

**Local Emergency Management & Airport Committee Meeting Agenda  
20 August 2019**

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**NOTICE OF LOCAL EMERGENCY MANAGEMENT & AIRPORT COMMITTEE MEETING**

A meeting of the Local Emergency Management & Airport Committee will be held on **Monday 5 August 2019, commencing at 4.00pm** in the Training Room at the Shire Administration Building at 70 Wotton Street

**Contents**

<b>1.</b>	<b>DECLARATION OF OPENING / ANNOUNCEMENT OF VISITORS.....</b>	<b>2</b>
<b>2.</b>	<b>RECORD OF ATTENDANCE AND APOLOGIES .....</b>	<b>2</b>
<b>3.</b>	<b>BUSINESS ARISING FROM THE PREVIOUS MINUTES .....</b>	<b>2</b>
<b>4.</b>	<b>INFORMATION REPORTS FROM CEO .....</b>	<b>2</b>
<b>5.</b>	<b>GENERAL BUSINESS .....</b>	<b>2</b>
<b>6.</b>	<b>CLOSURE OF MEETING .....</b>	<b>3</b>

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**APPENDICES**

Minutes LEMC Meeting 20 May 2019  
Geotechnical pavement report by Golder & Associates  
Contact and Resources Register – 15 July 2019



## REPORT

# Pavement investigation Report

## *Shire of Wiluna Airport*

Submitted to:

### **Shire of Wiluna**

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Submitted by:

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18113648-001-R-Rev0

April 2019



## Distribution List

1 Copy - Shire of Wiluna

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# Table of Contents

<b>1.0 INTRODUCTION .....</b>	<b>1</b>
<b>2.0 OBJECTIVES .....</b>	<b>1</b>
<b>3.0 SUPPLIED INFORMATION .....</b>	<b>1</b>
<b>4.0 PUBLICLY AVAILABLE INFORMATION .....</b>	<b>2</b>
4.1 Aerodrome.....	2
4.2 Climate and Rainfall .....	2
4.3 Geology .....	2
<b>5.0 FIELDWORK.....</b>	<b>2</b>
<b>6.0 LABORATORY TESTING .....</b>	<b>3</b>
<b>7.0 VISUAL ASSESSMENT .....</b>	<b>6</b>
7.1 Apron.....	6
7.2 Taxiway .....	6
7.3 Runway .....	6
<b>8.0 SUBSURFACE CONDITIONS.....</b>	<b>6</b>
8.1 Apron.....	6
8.2 Taxiway .....	6
8.3 Runway .....	7
8.4 General.....	7
<b>9.0 DISCUSSION .....</b>	<b>7</b>
9.1 Laboratory Testing .....	7
9.1.1 Moisture Content.....	7
9.1.2 Particle Size Distribution – Basecourse .....	8
9.1.3 Atterberg Limits and Linear Shrinkage – Basecourse .....	8
9.1.4 California Bearing Ratio .....	8
9.2 Falling Weight Deflectometer Testing .....	9
9.3 Pavement Composition .....	11
9.4 Subgrade Design CBR.....	12
<b>10.0 PAVEMENT CLASSIFICATION NUMBER .....</b>	<b>12</b>
10.1 Methodology.....	12

10.2	Design Traffic .....	13
10.3	Pavement Classification Number .....	14
<b>11.0</b>	<b>PAVEMENT REHABILITATION OPTIONS.....</b>	<b>14</b>
11.1	Pavement Structural Condition .....	14
11.2	Pavement Rehabilitation .....	14
11.3	Drainage .....	15
<b>12.0</b>	<b>IMPORTANT INFORMATION.....</b>	<b>15</b>

## TABLES

Table 1:	Pavement Dipping Details .....	3
Table 2:	Laboratory Test Data Summary .....	5
Table 3:	Summary of Pavement Moisture Ratio .....	7
Table 4:	Summary of Pavement Layer Indices .....	10
Table 5:	Summary of Back-calculated Layer Moduli .....	11
Table 6:	Summary of Pavement Thickness.....	11
Table 7:	Summary of Pavement Thickness.....	12
Table 8:	Design Traffic Information .....	13

## FIGURES

Figure 1: Location Plan

Figure 2: Site Plan

Figure 3: Basecourse Grading

## APPENDICES

### APPENDIX A

Pavement Dipping Reports

### APPENDIX B

Laboratory Test Certificates

### APPENDIX C

Pavement Visual Assessment Photos

### APPENDIX D

Falling Weight Deflectometer (FWD) Test Results

### APPENDIX E

Important Information

## 1.0 INTRODUCTION

This report presents the results of the pavement investigation and assessment of Pavement Classification Number (PCN) undertaken by Golder Associates Pty Ltd (Golder) at Wiluna Airport, Wiluna. The work was authorised by Angela Hoy of the Shire of Wiluna through a Purchase order dated 25 January 2019 and was undertaken in accordance with our proposal P18113648-001-L-Rev0. The Airport is an asset of the Shire of Wiluna.

The location of the site in relation to the surrounding area is shown on Figure 1, Location Plan.

The airport, which comprises sealed runway 15/33 (approximately 1,811 m long) and unsealed runway 03/21 (approximately 1,220 m long), a sealed taxiway, and a sealed Regular Public Transport (RPT) apron, was investigated by WML Consultants in 2016. Further investigation was undertaken by GHD in 2018. The Shire of Wiluna required further assessment to be undertaken following the GHD investigation.

Only the existing sealed pavements have been assessed as part of this investigation (runway 15/33, the taxiway and RPT apron).

## 2.0 OBJECTIVES

The pavement investigation had the following objectives:

- Assess the subsurface soil conditions for the sealed pavements – runway 15/33, the taxiway and the RPT apron
- Characterise the material properties of the subgrade, through sampling and testing including 4-day soaked and unsoaked California Bearing Ratio (CBR)
- Characterise material properties of the basecourse and subbase for the sealed pavements
- Determine the pavement thickness and layering of the sealed pavements
- Provide a professional opinion on the condition and strength of the subgrade and existing pavement materials (including potential areas of concern, if encountered), based on the investigation results and supplied information
- Assess the PCN in accordance with CASA Advisory Circular AC 139-25(0) – Strength Rating of Aerodrome Pavements
- Provide comment on other issues encountered that relate to pavement performance.

## 3.0 SUPPLIED INFORMATION

The following information has been provided by the Shire of Wiluna:

- GHD Advisory, *Wiluna Airport Funding Review*, dated October 2018.
- GHD Report 91/10733, *Wiluna Aerodrome - Preliminary Pavement Evaluation Study*, dated October 2018.
- WML Consultants Report 7368-G-R-001-A Rev4, *Runway Pavement Investigation Wiluna Aerodrome Report*, dated January 2017.
- Aerodrome Management Services Pty Ltd (AMS)'s Aerodrome Technical Inspection Report, dated June 2017
- Elite Electrical Contracting's Aerodrome Technical Inspection Report dated June 2017.

- Submission - Senate Inquiry into operation regulation funding of air route service delivery (endorsed by Council 2018.02.28)
- Cobham Aviation Services Pavement Concession, dated July 2018.

## 4.0 PUBLICLY AVAILABLE INFORMATION

### 4.1 Aerodrome

Detailed information is not available regarding the history of the aerodrome construction. Typically, rural aerodromes undergo a series of lengthening, widening and reconstruction in various stages over time to meet the current needs. We are aware that the runway was resealed in 2016, although we do not have information on the seal construction details (e.g. binder application rate).

### 4.2 Climate and Rainfall

Wiluna Airport services the community within the Shire of Wiluna and the nearby mine site operated by Blackman Resources. It is located at the edge of the Western Desert in Western Australia, in an area which experiences low rainfall and extreme temperatures. Bureau of Meteorology climate data for the Wiluna weather station, about 4 km north of the site, indicates a mean average rainfall of about 261 mm and a mean monthly maximum temperature between about 19°C and 38°C.

### 4.3 Geology

The Wiluna 1:250,000 Geological Series Map published by the Geological Survey of Western Australia indicates that the site is located within an area underlain by the following geological units:

- Sheetwash deposits - Clay, silt and sand as extensive fans; commonly ferruginous;
- Colluvium – Silt, sand and rock debris as slope deposits and proximal sheetwash; includes ironstone fragments.

## 5.0 FIELDWORK

Fieldwork for the pavement investigation was carried out from 20 to 22 February 2019 and comprised the following:

- Site inspection and visual assessment of the pavement and surface condition.
- Pavement dippings at 12 locations, PD01 to PD12, extending to depths ranging from about 350 mm to 700 mm as follows:
  - Nine pavement dippings, PD01 to PD06 and PD10 to PD12, within the runway areas.
  - One pavement dipping, PD09, within the taxiway.
  - Two pavement dippings, PD07 and PD08, within the apron.
- Dynamic cone penetrometer (DCP) testing at subgrade level at two locations, extending to depths ranging from about 350 mm to 420 mm.

The test locations are presented on Figure 2, Site Plan. A summary of the test locations is presented in Table 1.

**Table 1: Pavement Dipping Details**

Pavement Dipping	Test Location		Chainage (m)	Termination Depth (mm)	Pavement Thickness (mm)		Subgrade Material
	Easting	Northing			Seal	Basecourse	
Runway							
PD01	222928	7051948	1770	500	30	270	Clayey/Silty SAND
PD02	223015	7051796	1600	700	30	270	Clayey/Silty Gravelly SAND
PD03	223212	7051556	1290	480	30	270	Inferred Ironstone
PD04	223369	7051287	970	620	30	250	Clayey/Silty GRAVEL
PD05	223488	7051161	810	350	30	220	Clayey SAND
PD06	223910	7050524	40	480	30	210	Sandy CLAY
PD10	222976	7051856	1660	450	30	230	Clayey/Silty GRAVEL
PD11	223571	7051036	660	560	30	230	Sandy CLAY
PD12	223722	7050772	350	500	30	270	Clayey SAND
Apron							
PD07	223293	7051675	120	500	30	220	Clayey SAND
PD08	223216	7051763	5	420	30	210	GRAVEL
Taxiway							
PD09	223184	7051675	50	360	30	170	GRAVEL

Following logging and sampling, non-sampled spoil from each dipping was placed and compacted within the excavation and imported material sourced on site was used to replace sampled pavement material. Pavement material (moisture conditioned) was compacted, and surfacing was completed by placing and compacting cold mix asphalt. The reinstatement of each pavement dipping was conducted by Shire of Wiluna personnel.

An engineer from Golder positioned and observed the pavement dippings, logged the materials encountered, and collected samples for laboratory testing. Pavement dipping reports are shown in Appendix A, along with the method of soil classification, and notes and abbreviations used on the reports.

The findings of the visual assessment are provided in Section 7.0.

## 6.0 LABORATORY TESTING

The following laboratory testing was carried out on the samples collected from the pavement and subgrade:

- Moisture content on 12 basecourse and ten subgrade samples.
- Particle size distribution on five basecourse and ten subgrade samples.
- Atterberg limits and linear shrinkage testing on five pavement and ten subgrade samples.
- Dry density – moisture content relationship using modified compactive effort on five subgrade samples.
- Soaked and unsoaked CBR testing on five subgrade samples.
- Soaked CBR on two basecourse samples.



Laboratory testing was carried out at Golder's NATA-accredited laboratory in Osborne Park. Test reports are included in Appendix B and the test methods followed are noted on the test reports. A summary of the laboratory test results is provided in Table 2.

Due to inferred hardpan ironstone encountered at relatively shallow depth across the site (refer Section 8.0 and Appendix A), it was not possible to collect sufficient subgrade samples at a number of the test locations without significant disturbance of the pavement. Therefore, selected samples were blended in order to provide sufficient samples for CBR testing. Samples were blended following receipt of particle size distribution and Atterberg limits test results, and only samples with similar properties were blended for testing. Samples which were blended are indicated in Table 2.

**Table 2: Laboratory Test Data Summary**

Location	Location	Layer	Description	Particle Size Distribution (%)			MC	LL	PI	LS	MMDD (t/m <sup>3</sup> )	SCBR	UCBR
				Gravel	Sand	Fines							
PD05		Basecourse	Clayey/Silty Gravelly SAND	32	41	27	9	18	7	4	2.43	19	-
PD06		Basecourse	Clayey GRAVEL	51	29	20	4.3	20	9	4	-	-	-
PD07		Basecourse	Silty Gravelly SAND	30	49	21	4.7	13	2	1	-	-	-
PD09		Basecourse	Clayey SAND	19	54	27	8	17	8	3	-	-	-
PD10		Basecourse	Clayey Sandy GRAVEL	56	30	14	7.4	23	13	7	-	-	-
PD02		Subgrade	Clayey/Silty Gravelly SAND	31	50	19	8.8	16	4	2.5			-
PD04		Subgrade	Clayey/Silty GRAVEL	44	39	17	8	18	5	3	-	-	-
PD05		Subgrade	Clayey SAND	12	59	29	12.2	20	9	4	-	-	-
PD06		Subgrade	Sandy CLAY	27	37	36	10.5	26	10	5.5	-	-	-
PD07		Subgrade	Clayey SAND	9	64	27	9.2	18	8	4	-	-	-
PD08		Subgrade	GRAVEL	64	28	8	12.1	20	2	1	-	-	-
PD09		Subgrade	GRAVEL	63	27	10	12.9	SIB	NP	ND	-	-	-
PD10		Subgrade	Clayey/Silty GRAVEL	48	35	17	9	18	5	3	-	-	-
PD11		Subgrade	Sandy CLAY	19	46	35	8.3	20	8	5	2.2	4	60
PD12		Subgrade	Clayey SAND	27	44	29	8.5	20	9	4	-	-	-
PD04 & PD10 (blended)		Subgrade	-	-	-	-	-	-	-	-	2.34	15	70
PD05 & PD07 (blended)		Subgrade	-	-	-	-	-	-	-	-	2.25	25	70
PD06 & PD10 (blended)		Basecourse	-	-	-	-	-	-	-	-	2.50	30	-
PD06 & PD11 (blended)		Subgrade	-	-	-	-	-	-	-	-	2.12	11	40
PD08 & PD09 (blended)		Subgrade	-	-	-	-	-	-	-	-	1.89	60	100

Note: MC – moisture content, LL – liquid limit, PI – plasticity index, LS – linear shrinkage, MMDD – modified maximum dry density, SCBR – soaked California bearing ratio, UCBR – unsoaked California bearing ratio

## 7.0 VISUAL ASSESSMENT

A visual assessment of the pavement was conducted during the fieldwork. An aerial showing the extent of the defects on the runway can be found in figure 2, Site Plan. Photos of the main defects encountered can be found in

Appendix C.

### 7.1 Apron

The condition of the apron pavement and surfacing was noted to be in generally acceptable condition at the time of the fieldwork. Minor stripping of the aggregate was evident in the southeast portion of the apron, with isolated areas of minor rutting and flushing within the trafficked area in the northeast portion of the apron.

### 7.2 Taxiway

The condition of the taxiway was noted to be marginal. Moderate flushing was observed within the wheelpaths and stripping of the sealing aggregate was noted in un-trafficked areas. Ruts up to 20 mm depth (under a 1.2 m) straight edge were observed in the north-western section of the taxiway.

### 7.3 Runway

The overall condition of the runway was noted to be marginal, with the north-western section of the runway between chainage 1,100 m and 1,811 m generally showing increased evidence of pavement distress. Ruts up to approximately 20 mm depth were observed over this section. Rutting was most severe around chainage 1,811 m. Isolated flushing in wheel paths, stripping of aggregate, and multiple patches (inferred due to repair of pavement defects) were the main defects observed over this section.

The condition of the runway from chainage 0 m to 1,100 m was generally satisfactory.

Drainage was generally noted to be poor adjacent to the runway. Grades on the runoff areas adjacent to the runway are relatively flat. Drains beyond the runoff area appear relatively shallow.

## 8.0 SUBSURFACE CONDITIONS

Based on the materials encountered in the pavement dippings, subsurface conditions at the site can be generalised as follows:

### 8.1 Apron

- **SPRAYED SEAL**; inferred 10/5 mm double coat seal with prime, extending from the pavement surface to a depth of 30 mm, overlying
- **BASECOURSE: Silty Gravelly SAND/Sandy GRAVEL (SM/GP/GC)**; fine to coarse grained sand, fine to coarse, sub-rounded to sub-angular gravel, red brown, up to about 30% low plasticity fines, dry to moist, dense to very dense, extending to depths between about 240 mm and 250 mm, overlying
- **SUBGRADE: Clayey SAND/GRAVEL (SC/GW-GM)**; fine to coarse grained sand, fine to coarse, sub-rounded to sub-angular gravel, red brown, up to approximately 25% low plasticity fines, dry, dense to very dense, extending to the maximum depth investigated of 500 mm.

### 8.2 Taxiway

- **SPRAYED SEAL**; inferred 10/5 mm double coat seal with prime, extending from the pavement surface to a depth of 30 mm, overlying
- **BASECOURSE: Clayey SAND (SC)**; fine to coarse grained, red brown, approximately 25% low plasticity fines, with fine to coarse, sub-rounded to sub-angular gravel, dry, dense to very dense, extending to depth of about 200 mm, overlying

- **SUBGRADE: Gravel (GW-GM)**; fine to coarse, sub-rounded to sub-angular, red brown, with fine to coarse grained sand, with low liquid limit fines, dry, dense to very dense, extending to the maximum depth investigated of 360 mm.

## 8.3 Runway

- **SPRAYED SEAL**; inferred 10/5 mm double coat seal with prime, extending from the pavement surface to a depth of about 30 mm, overlying
- **BASECOURSE: Clayey/Silty SAND/Clayey/Silty GRAVEL (SC-SM/GC-GM)**; fine to coarse grained sand, fine to coarse, sub-rounded to sub-angular gravel, red brown, up to about 25% low plasticity/low liquid limit fines, dry to moist, dense to very dense, extending to depths between about 240 mm and 300 mm, overlying
- **SUBGRADE: Clayey/Silty SAND/Clayey/Silty GRAVEL (SC-SM/GC-GM)**; fine to coarse grained sand, fine to coarse, sub-rounded to sub-angular gravel, red brown, up to approximately 30% low plasticity/low liquid limit fines, dry to moist, extending to the maximum depth investigated of 700 mm.

Inferred medium strength ironstone (hardpan) was encountered below the basecourse at pavement dipping PD03. Inferred ironstone was generally noted to underly the subgrade across the site.

Low plasticity Sandy CLAY subgrade was encountered within pavement dippings PD06 and PD11.

## 8.4 General

Variations to the above generalised profile do occur. Reference should be made to the individual pavement dipping logs in Appendix A for further information.

## 9.0 DISCUSSION

### 9.1 Laboratory Testing

#### 9.1.1 Moisture Content

The moisture content test results indicate that the moisture content of the basecourse varies between 4.4% and 9.0%, and the moisture content of the subgrade varies between 8.2% and 12.9%. Moisture ratios (*in situ* moisture content divided by optimum moisture content) ranged from 59% to 120% for the basecourse and 92% and 122% for the subgrade. A summary of the moisture ratios for the tested material is presented in Table 3

**Table 3: Summary of Pavement Moisture Ratio**

Location	Basecourse			Subgrade		
	MC (%)	MOMC (%)	MR (%)	MC (%)	MOMC (%)	MR (%)
PD01	7	-	93	-	-	-
PD02	8.5	-	113	9.4	-	93
PD03	7.9	-	105	-	-	-
PD04	6.7	-	89	8.2	7.5	109
PD05	9	7.5	120	12.2	10	122
PD06	4.4	7.5	59	10.5	11	95
PD07	4.7	-	63	9.2	10	92
PD08	6.5	-	87	12.9	13.5	96
PD09	8	-	107	12.9	13.5	96
PD10	7.4	7.5	99	9	7.5	120

Location	Basecourse			Subgrade		
	MC (%)	MOMC (%)	MR (%)	MC (%)	MOMC (%)	MR (%)
PD11	5.3	-	71	8.3	8.5	98
PD12	6.2	-	83	8.5	-	83

Note: MC – moisture content, MOMC – modified optimum moisture content, MR – moisture ratio  
 Values in *italics* have been assessed using average MOMC values

The moisture content testing indicates that the moisture ratios of the basecourse and subgrade are relatively high and may be contributing to some of the performance issues observed. Upper limits for basecourse and subgrade moisture ratios of 70% and 85% respectively are generally considered suitable to manage the risk of poor performance in relation to moisture ingress.

### 9.1.2 Particle Size Distribution – Basecourse

Particle size distribution testing was undertaken on five basecourse and ten subgrade samples. The test results have been plotted together against Main Roads WA Specification 501 for natural gravel basecourse on Figure 3.

The basecourse material is generally finer than the Specification 501 limits and therefore likely to be lower strength than desired for the expected loads. The relatively high fines content (material passing a 0.075 mm sieve) encountered suggests the material may lose strength at elevated moisture contents.

### 9.1.3 Atterberg Limits and Linear Shrinkage – Basecourse

The laboratory testing indicates that the Atterberg limits and linear shrinkage properties of the basecourse range from the following values:

- Liquid limit: 13% to 23%
- Plasticity index: 2% to 13%
- Linear shrinkage: 1% to 7%.

The liquid limit is considered to be within an acceptable range for natural gravel basecourse materials. The plasticity index is variable and high (> 6%) for some samples. Some of the linear shrinkage results were noted to be high and this suggests that the basecourse may undergo volume change with changes in moisture content.

### 9.1.4 California Bearing Ratio

Soaked and unsoaked CBR testing was undertaken on selected basecourse and subgrade samples. Two soaked CBR tests were undertaken on the basecourse material. The soaked CBR test results are summarised with the laboratory test data in Table 2.

## 9.2 Falling Weight Deflectometer Testing

Falling weight deflectometer (FWD) testing was undertaken on sealed airside pavements in 2016 by WML. The Shire of Wiluna has provided the FWD data to Golder for assessment, and this data is included in Appendix D.

The FWD testing was performed at a target test stress of 1,200 kPa. The data has been assessed using the base layer index (BLI,  $D_0 - D_{300}$ ), middle layer index (MLI,  $D_{300} - D_{600}$ ) and lower layer index (LLI,  $D_{600} - D_{900}$ ) approach as detailed in Horak and Emery (2015)<sup>1</sup>. The FWD test data was adjusted to represent a test stress of 1415 kPa (assuming a linear relationship between drop stress and deflection) which is the benchmark stress presented in the Horak and Emery paper. The BLI, MLI and LLI is useful in indicating pavement inadequacies. Assessment of the data indicates:

- The apron generally has a “severe to warning” structural capacity for the base layer, with all test locations except one indicating a “warning or severe” structural condition ratings
- The taxiway generally has a “severe to warning” structural capacity for the base layer with about half of the test locations indicating “warning” or “severe” structural condition ratings.
- The runway pavement between chainage 0 m and 660 m east of the centreline generally has a “severe to warning” structural capacity for the base layer, with about 70% of the test locations undertaken 10 m east of the centreline indicating a “severe” structural condition rating.
- The runway pavement between chainage 660 m and 1,120 m generally has a “severe to warning” structural capacity rating for the base layer with the majority of the test locations indicating “warning” or “severe” structural condition ratings.
- The runway pavement between chainage 1,120 m and 1,810 m generally has a “severe” structural capacity rating for the base layer with all the test locations indicating “warning” or “severe” structural condition ratings, with the majority of the test locations indicating a “severe” structural condition rating.
- The subgrade generally has a “sound” structural capacity rating for the Aaron and runway, with only a small number of locations for each indicating a “warning” structural condition.
- The subgrade has a “sound to warning” structural capacity rating for the Taxiway with several test locations indicating a “warning” structural condition rating.

A summary of the pavement layer indices is presented in Table 4.

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<sup>1</sup> E. Horak, James Maina, and S. Emery, Review of Falling Weight Deflectometer Deflection Benchmark, CAPSA 2015.

**Table 4: Summary of Pavement Layer Indices**

Layer Index	Runway (Ch 0-660 m)			Runway (660-1,120 m)			Runway (1,120-1,811 m)			Taxiway			Apron		
	Base	Middle	Lower	Base	Middle	Lower	Base	Middle	Lower	Base	Middle	Lower	Base	Middle	Lower
"Sound" Index Maximum Limit ( $\mu\text{m}$ ) <sup>(1)</sup>	500	250	130	500	250	130	500	250	130	500	250	130	500	250	130
Maximum ( $\mu\text{m}$ )	1788	481	125	2025	307	81	1951	587	144	1625	526	242	1579	420	168
Average ( $\mu\text{m}$ )	677	191	60	859	175	34	1105	223	48	613	305	131	993	240	95

Note: <sup>(1)</sup> Values for which good performance can be expected

Average values indicated in red are above the "sound" limit

The Rubicon Toolbox back-calculation program was used to estimate the moduli of the basecourse and subgrade layers in the runway, taxiway and apron pavements based on the FWD results. It should be noted that the results are indicative rather than definitive; however, they can provide some insight into the structural capacity of the pavements. Rubicon allows the layer modulus to be restricted during assessment and the following limits were placed on the pavement layer moduli:

- Basecourse: 200 MPa to 400 MPa
- Subgrade: 60 MPa to 180 MPa.

The low basecourse upper limit was selected following refinement during back-calculation and assessment of the laboratory test results.

The outcomes of the FWD assessment are presented in Table 5.

**Table 5: Summary of Back-calculated Layer Moduli**

Area	Back-calculated Moduli (MPa)			
	Basecourse		Subgrade	
	Average	15% <sup>(1)</sup>	Average	15% <sup>(1)</sup>
Runway (Ch 0-660 m)	371	325	175	180
Runway (Ch 660-1,120 m)	353	272	180	180
Runway (Ch 1,120-1,811 m)	306	213	174	175
Taxiway	388	386	156	113
Apron	336	208	165	153

Note: <sup>(1)</sup> 15<sup>th</sup> percentile value

The back-calculation of layer moduli generally indicates that the basecourse is marginal and the subgrade has good strength. This is in general agreement with the laboratory testing conducted.

### 9.3 Pavement Composition

The average pavement layer thicknesses based on observations conducted during the pavement dippings is shown in Table 6.

**Table 6: Summary of Pavement Thickness**

Area	Approximate Layer Thickness (mm)		
	Seal	Basecourse	Total
Runway	30	210-270	240-300
Taxiway	30	170	200
Apron	30	210-220	240-250

No information relating to the construction history of the Airport was provided.

The pavement profiles used in our assessment of the pavement requirements are provided in Table 7.



**Table 7: Summary of Pavement Thickness**

Area	Approximate Layer Thickness		
	Seal	Basecourse	Total
Runway	30	230	260
Taxiway	30	170	200
Apron	30	210	240

## 9.4 Subgrade Design CBR

Soaked and unsoaked CBR testing was undertaken on the subgrade materials sampled from each airside pavement dipping. The CBR test results are summarised in Due to the moisture content of the subgrade, the design subgrade CBR value was calculated based on the mean of the soaked CBR results minus a factor multiplied by the standard deviation. This approach is adopted by Main Roads Western Australia (MRWA) and is considered suitable for assessing subgrade conditions at the site.

The outlying results of 4% (PD11) and 60% (PD08 & PD09 blended sample) were not considered in the assessment of subgrade design CBR. This is in accordance with CASA document AC 139-25(0), which allows results outside of the mean plus or minus one standard deviation to be discarded.

While it should be noted that the FWD data generally indicates the subgrade to be “sound” (MLI and LLI), the presence of isolated lower-strength material must be recognised. However, it is not considered practical to base the design subgrade CBR on this outlying result.

The following formula, taken from MRWA design document *Engineering Road Note 9*, was used for the assessment:

$$\text{Design CBR} = \bar{c} - ks$$

Where:

$\bar{c}$  = Mean of all CBR determinations within a single design unit

$s$  = Standard deviation of all CBR determinations within a single design unit

$k$  = A multiplier factor (for arid conditions and a low number of traffic repetitions  $k = 0.5$ )

The design CBR obtained from the above formula is 16%. This value is considered marginally high for airport pavement design and in accordance with accepted practice and our experience with similar materials the design subgrade CBR was reduced to 15%. This correlates to “Subgrade Code A” (high strength).

It is noted that the subgrade design CBR assessed with the above formula for soaked conditions is comparable to the back-calculated modulus assessed from the FWD test results (using the generally-accepted relationship of modulus = 10 × CBR).

## 10.0 PAVEMENT CLASSIFICATION NUMBER

### 10.1 Methodology

The Civil Aviation Safety Authority (CASA) Advisory Circular AC 139-25(0), Strength Rating of Aerodrome Pavements (August 2011) provides aerodrome operators with guidance on how to meet specified requirements in relation to the bearing strength of pavements. The CASA advisory circular refers to the US Federal Aviation Authority (FAA) methods of pavement design, which comply with ICAO, and references associated FAA design software: COMFAA and FAARFIELD.

The FAA method recommends the following minimum requirements for runway pavements servicing aircraft less than about 45 tonnes:

- a minimum thickness of asphalt surfacing of 100 mm.
- a crushed aggregate base course with minimum thickness of 150 mm.
- a minimum thickness of sub-base of 100 mm.

In Australia these minimum requirements are generally not complied with. CASA provides alternatives based on local experience in Advisory Circular AC 139-25(0). Natural gravels (sometimes modified with cement but still unbound) and crushed rocks are generally used for basecourse materials. Thin asphalt (generally 50 mm) or bituminous seals are often used for surface treatments.

## 10.2 Design Traffic

The Shire of Wiluna has provided an airport usage analysis for the financial year ending June 2017 in its “*Submission - Senate Inquiry into operation regulation funding of air route service delivery (endorsed by Council 2018.02.28)*” document. The data indicated that the aircraft composition will comprise generally of Pilatus PC-12, Aeronaut Embraer 120ER, Bombardier Dash 8, and BAe-146. A total of 469 aircraft movements occurred during this 12-month period. The maximum take-off weight category for each aircraft type were provided in the same document. A concession detailing the Maximum Take-off Weight for the BAe-146 was also provided separately. A summary of the design aircraft and movements is presented in Table 8.

A design life of 20 years and a subgrade design CBR of 15% has been adopted for analysis and design.

**Table 8: Design Traffic Information**

Design Aircraft	MTOW (kg)	%MG	Tyre pressure (kPa)	MPA	Traffic composition (%)	ACN at MTOW
Pilatus PC-12	4,740	95	531	164 <sup>(1)</sup>	35	2.8
EMB-120ER	12,000	95	931	130	28	5.9
Dash 8	19,505	93.6	740	90	19	8.4
BAe-146	35,000	94.2	880	85	18	16

Note: <sup>(1)</sup> 16 planes having a Maximum Take Off Weight of less than 3,000 kg have been combined to simplify assessment

MTOW – maximum take-off weight, %MG – percentage of weight on main gears, MPA – movements per annum,

ACN – aircraft classification number

An average runway pavement thickness of 277 mm has been considered for the PCN assessment. As the seal thickness is significant (about 30 mm) and the seal contains generally angular aggregate, we have assumed some load spreading will occur through the seal. Therefore, the seal thickness has been included for the PCN assessment.

To assess the PCN, the runway pavement must be converted to an equivalent thickness using the FAA standard profile (76 mm asphalt, 153 mm crushed rock and variable thickness of sub-base). For the purpose of assessment the pavement was assumed to comprise the following profile:

- 30 mm crushed aggregate (seal thickness, P-209)
- 100 mm aggregate (P-208)
- 147 mm sub-base (P-154).

COMFAA is provided with a supporting Excel spreadsheet which allows conversion of the actual pavement to a standard FAA profile. The above profile is equivalent to the following FAA standard profile:

- 76 mm hot mix asphalt
- 113 mm crushed aggregate base
- No sub-base.
- Total thickness 189 mm.

### 10.3 Pavement Classification Number

It should be noted that as discussed in CASA document 139-25(0), PCN assessment “*is not an exact science and therefore ratings obtained by a technical evaluation are at best a good approximation*”. It is assumed that pavement performance will be monitored by the airport operator and the PCN adjusted if required (e.g. reduced if performance is worse than expected).

AC 139-25(0) indicates that the PCN may be adopted from the aircraft classification number (ACN) of an aircraft at a particular weight such that the pavement is just adequate for 10,000 coverages. An assessment was made of the suitability of the above pavement designs to support 10,000 coverages of a Dash 8, with the aircraft weight reduced until the pavement could support 10,000 coverages. It should be noted the Bae-146 was not assessed as there are relatively few movements of this aircraft type.

The weight of the Dash 8 was assessed to be 16,860 kg. The ACN of the Dash 8 at this weight was assessed in the FAA design program COMFAA and found to be 8 for flexible pavement subgrade support type A (CBR 15%).

The maximum tyre pressure the aircraft expected to regularly use the airport is 931 kPa (135 psi). It is recommended the PCN limit the tyre pressure to this value to optimise wearing surface performance. It should be noted that the PCN tyre pressure limits of Y (1,250 kPa) and Z (500 kPa) are considered to be too high and low respectively.

The recommended PCN of the runway is considered to be **8/F/A/931 (135)/T**. It should be noted the PCN does not account for the current pavement condition, only the average pavement thickness. A reduction in advertised PCN may be warranted to reduce the rate of pavement deterioration.

## 11.0 PAVEMENT REHABILITATION OPTIONS

### 11.1 Pavement Structural Condition

The airside pavements were generally considered to be marginal at the time of the fieldwork. We have therefore provided brief comment on aircraft traffic and pavement remediation for consideration.

