Appendix 6

Geotechnical Assessment

AS/NZS ISO 9001
Certified
Davis Langdon Certification Services

REPORT

TO

CONCRETE RECYCLERS (GROUP) PTY LTD

ON

GEOTECHNICAL ISSUES

FOR

PART 3A PLANNING APPLICATION (05_157) FOR MATERIAL RECYCLING FACILITY

AT

LOT 6, DP1065574 NEWBRIDGE ROAD, MOOREBANK, NSW

8 November 2012

Ref: M22833SA6.2rpt

Jeffery and Katauskas Pty Ltd

CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

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1 INTRODUCTION

This report presents a geotechnical assessment for the proposed construction of a material recycling facility at Lot 6, DP 1065574 Newbridge Road, Moorebank, NSW. Our services were commissioned by Mr Brent Lawson of Concrete Recyclers (Group) Pty Ltd.

The site is a former landfill that has been capped. A Development Approval (DA1417/05) has been granted by Liverpool Council to carry out bulk earthworks on the site in accordance with a drawing by Asher McNeil and Partners (Drawing 9226flood01). Excavated landfill materials from the south of the site are to be spread evenly, compacted and recapped over the northern half of the site, where a construction material recycling facility is proposed. We have been asked to base our comments on the assumption that the following works have been completed at the site:

1. Finished levels are as per Drawing No 5018-06 Sheet 05 Issue A by Lyle Marshall and Associates (LMA);
2. A series of perimeter bund walls have been constructed and are in a sound and stable condition;
3. The groundwater level within the landfill is at or about RL 1m (AHD);
4. A well compacted capping of low permeability soil at least 1m thick is present; and
5. Surface gradients of the capping are sufficient to shed stormwater.

Also shown on the above referenced plan by LMA are the proposed plant, equipment and structures to be installed as part of the materials recycling facility. We are instructed that it is intended to use driven piles under those structures for support.

The stockpiles of crushed and uncrushed materials shown on the attached plan will be a maximum of 10 metres in height.

We have been asked to provide our opinion on the geotechnical issues regarding construction of the recycling facility on the completed platform.

2 COMMENTS AND RECOMMENDATIONS

As part of the DA approved works the following issues will have been addressed:

- The control of groundwater/leachate from within the landfill during excavation at the southern end of site;
- The stabilisation of the temporary cut batter slope at the southern end of site;
- The potential for acid sulphate soil conditions within the fluvial soils;
- The control of groundwater/leachate prior to and following compaction at the northern end of site; and
- The reconstruction of the western bund wall at the northern end of site and, if necessary, the northern bund wall.

As a result of these works it is our opinion that a materials recycling facility could be constructed subject to the issues summarised below being adequately addressed as part of the detailed design process.

2.1 Integrity of the Landfill and Capping

On the basis of the assumptions noted above, the landfill capping will be adequate to support the proposed stockpiles, roadways and minor structures without loss of integrity. As long term monitoring of the site will form part of the operating procedures, any loss of integrity could be quickly recognised and the operators' facilities would be available for remedial works. For example, stockpiling of materials may result in local settlements which adversely affect surface drainage; correction of this would be part of the standard operating procedures. Monitoring wells and

surface drains would be sampled and tested routinely to identify any adverse environmental conditions that may develop.

As part of the detailed design works an Operations Manual should be developed so that future operators of the site are fully aware of the need to maintain the integrity of the landfill and capping. Provided that the earthworks are satisfactorily completed, we consider that stockpiles of crushed recycled building materials may be supported on the landfill cap, provided that the stability of the perimeter bund walls is not compromised by surcharge loading. Analysis of safe set-backs etc would form part of the detailed design. If it were desired to place stockpiles close to the bund walls, then it would be a relatively straightforward exercise to install some piles behind the crest of the slope to improve stability. It will probably be necessary to raise the height of the stockpiles gradually over time to allow the underlying fill to consolidate and gain strength.

We note that the overall thickness of the capping layer will gradually increase with time as the landfill consolidates and design surface levels are maintained by adding to the cap. This will enhance the performance of the cap.

2.2 Management of Gas Migration in to the Proposed Buildings

Landfill gas is being generated from the buried waste at the site. Landfill gas is typically managed by a combination of gas membranes and venting. All buildings on the site should be constructed in a manner that will prevent the build-up of landfill gas. On-going monitoring of landfill gas within the final building structures may also be required. EIS note that since the initial investigations were completed a document titled *Draft Guidelines for the Assessment and Management of Sites Impacted by Hazardous Ground Gases* has been prepared by NSW EPA. Reference should be made to this document (or the finalised document) during the design of buildings.

