Appendix 11

Rehabilitation Report

Landscape Architecture
Urban Design
Horticulture

OCTOBER 2014

REHABILITATION REPORT

For:

Section 75W Modification (2)
DA No. 267 – 11 - 99
Roberts Rd, Maroota

Prepared For

Neil Kennan
Nexus Environmental Planning Pty Ltd
PO Box 212
CONCORD NSW 2137

T: (02) 9736 1313
F: (02) 9736 1306
M: 0418 419 279
E: kennan@ozemail.com.au

Client

Hodgson Quarry Products Pty Ltd

CONZEPT LANDSCAPE ARCHITECTS

Contents

Conzept
Suite 101, 506 Miller St
Cammeray, NSW 2062

enquiries@conzept.net.au
www.conzept.net.au
02 9922 5312

1.0 Introduction

This report has been prepared by R. L. Frew Landscape Architectural Services Pty Ltd, T/A Conzept, to describe the proposed landscape rehabilitation strategy for the sand extraction activity located at Hodgson Maroota Quarry (Lot 1 & 2, DP 228308, and Lot 2, DP 312327).

This report has been prepared to accompany consultants plans and reports prepared for the proposal, including the planning report prepared by **Nexus Environmental Planning Pty Ltd,** and the engineering plans and reports prepared by **VGT Environmental Compliance Solutions Pty Ltd.**

The site is subject to approved sand extraction activity, and the aim of this report is to regularise and update the landscape rehabilitation process in line with the proposal.

This report should be read in conjunction with the plans and reports prepared by the above mentioned consultants, and the following plans prepared by this office, including:

LPDA 15-94 / 1 - **Cover Sheet**

LPDA 15-94 / 2 – **Bund Rehabilitation Plan**

LPDA 15-94 / 3 – **Bund Rehabilitation Details**

LPDA 15-94 / 4 – **Final Rehabilitation Plan**

LPDA 15-94 / 5 – **Final Rehabilitation Details**

The report and associated plans have been prepared with reference to the following:

- EA, s75W Modification (2) Sand Extraction Report prepared by Nexus Environmental Planning
- Site Layout and Extraction Plans by VGT Environmental Compliance Solutions Pty Ltd.
- Modified Dam Design by VGT Environmental Compliance Solutions Pty Ltd.
- Acoustic Impact & Air Quality Assessment prepared by Wilkison Murray
- The Hills Local Environmental Plan 2012
- 'Leading Practice Sustainable Development Program for the Mining Industry' Commonwealth Government 2006
- Site Analysis and inspections during November 2014

2.0 Objectives

The objectives of the Landscape Rehabilitation Plans and Report presented here are to:

- Co-ordinate with the current application and associated reports and plans

Conzept
Suite 101, 506 Miller St
Cammeray, NSW 2062

enquiries@conzept.net.au
www.conzept.net.au
02 9922 5312

- Update the proposed rehabilitation methodology in line with the proposed modified staging, regularised extraction process and final extraction levels
- Propose a temporary landscape rehabilitation process for temporary bunding associated with the delineation of staged extraction cells
- Propose a permanent landscape rehabilitation process and methodology for permanent bunding associated with the final extraction cells and completing perimeter bunding to the site
- Propose a final rehabilitation treatment and methodology to suit the proposed final extraction levels and profile of the site
- Implementation of a landscape maintenance programme which will help assure the success of the proposed rehabilitation works

3.0 Visual Analysis

The site is located in Maroota at the intersection of Old Northern Road and Roberts Road, and is approximately 29.5 Hectares in size.

Whilst the subject site has undergone modification due to the nature of the activities including sand extraction for a period of time, the character of the surrounding natural areas is typical of **Shale – Sandstone Transitional Forest**. The proposed landscape rehabilitation plan proposes to largely reinstate this character, with a range of endemic plant species selected from local vegetation Community lists, and either harvested locally or purchased from a certified seed supplier.

Landscape bunds created as part of the initial rehabilitation works create a visual landscaped buffer around portions of the perimeter to the site, specifically along the southern portion of Old Northern Road & Roberts Rd. These create a visual buffer to these areas of the site, and the bunds will be extended as part of the completed landscape rehabilitation for the site (refer to LPDA 15-94 / 2 – **Bund Rehabilitation Plan**)

4.0 Rehabilitation Strategy

4.1 Protection of Existing Vegetation

As the subject site is proposed for sand extraction in its entirety, the focus of tree and vegetation protection would be limited to the existing vegetation to the perimeter of the site, including the vegetated earth bunds, which were created as part of the initial approval of the extraction works. These bunds will be extended in accordance with the proposed Bund Rehabilitation Plans, revegetated and the resulting area shall be treated as a 'no go' zone.

Temporary chain-mesh style fencing may be erected to protect these bunds, however, as they are at the perimeter of the site, and will be completed in line with the latter stages of staged cell extractions, it is unlikely the areas will be disturbed once planted.

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Suite 101, 506 Miller St
Cammeray, NSW 2062

enquiries@conzept.net.au
www.conzept.net.au
02 9922 5312

4.2 Cell Extraction & Revegetation

'All Works – Phases' Plans prepared by **VGT Environmental Compliance Solutions Pty Ltd** address the proposed Cell extraction for the site, which modifies and regularises the process outlined in the existing approval.

The updated process and methodology proposes that the extraction works will occur across the face of a number of active cells. The resulting extracted cells will primarily allow access for heavy machinery to extract from cells behind those extracted.

As a result, the proposed landscape rehabilitation of areas within the site can only occur when the active cells have been fully extracted all the way to the site perimeter and are no longer being utilized by machinery to access further cells, or for stockpiling etc.

As soon as areas within the site have been fully extracted as outlined above, these areas shall be made available for rehabilitation in accordance with the detailing and specification outlined in the rehabilitation plans, and fenced off to allow for undisturbed regeneration.

4.3 Top Soil Stripping & Storage

Areas of the site approved for extraction works shall have the topsoil level stripped and stockpiled for later re-use. This material will be referred to as **'Topsoil'**

Following topsoil stripping, approximately 500mm of the next layer of soil shall also be stripped and stockpiled, in a similar manner to the topsoil. The purpose of stripping this additional layer of soil is for reuse in temporary and permanent bunding (refer to LPDA 15-94 / 2 – **Bund Rehabilitation Plan**) and also to replicate the soil profile in rehabilitated areas as close to the existing growing conditions of the vegetation community to be re-established. This secondary stockpiled material will be referred to as **'Subsoil'**

It is proposed to stockpile the topsoil & Subsoil in a convenient location which is both out of the way of daily activity, however, easily accessed for re-use in the creation of bunds and for preparation of rehabilitation areas as necessary.

The **Stage 5 extraction cell** as identified on the 'All Works - Phases' plan prepared by **VGT Environmental Compliance Solutions Pty Ltd,** and as identified on the **Final Rehabilitation Plan (**LPDA 15-94 / 4) prepared by our office, is the location nominated for initial stockpiling.

The location of stockpiled material may change depending on the of nature extraction works on site, and the re-use of stockpiled material will occur in line with extraction operations and the timing schedules outlined in the planning report.

Conzept
Suite 101, 506 Miller St
Cammeray, NSW 2062

enquiries@conzept.net.au
www.conzept.net.au
02 9922 5312

4.4 Bunding Construction & Staging

There will be two types of bunding associated with the proposed staging of the extraction works. These will be **Temporary Bunds**, and **Permanent Bunds**. Both type of bunds will essentially be built in the same way, with the same form and profile (as detailed in 'Hodgson Maroota Quarry Schematics' Plans prepared by **VGT Environmental Compliance Solutions Pty Ltd &** LPDA 15-94 / 3 – **Bund Rehabilitation Details,** however, the top profile layer and final planting treatments shall vary as follows:

4.4.1 Temporary Bunds

Temporary bunds shall be constructed with a profile as detailed in the plans prepared by **VGT Environmental Compliance Solutions Pty Ltd** from site material, including stockpiled subsoil material where available.

The finished layer for planting shall consist of a 300mm layer of site topsoil, which shall be laid with turf stripped from site.

The completed turfed bund shall then be the subject of landscape maintenance in accordance with the **Landscape Maintenance Schedule** (Item 4.7)

4.4.2 Permanent Bunds

Permanent bunds shall be constructed with a profile as detailed in the plans prepared by **VGT Environmental Compliance Solutions Pty Ltd** from site material, including stockpiled subsoil material where available, as per temporary bunds. Material from temporary bunding may also be used.

The finished surface for planting shall consist of a 300mm layer of site topsoil, over which shall be pegged a layer of approved jute matting material.

Jute matting shall be pocket planting with specified planting as detailed in Details 05 & 06 on LPDA 15-94 / 3 – **Bund Rehabilitation Details,** and finished with a 75mm layer of approved organic mulch.

The completed landscaped bund shall then be the subject of landscape maintenance in accordance with the **Landscape Maintenance Schedule** (Item 4.7)

4.5 Final Rehabilitation Treatment

This section addresses the intended finished results for final rehabilitation, including the process involved and the source of the species to be planted on site.

Conzept
Suite 101, 506 Miller St
Cammeray, NSW 2062

enquiries@conzept.net.au
www.conzept.net.au
02 9922 5312

4.5.1 Seed Collection / Certified Stock

To ensure the re-establishment of plant communities that are indigenous to the area, native seed and plant cuttings shall be collected at appropriate times from the site and surrounding areas by a qualified and experience horticulturalist or bush regeneration specialist that has knowledge and proven experience in this work.

The majority of seed collected from the area shall be utilized in the hydromulch mix to be sprayed on site in accordance with LPDA 15-94 / 4 – **Final Rehabilitation Plan.** The remainder of the seed, together with site cuttings, shall be propagated under appropriate nursery conditions, and maintained until the resultant seedlings are ready to be planted on site in line with the proposed planting schedules and finishes.

Seed and cuttings shall be collected treated, stored and propagated by an approved specialist to ensure the quality, quantity and viability of the seed and plant stock for planting on site. The approved horticulturalist shall be appointed and co-ordination maintained during the extraction operations to ensure that the seed and cutting quantities are in line with those required for the areas made available for rehabilitation on an on-going basis.

If the seed and cutting quantities and quality collected and propagated cannot be achieved, or the range of specified species available using collection techniques, plant material may be sourced from a local supplier, who is able to certify seed or plant stock has been locally sourced and grown.

4.5.2 Rehabilitation Treatment

There are three (3) types of landscape rehabilitation treatments proposed; hydromulching, pocket planting in natural material & pocket planting in jute matting (for steeper grades).

1. **Hydromulching:** This treatment is proposed for the open, general flat areas of the site, located centrally. The process is detailed in **Detail 10** of LPDA 15-94 / 5 – **Final Rehabilitation Details,** which includes preparation and specification for the proposed hydromulching works

2. **Pocket planting in natural finishes:** This treatment is proposed for the finished embankments located around the perimeter of the site (in accordance with the 'Hodgson Maroota Quarry Final Landform' Plan prepared by **VGT Environmental Compliance Solutions Pty Ltd.** This treatment is proposed for embankments up to a **maximum grade of 1 in 3.** The process is detailed in **Detail 7 & 8** of LPDA 15-94 / 5 – **Final Rehabilitation Details,** which includes preparation and plant schedules for this process.

3. **Pocket planting in Jute Matting:** This treatment is proposed for the finished embankments located around the perimeter of the site (in accordance with the 'Hodgson Maroota Quarry Final Landform' Plan prepared by **VGT Environmental Compliance Solutions Pty Ltd.** This treatment is proposed for embankments **which exceed a grade of 1 in 3.**

Conzept
Suite 101, 506 Miller St
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02 9922 5312

The process is detailed in **Detail 7 & 11** of LPDA 15-94 / 5 – **Final Rehabilitation Details,** which includes preparation and plant schedules for this process.

4.6 Vegetation Cover & Progressive Rehabilitation

Following the establishment of soil profiles, the specified vegetation cover is to be established through the following process:

1. **Areas nominated for hydromulching:**

The central (level) areas of the site identified as areas suitable for hydromulching shall be prepared in accordance with **Detail 10** of LPDA 15-94 / 5 – **Final Rehabilitation Details.** The hydromulch mix shall be prepared and applied in accordance with the specification provided.

The hydromulch seed stock shall have two (2) components:

- A **Grass seed component** which is intended to produce a temporary vegetation cover to ensure surfaces a stabilized as the specified native seed mix germinates. The grass seed component has either an Autumn & Winter Mix, or a Spring & Summer mix to suit the period of the year for the application.
- A **Native Seed Mix,** which is made up of locally sourced and collected seed stock (refer to item 4.5.1 Seed Collection and Certified Stock) and shall be applied in the quantities and species outlined in the hydromulching specification (Detail 10)

All surfaces which fail to germinate following this application shall be reseeded.

2. **Areas nominated for pocket planting:**

The perimeter embankment areas of the site have been identified as areas requiring pocket planting, and shall be prepared in accordance with **Details 7, 8 & 11** of LPDA 15-94 / 5 – **Final Rehabilitation Details.** The pocket planting mix, layout and intended finish shall be in accordance with the schedules and sections shown on LPDA 15-94 / 5 – **Final Rehabilitation Details.** All planting sizes for pocket planting shall be **tube stock.**

All areas of pocket planting and rehabilitation shall be subject to on-going landscape maintenance (in accordance with the schedule & item 4.7).

The proposed landscape rehabilitation of areas within the site can only occur when the active cells have been fully extracted all the way to the site perimeter and are no longer being utilized by machinery to access further cells, or for stockpiling etc. Once such areas within the site become available, these areas shall be subject to rehabilitation in accordance with the detailing and specification outlined in the rehabilitation plans.

Once these areas have been hydromulched or planted, they shall be fenced off to allow for undisturbed regeneration. Temporary fencing for these areas shall be 1.8m star picket with galvanized wires to support plastic high visibility mesh fencing.

Conzept
Suite 101, 506 Miller St
Cammeray, NSW 2062

enquiries@conzept.net.au
www.conzept.net.au
02 9922 5312

5.0 Maintenance

5.1 General

After the completion of the specified rehabilitation works, vegetated areas shall be subject to a minimum landscape works period of **12 Months**. During this time the landscape contractor shall make good all defects which may occur for whatever reason.

Consolidation and Maintenance shall mean the care and maintenance of all areas undergoing rehabilitation in accordance with this report and associated plans, ensuring that a satisfactory result occurs for these areas with regards to germination and establishment.

The maintenance shall include, but not be limited to, the following items where and as required:

- Watering all landscaped areas
- Monitoring germination, Replacement planting and re-hydromulching
- Weed Control
- Make good areas of soil subsidence or erosion
- Topping up of mulched areas
- Spray / treatment for Insect and disease control
- Monitoring and controlling rabbits

5.2 Watering

All areas which have been hydromulched or pocket planted shall be watered in thoroughly following initial works, & shall be watered a minimum 3 times per week during winter, and 4 times per week during summer. Watering shall be done by hand, utilizing dam water on site. Frequency of watering may be adjusted based on whether conditions, with the objective to ensure the maximum percentage of successful established plant stock.

5.3 Monitoring Germination, Replacement planting & re-hydromulching

Areas undergoing rehabilitation shall be continually monitored until well established, with failures being replaced in line with the report and landscape specification, and failed hydromulching re-sprayed.

All replacements shall be to specification, and of a size equivalent to similar healthy species surrounding the rejected plant, or, as in the case of mature trees, to the original size and quality, as a minimum.

Conzept
Suite 101, 506 Miller St
Cammeray, NSW 2062

enquiries@conzept.net.au
www.conzept.net.au
02 9922 5312

5.4 Weed Control

Weed removal shall be conducted regularly, with hand remove all top growth roots, rhizomes and stolons of unwanted vegetation. The Regular control of all weeds is essential. The applications of pre-emergent sprays are acceptable with approved chemicals applied in strict accordance with manufacturer directions. Any spraying shall be done during calm days, to avoid winds blowing herbicides onto native planting.

5.5 Insect, Disease Control & Controlling Rabbits

The Landscape Contractor shall become familiar with the healthy appearance of the plant material and constantly monitor it for damage or pest infestations. When either of these become evident the Contractor shall immediately apply the necessary control measures.

If newly planted areas are becoming subject to rabbit attack, it may be necessary to install approved rabbit-proof fencing to the area of rehabilitation, to ensure minimal damage is done.

6.0 Conclusion

It is proposed that if the methods outlined in the report and plans are followed, then:

- The nominated extraction areas can be successfully rehabilitated, re-establishing an extensive endemic vegetation cover
- That vegetated bunds may be utilized to minimise the visual impact of the extraction works
- The proposed rehabilitation process can be staged in an effective manner so as to progressively rehabilitate areas of the site where extraction has been completed, final levels achieved, and all activity has ceased
- Appropriate standards will be set for the on-going monitoring of the rehabilitation process and maintenance works to ensure the successful establishment of rehabilitated areas on site, resulting in a sustainable, endemic landscape in character with the original **Shale – Sandstone Transitional Forest vegetation Community.**

On this basis, we recommend granting approval for this application,

Yours sincerely,

Robert Frew.

Robert Frew
BLA Cert. IV Hort. AILA RLA (Director)

Conzept
Suite 101, 506 Miller St
Cammeray, NSW 2062

enquiries@conzept.net.au
www.conzept.net.au
02 9922 5312

7.0 Plans

APPENDIX

7.1 LPDA 15-94 / 1 - Cover Sheet

7.2 LPDA 15-94 / 2 – Bund Rehabilitation Plan

7.3 LPDA 15-94 / 3 – Bund Rehabilitation Details

7.4 LPDA 15-94 / 4 – Final Rehabilitation Plan

7.5 LPDA 15-94 / 5 – Final Rehabilitation Details

Conzept
Suite 101, 506 Miller St
Cammeray, NSW 2062

enquiries@conzept.net.au
www.conzept.net.au
02 9922 5312

DOCUMENT REGISTER

Document 1:

Title: Cover Sheet

DWG #: LPDA 15 - 94 / 1

Document 2:

Title: Bund Rehabilitation Plan

DWG #: LPDA 15 - 94 / 2

Document 3:

Title: Bund Rehabilitation Details

DWG #: LPDA 15 - 94 / 3

Document 4:

Title: Final Rehabilitation Plan

DWG #: LPDA 15 - 94 / 4

Document 5:

Title: Final Rehabilitation Details

DWG #: LPDA 15 - 94 / 5

Document 6:

Title: Rehabilitation Report

CONSULTANTS INFORMATION

REFER TO PLANS, DETAILS, SPECIFICATION AND REPORTS PREPARED BY OTHER CONSULTANTS FOR ALL INFORMATION RELATING TO THAT PRACTICE, INCLUDING:

- NEXUS ENVIRONMENTAL PLANNING: PROJECT MANAGEMENT AND PLANNING
- LYLE MARSHALL & ASSOCIATES: TRAFFIC AND ACCESS
- AUSTRALIAN GROUNDWATER TECHNOLOGIES: GROUNDWATER MONITORING & MANAGEMENT
- PETER DUNDON & ASSOCIATES: GROUNDWATER
- VGT ENVIRONMENTAL COMPLIANCE SOLUTIONS: SITE LAYOUT AND EXTRACTION PLANS, MODIFIED DAM DESIGN, MODIFIED RESOURCE VOLUMES
- WILKINSON MURRAY: ACOUSTIC IMPACT ASSESSMENT, AIR QUALITY ASSESSMENT

PLANNER:

Nexus Environmental Planning Pty Ltd
PO Box 212
CONCORD NSW 2137

T: (02) 9736 1313
F: (02) 9736 1306
M: 0418 419 279
E: kennan@ozemail.com.au

GENERAL NOTE:

Figured dimensions take preference to scale readings. Verify all dimensions on site. PDF'd plans may vary slightly in Scale for that indicated on plans. Report any discrepancies to the Landscape Architect before proceeding with the work.