FWD test results analysis indicates that the runway generally has marginal structural capacity. This is supported by the defects observed (rutting). The PCN assessment also suggests the runway does not have capacity to support aircraft with an ACN above 8, such as the Bae-146.

To facilitate use of the pavements by heavier aircraft, pavement and drainage improvements may be considered.

### 11.2 Pavement Rehabilitation

A granular overlay with stabilisation is considered to be the most appropriate rehabilitation treatment for Wiluna Airport. This treatment should address the main defects observed (rutting and flushing) and come at significantly reduced cost compared with asphalt. However, it would require closure of the airport to facilitate construction. If this option is pursued it is recommended further advice be sought from potential contractors, but as a guide we anticipate a closure period of about six weeks to two months may be adequate.

Due to the size of the aircraft expected to use the airport we do not consider an asphalt overlay or asphalt wearing surface to be warranted.

This option is expected to provide good performance for the design life of the pavement. A general methodology for construction is provided below:

- Provide drainage improvements as required (e.g. deepening table drains, refer Section 11.3)
- Proof roll the existing pavement using a heavy roller (above 20 tonnes). The purpose of proof rolling is to densify and identify weaker areas prior to overlay.
- Box out weak areas identified during proof rolling to the required depth and replace with granular pavement material. Isolated areas of subgrade improvement may also be required (such as near pavement dipping PD11)
- Overlay the pavement with the required thickness of granular pavement material basecourse to achieve the design requirements. As a guide, about 100 mm to 150 mm may be sufficient, however, the actual thickness required will need to be assessed to accommodate the expected traffic and geometric requirements.
- Spread cement at the required rate across the pavement surface. The required cement content will need to be assessed through laboratory testing; however, based on our previous experience we anticipate a cement content of about 1.5% to 2.0% may be suitable.
- Blend the cement, overlay material, seal and existing pavement material using a pavement recycling machine (stabiliser) to a depth of about 150 mm to 200 mm. Water should be added during this time.
- Compact and trim the pavement within the working time of the cement.
- Allow to dry back, and apply a prime and sprayed seal wearing surface.

Further work is required to assess the suitability of the above option and optimise the design. Golder has significant experience in airport pavement and surfacing design and can provide further advice if required.

### 11.3 Drainage

The moisture content of the pavement and subgrade was noted to be relatively high. Moisture contents can weaken pavement and subgrade materials and reduce pavement life. Adequate drainage should be provided to keep moisture away from the pavement.

Poor drainage was observed at the site. The relatively shallow cemented material (inferred ironstone) is expected to inhibit infiltration of water below the pavement. It is therefore critical that moisture be intercepted before it can enter the pavement formation by providing sufficient table drains and crossfall at the surface to direct runoff to suitable drainage areas.

It should be noted that failure to provide adequate drainage may reduce pavement life.

## 12.0 IMPORTANT INFORMATION

Your attention is drawn to the document titled "Important Information Relating to this Report", which is included in Appendix E of this report. The statements presented in that document are intended to inform a reader of the report about its proper use. There are important limitations as to who can use the report and how it can be used. It is important that a reader of the report understands and has realistic expectations about those matters. The Important Information document does not alter the obligations Golder Associates has under the contract between it and its client.

The following limitations apply to the pavement design method adopted:

- 1) The PCN has been assessed for the provided design traffic based on the assumed material design parameters as presented in this report.
- 2) The assessment does not address future changes in aircraft loading. Future increases in aircraft loading may lead to premature failure.
- 3) The specified method only considers subgrade rutting.
- 4) Adequate drainage and a waterproof surfacing above the granular pavement material is required. The ingress of water in the pavement decreases its shear/rutting resistance. The assessment assumes that the pavement will be kept in a dry condition.
- 5) The pavement design relies on a waterproof condition of the pavement surface. If proper maintenance is not carried out during the life of the pavement and water is allowed to infiltrate, poor performance can be expected.

Where information was not provided, assumptions were considered based on experience in similar projects and engineering judgement. Should the assumptions presented in this report differ from actual conditions on site (e.g. aircraft loads and tyre inflation pressures), further assessment may be required.

## Signature Page

### Golder Associates Pty Ltd



Aichata Traore  
*Geotechnical Engineer*



Andrew Cray  
*Principal Geotechnical Engineer*

AT-BMH/AC/as

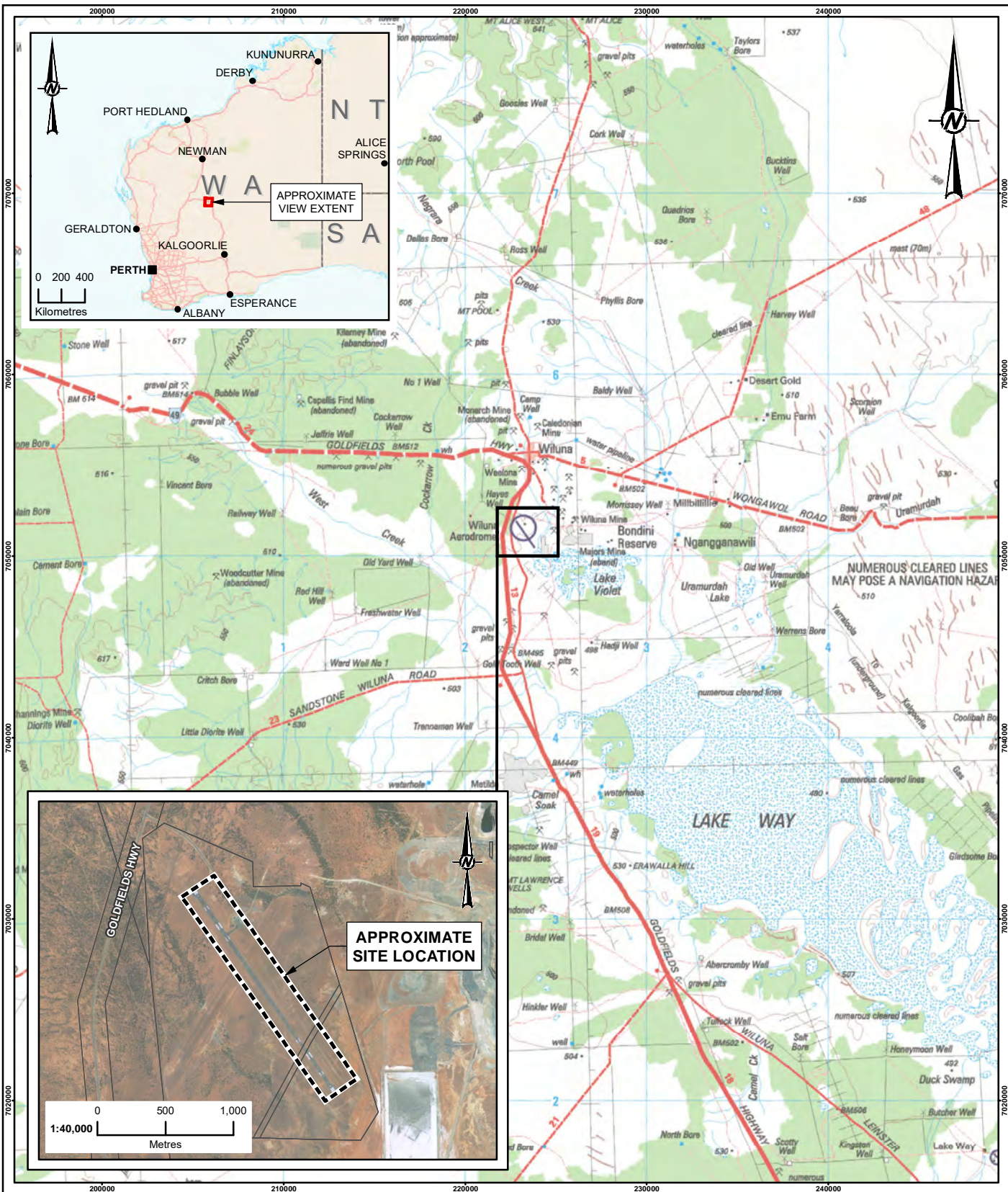
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<https://golderassociates.sharepoint.com/sites/101337/deliverables/18113648-001-r-rev0.docx>



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1:300,000 METRES

**NOTE:**

1. COORDINATE SYSTEM: GDA 1994 MGA ZONE 51

**REFERENCES:**

1. CADASTRE AND INSET AERIAL IMAGERY BASED ON INFORMATION PROVIDED BY AND WITH THE PERMISSION OF THE WESTERN AUSTRALIAN LAND INFORMATION AUTHORITY TRADING AS LANDGATE (2019). AERIAL IMAGERY DATED 2014.
2. IMAGE SOURCED FROM GEOSCIENCE AUSTRALIA 1:250,000 TOPOGRAPHIC MAPPING.

CLIENT  
SHIRE OF WILUNA

CONSULTANT



YYYY-MM-DD 2019.03.12

DESIGNED AT

PREPARED JRP

REVIEWED ARC

APPROVED ARC

PROJECT  
SHIRE OF WILUNA AIRPORT RUNWAY

TITLE  
**LOCATION PLAN**

PROJECT NO.  
18113648

CONTROL  
001 R

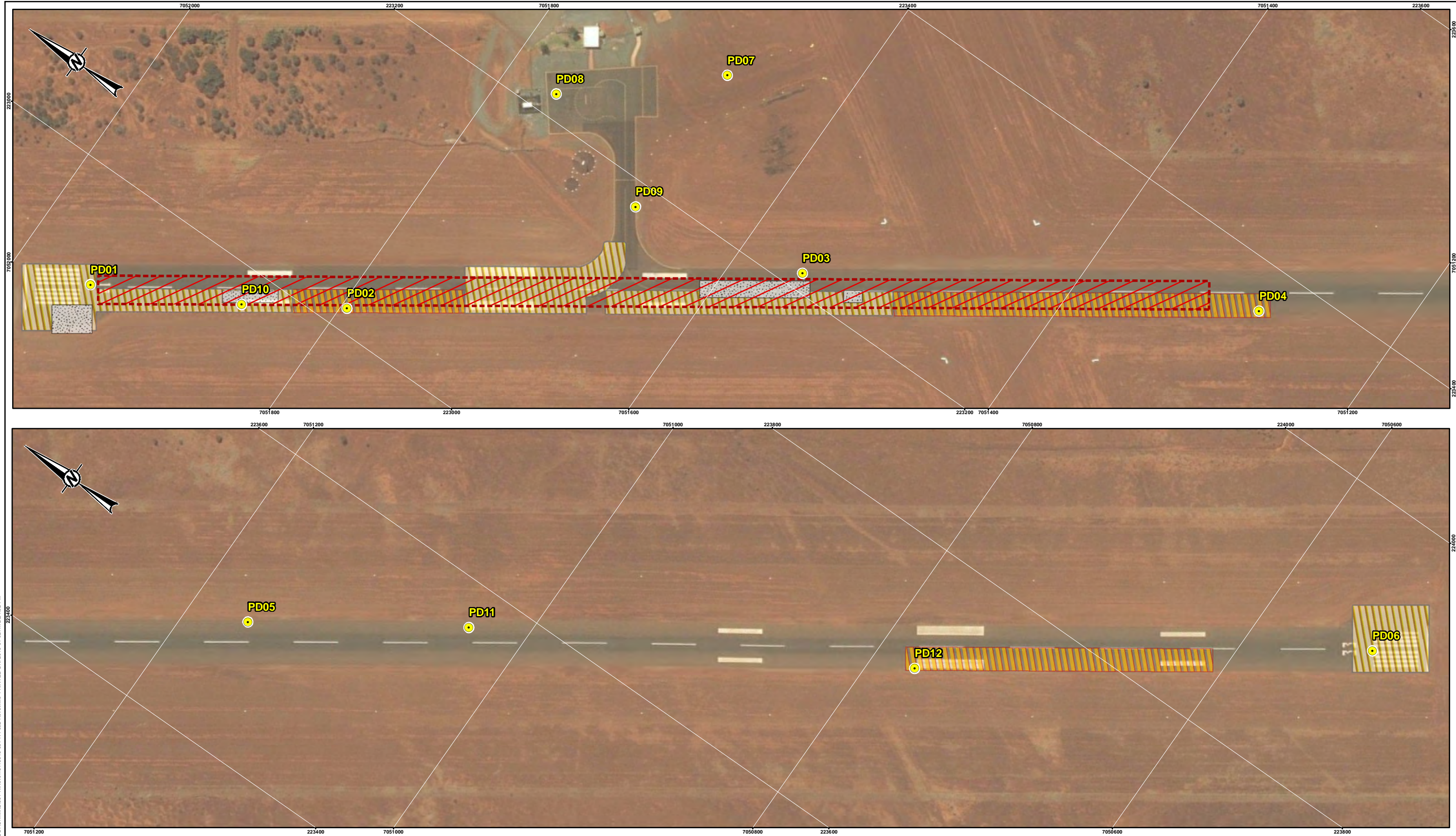
REV.  
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FIGURE  
1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ISO A4

25mm





- LEGEND**
- PAVEMENT DIPPING LOCATION
  - ▨ FLUSHING
  - ▨ PATCHES (APPROXIMATE LOCATION)
  - ▨ RUTTING BETWEEN ABOUT 10 AND 20mm
  - ▨ RUTTING LESS THAN ABOUT 10mm



**NOTE:**  
1. COORDINATE SYSTEM: GDA 1994 MGA ZONE 51

**REFERENCE:**  
1. AERIAL IMAGERY SOURCED FROM BING MAPS.  
© 2019 MICROSOFT CORPORATION © 2019 DIGITALGLOBE © CNES (2019) DISTRIBUTION AIRBUS DS

CLIENT  
SHIRE OF WILUNA

CONSULTANT



YYYY-MM-DD	2019-04-02
DESIGNED	AT
PREPARED	JRP
REVIEWED	ARC
APPROVED	ARC

PROJECT  
SHIRE OF WILUNA AIRPORT RUNWAY

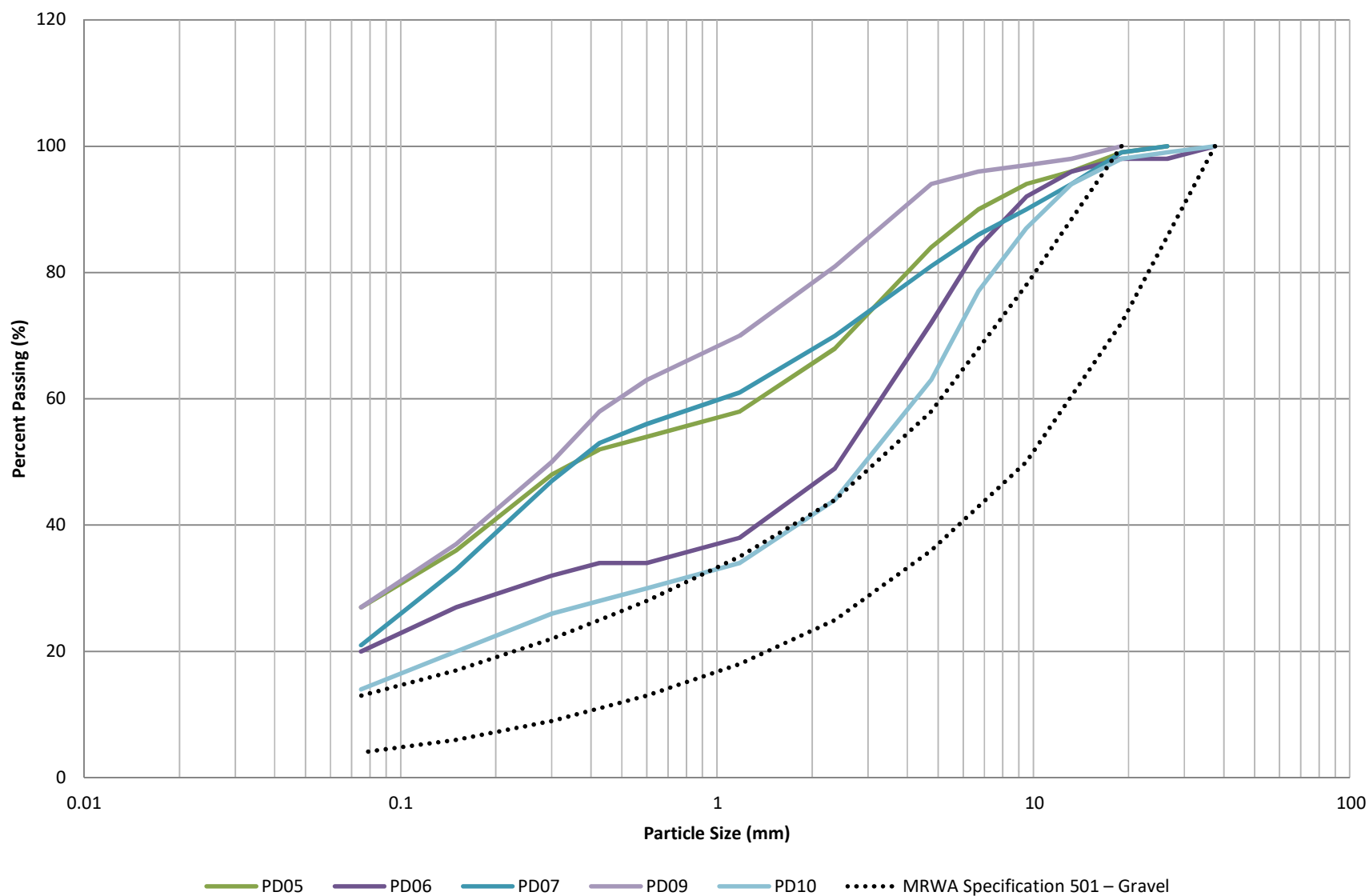
TITLE  
**SITE PLAN**

PROJECT NO.	CONTROL	REV.	FIGURE
18113648	001 R	0	2

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IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN THE SHEET SIZE HAS BEEN MODIFIED FROM ISO A3 25mm








CLIENT				Shire of Wiluna		PROJECT	Wiluna Airport		
DRAWN	AT	DATE	1 April 2019			Basecourse Grading			
CHECK	BMH	DATE	1 April 2019						
SCALE	NTS	A4				PROJECT No.	18113648-001-R-Rev0		Figure 3

**APPENDIX A**


# Pavement Dipping Reports


Pavement Dipping Location		PD01	Approx. Coordinates: 222928 E 7051948 N		Datum: MGA zone 51J
			Logged: AT	Date: 20/02/2019	Checked: BMH Date: 29/03/2019
Base of Pavement and Surfacing (mm)		300	Samples		
End of Hole (mm)		500			
Surfacing		SEAL: Inferred 10/5 mm double coat seal	1 DS (MC)		
Thickness (mm)		30			
Comments		Seal is in marginal condition with moderate stripping and bleeding observed			
Basecourse		Clayey/Silty SAND (SC-SM): fine to coarse grained sand, red brown, low plasticity fines, with fine to coarse grained, sub-rounded to sub-angular gravel	1 DS (MC)		
Thickness (mm)		270			
Comments		Moist, dense to very dense			
Subgrade		Clayey/Silty SAND (SC-SM) fine to coarse grained, red brown, approximately 15-20% low liquid limit fines, with fine to coarse, sub-rounded to sub-angular gravel			
Comments		Moist, dense to very dense. Refusal on inferred medium strength ironstone			
Pavement Conditions and General Comments					


Pavement Dipping Location	PD02		Approx. Coordinates: 223015 E 7051796 N	Datum: MGA zone 51J		
			Logged: AT	Date: 20/02/2019	Checked: BMH	Date: 29/03/2019
Base of Pavement and Surfacing (mm)	300	Samples				
End of Hole (mm)	700					
Surfacing	SEAL: Inferred 10/5 mm double coat seal	1				
Thickness (mm)	30					
Comments	Seal is in marginal condition with moderate stripping and bleeding observed					
Basecourse	Clayey/Silty SAND (SC-SM): fine to coarse grained sand, red brown, low plasticity fines, with fine to coarse grained, sub-rounded to sub-angular gravel.	1 DS (MC)				
Thickness (mm)	270					
Comments	Moist, dense to very dense					
Subgrade	Clayey/Silty Gravelly SAND (SC-SM) fine to coarse grained, red brown, approx. 20% low plasticity fines, approx. 30% fine to coarse, sub-rounded to sub-angular gravel					
Comments	Moist, dense to very dense. Refusal on inferred medium strength ironstone					
Pavement Conditions and General Comments						

Pavement Dipping Location		PD03		Approx. Coordinates: 223212 E 7051556 N		Datum: MGA	zone 51J
				Logged: AT	Date: 20/02/2019	Checked: BMH	Date: 29/03/2019
Base of Pavement and Surfacing (mm)		300	Samples				
End of Hole (mm)		480					
Surfacing		SEAL: Inferred 10/5 mm double coat seal					
Thickness (mm)		30					
Comments		Seal is in satisfactory condition with minor stripping and bleeding observed					
Basecourse		Clayey/Silty SAND (SC-SM): fine to coarse grained sand, red brown, low plasticity fines, with fine to coarse grained, sub-rounded to sub-angular gravel	1 DS (MC) 1 BDS				
Thickness (mm)		270					
Comments		Moist, dense to very dense					
Subgrade		Inferred IRONSTONE Distinctly weathered ironstone, medium strength, red brown and dark grey					
Comments		Dense to very dense. Refusal on inferred medium strength ironstone					
Pavement Conditions and General Comments							






Pavement Dipping Location		PD04			Approx. Coordinates: 223369 E 7051287 N		Datum: MGA zone 51J					
					Logged: AT		Date: 20/02/2019		Checked: BMH		Date: 29/03/2019	
Base of Pavement and Surfacing (mm)		280		Samples								
End of Hole (mm)		620										
Surfacing		SEAL Inferred 10/5 mm double coat seal		1 DS (MC)								
Thickness (mm)		30										
Comments		Pavement in marginal condition with minor stripping and minor rutting observed										
Basecourse		Clayey/Silty GRAVEL (GC-GM): fine to coarse, sub-rounded to sub-angular, red brown, low plasticity fines, with fine to coarse grained sand		1 DS (MC)								
Thickness (mm)		250										
Comments		Moist, dense to very dense										
Subgrade		Clayey/Silty GRAVEL (GC-GM) fine to coarse, sub-rounded to sub-angular, red brown, approx. 15% low plasticity fines, approx. 40% fine to coarse grained sand										
Comments		Moist, dense to very dense. Refusal on inferred medium strength ironstone										
Pavement Conditions and General Comments												


Pavement Dipping Location		PD05						Approx. Coordinates: 223488 E 7051161 N		Datum: MGA zone 51J					
								Logged: AT		Date: 21/02/2019		Checked: BMH		Date: 29/03/2019	
Base of Pavement and Surfacing (mm)		250			Samples										
End of Hole (mm)		350													
Surfacing		SEAL Inferred 10/5 mm double coat seal													
Thickness (mm)		30													
Comments		Seal in satisfactory condition with minor stripping observed													
Basecourse		Clayey/Silty Gravelly SAND (SC-SM): fine to coarse grained, red brown, approx. 25% low plasticity fines, approx. 30% sub-rounded to sub-angular, fine to coarse gravel			1 DS (MC) 2 BDS										
Thickness (mm)		220													
Comments		Moist, dense to very dense													
Subgrade		Clayey SAND (SC) fine to coarse grained, red brown, low plasticity fines, trace fine to medium gravel													
Comments		Moist, dense to very dense. Refusal on inferred medium strength ironstone													
Pavement Conditions and General Comments															
Dynamic Cone Penetrometer: Started at 260mm															
Testing Increment (mm)		0-100													
Blow Count / 100 mm		>25	R												

Pavement Dipping Location		PD06	Approx. Coordinates: 223910 E 7050524 N		Datum: MGA zone 51J
			Logged: AT	Date: 21/02/2019	Checked: BMH Date: 29/03/2019
Base of Pavement and Surfacing (mm)		240	Samples		
End of Hole (mm)		480			
Surfacing		SEAL Inferred 10/5 mm double coat seal	1 DS (MC) 2 BDS		
Thickness (mm)		30			
Comments		Seal is in satisfactory condition with moderate stripping and bleeding observed			
Basecourse		Clayey GRAVEL (GC): fine to coarse, sub-rounded to sub-angular, red brown, approx. 20% low plasticity fines, with fine to coarse grained sand	DS 1 Bag (20 to 320 mm)		
Thickness (mm)		210			
Comments		Dry, dense to very dense			
Subgrade		Sandy CLAY (CL): low plasticity, red brown, approx. 35-40% fine to coarse grained sand, approximately 25% fine to medium, sub-rounded to sub-angular gravel			
Comments		Moist, dense to very dense. Refusal on inferred medium strength ironstone			
Pavement Conditions and General Comments					




Pavement Dipping Location		PD07	Approx. Coordinates: 223293 E 7051675 N		Datum: MGA zone 51J				
Logged: AT		Date: 21/02/2019		Checked: BMH Date: 29/03/2019					
Base of Pavement and Surfacing (mm)		250	Samples						
End of Hole (mm)		500							
Surfacing		Inferred 10/5 mm double coat seal							
Thickness (mm)		30							
Comments		Seal in satisfactory condition with some minor stripping observed							
Basecourse		<b>Silty Gravelly SAND (SM):</b> fine to coarse grained, red brown, approx. 20% low plasticity fines, approx. 30% fine to coarse, sub-rounded to sub-angular gravel	1 DS (MC) 1 BDS						
Thickness (mm)		220							
Comments		Dry to moist, dense to very dense							
Subgrade		<b>Clayey SAND (SC):</b> fine to coarse grained, red brown, approx. 25% low plasticity fines, with fine to coarse grained, sub-rounded to sub-angular gravel							
Comments		Moist, dense to very dense. Refusal on inferred medium strength ironstone							
Pavement Conditions and General Comments									




Pavement Dipping Location		PD08		Approx. Coordinates: 223216 E 7051763 N				Datum: MGA zone 51J					
Logged: AT		Date: 21/02/2019		Checked: BMH		Date: 29/03/2019							
Base of Pavement and Surfacing (mm)		240		Samples									
End of Hole (mm)		420											
Surfacing		SEAL Inferred 10/5 mm doublecoat seal		1 DS (MC)									
Thickness (mm)		30											
Comments		Seal in satisfactory condition with minor stripping and minor rutting observed											
Basecourse		Sandy GRAVEL (GP-GC): fine to medium, sub-rounded to sub-angular, orange-red to brown, fine to medium grained sand, with low plasticity fines		1 DS (MC)									
Thickness (mm)		210 Dry to moist, dense to very dense											
Subgrade		GRAVEL (GW-GM) fine to coarse, sub-rounded to sub-angular, red brown, with fine to coarse grained sand, with low liquid limit fines											
Comments		Moist, dense to very dense. Refusal on inferred medium strength ironstone											
Pavement Conditions and General Comments													
Dynamic Cone Penetrometer: Test commenced at 300 mm depth													
Testing Increment (mm)		0-100											
Blow Count / 100 mm		> 25		R									


Pavement Dipping Location		PD09	Approx. Coordinates: 223184 E 7051675 N Datum: MGA zone 51J			
			Logged: AT	Date: 21/02/2019	Checked: BMH	Date: 29/03/2019
Base of Pavement and Surfacing (mm)		200	Samples			
End of Hole (mm)		360				
Surfacing		SEAL Inferred 10/5 mm double coat seal				
Thickness (mm)		30				
Comments		Seal is in marginal condition with stripping ,rutting and bleeding observed				
Basecourse		Clayey SAND (SC): Fine to coarse grained, red brown, approx. 25% low plasticity fines, with fine to coarse, sub-rounded to sub-angular gravel	1 DS (MC) 1 BDS			
Thickness (mm)		170				
Comments		Moist, dense to very dense				
Subgrade		GRAVEL (GW-GM) fine to coarse, sub-rounded to sub-angular, red brown, with fine to coarse grained sand, with non-plastic fines				
Comments		Moist, dense to very dense. Refusal on inferred medium strength ironstone				
Pavement Conditions and General Comments						



Pavement Dipping Location		PD10		Approx. Coordinates: 222976 E 7051856 N		Datum: MGA zone 51J	
				Logged: AT		Date: 21/02/2019	Checked: BMH Date: 29/03/2019
Base of Pavement and Surfacing (mm)		260	Samples				
End of Hole (mm)		450					
Surfacing		SEAL Inferred 10/5 mm double coat seal					
Thickness (mm)		30					
Comments		Seal is in marginal condition with moderate stripping and bleeding observed					
Basecourse		Clayey Sandy GRAVEL (GC): fine to coarse, sub-rounded to sub-angular, red brown, approx. 15% low plasticity fines, approx. 30% fine to coarse grained sand	1 DS (MC) 2 BDS				
Thickness (mm)		230					
Comments		Moist, dense to very dense					
Subgrade		Clayey/Silty GRAVEL (GC-GM) fine to coarse, sub-rounded to sub-angular, red brown, approximately 15-20% low liquid limit fines, with fine to coarse grained sand					
Comments		Moist, dense to very dense. Refusal on inferred medium strength ironstone					
Pavement Conditions and General Comments							

Pavement Dipping Location		PD11	Approx. Coordinates: 223571 E 7051036 N		Datum: MGA zone 51J
			Logged: AT		Date: 21/02/2019
			Checked: BMH		Date: 29/03/2019
Base of Pavement and Surfacing (mm)		260	Samples		
End of Hole (mm)		560			
Surfacing		SEAL Inferred 10/5 mm double coat seal			
Thickness (mm)		30			
Comments		Seal in satisfactory condition with minor stripping observed			
Basecourse		Clayey/Silty SAND (SC-SM): fine to coarse grained, red brown, low plasticity fines, with fine to coarse, sub-rounded to sub-angular gravel	1 DS (MC)		
Thickness (mm)		230			
Comments		Dry to moist, dense to very dense			
Subgrade		Sandy CLAY (CL): low plasticity, red brown, approx. 45% fine to coarse grained sand, with fine to medum, sub-rounded to sub-angular gravel			
Comments		Moist, dense to very dense. Refusal on inferred medium strength ironstone			
Pavement Conditions and General Comments					



Pavement Dipping Location		PD12	Approx. Coordinates: 223722 E 7050772 N Datum: MGA zone 51J	
			Logged: AT Date: 21/02/2019 Checked: BMH Date: 29/03/2019	
Base of Pavement and Surfacing (mm)	300	Samples		
End of Hole (mm)	500			
Surfacing	Inferred 10/5 mm double coat seal			
Thickness (mm)	30			
Comments	Seal in satisfactory condition with minor stripping observed			
Basecourse	Clayey/Silty SAND (SC-SM): fine to coarse grained, red brown, low plasticity fines, with fine to coarse grained, sub-rounded to sub-angular gravel	1 DS (MC) 2 BDS		
Thickness (mm)	270			
Comments	Moist, dense to very dense			
Subgrade	Clayey SAND (SC): fine to coarse grained, red brown, approx. 30% low plasticity fines, with fine to coarse grained, sub-rounded to sub-angular gravel			
Comments	Moist, dense to very dense. Refusal on inferred medium strength ironstone			
Pavement Conditions and General Comments				

**APPENDIX B**

# Laboratory Test Certificates

# Soils testing - Particle size distribution & consistency limits test report

Standard method (by sieving)

AS1289.3.6.1, 2.1.1, 3.1.2, 3.2.1, 3.3.1 & 3.4.1

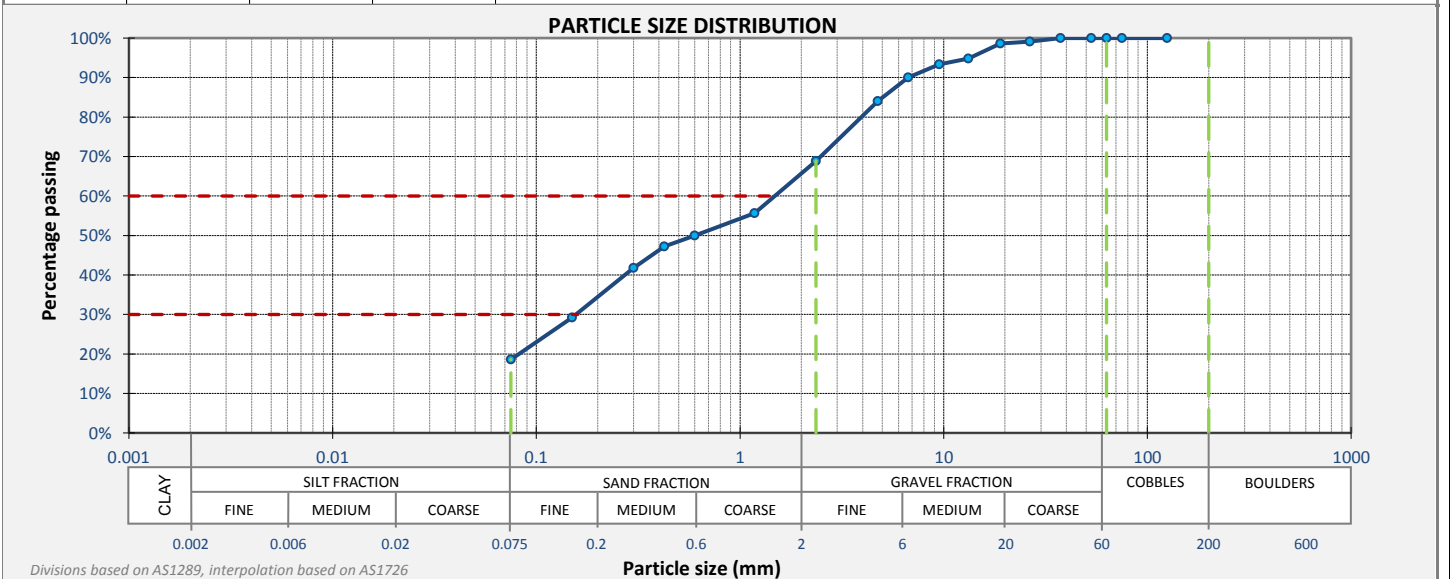


**GOLDER**

Test request #: TRP19-0043		Lab sample ID: LPER2019022726		Golder Associates Pty Ltd  PERTH GEOTECHNICAL LABORATORY 84 Guthrie Street, Osborne Park, Western Australia 6017		
Client: Shire of Wiluna						
Client address: 70 Wotton Street, Wiluna 6646						
Project ID: 18113648		Lab report ref.: LPER_19023735				
Project name: Shire of Wiluna Runway		Exploratory Hole PD02 - SG		Sample depth (m): 0.30 - 0.50		
				Client sample ref:		
Location: Wiluna, Western Australia		Project reference:				

