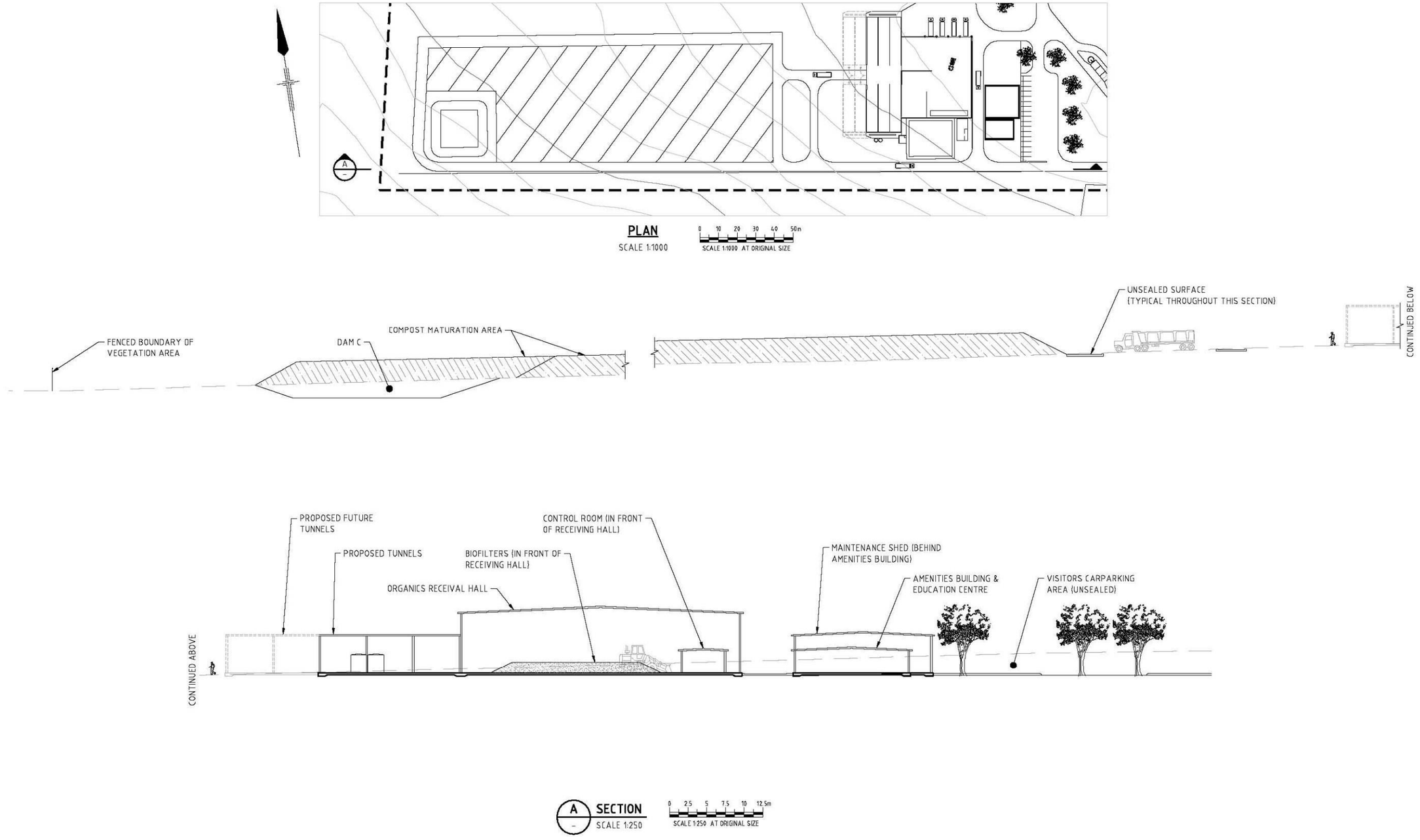


Figure C.1-5 Conceptual enclosed tunnel composting plant (elevations)

Photo C.1-1 Enclosed tunnel composting plant (overseas example)

Food and garden organics would be delivered to the receiving area of the tunnel composting building by compactor trucks that provide this dedicated service to residential and commercial customers. Each load would first be tipped onto a heavy-duty concrete tipping floor. This would enable it to be inspected for gross physical/visual contaminants, and these items removed before it is fed into the process.

A front-end loader would then push the screened waste into a dedicated storage bay or feed it into a de-compactor hopper. The de-compactor would break up lumps and even the material stream.

C.1.5.1 Waste receipt and shredding

Food and garden organics would then be fed into the feeding hopper of a low-speed shredder. The discharge conveyor would be fitted with a magnetic pulley to remove ferrous items from the shredded material (nails etc).

C.1.5.2 Composting plant

A tunnel composting plant, the simplest type of enclosed composting system, comprises a number of tunnels of approximately 25-30 m in length by 6 m wide by 5 m high. Photo C.1-2 shows the inside of a compost tunnel. Each tunnel would be self-operating and would comprise an air ducting system, blowers, process water collection and recycling systems, and various process control features (temperature, pressure, etc.).

During the composting process, which lasts approximately 28 days, the door would be locked hermetically to contain any odour and leachate and to prevent access by bees. Each tunnel would be equipped with a fan, which blows a mixture of fresh air and recycled air through the trenches into the tunnel (refer Photo C.1-3 which shows compost being aerated). At the same time, surplus exhaust air would be discharged to the deodorisation stage (biofilter, refer Section C.1.5.4).

Leachate from the tunnels would drain into a sealed process water tank, which would also connect to the biofilter / humidifier unit. The process water would then be collected and recycled back into the composting process to establish and / or maintain the desired material moisture content.

Photo C.1-2 Compost tunnel (example)

Photo C.1-3 Aeration of compost (example)

C.1.5.3 Maturation pads and controls

Compost produced in the composting tunnels generally needs to be matured for at least 6-8 weeks. This would be undertaken outdoors on a sealed maturation pad. This would prevent any leachate from the compost infiltrating into the surrounding soils. Runoff from this area would be controlled through grading and bunds and the water would be collected in a dedicated pond to the west of the maturation area and recirculated onto the compost.

Photo C.1-4 shows an example of compost being removed from tunnels after completion of a tunnel composting process.

Photo C.1-4 Unloading of compost from tunnels at Remondis Plant, Port Macquarie

After the compost has matured sufficiently, it would be blended with sands and topsoils to produce a range of high quality compost products for garden, landscape, and agriculture applications as identified in a (commercial-in-confidence) product market strategy developed for the Proponent. The product market strategy identified promising opportunities for potential products including compost product classified as Grade A and meeting AS 4454 -1999, suitable for unrestricted land application, and

landscaping soil mix comprising blended VENM and Grade A/AS 4454 compost mixed in a range of possible ratios for various applications. This product would then be direct sold to commercial landscapers and transported across the region and to other regional landfills for sale through bunded areas. Some would be transported to Ophir Road RRC for packaging for sale and distribution

C.1.5.4 Odour control

The main odour-generating activities (accelerated decomposition of a mixture of food / garden organics and biosolids) would be fully contained within the multiple concrete tunnels. This would ensure a high degree of emission control for odour, and minimum exposure of workers to this environment.

The odorous air from tunnels would be discharged to the environment through a large biofilter, which would reduce its odour level significantly, and ensure that the plant does not have an adverse impact on surrounding residents. Photo C.1-5 shows a typical tunnel composting air supply system and Photo C.1-6 shows a typical biofilter.

Photo C.1-5 Tunnel composting air supply system (example)

Photo C.1-6 Biofilter (example)

C.1.6 Landfill

C.1.6.1 Waste to be landfilled

The Euchareena Road RRC landfill would receive the following materials:

- Baled solid waste (primarily domestic solid waste and commercial and industrial waste);
- Non-baled solid waste (primarily bulky municipal and commercial and industrial waste and construction and demolition waste); and
- Virgin excavated natural material (VENM) for use as landfill daily cover and capping, and for blending with compost to produce soil products.

The waste would be come from the Orange LGA via the Ophir Road RRC and directly from the surrounding region as illustrated in Figure A.3-4 (page A.3-19).

The majority (approximately 60%) of waste landfilled at the Euchareena Road Site would be baled. This would be wrapped or enclosed during active bee periods, to minimise the risk to local apiary activities (see Section C.4.6 for more details). Only non-putrescible bulky waste not posing a risk to the local

apiary activities would be able to be landfilled in an unbaled state at the Euchareena Road RRC landfill. For example, used bee hives and other apiary industry waste would be banned for disposal at both Ophir Road and Euchareena Road RRC sites. Only if received as orphan waste (waste dumped by the roadside), would bee related materials be landfilled at the Ophir Road RRC, which has some long-term provision for special wastes.

The quantity of waste landfilled at the Euchareena Road RRC landfill would be dependent on the success of Orange's Waste Management Strategy (see Section A.3), the quantity of waste received from the region, and future local / regional development and population growth. When the Euchareena Road RRC opens in 2014 (see Section A.3.9), it is estimated that up to 45,000 t of waste could be landfilled at the site per annum (approximately 30,000 t from Orange and 15,000 t/yr from the region) (assuming an average 0.8% p.a. annual growth in waste quantities). This may increase or decrease over time for the reasons given previously. The design capacity of the landfill is approximately 1.5 million m^3 of waste, which equates to 1.5 million t of waste (at a density of 1.0 t/m^3 of landfill airspace). The final landform of the landfill is described in Section C.1.11.3.

C.1.6.2 Landfill layout and staging

The landfill would be constructed using a cellular system to enable the gradual development of the landfill site, minimising the active footprint of the landfill and consequently minimising any potential impacts on the environment, and allowing progressive rehabilitation throughout the life of the landfill. There would be eight landfill cells, rectangular in shape and measuring approximately 215 m x 70 m. Figure C.1-6 displays the indicative landfill layout and proposed stages.

The initial landfill cell (Stage 1) would be constructed in the northwestern corner of the landfill and would involve construction of the following:

- The stormwater drainage works, as shown on Figure C.1-7 (page C.1-15), including installation of appropriate erosion and sediment control measures;
- A sealed access road to the landfill;
- Stage 1 of screening bund 1, as shown on Figure C.1-7 (page C.1-15) and sufficient material would be excavated from the Stage 1 landfill cell to construct Stage 1 of this bund; and
- Stage 1 landfill cell, including the landfill lining system and leachate collection, storage and extraction system (see Section C.1.6.5 for more details).

Upon nearing the completion of landfilling in Stage 1, the Stage 2 landfill cell would be constructed, encompassing the following:

- Construction of the stormwater drainage works;
- Excavation of the Stage 2 landfill cell;
- Construction of the Stage 2 landfill lining system and leachate collection, storage and extraction system (see Section C.1.6.5 for more details); and
- Construction of additional screening bund as required.

As the landfill reaches the proposed final landform (see Figure C.1-13 on page C.1-24) the landfill would be progressively capped and revegetated. Details of the final capping are provided in Section C.1.11.3.

The sequence of progressive excavation, landfilling, and rehabilitation of each stage of the landfill is shown in Figure C.1-7 (page C.1-15) to Figure C.1-9 (page C.1-17).

Any excess excavated soil or clay, generated during the progressive landfilling process that is not required for the screening bund and required for operational purposes, would be temporarily stockpiled within the landfill area, and within the stormwater drainage works. In addition, suitable temporary erosion and sediment control measures would be implemented, including revegetation and silt fencing, as appropriate.

The landfill would be designed such that all excavated soil on the site would be used in construction of the screening bunds and in the landfilling operation i.e. the landfilling lining system, daily cover, intermediate, cover and the final capping layer. In total, approximately 800,000 m^3 of soil and clay would be progressively excavated at the site over the life of the landfill. There would be capacity to receive and utilise a limited amount of VENM from other sources for daily covering and capping of the landfill. However, as the composting operations progress, more and more of this material would be blended onsite with finished compost to create marketable soil products.

Initial estimates suggest that approximately 300,000 m^3 of VENM would be used for operational purposes during the landfilling operation, 100,000 m^3 of VENM would be used in the final landfill capping layer, and the balance would be used constructing the screening bunding (Bunds 1, 2 and 3). Apart from the estimated 4,000 t/yr of VENM received from Ophir Road RRC, or other sources in the Orange LGA, there would be no need to import additional soil to the site for operational landfill purposes.

C.1.6.3 Receipt and emplacement of baled waste

Bales of waste delivered to the landfill would be unloaded from the waste transfer trucks using a loader with a specially modified clamp. Once unloaded, the bales would be placed in the landfill cell in a brick like pattern with an excavator or forklift. Each cell would be filled progressively in lifts. During the active bee period, unbaled waste would be covered. Daily cover would be applied at the end of each day or on compromised bales or on unbaled waste expeditiously, and graded to ensure adequate drainage away from the active landfilling face.

Photo C.1-7 Baled waste landfill in Dublin, South Australia (stormwater pond in background)

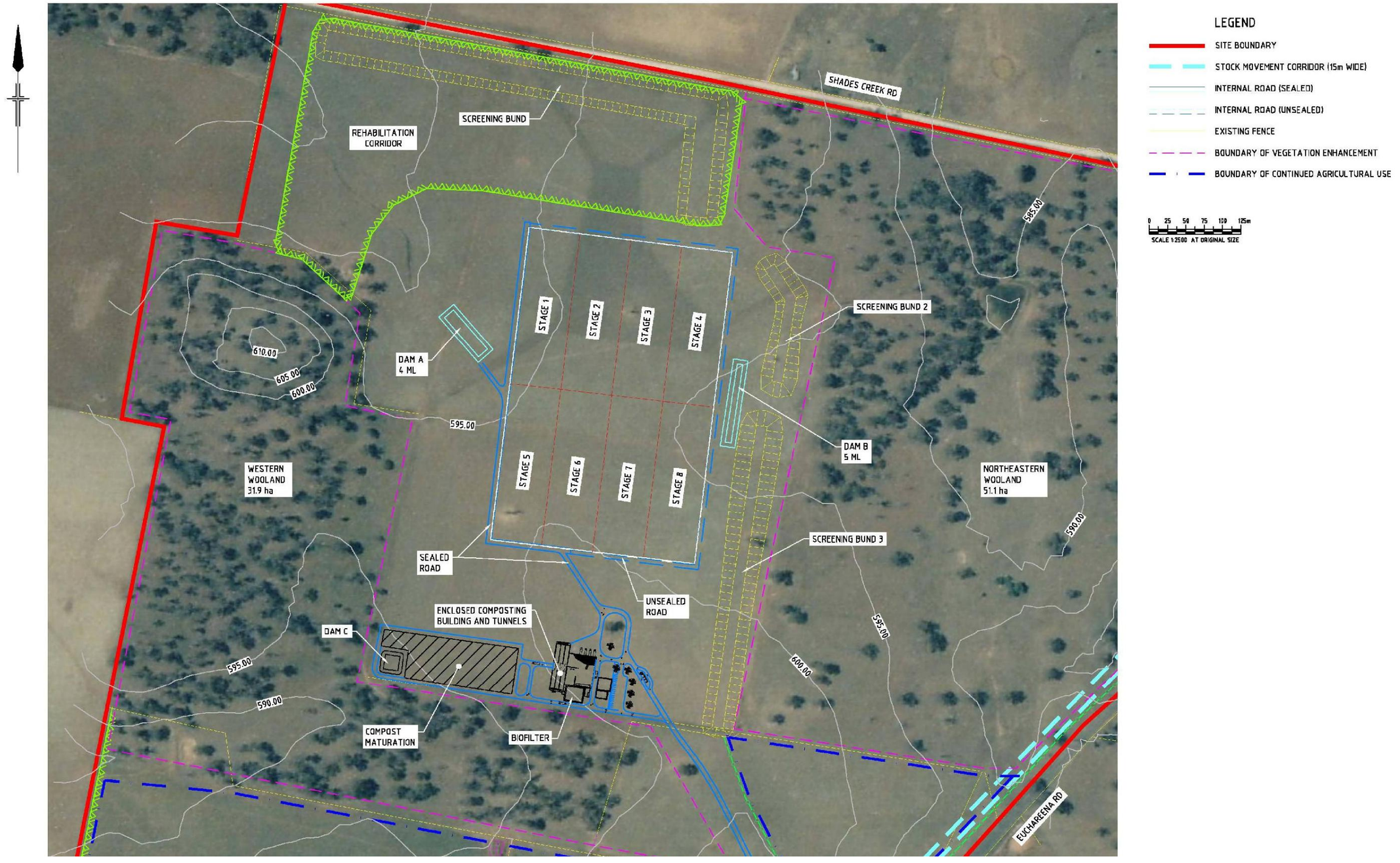


Figure C.1-6 Indicative landfill layout and stages

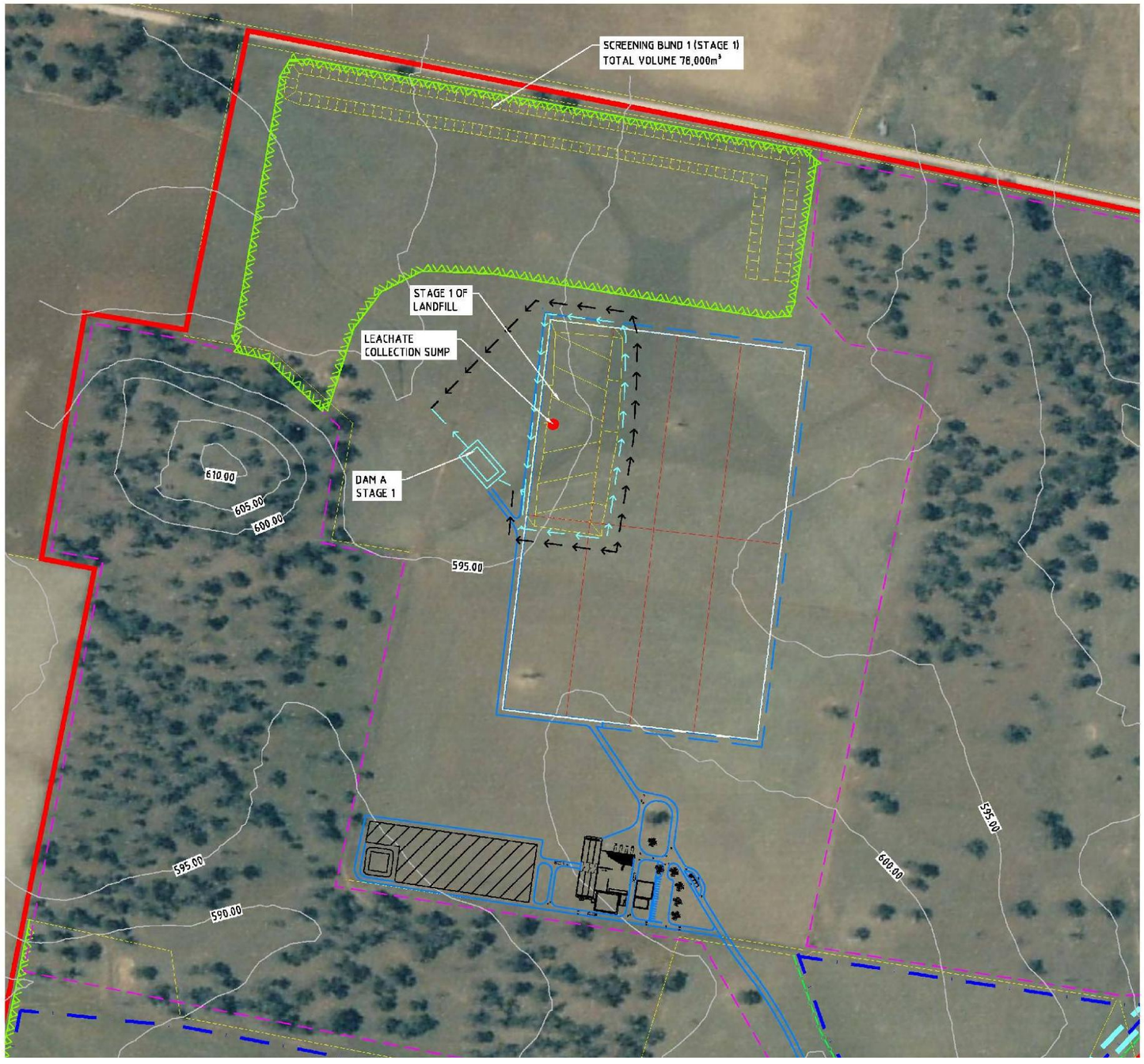


Figure C.1-7 Indicative landfill Stage 1 filling

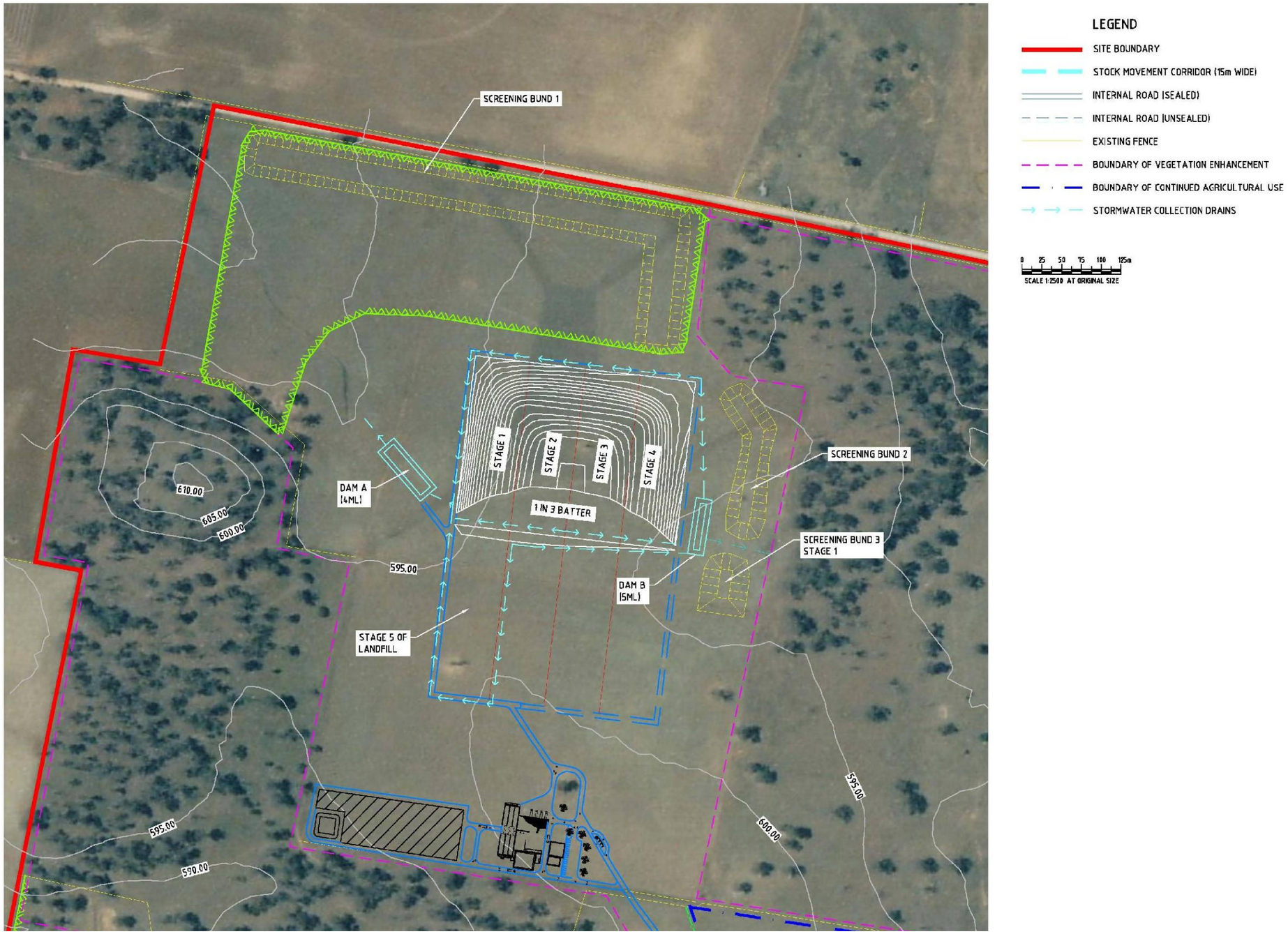


Figure C.1-8 Indicative landfill stage 5 filling

Figure C.1-9 Indicative landfill Stage 6 filling

C.1.6.4 Receipt and disposal of non-putrescible bulky wastes

Non-baled, non-putrescible bulky wastes would be unloaded from trucks into specific cells designated for non-baled waste, between the bale structure. These areas would be created by placing bales in such a way that they form a three sided barrier. Non-baled waste would be inspected upon and during delivery, deposited into these designated areas, spread and compacted. If the waste is deemed to contain materials that present a potential risk to bees then the waste would be immediately covered. If the waste material is deemed to be unattractive to bees e.g. inert wastes, it may be used to cover the landfilled waste.

C.1.6.5 Leachate generation and management

Leachate is deemed to include all water that has come into contact with waste. A range of appropriate measures would be implemented to minimise, contain, collect and dispose of leachate generated during landfilling at the site. All practicable measures would be undertaken to minimise the volume of leachate generated at the site, including:

- Diverting upstream, clean stormwater runoff around the landfilling operation, where able;
- Staging the landfilling operation, to minimise the active footprint of the landfill;
- Minimising exposed areas at the active landfilling area by regular covering of the landfilled waste (at least daily);
- Grading filled areas to direct surface water runoff away from the active waste landfilling area;
- Applying intermediate cover on all areas of the landfill that are left inactive for periods greater than 90 days; and
- Progressive capping and rehabilitation of landfilled areas.

Water balance modelling was undertaken to assess the quantity of leachate that may be generated by the landfilled waste. The model used local monthly climatic data and considered leachate generation during the 10-year ARI rainfall year, the median rainfall year, and the proposed staging of the landfilling operation, in accordance with DECCW Guidelines. The results of the water balance modelling are summarised in Table C.1-1. The results of the modelling show that peak leachate generation would occur during Stage 8 of the landfilling operation, when up to 9,500 kL of leachate may be generated if the 10-year ARI rainfall year occurs during filling of that stage of the landfill, and up to 3,000 kL of leachate storage would be required.

Table C.1-1 Estimated leachate generation

10% AEP Rainfall Year (1 in 10 year Rainfall Year)

Stage	Total Annual Leachate Generation (kL)	Peak Monthly Leachate Generation (kL)	Maximum Monthly Disposal (kL)	Maximum Storage Required (kL)
1	5,067	1,515	1,500	1,515
2	5,978	2,558	1,600	2,558
3	8,267	3,759	1,600	2,824

10% AEP Rainfall Year (1 in 10 year Rainfall Year)				
4	8,503	3,778	1,600	2,864
8	9,446	3,847	1,600	3,010
Final Landform	1,887	157	160	157
50% AEP Rainfall Year (Median Rainfall Year)				
Stage	**Total Annual Leachate Generation (kL)**	**Peak Monthly Leachate Generation (kL)**	**Maximum Monthly Disposal (kL)**	**Maximum Storage Required (kL)**
1	3,259	883	880	883
2	5,072	2,236	1,600	2,236
3	7,361	3,436	1,600	2,342
4	7,461	3,456	1,600	2,363
8	7,860	3,534	1,600	2,448
Final Landform	798	157,248	160	157

To manage leachate generated at the landfill site, each stage of the landfill would include a lining system, a network of leachate collection pipes and a minimum 300 mm thick layer of leachate drainage aggregate. Leachate would be collected and stored within the landfill until a sufficient quantity is available for transportation and disposal at the Orange Wastewater Treatment Plant, operated by the Proponent. Orange Council has confirmed that the plant has capacity to treat this quantity of leachate.

The proposed landfill lining system would comprise a minimum 1.0 m thick layer of compacted clay, progressively constructed across the whole landfill. In addition, the western side of the landfill (Cells 1, 2, 5 and 6) would incorporate an additional 2.0 mm thick high density polyethylene liner to provide an additional barrier to leachate escape, and allow storage of leachate generated during wet weather, within the leachate drainage layer and landfilled waste. Figure C.1-12 shows this area and the proposed leachate sump locations. The area of double lining has been determined based on the results of water balance modelling, which shows that during a 10-year- ARI rainfall year up to 3,000 kL of leachate storage may be required (see Table C.1-1).

Allowing leachate to accumulate within landfill cells 1 and 2 to a maximum depth of 1.5 m (at the leachate sump) (average of 0.5 m depth over the area) would provide 3,000 kL of leachate storage. This same quantity of storage would also be available in Stages 5 and 6. Thus the total storage available in Stages 1, 2, 5 and 6 would be 6,000 kL, to a depth of 1.5 m at the leachate sump. Note, the depth of the landfill is more than 3.5 m below ground level (at the leachate sumps) and thus the total storage capacity available within the landfill is much greater than 6,000 kL and could be used if required.

On site clay would be used to construct the 1.0 m thick compacted clay liner. Geotechnical testing shows that the clays are suitable and would have a very low permeability (k ranges from 5 x 10^{-10} m/s to 2 x 10^{-8} m/s) even without compaction, which is generally less that that required by the DECCW (k < 1 x 10^{-9} m/s). The high density polyethylene liner would also have a very low permeability (k < 1 x 10^{-14} m/s),

which is significantly less that that required by the DECCW. Note, the high density polyethylene liner would be protected by a layer of geotextile and/ or sand.

Leachate would be extracted from the landfill on a regular basis (as required) to ensure adequate storage is available in the event of an extended wet period. Water level monitoring (at the leachate sump) would be undertaken at least weekly and leachate extracted as required to ensure that leachate levels within the landfill are kept at a minimum (< 0.5 m).

Storage of leachate within the landfill would avoid the need for surface leachate storage ponds, which is a normal feature of conventional landfill designs. This approach has been used at this site to avoid potential contact between the landfill leachate and bees associated with the local apiary activities. Note, the leachate sumps would be sealed to ensure bees cannot access the landfill leachate collection system.

The DECCW (EPA 1996) provides guidance on the design of a landfill leachate collection system. In general the system should comply with the following criteria:

- Minimum longitudinal basal fall of 1%;
- Minimum transverse basal cross fall of 3%;
- Minimum 300 mm thick leachate drainage aggregate; and
- Leachate collection pipe work laid at minimum 50 m spacing.

The design for the leachate collection system for each stage of the landfill would comply with the above criteria. Figure C.1-12 (page C.1-23) shows the indicative leachate collection plan.

C.1.6.6 Stormwater management

Three main types of stormwater would be generated by the landfilling operation:

- Clean stormwater runoff from undisturbed and rehabilitated / revegetated areas of the site;
- Potentially sediment-laden stormwater runoff from disturbed areas of the site; and
- Potentially leachate contaminated stormwater runoff from the active landfilling area.

The fundamental approach to stormwater management would be as follows:

- Divert all clean stormwater runoff from upstream undisturbed areas and revegetated areas around disturbed areas;
- Maintain undisturbed and rehabilitated / revegetated area as filters for sediment from disturbed areas;
- Minimise disturbed areas on the site by undertaking the landfilling in a staged manner (see previously);
- Maintain all stormwater runoff from disturbed areas as diffuse as possible to minimise sediment loads and maximise the opportunities for the vegetation to strip sediment from the runoff. Any concentration of flow would be avoided, wherever possible;
- Implement and maintain appropriate erosion control measures e.g. re-vegetation, silt fencing etc, on all disturbed areas as soon as practicable; and

- Capture all potentially contaminated runoff from disturbed areas of the landfill and treat such water in the proposed stormwater dams (A and B);
- Following the closure of an area, intermediate covering and temporary re-vegetation would be applied to ensure that stormwater volumes are minimised and water quality improved;
- Progressive capping and rehabilitation of the landfill, once the landfill has reached the final landform (see Section C.1.11.3); and
- Ensure that water falling in the active landfilling areas does not leave the site, by placing a series of bunds around the perimeter of the active landfilling area.

All drainage works would be designed and constructed in accordance with the requirements of the NSW EPA, including the requirements specified in the NSW Department of Housing – Managing Urban Stormwater – Soils and Construction Guidebook (2004) and its recent 'Waste Landfills' update (2008), otherwise known as the 'Blue Book'.

C.1.6.7 Landfill capping

Waste disposal cells would be progressively capped with intermediate daily cover, with the final capping consisting of a low linear density polyethylene geomembrane (LLDPE). The intermediate daily cover would act as a seal bearing layer between the bales and the final capping geomembrane. The LLDPE would then be overlain with a soil layer 1 m thick, to allow grass and or vegetation to be established above the capping layer. This would ultimately allow the completed landfill to be used for grazing or to be planted with shallow rooted native flowering plants. The cap would also be contoured to minimise infiltration of rainwater. Figure C.1-13 (page C.1-24) shows the indicative final landfill cap contours.

C.1.6.8 Landfill gas management

Implementation of the Proponent's waste management strategy (see Section A.3) would result in diversion of a significant quantity of waste, including organic waste, from the landfill, which will result in reduced landfill gas generation at the proposed Euchareena Road RRC landfill. Modelling of landfill gas generation at the Euchareena Road Site was undertaken in accordance with the Australian Government's Department of Climate Change's (July 2008 and as amended 2009) National Greenhouse and Energy Reporting System Guidelines.

The composition of the waste stream landfilled at the site was determined considering the proposed waste management strategy, including the projected waste quantities, the diversion of significant quantities of organic waste for composting and the acceptance of regional waste. The estimated landfill gas generation is shown in Figure C.1-10 (page C.1-22).

From Figure C.1-10 (page C.1-22) it can be seen that landfill methane generation would decline immediately after closure of the landfill, at approximately 285 m^3/h (or 35,600 tCO_2-e/yr). Based on this level of landfill gas generation, which is relatively low and not sufficient for commercially viable recovery and energy (electricity) generation, it is proposed that an appropriate landfill gas management system would be developed during the detailed design phase of the Project, and would involve a passive landfill gas drainage and flaring system.

The estimated landfill gas emissions from the proposed landfill, allowing for 50% capture and treatment of landfill gas, are shown in Figure C.1-11 (page C.1-22). These have been calculated in accordance with the Australian Government's Department of Climate Change's National Greenhouse and Energy

Reporting System Guidelines (July 2008 and as amended 2009). With 50% capture and treatment, the landfill methane emissions are significantly less than the proposed threshold for participation in the Australian Government's proposed Carbon Pollution Reduction Scheme (25,000 tCO_2-e/yr).

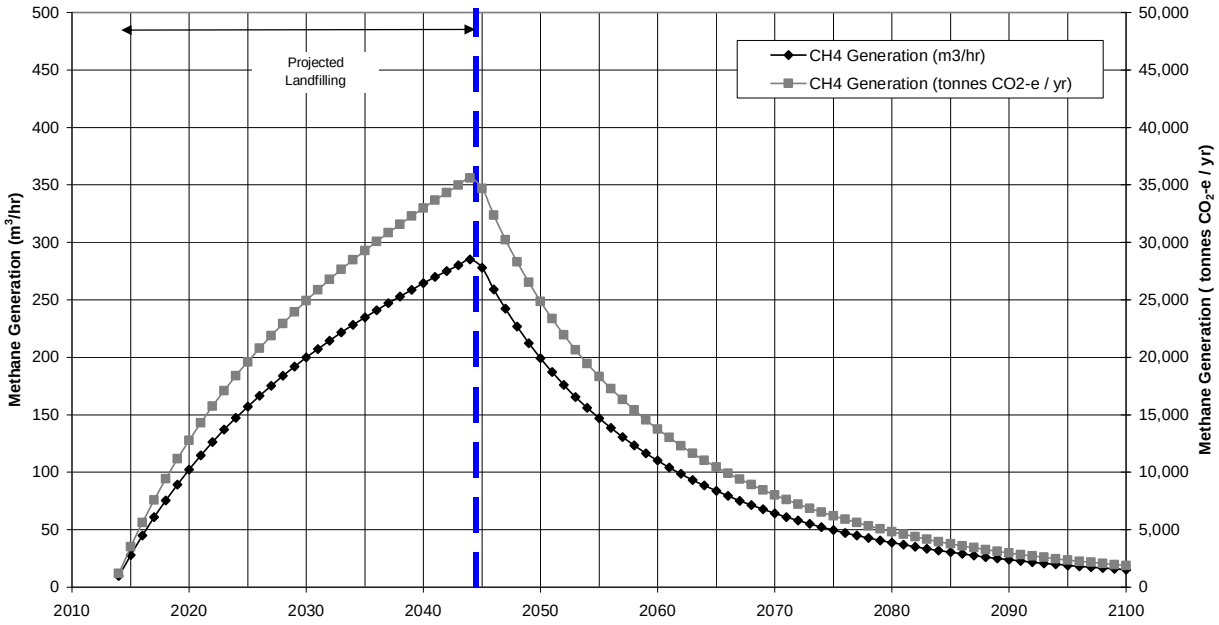


Figure C.1-10 Estimated landfill gas generation

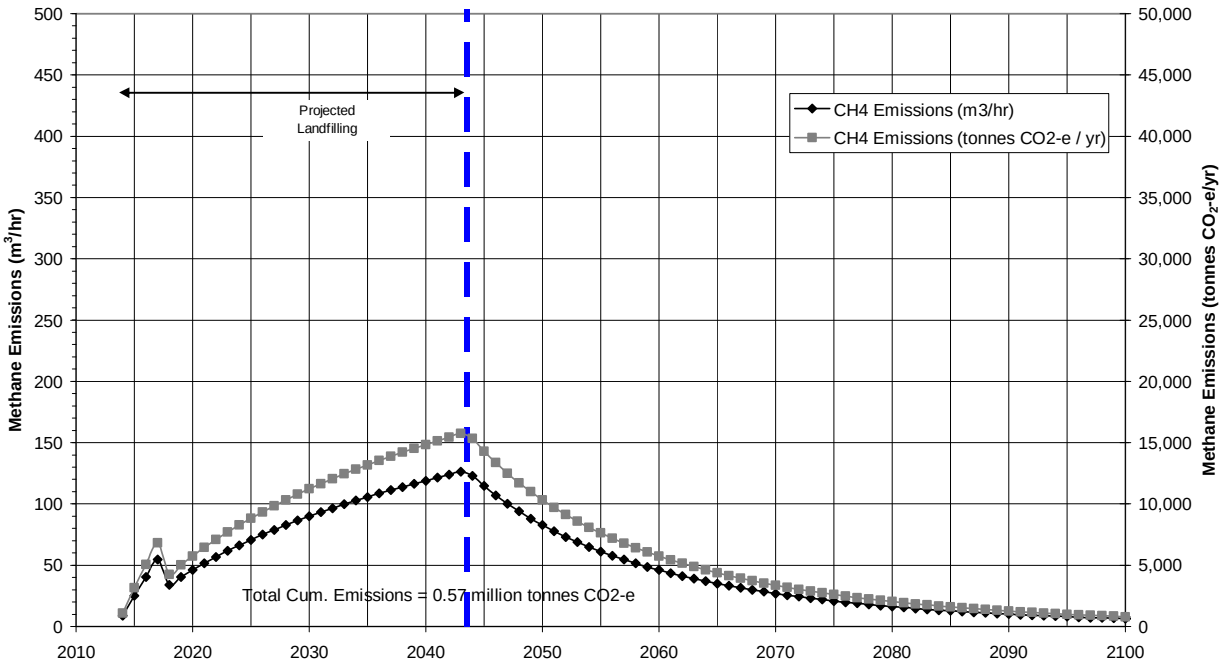


Figure C.1-11 Estimated landfill gas emissions

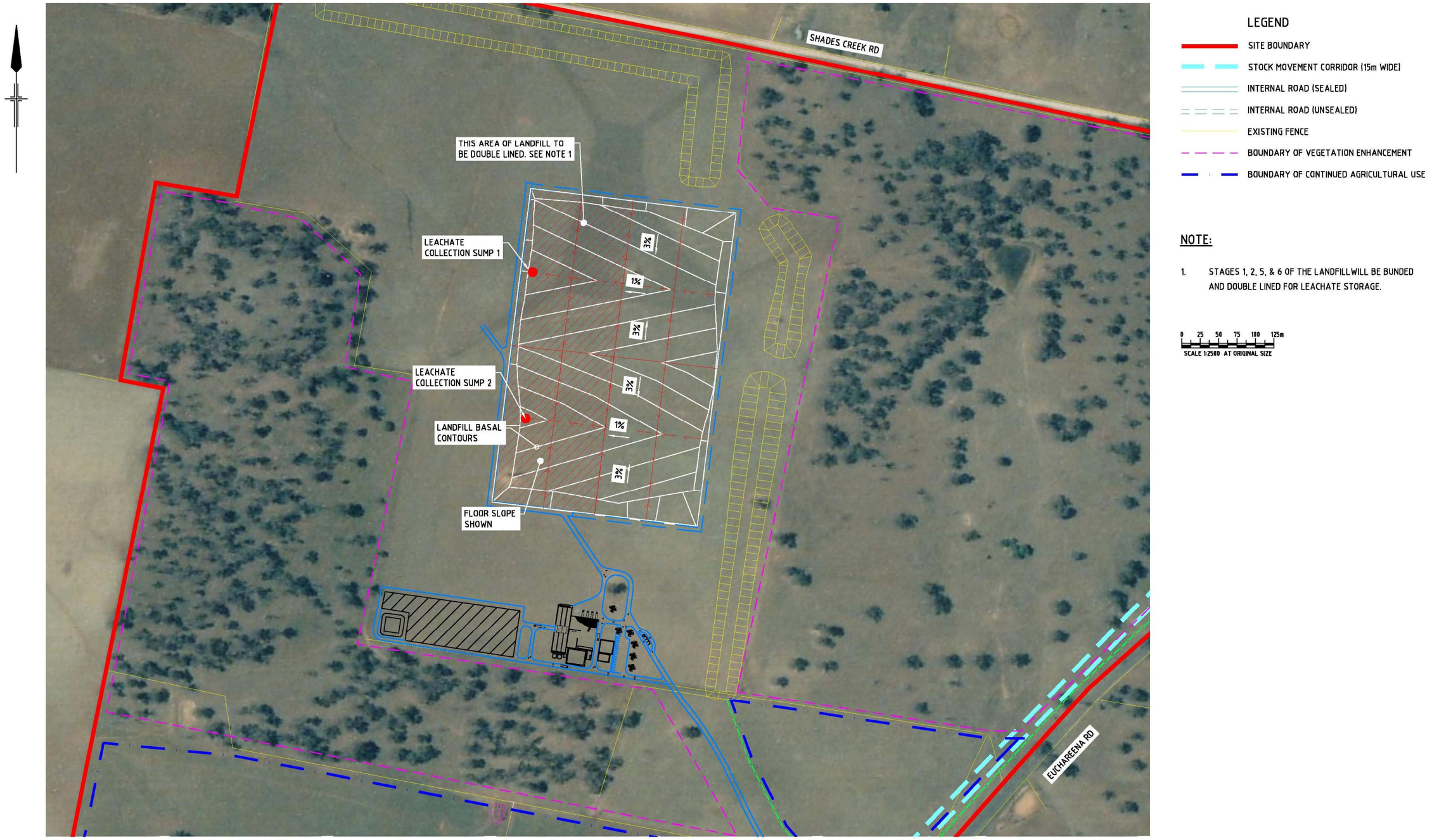


Figure C.1-12 Indicative leachate collection plan

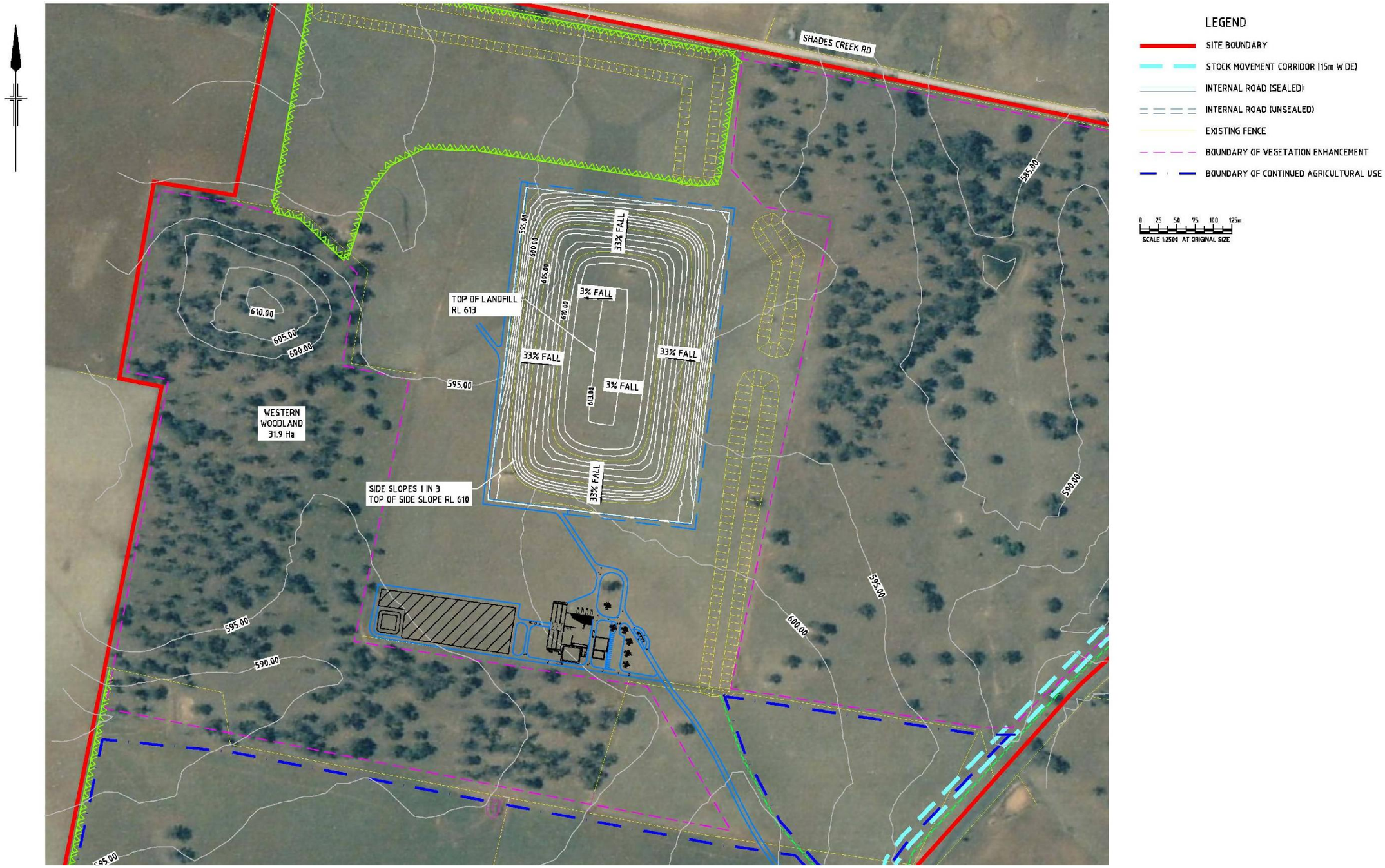


Figure C.1-13 Indicative landfill final cap contours

C.1.7 Traffic and Transport

It is currently proposed that all trucks travelling from the Ophir Road RRC would approach the Euchareena Road RRC via the Mitchell Highway (Watson Street) and Euchareena Road. The intersection between the Mitchell Highway and Euchareena Road would be upgraded to meet safety requirements (refer Section C.4.11.3 for details of upgrade works proposed).

Access to the Euchareena Road Site from Euchareena Road would be designed to comply with the NSW RTA (1999) Road Design Guide and include a left turn deceleration lane from Euchareena Road and a south-bound auxiliary lane on Euchareena Road adjacent to the Euchareena Road Site.

The Project, with increased resource recovery in Orange, would result in a total (average) of 58 truck movements daily (29 in / 29 out) based upon the predicted vehicle movements shown in Table C.1-2. This includes an allowance for waste from 'regional' local government areas corresponding to (average) 18 truck movements (9 in / 9 out). Hence, truck movements attributable to Orange City alone would be (average) 40 truck movements (20 in / 20 out).

Table C.1-2 Truck movements at Euchareena Road RRC

Waste Stream	Truck movements/ year	Truck movements/ day	Assumed Truck capacity
ORANGE CITY COMPONENT			
C&I food/garden organics	966	4	4.5 t
MSW food/garden organics	4,216	18	4.5 t
Biosolids	366	1 (see note 1)	20 t
VENM	446	2	18 t
Mixed waste (mostly C&D) transfer to Euchareena Road	544	4	18 t
Baled waste from Ophir Road RRC (attributable to Orange City)	1,242	4.8	30 t
Non-baled waste from Ophir Road RRC	192	0.7	18 t
Leachate disposal	520	2 (see note 2)	30 kL tanker
Compost to market (attributable to Orange City)	1,034	3 (see note 1)	20 t
Sub-total - Orange City Components	***9,526***	***40***	
REGIONAL COMPONENT (ALLOWANCE)			
Regional food/garden organics	2,224	10	4.5 t
Regional C&D waste	424	2	18 t
Regional mixed waste (baled)	400	2	30 t
Baled waste from Ophir Road RRC	318	2	30 t
Non-baled waste from Ophir Road RRC	28	0.1	18 t

Waste Stream	Truck movements/ year	Truck movements/ day	Assumed Truck capacity
Compost to market (attributable to regional areas)	338	2	20 t
Sub-total - Regional Components	***3,732***	***18***	
TOTAL	***13,258***	***58***	

Note 1. One load of compost daily will be backloaded using the biosolids delivery truck

Note 2. Average truck movements associated with leachate disposal is 2 per day, but can range from 0 to 4 per day.

In addition, there would be some small vehicle movements and truck movements for fuel deliveries for mobile equipment and occasional truck movements for pump out of the septic system / underground storage tanks. Further details on traffic movements and potential impacts are provided in Section C.4.11.

The Proponent proposes to upgrade Euchareena Road (as described in Section C.4.11.3) as part of the Project. Truck movements would be organised so that morning and afternoon school bus times (generally between 7.30 am and 8.30 am and 3.30 pm and 4.30 pm) would be avoided. Furthermore, in response to community feedback received during the consultation activities (Section A.5.2), waste would only be accepted on weekdays (except in case of emergencies).

C.1.8 Utilities and Services

Power would be drawn from local main supplies. Power connections would be confirmed with Country Energy during the detailed design phase of the Project. Water for composting would be sourced from the biosolids delivered to the site.

Water collected in surface water dams would be used for other operational purposes on the site. Rainwater would be used to supply water for the workshop sink, toilet flushing and other non potable uses. Potable water for drinking and for showers in the amenity block near the composting building would be brought in by tanker and stored in a tank on site.

An on-site septic tank system would be used for sewerage services. Fuel for earthmoving equipment would be stored in an on-site double-skin diesel tank. Standard telephone cabling and two-way radio/ mobile telephones would provide the required communications services.

C.1.9 Hours of Operation

Baled waste would be received 5 days a week at the Euchareena Road RRC and in order to avoid school bus times on Euchareena Road, only between 9 am and 3 pm and potentially after 4.30 pm if necessary. Non-baled waste would also be received during these times. Waste would be landfilled between 7 am and 6 pm on weekdays and the compost facility would operate 24 hours a day (however, would only accept food/garden organics on weekdays and during the above listed times).

C.1.10 Construction at the Euchareena Road Site

C.1.10.1 Construction activities

A 12 month construction program is envisaged, involving earthworks to prepare the site, building the composting facility and preparing Stage 1 of the landfill (3 months of bulk earthworks, 6 months of general construction and 3 months of commissioning). Construction activities associated with the Euchareena Road RRC would generally involve the following:

- Establishment of permanent and temporary fencing, work compounds and access;
- Construction and marking of construction roads and installation of traffic controls;
- Installation of temporary erosion, sediment and water quality controls;
- Stripping, stockpiling and management of topsoil;
- Utilities provision;
- Bulk earthworks and landfill (first stage) cell excavations and works to prepare the initial cell;
- Construction of visual amenity bunds;
- Installation of landfill liners, leachate and stormwater management systems;
- Building, weighbridge and compost plant construction;
- Installation of compost plant equipment and wiring; and
- Commissioning of equipment within the enclosed tunnel composting plant.

In parallel with installation and commissioning of the compost plant and landfill, other works would be undertaken including:

- Completion of the site access road and intersection, and internal roads;
- Upgrading of the Mitchell Hwy/Euchareena Road intersection;
- Road safety improvements along Euchareena Road;
- Linemarking and signposting of the site access road and facility;
- Installation of lighting; and
- Finishing works (including landscaping).