LANDSCAPE ARCHITECT:

Conzept Landscape Architects

Suit 101, 506 Miller Street,
CAMMERAY NSW 2062

Phone: 9922 5312
Fax: 8209 4982
Mob: 0413 861 351

www.conzept.net.au
enquiries@conzept.net.au

COUNCIL
HILLS SHIRE

CLIENT
HODGSON QUARRY PRODUCTS PTY LTD

PLANNER
NEXUS ENVIRONMENTAL PLANNING

REV	DATE	NOTATION/AMENDMENT
A	17/09/14	Preliminary concept prepared for review
B	14/10/14	Prepared for Section 75W Modification issue
D	07/09/15	Coordinated with revised final landform design

PROJECT:

PROPOSED REHABILITATION OF EXISTING SAND MINE
ROBERTS ROAD,
MAROOTA NSW

TITLE:

COVER SHEET

DWG.No: LPDA 15 - 94 / 1
ISSUE: D

STATUS: SECTION 75W MODIFICATION (2)
SCALE: 1:1500 @ A1
DATE: OCTOBER 2014
DRAWN: D.G
CHECKED: R.F

LEGEND

STAGED EXTRACTION ZONES - REFER ENGINEER'S PLANS

TEMPORARY BUND WALLS:
STAGES 1 AND 2 BUND WALL TO BE RE-TURFED WITH STRIPPED TURF FROM STAGES 1 AND 2 EXTRACTION ZONES - REFER DETAILS 1, 2 AND 3

PERMANENT BUND WALLS:
STAGES 3, 4, 5 AND 6 BUND WALLS TO BE STABILISED WITH JUTE MATTING AND POCKET PLANTING - REFER DETAILS 4, 5 AND 6

EXISTING VEGETATED BUND WALLS TO BE RETAINED

PRIOR TO COMMENCEMENT OF STAGES 1 AND 2 EXTRACTION WORKS, THE FOLLOWING SHALL BE UNDERTAKEN TO ENSURE AVAILABLE MATERIAL FOR THE CONSTRUCTION OF BUND WALLS:
- TURF TO BE STRIPPED USING A TURF CUTTER AND STORED IN AN APPROPRIATE LOCATION
- 300MM DEPTH TOPSOIL TO BE EXCAVATED AND STOCKPILED (OUTSIDE OF EXTRACTION AREAS)
- SUBSOIL TO BE TO BE EXCAVATED AND STOCKPILED (OUTSIDE OF EXTRACTION AREAS)

PRIOR TO COMMENCEMENT OF STAGES 3, 4, 5 AND 6 EXTRACTION WORKS, THE FOLLOWING SHALL BE UNDERTAKEN TO ENSURE AVAILABLE MATERIAL FOR THE CONSTRUCTION OF BUND WALLS:
- 300MM DEPTH TOPSOIL TO BE EXCAVATED AND STOCKPILED (OUTSIDE OF EXTRACTION AREAS)
- SUBSOIL TO BE TO BE EXCAVATED AND STOCKPILED (OUTSIDE OF EXTRACTION AREAS)

STOCKPILES MUST BE CLEARLY LABELLED AND IDENTIFIABLE TO ENSURE CORRECT FUTURE USE. STOCKPILING SHALL BE LOCATED IN AN AREA OUTSIDE OF SUBSEQUENT EXTRACTION AREAS AND AS CLOSE AS POSSIBLE TO THE FUTURE BUND WALLS LOCATIONS. APPROPRIATE SEDIMENT AND EROSION CONTROL MEASURES SHALL BE UNDERTAKEN TO ENSURE NO MIXING, LEACHING, RUN-OFF OR CONTAMINATION OF STOCKPILES.

CONSULTANTS INFORMATION

REFER TO PLANS, DETAILS, SPECIFICATION AND REPORTS PREPARED BY OTHER CONSULTANTS FOR ALL INFORMATION RELATING TO THAT PRACTICE, INCLUDING:

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- WILKINSON MURRAY: ACOUSTIC IMPACT ASSESSMENT, AIR QUALITY ASSESSMENT

SITE PHOTO 1: EXISTING GRASS BUND WALLS TO BE RETAINED

SITE PHOTO 2: GRASS BUND WALLS RECENTLY MASS PLANTED WITH ENDEMIC TUBE STOCK

SITE PHOTO 3: EXISTING BUND WALLS WITH ESTABLISHED ENDEMIC VEGETATION

PLANNER:
Nexus Environmental Planning Pty Ltd
PO Box 212
CONCORD NSW 2137
T: (02) 9736 1313
F: (02) 9736 1306
M: 0418 419 279
E: kennan@ozemail.com.au

LANDSCAPE ARCHITECT:
Conzept Landscape Architects
Suit 101, 506 Miller Street, CAMMERAY NSW 2062
Phone: 9922 5312
Fax: 8209 4982
Mob: 0413 861 351
www.conzept.net.au
enquiries@conzept.net.au

COUNCIL: HILLS SHIRE

CLIENT: HODGSON QUARRY PRODUCTS PTY LTD

PLANNER: NEXUS ENVIRONMENTAL PLANNING

REV	DATE	NOTATION/AMENDMENT
A	17/09/14	Preliminary concept prepared for review
B	14/10/14	Prepared for Section 75W Modification issue
C	10/11/14	Staging and bund walls revised to reflect engineer's plans
D	07/09/15	Coordinated with revised final landform design

PROJECT:
PROPOSED REHABILITATION OF EXISTING SAND MINE
ROBERTS ROAD,
MAROOTA NSW

TITLE:
BUND REHABILITATION PLAN

STATUS: SECTION 75W MODIFICATION (2)

SCALE: 1:1500 @ A1

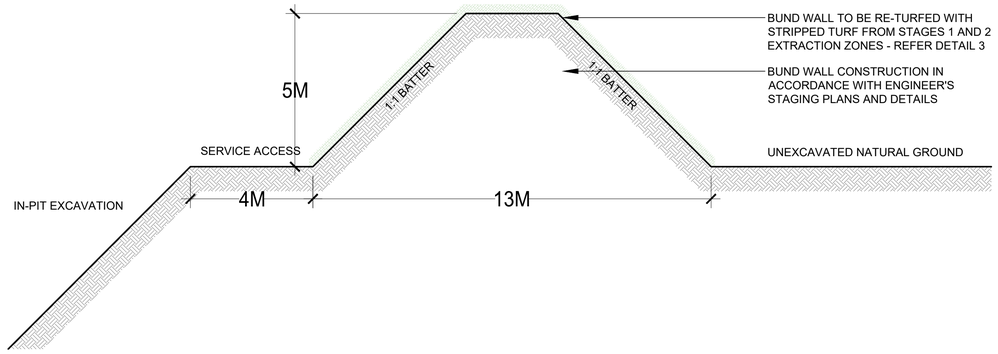
DATE: NOVEMBER 2014

DWG.No: LPDA 15 - 94 / 2

ISSUE: D

DRAWN: D.G

CHECKED: R.F



DETAIL 01: TEMPORARY BUND WALL SECTION

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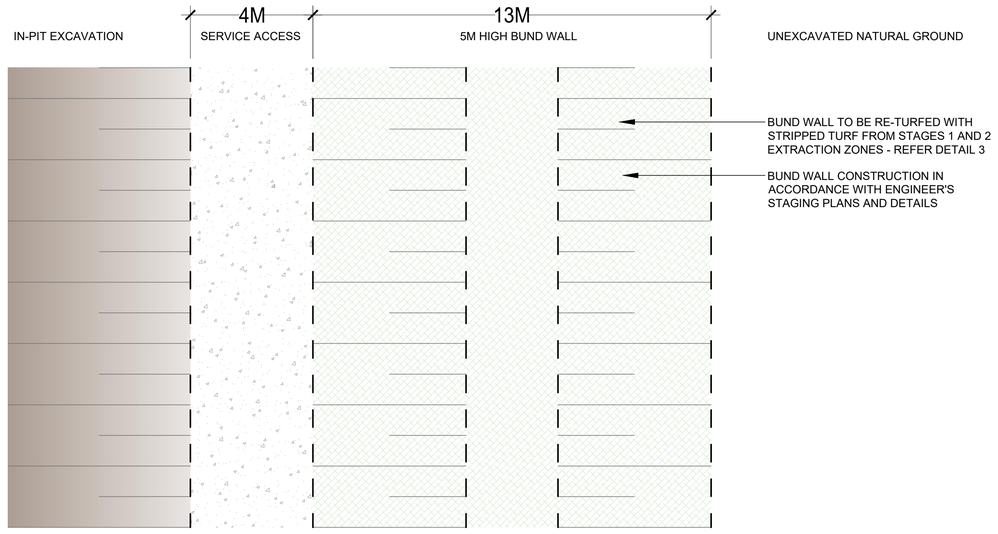
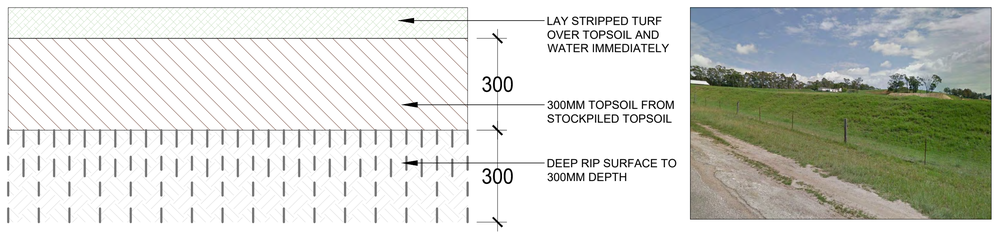


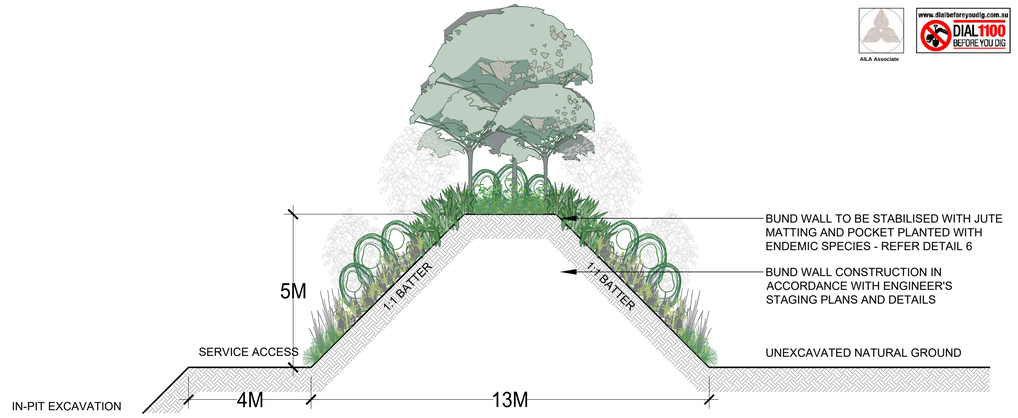
DETAIL 02: TEMPORARY BUND WALL PLAN

SCALE 1:100



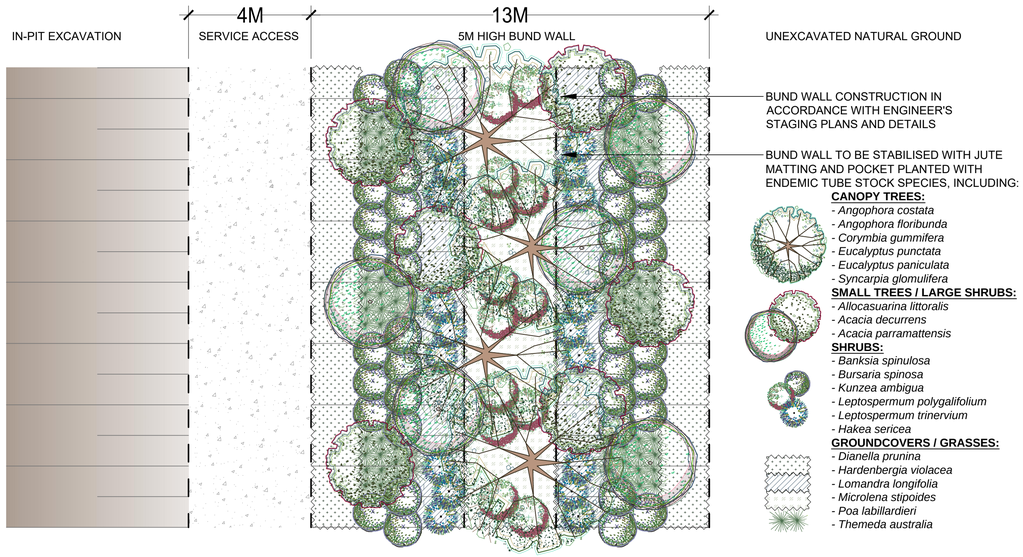
DETAIL 03: TEMPORARY BUND WALL TURFING

SCALE 1:10



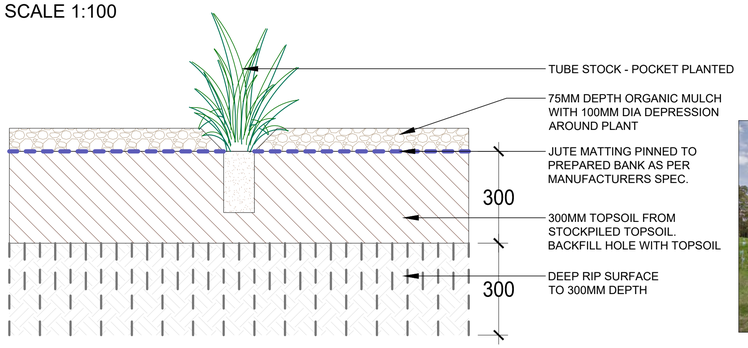
DETAIL 04: PERMANENT BUND WALL SECTION

SCALE 1:100



DETAIL 05: PERMANENT BUND WALL PLAN

SCALE 1:100



DETAIL 06: PERMANENT BUND WALL TUBE STOCK PLANTING

SCALE 1:10

MAINTENANCE SCHEDULE

GENERAL
AFTER THE COMPLETION OF THE SPECIFIED REHABILITATION WORKS, VEGETATED AREAS SHALL BE SUBJECT TO A MINIMUM LANDSCAPE WORKS PERIOD OF **12 MONTHS**. DURING THIS TIME THE LANDSCAPE CONTRACTOR SHALL MAKE GOOD ALL DEFECTS WHICH MAY OCCUR FOR WHATEVER REASON.

CONSOLIDATION AND MAINTENANCE SHALL MEAN THE CARE AND MAINTENANCE OF ALL AREAS UNDERGOING REHABILITATION IN ACCORDANCE WITH THIS REPORT AND ASSOCIATED PLANS, ENSURING THAT A SATISFACTORY RESULT OCCURS FOR THESE AREAS WITH REGARDS TO GERMINATION AND ESTABLISHMENT.

THE MAINTENANCE SHALL INCLUDE, BUT NOT BE LIMITED TO, THE FOLLOWING ITEMS WHERE AND AS REQUIRED:

- WATERING ALL LANDSCAPED AREAS
- MONITORING GERMINATION, REPLACEMENT PLANTING AND RE-HYDROMULCHING
- WEED CONTROL
- MAKE GOOD AREAS OF SOIL SUBSIDENCE OR EROSION
- TOPPING UP OF MULCHED AREAS
- SPRAY / TREATMENT FOR INSECT AND DISEASE CONTROL
- MONITORING AND CONTROLLING RABBITS

WATERING
ALL AREAS WHICH HAVE BEEN HYDROMULCHED OR POCKET PLANTED SHALL BE WATERED IN THOROUGHLY FOLLOWING INITIAL WORKS, & SHALL BE WATERED A MINIMUM 3 TIMES PER WEEK DURING WINTER, AND 4 TIMES PER WEEK DURING SUMMER. WATERING SHALL BE DONE BY HAND, UTILIZING DAM WATER ON SITE. FREQUENCY OF WATERING MAY BE ADJUSTED BASED ON WHETHER CONDITIONS, WITH THE OBJECTIVE TO ENSURE THE MAXIMUM PERCENTAGE OF SUCCESSFUL ESTABLISHED PLANT STOCK.

MONITORING GERMINATION, REPLACEMENT PLANTING AND RE-HYDROMULCHING
AREAS UNDERGOING REHABILITATION SHALL BE CONTINUALLY MONITORED UNTIL WELL ESTABLISHED, WITH FAILURES BEING REPLACED IN LINE WITH THE REPORT AND LANDSCAPE SPECIFICATION, AND FAILED HYDROMULCHING RE-SPRAYED.

ALL REPLACEMENTS SHALL BE TO SPECIFICATION, AND OF A SIZE EQUIVALENT TO SIMILAR HEALTHY SPECIES SURROUNDING THE REJECTED PLANT, OR, AS IN THE CASE OF MATURE TREES, TO THE ORIGINAL SIZE AND QUALITY, AS A MINIMUM.

WEED CONTROL
WEED REMOVAL SHALL BE CONDUCTED REGULARLY, WITH HAND REMOVE ALL TOP GROWTH ROOTS, RHIZOMES AND STOLONS OF UNWANTED VEGETATION. THE REGULAR CONTROL OF ALL WEEDS IS ESSENTIAL. THE APPLICATIONS OF PRE-EMERGENT SPRAYS ARE ACCEPTABLE WITH APPROVED CHEMICALS APPLIED IN STRICT ACCORDANCE WITH MANUFACTURER DIRECTIONS. ANY SPRAYING SHALL BE DONE DURING CALM DAYS, TO AVOID WINDS BLOWING HERBICIDES ONTO NATIVE PLANTING.

INSECT, DISEASE CONTROL AND RABBIT CONTROL
THE LANDSCAPE CONTRACTOR SHALL BECOME FAMILIAR WITH THE HEALTHY APPEARANCE OF THE PLANT MATERIAL AND CONSTANTLY MONITOR IT FOR DAMAGE OR PEST INFESTATIONS. WHEN EITHER OF THESE BECOME EVIDENT THE CONTRACTOR SHALL IMMEDIATELY APPLY THE NECESSARY CONTROL MEASURES.

IF NEWLY PLANTED AREAS ARE BECOMING SUBJECT TO RABBIT ATTACK, IT MAY BE NECESSARY TO INSTALL APPROVED RABBIT-PROOF FENCING TO THE AREA OF REHABILITATION, TO ENSURE MINIMAL DAMAGE IS DONE.

PLANNER:
Nexus Environmental Planning Pty Ltd
PO Box 212
CONCORD NSW 2137

T: (02) 9736 1313
F: (02) 9736 1306
M: 0418 419 279
E: kennan@ozemail.com.au

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Conzept Landscape Architects
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PROPOSED REHABILITATION OF EXISTING SAND MINE
ROBERTS ROAD,
MAROOTA NSW

TITLE:
BUND REHABILITATION DETAILS

DWG.No: LPDA 15 - 94 / 3
ISSUE: B

STATUS: SECTION 75W MODIFICATION (2)
SCALE: AS SHOWN @ A1
DATE: OCTOBER 2014
DRAWN: D.G
CHECKED: R.F

LEGEND

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- EXISTING VEGETATION TO BE RETAINED AND PROTECTED
- STAGES 3, 4, 5 AND 6 BUND WALLS TO BE STABILISED WITH JUTE MATTING AND POCKET PLANTING - REFER DETAILS 4, 5 AND 6
- STAGES 3, 4, 5 AND 6 BUND WALLS TO BE REMOVED WHERE WITHIN FINAL EXCAVATION EXTENTS
- EXISTING VEGETATED BUND WALLS TO BE RETAINED
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- BOTTOM OF PIT TO BE HYDRO-MULCHED WITH NATIVE SEED MIX - REFER DETAIL 10
- 1V:3H GRADE EMBANKMENTS MASS PLANTED WITH ENDEMIC SPECIES - REFER DETAILS 07 AND 08
- EMBANKMENTS WITH FINAL SLOPES STEEPER THAN 1V:3H TO BE STABILISED WITH JUTE MATTING AND POCKET PLANTED WITH ENDEMIC SPECIES - REFER DETAILS 07 AND 11
- ENDEMIC SCREEN PLANTING WITHIN PERIMETER BUFFER SETBACKS - REFER DETAILS 07 AND 08
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STOCKPILES MUST BE CLEARLY LABELLED AND IDENTIFIABLE TO ENSURE CORRECT FUTURE USE. APPROPRIATE SEDIMENT AND EROSION CONTROL MEASURES SHALL BE UNDERTAKEN TO ENSURE NO MIXING, LEACHING, RUN-OFF OR CONTAMINATION OF STOCKPILES.