Specimen description:				Sampling co-ordinates				Reduced Level		
				Easting (m)		Northing (m)				
PARTICLE SIZE DISTRIBUTION AS 1289.3.6.1				(SC-SM) Clayey/Silty SAND with gravel, fine to coarse grained, red brown, fine to coarse grained gravel						
Sieve Size	Passing	LB S	UB S	Method:	AS 1289.2.1.1	AS 1289.3.1.2	AS 1289.3.2.1	AS 1289.3.3.1	AS 1289.3.4.1	
125 mm	100%				Moisture content	1 point Liquid limit	Plastic limit	Plasticity index	Linear shrinkage	Curling/ Crumbling/ Cracking
75 mm	100%									
63 mm	100%									
53 mm	100%									
37.5 mm	100%									
26.5 mm	99%									
19 mm	99%									
13.2 mm	95%									
9.5 mm	93%									
6.7 mm	90%									
4.75 mm	84%									
2.36 mm	69%									
1.18 mm	56%									
600 µm	50%									
425 µm	47%									
300 µm	42%									
150 µm	29%									
75 µm	19%									
				Result:	8.8% As Rcvd.	16%	12%	4%	2.5%	None
				LB S:						-
				UB S:						-
				Att. preparation method:	Dry sieved			LSM length (mm):		125
				Specimen history/notes:	Preparation of specimen and testing performed on sample supplied to the laboratory					
				Definitions:	LB S = Lower bound specification LSM = Linear shrinkage mould UB S = Upper bound specification			N/A = Not applicable ND = Not determined; SIB = Slip in bowl NO = Not obtainable; NP = Non plastic		
GRADING SUMMARY										
Fines		Sand*		Gravel*		Cobbles*				
(<75 µm)		(>75 µm - <2.36 mm)		(>2.36 mm - <63 mm)		(>63mm - <200 mm)				
18.6%		50.3%		31.1%		0.0%				
Proportions based on guidance in AS1726-2017 Section 6.1.4.2										

Proportions based on guidance in AS1726-2017 Section 6.1.4.2



Testing performed by: RT		Results reviewed by: SLenihan		Date reported: 13/03/2019	
Cert. ref.:	18113648_PD02 - SG_TRP19-0043_PSD_19022726_Rep19023735			Approved signatory:	
	NATA accreditation number: 1961 - Site:1598 - Perth Accredited for compliance with ISO/IEC 17025 - Testing				
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# Soils testing - Particle size distribution & consistency limits test report

Standard method (by sieving)

AS1289.3.6.1, 2.1.1, 3.1.2, 3.2.1, 3.3.1 & 3.4.1

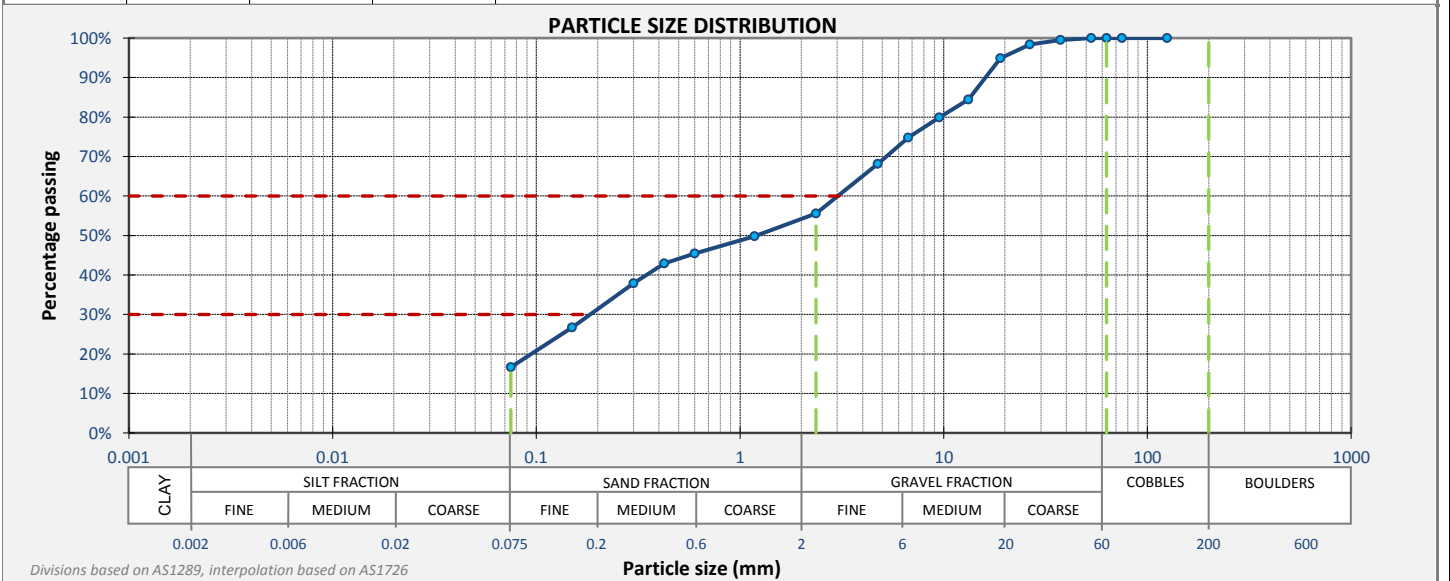


**GOLDER**

Test request #: TRP19-0043		Lab sample ID: LPER2019022729		Golder Associates Pty Ltd  PERTH GEOTECHNICAL LABORATORY 84 Guthrie Street, Osborne Park, Western Australia 6017	
Client: Shire of Wiluna					
Client address: 70 Wotton Street, Wiluna 6646					
Project ID: 18113648		Lab report ref.: LPER_19023736			
Project name: Shire of Wiluna Runway		Exploratory Hole PD04 - SG		Sample depth (m): 0.40 - 0.45	
				Client sample ref:	
Location: Wiluna, Western Australia		Project reference:			

Specimen description:				(GC-GM) Clayey/Silty GRAVEL with sand, fine to coarse grained, red brown, fine to coarse grained sand					Sampling co-ordinates		Reduced Level
									Easting (m)		
PARTICLE SIZE DISTRIBUTION				AS 1289.3.6.1							
Sieve Size	Passing	LB S	UB S	Method:	AS 1289.2.1.1	AS 1289.3.1.2	AS 1289.3.2.1	AS 1289.3.3.1	AS 1289.3.4.1		
125 mm	100%					Moisture content	1 point Liquid limit	Plastic limit	Plasticity index	Linear shrinkage	Curling/ Crumbling/ Cracking
75 mm	100%										
63 mm	100%										
53 mm	100%			Result:	8.0% As Rcvd.	18%	13%	5%	3.0%	Cracking	
37.5 mm	100%			LB S:							-
26.5 mm	98%			UB S:							-
19 mm	95%			Att. preparation method:	Dry sieved			LSM length (mm):		125	
13.2 mm	84%			Specimen history/notes:	Preparation of specimen and testing performed on sample supplied to the laboratory						
9.5 mm	80%			Definitions:		LB S = Lower bound specification		N/A = Not applicable			
6.7 mm	75%					LSM = Linear shrinkage mould		ND = Not determined; SIB = Slip in bowl			
4.75 mm	68%					UB S = Upper bound specification		NO = Not obtainable; NP = Non plastic			
2.36 mm	56%			GRADING SUMMARY							
1.18 mm	50%			Fines	Sand*			Gravel*		Cobbles*	
600 µm	45%			(<75 µm)	(>75 µm - <2.36 mm)			(>2.36 mm - <63 mm)		(>63mm - <200 mm)	
425 µm	43%			16.7%	38.9%			44.4%		0.0%	
300 µm	38%			Proportions based on guidance in AS1726-2017 Section 6.1.4.2							
150 µm	27%										
75 µm	17%										

Proportions based on guidance in AS1726-2017 Section 6.1.4.2



Testing performed by:		RT	Results reviewed by:		SLenihan	Date reported:		13/03/2019
Cert. ref.:	18113648_PD04 - SG_TRP19-0043_PSD_19022729_Rep19023736					Approved signatory:		
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# Soils testing - Particle size distribution & consistency limits test report

Standard method (by sieving)

AS1289.3.6.1, 2.1.1, 3.1.2, 3.2.1, 3.3.1 & 3.4.1

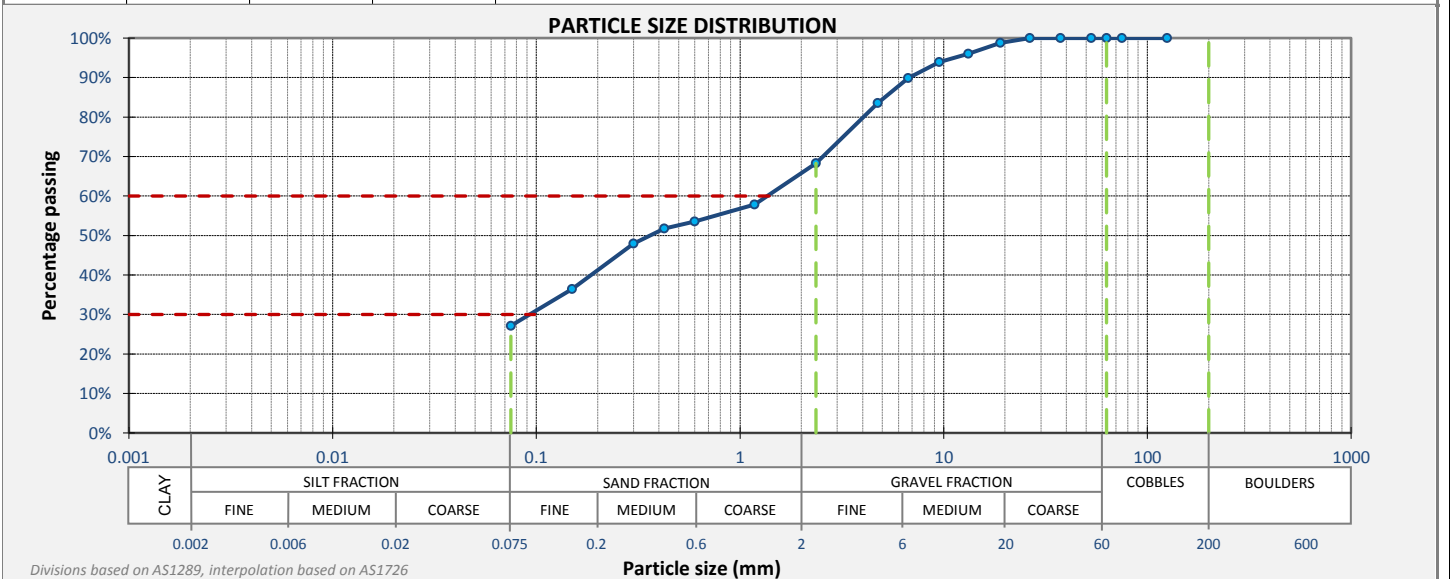


**GOLDER**

Test request #: TRP19-0043		Lab sample ID: LPER2019022730		Golder Associates Pty Ltd  PERTH GEOTECHNICAL LABORATORY 84 Guthrie Street, Osborne Park, Western Australia 6017	
Client: Shire of Wiluna					
Client address: 70 Wotton Street, Wiluna 6646					
Project ID: 18113648		Lab report ref.: LPER_19023757			
Project name: Shire of Wiluna Runway		Exploratory Hole PD05 - BC		Sample depth (m): 0.03 - 0.20	
				Client sample ref:	
Location: Wiluna, Western Australia		Project reference:			

Specimen description:				(SC-SM) Clayey/Silty SAND with gravel, fine to coarse grained, red brown, fine to medium grained gravel					Sampling co-ordinates		Reduced Level		
									Easting (m)			Northing (m)	
PARTICLE SIZE DISTRIBUTION				AS 1289.3.6.1									
Sieve Size	Passing	LB S	UB S	Method:	AS 1289.2.1.1	AS 1289.3.1.2	AS 1289.3.2.1	AS 1289.3.3.1	AS 1289.3.4.1				
125 mm	100%					Moisture content	1 point Liquid limit	Plastic limit	Plasticity index	Linear shrinkage	Curling/ Crumbling/ Cracking		
75 mm	100%												
63 mm	100%												
53 mm	100%			Result:	9.0% As Rcvd.	18%	11%	7%	4.0%	None			
37.5 mm	100%			LB S:							-		
26.5 mm	100%			UB S:							-		
19 mm	99%			Att. preparation method:	Dry sieved			LSM length (mm):		125			
13.2 mm	96%			Specimen history/notes:	Preparation of specimen and testing performed on sample supplied to the laboratory								
9.5 mm	94%			LB S = Lower bound specification LSM = Linear shrinkage mould UB S = Upper bound specification								N/A = Not applicable ND = Not determined; SIB = Slip in bowl NO = Not obtainable; NP = Non plastic	
6.7 mm	90%			GRADING SUMMARY									
4.75 mm	84%			Fines	Sand*			Gravel*		Cobbles*			
2.36 mm	68%			(<75 µm)	(>75 µm - <2.36 mm)			(>2.36 mm - <63 mm)		(>63mm - <200 mm)			
1.18 mm	58%			27.1%	41.1%			31.7%		0.0%			
600 µm	54%			Proportions based on guidance in AS1726-2017 Section 6.1.4.2									
425 µm	52%												
300 µm	48%												
150 µm	36%												
75 µm	27%												

Proportions based on guidance in AS1726-2017 Section 6.1.4.2



Testing performed by: RT		Results reviewed by: SLenihan	Date reported: 14/03/2019
Cert. ref.:	18113648_PD05 - BC_TRP19-0043_PSD_19022730_Rep19023757		Approved signatory:
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# Soils testing - Determination of the dry density moisture relationship

Modified compaction method

AS 1289.5.2.1-2017

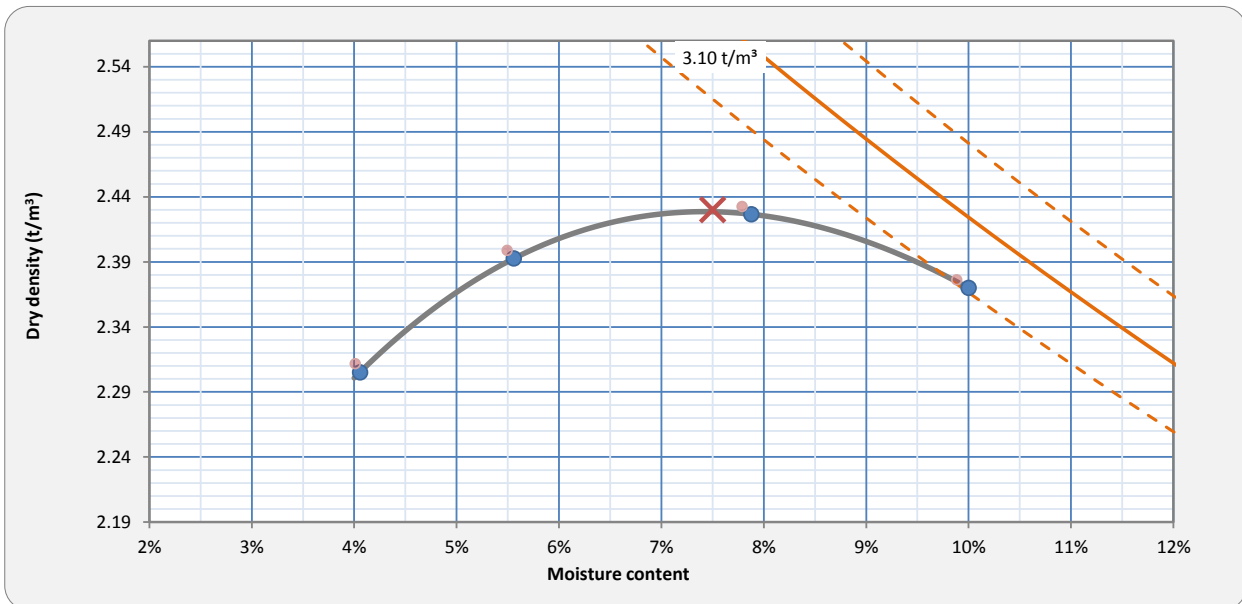


**GOLDER**

Test request ID: TRP19-0043				Lab sample ID: LPER2019022730		Golder Associates Pty Ltd PERTH GEOTECHNICAL LABORATORY 84 Guthrie Street Osborne Park, Western Australia 6017			
Client: Shire of Wiluna									
Client address: 70 Wotton Street, Wiluna 6646									
Project ID: 18113648		Lab report ref.: LPER_19024036							
Project name: Shire of Wiluna Runway				Exploratory Hole PD05 - BC		Sample depth (m): 0.03 - 0.20			
						Client sample ref:			
Location: Wiluna, Western Australia						Project reference: -			
Specimen description: (SC-SM) Clayey/Silty SAND with gravel, fine to coarse grained, red brown, fine to medium grained gravel (Based on visual and tactile assessment)						Sampling co-ordinates		Reduced	
						Easting (m)		Northing (m)	
								Level	
Curing compliance:		Liquid Limit				Moisture 7.8%			
Material type		Measured: 18%		Assumed:		Adopted: 18%		content: Field AS 1289 2.1.1-2005	
Cohesive		Curing times are compliant			Cure: 74 hrs		Portion test performed on: -19 mm		

## TEST REPORT - COMPACTION RESULTS

	Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	<b>Overflow material - (by dry mass)</b>  *Denotes value adjusted for overflow material <b>+19 mm: 1%</b> <b>+37.5 mm: 0%</b> <i>Overflow material was discarded</i>
<b>Dry density (t/m<sup>3</sup>):</b>	2.31 2.31*	2.39 2.40*	2.43 2.43*	2.37 2.38*			
<b>Moisture content:</b>	4.1% 4.0%*	5.6% 5.5%*	7.9% 7.8%*	10.0% 9.9%*			



### Notes:

Modified maximum dry density (t/m<sup>3</sup>):

Modified optimum moisture content:

Result	Adjusted for overflow
2.43	2.43
7.5%	7.5%

Specimens prepared by: AA Tests performed by: AA Date tested: 21/03/2019  
 Definition: ND = Not Determined Results reviewed by: Slenihan Date reported: 26/03/2019

<b>Cert. ref.:</b> 18113648_PD05 - BC_TRP19-0043_ModComp_s19022730_Rep19024036	<b>Approved signatory:</b>	
<b>NATA accreditation number: 1961 - Site:1598 - Perth</b> Accredited for compliance with ISO/IEC 17025 - Testing THIS DOCUMENT SHALL ONLY BE REPRODUCED IN FULL	Sean Lenihan	
	Shannon Wai - Laboratory Technician	

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# Soils testing - Determination of the California Bearing Ratio of a soil

Standard laboratory method for a remoulded specimen (Soaked)

AS 1289.6.1.1-2014



Test request #:	TRP19-0043	Lab sample ID:	LPER2019022730	Golder Associates Pty Ltd		
Client:	Shire of Wiluna			PERTH GEOTECHNICAL LABORATORY  84 Guthrie Street, Osborne Park, Western Australia 6017		
Client address:	70 Wotton Street, Wiluna 6646					
Project ID:	18113648	Lab report ref.:	LPER_19024072			
Lab project name:	Shire of Wiluna Runway		Exploratory Hole	Sample depth (m):	0.03	- 0.20
			PD05 - BC	Client sample ref.:		
Location:	Wiluna, Western Australia		Project reference:	-		
Specimen description:	(SC-SM) Clayey/Silty SAND with gravel, fine to coarse grained, red brown, fine to medium grained gravel			Sampled by:		
(Based on visual and tactile assessment)				Test date: 26/03/19		

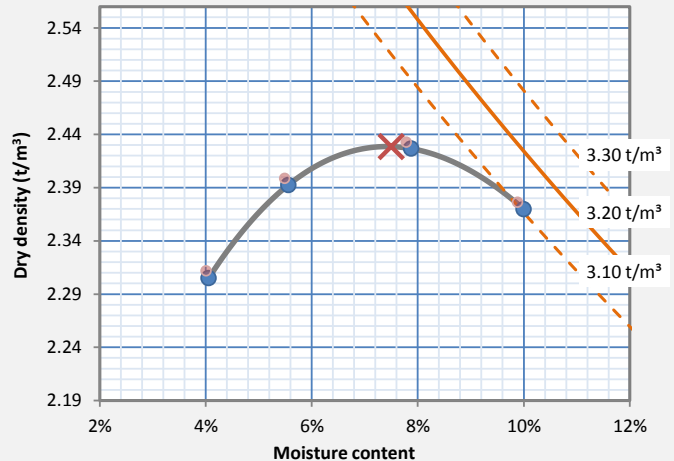
## SPECIMEN PREPARATION - SUMMARY OF COMPACTION AND MOISTURE CONTENT TEST RESULTS

Initial moisture content:	7.8% As rcvd.
Compaction method:	AS1289.5.2.1-2017 Modified
Maximum dry density ( $t/m^3$ ):	2.43
Optimum moisture content:	7.5%
Oversize material (>19mm):	1.0%
Compaction moisture content:	7.8%

### Note on compaction:

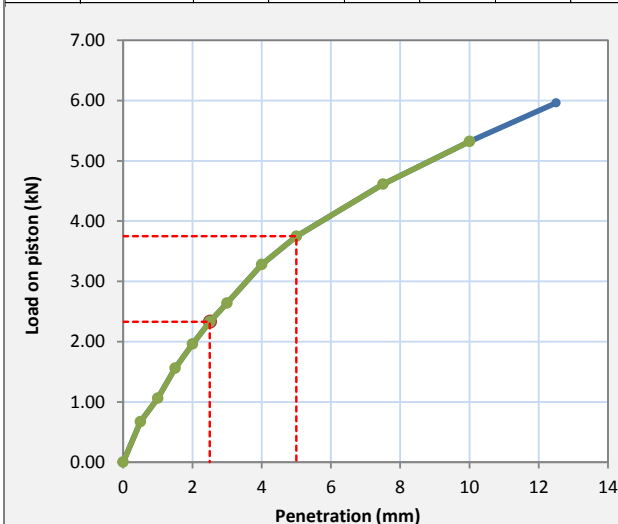
Oversize material has been excluded from the test

### Notes on test:



## SUMMARY OF CALIFORNIA BEARING RATIO TEST RESULT

Penetration (mm):	0.0	0.5	1.0	1.5	2.0	2.5	3.0	4.0	5.0	7.5	10.0	12.5	Correction:
Load (kN)	Original	0.00	0.67	1.06	1.56	1.96	2.33	2.64	3.28	3.75	4.61	5.32	5.96
	Corrected	0.00	0.67	1.06	1.56	1.96	2.33	2.64	3.28	3.75	4.61	5.32	



Dry density $t/m^3$	before soaking:	2.38
	after soaking:	2.38
Density ratio	before soaking:	98.0%
	after soaking:	98.0%
Moisture ratio at compaction:		103.5%
Duration of soaking (days):		4
Surcharge applied (kg):		6.8
Moisture content top 30mm:		9.8%
Moisture content remainder:		8.6%
Swell after soaking:		0.0%
Bearing ratio at 2.5mm penetration:		17.7%
Bearing ratio at 5.0mm penetration:		18.9%

Penetration (mm) 5.0 CBR Value 19.0%

Definitions:	Specimen prepared by:	SW	Test performed by:	SL
ND = Not determined	Results reviewed by:	SWai	Date reported:	27-Mar-19

Cert. ref.:	18113648_PD05 - BC_TRP19-0043_CBR_19022730_Rep-19024072	Approved signatory:
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# Soils testing - Particle size distribution & consistency limits test report

Standard method (by sieving)

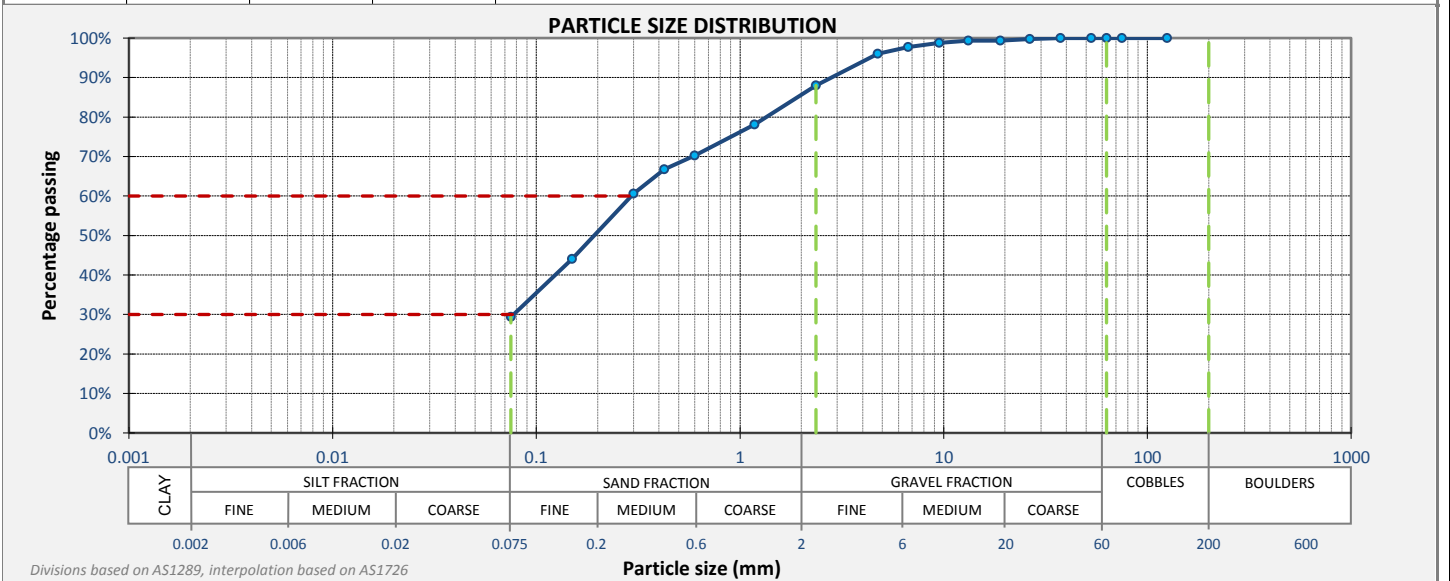
AS1289.3.6.1, 2.1.1, 3.1.2, 3.2.1, 3.3.1 & 3.4.1





**GOLDER**

Test request #: TRP19-0043		Lab sample ID: LPER2019022731		Golder Associates Pty Ltd  PERTH GEOTECHNICAL LABORATORY 84 Guthrie Street, Osborne Park, Western Australia 6017	
Client: Shire of Wiluna					
Client address: 70 Wotton Street, Wiluna 6646					
Project ID: 18113648		Lab report ref.: LPER_19023705_2			
Project name: Shire of Wiluna Runway		Exploratory Hole PD05 - SG		Sample depth (m): 0.25 - 0.35	
				Client sample ref:	
Location: Wiluna, Western Australia		Project reference:			

Specimen description:				(SC) Clayey SAND, trace of gravel, fine to coarse grained, red brown, low plasticity, fine to medium grained gravel				Sampling co-ordinates		Reduced Level
								Easting (m)	Northing (m)	
PARTICLE SIZE DISTRIBUTION				AS 1289.3.6.1						
Sieve Size	Passing	LB S	UB S	Method:	AS 1289.2.1.1	AS 1289.3.1.2	AS 1289.3.2.1	AS 1289.3.3.1	AS 1289.3.4.1	
125 mm	100%				Moisture content	1 point Liquid limit	Plastic limit	Plasticity index	Linear shrinkage	Curling/ Crumbling/ Cracking
75 mm	100%									
63 mm	100%									
53 mm	100%									
37.5 mm	100%									
26.5 mm	100%									
19 mm	99%									
13.2 mm	99%									
9.5 mm	99%									
6.7 mm	98%									
4.75 mm	96%									
2.36 mm	88%									
1.18 mm	78%									
600 µm	70%									
425 µm	67%									
300 µm	61%									
150 µm	44%									
75 µm	29%									
				Result:	12.2% As Rcvd.	20%	11%	9%	4.0%	None
				LB S:						-
				UB S:						-
				Att. preparation method:	Dry sieved		LSM length (mm):		125	
				Specimen history/notes:	Preparation of specimen and testing performed on sample supplied to the laboratory					
				Definitions:	LB S = Lower bound specification LSM = Linear shrinkage mould UB S = Upper bound specification		N/A = Not applicable ND = Not determined; SIB = Slip in bowl NO = Not obtainable; NP = Non plastic			
GRADING SUMMARY										
Fines		Sand*		Gravel*		Cobbles*				
(<75 µm)		(>75 µm - <2.36 mm)		(>2.36 mm - <63 mm)		(>63mm - <200 mm)				
29.3%		58.6%		12.0%		0.0%				
Proportions based on guidance in AS1726-2017 Section 6.1.4.2										



Testing performed by: RT		Results reviewed by: SWai	Date reported: 13/03/2019
Cert. ref.:	18113648_PD05 - SG_TRP19-0043_PSD_19022731_Rep023705_2		Approved signatory:
	NATA accreditation number: 1961 - Site:1598 - Perth Accredited for compliance with ISO/IEC 17025 - Testing		
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# Soils testing - Particle size distribution & consistency limits test report

Standard method (by sieving)

AS1289.3.6.1, 2.1.1, 3.1.2, 3.2.1, 3.3.1 & 3.4.1

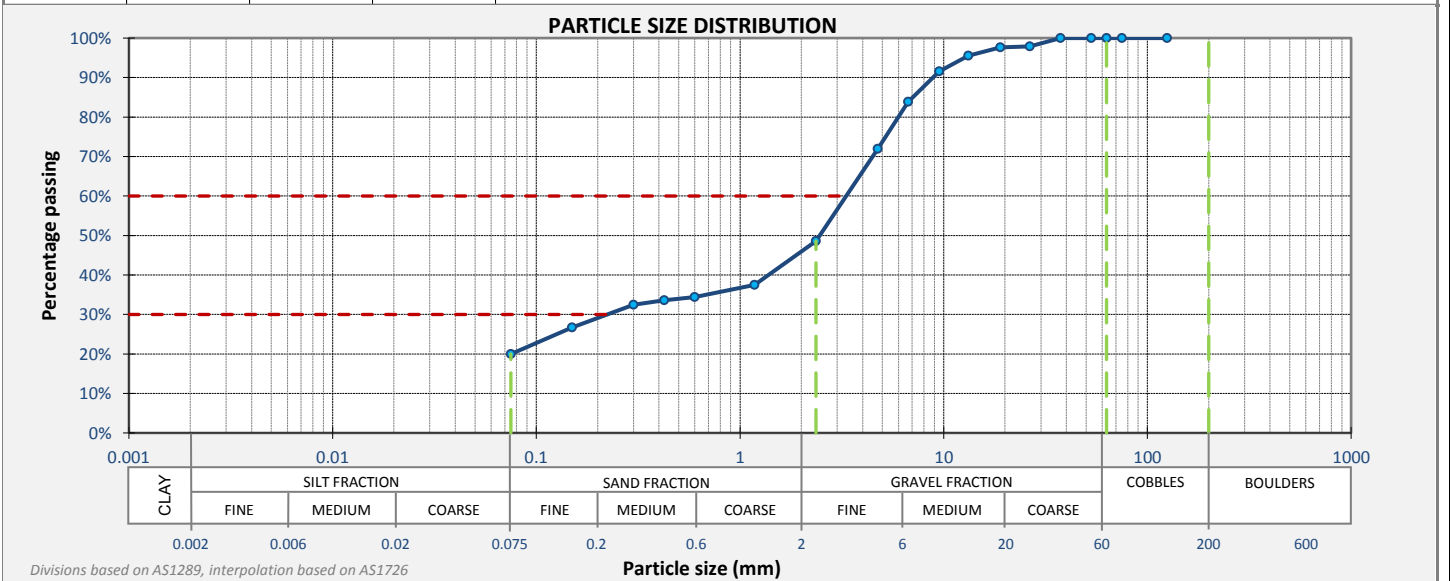


**GOLDER**

Test request #:	TRP19-0043	Lab sample ID:	LPER2019022732	Golder Associates Pty Ltd  PERTH GEOTECHNICAL LABORATORY 84 Guthrie Street, Osborne Park, Western Australia 6017		
Client:	Shire of Wiluna					
Client address:	70 Wotton Street, Wiluna 6646					
Project ID:	18113648	Lab report ref.:	LPER_19023758			
Project name:	Shire of Wiluna Runway		Exploratory Hole PD06 - BC	Sample depth (m):	0.03	- 0.20
				Client sample ref:		
Location:	Wiluna, Western Australia		Project reference:			