The exact construction methods would be determined by the Contractor at the time of construction, but would generally include the above listed activities. All works would be undertaken in accordance with the environmental controls presented in this Environmental Assessment, the conditions of the Project Approval and the Contractor's endorsed environmental management plan.

C.1.10.2 Construction equipment

An indicative list of construction equipment that would be used at the Euchareena Road Site for initial construction of the first landfill cell, access roads, the gatehouse and amenities and the composting plant is shown in Table C.1-3.

Table C.1-3 Proposed construction equipment

Equipment	Indicative make / model (or equivalent)	Construction use
2 Excavator	Volvo EG210	Continuous during earthworks phase (3 months)
1 Grader	CAT 140H	Periodic during earthworks phase (3 months)
1 Dozer	CAT D7	Continuous during earthworks phase (3 months)
1 Roller	Case SV216 & Bomag BW214	Continuous
1 Truck	25 t	Continuous (3 months)
1 Scraper	CAT 637	Continuous (3 months)
1 Mobile crane		Periodic during compost plant construction (6 months)
Concrete agitator		Periodic during initial stages of compost plant construction
Concrete delivery truck		Periodic during initial stages of compost plant construction
Water truck		Periodic for duration of construction period (12 months)

Note: Continuous – refers to during most periods 11 hrs/day.

C.1.10.3 Construction hours

Construction activities would be restricted to between 7 am and 6 pm Mondays to Fridays and 7 am to 1 pm on Saturdays. No construction work would be undertaken on Sundays or public holidays.

Construction work may be permitted outside of the hours specified above, however, this would be subject to consultation with the DECCW and confirmation that the proposed activities would not be audible at surrounding residencies.

C.1.10.4 Construction workforce

It is anticipated that the average construction workforce at the Euchareena Road Site is likely to be approximately 20 persons.

C.1.11 Rehabilitation and Site Closure

C.1.11.1 Introduction

Rehabilitation activities would be undertaken progressively throughout the operational life of the facility with the following objectives:

- To stabilise all disturbed areas to limit erosion and dust generation;

- To create a landform and soil substrate with a comparable agricultural land capability status to the existing landform that would maximise the opportunities for grazing; and
- To create a visually attractive site that has an overall natural appearance.

An additional objective is to create a long-term connection / corridor between the two existing woodland areas on site to enhance nature conservation across the site.

C.1.11.2 Final land use

It is proposed that the final land use for those areas disturbed during the life of the facility would be available for agricultural use, which may be grazing or cropping. Agricultural activities (but not cropping) would be undertaken on the rehabilitated areas of the landfill itself, but areas not needed for operational purposes would be suitable in the long term for cropping.

Areas of existing native woodland vegetation beyond the areas to be disturbed would be enhanced for nature conservation throughout the life of the facility. In addition, the existing 60 ha of native woodland vegetation would be expanded significantly through a planned vegetation enhancement program. This would involve fencing off the existing woodland vegetation and supplementary planting of trees and shrubs and planting the area to the north of the landfill with endemic native woodland species to create a rehabilitation corridor to link existing native woodland areas.

Areas disturbed throughout the life of the Project beyond the landfill area would also be retained for agricultural use as grazing and cropping, where appropriate.

Beyond the end of the life of the facility, the ongoing use of the land may be reviewed in light of the remaining buildings, landforms and services. Some alternative use(s) that benefit from these structures and services may be considered appropriate, provided they are permissible and approved at that time.

It is proposed that the Euchareena Road Site would remain in the ownership of the Proponent for a number of years after the closure of the facility to enable ongoing environmental monitoring and management of the site.

C.1.11.3 Final landform

The final landform across the Euchareena Road Site would be comparable to the existing landform. However an area of approximately 12 ha, created within the landfill area, would be raised to heights approximately at or below the existing woodland tree level (i.e. to a height approximately 12-13 m above the existing natural ground). The final landform profile would comprise grades of 1 in 3 (V:H) that then taper to 1 in 25 (V:H) to form a shallow dome shape, see Figure C.1-13. This landform would be suitable for grazing activities.

Retention or removal of part or all of the northern visual amenity bund would be considered at the end of the life of the Project. Vegetation cover on the bund may be worthy of being retained due to its value for shelter and conservation of biodiversity.

C.1.11.4 Progressive revegetation

From the commencement of the site establishment stage through the progressive completion of the landfill, the Proponent would undertake a program of progressive revegetation in those areas

progressively disturbed by the operations and of the area designated for vegetation enhancement to the north of the landfill.

Ideally, excavation of topsoil and subsoil from new areas would be placed directly or soon after onto areas requiring revegetation, to maximise the transfer of biomass and existing seed stock in the topsoil.

Areas where native woodland vegetation would be expanded would be planted with those species that already exist.

In the vegetation enhancement woodland areas, emphasis would be placed upon growth of local native tree species that would assist to create the long term connection between the two woodland trees on site. Local native tree species used would be:

- White Box, *Eucalyptus albens*;
- Blakely's Red Gum, *Eucalyptus blakelyi*; and
- Yellow Box, *Eucalyptus melliodora*.

The following flowering species would also be planted extensively around the site to provide nectar sources for bees:

- Yellow Box, *Eucalyptus melliodora*; and
- White Stringybark, *Eucalyptus globoidea.*

C.1.11.5 Site closure

Site closure would be undertaken in accordance with DECCW requirements including preparation of a Site Closure Plan consistent with Benchmark Technique 29, which requires DECCW approval. The landfill component would be progressively capped with a specifically designed capping layer (as described in Section C.1.6.7) to achieve long term stability and agricultural use.

At the conclusion of the operational life of the Euchareena Road RRC, the Proponent would undertake site decommissioning involving:

- Removal of all buildings, services and structures not required for any ongoing purpose/activity; and
- Ripping and removing all sealed or hardstand areas not required for any ongoing purpose/activity with these materials either placed within the final cell of the landfill area or recycled.

All infrastructure areas and the site of the enclosed composting plant disturbed throughout the life of the facility would be rehabilitated with topsoil replaced and the subject areas re-seeded with pasture species and flowering native plants and shrubs as appropriate.

C.1.11.6 Post closure operational management and monitoring

The Proponent would continue to manage the Euchareena Road Site following the closure of the facility in accordance with the documented set of procedures compiled in conjunction with the Site Closure Plan.

Monitoring would occur in accordance with the site's environment protection licence (EPL). It is expected that aftercare monitoring would be likely to include the following parameters until monitoring is no longer required:

- surface water;
- leachate;

- groundwater;
- landfill settlement;
- final capping layer integrity.
- landfill gas;
- vegetation; and

C.2 Environmental Setting

C.2.1 Locality Description

The Euchareena Road Site is bounded by Euchareena Road to the east and Shades Creek Road to the north. Figure C.2-1 displays the local setting of the Euchareena Road Site.

The land adjacent to the Euchareena Road Site is predominantly rural land used for grazing, cropping and bee-keeping. Other agricultural uses in the local area include chicken farming and viticulture.

Photo C.2-1 displays an oblique aerial view of the Euchareena Road Site.

Photo C.2-1 Oblique aerial view to the southwest across the Euchareena Road Site

C.2.2 Topography

C.2.2.1 Regional topography

The Euchareena Road Site lies within the Central West Slopes and Plains region of New South Wales which has a topography that is typically undulating with dispersed drainage systems. Areas of steeper terrain are found around Mount Canobolas, approximately 30 km to the southeast towards Orange, and the Mullion Range approximately 30 km east. The regional topography around the Molong area displays a general north-south alignment of a number of ridges with most streams generally flowing northwards. Topographic relief generally becomes flatter to the north towards Wellington and west towards Parkes.

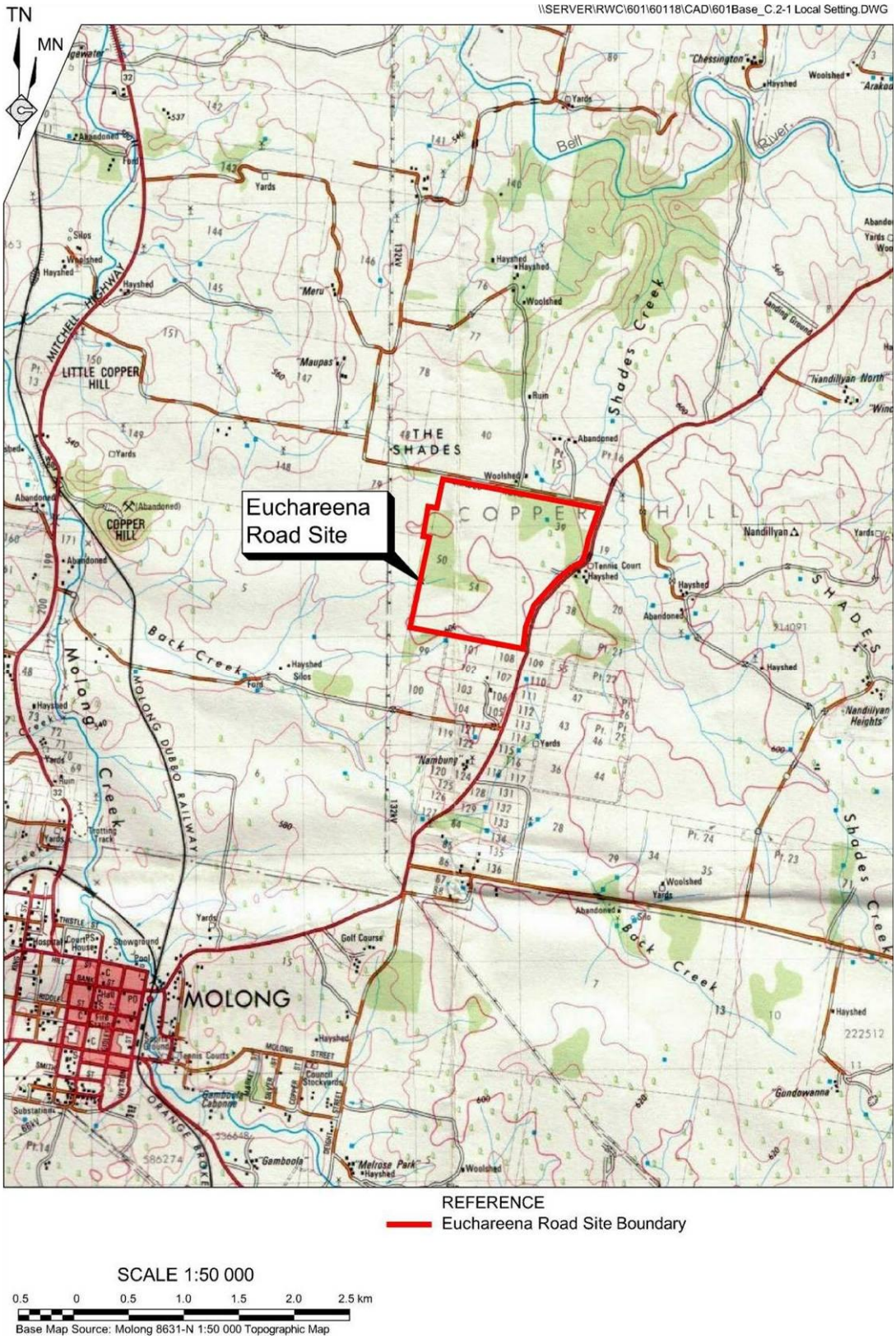


Figure C.2-1 Euchareena Road Site local setting

C.2.2.2 Local topography

The Euchareena Road Site is located within an area (Figure C.2-1) locally characterised by undulating low hills with elevations ranging from 540 m to 690 m AHD. Slopes in the area range between 4% and 8% with slope lengths ranging from 1,200 m to 3,000 m. Local relief averages up to 60 m with some hills reaching 80 m above the surrounding topography. Major drainages are from 1.5 km to 2.0 km apart with the northerly-flowing Molong Creek located to the west of the Euchareena Road Site and the northwesterly-flowing Bell River located to the north of the Euchareena Road Site.

C.2.2.3 Euchareena Road Site topography

The topography of the Euchareena Road Site is illustrated on Figure C.2-2. The site is located on a low flat central ridge surrounded to the east and west by gently undulating topography. Elevations across the Euchareena Road Site range from approximately 564 m AHD in the northeast, to 610 m AHD near the crest of a small prominent basalt capped hill along the western perimeter of the Euchareena Road Site. Drainage lines on the site are generally not incised below the natural surface.

Slopes typically range from approximately 1:4 to 1:50 (V:H) across the site. Slopes in the northwestern corner of the Euchareena Road Site have a typical gradient of 1:30 (V:H) while the prominent basalt capped hill along the western perimeter of the Euchareena Road Site has slopes up to 1:4 (V:H) leading up to the crest of the small hill. The central and southern parts of the Euchareena Road Site are characterised by undulating slopes ranging from 1:30 to 1:50 (V:H).

C.2.3 Geology and Potential Mineralisation

C.2.3.1 Regional geology

The Euchareena Road Site is located in the eastern Lachlan Fold Belt within a zone of Middle Ordovician to Early Silurian volcanic rocks known as the Molong Volcanic Belt. Rocks of the Molong Volcanic Belt represent the remnant of a volcanic arc and are characterised by high potassium intermediate to mafic volcanic and volcaniclastic rocks and their associated intrusive equivalents. These basement rocks have been folded, faulted and weathered to varying degrees. A number of the topographically high areas in the region are covered with one or more Tertiary basalt flows.

C.2.3.2 Euchareena Road Site geology

The geology of the Euchareena Road Site is characterised by intermediate-mafic volcaniclastic and volcanic rocks of the Middle Ordovician Fairbridge Volcanics (Kenilworth Group) and younger overlying basaltic volcanic rocks of Tertiary age. The Fairbridge Volcanics are exposed along the western side of the Euchareena Road Site and are interpreted to be in faulted contact (Nurea Fault) with younger rocks of the Late Ordovician Oakdale Formation.

The faulted contact is not evident on the surface and is interpreted to underlie the eastern half of the Euchareena Road Site. Rocks of the Oakdale Formation are interpreted to be entirely overlain by younger Tertiary basalt and consequently are not exposed at surface within the Euchareena Road Site. The distribution of the key rock types within the Euchareena Road Site are illustrated on Figure C.2-3.

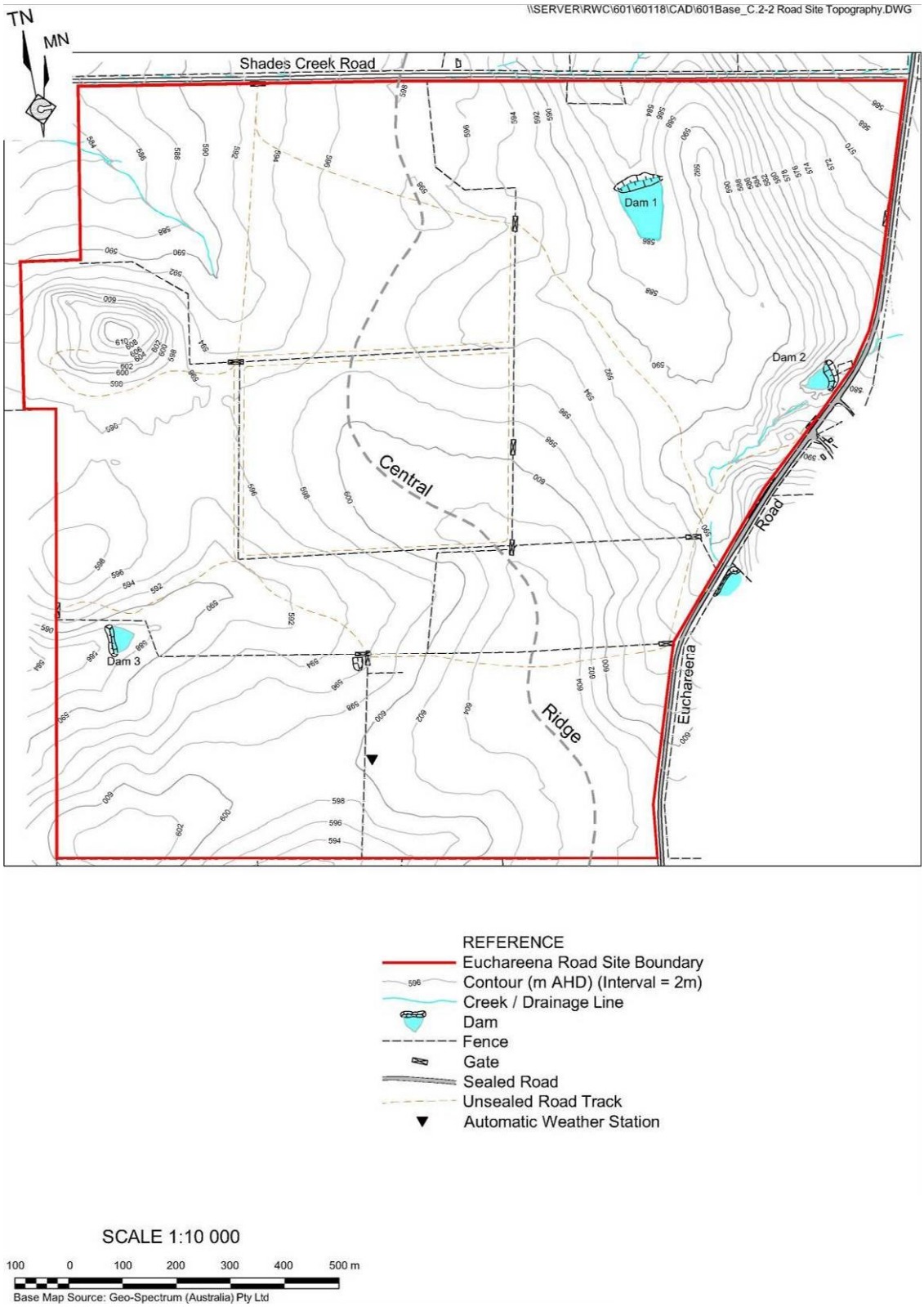


Figure C.2-2 Euchareena Road Site topography

The Ordovician rocks beneath the Euchareena Road Site are characterised by basaltic to andesitic to latitic to trachylatite lava, tuff, volcaniclastic sandstone, conglomerate, breccia and minor laminated siltstone and fine-grained cherty sedimentary rocks (Pogson and Watkins 1998). Tertiary basaltic rocks outcrop sporadically across the site and are dominant in the east where they are up to at least 60 m deep where they have infilled a Tertiary valley. Site specific geological mapping revealed that the extent of Tertiary basalt on the Euchareena Road Site is substantially less than that indicated on the Molong 1:100 000 Geology Map Sheet.

A drilling program in 2004, coordinated by Peter Dundon and Associates Pty Ltd as part of the groundwater investigations for the 2005 EIS, provided valuable information on the geology and depth of weathering across the Euchareena Road Site. The drilling program also identified the nature and extent of the by-products of weathering, such as soil and clay. Drill hole locations are shown on Figure C.2-3 with a summary of the geology identified by the drilling is presented in Table C.2-1. Three interpretive geological sections through the Euchareena Road Site are illustrated on Figure C.2-4.

The drilling showed that Ordovician basement rocks within the Euchareena Road Site are overlain by typically shallow weathering profiles characterised by up to 30 m of saprolitic clay development. The saprolite is the product of long-term in-situ weathering of the basement volcanic rocks. As illustrated by Figure C.2-4, the depth of saprolite development across the site is greater in the cleared northern and central parts of the Euchareena Road Site where erosion and denudation of the land surface has been comparatively minor in comparison with those areas of greater topographic variation along the perimeter of much of the site. In some areas of the Euchareena Road Site, saprolite development is absent, with partially weathered volcanic rocks directly overlain by a thin veneer of soil and transported clay.

The saprolitic clay derived from the basement volcanics is typically orange-yellow to red-brown in colour and exhibits many of the primary textural characteristics of the parent rock types when still in-situ. These clays typically have very low permeabilities in the order of 1×10^{-9} m/s to 5×10^{-10} m/s (Aquaterra 2009).

The Tertiary basaltic rocks of the Euchareena Road Site exhibit comparatively limited weathering profiles and are commonly overlain by up to 2 m of transported clay and soil. Limited occurrences of basalt derived clay (up to 6 m deep) occur in the western and central part of the Euchareena Road Site and are characterised by dark brown, light clays that have low permeabilities in the order of 1×10^{-6} m/s.

C.2.3.3 Potential mineralisation

The Euchareena Road Site lies approximately 2.8 km east of the former Copper Hill Mine, a small copper mine that operated in the early 1900's. The former Copper Hill Mine has been the subject of numerous exploration programs by mining and exploration companies. Golden Cross Operations Pty Ltd (GCO) currently holds an exploration licence (EL 6391) across a 95 km^2 area incorporating the former Copper Hill Mine and the Euchareena Road Site.

During the course of its exploration within EL 6391, GCO identified (through geophysical techniques) an anomalous exploration target referred to as the 'Power Anomaly' immediately southwest of the Euchareena Road Site. GCO sought and obtained agreement from the Proponent to undertake both surface geochemical and drilling investigations in a preferred area in the southwestern quadrant of the Euchareena Road Site (see Figure C.2-3). The exploration proceeded and GCO advises that some anomalous results were received which warrant some further exploration at some future date. GCO is in fact focusing its expenditure in the development of the main ore body already defined the vicinity of the former Copper Hill Mine rather than undertaking follow-up exploration activities.

It is noted that GCO's area of exploration interest within the Euchareena Road Site does not cover the area of the proposed landfill, the area of initial perceived concern from both GCO and the Department of Primary Industries-Mineral Resources. Rather, the closest part of the proposed landfill is located at least 300 m from the exploration area.

Table C.2-1 Summary geology from drilling program

Drill-hole Number	Drill-hole Type	Drill-hole Depth (m)	Depth Interval – Clay (m)	Depth Interval – Saprolite (m)	Depth Interval – Weathered to Unweathered Tertiary Basalt (m)	Depth Interval - Weathered to Unweathered Volcanic Rock (m)
HP1	Piezometer	60	0-6	6-36	Nil	36-60
HP2	Piezometer	50	0-4	4-10	Nil	10-50
HP3	Piezometer	40	0-2	2-12	Nil	12-40
HP4	Piezometer	48	0-8	8-26	Nil	26-48
HP5/HG5	Piezometer	60	Nil	28-36	0-28	36-60
HP6	Piezometer	68	0-24	Nil	24-64	64-68
HG1	Geological	20	0-2	2-18	Nil	18-20
HG2	Geological	20	0-2	2-20	Nil	Not Intersected
HG3	Geological	20	0-2	2-20	Nil	Not Intersected
HG4	Geological	20	0-4	8-20	4-8	Not Intersected
HG6	Geological	16	0-4	4-16	Nil	Not Intersected
HG7	Geological	16	0-2	2-16	Nil	Not Intersected
HG8	Geological	16	0-2	2-16	Nil	Not Intersected
HG9	Geological	16	0-2	2-8	Nil	8-16
HG10	Geological	8	Nil	Nil	Nil	0-8

Source: Peter Dundon & Associates Pty Ltd (2009) and D Bird – Tables A.1 and A.2

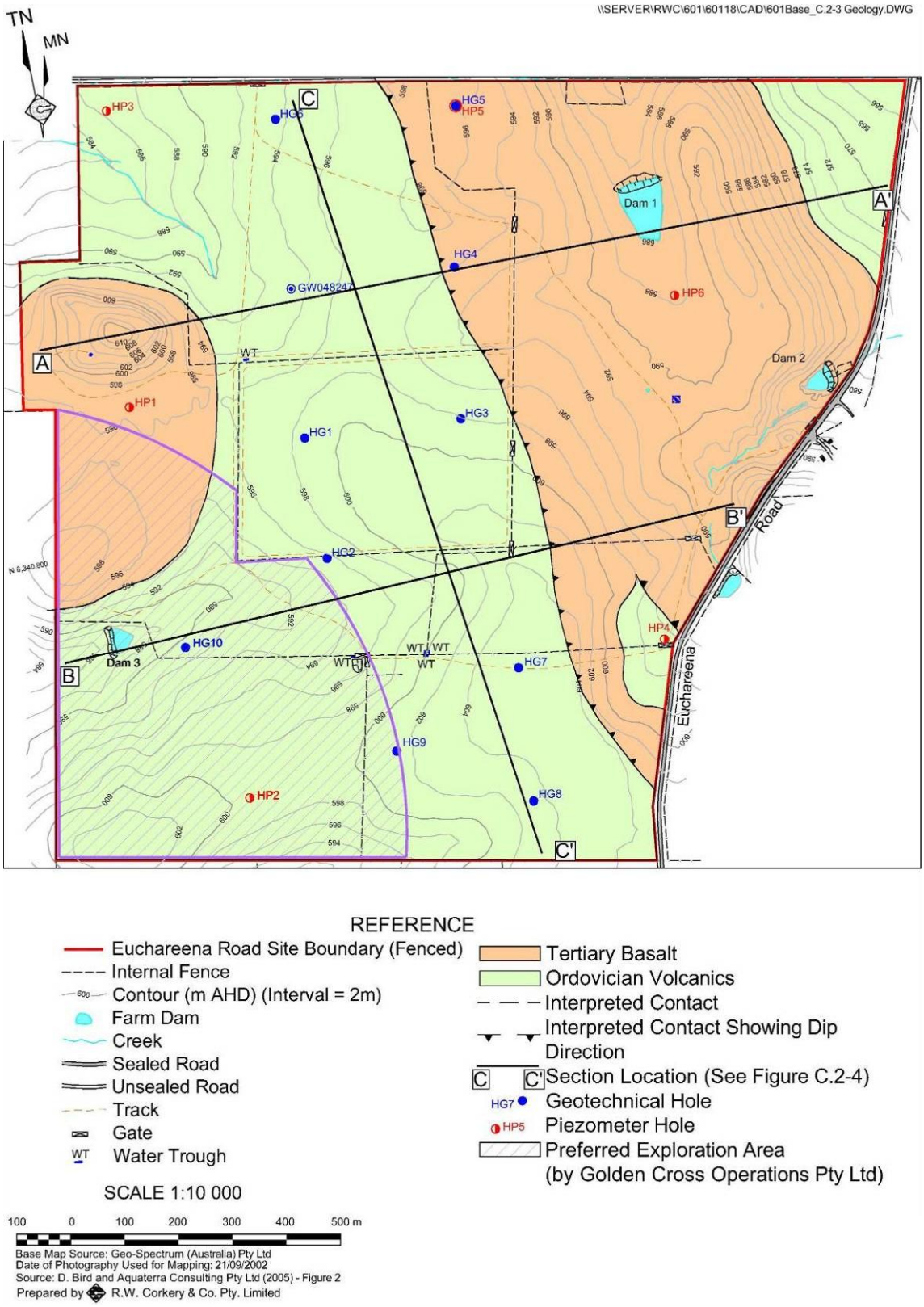


Figure C.2-3 Euchareena Road Site geology and drill hole locations

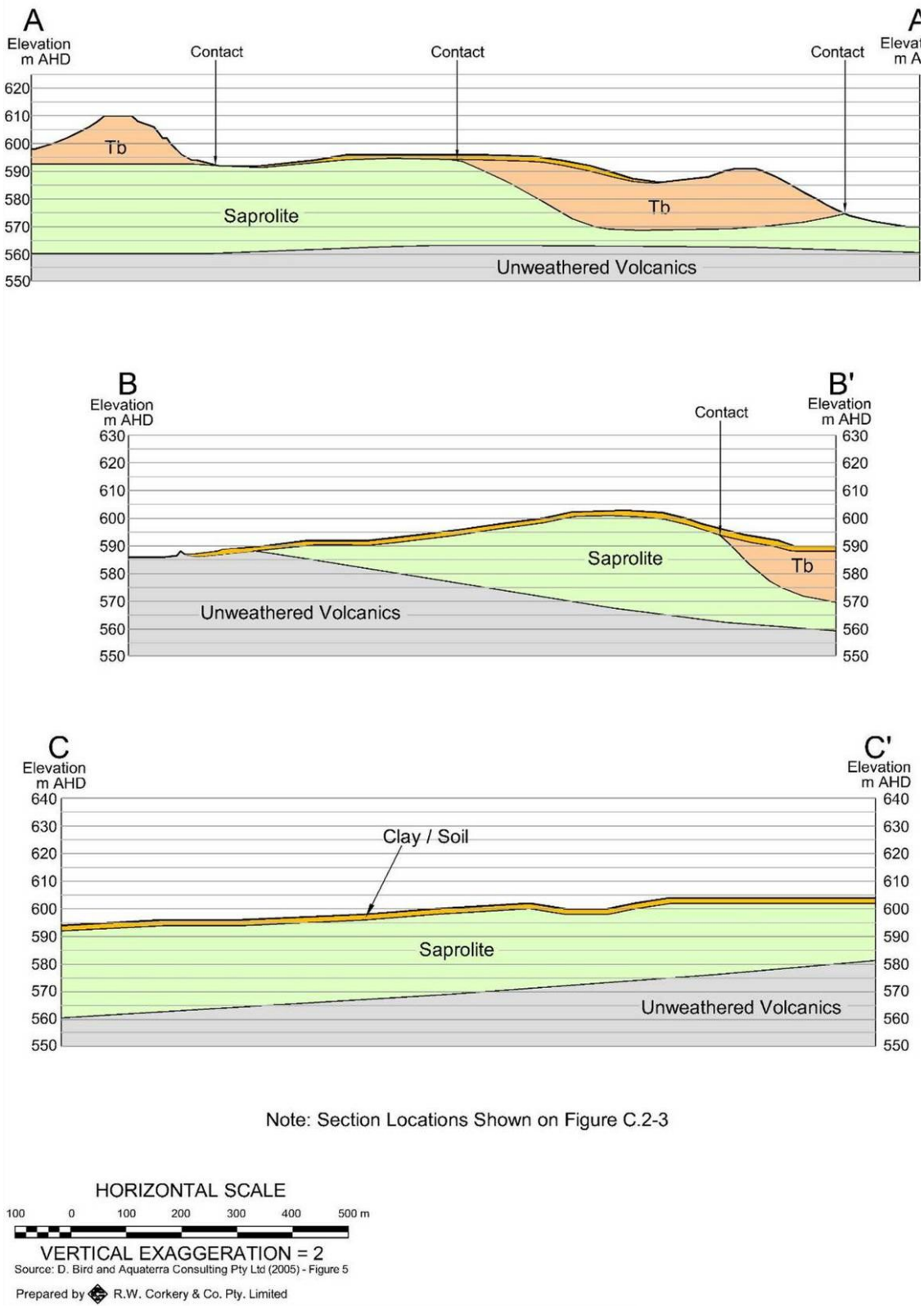


Figure C.2-4 Euchareena Road Site geological sections

C.2.4 Meteorology

C.2.4.1 Temperature

The following summaries of meteorological information have been drawn from data collected by the Bureau of Meteorology from their Molong Site (Number 65023) between 1884 and 2008, Orange Agricultural Research Station (Number 063254) between 1976-2008 and from an Automatic Weather Station (AWS) that was operational at the Euchareena Road Site from 9 May 2003 to 1 December 2004. A summary of available meteorological information relied upon for the various environmental assessments is provided in Table C.2-2.

Table C.2-2 Monthly temperature (Euchareena Road Site)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
TEMPERATURE (^{o}C) Station 065023 Molong King St – 72 years of records													
Mean Max	31.0	30.1	27.5	22.5	17.4	14.0	12.9	14.7	18.6	22.6	26.4	29.5	
Mean Min	13.3	13.2	10.4	6.0	2.7	0.9	-0.1	0.6	2.4	5.4	8.4	11.5	
RAINFALL (mm) Station 065023 Molong King St – 124 years of records													
Mean	61.6	68.2	39.7	24.1	25.8	60.9	49.0	39.3	59.1	45.6	89.8	70.7	625.
Median	54.1	57.1	47.0	23.7	10.2	52.8	52.5	44.7	47.4	52.2	95.6	56.0	664
Highest	256.6	279.3	301.5	190.9	172.9	206.1	153.0	173.6	164.7	245.7	180.4	214.8	1,590
Lowest	1.8	0.0	0.0	0.0	0.0	2.1	2.0	0.5	3.8	0.0	0.8	0.0	294
EVAPORATION (mm) Station 063254 Orange Agricultural Research Station – 32 years of records													
Mean	174.8	127.7	121.3	84.1	51.7	31.7	40.0	51.2	82.2	123.0	112.3	159.9	1185
Median	182.8	130.5	118.2	88.5	50.1	31.4	41.1	50.6	81.4	113.4	120.6	171.4	1184
Highest	225.6	190.4	167.7	105.3	88.4	43.6	50.0	75.2	96.6	145.8	217.8	247.1	1404
Lowest	127.0	99.0	83.4	55.8	36.3	25.9	29.0	38.6	57.5	60.3	88.7	120.9	974
RELATIVE HUMIDITY (%) Station 065023 Molong King St – 84 years of records													
Mean 9 am	51	57	60	68	79	82	84	79	68	60	50	52	
Mean 3 pm	34	38	39	43	53	56	58	54	46	45	36	37	
WINDS Station 065023 Molong King St – 95 years of records													
Mean 9 am Wind Speed (km/hr)	9.1	8.1	6.9	5.3	4.5	3.9	4.8	6.1	7.6	9.9	10.2	9.5	
Mean 3 pm Wind Speed (km/hr)	10.0	9.5	8.3	7.3	8.2	6.9	8.3	9.5	10	11.5	11.7	10.6	

Source: Bureau of Meteorology Molong, King St (No. 065023) and Orange Agricultural Research Station (No. 063254)

C.2.4.2 Rainfall

The annual rainfall distribution for Molong is shown in Table C.2-2 based on 124 years of records. January has recorded the highest average rainfall and April the lowest. Molong recorded a mean annual rainfall of 704 mm during the recording period. The on-site weather station recorded 416.6 mm rainfall during the 12 months, 1 June 2003 to 31 May 2004, which reflected the persistent dry conditions that were experienced across the Central West during the recent drought.

The surface water assessment by Evans and Peck Pty Ltd (Evans and Peck 2009) incorporates a range of additional rainfall statistics that have been used in the design of the surface water management components of the Euchareena Road Site and the evaluation of potential surface water impacts.

C.2.4.3 Evaporation

Table C.2-2 presents the monthly daily values of open water evaporation (evaporation that would affect dams and ponds – assumes a 'pan factor' of 0.8) at the Bureau of Meteorology Orange Agricultural Research Station. Evaporation is greatest from December to February and corresponds to the months of highest temperatures and lowest relative humidity. During each of these months, mean monthly evaporation exceeds 170 mm. Evaporation is lowest in June and July at 32.9 mm/month and 36.9 mm/month respectively. Monthly evaporation exceeds rainfall between September and March, with average annual evaporation exceeding the mean annual rainfall by a factor of approximately 1.5. Overall, there is an annual rainfall deficit of approximately 475 mm.

C.2.4.4 Temperature

Average monthly maximum and minimum temperatures recorded over 68 years at Molong are presented in Table C.2-2. January and February are the hottest months with mean monthly maximum temperatures on 31.0^{o}C and 30.1^{o}C and mean monthly minimum temperatures of 13.3^{o}C and 13.2^{o}C. June and July are the coldest months with mean monthly maximum temperatures of 14.0^{o}C and 12.9^{o}C and mean monthly minimum temperatures of 0.9^{o}C and -0.1^{o}C respectively. From the on-site weather station available data (9 May 2003 to 1 December 2004), the highest maximum temperature recorded was 40.8°C on 15 February 2004, and the lowest minimum was -1.9°C on 28 July 2004.

C.2.4.5 Wind

Wind behaviour at the Euchareena Road Site, based on data collected by the on-site weather station, indicated that:

- In autumn, the prevailing wind direction is from the southwest;
- In winter, the prevailing wind direction is predominantly from the south-southwest;
- In spring, the prevailing wind direction is from the north with an increasing southwesterly component; and
- In summer, the prevailing wind directions are from the north and northeast.

Wind data recorded on site is presented as wind roses in Figure C.2-5. Assessment of this data indicates that prevailing winds of less than 3 m/s do not occur greater than 30% of the time on site, hence have not been considered in the noise assessment.

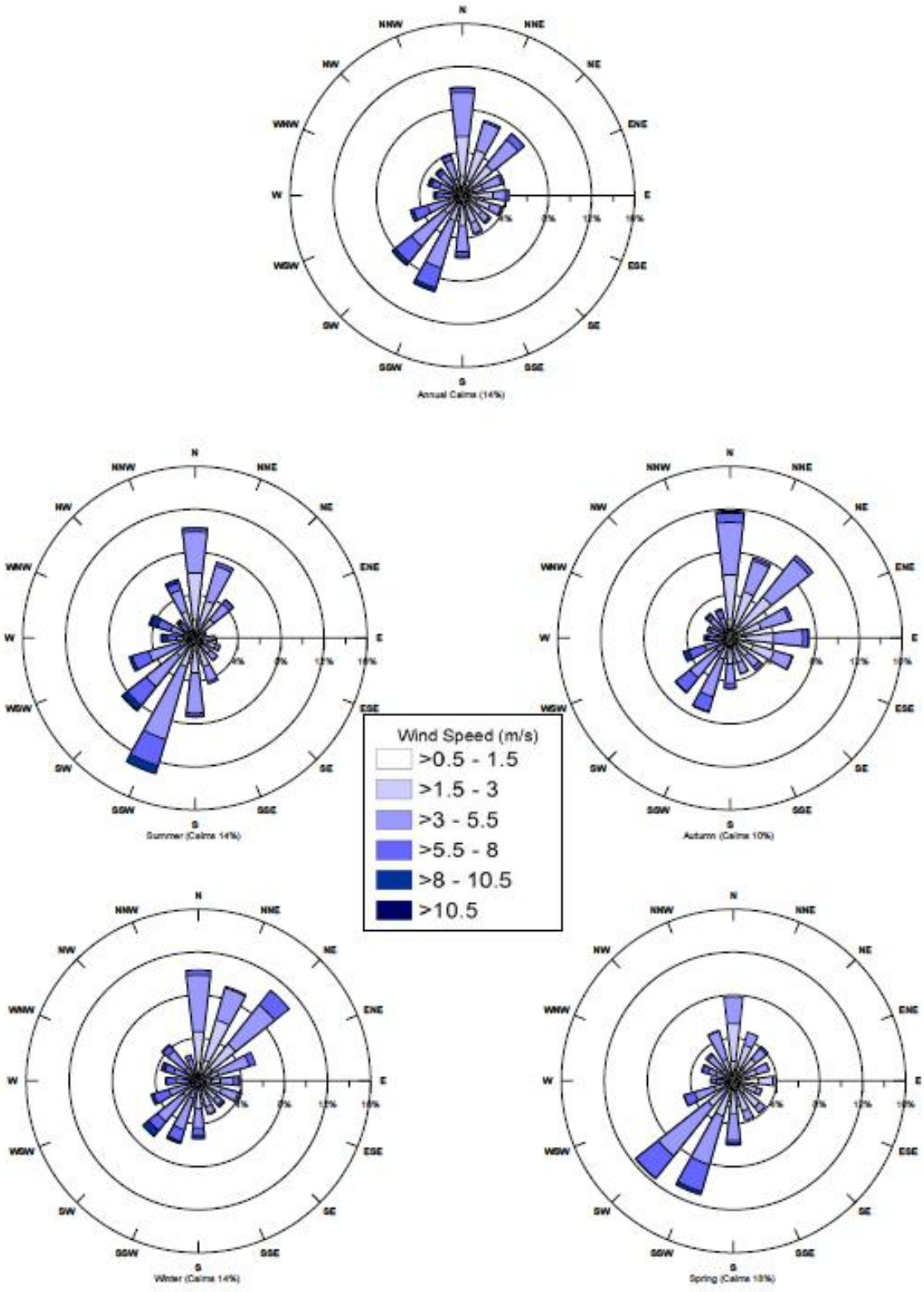


Figure C.2-5 Euchareena Road Site wind roses

C.2.5 Land Ownership and Land Use

C.2.5.1 Introduction

A range of information has been drawn together to describe the land ownership and land uses around the Euchareena Road Site to assist in understanding potential impacts of the proposed RRC and identifying possible mitigation measures to reduce or avoid the nominated impacts.

Information on land ownership has been provided by Cabonne Council with the locations of residences obtained from aerial photographs, published topographic plans or observations/discussions with land owners. Details of land use on the surrounding properties have been provided by the respective landowners.

C.2.5.2 Land ownership and surrounding residences

Figure C.2-6 illustrates the status of land ownership surrounding the Euchareena Road Site whilst Table C.2-3 records the distance from the surrounding residences to the proposed landfill and composting plant.

Table C.2-3 Land ownership residences surrounding the Euchareena Road Site

Property number	Residence	Land owner	Distance from residence to (m)	
			Landfill	Enclosed tunnel composting plant
1A	'The Shades'	I & M Gosper	820	940
1B	'Roseleigh'	I & M Gosper	2,520	2,710
3	'Maupas'	Peffer Family	2,050	2,430
4	'Nandillyan North'	R & JE Boersma	3,320	3,710
5	'West Point'	Abtourk (Syd No. 391) Pty Ltd	1,640	1,810
6B	'Hylands'	C & E Buckley	1,440	1,250
7	'Rumarlyn Grove'	Peffer Family	1,990	1,770
7	'Vale Head'	Peffer Family	4,420	4,240
10	'Riverlet'	D F MacLennan	2,700	2,475
12	'Copper Hill'	Parstock Pty Ltd	3,700	3,680
13	'Nandillyan Heights'	Abtourk (Syd No. 391) Pty Ltd	3,950	4,025
18	Ford Farm	TH & MA Schultz	2,710	3,260
19	Meru	BW & BM Horsefield & WE Bunting	2,390	2,855
26	Caleula Springs	AL & LE Ingham	4,595	4,410
27	Boomey Stud	R&W Kirby	4,665	5,120

* See Figure C.2-6 for property location

The Euchareena Road Site shares a common boundary with three adjoining properties owned by I & M Gosper ('Roseleigh'), Parstock Pty Ltd ('Copper Hill') and NL Star (no property name). The adjoining road network, namely Euchareena Road and Shades Creek Road separates three further neighbouring properties owned by I & M Gosper ('The Shades'), Peffer Family ('Maupas') and HF Lampe Investments ('Boomey Stud').

Two residences, 'The Shades' and 'Hylands', lie within 1.5 km of the nearest operational area, at 820 m and 1,250 m respectively. 'The Shades' residence is a well established, comparatively old residence whereas the construction of the 'Hylands' residence was completed in early 2004. The next closest residence, 'Rumarlyn Grove', lies approximately 1,770 m from the nearest operational area.

C.2.5.3 Surrounding land uses

Land adjoining and immediately surrounding the Euchareena Road Site is used for a range of land use activities all of which are agricultural in nature, namely:

- Grazing of sheep and cattle;
- Cropping grain and lucerne;
- Beekeeping;
- Chicken farming; and
- Viticulture.

Grazing and cropping

Mr and Mrs I & M Gosper operate a mixed farm on both 'The Shades' and 'Roseleigh' with sheep, cattle and cropping grain and lucerne. Mr Gosper also conducts bee-keeping on his properties. The Starr family runs both sheep and Shorthorn cows and their progeny on the properties adjoining the Euchareena Road Site (Property No. 6A on Figure C.2-6). The Peffer family runs a mixed farm with sheep, cows and 70,000 chickens. Approximately 900 acres of wheat and canola are also produced on their properties surrounding the Euchareena Road Site (Property No's 3 and 7 on Figure C.2-6).

Parstock Pty Ltd runs a mixed farm on the 'Copper Hill' property west of the Euchareena Road Site carrying ewes, cows and their progeny and up to 160 ha of cropping (mainly wheat).

A feature of the practices of the land owners surrounding the Euchareena Road Site is the transfer of stock and farming equipment between properties using the local road network. Stock are transferred during shearing and at other times in accordance with permits issued annually by the Livestock Health and Pest Authority. Each of these land owners has expressed concern regarding increased vehicle movements along Euchareena Road in particular as it relates to safety issues for both the stock and accompanying drovers.

Viticulture

Reynolds Vineyards Pty Ltd operates a vineyard approximately 5 km north of the Euchareena Road Site with approximately 507 ha of land under grapes producing up to 6,500 t of grapes annually (in a good season). The bulk of the produce is transported to Cudal (via Euchareena Road) for processing with some occasionally transported to the Hunter Valley.

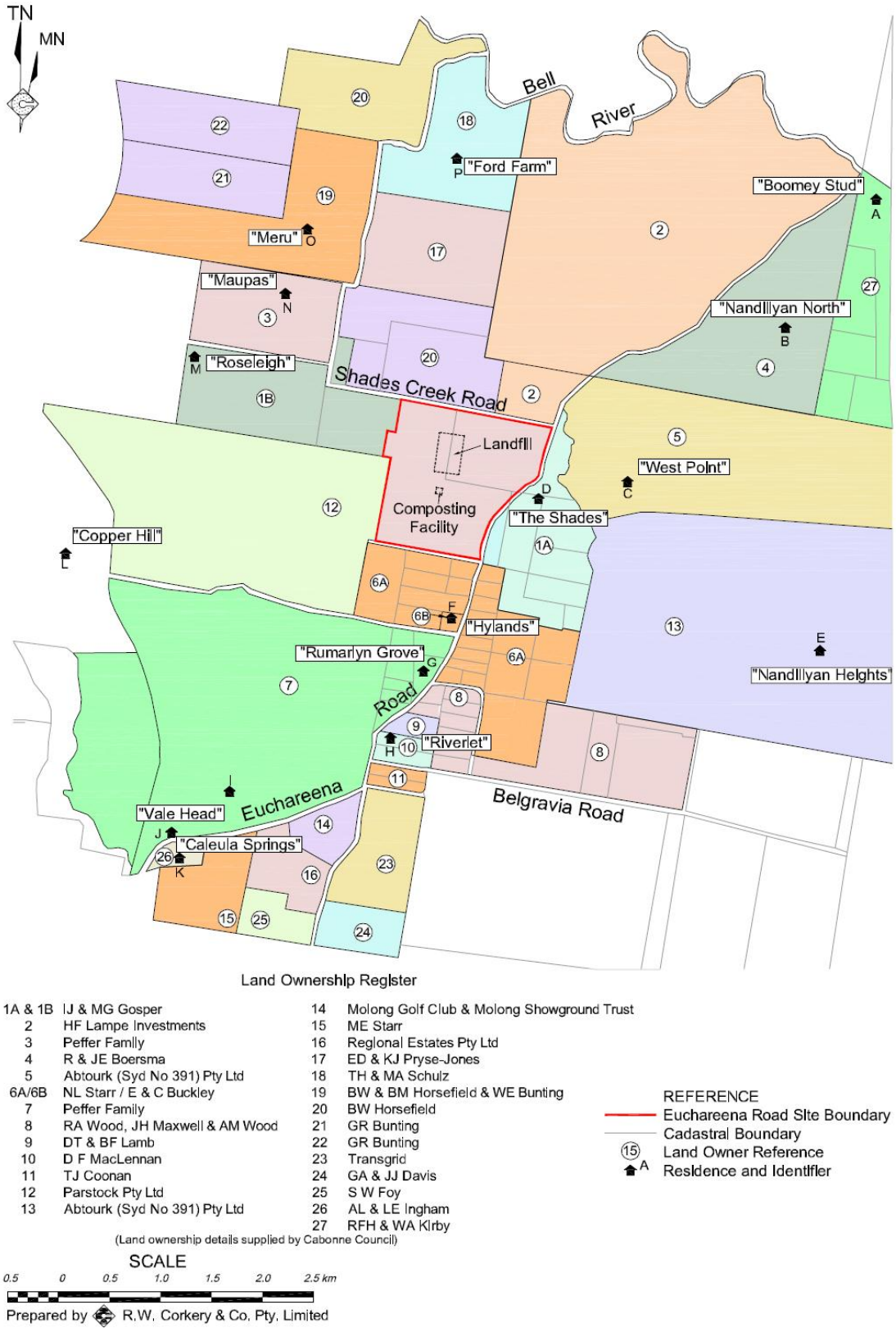


Figure C.2-6 Land ownership surrounding the Euchareena Road Site

Beekeeping

Two bee-keepers / honey producers operate on properties adjoining and near the Euchareena Road Site. Mr Ian Gosper, the owner of 'The Shades' and 'Roseleigh' properties which adjoin the Euchareena Road Site, is the largest of these producers and is part-owner of the company, C.L. & H.M. Marriott Pty Ltd, one of the largest honey producers in the Central West region of New South Wales. Mr Graham Peters operates as a part-time honey producer with hives placed on 'Maupas' and 'Vale Head' under an agreement with the Peffer family.

Mr Gosper operates with up to 1,800 hives which are typically located on 'The Shades' and 'Roseleigh' properties for approximately 50% of the year. For the remaining part of the year (principally from late-autumn to early-spring), the hives are located in areas where assurances have been provided by the landholder(s) that no conditions exist which may compromise the quality of honey. Mr Peters operates with up to 300 hives on the 'Maupas' and 'Vale Head' properties for approximately 75% of the year.

The principal honey types produced in the Molong area are Yellow Burr (specific to the area), Yellow Box and White Box (*Eucalyptus* sp.), Patterson's Curse, Canola, Lucerne and Clover. The Euchareena Road Site represents a substantial source of Yellow Box pollen and nectar for bees from hives located within flying distance of the Euchareena Road Site. Bees may also forage over the Euchareena Road Site for White Box and Patterson's Curse pollen and nectar.

Mr Gosper currently extracts honey from his hives at a privately owned honey extraction plant located in Molong and supplies all of his honey to Capilano Honey, Australia's largest honey producer. Mr Peters extracts honey at his facility in Cumnock. Both Mr Gosper and Mr Peters are shareholders of Capilano Honey and accordingly are bound by the Company's requirements in relation to quality control and the prevention and control of disease.

Both Mr Gosper and Mr Peters have expressed significant concern in relation to the possible impacts of the proposed landfill on his bee-keeping operations, principally because of the perceived potential that a disease (American Foul Brood) could be collected by the bees at the landfill site on the Euchareena Road Site which could in turn infect the bee hives placed on the properties surrounding the Euchareena Road Site. Mr Gosper and Mr Peters have advised that to date, their hives have been free of American Foul Brood.

C.2.5.4 Euchareena Road Site land use

The Euchareena Road Site is currently leased by the former land owner for the agistment of sheep and cattle from the 'Copper Hill' property. Immediately prior to the purchase of the Euchareena Road Site, the land was used for grazing predominantly sheep and some cattle. The gently sloping northern paddocks on the Euchareena Road Site were periodically sown with improved pasture. Prior to 1988 when the former owner purchased the property, the northern paddocks of the site had been periodically cropped for wheat, oats and/or barley.

Water for stock is available from three dams on the property and is also reticulated to water troughs in most paddocks from a water tank on top of the small hill near the western boundary of the property. This tank is fed from a bore on 'The Shades' property – a relic of the fact that the Euchareena Road Site and 'The Shades' were within one landholding in the past. This bore is able to reliably supply between 1,500 L and 2,000 L per day.

C.3 Issue Identification and Risk Assessment

C.3.1 Risk Assessment Methodology

The likelihood of an impact occurring can be described in terms of probability. Overlaying this is the need to recognise the uncertainty that may be associated with the possible impacts, particularly during the initial risk assessment process. Where there is scientific uncertainty a cautious approach will identify a higher level of risk.

Each identifiable impact can be assigned a likelihood between remote and almost certain. In simplifying the possible impacts for the purpose of a risk assessment an element of subjectivity is introduced. The purpose of the risk assessment is not necessarily to agree on the probability of any particular impact, but to facilitate an understanding of the relative probability of different impacts.

Columns 2 to 4 in Table C.3-1 give descriptions that elaborate on the possible likelihood categories. These are presented to help view the impact from different perspectives.

Table C.3-1 Likelihood and probability of occurrence

Likelihood	Description	Probability	Community attitude
Remote	May occur in exceptional circumstances	<1%	Few people interested
Unlikely	Not expected to occur in most circumstances	1-20%	Some people affected
Possible	May occur	21-49%	Many people affected
Likely	Probably will occur	50-85%	Most people affected
Almost Certain	Expected to occur	>85%	Almost everyone affected

C.3.1.1 Evaluating consequence

The consequences of an impact require a degree of subjective assessment as the likely consequences of an impact may consist of several elements.

The elements that have been considered in this risk assessment are described below. Table C.3-2 provides a guide to the elements considered when evaluating consequence.