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Suit 101, 506 Miller Street,
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www.conzept.net.au
enquiries@conzept.net.au

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PROPOSED REHABILITATION OF EXISTING SAND MINE
ROBERTS ROAD,
MAROOTA NSW

TITLE:
FINAL REHABILITATION PLAN

STATUS: SECTION 75W MODIFICATION (2)

SCALE: 1:1500 @ A1

DATE: MAY 2015

DWG.No: LPDA 15 - 94 / 4

ISSUE: D

DRAWN: D.G

CHECKED: R.F

SECTION AA: FINAL REHABILITATION OF SITE

SCALE 1:1000

LEGEND & SCHEDULE

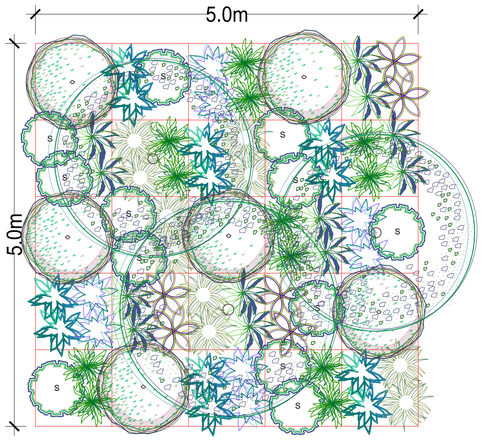
Planting shall be modified to suit embankment, existing trees and natural elements and where planting areas are smaller than the 5m grid. Refer to the Final Rehabilitation Plan for required planting areas.

TREES
Angophora costata, Angophora floribunda, Corymbia gummifera, Eucalyptus punctata, Eucalyptus paniculata, Syncarpia glomulifera
Pot size: tube stock
Planting Density: 3 per 5m grid (alternate species each 5m grid)

SHRUBS
Banksia spinulosa, Bursaria spinosa, Kunzea ambigua, Leptospermum polygalifolium, Leptospermum trinervium & Hakea sericea
Pot size: tube stock
Planting Density: 12 per 5m grid (2 of each species per 5m grid)

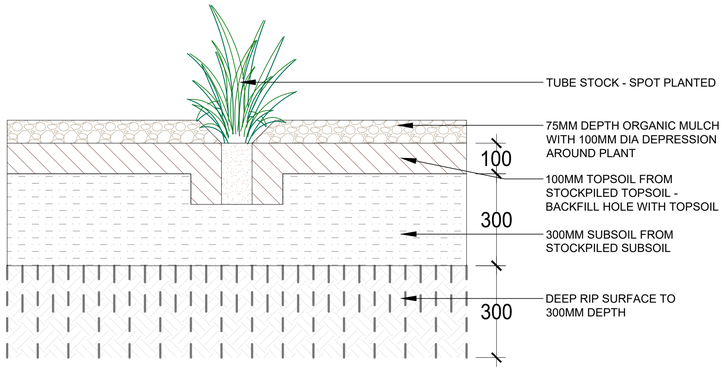
SMALL TREES / LARGE SHRUBS
Allocasuarina littoralis, Acacia decurrens & Acacia parramattensis
Pot size: tube stock
Planting Density: 6 per 5m grid (2 of each species per 5m grid)

GRASSES & GROUNDCOVERS
Dianella prunina, Hardenbergia violacea, Lomandra longifolia, Microlena stipoides, Poa labillarderi & Themeda australis
Pot size: tube stock
Planting Density: 60 per 5m grid (10 of each species per 5m grid)



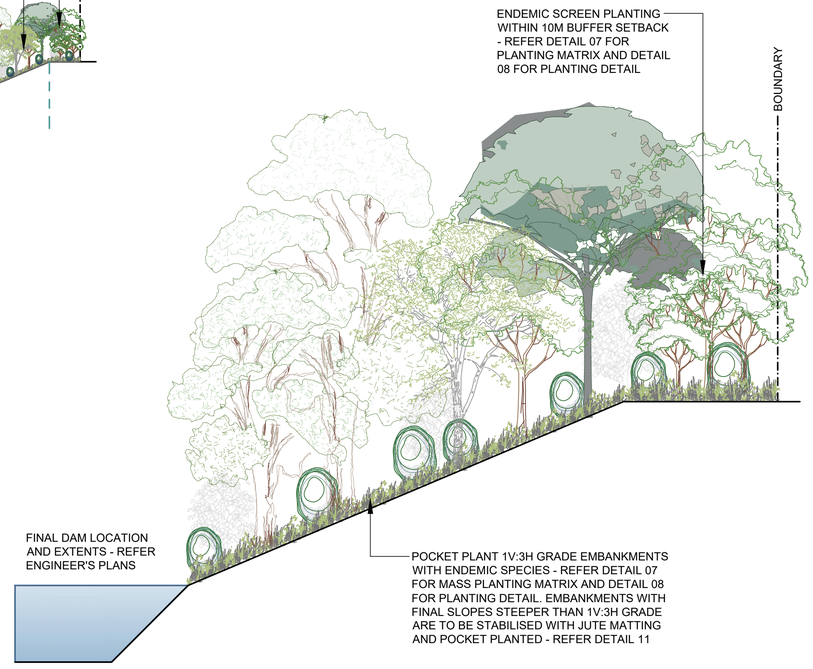
DETAIL 07: TUBE STOCK MASS PLANTING

SCALE 1:40



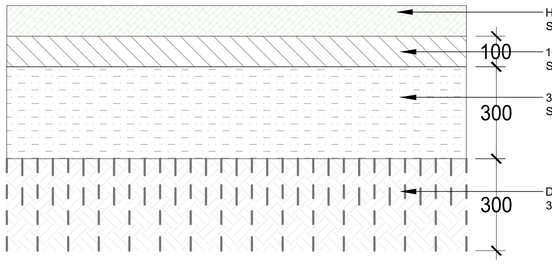
DETAIL 08: PLANTING FOR BUFFER SETBACKS AND EMBANKMENTS WITH 1V:3H GRADE

SCALE 1:10



DETAIL 09: TYPICAL BUFFER SCREEN PLANTING AND EMBANKMENT TREATMENT

SCALE 1:200



DETAIL 10: HYDRO-MULCH TREATMENT

SCALE 1:10

HYDRO-MULCHING SPECIFICATION:

Site Preparation
Areas to be seeded shall be ripped (up to 300mm deep) using a suitable machine or a chain designed for this purpose. The area should be free of weed growth, large stones or other debris prior to applying subsoil and topsoil as detailed.

Hydromulching
The application of Hydromulching Native seed shall commence immediately after topsoil has been placed or the surface prepared.

Application Rates
The required areas shall be treated by the Contractor will the following:
a. Native Seed 15 kgs per Hectare
b. Cover Crop Seed 35 kgs per Hectare
c. Fertiliser 200kg - 500 kg per hectare. Selection will depend on soil analysis results and client requirements.
d. Wood Fibre Mulch (Dyed green) 2 tonnes - 2.5 tonnes per hectare.
e. Binder Envirotack at 40- 60kg per hectare or Polymer binder maximum 250 litres per hectare. Note: The seed and fertiliser rates are a representative sample only of the quantities that should be applied per hectare.

Grass Seed Mix
A qualified ecologist shall be engaged to collect native seed from the area to be used as part of the hydromulch mix. Where appropriate quantities of seed are unable to be collected onsite, the required native seed shall be purchased from an endemic seed collector and shall include the following species, typical of the 'Sandstone - Shale Transition Forest':

Trees:
Allocasuarina littoralis, Angophora costata, Angophora floribunda, Eucalyptus acmenoides, Eucalyptus notabilis and Syncarpia glomulifera

Shrubs:
Acacia longifolia, Acacia parramattensis, Banksia spinulosa, Bursaria spinosa, Kunzea ambigua, Leptospermum polygalifolium, Leptospermum trinervium and Hakea sericea

Grasses and Groundcovers:
Dianella prunina, Hardenbergia violacea, Lomandra longifolia, Microlena stipoides, Poa labillarderi and Themeda australis

The grass seed component of the hydromulch mix shall, depending on the season, be made up of the following grasses:

Autumn / Winter Mix:	
- Oats	15Kg/ha
- Rye Grass	10Kg/ha
- White Clover	5Kg/ha
- Red Clover	5Kg/ha
Summer / Spring Mix:	
- Japanese Millet	20Kg/ha
- Dobson Ryegrass	9Kg/ha
- White Clover	3Kg/ha
- Red Clover	3Kg/ha

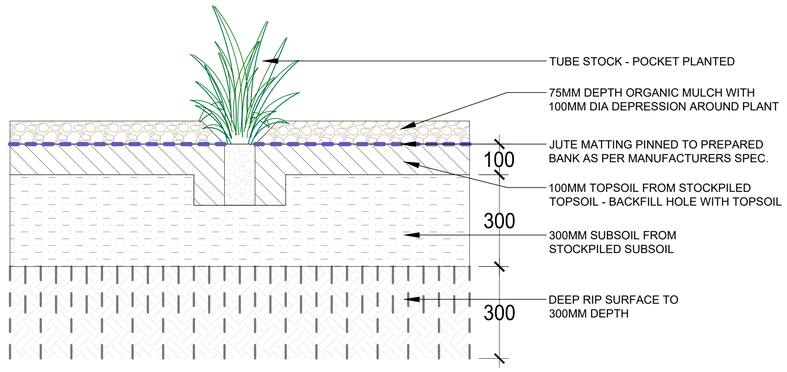
Grass seed mixes for areas where a permanent grass cover is required shal also contain:

- Rhodes Grass	5Kg/ha
- Hulled Couch	5Kg/ha

Operation
Seed, fertiliser, wood fibre mulch, water and binder shall be thoroughly mixed together with water to provide a slurry and then applied under pressure onto the area to be treated by means of hydromulching equipment specifically designed for this purpose and by operators trained n the use of this equipment.

After Care Maintenance
Watering of the seeded area shall be carried out immediately and the wood-fibre should be kept moist until a satisfactory germination occurs. After this, sufficient watering must be kept up until the native plants have reached a stage where they can survive in their own right.

Note:
1. The seeds of many Australian Native Species have a hard outer covering that must be removed or softened before germination can take place. Nature relies on bush fires to assist germination of some species by splitting the outer coating with heat. The hard seeds (eg Acacia) shall be immersed in boiled water and left to soak for up to 24 hours before planting.
2. In this operation the germination of Australia Native Species is not reliable and therefore can take up to 3 to 12 months before a result is achieved.
3. Sufaces that fail to germinate shall be reseeded.



DETAIL 11: PLANTING FOR EMBANKMENTS STEEPER THAN 1V:3H GRADE

SCALE 1:10

PLANNER:
Nexus Environmental Planning Pty Ltd
PO Box 212
CONCORD NSW 2137

T: (02) 9736 1313
F: (02) 9736 1306
M: 0418 419 279
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STATUS:
SECTION 75W MODIFICATION (2)

SCALE:
AS SHOWN @ A1

DATE:
OCTOBER 2014

DWG.No:
LPDA 15 - 94 / 5

ISSUE:
B

DRAWN:
D.G

CHECKED:
R.F

Appendix 12

Modified Final Rehabilitation Plan

LEGEND

- FINAL DAM LOCATION AND EXTENTS - REFER ENGINEER'S PLANS
- EXISTING VEGETATION TO BE RETAINED AND PROTECTED
- STAGES 3, 4, 5 AND 6 BUND WALLS TO BE STABILISED WITH JUTE MATTING AND POCKET PLANTING - REFER DETAILS 4, 5 AND 6
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STATUS: SECTION 75W MODIFICATION (2)

SCALE: 1:1500 @ A1

DATE: MAY 2015

DWG.No: LPDA 15 - 94 / 4

ISSUE: D

DRAWN: D.G

CHECKED: R.F

Appendix 13

Traffic Assessment

HODGSON QUARRY PRODUCTS PTY LTD

TRAFFIC IMPACT ASSESSMENT FOR
S75W MODIFICATION TO CONSENT 267-11-99
LOT 2, D.P. 312327 AND LOTS 1 AND 2, D.P. 228308
CNR. ROBERTS ROAD AND OLD NORTHERN ROAD,
MAROOTA.

Prepared by:

LYLE MARSHALL & ASSOCIATES PTY LTD
Consulting Engineers,
Transportation and Environmental Planners
Suite 8, 871 Pacific Highway
CHATSWOOD NSW 2067
Phone: (02) 9419-8191
Fax: (02) 9419-8107
EMAIL: lylemarshall@ozemail.com.au

Job No.: 9169
Report No.: 18/14

AMENDED MAY, 2015

CONTENTS

LIST OF FIGURES:

APPENDICES:

EXECUTIVE SUMMARY:

- The applicant Hodgson Quarry Products Pty Ltd seeks a Modification to extend the life of the existing consent for **10** years from **31st May 2015** to **31st May 2025** to complete sand extraction from the site.

- The existing consent gives approval for a maximum of *50 truck movements in* and *out* on a *weekday* and *25 truck movements in and out on Saturday*. The average load per truck is **33.5** tonnes. Daily haulage is 1**675** tonnes per day and based upon **5.5** days per week extraction equates to **286** days per annum and a maximum of **479,050** tonnes per annum extracted. There will be **no increase** over the approved **50** truck movements *in* and *out* on weekdays and **25** truck movements *in* and *out* on Saturdays.

- The Traffic Study has addressed the RMS written requirements, the transport requirements of Baulkham Hills Shire Council and the Secretary's requirements, NSW Department of Planning and Infrastructure.

- About **20** percent of the trucks carrying processed material will travel south along Old Northern Road and **80** percent will travel west on Wisemans Ferry Road. The *maximum* number of truck movements per hour is estimated to be **17**.

- Assuming an annual growth in through traffic of **1%** in Old Northern Road, the intersection of Roberts Road and Old Northern Road will continue to operate at **Level of Service A** in *Region A of Austroads Figure 5.23a*. No improvements are required.

- A twelve hour traffic count was made on **5/08/14** in Roberts Road and totaled **261** *movements including* **85** heavy truck movements.

- Automatic Counters were placed in Old Northern Road south of Roberts Road (**Station 4**), in Wisemans Ferry Road west of Old Northern Road (**Station 3**) and in Roberts Road east of Old Northern Road (**Station 5**) to record *hourly traffic volumes* by *direction* and vehicle classification on *week days* and *weekend days*. At Stations **4** and **3** the *average number of heavy vehicles* on a *weekday* was **233** and **453** respectively.

- About **91** and **86.2** percent of the *24 hour daily truck movements* occurred between **6:00am** and **6:00pm** at the *two* **Stations 3** and **4** respectively. The number of truck movements on Saturdays was **75** and **64** percent of the average weekday total at Stations **3** and **4** respectively.

- Old Northern Road and Wisemans Ferry Road have sealed pavements **6.4** metres wide plus sealed shoulders about **1** metre wide and unsealed gravel shoulders varying in width from **0.5** to **1.5** metres and carry *average daily volumes* of **1762** and **2034** respectively and carry **13** and **22 percent** heavy vehicles respectively.

- Roberts Road has a sealed pavement **5.7** metres wide for its full length.

- The Roberts Road / Old Northern Road intersection is operating in **Region A** for right-turns and **Region B** for left-turns (**Austroads Figure 5.23a**) and provides a *satisfactory Level of Service*. **SIDRA** Analysis of the existing and future **AM** and **PM** peak hour traffic volumes shows that the intersection is and will *continue to operate* at **Level of Service A**.

1.0 INTRODUCTION

1.1 Background

This report on traffic and transportation aspects of the proposed **S.75W** Modification to Consent **267-11-99** for an approved extractive industry on **Lot 2 D.P. 312327** and **Lots 1** and **2 D.P. 228308** at Maroota, has been prepared for the Environmental Assessment being undertaken by Nexus Environmental Planning Pty Ltd. Maroota is located some 40Km north of Parramatta, as shown in **Figure 1**, Regional Location Map. Hodgson Quarry Products Pty Ltd currently operates the approved extractive industry on the site.

The site of the approved extractive industry is shown in **Figure 2** Locality Plan.

1.2 Scope of Report

This report addresses the transport issues described in Section 3.0 of this report and describes our investigation and findings in respect of the following matters:-

- Existing traffic volumes on the proposed haul routes.
- Hourly and daily truck movements generated by the existing operations.
- Distribution of trucks to the State Arterial Road System.
- Proposed Access to and from the site.
- Performance of Roberts Road / Old Northern Road intersection. Standard of internal access road.
- Standard of internal access road.
- Impacts of increased truck traffic on the State Roads and nearby residential areas.
- Safety issues and measures to improve safety.

1.3 Proposed Modification

As stated in the Environmental Assessment prepared by Nexus Environmental Planning Pty Ltd *"It is proposed to modify the consent to not only modify the approved method of extraction but also to extend the life of the approved extraction to accommodate the additional material which has been determined as existing on the Site*.

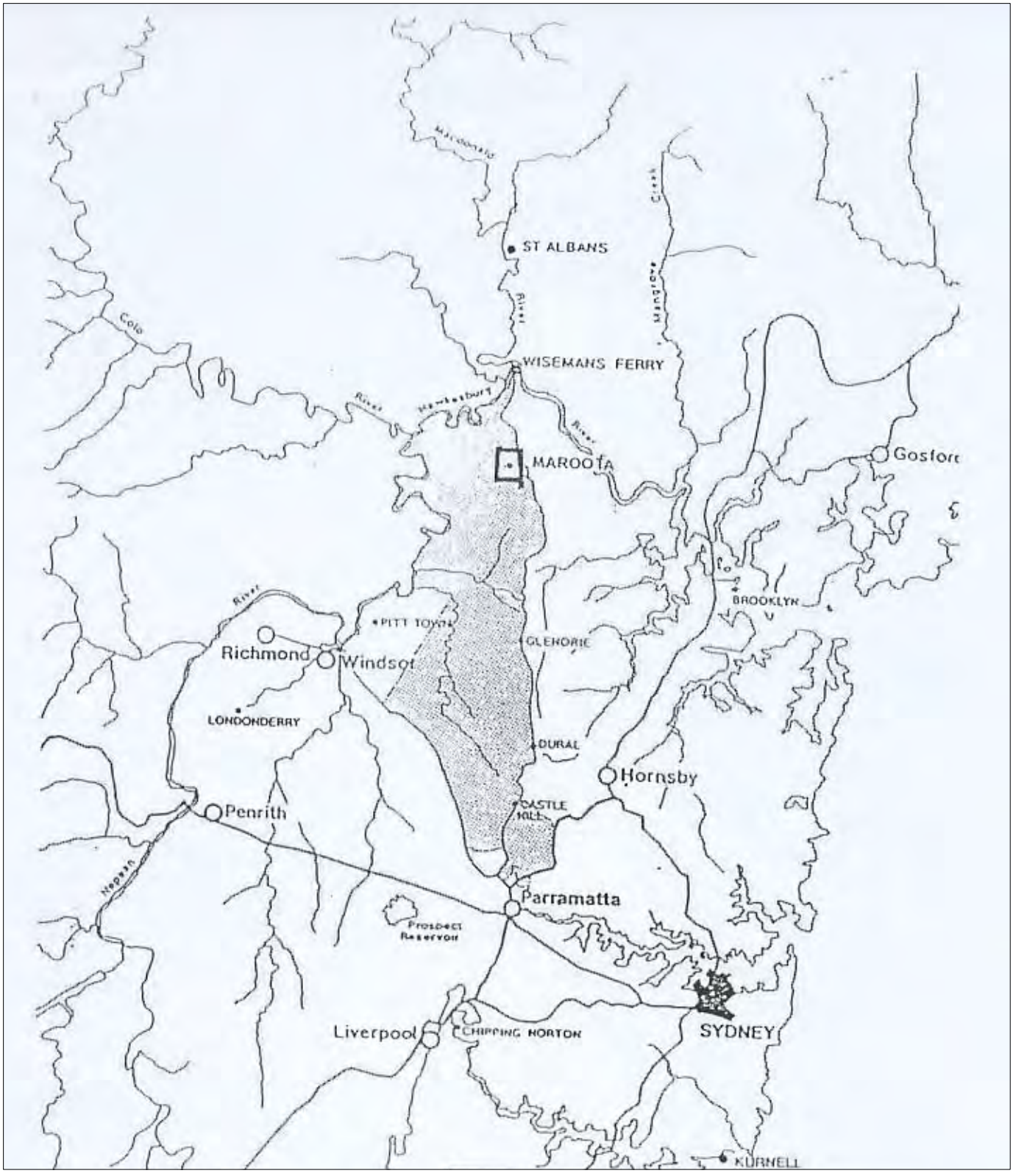


FIGURE 1
REGIONAL LOCATION MAP

HILLS SHIRE COUNCIL

SCALE 1:2000

NORTH

NORTH

LOCALITY MAROOTA
FIGURE 2 LOCALITY PLAN LOTS 1&2 DP 228308 AND LOT 2 DP312327

1.3 (Continued)

Advice from the applicant is that a conservative estimate of 2 tonnes per m^3 should be applied to determine the tonnage of material on the Site. Applying that conversion rate, there is 9,215,644 tonnes of material on the Site. The applicant has advised that a figure of 60% sand to 40% clay/gravel is generally obtained. As such, 5,529,386 tonnes of the volume calculated by VGT would be sand product.

