Section 2
Description of the Project

PREAMBLE

This section presents the Proponent's objectives and plans to develop and operate a waste and resource management facility within the former Erskine Park Quarry. Details are presented of the site establishment and operational components that focus upon recovery and recycling of as much waste as possible. Emphasis would be placed upon the emplacement of residual wastes that have no economic value through re-use, re-processing or recycling.

The Proponent also intends to resume clay/shale extraction on site to produce both brick manufacturing raw materials and a range of select filling materials and increase the void capacity for the emplacement of residual wastes.

Emphasis is placed throughout this section on presenting the Proponent's plans in sufficient detail to enable the environmental impacts of the Project to be assessed (in Section 4).

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2.1 INTRODUCTION

2.1.1 Objectives

The Proponent's objectives for the development and operation of the Orchard Hills Waste and Resource Management Facility ("the Project") are to:

a) provide a facility that would enable waste to be considered as a resource for recycling and re-processing to yield useful and beneficial products;

b) develop a licenced facility able to receive and emplace unusable wastes and residual wastes from the on-site recycling and re-processing equipment;

c) recover a considerable proportion of the remaining high grade light-firing clay/shale resources for the brick industry and other clay/shale products for the construction industry;

d) progressively rehabilitate the entire Project Site in a manner that re-instates the rural agriculturally productive land consistent with the adjoining land to the north and east; and

e) achieve (a) to (d) above in an environmentally and socially responsible manner.

2.1.2 The Project Site

The Project Site comprises Lot 40, DP 738126, a 60ha lot purchased by the Proponent in August 2008. **Figure 2.1** provides details of the form and dimensions of the Project Site.

Access to the Project Site is provided from Luddenham Road via Patons Lane, a public road which is oriented parallel to the southern boundary of the Project Site and intersects Luddenham Road approximately 1.1km to the east-southeast of the entrance to the Project Site (**Figure 2.2**).

2.1.3 Project Overview

The Project would involve a number of components designed to collectively underpin a financially sound facility able to provide an important environmentally friendly waste and resource management service and the ultimate re-instatement of productive rural grazing land in an area zoned for ongoing agricultural production. The principal Project activities would include the following.

- Erection and operation of the waste recycling and re-processing facility.
- Development and operation of staged waste emplacement cells to contain all residual wastes from the recycling facility, other imported wastes (unable to be re-processed) and selected construction and demolition wastes recovered from the on-site existing perimeter bund walls.

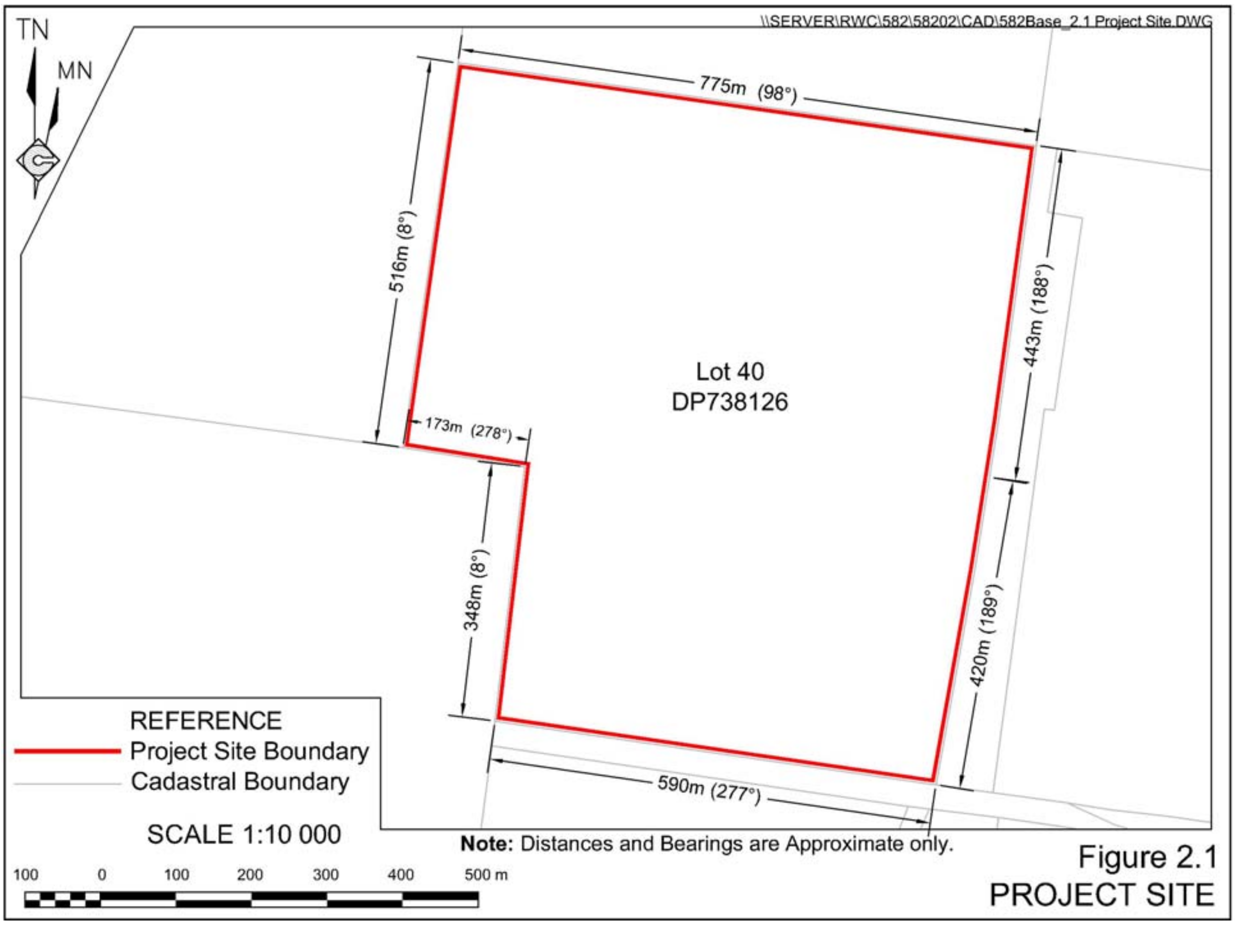

Figure 2.1
PROJECT SITE

- Refurbishment of the former weighbridges and offices together with the construction of a range of on-site infrastructure including truck wheel wash, site workshop and water management structures.
- Ongoing clay/shale extraction (subject to market demand) to recover light-firing shale for use by the brick industry and other clay/shale materials for off-site construction projects and as optimal cover material for the on-site waste emplacement and final capping.
- Selective removal and on-site disposal of material from the existing perimeter bund walls including disposal of waste materials previously illegally imported to site and incorporated into the bund walls in contravention to the requirements of the *Protection of the Environment Operations Act 1997* and the development consent for the site.

Each of the above components and activities are discussed in greater detail throughout the remaining subsections in this section.

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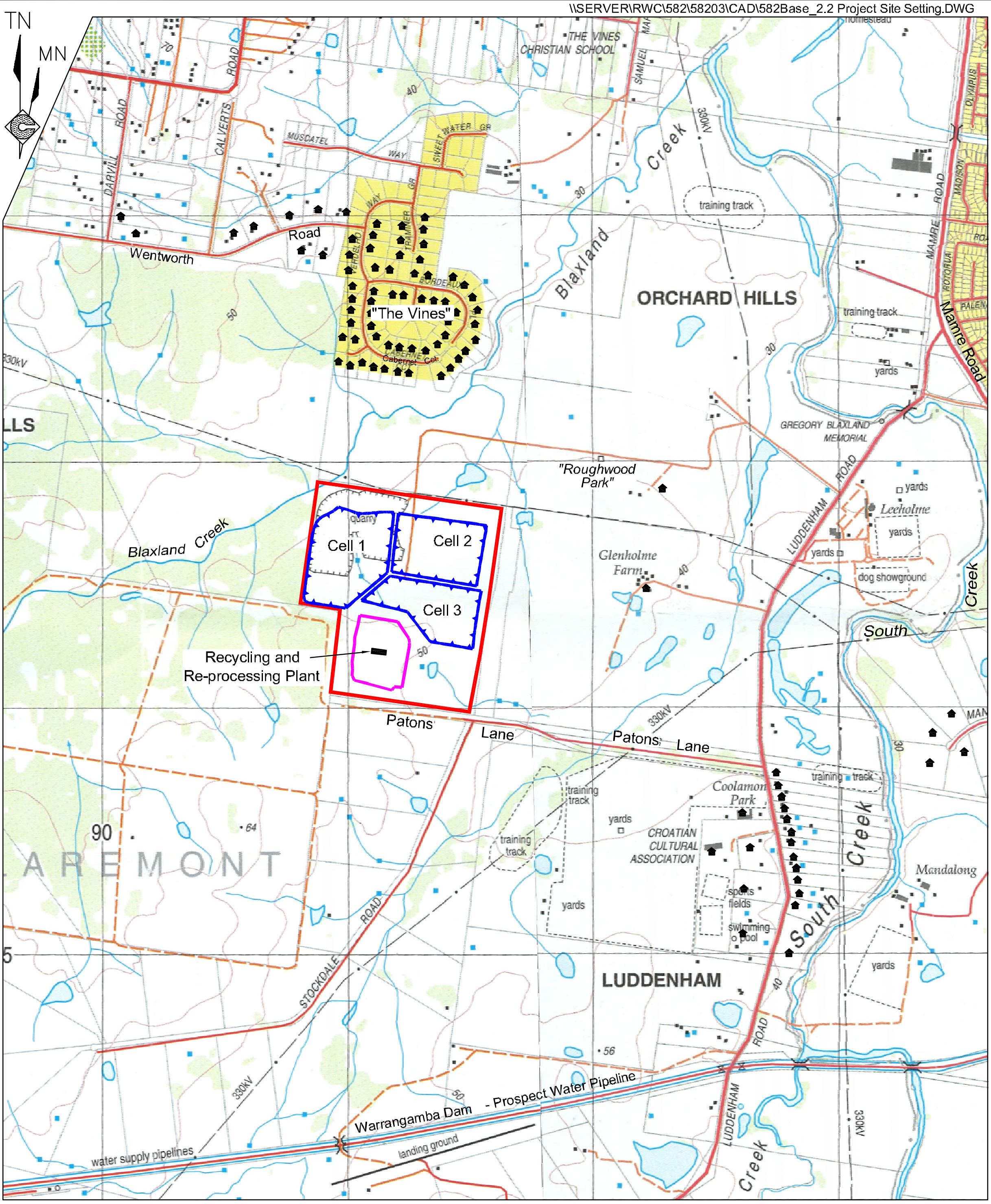

REFERENCE
- Project Site Boundary
- Residence
- Proposed Limit of Recycling and Re-processing Area
- Indicative Waste Emplacement Cell Boundary

SCALE 1:25 000

250 0 250 500 750 1000 1250 m

Base Map Source: Prospect (2001) and Penrith (2001) 1:25 000 Topographic Maps

Figure 2.2
PROJECT SITE SETTING

2.1.4 Approvals Required

The Proponent would require the following approvals from NSW State Government agencies for the Project to proceed.

- Project Approval under Part 3A of the *Environmental Planning and Assessment Act 1979*. The approval authority is the Minister for Planning.
- An Environment Protection Licence for the waste emplacement area (and ongoing clay/shale extraction) and a separate licence for the waste resource recovery facility (other activities which trigger the schedule would also be addressed by these licences) under the *Protection of the Environment Operations Act 1997*. The issuing authority is the Department of Environment, Climate Change and Water – Environment Protection and Regulation Group – DECCW-EP&RG.
- A Controlled Activity Approval under the *Water Management Act 2000* for works within 40m of protected waters (Blaxland Creek). The issuing authority is the Department of Environment, Climate Change and Water – Office of Water.
- A Water Access Licence under the *Water Management Act 2000* to account for the minor groundwater seepage that would flow into voids on the Project Site throughout the Project life. The issuing authority is the Department of Environment, Climate Change and Water – Office of Water.

It is noted that the proposed road upgrading activities along Patons Lane do not require any further approvals. Development Consent (DA03/0627) was granted by Penrith City Council on 3 July 2003 for the 'Realignment of Patons Lane and construction of a new intersection at the intersection of Patons Lane and Luddenham Road'. As part of this approval, a condition (No. 15) required the applicant to also upgrade the entire length of Patons Lane so that it was adequate to accommodate heavy vehicle traffic associated with the quarry. Engineering Construction Certificates were subsequently issued by Council for the realignment and intersection works and the upgrade of the remainder of Patons Lane respectively. The development consent was activated by the applicant via the realignment of Patons Lane and construction of a new intersection with Luddenham Road. The new intersection has been designed and constructed to cater for heavy vehicles up to 26m in length to turn into or out of Patons Lane. It is the Proponent's intention to complete the upgrade of the remainder of Patons Lane in accordance with the engineering plans endorsed by Council when issuing Engineering Construction Certificate No. v 05/0630.

It is also noted that as the site adjoins Commonwealth land, consideration was given to whether the Project should be referred to the Department of the Environment, Water, Heritage and the Arts (DEWHA) in accordance with Clause 26 of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). In light of the predicted low levels of impact for matters relating to flora, fauna, noise and air quality, it was determined that it was not necessary to refer the Project to the DEWHA. This determination was finalised in consultation with the Department of Defence, who manages the subject land on behalf of the Commonwealth.

2.1.5 Project Planning and Design

The Proponent has planned the Project and compiled the overall project design reflecting current trends in waste management and recycling/re-processing technologies, projected waste sources (and types), current legislative requirements, the progressively increasing waste levy ($120/tonne in 2015-2016) and community expectations. Consequently, the Proponent considered a range of alternative activities and outcomes relating to the Project. Ultimately, the Project design as outlined in this section became the preferred alternative. Suffice it to say, at this stage, emphasis was placed upon designing the entire project to avoid or minimise adverse environmental impacts. After detailed consideration of the various constraints, only one feasible approach was appropriate. Section 2.15 presents a brief overview of the feasible alternatives considered throughout the planning for this Project.

2.2 WASTE SOURCES AND CLASSIFICATION

2.2.1 Incoming Wastes

The facility would have the capacity to receive an average of approximately 300 000 tonnes per annum (tpa) and a maximum of 600 000tpa of general solid waste (non-putrescible) generated predominantly in the Sydney Metropolitan Area with some wastes potentially transported from the Blue Mountains. It is expected that the volume of waste received would ramp up over several years, with the level of 300 000 tonnes per annum of incoming wastes achieved by about Year 4 or 5. It is anticipated that this waste would consist predominantly of Construction and Demolition (C&D) and Commercial and Industrial (C&I) waste. No liquid, restricted or dangerous materials would be accepted at the facility. The principal C&D wastes targeted for receipt (and re-processing) include concrete, bitumen, bricks and roofing tiles. It is recognised that C&D wastes delivered may contain very small quantities of asbestos in a bonded matrix. However, the facility would not accept any asbestos sheeting (wrapped or unwrapped) or any asbestos material in a dust form. Small quantities of mixed C&D waste unable to be economically separated are also likely to be received. The principal C&D waste not suitable for re-processing and destined for on-site emplacement would be contaminated soil.

The Proponent would adopt a waste screening and refusal procedure both at the weighbridge and the unloading area(s) to ensure that only approved waste is accepted at the facility. The procedure would be incorporated in the Landfill Environmental Management Plan which would be regularly reviewed and updated.

The Proponent envisages receiving approximately 100 000tpa of low level contaminated soil from a number of potential sources namely from remediation sites such as old petrol stations or ex-commercial and industrial sites that either have low level contaminated soils or construction and demolition waste that have the potential for low level contamination. The rate of receival of contaminated soil would be dependent on construction and demolition activity and remediation projects in the greater Sydney region with potentially larger quantities received during peak years. The type of soil contaminants anticipated are a range of contaminants such as low level metals, hydrocarbons, polycyclic aromatic hydrocarbons and, potentially, chlorinated hydrocarbons that have undergone prior thermal treatment. The level of contamination would always be below the level which the soils would otherwise be considered hazardous waste. The Proponent would require chemical analyses of all received soils confirming the level of contamination is below these threshold levels. The Proponent intends, subject to the types and quantities received, to investigate re-processing selected low level contaminated soils.

The Proponent intends to progressively enter the market to attract a sustainable quantity of C&I waste following the establishment of the C&D component. C&I waste targeted is planned to include metals, wood, plastics and cardboard.

No wastes containing putrescible wastes would be received on site, however, it is acknowledged that small quantities of material contained in the C & I waste would be organic, some of which would contribute to the generation of leachate. No liquid, hazardous or restricted waste or dangerous materials would be accepted on site. The site would not be open for waste receipts from the general public thereby providing considerable control over wastes received.

The Proponent's preliminary market evaluation suggests that, during an average year receiving 300 000t of waste, between 50% and 67% of the waste received (150 000t per year / 200 000t per year on average) on site would be suited to recycling and/or re-processing with the remaining 50% to 33% of the waste received placed directly into the active emplacement cell. The average quantities of materials proposed to be removed off site and emplaced on site are shown in **Figure 2.3.** It is noted that, during a peak year when 600 000t of waste is received, up to 450 000t could be emplaced as a substantial proportion of the waste would likely be unsuitable for recycling, eg. low level contaminated soil or loads uneconomic to be segregated.

In any event, the range and quantity of wastes that are or are not capable of being recycled / re-processed reflects reality in the waste industry and the sites / sources of waste in any given year. It remains the Proponent's objective to recycle / re-process as much of the C&D waste as possible for re-use in the construction industry and to achieve or exceed the quantities nominated in Scenario B.

2.2.2 On-site Wastes

It is known that the former owner of the Project Site illegally imported a range of building demolition materials and incorporated those materials within a number of the existing bund walls (5m to 19m high) around the perimeter of the Project Site. The Proponent commissioned Douglas Partners Pty Ltd to undertake a drilling program to characterise the materials within the existing perimeter bund walls. A full copy of the in situ waste classification assessment completed by Douglas Partners Pty Ltd is reproduced in full as Part 1 of the *Specialist Consultant Studies Compendium*.

The investigations undertaken by Douglas Partners which were undertaken in May 2009 involved drilling 20 holes through the bund walls and the collection and analysis of 60 samples. This level of investigation is recognised to be preliminary in nature, however, has provided the Proponent with a good understanding of the nature and properties of materials that need to be managed throughout the life of the facility.

The results of the analyses were assessed in accordance with the DECC *Waste Classification Guidelines* (July 2009). The guidelines define General Solid Waste to include Virgin Excavated Natural Material (VENM) and Building and Demolition Waste (B&D Waste). However, Douglas Partners (2009) notes that by definition (EPA website) 'Excavated material that has been stored or processed in any way cannot be classified as VENM'. Therefore, the natural material on site that has been stored in the existing bund walls is referred as Excavated Natural Material (ENM).