Specimen description:				(GC) Clayey GRAVEL with sand, fine to coarse grained, red brown, low plasticity, fine to coarse grained sand					Sampling co-ordinates		Reduced Level
									Easting (m)		
PARTICLE SIZE DISTRIBUTION				AS 1289.3.6.1							
Sieve Size	Passing	LB S	UB S	Method:	AS 1289.2.1.1	AS 1289.3.1.2	AS 1289.3.2.1	AS 1289.3.3.1	AS 1289.3.4.1		
125 mm	100%				Moisture content	1 point Liquid limit	Plastic limit	Plasticity index	Linear shrinkage	Curling/ Crumbling/ Cracking	
75 mm	100%										
63 mm	100%										
53 mm	100%										
37.5 mm	100%										
26.5 mm	98%										
19 mm	98%										
13.2 mm	96%										
9.5 mm	92%										
6.7 mm	84%										
4.75 mm	72%										
2.36 mm	49%										
1.18 mm	38%										
600 µm	34%										
425 µm	34%										
300 µm	32%										
150 µm	27%										
75 µm	20%										
				Result:	4.3% As Rcvd.	20%	11%	9%	4.0%	None	
				LB S:						-	
				UB S:						-	
				Att. preparation method:	Dry sieved		LSM length (mm):		125		
				Specimen history/notes:	Preparation of specimen and testing performed on sample supplied to the laboratory						
				Definitions:	LB S = Lower bound specification LSM = Linear shrinkage mould UB S = Upper bound specification		N/A = Not applicable ND = Not determined; SIB = Slip in bowl NO = Not obtainable; NP = Non plastic				
GRADING SUMMARY											
Fines		Sand*		Gravel*		Cobbles*					
(<75 µm)		(>75 µm - <2.36 mm)		(>2.36 mm - <63 mm)		(>63mm - <200 mm)					
20.0%		28.6%		51.4%		0.0%					
Proportions based on guidance in AS1726-2017 Section 6.1.4.2											

Proportions based on guidance in AS1726-2017 Section 6.1.4.2



Testing performed by:		RT	Results reviewed by:		SWai	Date reported:		14/03/2019
Cert. ref.:	18113648_PD06 - BC_TRP19-0043_PSD_19022732_Rep19023758					Approved signatory:		
	NATA accreditation number: 1961 - Site:1598 - Perth Accredited for compliance with ISO/IEC 17025 - Testing							
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# Soils testing - Particle size distribution & consistency limits test report

Standard method (by sieving)

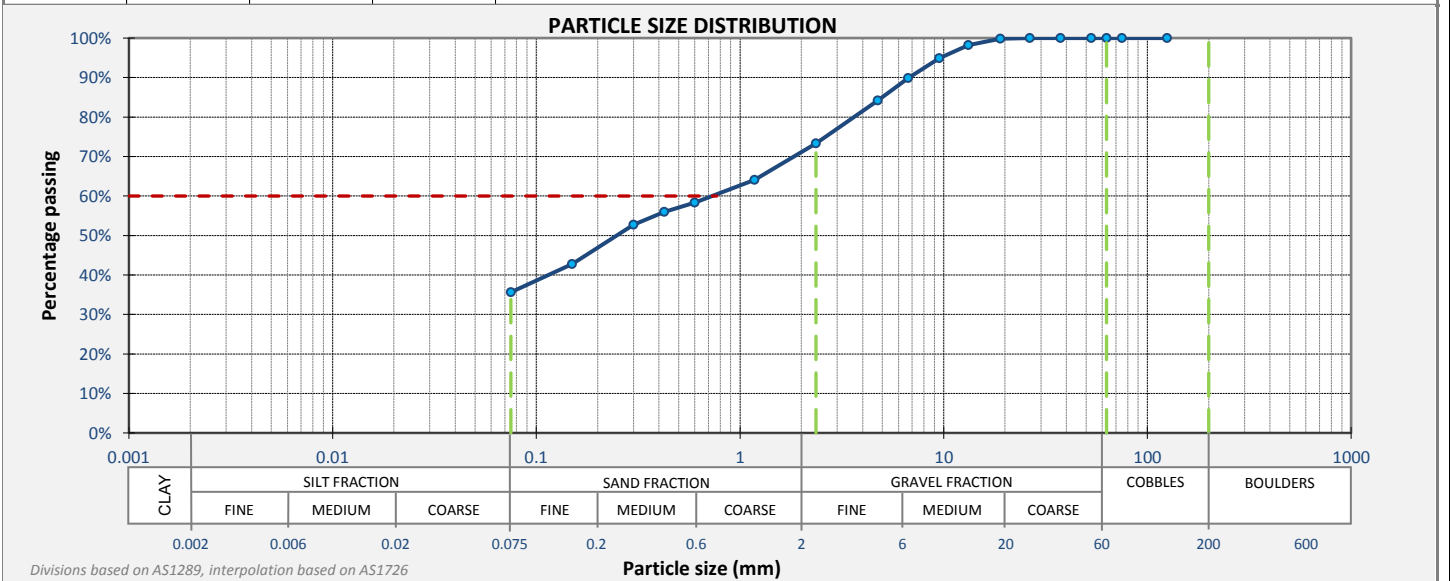
AS1289.3.6.1, 2.1.1, 3.1.2, 3.2.1, 3.3.1 & 3.4.1



**GOLDER**

Test request #:	TRP19-0043	Lab sample ID:	LPER2019022733	Golder Associates Pty Ltd  PERTH GEOTECHNICAL LABORATORY 84 Guthrie Street, Osborne Park, Western Australia 6017		
Client:	Shire of Wiluna					
Client address:	70 Wotton Street, Wiluna 6646					
Project ID:	18113648	Lab report ref.:	LPER_19023706_2			
Project name:	Shire of Wiluna Runway		Exploratory Hole PD06 - SG	Sample depth (m):	0.25	- 0.48
Location:	Wiluna, Western Australia		Project reference:	Client sample ref:		

Specimen description:				(CL) Sandy CLAY with gravel, low plasticity, red brown, fine to coarse grained sand, fine to medium grained gravel				Sampling co-ordinates		Reduced Level
								Easting (m)	Northing (m)	
PARTICLE SIZE DISTRIBUTION				AS 1289.3.6.1						
Sieve Size	Passing	LB S	UB S	Method:	AS 1289.2.1.1	AS 1289.3.1.2	AS 1289.3.2.1	AS 1289.3.3.1	AS 1289.3.4.1	
125 mm	100%				Moisture content	1 point Liquid limit	Plastic limit	Plasticity index	Linear shrinkage	Curling/ Crumbling/ Cracking
75 mm	100%									
63 mm	100%									
53 mm	100%									
37.5 mm	100%									
26.5 mm	100%									
19 mm	100%									
13.2 mm	98%									
9.5 mm	95%									
6.7 mm	90%									
4.75 mm	84%									
2.36 mm	73%									
1.18 mm	64%									
600 µm	58%									
425 µm	56%									
300 µm	53%									
150 µm	43%									
75 µm	36%									
Result:					10.5% As Rcvd.	26%	16%	10%	5.5%	None
LB S:										-
UB S:										-
Att. preparation method:					Dry sieved		LSM length (mm):		125	
Specimen history/notes:					Preparation of specimen and testing performed on sample supplied to the laboratory					
Definitions:					LB S = Lower bound specification LSM = Linear shrinkage mould UB S = Upper bound specification		N/A = Not applicable ND = Not determined; SIB = Slip in bowl NO = Not obtainable; NP = Non plastic			
GRADING SUMMARY										
Fines			Sand*			Gravel*			Cobbles*	
(<75 µm)			(>75 µm - <2.36 mm)			(>2.36 mm - <63 mm)			(>63mm - <200 mm)	
35.6%			37.7%			26.7%			0.0%	
Proportions based on guidance in AS1726-2017 Section 6.1.4.2										



Testing performed by: RT		Results reviewed by: SWai		Date reported: 13/03/2019	
Cert. ref.:	18113648_PD06 - SG_TRP19-0043_PSD_19022733_Rep023706_2			Approved signatory:	
	NATA accreditation number: 1961 - Site:1598 - Perth Accredited for compliance with ISO/IEC 17025 - Testing				
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These tests were carried out in accordance with the Australian standards identified in this certificate.

Rep AS1289.3.6.1 - RL34



# Soils testing - Particle size distribution & consistency limits test report

Standard method (by sieving)

AS1289.3.6.1, 2.1.1, 3.1.2, 3.2.1, 3.3.1 & 3.4.1

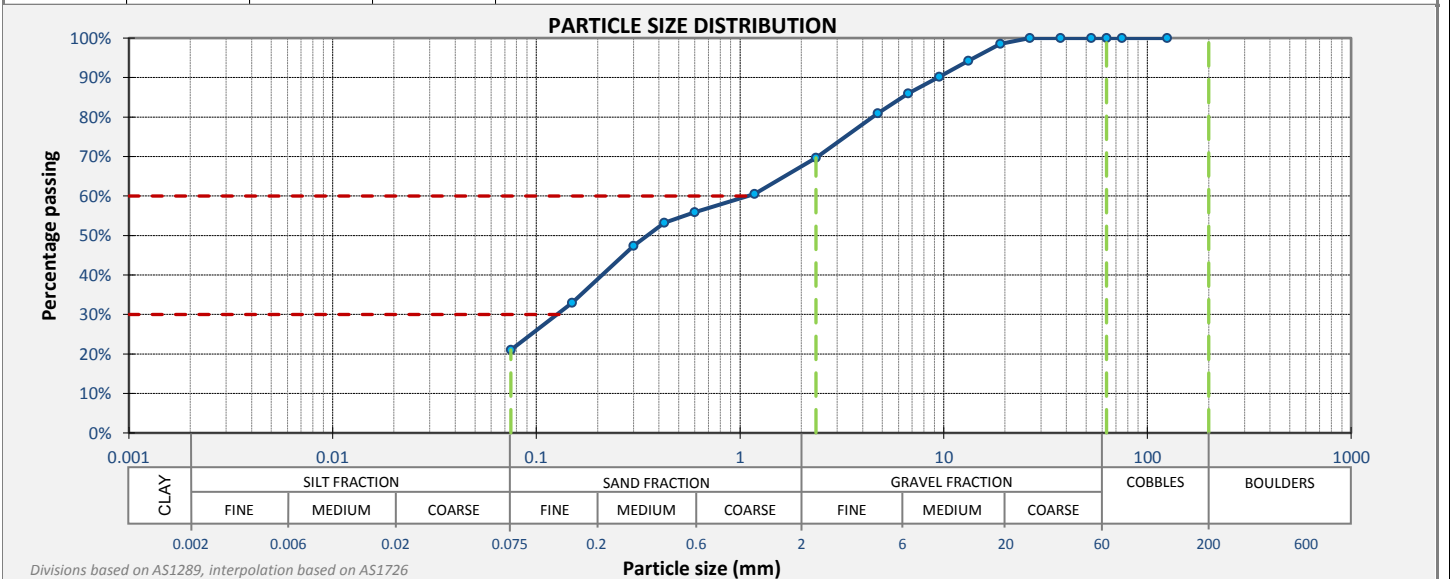


**GOLDER**

Test request #:	TRP19-0043	Lab sample ID:	LPER2019022734	Golder Associates Pty Ltd  PERTH GEOTECHNICAL LABORATORY 84 Guthrie Street, Osborne Park, Western Australia 6017		
Client:	Shire of Wiluna					
Client address:	70 Wotton Street, Wiluna 6646					
Project ID:	18113648	Lab report ref.:	LPER_19023759			
Project name:	Shire of Wiluna Runway		Exploratory Hole PD07 - BC	Sample depth (m):	0.03	- 0.20
Location:	Wiluna, Western Australia		Project reference:	Client sample ref:		

Specimen description:				(SM) Silty SAND with gravel, fine to coarse grained, red brown, fine to medium grained gravel					Sampling co-ordinates		Reduced Level
									Easting (m)		
PARTICLE SIZE DISTRIBUTION				AS 1289.3.6.1							
Sieve Size	Passing	LB S	UB S	Method:	AS 1289.2.1.1	AS 1289.3.1.2	AS 1289.3.2.1	AS 1289.3.3.1	AS 1289.3.4.1		
125 mm	100%				Moisture content	1 point Liquid limit	Plastic limit	Plasticity index	Linear shrinkage	Curling/ Crumbling/ Cracking	
75 mm	100%										
63 mm	100%										
53 mm	100%										
37.5 mm	100%										
26.5 mm	100%										
19 mm	99%										
13.2 mm	94%										
9.5 mm	90%										
6.7 mm	86%										
4.75 mm	81%										
2.36 mm	70%										
1.18 mm	61%										
600 µm	56%										
425 µm	53%										
300 µm	47%										
150 µm	33%										
75 µm	21%										
				Result:	4.7% As Rcvd.	13%	11%	2%	1.0%	Cracking	
				LB S:						-	
				UB S:						-	
				Att. preparation method:	Dry sieved			LSM length (mm):		125	
				Specimen history/notes:	Preparation of specimen and testing performed on sample supplied to the laboratory						
				Definitions:	LB S = Lower bound specification LSM = Linear shrinkage mould UB S = Upper bound specification		N/A = Not applicable ND = Not determined; SIB = Slip in bowl NO = Not obtainable; NP = Non plastic				
GRADING SUMMARY											
Fines				Sand*				Gravel*		Cobbles*	
(<75 µm)				(>75 µm - <2.36 mm)				(>2.36 mm - <63 mm)		(>63mm - <200 mm)	
21.0%				48.6%				30.3%		0.0%	
Proportions based on guidance in AS1726-2017 Section 6.1.4.2											

Proportions based on guidance in AS1726-2017 Section 6.1.4.2



Testing performed by: RT		Results reviewed by: SWai		Date reported: 14/03/2019	
Cert. ref.:	18113648_PD07 - BC_TRP19-0043_PSD_19022734_Rep19023759			Approved signatory:	
	NATA accreditation number: 1961 - Site:1598 - Perth Accredited for compliance with ISO/IEC 17025 - Testing				
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# Soils testing - Particle size distribution & consistency limits test report

Standard method (by sieving)

AS1289.3.6.1, 2.1.1, 3.1.2, 3.2.1, 3.3.1 & 3.4.1

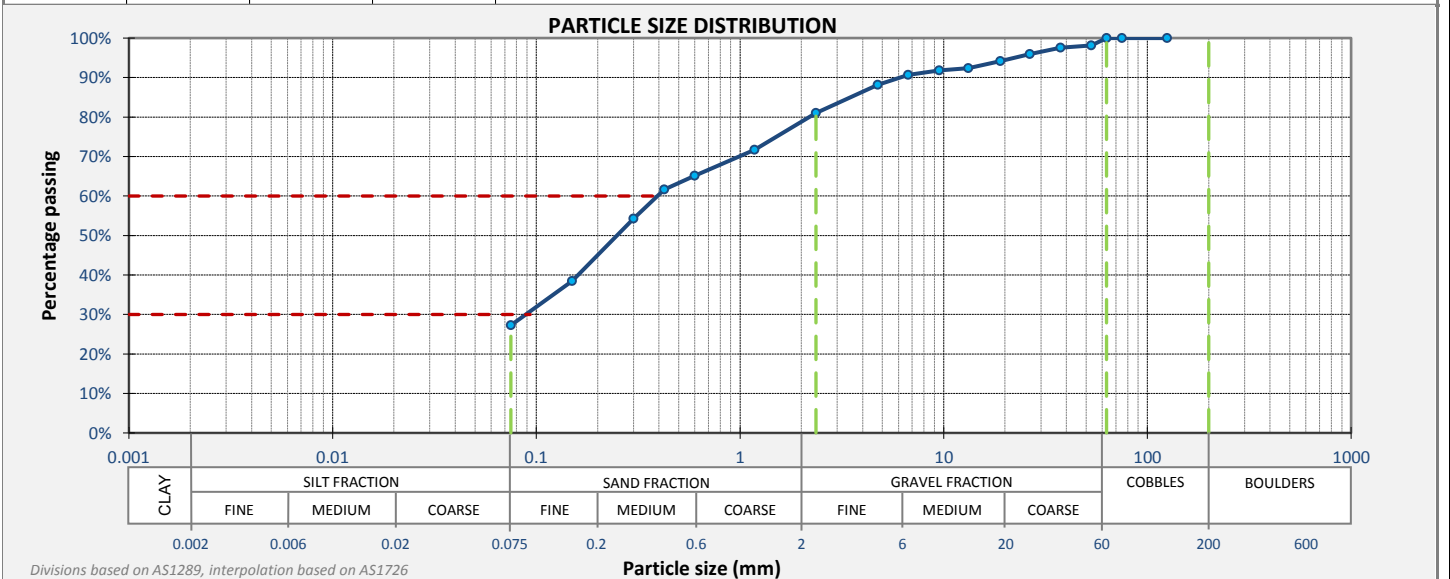


**GOLDER**

Test request #:	TRP19-0043	Lab sample ID:	LPER2019022735	Golder Associates Pty Ltd  PERTH GEOTECHNICAL LABORATORY 84 Guthrie Street, Osborne Park, Western Australia 6017		
Client:	Shire of Wiluna					
Client address:	70 Wotton Street, Wiluna 6646					
Project ID:	18113648	Lab report ref.:	LPER_19023707_2			
Project name:	Shire of Wiluna Runway		Exploratory Hole PD07 - SG	Sample depth (m):	0.25	- 0.30
				Client sample ref:		
Location:	Wiluna, Western Australia		Project reference:			

Specimen description:				(SC) Clayey SAND with gravel, fine to coarse grained, red brown, low plasticity, fine to coarse grained gravel					Sampling co-ordinates		Reduced Level
									Easting (m)		
PARTICLE SIZE DISTRIBUTION				AS 1289.3.6.1							
Sieve Size	Passing	LB S	UB S	Method:	AS 1289.2.1.1	AS 1289.3.1.2	AS 1289.3.2.1	AS 1289.3.3.1	AS 1289.3.4.1		
125 mm	100%				Moisture content	1 point Liquid limit	Plastic limit	Plasticity index	Linear shrinkage	Curling/ Crumbling/ Cracking	
75 mm	100%										
63 mm	100%										
53 mm	98%										
37.5 mm	98%										
26.5 mm	96%										
19 mm	94%										
13.2 mm	92%										
9.5 mm	92%										
6.7 mm	91%										
4.75 mm	88%										
2.36 mm	81%										
1.18 mm	72%										
600 µm	65%										
425 µm	62%										
300 µm	54%										
150 µm	38%										
75 µm	27%										
				Result:	9.2% As Rcvd.	18%	10%	8%	4.0%	None	
				LB S:						-	
				UB S:						-	
				Att. preparation method:	Dry sieved		LSM length (mm):		125		
				Specimen history/notes:	Preparation of specimen and testing performed on sample supplied to the laboratory						
				Definitions:	LB S = Lower bound specification LSM = Linear shrinkage mould UB S = Upper bound specification		N/A = Not applicable ND = Not determined; SIB = Slip in bowl NO = Not obtainable; NP = Non plastic				
GRADING SUMMARY											
Fines		Sand*		Gravel*		Cobbles*					
(<75 µm)		(>75 µm - <2.36 mm)		(>2.36 mm - <63 mm)		(>63mm - <200 mm)					
27.3%		53.8%		19.0%		0.0%					
Proportions based on guidance in AS1726-2017 Section 6.1.4.2											

Proportions based on guidance in AS1726-2017 Section 6.1.4.2



Testing performed by: RT		Results reviewed by: SWai		Date reported: 13/03/2019	
Cert. ref.:	18113648_PD07 - SG_TRP19-0043_PSD_19022735_Rep023707_2			Approved signatory:	
	NATA accreditation number: 1961 - Site:1598 - Perth Accredited for compliance with ISO/IEC 17025 - Testing				
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# Soils testing - Particle size distribution & consistency limits test report

Standard method (by sieving)

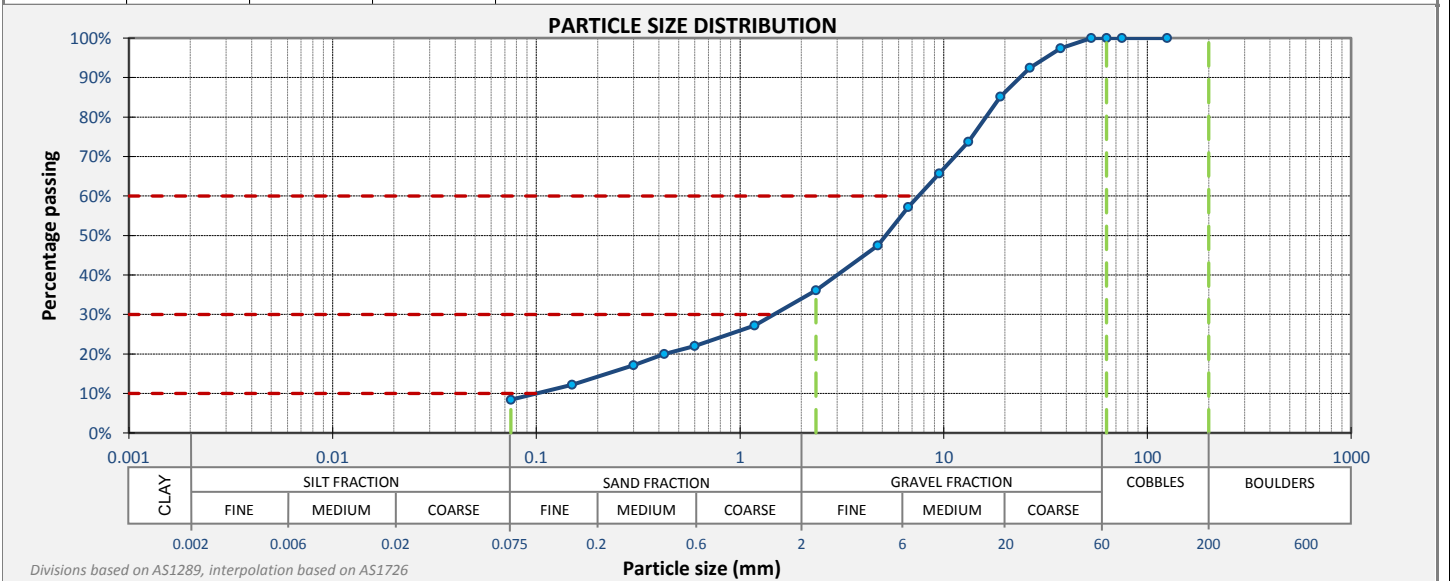
AS1289.3.6.1, 2.1.1, 3.1.2, 3.2.1, 3.3.1 & 3.4.1

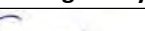


**GOLDER**

Test request #:	TRP19-0043	Lab sample ID:	LPER2019022737	Golder Associates Pty Ltd  PERTH GEOTECHNICAL LABORATORY 84 Guthrie Street, Osborne Park, Western Australia 6017		
Client:	Shire of Wiluna					
Client address:	70 Wotton Street, Wiluna 6646					
Project ID:	18113648	Lab report ref.:	LPER_19023708_1			
Project name:	Shire of Wiluna Runway		Exploratory Hole PD08 - SG	Sample depth (m):	0.25	- 0.30
Location:	Wiluna, Western Australia		Project reference:	Client sample ref:		

Specimen description:				Sampling co-ordinates				Reduced Level		
				(GW-GM) GRAVEL with silt, with sand, fine to coarse grained, red brown, fine to coarse grained sand						
PARTICLE SIZE DISTRIBUTION AS 1289.3.6.1				Easting (m)		Northing (m)				
Sieve Size	Passing	LB S	UB S	Method:	AS 1289.2.1.1	AS 1289.3.1.2	AS 1289.3.2.1		AS 1289.3.3.1	AS 1289.3.4.1
125 mm	100%									
75 mm	100%									
63 mm	100%									
53 mm	100%									
37.5 mm	97%									
26.5 mm	92%									
19 mm	85%									
13.2 mm	74%									
9.5 mm	66%									
6.7 mm	57%									
4.75 mm	47%									
2.36 mm	36%									
1.18 mm	27%									
600 µm	22%									
425 µm	20%									
300 µm	17%									
150 µm	12%									
75 µm	8%									



Testing performed by: RT		Results reviewed by:		Date reported: 13/03/2019	
Cert. ref.:	18113648_PD08 - SG_TRP19-0043_PSD_19022737_Rep023708_1			Approved signatory:	
	NATA accreditation number: 1961 - Site:1598 - Perth Accredited for compliance with ISO/IEC 17025 - Testing				
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These tests were carried out in accordance with the Australian standards identified in this certificate.

Rep AS1289.3.6.1 - RL34

# Soils testing - Particle size distribution & consistency limits test report

Standard method (by sieving)

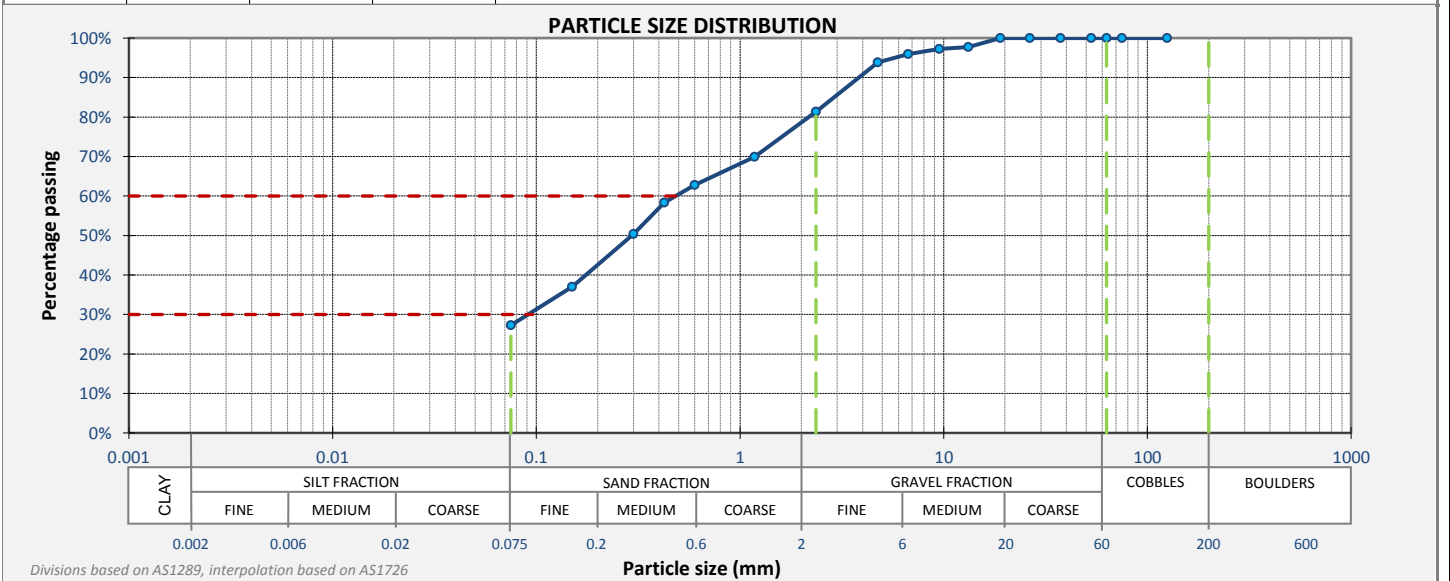
AS1289.3.6.1, 2.1.1, 3.1.2, 3.2.1, 3.3.1 & 3.4.1



**GOLDER**

Test request #: TRP19-0043		Lab sample ID: LPER2019022738		Golder Associates Pty Ltd  PERTH GEOTECHNICAL LABORATORY 84 Guthrie Street, Osborne Park, Western Australia 6017	
Client: Shire of Wiluna					
Client address: 70 Wotton Street, Wiluna 6646					
Project ID: 18113648		Lab report ref.: LPER_19023760			
Project name: Shire of Wiluna Runway		Exploratory Hole PD09 - BC		Sample depth (m): 0.03 - 0.15	
				Client sample ref:	
Location: Wiluna, Western Australia		Project reference:			

Specimen description:				(SC) Clayey SAND with gravel, fine to coarse grained, red brown, low plasticity, fine to medium grained gravel				Sampling co-ordinates		Reduced Level	
								Easting (m)	Northing (m)		
PARTICLE SIZE DISTRIBUTION				AS 1289.3.6.1							
Sieve Size	Passing	LB S	UB S	Method:	AS 1289.2.1.1	AS 1289.3.1.2	AS 1289.3.2.1	AS 1289.3.3.1	AS 1289.3.4.1		
125 mm	100%					Moisture content	1 point Liquid limit	Plastic limit	Plasticity index	Linear shrinkage	Curling/ Crumbling/ Cracking
75 mm	100%										
63 mm	100%										
53 mm	100%										
37.5 mm	100%										
26.5 mm	100%										
19 mm	100%										
13.2 mm	98%										
9.5 mm	97%										
6.7 mm	96%										
4.75 mm	94%										
2.36 mm	81%										
1.18 mm	70%										
600 µm	63%										
425 µm	58%										
300 µm	50%										
150 µm	37%										
75 µm	27%										



Testing performed by:		RT	Results reviewed by:		SLenihan	Date reported:		14/03/2019
Cert. ref.:	18113648_PD09 - BC_TRP19-0043_PSD_19022738_Rep19023760					Approved signatory:		
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# Soils testing - Particle size distribution & consistency limits test report

Standard method (by sieving)

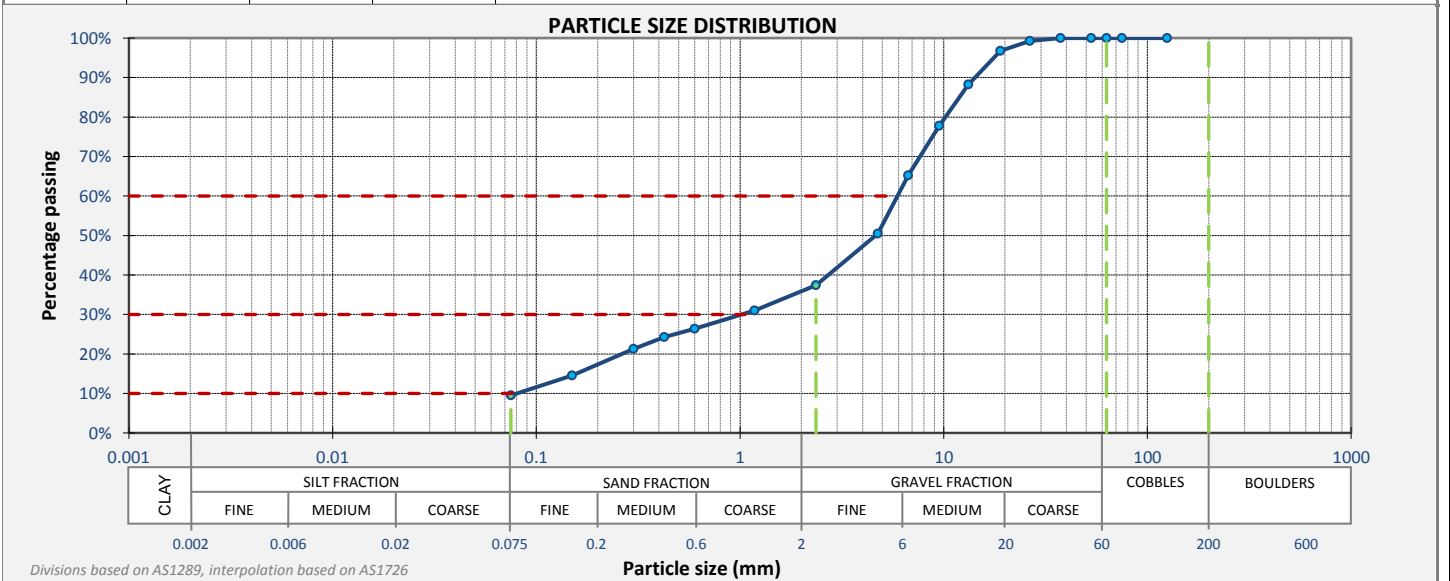
AS1289.3.6.1, 2.1.1, 3.1.2, 3.2.1, 3.3.1 & 3.4.1





**GOLDER**

Test request #:	TRP19-0043	Lab sample ID:	LPER2019022739	Golder Associates Pty Ltd  PERTH GEOTECHNICAL LABORATORY 84 Guthrie Street, Osborne Park, Western Australia 6017		
Client:	Shire of Wiluna					
Client address:	70 Wotton Street, Wiluna 6646					
Project ID:	18113648	Lab report ref.:	LPER_19023709_1			
Project name:	Shire of Wiluna Runway		Exploratory Hole PD09 - SG	Sample depth (m):	0.20	- 0.30
Location:	Wiluna, Western Australia		Project reference:	Client sample ref:		