The applicant has advised that approximately 1,000,000 tonnes of sand has been exported from the Site during the life of the extraction to date which means that approximately 4.5 million tones of sand product remains to be extracted.

Using the above formula for the rate of extraction contained in the EIS, the following applies:

- *maximum 50 trucks per day (approved).*
- *average load per truck 33.5 tonnes.*
- *1,675 tonnes per day.*
- *5.5 days per week extraction = 286 days per annum.*
- *maximum 479,050 tonnes per annum extracted.*
- *9.4 years of extraction remaining.*

Allowing from the 1 year remaining for the approved extraction, it is estimated that a further 10 years of extraction would be required after 31 May 2015 to complete the extraction of the Site.

Having regard to the errors in the original calculations undertaken by Woodward Clyde, it is now proposed to modify the consent based on the volume figures calculated by VGT.

The applicant seeks a modification to the life of the consent from 31 May 2015 to 31 May 2025".

2.0 EXISTING TRAFFIC CONDITIONS

2.1 Existing Traffic Volumes

1) Old Northern Road / Roberts Road Intersection

Twelve hour Traffic Volume and Classification Counts were made at the intersection of Old Northern Road and Roberts Road to determine the highest hourly volumes and turning movements at the intersection in order to assess the performance of the intersection.

12 Hour Volume & Heavy Trucks. Count 5/8/14

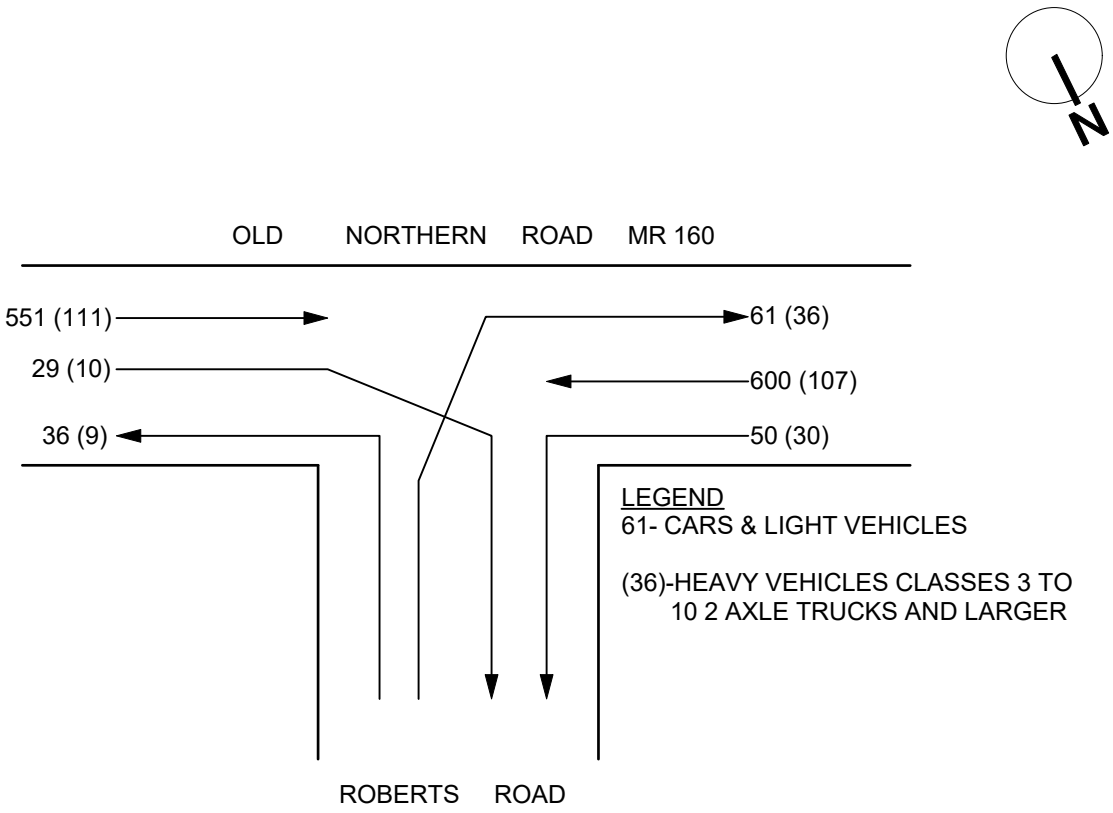
The 12 hour two-way traffic volume was **261** in Roberts Road, a marginal increase of **10** since the count in 1998. The number of heavy vehicles Austroad Classes 3 to 9 was **85** and amounted to **32.6%** of total vehicles. In 1998 the number of heavy vehicles was **78** and amounted to **31%** of total vehicles. The number of heavy vehicles Austroads Class 9 (truck and dog trailer) was **37** and amounted to **14.2%** of total vehicles.

Peak Hour Volumes

The AM and PM peak hours were from **6.30-7.30am** and **4.00-5.00pm**. The peak hour two-way through traffic volumes in Old Northern Road were **149** vphr and **154** vphr respectively. The twelve hour count showing cars and light vehicles and heavy trucks and the two *peak hour counts* are shown in **Figures 3A** and **3B** respectively.

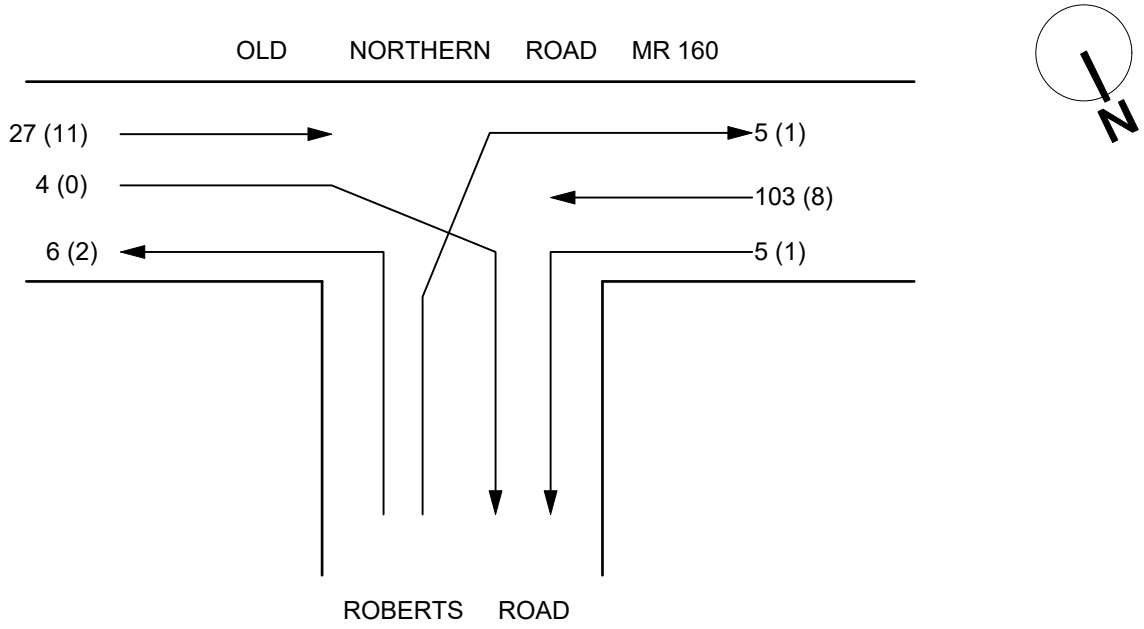
Week Day and Weekend Volumes on Roberts Road

An automatic counter was placed in Roberts Road (see **Figure 4)** to determine the time pattern and volumes of light and heavy vehicles over 7 days including a weekend. *Light vehicles* are vehicles *Classes 1 and 2* and *heavy vehicles* are *Classes 3 to 10*. Heavy vehicles Class 9 (truck and dog trailer) are used for the transport of sand from extractive industries in the area. A Classification Chart is included in **Appendix D**. The average week day and weekend two-way traffic volumes at **Station 5** were as follows:-

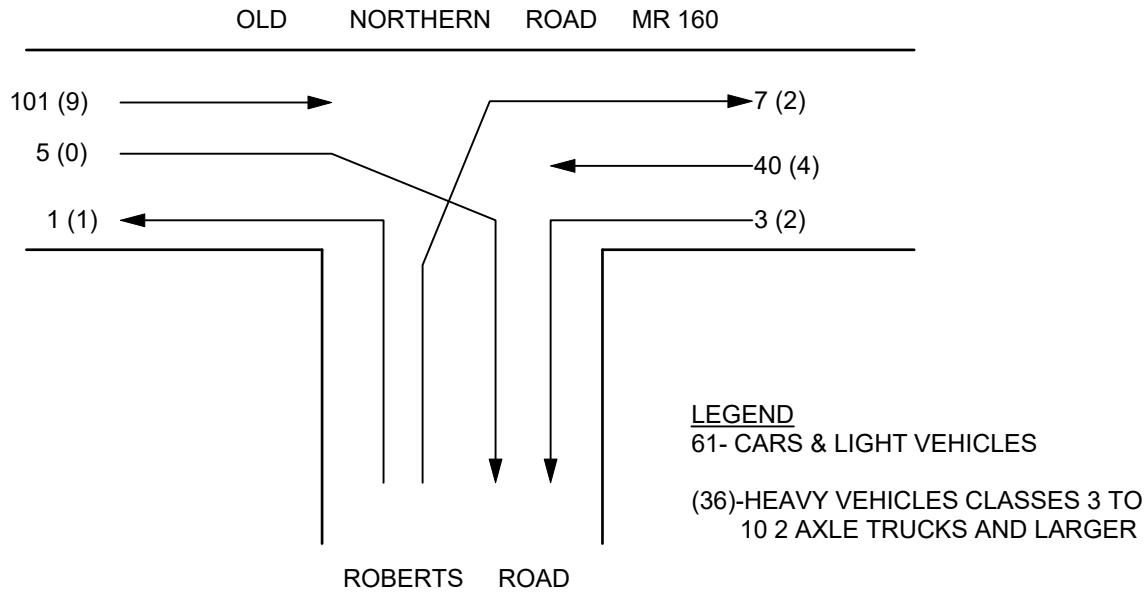


12 HOUR INTERSECTION TRAFFIC
VOLUME COUNT 6:00am-6:00pm
TUES 5-8-14

FIGURE 3A
12 HOUR TRAFFIC VOLUMES



MORNING PEAK HOUR TRAFFIC
VOLUMES 6:30-7:30AM



LEGEND
61- CARS & LIGHT VEHICLES

(36)-HEAVY VEHICLES CLASSES 3 TO 10 2 AXLE TRUCKS AND LARGER

AFTERNOON PEAK HOUR TRAFFIC
VOLUMES 4:00-5:00PM

FIGURE 3B
EXISTING PEAK HOUR TRAFFIC VOLUMES
TUES 5-8-14

2.1 (Continued)

Average Daily Volumes	Roberts Road
Average Weekday	
Total vehicles	324.4
Light vehicles	242.8
Heavy vehicles	81.6
Heavy vehicles Class 8, 9, 10	34.8
Average Weekend	
Total vehicles	199.5
Light vehicles	190.5
Heavy vehicles	9
Heavy vehicles Classes 8,9,10	0

2) Weekday and Weekend Volumes on State Main Roads

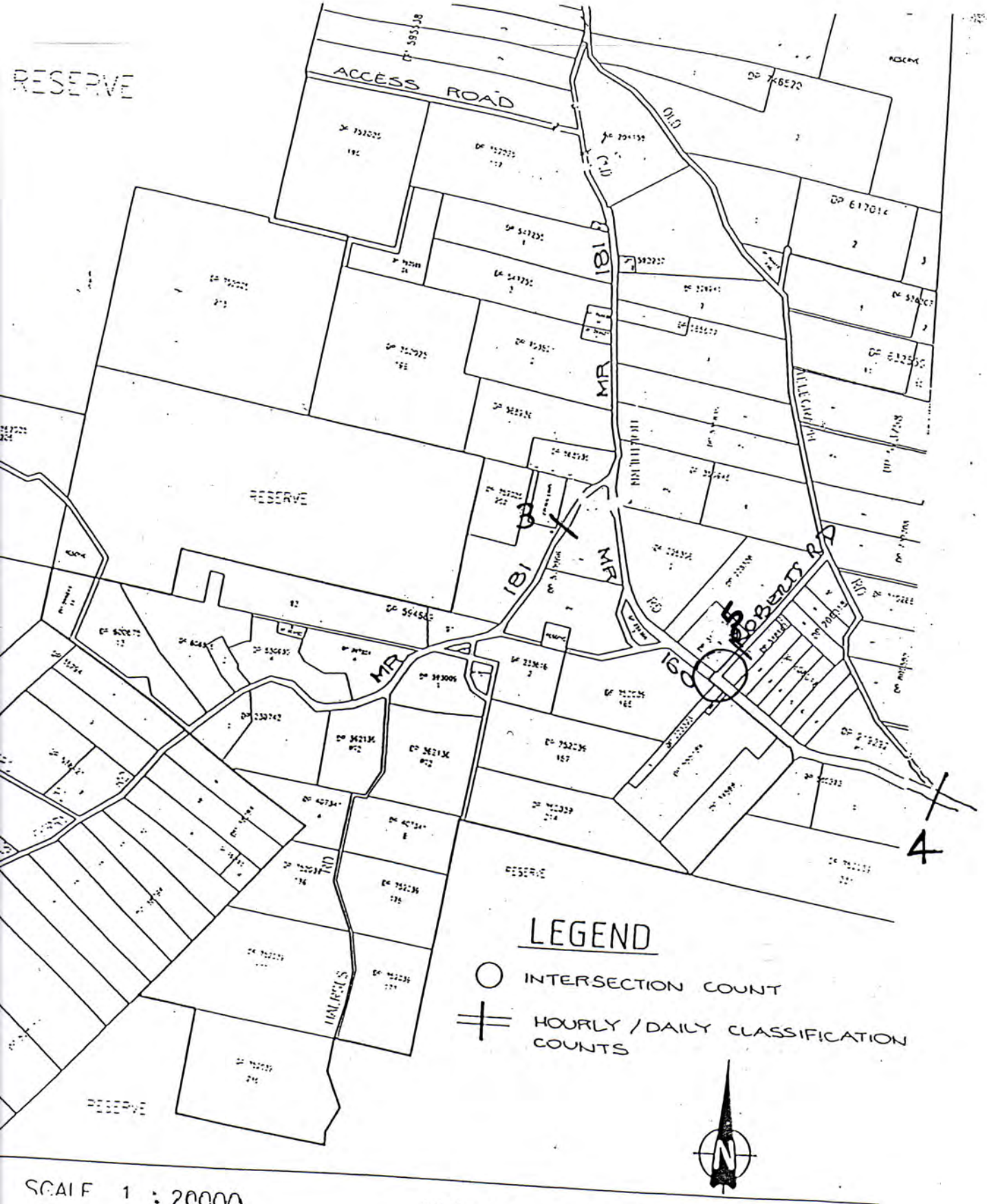
Automatic counters were placed at two locations (see **Figure 4)** on the haul road network from the subject site to determine the time pattern and volumes of light vehicle and heavy truck movements over 7 days including a weekend. A Classification Chart is included in **Appendix D.** The location of **Counting Station 4** is in Old Northern Road, a few metres south of the tee intersection where Old Telegraph Road joins Old Northern Road as shown in **Figure 4.**

The average week day and weekend two-way daily traffic volumes at **Station 3** and **4** were as follows:-

Average Daily Volumes	Old Northern Road MR160 Station 4	Wisemans Ferry Road MR181 Station 3
Average Week day		
Total vehicles	1761.6 (1923)	2034.2 (1706)
Light vehicles	1528.8 (1710)	1581.2 (1495)
Heavy vehicles	232.8 (213)	453.0 (211)
HV classes 9,10	74.4	229.4
Average Weekend		
Total vehicles	2010 (2285)	1882.5 (1927)
Light vehicles	1945.5 (2178)	1739.5 (1824)
Heavy vehicles	64.5 (107)	143.0 (103)
HV classes 9,10	11.5	38.0

A Tube Count was carried out over *7 days* in **October 1997** for our Traffic Report 28/99 at **Location 4** in Old Northern Road. The average week day volume was **1923.** From the tube count at the same location over *7 days* in **August 2014**, the *average week day volume* was **1761.6**. The *average weekday traffic volume* **fell** by **10.72%**. The annual compound decrease per annum over the *17 year period* was **0.6%.** The *Count in 1997* is in **Appendix C**.

The Counts taken in **October 1997** are shown in *brackets* for comparison with the current traffic volumes. In Wisemans Ferry Road total *vehicles have increased* by **1%** per annum compound and *heavy vehicle growth* has been **4.5%** per annum compound. In Old Northern Road total vehicles have *fallen* by **0.6%** per annum compound and *heavy vehicles* have *increased* by **0.5%** per annum compound.



SCALE 1 : 20000

LOCALITY MAROOTA

FIG 4
TRAFFIC COUNTING STATIONS

2.2 Pattern of Truck Movements on Transport Routes in Maroota

The complete counts of light and heavy vehicles for each hour of the day by direction for one week in August/September 2014 at survey Stations 3, 4 and 5 are included in **Appendix B.**

The average number of heavy truck movements Monday to Friday by hour of day from **6:00am** to **6:00pm** and for the *24 hour period* at each survey location are contained in **Table C1** in **Appendix C**.

Similar data for Saturday is contained in **Table C3** in **Appendix C**. The main findings were:-

Station 3 - **Wisemans Ferry Road**

Total heavy truck movements over 24 hours on weekdays averaged 219.2 eastbound and 233.8 westbound. However, the average truck movements over 12 hours were similar to westbound (208.6) and eastbound (204). The peak hourly movement westbound (average over 5 days) was 24.2 between 6:00 – 7:00am and the peak hourly movement eastbound (average over 5 days) was 19.4 between 10:00 and 11:00am.

Station 4 - **Old Northern Road**

The average heavy week day truck volumes northbound and southbound were similar over 24 hours (115.4 compared with 117.4) and also over 12 hours between 6:00am and 6:00pm.

The peak hourly volume was 13.0 (average over 5 days) southbound from 6:00am to 7:00am. The peak hourly volume northbound (average over 5 days) was 11.6 from 12:00pm to 1:00pm.

The counts show that about **91** percent and **86.2** percent of the *24 hour daily truck movements* occurred between **6:00am** and **6:00pm** at **survey locations 3** and **4** respectively. The *total number of truck movements* on *Saturday* was **36.2** percent of the daily *Monday to Friday total* at Station **3** and **32.7** percent at Station **4**. The number of light vehicles was significantly greater southbound on Sundays (**Appendix B**) at Station **4** than on other days.

Major Changes 1997 – 2014

Heavy vehicle volumes have doubled in both directions in Wisemans Ferry Road whereas the increase is marginal in both directions in Old Northern Road.

2.3 Road Inventory

Old Northern Road has a sealed pavement about **6.5** to **6.7** metres wide, sealed shoulders about **1** metre wide and unsealed gravel shoulders beyond which vary in width from about **0.5** to **1.5** metres. Wisemans Ferry Road is of a similar standard to Old Northern Road. The edges of the sealed pavement are subject to higher loading by heavy vehicles travelling near the edges of the road pavement and require higher maintenance to repair the broken edges. The road pavement is generally in reasonable condition.

Based upon *Table 4.1 in Austroads Rural Road Design* the desirable sealed pavement width in Old Northern Road and Wisemans Ferry Road is **7.0** metres because the **AADT** Traffic Volumes are well in excess of **1000 veh/day**.

Photographs P1 and **P3,** indicate the general pavement conditions, shoulders and line marking in Old Northern Road, in the vicinity of Roberts Road.