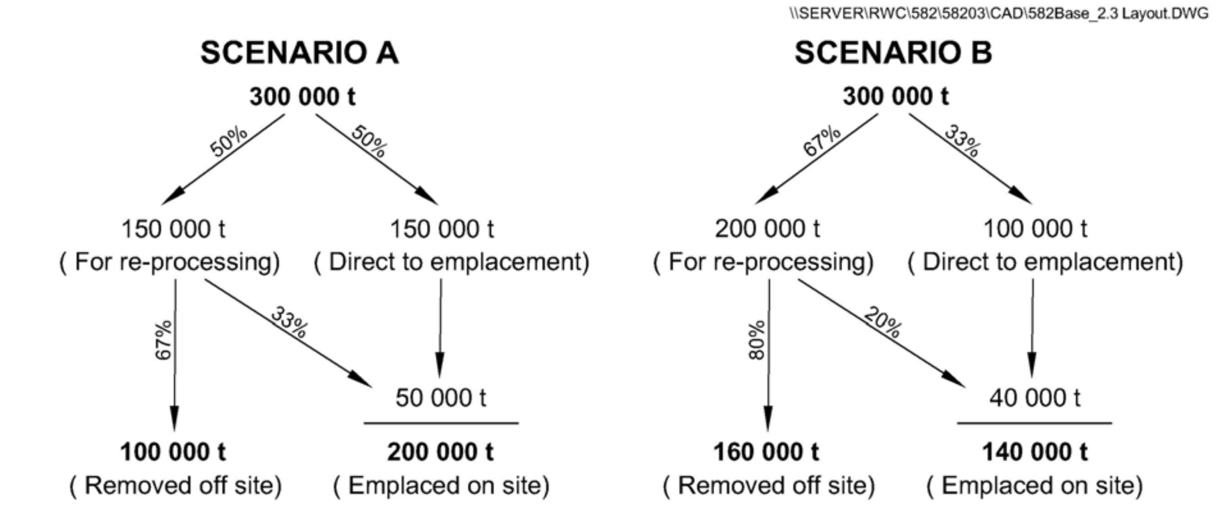

Figure 2.3
AVERAGE QUANTITIES OF MATERIALS
REMOVED OFF SITE AND EMPLACED ON SITE

Based on site observations and laboratory results, Douglas Partners (2009) concluded that the materials within the existing perimeter bund walls are largely general solid waste (non-putrescible) comprising excavated natural material and general building rubble. Asbestos was found embedded in plaster fragments in one sample near the surface of the eastern bund wall, slightly above the reporting limit of 0.1g/kg at 0.42g/kg. Material containing this level of asbestos is referred to by Douglas Partners as Special Waste (Asbestos). Douglas Partners also clarify that this material was in fact bound "asbestos containing material" for which less stringent health standards apply. Asbestos was also detected, but below the reporting limit, in six other samples recovered from other bores in the eastern bund wall where construction and demolition materials were identified. It is noted that the recently released Western Australian health-related *Guidelines for the Assessment, Remediation and Management of Asbestos* recognise that small but detectable quantities of asbestos can safely occur in materials placed around homes, day care centres, parks and commercial premises.

It is estimated that approximately 900 000t (650 000m^3) of material is incorporated in the existing perimeter bund walls on the Project Site. As a result of the investigation by Douglas Partners, it is estimated that:

- approximately 540 000 tonnes (60%) of the materials comprise excavated natural materials (ENM) originating from Cell 1 within the Project Site;
- approximately 355 000 tonnes (40%) of the materials comprise general solid waste (non-putrescibles) being general builders rubble including largely demolition waste and waste concrete and similar materials; and
- up to 5 000 tonnes (<0.01%) of material comprises special waste (asbestos).

In light of the investigation results compiled by Douglas Partners (2009), the Proponent would consider all construction and demolition wastes that need to be removed to achieve the required final landform as Special Waste (Asbestos) and therefore disposed them on site in accordance with the procedures related to Special Waste (Asbestos). Whilst it is recognised that the actual asbestos content of the construction and demolition waste is very low, this approach would avoid the need for further and time consuming characterisation to define the actual quantity of

Special Waste (Asbestos) present within the section of the existing perimeter bund walls to be removed. Section 2.5.2 further describes the Proponent's plans for the partial deconstruction and shaping of the existing perimeter bund walls on the Project Site.

2.3 GEOLOGY AND RESOURCES

2.3.1 Geological Setting

The clay/shale resources within the Project Site occur within the Bringelly Shale, a geological unit common throughout Sydney's western suburbs and comprising interbedded claystones, siltstones, laminites and minor sandstones and carbonaceous units (Herbert, 1979). The Bringelly Shale lies above the Ashfield Shale which, in turn, lies above the Hawkesbury Sandstone.

2.3.2 Site Geology

In the vicinity of the Project Site, the Bringelly Shale dips gently to the south at approximately 5^o and, based on descriptive drill logs of a bore on the Project Site, the shale is almost 90m thick. The rock units within the Bringelly Shale show strong lateral facies variation, especially in the coarser grained sandstone beds, resulting in difficult lithological correlation between drill holes. Faulting is evident within the existing extraction area but is not thought to significantly constrain the geological interpretation between drill holes.

Weathering is a common feature on site with well developed clays and weathered claystones and siltstones generally encountered within 4m to 8m below the natural surface.

2.3.3 Site Investigations

Approximately 30 cored diamond drill holes have been drilled on the Project Site since the early 1980s by either the land owner/quarry operator or brick companies. Only the top 25m to 35m of the Bringelly Shale beneath the Project Site has been investigated in detail for their resource potential. The most recent investigation and assessment of the clay/shale resources within the Project Site was undertaken by R.W. Corkery & Co. Pty Limited in 2004 to assist in defining the optimum areas for the recovery of light-firing claystone and siltstone. The claystones and siltstones are collectively referred to as "shale". The result of this investigation drew upon the available data from the previous investigations. Based upon the results of the 2004 investigation and assessment, the following resources have been identified on site.

2.3.4 Resources

2.3.4.1 Clay/Shale Resources

The most sought-after resource is light-firing shale, a product used by the brick industry to manufacture light coloured bricks. The remaining resources are suitable for the manufacture of darker bricks and equally suitable for general purpose fill at construction sites. The Proponent has established the current depressed building industry has caused the brick industry to substantially reduce brick production which, in turn, has resulted in limited demand for imported light-firing clay/shale. All brick manufacturing plants are currently relying upon resources either extracted in quarries adjoining each brick plant or accumulated stocks.

Furthermore, the demand for bricks manufactured from light-firing clay/shale has diminished in recent years as builders/home owners have increased the purchases of darker coloured bricks. Notwithstanding this depressed market, the Proponent has entered into dialogue with various brick manufacturers to explore opportunities throughout the Project life to remove as much light-firing and red-firing clay/shale off site.

Within Cell 1, in the order of 490 000m^3 of clay/shale needs to be removed to optimise the Cell's storage capacity. It is estimated the materials to be removed from Cell 1 (to an average depth of approximately 28m AHD) would comprise:

- 230 000t of clay;
- 80 000t of light-firing shale; and
- 700 000t of red-firing shale.

An estimated 200 000t of light-firing clay/shale could be recovered from Cell 2 in the event extraction in that cell achieves an average depth of approximately 28m AHD.

Figure 2.4 displays an area within the southeastern section of the Project Site (within Cell 3) referred to as the "Optimum Clay/Shale Extraction Area". It is assessed that this area would yield approximately 900 000t of light-firing clay/shale (to an average depth of approximately 28m AHD) but requiring the extraction of a quantity of clay and non light-firing clay/shale, principally as overburden (totalling 1 470 000t of material).

Table 2.1 summarises the resources proposed for extraction within Cells 1, 2 and 3.

Table 2.1
Clay/Shale Resources within Cells 1, 2 and 3 [1]

Resource	Cell 1	Cell 2	Cell 3	Total
Clay [2]	230 000t	990 000t	720 000t	1 940 000t
Light-firing shale [3]	80 000t	200 000t	900 000t	1 180 000t
Red-firing shale [3, 4]	700 000t	1 080 000t	750 000t	2 530 000t
TOTAL	1 010 000t	2 270 000t	2 370 000t	5 650 000t

[1] To an average depth of 28m AHD [2] 1m^3 clay = 1.8 tonnes [3] 1m^3 shale = 2.2 tonnes
[4] Incorporates limited quantities of sandstone and laminite

The Project incorporates the ongoing extraction and off-site despatch of both red-firing and light-firing clay/shale. Whilst it is a difficult to forecast the likely market requirements over the next 30 years, the Proponent considers it is realistic that approximately 3.8 million tonnes, or an average of approximately 200 000 tonnes per year, could be extracted and sold off site during the first 20 years of the Project life. It is recognised that, whilst the average annual quantity of clay/shale despatched throughout the Project life would be 200 000t, the maximum annual sales may in some years be up to 400 000tpa. The implications of the variable quantities of clay/shale despatched on heavy vehicle movements is discussed in Section 2.9.3.2.

The Proponent is mindful of the on-site requirements for red-firing shale for daily cover and capping and clay for cell lining and capping. Accordingly, it is proposed to limit the quantities of red-firing shale and clay despatched off site to 800 000t and 1 000 000t respectively.

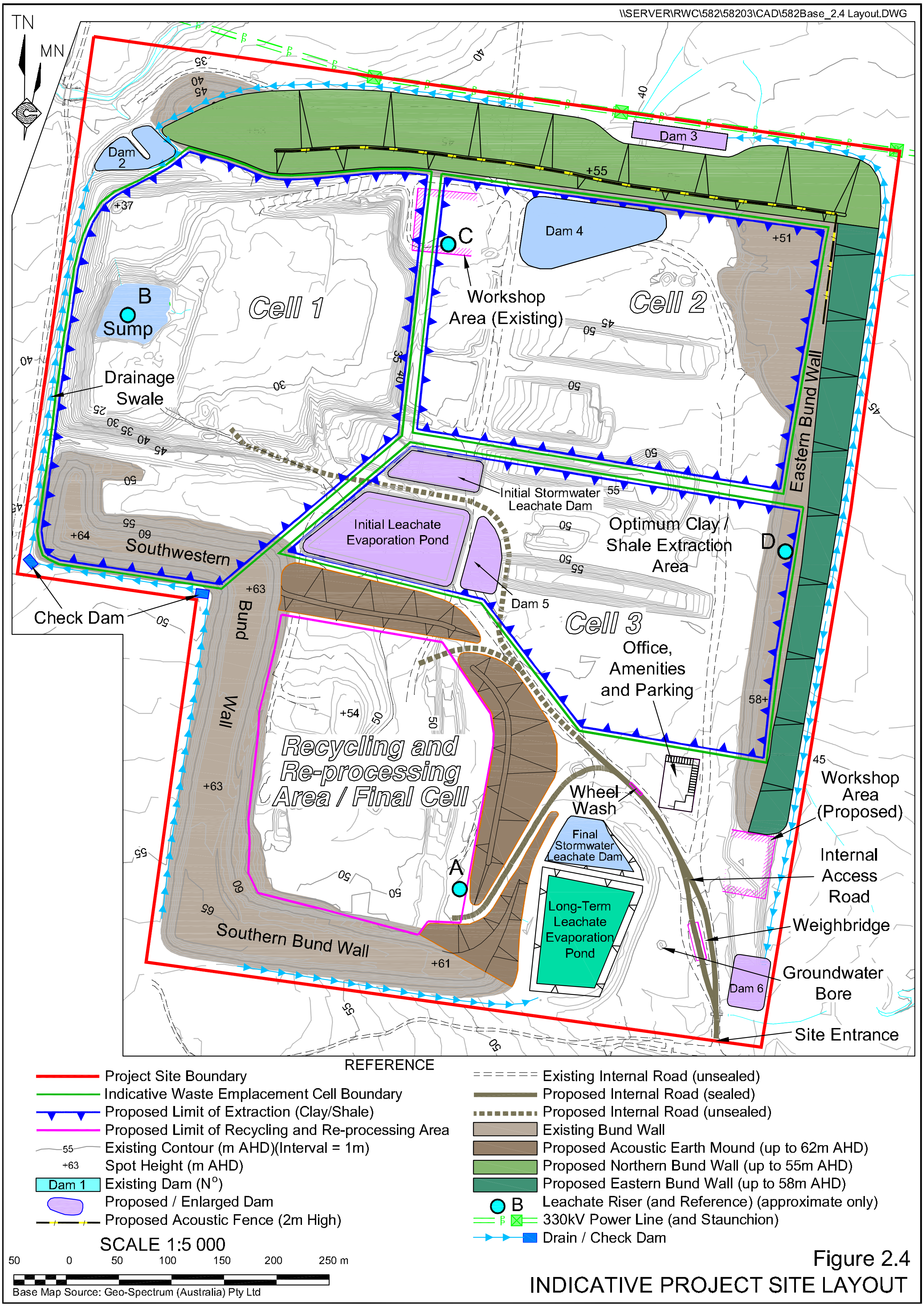

Figure 2.4
INDICATIVE PROJECT SITE LAYOUT

2.3.4.2 Extraction/Resource Recovery Areas

Based on the defined clay/shale resources within Cells 1, 2 and 3, it is proposed to extract/recover clay/shale from the following areas.

1. **Cell 1**

   It is proposed during the development and operation of the Cell 1 emplacement that a quantity of clay/shale would be progressively recovered from the margins and floor of Cell 1 to facilitate development of the cell, provide locally sourced cover material and sales of brick manufacturing raw materials and fill materials. The removal of construction fill and brick manufacturing raw materials off site would increase the overall capacity of the Cell 1 void by approximately 490 000m^3. For the purposes of calculating recoverable quantities of clay/shale in Cell 1, an average depth of extraction of 28m AHD has been adopted, although it is known, based upon drilling data, that the shale continues to depths well below 15m AHD.

2. **Cell 2**

   The Proponent also intends to recover clay/shale from Cell 2 to an average depth of extraction of 28m AHD. The sequence and rate of extraction and ultimate depth of extraction would depend largely on the quantities sold and despatched off site and the quantities used on site for cover materials and final capping.

3. **Optimum Clay/Shale Extraction Area (Cell 3)**

   Figure 2.4 displays the location of the optimum clay/shale extraction area immediately north of the site office within Cell 3. This area has been designated as the "optimum" area as the ceramic evaluation documented by R.W. Corkery & Co. (2004) recorded the area has the greatest quantity of light-firing clay/shale and least overburden material. Hence, in order to provide the greatest opportunity to recover the light-firing clay/shale from this area, it would be desirable for as much of the materials that are required on site (and off site) to be extracted from this area. By the time the light-firing clay/shale is exposed, it is possible the demand for this raw material from the brick industry would be re-established. It is noted that the optimum clay/shale extraction area covers approximately 50% of the area of Cell 3 although some light-firing clay/shale is present to the west of the optimum area.

Section 2.2.2 records that the bund walls around the perimeter of the Project Site (see **Figure 2.4**) contain a substantial quantity of clay/shale that was extracted from the area within the Project Site now nominated as Cell 1. Approximately 60% of the materials within the existing bund walls is clay/shale or Excavated Natural Material. The fact that the materials within the bund walls are already extracted and loose would assist to cost-effectively removing it from site. Hence, these materials also provide a resource that could be progressively extracted and despatched off site during the life of the Project.

2.4 SITE LAYOUT AND PROJECT COMPONENTS

Figure 2.4 displays the following principal project components.

- A waste recycling and re-processing plant within a designated area of approximately 5.6ha. This area is also defined as the Final Cell on **Figure 2.4** as it is proposed that, following the completion of the three initial cells, the recycling and reprocessing plant would be removed and this area would also be used for waste emplacement.
- An ancillary waste emplacement area divided into three cells, that is in addition to the final cell created within the Recycling and Re-processing Area. Each of the cells would be subdivided into either two or three sub-cells to achieve the planned progressive/staged approach to site operations and rehabilitation.
- An optimum clay/shale extraction area (within Cell 3).
- A network of site access roads providing access to the waste recycling and re-processing plant and active waste emplacement cell.
- Site offices, amenities, workshop, weighbridges and wheel wash.
- Amenity bunding, audio-visual mounding (around the Recycling and Re-processing Area) and safety barriers. The principal bund wall would be the Northern Bund Wall created along the entire northern side of the Project Site with the eastern bund wall also increased in height to provide audio-visual shielding.
- Various water management structures.

2.5 SITE ESTABLISHMENT AND BUND WALL MANAGEMENT

2.5.1 Site Establishment

Site establishment would involve the range of activities required to enable the first waste to be received on the Project Site. It is noted that during the site establishment period, the Proponent would also complete the construction and sealing of the 1.1km section of Patons Lane between Luddenham Road and the Project Site.

Figure 2.5 displays the locations of each of the activities to be completed during the site establishment phase. The principal activities involved in site establishment would include the following.

i) Upgrading of the entrance to the Project Site (from Patons Lane) together with the refurbishment of the existing dual weighbridge and associated office.

ii) Extending the road sealing from the upgraded Patons Lane to and beyond the weighbridge, that is to the entrance of the proposed Recycling and Re-processing Area.

iii) Construction and commissioning of the on-site wheel wash facility.

iv) Upgrading the internal road network beyond the proposed wheel wash facility to the exit point from the Recycling and Re-processing Area and the entry point to Cell 1.

v) Excavation/extraction of the excess clay/shale within the Recycling and Re-processing Area to achieve the final cell pre-waste acceptance landform and create a suitable pad for the recycling and re-processing plant.

vi) Installation of the required liners, drainage layer, leachate risers and associated infrastructure in Cell 1A (see Section 2.7.4 for details).

vii) Construction of the Initial Leachate Evaporation Pond and the surface water management structures within each of the active cells and elsewhere on site.

viii) Construction/shaping of the northern bund wall and deconstruction / shaping of the eastern bund wall (see Section 2.5.2).

The Proponent would establish communications with the closest neighbours prior to and during the site establishment phase to discuss the timetable and details of the proposed works.

2.5.2 Bund Wall Management

The bund walls on the Project Site would require management throughout the life of the Project as:

i) their outer slopes are currently too steep and would need to be reduced in angle;

ii) they are located in places on the footprint of the waste emplacement cells that are planned to be extracted as part of the Project;

iii) they contain construction and demolition waste classified as general solid waste (non-putrescibles) and, in one location, a small quantity of special waste (asbestos); and

iv) they contain substantial quantities of excavated natural materials (from Cell 1) that could either be transported off site for use as fill materials or used on site for cover materials for the waste emplacement cells.

At the outset, the Proponent has committed to remove the defined special waste (asbestos) from in the vicinity of Hole 12 on the surface of the eastern bund wall (see Section 5 – Draft Statement of Commitments) and emplace it within Cell 1 within 3 months of the commencement of emplacement activities in Cell 1.

The Proponent proposes to initially improve the external visual appearance of the bund walls on the northern and eastern sides of the Project Site throughout the construction stage of the Project. The bund walls on the southern and western boundaries would either be substantially removed or re-shaped at the most appropriate time to blend with the final landform. The general sequence and type of work on the various perimeter bund walls would be as follows.

1. During the site establishment phase, the northwestern and northeastern bund walls would be enlarged to create a single bund wall referred to as the "northern bund wall". The western section of the northwestern bund wall would be excavated and reshaped with the excavated material placed on the northern side of the northwestern bund wall. Further clay and shale would be excavated from within Cell 1 for placement adjacent to the northern slope of the northwestern bund wall.