Table C.3-2 Consequences of occurrence

Consequence		Minimal	Minor	Moderate	Major	Catastrophic
Magnitude	Spatial	A small isolated area	A part of the site	The whole Site	The Site and surrounding areas	Whole of Region
	Intensity	Chronic/ low Level. behavioural, lifespan or	Acute impacts on some species.	Acute/ Moderate. Impact on growth,	Lethal impacts on some species.	Lethal/ extreme. For individuals or

Consequence		Minimal	Minor	Moderate	Major	Catastrophic
		condition effect		recruitment or survival rates		communities
Temporal	Duration	Single incident. transient event	Short term impact (single generation)	Medium term	Long term effect (multiple generations)	Permanent
	Timing (periodic events)	Occurs outside breeding times.	Occasional interruption of feeding or breeding.	Interrupts one life cycle.	Regularly interrupts life cycle.	Permanent interruption of ecosystem cycle.
Ecological	Values	Previously disturbed areas	Parkland	Native flora or fauna	Conservation area or listed Species	Wilderness or nationally threatened Species.
	Sensitivity	Will recover completely.	Will recover with some changes	Moderate change to ecosystem function	Significant change to ecosystem function	Will not recover.
Social	Number of People	Some people indirectly affected	Some people directly impacted, or several indirectly	Several people directly impacted, or many indirectly	Large number of people directly impacted.	Loss of life
	Heritage Considerations	Impact on place(s) or object(s) assessed below significance threshold	Impact on place(s) or object(s) with limited levels of significance, or, minor impact to significant place(s) or object(s)	Substantial degree of impact on significant place(s) or object(s)	Major degree of impact on significant place(s) or object(s) with a high level of significance	Major degree of impact on place(s) or object(s) with an exceptional level of significance
Economic	General	Minimal losses	Sever thousands of dollars in lost revenue or remediation costs	Half a million dollars in lost revenue or remediation costs	A million dollars in lost revenue or remediation costs	Several million dollars in lost revenue or remediation costs
	Financial/ Business Cost	No Loss	<$100,000	<1,000,000	<$10,000,000	>$10,000,000

C.3.1.2 Risk assessment matrix

Based on the assessment of likelihood and consequence (as described above) any foreseeable impact can be assigned a risk rating. An Environmental Assessment is intended to focus on potentially significant environmental impacts.

The table below is to be read as a matrix, with increased consequence across the top and increased likelihood down the left side. Any potential impacts that fall in the bottom right are to be specifically addressed in the Environmental Assessment.

Table C.3-3 Risk assessment matrix

	Consequence				
Likelihood	Minimal	Minor	Moderate	Major	Catastrophic
Remote	Negligible	Negligible	Very Low	Low	Medium
Unlikely	Negligible	Very Low	Low	Medium	High
Possible	Very Low	Low	Medium	High	Very High
Likely	Low	Medium	High	Very High	Significant
Almost Certain	Medium	High	Very High	Significant	Significant

C.3.2 Potential Impacts

Table C.3-4 lists the potential impacts associated with the Euchareena Road Site. A similar assessment for the Ophir Road Site is provided in Table B.4-4. It is important to note that some potential impacts associated with the Project would be reduced to lower levels with the implementation of appropriate mitigation measures. As a result, it is unlikely that any of the potential impacts identified would remain significant once mitigation measures are implemented.

In addition, the ongoing monitoring programs proposed for the Project would provide the necessary information to inform, and if required, adapt the operation of the Project.

Table C.3-4 Risk assessment – Euchareena Road Site

Issue	Potential impacts	Likelihood	Consequence	Assessed Risk Level	Comment/Response
Groundwater	Groundwater contamination from leachate infiltration (landfill and or maturation runoff pond). Leakage of diesel storage tanks.	Unlikely	Moderate	Low	This is considered a key issue at the Euchareena Road Site and was also identified in the Director-General's requirements as a key issue and it is therefore addressed in Section C.4.3. The landfill and diesel storage facilities would be specially designed to minimise/eliminate potential leakage.
Transport	Road safety impacts with increased truck movements along Euchareena Road, Change in network efficiency due to changes in traffic flows.	Possible	Minor	Low	This is considered a key issue at the Euchareena Road Site and was also identified in the Director-General's requirements as a key issue and it is therefore addressed in Section C.4.11. Intersections and roads would be upgraded progressively to eliminate any safety hazards identified.
Air quality and odour	Dust emissions from construction activities and ongoing operations, odour emissions from the landfill operation and enclosed tunnel composting process.	Possible	Moderate	Medium	This is considered a key issue at the Euchareena Road Site and was also identified in the Director-General's requirements as a key issue and therefore has been addressed in Section C.4.10. A baled waste landfill would be used to minimise landfill odours and dust, and biofilters used for composting operations.
Biodiversity	Disturbance of threatened flora and or fauna species during construction and or operation.	Unlikely	Moderate	Low	This is considered a key issue at the Euchareena Road Site and was also identified in the Director-General's requirements as a key issue and therefore has been addressed in Sections C.4.4 and C.4.5. Significant areas of critically endangered ecological community would be fenced off and protected from other activities.

Issue	Potential impacts	Likelihood	Consequence	Assessed Risk Level	Comment/Response
Soil and water	Disturbance of soils during construction activities and preparation of the landfill cells and hence potential for sediment movement. Surface water impacts from runoff from disturbed areas.	Likely	Minor	Medium	This is considered a key issue at the Euchareena Road Site and was also identified in the Director-General's requirements as a key issue and therefore has been addressed in Sections C.4.1 (Soils and Land Capability) and C.4.2 (Surface Water). Sediment dams would prevent runoff from the landfill from reaching water catchments.
Aboriginal heritage	Disturbance of Aboriginal heritage items during construction and or operation.	Possible	Minor	Low	This is considered a key issue at the Euchareena Road Site and was also identified in the Director-General's requirements as a key issue and therefore has been addressed in Section C.4.7. Fencing would be used to prevent identified areas from being disturbed.
European heritage	Encounter and disturb items of European heritage during construction	Remote	Minimal	Negligible	This is not considered a key issue at the Euchareena Road Site. Covering of loads would ensure that windblown litter does not affect these sites.
Noise	Construction noise, operational noise emissions from plant and equipment. Traffic noise.	Possible	Moderate	Medium	This is considered a key issue at the Euchareena Road Site and was also identified in the Director-General's requirements as a key issue and therefore has been addressed in Section C.4.12. Earthmoving equipment used on-site would be fitted with low impact broad band reversing alarms approved by WorkCover.
Hazards	Health, occupational health and safety, operational and construction hazards associated with the Project. This may include noise, operation of heavy equipment, construction, ground instability due to excavation, etc.	Unlikely	Moderate	Low	This is considered a key issue at the Euchareena Road Site and was also identified in the Director-General's requirements as a key issue and therefore has been addressed in Section C.4.9. Construction and operational activities would be managed using site specific

Issue	Potential impacts	Likelihood	Consequence	Assessed Risk Level	Comment/Response
	Hazards associated with composting and landfilling including landfill gas and compost self-combustion.				procedures, and facilities would be designed to minimise the possibility of fire, groundwater contamination, and other potential external impacts.
Visual amenity	Visibility of the landfill and other site infrastructure from public roads and surrounding residences.	Likely	Minor	Medium	This is considered a key issue at the Euchareena Road Site and was also identified in the Director-General's requirements as a key issue and therefore has been addressed in Section C.4.13. Vegetated earth mounds would be used to shield site operations at Euchareena Road, as well as planting of tree screens at strategic locations.
Greenhouse gas	Emissions from fuel use in construction equipment and electricity use, mobile equipment and transport contributing to global warming.	Almost certain	Minimal	Medium	This is considered a key issue at the Euchareena Road Site and was also identified in the Director-General's requirements as a key issue and therefore this issue is addressed in Section D.2 and considers the Project as a whole. Potential energy efficiency measures would be incorporated in the design of all facilities, and landfill gas emissions would be managed through a passive drainage and flaring system.
Apiary industry	Infection of nearby hives with AFB or contamination with propolis substitutes.	Unlikely	Minor	Very low	Euchareena Road Site, however the Director-General's requirements identify this as a key issue and therefore is addressed in Section C.4.6. Wrapping of bales of waste prior to landfilling, during periods when bees are active in the area surrounding the Euchareena Road site, would be the primary measure used to minimise biosecurity risks.
Socio-	Cost of infrastructure and operations	Possible	Minor	Low	The Director-General's requirements identify this as a key issue and therefore is addressed in

Issue	Potential impacts	Likelihood	Consequence	Assessed Risk Level	Comment/Response
economic	compared to alternatives. Impacts on the agricultural capability of the Site and region. Potential financial impacts on the apiary industry. Potential to impact on future development centred on the Copper Hill Mine.				Section D.1 and considers the Project as a whole. A comprehensive financial model has been used to compare the Project with various alternatives, which has demonstrated that the project has lower long term costs than alternatives. Rehabilitated areas of the Site would be available for grazing once landfilling is complete. Impacts on the Apiary industry would be minimised by wrapping of wastes before landfilling. Future mining activities nearby would not be affected by site operations.
Land capability	Detrimental change in land capability of the Euchareena Road Site.	Possible	Minor	Low	This is considered a key issue and has therefore been addressed in Section C.4.1. Double skin diesel storage tanks would be used to prevent fuel leakages. Topsoils stripped during construction would be re-used during rehabilitation of the landfill.

C.4 Impact Assessment

C.4.1 Soils and Land Capability

C.4.1.1 Introduction

A soils, land capability and agricultural suitability assessment of the Euchareena Road Site was undertaken by Geoff Cunningham Natural Resource Consultants Pty Ltd (GCNRC) based upon field work undertaken in October, 2003. The purpose of the assessment was to determine the potential impact of the Project on the soils and land capability of the site and to identify appropriate impact mitigation measures to implement throughout the design and operation of the Euchareena Road RRC.

The soils assessment was undertaken across an area of the Euchareena Road Site substantially greater than that proposed to be disturbed by the Project. The area of the soils study is referred to throughout this subsection as the 'Soils Study Area' (see Figure C.4-1). The description of site's land capability and agricultural suitability relates to the entire Euchareena Road Site. The full assessment report is presented in Appendix I and is summarised in this subsection.

C.4.1.2 Soil occurrences and characteristics

Soil mapping methodology

The Euchareena Road Site occurs within the Cudal Soil Landscape (cl) as defined by Kovac, Lawrie and Murphy (1989) on the Bathurst 1: 250 000 scale Soil Landscapes Map. The Cudal Soil Landscape occurs on undulating rises, undulating low hills and dissected plateaus around Cudal and consists of euchrozems on the crests and upper slopes and non-calcic brown soils further down the slope.

The investigations to verify this soil mapping comprised stereoscopic airphoto interpretation followed by excavation of eight pits within the Soil Study Area (Figure C.4-1). Sampling of the soil pits involved the complete description of eight profiles to a depth of 2.5 m or the depth of backhoe refusal. Soils were classified (based on Isbell (1996) and two representative samples (from Profiles 3 and 7) were forwarded to the Department of Lands' NATA - registered soil testing laboratory at Scone for more detailed analysis to determine a range of chemical and physical characteristics. It is noted that three profiles, namely 1, 3 and 4 are located in close proximity to the proposed areas of disturbance. Hence, particular emphasis is placed upon the laboratory results for Profile 3.

Soil mapping results

The soil assessment identified only one Soil Mapping Unit (SMU) within the Soils Study Area, SMU1, which is described below.

Soil – typically 120 cm to 260+ cm deep, surface generally firm, sometimes loose or hardsetting; little if any surface stone.

Topsoil: (A1 horizon) - always present; 10 cm to 19 cm depth (Average 15 cm)

Fine sandy clay loam, silty clay, clay loam, clay loam to light clay or light to medium clay; 10 cm to 19 cm deep; pH 4.5 to 6.0; many roots; reddish brown, yellowish brown to brown colour; highly structured.

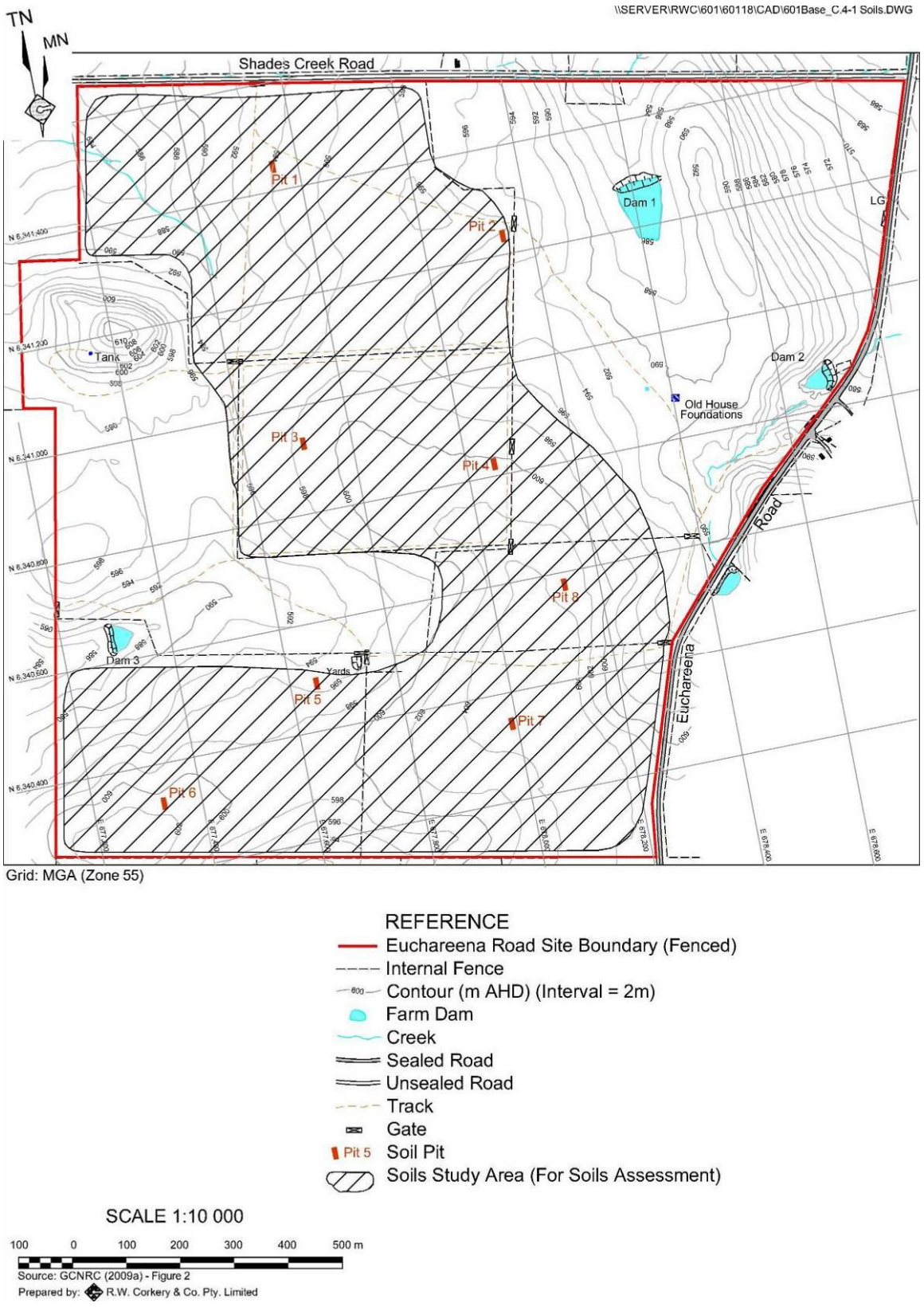


Figure C.4-1 Soils study area and soil pit locations

Subsoil: (B1 horizon) - always present; 31 cm to 68 cm depth,

(B2 horizon) - always present; 24 cm to 50 cm depth

(B2.2 horizon) - usually present; 22 cm to 58 cm depth

(B2.3 horizon) - sometimes present; 69 cm to 81 cm depth,

(B3 horizon) - always present; 29 cm to 149 cm depth.

Light clay, sticky light clay, medium clay, medium to heavy clay in texture; roots few to many, more common closer to the surface; pH 6.0 to 8.0; manganese present in some profiles as stains, flecks and small nodules; small rounded gravel, smooth (few) and angular stones to 8 cm present in some profiles; lime nodules to 15 mm diameter present in one profile; yellowish red, red, reddish brown or strong brown coloured dry; dusky red, dark red, reddish brown, dark reddish brown, brown or strong brown coloured; moist; highly structured.

Overlies - generally mottled medium to heavy clay subsoils and weathering rock.

Soil mapping unit 1 physical and chemical characteristics

Physical characteristics

The tests undertaken on the soil samples sent to the Department of Lands were aimed at assessing the potential erodibility of the soils and included the following tests.

- Particle Size Analysis (PSA) - indicates the amounts of clay, silt, fine sand, coarse sand and gravel contained within each sample;
- Dispersion percentage (D%) - indicates the proportion of the soil material less than 0.005 mm in size that will disperse on wetting;
- Emerson Aggregate Test (EAT) - provides a measure of the coherence of soil aggregates when they are immersed in water. The degree of soil aggregate stability increases from Class 1 through to Class 8;
- PH; and
- Electrical Conductivity (EC) - a measure of the presence of water-soluble salts, mainly of sodium, calcium and magnesium in the soil solution. These salts may be chlorides, sulphates or carbonates and can have a major impact on plant growth if they occur in sufficiently large quantities.

When considered together, PSA, D% and EAT provide a good indication of each soil's likely behaviour in relation to the erosive forces encountered in the field. The results of these tests for Profile 3 are listed in Table C.4-1.

With respect to PSA, it should be noted that the field textures of many layers of the two profiles that were examined indicated that the soils were generally more clayey than was shown in the laboratory analyses. Soil horizons with high clay contents and high Dispersion % values will be more dispersive in practice than those with a high Dispersion % value and a low clay content in the soil. The laboratory D% values, however, indicated only slight D% values, that is, low dispersibility.

Table C.4-1 Physical laboratory analysis data for soil profile 3

Layer	Texture [fine earth]	Depth [cm]	PSA % Clay	PSA % Silt	PSA % Fine Sand	PSA % Coarse Sand	PSA % Total Sand	PSA % Gravel	D %	EAT
1	Loam	0-12	25	21	48	6	54	<1	6	8/3
2	Clay	12-80	59	11	25	4	29	1	7	5
3	Clay	80-130	37	9	22	16	38	16	15	5
4	Clay	130-182	37	10	20	13	33	20	25	3
5	Clay	182-252	52	17	18	8	26	5	37	3

PSA = Particle Size Analysis

Source: Geoff Cunningham Natural Resource Consultants (2005a) – Table 1

The subsoil layers showed generally moderate dispersibility values. Given this, the erosion potential is generally moderate for any areas of exposed subsoil within the proposed area of disturbance.

Chemical characteristics

Chemical characteristics of Profile 3 are listed in Table C.4-2.

Table C.4-2 Chemical characteristics of profile 3

Layer	Texture (Fine Earth)	Depth (cm)	pH (Field - Raupach)	EC (dS/m)
1	loam	0-12	6.0	0.04
2	clay	12-80	7.5	0.09
3	clay	80-130	7.5	0.04
4	clay	130-182	7.5	0.04
5	clay	182-252	8.0	0.04

Source: Geoff Cunningham Natural Resource Consultants (2005a) – Table 4

The pH results indicate that all horizons had pH readings within the 5.5 to 8.0 range which would provide suitable conditions for vegetation growth. The EC values presented in Table C.4-2 indicate that all soil materials in SMU1 identified within the Soils Study Area are non-saline.

Erosion potential

The soils within the Soils Study Area are currently generally stable and well protected by a cover of native and introduced vegetation. The erosion potential of the soils was determined using the 'SOILOSS' computer program which computes soil loss values for a given site under various land uses and climatic conditions. The results of this assessment for Profile 3 are presented in Table C.4-3.

Table C.4-3 Soil erodibility values and ratings

Pit Number	Topsoil Layer	Topsoil 'K' Rating	Subsoil Layer	Subsoil 'K' Rating	Average 'K' Rating (Whole Soil)	Soil Mapping Unit Erodibility
3	0-12 cm	0.041	130-182 cm	0.027	0.034	Moderate

Source: Geoff Cunningham Natural Resource Consultants (2005a) – Table 7

The data in Table C.4-3 indicates that the 'SOILOSS' program predicts that the soils within the proposed areas of disturbance have moderate erodibility in both topsoil and subsoil. As such, the soils would require careful management during the stripping and rehabilitation stages to ensure that soil structure damage is minimal and that they are suitably protected by vegetation or some other medium at all times.

C.4.1.3 Land capability and agricultural land suitability

Land capability

Houghton and Charman (1986) define land capability as

> *'The ability of land to accept a type and intensity of use permanently, or for specified periods under specific management, without permanent damage.'*

Land that is used beyond its capability ultimately loses its productive capacity as a consequence of exhaustion of soil nutrient supplies or the development of various forms of land degradation.

The land capability classification system used in New South Wales has been described by Emery (undated) and provides for eight classes of land based on the management and protection needs of different types of land ranging from land needing no special soil conservation works or practices (Class I) through to land that is unsuitable for agricultural or pastoral production (Class VIII).

The field assessment of the Euchareena Road Site identified that the majority of the Site is classified as Class III land (Figure C.4-2), i.e. land suitable for cropping on a rotational basis but requiring the use of structural soil conservation works such as graded banks, waterways and diversion banks, together with soil conservation practices such as conservation tillage and adequate crop rotation.

The exception is the small stony hill in the northwest section of the Site, which is classified as Class VI land i.e., land not capable of being cultivated but suitable for grazing with limitation of stocking, broadcasting of seed and fertilizer, prevention of fire and destruction of vermin.

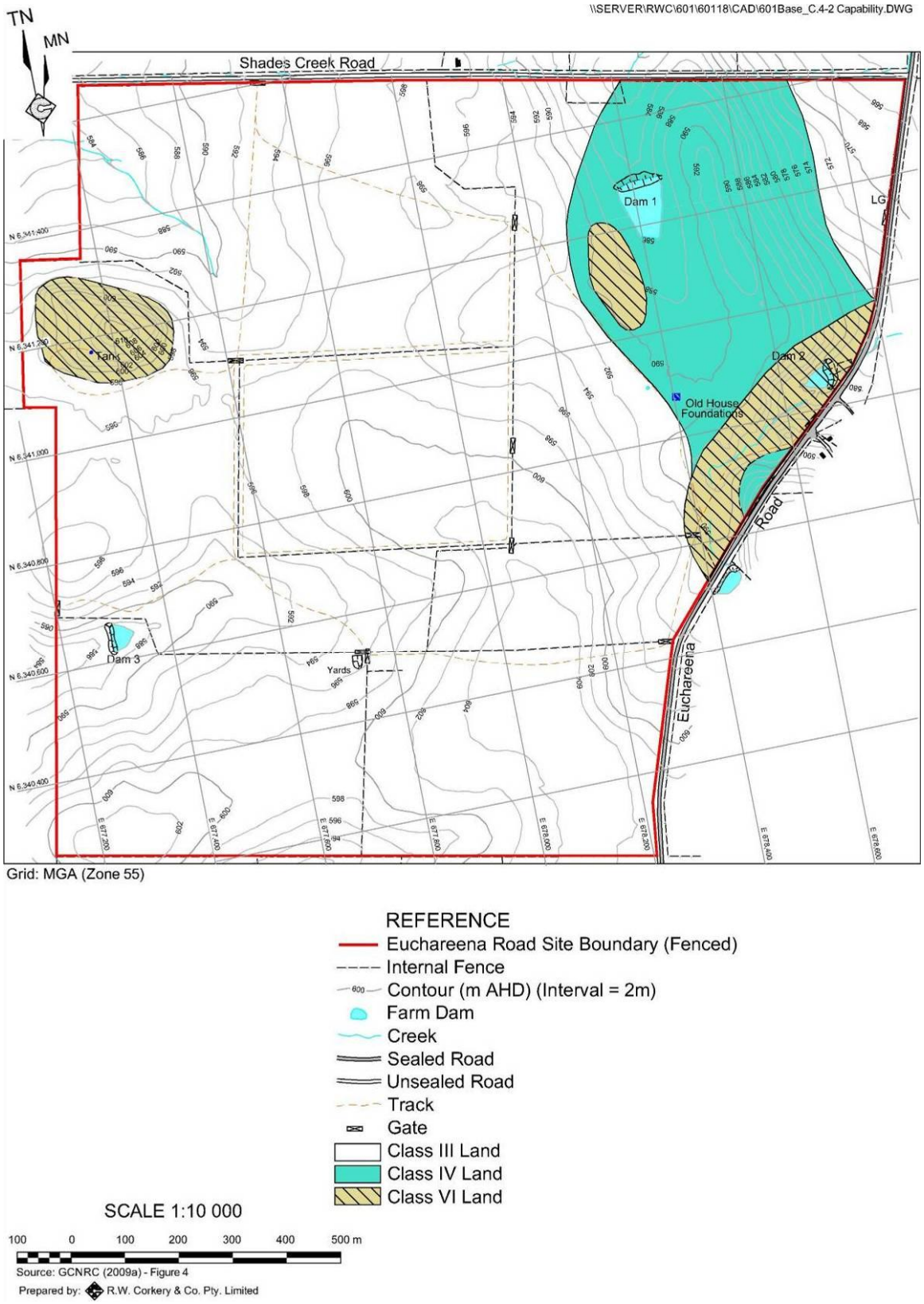


Figure C.4-2 Land capability

Agricultural land suitability

The field assessment determined that the majority of the Euchareena Road Site was classified as Class 3 land for agricultural suitability, that is, grazing lands or those well suited to pasture improvement. These lands have a moderate productivity and may be cultivated or cropped in rotation with pasture although soil and environmental constraints (e.g. erosion hazard and soil structure breakdown) limit productivity.

The drainage line and the rocky slope in the northeastern section of the Site are more correctly classified as Class 4 land (Figure C.4-3). Class 4 land is land suitable for grazing but not for cultivation. Agriculture is based on native pastures or improved pastures established using minimum tillage techniques.

Based upon the above definitions and those in Cabonne LEP 1991, the bulk of the Euchareena Road Site is recognised as 'prime crop and pasture land'. Both the LEP 1991 and the Industry and Investment NSW (Agriculture) policy for the protection of agricultural land call for justification of non-agricultural developments on such land. For the purposes of justifying the use of 12 ha of prime crop and pasture land for a landfill, the following matters are raised.

1. The land is within the landfill footprint underlain by a considerable thickness (up to 20 m) of saprolitic clay which provides for good soil development (with the benefit of the residual basalt cover). From a landfill perspective, the same clay would provide an excellent substrate for a landfill given its very low permeability.
2. The use of the subject land for a non-agricultural use would not be permanent. Rather, the Proponent would progressively rehabilitate the subject land back to pasture suitable for grazing or selected crops beyond the 40 year life of the Project.
3. An important feature of the Project would be the production of a range of compost products within the enclosed composting plant suitable for the agricultural sector. The landfill for which 12 ha of land would be required is a companion component of the overall Project that would yield these products for the local agricultural industry.
4. It is important that the agricultural sector has access to a professionally engineered landfill to avoid past practices where agricultural land has been contaminated by inappropriately placed wastes on farms and in local unsupervised landfills. Further, the placement of the proposed landfill on the area of land underlain by such a substantial thickness of clay would provide long term protection for both surface water and groundwater resources which are fundamental to long term agricultural production in the local area.

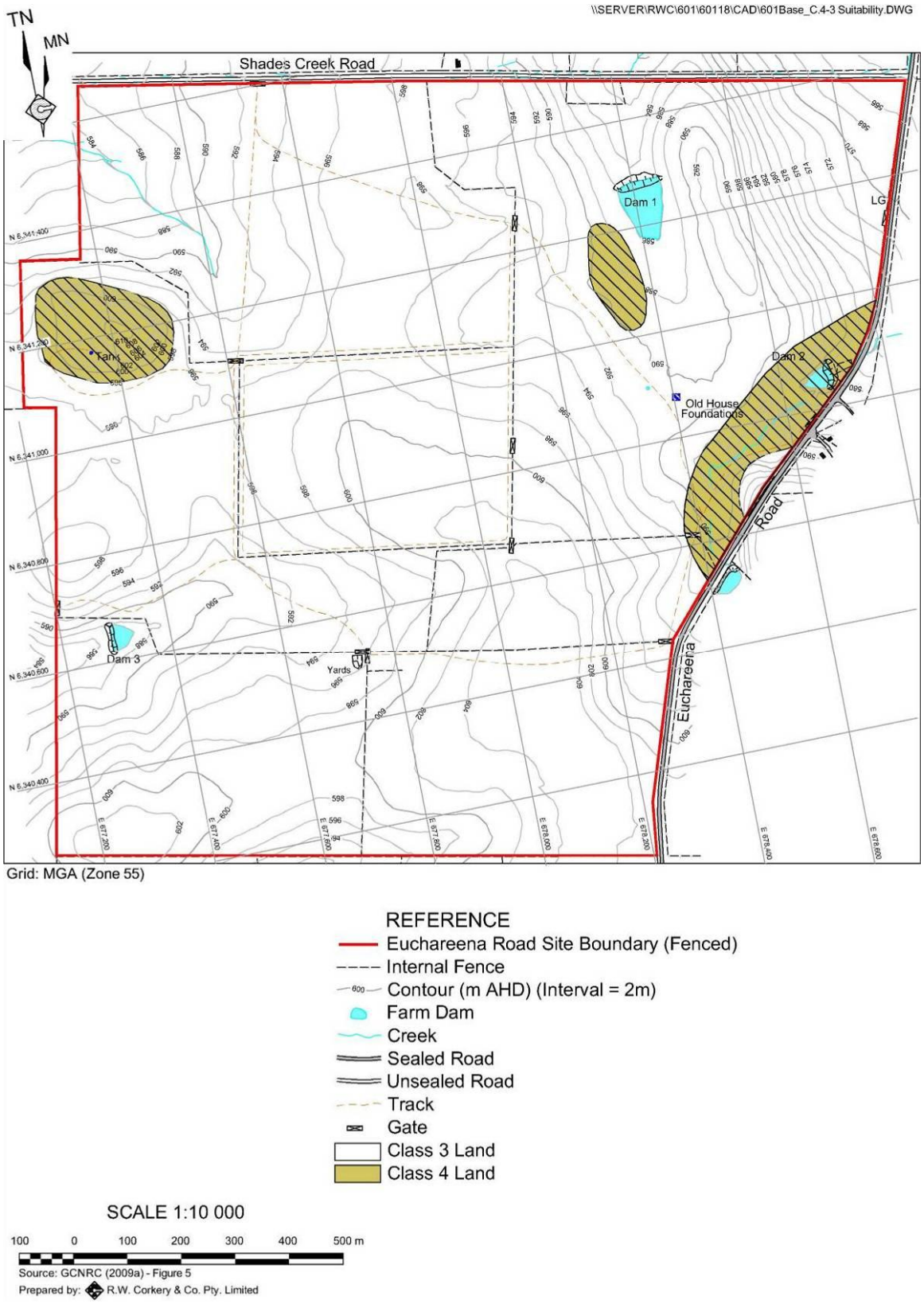


Figure C.4-3 Agricultural land suitability

C.4.1.4 Mitigation measures

The Proponent's approach to the stripping and stockpiling of topsoil and subsoil and soil management in the proposed areas of disturbance are set as follows and reflect the recommendations of GCNRC (2009).

- Topsoil: This material contains valuable seed, organic matter and nutrients. This material would be stripped to a depth of approximately 0.15 m, stockpiled and used later for rehabilitation of the final landscape. Towards the latter stages of the landfill development, topsoil would be transferred directly onto completed areas of the landfill to assist in revegetation.
- Subsoil: This material is an important component of the soil profile as it assists to retain soil moisture. This material would be stripped to a depth of approximately 0.75 m from the existing surface (0.6 m total) unless mottled soil is encountered at lesser depths. If mottled soil is encountered at depths of less than 0.75 m below the existing surface, subsoil stripping would cease in that area.
- Any material at depths greater than 0.75 m would be regarded as suitable for bund wall construction, daily cover or landfill capping.
- Handling of topsoil and subsoil would be minimised to reduce potential of mechanical damage to soil structure that would be detrimental to rapid establishment of ground cover once rehabilitation works commence.
- Stripping operations would be carried out using machines such as open-bowl scrapers or bulldozers. If scrapers are used, they would dump their loads neatly to form a uniform stockpile that requires little further forming prior to establishment of a vegetation cover. Care would be taken also to ensure that topsoils and subsoils are not stripped when they are too moist as greater damage will occur at this time.
- Driving of machinery on the topsoil and subsoil stockpiles, other than the scrapers during unloading, would be kept to an absolute minimum to maximise soil aggregation and prevent compaction, particularly when the stockpiles are moist.
- Topsoil stockpiles, once required, would be up to 1 m high and the subsoil stockpiles would not exceed 3 m in height. Subsoil and topsoil stockpiles would be located either within the footprint of the landfill or on the upper surface of the completed landfill stages. The placement of the topsoil and subsoil on top of the amenity bunds would ensure those materials are removed from any surface water flows which could cause erosion and sedimentation. Stabilisation measures such as silt-stop fencing and/or hay bales would be used until vegetation is established on the stockpiled soil, which would occur as soon as possible after stockpiling. In addition, the stockpile surfaces would be left as 'rough' as possible, in a micro-sense, to assist in runoff control and seed retention and germination.

C.4.1.5 Impact assessment

Soils

The identification of the topsoil and subsoil resources on site and their properties and the adoption of the proposed mitigation measures would enable the planned disturbance of topsoil and subsoil to proceed without any adverse impacts. The use of correct stripping, stockpiling and replacement methods would ensure that the overall impacts on the soil resources is minimal.

Land capability / agricultural suitability

The progressive replacement of topsoil and subsoil on completed landforms would enable the land capability of the disturbed area to ultimately be similar to those of the existing land. Revegetation of the final surface of the landfill in the manner proposed would enable improved pasture and ongoing grazing across the entire landfill surface, i.e. once it is fully stabilised. The opportunity would exist for selected cropping of low-rooted shrubs and grasses, particularly those suited for nectar production.

Overall, the changed practices on the Euchareena Road Site and increase in native vegetation, would have beneficial ecological impacts whilst retaining comparable land capability and agricultural suitability.

C.4.2 Surface Water

C.4.2.1 Introduction

Surface water management is an important part of the Project to ensure that the proposed activities on the Euchareena Road Site do not adversely impact upon the surrounding agricultural land or drainage lines and waterways with respect to water quality or the quantity of surface water flowing off site.

The surface water assessment of the Project was conducted by Evans & Peck Pty Ltd (2009) whose report is summarised in the following section and is presented in full in Appendix J.

C.4.2.2 Existing environment

Existing catchments

Regional and local catchments

The Euchareena Road Site lies close to the southern boundary of the regional Macquarie River catchment (Figure C.4-4) that ultimately flows to the Murray Darling system in the west and southwest of NSW.

In the local area of the Euchareena Road Site, there are two primary catchments, namely, Shades Creek and Molong Creek (Figure C.4-4). The Shades Creek catchment covers approximately 1,530 ha to the northeast and southeast of the Euchareena Road Site, of which approximately 97 ha are located within the Site itself. Shades Creek joins the Bell River approximately 3 km north of the Euchareena Road Site.

The Molong Creek catchment in the vicinity of the Euchareena Road Site can be divided into two subcatchments: one encompassing an unnamed tributary to the northwest (670 ha catchment of which 22 ha is located within the Site) and one encompassing Back Creek (1,580 ha catchment of which 72 ha is within the Site). Molong Creek joins Bell River approximately 7 km north of the Site. Bell River in turn, joins Macquarie River at Wellington, approximately 55 km north of the Site.

Euchareena Road Site catchments

The Euchareena Road Site is located on the crest of a gently sloping ridge, which gives rise to three main shallow valleys that drain in northerly, northwesterly and westerly directions (Figure C.4-5). Approximately 51% of the Site drains in a northerly direction to Shades Creek whilst the remainder of the Site drains generally in a westerly direction via two tributaries of Molong Creek.

All drainage lines on the Euchareena Road Site are ephemeral depressions without distinct bed and banks and only flow after major rain events. Approximately 60% of the Euchareena Road Site area (114

ha of the total 193 ha) drains via ephemeral drainage lines into the following three existing stock water dams on the Site (Figure C.4-5).

- Dam 1 Estimated capacity 6,000 m^3 – 32 ha catchment (Shades Creek)
- Dam 2 Estimated capacity 750 m^3 – 36 ha catchment (Shades Creek)
- Dam 3 Estimated capacity 800 m^3 – 46 ha catchment (Back Creek)

The majority of the remainder of the Site drains in a northwesterly direction to an unnamed tributary of Molong Creek.

Water use

The Bell River Natural Resources Plan (Mid-Macquarie Landcare and Central Tablelands Landcare, 2004) assessed water use across the Bell River catchment to Wellington and identified a total of 221 irrigation licences with a total entitlement of 8,796 ML/year and 158 licences for stock and domestic supply. No details are provided of the numbers of licences for Bell River and Molong Creek in the immediate vicinity of the Euchareena Road Site, however, the Plan notes that the majority of irrigation in the Bell River catchment occurs in the area to the south of Molong and in the northeast in the Neurea – Wellington area. Not withstanding the fact that the majority of irrigation water extraction occurs outside the immediate vicinity of Molong, it can be assumed that river water in the vicinity of the Euchareena Road Site is extracted for both stock and domestic supply and irrigation.

Surface water quality

Regional and local water quality

Spasmodic water quality monitoring has been undertaken in Molong Creek and Bell River over a number of years. Analysis of this data concludes that Molong Creek and the Bell River have degraded water quality on account of the following.

- Elevated conductivity (average in excess of 800 µS/cm) with an increasing trend in the Bell River of about 3 µS/cm per year. In low flow conditions, conductivity in excess of 1,200 µS/cm has been recorded in both Molong Creek and the Bell River. While this conductivity is within the default ANZECC guideline for aquatic ecosystem protection (1,500 µS/cm), it is above the limit for human consumption.
- Phosphorus concentrations consistently above the default ANZECC guideline for aquatic ecosystem protection (0.05 mg/L).
- Elevated Faecal Coliform levels, particularly in Molong Creek. Although there only a few recordings available, these readings are all above the default ANZECC guideline for primary contact recreation (150 CFU/ 100 mL) and make the water unsuitable for untreated drinking water.

Both the Bell River Natural Resources Plan and the Central West Catchment Blueprint, identify the need to reduce impacts on the watercourses from point source pollution as key elements of a strategy to improve the future water quality in the rivers.

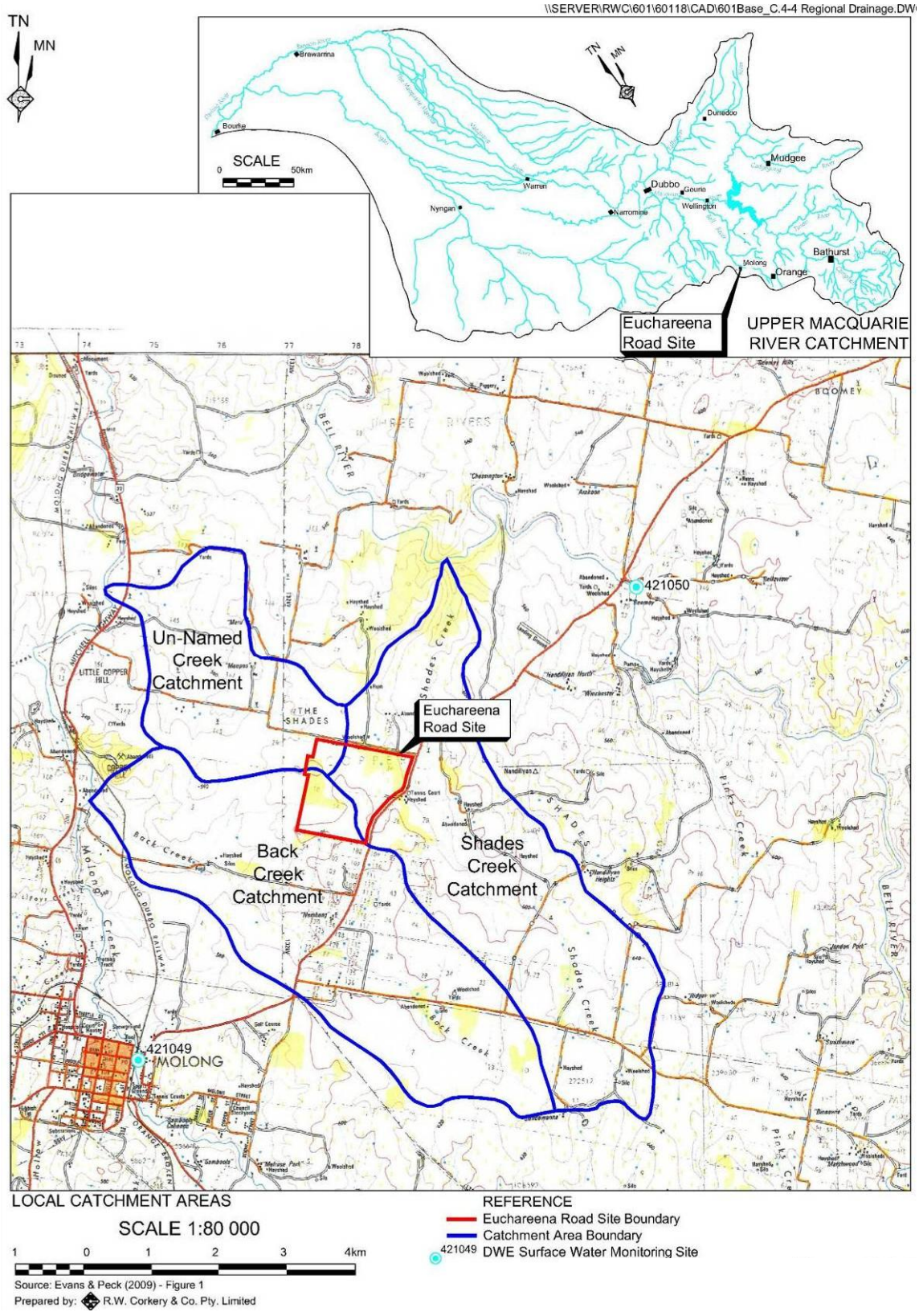


Figure C.4-4 Regional and local catchments

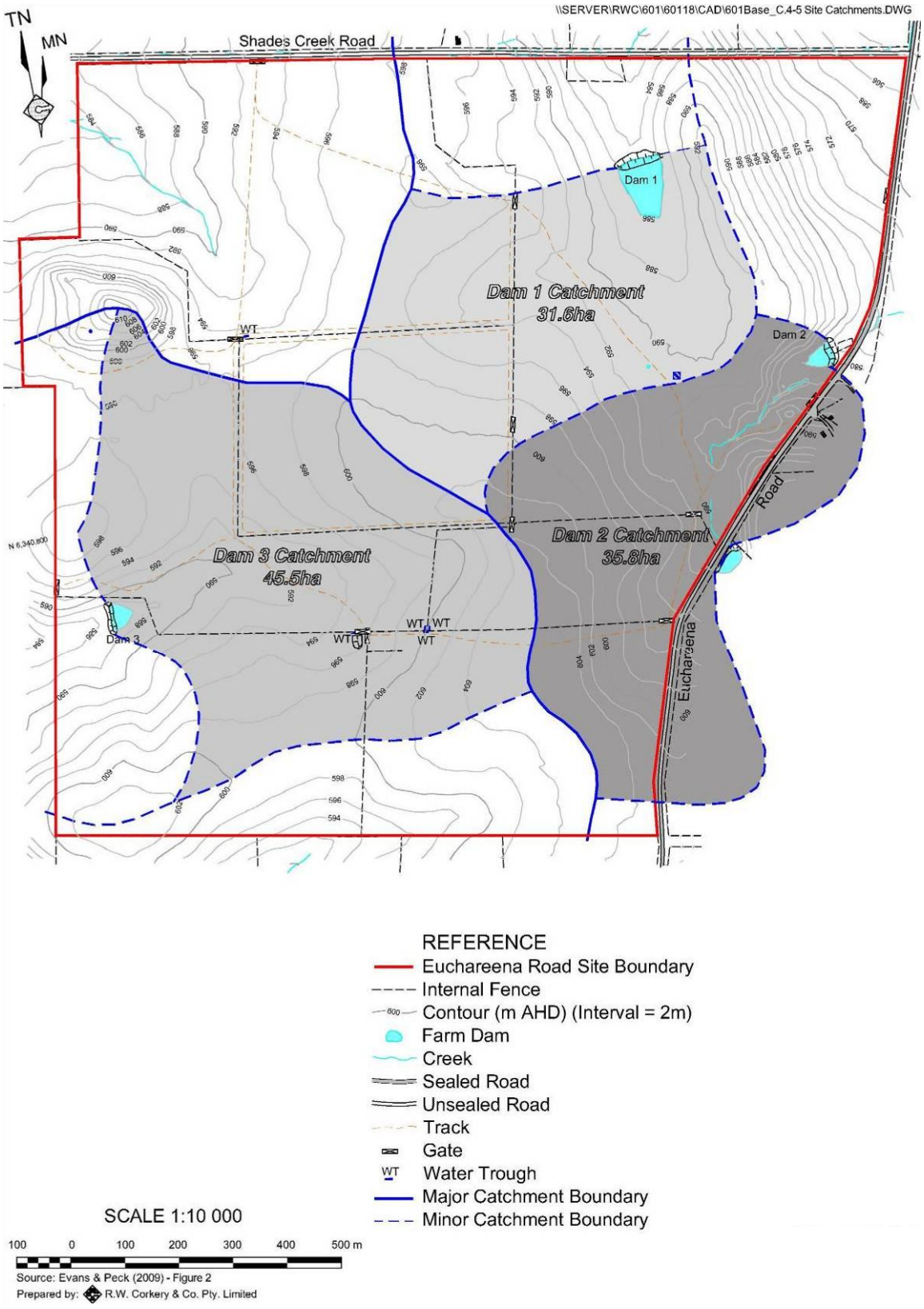


Figure C.4-5 Euchareena Road Site catchments

Euchareena Road Site water quality

Little surface water monitoring was undertaken on the Site and in the surrounding drainage lines due to the drought conditions experienced for many years. Surface water was sampled at the following locations in December 2004. The Bell River upstream of the confluence with Shades Creek was dry at the time of sampling.

- Dam 1 within the Euchareena Road Site.
- Dam 2 within the Euchareena Road Site.
- Dam 3 within the Euchareena Road Site.
- Bell River downstream of confluence with Shades Creek.
- Molong Creek upstream of the confluence with Back Creek.
- Molong Creek downstream of the confluence with Back Creek.

The notable features of the surface water quality monitoring data, which is presented in full in Evans & Peck (2009), are as follows.

- Significantly higher conductivity (and total dissolved solids) in the Bell River and Molong Creek (654 µS/cm to 687 µS/cm) compared to that in the dams (137 µS/cm to 208 µS/cm). This is likely due to saline seepage elsewhere in the watercourse catchments. It should be noted that the conductivity levels recorded in the Bell River and Molong Creek consistently exceed the ANZECC default trigger value for conductivity (350 µS/cm).
- Higher suspended solids in the dams (38 mg/L to 142 mg/L) compared to the Bell River and Molong Creek (3 mg/L to 6 mg/L), reflecting the runoff from surrounding agricultural land to the dam and the sedimentation process in the watercourses.
- Higher concentrations of all anions and cations except potassium in the river and creek water than in the dams (consistent with the higher conductivity).
- Elevated levels of total kjeldahl nitrogen in two of the dams (1.9 mg/L and 3.3 mg/L respectively), reflecting the instream processes that would lower levels in the watercourses. The levels recorded in the watercourses, however, exceed the ANZECC default trigger levels.
- Total phosphorus levels in both the dams and the rivers (0.07 mg/L to 0.23 mg/L) which exceed the ANZECC default trigger levels for all samples (0.02 mg/L).
- Except for aluminium, the water in the rivers consistently meets the ANZECC default criteria for protection of 95% of species (which is applicable to slightly to moderately disturbed ecosystems) with respect to metal concentrations. Water quality in the dams meets the default criteria for slightly to moderately disturbed ecosystems for all elements except aluminium, manganese and zinc.

In general, the water quality in the dams on the Euchareena Road Site and the local watercourses is consistent with moderately disturbed catchments which exhibit elevated levels of suspended sediment (turbidity), salinity, nitrogen and phosphorus. The water quality in the dams meets the ANZECC guidelines for stock watering.

Surface water flows

There is no streamflow information available for the small creeks adjacent to, nor the drainage lines on, the Euchareena Road Site. The closest DWE recording gauge is Bell River at Euchareena Road and the runoff statistics are presented in Table C.4-4.

Table C.4-4 Runoff statistics – Bell River

	Bell River
Catchment area (ha)	36,500
Years of record	25
Average annual runoff (mm)	99
Median annual runoff (mm)	49
Maximum annual runoff (mm)	390
Minimum annual runoff (mm)	12.5

Source: Evans & Peck (2009) – Modified from Table 11

These statistics indicate a watercourse with a catchment area significantly larger than the catchments on the Euchareena Road Site or the creeks to which they contribute. Although the runoff from smaller catchments can be expected to be far more episodic than flow in larger creeks, the yield (runoff as a percentage of rainfall) from small catchments is generally higher because of the absence of channel losses.

With respect to surface water harvestable rights, the Farm Dams Assessment Guide (DLWC 1999) stipulates that the 'harvestable right' is based on a landholder being allowed to retain 10% of the runoff from the property, hence the 'harvestable right' specified for the Molong area of 0.07 ML/ha/year (or 7 mm/year of runoff) is based on an assessment by DWE that the runoff from the landscape is 70 mm/year. Natural runoff from the Euchareena Road Site would be highly variable depending on the rainfall in a particular year (in a 1 in 10 wet year about three times the average annual runoff can be expected (of the order of 250 mm) while in a 1 in 10 dry year, runoff is likely to be negligible). The maximum dam capacity harvestable right appropriate to the Euchareena Road Site is 192.6 x 0.07 = 13.5 ML.

C.4.2.3 Surface water management controls

Surface water management principles

The following key principles have been used as the basis for the design of the surface water management controls around the Site.

1. Minimise the volume of runoff to be managed by minimising the contributing catchment area that is active at any particular time.
2. Keep sources of different quality water separate from each other, namely:
   - 'leachate' drainage from the base of the landfill and the active landfill area;
   - 'dirty' runoff containing sediment from soil stockpiles and rehabilitated landfill; and
   - 'clean' runoff from grassed paddocks with no waste-related activities.
1. Re-use or dispose of water on site:
   - ensure zero discharge of leachate to local streams through the removal of all leachate from the site by tanker for transportation to the Orange wastewater treatment plant;

- re-use of ‘dirty’ runoff for dust suppression; and
- divert ‘clean’ runoff into dams for supplementary water supply or overflow off site.

Operational areas

Due to the topography of the Euchareena Road Site, no runoff from outside the Site would enter the water management facilities designed to handle the various sources of water on the Site. As such, the surface water management controls have been developed specifically for each of the five operational areas, namely:

- The access road and site office;
- The enclosed composting facility, compost maturation bed and runoff collection pond;
- Landfill area;
- Soil stockpile area; and
- Amenity and screening bunds containing excess subsoil.

The surface water management controls would be progressively developed as the operational areas are developed. Figure C.4-6 presents the proposed surface water management components of the Euchareena Road Site.