Roberts Road is a sealed local road and has a pavement width of **5.7** metres. The pavement condition, geometric alignment and line marking are shown in **Photographs P2, P6** and **P7**. The internal access road to the sand extraction site is located on the northern side of Roberts Road about **290** metres east of Old Northern Road and is shown in **Photograph P5.**

2.4 Operation of Roberts Road/Old Northern Road Intersection

This intersection was *up-graded prior* to October 1997 to provide a sheltered right-turn-bay in Old Northern Road, as shown in **Photograph P1**. The pavement striping continues on the northern side of Roberts Road, as shown in **Photograph P3**. The full extent of pavement markings south and north of Roberts Road can be seen in the *photographs.*

A layout of Roberts Road and Old Northern Road Intersection has been compiled from site measurements and is drawn to scale in **Figure 5**.

On Tuesday 5th August 2014, there were **16** truck movements into the quarry and **16** movements out. The **SIDRA** analysis of existing traffic was made using the turning volumes in **Figures 3A** and **3B** from the *Coun*t made on *5/8/2014*.

The traffic counts show that there is **considerable variation** in truck movements from *hour to hour* and *day to day* due to *weather co*nditions and *market requirements*.

An analysis of the performance of the intersection under existing am and pm peak hour volumes from **Figures 3A** and **Figure 3B** has been made using **SIDRA** Version 5.0. The intersection is operating at **Level of Service A** in both peak hours as shown in **Table 2.4**. This is the *highest* and *best Level of Service*, as shown in **Table 4.2** from the **RMS Guide to Traffic Generating Developments**.

PHOTO P1 VIEW SOUTH OF OLD NORTHERN ROAD FROM ROBERTS ROAD. 14.8.14

PHOTO P2 VIEW EAST OF ROBERTS ROAD FROM OLD NORTHERN ROAD.

PHOTO P3 VIEW NORTH OF OLD NORTHERN ROAD FROM ROBERTS ROAD.

PHOTO P5 VIEW OF CONCRETE PAVED ENTRANCE ROAD TO HODGSON QUARRY PRODUCTS FROM ROBERTS ROAD.

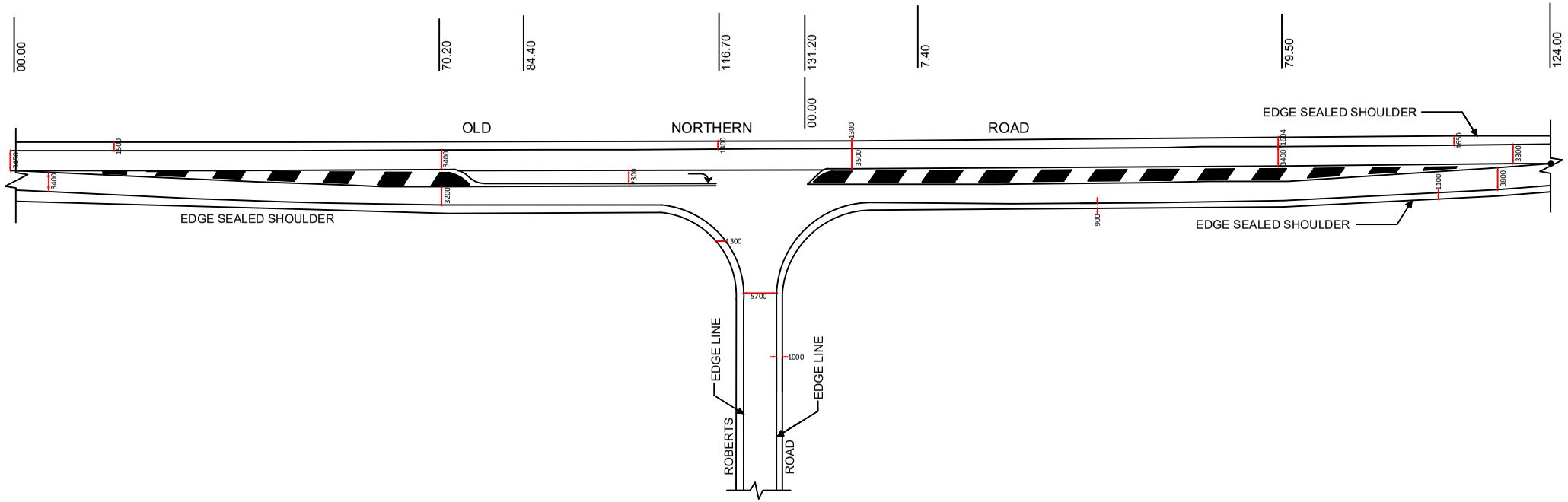


FIGURE 5
LAYOUT OF ROBERTS ROAD AND
OLD NORTHERN ROAD INTERSECTION
SCALE 1:1000

0 10 20 30

2.4 (Continued)

SIDRA ANALYSIS
Old Northern Road / Roberts Road

Scenario	Peak Hour	DoS	LoS	Max Delay (sec/veh)	Critical Movement
Existing	AM	.005	A	8.1	Right Turn from Old Northern Road
	PM	0.027	A	8.3	Left turn from Old Northern Road

NOTE: DoS Degree of Saturation
LoS Level of Service.

However, since the maximum number of movements *in* and *out* on a weekday is capped at 50 and as the Level of Service at the Roberts Road / Old Northern Road intersection is **A** with **20** truck movements *in* and *out* per day, the *highest* truck movements in the *morning peak hours*, as shown in **Table C2,** will *not change* the *Level of Service*.

The *hourly* distribution at **Station 5** in Roberts Road shows a similar pattern over the 5 weekday count (**Appendix B**) during the AM peak hours **6:00 – 7:00** and **7:00 – 8:00am**.

	EASTBOUND		WESTBOUND	
	Highest	Lowest	Highest	Lowest
6:00 – 7:00AM	4	2	7	3
7:00 – 8:00AM	8	3	7	2

Adoption of the highest truck volumes will *not change* the Level of Service.

Table 4.2
(RTA Guide to Traffic Generating Developments)
Level of Service criteria for intersections.

Level of Service	Average Delay per Vehicle (secs/veh)	Traffic Signals, Roundabout	Give Way & Stop Signs
A	< 14	Good operation	Good operation
B	15 TO 28	Good with acceptable delays spare capacity	Acceptable delays & spare capacity
C	29 TO 42	Satisfactory	Satisfactory, but accident study required
D	43 TO 56	Operating near capacity	Near capacity & accident study required
E	57 TO 70	At capacity; at signals, incidents will cause excessive delays Roundabouts require other control mode	At capacity, requires other control mode

2.5 Vehicle Access to Site

The site entry gate is on the northern side of Roberts Road and is located some **290** metres east of Old Northern Road. The sight distance from the entry road is excellent in both directions along Roberts Road, as shown in **photographs P6** and **P7**.

The entry road is a concrete paved road in good condition as shown in **photograph P5**. The layout of the concrete paved entrance road to the weighbridge is drawn to scale in **Figure 6.**

The entrance road shown in **Figure 6** was measured during my inspection and is drawn to scale. The concrete Layback is **17** metres wide and the width at the boundary fence is **14.4** metres wide. The driveway entrance is *considerably wider* than the minimum design shown in *attached* **Figure 3.1** in **AS 2890.2** which caters for **AV's** (articulated vehicles).

2.6 Quarry Employees On Site

There are a *maximum* of **6** employees on site. This will *not change*. Adequate parking spaces are available on the concrete hardstand to the left of the gate to the weigh bridge as indicated in **Figure 6**.

PHOTO P6 VIEW WEST ALONG ROBERTS ROAD FROM ENTRANCE ROAD

PHOTO P7 VIEW ALONG ROBERTS ROAD FROM ENTRANCE ROAD.

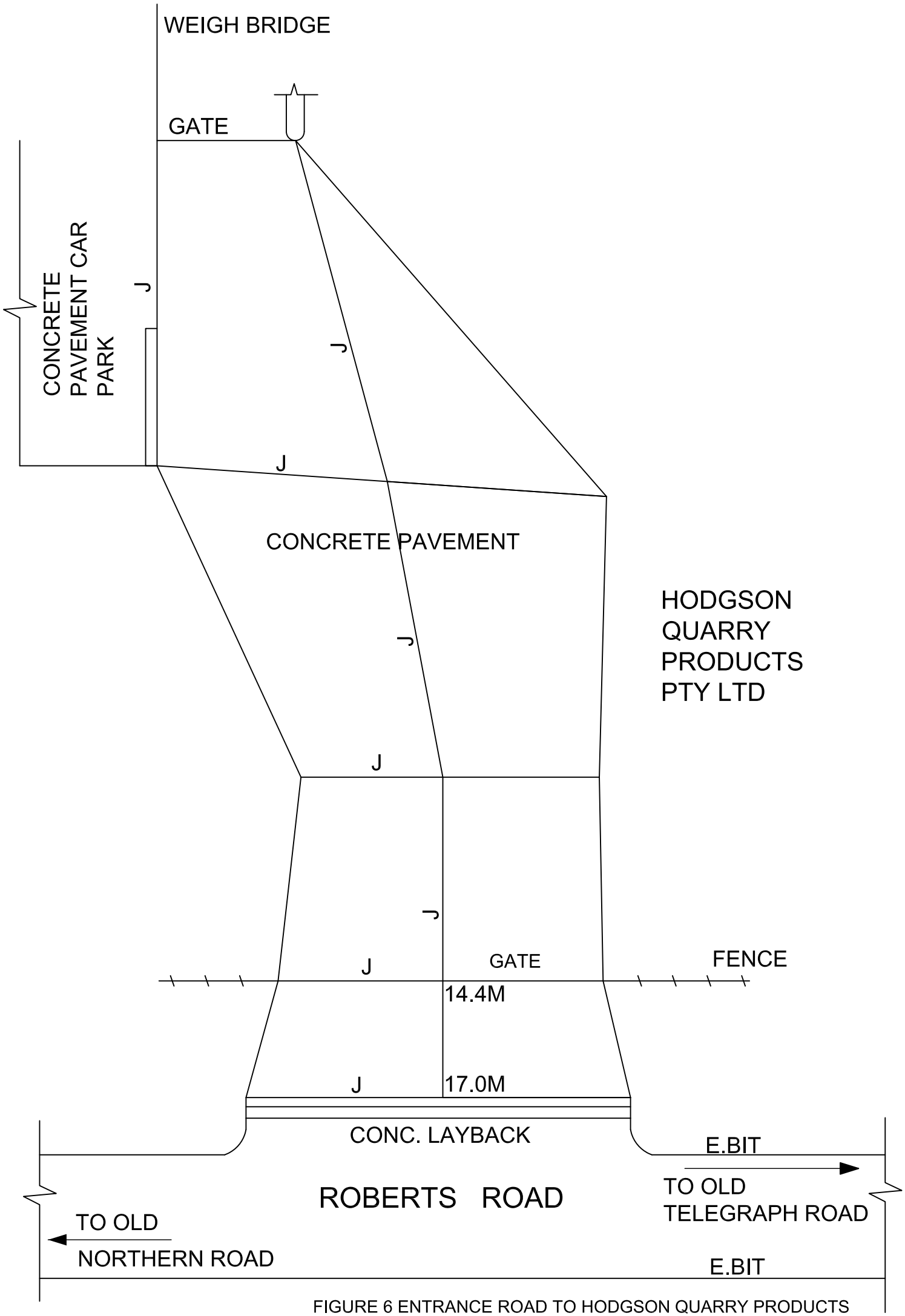
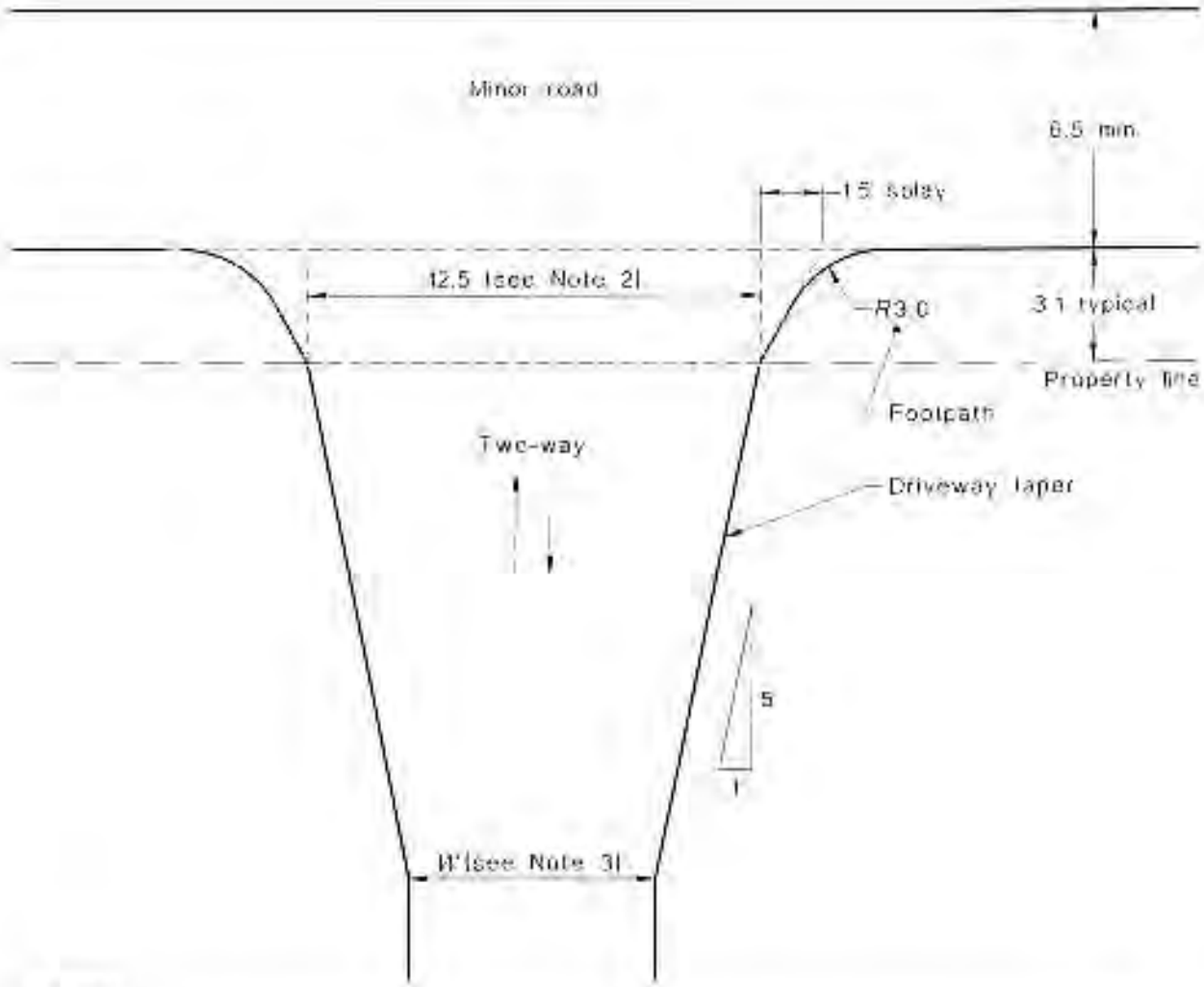


FIGURE 6 ENTRANCE ROAD TO HODGSON QUARRY PRODUCTS
SCALE 1:20



NOTES:

1 In the case illustrated the HRV can turn left into the driveway from the left hand side of the public road. The design (19.0 m long) AV will take up most of the public road width when turning left into or out of the driveway, as will the HRV when turning out.

2 Corresponding dimensions for the MRV and SRV are 9 m and 6 m respectively. Larger vehicles may be able to use these narrower driveways depending on the width of public road available for manoeuvring in or out.

3 W = width of circulation roadway (see Table 3.1).

DIMENSIONS IN METRES

FIGURE 3.1 MINIMUM DESIGN FOR AN ACCESS DRIVEWAY ON A MINOR ROAD CATERING FOR HRVs AND AVs

3.0 TRANSPORT ISSUES TO BE ADDRESSED

3.1 RMS Requirements

In a letter dated *28/4/2014* from the Acting Senior Land Use Planner, Network and Safety Section RMS, the following issues were required to be addressed in the Transport and Traffic impact assessment of the proposed development:-

1. Daily and peak traffic movements likely to be generated by the proposed development including the impact on nearby intersections and the need/associated funding for upgrading or road improvement works (if required).
2. Details of the proposed accesses and the parking provisions associated with the proposed development including compliance with the requirements of the relevant Australian Standards (ie: turn paths, sight distance requirements, aisle widths, etc).
3. Proposed number of car parking spaces and compliance with the appropriate Parking Codes.
4. Details of service vehicle movements (including vehicle type and likely arrival and departure times).
5. Roads and Maritime will require in due course the provision of a traffic management plan for all demolition/construction activities, detailing vehicle routes, number of trucks, hours of operation, access arrangements and traffic control measures.

3.2 Baulkham Hills Shire Council

The principal *Executive Planner, Baulkham Hills Shire Council* in a letter dated 23/4/14 to the *NSW Department of Planning and Infrastructure* provided comments under points **1** to **6** for your incorporation into the requirements of which point **6** is *relevant to this report* namely:-

" 6. The submission of a detailed traffic impact assessment report addressing the increased maximum number of truck movements associated with the operation".

3.3 Secretary's Requirements, NSW Department of Planning and Infrastructure

These requirements were set out in a letter from the Director, Mining Projects, NSW Department of Planning and Environment to Mr. M Hodgson, Hodgson Quarry Products Pty Ltd on 29/5/2014. The relevant requirements relating to traffic were as follows:-

- **Traffic** - including an assessment of the likely traffic impacts of the development on the capacity, condition, safety and efficiency of the local and State road network, having regard to the RMS's requirements (See attachment 2);

4.0 TRAFFIC IMPACTS OF PROPOSED S.75W MODIFICATION

As stated in *Section 1.3* truck movements associated with the haulage of sand from the site would be using the road network for an additional *10 years* from **31/5/2015** to **31/5/2025**.

4.1 Distribution of Trucks to Main Road System

We have been advised that **20** per cent of trucks carrying processed material from the site will travel south along Old Northern Road. These trucks will pass through survey **Counting Station 4** in Old Northern Road.

The remaining **80** percent of trucks will travel west on Wisemans Ferry Road and pass through **Counting Station 3**.

4.2 Maximum Hourly and Daily Truck Movements from Hodgson Quarry Products

The site was not operating at full approved capacity of **50** truck movements *in and out per day* when the traffic volume and classification counts included in **Appendix B** were carried out.

Based upon the distribution and time pattern of truck classes **8**, **9** and **10** to the road network, the *estimated hourly truck movements* from the site and distribution to Old Northern Road and Wisemans Ferry Road are contained in **Table C2** in **Appendix C**. Since the site is currently generating some **20** movements *in and out* on a *weekday* the increase in hourly truck movements and distribution to the road network when the site is operating at its maximum approved capacity are shown in **Table C4**.

The Traffic Counts show that there is considerable *variation* in truck movements from *hour to hour* and *day to day* due to *weather conditions* and market *requirements*.

4.3 Section 94 Contribution

Since there is no increase over the approved **50** truck movements *in and out* on weekdays and **25** truck movements *in and out* on Saturday, it is assumed that the current **Section 94 Contribution** for road maintenance on the haulage routes will continue for a further 10 years.

A maximum of **50** truck movements per day has been allowed for in the current **Section 94 Contribution** for road maintenance. It is assumed that the current contribution will continue for a further 10 years. The road pavement in Old Northern Road, Wisemans Ferry Road and Roberts Road are in reasonable condition. There are *no road safety issues*.

4.4 Operation of Roberts Road / Old Northern Road Intersection

Allowing for variations in weather and market demand, the resource extraction is likely to be completed within 10 years. Traffic volumes in Old Northern Road at Counting **Station 4** have fallen at **0.6%** per annum compound over the past 17 years. It is reasonable to expect that the current trend will continue. However, for the analysis it has been assumed that *traffic volumes* in Old Northern Road will *increase* at **1%** per annum over the *10 year period*. Based upon the maximum approved **50** *daily movements in* and *out* and the hourly pattern based upon current counts the heavy vehicle movements when the site is operating at its maximum approved capacity are shown in **Figure 7**.

The *estimated maximum future peak hour volumes in 10 years*, expressed in (passenger car units) pcu's at the intersection of Roberts Road and Old Northern Road are shown in **Figure 7**.

Using **SIDRA** Analysis the intersection will continue to operate at Level of Service **A**. The results are as tabulated below:-

Scenario	Peak Hour	DoS	LoS	Max Delay (sec/veh)	Critical Movement
Existing	**AM**	**.01**	**A**	**9.4**	**Right Turn from Old Northern Road**
	PM	**0.027**	**A**	**9.0**	**Right Turn from Roberts Road**

NOTE: EACH TRUCK FACTORED BY 2 TO ACHIEVE EQUIVALENT PASSENGER UNITS FOR ANALYSIS.