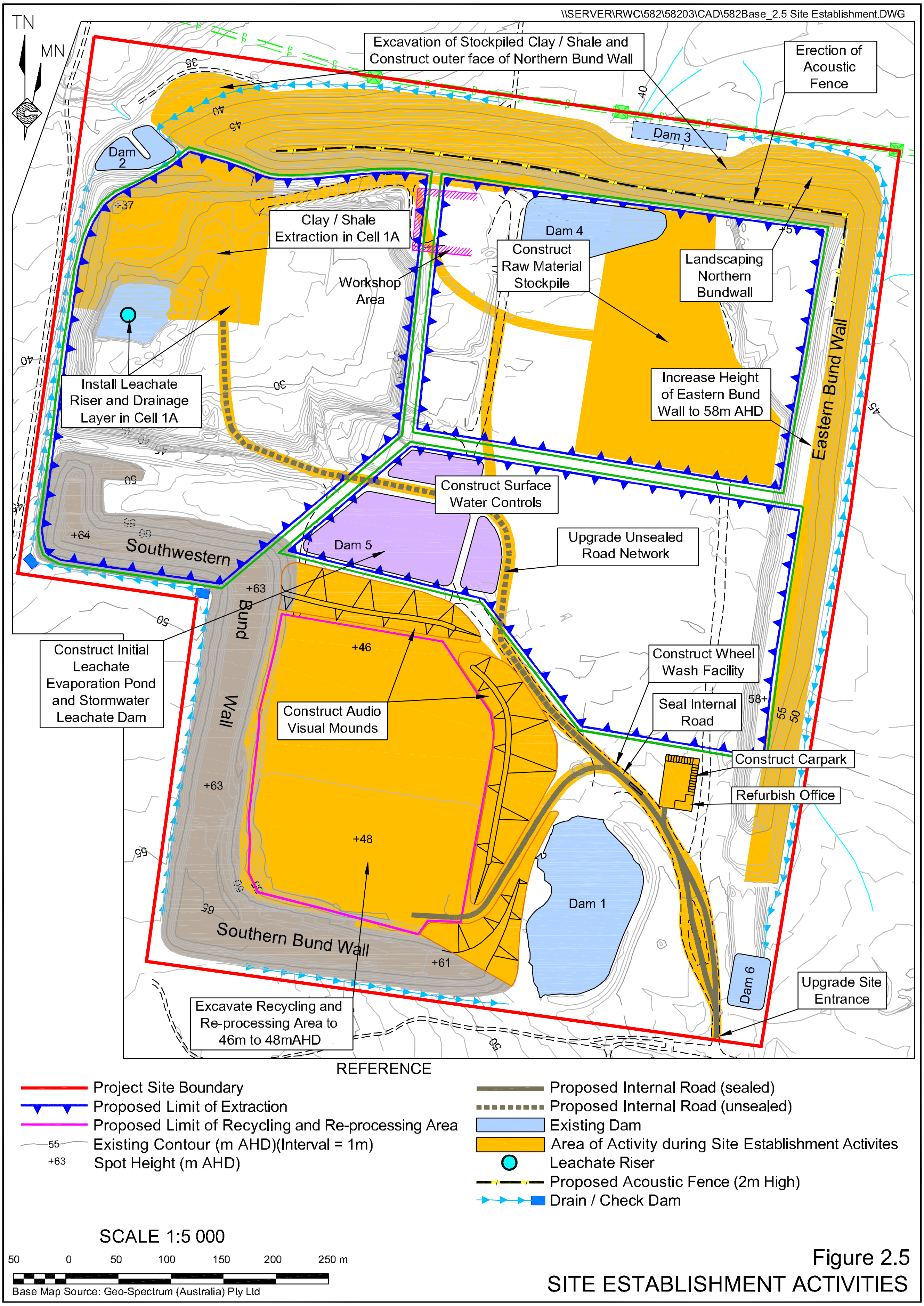

Figure 2.5
SITE ESTABLISHMENT ACTIVITIES

This material would also be placed on the northern slope of the northeastern bund wall and used to close the existing gap between the northwestern and northeastern bund walls**. Figure 2.6** displays three representative sections through the northern bund wall recording the extent of VENM placement and final slopes. At the completion of this earthworks program, the newly created northern bund wall would have an elevation of approximately 55m AHD along its full length. Revegetation of the completed northern bund wall is discussed further in Section 2.14.6.

2. The eastern bund wall adjacent to Cell 2 comprises an elevated section adjacent to the eastern boundary (52m-55m AHD) and a lower area (approximately 50m AHD) within the footprint of Cell 2. The Proponent intends, during the latter stages of the site establishment stage to deconstruct the outer steeper face of the bund wall to achieve a final slope of ≤1:3 (V:H). **Figure 2.7** displays the proposed sequence of deconstruction and construction of the outer final bund wall. This wall would be constructed from compacted clay and would provide long term containment of the remaining construction and demolition wastes. The Proponent proposes to increase the elevation of the eastern bund wall to a uniform elevation of 58m AHD. This would be achieved through the placement of VENM from Cell 1 to the desired elevation prior to the placement of compacted clay and topsoil. It is proposed to complete the reshaping of the eastern bund wall immediately prior to the completion of the site establishment phase.
3. Towards the end of the extraction stage within Cell 1, the Proponent intends to deconstruct the bulk of the northwestern bund wall adjacent to the southern boundary of Cell 1. This material would be removed largely through dozer pushing and/or excavator recovery and loading into either registered trucks for despatch off site or on-site haul trucks for use on site as cover material.
4. The southern bund wall and section of the southwestern bund wall adjacent to the Final Cell would be retained until towards the end of the operational life of the facility. At that time, it would be necessary to reshape the outer slopes of the bund wall to achieve the intended long term final slopes on the final landform. The surplus material recovered during the reshaping program would either be used on site for rehabilitation purposes or despatched off site for use as filling material.

For those sections of bund walls where construction and demolition wastes are encountered during the re-shaping of the bunds, the Proponent would adopt a procedure to confirm the materials are general solid waste (non putrescible). This material would be loaded into a site haul truck and transported either to the recycling and re-processing plant or the active waste emplacement area for burial in conjunction with incoming wastes. Sufficient building materials would be removed to allow up to 1m of clay to be placed (and compacted) above the remaining building materials to achieve the final landform.

In addition to the proposed capping layer above the general solid wastes (non putrescible), the bunds are positioned upon 4m to 8m of clay which provides an added level of protection in the event leachate is generated from the C&D waste in the bunds. Furthermore the groundwater below the bunds moves very slowly and the low point in Cell 1 (and possibly Cells 2 and 3) would act as a sump to draw groundwater into the site.

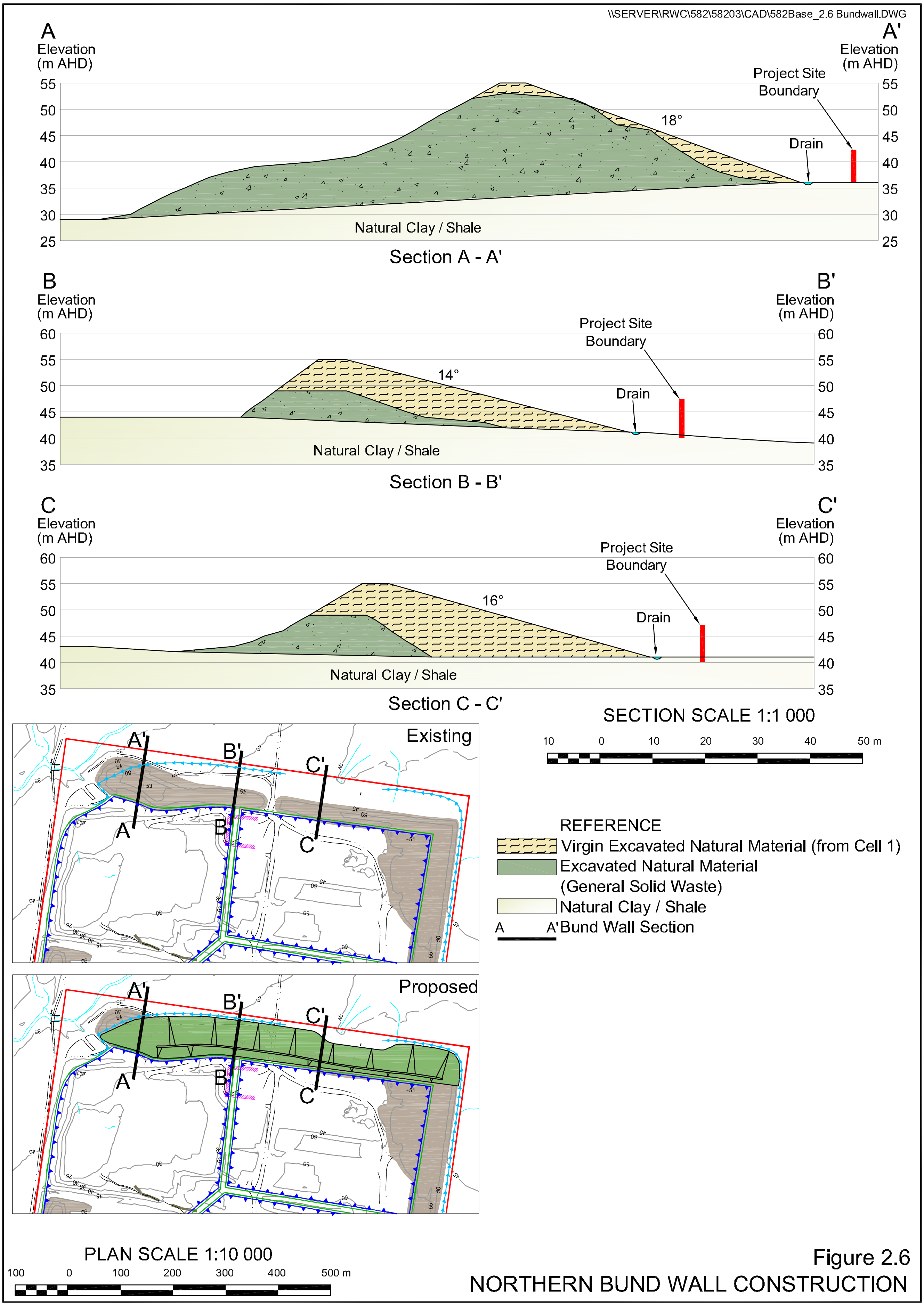

Figure 2.6
NORTHERN BUND WALL CONSTRUCTION

2.6 RECYCLING AND RE-PROCESSING OPERATIONS

2.6.1 Introduction

An important component of the Project is the diversion of as much waste as possible through recycling and re-processing. This subsection introduces the proposed recycling and re-processing operations on site and the approach to the use of an initial and long term plant.

2.6.2 Site Layout and Plant Components

2.6.2.1 Site Layout

The recycling and re-processing plant would be located within the Recycling and Re-processing Area at a level of 46m to 48m AHD. The proposed location of the waste recycling and re-processing plant is the most accessible on the Project Site from Patons Lane and is, importantly located at the furthest distance to surrounding neighbours to the north and east. Protection is provided by the existing perimeter bund walls that would assist to reduce potential amenity impacts. Furthermore, audio-visual mounds up to an elevation 62m AHD would also be constructed on the northern and eastern sides of the Recycling and Re-processing Area during the site establishment phase, ie. to a height comparable to the southwestern and southern bund walls.

2.6.2.2 Initial Recycling and Re-processing Plant

The initial recycling and re-processing plant would comprise three main items of mobile equipment focussing on the recycling and re-processing of C&D waste.

1. A mobile crusher – with a hopper capacity of $7m^3$ and throughput of between 80t and 150t per hour.
2. A tracked mobile trommel (eg. Finlay 740) – with a hopper capacity of $5m^3$ and throughput of approximately 60t per hour, depending on the materials processed.
3. A skid-mounted shredder – with a throughput up to 40t per hour.

All equipment would be located centrally within the southern half of the Recycling and Re-processing Area (See **Figure 2.8**). The various raw materials would be stockpiled largely on the southern side of the plant, generally in stockpiles containing <200t and ≤5m in height. Products would be stored on the northern side of the plant in ordered stockpiles.

2.6.2.3 Long Term Recycling and Re-processing Plant

Following the establishment of waste contracts to secure consistent quantities of required waste streams, additional long term recycling and re-processing plant would be established. The long term plant would comprise two sets of equipment designed to manage different waste streams. It is envisaged the long term equipment would also be mobile, albeit marginally larger than the initial plant, to provide the Proponent with the flexibility to re-configure the plant layout to accommodate operational requirements throughout the life of the plant. It is proposed that the plant is constructed with a range of acoustic barriers to ensure the contribution to overall noise levels is acceptable. The Proponent may in time consider partial enclosure of one or more items of equipment, particularly for the re-processing of C&I wastes.

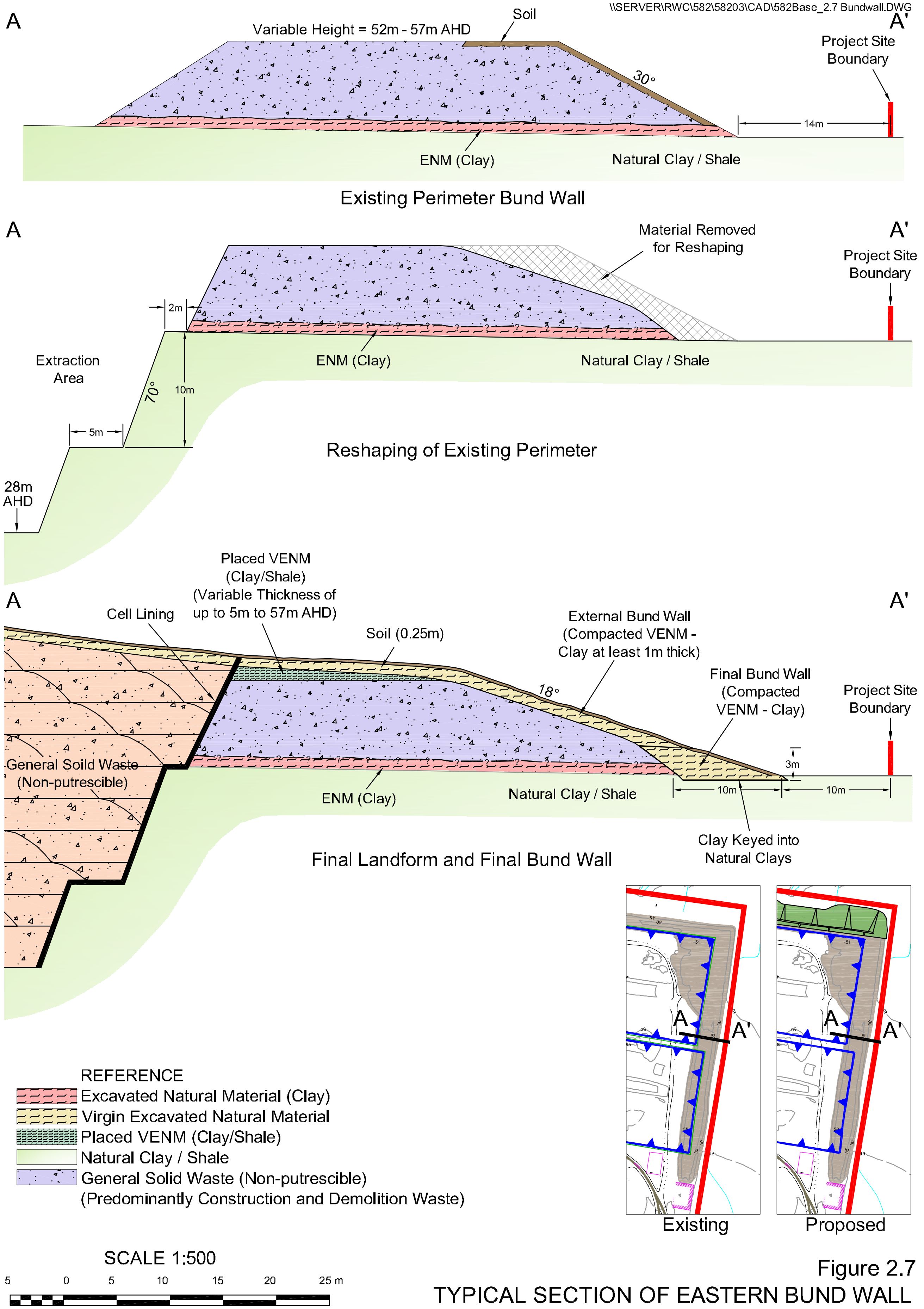

Figure 2.7
TYPICAL SECTION OF EASTERN BUND WALL

Set 1: Predominantly C&D Waste.

1. An impact crusher (eg. Finlay 1312) fitted with a permanent steel magnet – with a throughput of 100t to 350t per hour.
2. A tracked mobile trommel (eg. Finlay J-790) – with a hopper capacity of $7m^3$ and throughput of 90t to 100t per hour.
3. A jaw crusher (eg. Finlay J-1175) – with a hopper capacity of $9m^3$ and throughput of 120t to 340t per hour.

Set 2: Predominantly C&I Waste.

1. A primary shredder (eg. M & J 4000S) – with a hopper capacity of $10.56m^3$ and throughput typically of approximately 40t per hour.
2. A picking station fitted with a bin vibratory feeder – the rate of throughput would vary from 20t to 30t per hour.
3. A secondary shredder (eg M & J 1000) – with a hopper capacity of $6.51m^3$ and throughput of 20t per hour.

Figure 2.8b displays an indicative layout for the long-term plant.

Other supplementary equipment that may be utilised include balers, eddie current separators which remove aluminium from waste streams, a waterbath to separate timbers from heavy materials, possibly optical sorters and/or air classifiers. In the event that alternative waste technologies which would further improve the recovery and recycling of waste become available and economic throughout the life of the project, if required, approval may also be sought to implement these technologies.

The design of the recycling and re-processing plant would take into account the resource recovery exemptions available under the *Protection of the Environment Operations Act 1997*. The plant would also be reviewed annually taking into account any revisions to the targets provided within the Waste Strategy 2007. Currently, that design would aim to achieve a target recovery efficiency of up to 80% or greater, consistent with the target in the Waste Strategy 2007.

The approach to the final equipment selection for the long term plant would be guided by the experience gained with the initial plant, emerging technologies and the economics of re-processing, i.e. with respect to the increasing waste levy. The Proponent intends to retain as much flexibility as possible until appropriate quantities and types of waste are established, particularly with respect to the C&I waste.

2.6.3 Site Operations

All trucks entering the Project Site would pass over the incoming weighbridge where each load would be inspected and heavy vehicles carrying loads able to be recycled would be directed to turn left into the Recycling and Re-processing Area. Any wastes not permitted to be received at the facility would not be accepted.