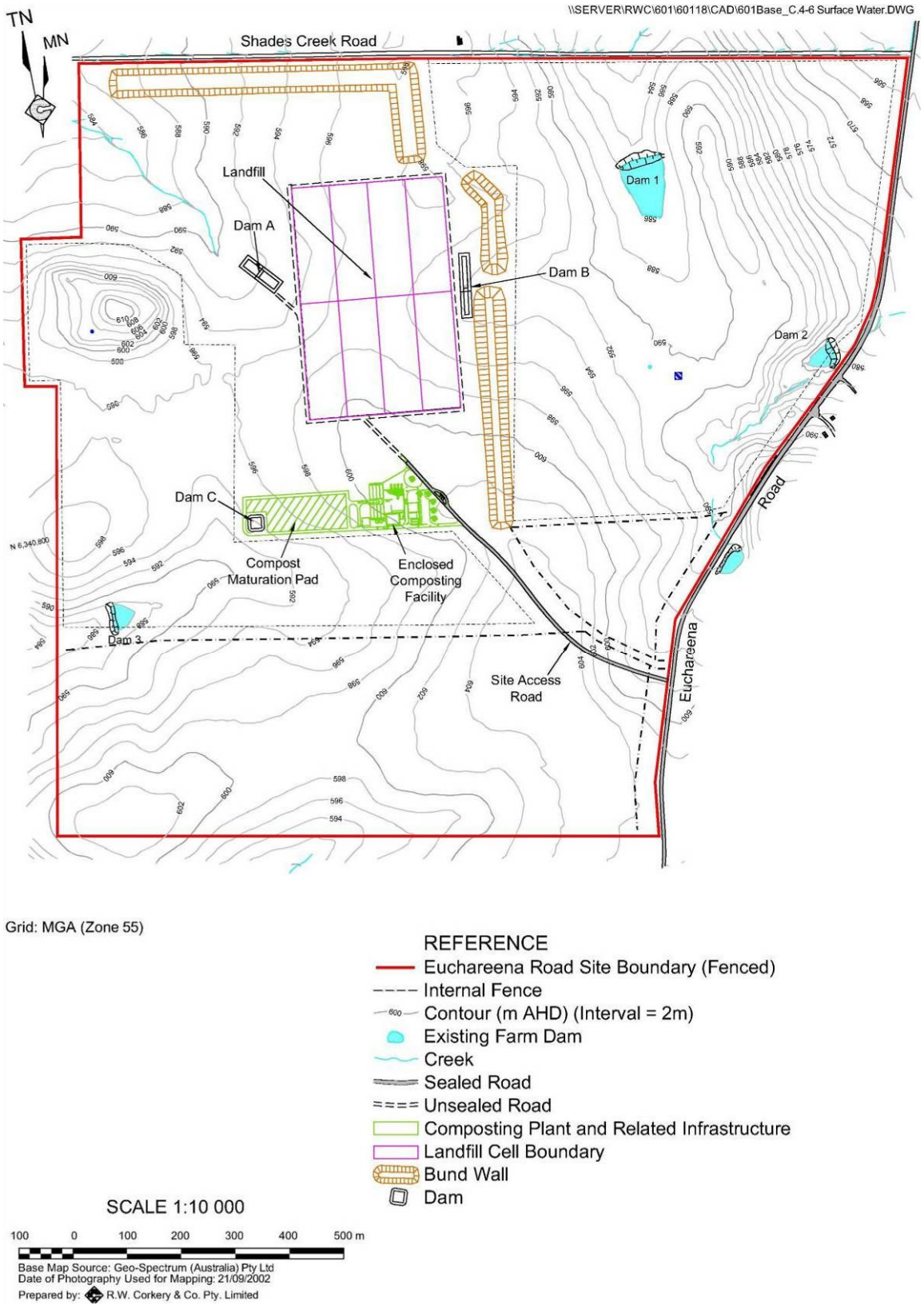


Figure C.4-6 Indicative Euchareena Road Site surface water management

Access road and site office

This area of surface water management encompasses the site access road (between Euchareena Road and the weighbridge), the site office and weighbridge. Surface water management controls relevant to the site access road would be applicable principally during the site establishment phase until the road is sealed and roadside drainage is stabilised. Regularly spaced mitre drains would be constructed adjacent to the road together with the use of stacked hay bales in roadside drains.

Roof runoff from the site office would be collected in a rainwater tank and used for general water supply and landscape watering in the immediate vicinity of the weighbridge. All areas disturbed during the construction / installation of the site office and weighbridge would be stabilised with a pasture mix. The area adjacent to the site office would also be landscaped to provide an approach to the Centre.

Enclosed tunnel composting plant

The enclosed tunnel composting plant would comprise a series of individual buildings to house different elements of the composting process. Two aspects of the operation would potentially occur in areas which may be partially uncovered. For assessment purposes, the worst case scenario (i.e. completely uncovered) has been assumed.

- Product maturation area (assumed 1,400 m^2, bunded hardstand).
- Product storage area (assumed approx 600 m^2 uncovered).

Although the processed wastes are anticipated to be relatively inert, stormwater drainage from the product maturation and product storage areas would be directed into a separate dedicated pond from which it would be re-circulated into the composting process. The maturation pond would be lined to prevent any leachate from the compost infiltrating into the soils beneath or surrounding the pond.

Landfill area

A perimeter bund would be progressively constructed around the landfill area to exclude upslope runoff and provide an additional visual barrier around the landfilling activities. All runoff from the landfill area would be directed to one of two dams, referred to as Dam A and Dam B. Both of these dams will be constructed as a sediment retention dam and water storage dam. Evans and Peck (2009) calculate

- The ‘sediment settlement zone’ capacity would be 1 ML and 1.5 ML for Dams A and B respectively.
- The ‘water storage zone’ capacity would be 3 ML and 4.5 ML for Dams A and B respectively.

That is, Dam A would have a total capacity of 4 ML and Dam B a capacity of 6 ML.

Soil stockpile area

Runoff from the 1 ha topsoil stockpile area on the southern side of the landfill area would be directed by means of diversion drains into Dam B (see Figure C.4-6).

Amenity and screening bunds

Runoff from the outer faces of the amenity and screening bunds would be directed as sheet flow into the areas beyond the bunds. Until the outer faces of the bunds are vegetated, silt-stop fencing would be used to collect any coarse sediment washed from the bunds. Runoff from the inner faces of the bunds would drain to Dam A or Dam B.

Runoff from completed landfill areas

While waste is being placed in a cell, all runoff that has been in contact with wastes would be treated as leachate and directed to the leachate collection system. Once waste placement has been completed and each cell capped, the surface of the cell would be revegetated to minimise erosion. All runoff from the completed landfill area would be directed to Dam A or Dam B.

The water levels within Dam A and/or Dam B would be drawn down to the bottom of the settlement zone level within 5 days of the cessation of any significant rainfall. Given the dispersive nature of some of the clay materials on site, it is unlikely that the water held in Dam A would achieve sufficient settlement within 5 days to achieve a TSS concentration of <50mg/L necessary for discharge from the site. Therefore, any water that needs to be removed to achieve the necessary drawdown would be used for on-site purposes (dust suppression, etc) or irrigated onto adjacent pasture areas.

Clean water runoff diversion system

It is proposed that apart from the site access road that traverses the upper section of Catchment 2 that Catchment 2 would not be affected by site activities i.e., clean water would continue to flow into Dam 2. Approximately 12 ha of Catchment 1 would be redirected into Dam B whilst runoff from the remainder of the catchment would continue to flow towards Dam 1 and beyond. Approximately 3 ha of Catchment 3 would be captured by the proposed composting area with the runoff from the remainder of the runoff from the catchment flowing towards and beyond Dam 3.

General sediment and erosion control

During the establishment phase of the Euchareena Road Site, the construction of the site access road, visual amenity bunds, Dams A and B and the maturation pad runoff pond would be required before any landfilling activities (or operational phase) of the Site begins. The strategy employed would be to provide temporary erosion control measures where necessary, and to progressively and promptly provide for permanent stabilisation of embankments and channels through revegetation. Additionally, landfill construction would be staged and progressive rehabilitation undertaken to minimise the area available to erosion at any one time.

In general, sediment control fencing would only be used temporarily and would only be placed where vegetation establishment on steep batters (steeper than 1 in 5 (V:H)) is delayed more than two weeks after topsoil spreading, earthworks are located immediately adjacent to a local minor drainage line or for temporary (greater than two weeks) stockpiles.

The downstream slope of all dam embankments would be stabilised though pasture establishment.

Vegetation establishment would also be undertaken as soon as possible and progressively on the site visual amenity bunds to minimise erosion and sedimentation.

Hydrocarbon management

All hydrocarbons brought to the site would either be used on the day of delivery or stored in a double lined tank. Procedures would be adopted when refuelling all mobile equipment to avoid spillages. In any event, spill collection and clean-up materials would be held on site.

Maintenance

The following operation and maintenance strategies would be implemented in relation to erosion control and water management facilities.

- Grass-lined diversion channels would be inspected and repaired if necessary after any significant storms that have led to flow in the channels.
- In order to maintain the effectiveness of Dams A and B for sediment retention, each dam would be drained down and cleaned once the accumulated sediment reduces the storage capacity by 20%.
- Any sediment control fences would be inspected and, if necessary, repaired/reinstated after any significant rainfall (>10 mm in a day).

C.4.2.4 Site water balance

The water balance for the Euchareena Road RRC has been undertaken by Evans and Peck (2009) who recorded the following site water requirements and on-site water sources.

Site Water Requirements

- The quantity of water required annually for dust suppression would be approximately 8.1 ML.
- The annual water requirement for operation of the enclosed composting plant would be zero. In fact, a small surplus of water may be generated.
- Negligible quantities of water would be recovered on site for ablutions, drinking water etc as this would be brought to site, as required (by tanker from Orange).

On-Site Water Sources

- Dams A and B would be able to provide the 8.1 ML of water required for dust suppression with a 92% reliability from the water storage zones.
- The remaining water required for dust suppression, if not available from Dams A and B could be drawn from Dams 1 and 2. Dam 1 has a storage capacity of 5.0 ML and Dam 2 has a storage capacity of 0.7 ML.
- In the event there is insufficient stored water in Dams 1 and 2 (as was the case during the recent drought), water would be transported by tanker from Orange (when backloading leachate).

C.4.2.5 Impact assessment

The surface water management and maintenance controls proposed for the Euchareena Road RRC would provide a high level of impact mitigation. In fact, the location of the Euchareena Road Site on the crest of a ridge and the gently sloping topography provide an excellent setting in which the site facilities have been located in a manner that minimises the potential environmental impacts from surface water runoff and means that there is no runoff from external catchments into the operations areas of the Site. Therefore, the water management facilities only need to cater for runoff generated within the Site. The management of surface water has been aided by the location of the main facilities areas where runoff does not drain to other parts of the site or can be easily controlled.

The Project would result in the control runoff from only 20 ha in the headwaters of two catchments on site, i.e. runoff from approximately 172 ha of the Site would continue to flow and be stored as it currently occurs. The two catchments managed on site would include:

- Shades Creek (12 ha); and
- An unnamed creek that drains from the northwestern corner of the Site (8 ha).

The overall effect of these changes would be a reduction in the average annual runoff from the Site by about 14 ML/year to about 120 ML/year (after accounting for about 6.5 ML retained in existing storages on site). The changes in off-site flow would only affect catchments which do not have any other farm dams in close proximity to the site. The change in discharge from the site would only adversely affect the ability of downstream landholders to capture and store runoff within their entitlement under the 'harvestable rights' regulations.

C.4.2.6 Monitoring

The following surface water monitoring program would be implemented throughout the operational life of the Euchareena Road RRC:

- Monitoring at all three sampling sites on the Euchareena Road Site would initially be undertaken four times per year, i.e. at Sites 3, 4 and 5 (Figure C.4-7). These four times would occur at approximately three monthly intervals but would be adjusted to ensure that at least one (preferably two) samples are taken from the nominated sites during wet weather (>10 mm during the previous day);
- In the event of any overflow from Dams 1, 2 or 3 the water at the respective monitoring locations beyond the Site would be sampled. The sites that would be monitored beyond the Site would include sites:
  - upstream and downstream of the confluence of Back Creek and Molong Creek (Site 1 and 2); and
  - upstream and downstream of the junction of Shades Creek and the Bell River Site 6 and 7.
- The proposed location of each monitoring site is displayed on Figure C.4-7 although the exact location would be finalised in consultation with the respective landholders and the DECCW;
- Whilst Dam A and Dam B are designed to function as sediment retention dams, routine monitoring of water retained in both dams would be undertaken. This monitoring would initially be undertaken on a quarterly basis, with the frequency reviewed two years after commencement of operations. In the event that monitoring identifies elevated levels of any waste-derived contaminants, the source of any contaminants in the water would be promptly investigated and rectified; and
- Any overflow of surface runoff from Dams A and B would be monitored.

Conditions relating to water monitoring would be incorporated into the site Environment Protection Licence issued by DECCW.

In the event that monitoring identifies any abnormal water quality, investigations would be undertaken to establish the cause of the abnormality and the need for any mitigation measures. All monitoring results would be assembled and published annually in the Annual Environmental Management Report for the Project. All monitoring data would be evaluated to ensure that all results are meaningful and contribute to a thorough understanding of the impacts (if any) of the Project on downstream / off-site water quality. If not, the program would be adjusted in consultation with the DECCW.

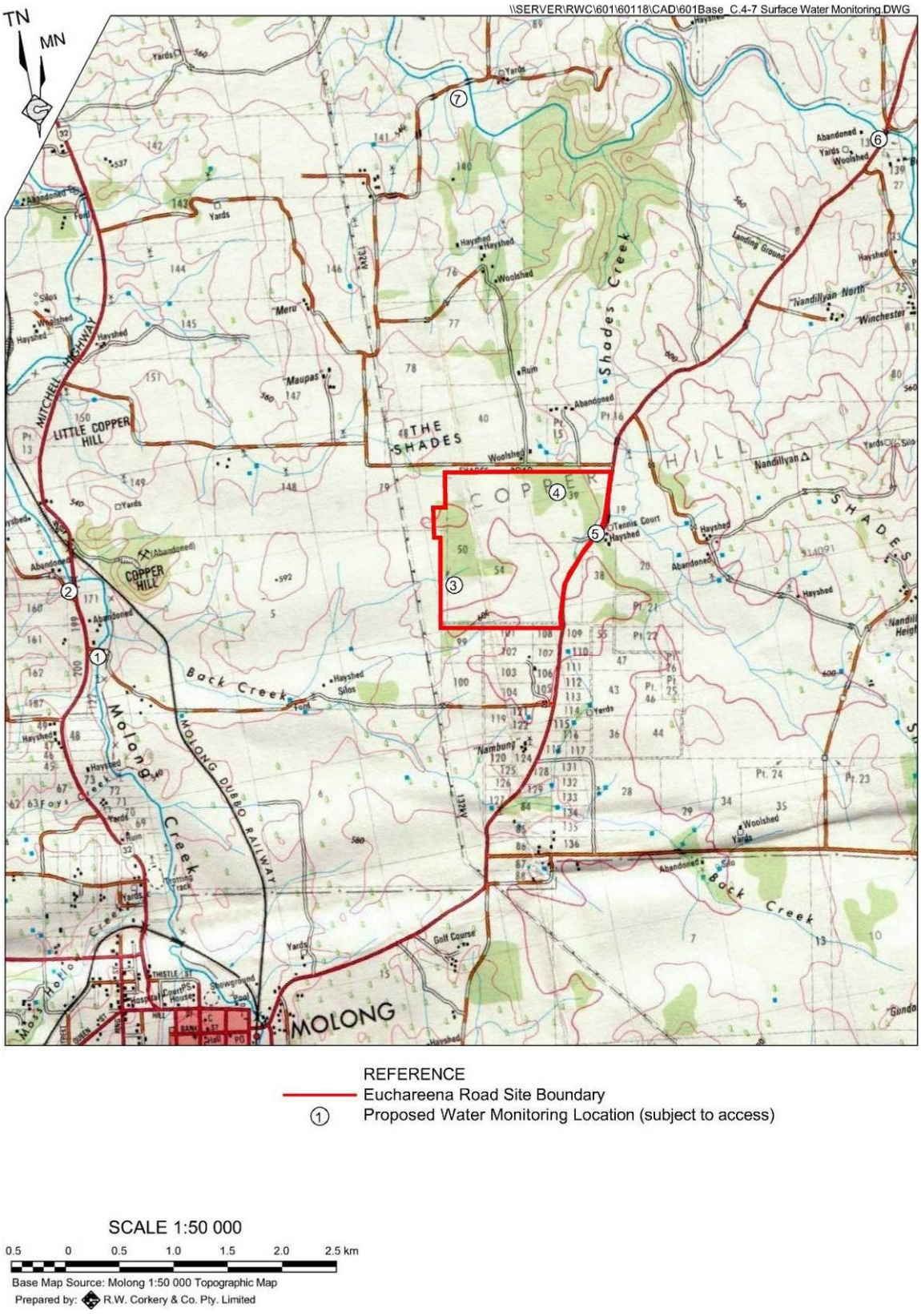


Figure C.4-7 Surface water monitoring locations

C.4.3 Groundwater

C.4.3.1 Introduction

The groundwater assessment for the Euchareena Road RRC was undertaken by Aquaterra Consulting Pty Ltd, a specialist groundwater consultancy that merged with Peter Dundon and Associates Pty Ltd in 2008, the authors of the groundwater assessment for the 2005 Groundwater Assessment of the Hub Regional Resource Reprocessing Facility. The purpose of the assessment was to identify the occurrence(s) of groundwater in the vicinity of the Euchareena Road Site, determine the potential impact(s) of the Project on the Euchareena Road Site and local groundwater resources and identify appropriate impact mitigation and management controls to implement throughout the design, construction, operation and rehabilitation, and post-closure management of the Euchareena Road RRC.

The full groundwater assessment (combined with the geotechnical assessment) report is presented in Appendix K and is summarised in this subsection.

C.4.3.2 Local groundwater occurrence and use

A search of the DWE (now part of DECCW) groundwater database identified the presence of 20 licensed groundwater bores/wells within approximately 3 km of the centre of the Euchareena Road Site (Figure C.4-8). Additionally, a number of apparently unlicensed bores were also identified on properties surrounding the Euchareena Road Site, some of which were sampled during the groundwater investigation for comparison of water quality (Bores C2 and L1). It is noted that four of the 20 bores/wells were licensed by the DWE during the period since 2005 when the previous assessment by Peter Dundon and Associates was completed.

It is possible that other groundwater bores may exist within the 3 km radius of the Euchareena Road Site, which are either unlicensed, or if licensed, are not yet included in the DWE database.

Due to the number of licensed and unlicensed bores in the local area around the Euchareena Road Site, it is concluded that there is a useable groundwater aquifer in the local area.

C.4.3.3 Site groundwater

Site groundwater occurrences

Six piezometer bores were drilled on the site as part of the groundwater investigation and although three intersected no water during drilling, all six piezometers confirmed the presence of a regionally extensive groundwater body beneath the Euchareena Road Site and the surrounding area. The three piezometers that apparently drilled ‘dry’ established a groundwater level following slow seepage from the saturated zone below the water table.

This intermittent flow, both spatially and vertically, indicates that the groundwater occurs in a fractured rock aquifer, in which water flows preferentially through zones of fracturing. The unfractured component of the aquifer may or may not be fully saturated. The groundwater presence appears to be continuous through both of the bedrock units present on the site, i.e. the Tertiary basalt and the Ordovician volcanics. This aquifer appears to be hydraulically connected with alluvium associated with Shades Creek and other drainage lines in the area, although the alluvium is limited and is considered to be a minor component of the groundwater flow system.

Permeability tests were undertaken on the six on-site piezometers which revealed that the permeability within the aquifer system varies from less than 0.001 m/d to about 1 m/d (i.e. from much less than 1 x 10^{-8} to about 1 x 10^{-5} m/s). The general rock mass permeability would be less than 10^{-8} m/s, with occasional zones of fracturing showing localised enhanced permeability, potentially up to 1 x10^{-5} m/s.

Site groundwater flow, recharge and discharge

Groundwater flow

Groundwater levels were measured in the six piezometers on the Euchareena Road Site on a monthly basis between July 2003 and August 2004 and on three occasions since, the most recent being in May 2009. The measured groundwater levels, converted to AHD elevations, have been contoured as shown on Figure C.4-9. Groundwater levels beneath the landfill area typically vary from about 563 m AHD and 576 m AHD. Note that water levels measured in Bore L1 and Well G3 on adjacent properties have been used to extend the contours beyond the northeastern boundary of the Euchareena Road Site.

The contours on Figure C.4-9 indicate a ridge plunging in a northwesterly direction across and beyond the Euchareena Road Site, suggesting that recharge probably occurs from the southeast of the Site. The groundwater contours suggest groundwater flows both to the west and to the northeast from the Site, with a lesser component to the northwest. Average groundwater gradients are approximately 0.008 (1 in 120) to the west, and 0.019 (1 in 53) to the northeast.

Recharge and discharge

Recharge to the aquifer system is believed to occur by direct infiltration of rainfall (likely to be less than 5% of total rainfall) and locally-collected surface runoff into the ground surface across the entire Site and downward percolation to the water table.

Groundwater discharge would take place by either direct discharge to the surface, if the water table is intersected by the ground surface, or by evapotranspiration from any areas where the water table within a few metres of the ground surface, hence would occur in topographically lower places. The groundwater contours on Figure C.4-9 suggest that some groundwater discharge may be occurring in the Shades Creek valley to the east of the Euchareena Road Site, although groundwater seepage to Shades Creek does not appear to be significant, while most discharge probably occurs to the west towards Molong Creek. Groundwater discharge in the Shades Creek valley is therefore believed to be virtually all by evapotranspiration where the water table is sufficiently shallow.

While no obvious points of direct groundwater discharge into either Shades Creek or Back Creek were observed, it is possible that some seepage does occur maintaining a very slight base flow in these two creeks during extended periods lacking rainfall. The unnamed tributary that drains to the west from the northwestern corner of the Euchareena Road Site is generally dry for at least 3 km away from the Site and is unlikely to receive any direct groundwater discharge in its upper reaches.

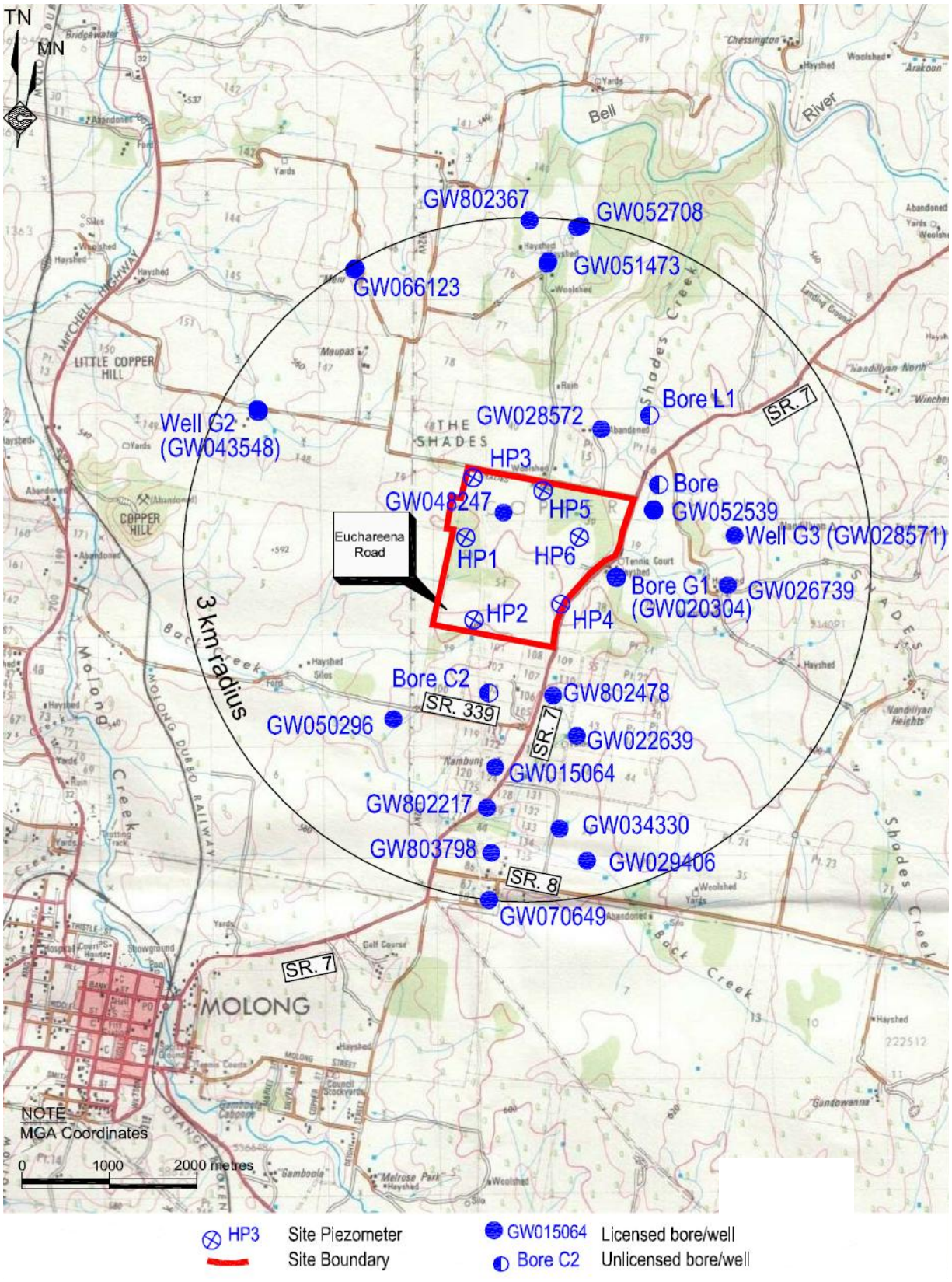


Figure C.4-8 DWE licensed and unlicensed bores and wells

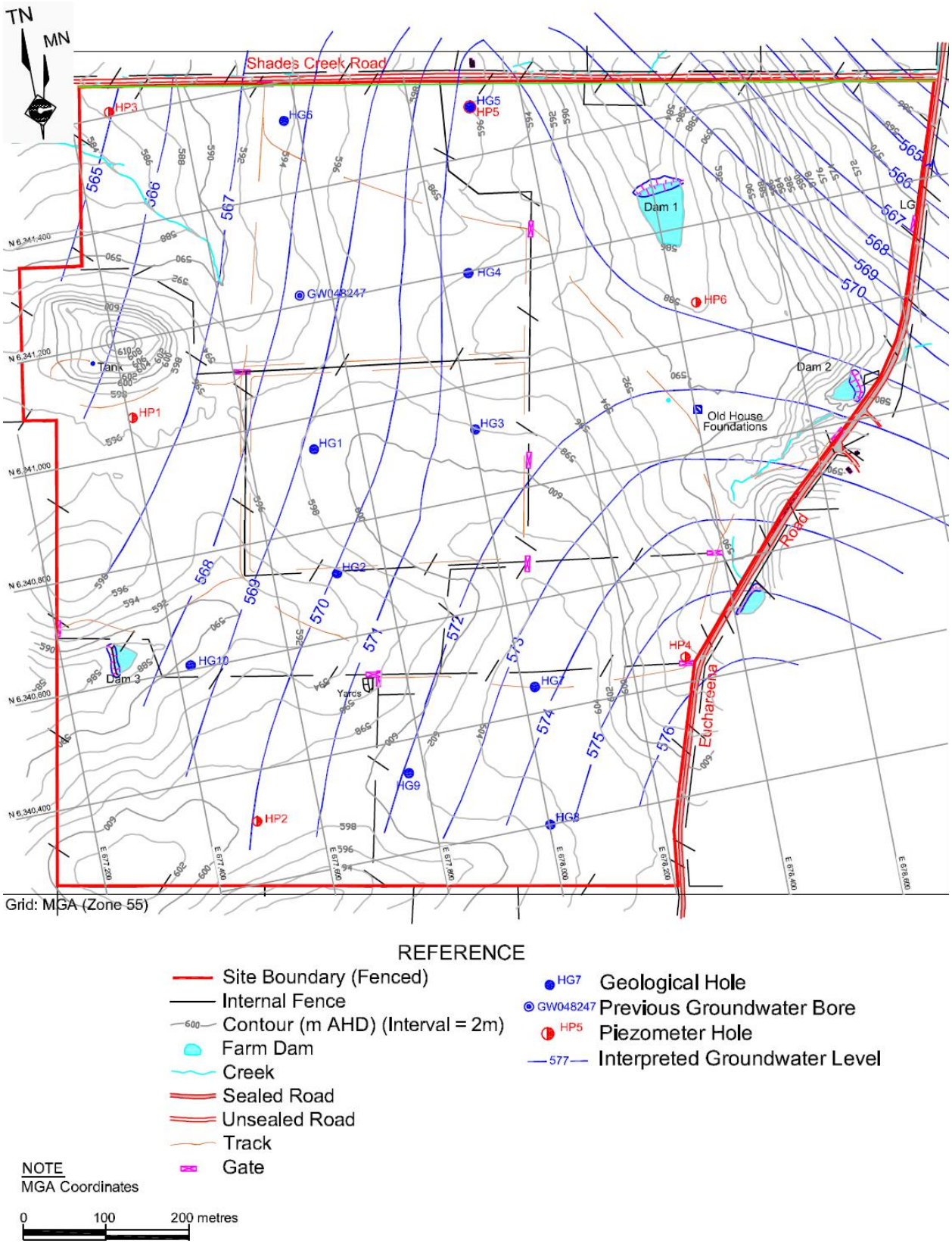


Figure C.4-9 Groundwater levels

Site groundwater quality

Groundwater samples were collected from the six piezometer holes on the Euchareena Road Site, and from five bores and wells on neighbouring properties. The results of laboratory testing of all samples are presented in Aquaterra (2009). The groundwater quality across the Euchareena Road Site is quite variable and is summarised below.

- Total Dissolved Solids (TDS) which is a parameter reflecting the extent of salinity present, ranged from 530 mg/L to 2,040 mg/L with the variability in salinity being consistent with the aquifer being a fractured rock system. The occurrence of fracturing leads to heterogeneity in the aquifer and the groundwater tends to be more saline in the less permeable parts of the aquifer where the groundwater has greater opportunity to dissolve soluble minerals from the rock as it passes through more slowly.
- The salinity of samples collected from neighbouring properties ranged from 808 mg/L to 1,420 mg/L TDS. As these samples were collected from water supply bores and wells, it is likely that these lower values reflects a more permeable section of the aquifer.
- pH - All samples collected both from within the Site and from adjoining properties were slightly alkaline, with pH values ranging from 7.20 to 8.02.
- Dissolved Metals - Dissolved metals were only detected in some samples, with arsenic, aluminium, boron, copper, nickel, zinc, iron and manganese being identified. All metal concentrations were relatively low with few exceedances of the relevant drinking water guideline value or the freshwater ecosystem protection guideline value.
- Total Petroleum Hydrocarbons (TPHs) - Initial samples at the Site contained low levels of total petroleum hydrocarbons, however, further investigation and purging suggested that these levels were as a result of drilling residue and no further hydrocarbons have been identified. The lack of hydrocarbons in the off-site bores and wells support this conclusion.
- Nutrients - Nitrate and phosphorus were generally at low concentrations in the groundwater beneath the Site. HP4 contained 1.45 mg/L nitrate, which exceeds the fresh water ecosystem protection guideline of 0.7 mg/L (ANZECC 2000). Much higher nitrate concentrations were detected in the off-site samples (9.79 mg/L in C1, 21.0 mg/L in G1 and 13.1 mg/L in G2), suggesting possible contamination from either fertilizers or animal waste, rather than a natural presence in the groundwater.
- Major Ion Composition - The consistency in major cation and anion results from the Site and off-site samples suggest that all sample locations access the same aquifer. The relationship of the different cations and anions indicates that as groundwater salinity increases, chloride concentration increases relative to bicarbonate. In all samples, the sulphate concentration is relatively minor.

The dominance of bicarbonate at lower salinity, and chloride at higher salinity, is consistent with the expected recharge behaviour. The samples with low salinity and bicarbonate dominance are typical of recently recharged groundwater (i.e. located across the Site), whereas the higher salinity and chloride dominance indicates less proximity to recharge (i.e. to the east and west of Site). It is considered that in general, the lower salinity/bicarbonate samples have been derived from relatively more permeable sections of the aquifer system, which are favoured with more efficient recharge.

C.4.3.4 Groundwater management controls

The primary groundwater management control for the Euchareena Road RRC would be the proper compaction of the floor of each landfill cell and the maturation pad to achieve a uniform low permeability equivalent to <1 x 10^{-9} m/s for a depth of at least 0.9 m. The use of this DECCW (EPA) performance value is highly conservative as the natural permeability of the underlying saprolite material is on the whole lower than this DECCW (EPA) guideline. Nonetheless in order to minimise the opportunity for a breach in the compacted layer, the compacted areas would be inspected in detail prior to use for any structural features that might be associated with higher permeability. Any such areas identified would be carefully treated, if necessary with other suitable clay fill to replace the more permeable material, and thoroughly compacted prior to being covered over. The in situ permeability of the compacted material would be tested by sampling and laboratory testing to ensure the required permeability level has been achieved.

The project design incorporates HDPE lined sumps providing sufficient leachate storage to be generated during the peak monthly rainfall event in a 10-year ARI rainfall year. Water level monitoring at the leachate sumps would be undertaken and leachate pumped out as required to ensure that leachate levels within the landfill are kept at a minimum (< 0.5 m).

The compost maturation pad would also be sealed and the adjoining runoff collection pond would be lined.

C.4.3.5 Impact assessment

Potential infiltration from the landfill and other sources

Although the existing permeability of the natural near-surface earth beneath the Euchareena Road Site exhibits very low permeability (5 x 10^{-10} m/s to 2 x 10^{-8} m/s), the landfill floor and the floor and walls of the leachate ponds would be compacted to achieve a permeability of <1 x 10^{-9} m/s (9 x 10^{-5} m/d) for a depth of at least 0.9 m. In reality, beneath this compacted zone, there would be a further 15 m to 20 m of in-situ saprolitic clay as a barrier to leachate migration.

Potential for leachate infiltration to groundwater from the landfill would be controlled by the permeability of the compacted clay layer, due to its low permeability as well as the HDPE liner within the landfill sump. As there is low permeability saprolitic clay between the landfill and the groundwater table, then the rate of seepage through the compacted layer would be limited further by the low permeabilities of the saprolite. As such, the potential seepage rate through the compacted layer is very low.

Potential also exists for some runoff from the compost maturation pad (and stored within the adjacent pond) to enter the groundwater, but their combined contribution would be negligible.

Groundwater flow modelling

Rather than developing a new groundwater model to assist in predicting groundwater flows from the 2009 landfill project, Aquaterra Consulting instead relied upon the previous modelling conducted by Peter Dundon and Associates, particularly given the following.

- The new (2009) landfill has a smaller footprint than the 2005 landfill.
- The sumps holding accumulated leachate would be double lined (a HDPE liner above compacted clay) - thereby increasing protection over part of the landfill.

- A lower leakage rate of leachate from the landfill and compost maturation pond and its pond (compared with that modelled in 2005).
- Capping of the landfill with a flexible membrane liner which will reduce further the leachate infiltration, post landfill rehabilitation.

For the purposes of predicting groundwater impacts using a groundwater model, a worst case was adopted involving the breaching of the compacted clay liner by an inadvertent absence of the low permeability clays or by an over-excavation to expose a higher permeability pathway. In the unlikely event this occurs, the seepage losses could potentially be greater than the above.

As a worst case scenario, if the permeability were an improbable two orders of magnitude higher (i.e. 0.9 x 10^{-3} m/d) over an area of 10 m x 10 m, then the potential seepage rate through that zone would be 90 m^3/d. It should be noted, however, that this is unlikely to occur as the average permeability of the underlying saprolite is on the whole much lower than the design compaction permeability. Subsequently, it would only be possible for seepage at this flow rate from a compaction layer breach to reach groundwater if a direct high permeability pathway existed through the 20 m to 30 m thickness of underlying saprolite. No such pathway has been identified.

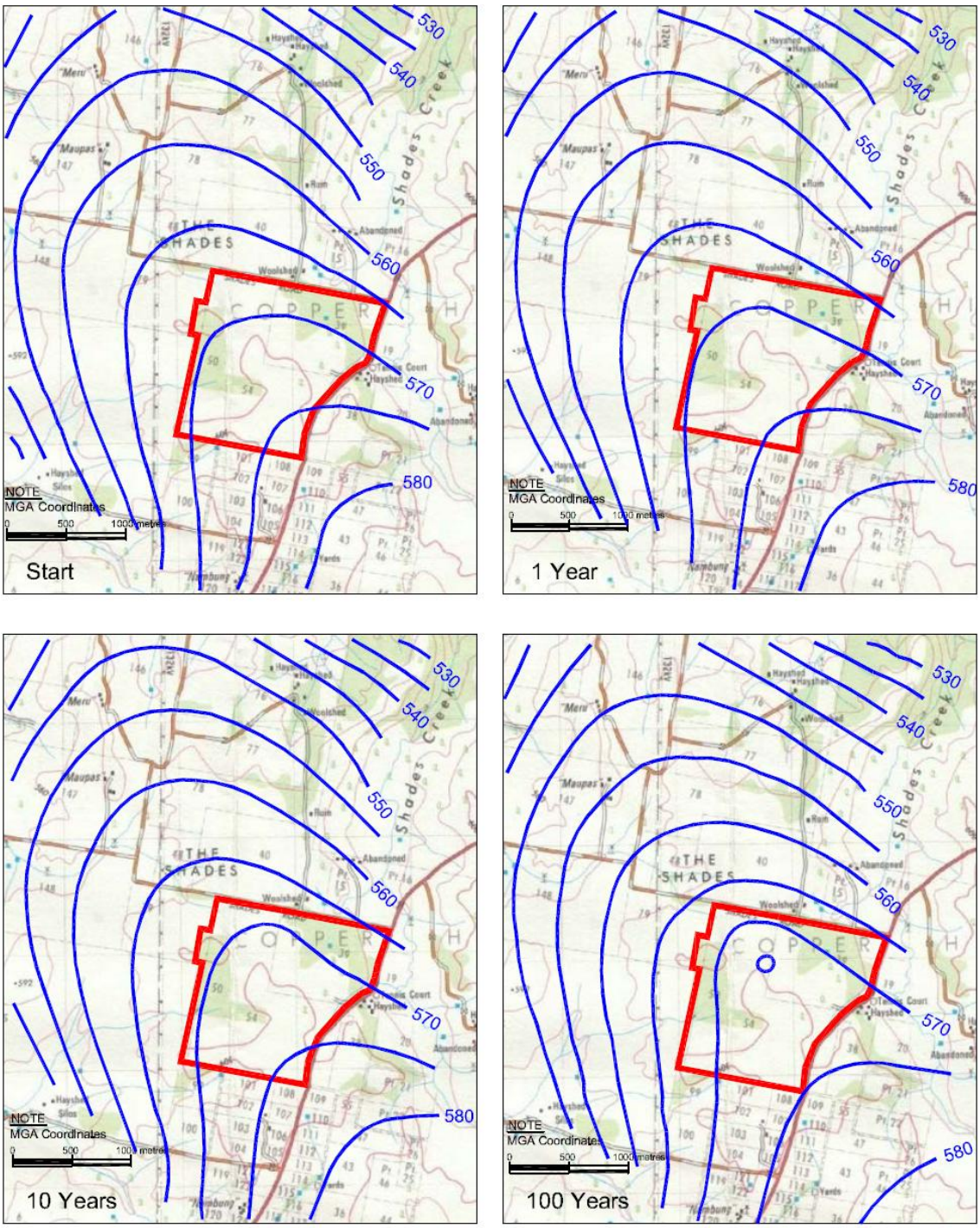
The groundwater model used was a finite difference groundwater flow model ('Modflow' in conjunction with Groundwater Vistas). The boundaries of the model were set at Molong Creek to the west, Shades Creek and portion of Bell River to the east and arbitrary boundaries to the north and south of the Site, well past the limit of potential impact. The Molong and Shades Creeks were represented as drain cells in the model, while the northern and southern boundary cells were set as no-flow cells.

The model was first run in steady state mode to establish a starting groundwater condition. The resultant contours in the vicinity of the Euchareena Road Site show close agreement with the contours of actual measured groundwater levels depicted on Figure C.4-9 and confirm a general flow pattern to the northeast and to the west from the ridge upon which the Site is located, with a lesser component of flow to the northwest.

A series of transient runs were then completed with various higher rates of recharge over the model cells coinciding with the proposed landfill. This was done to simulate the impact of leakage of leachate from the landfill.

The first transient run (Scenario 1) incorporated the design infiltration rate of 9 x 10^{-5} m/d. The simulation was run for a period of 100 years. The results showed a very small groundwater mound developing very slowly beneath the landfill, but the contours (Figure C.4-10) indicate that in areas outside the Site, there is no perceptible difference from the existing conditions.

The transient run for the worst case scenario (Scenario 2) was conducted to simulate the impact of a potential breach in one part of the low permeability compacted clay floor. Assuming a recharge rate of 0.009 m/d over one of the landfill cells (which represents the 90 m^3/d seepage rate) distributed across the full cell area over 100 years a groundwater mound would develop beneath the landfill area, which progressively expands with time (Figure C.4-11). The effect would be minimal, however, and it is only after 100 years that the 570 m AHD groundwater contour would reach Shades Creek Road at the northern boundary of the Euchareena Road Site.



REFERENCE

580 Predicted Groundwater Levels (mAHD)

Site Boundary

Figure C.4-10 Predicted groundwater levels – scenario 1

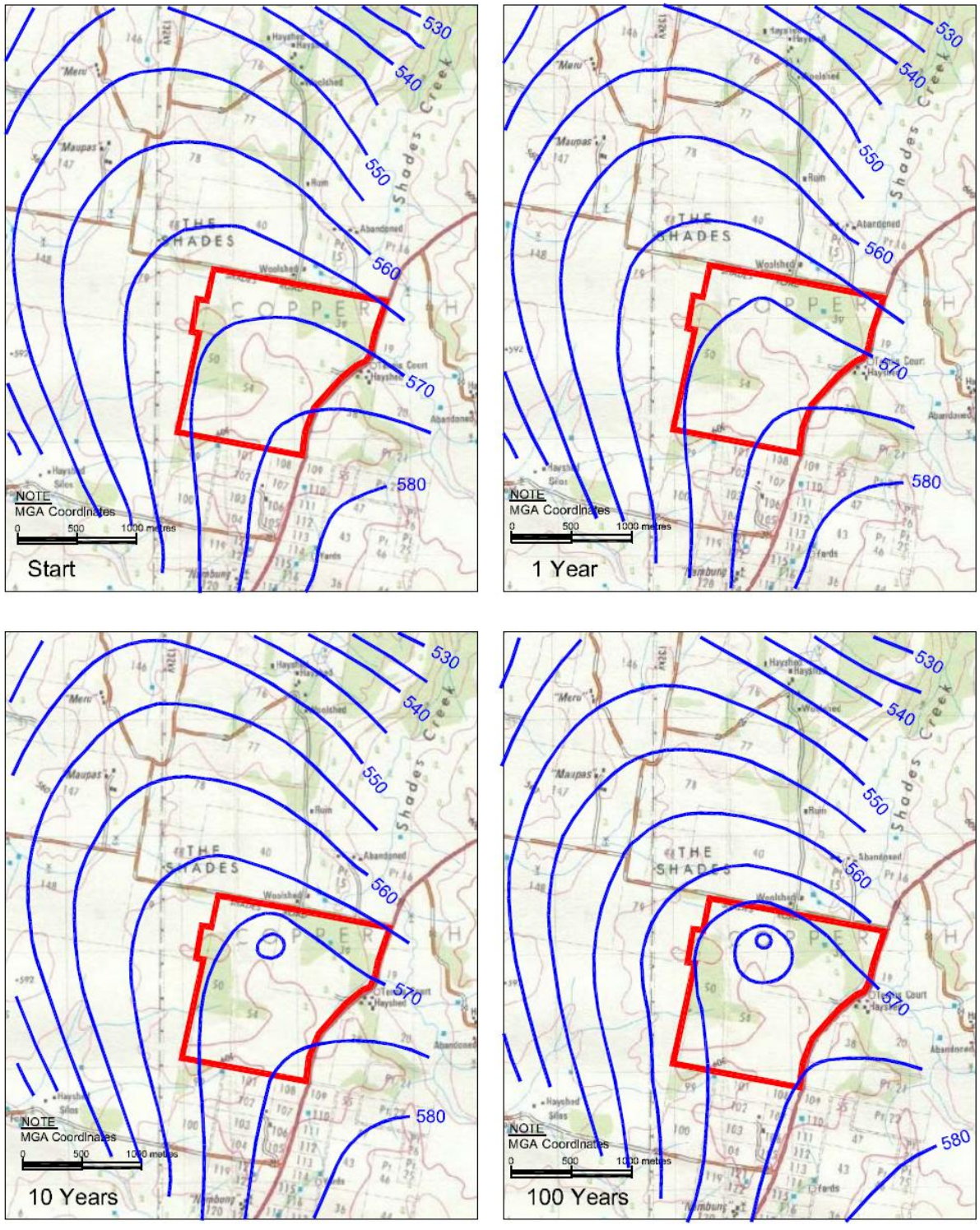


Figure C.4-11 Predicted groundwater levels – scenario 2

Additional to the low predicted infiltration and groundwater quantity impact needs to be considered. The clays between the surface and the water table beneath the Euchareena Road Site are very low in permeability and are expected to have very high potential for attenuation and adsorption of any dissolved contaminants. The extremely slow infiltration rate would ensure that contaminant loads even beneath the Site itself would be negligible and this has been evidenced in the clays of the Ashfield Shale formation in the Sydney Basin (Dupen 1993).

In summary, the groundwater simulation modelling suggests that the potential impact(s) of the proposed landfill on the Euchareena Road Site would be small and predicted to be as follows.

- Under design conditions (Scenario 1), a groundwater mound would develop beneath the Euchareena Road Site and if infiltration/seepage were to continue for 100 years, the mound would be approximately 5m high and contained totally within the Euchareena Road Site perimeter.
- Under worst case conditions (Scenario 2), which are highly unlikely to occur due to the low permeability of the underlying saprolite, the impact would be a slightly larger groundwater mound that after 100 years would have caused the 570 m AHD groundwater contour to have migrated approximately 100 m further than the design scenario prediction.

C.4.3.6 Monitoring

The piezometer bores installed on the Euchareena Road Site for this investigation would remain as monitoring bores to detect any changes to groundwater levels over the life of the Euchareena Road RRC. In the highly unlikely event that unexplained changes in groundwater levels and/or groundwater quality are detected (that might indicate a breach), selected monitoring bores could also be used as interception wells to capture and pump out the affected leachate, for return to the landfill or to the evaporation ponds.

The following groundwater monitoring program would be implemented.

- Quarterly measurement of groundwater levels in all the Site piezometers (HP1 to HP6);
- Quarterly field measurements of pH, total dissolved solids (TDS) and electrical conductivity (EC);
- Annual sampling of each piezometer, and detailed laboratory analysis to include:
  - physical parameters (pH, TDS, EC);
  - major ions (Ca, Mg, Na, K, Cl, SO_4, HCO_3, CO_3);
  - dissolved metals (to include Ag, Al, As, B, Cd, Cr, Cu, Fe, Hg, Mn, Mo, Ni, Se, Zn);
  - Nutrient species (NH_4, NO_3, total P, reactive P); and
  - organics (TPHs, BTEX and a screening analysis for volatiles and semi-volatiles).
- Annual sampling of selected off-site farm bores or wells in areas down-gradient from the Euchareena Road Site, and laboratory analysis as above. The initial suite of farm bores and wells would be those sampled as part of the investigation program (i.e. C2, G1, G2, G3 and L1 – see Figure C.4-8).

Conditions relating to groundwater monitoring would be incorporated into the site Environment Protection Licence issued by DECCW.

This monitoring program would continue until the end of the Project although the analytes and frequency of monitoring would be re-evaluated periodically to ensure only meaningful data is being collected. An appropriate ongoing monitoring program would also be established for continued monitoring after

completion of the Project and closure of the Euchareena Road Site. This would likely comprise annual water levels and annual water quality sampling of a selected set of screening parameters.

C.4.4 Flora

C.4.4.1 Introduction

A flora assessment of the Euchareena Road Site was undertaken by Geoff Cunningham Natural Resource Consultants Pty Ltd (GCNRC) with field work initially undertaken in October 2003 and most recently in April 2009. The purpose of the assessment was to identify the vegetation communities present on the Euchareena Road Site, identify the presence of any threatened species, populations or ecological communities, determine the potential impact of the Project upon flora and to identify appropriate impact mitigation measures to implement throughout the design, operation and rehabilitation of the Euchareena Road RRC. During the most recent field work (April 2009), GCNRC also assessed the impacts of removing a minor amount of native vegetation during the proposed widening of the Euchareena Road at the Back Creek Bridge.

The full flora assessment report is provided in Appendix L and is summarised in this subsection.

C.4.4.2 Regional threatened flora

NSW Threatened Species Conservation Act 1995

Prior to the both surveys, requests were made to the former NSW National Parks and Wildlife Service 'Atlas of NSW Wildlife' database for details of occurrences of any Threatened Species of plants listed in Schedules 1 and 2 of the *Threatened Species Conservation Act 1995* (TSC Act).

The following 13 species of threatened flora were recorded within the regional area, which consisted of the Orange (8731), Molong (8631), Wellington (8632) and Euchareena (8732) 1: 100 000 scale map sheet areas.

- *Acacia ausfeldii* [4 records]*
- *Caladenia arenaria* [1 record]*
- *Eucalyptus cannonii* [3 records]
- *Eucalyptus canoblensis* [27 records]
- *Eucalyptus robertsonii subsp. hemisphaerica* [12 records]
- *Eucalyptus saxicola* [1 record]
- *Euphrasia scabra* [1 record]
- *Lepidium hyssopifolium* [2 records]*
- *Philotheca ericifolia* [1 record]
- *Prostanthera cryptandroides subsp. cryptandroides* [1 record]
- *Swainsona recta* [19 records]*
- *Swainsona sericea* [10 records]*
- *Zieria obcordata* [25 records]

Those species above marked * are further assessed in Table C.4-5 as GCNRC (2009b) considers that those species may possibly occur on the Site.

No endangered plant populations were recorded in the region, however the following listed Endangered Ecological Communities were identified as likely to occur near the Euchareena Road Site:

- White Box Yellow Box Blakely's Red Gum Woodland; and
- Mount Canobolas *Xanthoparmelia* Lichen Community.

Table C.4-5 Assessment of the likelihood of occurrence of threatened flora species within the Euchareena Road Site

Species	Assessment
Acacia ausfeldii	NSW Conservation Status: Vulnerable. Erect or spreading shrub to 2-4 m high; branches angled or flattened; occurs to the east of Dubbo in the Mudgee - Ulan - Gulgong area; recorded on flat terrain in remnant eucalypt woodland; associated species include Eucalyptus albens [White Box], *Eucalyptus blakelyi* [Blakely's Red Gum] and Cypress Pines [*Callitris spp*.] with an understorey dominated by Cassinia spp. and grasses; flowers from August to October .A POSSIBLE OCCURRENCE as suitable habitat may be present. The species was not recorded during field inspection and there are no records of its presence within the study area in the past. IT IS CONCLUDED THAT THIS SPECIES IS NOT PRESENT WITHIN THE STUDY AREA.
Caladenia arenaria	NSW Conservation Status Endangered: Ground orchid with basla leaves to 10 cm long and flower stalks to 40 cm high; with one or two pale yellow flowers comprised of 5 long spreading petals and sepals theatre stiffly spread into a cross shape; recorded from Nangus, Adelong and in the Urana and Narrandera districts; recorded in woodlands with sandy soils, especially those dominated by *Callitris glaucophylla* [White Cypress Pine]; flowers September to November. A POSSIBLE OCCURRENCE. The species was not recorded during field inspection and there are no records of its presence within the study area in the past. IT IS CONCLUDED THAT THIS SPECIES IS NOT PRESENT WITHIN THE STUDY AREA.
Calotis glandulosa	NSW Conservation Status Vulnerable: A sprawling, branched herb to 20 cm high and forming mats up to 1m wide; leaves hairy, soft and bright green; flower heads 2 cm wide, solitary, usually mauve but can be white , blue or pink; recorded in montane grasslands in the Australian Alps, the upper Shoalhaven catchment and near Oberon, with an old record from Dubbo; occurs in grasslands and appears to be a coloniser of bare areas - often along roadsides; recorded from *Poa spp*. dominated subalpine grassland, *Themeda australis* dominated temperate grasslands and *Eucalyptus pauciflora* [Snow Gum] woodlands in the south east of the State; flowers spring and summer. A POSSIBLE OCCURRENCE. The species was not recorded during field inspection and there are no records of its presence within the study area in the past. IT IS CONCLUDED THAT THIS SPECIES IS NOT PRESENT WITHIN THE STUDY AREA.
Lepidium hyssopifolium	NSW Conservation Status Endangered: An erect perennial herb to 50 cm high; leaves divided, toothed or entire; recorded from Bathurst, Bungendore, Crookwell and Armidale; grows in a variety of habitats including woodlands with a grassy understorey and grasslands. Flowering time unknown. A POSSIBLE OCCURRENCE. The species was not recorded during the field inspection and there are no records of its presence within the study area in the past. IT IS CONCLUDED THAT THIS SPECIES IS NOT PRESENT WITHIN THE STUDY AREA.