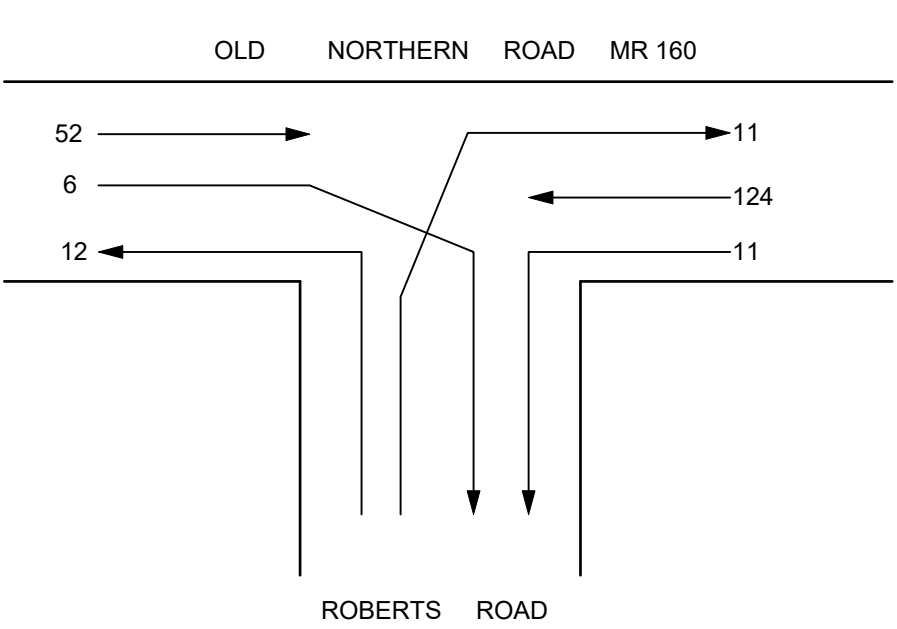
The **SIDRA** analysis shows the *Level of Service* and *Maximum Delay* for the critical movement which is the *right-turn movement* from Roberts Road in the **PM** peak hour and the right turn movement from Old Northern Road in the **AM** peak hour (*Section 4.4*). The Level of Service is **A** for the *critical movements* under *existing* and *future* traffic *conditions*. The intersection as a whole will have a *lower delay* and **Level of Service A**.

4.5 Operation of Old Northern Road / Wisemans Ferry Road Intersection

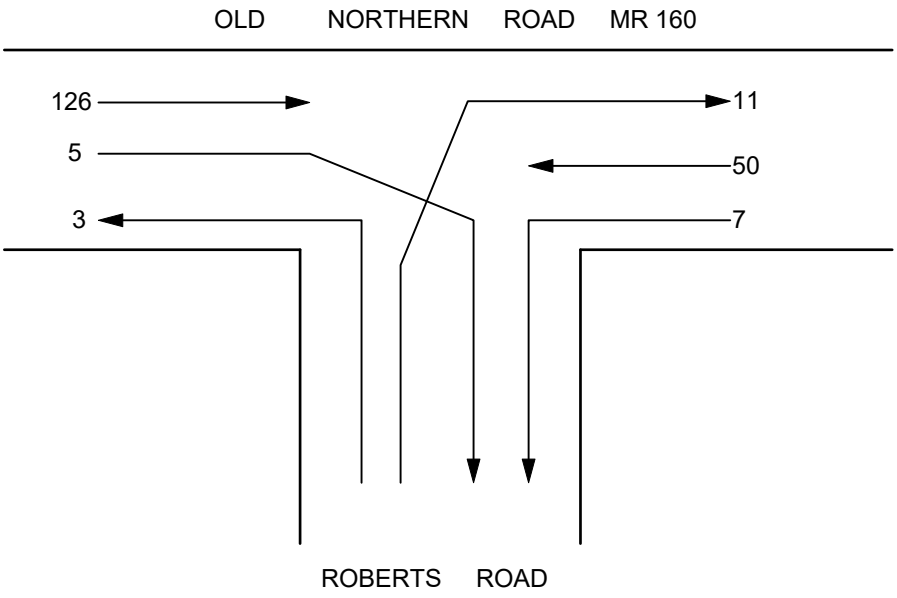
A maximum of **50** truck movements per day *in* and *out* was approved. The number of truck movements *turning left* from Old Northern Road into Wisemans Ferry Road and *turning right* from Wisemans Ferry Road into Old Northern Road in the AM and PM peak hours is *very small* (refer **Table C2** in **Appendix C**). A *SIDRA Analysis* was not considered necessary.

4.6 Internal Access Road

The internal concrete pavement access road and concrete layback crossing are in good condition and considered satisfactory for the approved truck movements over the proposed 10 year period to 2025.



MORNING PEAK HOUR TRAFFIC
VOLUMES 6:30-7:30AM



AFTERNOON PEAK HOUR TRAFFIC
VOLUMES 4:00-5:00PM

NOTE:
THE FUTURE TRAFFIC VOLUMES ASSUME AN ANNUAL INCREASE OF 1% WHEREAS THERE WAS AN ANNUAL DECREASE FROM 1997 TO 2014 OF 0.6% 1 HEAVY VEHICLE EQUALS 2 PCU's

LEGEND
PASSENGER CAR UNITS PCU's

FIGURE 7
FUTURE PEAK HOUR TRAFFIC
VOLUMES 2025

APPENDICES

APPENDIX A

Lyle Marshall & Associates

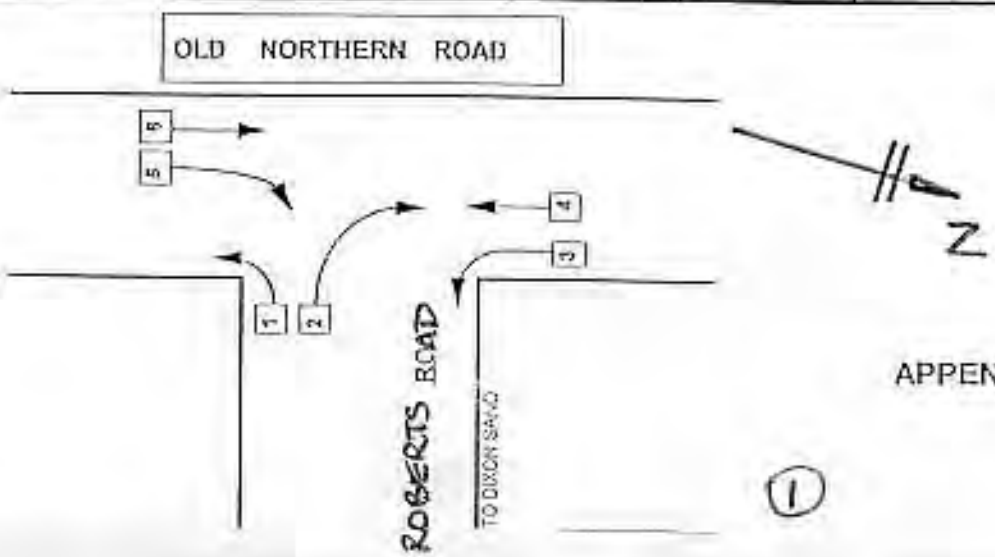
JOB No. 9169

OLD NORTHERN RD, MARODA

DATE: 5.08.14 WEATHER: FINE COUNTER NAME: B HALDEY

TYPE OF VEHICLE							
A		B	C	D			
Cars, Utilities, Station Wagons, Panel Vans, Motor Bikes.	Light Commercial vehicles 2-AXLE up to 6.4m LONG. Vans, Flat Top Trucks.	2-AXLE RIGID TRUCKS & VANS, TANKERS over 6.4m LONG.	3-AXLE RIGID TRUCKS VANS & TANKERS	4-AXLE SEMI-TRAILERS.	5-AXLE SEMI-TRAILERS	6-AXLE SEMI-TRAILERS, TRUCK & DOG TRAILER	

TIME AM/	VEH TYPE	MOVEMENT 1	2	3	4	5	6	TOTALS
6.00am	A	1	1	1	43	–	11	57
to	B	–	–	–	–	–	–	–
6.30am	C	2	–	–	4	–	2	8
	D	–	2	2	7	–	2	13
6.30	A	4	2	3	38	2	8	57
To	B	1	–	–	–	–	2	3
7.00	C	–	1	–	–	–	3	4
	D	–	–	–	4	–	4	8
7.00	A	2	3	2	65	2	19	93
to	B	1	–	1	–	–	–	2
7.30	C	–	–	–	3	–	–	3
	D	–	–	–	1	–	2	3
7.30	A	1	4	5	40	–	11	61
to	B	–	1	–	–	–	1	2
8.00	C	–	–	1	–	1	2	4
	D	–	–	1	2	–	–	3
8.00	A	2	1	3	36	–	16	58
to	B	–	–	–	–	–	1	1
8.30	C	1	–	–	2	–	–	3
	D	–	1	–	–	–	–	1
8.30	A	2	5	3	28	2	17	57
to	B	–	–	–	1	1	2	4
9.00	C	–	–	–	1	–	1	2
	D	–	–	1	2	–	–	3



APPENDIX A

Eyre Marshall & Assoc. ph

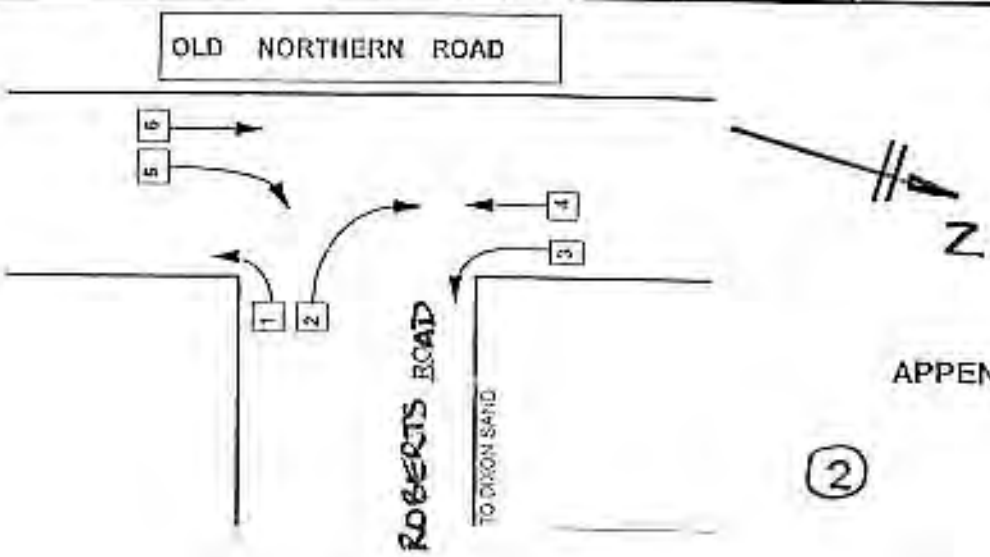
JOB No.

OLD NORTHERN RD, MAROOTA

DATE: 5.02.14 WEATHER: FINE COUNTER NAME: B. HALDEY

TYPE OF VEHICLE							
A		B	C	D			
Cars, Utilities, Station Wagons, Panel Vans, Motor Bikes.	Light Commercial vehicles 2-AXLE up to 6.4m LONG. Vans, Flat Top Trucks.	2-AXLE RIGID TRUCKS & VANS, TANKERS over 6.4m LONG.	3-AXLE RIGID TRUCKS VANS & TANKERS	4-AXLE SEMI-TRAILERS.	5-AXLE SEMI-TRAILERS.	6-AXLE SEMI-TRAILERS, TRUCK & DOG TRAILER	

TIME AM/	VEH TYPE	MOVEMENT 1	2	3	4	5	6	TOTALS
9.00	A	2	2	3	27	–	23	57
to	B	1	1	1	1	–	2	6
9.30	C	–	–	–	–	–	–	–
	D	–	1	–	1	–	6	8
9.30	A	4	3	3	27	2	17	56
to	B	–	–	–	–	–	1	1
10.00	C	–	1	–	–	–	–	1
	D	–	–	1	–	–	2	3
10.00	A	2	1	6	22	1	22	54
to	B	–	2	–	3	–	1	6
10.30	C	–	–	1	1	–	3	5
	D	–	1	2	3	1	2	9
10.30	A	–	6	2	23	2	11	44
to	B	–	1	–	1	1	1	4
11.00	C	–	1	–	1	–	8	10
	D	–	2	3	5	–	3	13
11.00	A	4	2	2	17	1	18	44
to	B	–	1	–	–	–	–	1
11.30	C	–		2	3	–	1	6
	D	1	2			1	1	5
11.30	A	–	3	3	17	1	17	41
to	B	–	–	–	–	–	1	1
12.00	C	–	1	1	1	–	–	3
	D	–	–	–	4	–	2	6



APPENDIX A

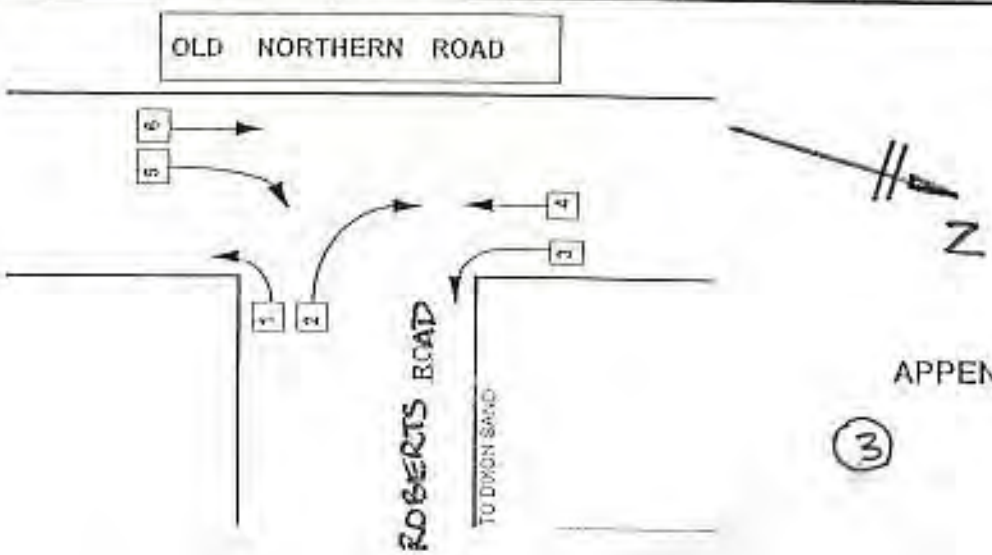
Lyle Marshall & Assoc. ph | Job No. | OLD NORTEHRN RD, MAROOTA

DATE: 5.08.14 | WEATHER: FINE | COUNTER NAME: B. HALDEN

TYPE OF VEHICLE							
A		B	C	D			
Cars, Utilities, Station Wagons, Panel Vans, Motor Bikes.	Light Commercial vehicles 2-AXLE up to 6.4m LONG. Vans, Flat Top Trucks.	2-AXLE RIGID TRUCKS & VANS, TANKERS over 6.4m LONG.	3-AXLE RIGID TRUCKS VANS & TANKERS	4-AXLE SEMI-TRAILERS	5-AXLE SEMI-TRAILERS	6-AXLE SEMI-TRAILERS, TRUCK & DOG TRAILER	

MOVEMENT

TIME PM	VEH TYPE	1	2	3	4	5	6	TOTALS
12.00	A	–	5	1	18	1	20	45
to	B	–	–	–	–	–	2	2
12.30	C	–	–	–	2	1	1	4
	D	–	–	–	2	–	2	4
12.30	A	1	2	1	15	–	20	39
to	B	–	1	1	–	1	–	3
1.00	C	1	–	1	1	–	2	5
	D	–	–	1	2	–	3	6
1.00	A	2	1	1	19	2	19	44
to	B	–	–	–	1	–	4	5
1.30	C		1	2	6	–	1	10
	D		2	1	6	–	4	13
1.30	A	1	1	–	14	1	22	39
to	B	–	–	–	1	–	–	1
2.00	C	–	1	–	2	–	–	3
	D	–	1	–	2	–	5	7
2.00	A	1	2	2	16	1	18	40
to	B	1	1	–	1	1	–	4
2.30	C	–	–	1	4	–	3	8
	D	–	2	1	3	–	4	10
2.30	A	2	3	2	19	3	29	58
to	B	–	1	–	1	–	–	2
3.00	C	–	1	–	2	–	–	3
	D	–	1	–	2	–	–	3

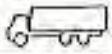
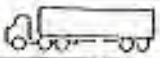
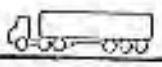


APPENDIX A

Lyle Marshall & Assoc. ph | Job No. | OLD NORTEHRN RD, MAROOTA

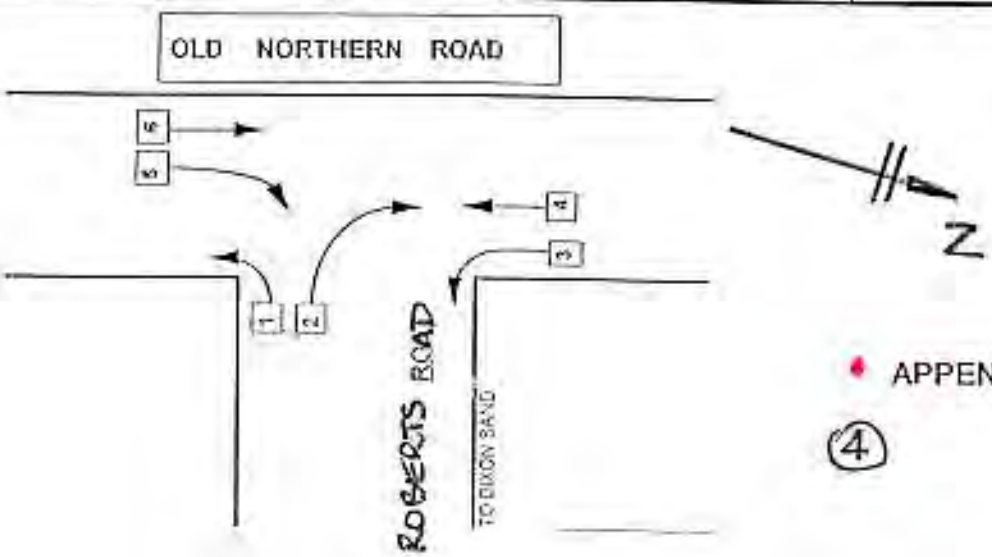
DATE: 5.08.14 WEATHER: FINE COUNTER NAME: B. HALDEY

TYPE OF VEHICLE

A		B	C	D		
Cars, Utilities, Station Wagons, Panel Vans, Motor Bikes. 	Light Commercial Vehicles 2-AXLE up to 6.4m LONG. Vans, Flat Top Trucks. 	2-AXLE RIGID TRUCKS & VANS, TANKERS over 6.4m LONG. 	3-AXLE RIGID TRUCKS VANS & TANKERS. 	4-AXLE SEMI-TRAILERS. 	5-AXLE SEMI-TRAILERS 	6-AXLE SEMI-TRAILERS, TRUCK & DOG TRAILER 

MOVEMENT

TIME JPM	VEH TYPE	1	2	3	4	5	6	TOTALS
3.00	A	1	–	3	23	–	19	46
to	B	–	–	–	1	1	3	5
3.30	C	–	–	–	2	–	1	1
	D	–	–	2	5	1	2	10
3.30	A	–	3	–	22	2	37	64
to	B	1	–	–	1	–	3	5
4.00	C	–	–	1	2	–	1	4
	D	–	2	–	2	–	3	7
4.00	A	–	3	–	18	2	58	83
to	B	1	–	1	2	–	2	6
4.30	C	–	1	–	–	–		1
	D	–	–	1	–	–	2	3
4.30	A	1	2	3	22	3	43	74
to	B	–	–	–	1	–	2	3
5.00	C	–	–	–	–	–	2	2
	D	–	1	–	1	–	1	3
5.00	A	2	3	1	19	–	49	74
to	B	–	1	–	–	–	–	1
5.30	C	–	–	–	–	–	1	1
	D	–	–	–	1	–	–	1
5.30	A	1	1	–	12	1	27	42
to	B	–	–	–	1	–	–	1
6.00	C	–	–	–	1	–	–	1
	D	–	–	–	–	–	1	1