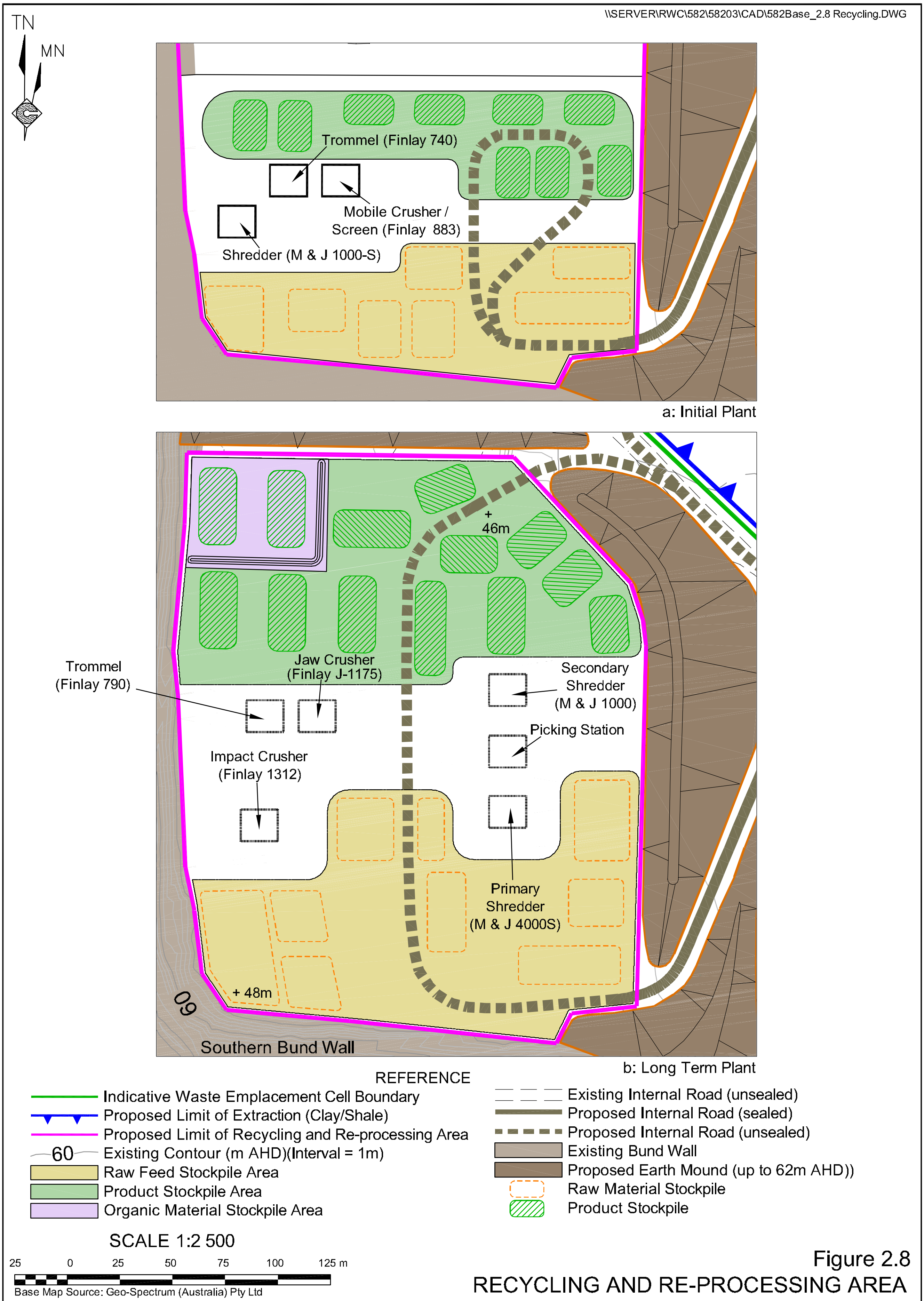

Figure 2.8
RECYCLING AND RE-PROCESSING AREA

Within the Recycling and Re-processing Area, truck drivers delivering mixed loads would be directed to place their loads within a designated sorting area. Following delivery, these materials would be sorted and any materials unable to be recycled and/or re-processed would be separated and loaded into a haul truck and taken back over the incoming weighbridge to the active waste emplacement area. Incoming trucks delivering loads comprising single waste types, eg. concrete, soil, etc. would be directed at the weighbridge to a dedicated raw feed stockpile within the receival area adjacent to the recycling and re-processing plant.

During sorting, steel would be recovered using magnetic separation, after which the remaining recyclable materials would be loaded either into a trommel or a primary shredder, depending upon the type of waste. C&D waste would typically be passed through the trommel and effectively separated into recyclables (eg. bricks, concrete, etc.) and non-recyclable wastes. The recyclable materials would be stockpiled until sufficient quantities of materials accumulate after which they would be loaded into a simple crushing and screening circuit producing saleable aggregate and soil material. Any steel not recovered during sorting would also be recovered during this process.

C&I wastes would typically be passed through a shredder to reduce the size of the material after which the material would be passed through a trommel for separation. Depending on the market for the residual plastic and timber products, a secondary shredder may also be utilised for further size reduction, as required.

2.6.4 Raw Feed Stockpiles

The Proponent would establish a series of raw feed stockpiles on the southern side of both the initial and long term plants. These stockpiles may be positioned in the open areas or established in storage bays.

Materials would be accumulated in the raw feed stockpiles until sufficient quantities are available to re-process the materials in a batch/campaign process.

2.6.5 Products and Product Stockpiles

It is proposed that the saleable products likely to be produced from the C&D recycling and re-processing would include the following.

- Recycled concrete.
- Steel reinforcing.
- Standard fill (clean soil).
- Ferrous metals.
- Varying sizes of aggregate (<12mm, 12mm to 35mm, 40mm to 75mm).

Saleable products likely to be produced from the C&I recycling and re-processing would include the following.

- Plastics.
- Metal.
- Cardboard.
- Woodchips (mulch/fired boilers).

The resource recovery exemptions under the *Protection of the Environment Operations Act 1997* would be taken into account in producing the saleable products.

These items would either be stockpiled or stored within defined bays or storage enclosures located generally to the north of the plants for sale and despatch off site.

Throughout the life of the Project, new products would continue to be investigated as markets and additional resource recovery exemptions are introduced and new re-processing and recycling technologies become available. Such markets could include alternative fuel sources.

2.6.6 Residual Wastes

Following re-processing, the remaining residual wastes (ie. wastes that cannot be economically recycled or sold) would be loaded into an articulated truck and taken back over the incoming weighbridge to the active waste emplacement cell. Based on an average of 150 000tpa of waste received to site being suitable for re-processing and a recovery rate of 65%, an average of approximately 50 000t of residual wastes would be generated each year.

Additionally, materials that are unsuitable or uneconomical for recovery and recycling (eg. contaminated soil and loads that cannot be physically sorted), would be directed at the weighbridge directly to the active waste emplacement cell. It is expected that an average of 100 000tpa to 150 000tpa of waste may be directly emplaced. During a peak year, a total maximum of 450 000tpa of waste would be directed to the active waste emplacement cell (either as residual waste or directly emplaced).

The residual waste, whilst not being recovered, would be inspected to ensure compliance with the permitted waste classification able to be emplaced on site, ie. general solid waste (non-putrescible).

2.6.7 Long Term Operations

In the event the waste emplacement capacity of the Project Site is exhausted prior to the 30 year Project life, and subject to demand at the time, it is proposed to continue the operation of the waste recycling and re-processing plant and effectively commence the use of the site as a Waste Transfer Station. As there would be no ancillary emplacement or landfill for non-recyclable residual waste to be disposed of on site, these materials would be transported from the site to alternative facilities licensed to accept such waste.

Those areas at the southern end of the Project Site to remain active would include the recycling and re-processing plant, material stockpile areas, the site access and internal road access to and from the aforementioned areas, wheel wash, weighbridge and the office and amenities buildings. Environmental management of the waste emplacement cells would continue throughout the ongoing operation of the waste transfer station.

If the waste recycling and re-processing plant and waste transfer station uses were to cease on the site, the area of land upon which these uses occupy would also be rehabilitated and the site closed and decommissioned (see Section 2.14).

2.7 ANCILLARY WASTE EMPLACEMENT

2.7.1 Introduction

The design and operation of the ancillary waste emplacement or landfill is based on achieving the environmental requirements nominated within:

- the *Protection of the Environment Operations Act 1997*; and
- the Environmental Goals in *Environmental Guidelines: Solid Waste Landfills (EPA, 1996)*.

Additionally, a number of best practice environmental management techniques are proposed in the design and operation of the ancillary waste emplacement to minimise the environmental impacts from the facility.

The following subsections outline the:

- concept design for the engineered waste emplacement cells;
- the operation of the waste emplacement;
- cell development;
- emplacement sequence;
- leachate management; and
- methane management.

The minimum design capacity (airspace) that is available to emplace waste on the Project Site (and its associated daily cover and capping) is approximately 4.4 million cubic metres (m^3) based upon the existing void space and the proposed final landform. Additional airspace would be created through ongoing extraction operations and sale of on-site clay and shale.

Subject to the volume of clay and shale extracted and despatched from site, the maximum design capacity could be approximately 7.8 million m^3 ie. assuming extraction in Cells 1, 2 and 3 is undertaken to an average depth of 28m AHD. Based upon approximately 50% (average 150 000tpa) of received material being suitable for re-processing and recycling, of which approximately 35% (50 000tpa) would constitute residual waste, approximately 200 000tpa of material on average would be emplaced each year. However, in some years, when large quantities of material that cannot be re-processed or recycled (eg. contaminated soil) are received, the total emplaced tonnages may increase up to 450 000tpa.

Based on the *Environmental Guidelines: Solid Waste Landfills* target waste compaction of $0.85t/m^3$ (excluding cover material) the average quantity of waste emplaced annually would equate to the use of approximately $240\,000m^3$ of air space each year. It is noted that greater compaction would likely be achieved for wastes such as contaminated soil material which would reduce the required air space per tonne of material received. It is anticipated that an average compaction rate of $1.0t/m^3$ (excluding cover material) could be achieved equating to the use of an average of approximately $200\,000m^3$ of air space each year. Actual compaction rates achieved would be determined throughout operations and reported to the DECCW.

The conceptual design of the ancillary engineered waste emplacement addresses the environmentally secure emplacement of waste classified as General Solid (non-putrescible) waste and encompasses the following principles and design elements.

2.7.2 Design

2.7.2.1 Introduction

The design of the overall emplacement and its components has been undertaken by Aquaterra whose integrated emplacement cell design is detailed in Aquaterra (2010). The principal objective of the design is to achieve the following specific environmental requirements.

1. Leachate needs to be contained on site to ensure that groundwater and surface water is not polluted off site.
2. Gas would be contained within the Project Site such that it does not migrate off site through the subsurface. Furthermore, gas generated by the emplaced waste would be managed to ensure that it does not create offensive odour off site, and is subject to oxidation to minimise greenhouse gas emissions.

The conceptual design outlined below takes into account the design capacity of either 4.4 million m^3 or up to 7.8 million m^3 and the emplacement of waste above and below the groundwater table.

Cells would be set back at least 10m from the site's perimeter in accordance with conservative modelling work undertaken by Dupen (1993) for containment of leachate in unlined clay/shale quarries in Sydney.

This subsection considers the design of the cell barriers and the cells themselves. It is noted that the design features of the cell barriers and the cells would be compiled in detail within a construction quality assurance plan and reviewed throughout the life of the Project. Where appropriate, design adjustments would be incorporated into the design of the remaining cell barriers and cells in response to site observations, monitoring or technological advances.

2.7.2.2 Cell Barriers

At least 10m of clay/shale would exist between the emplacement cells and the site's boundary. This natural clay/shale geology would act as the primary barrier to prevent the off-site migration of contaminants as it has a low permeability.

An engineered barrier would also be installed:

1. around the external perimeter walls of all cells up to the crest of the land's natural surface and 'keyed' into the floor of the cell; and
2. on the floors of all cells.

Aquaterra demonstrated that the on-site clays are able to be re-compacted to achieve a permeability of less than 7.3×10^{-10} m/s and that, provided it is placed within a thickness of at least 37cm, it would offer an equivalent hydraulic performance as the DECCW's benchmark clay liner.

The engineered liner constructed would comprise either 40cm to 90cm of re-compacted clay with a permeability between 7.3×10^{-10} m/s and 1×10^{-9} m/s, or another approved equivalent liner, such as a HDPE liner.

In order to complement the performance of the perimeter wall liner, a series of gravel chimneys would be installed against it at intervals around the cell. The chimneys would be designed to relieve any leachate or gas pressure against the liner and funnel leachate and gas (if present) to the extraction points.

The walls of the cells would be very steeply sloped which naturally enables leachate to run down them, whereas leachate would pool on the floor of the cells, if it is not extracted. It is possible that, if a continuous permeable layer is installed around the perimeter walls of the emplacement cells, this would perform as effectively as the engineered liner. If this design option is selected in the future, it would be supported by modelling to advise whether leachate or gas can be retained on-site. If the modelling results conclude that this outcome can be achieved by a continuous permeable drainage layer, an application with the supporting information would be made to DECCW seeking approval for its use, in-lieu of the perimeter wall liner.

2.7.2.3 Emplacement Cells

2.7.2.3.1 Cell Definition

The waste emplacement area within the Project Site has been designed with four defined cells, namely three cells nominated as Cells 1, 2 and 3 and the Final Cell. Cells 1 and 3 have been divided into three sub-cells whereas Cell 2 and the Final Cell have been divided into two sub-cells. The boundaries of the four cells and their sub-cells are displayed on **Figure 2.9**.

2.7.2.3.2 Cells 1, 2 and 3

The design of Cells 1, 2 and 3 is summarised as follows.

- Each cell would involve the progressive deconstruction of a proportion of the adjoining perimeter bund walls in the manner described in Section 2.5.2. Where the bund walls (which have been identified to contain general solid (non-putrescible) waste are not relocated, these would be managed from the commencement of waste emplacement activities. This is further outlined in Section 2.5.2.
- The cell floors of Cells 1, 2 and 3 would comprise the in-situ shale (with very low vertical permeability), upon which an engineered liner would be installed. The engineered liner would be a compacted clay liner with a permeability of $<7.3 \times 10^{-10}$m/s or an alternative engineered liner which offers an equivalent hydraulic performance such as a geomembrane (eg. HDPE) or geosynthetic clay. Should an alternate engineered liner be proposed, approval would be sought from DECCW before its deployment.

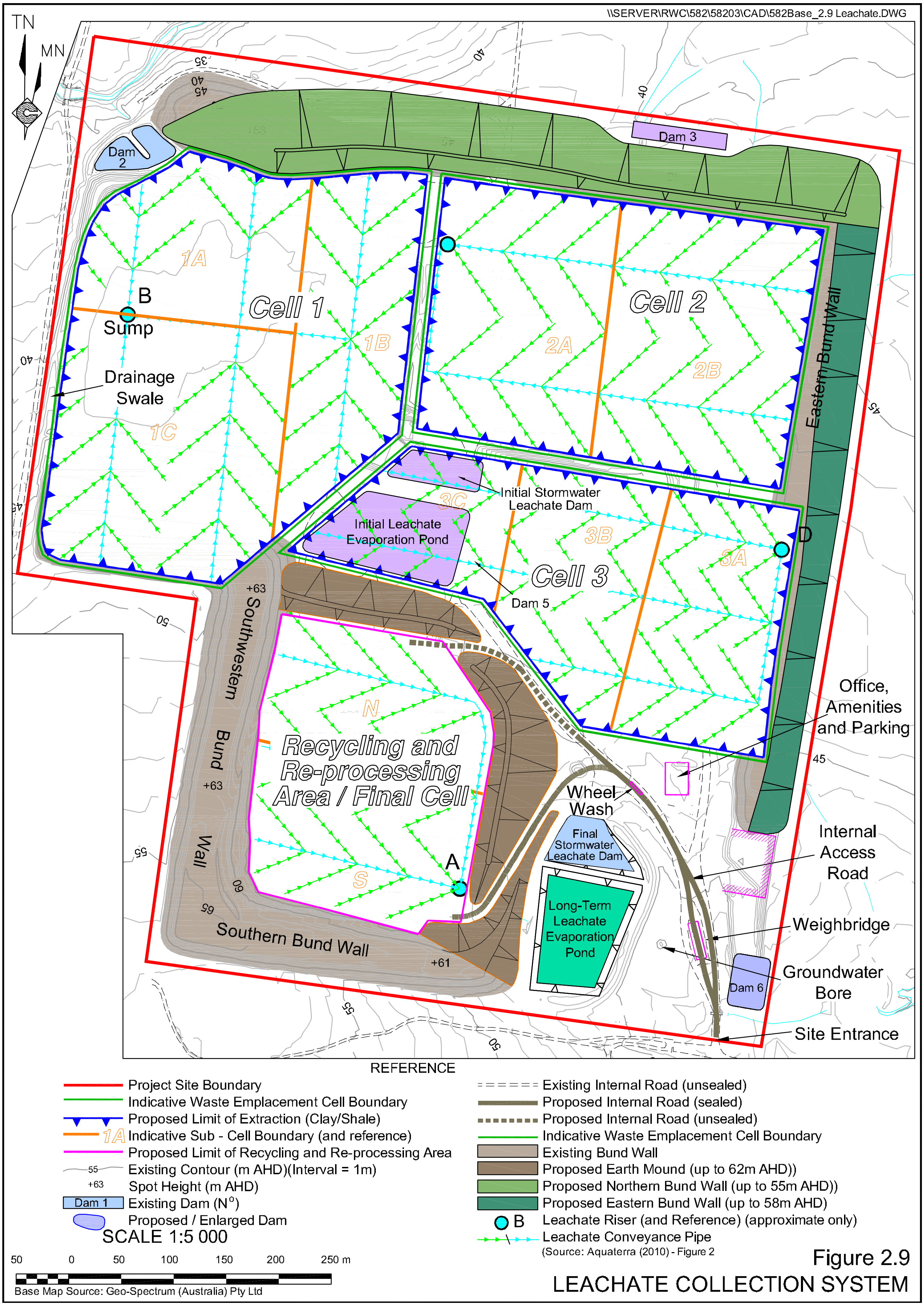

Figure 2.9
LEACHATE COLLECTION SYSTEM

- Within all cells a leachate drainage layer with a transmissivity satisfying the DECCW's benchmark gravel would then be placed over the entire surface of the engineered liner. Above the drainage layer, a separation geotextile would be placed to prevent fines entering and clogging the leachate drainage layer. The leachate drainage layer would slope at 1% horizontally and 3% in the transverse direction.

  The basal leachate drainage layer would comprise one of the materials described in **Table 2.2**.

Table 2.2
Possible Basal Leachate Drainage Layers

Material Description	Specification
Basalt Gravel (or similar material)	Transmissivity > $3x10^{-4}$ m^2/s, rounded (< 30% misshapen), < 10% passing the 10mm sieve, <3% passing the 0.075mm sieve
Triplanar Geonet	Transmissivity greater than $4.05x10^{-4}$ m^2/s at 500kPa (Aquaterra, 2010)
Basalt Gravel with concrete	Transmissivity > $3x10^{-4}$ m^2/s, rounded (<30% misshapen), < 10% passing the 10mm sieve, <3% passing the 0.075mm sieve, < 20% by mass concrete*, <0.5% foreign matter (anything other than concrete or gravel) – at 500kPa
Geotextile	Non-woven, mass > 270g/m^2, O95 < 0.21mm, Grab Strength N > 900, Trapezoidal Tear N > 350, Puncture Strength N > 350, Burst Strength kPa > 1700
Source: Aquaterra (2010) – Table 4.1	

  The leachate drainage layer would incorporate HDPE collection pipes spaced at 50m intervals selected to withstand the weight of the overlying waste without buckling (see Aquaterra (2010)). The leachate drainage pipes would report to a riser from which leachate would be extracted out of the cell once a pre-determined level is reached and pumped to the evaporation ponds. Further details are provided in Section 2.7.4.

- Dual leachate/gas drainage chimneys may be placed against the cell walls at regular intervals around the cells. This would prevent the build up of leachate and/or gas pressure against the cell's outer walls thereby containing it within the cell allowing gas extraction in a controlled manner.

  Should sufficient quantities of gas commence to be generated, gas would be extracted from the emplacement cells and its methane component would be oxidised in accordance with the regulatory requirements (which are yet to be stipulated by the Federal Government) to minimise the Project's greenhouse impact. At a minimum, the gas would be collected and oxidised from the rehabilitated cells.

- At the northern sides of Cells 1 and 2 and between the Final Cell and Cell 3 only VENM would be emplaced to achieve the final contours. This would negate the need for including a leachate underdrain system for these areas.

The design of each cell is fully in accordance with *Environmental Guidelines: Solid Waste Landfills* (EPA, 1996).