Specimen description:				(GW-GM) GRAVEL with silt, with sand, fine to coarse grained, red brown, fine to coarse grained sand				Sampling co-ordinates		Reduced Level
								Easting (m)	Northing (m)	
PARTICLE SIZE DISTRIBUTION				AS 1289.3.6.1						
Sieve Size	Passing	LB S	UB S	Method:	AS 1289.2.1.1	AS 1289.3.1.2	AS 1289.3.2.1	AS 1289.3.3.1	AS 1289.3.4.1	
125 mm	100%				Moisture content	1 point Liquid limit	Plastic limit	Plasticity index	Linear shrinkage	Curling/ Crumbling/ Cracking
75 mm	100%									
63 mm	100%									
53 mm	100%									
37.5 mm	100%									
26.5 mm	99%									
19 mm	97%									
13.2 mm	88%									
9.5 mm	78%									
6.7 mm	65%									
4.75 mm	50%									
2.36 mm	37%									
1.18 mm	31%									
600 µm	26%									
425 µm	24%									
300 µm	21%									
150 µm	15%									
75 µm	10%									
				Result:	12.9% As Rcvd.	SIB	NP	ND		
				LB S:						-
				UB S:						-
				Att. preparation method:	Dry sieved		LSM length (mm):			
				Specimen history/notes:	Preparation of specimen and testing performed on sample supplied to the laboratory					
				Definitions:		LB S = Lower bound specification LSM = Linear shrinkage mould UB S = Upper bound specification		N/A = Not applicable ND = Not determined; SIB = Slip in bowl NO = Not obtainable; NP = Non plastic		
GRADING SUMMARY										
Fines		Sand*		Gravel*		Cobbles*				
(<75 µm)		(>75 µm - <2.36 mm)		(>2.36 mm - <63 mm)		(>63mm - <200 mm)				
9.5%		27.9%		62.6%		0.0%				
Proportions based on guidance in AS1726-2017 Section 6.1.4.2										



Testing performed by: RT		Results reviewed by: SWai		Date reported: 13/03/2019	
Cert. ref.:	18113648_PD09 - SG_TRP19-0043_PSD_19022739_Rep023709_1			Approved signatory:	
	NATA accreditation number: 1961 - Site:1598 - Perth Accredited for compliance with ISO/IEC 17025 - Testing				
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# Soils testing - Particle size distribution & consistency limits test report

Standard method (by sieving)

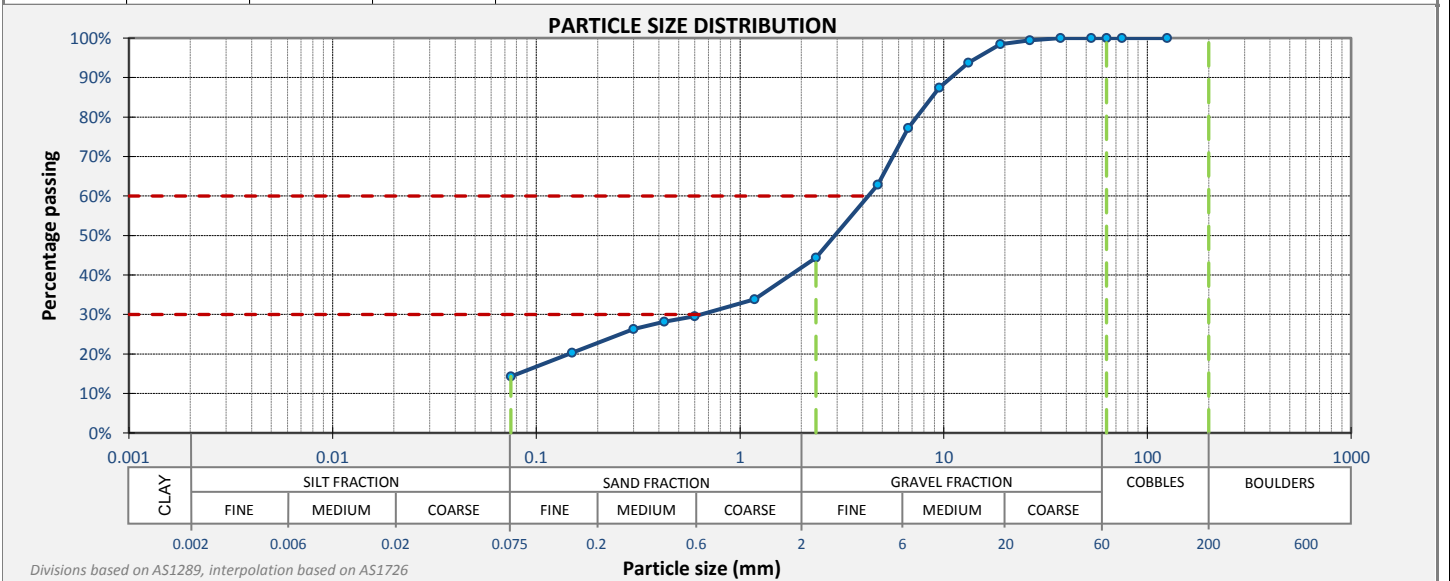
AS1289.3.6.1, 2.1.1, 3.1.2, 3.2.1, 3.3.1 & 3.4.1



**GOLDER**

Test request #:	TRP19-0043	Lab sample ID:	LPER2019022740	Golder Associates Pty Ltd  PERTH GEOTECHNICAL LABORATORY 84 Guthrie Street, Osborne Park, Western Australia 6017		
Client:	Shire of Wiluna					
Client address:	70 Wotton Street, Wiluna 6646					
Project ID:	18113648	Lab report ref.:	LPER_19023761			
Project name:	Shire of Wiluna Runway		Exploratory Hole PD10 - BC	Sample depth (m):	0.15	- 0.26
				Client sample ref:		
Location:	Wiluna, Western Australia		Project reference:			

Specimen description:				(GC) Clayey GRAVEL with sand, fine to coarse grained, red brown, low plasticity, fine to coarse grained sand					Sampling co-ordinates		Reduced Level
									Easting (m)		
PARTICLE SIZE DISTRIBUTION				AS 1289.3.6.1							
Sieve Size	Passing	LB S	UB S	Method:	AS 1289.2.1.1	AS 1289.3.1.2	AS 1289.3.2.1	AS 1289.3.3.1	AS 1289.3.4.1		
125 mm	100%				Moisture content	1 point Liquid limit	Plastic limit	Plasticity index	Linear shrinkage	Curling/ Crumbling/ Cracking	
75 mm	100%										
63 mm	100%										
53 mm	100%										
37.5 mm	100%										
26.5 mm	99%										
19 mm	98%										
13.2 mm	94%										
9.5 mm	87%										
6.7 mm	77%										
4.75 mm	63%										
2.36 mm	44%										
1.18 mm	34%										
600 µm	30%										
425 µm	28%										
300 µm	26%										
150 µm	20%										
75 µm	14%										
				Result:	7.4% As Rcvd.	23%	10%	13%	7.0%	None	
				LB S:						-	
				UB S:						-	
				Att. preparation method:	Dry sieved			LSM length (mm):		125	
				Specimen history/notes:	Preparation of specimen and testing performed on sample supplied to the laboratory						
				Definitions:	LB S = Lower bound specification LSM = Linear shrinkage mould UB S = Upper bound specification		N/A = Not applicable ND = Not determined; SIB = Slip in bowl NO = Not obtainable; NP = Non plastic				
GRADING SUMMARY											
Fines		Sand*		Gravel*		Cobbles*					
(<75 µm)		(>75 µm - <2.36 mm)		(>2.36 mm - <63 mm)		(>63mm - <200 mm)					
14.3%		30.1%		55.6%		0.0%					
Proportions based on guidance in AS1726-2017 Section 6.1.4.2											



Testing performed by: RT		Results reviewed by: SLenihan	Date reported: 14/03/2019
Cert. ref.:	18113648_PD10 - BC_TRP19-0043_PSD_19022740_Rep19023761		Approved signatory:
	NATA accreditation number: 1961 - Site:1598 - Perth Accredited for compliance with ISO/IEC 17025 - Testing		
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# Soils testing - Particle size distribution & consistency limits test report

Standard method (by sieving)

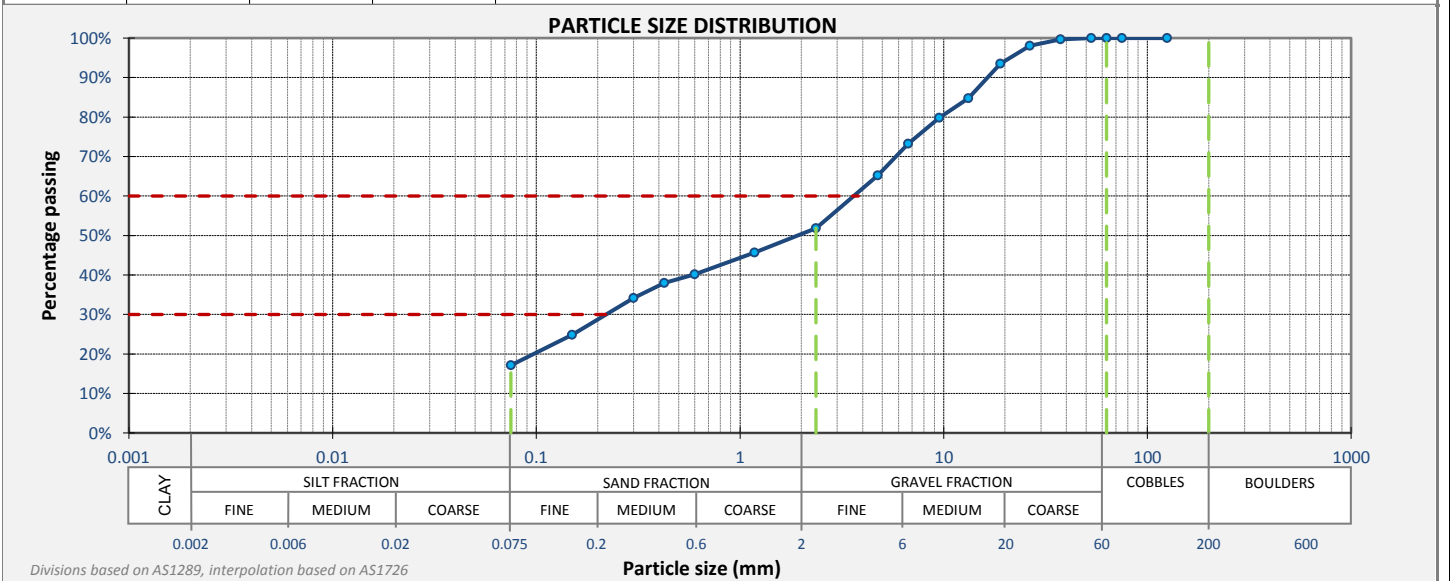
AS1289.3.6.1, 2.1.1, 3.1.2, 3.2.1, 3.3.1 & 3.4.1



**GOLDER**

Test request #:	TRP19-0043	Lab sample ID:	LPER2019022741	Golder Associates Pty Ltd  PERTH GEOTECHNICAL LABORATORY 84 Guthrie Street, Osborne Park, Western Australia 6017		
Client:	Shire of Wiluna					
Client address:	70 Wotton Street, Wiluna 6646					
Project ID:	18113648	Lab report ref.:	LPER_19023731			
Project name:	Shire of Wiluna Runway		Exploratory Hole PD10 - SG	Sample depth (m):	0.40	- 0.46
Location:	Wiluna, Western Australia		Project reference:	Client sample ref:		

Specimen description:				(GC-GM) Clayey/Silty GRAVEL with sand, fine to coarse grained, red brown, fine to coarse grained sand					Sampling co-ordinates		Reduced Level
									Easting (m)		
PARTICLE SIZE DISTRIBUTION				AS 1289.3.6.1							
Sieve Size	Passing	LB S	UB S	Method:	AS 1289.2.1.1	AS 1289.3.1.2	AS 1289.3.2.1	AS 1289.3.3.1	AS 1289.3.4.1		
125 mm	100%				Moisture content	1 point Liquid limit	Plastic limit	Plasticity index	Linear shrinkage	Curling/ Crumbling/ Cracking	
75 mm	100%										
63 mm	100%										
53 mm	100%										
37.5 mm	100%										
26.5 mm	98%										
19 mm	93%										
13.2 mm	85%										
9.5 mm	80%										
6.7 mm	73%										
4.75 mm	65%										
2.36 mm	52%										
1.18 mm	46%										
600 µm	40%										
425 µm	38%										
300 µm	34%										
150 µm	25%										
75 µm	17%										
Result:					9.0% As Rcvd.	18%	13%	5%	3.0%	None	
LB S:										-	
UB S:										-	
Att. preparation method:					Dry sieved			LSM length (mm):		125	
Specimen history/notes:					Preparation of specimen and testing performed on sample supplied to the laboratory						
Definitions:					LB S = Lower bound specification LSM = Linear shrinkage mould UB S = Upper bound specification		N/A = Not applicable ND = Not determined; SIB = Slip in bowl NO = Not obtainable; NP = Non plastic				
GRADING SUMMARY											
Fines		Sand*			Gravel*			Cobbles*			
(<75 µm)		(>75 µm - <2.36 mm)			(>2.36 mm - <63 mm)			(>63mm - <200 mm)			
17.1%		34.7%			48.2%			0.0%			
Proportions based on guidance in AS1726-2017 Section 6.1.4.2											



Testing performed by:		RT	Results reviewed by:		SLenihan	Date reported:		13/03/2019
Cert. ref.:	18113648_PD10 - SG_TRP19-0043_PSD_19022741_Rep19023731					Approved signatory:		
	NATA accreditation number: 1961 - Site:1598 - Perth Accredited for compliance with ISO/IEC 17025 - Testing							
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# Soils testing - Particle size distribution & consistency limits test report

Standard method (by sieving)

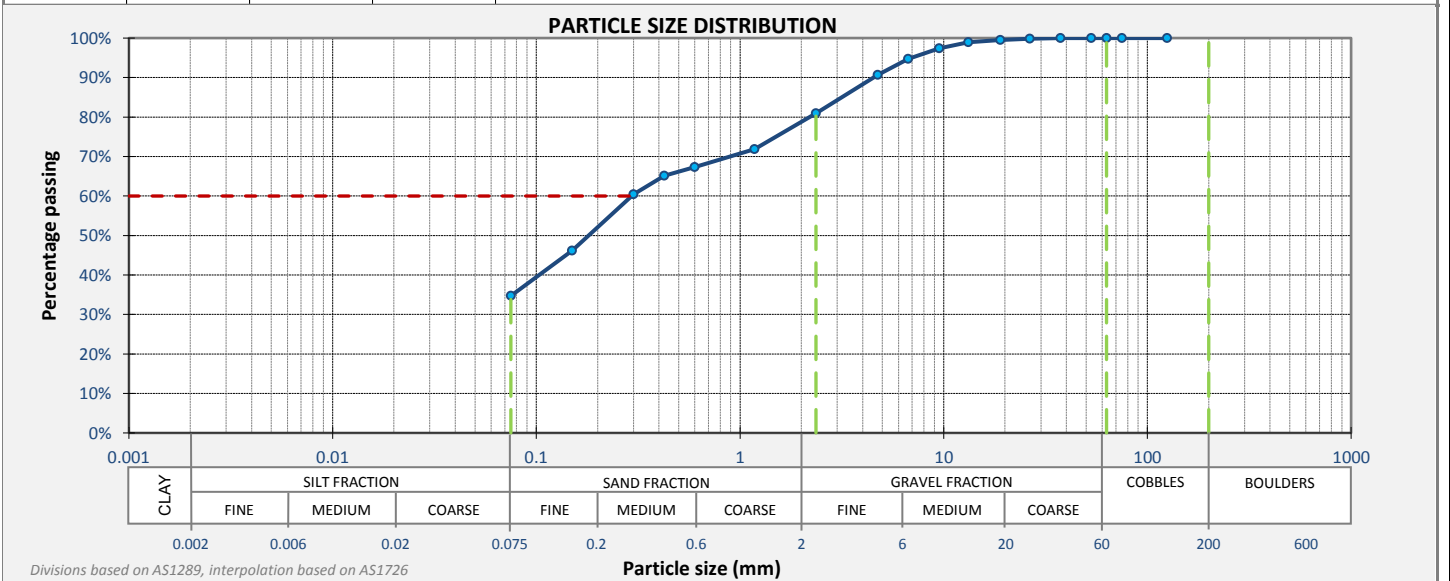
AS1289.3.6.1, 2.1.1, 3.1.2, 3.2.1, 3.3.1 & 3.4.1





**GOLDER**

Test request #: TRP19-0043		Lab sample ID: LPER2019022743		Golder Associates Pty Ltd  PERTH GEOTECHNICAL LABORATORY 84 Guthrie Street, Osborne Park, Western Australia 6017	
Client: Shire of Wiluna					
Client address: 70 Wotton Street, Wiluna 6646					
Project ID: 18113648		Lab report ref.: LPER_19023710_1			
Project name: Shire of Wiluna Runway		Exploratory Hole PD11 - SG		Sample depth (m): 0.30 - 0.50	
				Client sample ref:	
Location: Wiluna, Western Australia		Project reference:			

Specimen description:				(CL) Sandy CLAY with gravel, low plasticity, red brown, fine to coarse grained sand, fine to medium grained gravel				Sampling co-ordinates		Reduced Level
								Easting (m)	Northing (m)	
PARTICLE SIZE DISTRIBUTION				AS 1289.3.6.1						
Sieve Size	Passing	LB S	UB S	Method:	AS 1289.2.1.1	AS 1289.3.1.2	AS 1289.3.2.1	AS 1289.3.3.1	AS 1289.3.4.1	
125 mm	100%				Moisture content	1 point Liquid limit	Plastic limit	Plasticity index	Linear shrinkage	Curling/ Crumbling/ Cracking
75 mm	100%									
63 mm	100%									
53 mm	100%									
37.5 mm	100%									
26.5 mm	100%									
19 mm	100%									
13.2 mm	99%									
9.5 mm	97%									
6.7 mm	95%									
4.75 mm	91%									
2.36 mm	81%									
1.18 mm	72%									
600 µm	67%									
425 µm	65%									
300 µm	60%									
150 µm	46%									
75 µm	35%									
				Result:	8.3% As Rcvd.	20%	12%	8%	5.0%	None
				LB S:						-
				UB S:						-
				Att. preparation method:	Dry sieved		LSM length (mm):		125	
				Specimen history/notes:	Preparation of specimen and testing performed on sample supplied to the laboratory					
				Definitions:		LB S = Lower bound specification LSM = Linear shrinkage mould UB S = Upper bound specification		N/A = Not applicable ND = Not determined; SIB = Slip in bowl NO = Not obtainable; NP = Non plastic		
GRADING SUMMARY										
Fines		Sand*		Gravel*		Cobbles*				
(<75 µm)		(>75 µm - <2.36 mm)		(>2.36 mm - <63 mm)		(>63mm - <200 mm)				
34.7%		46.2%		19.0%		0.0%				
Proportions based on guidance in AS1726-2017 Section 6.1.4.2										



Testing performed by: RT		Results reviewed by: SWai		Date reported: 13/03/2019	
Cert. ref.:	18113648_PD11 - SG_TRP19-0043_PSD_19022743_Rep023710_1			Approved signatory:	
	NATA accreditation number: 1961 - Site:1598 - Perth Accredited for compliance with ISO/IEC 17025 - Testing				
	THIS DOCUMENT SHALL ONLY BE REPRODUCED IN FULL			Shannon Wai - Laboratory Technician	

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# Soils testing - Determination of the dry density moisture relationship

Modified compaction method

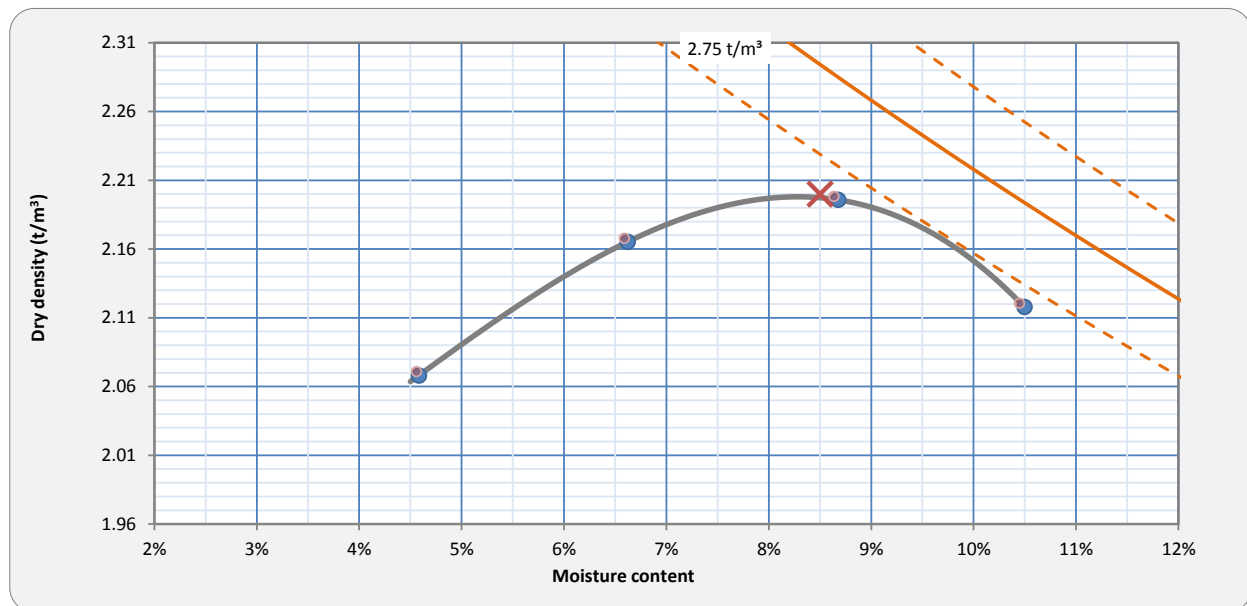
AS 1289.5.2.1-2017



<b>Test request ID:</b> TRP19-0043	<b>Lab sample ID:</b> LPER2019022743	<b>Golder Associates Pty Ltd</b> <b>PERTH GEOTECHNICAL LABORATORY</b> 84 Guthrie Street, Osborne Park, Western Australia 6017
<b>Client:</b> Shire of Wiluna		
<b>Client address:</b> 70 Wotton Street, Wiluna 6646		
<b>Project ID:</b> 18113648	<b>Lab report ref.:</b> LPER_19024041	
<b>Project name:</b> Shire of Wiluna Runway	<b>Exploratory Hole</b> PD11 - SG	<b>Sample depth (m):</b> 0.30 - 0.50 <b>Client sample ref:</b>
<b>Location:</b> Wiluna, Western Australia	<b>Project reference:</b>	-
<b>Specimen description:</b> (CL) Sandy CLAY with gravel, low plasticity, red brown, fine to coarse grained sand, fine to medium grained gravel <small>(Based on visual and tactile assessment)</small>		<b>Sampling co-ordinates</b> <b>Easting (m)</b> <b>Northing (m)</b> <b>Reduced Level</b>
<b>Curing compliance:</b>	<b>Liquid Limit</b>	<b>Moisture content:</b> 8.6% Field AS 1289 2.1.1-2005
<b>Material type</b>	<b>Measured:</b> 20% <b>Assumed:</b> <b>Adopted:</b> 20%	
Cohesive	<b>Curing times are compliant</b> <b>Cure:</b> 145.25 hrs	
		<b>Portion test performed on:</b> -19 mm

## TEST REPORT - COMPACTION RESULTS

	Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	<b>Overflow material - (by dry mass)</b>  *Denotes value adjusted for overflow material <b>+19 mm: 0%</b> <b>+37.5 mm: 0%</b> <i>Overflow material was discarded</i>
<b>Dry density (t/m<sup>3</sup>):</b>	2.12 2.12*	2.20 2.20*	2.17 2.17*	2.07 2.07*			
<b>Moisture content:</b>	10.5% 10.4%*	8.7% 8.6%*	6.6% 6.6%*	4.6% 4.6%*			



### Notes:

Modified maximum dry density (t/m<sup>3</sup>):

Modified optimum moisture content:

Result	Adjusted for overflow
2.20	2.20
8.5%	8.5%

<b>Specimens prepared by:</b> SW	<b>Tests performed by:</b> SL	<b>Date tested:</b> 14/03/2019
<b>Definition:</b> ND = Not Determined	<b>Results reviewed by:</b> Slenihan	<b>Date reported:</b> 26/03/2019

<b>Cert. ref.:</b> 18113648_PD11 - SG_TRP19-0043_ModComp_s19022743_Rep19024041	<b>Approved signatory:</b>
<b>NATA accreditation number: 1961 - Site:1598 - Perth</b> Accredited for compliance with ISO/IEC 17025 - Testing THIS DOCUMENT SHALL ONLY BE REPRODUCED IN FULL	Sean Lenihan Shannon Wai - Laboratory Technician

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# Soils testing - Determination of the California Bearing Ratio of a soil

Standard laboratory method for a remoulded specimen (Soaked)

AS 1289.6.1.1-2014



Test request #:	TRP19-0043	Lab sample ID:	LPER2019022743	Golder Associates Pty Ltd
Client:	Shire of Wiluna	PERTH GEOTECHNICAL LABORATORY		
Client address:	70 Wotton Street, Wiluna 6646	84 Guthrie Street, Osborne Park, Western Australia 6017		
Project ID:	18113648	Lab report ref.:	LPER_19024050	
Lab project name:	Shire of Wiluna Runway	Exploratory Hole	PD11 - SG	Sample depth (m): 0.30 - 0.50 Client sample ref.:
Location:	Wiluna, Western Australia	Project reference:		
Specimen description:	(CL) Sandy CLAY with gravel, low plasticity, red brown, fine to coarse grained (Based on visual and tactile assessment) sand, fine to medium grained gravel			Sampled by: Test date: 25/03/19

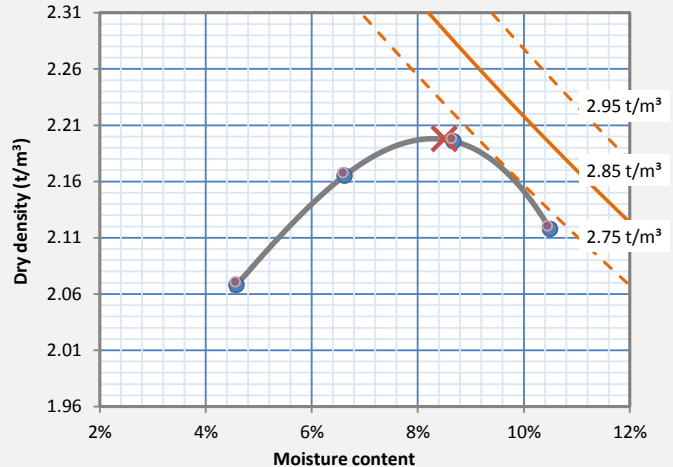
## SPECIMEN PREPARATION - SUMMARY OF COMPACTION AND MOISTURE CONTENT TEST RESULTS

Initial moisture content:	8.6% As rcvd.
Compaction method:	AS1289.5.2.1-2017 Modified
Maximum dry density (t/m <sup>3</sup> ):	2.20
Optimum moisture content:	8.5%
Oversize material (>19mm):	-
Compaction moisture content:	8.7%

### Note on compaction:

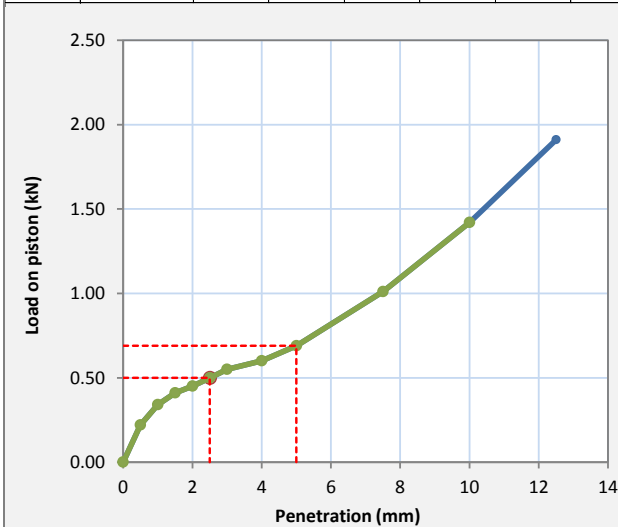
No oversize material was retained on the 19mm sieve

### Notes on test:



## SUMMARY OF CALIFORNIA BEARING RATIO TEST RESULT

Penetration (mm):		0.0	0.5	1.0	1.5	2.0	2.5	3.0	4.0	5.0	7.5	10.0	12.5	Correction:	
Load (kN)	Original	0.00	0.22	0.34	0.41	0.45	0.50	0.55	0.60	0.69	1.01	1.42	1.91		
	Corrected	0.00	0.22	0.34	0.41	0.45	0.50	0.55	0.60	0.69	1.01	1.42			



Dry density t/m <sup>3</sup>	before soaking:	2.06
	after soaking:	2.06
Density ratio	before soaking:	94.0%
	after soaking:	93.5%
Moisture ratio at compaction:		102.0%
Duration of soaking (days):		4
Surcharge applied (kg):		6.8
Moisture content top 30mm:		12.5%
Moisture content remainder:		12.2%
Swell after soaking:		NIL
Bearing ratio at 2.5mm penetration:		3.8%
Bearing ratio at 5.0mm penetration:		3.5%

Penetration (mm) 2.5 CBR Value 4.0%

Definitions:	Specimen prepared by:	SW	Test performed by:	SL
ND = Not determined	Results reviewed by:	SWai	Date reported:	26-Mar-19

Cert. ref.:	18113648_PD11 - SG_TRP19-0043_CBR_19022743_Rep-19024050	Approved signatory:
	NATA accreditation number: 1961 - Site:1598 - Perth	
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**Soils testing - Determination of the California Bearing Ratio of a soil**

Standard laboratory method for a remoulded specimen (Unsoaked)

AS 1289.6.1.1-2014



Test request #:	TRP19-0043	Lab sample ID:	LPER201903190	Golder Associates Pty Ltd
Client:	Shire of Wiluna	PERTH GEOTECHNICAL LABORATORY 84 Guthrie Street, Osborne Park, Western Australia 6017		
Client address:	70 Wotton Street, Wiluna 6646			
Project ID:	18113648	Lab report ref.:	LPER_19024056	
Lab project name:	Shire of Wiluna Runway	Exploratory Hole	PD11 - SG	Sample depth (m): 0.00 - Client sample ref.:
Location:	Wiluna, Western Australia	Project reference:		
Specimen description:	(CL) Sandy CLAY with gravel, low plasticity, red brown, fine to coarse grained (Based on visual and tactile assessment) sand, fine to medium grained gravel			Sampled by: Sampled type: BDS

**SPECIMEN PREPARATION - SUMMARY OF COMPACTION AND MOISTURE CONTENT TEST RESULTS**

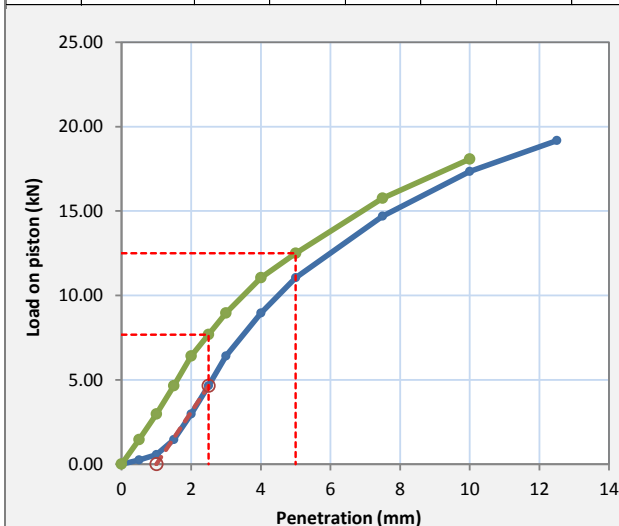
Initial moisture content:	8.3% As rcvd.
Compaction method:	AS1289.5.2.1-2017 Modified
Maximum dry density (t/m <sup>3</sup> ):	2.20
Optimum moisture content:	8.5%
Oversize material (>19mm):	0.0%
Compaction moisture content:	8.7%

**Note on compaction:**

Oversize material has been excluded from the test

**Notes on test:****Notes on compaction test****SUMMARY OF CALIFORNIA BEARING RATIO TEST RESULT**

Penetration (mm):		0.0	0.5	1.0	1.5	2.0	2.5	3.0	4.0	5.0	7.5	10.0	12.5	Correction:	1.0mm
Load (kN)	Original	0.00	0.25	0.56	1.45	2.97	4.64	6.40	8.95	11.04	14.69	17.35	19.17		
	Corrected	0.00	1.45	2.97	4.64	6.40	7.68	8.95	11.04	12.50	15.75	18.08			



Dry density t/m <sup>3</sup>	2.06
Density ratio	94.0%
Moisture ratio at compaction:	102.0%
Surcharge applied (kg):	6.8
CBR test type:	Unsoaked
Moisture content:	8.7%
Bearing ratio at 2.5mm penetration:	58.1%
Bearing ratio at 5.0mm penetration:	63.1%