Species	Assessment
Swainsona recta	NSW Conservation Status Endangered: A slender, erect perennial herb to 30 cm high; leaves divided into leaflets; flowers purple; recorded from Carcoar, Culcairn, Wagga Wagga, Queanbeyan and the Mudgee - Wellington areas; grows in grassy woodlands and open-forests with a range of eucalypts and grasses such as *Themeda australis* [Kangaroo Grass], *Poa spp*. [Tussock grasses] and *Austrostipa spp*. [Speargrasses]; flowers late September to early December. A POSSIBLE OCCURRENCE but suitable habitat is absent. The species was not recorded during the field inspection and there are no records of its presence within the study area in the past. IT IS CONCLUDED THAT THIS SPECIES IS NOT PRESENT WITHIN THE STUDY AREA.
Swainsona sericea	NSW Conservation Status Vulnerable: A prostrate or erect perennial herb to 10 cm high; leaves and stems densely hairy; flowers purple; recorded from a wide range of locations on the NSW tablelands, slopes and plains; found in grasslands and Snow Gum woodland sin the south and in box-gum woodlands and sometimes in association with Cypress Pines in the slopes; flowers in spring. A POSSIBLE OCCURRENCE. The species was not recorded during the field inspection and there are no records of its presence within the study area in the past. IT IS CONCLUDED THAT THIS SPECIES IS NOT PRESENT WITHIN THE STUDY AREA
Thesium australe	NSW Conservation Status Vulnerable: EPBC Act Conservation Status Vulnerable: A small straggling herb to 40 cm high; leaves pale green to yellow green; recorded in small scattered populations in eastern NSW; found in grasslands, often at damp sites particularly with Kangaroo Grass; it is a root parasite that takes moisture and some nutrients from other plants, particularly Kangaroo Grass; flowers spring. A POSSIBLE OCCURRENCE. The species was not recorded during both field inspections and there are no records of its presence within the study area in the past. IT IS CONCLUDED THAT THIS SPECIES IS NOT PRESENT WITHIN THE STUDY AREA.

Predicted Occurrences

In addition to the records contained in the 'Atlas of NSW Wildlife', the Department of Environment and Climate Change has provided an additional listing of Threatened flora species likely to be recorded within the boundaries of the Orange, Molong, Wellington and Euchareena 1: 100 000 map sheet areas. These predictions are based on use of the BIOCLIM model. These are:

- *Calotis glandulosa*[#];
- *Eucalyptus cannoniil*;
- *Eucalyptus robertsonii ssp. hemisphaericaI;*
- *Philotheca ericifolia*;
- *Pilularia novae-hollandiae*;
- *Swainsona recta*[#]; and
- *Thesium australe*[#].

The species above marked # are also further assessed in Table C.4-5 as GCNRC (2009b) considers that these species may possibly occur on the Site.

Commonwealth Environment Protection and Biodiversity Conservation Act 1999

A search of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) Online Database in April 2009 identified the following two listed Threatened plant species likely to occur in the 15 km radius of the centre of the Euchareena Road Site.

- *Philotheca ericifolia.*
- *Thesium australe.*

GCNRC (2009b) assessed both species and determined that *Philothecas ericifolia* was unlikely to be present on site whereas it is possible *Thesium australe* is present on site. As such, *Thesium australe* is discussed further in Table C.4-5.

The EPBC Act listing of Threatened Ecological Communities also lists the endangered White Box-Yellow Box - Blakeley's Red Gum Grassy Woodland and Derived Native Grassland as likely to occur in the region surrounding the Euchareena Road Site.

C.4.4.3 Flora Survey Results

General Flora

The October 2003 and April 2009 field assessments (undertaken using a total of sixty one 20 m x 20 m quadrats) identified that approximately 65% of the overall Site has been cleared much of which has been cultivated in the past. At least some, and possibly all, of this area has been sown to improved pasture species in the past. As such, two vegetation communities were identified on the Euchareena Road Site (Figure C.4-12):

- Community 1 - White Box (*Eucalyptus albens*) Yellow Box (*Eucalyptus melliodora*) Blakely's Red Gum (*Eucalyptus blakelyi*) Woodland community; and
- Community 2 - Cleared Grassland Community.

Community 1 - White Box (Eucalyptus albens) Yellow Box (Eucalyptus melliodora) Blakely's Red Gum (Eucalyptus blakelyi) Woodland community

Trees are spaced from <2 m to more than 100 m apart but are generally recorded at approximately 5 m to 20 m spacings. The main species is White Box (*Eucalyptus albens*), with Yellow Box (*Eucalyptus melliodora*) in lower areas and a scattering of Blakely's Red Gum (*Eucalyptus blakelyi*). Apple Box (*Eucalyptus bridgesiana*) is found on the eastern side of the Euchareena Road Site near the drainage depression in that location. In 2003, some White Box trees were showing signs of dieback. This situation was more noticeable during the 2009 survey when many trees in ridgetop locations were observed to be dying back or dead.

Shrubs are uncommon with only two native species recorded - Riceflower (*Pimelea sp.* and Hickory Wattle (*Acacia implexa*).

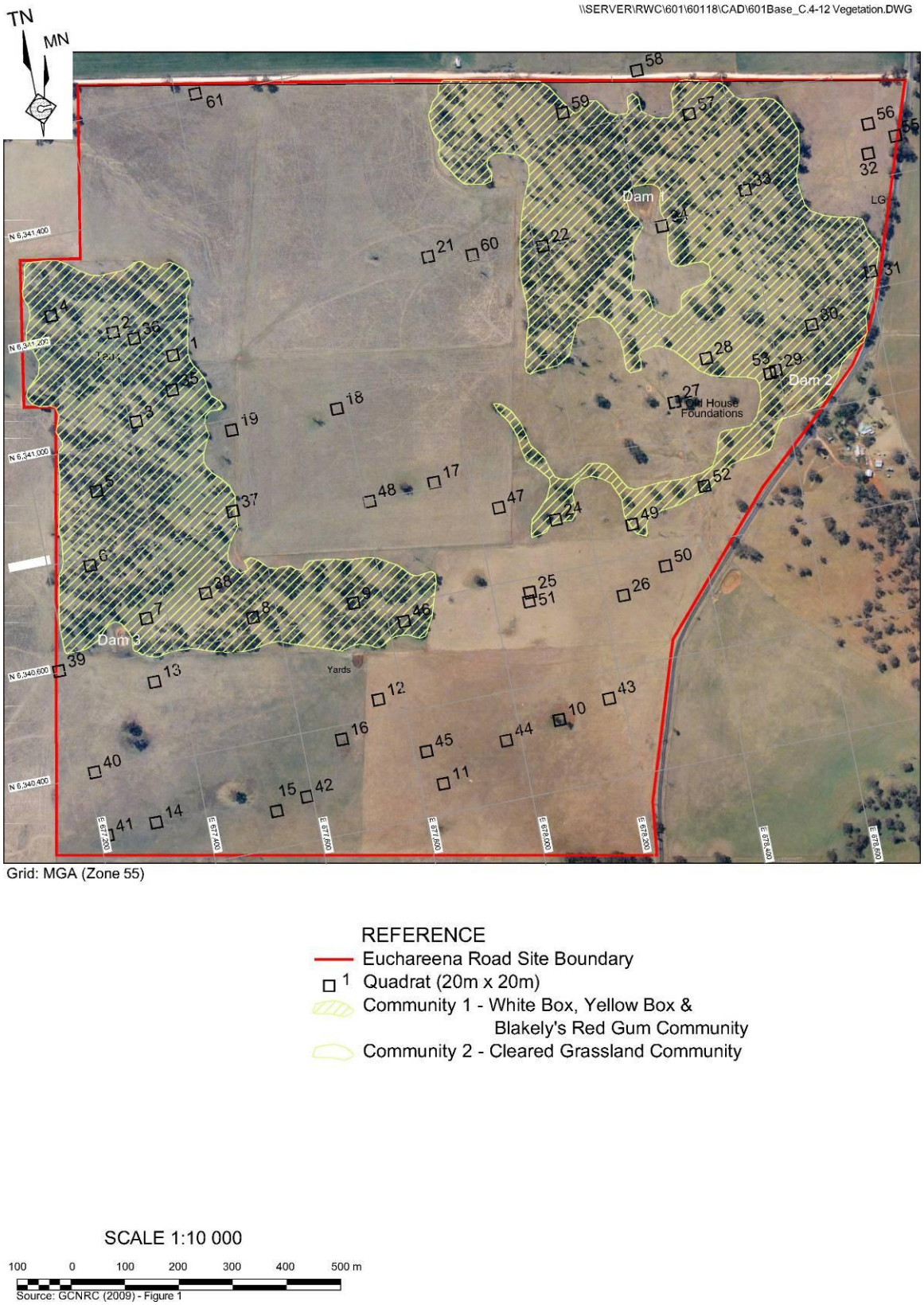


Figure C.4-12 Vegetation communities and quadrat locations

This community is widespread in the region surrounding the Euchareena Road Site. Although much of the area that the community originally occupied has been cleared there are still many remnants present in the Orange - Molong - Wellington area. The remnants on the Site have been affected by clearing and grazing by domestic livestock. Its health, or condition, is at low to moderate levels and there is little evidence of recent regeneration of native trees and shrubs.

Community 2 - cleared grassland community

This community has been almost completely cleared and supports only a few scattered paddock trees, generally White Box, which exhibit varying stages of decline in health.

Shrubs are absent and much of the area has been cultivated in the past and much has been sown to improved pasture species.

The main ground cover species include Smooth Brome* (*Bromus molliformis*), SaffronThistle* (*Carthamus lanatus*), Mouse-ear Chickweed* (*Cerastium glomeratum*) and Barley Grass* (*Hordeum leporinum*).

Introduced species and noxious weeds

The study area is heavily invaded by introduced weed species as well as sown pasture grasses and legumes. Of the 120 ground cover species recorded at the site during two field inspections, 59 or almost 50% are introduced species. These are either naturalised exotics or weed species.

The proportion of the cover provided by introduced species on ALL sections of the study area is quite significant - to the extent that an estimated 80 to 90% of the ground overall is provided by exotic species with some sown pasture paddocks having very few native species present.

Thistles such as Saffron Thistle* [*Carthamus lanatus*], Winged Slender Thistle* [*Carduus tenuiflorus*] and, to a much lesser extent Scotch Thistle* [*Onopordum acanthium*] are prominent within the ground cover species within the study area.

Of the introduced flora species, four are classified as noxious weeds for Cabonne Shire [search date 5th May, 2009]. These are:

- Bathurst Burr* [*Xanthium spinosum*] [Class 4];
- Briar Rose* [*Rosa rubiginosa*] [Class 4];
- Scotch Thistle* [*Onopordum acanthium*] [Class 4]; and
- St John's Wort* [*Hypericum perforatum*] [Class 4].

Class 4 noxious weeds are plants that pose a threat to primary production, the environment or human health, are widely distributed in an area to which the order applies and are likely to spread in the area or to another area. The Proponent recognises that these species would need to be controlled.

Koala habitat considerations

State Environmental Planning Policy No. 44 (SEPP 44) - Koala Habitat Protection identifies the Cabonne Local Government Area (LGA) as a LGA to which the policy applies.

SEPP 44 requires the identification of any 'potential Koala habitat' within the Euchareena Road Site.

Potential Koala habitat is an area '…of native vegetation where trees of the types listed in Schedule 2 (of SEPP 44) constitute at least 15% of the total number of trees in the upper and lower components of the

tree component.' Section 1.4.4 of the 'Explanation of the Policy' notes, however, that 'In relation to affected DA's it is the intention of the policy that investigations for 'potential' and 'core' Koala habitats be limited to those areas in which it is proposed to disturb habitat'.

One of the habitat tree species listed in Schedule 2 of SEPP 44, White Box (*Eucalyptus albens*), is found within the Euchareena Road Site and is the dominant tree species across the Site. This species occurs commonly in the remnant vegetation areas as well as being present as very scattered paddock trees. Overall, it comprises >15% of the trees present.

Threatened species considerations

Threatened species

In conclusion, the Euchareena Road Site does not currently support, and is unlikely to support, any State or Nationally listed threatened plant species.

Endangered ecological communities

The Euchareena Road Site supports two major remnants of the White Box Yellow Box Blakely's Red Gum Woodland Community (TSC Act), which is also equivalent to the EPBC Act listed Grassy White Box Woodlands and Derived Native Grassland. These are located in the western (27 ha) and northeastern (33 ha) sections of the Site and are illustrated in Figure C.4-12.

Endangered flora populations

There are no Endangered Flora Populations listed in the Schedules of the TSC Act for the Euchareena Road Site.

Critical habitat

There are no areas of critical habitat listed for the Euchareena Road Site or the surrounding local environment.

C.4.4.4 Flora management controls

The safeguards and mitigation measures proposed for the design and operation of the Euchareena Road RRC generally relate to the retention and improvement of the remaining remnant woodland areas, replanting of native species through rehabilitation, weed management and fire prevention. Additionally, to prevent erosion and dust creation opportunities, the areas of disturbance would be minimised and groundcover retained over all other areas of the Site.

Replanting of native species

Many of the original native groundcover species have disappeared from within the woodland remnants at the Euchareena Road Site and many of the mature trees that exist within these remnants are debilitated. The Project includes the conservation and enhancement of these woodland remnants and the planting of a connecting area of vegetation between the two remnant stands (refer to section C.1.11). As such, the Proponent would supplement the existing woodland through planting seedlings of White Box, Yellow Box and Blakeley's Red Gum within the existing remnants. The plantings would not be too dense as the original woodlands were relatively open and 'grassy' for the most part. These seedlings would be propagated from seed collected on site together with specific understorey species sourced locally. The seedlings would be protected from grazing by native and domestic animals by well-maintained perimeter fencing, and where appropriate, substantial tree guards.

Encouragement of natural regeneration

The likelihood of native groundcover species on the Euchareena Road Site out-competing the entrenched populations of introduced species is low. Tree and shrub regeneration is more likely to occur and as such, whenever natural regeneration of native trees and shrubs occurs, the individuals or clumps would be protected from damage by grazing animals by tree guards or temporary fencing of the regeneration areas.

Weed management

The nature of the proposed Euchareena Road RRC could make the site susceptible to the possible infestation of weed species not already present in the area. To combat this, the following would be implemented:

- All seed stock in incoming green waste would be rendered infertile through the enclosed composting process;
- Regular inspections of the Euchareena Road Site;
- Education of staff with respect to weed identification and control;
- Continual monitoring and control of identified noxious weeds; and
- Investigation into the practicality of sowing crops or competitive improved pastures on sections of the Site not required for immediate disturbance as a means of weed control.

Prevention of fire and fire management

The management of the entire Euchareena Road Site is an important part of the Project as the undisturbed areas, if left ungrazed, could present a fire hazard due to the growth of dense groundcover. Occasional slashing or controlled grazing would be undertaken as part of responsible land management in areas not included in the woodland enhancement efforts, to minimise fire risk on the property.

Groundcover management within the native vegetation remnants would be appropriately achieved by grazing with cattle using appropriate seasonal stocking rates to ensure that seasonal conditions are taken into account and that an adequate level of ground cover remains at all times. This would be undertaken through a contractual arrangement with a stock owner that allows grazing of the remnant woodland areas when herbage is available and provides for immediate adjustment of stocking rates or stock removal once critical ground cover levels are reached. In the remnant woodland areas, grazing is preferable to mowing / slashing due to the restricted machine access due to the presence of rocks, logs and other obstructions. Grazing would also achieve a more even management of herbage. Cattle would be used as they generally tend not to graze plants as low as sheep and thus the potential for natural tree and shrub establishment would be enhanced.

The Proponent would incorporate a fire management plan as part of the Site Environmental Management Plan. This plan would incorporate details of sources of water for firefighting, the need for fire extinguishers on all mobile equipment and suitable training for site-based personnel. It is also noted that all composting to be conducted on site would be undertaken in enclosed buildings. Specific controls would be adopted to ensure spontaneous combustion does not occur throughout the life of the Euchareena Road RRC.

Final rehabilitation

The final rehabilitation, as discussed in section C.1.11, provides for the return of disturbed areas of the Euchareena Road Site (i.e. areas not included in the woodland enhancement program) to agricultural activity including improved pasture for grazing.

C.4.4.5 Impact assessment

The majority of the Euchareena Road Site has been highly modified from its original condition and habitat values as a consequence of previous clearing of vegetation for agricultural purposes and invasion by introduced weed species. However, the proposed Euchareena Road RRC has been designed to avoid any significant impact(s) on the remnant vegetation on the Site.

It is also noted that the level of dust generation on the Euchareena Road Site would not be significantly different to the existing situation or surrounding rural area traversed by unsealed roads. Hence, the impact of dust on any native vegetation on or surrounding the Site would be negligible.

The likelihood of the occurrence of Threatened flora species within the Euchareena Road Site has been presented in Table C.4-5 and concluded that it is unlikely for any Threatened flora species to occur on the site, hence there would be no impact on these species.

Koala habitat considerations

Only isolated paddock trees would be removed during the development of the Euchareena Road Site. Many of these trees are already in relatively poor condition. As the majority of potential Koala habitat occurs within the remnant woodland, the removal of isolated paddock trees would not have a significant impact on any potential Koala habitat at the Euchareena Road Site.

Seven-part test

All of the study area has been highly modified from its original condition and habitat values as a consequence of its use as a grazing and farming property over a period of many years.

There is no suitable habitat present at the site for many of the threatened flora species likely / predicted to occur there.

Field observations have failed to record any threatened flora species and there are no past records of any threatened flora species at the site. There are no endangered flora populations or occurrences of critical habitat recorded for the site.

However, two remnants of the White Box, Yellow Box, Blakely's Red Gum Community [Endangered] [*NSW Threatened Species Conservation Act*] or the White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland [Critically Endangered] [*Commonwealth Environment Protection and Biodiversity Conservation Act*] occur at the Euchareena Road Site. These remnants would not be affected by the Project but some isolated paddock trees that are typical components of the tree layer within the endangered ecological community would be removed if the proposed work is approved. These trees are in varying states of health.

The outcome of the assessments and field survey observations has been the conclusion that none of the Threatened flora species recorded or predicted to occur in the wider region within the boundaries of the Molong 1: 100 000 scale map sheet area.

For the purposes of the EP&A Act the following must be taken into account in deciding whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats:

a. each of the factors listed in the following paragraph; and

b. any assessment guidelines.

The following factors must be taken into account in making a determination of the likely significance of an action on threatened species, populations or communities or their habitats.

1. **in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction:**

   No threatened flora species have been recorded from the Euchareena Road Site in the past and none were recorded during the two field surveys. Consequently it is concluded that there would be no adverse affect from the proposed development on the life cycle of any threatened flora species such that a viable local population of the species is likely to be placed at risk of extinction.

2. **in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction:**

   No endangered flora populations have been recorded from the Euchareena Road Site in the past and none were recorded during field survey. Consequently it is concluded that there would be no adverse affect from the proposed development on the life cycle of any flora species that constitutes an endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

3. **in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:**

   a. **is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or**

   b. **is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.**

   Two remnants of the White Box, Yellow Box, Blakely's Red Gum Community [Endangered] [*NSW Threatened Species Conservation Act*] or the White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland [Critically Endangered] [*Commonwealth Environment Protection and Biodiversity Conservation Act*] occur at the site.

   It is not intended that these remnants would be adversely affected by the proposed development. Rather, the remnants would be enhanced by the planting of additional species that are components of the endangered ecological community.

   In addition a number of isolated paddock trees that are typical component species of the endangered ecological community are present in scattered locations. The proposed development would require the removal of some of these trees.

Given the extent of occurrence of this endangered ecological community within the Molong region and the conservation and enhancement of the Project Site remnants, it is considered that the proposed action is not likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

4. **in relation to the habitat of a threatened species, population or ecological community:**
    a. **the extent to which the habitat is likely to be removed or modified as a result of the action proposed, and**
    b. **whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and**
    c. **the importance of the habitat to be removed, modified fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.**

There are no threatened flora species or populations present at the study area and there would be no removal, fragmentation, isolation or modification of the habitat of such species or populations proposed. Consequently it is concluded that there will be no significant impact on the habitat of any threatened flora species or population.

The remnants of the White Box Yellow Box Blakely's Red Gum Woodland [White Box- Yellow Box – Blakely's Red Gum Grassy Woodlands and Derived Native Grasslands] endangered / critically endangered ecological community that would not be affected by the proposed development and the removal of the scattered paddock trees is not considered not to have any detrimental effect on the larger remnants of the community in the locality.

In addition, the removal of these trees would be more than adequately offset by the plantings of species representative of this endangered ecological community proposed at the Euchareena Road Site.

Given the extent of occurrence of this endangered ecological community within the Molong region and the conservation and enhancement of the Project Site remnants, it is considered that the proposed action is not likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

The proposed action is not likely to remove, modify, fragment or isolate habitat from other areas of habitat such that the long-term survival of the endangered ecological community in the locality is affected.

5. **whether the action proposed is likely to have an effect on critical habitat [either directly or indirectly].**

No critical habitat is present at the Euchareena Road Site. Consequently, it is concluded that the proposed development would not have any effect on any critical habitat.

6. **whether the action proposed is consistent with the objectives or actions of a species recovery plan or threat abatement plan.**

There are no threatened species recorded for the Euchareena Road Site and so there are no actions specified in a species recovery plan that must be considered in relation to the proposed development.

There are no threat abatement plans relating to the proposed limited clearing at the study area and so there is no requirement to further consider this issue

7. **whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.**

   Clearing of Native Vegetation is listed as a key threatening process under the NSW TSC Act and Land Clearing is similarly listed under the Commonwealth EPBC Act.

   It is proposed to clear a number of scattered paddock trees of species representative of the White Box, Yellow Box, Blakely's Red Gum Community [Endangered] [*NSW Threatened Species Conservation Act*] or the White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland Community [Critically Endangered] [*Commonwealth Environment Protection and Biodiversity Conservation Act*].

   In addition, Removal of Dead Wood and Dead Trees is listed as a key threatening process under the NSW TSC Act. The removal of a number of dead trees from scattered paddock locations would be required to progress the proposed development.. Given the number of dead trees located in the remnants within the Project Site boundaries it is not considered that this clearing would have any significant impact on the availability of fauna habitat at the Euchareena Road Site.

   As a consequence GCNRC has concluded that there would be no requirement for the preparation of a Species Impact Statement [TSC Act] or a Referral to the Commonwealth Department of Environment and Heritage [EPBC Act] in relation to the proposed development at the Euchareena Road Site.

   However, it should be noted that a Referral (EPBC 2002/783) was submitted for a Regional Resource Reprocessing Facility on the same site at Euchareena Road, Molong, NSW. This Referral was formally withdrawn in a letter from consultant RW Corkery (who prepared the last referral) to Mark Jenkins of DEHWA on 1 May 2009.

   A new Referral for this Project (EPBC 2009/520) was prepared by GHD and submitted to DEHWA in July 2009.

C.4.4.6 Monitoring

The Proponent proposes to establish permanent quadrats / transects across the western and northeastern woodland areas to enable periodic monitoring to record the extent of flora regrowth within the protected woodland remnants. The results of the monitoring would be used to establish whether an appropriate level of diversity is being achieved. Where species diversity is insufficient, supplementary planting programs would be undertaken.

C.4.4.7 Back Creek Bridge Area

The planned widening of Euchareena Road and installation of a new culvert at the existing Back Creek Bridge would necessitate the removal of three living Blakely's Red Gums (*Eucalyptus blakelyi*), one white box (*E. albens*) seedling and two dead trees (species unknown). This vegetation is a remnant of the *White Box Yellow Box Blakely's Red Gum* Community [Endangered] [NSW *Threatened Species Conservation Act 1995*] or the White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland [Critically Endangered] [*Commonwealth Environment Protection and Biodiversity Conservation Act 1999*]. The roadside remnant is part of a larger remnant located on private

property to the east of Euchareena Road. The bulk of the ground cover species recorded were introduced species.

A seven part test was undertaken by GCNRC, a full copy of which is included as Appendix 2 in GCNRC (2009). It was concluded that the removal of the living and dead trees would not be a significant loss particularly in light of the planned vegetation enhancement of the similar community on the Euchareena Road Site. Furthermore, given the area in the vicinity of the bridge is a recognized safety hazard, it would only be a matter of time before Cabonne Council undertakes similar works.

Overall, it is concluded the planned removal of the subject trees will not cause a significant impact.

C.4.5 Fauna

C.4.5.1 Introduction

A fauna assessment of the Euchareena Road Site was originally undertaken by Countrywide Ecological Service in 2005 based upon a comprehensive survey program conducted in 2003 and 2004. The purpose of the assessment was to identify the fauna species which could utilise the Euchareena Road Site, identify the presence of any threatened species, populations or critical habitat, determine the potential impact of the Project on the Euchareena Road Site fauna and to identify appropriate impact mitigation measures to implement throughout the design, operation and rehabilitation of the 2005 proposal to establish a resource recovery facility on site.

Given Dr Lim of Countrywide Ecological Service was not available to update his 2005 report, OzArk Environmental and Heritage Management Pty Limited was commissioned to undertake a gap analysis to establish if the field methods used by CES in 2003 and 2004 were appropriate to detect any additional species / populations added to the NSW or Federal Threatened species lists since 2005. The gap analysis undertaken showed the CES (2005) assessment to be comprehensive and that no further fieldwork is required - hence the CES (2005) report remains relevant.

This subsection therefore repeats the summary of CES (2005) with modifications only relating to terminology and referencing to relevant additional fauna species added to the NSW Federal threatened species lists since 2005.

A full copy of the 2009 assessment by OzArk Environmental and Heritage Management Pty Limited is included as Appendix M, whilst a full copy of CES (2005) is incorporated in full on the Project CD.

C.4.5.2 Regional threatened fauna

NSW Threatened Species Conservation Act 1995

A search of the DECCW (NPWS) Atlas of NSW Wildlife database (Molong 1:100 000 Map Sheet 8631) was conducted and a list of threatened species which have been recorded in the region was added to a list of threatened fauna species predicted to occur in the area using Bioclim.

A search of this list of species in 2005 identified 60 listed threatened species which had been recorded in the area. The more recent 2009 search established a total of 67 threatened species have now been recorded in the area. The listed species include the following.

- Fish: one endangered species and one vulnerable species.

- Amphibians: one vulnerable and one endangered species.
- Mammals: one presumed extinct species, one endangered species and six vulnerable species.
- Birds: six endangered species and 31 vulnerable species.
- Reptiles: one vulnerable species.

Commonwealth Environment Protection and Biodiversity Conservation Act 1999

An online query of the Commonwealth Department of Environment, Heritage and the Arts database indicated that the following matters related to the EPBC Act could potentially occur within a 20 km radius of the Euchareena Road Site.

- Threatened ecological community: Grassy White Box Woodlands is present on the Euchareena Road Site, however, no fauna community has been associated with this woodland.
- Ramsar-listed wetlands: The Euchareena Road Site is within the extended catchment of the Macquarie Marshes Nature Reserve, a Ramsar-listed wetland. The Euchareena Road Site is located within the Bell River catchment, which joins the Macquarie River below Burrendong Dam, some 50 km north of the Euchareena Road Site. Due to the considerable distance (approximately 200 km) and the variety of potential water quality impacts from existing land use (and the presence of Burrendong Dam itself) between the Macquarie Marshes and the Euchareena Road Site, there has been no further consideration of this matter.
- Threatened species, comprising the following.
  - Birds: two endangered species and two vulnerable species.
  - Mammals: three vulnerable species.
  - Fish: one endangered and one vulnerable species.
  - Migratory and wetland species
    - Migratory species: six bird species.
    - Wetland species: two bird species.

C.4.5.3 Fauna survey results

Method

Fauna surveys were undertaken on the Euchareena Road Site during the following time periods.

- Winter (14 and 15 June 2003) – no amphibian or reptile sampling conducted.
- Spring (7 to 9 October 2003) – full sampling.
- Summer (28 September, 5 November 2003 and 19 to 20 February 2004) – full sampling.

The methods used during the fauna sampling are briefly described below.

- Amphibians: four pitfall trap lines consisting of 2 x 10 L buckets and two tube traps along a 30 cm high and 12.0 m long drift fence. The drift fence extended across two buckets dug into the ground, each about 2.0 m from each end of the drift fence. These sites were set for two successive nights. Call recognition and opportunistic hand capture techniques were also used.
- Birds: visual observation and call recognition as well as location of roosting and nesting sites and recording of other signs (e.g. white wash, feathers, skeletal remains). Nocturnal birds were targeted

during spotlight surveys and from responses to broadcasts of taped calls (locations 'C1' to 'C3' in Figure C.4-13) and opportunistic encounters.

- Small mammals: 100 Elliott traps (Type A) were set over three successive nights from 7 to 9 October 2003. These traps were laid in four lines each with 25 traps spaced 8.0 m to 10.0 m apart (Locations T1 to T4, Figure C.4-13). Twenty-four hair sampling tubes were set at eight locations with one secured 8.0m high on a tree and two on the ground at suitable locations (under, in or between logs and fallen timber or next to a tree trunk, (Locations 1 to 8, Figure C.4-13). The hair caught on the double-sided sticky tapes on these tubes were analysed to identify the mammals that had visited these hair traps.
- Large terrestrial and arboreal mammals: daytime observations, spotlighting and responses to broadcasts of taped calls (Koala, *Phascolarctos cinereus* and Yellow-bellied Glider, *Petaurus australis*). Any other signs of mammals such as scats or footprints were also recorded.
- Insectivorous Bats: sampled by recording their ultrasonic calls using an ANABAT-CF detectors system. Additionally, a harp trap was used at location 'HP' (Figure C.4-13) near the dam to catch bats that come into drink from the dam or hunt around the dam for insects.
- Reptiles: systematic hand searching along the fence lines, under logs, bark and leaf litter, pitfall traps, general observation, and chance capture in Elliott traps.

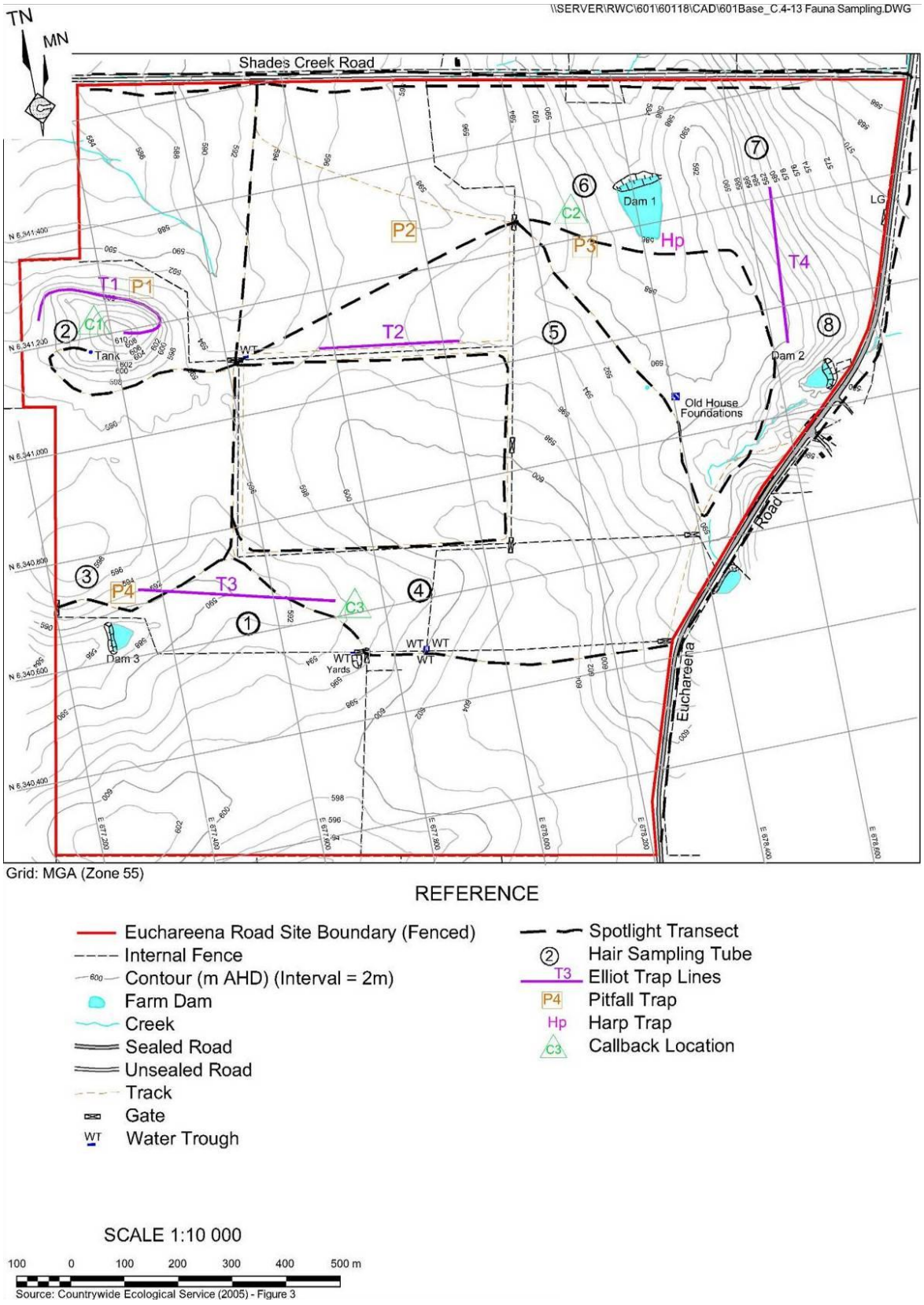


Figure C.4-13 Fauna sampling locations

C.4.5.4 Results

Table C.4-6 presents a list of all species identified on the Euchareena Road Site during the fauna surveys.

Table C.4-6 Fauna species identified on Euchareena Road site

Scientific Name	Common Name	Scientific Name	Common Name
AMPHIBIANS		BIRDS cont…	
Uperoleia rugosa	Wrinkled Toadlet	*Ninox novaeseelandiae*	Southern Boobook
Limnodynastes tasmaniensis	Spotted Marsh Frog	*Pardalotus punctatus*	Spotted Pardalote
Crinia signifera	Common Froglet	*Manorina melanocehrla*	Noisy Miner
Limnodynastes peronii	Striped Marsh Frog	*Coracina novaehollandiae*	Black-faced Cuckoo-shrike
BIRDS		*Cracaticus nigrogulsris*	Pied Butcherbird
Grallina cyanoleuca	Magpie-lark	MAMMALS	
Chenonetta jubata	Australian Wood Duck	*Ovis aries*	Sheep
Anas gracilis	Grey Teal	*Macropus giganteus*	Grey Kangaroos
Threskiornis aethiopica	Sacred Ibis	*Vulpes vulpes*	Red Fox
Falco berigora	Brown Falcon	*Felis cattus*	Feral Cat
Falco cenchroides	Nankeen Kestrel	*Canis familiaris*	Farm Dog
Vanellus miles	Masked Lapwing	*Oryctolagus cuniculus*	European Rabbit
Ocyphaps lophotes	Crested Pigeon	*Trichosurus vulpecula*	Brush-tailed Possum
Cacatua roseicapilla	Galah	*Tachyglossus aculeatus*	Short-beak Echidna
Cacatua galerita	Sulphur-crested Cockatoo	*Lepus capensis*	Brown Hare
Polytelis swainsonii	Superb Parrot*	INSECTIVORES BATS	
Platycercus elegans	Crimson Rosella	*Vespedelus vulturnus*	Pale Eptesicus
Platycercus eximius	Eastern Rosella	*Chalinolobus gouldii*	Gould's Wattle Bat
Platycercus zonarius	Mallee Ringneck	*Nyctophilus geoffroyi*	Lesser Long-eared Bat
Gymnorhina tibicen	Australian Magpie	*Tadarida australis*	White-striped Mastiff-bat
Corvus coronoides	Australian Raven+	*Mormopterus planiceps (sp 2)*	Little Mastiff-bat

Scientific Name	Common Name	Scientific Name	Common Name
Corcorax melanorhamphos	White-winged Chough	REPTILES	
Aquila audax	Wedge-tail Eagle	*Morethia boulengeri*	South-eastern Morethia Skink
Dacelo novaeguineae	Australian Kookaburra	*Egernia cunninghami*	Cunningham's Skink
Sturnus vulgaris	Common Starling+#	*Tiliqua scincoides*	Blue-tongued Lizard
Psephotus haematonotus	Red-rumped Parrot		
# Introduced Species	+ Potential Pest Species	*Threatened Species	

Source: Countrywide Ecological Service (2005) – Modified from Tables 6 to 10

Amphibians

The four amphibian species identified were all common protected species.

Birds

Twenty-six bird species were recorded on the Euchareena Road Site. Except for the Common Starling, which is an exotic pest, all species are native birds. The Superb Parrot, *P. swainsonii*, is a listed vulnerable species under the TSC and EPBC Acts.

Mammals

Nine mammal species were recorded on the Euchareena Road Site, six being domesticated or introduced species. No listed threatened arboreal terrestrial mammal was recorded on or adjacent to the Euchareena Road Site. The Red Fox, *V. vulp*es, European Rabbit, *O. cuniculus*, and Feral Cat, *F. cattus,* are listed as Key Threatening Processes both in the TSC and EPBC Acts.

Insectivores bats

Five species of insectivores bat were recorded on the Euchareena Road Site, all of which are common protected species.

Reptiles

Only three reptile species were recorded during the spring survey, all of which are common protected species.

C.4.5.5 Fauna management controls

The proposed fauna management controls largely relate to the conservation of habitat and as such, overlap with the flora management controls presented in section C.4.4.4. Additionally, fauna management controls relating to vermin and pest control would be required due to the potential attraction of these animals to the waste disposal areas.

- Isolated paddock tree clearing: prior to the removal of any tree, a pre-start survey would be carried out to minimise the potential impact on spring nesting birds and over-wintering bats or any other species utilising the tree at the time.

- Timber from felled trees would be relocated to a position where it can form part of the ground cover habitat in the woodland habitat on site.
- The areas of Euchareena Road Site that are not directly affected by the proposed activity would be destocked and remain free of grazing by domestic stock until such time when a long term vegetation rehabilitation management plan can be implemented to ensure the recovery of the woodland remnants on the site.
- The existing remnant woodland areas would be fenced-off, if necessary, in order to allow the woodland remnants on site to regenerate free from uncontrolled stock grazing pressure. Slashing would be used to minimise fire risk.
- Vegetation screens would be no less than 20 m wide to enhance wildlife habitat corridors around the perimeter of the Euchareena Road Site.
- A pest control plan would be formulated and adopted that includes, in particular, the control of foxes and feral cats and any other vertebrate pest that may be a problem to the surrounding properties. This pest control plan would form part of the overall Environmental Management Plan for the Euchareena Road RRC.
- Should a vermin-proof fence be constructed around the perimeter of the Euchareena Road Site, a plan to manage the kangaroos confined within this fence would be put in place in order to keep the natural ground cover at an appropriate level. It is noted that at this stage that construction of this fence is not anticipated.
- Implement strict site hygiene controls and an effective control plan to manage the potential impact of rodents, such as the Black Rat and House Mouse, exotic predators such as the European Red Fox and Feral Cat and introduced bird species. This control plan would include the baling and covering of wastes deposited in the landfill and enclosure of all resource reprocessing facility buildings and would be included in the Environmental Management Plan for the Euchareena Road RRC.

C.4.5.6 Fauna impact assessment

Threatened species likelihood and impact assessment

Fish species

No fish species listed threatened under the Fisheries *Management Act 1994* that occur in the lower river catchments below Burrendong Dam are relevant to the Euchareena Road Site. The listed fish species that are predicted to occur near the Euchareena Road Site, namely, the Murray Cod, *Maccullochella peelii*, Macquarie Perch, *Macquaria australasica* and Trout Cod, *Maccullochella macquariensis*, generally require deep, flowing rivers. This habitat does not occur on or adjacent to the Euchareena Road Site.

Amphibian species

Based on the existing Euchareena Road Site habitat, the only amphibious species that could potentially occur in the Molong region, although it was not predicted to occur, is the Booroolong Frog, *Litoria booroolongensis*. This species is a stream dwelling frog that occurs along the ranges and western slopes from NSW to Victoria, generally above 200 m. The absence of permanent running rocky streams would preclude this frog from inhabiting the Euchareena Road Site.

The Euchareena Road Site is outside the range of the listed endangered Yellow-spotted Tree Frog, *L. castanea*, the listed endangered Green & Golden Bell Frog, *L. aurea* and the Southern Bell Frog, *L. raniformis*.

Thus no listed threatened amphibian is expected to be adversely affected by the proposed activity on the Euchareena Road Site.

Bird species

Three listed threatened bird species have been recorded within 10 km of the Euchareena Road Site.

- Diamond Firetail: The Diamond Firetail, *Stagonopleura guttata*, is a widespread species in eastern Australia, primarily found in open woodland, forest and mallee where there is a grassy understorey. It feeds on grass seeds, other plant material and insects on the ground. They appear to be unable to persist in habitat remnants less than 200 ha.

  As the remnant woodland would not be affected and would be allowed to regenerate its natural understorey free of regular grazing, the proposed activity is not expected to adversely affect this bird.

- Brown Treecreeper: The eastern population of the Brown Treecreeper, *Climacteris picummus*, is now distributed through central NSW on the western side of the Great Dividing Range. This species is a sedentary medium size insectivorous bird that inhabits eucalypt open woodland with sparse understorey.

  As the remnant woodland would largely be unaffected and would be allowed to regenerate the proposed activity is not expected to adversely affect this bird.

- Superb Parrot: This species was identified on the Euchareena Road Site during the fauna survey and as such a seven-part test of significance as required under the EP&A Act has been undertaken.

- Other Parrots: Other species like the Pink (or Major Mitchell's) Cockatoo and Turquoise Parrot may forage for grass seeds through the Euchareena Road Site, while the Swift Parrot and Regent Honeyeater may feed on Eucalypt blossoms. As there would be no adverse impact on the existing woodland vegetation, the proposed activity would not affect these species.

- Although the Glossy Black Cockatoo has been recorded in the region, there are no potential feed trees (*Allocasuarina spp*) or large nesting tree with hollows on which this species is dependent. Hence, the proposed activity is unlikely to affect this species.

- Other threatened bird species predicted to occur: No wetland occurs on the Euchareena Road Site except for three small farm dams where wetland species like the Freckled Duck and Blue-billed Duck, may visit from time to time. These transient individuals are unlikely to be adversely affected by the proposed activity.

With the absence of large trees and tree thickets, none of the listed threatened owls are likely to use the Euchareena Road Site as a core area of their home range. In any case, as no vegetation remnant Eucalyptus tree stand will be adversely impacted by the Project, the proposed activity would not affect these large hollow-dependent species or its foraging habitat.

No raptor species were recorded on, or in the vicinity of the Euchareena Road Site. Although some species may use the site for transient foraging, retention of the woodland would mean these species would not be adversely affected by this Project.

The poor groundcover habitat of the Euchareena Road Site and the surrounding farmland makes it unsuitable habitat for species such as the mallee fowl, *Leipoa ocellate*, hence these species are unlikely to be impacted by the Project.

Mammal species

Based on the habitat observations during the various fauna surveys, the poor understorey structure and the long agricultural history of this area, it is unlikely that mammals such as the listed presumed extinct Bilby or the listed endangered Eastern Quoll and listed vulnerable Tiger Quoll are likely to have survived around the Euchareena Road Site. Additionally, the degraded habitat quality of the open woodland remnants means that this habitat is unlikely to support any of the other listed mammals that has been recorded in the region.

Although it is possible that some of the threatened insectivorous bat species could occur in the local area, as the remnant woodland would be retained and enhanced, none of these species would be adversely affected by the Project.

Reptiles species

The Euchareena Road Site has only one suitable habitat on the rocky knoll on the western side of the site for the listed vulnerable Pink-tailed Worm Lizard (sometimes called the Granite Worm-lizard) *Aprasia parapulchella*. No individuals or any traces in the form of shed skins were found despite intensive moving of rocks on the hill, hence it is unlikely the species occurs on the Euchareena Road Site given the limited extent of its preferred habitat.

The other listed vulnerable reptile species predicted to occur in the region, the Striped Legless Lizard, *Delma impar*, has a preferred habitat of dense, relatively undisturbed native grassland dominated by perennial Stipa and Themeda species. While this habitat probably still occurs around the Molong area there is no evidence to suggest that this species extends so far north, hence is unlikely to occur on the Euchareena Road Site.

Superb Parrot assessment of significance

Table C.4-7 presents the seven-part Test of Significance relevant to the Superb Parrot, i.e. in accordance with the provisions of the TSC Act 1995 and EP&A Act 1979.

Table C.4-7 Seven-part test of significance – Superb Parrot (following State criteria)

	Superb Parrot **(Polytelis swainsonii),** **(V) TSC Act 1995.**
in the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction.	For the purpose of this report a local population is observation of two superb parrots overflying the Study Area. The Study Area is considered 'winter habitat' and no trees that have potential to be cleared – possibly two to three paddock trees possess hollow suitable for breeding. The Study Area does not support known breeding trees for this species. The closest known breeding area is south-west of Molong. Any trees on site suited as potential breeding sites will remain unaffected by the Project. The Project does not involve activities that will disrupt the breeding cycle of the bird nor will it involve the storage or transportation of grain that may increase the potential for birds to be killed (road kill). The long term effect of the Project is unlikely to disrupt the life cycle of the species such that a local population may be placed at risk of extinction.
in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.	Not relevant
in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed: is likely to have an adverse effect on the extent of the ecological community such that its occurrence is likely to be placed at risk of extinction, or is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,	Not relevant

Superb Parrot

(Polytelis swainsonii),

(V) TSC Act 1995.

in relation to habitat of a threatened species, population or ecological community: the extent to which habitat is likely to be removed or modified as a result of the action proposed, and whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.	A review of the proposed landfill layout Stage 1 figure (GHD 2009:44) shows that two to three isolated paddock trees are within the impact footprint. CES (2005:6-23) note 'Notwithstanding the loss of a small number of paddock trees and stags (all of which are smaller than 750 mm in trunk diameter), no threats to this parrot will eventuate from the proposed activity'. Further, development of Clear Open Pasture within the Study Area would remove a potential feeding resource. Modification of habitat will include planting approximately 13.6 ha of native vegetation corridors (Figure C.1-3 where Clear Open Pasture currently exists. *Fragmentation* and / or *isolation* of potential habitat would not occur. The importance of the habitat to be removed lies predominately with the Clear Open Pasture as a potential source of seeds and herbaceous plants. As this habitat type is locally and regionally abundant and considering there would be a net gain of native vegetation it is not considered that its removal is 'important'. The proposed works are unlikely to effect the *long-term survival* of the Superb Parrot in the locality.
whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).	Critical habitat for the Superb Parrot has not been declared and at present there are no habitats listed as critical in the locality.
whether the actions proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.	A recovery plan or threat abatement plan for the Superb Parrot has not been written.
whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.	The following threatening processes apply to this species: ◗ Clearing of native vegetation ◗ Competition and grazing by the feral European rabbit ◗ Competition from feral honeybees ◗ Loss of hollow-bearing trees ◗ Predation by feral cats ◗ Predation by the European red fox ◗ Human-caused climate change The Project would have a 'maintain or improve outcome' for the majority of these KTPs, most of which are already occurring on site. Management of the area through providing an additional 13.6 ha of native vegetation and a Pest Control plan would occur.
Conclusion	The Project would achieve a 'maintain or improve' outcome for any extant population of Superb Parrots. No further assessment is required.

Source: OzArk Environmental & Heritage Management 2009 - Table 5

Table C.4-8 presents the assessment of significance for the Superb Parrot based upon the criteria specified in the EPBC Act 1999.

Table C.4-8 Assessment of significance – Superb Parrot (following National assessment criteria)

An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:	**Superb Parrot** ***(Polytelis swainsonii)*** **(V) EPBC Act 1999.**
lead to a long-term decrease in the size of a important population, or	The Study Area does not contain 'important population' as defined. It may provide winter habitat – roosting and feeding for transient individuals. The long term effects of the activity are unlikely to disrupt the life cycle of the species such that it will decrease the size of a local population.
reduce the area of occupancy of an important population, or	The Project would not reduce the area of occupancy for this species. As noted an 'important population' does not occur within or adjacent to the Study Area.
fragment the existing important population* into two or more populations, or	As noted an 'important population' does not occur within or adjacent to the Study Area.
adversely affect habitat critical** to the survival of a species, or	Habitat 'critical' to the survival of this species would, in the long term be maintained or improved.
disrupt the breeding cycle of a population, or	The Project would not disrupt the breeding cycle of the species as a breeding population does not occur in the Study Area.
modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or	The Project would remove approximately 1 ha of Clear Open Pasture at any one time when a landfill cell is in operation (disturbed areas would be progressively capped and rehabilitated). Clear Open Pasture is a habitat type which the species may feed in. The Project would include planting approximately 13.6 ha of native vegetation which is more biologically diverse than Clear Open Pasture and as such would be an area with higher potential for birds to feed in. The Project in the long term would increase the quality of habitat this species could utilise and as such would be consistent with a 'maintain or improve' outcome for local biodiversity.
result in invasive species that are harmful to a vulnerable species becoming established in the species habitat, or	CES (2005:38) note that feral bees, rodents (mice and rats) cats and foxes, starlings, sparrows, Australian raven, little crow, brown falcon, black kite and silver gull could be considered as potential 'invasive species'. Exotic animals will be managed through a Pest Control plan. Management of native invasive species is primarily intertwined with the design of the facilities – many components of which is covered or have small surface areas and collectively lower the potential for invasive native species populations to become established. The Pest Control Plan would need to be reviewed regularly and include management of native invasive species (with appropriate approvals from NSW DECCW) if required.

interferes substantially with the recovery of the species.	The Project is unlikely to interfere with the natural recovery of this species. In the long tern having an additional 13.6 ha of native vegetation would provide a 'maintain or improve' outcome for the species.
Conclusion	This species is unlikely to be impacted by the proposed action. Referral to the Department of Environment and Water Heritage and the Arts is not required.

* An important population is a population that is necessary for a species' long-term survival and recovery. This may include populations that are:

- key source populations either for breeding or dispersal;
- populations that are necessary for maintaining genetic diversity; and/or
- populations that are near the limit of the species range.

** Habitat critical to the survival of a species refers to:

i) habitat identified in a recovery plan for the species as habitat critical for those species or communities; and/or

ii) habitat listed on the Register of Critical Habitat maintained by the Minister under the Act; and/or

iii) areas that are necessary:

- for activities such as foraging, breeding, roosting, or dispersal;
- for succession;
- to maintain genetic diversity and long term evolutionary development; or
- for the reintroduction of populations or recovery of the species.

Source:OzArk Environmental & Heritage Management 2009 – Table 6

In summary, the Project is unlikely to adversely affect the Superb Parrot. Rather, the Project could provide enhanced wintering habitat for this species.

C.4.5.7 Koala habitat (SEPP 44) consideration

As detailed in section C.4.4.5, there is potential Koala habitat on the Euchareena Road Site as defined by SEPP 44. As no area of the woodland remnants would be removed, no potential or core Koala habitat on the Euchareena Road Site would be affected by the Project. Additionally, there are no historical records of Koala occurring near Molong, hence no further consideration for a Koala Habitat Management Plan is warranted.

C.4.5.8 Potential pest species

Implementation of strict site hygiene and other pest management controls, would ensure that rodent species such as the House Mouse, *Mus domesticus*, do not become a pest. The compaction of the bulk of the waste, site hygiene combined with daily cover of the landfill waste and enclosure of the composting plant would also ensure that bird species, including raptors, and the feral cat and European Red Fox do not become pests on the Euchareena Road Site or surrounding farmland.

The management of the European Rabbit on the Euchareena Road Site would be comparable with that on the surrounding farmland and the Euchareena Road Site would not result in significant impacts resulting from these species.

C.4.5.9 Conclusion

The connectivity and conductivity of the existing habitat on the Euchareena Road Site would be enhanced through the planting of vegetative screens and the 13.6 ha rehabilitated woodland (hence a net increase of habitat). The enhancement of the two existing woodland stands and no further habitat fragmentation or isolation of habitat would occur as a result of the Project. Given that no significant habitat on the Euchareena Road Site is to be adversely impacted, it is concluded that the Project is:

- Unlikely to significantly affect any of the listed threatened species, fauna populations or communities;
- Unlikely to augment or significantly contribute to any of the Federal or State listed key threatening processes, if the appropriate safeguards regarding the control of potential vertebrate pests are effectively applied;
- Unlikely to significantly affect any Ramsar wetland or any CAMBA or JAMBA listed species;
- Unlikely to significantly affect any of the creeks if adequate water run-off safeguards and possible seepage from the site are adopted; and
- Consistent with ESD principles with regards to fauna and would not adversely affect the local biodiversity and no issue of inter-generational or value added matters are relevant in this instance.