2.3 Foundations for Plant and Structures

Clearly the compacted fill and capping will be subject to long term settlements, will have limited bearing capacity and will not be suitable foundations for heavy plant and structures. Any heavy and/or vibrating plant and any structures such as office buildings will have to be supported on piled foundations. The investigations to date have revealed fluvial, mainly sandy soils below the landfill. The upper soil profile was generally very loose or loose but contained medium dense layers. At depths generally between 5.6m and 11.0m medium dense sands were encountered with a thickness of several meters.

Driven piles produce the most economic solution in the soils present at the site and have the benefit of not generating any spoil. As there are no adjacent structures which may be damaged by vibration, there is no reason not to use driven piles for this project. Pre-cast concrete piles are generally the most cost-effective option. Some further assessment of groundwater conditions would be required to assess the potential aggressivity to buried steel and concrete.

The bearing capacity of driven piles will vary from point to point around the site and will have to be designed on a case by case basis. Nevertheless, end bearing capacities of around 1,000kPa will generally be achievable with a “worse case” of about 500kPa if any zones of loose sand are encountered. Allowable skin friction in the sandy soils below the landfill will range from about 5kPa in loose sand to 15kPa in medium dense sand. The above values are adequate to achieve reasonable pile capacities and in practice may be improved upon as driven piles are “self-proving” by virtue of the driving characteristics which can be used to back calculate pile capacity by means of formulae such as Hiley.

There would also be a negative factor to consider in design, being the negative skin friction which arises due to consolidation of the fill. Again, due to the nature of the fill the negative skin friction will not be of sufficient magnitude to greatly reduce pile capacities.

Alternatives to pre-cast concrete piles include timber and steel tubes. Whilst timber piles may well be suitable for lighter structures, it is unlikely that steel tube piles will offer any economic advantages. Steel screw piles would be feasible if they could penetrate the fill, but as it would not be viable to remove obstructions we do not anticipate this type of pile to be practicable. Bored displacement piles such as Wagstaff Omega pile would be feasible but more expensive than driven piles and of lower bearing capacity. Some specialised (in-house) proprietary systems such as the Red Bull pile by Civil Foundations would be technically suitable, though we doubt they would offer any economic or performance advantages.

2.4 SEPP 55

The EGIS Consulting Australia Site Audit Statement (Site Audit Number 005/PRN, dated 31 December 2001) states the site is suitable for *"commercial industrial use, including concrete recycling facility"* subject to a number of conditions. Provided that these conditions are observed it is our opinion that the site audit statement would satisfy the requirements of SEPP55 provided that:

- The integrity of the landfill caps and bunds are maintained;
- The infra-structure constructed to control water levels inside the landfill and treat any extracted groundwater are maintained;
- The groundwater level and properties (including pH) both inside and outside the landfill are monitored on a regular basis; and
- The detailed design includes suitable measures to prevent the ingress of landfill gas into buildings or enclosed spaces.

2.5 Acid Sulfate Soil

The acid sulfate soil risk map (Liverpool, 1:25000, Dept of Land and Water Conservation Ed2 1997) indicates that there is a risk of acid sulfate soil beneath the natural landform of the site. Potential Acid Sulfate Soil (PASS) has been identified at depths of approximately 2.5m below the existing landfill level. This included soil sampling in the area of the proposed excavation. As expected, the incidence of acid sulfate soil corresponds approximately with the former site level prior to landfilling. Disturbance of acid sulfate soil at the site during the initial earthworks will be addressed by implementation of an acid sulfate soil management plan.

Assuming that the groundwater level within the landfill is at or about RL 1m(AHD) and that driven piles are installed for foundations, the construction and operation of the concrete re-cycling facility should not impact on the underlying acid sulfate soil.

2.6 Water Table Monitoring

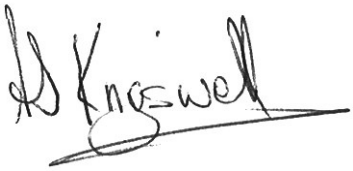
The number and location of wells to monitor the height of the water table and the composition of groundwater will depend on the final location of the facilities. As a minimum we would expect at least eight groundwater monitoring wells would be required.

Initially we would recommend that samples are obtained every three months for the first year of operation. At the end of the first year the groundwater results should be reviewed and a decision made regarding the frequency of future monitoring.

In the event that published groundwater guidelines change in the future these changes should be incorporated into threshold levels for the site (if applicable). Any changes to the threshold levels should be documented.

Should you have any queries regarding this report, please do not hesitate to contact the undersigned.