Penetration (mm) **5.0** CBR Value **60.0%**

Definitions:	Specimen prepared by:	SW	Test performed by:	SW
ND = Not determined	Results reviewed by:	SWai	Date reported:	26-Mar-19

Cert. ref.:	18113648_PD11 - SG_TRP19-0043_CBRU_1903190_Rep-19024056	Approved signatory:
	NATA accreditation number: 1961 - Site:1598 - Perth	
	Accredited for compliance with ISO/IEC 17025 - Testing	
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# Soils testing - Particle size distribution & consistency limits test report

Standard method (by sieving)

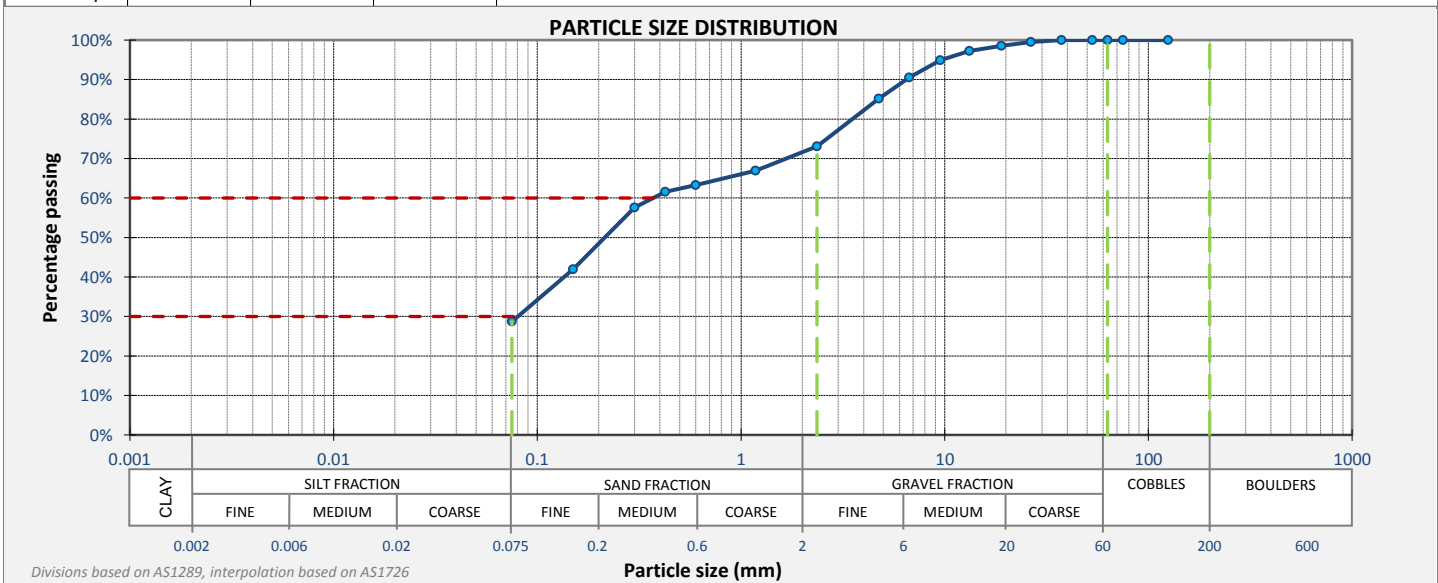
AS1289.3.6.1, 2.1.1, 3.1.2, 3.2.1, 3.3.1 & 3.4.1


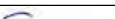


**GOLDER**

Test request #:	TRP19-0043	Lab sample ID:	LPER2019022745	<div>Golder Associates Pty Ltd</div> <div>PERTH GEOTECHNICAL LABORATORY</div> <div>84 Guthrie Street, Osborne Park, Western Australia 6017</div>		
Client:	Shire of Wiluna					
Client address:	70 Wotton Street, Wiluna 6646					
Project ID:	18113648	Lab report ref.:	LPER_19023711_1			
Project name:	Shire of Wiluna Runway		Exploratory Hole	Sample depth (m):	0.30	- 0.35
			PD12 - SG	Client sample ref:		
Location:	Wiluna, Western Australia		Project reference:			

Specimen description:				Sampling co-ordinates					Reduced Level	
				Easting (m)		Northing (m)				
PARTICLE SIZE DISTRIBUTION AS 1289.3.6.1				(SC) Clayey SAND with gravel, fine to coarse grained, red brown, low plasticity, fine to coarse grained gravel						
Sieve Size	Passing	LB S	UB S	Method:	AS 1289.2.1.1	AS 1289.3.1.2	AS 1289.3.2.1	AS 1289.3.3.1	AS 1289.3.4.1	
125 mm	100%			Moisture content	1 point Liquid limit	Plastic limit	Plasticity index	Linear shrinkage	Curling/ Crumbling/ Cracking	
75 mm	100%									
63 mm	100%									
53 mm	100%									
37.5 mm	100%									
26.5 mm	100%									
19 mm	99%									
13.2 mm	97%									
9.5 mm	95%									
6.7 mm	90%									
4.75 mm	85%									
2.36 mm	73%									
1.18 mm	67%									
600 μm	63%									
425 μm	62%									
300 μm	58%									
150 μm	42%									
75 μm	29%									
				Result:	8.5% As Rcvd.	20%	11%	9%	4.0%	None
				LB S:						-
				UB S:						-
				Att. preparation method:		Dry sieved		LSM length (mm):		125
				Specimen history/notes:	Preparation of specimen and testing performed on sample supplied to the laboratory					
				Definitions:		LB S = Lower bound specification LSM = Linear shrinkage mould UB S = Upper bound specification		N/A = Not applicable ND = Not determined; SIB = Slip in bowl NO = Not obtainable; NP = Non plastic		
				GRADING SUMMARY						
				Fines	Sand*		Gravel*		Cobbles*	
				(<75 μm)	(>75 μm - <2.36 mm)		(>2.36 mm - <63 mm)		(>63mm - <200 mm)	
				28.7%	44.4%		26.9%		0.0%	
				Proportions based on guidance in AS1726-2017 Section 6.1.4.2						



Testing performed by: RT		Results reviewed by: SWai		Date reported: 13/03/2019	
Cert. ref.:	18113648_PD12 - SG_TRP19-0043_PSD_19022745_Rep023711_1			Approved signatory:	
	NATA accreditation number: 1961 - Site:1598 - Perth Accredited for compliance with ISO/IEC 17025 - Testing				
	THIS DOCUMENT SHALL ONLY BE REPRODUCED IN FULL			Shannon Wai - Laboratory Technician	

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# Soils testing - Determination of the California Bearing Ratio of a soil

Standard laboratory method for a remoulded specimen (Soaked)

AS 1289.6.1.1-2014



Test request #:	TRP19-0043	Lab sample ID:	LPER201903142	<b>Golder Associates Pty Ltd</b>	
Client:	Shire of Wiluna			PERTH GEOTECHNICAL LABORATORY	
Client address:	70 Wotton Street, Wiluna 6646			84 Guthrie Street, Osborne Park, Western Australia 6017	
Project ID:	18113648	Lab report ref.:	LPER_19024046		
Lab project name:	Shire of Wiluna Runway		Exploratory Hole	Sample depth (m):	0.30 - 0.25
			PD07 & PD05 - SG	Client sample ref.:	
Location:	Wiluna, Western Australia		Project reference:		
Specimen description:	Clayey SAND, trace of gravel, red brown (Based on visual and tactile assessment)			Sampled by:	
				Test date:	25/03/19

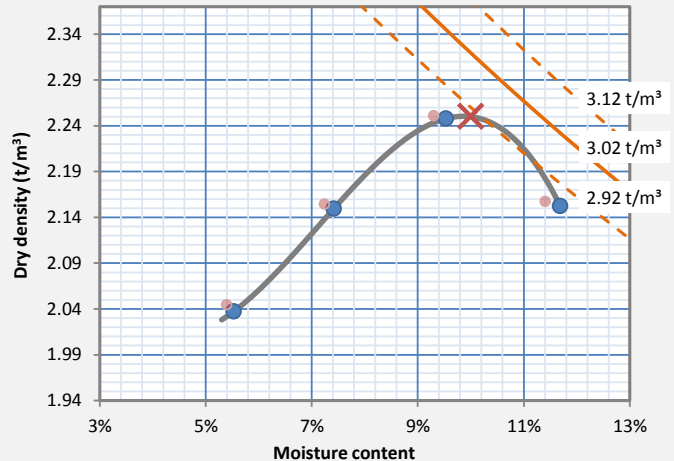
## SPECIMEN PREPARATION - SUMMARY OF COMPACTION AND MOISTURE CONTENT TEST RESULTS

Initial moisture content:	9.5%	As rcvd.
Compaction method:	AS1289.5.2.1-2017	Modified
Maximum dry density (t/m <sup>3</sup> ):	2.25	
Optimum moisture content:	10.0%	
Over-size material (>19mm):	2.0%	
Compaction moisture content:	9.8%	

### Note on compaction:

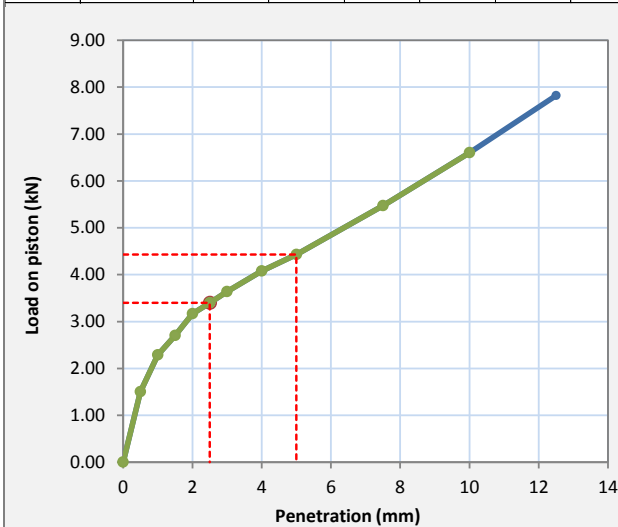
Over-size material has been excluded from the test

### Notes on test:



## SUMMARY OF CALIFORNIA BEARING RATIO TEST RESULT

Penetration (mm):	0.0	0.5	1.0	1.5	2.0	2.5	3.0	4.0	5.0	7.5	10.0	12.5	Correction:	
Load (kN)	Original	0.00	1.50	2.29	2.70	3.17	3.40	3.64	4.08	4.43	5.47	6.60	7.82	
	Corrected	0.00	1.50	2.29	2.70	3.17	3.40	3.64	4.08	4.43	5.47	6.60		



Dry density t/m <sup>3</sup>	before soaking:	2.12
	after soaking:	2.12
Density ratio	before soaking:	94.0%
	after soaking:	94.0%
Moisture ratio at compaction:		98.0%
Duration of soaking (days):		4
Surcharge applied (kg):		6.7
Moisture content top 30mm:		13.8%
Moisture content remainder:		11.2%
Swell after soaking:		NIL
Bearing ratio at 2.5mm penetration:		25.8%
Bearing ratio at 5.0mm penetration:		22.4%

Penetration (mm) **2.5** CBR Value **25.0%**

Definitions: Specimen prepared by: SW Test performed by: SL  
ND = Not determined Results reviewed by: SWai Date reported: 26-Mar-19

Cert. ref.:	18113648_PD07 & PD05 - SG_TRP19-0043_CBR_1903142_Rep-19024046		Approved signatory:
	NATA accreditation number: 1961 - Site:1598 - Perth		
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# Soils testing - Determination of the California Bearing Ratio of a soil

Standard laboratory method for a remoulded specimen (Soaked)

AS 1289.6.1.1-2014



Test request #:	TRP19-0043	Lab sample ID:	LPER201903140	Golder Associates Pty Ltd	
Client:	Shire of Wiluna			PERTH GEOTECHNICAL LABORATORY	
Client address:	70 Wotton Street, Wiluna 6646			84 Guthrie Street, Osborne Park, Western Australia 6017	
Project ID:	18113648	Lab report ref.:	LPER_19024042		
Lab project name:	Shire of Wiluna Runway		Exploratory Hole	Sample depth (m):	0.45 - 0.40
			PD04 & PD10 - SG	Client sample ref.:	
Location:	Wiluna, Western Australia		Project reference:		
Specimen description:	Clayey/Silty GRAVEL with sand, red brown (Based on visual and tactile assessment)			Sampled by:	
				Test date:	25/03/19

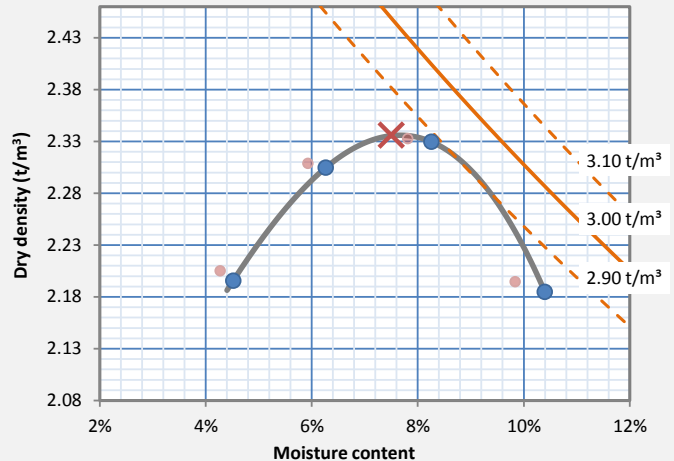
## SPECIMEN PREPARATION - SUMMARY OF COMPACTION AND MOISTURE CONTENT TEST RESULTS

Initial moisture content:	8.2% As rcvd.
Compaction method:	AS1289.5.2.1-2017 Modified
Maximum dry density (t/m <sup>3</sup> ):	2.34
Optimum moisture content:	7.5%
Over-size material (>19mm):	5.0%
Compaction moisture content:	7.9%

### Note on compaction:

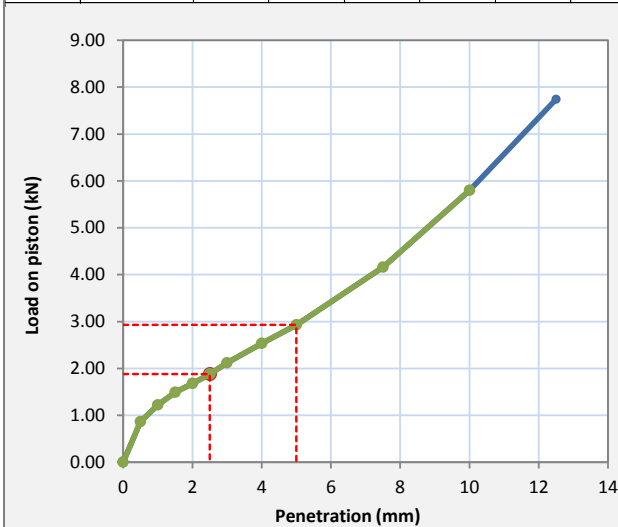
Over-size material has been excluded from the test

### Notes on test:



## SUMMARY OF CALIFORNIA BEARING RATIO TEST RESULT

Penetration (mm):	0.0	0.5	1.0	1.5	2.0	2.5	3.0	4.0	5.0	7.5	10.0	12.5	Correction:	
Load (kN)	Original	0.00	0.86	1.22	1.49	1.68	1.88	2.12	2.53	2.93	4.16	5.80	7.74	
	Corrected	0.00	0.86	1.22	1.49	1.68	1.88	2.12	2.53	2.93	4.16	5.80		



Dry density t/m <sup>3</sup>	before soaking:	2.19
	after soaking:	2.19
Density ratio	before soaking:	93.5%
	after soaking:	93.5%
Moisture ratio at compaction:		105.5%
Duration of soaking (days):		4
Surcharge applied (kg):		6.8
Moisture content top 30mm:		10.3%
Moisture content remainder:		10.0%
Swell after soaking:		NIL
Bearing ratio at 2.5mm penetration:		14.2%
Bearing ratio at 5.0mm penetration:		14.8%

Penetration (mm) **5.0** CBR Value **15.0%**

Definitions: Specimen prepared by: SW Test performed by: SL  
ND = Not determined Results reviewed by: SWai Date reported: 26-Mar-19

Cert. ref.:	18113648_PD04 & PD10 - SG_TRP19-0043_CBR_1903140_Rep-19024042		Approved signatory:
	NATA accreditation number: 1961 - Site:1598 - Perth		
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**Soils testing - Determination of the California Bearing Ratio of a soil**

Standard laboratory method for a remoulded specimen (Unsoaked)

AS 1289.6.1.1-2014



Test request #:	TRP19-0043	Lab sample ID:	LPER201903144	Golder Associates Pty Ltd
Client:	Shire of Wiluna	PERTH GEOTECHNICAL LABORATORY 84 Guthrie Street, Osborne Park, Western Australia 6017		
Client address:	70 Wotton Street, Wiluna 6646			
Project ID:	18113648	Lab report ref.:	LPER_19024052	
Lab project name:	Shire of Wiluna Runway	Exploratory Hole	PD04 & PD10 - SG	Sample depth (m): 0.45 - 0.40 Client sample ref.:
Location:	Wiluna, Western Australia	Project reference:		
Specimen description:	Clayey/Silty GRAVEL with sand, red brown (Based on visual and tactile assessment)			Sampled by: Sampled type: BDS

**SPECIMEN PREPARATION - SUMMARY OF COMPACTION AND MOISTURE CONTENT TEST RESULTS**

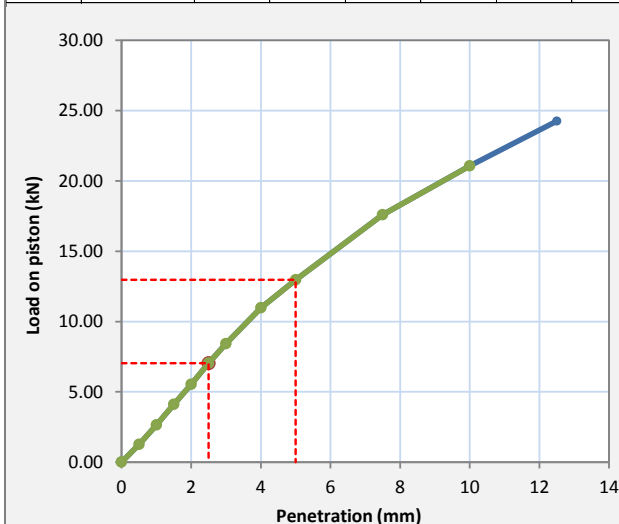
Initial moisture content:	8.3% As rcvd.
Compaction method:	AS1289.5.2.1-2017 Modified
Maximum dry density (t/m <sup>3</sup> ):	2.34
Optimum moisture content:	7.5%
Oversize material (>19mm):	5.0%
Compaction moisture content:	7.9%

**Note on compaction:**

Oversize material has been recombined

**Notes on test:****Notes on compaction test****SUMMARY OF CALIFORNIA BEARING RATIO TEST RESULT**

Penetration (mm):		0.0	0.5	1.0	1.5	2.0	2.5	3.0	4.0	5.0	7.5	10.0	12.5	Correction:	
Load (kN)	Original	0.00	1.26	2.64	4.10	5.54	7.04	8.42	10.97	12.97	17.59	21.06	24.25		
	Corrected	0.00	1.26	2.64	4.10	5.54	7.04	8.42	10.97	12.97	17.59	21.06			



Dry density t/m <sup>3</sup>	2.19
Density ratio	-
Moisture ratio at compaction:	-
Surcharge applied (kg):	6.8
CBR test type:	Unsoaked
Moisture content:	7.9%
Bearing ratio at 2.5mm penetration:	53.3%
Bearing ratio at 5.0mm penetration:	65.5%

Penetration (mm) **5.0** CBR Value **70.0%**

Definitions:	Specimen prepared by:	SW	Test performed by:	SW
ND = Not determined	Results reviewed by:	SWai	Date reported:	26-Mar-19

Cert. ref.:	18113648_PD04 & PD10 - SG_TRP19-0043_CBRU_1903144_Rep-19024052	Approved signatory:
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# Soils testing - Determination of the dry density moisture relationship

Modified compaction method

AS 1289.5.2.1-2017

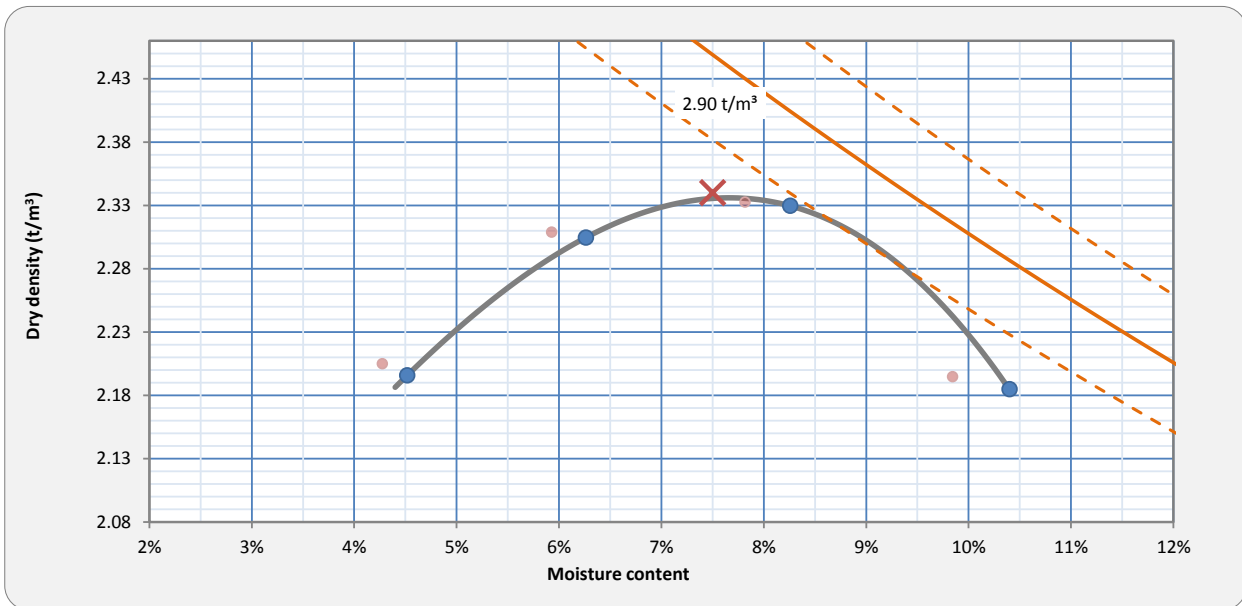


**GOLDER**

Test request ID: TRP19-0043				Lab sample ID: LPER201903140		Golder Associates Pty Ltd  PERTH GEOTECHNICAL LABORATORY  84 Guthrie Street, Osborne Park, Western Australia 6017				
Client: Shire of Wiluna										
Client address: 70 Wotton Street, Wiluna 6646										
Project ID: 18113648		Lab report ref.: LPER_19024035								
Project name: Shire of Wiluna Runway				Exploratory Hole PD04 & PD10 - SG		Sample depth (m): 0.45 - 0.40				
						Client sample ref:				
Location: Wiluna, Western Australia				Project reference:			-			
Specimen description: Clayey/Silty GRAVEL with sand, red brown (Based on visual and tactile assessment)						Sampling co-ordinates		Reduced		
						Easting (m)		Northing (m)		Level
Curing compliance:		Liquid Limit				Moisture				
Material type		Measured:		Assumed: 18%		Adopted: 18%		8.2%		
Cohesive		Curing times are compliant		Cure: 98.42 hrs		content: Field		AS 1289 2.1.1-2005		
						Portion test performed on:			-19 mm	

## TEST REPORT - COMPACTION RESULTS

	Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	<b>Overflow material - (by dry mass)</b>  *Denotes value adjusted for overflow material <b>+19 mm: 5%</b> <b>+37.5 mm: 0%</b> <i>Overflow material was discarded</i>
<b>Dry density (t/m<sup>3</sup>):</b>	2.20 2.20*	2.30 2.31*	2.33 2.33*	2.18 2.19*			
<b>Moisture content:</b>	4.5% 4.3%*	6.3% 5.9%*	8.3% 7.8%*	10.4% 9.8%*			



### Notes:

Modified maximum dry density (t/m<sup>3</sup>):

Modified optimum moisture content:

Result	Adjusted for overflow
2.34	2.34
7.5%	7.5%

<b>Specimens prepared by:</b>	SW	<b>Tests performed by:</b>	SW	<b>Date tested:</b>	18/03/2019
<b>Definition:</b>	ND = Not Determined	<b>Results reviewed by:</b>	SWai	<b>Date reported:</b>	26/03/2019

<b>Cert. ref.:</b>	<b>18113648_PD04 &amp; PD10 - SG_TRP19-0043_ModComp_s1903140_Rep19024035</b>	<b>Approved signatory:</b>	
<b>NATA accreditation number: 1961 - Site:1598 - Perth</b> Accredited for compliance with ISO/IEC 17025 - Testing			
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**Soils testing - Determination of the California Bearing Ratio of a soil**

Standard laboratory method for a remoulded specimen (Unsoaked)

AS 1289.6.1.1-2014



Test request #:	TRP19-0043	Lab sample ID:	LPER201903146	Golder Associates Pty Ltd	
Client:	Shire of Wiluna	PERTH GEOTECHNICAL LABORATORY		84 Guthrie Street, Osborne Park, Western Australia 6017	
Client address:	70 Wotton Street, Wiluna 6646				
Project ID:	18113648	Lab report ref.:	LPER_19024054		
Lab project name:	Shire of Wiluna Runway	Exploratory Hole	PD07 & PD05 - SG	Sample depth (m):	0.30 - 0.25
Location:	Wiluna, Western Australia	Project reference:	-	Client sample ref.:	
Specimen description:	Clayey SAND, trace of gravel, red brown (Based on visual and tactile assessment)			Sampled by:	
				Sampled type:	BDS

**SPECIMEN PREPARATION - SUMMARY OF COMPACTION AND MOISTURE CONTENT TEST RESULTS**

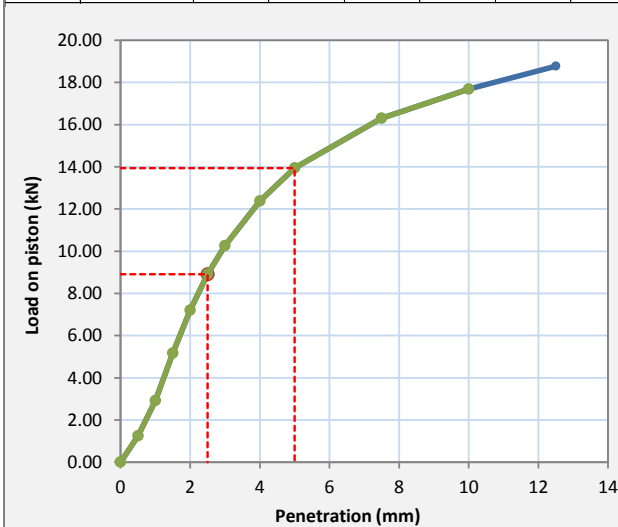
Initial moisture content:	9.9% As rcvd.
Compaction method:	AS1289.5.2.1-2017 Modified
Maximum dry density (t/m <sup>3</sup> ):	2.25
Optimum moisture content:	10.0%
Oversize material (>19mm):	2.0%
Compaction moisture content:	9.6%

**Note on compaction:**

Oversize material has been excluded from the test

**Notes on test:****Notes on compaction test****SUMMARY OF CALIFORNIA BEARING RATIO TEST RESULT**

Penetration (mm):		0.0	0.5	1.0	1.5	2.0	2.5	3.0	4.0	5.0	7.5	10.0	12.5	Correction:	
Load (kN)	Original	0.00	1.24	2.92	5.17	7.21	8.91	10.26	12.38	13.94	16.31	17.68	18.77		
	Corrected	0.00	1.24	2.92	5.17	7.21	8.91	10.26	12.38	13.94	16.31	17.68			



Dry density t/m <sup>3</sup>	2.12
Density ratio	94.5%
Moisture ratio at compaction:	96.5%
Surcharge applied (kg):	6.7
CBR test type:	Unsoaked
Moisture content:	9.6%
Bearing ratio at 2.5mm penetration:	67.5%
Bearing ratio at 5.0mm penetration:	70.4%

Penetration (mm) **5.0** CBR Value **70.0%**

Definitions:	Specimen prepared by:	SW	Test performed by:	SW
ND = Not determined	Results reviewed by:	SWai	Date reported:	26-Mar-19

Cert. ref.:	18113648_PD07 & PD05 - SG_TRP19-0043_CBRU_1903146_Rep-19024054	Approved signatory:	
	NATA accreditation number: 1961 - Site:1598 - Perth		
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# Soils testing - Determination of the dry density moisture relationship

Modified compaction method

AS 1289.5.2.1-2017

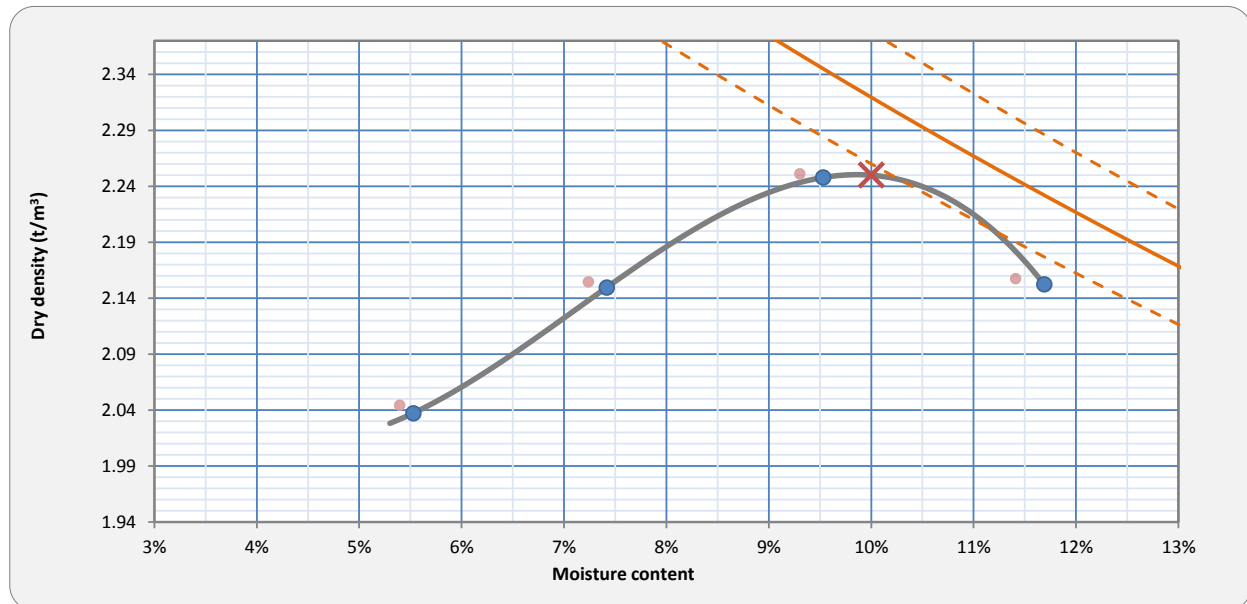


**GOLDER**

Test request ID: TRP19-0043				Lab sample ID: LPER201903142		Golder Associates Pty Ltd PERTH GEOTECHNICAL LABORATORY 84 Guthrie Street Osborne Park, Western Australia 6017					
Client: Shire of Wiluna											
Client address: 70 Wotton Street, Wiluna 6646											
Project ID: 18113648		Lab report ref.: LPER_19024039									
Project name: Shire of Wiluna Runway				Exploratory Hole PD07 & PD05 - SG		Sample depth (m): 0.30 - 0.25			Client sample ref:		
Location: Wiluna, Western Australia				Project reference:				-			
Specimen description: Clayey SAND, trace of gravel, red brown (Based on visual and tactile assessment)						Sampling co-ordinates			Reduced		
						Easting (m)		Northing (m)		Level	
Curing compliance:		Liquid Limit				Moisture		9.5%		AS 1289 2.1.1-2005	
Material type		Measured:		Assumed: 20%		Adopted: 20%		content: Field			
Cohesive		Curing times are compliant			Cure: 99.08 hrs		Portion test performed on: -19 mm				

## TEST REPORT - COMPACTION RESULTS

	Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	<b>Overflow material - (by dry mass)</b>  *Denotes value adjusted for overflow material  <b>+19 mm: 2%</b> <b>+37.5 mm: 1%</b> <i>Overflow material was discarded</i>
<b>Dry density (t/m<sup>3</sup>):</b>	2.04 2.04*	2.15 2.15*	2.25 2.25*	2.15 2.16*			
<b>Moisture content:</b>	5.5% 5.4%*	7.4% 7.2%*	9.5% 9.3%*	11.7% 11.4%*			



### Notes:

Modified maximum dry density (t/m<sup>3</sup>):

Modified optimum moisture content:

Result	Adjusted for overflow
2.25	2.25
10.0%	9.5%

<b>Specimens prepared by:</b>	SW	<b>Tests performed by:</b>	SW	<b>Date tested:</b>	18/03/2019
<b>Definition:</b>	ND = Not Determined	<b>Results reviewed by:</b>	SWai	<b>Date reported:</b>	26/03/2019