C.4.6 Apiary Industry Issues

C.4.6.1 Introduction

This subsection presents an overview of the range of issues relevant to the consideration of the potential interaction between the Project's Euchareena Road Site and the local apiary industry. The overview commences with an outline of the reasons claimed by local apiarists that the operation of a landfill on the Euchareena Road Site would impact upon their apiary businesses. Information is provided highlighting the current distribution of American Foulbrood (AFB) Disease and its sources and practices currently adopted by apiarists.

The issues related to broader food security risks in the form of propolis, sticky substances used by bees to repair hives, are also explored. The subsection includes a detailed description of the Proponent's planning and mitigation measures and an assessment of the impacts based largely upon a statistical approach, supported by assessment by an independent expert Mr Robert Gulliford, to the risk and financial implications of the claimed adverse interactions between the Euchareena Road Site and the surrounding apiaries.

The information presented in this subsection is drawn from a range of sources, each of which is referenced throughout this subsection.

In summary, AFB infection and access to propolis is considered improbable. This is based on the baling of waste and the cover practice for both baled and unbaled waste (around 20% of commercial waste). The statistical analysis of timeframes for bees to access either is compelling with infection and access probabilities at 1 in 890 years (see Appendix T) at 500 m and over 1 in a million years at 2 km. Not withstanding this, it is argued that the analysis indicates that bee memory would quickly determine that well managed and covered landfills such as the one proposed are poor food sources. Logically bees would not continue to access a source that did not provide a food source when they responded to a scout bee discovery. If covered landfills were a bee memory source of food then bees would be constantly observed at such landfills, and they are not.

As well as proposing to implement a variety of mitigation measures, the Proponent would make arrangement for independent testing of nearby hives in the ownership of local apiarists. Failing that, the Proponent would establish a control, by placing hives at 500 m from the landfill and test for propolis and AFB during periods that the local hives are active.

C.4.6.2 The potential problem

Local apiarists claim that the construction and operation of the Euchareena Road Site would unacceptably increase the risk of their bees contracting AFB, a disease that affects the health of bees. This disease has been in Australia, principally in the eastern states, for many decades with its distribution in NSW becoming more widespread and increasing in incidence (Rhodes and McCorkell 2006).

The two principal sources of AFB are infected honey and infected apiary equipment. Honey infected with AFB spores is currently able to be sold throughout NSW, as it does not affect human health, however, in doing so, is one of the potential sources of the continuing spread of AFB, as glass and plastic containers with honey residue with AFB spores are generally disposed of in landfills if the container is not recycled.

It is claimed that when beekeepers do not relocate hives to new nectar sources, and there is insufficient natural nectar available in close proximity to beehives, bees may be attracted to honey residue in glass or plastic containers left exposed in locations such as a landfill. Whilst it is possible for bees to fly up to 10 km from their hives, it is recognised that most bees would typically fly up to 4 km or 5 km in search of nectar. Hence, it is claimed that a landfill within 5 km of a beehive could pose an unacceptable risk to an apiarist as one or more bees may return to their hives, with honey infected with AFB spores.

It is also recognised that bees can be infected during winter, when apiarists feed their dormant bees with honey that could be infected with AFB spores.

The 2006 survey of NSW apiarists regarding AFB (Rhodes and McCorkell 2006) identified that approximately 50% of responses recorded the main risk in spreading AFB external to their apiaries as robbing of infected honey from nearby apiaries, abandoned or neglected hives, feral colonies or dead-out hives. A retired bee expert from the Department of Primary Industry, Mr Robert Gulliford, has provided a report in Appendix U that gives some insight into the potential for bees to be infected by AFB. Mr Gulliford stated that he had not seen any substantive evidence that AFB is caught from feral colonies, despite that claim often being made by beekeepers who have no other explanation for outbreaks of AFB in their apiaries.

Infected hives and beekeeping equipment were also recorded as a common risk. In total, 22 separate risks were identified, **none** of which related to household waste or waste facilities. Hence, it remains a common understanding amongst apiarists that bees that are properly managed and regularly relocated to sufficiently abundant pollen and nectar sources are unlikely to be attracted to landfills. Recent articles by Lynes-Kelly of NSW Industry and Investment NSW (Agriculture) (The Land, 28 May 2009) indicate a growing need to provide a diverse range of flowering food sources to increase hive health. The Project seeks to add to this diversity.

This is supported through observations and experience at the Jugiong landfill 60 km west of Yass in southern NSW, a regional landfill serving seven local government areas. The Murrumbidgee Valley is a well-recognised honey production area in NSW with one of the State's larger honey producers, placing hives annually within 1 km of the Jugiong landfill without any concern that the landfill poses any risk to the health of the bees in the placed hives. (S. Kershaw, pers comm.).

The second food security risk is propolis, a sticky substance used by bees in hive construction. There have been reports of roadside tar being used for such purposes. Indeed many farm substances including non-triple rinsed chemical drums could be accessed. It is argued that measures need to be taken to ensure bees do not access propolis at the Euchareena Road Site.

It does, however, need to be recognised that a reference to 'waste sites' invariably relates to landfills that are operated in a manner comparable to those recently and/or currently operated in the Cabonne LGA, where they are unsupervised, have traditionally lacked daily covering and have, limited recycling facilities etc. i.e. a standard not comparable to the landfill proposed on the Euchareena Road Site. Of much greater risk are illegal landfills that operate on farms in the area. One such farm landfill was referred to in the Land and Environmental Court case (Land and Environment Court of NSW 2008) in evidence in the Orange sitting by its owner.

C.4.6.3 Current distribution of apiaries

The most informative data available on the distribution of beehives throughout the Central West of NSW is obtained through the Department of Primary Industries (Agriculture), which maintains a database based on postcodes of registered apiarists and the number of beehives held.

There is a considerable variation, both in the number of apiarists and hives within the Central West of NSW, however, it is recognised that each apiarist would use a number of sites around their home base to place their hives during late spring to early autumn to produce a good honey flow. Invariably, these sites are not owned by the apiarist, but access to the sites is by mutual agreement with the respective land owner.

The proximity of the bee sites to the proposed landfill maintained by Mr Ian Gosper, the closest apiarist to the site, varies from 540 m to 6.28 km. These sites are typically 1 km to 2 km apart. It is noted that Mr Gosper typically places his hives at the same locations during a six-month period each year, when operating from his home base.

Given the distribution of apiarists and the beehives throughout the Central West of NSW, and the practices of the apiarists surrounding the Euchareena Road Site, it is not unreasonable to assume these sites are similarly spaced throughout the Central West of NSW at distances comparable with those around the Euchareena Road Site.

C.4.6.4 Mitigation measures

In order to obviate perceived risk to the apiary industry, a range of mitigation measures are proposed, both in terms of the design of the facility and its operations. The proposed mitigation measures and the reasons for their adoption are outlined as follows.

1. **Non-acceptance of apiary equipment and pesticide/chemical containers**

   It is proposed that no apiary-related equipment or pesticide/chemical containers would be accepted at the Euchareena Road Site. This would be achieved by firstly displaying apiary equipment and pesticide/chemical containers as wastes not accepted at the Ophir Road RRC, and at any transfer stations operated by councils participating in the use of the facility. It is noted that all the regional councils participate in the drumMUSTER program for the collection of pesticide/chemical containers. The facility for the collection of these containers would not be located at the Euchareena Road Site. Secondly, Council officers supervising the delivery of wastes to the respective transfer stations would

be trained to recognise apiary equipment and pesticide/chemical containers. Thirdly, the Proponent would work closely with Industry and Investment NSW (Agriculture) to inform all registered apiarists in the Orange City regional areas regarding the appropriate manner in which to dispose of apiary equipment and pesticide/chemical containers (which is prescribed by regulation in any case).

Each of the above measures would be introduced to ensure that no apiary equipment is delivered to the Euchareena Road Site to enable any bees to recover any AFB spores from the infected equipment. Similarly, the non-acceptance of the pesticide/chemical containers would remove the opportunities for bees to collect any pesticides or chemicals and return these to their hives.

2. **Education programs to further promote recycling**

   Cabonne, Parkes, Forbes, Blayney and Orange City Councils are already committed to a comprehensive recycling program. Recyclables from each local government area are currently collected from the kerbside of all towns and villages by a common contractor and delivered to the materials recovery facility at the Ophir Road RRC in Orange. All these councils have a comprehensive education program facilitated through NetWaste and this will continue to maximise the recovery of glass and plastic honey containers. This measure is designed to maximise the diversion of glass and plastic honey containers from the waste stream that would otherwise be delivered to the landfill on the Euchareena Road Site.

3. **Operator training for waste and transfer station personnel**

   All operators responsible for the receipt, compaction and covering of waste delivered to the Euchareena Road Site would be fully trained firstly to recognise any apiary equipment and pesticide/chemical containers and secondly to identify the presence of any bees on site. Similar training would also be provided for operational staff at councils in the region that would send waste to Euchareena Road RRC for disposal. Detailed operational procedures would be prepared and implemented at the Euchareena Road Site and transfer stations in the event that any apiary equipment or pesticide/chemical containers are delivered to the receival areas at either the Euchareena Road Site or transfer stations.

   Comprehensive training would also be undertaken for all personnel working on the Euchareena Road Site to ensure that the bale placement and covering of wastes within optimum periods is undertaken in accordance with the approved procedures.

   The training of all Euchareena Road RRC and Ophir Road RRC personnel would be fundamental to the successful implementation of each of the approved and operational procedures identified to ensure that the operations at the Euchareena Road Site do not adversely increase the risks to the local apiary industry. Such training is already in place for chemicals and prohibited waste such as medical and nuclear waste.

4. **Defined operational Periods for the acceptance of waste**

   Delivery of bales would be between 9 am and 5 pm (excluding school bus times) and wrapped bales would be placed in the landfill and covered. Wrapping would not occur when bees are not active, however bales would be secured with straps all year round. Once a day on average, a non compacted C&I and C&D load would be delivered and covered with daily soil cover or an intermediate temporary cover.

5. **Enclosed tunnel composting facility**

   The enclosed tunnel composting facility at Euchareena Road RRC would receive food/garden organics, which would be delivered into the receival hall. Here it would be placed on the floor and contaminants manually removed. Following this, the material would be shredded into fine sized particles ready for composting. This would then be mixed with biosolids prior to being loaded into the tunnels. This process would be under supervision and take some 2-3 hours to process each batch. Coffs Harbour Council advises that since the commissioning of its food and garden organics composting plant two years ago, no bees have been detected in the receival hall, which has an open door arrangement (pers comm. Jeff Green, June 2009).

   Once the tunnels are full, the enclosed tunnel composting process commences. This takes 28 days at temperatures of around 65 degrees, which is designed to kill pathogens, weed seeds and spores. The floor of the composting building receival area, where uncomposted food and garden organics would be deposited would be washed daily.

   After being removed from the tunnels the compost would be matured on an outdoor pad for 6-8 weeks.

6. **Planting bee-friendly vegetation around the Euchareena Road Site**

   It is proposed to plant and maintain bee-friendly native vegetation around the Euchareena Road Site within the various perimeter tree screens to provide a more appropriate alternative nectar source away from the landfilling operation. The species of trees and shrubs planted within the perimeter trees screens would be selected in consultation with the Department of Primary Industries (Agriculture) and local apiarists.

   This measure would be introduced, as it is understood bees preferentially seek natural nectar sources over honey in containers. It is acknowledged that this measure would not be of significant value for at least 10 years, depending on the species grown.

   It is also proposed to plant a variety of flowering plants to increase food source diversity and provide strong competing nectar sources to the landfill and the composting facility. Recent research on Bee Colony Collapse Disorder (CCD) identifies the need for such plant diversity to ensure continued colony health (Scientific America, www.scientificamerica.com/article.cfm?id=saving-the-honeybee).

7. **Regular programs to identify feral bee colonies on the Euchareena Road Site**

   Advice from Mr Gulliford is that feral bees are not a source of AFB to the commercial bee industry. He argues that feral bee hives that die out from AFB are cleaned by moths and that no spores would remain.

It is recognised that the above mitigation measures are able to be implemented by the Proponent. There are additional measures that both the apiary industry and Industry and Investment NSW (Agriculture) could adopt to reduce the incidence of AFB disease in hives throughout NSW. This is referred to in the DPI (now Industry and Investment NSW) letter contained in Appendix C. These measures relate principally to the education of apiarists and the progressive reduction of AFB spores in honey distributed for human consumption. The education campaign would need to focus on good apiary practice where the hives are moved once nectar sources are depleted. This would limit opportunities for bees to forage around any waste facility.

C.4.6.5 Impact assessment

The level of impact(s) of the Project upon the local apiary industry has been assessed principally through a statistical assessment conducted by Emphron Informatics Pty Ltd (2009). A full copy of the assessment identifying the risks of transmitting AFB from the Euchareena Road Site is presented in Appendix T. In order to undertake the statistical assessment of risk of AFB being transmitted from the Euchareena Road Site, probability of infection was established to be dependent upon a combination of the following variables:

1. The distribution of the number of contaminated honey jars reaching the landfill site in each load or bale.
2. The number of bales that are compromised or broken potentially exposing honey jars.
3. The distribution of the length of exposure for each contaminated honey container.
4. The probability that foraging bees will be active during the exposure period for a contaminated honey container (this is driven by temperature).
5. The probability that an active foraging bee will locate any exposed honey container.
6. The probability that such an exposed honey container will be contaminated with AFB spores.
7. The probability of infection of the hive arising from contact with a single bee.
8. The probability that a foraging bee will successfully recruit other bees to the contaminated exposed honey container.
9. The relevance of access opportunities to propolis.

A critical outcome from the risk assessment relates to the occurrence of AFB spores in honey sold in the Orange City and Cabonne LGAs. Analyses of 38 honey samples purchased at a range of retail and other outlets identified that whilst approximately 70% of honey sampled contained AFB spores, the spore burden is too small for there to be any meaningful risk of AFB contamination from retail honey residues (Emphron Informatics 2009).

The detailed computer simulations reflecting each of the above nine variables when evaluated collectively show that the yearly probability of AFB infection of bee hives would effectively be zero whilst the average time for a bee hive to become infected at distances of 500 m is 1 in 890 years, 1 km, 2 km and 3 km would be in the order of 1 in 1 million years.

Given that the Euchareena Road Site is intended to provide long term regional options to close unsupervised landfills it is firstly concluded that the impact of the Project would be beneficial to the apiary industry throughout the region, given council-operated landfills capable of allowing bees access to honey containers in the manner in which they have in the past will be progressively closed. Further, the improved supervision/signage and separation of wastes at the regional waste transfer stations would reduce the potential for any foraging bees gaining access to residue honey in containers.

Overall, the Project with its additional safeguards would further reduce the predicted impacts upon the local apiary industry. The standard of management proposed is far superior than is currently adopted at the existing landfills throughout the region and elsewhere in country NSW. It is apparent that the apiary industry's concerns relate more to landfills with few or no controls compared to a landfill with the standard of safeguards and controls proposed at the Euchareena Road Site.

To the knowledge of the Proponent, the consideration of the apiary industry in the evaluation of a proposal to develop and operate a waste management facility has not been required before in Australia. It is accepted that, to date, both waste management facilities and apiaries have co-existed without any apparent adverse impacts. The results of the 2006 survey of apiarists provided testament to that together with the actions / comments of a range of apiarists. This is also supported by the statistical risk assessment undertaken by Emphron Informatics (Appendix T).

Notwithstanding the survey results and the outcome from the statistical risk assessment, the Proponent accepts that it is important to adopt best practice techniques that would provide a level of confidence to local apiarists that the transmission of AFB is avoided. The detailed assessment of this issue has led to the development of a range of specific mitigation measures (previously described) that would reduce the risk of transmission of AFB spores to a level that virtually removes all opportunities for bees contracting the AFB disease or access to propolis. Each of the mitigation measures has been developed to provide a level of certainty that the practices on the Euchareena Road Site would not adversely affect surrounding apiarists.

This assessment has also clearly identified that there are considerable opportunities for the apiary industry itself and its administration by State Departments of Primary Industries (Agriculture) or similar bodies to contribute to the reduction in the incidence of AFB throughout NSW and Australia. The strategies adopted, for example, by the WA Government has contributed to a substantially lower level of disease in that State and the occurrence of AFB spores in honey.

The increased awareness of the infinitesimal risk to the apiary industry from discarded honey containers arising from this project, together with a greater concerted effort from the apiary industry would no doubt contribute to a reduction in the incidence of AFB throughout NSW. By the time the baled wastes from Orange region are delivered to the Euchareena Road Site in about 2014, there would desirably be a further reduction in the threat of AFB because of reduced levels of AFB spores in honey sold throughout Orange City and immediate region.

C.4.7 Aboriginal Heritage

C.4.7.1 Introduction

An Aboriginal heritage assessment was undertaken by Archaeological Surveys and Reports Pty Ltd in conjunction with the Orange Local Aboriginal Land Council. The objectives of the assessment were to consult with interested local Aboriginal stakeholders and identify any existing, or potential for, items or sites of Aboriginal heritage significance on the Euchareena Road Site. In the event that any items or sites were identified, the objective was then to identify appropriate management of the site and assess the potential impact of the Project.

The assessment report was dated April 2005 and included in the Specialist Consultant Studies Compendium for the 2005 proposal.

For the assessment of the 2009 project, the Proponent commissioned OzArk Environmental Heritage and Management Pty Ltd (OzArk) to update the 2005 report as Mr Appleton of Archaeological Surveys & Reports was unavailable to update his report. Given the release of the Interim Community Consultation Requirements for Aboriginal Cultural Heritage Assessments since the 2003 survey, OzArk re-consulted with interested Aboriginal Stakeholders in accordance with the new guidelines. The Aboriginal Stakeholders consulted included:

- Orange Local Aboriginal Land Council;
- Mooka Traditional Owners Council; and
- Wiradjuri Council of Elders.

The results of the consultation with the Aboriginal stakeholders groups has been reflected in the updated Aboriginal Heritage Assessment and accompanying draft Aboriginal Heritage Management Plan. This subsection effectively repeats the various components of the 2005 report that have been relied upon by OzArk and presents the management controls that have been developed in consultation with the Aboriginal stakeholders during the recent consultation program managed by OzArk. Accordingly, reliance has been placed upon repeating the observations and assessments of Archaeological Surveys & Reports (2005).

The report by OzArk Environmental & Heritage Management (2009) is included as Appendix N whilst the report by Archaeological Surveys & Reports Pty Ltd (2005) has been included on the Project CD.

C.4.7.2 Archaeological records and consultation

The Aboriginal Heritage Information Management System (AHIMS) at DECCW (NPWS) was searched to identify recorded sites of Aboriginal heritage significance in the local area (defined as an area of 13 km^2 centred on the Euchareena Road Site). Apart from the two sites previously recorded by Archaeological Surveys & Reports Pty Ltd no records were identified within this area, although this may reflect lack of surveys rather than the lack of sites.

Molong is located near the northern boundary of Wiradjuri country. The Wiradjuri (Warradgerry) people occupied the catchment of three rivers: the Wambool group occupied the Macquarie River, the Kalar occupied the Lachlan River and the Murrumbidgerie occupied the Murrumbidgee River. As such, the Molong area was home to the Wambool.

The most well known Aboriginal association with the region is with Yuranigh's Grave at 'Gamboola' station (also registered on the Australian Heritage Database). Yuranigh was a local Aboriginal man who accompanied explorer Thomas Mitchell on his 1845-46 attempt to find a route from Sydney to Port Essington near Darwin. Yuranigh's role included finding water, determining the route ahead and acting as an intermediary with Aboriginal groups encountered along the way. Toward the end of his life, Yuranigh returned to Molong and died in 1850. In 1852, Mitchell arranged for a headstone and fencing for Yuranigh's grave.

C.4.7.3 Survey method

Predictive model

A predictive model was used by Archaeological Surveys and Reports (2005) to identify the most likely locations for sites and items of Aboriginal heritage significance to occur. The predictive model is based on categorising the survey area according to a number of factors which are likely to affect the following:

- Where Aboriginal people are most likely to have been;
- Where they left evidence of their activities; and
- The degree to which that evidence is observable in the present record.

The Euchareena Road Site contains no shelters or overhangs and no reliable water sources but may contain a source of silcrete. As such, the following model for site distribution was used for the Euchareena Road Site:

- Isolated artefacts may be present and visible in erosion features;
- Low-density artefact scatters may be present and visible in erosion features, but it is unlikely that any debitage will be visible;
- There is a potential for trees more than 150 years old to exhibit scarred and/or carved surfaces;
- There will be no surviving stone quarries;
- In the absence of any shelters there will be no art sites;
- In the absence of any exposed sandstone there will be no engravings, or grinding grooves within the Euchareena Road Site;
- There will be no shell middens;
- There will be no intact occupation deposits;
- There will be no visible evidence of burials;
- There will be no surviving Bora rings;
- There will be no surviving stone arrangements; and
- There are no known cultural associations with the area.

May 2003 field survey

The field survey was conducted on 7 May 2003. Mr John Appleton of Archaeological Surveys and Reports Pty Ltd was accompanied by a Field Officer from the Orange Local Aboriginal Land Council (LALC), Mr Sam Ah-See. The survey was made on foot with the exception of the southeastern paddock and the central paddock, which were surveyed from a slowly moving vehicle, in dry conditions, in light ideal for observing any artefactual material present and observable.

There was a dense grass cover in most cleared areas but sheep had exposed the ground surface in many of the wooded areas, and there was sufficient ground surface exposure on tracks, and other erosion features, and in environments in which artefactual material was most likely to be present if at all, for an effective sampling of the survey area. There was also access to all old growth trees and so the survey in respect of identifying scarred or carved trees was highly effective. It was assumed that most artefactual material, if exposed and visible, can be observed for up to 5 m to either side of the path of the observer. Figure C.4-14 shows the effective survey coverage.

The survey technique was the most appropriate one to use in the circumstances, and the results are believed to be generally representative of the archaeological record in the survey area, in which it was predicted there would be very little artefactual material.

Table C.4-9 lists the various survey units on the site as defined by observed topographical features, environments, and/or land use and indicates the archaeological visibility and the percentage of the area actually surveyed in each unit.

July 2009 site meeting

A site meeting was held on 7 July 2009 at which representatives of all Aboriginal Stakeholders were invited. Unfortunately, the representatives of the Mooka Traditional Owners Council and Wiradjuri Council of Elders could not attend. Mr James Williams represented the Orange LALC at the meeting during which the management of the two previously identified site was discussed. The results of more discussions were reflected in the draft Aboriginal Heritage Management Plan which was then circulated to all Aboriginal Stakeholders.

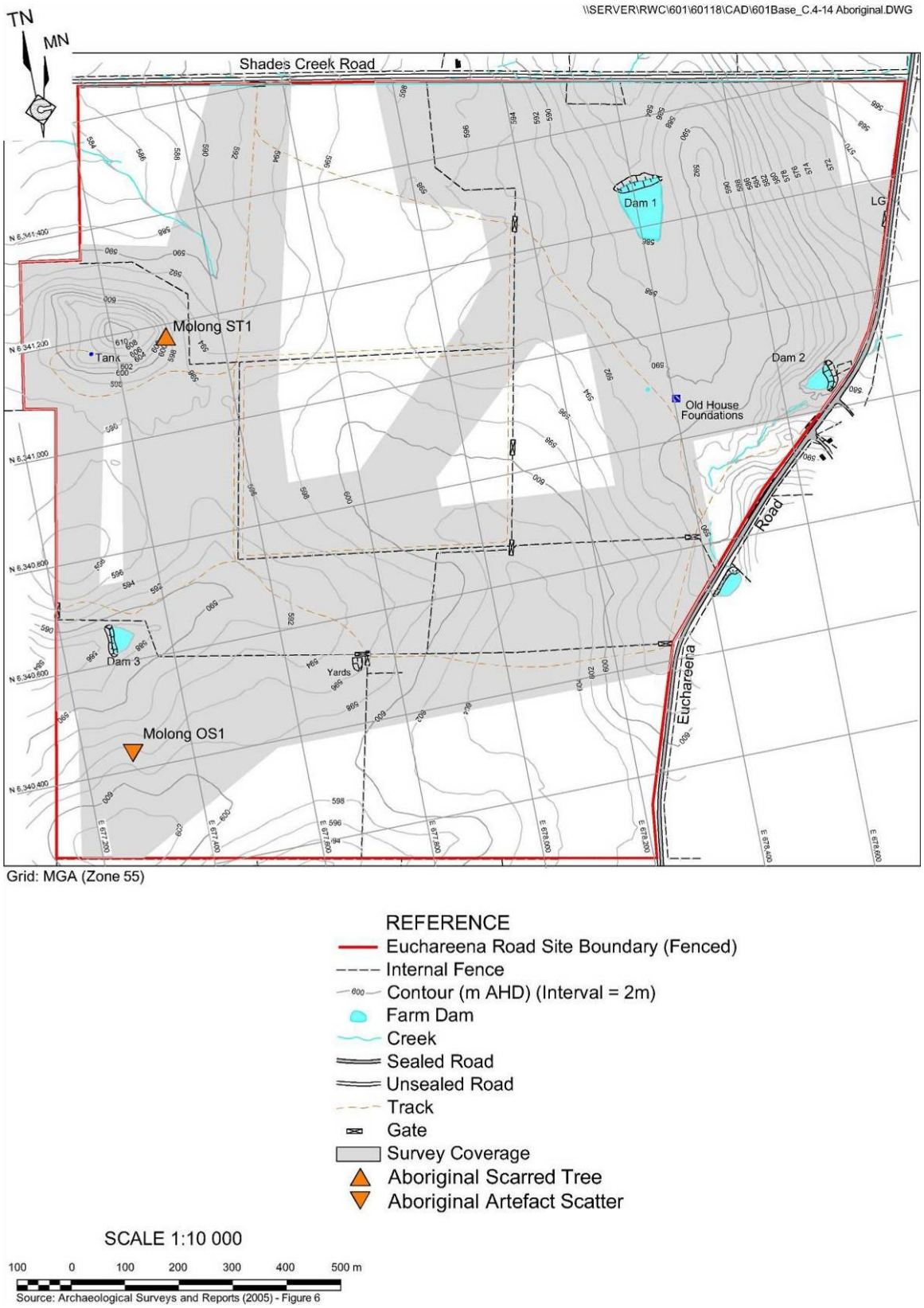


Figure C.4-14 Aboriginal heritage survey coverage and results

C.4.7.4 Survey Results and Conservation Significance

Survey results

One scarred tree, a grindstone or muller and a ground-edged axe were recorded during the field survey (Figure C.4-14). Although the two artefacts were clearly in a disturbed context, having been dumped with other surface rock around the base of a tree, the find location will be recorded as a site for the purposes of providing a location of known Aboriginal activity and a reference point in the archaeological landscape. Details of the sites are provided as follows.

Site: 'Molong ST1'

Site type: Scarred tree

Tree: Box (living)

Shape of scar: elliptical (shield-shaped)

Length of scar: 147 cm Width of scar: 16 cm

Girth mid scar: 247 cm Depth of bark: 15 cm

Height of base of scar above ground: 90 cm.

Table C.4-9 Survey units within the Euchareena Road Site

Area	Description	Study area (approx. 190ha)	Rock/soil	Vegetation	Average Surface Visibility	Exposures	Approx. area Surveyed on Foot	Average arch. Visibility of Exposures	Archaeology
1	Central paddock including the northwestern corner	553 000m^2	Weathered basalt	Cleared pasture and crops	<5%	Tracks, stock wear and gates	30%	95%	Nil
2	Eastern woodland	504 000m^2	Weathered basalt dipping to sedimentary	Open dry sclerophyll woodland and grassland	<5%	Tracks, stock wear and gates	75%	80%	Nil
3	Northeastern corner	42 000m^2	Sedimentary soils	Cleared pasture	<5%	Tracks, stock wear and gates	10%	90%	Nil
4	Western woodland including the knoll	304 000m^2	Basalt knoll dipping to weathered basalt soils	Open dry sclerophyll woodland and grassland	<15%	Tracks, stock wear and gates	95%	95%	Molong ST1 scarred tree

Area	Description	Study area (approx. 190ha)	Rock/soil	Vegetation	Average Surface Visibility	Exposures	Approx. area Surveyed on Foot	Average arch. Visibility of Exposures	Archaeology
5	Southwestern paddock	211 000m^2	Weathered basalt dipping to sedimentary	Cleared pasture	<5%	Tracks, stock wear and gates	60%	75%	Molong OS1 open scatter
6	Southeastern paddock	286 000m^2	Weathered basalt	Cleared pasture	<5%	Tracks, stock wear and gates	40%	75%	Nil

Source: Archaeological Surveys & Reports (2005) – Table 1

Site: 'Molong OS1'

Site type: Open site/artefact scatter

Artefacts comprise: Grindstone or muller. A water-worn river cobble of layered (laminated) sandstone, exhibiting a worn surface. Regardless of the artefacts' history, either grinding stone or natural movement from water movement, the cobble is out of its natural geological context, being too large to have come from the sedimentary soils within the Euchareena Road Site, and must therefore have been manually brought onto the site. During the site meeting on 7 July 2009, it was considered the muller may indeed only be a natural stone without elements of Aboriginal use and that the hand axe is at best interpreted as a blank. Hence it was assessed these artefacts had minimal archaeological significance.

A ground-edged axe manufactured from a river cobble of indurated sandstone. The sharpened end was damaged, half of the cutting edge having been broken off as a single flake, either during use or from a post-depositional event. The butt-end was battered and pitted indicating that it had also been used as a hammerstone.

C.4.7.5 Aboriginal heritage management controls

The following management controls would be undertaken to minimise the impact on items of Aboriginal heritage significance:

- The woodland remnant containing the scarred tree (Molong ST1) would be retained and existing fencing retained and maintained to ensure no impact to the standing trees, including the scarred tree;
- The artefact scatter (Molong OS1) located within the southwestern corner of the Site would be left in its identified location and not salvaged.

In order to ensure the continued conservation of both recorded sites, the Proponent would also adopt the following management controls:

- The location of site Molong ST1 and Molong OS1 would be recorded on a master plan in the Site Office, where the Site Manager has visual access to it. This plan would note that protected heritage items are present at these locations and that there are to be no impacts in the vicinity of these locations;
- The Proponent would appoint a Site Manager to take responsibility for the continued protection of these sites from future impacts as they arise and to ensure that fencing, if it is to be permanent, is appropriately maintained; and
- Part of the site induction for all staff and contractors would include a section on Aboriginal heritage. This induction would include brief reference to the legislative framework through which Indigenous heritage is protected, particular reference would be made to the location of the sites as well as providing a more general introduction to cultural heritage.

Under the provisions of the National Parks and Wildlife Act 1974, all earthmoving contractors and operators would be instructed that in the event of any bone or stone artefacts, or discrete distributions of shell, being unearthed during earthmoving, work would cease immediately in the area of the discovery, and the Orange LALC and officers of the DECCW (NPWS), informed of the discovery.

C.4.7.6 Aboriginal heritage impact assessment

The field survey identified definite evidence of Aboriginal use of the local area. Although there is invariably some doubt as to the positive identification of a scar as having been deliberately made where there is an absence of axe-marks, and some doubt as to whether the 'muller' was a tool or merely a strangely worn river rock (in which case it would have been carried to its current location), there can be no doubting the identification of the ground-edged axe as an artefact.

Although the Euchareena Road Site has been significantly altered by clearing for crops and grazing and so any artefactual material present is likely to be in a disturbed context, the fact that the axe and muller were in a pile of rocks raked-up from the southwestern paddock implies that their original depositional context was somewhere in the surrounding paddock.

The scarred tree has survived clearing due to its location amongst large boulders at the base of a short steep slope where clearing would not have improved the grazing potential and where cropping was not practical. This tree is located within the woodland vegetation which has been designated for conservation and enhancement, hence there would be no impact.

Given the impact assessment for the two identified sites the proposed management controls, and in the absence of any defined artefactual context or places of Indigenous cultural significance within the footprint of the proposed impact area, it is assessed that there would be no archaeological or cultural impacts caused by the Project on the Euchareena Road Site.

C.4.8 European Heritage

C.4.8.1 Existing European heritage

A search of the Australian Heritage Database, NSW State Heritage Register and the NSW State Heritage Inventory (which includes Council-listed items) was conducted in June 2009. The following heritage items were identified within the Molong area (Table C.4-10) and are located on Figure C.4-15.

The foundations of a former residence remain near the eastern boundary of the Euchareena Road Site beyond the proposed area of disturbance associated with the Project.

Table C.4-10 Recorded European heritage items – Molong Area

Item Number*	Item Name – location	Comment
Australian Heritage Database		
1	Alexander Family Graves	Indicative Place
2	Copper Hill Geological Site – Mitchell Highway	Removed from register
3	Molong Cemetery Woodland Remnant – Riddle Street	Indicative Place
4	Molong Courthouse Group – Edward Street	Registered – also listed under State Heritage Inventory (includes adjoining police station)
5	Molong General Cemetery – Riddle Street	Indicative Place
6	New Royal Hotel Stables (remnant) – Bank Street	Indicative Place
7	Yuranigh's Grave – Yuranigh Road	Registered
State Heritage Register		
8	Molong Railway Station and Yard Group – Main Western Railway	Also listed under State Heritage Inventory
State Heritage Inventory		
9	Shop Buildings – 89-93 Bank Street	
10	Haslam's Mill – Gidley Street	
11	Historic Museum – Gidley Street	
12	House (former Quinn's residence) – Molong Street	
13	Molong Fire Station – 58 Gidley Street	
14	Police Residence – Edward Street	
15	Quinn's Stables (former) – Molong Street	
16	Starr House – Euchareena Road	

* corresponds to item numbers on Figure C.4-15

Source: Australian Heritage Database, State Heritage Register, State Heritage Inventory (Search date: June 2009)

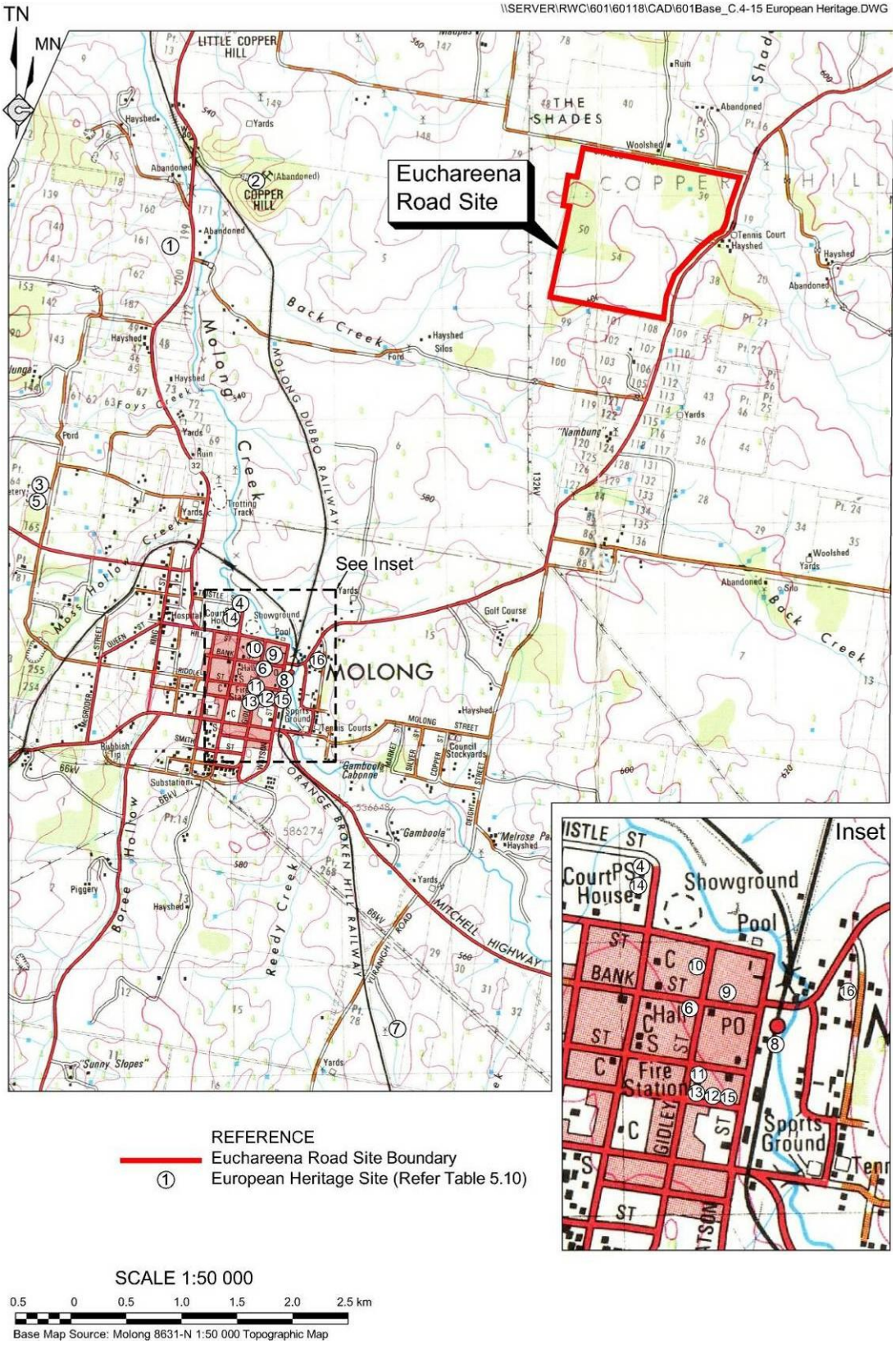


Figure C.4-15 European heritage item locations

C.4.8.2 European heritage management

None of the European heritage items listed in Table C.4-10 are located within 2.8 km of the Euchareena Road Site and only two items, the Molong Railway Station and Yard Group (Item No. 8), and Starr House (Item No. 16), are located in the vicinity of the Mitchell Highway. As the proposed transport route is already used by trucks travelling between Orange and Dubbo without identified damage to the Molong Railway Station and Yard Group and the Starr house lies adjacent to the section of Euchareena Road already passed by trucks and cars travelling to and from local businesses and properties, the primary management control to be implemented with respect to vehicles travelling to and from the Euchareena Road Site would be ensuring all loads are covered or trucks are enclosed. This would ensure that windblown litter does not affect these sites.

C.4.8.3 European heritage impact assessment

No items of European heritage significance are located in the vicinity of the Euchareena Road Site. Only two items are located adjacent to the proposed transport route and as this is an existing truck route, with the implementation of the management controls in section C.4.8.2, no impact is anticipated.

C.4.9 Hazards

C.4.9.1 SEPP 33 overview and risk framework

State Environmental Planning Policy No. 33 – Hazardous and Offensive Development aims to ensure that appropriate measures are employed to minimise the impacts of developments that are deemed to be either 'hazardous' or 'offensive'.

Under SEPP 33, the Project is considered to be potentially offensive because waste related activities could potentially impact on the surrounding localities, even after measures are taken to reduce or minimise the potential impacts.

However, the Project is not considered hazardous, as environmental controls proposed for the Project would limit the potential health risk to workers and nearby residents and risk to the biophysical environment. Mitigation measures for these risks are outlined in the various sections of this Environmental Assessment.

SEPP 33 requires that potentially hazardous or offensive development are publicly advertised under the same requirements as for designated developments. Community consultation has been carried out as per these requirements and in accordance with the EP&A Act.

C.4.9.2 Hazard identification and potential impacts

A hazard is defined as a source of potential harm or a situation with a potential loss. Hazards can relate to situations with potential for human injury, damage to property, damage to the environment, or a combination of these factors.

Hazards typically associated with waste management facilities include:

- Health (biological) hazards;
- Occupational Health and Safety (OH&S) hazards;
- Operational hazards; and

- Hazards during excavation and construction works.

C.4.9.3 Impact assessment

Construction

Construction type activities at Euchareena Road RRC would occur initially to establish the landfill and enclosed tunnel composting plant. Approximately every five years, a new cell would be excavated in the landfill within the approved footprint. This would involve a lower level of construction activity than the initial construction works, and would be classified as normal operations on a typical landfill site.

General safety hazards

Safety hazards from proposed construction works include operation of heavy equipment for the construction of the enclosed tunnel composting plant and landfill, ground instability due to the excavation and stockpiling of soil and common construction hazards such as heights, stockpiled building materials and mechanical equipment. Safety hazards from proposed construction works would be managed through occupational health and safety procedures and through development and implementation of an occupational health and safety plan for these works.

Noise

Earth moving equipment and other heavy equipment would be used during construction activities. Occupational health and safety procedures such as the use of earmuffs would be followed during use of this equipment.

Operations

General operations

There would be two separate facilities on the site – an enclosed tunnel composting plant, and a new landfill. Neither of these facilities would be considered as hazardous. Normal levels of hazard and risk associated with industrial sites and many construction sites would exist for site workers. These would be managed through development and implementation of a site operations plan.

Fires associated with composting and landfilling

Potential hazards are associated with composting operations and with landfills. Compost can potentially self combust, if it is stockpiled whilst still biologically active. This is rare because composting operators are aware of this possibility, and take steps to avoid this situation. With a tunnel composting operation, the possibility of this occurring is much less than for an open windrow process, which because the majority of the heat is produced within the tunnels, over a very short time period, and the composting process is actively monitored and managed. The plant operators would monitor temperatures within compost from the tunnels that is undergoing maturation and ensure that it is turned frequently, to minimise internal temperatures.

Methane would be produced by some of the wastes in the on-site landfill. The amount of gas produced would be much reduced compared to a normal municipal waste landfill, because of the diversion of municipal food/garden organics via separate collection and composting. However, the landfill would be lined, which would prevent off-site migration of this gas, and a gas management system would be designed in the detailed design phase which would likely include a passive gas biofiltration system that

would be designed to prevent methane from being discharged to the atmosphere from closed areas of the landfill.

Dangerous goods

No dangerous goods would be stored on site, apart from small quantities of paints and solvents, used for equipment maintenance, and herbicides used for controlling weeds on site. However, all such chemicals would be stored within a building in accordance with standard dangerous goods storage practices. Diesel fuel for on-site machinery would be stored in a double skin tank, located near the landfill site.

General safety hazards

Safety hazards would exist from on-going landfilling, cell construction works, movement of food/garden organics through the composting process, and handling of semi-finished and mature compost. These would mainly be from the use of heavy equipment, and from specialised equipment such as tub grinders used for converting garden wastes into chipped material prior to composting. Occupational health and safety procedures would be followed during use of this equipment.

Noise

Earth moving equipment and other noisy equipment (such as tub grinders) used during various operational activities could exceed noise levels for operators. Occupational health and safety procedures such as the use of personal protective equipment such as earmuffs where noise exposure is unavoidable, would be followed during use of this equipment.

C.4.10 Air Quality

C.4.10.1 Introduction

The air quality assessment of the 2009 project was conducted by Heggies Pty Ltd. The objectives of the assessment were to describe the ambient air quality in the local area, identify the potential sources of air quality contaminants that would arise from the Project, identify appropriate management measures to minimise the impact of these contaminants and model the potential impact of these contaminants at surrounding residences.

The full assessment report is provided as Appendix O and is summarised in this subsection.

C.4.10.2 Existing air quality

Existing sources of air quality pollutants

The existing sources of air quality contaminants in the local area surrounding the Euchareena Road Site are agricultural activities such as ploughing and crop harvesting which result in dust and airborne organic matter and cattle / sheep grazing which could also result in localised dust generation. Dust is also generated on local roads such as Shades Creek Road and farm access tracks. Other intensive agricultural enterprises such as the nearby Canobolas Eggs is known to be a source of occasional localised odour arising from their manure management.

Background dust deposition environment

Background dust deposition monitoring was conducted at four locations (HA1 to HA4) (Figure C.4-16) surrounding the Euchareena Road Site between May 2003 and May 2004. These locations were

established following a review of surrounding residential locations (HA1 to HA3), and a convenient location to the north of the Euchareena Road Site. The dust deposition results obtained during this period are presented in Table C.4-11.

Based on this monitoring data, a conservatively high estimation of the background dust deposition rate (insoluble solids) in the vicinity of the Euchareena Road Site for assessment purposes is assumed to be of the order of 1.8 g/m^2/month expressed as an annual average.

Background particulate matter environment

'Particulate matter' refers to a category of airborne particles typically between 50 µm and 0.1 µm in diameter. Particles less than 10 µm and 2.5 µm are referred to as PM_{10} and $PM_{2.5}$ respectively.

As no historical monitoring data is available for the Euchareena Road Site or surrounds to establish the existing background concentrations of suspended particulate matter, two real-time PM_{10} dust monitors (TSI DustTrak) were installed at two locations in close proximity to the Euchareena Road Site, HA1 and HA2 (Figure C.4-16). PM_{10} monitoring was undertaken at HA1 for the period 21 May 2003 to 26 May 2003 and HA2 for the period 28 May 2003 to 2 June 2003. The results of this monitoring are presented in Figure C.4-17 and C.4-18.

Table C.4-11 Background dust deposition monitoring data

Dates Sampled	Insoluble Solids (g/m^2/month)				Ash Residue (g/m^2/month)			
	HA1	HA2	HA3	HA4	HA1	HA2	HA3	HA4
19/5/03 to 20/6/03	0.6	0.4	0.6	0.4	0.4	0.2	0..6	0.3
20/6/03 to 21/7/03	0.2	0.2	0.1	1.5	0.1	0.1	0.1	0.5
21/7/03 to 21/8/03	1.3	1.2	0.9	11.6[1]	0.5	0.4	0.2	5.9[1]
21/8/03 to 19/9/03	1.6	0.2	0.2	0.4	0.9	0.1	0.1	0.4
19/9/03 to 21/10/03	1.2	1.9	1.6	0.9	1.1	1.5	1.3	0.8
21/10/03 to 19/11/03	0.6	0.5	1.6	0.8	0.6	0.4	0.9	0.7
19/11/03 to 19/12/03	1.0	2.0	1.4	1.1	0.5	1.1	0.8	0.8
19/12/03 to 20/1/04	2.4	1.4	3.2	1.5	1.3	1.0	1.5	0.7
20/1/04 to 20/2/04	2.6	2.4	2.8	1.4	2.0	1.4	1.4	0.4
20/2/04 to 19/3/04	2.3	1.3	1.8	0.7	0.9	0.8	0.7	0.5
19/3/04 to 21/4/04	1.4	3.0	0.8	1.3	0.8	1.0	0.5	0.5
21/4/04 to 20/5/04	1.2	6.7	1.6	0.8	0.9	1.2	1.1	0.6
Average	1.4	1.8	1.4	1.0	0.8	0.8	0.8	1.0

Note 1: This result is inconsistent with other results obtained at HA4 and the results obtained at other sites during the same monitoring period. It is therefore considered to be anomalous and has not been used to calculate the average dust deposition rate

Source: Heggies (2009c) – Table 4

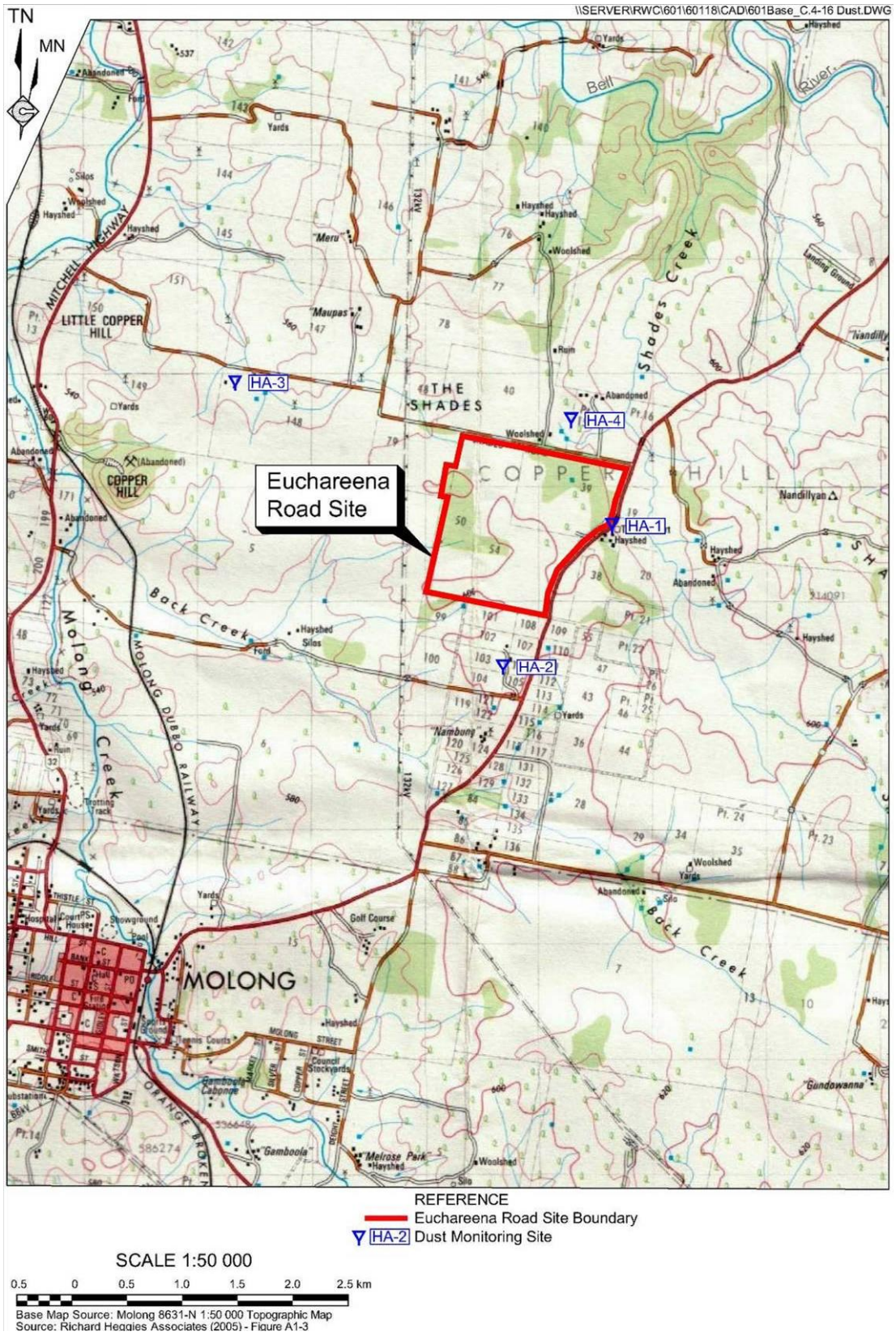


Figure C.4-16 Dust deposition gauge locations

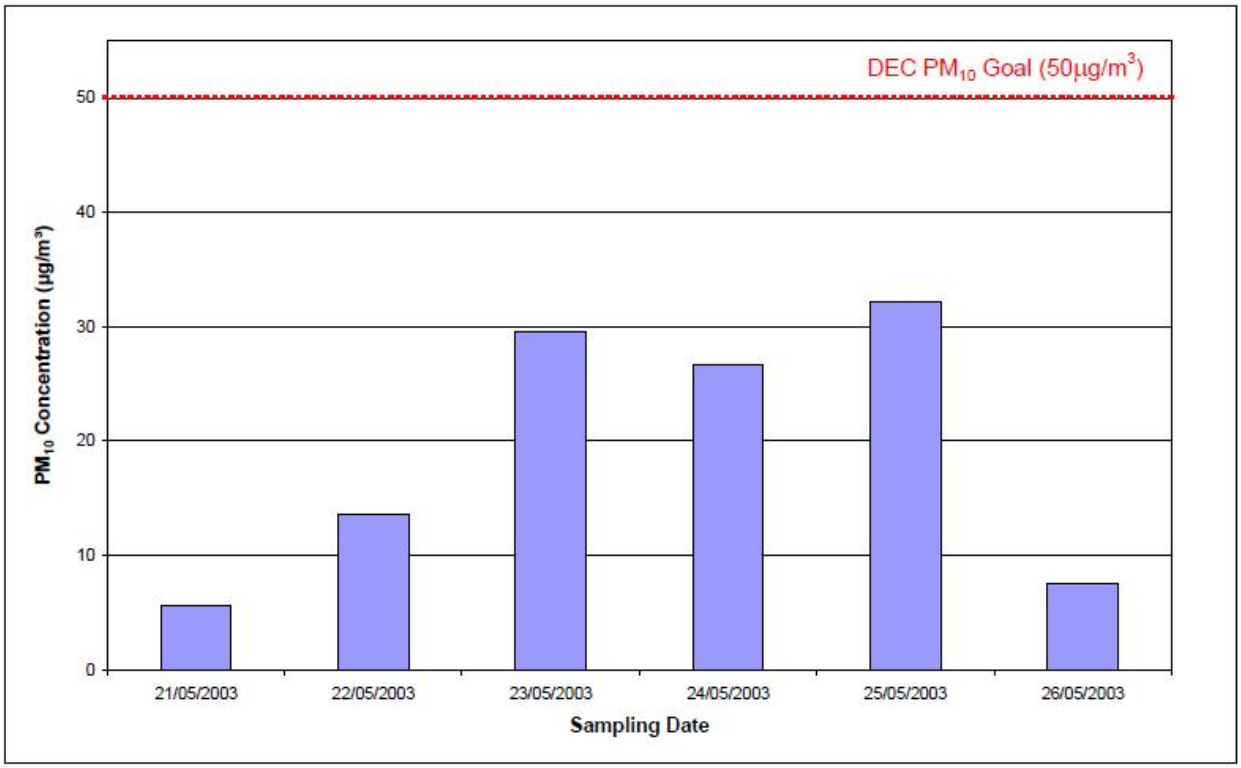


Figure C.4-17 HA1 – PM_{10} Dustrak sampling (24 hour averages)

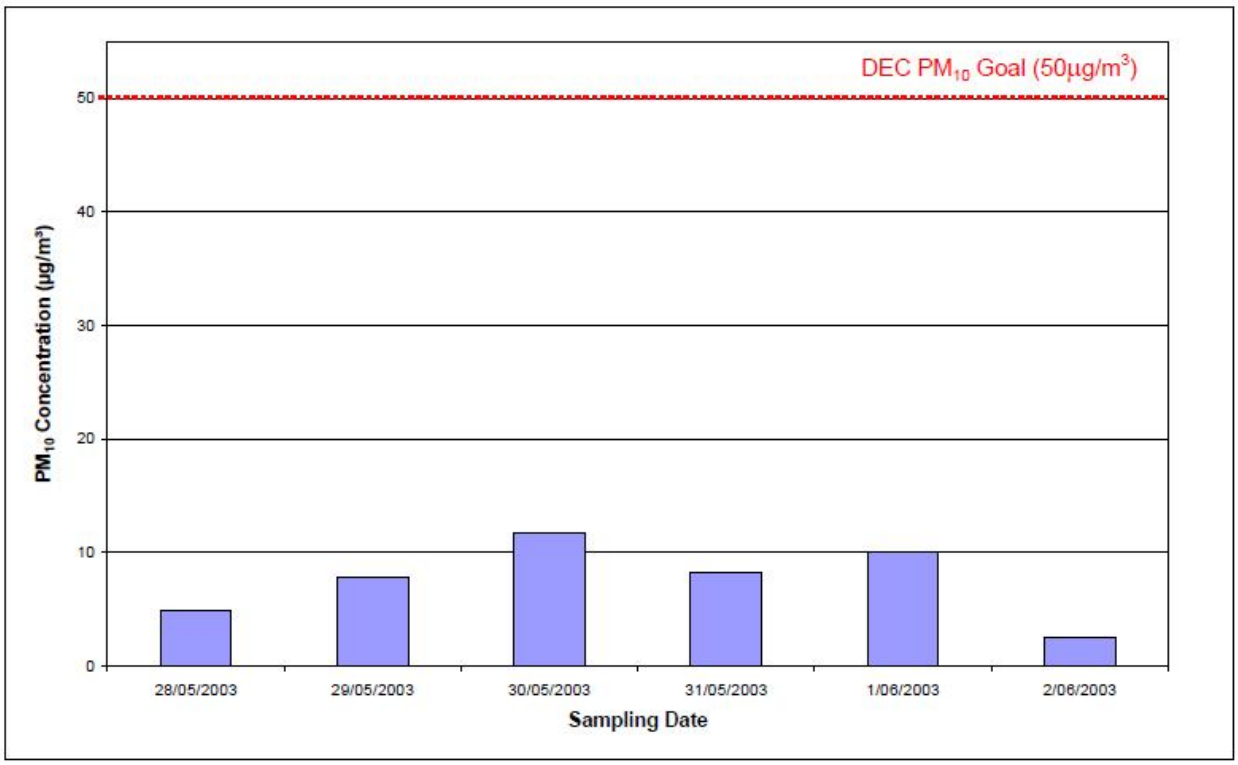


Figure C.4-18 HA2 – PM_{10} Dustrak sampling (24 hour averages)

The maximum 24-hour average recorded at HA1 was 34 µg/m^3 and at HA2 was 12 µg/m^3.