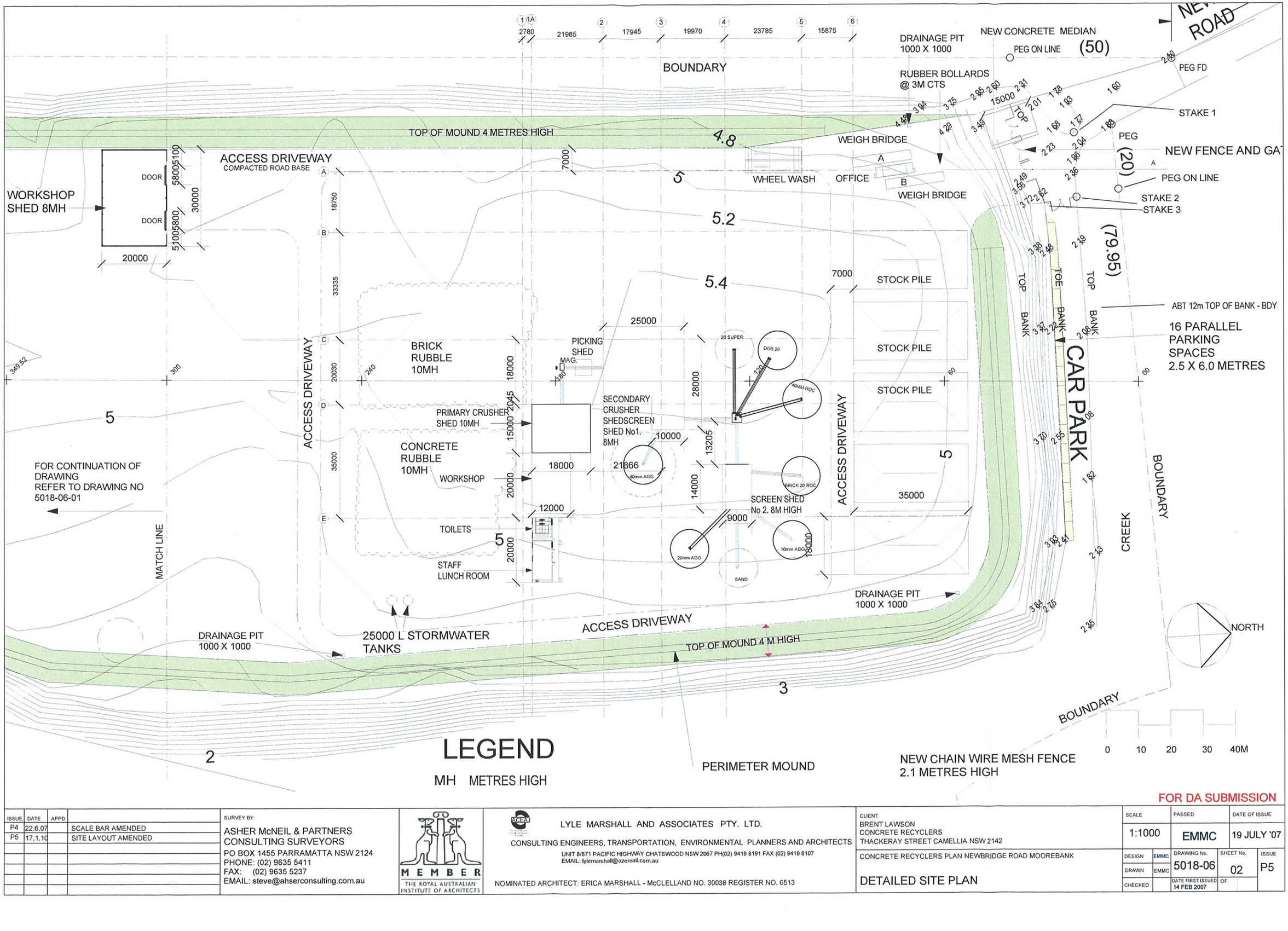
Paul Stubbs
Principal for and on behalf of
JEFFERY AND KATAUSKAS PTY LTD



Adrian Kingswell
Principal for and on behalf of
ENVIRONMENTAL INVESTIGATION SERVICES

APPENDIX A

Detailed Site Plan by Lyle Marshall and Associates
(Reference 5018-06 Sheet 05 Issue A)



FOR DA SUBMISSION

ISSUE	DATE	APPD	
P4	22.6.07		SCALE BAR AMENDED
P5	17.1.10		SITE LAYOUT AMENDED

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CONCRETE RECYCLERS PLAN NEWBRIDGE ROAD MOOREBANK

DETAILED SITE PLAN

SCALE	PASSED	DATE OF ISSUE
1:1000	EMMC	19 JULY '07

DESIGN	EMMC	DRAWING No. 5018-06	SHEET No. 02	ISSUE P5
DRAWN	EMMC			
CHECKED		DATE FIRST ISSUED 14 FEB 2007	OF	