APPENDIX A

APPENDIX B

CFE INFORMATION TECHNOLOGY (02) 9740 8600
Hourly Volume By Day
Week commencing : Wednesday, 27/8/2014

Site: OLD NORTHERN ROAD
Location: 4
Direction: SOUTH bound

Day	Tue		Wed		Thur		Fri		Sat		Sun		Mon	
Time	26/8		27/8		28/8		29/8		30/8		31/8		1/9	
	C	T	C	T	C	T	C	T	C	T	C	T	C	T
00.00	0	2	1	1	1	0	1	3	3	0	4	0	1	1
01.00	2	0	2	3	1	3	1	2	3	2	1	0	1	3
02.00	0	0	0	0	1	0	0	0	5	0	2	0	1	0
03.00	1	1	1	3	2	1	1	0	4	0	4	0	2	2
04.00	7	2	10	0	8	1	10	0	3	0	2	0	4	1
05.00	56	10	48	9	52	6	43	7	9	1	8	1	50	9
06.00	96	11	85	11	76	17	87	14	19	5	11	0	91	12
07.00	99	8	90	13	88	6	78	8	41	2	29	2	101	11
08.00	84	13	69	7	72	9	83	10	41	6	51	1	86	16
09.00	53	13	64	12	51	7	62	13	41	1	66	0	44	13
10.00	48	8	38	3	46	8	36	13	56	4	59	1	45	8
11.00	40	9	39	8	38	8	46	1	56	2	72	3	42	10
12.00	37	9	30	13	38	4	40	6	63	4	95	3	40	7
13.00	44	11	35	17	27	10	30	11	45	4	126	3	53	10
14.00	49	9	50	5	34	2	55	8	76	1	155	1	44	5
15.00	33	9	41	3	37	6	61	5	63	3	200	3	50	5
16.00	49	5	37	6	39	4	51	5	61	4	170	0	43	7
17.00	28	2	29	3	26	3	34	3	48	2	126	4	64	1
18.00	22	1	21	2	18	1	33	2	33	2	52	3	25	0
19.00	7	2	9	0	15	2	18	0	45	0	20	1	11	0
20.00	12	0	6	1	9	2	12	0	22	1	14	1	4	0
21.00	1	1	6	0	3	1	9	1	10	0	14	0	9	0
22.00	2	1	2	1	7	0	6	0	13	1	2	1	2	1
23.00	2	3	3	0	1	2	9	0	6	0	4	4	3	0
TOTAL	772	130	716	121	690	103	807	112	766	45	1287	32	816	121

* Legend

C : light Vehicles Classes 1 & 2

T : Heavy Vehicles Classes 3 to 10

APPENDIX E

CFE INFORMATION TECHNOLOGY(02) 9740 8600
Hourly Volume By Day
Week commencing : Wednesday, 27/8/2014

Site: OLD NORTHERN ROAD
Location: 4
Direction: NORTH bound

Day	Tue		Wed		Thur		Fri		Sat		Sun		Mon	
Time	2/9		27/8		28/8		29/8		30/8		31/8		1/9	
	C	T	C	T	C	T	C	T	C	T	C	T	C	T
00.00	2	0	2	0	3	1	2	0	6	0	9	0	3	0
01.00	2	0	3	1	1	0	3	1	0	0	1	0	2	1
02.00	0	1	2	1	2	0	0	2	3	0	1	0	1	2
03.00	3	0	2	1	2	0	2	1	1	0	3	0	1	1
04.00	1	0	1	0	1	2	1	0	3	1	2	0	1	1
05.00	5	4	7	6	6	2	12	2	5	1	2	0	7	2
06.00	18	4	14	1	16	2	14	2	13	1	27	0	17	4
07.00	18	10	30	9	19	9	29	8	19	6	57	1	19	11
08.00	30	11	30	7	32	6	28	7	39	2	56	2	21	7
09.00	33	11	28	5	33	10	32	6	49	2	64	2	44	15
10.00	43	9	32	11	41	6	48	6	76	4	86	1	37	13
11.00	38	13	45	11	32	5	51	11	82	2	134	2	46	9
12.00	38	12	31	9	43	11	46	18	94	1	125	0	40	8
13.00	37	13	35	10	32	10	51	7	88	3	105	0	32	7
14.00	50	7	44	9	57	10	74	13	60	2	64	1	50	16
15.00	65	13	53	7	72	7	86	5	56	1	62	3	84	12
16.00	97	8	88	13	84	5	103	5	56	3	50	5	89	11
17.00	101	12	86	1	85	2	112	6	50	1	44	0	111	4
18.00	58	0	65	0	62	3	66	5	39	0	45	1	46	4
19.00	34	2	32	1	37	5	78	2	30	1	22	0	41	2
20.00	20	0	31	2	29	1	41	1	19	0	15	1	23	1
21.00	19	2	24	1	17	1	22	0	23	0	9	1	13	0
22.00	9	0	10	0	15	0	25	0	22	0	9	0	13	0
23.00	7	2	5	0	7	0	14	0	10	0	3	1	6	0
TOTAL	728	134	700	106	728	98	940	108	843	31	995	21	747	131

* Legend

C : light Vehicles CLASSES 1&2

T : Heavy Vehicles CLASSES 3 to 10

APPENDIX E

CFE INFORMATION TECHNOLOGY(02) 9740 8600
Hourly Volume By Day
Week commencing : Wednesday, 27/8/2014

Site: WISEMANS FERRY ROAD
Location: 3
Direction: West bound

Day	Tue		Wed		Thur		Fri		Sat		Sun		Mon	
Time	2/9		27/8		28/8		29/8		30/8		31/8		1/9	
	C	T	C	T	C	T	C	T	C	T	C	T	C	T
00.00	1	1	2	1	0	2	1	1	4	3	2	0	2	1
01.00	1	1	2	0	2	0	1	2	4	1	0	0	2	0
02.00	0	0	0	0	0	1	0	0	2	0	2	0	1	0
03.00	1	0	0	0	2	0	1	0	0	0	3	0	0	0
04.00	9	3	10	0	10	1	10	2	3	1	2	0	6	4
05.00	50	25	37	16	38	15	32	16	14	6	6	0	35	21
06.00	77	27	68	31	64	17	67	23	27	11	17	0	66	23
07.00	75	29	61	19	64	15	73	23	20	9	15	3	75	19
08.00	75	23	71	17	83	21	68	23	42	7	49	5	78	26
09.00	47	22	47	25	37	15	41	27	63	2	83	17	38	28
10.00	39	22	40	20	51	17	48	22	56	8	102	15	43	24
11.00	51	25	41	15	38	19	41	15	44	4	108	8	47	11
12.00	45	16	42	20	42	13	45	21	67	3	95	7	53	14
13.00	45	18	28	14	48	13	58	15	59	1	100	2	43	15
14.00	52	15	62	13	53	18	72	17	61	3	100	3	56	13
15.00	42	17	47	11	43	11	65	14	58	7	91	5	58	8
16.00	56	16	52	8	48	7	77	12	76	4	66	2	50	11
17.00	52	3	45	3	43	4	66	9	52	4	45	3	47	5
18.00	34	3	41	6	44	1	56	5	36	3	32	2	28	1
19.00	16	0	15	0	22	3	32	0	29	0	21	2	17	0
20.00	15	2	10	1	18	0	15	1	20	2	9	1	10	2
21.00	7	1	11	1	20	0	23	0	16	1	12	0	7	1
22.00	5	1	7	0	5	1	11	1	12	0	3	0	2	1
23.00	5	2	4	0	3	2	9	1	7	0	3	1	1	0
TOTAL	800	272	743	221	778	199	913	249	772	80	966	76	771	228

* Legend

C : light Vehicles CLASSES 1&2

T : Heavy Vehicles CLASSES 3 to 10

APPENDIX E

CFE INFORMATION TECHNOLOGY(02) 9740 8600

Hourly Volume By Day

Week commencing : Wednesday, 27/8/2014

Site: WISEMANS FERRY ROAD

Location: 3

Direction: East bound

Day	Tue		Wed		Thur		Fri		Sat		Sun		Mon	
Time	2/9		27/8		28/8		29/8		30/8		31/8		1/9	
	C	T	C	T	C	T	C	T	C	T	C	T	C	T
00.00	2	0	1	0	4	0	1	0	5	1	4	0	2	0
01.00	1	0	1	1	1	0	1	1	1	0	5	0	2	1
02.00	2	1	1	0	0	0	1	1	1	1	2	0	0	1
03.00	1	1	2	0	1	1	0	1	2	0	2	0	1	1
04.00	5	1	7	0	6	1	4	1	4	1	2	0	5	0
05.00	21	1	18	2	18	2	25	2	12	2	3	1	27	1
06.00	33	22	39	15	30	18	25	20	20	10	24	2	35	19
07.00	53	21	43	17	42	13	38	19	24	11	42	2	36	17
08.00	58	16	55	21	42	15	49	17	35	9	49	2	59	18
09.00	58	16	42	17	51	21	57	14	58	6	58	2	45	24
10.00	44	18	49	20	42	17	43	22	58	18	70	4	40	20
11.00	40	23	34	23	45	14	52	18	59	5	74	2	37	16
12.00	24	16	44	20	39	14	43	26	52	4	103	15	51	14
13.00	34	24	41	15	35	17	67	22	69	6	119	4	44	15
14.00	40	16	57	19	62	14	70	20	61	3	86	1	44	15
15.00	74	29	54	23	73	17	79	19	53	2	128	6	82	25
16.00	84	16	85	12	80	15	83	11	60	3	83	1	91	17
17.00	75	12	61	5	71	4	73	10	47	1	72	0	83	10
18.00	55	0	37	0	45	4	55	4	29	0	37	3	37	2
19.00	22	0	19	1	14	2	36	1	21	0	21	1	17	1
20.00	6	0	15	1	16	2	18	2	16	0	7	0	11	0
21.00	14	1	23	1	24	0	16	0	9	1	12	0	12	0
22.00	7	0	7	1	20	0	17	0	26	0	6	0	7	0
23.00	3	0	3	0	6	0	14	0	7	0	3	0	3	1
TOTAL	756	244	740	212	767	191	867	231	729	84	1012	46	771	216

* Legend

C : light Vehicles CLASSES 1&2

T : Heavy Vehicles CLASSES 3 to 10

APPENDIX E

CFE INFORMATION TECHNOLOGY(02) 9740 8600

Hourly Volume By Day

Week commencing : Wednesday, 27/8/2014

Site: ROBERTS ROAD

Location: 5

Direction: East bound

Day	Tue		Wed		Thur		Fri		Sat		Sun		Mon	
Time	2/9		27/8		28/8		29/8		30/8		31/8		1/9	
	C	T	C	T	C	T	C	T	C	T	C	T	C	T
00.00	1	0	1	0	1	1	0	0	0	0	1	0	0	0
01.00	0	1	0	0	0	0	2	0	0	0	0	0	0	0
02.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03.00	0	0	0	0	0	0	0	0	0	0	1	0	0	1
04.00	0	1	0	0	0	0	1	2	0	0	0	0	1	2
05.00	0	7	0	2	1	5	2	2	1	0	0	0	1	2
06.00	11	3	5	2	8	4	11	2	8	0	1	0	11	3
07.00	8	7	12	6	9	3	9	8	4	0	4	0	7	6
08.00	10	4	8	4	15	4	8	5	3	0	8	0	6	3
09.00	11	7	6	1	6	3	0	5	12	0	6	0	7	8
10.00	12	4	6	2	7	1	10	2	9	0	9	0	10	10
11.00	5	1	9	2	8	4	3	2	6	2	7	0	6	5
12.00	5	4	7	1	4	7	6	2	4	0	9	1	8	7
13.00	10	2	5	4	5	3	8	4	9	0	9	0	7	2
14.00	10	1	8	2	10	4	11	3	10	0	9	0	11	5
15.00	12	1	5	0	8	1	13	1	4	1	11	1	12	2
16.00	7	3	18	3	13	1	9	2	6	1	8	1	7	2
17.00	15	1	9	0	12	2	10	1	2	1	7	0	13	5
18.00	1	0	10	2	8	0	6	1	3	0	6	1	4	0
19.00	4	1	0	1	3	1	3	1	3	0	0	0	4	1
20.00	1	0	2	0	1	0	1	0	0	0	1	0	1	0
21.00	2	1	2	0	3	0	1	0	3	0	2	1	3	0
22.00	1	1	1	0	0	0	1	0	0	0	0	0	0	0
23.00	0	0	1	0	0	1	1	1	1	0	0	0	2	0
TOTAL	126	50	115	32	122	45	116	44	88	5	99	5	121	64

* Legend

C : light Vehicles Classes 1 & 2

T : Heavy Vehicles Classes 3 to 10

APPENDIX E

CFE INFORMATION TECHNOLOGY(02) 9740.8600
Hourly Volume By Day
Week commencing : Wednesday, 27/8/2014

Site: ROBERTS ROAD
Location: 5
Direction: West bound

Day	Tue		Wed		Thur		Fri		Sat		Sun		Mon	
Time	2/9		27/8		28/8		29/8		30/8		31/8		1/9	
	C	T	C	T	C	T	C	T	C	T	C	T	C	T
00.00	0	1	0	1	0	1	0	1	0	0	0	0	0	1
01.00	1	0	1	0	1	0	1	0	0	0	0	0	0	1
02.00	0	0	0	0	0	0	0	0	1	0	1	0	0	0
03.00	0	0	0	1	0	0	0	0	0	0	1	0	0	0
04.00	0	0	0	0	0	0	1	0	0	0	0	0	0	1
05.00	3	1	3	0	3	0	3	0	1	0	0	0	4	0
06.00	10	7	2	3	2	6	5	4	2	0	0	0	7	5
07.00	14	5	11	4	10	2	7	6	5	1	3	0	9	7
08.00	6	4	9	4	13	2	9	5	6	0	8	0	10	3
09.00	14	3	8	2	10	5	8	5	13	0	5	1	10	3
10.00	9	3	7	0	4	4	9	1	12	1	6	0	7	6
11.00	7	1	7	4	11	2	4	1	8	0	8	0	6	4
12.00	7	3	5	0	4	1	5	2	10	0	10	0	16	3
13.00	12	2	4	0	6	5	8	2	9	0	10	0	10	3
14.00	5	0	11	2	13	3	13	2	7	0	9	0	11	3
15.00	17	1	10	0	10	1	21	0	4	1	7	1	10	2
16.00	3	3	15	3	13	2	7	2	6	1	13	0	11	1
17.00	12	0	6	2	14	1	7	1	4	0	9	0	11	0
18.00	3	0	7	0	6	0	6	1	6	0	4	1	5	0
19.00	1	0	3	0	2	0	1	0	1	0	3	1	6	0
20.00	0	1	3	0	3	0	0	1	0	0	1	0	1	0
21.00	0	0	1	0	1	0	0	0	0	0	0	0	1	0
22.00	0	0	0	0	0	0	1	0	0	0	1	0	0	0
23.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	124	35	113	26	126	35	116	34	95	4	99	4	135	43

* Legend

C : light Vehicles Classes 1 & 2

T : Heavy Vehicles Classes 3 to 10

APPENDIX E

Traffic Counting Supplies & Service (02) 476-6266
Hourly Volume By Day
Week commencing : Wednesday, 15/10/1997

Site: 140
Location: 4 OLD NORTHERN ROAD
Direction: South Bound

Day	Tue		Wed		Thur		Fri		Sat		Sun		Mon	
Time	21/10		15/10		16/10		17/10		18/10		19/10		20/10	
	C	T	C	T	C	T	C	T	C	T	C	T	C	T
00.00	0	0	3	0	0	0	3	1	1	0	16	0	5	2
01.00	2	0	5	2	5	1	3	1	2	0	18	0	4	1
02.00	2	0	6	1	1	0	5	0	3	0	11	0	5	2
03.00	4	1	1	0	4	1	4	1	1	1	11	1	3	1
04.00	7	0	7	1	10	4	10	2	3	0	8	0	9	1
05.00	36	2	33	0	36	3	36	4	11	1	10	1	30	0
06.00	92	13	82	19	84	16	95	19	35	1	18	1	88	17
07.00	115	5	123	5	117	6	94	5	38	1	28	1	114	3
08.00	84	6	88	18	90	12	91	11	54	3	55	3	83	12
09.00	65	15	50	3	49	6	43	4	57	4	49	4	62	6
10.00	39	8	54	3	51	11	62	12	51	2	59	2	57	13
11.00	41	12	38	7	44	10	34	8	49	4	69	4	46	11
12.00	44	8	47	8	54	8	43	5	40	1	66	1	31	7
13.00	36	8	39	14	52	14	52	13	72	5	104	5	34	9
14.00	47	13	45	2	54	9	55	2	70	9	123	9	54	7
15.00	57	2	46	3	66	6	63	3	71	5	151	5	41	6
16.00	43	3	44	4	54	5	61	4	105	14	222	14	48	5
17.00	44	0	30	1	48	0	33	1	100	3	172	3	39	1
18.00	23	1	26	1	49	3	45	3	59	4	135	4	35	1
19.00	9	2	13	0	20	1	29	1	38	0	43	0	13	2
20.00	6	0	13	1	12	0	13	0	17	0	33	0	8	0
21.00	4	0	7	0	8	0	3	0	18	0	18	0	6	0
22.00	3	0	7	0	3	0	9	0	23	0	5	0	5	1
23.00	0	0	0	0	5	0	6	0	18	0	3	0	1	0
TOTAL	803	88	807	93	916	118	892	100	936	53	1427	58	821	108

* Legend

C : Cars and light Vehicles T : Heavy Trucks

APPENDIX B

Traffic Counting Supplies & Service (02) 476-6266
Hourly Volume By Day
Week commencing : Wednesday, 15/10/1997

Site: 140
Location: 4 OLD NORTHERN ROAD
Direction: NorthBound

Day	Tue		Wed		Thur		Fri		Sat		Sun		Mon	
Time	21/10		15/10		16/10		17/10		18/10		19/10		20/10	
	C	T	C	T	C	T	C	T	C	T	C	T	C	T
00.00	5	0	8	0	2	0	3	0	14	0	12	0	5	0
01.00	2	0	2	0	4	0	1	0	5	0	10	2	1	0
02.00	2	0	1	0	2	0	1	0	5	0	5	0	0	0
03.00	2	0	0	0	2	0	2	1	1	0	4	0	0	0
04.00	1	0	4	1	6	2	6	2	5	0	8	0	7	1
05.00	11	5	17	7	9	4	9	5	12	3	10	0	15	6
06.00	18	3	15	1	20	4	19	2	13	4	12	0	12	0
07.00	25	5	36	8	48	12	41	8	47	4	23	0	34	11
08.00	33	10	54	14	34	8	36	7	53	12	50	3	32	5
09.00	45	17	37	6	49	4	48	7	79	12	72	2	36	8
10.00	35	5	41	10	50	12	62	17	88	12	100	5	50	19
11.00	58	14	59	11	60	15	55	9	95	8	141	2	44	10
12.00	45	9	48	10	52	13	51	10	80	3	104	3	49	8
13.00	49	14	43	12	54	13	63	7	95	9	82	2	41	10
14.00	54	9	49	10	52	11	66	7	106	3	61	0	66	15
15.00	49	8	58	6	56	7	81	10	85	4	50	0	57	7
16.00	78	2	81	5	79	9	66	2	62	1	42	1	85	5
17.00	94	6	69	2	87	6	119	5	52	2	37	0	93	5
18.00	73	3	77	1	86	2	103	4	41	0	24	1	79	0
19.00	41	0	42	0	43	0	64	4	39	3	19	0	29	0
20.00	16	1	23	0	42	0	49	2	30	1	23	1	20	1
21.00	26	0	25	1	30	1	30	0	26	0	16	0	15	0
22.00	13	0	16	1	19	0	27	0	16	0	10	0	11	0
23.00	11	0	13	0	14	0	15	0	19	0	9	0	10	0
TOTAL	786	111	818	106	900	123	1017	109	1068	81	924	22	791	111

* Legend

C : Cars and light Vehicles T : Heavy Trucks

APPENDIX B

APPENDIX C

TABLE C1 EXISTING AVERAGE HOURLY HEAVY VEHICLE VOLUMES MONDAY TO FRIDAY ON MAIN ROADS AND ROBERTS ROAD PERIOD 27-08-14 TO 02-09-14

Time	Wisemans Ferry Road		Old Northern Road		Roberts Road	
	Station 3		Station 4		STATION 5	
	East Bound	West Bound	North Bound	South Bound	East Bound	West Bound
6.00 - 7.00 am	18·8	24·2	2·6	13·0	2·8	5·0
7.00 - 8.00 am	17·4	21·6	9·4	9·2	6·0	4·8
8.00 - 9.00 am	17·4	22·0	7·6	11·0	4·0	3·6
9.00 - 10.00 am	18·4	23·4	9·4	11·6	4·8	3·6
10.00-11.00 am	19·4	21·0	9·0	8·0	3·8	2·8
11.00-12.00 am	18·8	17·0	9·8	7·2	2·8	2·4
12.00 - 1.00 pm	18·0	16·8	11·6	7·8	4·2	1·8
1.00 - 2.00 pm	18·6	15·0	9·4	11·8	3·0	2·4
2.00 - 3.00 pm	16·8	15·2	11·0	5·8	3·0	2·0
3.00 - 4.00 pm	22·6	12·2	8·8	5·6	1·0	0·8
4.00 - 5.00 pm	14·2	10·8	8·4	5·4	2·2	2·2
5.00 - 6.00 pm	8·2	4·8	5·0	2·4	1·8	0·8
(6.00am to 6.00 pm) TOTAL	208·6	204	102	98·8	39·4	32·2
(24 hours) TOTAL	219·2	233·8	115·4	117·4	47·0	34·6

TABLE C2

MAXIMUM DAILY HEAVY TRUCKS GENERATED BY DEVELOPMENT AND HOURLY DISTRIBUTION TO MAIN ROADS AND ROBERTS ROAD.