Although these results provide an indication of the background concentration of PM_{10} in the area surrounding the Euchareena Road Site, the relevant DECCW air quality goal refers to an annual average background PM_{10} concentration in addition to a 24-hour average. As such, the results have been compared with the DECCW's Tapered Element Oscillating Microbalance (TEOM) monitoring location at Bathurst.

While it is recognised that the sources of PM_{10} may differ between Bathurst and the Euchareena Road Site, it is considered that the PM_{10} concentrations recorded at the Bathurst location would be a conservatively high estimation of PM_{10} concentrations at the (rural) Euchareena Road Site. A comparison of data collected at Bathurst during the period of monitoring near the Euchareena Road Site revealed that on six of the seven days compared, the PM_{10} levels at Bathurst were higher and at times greater than twice the values near the Euchareena Road Site. Therefore, the use of the long term data from Bathurst as a basis for impact assessment is considered appropriately conservative.

Daily-varying monitoring data from Bathurst TEOM monitoring concurrent with the meteorological data set (i.e. 1 August 2003 to 31 July 2004) has been used in the atmospheric dispersion modelling conducted for this assessment. The TOEM results for this period indicate that the highest 24-hour PM_{10} average concentration at the DECCW's Bathurst monitoring site was 73 µg/m^3 recorded on 14 April 2004 with the annual average PM_{10} concentration 18 µg/m^3. It is also noted Heggies reviewed the dataset for the Bathurst TEOM for the period 1 January to 31 December 2006 and found that the annual average PM_{10} concentration in that year was 17.5 µg/m^3.

The PM_{10} sub-set is typically 50% of total suspended particulate (TSP) in the ambient air of regions where road traffic is not the dominant particulate source, such as rural areas. As such, in the absence of monitoring data for TSP, the annual average TSP concentration for the region has been derived from the DEC Bathurst annual average PM_{10} concentration. This corresponds to a background TSP concentration of 36 µg/m^3.

Background odour environment

As the Euchareena Road Site is located in a rural area the existing odour concentrations are considered to be negligible. Anecdotes provided during the community consultation program identified that manure management at the nearby Canobolas Eggs Farm has been a contributor to local odours in the past.

Background air quality summary

For the purposes of the air quality impact assessment, background air quality parameters have been measured and selected (Table C.4-12). These background levels have been selected in accordance with the NSW DEC's Approved Methods and Guidance for the Modelling and Assessment of Air Pollutants in NSW.

Table C.4-12 Background air quality environment for assessment purposes

Air Quality Parameter	Averaging Period	Assumed Background Ambient Level
TSP	Annual	36 μg/m^3
PM_{10}	24-Hour	Daily varying
	Annual	18 μg/m^3
Dust	Annual	1.8 g/m^2/month
Odour	Nose-Response Time (1s)	Negligible

Source: Heggies Pty Ltd (2009c) – Table 5

C.4.10.3 Potential sources of air quality contaminants

All construction activities and operations proposed to be undertaken on the Euchareena Road Site have the potential to result in the emission of air pollutants. The following activities would the principal potential sources of air pollutants.

- Excavating activities within the proposed landfill cell area (excavator, front-end loader)
- Scraper and Grader on access road and within the active landfill cell during excavation
- Waste unloading from waste trucks
- Wind erosion from active landfill/cover material cell stockpiles
- Low speed shredder
- Compost screening
- Movement of compost/waste (front-end loader)
- Movement of heavy vehicles on unsealed roads within the site (haul trucks and waste trucks)

C.4.10.4 Air quality management controls

The Proponent would implement a number of air quality management controls during the life of the Project to minimise the impact of air quality contaminants on surrounding residents and land uses. These management controls consist of the following.

- Watering of exposed surfaces, including stockpiles unless revegetated or have a stable surface.
- Minimisation of the area of exposed surfaces.
- Rapid progressive rehabilitation of available areas of disturbance.
- Establishment and maintenance of visual amenity bunds and tree screens to limit emissions of particulate matter and odour beyond the site boundary.
- Covering of the active landfill area following the completion of waste placement at the end of each day with approximately 150 mm of daily cover material or a landfill tarpaulin.
- Conducting regular inspection and maintenance of the biofilter servicing the resource reprocessing facility buildings.

- Attending immediately to odorous waste loads to limit transfer of odour off-site.
- Recording any complaints with respect to odour, and correlating with weather conditions and deliveries of particularly odorous wastes.
- Minimising the drop heights of waste placed into the landfill.
- Avoiding high dust-generating activities during adverse wind conditions when blowing directly towards the nearest residences.
- An air quality (including dust and odour management strategy) would be incorporated into the Operational Environmental Management Plan.

With respect to landfill gas, it is possible that very small quantities of landfill gas may be generated by organic materials entrained within the near-inert waste stream, and from minor quantities of organics which are not completely degraded during processing. The level of this gas would be monitored during annual landfill gas testing and in the unlikely event that unacceptable levels of landfill gas are detected, the Proponent would develop procedures for a gas collection and flaring system which would be incorporated in the post-operational management of the landfill. The frequency of landfill gas testing would be reviewed in consultation with the DECCW (EPA).

C.4.10.5 Air quality impact assessment

Guidelines for air quality impact assessment

Criteria applicable to particulate matter less than 10 microns (PM_{10})

PM_{10} and $PM_{2.5}$ particles are considered important pollutants with respect to impact due to their ability to penetrate into the respiratory system. In the case of the $PM_{2.5}$ category, recent health research has shown that this penetration can occur deep into the lungs.

The NSW DECCW PM_{10} impact assessment criteria, as expressed in the Approved Methods and Guidance for Modelling and Assessment of Air Pollutants in New South Wales, are:

- A 24-hour maximum of 50 µg/m^3; and
- An annual average of 30 µg/m^3.

The 24-hour PM_{10} reporting standard of 50 µg/m^3 is numerically identical to the equivalent National Environment Protection Measure (or NEPM) reporting standard except that the NEPM reporting standard allows for five exceedances per year.

Criterion applicable to total suspended particulate (TSP)

The annual criterion for Total Suspended Particulate (or TSP) is given as 90 µg/m^3, as recommended by the National Health and Medical Research Council (NHMRC). As the PM_{10} particle size fraction is typically of the order of 50% of the TSP mass, this criterion is consistent with an annual PM_{10} criterion of approximately 45 µg/m^3, hence less stringent than the newer PM_{10} criteria of 30 µg/m^3 expressed as an annual average. Therefore, as the annual TSP criteria is seen to be achieved if the annual PM_{10} criteria is satisfied, TSP has not been considered further in this assessment.

Criteria applicable to particulate matter less than 2.5 microns ($PM_{2.5}$)

The NEPM references the following criteria for $PM_{2.5}$:

- A 24-hour maximum of 25 µg/m^3; and
- An Annual Average of 8 µg/m^3.

These criteria were developed in 2003 and there is little data available regarding $PM_{2.5}$ emission factors and subsequently $PM_{2.5}$ has not been quantitatively assessed. However, a qualitative assessment of likely $PM_{2.5}$ concentrations attributable to the proposed facility, based on future modelling of PM_{10} concentrations has been provided.

Nuisance impacts of fugitive emissions

Nuisance impacts with respect to air quality generally relate to deposited dust. The DECCW impact assessment criteria to avoid nuisance impact from dust fallout are:

- Maximum total deposited dust level: 4 g/m^2/month annual average; and
- Maximum increase in deposited dust level: 2 g/m^2/month annual average.

Criteria applicable to odour emissions

Odour impacts are generally nuisance related as opposed to health related. Odour performance criteria guide decisions on odour management, but are not specifically intended to achieve 'no odour'. The detectability of an odour is a sensory property that refers to the theoretical minimum concentration that produces an olfactory response or sensation, i.e. the odour threshold. The odour threshold defines one odour unit (OU), hence an odour criterion of less than 1 OU would theoretically result in no odour impact being experienced.

In practice, odour is dependent on a number of factors including odour quality, population sensitivity to odour, background levels, public expectations of odour, source characteristics and potential health effects.

Based on experience with proposed and developed facilities throughout NSW, the DECCW compiled the Technical Notes: Assessment and Management of Odour from Stationary Sources in New South Wales. This document expresses that, as design criteria, no individual be exposed to ambient odour levels of greater than 7 OU. This is expressed as the 99th percentile value, as a nose response time average (approximately one second). This criterion decreases as the population of the surrounding area increases (Table C.4-13), the rationale being that in a larger population there are more likely to be a greater number of odour sensitive individuals

As the population surrounding the Euchareena Road Site is predominantly rural and sparsely populated, and the modelling used conservative assumptions throughout, it has been assumed that the population that may potentially be affected by odour emissions from the facility is of the order of 10 and 30 people. Consequently, the Project odour performance goal adopted for this assessment is:

- 99th percentile 6.0 odour units (OU) expressed as a nose response average (1-second) value.

Table C.4-13 Odour performance criteria vs. population density

Population of Affected Community	Odour Performance Criteria OU
Urban area (≥ 2000)	2.0
500 – 2000	3.0

Population of Affected Community	Odour Performance Criteria OU
125 – 500	4.0
30-125	5.0
10-30	6.0
Single residence (≤ 2)	7.0

Note: These should be regarded as interim criteria to be refined over time through experience and case studies.

Source: DECC (2006)

Source: Heggies (2009c) – Table 7

Project air quality criteria - summary

In summary, the specific goals being applied to the Project, which conform to current DECCW air quality targets, are as follows.

PM_{10}: A 24-hour maximum of 50 µg/m^3
An Annual average of 30 µg/m^3

Dust: Nuisance expected to impact on residential areas when annual average dust deposition levels exceed 3.8 g/m^2/month.

Odour: A 99th percentile of 6.0 OU expressed as a nose response average (1-second) value.

Modelling methodology

The pollutant dispersion modelling carried out for the Euchareena Road Site utilises the USEPA Approved CALPUFF Dispersion Modelling software. The choice of the CALPUFF (Version 6.4) modelling system for the current assessment is to ensure consistency with the Air Quality Assessment for the Ophir Road RRC, which forms part of the Proponent's overall project application.

The following two scenarios, selected to encompass typical activities and stages of site activities and operations, were modelled to predict the fugitive emissions (PM_{10}, dust deposition and odour) likely to be emitted from the Euchareena Road Site.

- Scenario 1 – Preparation and earthworks (which largely corresponds to the activities planned during each landfill cell construction); and
- Scenario 2 – Site operations.

Each scenario takes into consideration the location of active cells, the internal haul route used to transport material to the compost receival hall and the location of individual items of plant and equipment. For odour scenarios, the operation of the biofilter, compost maturation and material within the landfill (fresh and capped) have been taken into account.

A number of assumptions were made during the development of these scenarios and they are all detailed in the full air quality assessment report (Appendix O).

The modelling of an odour scenario also required the incorporation of Peak-to-Mean ratios, in accordance with the requirements of the DECC (2006) document *Technical Notes: Assessment and Management of Odour from Stationary Sources in New South Wales*. Peak-to-Mean ratios are modelling

correction factors used to account for the difference between the effects of plume meandering and the instantaneous concentration fluctuations perceived by the human nose. To estimate peak concentrations, this assessment has used Table 10.1 of the '*Technical Notes - Assessment and Management of Odour from Stationary Sources in New South Wales'*, document. Specifically, to establish a conservatively high estimate of peak odour concentrations, the following peak to mean ratio (P/M60) has been adopted, corresponding to near-field receptors for area sources:

- A Peak-to-Mean Ratio (P/M60) of 2.5 has been applied to the maximum predicted hourly average concentration during atmospheric stability classes A-D.
- A Peak-to-Mean Ratio (P/M60) of 2.3 has been applied to the maximum predicted hourly average concentration during atmospheric stability classes E and F.

For volume sources:

- A Peak-to-Mean Ratio (P/M60) of 2.3 has been applied to the maximum predicted hourly average concentration during atmospheric stability classes A-F.

Modelling results

Deposited dust

The results of the modelling for the average dust deposited over a one year average are presented in Table C.4-14 and a contour plot of the results is presented as Figure C.4-19. In reality, the incremental change to air quality attributable to the activities on the Euchareena Road Site would be minor.

The predicted mean monthly deposited dust rates presented in Table C.4-14 are well below the project goal of 3.8 g/m^2/month for all modelled scenarios.

Particulate matter PM_{10} – 24-hour average

A contour plot of the predicted PM_{10} impact is presented in Figure C.4-19 and the 24-hour average results are listed in Table C.4-14.

Table C.4-14 Background and predicted incremental dust deposition at the assessment locations

Assessment location	Annual average dust deposition rate (g/m^2/month)			
	Background	Increment	Background + Increment	Project Goal
Scenario 1				
'The Shades'	1.8	0.2	2.0	3.8
'Hylands'	1.8	0.2	2.0	3.8
'Roseleigh'	1.8	0	1.8	3.8
Scenario 2				
'The Shades'	1.8	0.1	1.9	3.9
'Hylands'	1.8	0.1	1.9	3.9
'Roseleigh'	1.8	0	1.8	3.8

Source: Heggies (2009c) – Table 11

Table C.4-15 indicates that the predicted PM_{10} levels at all surrounding residences would include six exceedances above the project goal of 50 µg/m^3 (24-hour average) for all modelling scenarios, albeit that the exceedance would have been caused by the abnormally high background levels attributable to other sources.

Particulate matter PM_{10} – annual average

Table C.4-16 provides the predicted annual average PM_{10} concentrations for all modelling scenarios.

Table C.4-15 Top 10 cumulative (background plus incremental) 24-hour average PM_{10} concentrations

Maximum 24-Hour average PM_{10} concentration (µg/m^3)			
Background + increment	**Background**	**Increment**	**Project goal**
'The Shades' Construction Scenario 1			
76.4	72.9	3.5	50
74.5	70.1	4.4	50
59.9	58.7	1.2	50
58.3	56.9	1.4	50
55.8	54.4	1.4	50
53.5	53.3	0.2	50
52.3	46.1	6.2	50
52.3	47.2	5.1	50
49.4	46.9	2.5	50
48.5	43.5	5.0	50
'The Shades' Operation Scenario 2			
74.5	72.9	1.6	50
70.9	70.1	0.8	50
58.8	58.7	0.1	50
57.4	56.9	0.5	50
54.8	54.4	0.4	50
53.4	53.3	0.1	50
48.9	47.2	1.7	50
48.4	46.9	1.5	50
46.7	46.1	0.6	50
46.6	46.1	0.5	50

Maximum 24-Hour average PM_{10} concentration ($\mu g/m^3$)

Background + increment	Background	Increment	Project goal
'Hylands' Construction Scenario 1			
75.8	72.9	2.9	50
73.6	70.1	3.5	50
62.3	58.7	3.6	50
57.2	56.9	0.3	50
54.4	54.4	0.0	50
53.9	47.2	6.7	50
53.4	53.3	0.1	50
51.1	46.1	5.0	50
49.0	45.3	3.7	50
48.0	46.9	1.1	50
'Hylands' Operation Scenario 2			
74.2	72.9	1.3	50
70.8	70.1	0.7	50
59.4	58.7	0.7	50
56.9	56.9	0.0	50
54.4	54.4	0.0	50
53.3	53.3	0.0	50
48.8	47.2	1.6	50
48.1	46.9	1.2	50
46.7	46.1	0.6	50
46.6	46.1	0.5	50
'Roseleigh' Construction Scenario 1			
73.2	72.9	0.3	50
70.3	70.1	0.2	50
58.7	58.7	0.0	50
56.9	56.9	0.0	50
54.4	54.4	0.0	50
53.4	53.3	0.1	50
47.4	47.2	0.2	50

Maximum 24-Hour average PM_{10} concentration ($\mu g/m^3$)

Background + increment	Background	Increment	Project goal
47.0	46.9	0.1	50
46.9	46.1	0.8	50
46.5	46.1	0.4	50
'Roseleigh' Operation Scenario 2			
73.0	72.9	0.1	50
70.1	70.1	0.0	50
58.7	58.7	0.0	50
56.9	56.9	0.0	50
54.4	54.4	0.0	50
53.3	53.3	0.0	50
47.2	47.2	0.0	50
46.9	46.9	0.0	50
46.3	46.1	0.2	50
46.2	46.1	0.1	50

Note: In accordance with the draft DECC document *'Approved Methods for Modelling and Assessment of Air Pollutants in New South Wales*', days on which the background concentration exceeds the DECCW PM_{10} goal are not included in this table.

Source: Heggies Pty Ltd (2009c) - Modified after Tables 12, 13 and 14

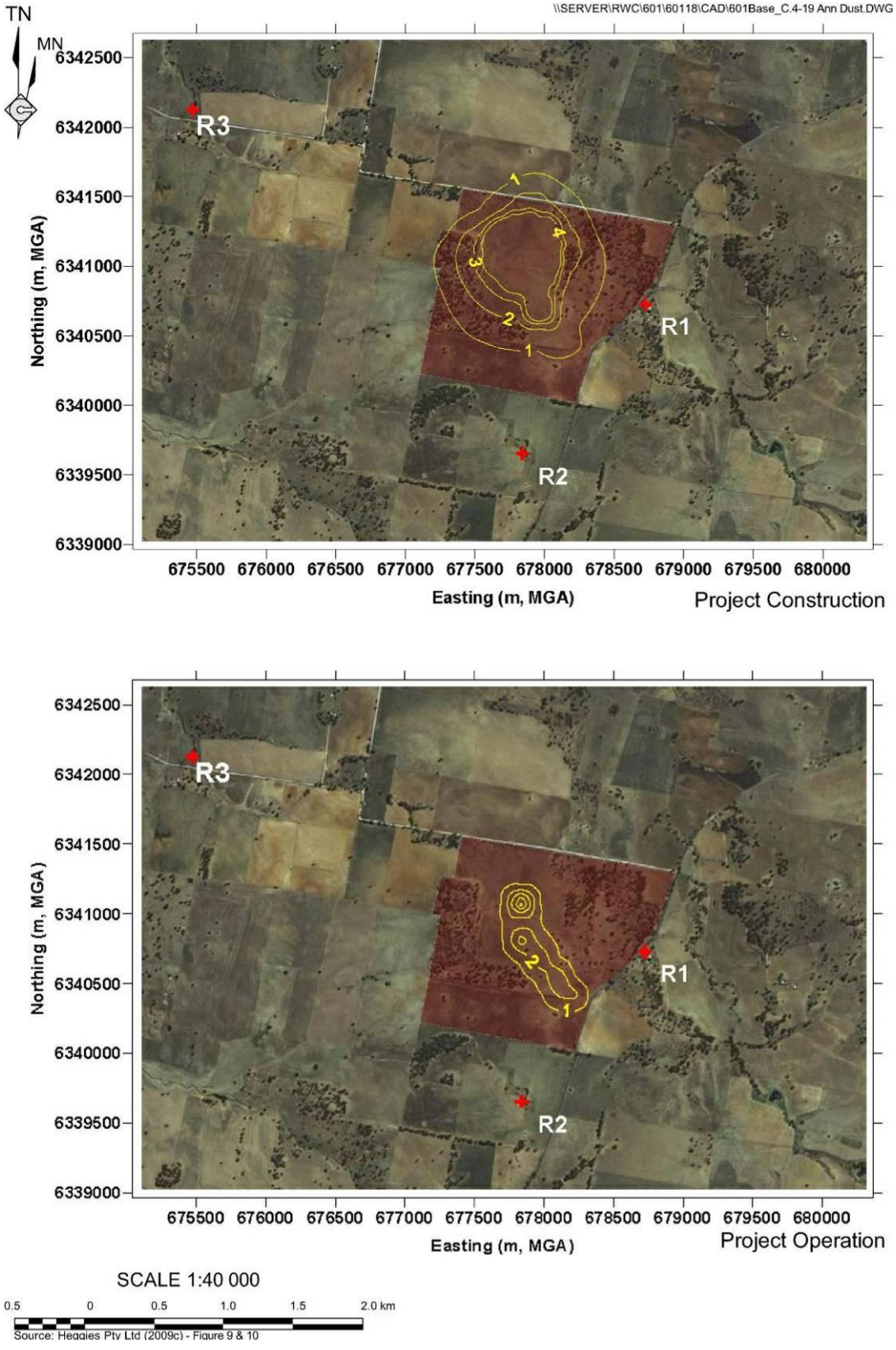


Figure C.4-19 Annual average deposited dust predicted contours

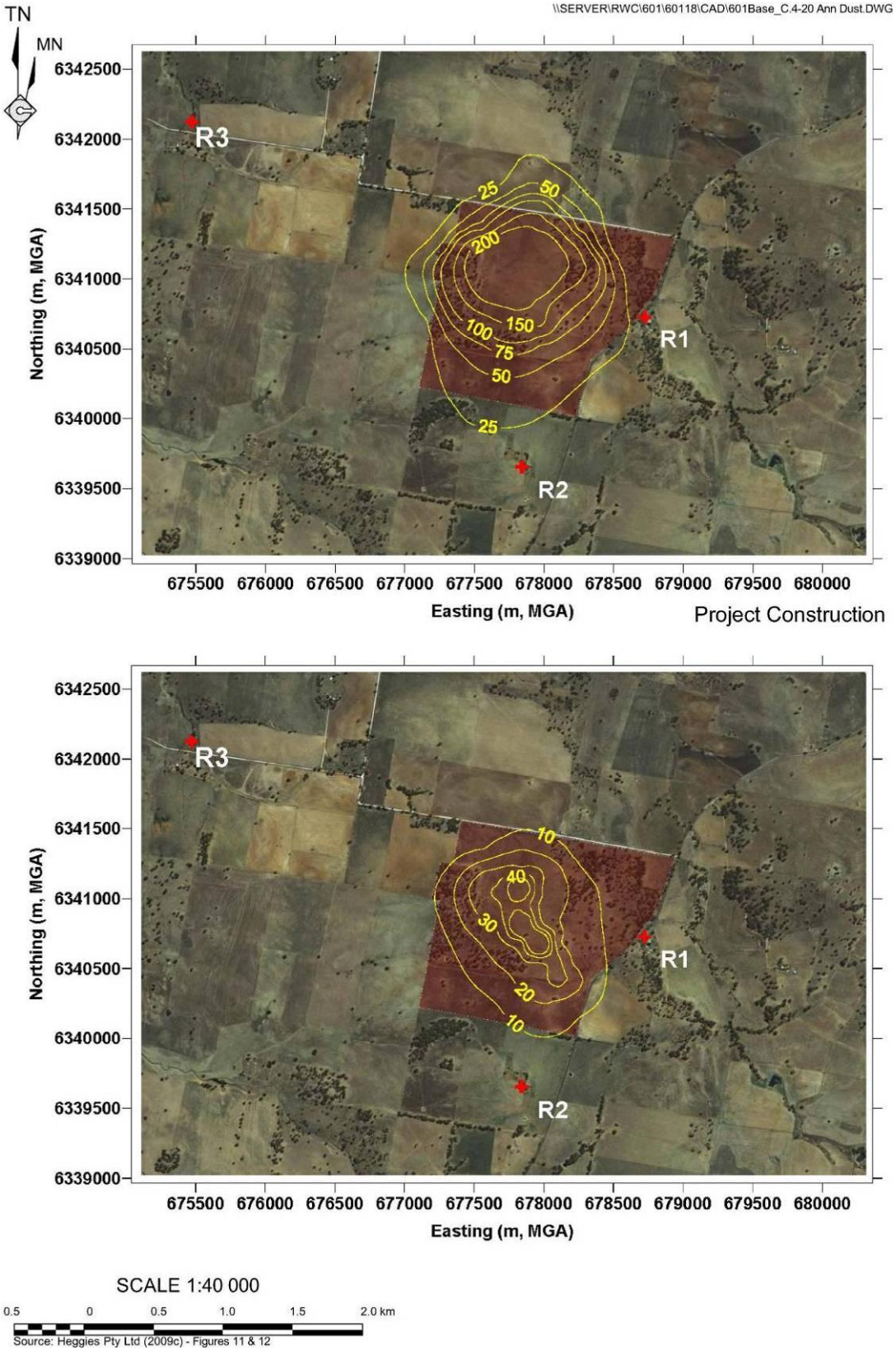


Figure C.4-20 24 hour average PM_{10} predicted contours

Table C.4-16 Annual average PM_{10} concentrations at the assessment locations

Receptor	Annual average PM_{10} concentration ($\mu g/m^3$)			
	Background	Increment	Background + increment	Project goal
Construction Scenario				
R1 'The Shades'	18	1.7	19.7	30
R2 'Hylands'	18	1.6	19.6	30
R3 'Roseleigh'	18	0.2	18.2	30
Operation Scenario				
R1 'The Shades'	18	0.4	18.4	30
R2 'Hylands'	18	0.5	18.5	30
R3 'Roseleigh'	18	0.0	18	30

Source: Heggies (2009c) - Table 16

The predicted levels presented in Table C.4-16 are significantly lower than the project goal of 30 $\mu g/m^3$ for all modelling scenarios.

Particulate Matter $PM_{2.5}$

A qualitative assessment of likely $PM_{2.5}$ concentrations has been undertaken by Heggies (2009c) which has been, based on the PM_{10} predictions and data and the assumption that approximately 30% of the PM_{10} particle size fraction will constitute $PM_{2.5}$.

A simple calculation based on the above assumption, combined with the highest predicted PM_{10} concentration for the relevant averaging period, indicates that:

- Worst-case 24-hour average $PM_{2.5}$ may be expected to be of the order of 14 $\mu g/m^3$; and
- Annual average $PM_{2.5}$ may be expected to be of the order of 6 $\mu g/m^3$.

As such, it is predicted that both the 24-hour average $PM_{2.5}$ goal of 25 $\mu g/m^3$ and the annual average goal of 8$\mu g/m^3$ $PM_{2.5}$ would be achieved during all stages of construction and operation.

Odour

The modelled predictions for the peak (99th percentile) odour levels are presented on Figure C.4-21 and in Table C.4-17. The actual levels for the 99th percentile odour criteria lie within those shown on Figure C.4-21 almost exclusively within the Euchareena Road Site. The contour for 6 OU would only cover approximately 9 ha of surrounding agricultural land.

The results presented in Table C.4-17 indicate that the odour concentration associated with the Project is predicted to be significantly below the project goal of 6.0 OU expressed as a nose response average (1-second) value.

Vehicle Emissions

The maximum estimated 58 heavy vehicle movements generated per day along Euchareena Road is a relatively low volume of traffic and as such, is not anticipated to impact significantly on the local air shed's capability to achieve the air quality goals associated with vehicle emissions (principally NO_2, SO_2 and hydrocarbons). Additionally, since all roads on the transportation route to the Euchareena Road Site are sealed, wheel-generated dust emissions off-site would also be negligible.

Table C.4-17 Peak odour concentrations for the Operations Scenario 2

Assessment location	Peak odour concentration (OU/m^3, expressed as a nose response average)			
	Background	Increment	Background + increment	Project goal
'The Shades'	Negligible	2.1	2.1	6
'Hylands'	Negligible	2.3	2.3	6
'Roseleigh'	Negligible	0.2	0.2	6

Source: Heggie s (2009c) – Table 17

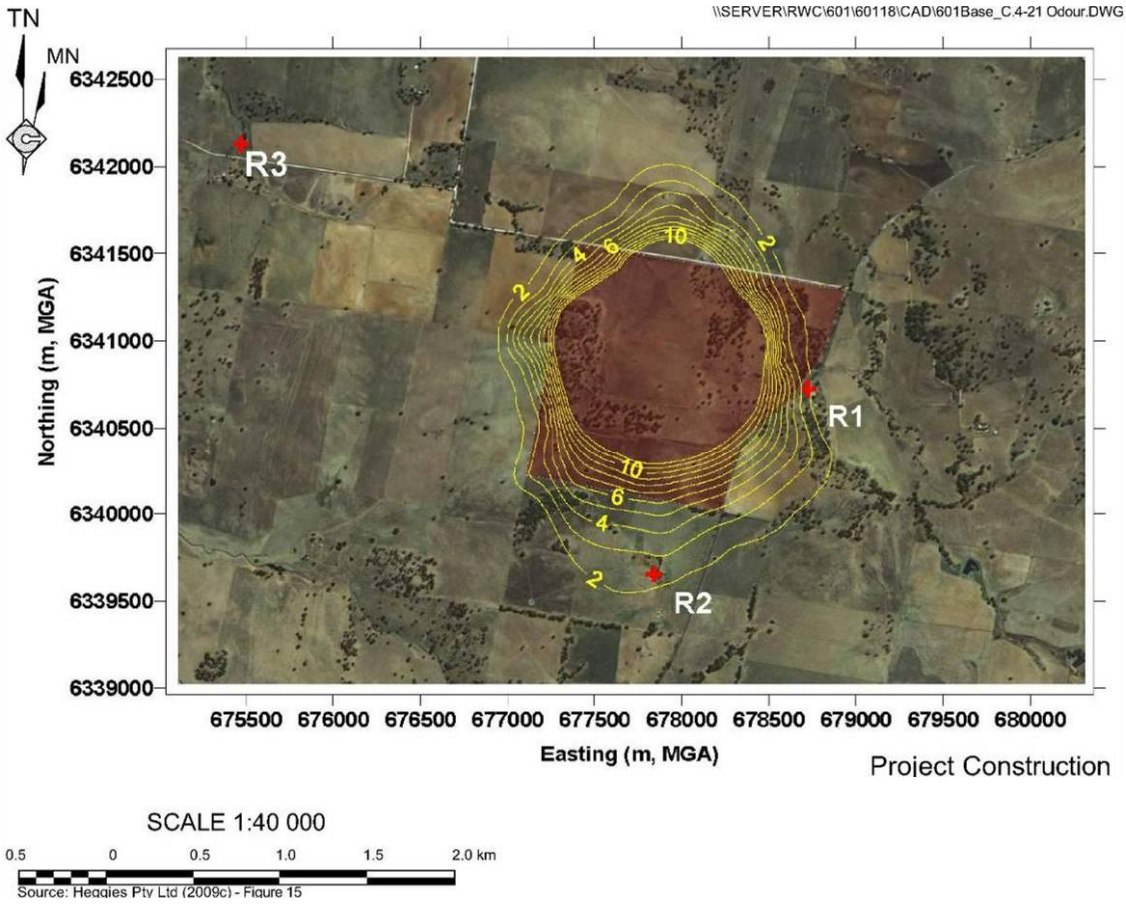


Figure C.4-21 Peak odour predicted contours

Cumulative impacts

The proposed activities within the Euchareena Road Site would be the only 'industrial' activity in the vicinity of the Site that has potential to emit air quality contaminants and as such, no cumulative impact assessment is required. The use of deposited dust and PM_{10} monitoring data obtained from the local area accounts for air quality contaminants arising from agricultural activities and as such, the results can be viewed as representing a cumulative impact assessment.

C.4.10.6 Monitoring

It is proposed that dust deposition gauges would be re-installed at the sites near 'The Shades' and 'Hylands' during the construction period. These gauges would be retained and samples collected monthly until there is no further need for such monitoring. In the event that high dust deposition levels are recorded and confirmed to be attributable to activities on the Euchareena Road Site, a supplementary program of PM_{10} monitoring would be conducted, i.e. in addition to a review of dust management practices across the site.

It is proposed that odour sampling and the related modelling would be undertaken only in response to sustained complaints. An important component of the air quality modelling would be the evaluation of all data collected in the context of prevailing weather conditions measured at the on-site automatic weather station.

All air quality monitoring data would be included in the relevant annual reports and annual returns for the site's Environment Protection Licence, if required.

C.4.11 Traffic and Transport

C.4.11.1 Introduction

The following sections are based on the Euchareena Road RRC Traffic and Transport Assessment (Appendix P) prepared by GHD which in turn relies upon some components and data assembled by Transport and Urban Planning (2005).

C.4.11.2 Existing road network and conditions

The existing road network servicing the Euchareena Road Site comprises both the Mitchell Highway (Watson Street) and Euchareena Road.

Mitchell Highway

The Mitchell Highway (SH 7) is an existing State Road under the care / control of the RTA which is oriented generally in a northwesterly direction between Orange and Wellington and beyond. It is generally constructed to an undivided two-lane rural highway standard, with two 3.5 m lanes with unsealed gravel shoulders up to 2.0 m wide and is speed zoned to 100 km/hr outside urban areas. The Mitchell Highway is the principal transport corridor from Orange to Wellington via Molong and carries some 3,280 passenger vehicle equivalents per day north of Molong. (Source: RTA AADT Traffic Volume Data 2005).

Traffic volumes collected on the Mitchell Highway approximately 1 km south of the Euchareena Road intersection indicate average 7 day directional flows and classifications as presented in Table C.4-18**.**

Table C.4-18 ADT volumes – 2003 Mitchell Highway south of Euchareena Road

Direction	7 Day ADT Volumes	% Heavy Vehicles	85% Speed km/h	5 Day ADT Volumes	% Heavy Vehicles	85% Speed km/h
Northbound	1,632	14%	88	1,673	16%	88
Southbound	1,526	15%	86	1,549	16%	86
Two-way	3,158	14.5%	87	3,222	16%	87

Source: Transport and Traffic Assessment (Transport and Urban Planning 2005)

Euchareena Road

Euchareena Road is an undivided two-lane rural road linking Molong to Euchareena under the care and control of Cabonne Council. Euchareena Road is a low volume rural road (carries about 190 vehicles per day (6.5% heavy vehicles) with a 6.0 – 6.5 m wide pavement, unsealed 0.5 to 1.0 m shoulders and a posted speed limit of 100 km/h in the vicinity of the proposed development. The alignment is made up of a combination of short straight lengths and curves through undulating terrain. A small radius curve at the intersection of Euchareena Road/ Back Saleyards Road has an advisory speed sign of 35 km/h.

The residual pavement life for Euchareena Road is approximately 10 years (Transport and Urban Planning 2005). There is evidence of recent patching to repair edge break and other pavement wear and continued regular maintenance will be required to maintain the pavement in reasonable condition.

A narrow two-lane bridge/ culvert at Back Creek about 400 m north of Belgravia Road is considered to be hazardous. There are no shoulders extended across the bridge and no safety barriers.

The condition of the 'clear zone' along Euchareena Road is generally unsafe with non-frangible objects, mainly large trees commonly located within the 'clear zone' width for a 100 km/h speed environment.

Daily traffic

Euchareena Road carries some 191 vehicles per day (7 day average) north of Back Creek culvert (refer Table C.4-19).

Table C.4-19 ADT Volumes – 2003 Euchareena Road 1 km North of Back Creek Culvert

Direction	7 Day ADT Volumes	% Heavy Vehicles	85% Speed km/hr	5 Day ADT Volumes	% Heavy Vehicles	85% Speed km/hr
Northbound	95	8%	99	97	9%	99
Southbound	96	5%	104	99	7%	104
Two-way	191	6.5%	102	196	8% *	102

Source: Transport and Traffic Assessment (Transport and Urban Planning 2005)

A daily school bus service operates along Euchareena Road generally between 7.30 am and 8.30 am and 3.30 pm and 4.30 pm.

Regular movements of livestock and periodically farming equipment occur regularly along Euchareena Road. There is currently no separate provision for livestock movements.

Seasonal traffic

Data for seasonal variations in wheat harvest (Dec/ Jan) and grape harvest (Feb/ Mar) suggest commercial vehicle traffic (truck volumes) may increase by up to 100% during these seasons (depending on actual yield).

In 2001, approximately 800 x 20 t capacity trucks delivered wheat to the Molong silos originating from the entire Molong District. An estimated 20% of the trucks destined for the silos are likely to travel along Euchareena Road past the Euchareena Road Site over a six week period. Daily truck movements along Euchareena Road during this period are estimated to vary from 12 to 24 (i.e. 6 to 12 loads per day) between the hours of 8.00 am to 8.00 pm.

However, future seasonal variation levels, (i.e. additional trucks on adjoining access road) will ultimately be influenced by actual harvest levels and longer term economic parameters within the wheat, grape and other ancillary agricultural uses.

Level of Service

The *Austroads Guide to Traffic Engineering Practice - Roadway Capacity* provides a method for estimating the Service Flow (SF) rate for a selected Level of Service (LOS) on two-lane two-way rural road. The equation is:

$SF_i = 2800*(v/c)_i*f_d*f_w*f_{HV}$

The following values were adopted for the various adjustment factors for the existing conditions on Euchareena Road are:

- $(v/c)_{A=}$ 0.08, based on no overtaking opportunities for 50% of the length of the road due to sight distance constraints, rolling terrain and a selected LOS 'A'
- (f_d) = 1.00, based on a directional distribution of traffic of 50/50
- (f_w) = 0.58, based on lane width of 3.0 m and no usable shoulder
- (f_{HV}) = 0.84, based on a 6.5% heavy vehicles
- Terrain: Rolling
- Percentage with no overtaking opportunities = 50%

The resultant service flow rate for existing conditions is 109 veh/hr (two way flow). As the existing peak period traffic flow is estimated to be about 22 veh/hr (approx 10% of the daily volume), traffic using the road currently operate at Level of Service 'A' which is considered to be at free flow conditions with no delay experienced due to disparity in speeds between vehicles in a traffic steam.

Mitchell Highway/ Euchareena Road intersection

The existing 'T' intersection formed with Euchareena Road within Molong is currently constructed to an Austroads/RTA Basic (BA) standard, with no formal separation of through and turning traffic on Mitchell Highway. A median island on Mitchell Highway constructed of temporary materials provides refuge for pedestrians crossing the highway between Bank Street and Euchareena Road to access the railway station and library, the Bowling Club, recreational playing fields and residences on the eastern side of the Highway. Vehicle access from the Highway to the railway station car park has been closed to simplify traffic movements at the intersection.

Level of Service

The two-way traffic volume on Mitchell Highway is approximately 3,500 vehicles per day or about 350 vehicles per hour in peak periods. Euchareena Road carries in the order of 200 vehicles per day or about 20 vehicles per hour during peak periods. From Section 8.3.1 of the Austroads *Guide to Traffic Engineering Practice – Roadway Capacity (Part 2)*, no analysis is required to assess the traffic capacity of these low intersecting volumes.

Based on the relatively low intersecting traffic volumes, it is estimated that the intersection presently operates at Level of Service A/B at present. The RTA *Guide to Traffic Generating Development* (October 2002) describes Level of Service A and B as follows:

- Level of Service A: Good operation
- Level of Service B: Acceptable delays and spare capacity

Railway level crossing

The level crossing on Euchareena Road about 40 m east of the highway is controlled by boom gates and signal displays. There is gated provision for pedestrians but no provision for disabled or perambulator access. The nearby railway station is a tourist attraction due to its heritage value.

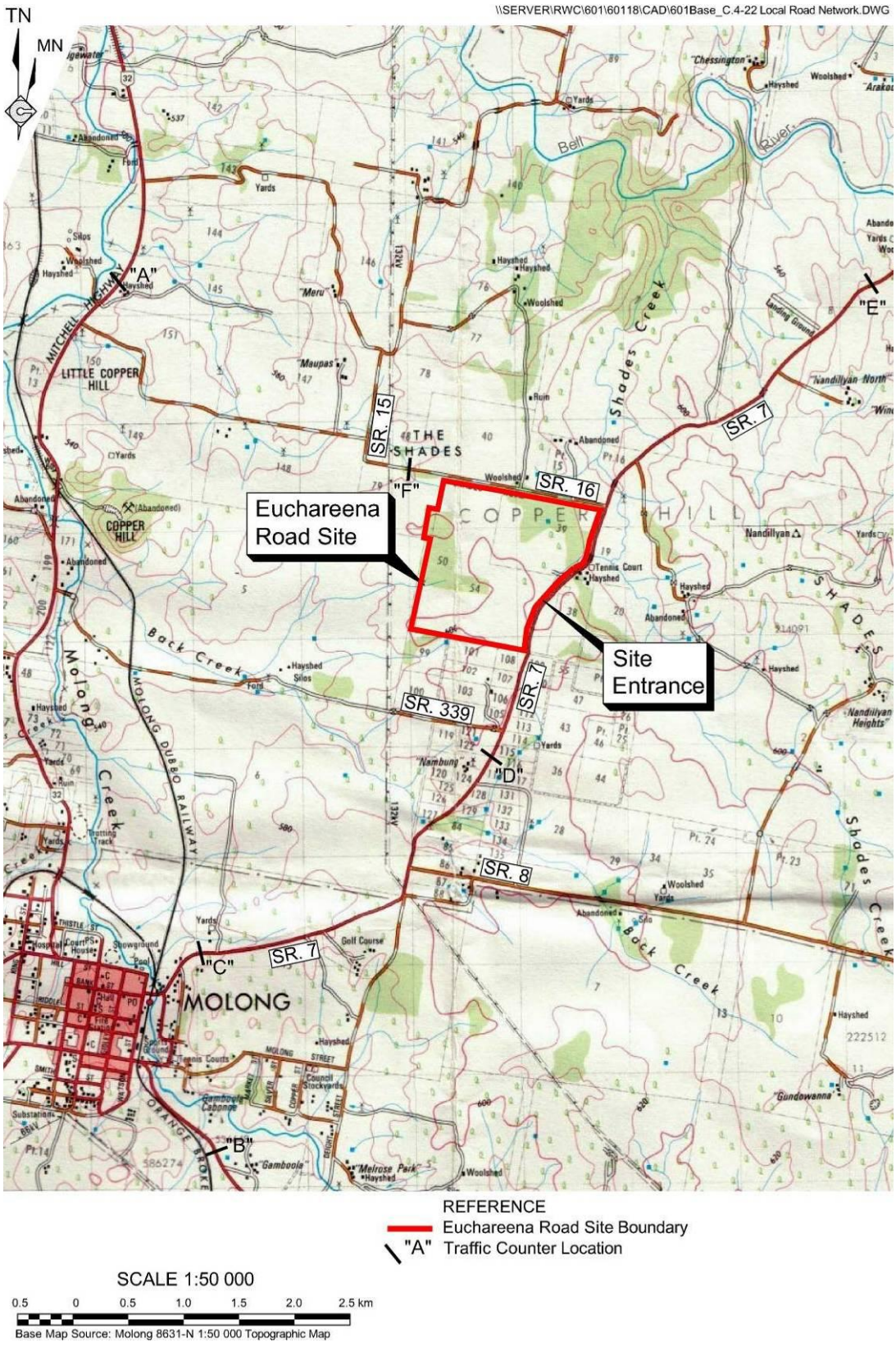


Figure C.4-22 Local road network

C.4.11.3 Mitigation measures

The Proponent proposes to implement a range of mitigation measures to ensure that motorists and pedestrian safety is maintained along the entire transport route throughout the operational life of the Euchareena Road RRC. The mitigation measures would be implemented both before the commencement of site operations and during the life of the Euchareena Road RRC.

The following measures would be implemented along Euchareena Road prior to the receipt of wastes on site to either improve safety in those areas recognised to be either currently substandard, i.e. (i) and (ii) below or to provide safe turning movements at the two critical intersections, i.e. (iii) and (iv) (below).

(i) Low cost safety improvements.

GHD (2009b) has identified some works that could be undertaken along Euchareena Road to improve safety for existing motorists. These improvements relate to improving visibility, road delineation and improving the status of the 'clear zone' along the road edges. The Proponent and Cabonne Council have agreed to conduct an independent review of road safety measures along Euchareena Road to identify those measures which are critical prior to operation of the Euchareena Road RRC.

(ii) New box culvert at Back Creek.

The new box culvert at Back Creek would replace the current narrow bridge and improve the approaches to the creek itself. The culvert would provide for an 8 m wide separation between the side railings on the crossing. It would be necessary to remove three mature trees and one seedling to achieve the proposed works (see section C.4.4.7).

(iii) New intersection at the site entrance to the Euchareena Road Site.

The intersection of the site access road and Euchareena Road would be designed as per Figure C.4-23, in accordance with the NSW RTA AUR/AUL standards. The design would include a separate left turn lane allowing vehicles entering the Euchareena Road RRC to move out of the through-traffic stream and decelerate to a safe turning speed and provide sufficient widening of the main road to permit through-traffic to pass to the left of an occasional vehicle waiting to turn right into the site access road. The design would satisfy the swept paths of 25 m articulated vehicles and truck and dog trailer combinations.

(iv) Upgraded intersection with Mitchell Highway in Molong.

The intersection of the Mitchell Highway (Watson Street) and Euchareena Road would be upgraded to meet NSW RTA standards (as per Figure C.4-24). This design was developed in consultation with the NSW RTA to suit site conditions and requirements. The principal components of the upgraded intersection would be as follows.

- Create a safe right-turn bay for traffic travelling northwards to wait for safe passage to turn into Euchareena Road.
- Create a through kerb-side lane for through traffic travelling northwards.
- Relocate the existing pedestrian refuge closer to the eastern side of the highway.
- Re-align the eastern footpath from Euchareena Road to the entrance to the Memorial Rose Garden.
- Undertake line markings to better define all lanes.

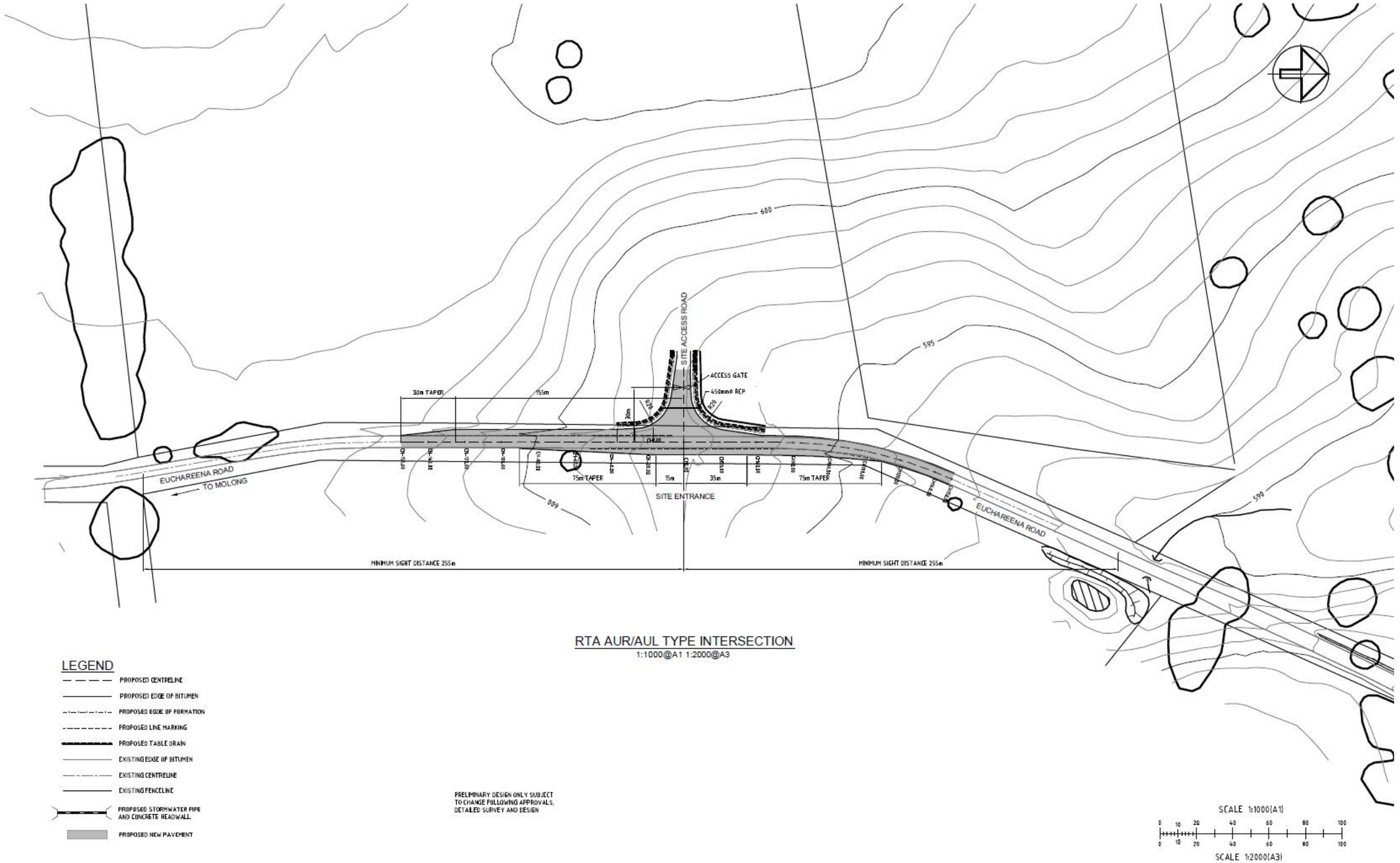


Figure C.4-23 Proposed intersection to the Euchareena Road Site

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GENERAL NOTES:

1. THIS DESIGN AND ALL DIMENSIONS ARE PRELIMINARY AND ARE SUBJECT TO FINAL DETAILED DESIGN AND SURVEY TO RTA SATISFACTION AND TO MEET ALL RELEVANT SPECIFICATIONS.
2. THIS DESIGN AND ALL DIMENSIONS WERE DIGITIZED FROM EXISTING PLANS AND THEREFORE INACCURATE. ALL DIMENSIONS SHOULD BE CONSIDERED AS INDICATIVE ONLY AND SUBJECT TO DETAILED SURVEY AND DESIGN.
3. ALL LINEMARKING AND SIGNANGE TO MEET THE REQUIREMENTS OF CABONNE COUNCIL AND RTA WHERE APPLICABLE.
4. ASSUMED SPEED LIMIT AS POSTED AT 50KM/H WITH ALL TAPERS AND MERGES DESIGNED IN ACCORDANCE WITH THE REQUIREMENTS OF THE RTA ROAD DESIGN GUIDE.