2.7.2.3.3 Final Cell

During site establishment, the base of the Final Cell would be constructed at elevations of between 46m AHD to 48m AHD. The geology at these elevations consists of clays and some weathered shale and is expected to be above the groundwater level in the underlying shale. As for Cells 1 to 3, prior to the emplacement of waste, an engineered liner would be installed for the Final Cell which meets the DECCW liner permeability requirements. A leachate drainage layer and collection system would also be installed together with leachate/gas drainage chimneys, if required. The cell design would be fully in accordance with Environmental Guidelines: Solid Waste Landfills (EPA, 1996).

2.7.3 Cell Operations

2.7.3.1 Introduction

The operation of the ancillary waste emplacement component of the facility would be undertaken by an established and experienced waste management company.

The classification of the waste to be emplaced is General solid (non-putrescible). No liquid, hazardous, restricted or dangerous materials would be accepted to the site.

The facility would only receive waste from commercial operators and would not be open to the general public.

2.7.3.2 Waste Receipts and Placement

Waste received from off site would be screened at the weighbridge as a first check to ensure that it meets the general solid waste (non-putrescible) classification. Some loads would be directed to the recycling and re-processing plant for the recovery of materials where a second stage of screening would take place. All other waste received at the site, after initial screening at the weighbridge, would be directed to the active emplacement cell and subjected to secondary screening as it is deposited/unloaded from the vehicle.

Any vehicle entering the site which contains waste which does not meet the classification of general solid waste (non-putrescible) would be directed back off site. In the event that waste not meeting the classification of general solid waste (non-putrescible) is deposited on site and the vehicle has departed the site, the waste would be collected and stored in a covered skip bin until it can be taken off site to a facility which can lawfully receive it. This would be acted on as a priority.

Waste resulting from deconstructing the on-site bund walls would be screened during deconstruction to confirm that it meets the classification of general solid waste (non-putrescible). At that stage any waste identified for recovery of resources would be excavated and transported to the on-site recycling and re-processing plant. The remaining waste material from the bund walls that cannot be re-processed would be transported into the active waste emplacement cell for emplacement.

A fine misting spray of water would be applied over the area of the bund wall, where wastes are being removed as a safeguard to prevent the airborne emission of any asbestos fibres, should they be present.

Any waste identified in the bund walls not meeting the classification of general solid waste (non-putrescible) would be managed in accordance with the requirements of the *Protection of the Environment Operations Act 1997* (and, if required, removed off site to a facility which can lawfully receive it).

Figures 2.10 to **2.13** depict the progressive emplacement and rehabilitation of the Cells 1, 2 and 3 and the Final Cell. Progressive deconstruction of the on-site bund walls is also depicted. The indicative emplacement and progressive cell rehabilitation sequence is outlined in **Table 2.3**. **Figures 2.14** and **2.15** display a sequence of north/south and east/west cross-sections that similarly explain the sequence of clay/shale extraction, cell development, waste emplacement and rehabilitation.

Table 2.3
Indicative Emplacement and Cell Rehabilitation Staging

Year#	**Activity***
Year 1 (see **Figure 2.10**)	Cell 1A prepared to receive waste and filling to commence. Deconstruction of the section of the Eastern Bund located over the clay/shale extraction area within Cell 2 would be commenced and all wastes placed in Cell 1A.
Year 5	Cell 1B has been constructed and is available to commence waste emplacement and about the same time Cell 1A would have been capped and rehabilitated.
Year 8	Cell 1C has been constructed and is available to commence waste emplacement and about the same time Cell 1B would have been capped and rehabilitated.
Year 13 (see **Figure 2.11**)	Cell 2A has been constructed and is available to commence waste emplacement and about the same time Cell 1C would have been capped and rehabilitated
Year 17	Cell 2B has been constructed and is available to commence waste emplacement and about the same time Cell 2A would have been capped and rehabilitated
Year 22	Cell 3A has been constructed and is available to commence waste emplacement and about the same time Cell 2B would have been capped and rehabilitated
Year 25 (see **Figure 2.12**)	Cell 3B has been constructed and is available to commence waste emplacement and about the same time Cell 3A would have been capped and rehabilitated
Year 27 (see **Figure 2.13**)	Cell 3C has been constructed and is available to commence waste emplacement and about the same time Cell 3B would have been capped and rehabilitated
Year 30	The Final Cell would be filled to finished levels, capped and rehabilitated.

Indicative Only
* Assumes an average waste emplacement rate of 200 000tpa
See **Figure 2.9** for individual cell location.

Each of the cells would be progressively filled to finished levels so that only a small area of each cell remains to be capped and rehabilitated when emplacement activities commence in the next cell. This approach would ensure that minimum time is taken to cap and rehabilitate each cell, rather than leaving the area to be completed in one exercise. This also reduces the risk of rainfall delaying these works and minimises the generation of leachate.

2.7.3.3 Compaction and Daily Cover

All emplaced waste would be compacted to optimise the use of the cells' airspace. Compaction equipment would comprise a Caterpillar 826H (or similar) to achieve a minimum compaction goal of 0.85 tonnes per m^3 of waste. The Proponent does intend, however, to aim to achieve a compaction level of 1 tonne per m^3 of emplaced waste, or greater.

At the completion of each day's waste placement, daily cover would be applied to the exposed waste in order to contain offensive odours, minimise windblown litter and infiltration by stormwater and prevent access to vermin. Daily cover would be drawn from:

i) VENM, ENM (or a DECCW approved alternative material) applied to a depth of at least 150mm;

ii) material processed on site and suitable and approved by DECCW for use as daily cover;

iii) sprayed on latex or similar types of temporary impermeable membranes; and/or

iv) re-used mining conveyor belt or similar material capable of performing the role of daily cover.

The Proponent would ensure that a stockpile of between 250t and 500t of either materials 1 or 2 above is maintained close to the active emplacement area. The cover material would be drawn principally from the active extraction area with some periodically drawn from the ENM recovered from perimeter bund walls. Any material delivered to site which is suitable for cover material and cannot be recycled would be preferentially used as cover material.

Each day's operations would involve the emplacement of approximately $600m^3$ (548t) of waste, ie. assuming average annual input to the emplacement cells of 200 000tpa. In order to minimise the consumption of airspace, each day's tipping area would be restricted to an area with the typical dimensions of 1.4m batter height, length of 70m and a width of 6m.

The uncovered daily emplacement area would be bunded when rainfall is likely or when leachate is being applied to it to ensure leachate does not enter the stormwater system. The uncovered daily emplacement area would also be either totally covered or reduced in size when rainfall is occurring.

2.7.3.4 Stormwater and Leachate Management

Daily cover comprising VENM, ENM or alternative materials would be placed by the compactor with the finished surface completed with divots from the compactor's sheep foot blades. In order to prevent these divots from holding rainwater and increasing the potential for leachate generation, it is proposed to either roll the daily cover with a smooth drum roller or grade the compacted cover to remove the divots and thereby limit infiltration. It is noteworthy that neither rolling or grading would be required if (iii) or (iv) above are used as daily cover. Run-off from daily cover would then be directed to the stormwater system (provided it has not come into contact with uncovered waste or leachate). This would minimise the generation of leachate by ensuring rainfall infiltration is less than 25% of rainfall (Aquaterra, 2010) for the cells which have not yet been capped and rehabilitated.

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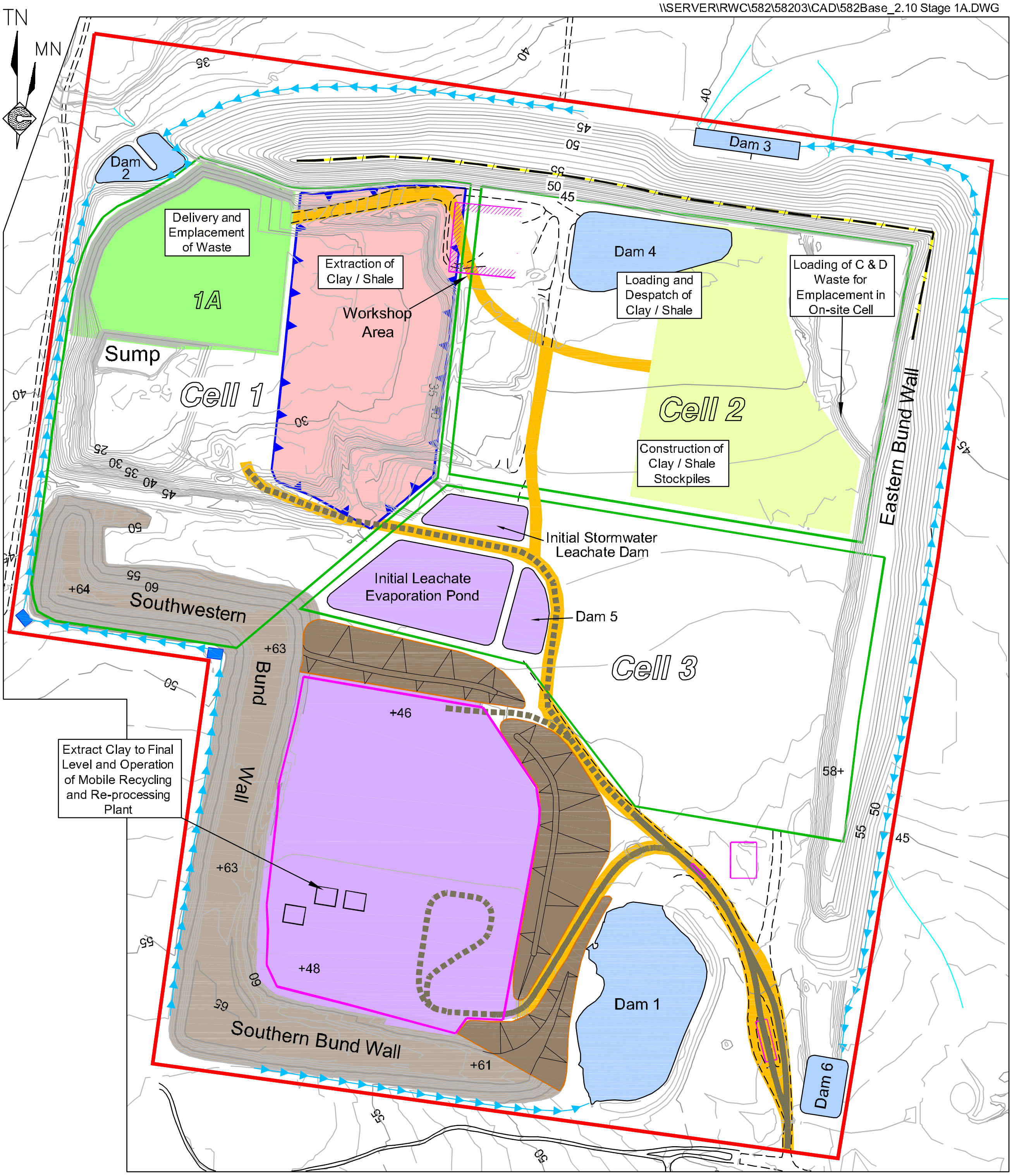

REFERENCE

- Project Site Boundary
- Indicative Waste Emplacement Cell Boundary
- Proposed Limit of Extraction
- Proposed Limit of Recycling and Re-processing Area
- 55 Existing Contour (m AHD)(Interval = 1m)
- +63 Spot Height (m AHD)
- Existing / Proposed Dam (N°)
- Proposed Acoustic Fence (2m High)
- Proposed Internal Road (sealed)
- Proposed Internal Road (unsealed)
- Indicative Area of Activity
- Delivery and Emplacement of Waste
- Extraction of Clay / Shale
- Construction of Clay / Shale Stockpiles
- Operation of Recycling and Re-processing Plant
- Internal Transport Route
- Drain / Check Dam

SCALE

50 0 50 100 150 200 250 m

Base Map Source: Geo-Spectrum (Australia) Pty Ltd

Figure 2.10
STAGE 1A OPERATIONS

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REFERENCE

- Project Site Boundary
- Indicative Waste Emplacement Cell Boundary
- Proposed Limit of Extraction (Clay/Shale)
- Proposed Limit of Recycling and Re-processing Area
- 55 Existing Contour (m AHD)(Interval = 1m)
- +63 Spot Height (m AHD)
- Existing / Proposed Dam (N°)
- Proposed Acoustic Fence (2m High)
- Proposed Internal Road (sealed)
- Proposed Internal Road (unsealed)
- Indicative Area of Activity
- Delivery and Emplacement of Waste
- Extraction of Clay / Shale
- Construction of Clay / Shale Stockpiles
- Operation of Recycling and Re-processing Plant
- Internal Transport Route
- Drain / Check Dam