MONDAYS TO FRIDAY

Time	Roberts Road		Wisemans Ferry Road Station 3		Old Northern Road Station 4	
	Eastbound	Westbound	Westbound	Eastbound	Southbound	Northbound
6.00 - 7.00 am	3	6	5	3	1	0
7.00 - 8.00 am	4	2	2	3	0	1
8.00 - 9.00 am	5	6	5	4	1	1
9.00 - 10.00 am	7	6	5	5	1	2
10.00-11.00 am	10	7	6	8	1	2
11.00-12.00 am	3	5	5	2	1	1
12.00 - 1.00 pm	4	2	2	4	0	0
1.00 - 2.00 pm	4	6	5	4	1	0
2.00 - 3.00 pm	4	6	5	3	1	1
3.00 - 4.00 pm	1	2	2	3	0	1
4.00 - 5.00 pm	1	1	1	1	0	0
5.00 - 6.00 pm	1	0	0	1	0	0
TOTAL	50	50	43	41	7	9

TABLE C 3

EXISTING HEAVY TRUCK VOLUMES ON MAIN ROADS AND ROBERTS ROAD.

SATURDAY 30-8-14-

Time	Roberts Road STATION 5		Wisemans Ferry Road Station 3		Old Northern Road Station 4	
	East Bound	West Bound	West Bound	East Bound	North Bound	South Bound
6.00 - 7.00 am	0	0	11	10	1	5
7.00 - 8.00 am	0	1	9	11	6	2
8.00 - 9.00 am	0	0	7	9	2	6
9.00 - 10.00 am	0	0	2	6	2	1
10.00-11.00 am	0	1	8	18	4	4
11.00-12.00 am	2	0	4	5	2	2
12.00-1.00 pm	0	0	3	4	1	4
1.00-2.00 pm	0	0	1	6	3	4
2.00-3.00 pm	0	0	3	3	2	1
3.00-4.00 pm	1	1	7	2	1	3
4.00-5.00 pm	1	1	4	3	3	4
5.00-6.00 pm	1	0	4	1	1	2
(6.00am – 6.00 pm) TOTAL	5	4	63	78	28	38
(24 Hours) TOTAL	5	4	80	84	31	45

TABLE C4 INCREASE IN HEAVY TRAFFIC ON MAIN ROADS AND ROBERTS ROAD WHEN DEVELOPMENT GENERATES MAXIMUM DAILY TRUCK MOVEMENTS 50 IN AND 50 OUT

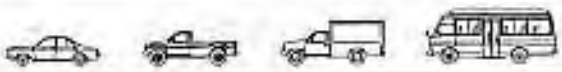
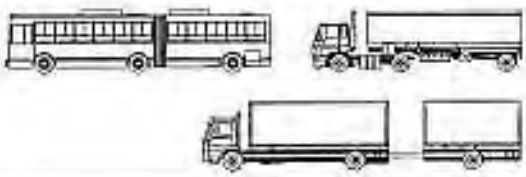
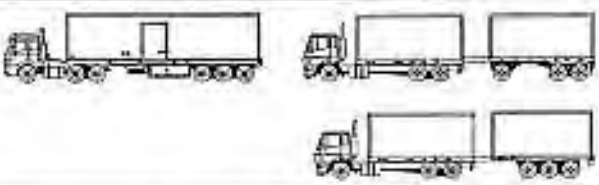
MONDAY TO FRIDAY

Time	Roberts Road		Wisemans Ferry Road Station 3		Old Northern Road Station 4	
	East Bound	West Bound	West Bound	East Bound	North Bound	South Bound
6.00 - 7.00 am	1	4	3	1	0	1
7.00 - 8.00 am	4	2	2	3	1	0
8.00 - 9.00 am	4	5	4	3	1	1
9.00 - 10.00 am	6	5	4	4	2	1
10.00-11.00 am	4	4	3	3	1	1
11.00-12.00 am	2	3	3	2	0	0
12.00-1.00 pm	3	2	2	3	0	0
1.00-2.00 pm	3	3	2	3	0	1
2.00-3.00 pm	3	3	2	2	1	1
3.00-4.00 pm	1	0	0	1	0	0
4.00-5.00 pm	0	0	0	0	0	0
5.00-6.00 pm	1	0	0	1	0	0
(6.00am - 6.00 pm) TOTAL	32	31	25	26	6	6

APPENDIX D

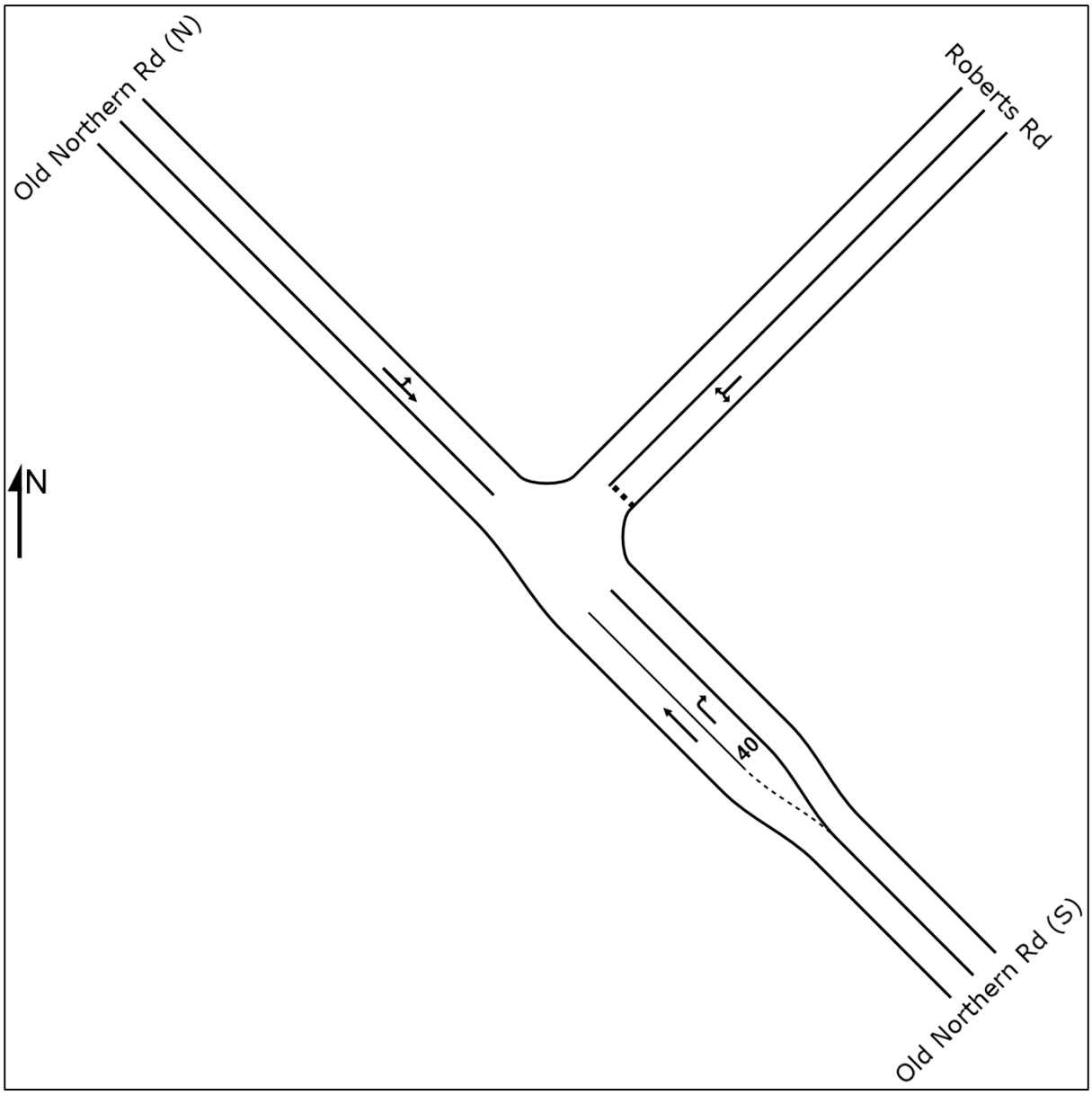
VEHICLE CLASSIFICATION SYSTEM

AUSTROADS : January 1994

Class	LIGHT VEHICLES	
1	SHORT Car, Van, Wagon, 4WD, Utility, Bicycle, Motorcycle	
2	SHORT – TOWING Trailer, Caravan, Boat	
	HEAVY VEHICLES	
3	TWO AXLE TRUCK OR BUS (2 axles)	
4	THREE AXLE TRUCK OR BUS (3 axles, 2 groups)	
5	FOUR AXLE TRUCK (4 axles, 2 groups)	
6	THREE AXLE ARTICULATED (3 axles, 3 groups)	
7	FOUR AXLE ARTICULATED (4 axles, 3 or 4 groups)	
8	FIVE AXLE ARTICULATED (5 axles, 3 to 5 groups)	
9	SIX AXLE ARTICULATED (6 axles, 3 to 6 groups 7+ axles, 3 groups)	
10	B DOUBLE (7+ axles, 4 groups)	
11	DOUBLE ROAD TRAIN (7+ axles, 5 or 6 groups)	
12	TRIPLE ROAD TRAIN (7+ axles, 7+ groups)	

APPENDIX E

Old Northern Road / Roberts Road Site Layout



MOVEMENT SUMMARY

▽ Site: Old Northern Road / Roberts Road AM EXISTING

Old Northern Road / Roberts Road
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
SouthEast: Old Northern Rd (S)											
22	T1	38	28.9	0.023	0.0	LOS A	0.0	0.0	0.00	0.00	90.0
23	R2	4	0.0	0.005	8.1	LOS A	0.0	0.1	0.28	0.60	55.2
Approach		42	26.2	0.023	0.8	NA	0.0	0.1	0.03	0.06	84.9
NorthEast: Roberts Rd											
24	L2	8	25.0	0.018	5.4	LOS A	0.1	0.5	0.28	0.53	49.7
26	R2	6	16.7	0.018	6.5	LOS A	0.1	0.5	0.28	0.53	50.9
Approach		14	21.4	0.018	5.9	LOS A	0.1	0.5	0.28	0.53	50.2
NorthWest: Old Northern Rd (N)											
27	L2	6	16.7	0.063	7.8	LOS A	0.0	0.0	0.00	0.03	73.9
28	T1	111	7.2	0.063	0.0	LOS A	0.0	0.0	0.00	0.03	89.2
Approach		117	7.7	0.063	0.4	NA	0.0	0.0	0.00	0.03	88.3
All Vehicles		173	13.3	0.063	0.9	NA	0.1	0.5	0.03	0.08	82.4

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LANE SUMMARY

▽ Site: Old Northern Road / Roberts Road AM EXISTING

Old Northern Road / Roberts Road
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows Total	HV	Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue Veh	Dist	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
SouthEast: Old Northern Rd (S)													
Lane 1	38	28.9	1641	0.023	100	0.0	LOS A	0.0	0.0	Full	500	0.0	0.0
Lane 2	4	0.0	753	0.005	100	8.1	LOS A	0.0	0.1	Short	40	0.0	NA
Approach	42	26.2		0.023		0.8	NA	0.0	0.1				
NorthEast: Roberts Rd													
Lane 1	14	21.4	778	0.018	100	5.9	LOS A	0.1	0.5	Full	500	0.0	0.0
Approach	14	21.4		0.018		5.9	LOS A	0.1	0.5				
NorthWest: Old Northern Rd (N)													
Lane 1	117	7.7	1851	0.063	100	0.4	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	117	7.7		0.063		0.4	NA	0.0	0.0				
Intersection	173	13.3		0.063		0.9	NA	0.1	0.5				

Level of Service (LOS) Method: Delay (RTA NSW).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

▽ Site: Old Northern Road / Roberts Road PM EXISTING

Old Northern Road / Roberts Road
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
SouthEast: Old Northern Rd (S)											
22	T1	110	8.2	0.059	0.0	LOS A	0.0	0.0	0.00	0.00	90.0
23	R2	5	0.0	0.006	7.5	LOS A	0.0	0.2	0.17	0.60	55.5
Approach		115	7.8	0.059	0.3	NA	0.0	0.2	0.01	0.03	87.6
NorthEast: Roberts Rd											
24	L2	2	50.0	0.017	5.3	LOS A	0.1	0.5	0.27	0.55	45.1
26	R2	9	22.2	0.017	6.7	LOS A	0.1	0.5	0.27	0.55	49.5
Approach		11	27.3	0.017	6.4	LOS A	0.1	0.5	0.27	0.55	48.6
NorthWest: Old Northern Rd (N)											
27	L2	5	40.0	0.027	8.3	LOS A	0.0	0.0	0.00	0.07	65.1
28	T1	44	9.1	0.027	0.0	LOS A	0.0	0.0	0.00	0.07	88.8
Approach		49	12.2	0.027	0.9	NA	0.0	0.0	0.00	0.07	85.7
All Vehicles		175	10.3	0.059	0.9	NA	0.1	0.5	0.02	0.07	82.9

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LANE SUMMARY

▽ Site: Old Northern Road / Roberts Road PM EXISTING

Old Northern Road / Roberts Road
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows Total	HV	Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue Veh	Dist	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
SouthEast: Old Northern Rd (S)													
Lane 1	110	8.2	1852	0.059	100	0.0	LOS A	0.0	0.0	Full	500	0.0	0.0
Lane 2	5	0.0	836	0.006	100	7.5	LOS A	0.0	0.2	Short	40	0.0	NA
Approach	115	7.8		0.059		0.3	NA	0.0	0.2				
NorthEast: Roberts Rd													
Lane 1	11	27.3	653	0.017	100	6.4	LOS A	0.1	0.5	Full	500	0.0	0.0
Approach	11	27.3		0.017		6.4	LOS A	0.1	0.5				
NorthWest: Old Northern Rd (N)													
Lane 1	49	12.2	1791	0.027	100	0.9	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	49	12.2		0.027		0.9	NA	0.0	0.0				
Intersection	175	10.3		0.059		0.9	NA	0.1	0.5				

Level of Service (LOS) Method: Delay (RTA NSW).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

▽ Site: Old Northern Road / Roberts Road AM FUTURE 2025

Old Northern Road / Roberts Road
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
SouthEast: Old Northern Rd (S)											
22	T1	76	28.9	0.046	0.0	LOS A	0.0	0.0	0.00	0.00	90.0
23	R2	6	0.0	0.010	9.4	LOS A	0.0	0.2	0.41	0.64	54.1
Approach		82	26.8	0.046	0.7	NA	0.0	0.2	0.03	0.05	85.8
NorthEast: Roberts Rd											
24	L2	12	25.0	0.038	6.3	LOS A	0.1	1.1	0.43	0.61	48.5
26	R2	11	18.2	0.038	9.1	LOS A	0.1	1.1	0.43	0.61	49.4
Approach		23	21.7	0.038	7.6	LOS A	0.1	1.1	0.43	0.61	49.0
NorthWest: Old Northern Rd (N)											
27	L2	11	18.2	0.126	7.8	LOS A	0.0	0.0	0.00	0.03	73.3
28	T1	222	7.2	0.126	0.0	LOS A	0.0	0.0	0.00	0.03	89.3
Approach		233	7.7	0.126	0.4	NA	0.0	0.0	0.00	0.03	88.4
All Vehicles		338	13.3	0.126	0.9	NA	0.1	1.1	0.04	0.07	83.2

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LANE SUMMARY

▽ Site: Old Northern Road / Roberts Road AM FUTURE 2025

Old Northern Road / Roberts Road
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows Total	HV	Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue Veh	Dist	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
SouthEast: Old Northern Rd (S)													
Lane 1	76	28.9	1641	0.046	100	0.0	LOS A	0.0	0.0	Full	500	0.0	0.0
Lane 2	6	0.0	617	0.010	100	9.4	LOS A	0.0	0.2	Short	40	0.0	NA
Approach	82	26.8		0.046		0.7	NA	0.0	0.2				
NorthEast: Roberts Rd													
Lane 1	23	21.7	602	0.038	100	7.6	LOS A	0.1	1.1	Full	500	0.0	0.0
Approach	23	21.7		0.038		7.6	LOS A	0.1	1.1				
NorthWest: Old Northern Rd (N)													
Lane 1	233	7.7	1851	0.126	100	0.4	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	233	7.7		0.126		0.4	NA	0.0	0.0				
Intersection	338	13.3		0.126		0.9	NA	0.1	1.1				

Level of Service (LOS) Method: Delay (RTA NSW).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

▽ Site: Old Northern Road / Roberts Road PM FUTURE 2025

Old Northern Road / Roberts Road
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
SouthEast: Old Northern Rd (S)											
22	T1	220	8.2	0.119	0.0	LOS A	0.0	0.0	0.00	0.00	89.9
23	R2	5	0.0	0.006	7.9	LOS A	0.0	0.2	0.25	0.60	55.3
Approach		225	8.0	0.119	0.2	NA	0.0	0.2	0.01	0.01	88.7
NorthEast: Roberts Rd											
24	L2	3	33.3	0.027	5.4	LOS A	0.1	0.8	0.39	0.61	46.7
26	R2	11	18.2	0.027	9.0	LOS A	0.1	0.8	0.39	0.61	49.0
Approach		14	21.4	0.027	8.3	LOS A	0.1	0.8	0.39	0.61	48.5
NorthWest: Old Northern Rd (N)											
27	L2	7	42.9	0.053	8.4	LOS A	0.0	0.0	0.00	0.05	64.3
28	T1	88	9.1	0.053	0.0	LOS A	0.0	0.0	0.00	0.05	89.2
Approach		95	11.6	0.053	0.6	NA	0.0	0.0	0.00	0.05	86.7
All Vehicles		334	9.6	0.119	0.6	NA	0.1	0.8	0.02	0.05	85.2

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LANE SUMMARY

▽ Site: Old Northern Road / Roberts Road PM FUTURE 2025

Old Northern Road / Roberts Road
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows Total	HV	Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue Veh	Dist	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
SouthEast: Old Northern Rd (S)													
Lane 1	220	8.2	1852	0.119	100	0.0	LOS A	0.0	0.0	Full	500	0.0	0.0
Lane 2	5	0.0	778	0.006	100	7.9	LOS A	0.0	0.2	Short	40	0.0	NA
Approach	225	8.0		0.119		0.2	NA	0.0	0.2				
NorthEast: Roberts Rd													
Lane 1	14	21.4	527	0.027	100	8.3	LOS A	0.1	0.8	Full	500	0.0	0.0
Approach	14	21.4		0.027		8.3	LOS A	0.1	0.8				
NorthWest: Old Northern Rd (N)													
Lane 1	95	11.6	1802	0.053	100	0.6	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	95	11.6		0.053		0.6	NA	0.0	0.0				
Intersection	334	9.6		0.119		0.6	NA	0.1	0.8				

Level of Service (LOS) Method: Delay (RTA NSW).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.