<b>Cert. ref.:</b>	<b>18113648_PD07 &amp; PD05 - SG_TRP19-0043_ModComp_s1903142_Rep19024039</b>	<b>Approved signatory:</b>	
<b>NATA accreditation number: 1961 - Site:1598 - Perth</b> Accredited for compliance with ISO/IEC 17025 - Testing			
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# Soils testing - Determination of the California Bearing Ratio of a soil

Standard laboratory method for a remoulded specimen (Soaked)

AS 1289.6.1.1-2014



Test request #:	TRP19-0043	Lab sample ID:	LPER201903211	<b>Golder Associates Pty Ltd</b>	
Client:	Shire of Wiluna			PERTH GEOTECHNICAL LABORATORY	
Client address:	70 Wotton Street, Wiluna 6646			84 Guthrie Street, Osborne Park, Western Australia 6017	
Project ID:	18113648	Lab report ref.:	LPER_19024073		
Lab project name:	Shire of Wiluna Runway		Exploratory Hole	Sample depth (m):	0.00 -
			PD06 & PD10 - BC	Client sample ref.:	
Location:	Wiluna, Western Australia		Project reference:		
Specimen description:	Clayey GRAVEL with sand, red brown (Based on visual and tactile assessment)			Sampled by:	
				Test date:	26/03/19

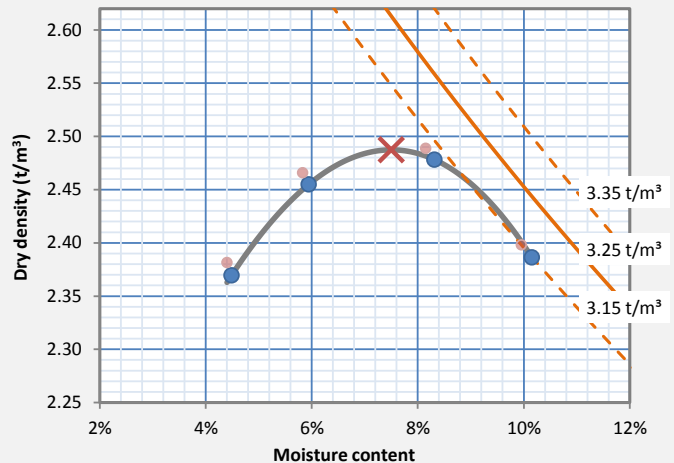
## SPECIMEN PREPARATION - SUMMARY OF COMPACTION AND MOISTURE CONTENT TEST RESULTS

Initial moisture content:	5.9% As rcvd.
Compaction method:	AS1289.5.2.1-2017 Modified
Maximum dry density (t/m <sup>3</sup> ):	2.49
Optimum moisture content:	7.5%
Over-size material (>19mm):	2.0%
Compaction moisture content:	7.1%

### Note on compaction:

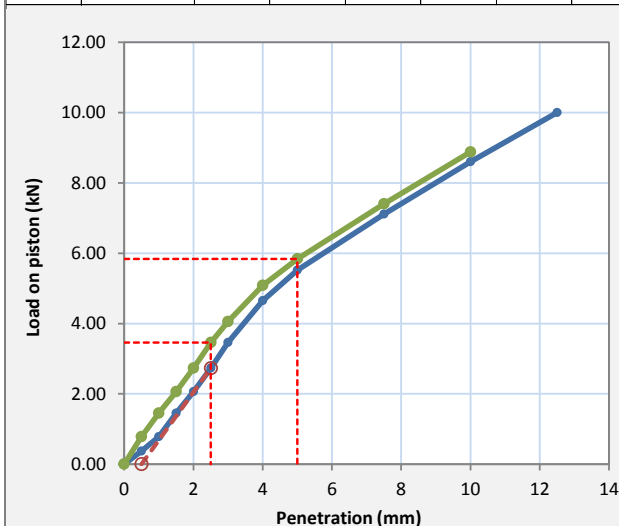
Over-size material has been excluded from the test

### Notes on test:



## SUMMARY OF CALIFORNIA BEARING RATIO TEST RESULT

Penetration (mm):	0.0	0.5	1.0	1.5	2.0	2.5	3.0	4.0	5.0	7.5	10.0	12.5	Correction:	0.5mm
Load (kN)	Original	0.00	0.37	0.78	1.45	2.06	2.73	3.46	4.65	5.52	7.11	8.60	10.00	
	Corrected	0.00	0.78	1.45	2.06	2.73	3.46	4.06	5.09	5.84	7.41	8.88		



Dry density t/m <sup>3</sup>	before soaking:	2.44
	after soaking:	2.45
Density ratio	before soaking:	98.5%
	after soaking:	98.5%
Moisture ratio at compaction:		95.0%
Duration of soaking (days):		4
Surcharge applied (kg):		0.0
Moisture content top 30mm:		8.2%
Moisture content remainder:		9.4%
Swell after soaking:		0.0%
Bearing ratio at 2.5mm penetration:		26.2%
Bearing ratio at 5.0mm penetration:		29.5%

Penetration (mm) **5.0** CBR Value **30.0%**

Definitions: Specimen prepared by: SW Test performed by: SL  
ND = Not determined Results reviewed by: SWai Date reported: 27-Mar-19

Cert. ref.:	18113648_PD06 & PD10 - BC_TRP19-0043_CBR_1903211_Rep-19024073		Approved signatory:
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# Soils testing - Determination of the dry density moisture relationship

Modified compaction method

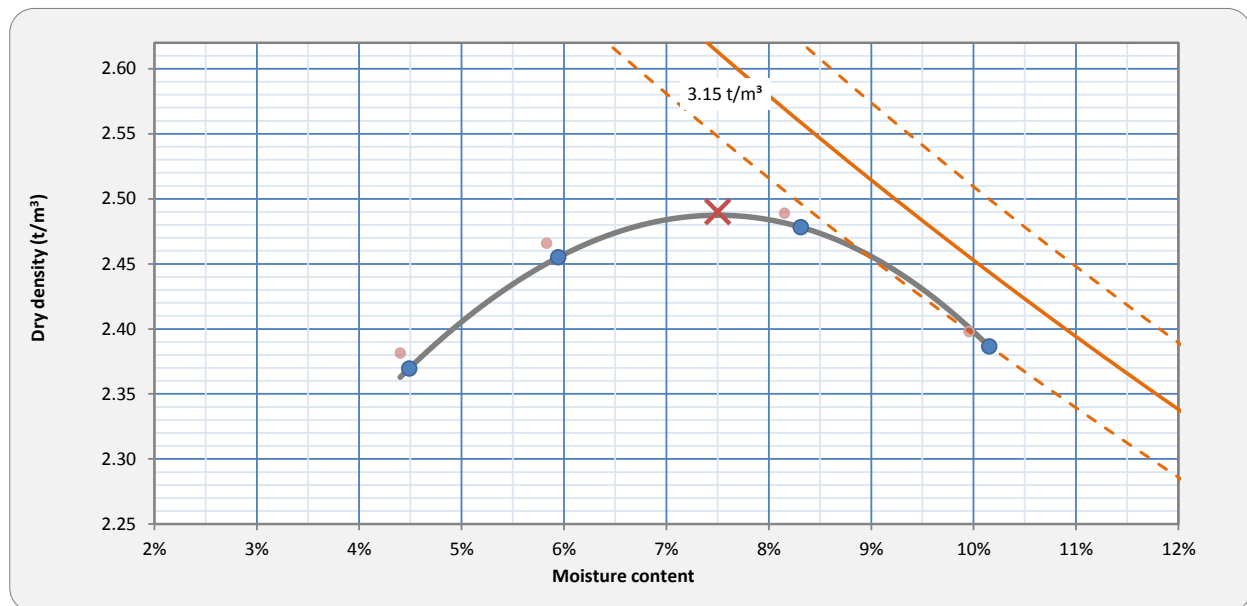
AS 1289.5.2.1-2017



<b>Test request ID:</b> TRP19-0043	<b>Lab sample ID:</b> LPER201903211	<b>Golder Associates Pty Ltd</b> PERTH GEOTECHNICAL LABORATORY 84 Guthrie Street, Osborne Park, Western Australia 6017
<b>Client:</b> Shire of Wiluna		
<b>Client address:</b> 70 Wotton Street, Wiluna 6646		
<b>Project ID:</b> 18113648	<b>Lab report ref.:</b> LPER_19024037	
<b>Project name:</b> Shire of Wiluna Runway	<b>Exploratory Hole</b> PD06 & PD10 - BC	<b>Sample depth (m):</b> 0.00 - <b>Client sample ref:</b>
<b>Location:</b> Wiluna, Western Australia	<b>Project reference:</b>	-
<b>Specimen description:</b> (Based on visual and tactile assessment) Clayey GRAVEL, with sand, red brown		<b>Sampling co-ordinates</b> <b>Easting (m)</b> <b>Northing (m)</b> <b>Reduced Level</b>
<b>Curing compliance:</b>	<b>Liquid Limit</b>	<b>Moisture content:</b> 5.9% AS 1289 2.1.1-2005 Field
<b>Material type</b>	<b>Measured:</b> <b>Assumed:</b> 23% <b>Adopted:</b> 23%	
<b>Cohesive</b>	<b>Curing times are compliant</b> <b>Cure:</b> 74.33 hrs	<b>Portion test performed on:</b> -19 mm

## TEST REPORT - COMPACTION RESULTS

	Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	<b>Overflow material - (by dry mass)</b>  *Denotes value adjusted for overflow material <b>+19 mm: 2%</b> <b>+37.5 mm: 0%</b> <i>Overflow material was discarded</i>
<b>Dry density (t/m<sup>3</sup>):</b>	2.39 2.40*	2.37 2.38*	2.46 2.47*	2.48 2.49*			
<b>Moisture content:</b>	10.2% 10.0%*	4.5% 4.4%*	5.9% 5.8%*	8.3% 8.2%*			



### Notes:

Modified maximum dry density (t/m<sup>3</sup>):

Modified optimum moisture content:

Result	Adjusted for overflow
2.49	2.50
7.5%	7.5%

**Specimens prepared by:** AA **Tests performed by:** AA **Date tested:** 21/03/2019  
**Definition:** ND = Not Determined **Results reviewed by:** SWai **Date reported:** 26/03/2019

<b>Cert. ref.:</b> 18113648_PD06 & PD10 - BC_TRP19-0043_ModComp_s1903211_Rep19024037	<b>Approved signatory:</b>
<b>NATA accreditation number: 1961 - Site:1598 - Perth</b> Accredited for compliance with ISO/IEC 17025 - Testing THIS DOCUMENT SHALL ONLY BE REPRODUCED IN FULL	Sean Lenihan Sean Lenihan - Laboratory Technician

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# Soils testing - Determination of the California Bearing Ratio of a soil

Standard laboratory method for a remoulded specimen (Soaked)

AS 1289.6.1.1-2014



Test request #:	TRP19-0043	Lab sample ID:	LPER201903141	Golder Associates Pty Ltd
Client:	Shire of Wiluna	PERTH GEOTECHNICAL LABORATORY		
Client address:	70 Wotton Street, Wiluna 6646	84 Guthrie Street, Osborne Park, Western Australia 6017		
Project ID:	18113648	Lab report ref.:	LPER_19024044	
Lab project name:	Shire of Wiluna Runway	Exploratory Hole	PD06 & PD11 - SG	Sample depth (m): 0.48 - 0.25
Location:	Wiluna, Western Australia	Project reference:		
Specimen description:	Sandy CLAY with gravel, red brown (Based on visual and tactile assessment)			Tested by:
				Test date: 25/03/19

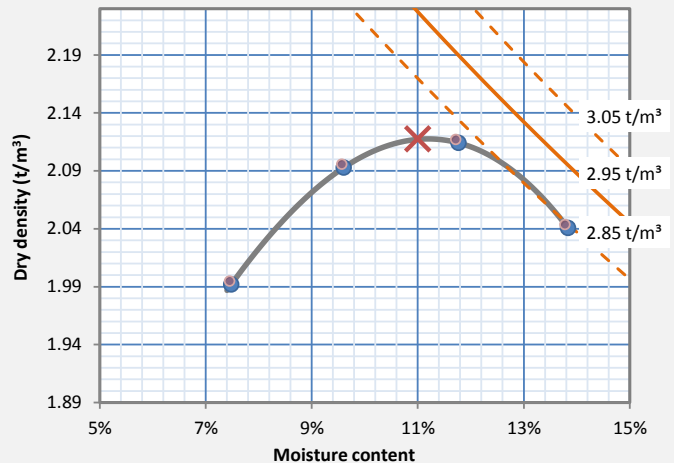
## SPECIMEN PREPARATION - SUMMARY OF COMPACTION AND MOISTURE CONTENT TEST RESULTS

Initial moisture content:	11.7% As rcvd.
Compaction method:	AS1289.5.2.1-2017 Modified
Maximum dry density (t/m <sup>3</sup> ):	2.12
Optimum moisture content:	11.0%
Over-size material (>19mm):	-
Compaction moisture content:	11.5%

### Note on compaction:

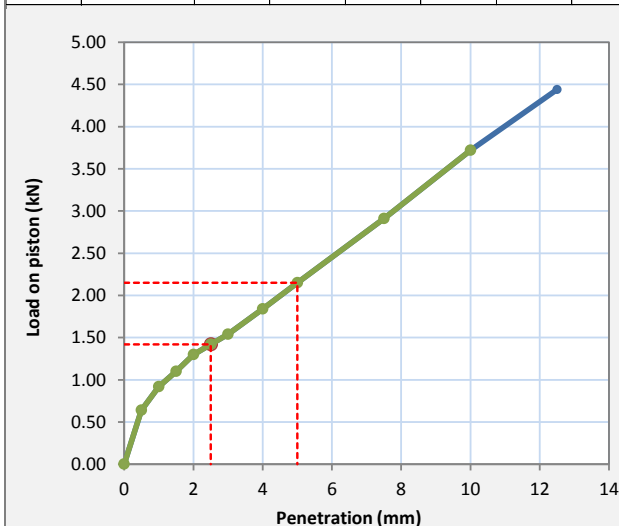
No over-size material was retained on the 19mm sieve

### Notes on test:



## SUMMARY OF CALIFORNIA BEARING RATIO TEST RESULT

Penetration (mm):	0.0	0.5	1.0	1.5	2.0	2.5	3.0	4.0	5.0	7.5	10.0	12.5	Correction:
Load (kN)	0.00	0.64	0.92	1.10	1.30	1.42	1.54	1.84	2.15	2.91	3.72	4.44	
	0.00	0.64	0.92	1.10	1.30	1.42	1.54	1.84	2.15	2.91	3.72		



Dry density t/m <sup>3</sup>	before soaking:	1.98
	after soaking:	1.98
Density ratio	before soaking:	93.5%
	after soaking:	93.5%
Moisture ratio at compaction:		104.5%
Duration of soaking (days):		4
Surcharge applied (kg):		6.7
Moisture content top 30mm:		14.5%
Moisture content remainder:		14.3%
Swell after soaking:		NIL
Bearing ratio at 2.5mm penetration:		10.8%
Bearing ratio at 5.0mm penetration:		10.9%

Penetration (mm) 5.0 CBR Value 11.0%

Definitions:	Specimen prepared by:	SW	Test performed by:	SL
ND = Not determined	Results reviewed by:	SWai	Date reported:	26-Mar-19

Cert. ref.:	18113648_PD06 & PD11 - SG_TRP19-0043_CBR_1903141_Rep-19024044	Approved signatory:
	NATA accreditation number: 1961 - Site:1598 - Perth	
	Accredited for compliance with ISO/IEC 17025 - Testing	
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**Soils testing - Determination of the California Bearing Ratio of a soil**

Standard laboratory method for a remoulded specimen (Unsoaked)

AS 1289.6.1.1-2014



Test request #:	TRP19-0043	Lab sample ID:	LPER201903145	Golder Associates Pty Ltd
Client:	Shire of Wiluna	PERTH GEOTECHNICAL LABORATORY 84 Guthrie Street, Osborne Park, Western Australia 6017		
Client address:	70 Wotton Street, Wiluna 6646			
Project ID:	18113648	Lab report ref.:	LPER_19024053	
Lab project name:	Shire of Wiluna Runway	Exploratory Hole	PD06 & PD11 - SG	Sample depth (m): 0.48 - 0.25 Client sample ref.:
Location:	Wiluna, Western Australia	Project reference:		
Specimen description:	Sandy CLAY with gravel, red brown (Based on visual and tactile assessment)			Sampled by: Sampled type: BDS

**SPECIMEN PREPARATION - SUMMARY OF COMPACTION AND MOISTURE CONTENT TEST RESULTS**

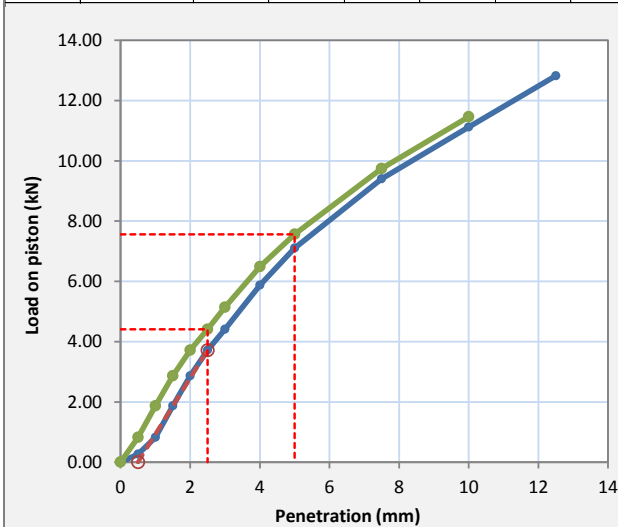
Initial moisture content:	11.8% As rcvd.
Compaction method:	AS1289.5.2.1-2017 Modified
Maximum dry density (t/m <sup>3</sup> ):	2.12
Optimum moisture content:	11.0%
Oversize material (>19mm):	0.0%
Compaction moisture content:	11.4%

**Note on compaction:**

Oversize material has been excluded from the test

**Notes on test:****Notes on compaction test****SUMMARY OF CALIFORNIA BEARING RATIO TEST RESULT**

Penetration (mm):		0.0	0.5	1.0	1.5	2.0	2.5	3.0	4.0	5.0	7.5	10.0	12.5	Correction:	0.5mm
Load (kN)	Original	0.00	0.27	0.82	1.87	2.87	3.72	4.41	5.87	7.10	9.40	11.12	12.82		
	Corrected	0.00	0.82	1.87	2.87	3.72	4.41	5.14	6.49	7.56	9.74	11.46			



Dry density t/m <sup>3</sup>	1.98
Density ratio	93.5%
Moisture ratio at compaction:	104.0%
Surcharge applied (kg):	6.7
CBR test type:	Unsoaked
Moisture content:	11.4%
Bearing ratio at 2.5mm penetration:	33.4%
Bearing ratio at 5.0mm penetration:	38.2%

Penetration (mm) **5.0** CBR Value **40.0%**

Definitions:	Specimen prepared by:	SW	Test performed by:	SW
ND = Not determined	Results reviewed by:	SWai	Date reported:	26-Mar-19

Cert. ref.:	18113648_PD06 & PD11 - SG_TRP19-0043_CBRU_1903145_Rep-19024053	Approved signatory:
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# Soils testing - Determination of the dry density moisture relationship

Modified compaction method

AS 1289.5.2.1-2017

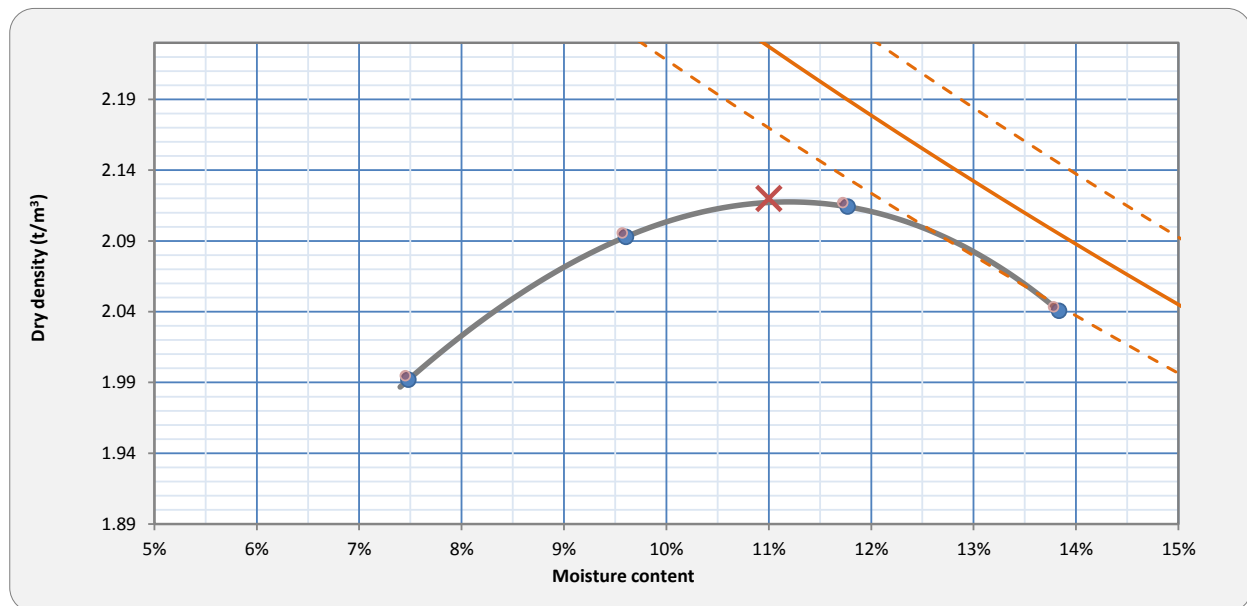


**GOLDER**

Test request ID: TRP19-0043		Lab sample ID: LPER201903141		Golder Associates Pty Ltd  PERTH GEOTECHNICAL LABORATORY  84 Guthrie Street, Osborne Park, Western Australia 6017		
Client: Shire of Wiluna						
Client address: 70 Wotton Street, Wiluna 6646						
Project ID: 18113648		Lab report ref.: LPER_19024038				
Project name: Shire of Wiluna Runway		Exploratory Hole PD06 & PD11 - SG		Sample depth (m): 0.48 - 0.25		
				Client sample ref:		
Location: Wiluna, Western Australia		Project reference: -				
Specimen description: Sandy CLAY with gravel, red brown (Based on visual and tactile assessment)				Sampling co-ordinates		Reduced
				Easting (m)		Northing (m)
				Level		
Curing compliance:		Liquid Limit				
Material type		Measured:	Assumed: 26%	Adopted: 26%	Moisture content: 11.7% Field	AS 1289 2.1.1-2005
Cohesive		Curing times are compliant		Cure: 171.17 hrs	Portion test performed on: -19 mm	

## TEST REPORT - COMPACTION RESULTS

	Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	<b>Overflow material - (by dry mass)</b>  *Denotes value adjusted for overflow material <b>+19 mm: 0%</b> <b>+37.5 mm: 0%</b> <i>Overflow material was discarded</i>
<b>Dry density (t/m<sup>3</sup>):</b>	1.99 1.99*	2.09 2.10*	2.11 2.12*	2.04 2.04*			
<b>Moisture content:</b>	7.5% 7.5%*	9.6% 9.6%*	11.8% 11.7%*	13.8% 13.8%*			



### Notes:

Modified maximum dry density (t/m<sup>3</sup>):

Modified optimum moisture content:

Result	Adjusted for overflow
2.12	2.12
11.0%	11.0%

<b>Specimens prepared by:</b>	SW	<b>Tests performed by:</b>	SW	<b>Date tested:</b>	19/03/2019
<b>Definition:</b>	ND = Not Determined	<b>Results reviewed by:</b>	SWai	<b>Date reported:</b>	26/03/2019

Cert. ref.:	18113648_PD06 & PD11 - SG_TRP19-0043_ModComp_s1903141_Rep19024038	Approved signatory:
	NATA accreditation number: 1961 - Site:1598 - Perth Accredited for compliance with ISO/IEC 17025 - Testing	
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# Soils testing - Determination of the California Bearing Ratio of a soil

Standard laboratory method for a remoulded specimen (Soaked)

AS 1289.6.1.1-2014



Test request #:	TRP19-0043	Lab sample ID:	LPER201903143	<b>Golder Associates Pty Ltd</b>	
Client:	Shire of Wiluna			PERTH GEOTECHNICAL LABORATORY	
Client address:	70 Wotton Street, Wiluna 6646			84 Guthrie Street, Osborne Park, Western Australia 6017	
Project ID:	18113648	Lab report ref.:	LPER_19024048		
Lab project name:	Shire of Wiluna Runway		Exploratory Hole	Sample depth (m):	0.30 - 0.25
			PD08 & PD09 - SG	Client sample ref.:	
Location:	Wiluna, Western Australia		Project reference:		
Specimen description:	GRAVEL with silt, with sand, red brown (Based on visual and tactile assessment)			Sampled by:	
				Test date:	25/03/19

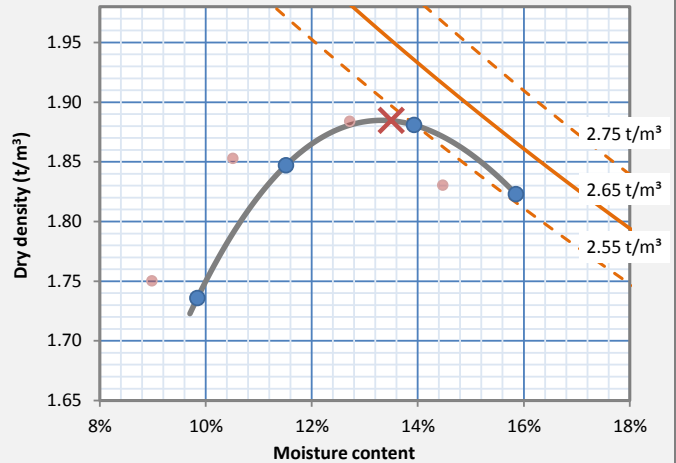
## SPECIMEN PREPARATION - SUMMARY OF COMPACTION AND MOISTURE CONTENT TEST RESULTS

Initial moisture content:	11.6% As rcvd.
Compaction method:	AS1289.5.2.1-2017 Modified
Maximum dry density (t/m <sup>3</sup> ):	1.88
Optimum moisture content:	13.5%
Over-size material (>19mm):	8.0%
Compaction moisture content:	13.0%

### Note on compaction:

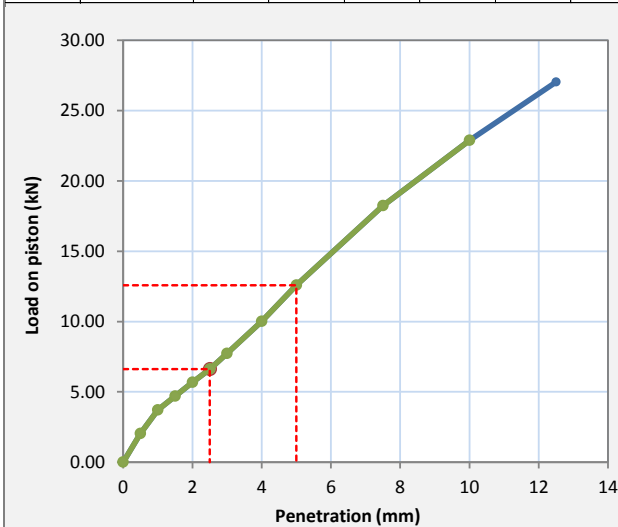
Over-size material has been excluded from the test

### Notes on test:



## SUMMARY OF CALIFORNIA BEARING RATIO TEST RESULT

Penetration (mm):	0.0	0.5	1.0	1.5	2.0	2.5	3.0	4.0	5.0	7.5	10.0	12.5	Correction:
Load (kN)	0.00	2.04	3.72	4.69	5.68	6.62	7.73	10.02	12.58	18.23	22.88	27.03	
Original	0.00	2.04	3.72	4.69	5.68	6.62	7.73	10.02	12.58	18.23	22.88	27.03	
Corrected	0.00	2.04	3.72	4.69	5.68	6.62	7.73	10.02	12.58	18.23	22.88		



Dry density t/m <sup>3</sup>	before soaking:	1.78
	after soaking:	1.78
Density ratio	before soaking:	94.5%
	after soaking:	94.5%
Moisture ratio at compaction:		96.0%
Duration of soaking (days):		4
Surcharge applied (kg):		6.8
Moisture content top 30mm:		16.1%
Moisture content remainder:		19.5%
Swell after soaking:		NIL
Bearing ratio at 2.5mm penetration:		50.2%
Bearing ratio at 5.0mm penetration:		63.5%

Penetration (mm) **5.0** CBR Value **60.0%**

Definitions: Specimen prepared by: SW Test performed by: SL  
 ND = Not determined Results reviewed by: SWai Date reported: 26-Mar-19

Cert. ref.:	18113648_PD08 & PD09 - SG_TRP19-0043_CBR_1903143_Rep-19024048		Approved signatory:
	NATA accreditation number: 1961 - Site:1598 - Perth		
	Accredited for compliance with ISO/IEC 17025 - Testing		
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**Soils testing - Determination of the California Bearing Ratio of a soil**

Standard laboratory method for a remoulded specimen (Unsoaked)

AS 1289.6.1.1-2014



Test request #:	TRP19-0043	Lab sample ID:	LPER201903147	Golder Associates Pty Ltd
Client:	Shire of Wiluna	PERTH GEOTECHNICAL LABORATORY		
Client address:	70 Wotton Street, Wiluna 6646	84 Guthrie Street, Osborne Park, Western Australia 6017		
Project ID:	18113648	Lab report ref.:	LPER_19024055	
Lab project name:	Shire of Wiluna Runway	Exploratory Hole	PD08 & PD09 - SG	Sample depth (m): 0.30 - 0.25 Client sample ref.:
Location:	Wiluna, Western Australia	Project reference:		
Specimen description:	GRAVEL with silt, with sand, red brown (Based on visual and tactile assessment)			Sampled by: Sampled type: BDS

**SPECIMEN PREPARATION - SUMMARY OF COMPACTION AND MOISTURE CONTENT TEST RESULTS**

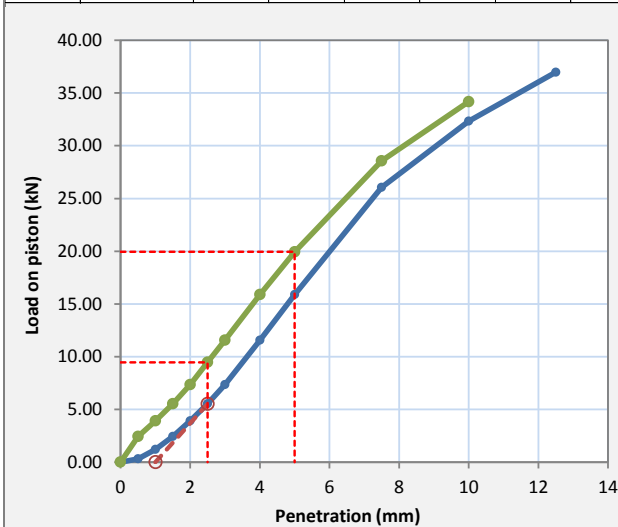
Initial moisture content:	12.4% As rcvd.
Compaction method:	AS1289.5.2.1-2017 Modified
Maximum dry density (t/m <sup>3</sup> ):	1.89
Optimum moisture content:	13.5%
Oversize material (>19mm):	8.0%
Compaction moisture content:	13.1%

**Note on compaction:**

Oversize material has been excluded from the test

**Notes on test:****Notes on compaction test****SUMMARY OF CALIFORNIA BEARING RATIO TEST RESULT**

Penetration (mm):		0.0	0.5	1.0	1.5	2.0	2.5	3.0	4.0	5.0	7.5	10.0	12.5	Correction:	1.0mm
Load (kN)	Original	0.00	0.32	1.20	2.43	3.92	5.53	7.36	11.57	15.88	26.05	32.32	36.97		
	Corrected	0.00	2.43	3.92	5.53	7.36	9.47	11.57	15.88	19.95	28.56	34.18			



Dry density t/m <sup>3</sup>	1.78
Density ratio	94.5%
Moisture ratio at compaction:	97.0%
Surcharge applied (kg):	6.8
CBR test type:	Unsoaked
Moisture content:	13.1%
Bearing ratio at 2.5mm penetration:	71.7%
Bearing ratio at 5.0mm penetration:	100.7%

Penetration (mm) **5.0** CBR Value **100.0%**

Definitions:	Specimen prepared by:	SW	Test performed by:	SW
ND = Not determined	Results reviewed by:	SWai	Date reported:	26-Mar-19

Cert. ref.:	18113648_PD08 & PD09 - SG_TRP19-0043_CBRU_1903147_Rep-19024055	Approved signatory:
	NATA accreditation number: 1961 - Site:1598 - Perth	
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# Soils testing - Determination of the dry density moisture relationship