SCALE

50 0 50 100 150 200 250 m

Base Map Source: Geo-Spectrum (Australia) Pty Ltd

Figure 2.11
STAGE 2A OPERATIONS

Figure 2.12
STAGE 3B OPERATIONS

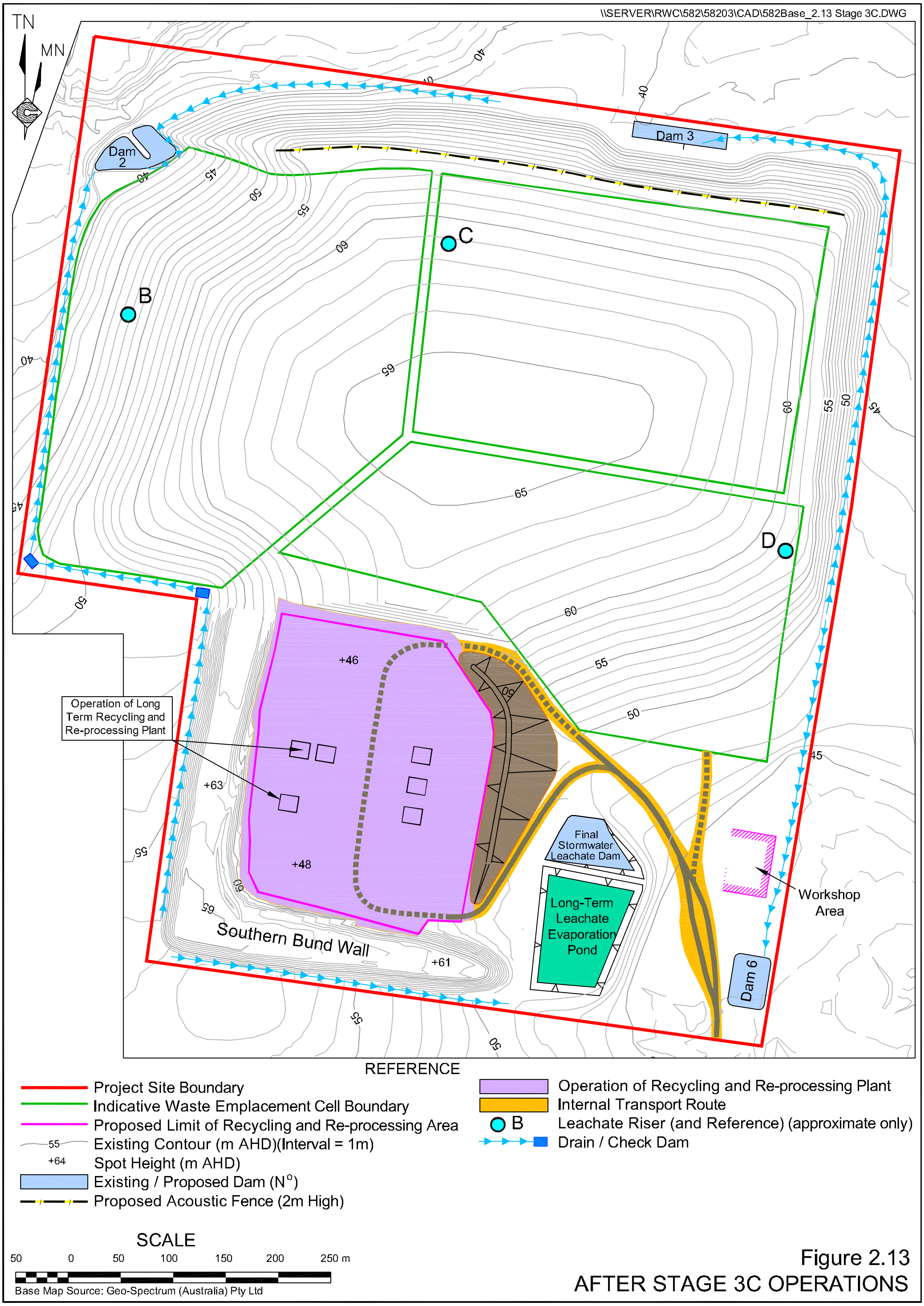

Figure 2.13
AFTER STAGE 3C OPERATIONS

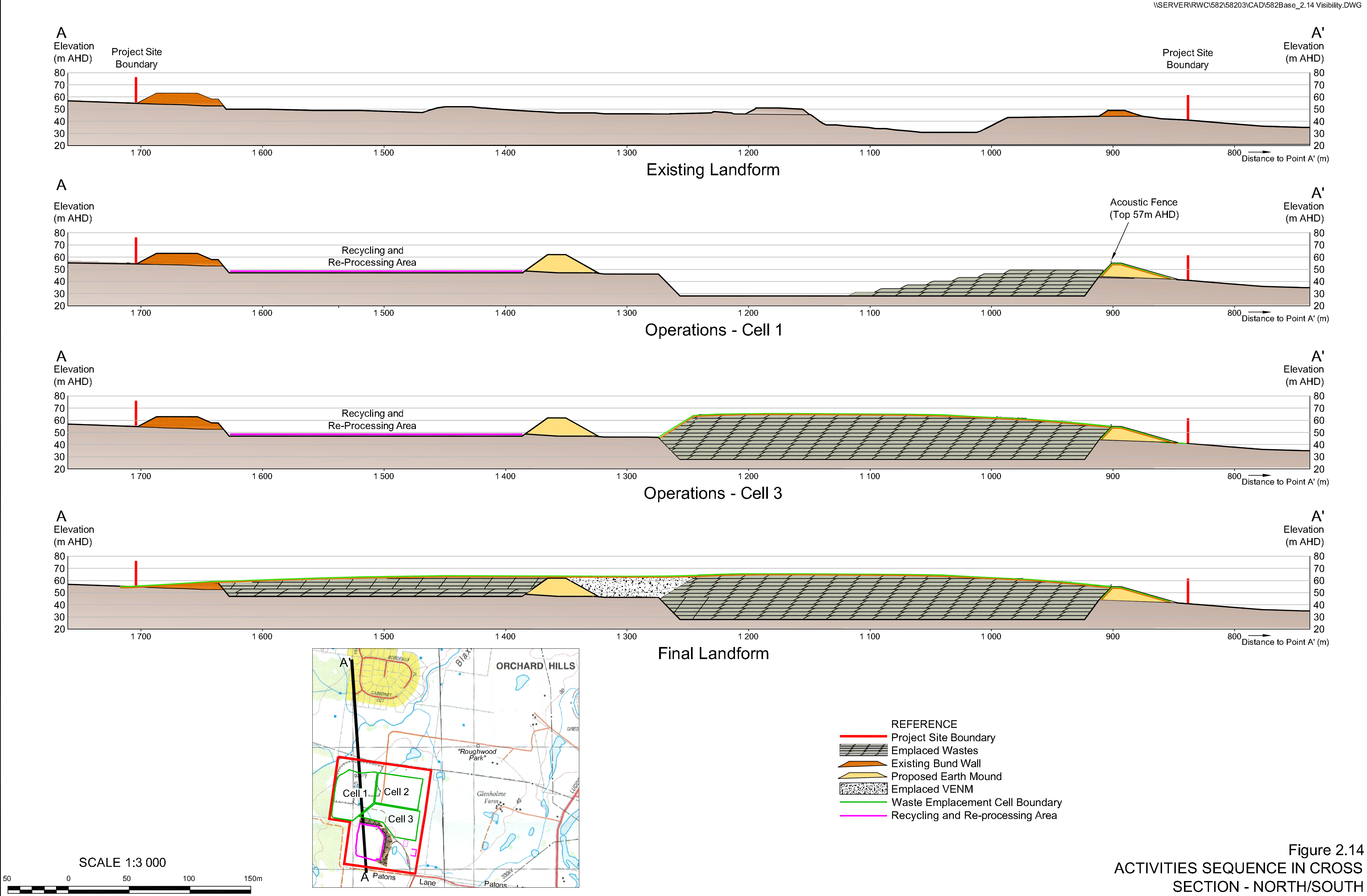

Figure 2.14
ACTIVITIES SEQUENCE IN CROSS SECTION - NORTH/SOUTH

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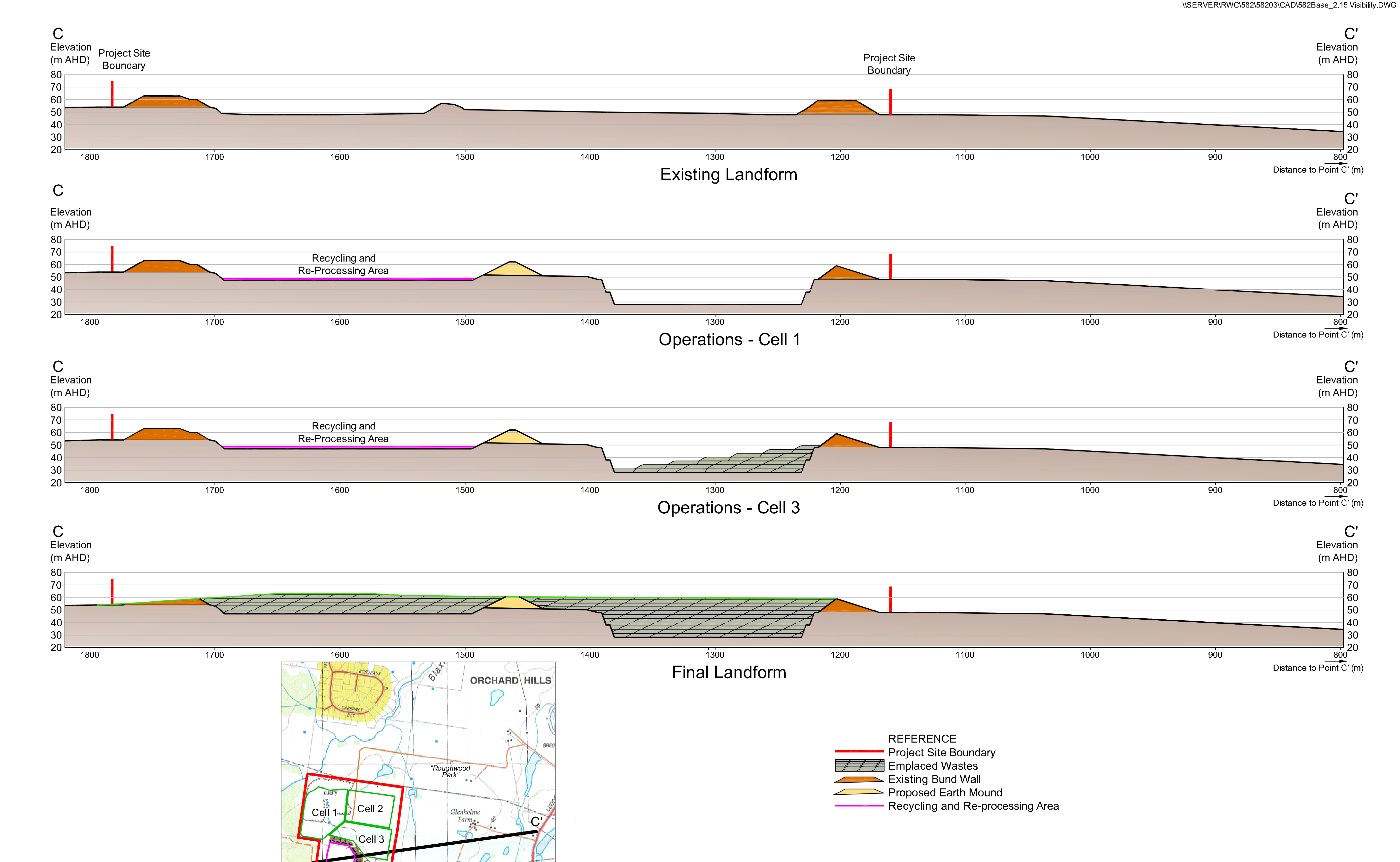

Figure 2.15
ACTIVITIES SEQUENCE IN CROSS SECTION - EAST/WEST

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2.7.3.5 Litter, Dust and Fire Controls

The most effective way of controlling litter and preventing fire is by the application of daily cover.

Litter would be controlled at the facility by regular clean-up campaigns during windy conditions and through the application of mobile litter fences, trash racks on stormwater flow lines and the collection of all litter on a regular basis.

Dust emissions would be minimised by:

- the progressive rehabilitation of the emplacement cells;
- regular watering of exposed surfaces and highly trafficked areas (with the on-site water truck);
- a fine misting spray of water applied to the areas of the perimeter bund walls which are being shaped and partially deconstructed; and
- the suspension of clay/shale extraction and despatching of clay/shale products on days predicted and/or observed to experience high temperatures and wind speeds.

A fire management plan is documented in Aquaterra (2010).

2.7.4 Leachate Management

Leachate management arising from the waste emplacement cells and deconstructing the bund walls containing waste capable of generating leachate would be centred on minimising its generation and ensuring that any leachate generated does not pollute groundwater or surface water.

2.7.4.1 Leachate Extraction from Emplacement Cells and Deconstruction of the Bund walls

Figure 2.9 depicts the leachate drainage network for all emplacement cells. The leachate riser in each cell would have a pump installed which would automatically extract leachate from the cell once the level of leachate around the riser reaches a pre-determined level. The level at which leachate would be automatically extracted would be:

- 0.3m above the floor of each cell where the floor is above the surrounding groundwater table (Final Cell, and possibly Cells 2 and 3); and
- 2m below the groundwater level for Cell 1 (and possibly Cells 2 and 3), to ensure the inward flow of groundwater into these cells. In the case of Cells 2 and 3, this would be applicable if they are excavated at least 2m below the level of the surrounding groundwater table.

The Proponent proposes to commence pumping any leachate generated directly into a 25 000L tank positioned near the leachate riser in Cell 1A. The use of the tank would occur during the period between the commencement of waste acceptance and the completion of the Initial Leachate Evaporation Pond, a period when leachate generation is expected to be negligible.

Following the completion of the 12ML capacity Initial Leachate Evaporation Pond, leachate would be pumped to the pond during operations in Cells 1 and 2. Following the completion of operations within Cell 1 and 2 and commencement within Cell 3, the 12ML capacity Long-Term Evaporation Pond would be constructed and the Initial Leachate Evaporation Pond decommissioned.

Both the Initial and Long-Term Leachate Evaporation Ponds would be lined with 1.0 mm (nominal) HDPE on a rolled subgrade of clay free of protrusions. This composite liner would be installed with strict quality control and accordingly it would leak less than 1150L/ha/day, as required by DECC (Giroud 1997). Should the level of leachate in the evaporation ponds reach the pond's freeboard then a signal would be sent back to the pumps preventing them from pumping leachate and thereby preventing leachate overflowing from the evaporation ponds and entering the stormwater system.

The pipeline from the risers to the leachate evaporation ponds would also have pressure controls included to prevent leachate being pumped out of the cells if the transfer pipeline has ruptured, again to prevent leachate entering the stormwater system.

It is possible when deconstructing the on-site perimeter bund walls which contain some waste, ie. those in the northeastern, eastern and possibly the southwestern bund walls, that stormwater coming into contact with the waste could contaminate stormwater at concentrations above the ANZECC 2000 95th percentile values. Should this be the case this water would be managed in the same manner as leachate and this circumstance has been included in the leachate modelling. As a safeguard, all bund walls which are being deconstructed and known to contain waste that would generate leachate would have an earthen bund installed around their lower points to contain run-off from rainfall, before the decision is made on whether the run-off would be managed as stormwater, or leachate.

2.7.4.2 Leachate Disposal

The generation of leachate would be minimised by a series of best practice design and operational techniques. The generation of leachate would be minimised by preventing stormwater running onto the active emplacement cell and by minimising the area of the emplacement that is uncovered daily, minimising the area of the deconstruction of the bund wall, diverting stormwater away from areas of daily cover and progressively rehabilitating the emplacement cells once they achieve the nominated final elevations.

Aquaterra (2010) incorporates the results of leachate generation modelling. The modelling is conservative and is expected to overestimate leachate generation volumes. These results demonstrate that the Initial Leachate Evaporation Pond and Long-Term Leachate Evaporation Pond, both with capacities of 12ML, would adequately store (and evaporate) all leachate generated throughout the life of the Project. Further details of the approach to leachate management is provided in Section 4.2.5 of this document and in Aquaterra (2010).

2.8 CLAY/SHALE EXTRACTION

2.8.1 Introduction

The Proponent's intention to resume extraction of clay/shale from the Project Site would provide the opportunity for the recovery of light-firing raw materials suited to the brick industry and a range of other materials for the construction industry in western Sydney. Furthermore, the removal of clay/shale would increase the quantity of air space available for emplacement of wastes.

The approach to the extraction of clay/shale would vary depending upon the intended use of the material. This subsection reviews the approach to the extraction method, stockpiling and proposed extraction rates.

2.8.2 Extraction Method

Extraction operations would generally be undertaken on a campaign basis depending upon market demand for both light-firing and red-firing clay/shale and/or the on-site need for cover material. Extraction would be undertaken using ripping and pushing methods without the need for blasting. Extraction operations would typically be undertaken as follows.

- Topsoil and subsoil (where present – Cell 3 only) would be stripped to depths determined by the soil structure typically using a scraper and either stockpiled for future use in rehabilitation or directly transferred to an area awaiting rehabilitation.
- Where clay is present, it would be recovered using a scraper and stockpiled in an area not required for waste emplacement for some time or delivered by articulated truck to an area of the final landform being capped.
- Underlying shale units would be ripped using a bulldozer and either loaded directly into road registered trucks for despatch off site or into a haul truck or scraper for stockpiling either in a product stockpile or a cover material stockpile.

Where extraction depths exceed 15m, operational benches would be formed with the following criteria generally adopted.

- Operational Face Height:....15m
- Operational Face Angle:...... 70°
- Operational Bench Width:................. 20m
- Terminal Bench Width (if required):... 5m

Once the ancillary waste emplacement is operating at full capacity, it is expected that up to approximately 20 000t of clay/shale (ie. 10% of the 200 000t of emplaced waste) would be extracted each year (or recovered from the perimeter bund walls) for use as cover material on site. Larger quantities would be required if > 200 000tpa of waste is placed in the emplacement cells with potentially up to 45 000t clay/shale required during a year of maximum waste emplacement (ie. 450 000t).

2.8.3 Stockpiling

Clay/shale would be stockpiled for two main reasons.

1. It is the preference of the brick industry for stockpiles of light-firing clay/shale to be of at least 50 000t to be created to achieve a high level of blending to achieve good quality control for all material in the stockpile.
2. Material (normally red-firing material) which is in excess of market sales.

Stockpiles of light-firing clay/shale would be created in areas yet to be developed for waste emplacement. For example, clay/shale extracted from Cells 1A and 1B would be stockpiled in the footprint of Cell 2. Similarly, clay/shale extracted from Cell 2B would be stockpiled in the western side of Cell 3 beyond the optimum clay/shale extraction area. Red-firing material and undifferentiated clay/shale destined for construction projects would preferentially be loaded directly within the extraction area and removed directly from site without stockpiling. Clay/shale to be used as cover material would be transported to a defined area near the active emplacement area and stockpiled typically in stockpiles of approximately 250t to 500t.

2.8.4 Extraction Rates

Extraction rates would be determined largely by external sales of the clay/shale products. Theoretically, the average annual rate of clay/shale extraction would be approximately 200 000tpa for the proposed period of extraction. However, it is possible that during some years when above-average sales occur, up to 400 000tpa of clay/shale would be extracted and transported off site. Such larger quantities would be required in the event a subsequent contract was awarded to supply fill material. It is noted that, during those periods when there is above average clay/shale sales, the Proponent would be required to limit importation of wastes to ensure the maximum number of heavy vehicle movements are not exceeded on a daily basis.

It is proposed that, if the annual extraction level of 200 000tpa is achieved, this would be undertaken in either two or three campaigns – depending upon the stockpile area availability. For periods when annual clay/shale production is higher than the average level, the extraction rate and the length of each campaign would be increased. Almost continuous operations would occur in the event an annual production level of 400 000tpa is achieved.

2.8.5 Extraction Sequence

It is proposed that the sequence of extraction would generally follow the staged emplacement cells, namely 1A → 1B → 1C → 2A → 2B → 3A → 3B → 3C.

However, variations to this sequence could occur if the following scenarios arose.

i) There is renewed interest by the brick industry for the supply of light-firing clay/shale. In this case, it may be necessary to prioritise extraction within the optimum clay/shale area in Cell 3.

ii) A substantial quantity of clay is required to cap a completed section of the emplacement area – thereby requiring clay to be extracted from an area ahead of the above extraction sequence.

iii) In the event the Proponent receives an order for a particular type or types of raw materials that may be recovered from areas out of the sequence described above.

2.9 PROJECT TRAFFIC AND TRANSPORTATION

2.9.1 Introduction

The location of the Project Site and the nature and origins/destinations of the wastes and clay/shale deliveries dictates that the Project is reliant upon road transportation. This subsection reviews the proposed routes to be used by vehicles travelling to and from the Project Site together with the vehicle types and traffic levels.

It is noted that the upgrading of Patons Lane would be undertaken by the Proponent in accordance with the existing development consent and engineering construction certificate already issued by Penrith City Council and approved on 25 February 2005.

Figure 2.16 displays details of a typical section of Patons Lane, detail of concrete cross over and overlay pavement. The sealed width of the road would be 9m, with a 1.5m wide table drain on either side. The 2 coat 14mm/20mm hot bitumen seal will be supported by 250mm of compacted thickness DGB30 basecourse and 220mm existing sub-base pavement. The upgrade to Patons Lane would be completed prior to the receipt of any waste from the external road network.

2.9.2 Transport Routes

Figure 2.17 displays the road network in the vicinity of the Project Site and likely transportation routes. All vehicles would approach the Project Site via Mamre Road, Luddenham Road and Patons Lane. Vehicles travelling to/from the north would likely exit/enter Mamre Road from either the M4 Western Motorway or Great Western Highway. Vehicles travelling to/from the south would enter/exit Mamre Road from Elizabeth Drive and subsequently the Westlink M7.

Vehicles would not travel on local roads between the Project Site and the Western Motorway or Westlink M7 except when materials are being received from/delivered to those areas.

For planning purposes, the Proponent estimates that 80% of the truck movements to and from the Project Site would occur along Mamre Road northwards whilst the remainder of truck movements would occur along Mamre Road southwards.

2.9.3 Vehicle Types and Traffic Levels

2.9.3.1 Site Establishment

During the site establishment period, a range of goods and equipment would be transported to and from the Project Site. The principal vehicle types would be as follows.

- Low loaders delivering earthmoving equipment (up to 2 loads/4 movements per day for up to 5 days during the site establishment period).
- Table-top trucks or tankers delivering parts/equipment/fuel/drainage material for use on site (up to 4 loads/8 movements per day for 25 days during the site establishment period).