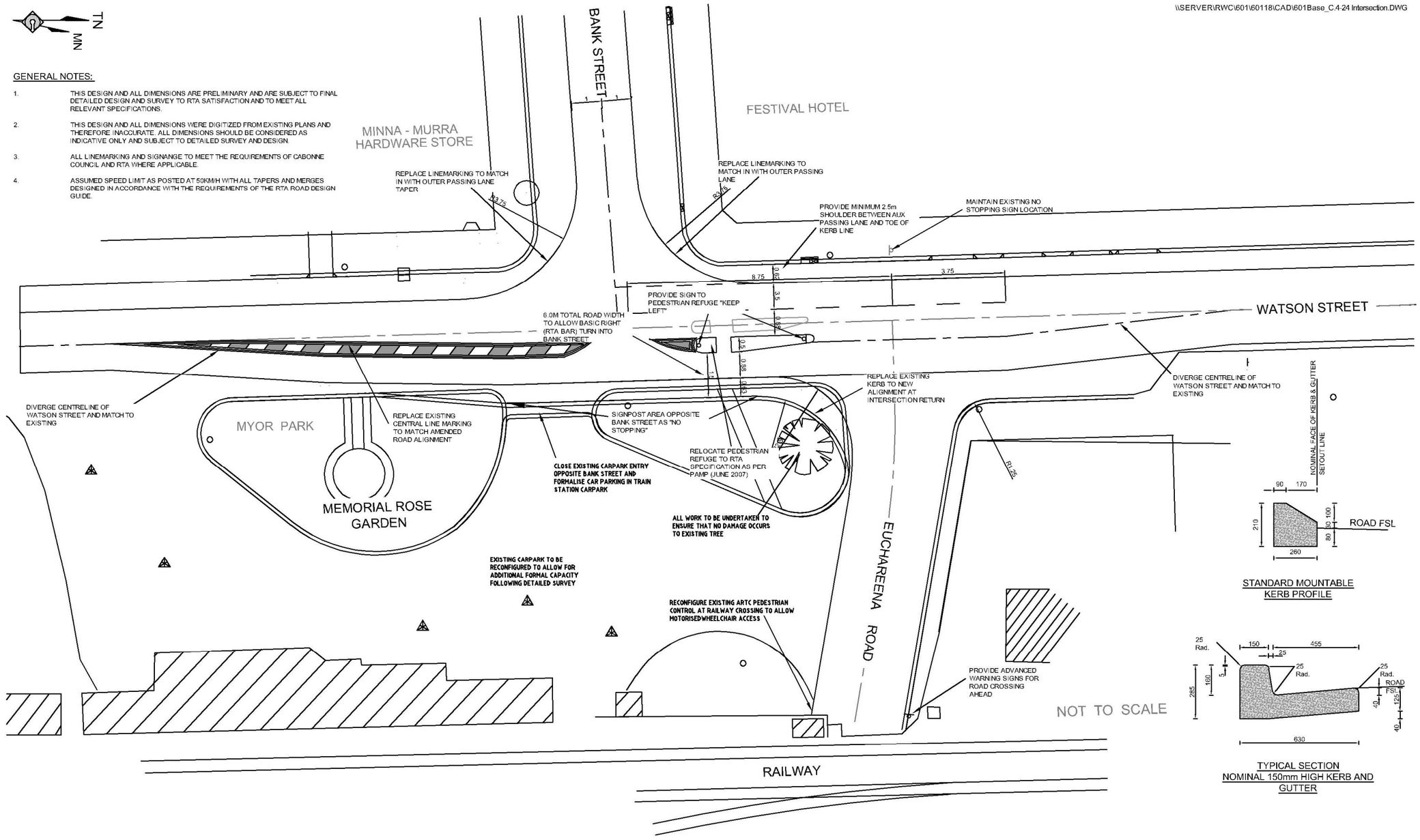

Figure C.4-24 Proposed Mitchell Highway / Euchareena Road intersection upgrade

All of the above works would not necessarily improve traffic flow given the existing and projected high level of service for the intersection. Rather, the works would provide a greater level of safety for school buses turning into Myor Park, pedestrians, and through traffic travelling northwards.

Apart from the proposed road upgrading works prior to the receipt of wastes, the Proponent would also commit funds for the ongoing maintenance of the section of Euchareena Road used by trucks travelling to and from the Euchareena Road Site.

The Proponent intends to submit a Voluntary Contribution Agreement to Cabonne Council in accordance with Clause 4.1 of Council's Road Contribution Plan (Section 94) for General Rural Zones to cover the required road maintenance. It is proposed the agreement would reflect the general principles adopted for all heavy vehicles generating projects, e.g. quarries, i.e. a rate is paid per t/km travelled on the subject road(s). Based upon currently accepted rates, the Proponent proposes to pay Cabonne Council $0.20/t (plus annual CPI increments) for each tonne of waste material delivered or product despatched from the site with a minimum payment of $10,000 per year. The first payment would be made upon the delivery of the first truck of waste being delivered to the Euchareena Road RRC. Subsequent payments would be made at the commencement of subsequent years with additional payments at the prevailing rate for any quantities in excess of 50,000 t transported during the previous year.

The Proponent recognises that the majority of drivers of trucks travelling to and from the Euchareena Site would be regular visitors to the site. Accordingly, the Proponent would require each driver to sign (during their first visit) a Code of Conduct to reinforce the Proponent's commitments to adherence of:

- Off-site requirements relating to, for example, hours of operation (avoiding school bus periods), litter, driving habits; and
- On-site safety requirements.

Stock and equipment movements

During the community consultation process, a number of landowners who have frontage on Euchareena Road hold permits to periodically transfer stock and farm equipment along Euchareena Road. Given the progressive increase in traffic levels during the life of the Project, these landowners expressed concern about the reduced safety for both the stock and their drovers, particularly from the trucks travelling to and from the Euchareena Road Site. In order to address these concerns the following mitigation measures are proposed:

- A 15 m wide stock movement corridor would be provided within the Euchareena Road Site along the full length of the Euchareena Road Site fronting onto Euchareena Road (see Figure C.1-3). This corridor could form part of a longer corridor developed by other landowners fronting onto Euchareena Road.
- Permanent stock advisory signs with drop down sections for use during active droving/equipment movement would be positioned at appropriate locations adjacent to Euchareena Road. These signs would be positioned in consultation with local landowners. If necessary, these signs could be supplemented with solar-powered flashing lights similar to those adjacent to 40 km/h school zone signs.

Roadside litter

It is a concern to landholders adjoining Euchareena Road that the Project, if approved, would contribute to an increase in roadside litter arising from poor / lack of appropriate waste covering / tie down

procedures. However, these problems are invariably caused by members of the general public and not professional truck drivers with enclosed trucks. Given the Euchareena Road RRC would not be open to the public, few litter problems are expected.

However, in order to avoid/manage roadside litter adjacent to Euchareena Road, the Proponent would undertake the following:

- Enforce the litter fines appropriate to this section of Euchareena Road;
- Undertake regular litter patrols along the edge of Euchareena Road between Molong and the Euchareena Road Site; and
- Promote litter avoidance through the drivers Code of Conduct.

The increase in traffic on Euchareena Road would become noticeable to landowners adjoining Euchareena Road. Traffic, particularly trucks, would tend to be observed on a regular, cyclical basis as they travel to and from the Euchareena Road Site.

The upgrading of the intersection of the Mitchell Highway and Euchareena Road would require the modification of the roadside line markings which would cause the loss of two parking spaces on the northbound side of the highway and potentially two parking spaces on the southern side of the intersection. The 'No Standing' signs on the northbound side of the highway opposite Euchareena Road would need to be moved northwards to improve safety. Such improvements in the interests of safety for all motorists and pedestrians are assessed to be acceptable.

C.4.11.4 Impact assessment

Construction and site establishment

A progressive construction program over a 12 month period is envisaged, involving site preparation, building the new MRF building, modifying the existing building and installing new equipment. Construction activities would be restricted to between 7 am and 6 pm Mondays to Fridays and 7 am to 1 pm on Saturdays. No construction work would be undertaken on Sundays or public holidays. Construction work may be permitted outside of the hours specified above, however, this would be subject to consultation with the DECCW.

It is anticipated that the average construction workforce at the site is likely to be approximately 20 persons, generating 40 trips per day (20 in/ 20 out). An average of 5 trucks per day delivering materials to each site is assumed, generating 10 trips per day (5 in/ 5 out).

The total traffic generated during the construction phase is therefore estimated to be approximately 50 trips per day (25 in/ 25 out).

Operational traffic volume

Future traffic volumes based on a review of AADT traffic volume growth on adjoining roads within Cabonne LGA (1988 to 1999) suggested traffic flows on Euchareena Road would be expected to grow on average at around 2.5% annually, under favourable economic conditions within the region. This is considered to be a high estimate of likely average growth rate considering the effects of the ongoing economic recession.

There would be an estimated 58 truck movements and 16 light vehicle movements per day generated by the Project on a typical day during operations. Approximately 80% of the trucks would have their origins /

destinations in Orange. The additional vehicles attributable to the Euchareena Road RRC would increase total vehicle movements by approximately 30%, i.e. assuming current traffic levels are in the order of 220 vehicle movements per day with 6.5% heavy vehicles. Overall, the total number of vehicles would remain well below the 500 vehicle movements per day for a minor rural road.

Euchareena Road

Post-development Level of Service

The revised adjustment factor (fHV) corresponding to the increased number of heavy vehicles using the road is fHV = 0.57. The calculated SF rate after adjusting for the increased heavy vehicle traffic is reduced from 109 veh/hr to 74 veh/hr. As the peak period traffic flow including traffic from the Euchareena Road RRC is estimated to be about 29 veh/hr, which is less than the calculated SF rate of 74 km/hr, traffic using the road would continue to operate at Level of Service A.

Future Level of Service

As discussed above, a conservative estimate of growth in traffic volume on Euchareena Road is 2.5% pa. Applying this growth rate to a ten-year period following the development of the proposed Euchareena Road RRC and assuming operations commence in 2012, the traffic volumes on Euchareena Road inclusive of project traffic would be:

- 2012 (without project traffic): 237 vpd
- 2012 (with project traffic): 311 vpd
- 2021: (with project traffic) 455 vpd

This corresponds to a peak period flow on Euchareena Road of about 46 veh/hr in 2021, well below the calculated SF rate of 74 veh/hr and consistent with Level of Service 'A' operating conditions.

Road pavement

The already approved upgrade of Euchareena Road between Betts Street and Back Saleyards Road together with the upgrading of the Back Creek Bridge and its approaches would result in improvements for road pavement in areas in need of improvement. The funds provided annually by the Proponent would contribute to the ongoing maintenance of Euchareena Road throughout the operational life of the Euchareena Road RRC. Clearly, the overall comparatively low level of traffic on the section of Euchareena Road beyond Back Saleyards Road would not contribute substantially to pavement deterioration. Any areas of deterioration would be remediated using funds provided by the Proponent and Cabonne Council through its road maintenance budget.

Mitchell Highway / Euchareena Road intersection

Operational traffic safety

Lower volume roads such as Euchareena Road typically have lower road design standards for pavement and shoulder widths. These are often considered to be acceptable, although not desirable from a road safety perspective.

Motorists travelling on low volume roads at relatively high speeds (the measured 85th percentile speed on Euchareena Road is 102 km/hr) can lose control of their vehicles and would not have the benefits of a 'forgiving' roadside normally provided on higher volume roads. Roadside features such as formed shoulders, unobstructed 'clear zones', guard fencing and good edge delineation are desirable to achieve

a safe road environment. The upgrading of the Back Creek Bridge prior to the commencement of waste receipts will remove a notorious black spot on Euchareena Road.

C.4.11.5 Conclusion

With implementation of the proposed road improvements, commitment to ongoing road maintenance and drivers' Code of Conduct, the Project is not expected to have adverse traffic-related impacts on traffic safety. Furthermore, the Project would meet the requirements and guidelines of the Roads and Traffic Authority in terms of road safety and network efficiency.

C.4.12 Noise

C.4.12.1 Introduction

The noise assessment for the Euchareena Road RRC was conducted by Heggies Pty Ltd. The objectives of the assessment were to review the previously recorded background noise levels, including the contribution from existing Euchareena Road traffic, at the surrounding residences and assess the potential noise impact of the Project. The noise assessment report is presented in full in Appendix Q and is summarised in the following sub section.

C.4.12.2 Background noise environment

Noise surveys were conducted in May/June 2003 to characterise and quantify the background acoustical environment in the local area surrounding the Euchareena Road Site. Both unattended and operator-attended noise surveys were conducted. Given there have been no substantial changes in land uses in the area around the Euchareena Road Site between 2003 and 2009, Heggies (2009d) consider it is appropriate to rely on the 2003 background noise measurements for the 2009 project.

Unattended noise loggers were positioned at two surrounding residences adjoining the Euchareena Road Site for a period of up to 14 days, commencing Tuesday 20 May 2003. A third unattended noise logger was positioned adjacent to Euchareena Road on the outskirts of Molong for a period of five days.

The operator-attended noise surveys were conducted at the same three locations to supplement the unattended logger measurements and assist in identifying the character and duration of background noise sources. The operator-attended measurement results are summarised in Table C.4-20.

No significant industrial noise (that is, non-transport related noise) from any other developments or activities in the local area was detected at any of the monitoring locations.

The noise data from the unattended loggers was processed in accordance with the requirements of the NSW Industrial Noise Policy (INP) and based on information obtained during the operator-attended monitoring, in order to derive the Monday to Sunday background noise levels (Table C.4-20).

Table C.4-20 Operator-attended daytime background noise May/June 2003 (dB(A) re 20 µPa)

Location	Property name	Property number*	$L_{A90(15minute)}$ Background level	$L_{Aeq(15minute)}$ Background level	$L_{Aeq(15minute)}$ Industrial noise
HN1 Site Noise	'The Shades'	1A	34 to 36	41 to 45	<44
HN2 Site Noise	'Hylands'	6B	33 to 37	40 to 43	<44
HN3 Traffic Noise	'Vale Head'	26	40	48 to 49	<44

*Refer to Figure C.4-25

Source: Heggies (2009d) - Table 5

The Rating Background Levels (RBLs) adopted for assessment purposes are representative of the existing noise environment, with RBLs ranging from 26 dB(A) to 28 dB(A) in the vicinity of the Euchareena Road Site. In accordance with the NSW INP, if the RBL is below 30 dB(A), then 30 dB(A) is used as the assumed RBL.

Table C.4-21 Background and industrial amenity noise environment May/June 2003 (dB(A) re 20 µPa)

Location	Rating background level[1,2,3] All noise sources			$L_{Aeq(Period)}$[3] All noise sources			Estimate $L_{Aeq(Period)}$[3] Industrial noise amenity		
	Day	Evening	Night	Day	Evening	Night	Day	Evening	Night
HN1 'The Shades'	28	27	28	47	35	33	<44	<39	<34
HN2 'Hylands'	27	26	26	45	38	33	<44	<39	<34

Note 1: Measured noise levels less than 31 dB(A) may have a signal to noise ratio less than 5 dB(A)

Note 2: In accordance with the NSW INP (2000), if the RBL is below 30 dB(A), then 30 dB(A) is the assumed RBL

Note 3: Daytime: 0700 hrs to 1800 hrs, Evening: 1800 hrs to 2200 hrs and Night-time: 2200 hrs to 0700 hrs

Source: Heggies (2009d) – Table 6

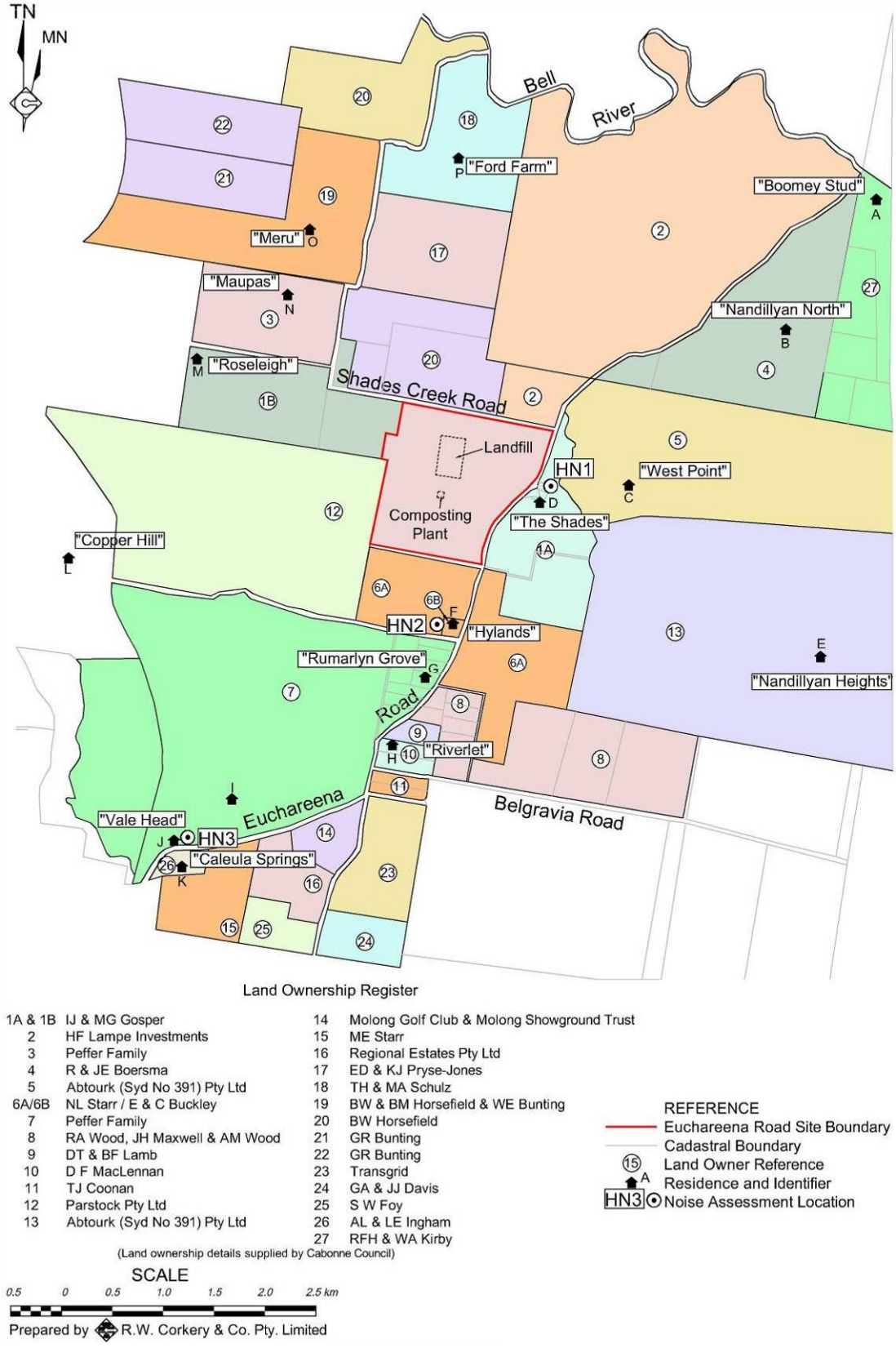

Figure C.4-25 Noise measurement and assessment locations

C.4.12.3 Noise environment for off-site road traffic

The closest residence to the proposed transport route, i.e. on Euchareena Road, is 'Vale Head', which is set back approximately 18 m from the road. Residences considered in the assessment of off-site road traffic noise are up to 210 m from Euchareena Road.

The traffic impact assessment was undertaken based on data from traffic counts conducted in May 2003 during a period which correlated with an unattended noise logger being deployed at 'Vale Head' (Location HN3). The noise data was processed in accordance with the requirements of the DECCW's Environmental Criteria for Road Traffic Noise (ERCTN) in order to derive the existing traffic noise levels (Table C.4-22).

Table C.4-22 Existing traffic noise environment - May 2003 (dB(A) re 20 µPa)

Location	Morning peak		Afternoon peak	
	Vehicles	$L_{Aeq(1hour)}$	Vehicles	$L_{Aeq(1hour)}$
HN3 traffic noise	39 movements	54dB(A)	38 movements	56dB(A)

Source: Heggies (2009d) – Table 7

C.4.12.4 Environmental noise assessment guidelines and objectives

Introduction

As the proposed Euchareena Road RRC is designated as a 'scheduled premise' under the Protection of the Environment Operations Act 1997, the Department of Environment and Climate Change (EPA) (DECCW (EPA)) is the regulatory authority for noise control. Primarily, noise control at industrial premises is governed through the DECCW's (EPA) implementation of the NSW Industrial Noise Policy 2000 (INP), which has two broad objectives, namely controlling intrusive noise impacts in the short-term and maintaining noise level amenity for particular land uses over the medium to long term.

On-site construction noise emissions

The assessment of noise impact from on-site construction works has been conducted in accordance with DECCW's Environmental Noise Control Manual (ENCM) 1994. As the duration of the predominant noise-generating earthworks component of the construction program is planned to be between 1 month and 6 months, the guideline suggests that the construction noise emissions would generally not exceed the background noise level by more than 10 dB(A).

On-site operating noise emissions

The INP provides procedures for setting acceptable $L_{Aeq(15minute)}$ intrusive and $L_{Aeq(period)}$ amenity noise levels for various receiver types as well as providing guidelines for assessing noise impacts from on-site noise sources.

The INP provides for the establishment of 'project specific' $L_{Aeq(15minute)}$ intrusive criteria and $L_{Aeq(period)}$ amenity criteria for a development at the potentially affected residences. The INP states that the project specific criteria have been selected to protect at least 90% of the population living in the vicinity of industrial noise sources from the adverse effects of noise for at least 90% of the time. Provided the criteria in the INP are achieved, it is unlikely that most people would consider the resultant noise levels excessive.

In addition, 'vacant land' is defined as a lot which is permitted to have (but does not yet have) a residence. Current Department of Planning policy requires consideration of vacant land (in the absence of a residence) if more than 25% of the subject property is predicted (and confirmed through monitoring) to receive noise levels higher than the relevant criterion for the land.

Off-site road traffic noise emissions

The NSW DECC's (1999) Environmental Criteria for Road Traffic Noise (ECRTN) provides procedures for setting acceptable L_{Aeq} noise levels on arterial, collector and local roads as well as providing guidelines for assessing noise impacts from off site road traffic.

Based on the ECRTN, Euchareena Road is classified as a 'collector' road and the applicable noise criteria are presented in Table C.4-23.

Table C.4-23 ECRTN traffic noise assessment criteria (dB(A) re 20 µPa)

Road	Policy	Assessment criteria	
		Daytime $L_{Aeq(1hour)}$	Night-time $L_{Aeq(1hour)}$
Euchareena Road	Land use developments with the potential to create additional traffic on collector roads	60 dB(A)	55 dB(A)

Source: Heggies (2009d) – Table 12

The ECRTN also cites that, where the nominated criteria are already exceeded, traffic associated with the development would not lead to an increase in the existing noise traffic levels of more than 2 dB(A).

Cumulative noise emissions

The INP also provides cumulative noise assessment guidelines that address existing and successive industrial development by setting acceptable (and maximum) cumulative $L_{Aeq(period)}$ amenity levels for all industrial (i.e. non-transport related) noise in an area. No intrusive criteria for industrial sources are set by the INP, rather cumulative noise is controlled through implementation of the amenity criteria. As such, if the project specific amenity criteria are met, cumulative noise is assumed to be acceptable.

C.4.12.5 Noise management controls

The noise management controls that would be implemented during the operation of the Euchareena Road RRC are detailed as follows:

- Construction of the perimeter amenity bunds would provide a noise barrier between a number of surrounding residences and the various operational components on site;
- All composting operations (other than maturation) would be undertaken within enclosed buildings;
- All construction and operational activities would be undertaken during daytime hours with the exception of the composting operation, some components of which need to operate on a continuous basis, 24 hours per day, 7 days per week, albeit generating negligible noise levels:
- The Proponent would ensure all equipment, particularly waste delivery trucks, are maintained to a high standard to ensure there are no unnecessary noise emissions; and

- Earthmoving equipment used on-site would be fitted with low impact broad band reversing alarms approved by WorkCover.

C.4.12.6 Noise impact assessment

Modelling method

The Industrial Module of a German computer model, SoundPLAN V6.1, was used to determine the acoustical impact of the proposed activities on the Euchareena Road Site. The model was run using the CONCAWE algorithm, which is suitable for the assessment of large industrial plants. The noise modelling conducted took into account source sound level emissions and locations, screening effects, receiver locations, meteorological effects, ground topography and noise attenuation due to spherical spreading and atmospheric absorption.

Noise predictions were calculated at the closest residences to the Euchareena Road Site and the following three scenarios were assessed:

- Construction: included site access road construction, initial landfill cell excavation and northern amenity bund construction;
- Stage 1 Operations: full scale operations of the enclosed tunnel composting plant, truck transportation to landfill, unloading and placement of bales and compaction within initial landfill cell (nominated as Stage 1): and
- Final Stage Operations: full scale operations of the enclosed tunnel composting plant, truck transportation to landfill, unloading and placement of bales and compaction of final landfill cells.

The modelling of the proposed operations included all the anticipated plant items operating concurrently in order to simulate the overall maximum energy equivalent (i.e. the $L_{Aeq(15minute)}$ intrusive noise level). A large proportion of the mobile equipment is operated in repeatable routines, with a smaller proportion of the emissions from the continuous fixed plant items. Modelling also incorporated an assessment of two truck movements per 15 minutes or equivalent to eight truck movements per hour.

The noise level predictions for the Project were undertaken assuming calm meteorological conditions. Heggies Pty Ltd (2009b) established that the frequency of winds from any direction likely to enhance noise levels are below the threshold for consideration, i.e. >30% of time in any one season.

Construction

As noted in section C.1.8, construction activities during the site development phase would be undertaken during the daytime period only. The noise contours predicted by the model for the construction scenario are presented in Figure C.4-26 while the predicted $L_{A10(15minute)}$ noise emissions at the three modelled residences are presented in Table C.4-24 for the daytime period.

Table C.4-24 Construction $L_{A10(15minute)}$ noise emissions

Assessment location	Predicted $L_{A10(15minute)}$ emission (dB(A))	Euchareena Road site specific $L_{A10(15minute)}$ criterion (dB(A))	Noise assessment
	Daytime		
HN1 'The Shades'	33	40	Below Criterion
HN2 'Hylands'	30	40	Below Criterion
'Roseleigh'	20	40	Below Criterion

Source: Heggies (2009d) – Table 13

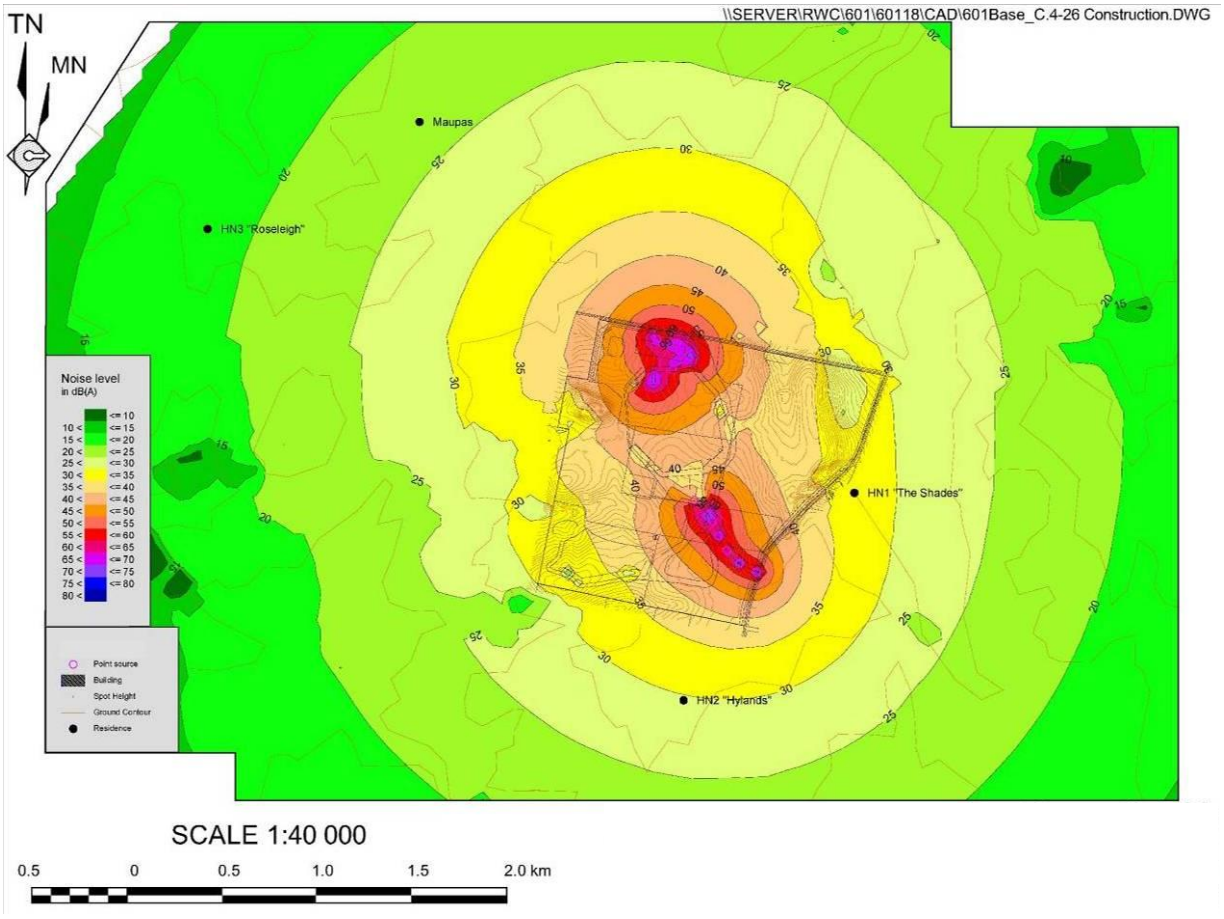

Figure C.4-26 $L_{A10(15min)}$ daytime construction noise contours

Table C.4-24 shows that predicted construction noise for the Euchareena Road Site would be below the DECCW criteria at the three closest, hence at all, surrounding residences.

Stage 1 Operations

The predicted noise contours for the Stage 1 operational scenario are presented in Figure C.4-27 and the predicted levels at the surrounding residences are presented in Table C.4-25.

Table C.4-25 indicates that predicted noise emissions from the Stage 1 operational scenario under calm daytime conditions would be within the nominated criteria at all surrounding residences.

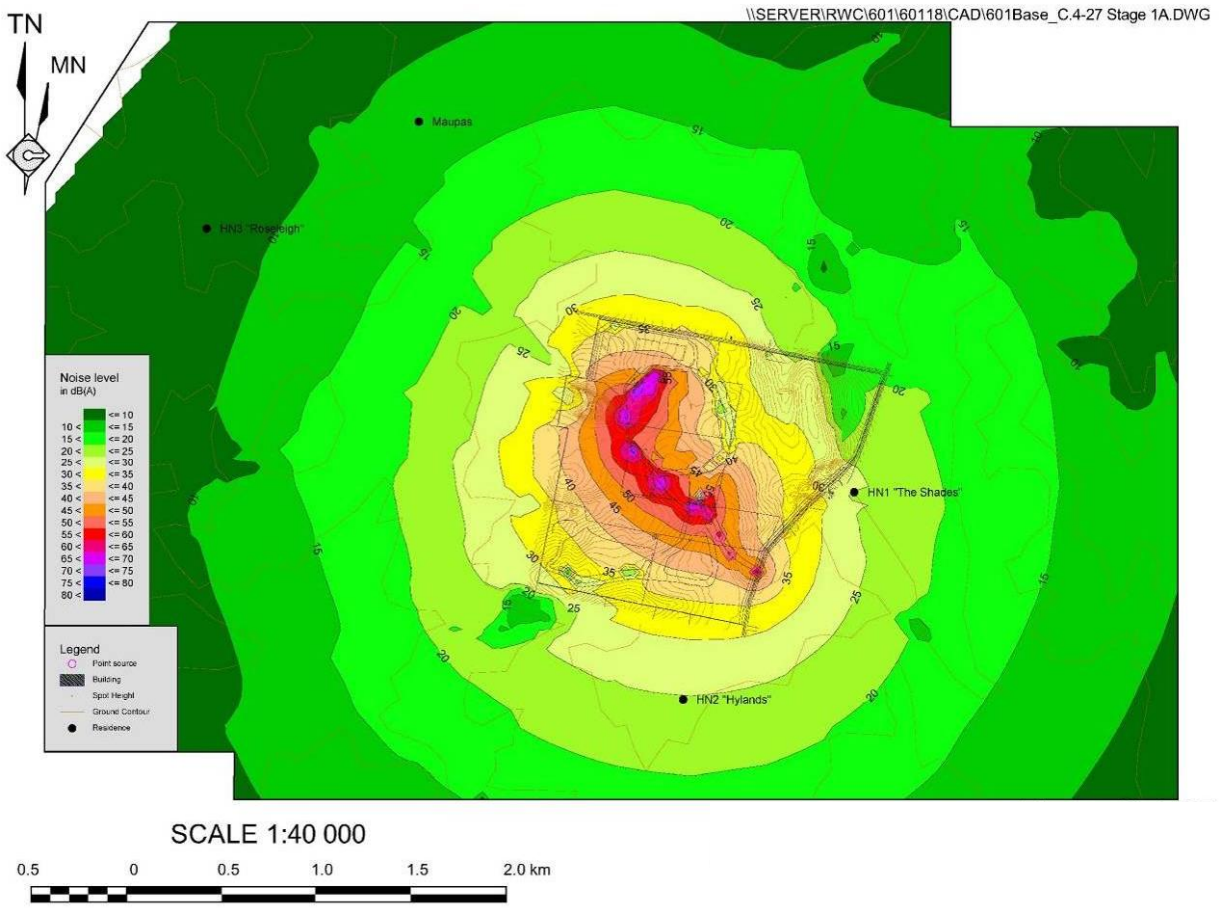

Figure C.4-27 $L_{Aeq(15min)}$ daytime Stage 1 noise contours

Table C.4-25 Stage 1 operational $L_{Aeq(15minute)}$ noise emissions

Assessment location	Predicted $L_{Aeq(15minute)}$ emission – (dB(A))	Euchareena Road site specific $L_{Aeq(15minute)}$ criteria – (dB(A))	Noise assessment
HN1 'The Shades'	17	35	Below Criterion
HN2 'Hylands'	28	35	Below Criterion
'Roseleigh'	13	35	Below Criterion

Source: Heggies (2009d) – Table 14

Final stage operations

The predicted noise contours for the Final Stage operational scenario are presented in Figure C.4-28. The predicted noise levels are listed in Table C.4-26.

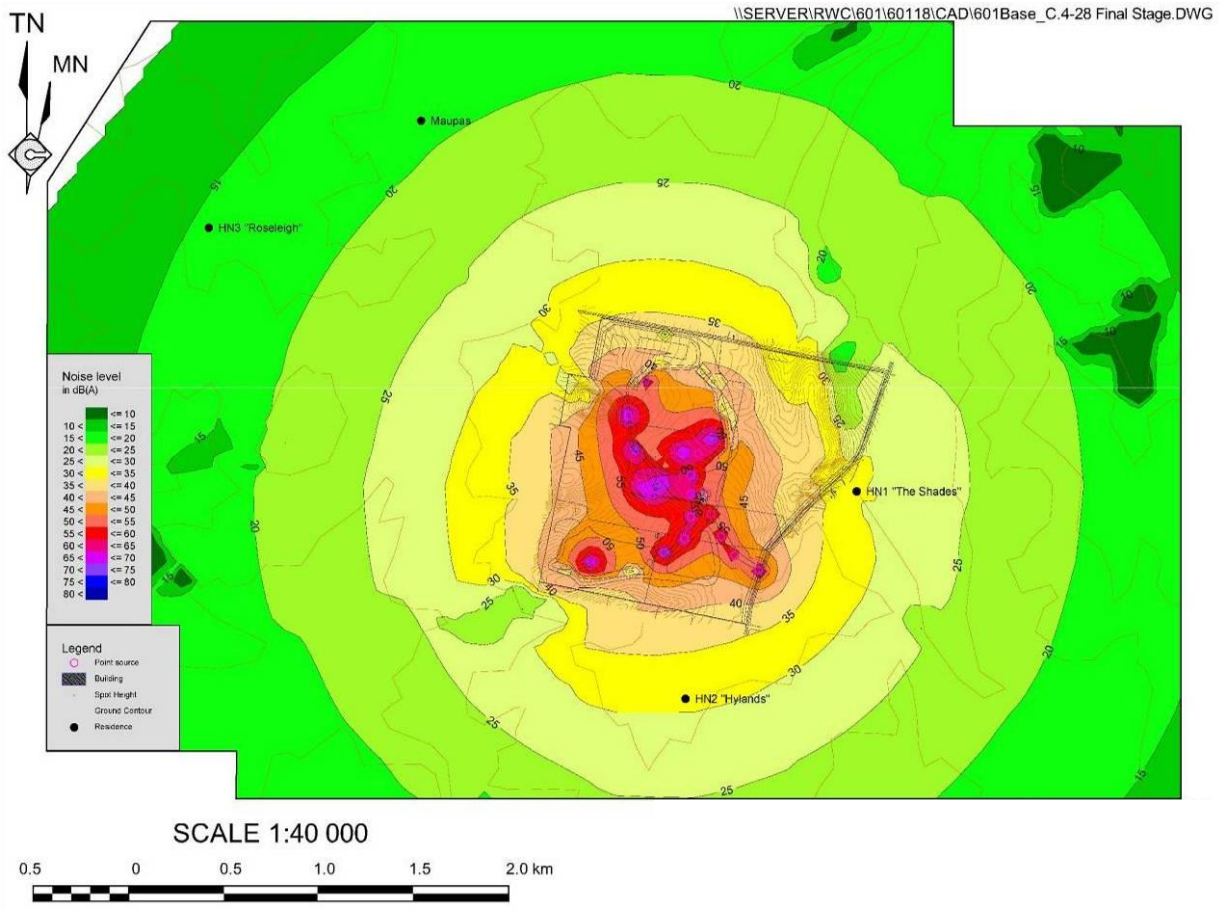

Figure C.4-28 $LA_{eq(15min)}$ daytime final stage noise contours

Table C.4-26 Final stage operational $L_{Aeq(15minute)}$ noise emissions

Assessment location	Predicted $L_{Aeq(15minute)}$ emission (dB(A))	Euchareena Road site specific $L_{Aeq(15minute)}$ criteria (dB(A))	Noise assessment
HN1 'The Shades'	24	35	Below criterion
HN2 'Hylands'	29	35	Below criterion
'Roseleigh'	13	35	Below criterion

Source: Heggies (2009d) – Table 15

The noise attributable to some silenced electric motors and fans operating at night or of an evening would not be audible at surrounding residences. Hence, no adverse impacts are predicted.

C.4.12.7 Transportation noise impact assessment

Based on the measured traffic noise emissions at 'Vale Head' and the existing and predicted traffic flows, the predicted traffic noise emissions ($L_{Aeq(1\ hour)}$) at the nearest residences to Euchareena Road are presented in Table C.4-27.

All predicted traffic noise at the residences adjacent to Euchareena Road complies with the daytime DECCW ECTRN criteria of 60 dB(A) for all stages of the Project.

Table C.4-27 Existing and predicted future $L_{Aeq(1hour)}$ traffic noise levels

Offset distance to road	Existing traffic	Existing plus proposed Euchareena Road Site traffic	
		Normal Case	Worst Case
18 m	56 dB(A)	60 dB(A)	60 dB(A)
57 m	49 dB(A)	52 dB(A)	53 dB(A)
86 m	46 dB(A)	49 dB(A)	50 dB(A)
178 m	41 dB(A)	44 dB(A)	45 dB(A)
185 m	41 dB(A)	44 dB(A)	45 dB(A)
210 m	40 dB(A)	43 dB(A)	44 dB(A)

Source: Heggies (2009d) – Table 18

C.4.12.8 Cumulative noise impact assessment

As there are no other industrial developments in the local area and the noise emissions from the operation of the Euchareena Road RRC are predicted to comply with all relevant amenity criteria, the cumulative noise in the local area would also comply with relevant amenity criteria.

C.4.12.9 Monitoring

A program of noise monitoring would be undertaken at specific stages of site construction and operations to ensure the project noise criteria specified in the Environment Protection Licence for the site are being complied with.

In the first instance, noise monitoring would be confined to the area immediately adjacent to 'The Shades' and 'Hylands' residences. Monitoring would target the potentially noisy operations, e.g. during bund wall construction.

In the event that noise monitoring identifies any noise levels close to or above the nominated noise criteria, investigations would commence immediately to isolate the cause of the highest noise levels and mitigation measures would be identified and implemented.

All noise monitoring results would be incorporated in the relevant annual reports and annual returns for the site's Environment Protection Licence, if required.

C.4.13 Visual Impact

C.4.13.1 Existing visibility

The Euchareena Road Site is located on a local ridge which is visible mainly from a range of vantage points on the adjoining road network and surrounding properties. Sections of the Euchareena Road Site are also visible from distant landforms where the considerable intervening distance reduces the extent of detail observed.

The views of the Euchareena Road Site from Euchareena Road are predominantly those on the eastern side of the central ridge that traverses the Euchareena Road Site. Views from 'The Shades' are similar to those from the northern section of Euchareena Road where it is necessary to look at topographically higher areas, although the woodland vegetation in the northeastern part of the Euchareena Road Site limits views onto certain parts of the Site.

The central section of the Euchareena Road Site adjacent to Shades Creek Road provides the best views to the south across the Site, albeit at virtually the same elevation. Some residences to the north and northwest of the Euchareena Road Site, e.g. 'Maupus' and 'Meru' occur on the same ridge line as the Euchareena Road Site at comparable elevations. Consequently, limited distant views of the Euchareena Road Site are available from these residences. Views are not possible from other residences on adjoining or nearby properties as they are either topographically lower or there is intervening topography between the Euchareena Road Site and these residences.

C.4.13.2 Visual controls

On-site controls

The proposed Euchareena Road RRC incorporates a range of visual controls to restrict the visibility of the various components of the centre.

All components of the Euchareena Road RRC are proposed to be constructed / positioned on or close to the western side of the central ridge that traverses the Site. This design feature would assist to limit the visibility of those components, particularly the enclosed composting plant when viewed from Euchareena Road and 'The Shades'. The enclosed tunnel composting plant would be positioned in an area of the Site shielded to the south and west by the existing woodland vegetation.

The following components / structures have been designed to either prevent local views onto the Euchareena Road Site or to progressively reduce the impact of views of site components, principally the landfill.

Northern amenity bund

This earth mound, up to 2 m high, would be constructed adjacent to the northern boundary of the Euchareena Road Site for a distance of 600 m along the alignment of Shades Creek Road. The bund would only be constructed to a height of 2 m as vantage points from the road or more distant properties occur at an elevation comparable to the Euchareena Road Site. The northern visual amenity bund would be constructed with gentle external slopes and revegetated to limit the visibility of the bund itself.

Eastern amenity bunds

The eastern amenity bunds, up to 4 m high, would be constructed immediately adjacent to the eastern limit of the landfill to provide a visual shield to the periodic construction activities and daily activities on sections of the landfill, particularly when viewed from 'The Shades'.

Regeneration corridor

An area of approximately 13.6 ha immediately south of the northern amenity bund would be planted during the first three years of operations. This corridor, as it grows and matures would provide a useful visual screen to shield the landfill from 'Maupas' and 'Meru'.

Strategic tree screens

The Proponent intends to plant some tree screens at strategic locations to limit visibility of the landfill, principally setback from Euchareena Road.

The emphasis when constructing the amenity bunds would be upon the creation of an immediate barrier to shield views of site activities. The growth of the trees is intended to provide a long term visual screen that would be well advanced when the landfill gradually covers a considerable area.

It is, however, noted that the area covered by the landfill (12 ha) is considerably less than the 21 ha covered by the landfill in the 2005 proposal. The principal compensating factor arising from the reduced landfill footprint is the increased height. A review of vegetation heights adjacent to the landfill established the vegetation is typically in excess of 15 m in height and occasionally as high as 25 m. Hence, keeping the height of the landfill to less than 18 m above the surrounding landform will minimise its visual impact from areas east of the Euchareena Road Site, e.g. from 'The Shades'. Without the intervening tree screen adjacent to the northern amenity bund, the operation on the landfill surface would be quite visible.

The visual character of the other activities on site would also be considered through the following:

- All buildings / structures would be clad with materials either coated or painted with a light green hue;
- Selective landscaping would be positioned around the office, weighbridge and enclosed composting plant; and
- The site would be kept clean and tidy at all times.

C.4.13.3 Assessment of impacts

Motorists travelling along both Euchareena Road and Shades Creek Road would be able to observe the various construction activities during the site establishment phase. The impacts of such observations would be minor given the relatively short construction period. In reality, the activities may attract observers interested in the progress of construction activities.

The construction of the northern visual amenity bund would immediately shield all activities from motorists travelling along Shades Creek Road and the more distant residences 'Maupus' and 'Meru' to the north. The progressive extension of the eastern amenity bunds would also successfully shield the landfill area such that there would be negligible visual impact.

In the longer term as the tree screens grow in height and thicken out, their effectiveness as screens would improve.

Whilst it is not likely that road-side litter would be eliminated completely, it is assessed that with the implementation of the litter management controls, the impacts would be acceptable.

Figure C.4-29 displays three visibility sections across the Euchareena Road Site highlighting the extent or absence of visibility of the final landform created by the landfill. Discussions relating to each section and the potential visual impacts of the Project are as follows.

Section A-A': provides the sight line from 'The Shades' residence to the centre of the landfill. Essentially, at least two-thirds of the landfill will be shielded from the residence by existing vegetation. The southern one-third of the landfill would be less shielded by existing vegetation, however, the proposed enhanced vegetation program in the northeastern woodland would contribute to shielding the southern one-third of the landfill from 'The Shades' residence. Given landfilling activities are proposed to commence in the northern section of the landfill, it is concluded that the overall visual impact from the east of the Site will be minor.

Section B-B': provides the sight line from 'Maupas' towards the landfill. Essentially, the landfill would be visible from 'Maupas' for a number of years until the vegetation within the regeneration corridor reaches a height of at least 8 m. Section BB' similarly shows the landfill would initially be visible from the northwestern corner of the Euchareena Road Site from Shades Creek Road, again until the regeneration corridor becomes effective.

Section C-C': provides the sight line from the southeastern corner of the Euchareena Road Site to the centre of the landfill. The upper 4 m to 5 m of the landfill would be visible from this vantage point in the short term, however, the proposed vegetation screening adjacent to the stock movement corridor would remove visual access from this and other areas along Euchareena Road.

In conclusion, the enclosed composting plant and its related infrastructure would be well shielded, however, the landfill would be visible from a range of vantage points on both the local public road network and a few surrounding residences until screening vegetation becomes effective. The Proponent recognises that the increased visibility of the landfill is a consequence of reducing the landfill footprint to reduce the area of agricultural land that would be removed from agricultural production throughout the life of the Project.

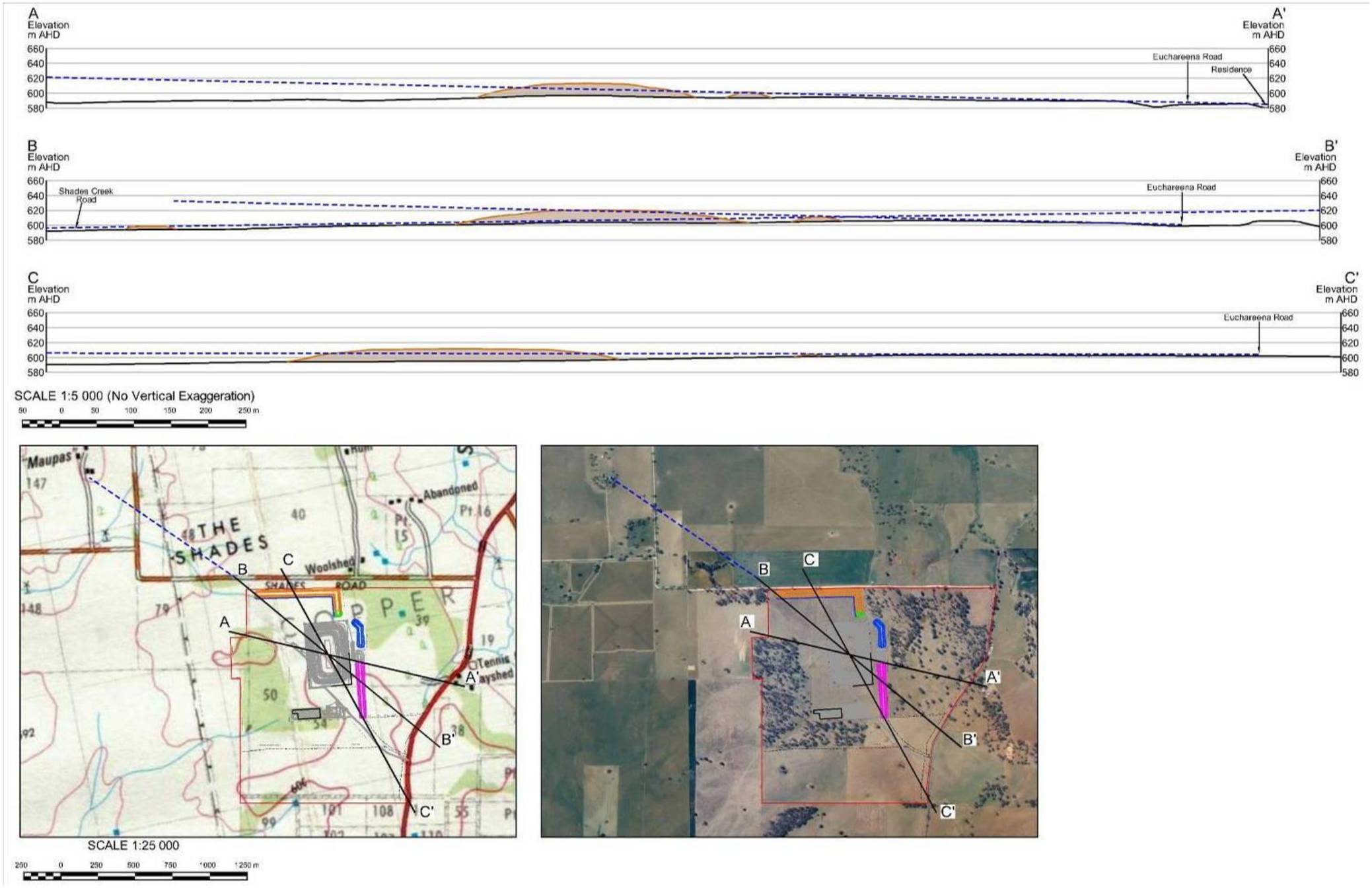

Figure C.4-29 Visibility sections