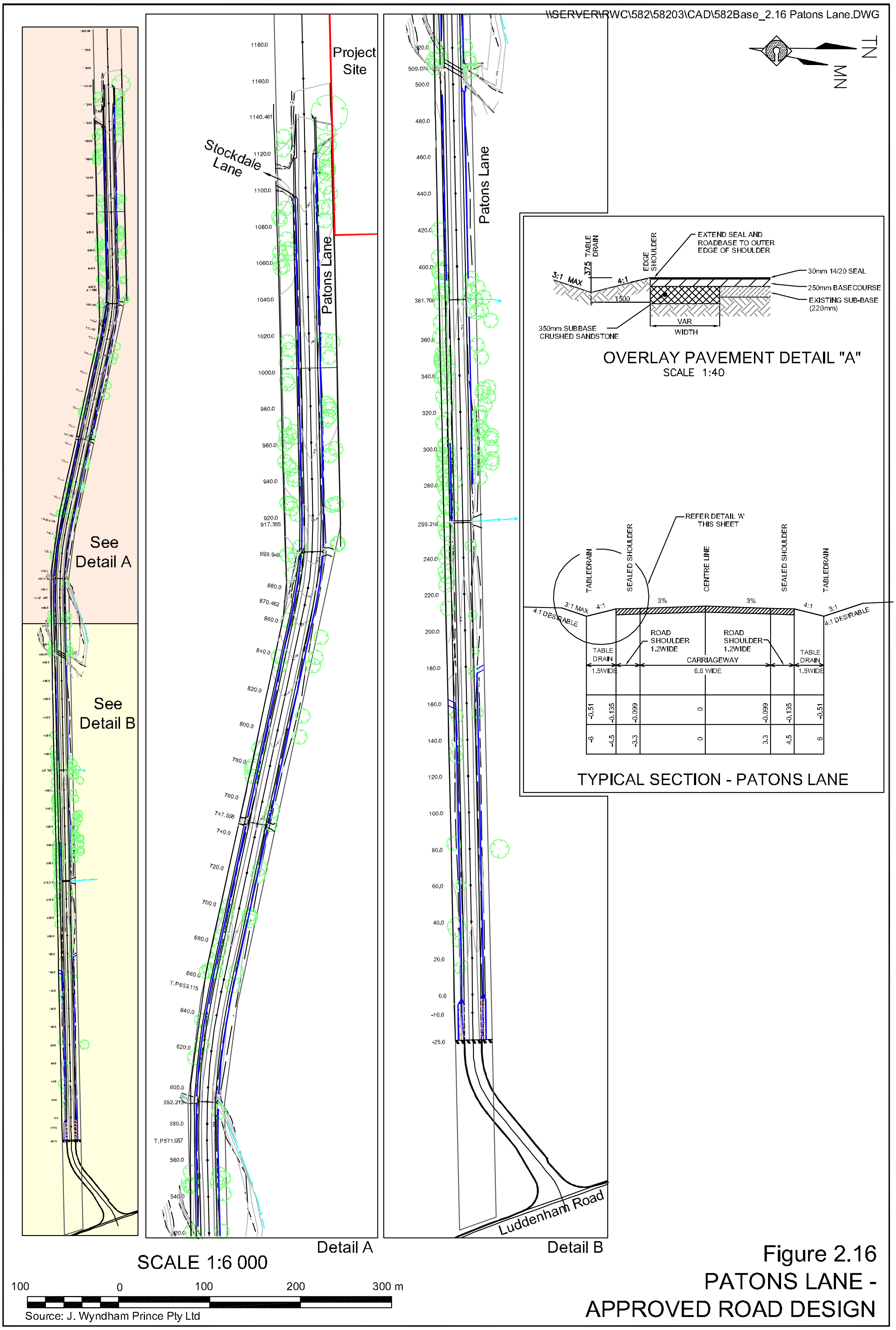
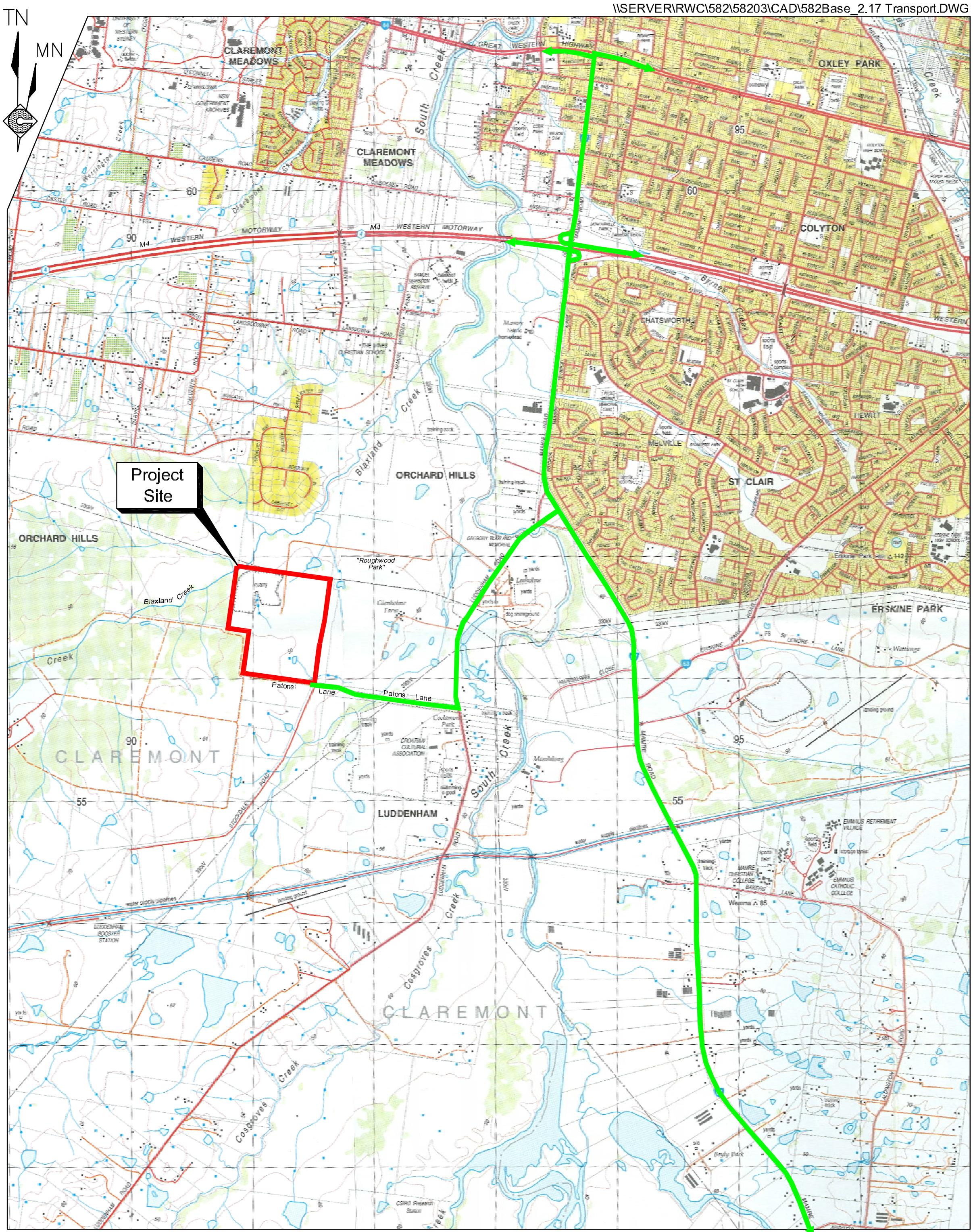


Figure 2.16
PATONS LANE - APPROVED ROAD DESIGN

\\SERVER\RWC\582\58203\CAD\582Base_2.17 Transport.DWG



to Elizabeth Drive, then
Westlink M7 Southbound

REFERENCE

Project Site Boundary
Proposed Transport Route

SCALE 1:50 000

0.5 0 0.5 1.0 1.5 2.0 2.5 km

Base Map Source: Prospect and Penrith 1:25 000 Topographic Maps

Figure 2.17
PROPOSED TRANSPORT ROUTES

- Tri-axle truck and dog trailers for use in transporting clay/shale from the site for brick manufacture or for the construction industry (up to 20 loads/40 movements per day throughout the entire site establishment period).
- Light vehicles used by employees, couriers and visitors (up to 25 return vehicle trips (50 movements per day).

2.9.3.2 Operations – Heavy Vehicles

Waste Receipt

Heavy vehicles transporting waste to the Project Site would typically range from two axle rigid trucks including covered open bin vehicles (roll on/roll off) and compactor vehicles, truck and dog trailers, six axle semi-trailers and B-doubles. For the purposes of the assessments of impacts of heavy vehicles delivering waste to the Project Site, four levels of waste deliveries are proposed which, based on an average load of 20 tonnes, would generate the heavy vehicle movements listed in **Table 2.4**.

Table 2.4
Average Daily Heavy Vehicle Movements for Waste Deliveries

Scenario	Annual Waste Deliveries	Average Daily Deliveries	Average Daily Heavy Vehicle Movements*
1	200 000t	740t	74
2	300 000t	1090t	110
3	450 000t	1640t	164
4	600 000t	2180t	220
* Assumes receipts on Saturday = 50% weekday quantities			

Clay/shale Despatch

Trucks transporting clay/shale from the Project Site would invariably be truck and dog trailers carrying an average 30t load. For the purposes of the assessments of impacts of heavy vehicles transporting clay/shale from the Project Site, three production levels are proposed which, based on an average load of 30 tonnes, would generate the heavy vehicle movements listed in **Table 2.5**.

Table 2.5
Average Daily Heavy Vehicle Movements for Clay/Shale Despatch

Scenario	Annual Clay/shale Despatched	Average Daily Clay/shale Despatched	Average Daily Heavy Vehicle Movements@
1	200 000t	800t	54
2	300 000t	1200t	80
3	400 000t	1600t	108
@ Assumes clay/shale despatched Mondays to Fridays only			

Recycled / Re-processed Product Despatch

The products produced by the recycling and re-processing plant would be despatched from site, with a small proportion as backloads in heavy vehicles carrying an average 25t load. For assessment purposes, it is estimated approximately 20% of the recycled products are backloaded and four production levels are considered. The production levels are their corresponding average daily movements are listed in **Table 2.6**.

Table 2.6
Average Daily Heavy Vehicle Movements for Product Despatch

Scenario	Recycled/Re-processed Products Despatched	Average Daily quantity Despatched	Average Daily Movements#
1	80 000t	290	20
2	120 000t	440	30
3	150 000t	545	38
4	160 000t	580	40
# Assumes products despatched on Saturday = 50% weekday quantities			

Cumulative Heavy Vehicle Traffic Movement

In order to establish a realistic cap to place on overall heavy vehicle traffic levels, the operational scenarios listed in **Tables 2.4** to **2.6** and their heavy vehicle movements were considered collectively for each scenario. It is noted that, whilst Scenario 1 involves the delivery of 600 000tpa of waste, a smaller proportion of recycled products would be transported off site as a substantial proportion of the waste delivered would likely be unable to be recycled / re-processed – such as low level contaminated soil (meeting the definition of general solid (non-putrescible) waste).

Table 2.7
Heavy Vehicle Transport Scenarios

Scenario	Waste Deliveries		Clay/Shale Despatched		Recycled / Re-processed Products Despatched		Total Truck Movements
	Quantity	Av. Daily Movements	Quantity	Av. Daily Movements	Quantity	Av. Daily Movements	
1	600 000	220	-	-	150 000	38	258
2	450 000	164	200 000	54	160 000	40	258
3	300 000	110	300 000	80	120 000	30	220
4	200 000	74	400 000	108	80 000	20	202

Based on the scenarios listed in **Table 2.7**, the maximum average heavy vehicle movements for deliveries of wastes to the Project Site or clay/shale and recycled/re-processed products from the Project Site would vary from 202 to 258 per day (101 to 129 loads). In reality, whilst these scenarios are based on average levels, above average traffic levels would occur, not necessarily for all three materials on the one day. It is therefore proposed to set a maximum number of heavy vehicle movements at a level of 15% above the average level for Scenario 1 in **Table 2.7**, ie. 296 movements or 148 loads per day.

During the operational life of the facility, there would be periods at the start and finish of each extraction campaign where low loaders would be used to deliver/remove earthmoving equipment. Other trucks likely to travel to and from the Project Site during operational periods include those delivering fuel, tyres, gravel for leachate drainage, leachate piping, etc. For the purpose of predicting traffic-related impacts, it is anticipated these other trucks would generate up to 10 additional truck loads or 20 additional heavy vehicle movements, Monday to Saturday. Hence, the maximum daily heavy vehicle movements would be 316.

2.9.3.3 Operations – Light Vehicles

The number of light vehicles travelling to and from the Project Site daily would typically vary between 20 and 30 or generating between 40 and 60 light vehicle movements. These movements would be concentrated at the beginning and end of each operational day. Typically, morning and afternoon light vehicle levels would be between 10 and 15 with the remainder spread throughout the remainder of the day. On-site parking for light vehicles would be constructed during the site establishment period, adjacent to the site office (20 spaces) and workshop (5 spaces). The parking adjacent to the office would be provided in two banks of 10 on the northern and eastern side of the compound (see **Figure 2.5**).

2.10 PROJECT STAGING, HOURS OF OPERATION AND PROJECT LIFE

2.10.1 Project Staging

The Proponent intends to undertake the site establishment stage in a period of approximately 6 months after which a period of approximately 12 months would elapse whilst the pad for the initial re-processing plant is constructed. During this initial period, the Proponent anticipates receiving at least 100 000tpa of waste destined for the on-site emplacements increasing up to 300 000tpa by Year 4 or Year 5.

It is currently expected the initial re-processing plant would operate for up to 18 months after which it would be progressively expanded as the area for the long term plant is progressively created. In reality, the Proponent anticipates the entire project being fully operational within 4 to 5 years of receipt of project approval.

2.10.2 Hours of Operation

Table 2.8 records the proposed hours of operation for all activities. It is noted that non-audible maintenance activities may need to be undertaken outside the nominated hours, 7 days per week, public holidays excluded.

Table 2.8
Proposed Hours of Operation

Activity	Monday to Friday	Saturday	Sunday
Site Establishment/Construction	7:00am to 6:00pm	8:00am to 5:00pm	-
Waste Receipts and Recycled Products Despatch	6:00am to 5:00pm	8:00am to 5:00pm	-
Clay/Shale Transportation	7:00am to 6:00pm	8:00am to 5:00pm	-
Extraction Activities	7:00am to 6:00pm	8:00am to 5:00pm	-
Waste Re-processing	7:00am to 6:00pm	8:00am to 5:00pm	-
Waste Emplacement Management	7:00am to 6:00pm	8:00am to 5:00pm	-

2.10.3 Project Life

The overall project life of the facility would be approximately 25 to 30 years depending on the additional airspace created through clay/shale extraction, compaction rates, type and quantity of waste receipts, re-processing efficiencies and the quantity of residual wastes. Should the ancillary waste emplacement activities be completed in Cell 3C before Year 25, the site would continue to operate as a waste recycling and re-processing facility with residual wastes transported to another licensed facility.

It is anticipated the recycling and re-processing plant would operate for approximately 25 years, thereby allowing approximately 5 years for the emplacement of waste within the Final Cell to complete the final landform. For the purposes of the project application the life of the Project would be 30 years.

2.11 EMPLOYMENT

2.11.1 Site Establishment

It is expected that between five and ten people would be employed during the site establishment period.

2.11.2 Operations

Once fully operational, the Project would directly employ approximately 20 people on a full-time basis. The Project would also provide part-time employment for up to 10 contractors on site.

The Project would also support employment within the western Sydney through flow-on benefits, including the purchase of consumables and spending of employee wages.

2.11.3 Transportation

An estimated 12 to 20 truck drivers would be employed for delivery of clay/shale and recycled/re-processed materials from the site.

2.12 INFRASTRUCTURE, UTILITIES AND SERVICES

2.12.1 Infrastructure

2.12.1.1 Internal Roads

The Proponent would construct a network of internal roads to provide access for off-road haul trucks to transport materials on site (eg. cover material) or road-registered trucks to deliver wastes to the active emplacement area(s). These internal roads would be unsealed and surfaced and graded, as required, for regular use. Where any internal roads are located close to any steep slopes or directly adjacent to in-ground leachate ponds or dams, a roadside barrier would be constructed to a height at least one half the wheel height of the vehicles travelling on the road.

The internal roads would be re-located as required throughout the life of the Project.

2.12.1.2 Wheel Wash Facility

The Proponent would install a wheel wash facility near the site office and approximately 130m from the outgoing weighbridge for all departing road registered trucks. The facility would be fitted with spreader bars, sprays and a recirculating water system.

2.12.1.3 Workshop Area

The Proponent would continue to use the existing workshop area in the northwestern corner of Cell 2 until extraction commences in that area. After that time, a new workshop area would be established near the southeastern corner of the Project Site. The workshop area would comprise a covered work area for earthmoving equipment, one or more containers for equipment and tool storage, storage of diesel, oils and greases, and parking of earthmoving equipment overnight.

2.12.2 Utilities and Services

2.12.2.1 Electricity and Lighting

Currently, no electricity is connected to the site with previous extraction-related activities, offices etc utilising power from on-site diesel generators. The Proponent has investigated a range of energy sources for electrical power requirements and accordingly proposes the use of the following.

It is proposed that diesel generators would initially continue to provide the necessary power requirements. However, it is proposed that a substation and transformer would be installed on site and three phase electricity connected to provide power for the office and facilities and to operate the recycling and re-processing plant. Initial discussions with energy providers indicate that power could be brought to site from existing lines on Luddenham Road via Patons Lane using overhead lines. Cost effective alternative power sources e.g. wind /solar would not be appropriate to generate electrical power for the sites power usage, particularly during the early stage of operation.

Lighting would be required on site during the period May to August when insufficient daylight is present between 6:00am and 7:00am and 5:00pm and 6:00pm to enable safe operation of the unloading and loading activities. Lighting would be positioned between the entrance of the Project Site and the site weighbridge and directed towards the centre of the Project Site. Lighting would also be provided in the vicinity of the site office, amenities and parking area and the proposed workshop area (see **Figure 2.4**). A mobile lighting tower would also be positioned adjacent to the active unloading area.

2.12.2.2 Water

Water is currently available on site from the internal sediment dams including the sump of the existing clay/shale extraction area, the existing water storage dam (Dam 1) and a registered groundwater bore (GW 105054). It has been established through the water balance for the Project (see Section 4.3.6) that the existing water supply should be sufficient to supply both the recycling and re-processing plant and dust control for the extraction operations and waste emplacement activities on the Project Site. Emphasis would be placed upon sourcing water for dust suppression from the on-site sedimentation dams with water drawn from the registered groundwater bore as the final source.

Potable water would be trucked to site, as required, and/or delivered in bottles.

2.12.2.3 Sewage

Sewage treatment is currently achieved using a septic tank system. The septic system would be upgraded as required to accommodate the expected number of employees on site and use by truck drivers.

The availability of sewer is not predicted to be necessary to dispose of leachate generated at the site. Aquaterra (2010) has demonstrated that by the implementation of best practice leachate controls that the site can dispose of leachate at the site, via evaporation. Aquaterra concluded that at no time will the Site's leachate storage capacity be exceeded. This modelling is very conservative and monitoring would be undertaken of the actual leachate generation, storage and disposal volumes to demonstrate that the Site would always have into the future sufficient leachate storage and evaporative disposal capacity.

2.12.2.4 Communications

The site currently has telephone lines to operate phones, faxes and internet facilities. Mobile phones would also be utilised together with two-way radios for on-site communications.

2.12.2.5 Fuel

All fuel required for earthmoving equipment either permanently or intermittently on site would be stored and dispensed from a double-skin fuel tank located within the workshop area.

2.13 SAFETY AND SECURITY

2.13.1 Site Security

The entire perimeter of the Project Site is currently fenced with standard stock fencing. Given the surrounding rural properties and the fact that the gates across Patons Lane would remain locked outside of operational hours, this level of fencing is considered sufficient for security purposes. The site would be supervised during operational hours and, in addition to the gate across Patons Lane, a security gate across the Project Site entrance would be locked at all other times.

Limited lighting would be required for security and safety purposes and would be designed to comply with AS 4282 – 1997. Security lighting would result in no significant light overspill.

2.13.2 Visitor Safety

As there would be no delivery of waste to the site by the general public, access to the general public would be very limited. In any event, appropriate signage would be installed throughout the site to ensure both waste delivery vehicles and any visitors remain within nominated areas.

As part of their induction, all on-site employees and contractors would be made aware of potential hazards and risks on-site to both staff and visitors and the appropriate management and safeguard measures required to mitigate these risks.

2.13.3 Staff Safety and Human Health

The Project Site would be operated in accordance with an appropriate occupational health and safety system, including relevant procedures, prepared in accordance with relevant safety legislation. A comprehensive integrated Safety Management Plan relating to all on-site activities would be prepared and comprehensively implemented throughout the life of the Project. Site inductions would be implemented and all staff would receive sufficient training to ensure they can complete their jobs in a safe manner.

2.14 REHABILITATION

2.14.1 Introduction

Successful rehabilitation of the Project Site is one of the Proponent's principal objectives for the overall Project. It is recognised that rehabilitation would need to be progressive to achieve both slope and soil stability and acceptable visual impacts. Progressive rehabilitation would assist in minimising the leachate generation volumes and more effective greenhouse (methane) reduction would be achieved by oxidising the methane from the rehabilitated portions of the Project Site.

This subsection reviews the intended final land use for the Project Site which provides the focus for the approach to rehabilitation together with the plans for ultimately decommissioning the site. Specific issues discussed which are relevant to the rehabilitation of the site relate to final landform, rehabilitation during the site establishment phase, design of the emplacement and bund wall capping and revegetation. The discussion concludes with a review of the staged approach to rehabilitation and post operational approach to management and monitoring of the site.

2.14.2 Final Land Use

It is intended that the bulk of Project Site would be returned to land suitable for grazing, although the northeastern corner and northern slopes of the Project Site would be revegetated with a range of woodland and riparian species for its ongoing use for nature conservation.

The substantial dams retained on site would also provide an opportunity for irrigation of the area developed for grazing.

2.14.3 Site Decommissioning

Site decommissioning would commence following the completion of waste emplacement in Cell 3C and involve the progressive reduction in recycling and reprocessing and ongoing waste emplacement. The operational area for the recycling and re-processing plant would be gradually reduced until it is no longer practical to operate in that area. Waste emplacement would commence at the northern side of the Final Cell and advance southwards.

Following the removal of all plant and equipment from the Recycling and Re-processing Area, the Final Cell would be completed through the placement of wastes not requiring re-processing. The remaining area would then be capped. Once the acceptance of wastes on site ceases, the Proponent would remove the weighbridge and associated infrastructure. It remains the Proponent's intention to retain the on-site offices until the Environment Protection Licence is relinquished. The Long-Term Leachate Evaporation Pond would be retained on site until it is no longer required. Based upon forecasts by Aquaterra (2010), the Long-Term Leachate Evaporation Pond could be decommissioned approximately 8 years after the cessation of waste emplacement activities and Dam 1 would be retained and may instead be utilised

2.14.4 Final Landform

The final landform would result in the creation of a gently sloping grassed knoll with an elevation of approximately 65m AHD (see **Figure 2.18**). The final landform (ie. following decommissioning of required leachate management structures) would incorporate four dams and perimeter diversion banks providing long-term water management and storage.

2.14.5 Design of Emplacement and Bund Wall Capping

The design of the final cap and rehabilitated surface is detailed in Aquaterra (2010). The role of the capping works is to:

- minimise rainfall infiltration and hence minimise the generation of leachate;
- create a stable landform;
- enable revegetation to grow;
- enable surface run-off from the vegetated surface to be released directly off-site, without entraining unacceptable concentrations of suspended solids; and
- control and oxidise the emission of gas.

In order to fulfil these roles a multiple layer capping system is proposed.

The design of the capping above the emplacement areas which has either a leachate underdrain system or only VENM has been emplaced has the following layers starting from the bottom to the surface.

- Gas collection layer at set intervals comprising selected C&D waste aggregates, overlaid with a geotextile.
- A seal-bearing layer of up to 100mm of crushed shale.
- A sealing layer of up to 0.3m of clay with a permeability of less than 1x 10^{-8} m/s.

- A clay moisture regulating layer of up to 200mm of crushed shale.
- A soil revegetation layer of at least 1 000mm comprising at least 750mm of on-site clay and 250mm of topsoil which may be manufactured from selected incoming waste. Also included in this layer would be a gas distribution layer which would comprise selected C&D waste aggregates and a perforated HDPE pipe.

A schematic section through the capping is displayed on **Figure 2.18**.

Gas would be passively extracted from beneath the seal-bearing layer and directed into the landfill gas drainage layer within the vegetation layer. The methane component of the gas would then be subject to oxidation by naturally occurring bacteria in the revegetation layer, thereby reducing the site's greenhouse impact (Passive Drainage and Biofiltration of Landfill Gas Using Recycled Materials- DEC, 2006).

A research project underway in Australia is the Australian Alternative Capping and Assessment Program. This and other capping studies would be reviewed and may result in changes to the design of the capping works. Any changes to the design of the capping works would be agreed with DECCW, before the works are constructed.

2.14.6 Revegetation

All areas of the final landform would be progressively revegetated soon after the areas are shaped and covered with topsoil.

Revegetation would commence during the site establishment phase principally to stabilise the constructed drainage channels and embankments and the northern face of the northern bund wall. Emphasis would be placed upon rapid stabilisation using a selected pasture mix appropriate for that season. In all areas, except where native trees and shrubs are to be planted, appropriate levels of fertiliser would be applied.

Following stabilisation of the northern face of the northern bund wall, the entire northern fence and the riparian zone adjoining Blaxland Creek would be revegetated with native trees and shrubs.

Table 2.9 lists the proposed species to be grown using both direct seeding and tubestock. These species are consistent with those that occur in the nearby Cumberland Plain Woodland and Blaxland Creek riparian zone.

2.14.7 Staging

Rehabilitation activities would be staged to follow the cessation of waste emplacement in each sub-cell. It is proposed that capping is undertaken when areas of 1ha to 2ha achieve the required height.

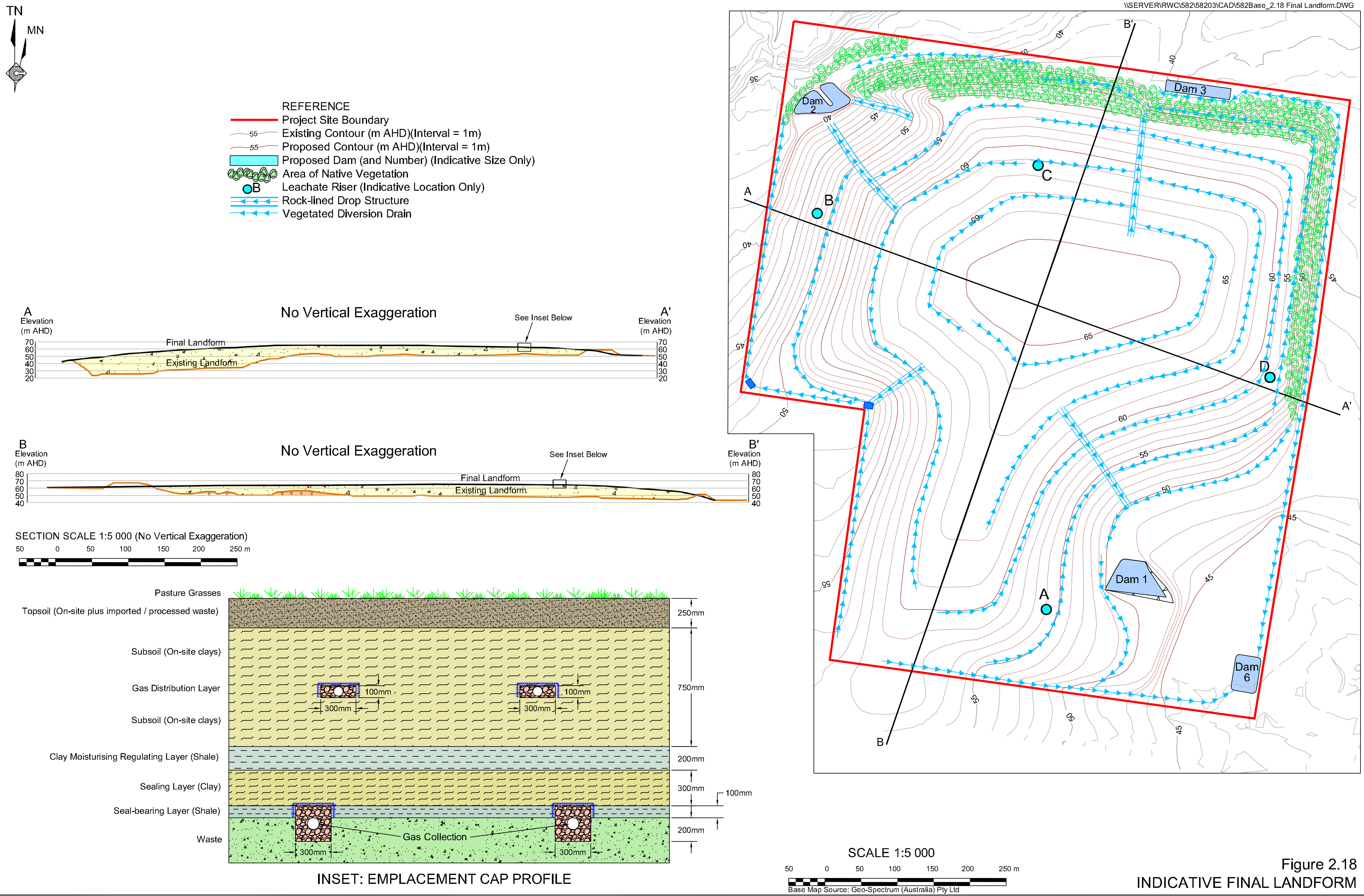


Figure 2.18
INDICATIVE FINAL LANDFORM

Table 2.9
Revegetation Species

Page 1 of 2

Northern/Eastern Bund Walls		Riparian Zone	
Common Name	**Scientific Name**	**Common Name**	**Scientific Name**
Trees and Shrubs		**Trees and Shrubs**	
Grey Box	*Eucalyptus moluccana*	Cabbage Gum	*Eucalyptus amplifolia*
Thin-leaved Stringybark	*Eucalyptus eugenioides*	Forest Red Gum	*Eucalyptus tereticornis*
[Narrow-leaf Ironbark],	*Eucalyptus crebra*	Rough-barked Apple	*Angophora floribunda*
Forest Red Gum	*Eucalyptus tereticornis*	Native Blackthorn	*Bursaria spinosa*
Spotted Gum	*Corymbia maculata*	**Groundcovers**	
Native Blackthorn	*Bursaria spinosa*		*Oplismenus aemulus*
Parramatta Green Wattle	*Acacia parramattensis* subsp. *parramattensis*	Weeping Rice Grass	*Microlaena stipoides* var. *stipoides*
Sydney Green Wattle	*Acacia decurrens*	Bordered Panic	*Entolasia marginata*
Cherry Ballart	*Exocarpos cupressiformis*	Forest Hedgehog Grass	*Echinopogon ovatus*
Groundcovers			*Solanum prinophyllum,*
Kidney Weed	*Dichondra repens*	White Root	*Pratia purpurascens*
Weeping Rice Grass	*Microlaena stipoides* var. *stipoides*	Scurvy Weed	*Commelina cyanea*
[Kangaroo Grass],	*Themeda australis*		
Wiregrass	*Aristida vagans*		
Blue Trumpets	*Brunoniella australis*		
Slender Tick-trefoil	*Desmodium varians*		
Source: GCNRC (2009) – Table 5			

2.14.8 Post Operational Management and Monitoring

Following the completion of emplacement activities in each cell the Proponent would commence post operational management. The principal components of the post operational management would be as follows.

- Capping, revegetation and sediment and erosion control maintenance.
- Leachate and gas management and maintenance.

Typical actions would involve filling depressions in the capping layer where subject to settlement to ensure that surface water does not pond above the emplaced waste. Also landfill gas bio-oxidation works would be maintained as required, for example, by moisture addition to optimise the oxidation of methane.

The Proponent intends to continue its monitoring regime throughout the latter years of the Project life and beyond the closure of the facility. It is proposed to monitor the following.

- Surface and subsurface gas (methane) monitoring.
- Leachate generation, level and disposal monitoring.
- Surface and groundwater monitoring.
- Vegetation status monitoring.
- Settlement monitoring of the capping to ensure that the design grades are maintained.

The monitoring data collected on site would be reviewed annually in conjunction with the Annual Return for the site's environment protection licences to ensure it remains meaningful. Any appropriate adjustments would be discussed with the DECCW.

2.15 ALTERNATIVES ASSESSMENT

2.15.1 Introduction

The Director-General's Requirements for the Project (see **Appendix 2**) nominate that the *Environmental Assessment* include an analysis of feasible alternatives and justification for the preferred alternative (ie. "the Project"). It is acknowledged that some alternatives considered were in fact not economically feasible nor practical, hence, they have not been outlined in this section.

Alternatives for the following project components were considered by the Proponent during the planning stages of the Project.

1. Extent of clay/shale extraction.
2. Waste types received and recycled/re-processed.
3. Recycling and re-processing area, design and construction sequence.
4. Deconstruction of the existing perimeter bund walls.
5. Height of the final landform.

2.15.2 Extent of Clay/Shale Extraction

The factors taken into account when establishing the extent of clay/shale and their implications upon the project design included the following.

1. The location/occurrence of raw materials suited for brick manufacture. The geological and ceramic investigation undertaken by R. W. Corkery & Co. (2004) defined a range of resources suitable for the brick industry. The resources were defined over the entire Project Site to elevations of 17m AHD. From a practical and economic perspective, it was recognised that the recovery of light-firing clay/shale decreased with depth and the proportion recoverable of this premium material varied across the Project Site.

   In light of the drilling/ceramic results, it was recognised that the depth of extraction could vary to elevations/depths of between 35m AHD and 25m AHD. It was ultimately decided upon extracting clay/shale in Cells 1, 2 and 3 to an average depth of 28m AHD as extraction to this depth would yield approximately 5.65 million tonnes which would provide approximately 3.85 million tonnes of clay/shale for the brick and construction industry and 1.8 million tonnes for cell lining and capping.

2. Likely quantities of clay/shale (and types) required by the brick industry and construction industry.

   Through discussions with brick and construction industry representatives, the Proponent established that annual quantities of clay/shale despatched could be generally in the order of 150 000t to 250 000t per year for the brick industry (averaging approximately 200 000t per year) and 70 000t to 170 000t for the construction industry (averaging 120 000t per year). It is recognised greater variability is likely in the supply of clay/shale when supplying clay/shale to the construction industry.

3. The likely timetable for the provision of voids for the emplacement of wastes not suited for recycling/re-processing.

   It is the Proponent's intention to extract as much clay/shale as possible from Cell 1 during the site establishment stage and following 3 years of operation. The void created would provide sufficient emplacement capacity for a life of at least 7 to 8 years during which time, extraction would proceed in Cell 2 (and perhaps Cell 3). The recovery of approximately 2.27 million tonnes of clay/shale from Cell 2 (**Table 2.1**) over a period of approximately 7 to 8 years would yield approximately 300 000t per year.

4. The recognition in *Sydney Regional Environmental Plan No. 9(2)* that the Project Site contains important quantities of light-firing clay/shale suited to brick manufacture.

   The planned sequence of extraction was also influenced by the occurrence of the clay/shale resource types on site. Emphasis has been placed upon leaving the area incorporating the optimum clay/shale extraction area as long as possible to maximise the opportunity for recovery of this more valuable light-firing clay/shale in that area.

Concluding Comment/Justification

In light of the above variables and alternatives, it is planned to extract clay/shale in the sequence Cell 1 → Cell 2 → Cell 3 to an average depth of 28m AHD at an average rate of 300 000tpa for both despatch and use on site for daily cover and capping. This approach is justified as it is considered to realistically satisfy each of the contributing factors.

2.15.3 Waste Types

The factors taken into account when selecting waste types to be accepted at the proposed facility and their implications upon the project design are as follows.

1. Extent of Putrescible Wastes

   The Proponent determined early in the design of the Project to avoid accepting wastes containing putrescible wastes principally to avoid potential problems relating to odour. In any event, it is recognised private enterprises are not permitted to manage/dispose of municipal solid wastes containing putrescible wastes.

2. The Views of the Local Community

   The Proponent established early in the overall consultation process that local residents were not at all receptive to a proposed facility that smells (ie. from putrescible wastes) or accepts asbestos or hazardous wastes.

3. Waste Sources and Types

   Waste sources identified throughout the Proponent's market assessment identified wastes that were either recyclable/re-processible or suited only for emplacement as they could not be economically recycled/re-processed. It was recognised that as the waste levy rises, the economics for recycling/re-processing some wastes will become positive.

   The principal wastes suited to recycling/re-processing are both construction and demolition (C&D) wastes and commercial and industrial (C&I) wastes. It is recognised the existing rate of recycling/re-processing C&I wastes is not as high as the C&D wastes, therefore, more opportunities/innovation are possible for recycling C&I wastes.

   The principal wastes not currently suited for recycling/re-processing are low level contaminated soils, however, in time this is likely to change with the increase in the waste levy.

Concluding Comment/Justification

In light of the above variables, the Proponent plans to accept only C&D and C&I wastes for recycling/re-processing and low level contaminated soil.

No putrescible or asbestos sheet waste would be accepted on site.

2.15.4 Recycling and Re-processing Area

Whilst no alternatives were considered regarding the preferred location of the Recycling and Re-processing Area, two alternatives were considered for the staging for the area.

Option 1: Minimal Reshaping and Use at 48m AHD

This option (the preferred option) would involve the reshaping of the area defined for the Recycling and Re-processing Area and creating a generally flat area with a 1% grade and average elevation of approximately 48m AHD. The area would be used for the recycling and re-processing plant for the life of the project until the area was required for use as an emplacement cell. All required leachate management facilities, etc. would then be installed at that stage.

Option 2: Establishment of an Interim Waste Cell and Use at 56m AHD

This option provides for the establishment of a generally flat area above an area prepared as a waste emplacement cell from the commencement of site operations typically at approximately 56m AHD. This option requires the construction of a substantial compacted clay liner on the surface of the wastes emplaced in the Recycling and Re-processing Area to the 56m AHD level and the resumption of waste emplacement following the removal of the recycling and re-processing plant.

The Proponent prefers Option 1 as this option would provide operational simplicity and avoid the need to establish an additional leachate collection system and temporary clay liner during the initial years of operation for a relatively small volume of waste. It is noted that the use of Option 1 also reduces the volume of leachate generated over the life of the Project and therefore the size of the Leachate Evaporation Pond required.

Concluding Comment/Justification

In light of the above reasons, the Proponent intends to pursue Option 1.

2.15.5 Deconstruction of the Existing Perimeter Bund Walls

It is recognised that the placement of construction and demolition waste in the eastern bund wall and part of the northeastern bund wall was in contravention of the development consent in place and the environment protection licence held by the then owner/operator. The approach to the management of the C&D waste was discussed with the then DECC regarding acceptable options. Options considered included the following.

1. Removing all C&D waste and taking it to a licenced facility – rejected because of substantial cost in removing and transporting the waste, gate fees (including the waste levy).
2. Removal of all C&D waste and placing it in an emplacement cell on site – rejected in favour of Option 3.
3. Removal of a proportion of the C&D waste from the outer face of the existing bund wall (for on-site emplacement) and encapsulation of the remaining materials towards the margin of the final landform with a compacted perimeter final bund wall providing the protection required as nominated in the DECCW's Benchmark Techniques.

The third option is preferred as it achieves a good environmental outcome at an economically affordable price.

2.15.6 Height of the Final Landform

Factors influencing the height of the final landform and their implications upon the Project design include the following.

1. Visibility

   At present, the existing perimeter bund walls have upper surfaces at approximately 45m AHD to 63m AHD and provide a generally geometric profile to observers external to the Project Site. It is preferable for the final landform to avoid being a contrasting landform compared with the surrounding rural landform, ie. with side slopes ideally <1:3 (V:H) (18º).

2. Ongoing Agricultural Use

   It is an important objective for the final landform to be returned to a form that would again be able to sustain grazing activities. Hence, the slopes of the final landform need to be suitable for grazing stock.

3. Waste Quantities and Economics

   The establishment of a facility with all emplacement areas incorporating comprehensive leachate collection systems, etc. requires a sufficient quantity of waste to be emplaced for the overall project to be profitable. Any facility that is not profitable would invariably display sub-optimal environmental outcomes.

   The options considered for the height of the final landform were 70m AHD, 65m AHD and 63m AHD. The height of 70m AHD was considered as the overall quantity of the waste emplacement cells that could be emplaced to that final height was 7.8 million m^3. The level of 63m AHD was selected as that is just below the height of the highest existing perimeter bund wall on the Project Site (64m AHD) and a level considered acceptable from a visual perspective. The intermediate level of 65m AHD was selected as an intermediate level. Notwithstanding the issue of visibility, the Proponent recognises the height of the final landform will reflect the quantity of wastes emplaced over the 30 year Project life. In the event a lesser quantity of wastes are emplaced and more waste is recycled/re-processed, the height of the final landform after 30 years would for parts of the site be less than 65m. However, it is considered fundamental to the overall Project's feasibility that the final height be retained at 65m AHD.

Concluding Comment/Justification

It remains the Proponent's preferred position to develop the overall facility with an overall capacity of 7.8 million m^3 of waste. This can be achieved with a maximum elevation of 65m AHD which generally rises between 7m and 25m above the surrounding topography.

Overall, the preferred height of the final landform (65m AHD) is considered acceptable as it achieves acceptable visible profiles (see photomontages in Section 4.7.5), achieves acceptable slopes for ongoing grazing use over much of the property and importantly provides for the emplacement of a sufficient quantity of non recyclable/re-processible wastes to financially underpin the overall Project.