Modified compaction method

AS 1289.5.2.1-2017

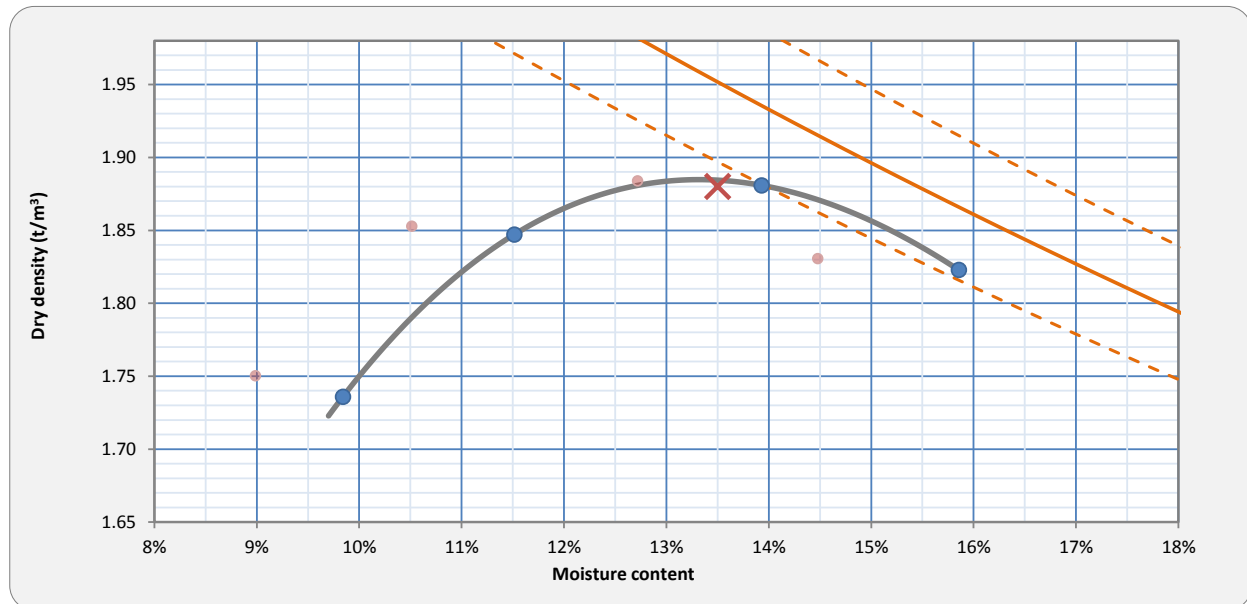


**GOLDER**

Test request ID: TRP19-0043		Lab sample ID: LPER201903143		Golder Associates Pty Ltd  PERTH GEOTECHNICAL LABORATORY  84 Guthrie Street, Osborne Park, Western Australia 6017		
Client: Shire of Wiluna						
Client address: 70 Wotton Street, Wiluna 6646						
Project ID: 18113648		Lab report ref.: LPER_19024040				
Project name: Shire of Wiluna Runway			Exploratory Hole PD08 & PD09 - SG		Sample depth (m): 0.30 - 0.25	
					Client sample ref:	
Location: Wiluna, Western Australia			Project reference: -			
Specimen description: GRAVEL, with silt, with sand, red brown (Based on visual and tactile assessment)				Sampling co-ordinates		Reduced
				Easting (m)		Northing (m)
						Level
Curing compliance:		Liquid Limit			Moisture	
Material type		Measured:	Assumed: 20%	Adopted: 20%	content: 11.6%	AS 1289 2.1.1-2005
Cohesive		Curing times are compliant			Cure: 99.5 hrs	Field
Portion test performed on: -19 mm						

## TEST REPORT - COMPACTION RESULTS

	Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	<b>Oversize material - (by dry mass)</b>  *Denotes value adjusted for oversize material  <b>+19 mm: 7%</b> <b>+37.5 mm: 1%</b> <i>Oversize material was discarded</i>
<b>Dry density (t/m<sup>3</sup>):</b>	1.74 1.75*	1.85 1.85*	1.88 1.88*	1.82 1.83*			
<b>Moisture content:</b>	9.8% 9.0%*	11.5% 10.5%*	13.9% 12.7%*	15.9% 14.5%*			



### Notes:

Modified maximum dry density (t/m<sup>3</sup>):

Modified optimum moisture content:

Result	Adjusted for oversize
1.88	1.89
13.5%	12.0%

<b>Specimens prepared by:</b>	SW	<b>Tests performed by:</b>	SW	<b>Date tested:</b>	18/03/2019
<b>Definition:</b>	ND = Not Determined	<b>Results reviewed by:</b>	SWai	<b>Date reported:</b>	26/03/2019

Cert. ref.:	18113648_PD08 & PD09 - SG_TRP19-0043_ModComp_s1903143_Rep19024040	Approved signatory:
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**Soils testing - Determination of the moisture content of soil**

Oven drying method (standard method)

**AS 1289.2.1.1-2005**

<b>Test request ID:</b>	<b>TRP19-0043</b>	<b>Lab sample IDs:</b>	1903140-9022736	<b>Golder Associates Pty Ltd</b> <b>PERTH GEOTECHNICAL LABORATORY</b> 84 Guthrie Street, Osborne Park, Western Australia 6017
<b>Client:</b>	Shire of Wiluna			
<b>Client address:</b>	70 Wotton Street, Wiluna 6646			
<b>Project ID:</b>	<b>18113648</b>	<b>Lab report ref.:</b>	LPER_19023966	
<b>Project name:</b>	Shire of Wiluna Runway		<b>Location:</b>	Wiluna, Western Australia

**TEST REPORT - SUMMARY OF ANALYSIS**

Lab sample ID	Exploratory hole reference	Sample depth (m)	Specimen reference	Specimen description (Based on visual and tactile assessment)	Moisture content
LPER2019022724	PD01 - BC	0.03		Clayey/Silty SAND with gravel, red brown	7.0%
		0.30			As Rcvd.
LPER2019022725	PD02 - BC	0.03		Clayey/Silty SAND with gravel, red brown	8.5%
		0.30			As Rcvd.
LPER2019022726	PD02 - SG	0.30		(SC-SM) Clayey/Silty SAND with gravel, fine to coarse grained, red brown, fine to coarse grained gravel	9.4%
		0.50			As Rcvd.
LPER2019022727	PD03 - BC	0.03		Clayey/Silty SAND with gravel, red brown	7.9%
		0.25			As Rcvd.
LPER2019022728	PD04 - BC	0.20		Clayey/Silty GRAVEL with sand, red brown	6.7%
		0.25			As Rcvd.
LPER2019022729	PD04 - SG	0.40		(GC-GM) Clayey/Silty GRAVEL with sand, fine to coarse grained, red brown, fine to coarse grained sand	8.2%
		0.45			As Rcvd.
LPER201903140	PD04 & PD10 - SG	0.45		Clayey/Silty GRAVEL with sand, red brown	8.3%
		0.40			As Rcvd.
LPER2019022730	PD05 - BC	0.03		(SC-SM) Clayey/Silty SAND with gravel, fine to coarse grained, red brown, fine to medium grained gravel	8.5%
		0.20			As Rcvd.
LPER2019022731	PD05 - SG	0.25		(SC) Clayey SAND, trace of gravel, fine to coarse grained, red brown, low plasticity, fine to medium grained gravel	8.4%
		0.35			As Rcvd.
LPER2019022732	PD06 - BC	0.03		(GC) Clayey GRAVEL with sand, fine to coarse grained, red brown, low plasticity, fine to coarse grained sand	4.4%
		0.20			As Rcvd.
LPER2019022733	PD06 - SG	0.25		(CL) Sandy CLAY with gravel, low plasticity, red brown, fine to coarse grained sand, fine to medium grained gravel	4.2%
		0.48			As Rcvd.
LPER201903211	PD06 & PD10 - BC	0.00		Clayey GRAVEL with sand, red brown	6.2%
		0.26			As Rcvd.
LPER201903141	PD06 & PD11 - SG	0.48		Sandy CLAY with gravel, red brown	11.8%
		0.25			As Rcvd.
LPER2019022734	PD07 - BC	0.03		(SM) Silty SAND with gravel, fine to coarse grained, red brown, fine to medium grained gravel	12.2%
		0.20			As Rcvd.
LPER2019022735	PD07 - SG	0.25		(SC) Clayey SAND with gravel, fine to coarse grained, red brown, low plasticity, fine to coarse grained gravel	5.9%
		0.30			As Rcvd.
LPER201903142	PD07 & PD05 - SG	0.30		Clayey SAND, trace of gravel, red brown	9.9%
		0.25			As Rcvd.
LPER2019022736	PD08 - BC	0.03		GRAVEL with clay/silt, with sand, red brown	6.5%
		0.20			As Rcvd.

<b>Definitions:</b>	<b>Specimen prepared by:</b>	SW	<b>Test performed by:</b>	SW
ND = Not determined	<b>Result reviewed by:</b>	SWai	<b>Date reported:</b>	22/03/2019

<b>Cert. ref.:</b>	18113648_TRP19-0043_SMC_1903140-9022736_LPER_19023966	<b>Approved signatory:</b>	
	<b>NATA accreditation number: 1961 - Site:1598 - Perth</b> Accredited for compliance with ISO/IEC 17025 - Testing		
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Oven drying method (standard method)

AS 1289.2.1.1-2005



Test request ID:	TRP19-0043	Lab sample IDs:	1903143-9022745	<div>Golder Associates Pty Ltd</div> <div>PERTH GEOTECHNICAL LABORATORY</div> <div>84 Guthrie Street, Osborne Park, Western Australia 6017</div>
Client:	Shire of Wiluna			
Client address:	70 Wotton Street, Wiluna 6646			
Project ID:	18113648	Lab report ref.:	LPER_19023967	
Project name:	Shire of Wiluna Runway			<div>Location:</div> <div>Wiluna, Western Australia</div>
		Project reference:	-	

## TEST REPORT - SUMMARY OF ANALYSIS

[illegible]

### Definitions:

**Specimen prepared by:**

SW

**Test performed by:**

SW

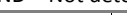

ND = Not determined

**Result reviewed by:**

SWai

**Date reported:**

22/03/2019

	<p><b>Cert. ref.:</b> <u>18113648_TRP19-0043_SMC_1903143-9022745_LPER_19023967</u></p>	<p><b>Approved signatory:</b></p>
	<p><b>NATA accreditation number: 1961 - Site:1598 - Perth</b>          Accredited for compliance with ISO/IEC 17025 - Testing</p>	
	<p><b>THIS DOCUMENT SHALL ONLY BE REPRODUCED IN FULL</b></p>	<p><b>Shannon Wai - Laboratory Technician</b></p>

**Phone:** +61 (0)8 9441 0700

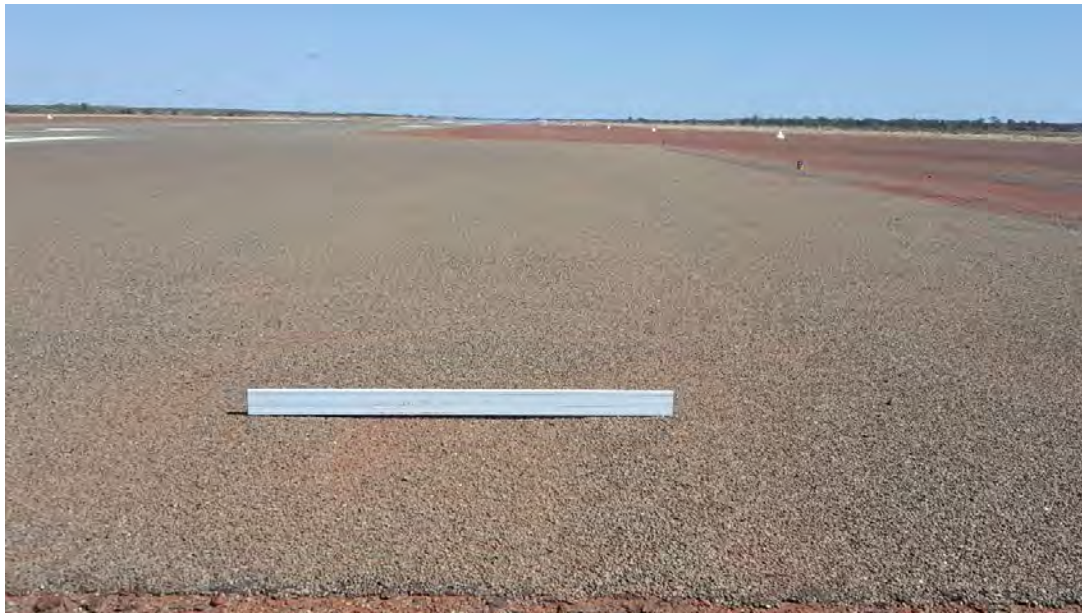
**Fax:** +61 (0)8 9441 0701

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**Web:** [www.golder.com.au](http://www.golder.com.au)

**APPENDIX C**

# Pavement Visual Assessment Photos



P01: CH 0 m facing northwest showing rutting near start of the runway.



P02: CH 460 m facing northwest showing rutting along the wheelpaths and stripping





P03: CH 920 m facing northwest showing stripping of seal.



P04: CH 1160 m facing northeast showing stripping of seal.



P05: CH 1250 m facing southeast showing patch with ravelling at joints.



P06: CH 1280 m facing northeast showing rutting, bleeding and stripping of seal.





P07: CH 1360 km facing southeast showing stripping seal, rutting and bleeding.



P08: CH 1550 m facing southeast showing stripping of seal.





P09: CH 1620 m facing southeast showing rutting in wheelpaths and stripping of seal.



P10: CH 1800 m facing southeast showing rutting near end of the runway.



P11: CH 1430 km facing southeast showing rutting at the northern end of the taxiway.



P12: End of Taxiway facing West showing bleeding and rutting.





P13: Southeast corner of Apron facing north showing bleeding and rutting of apron and taxiway.



P14: Northwestern corner of the apron facing south showing rutting and flushing.



P15: Apron near shed, showing roughness of surface.

**APPENDIX D**

# Falling Weight Deflectometer (FWD) Test Results

<b>Client :</b>	WML Consultants	<b>Job No:</b>	1010544
<b>Project Name:</b>	FWD Testing - Wiluna Aerodrome	<b>File Name:</b>	<b>MainRunwayCenter</b>
<b>Road Name:</b>	Main Runway	<b>Survey Date:</b>	<b>18th November 2016</b>
<b>Section / Lane:</b>	+5m off Centre Line <b>Northwest bound</b>	<b>Tested By:</b>	<b>BB/RA</b>
<b>Surface Tested:</b>	Seal	<b>Testing Interval:</b>	<b>40m</b>
<b>Prepared By:</b>	BB	<b>Checked By:</b>	TM

**DYNATEST FWD (E- 044) TEST RESULTS TO WA:326.2**

**Normalised to (kPa)**

**1200**

Chainage (km)	Surface Temp'r deg °C	Lane	FWD Stress (kPa)	Geophone Location (mm) and Deflections (micron)							Deflection (mm)	Curvature (mm)
				0	200	300	400	600	900	1500		
0.020	38.0	+5m	1194	688	406	271	200	117	63	32	0.692	0.284
0.060	38.0	+5m	1201	824	524	368	276	192	124	62	0.823	0.300
0.100	38.0	+5m	1205	501	241	175	135	91	57	27	0.499	0.259
0.140	41.9	+5m	1195	590	371	294	226	146	88	47	0.593	0.220
0.180	40.8	+5m	1196	675	405	313	248	176	107	53	0.677	0.271
0.220	40.8	+5m	1203	578	363	268	217	125	67	25	0.577	0.215
0.260	40.8	+5m	1196	806	546	418	342	242	136	58	0.809	0.261
0.300	40.8	+5m	1206	799	471	356	262	158	88	42	0.795	0.327
0.340	40.8	+5m	1196	774	414	287	217	140	85	39	0.776	0.361
0.380	40.8	+5m	1205	466	266	197	160	112	72	41	0.464	0.198
0.420	40.8	+5m	1191	645	469	348	252	193	132	78	0.649	0.177
0.460	40.8	+5m	1190	574	336	239	191	128	86	50	0.579	0.240
0.500	40.8	+5m	1187	569	310	218	146	92	52	27	0.575	0.261
0.540	41.8	+5m	1201	608	284	185	119	76	49	37	0.607	0.324
0.580	41.8	+5m	1206	1048	496	308	220	140	84	41	1.042	0.548
0.620	41.8	+5m	1203	869	386	246	179	116	77	45	0.866	0.481
0.660	41.8	+5m	1188	513	220	156	126	92	62	38	0.518	0.296
0.700	41.8	+5m	1200	1320	649	369	232	121	52	20	1.320	0.672

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<b>Project Name:</b>	FWD Testing - Wiluna Aerodrome	<b>File Name:</b>	MainRunwayCenter
<b>Road Name:</b>	Main Runway	<b>Survey Date:</b>	18th November 2016
<b>Section / Lane:</b>	+5m off Centre Line Northwest bound	<b>Tested By:</b>	BB/RA
<b>Surface Tested:</b>	Seal	<b>Testing Interval:</b>	40m
<b>Prepared By:</b>	BB	<b>Checked By:</b>	TM

### DYNATEST FWD (E- 044) TEST RESULTS TO WA:326.2

Normalised to (kPa)

1200

Chainage (km)	Surface Temp'tr deg °C	Lane	FWD Stress (kPa)	Geophone Location (mm) and Deflections (micron)							Deflection (mm)	Curvature (mm)
				0	200	300	400	600	900	1500		
0.740	42.9	+5m	1199	1077	453	254	171	102	62	30	1.078	0.625
0.780	42.9	+5m	1209	1021	400	191	116	52	31	18	1.013	0.616
0.820	43.0	+5m	1193	930	464	261	161	81	39	14	0.936	0.469
0.860	44.0	+5m	1199	1529	649	330	191	70	24	14	1.530	0.881
0.900	44.0	+5m	1199	887	452	249	150	75	47	22	0.888	0.436
0.940	44.0	+5m	1200	828	351	205	139	91	68	49	0.828	0.477
0.980	44.0	+5m	1192	767	365	207	134	78	46	23	0.773	0.405
1.020	44.0	+5m	1207	550	257	178	135	101	80	57	0.546	0.291
1.060	44.0	+5m	1202	731	429	282	168	83	50	30	0.729	0.301
1.100	45.0	+5m	1200	1047	422	211	135	80	48	27	1.047	0.625
1.140	45.0	+5m	1195	760	256	139	108	82	59	31	0.763	0.506
1.180	45.0	+5m	1183	1166	505	229	124	56	25	17	1.183	0.671
1.220	45.0	+5m	1200	1412	673	450	292	132	43	12	1.412	0.739
1.260	44.3	+5m	1199	1307	554	339	226	124	66	30	1.308	0.753
1.300	44.3	+5m	1182	987	369	202	114	51	33	17	1.002	0.627
1.340	44.3	+5m	1205	1361	456	237	163	86	45	22	1.356	0.902
1.380	44.3	+5m	1182	1779	834	527	344	155	58	18	1.806	0.960
1.420	44.3	+5m	1177	1287	516	276	176	75	32	23	1.312	0.787



<b>Client :</b>	WML Consultants	<b>Job No:</b>	1010544
<b>Project Name:</b>	FWD Testing - Wiluna Aerodrome	<b>File Name:</b>	<b>MainRunwayCenter</b>
<b>Road Name:</b>	Main Runway	<b>Survey Date:</b>	<b>18th November 2016</b>
<b>Section / Lane:</b>	+5m off Centre Line <b>Northwest bound</b>	<b>Tested By:</b>	<b>BB/RA</b>
<b>Surface Tested:</b>	Seal	<b>Testing Interval:</b>	<b>40m</b>
<b>Prepared By:</b>	BB	<b>Checked By:</b>	TM

**DYNATEST FWD (E- 044) TEST RESULTS TO WA:326.2**

**Normalised to (kPa)**

**1200**

Chainage (km)	Surface Temp'tr deg °C	Lane	FWD Stress (kPa)	Geophone Location (mm) and Deflections (micron)							Deflection (mm)	Curvature (mm)
				0	200	300	400	600	900	1500		
1.460	44.0	+5m	1178	1144	611	247	133	50	31	19	1.166	0.543
1.500	44.4	+5m	1209	1231	573	335	219	112	59	35	1.222	0.653
1.540	44.4	+5m	1202	1252	537	303	183	92	50	28	1.250	0.714
1.580	44.4	+5m	1183	1290	553	290	189	116	76	37	1.309	0.748
1.620	44.4	+5m	1185	1125	435	237	143	82	49	25	1.139	0.699
1.660	45.2	+5m	1201	1008	390	221	140	78	41	22	1.007	0.618
1.700	45.2	+5m	1197	890	330	182	109	56	28	17	0.892	0.562
1.740	45.2	+5m	1201	1133	536	303	185	88	41	26	1.132	0.597
1.780	45.2	+5m	1206	1497	646	360	205	96	40	18	1.490	0.847
<b>Mean</b>			1197	952	448	272	184	107	61	32	<b>0.955</b>	<b>0.505</b>
<b>SDEV</b>			8	320	131	80	59	41	27	15	<b>0.32</b>	<b>0.22</b>
<b>COVR, %</b>			1	34	29	29	32	39	44	46	<b>33.7</b>	<b>43.4</b>
<b>97.5 Percentile</b>											<b>1.526</b>	

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<b>Section / Lane:</b>	+10m off Centre Line Northwest bound	<b>Tested By:</b>	BB/RA
<b>Surface Tested:</b>	Seal	<b>Testing Interval:</b>	40m
<b>Prepared By:</b>	BB	<b>Checked By:</b>	TM

### DYNATEST FWD (E- 044) TEST RESULTS TO WA:326.2

Normalised to (kPa)

1200

Chainage (km)	Surface Temp'r deg °C	Lane	FWD Stress (kPa)	Geophone Location (mm) and Deflections (micron)							Deflection (mm)	Curvature (mm)
				0	200	300	400	600	900	1500		
0.000	45.2	+10m	1199	1339	706	482	352	223	137	61	1.340	0.634
0.040	45.5	+10m	1197	721	398	288	222	148	91	40	0.723	0.325
0.080	45.5	+10m	1217	968	531	371	264	145	77	37	0.954	0.431
0.120	45.5	+10m	1196	1113	456	276	176	99	53	24	1.117	0.659
0.160	45.5	+10m	1209	1184	526	328	220	137	86	47	1.175	0.653
0.200	45.5	+10m	1210	1422	609	337	208	125	70	34	1.410	0.806
0.240	46.1	+10m	1203	1546	639	342	190	89	69	41	1.543	0.905
0.280	46.1	+10m	1212	1299	711	499	346	210	124	53	1.286	0.582
0.321	46.1	+10m	1220	2074	1055	656	422	241	164	95	2.040	1.002
0.360	46.1	+10m	1205	1477	891	594	409	229	124	54	1.471	0.583
0.400	45.0	+10m	1187	1429	740	511	378	258	186	96	1.445	0.697
0.440	45.0	+10m	1194	1403	618	369	249	163	122	74	1.410	0.789
0.480	45.0	+10m	1200	1931	842	415	230	109	64	38	1.931	1.089
0.520	45.0	+10m	1189	1666	648	315	167	70	38	26	1.682	1.028
0.560	45.0	+10m	1194	1424	509	259	152	87	57	27	1.431	0.920
0.600	46.0	+10m	1197	1210	458	205	114	62	40	20	1.213	0.754
0.640	46.0	+10m	1189	1109	611	388	248	159	90	44	1.119	0.502
0.680	46.0	+10m	1201	1333	545	282	167	82	52	31	1.332	0.788

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<b>Road Name:</b>	Main Runway	<b>Survey Date:</b>	18th November 2016
<b>Section / Lane:</b>	+10m off Centre Line Northwest bound	<b>Tested By:</b>	BB/RA
<b>Surface Tested:</b>	Seal	<b>Testing Interval:</b>	40m
<b>Prepared By:</b>	BB	<b>Checked By:</b>	TM

### DYNATEST FWD (E- 044) TEST RESULTS TO WA:326.2

Normalised to (kPa)

1200

Chainage (km)	Surface Temp'r deg °C	Lane	FWD Stress (kPa)	Geophone Location (mm) and Deflections (micron)							Deflection (mm)	Curvature (mm)
				0	200	300	400	600	900	1500		
0.720	46.0	+10m	1207	1124	516	224	114	45	26	14	1.117	0.604
0.760	46.0	+10m	1204	1257	545	299	180	85	48	27	1.253	0.710
0.800	46.0	+10m	1201	1156	427	230	144	78	49	30	1.155	0.728
0.840	46.0	+10m	1191	1184	461	235	134	67	44	36	1.193	0.728
0.880	46.0	+10m	1178	1296	548	295	169	72	34	20	1.320	0.762
0.920	46.0	+10m	1182	1254	521	301	195	115	68	45	1.273	0.745
0.960	46.0	+10m	1194	1094	432	261	128	79	61	39	1.100	0.666
1.000	46.0	+10m	1195	1315	670	276	149	59	29	28	1.320	0.648
1.040	46.0	+10m	1195	1916	691	206	72	20	43	39	1.924	1.230
1.080	47.0	+10m	1198	1172	440	201	97	49	39	25	1.174	0.733
1.120	47.0	+10m	1208	1187	335	153	89	62	47	32	1.179	0.847
1.160	47.0	+10m	1200	1121	334	205	149	100	54	20	1.121	0.787
1.200	47.0	+10m	1192	1182	534	290	185	95	54	27	1.190	0.652
1.240	47.0	+10m	1198	1283	682	342	201	91	43	31	1.285	0.602
1.280	47.0	+10m	1210	1551	657	383	222	85	28	10	1.538	0.886
1.320	47.5	+10m	1209	1537	619	309	175	66	39	28	1.525	0.911
1.360	47.5	+10m	1191	1385	602	355	230	109	55	31	1.396	0.789
1.400	47.5	+10m	1191	1167	532	285	174	84	52	34	1.175	0.639

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<b>Road Name:</b>	Main Runway	<b>Survey Date:</b>	<b>18th November 2016</b>
<b>Section / Lane:</b>	+10m off Centre Line <b>Northwest bound</b>	<b>Tested By:</b>	<b>BB/RA</b>
<b>Surface Tested:</b>	Seal	<b>Testing Interval:</b>	<b>40m</b>
<b>Prepared By:</b>	BB	<b>Checked By:</b>	TM

**DYNATEST FWD (E- 044) TEST RESULTS TO WA:326.2**

**Normalised to (kPa)**

**1200**

Chainage (km)	Surface Temp'tr deg °C	Lane	FWD Stress (kPa)	Geophone Location (mm) and Deflections (micron)							Deflection (mm)	Curvature (mm)
				0	200	300	400	600	900	1500		
1.440	47.5	+10m	1207	782	260	122	85	56	39	31	0.777	0.519
1.480	47.5	+10m	1203	1083	449	236	137	66	39	28	1.081	0.633
1.520	47.5	+10m	1217	1392	536	252	146	70	38	21	1.372	0.843
1.560	47.5	+10m	1209	1293	475	186	101	56	34	42	1.283	0.811
1.600	47.5	+10m	1200	1039	390	195	125	81	59	36	1.039	0.648
1.640	47.5	+10m	1198	1073	413	212	141	80	40	15	1.074	0.660
1.680	47.5	+10m	1208	899	355	199	145	91	54	19	0.893	0.540
1.720	47.5	+10m	1202	1145	435	238	148	79	45	33	1.143	0.709
1.760	47.5	+10m	1196	1573	601	281	157	70	48	40	1.579	0.976
1.800	47.5	+10m	1206	1564	726	324	192	107	83	45	1.556	0.834
<b>Mean</b>			1200	1297	558	305	189	103	64	36	<b>1.297</b>	<b>0.739</b>
<b>SDEV</b>			9	271	153	109	82	54	36	18	<b>0.27</b>	<b>0.17</b>
<b>COVR, %</b>			1	21	27	36	43	53	56	49	<b>20.8</b>	<b>23.2</b>
<b>97.5 Percentile</b>											<b>1.930</b>	

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<b>Road Name:</b>	Main Runway	<b>Survey Date:</b>	18th November 2016
<b>Section / Lane:</b>	Centre Line Northwest bound	<b>Tested By:</b>	BB/RA
<b>Surface Tested:</b>	Seal	<b>Testing Interval:</b>	40m
<b>Prepared By:</b>	BB	<b>Checked By:</b>	TM

**DYNATEST FWD (E- 044) TEST RESULTS TO WA:326.2**

**Normalised to (kPa)**

**1200**

Chainage (km)	Surface Temp'r deg °C	Lane	FWD Stress (kPa)	Geophone Location (mm) and Deflections (micron)							Deflection (mm)	Curvature (mm)
				0	200	300	400	600	900	1500		
0.000	33.7	Cntr	1189	908	551	355	252	150	89	40	0.917	0.361
0.040	33.7	Cntr	1200	538	396	318	244	145	66	31	0.538	0.142
0.080	33.7	Cntr	1190	699	477	349	279	190	114	50	0.705	0.224
0.120	31.7	Cntr	1197	471	247	178	133	71	45	24	0.472	0.224
0.160	31.7	Cntr	1196	468	293	224	168	102	61	40	0.470	0.176
0.200	31.7	Cntr	1203	1297	545	282	178	100	63	34	1.294	0.750
0.240	31.7	Cntr	1194	1016	452	298	220	135	89	49	1.021	0.567
0.280	32.0	Cntr	1193	1169	467	279	178	95	63	30	1.176	0.707
0.320	32.4	Cntr	1195	536	263	188	144	85	51	26	0.538	0.274
0.360	32.4	Cntr	1193	540	315	250	205	156	98	56	0.544	0.227
0.400	32.4	Cntr	1195	473	293	231	188	135	71	31	0.475	0.180
0.440	32.4	Cntr	1194	439	256	196	152	97	62	33	0.442	0.185
0.480	32.4	Cntr	1186	645	360	289	232	160	98	51	0.653	0.288
0.520	32.4	Cntr	1201	409	218	158	124	82	50	29	0.409	0.191
0.560	32.4	Cntr	1190	470	277	209	175	132	99	65	0.473	0.195
0.600	32.4	Cntr	1186	419	221	155	117	70	48	29	0.424	0.201
0.640	32.4	Cntr	1207	435	240	166	113	68	46	32	0.432	0.194
0.680	32.4	Cntr	1198	505	279	196	150	101	65	34	0.506	0.227



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<b>Road Name:</b>	Main Runway	<b>Survey Date:</b>	<b>18th November 2016</b>
<b>Section / Lane:</b>	Centre Line Northwest bound	<b>Tested By:</b>	<b>BB/RA</b>
<b>Surface Tested:</b>	Seal	<b>Testing Interval:</b>	<b>40m</b>
<b>Prepared By:</b>	BB	<b>Checked By:</b>	TM

**DYNATEST FWD (E- 044) TEST RESULTS TO WA:326.2**

**Normalised to (kPa)**

**1200**

Chainage (km)	Surface Temp'tr deg °C	Lane	FWD Stress (kPa)	Geophone Location (mm) and Deflections (micron)							Deflection (mm)	Curvature (mm)
				0	200	300	400	600	900	1500		
0.720	32.4	Cntr	1188	445	205	140	108	74	48	22	0.450	0.243
0.760	33.5	Cntr	1193	566	281	169	109	57	28	34	0.569	0.286
0.800	33.5	Cntr	1178	527	196	147	122	77	66	56	0.536	0.336
0.840	33.5	Cntr	1182	622	263	184	138	77	42	24	0.632	0.365
0.880	33.5	Cntr	1186	512	276	195	144	77	45	27	0.518	0.238
0.920	33.5	Cntr	1194	359	213	166	127	73	53	34	0.361	0.147
0.960	34.4	Cntr	1187	407	225	171	132	88	63	43	0.412	0.184
1.001	34.4	Cntr	1190	413	181	124	94	73	48	26	0.416	0.234
1.040	34.4	Cntr	1178	574	319	211	183	119	81	42	0.585	0.260
1.080	35.0	Cntr	1184	543	252	170	123	77	53	34	0.551	0.295
1.120	35.0	Cntr	1171	1265	469	328	232	129	75	37	1.296	0.816
1.160	34.5	Cntr	1158	1246	531	278	164	88	60	36	1.292	0.741
1.200	34.5	Cntr	1155	1540	534	632	237	153	90	33	1.599	1.044
1.240	34.5	Cntr	1120	1904	714	360	170	60	42	25	2.040	1.275
1.280	34.5	Cntr	1167	1293	527	307	185	80	31	14	1.330	0.789
1.320	35.0	Cntr	1150	1232	444	262	157	72	35	25	1.285	0.822
1.360	35.0	Cntr	1163	1434	754	539	412	276	158	59	1.480	0.701
1.400	35.0	Cntr	1186	1036	560	245	100	42	27	16	1.048	0.482

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<b>Road Name:</b>	Main Runway	<b>Survey Date:</b>	<b>18th November 2016</b>
<b>Section / Lane:</b>	Centre Line Northwest bound	<b>Tested By:</b>	<b>BB/RA</b>
<b>Surface Tested:</b>	Seal	<b>Testing Interval:</b>	<b>40m</b>
<b>Prepared By:</b>	BB	<b>Checked By:</b>	TM

**DYNATEST FWD (E- 044) TEST RESULTS TO WA:326.2**

**Normalised to (kPa)**

**1200**

Chainage (km)	Surface Temp'tr deg °C	Lane	FWD Stress (kPa)	Geophone Location (mm) and Deflections (micron)							Deflection (mm)	Curvature (mm)
				0	200	300	400	600	900	1500		
1.440	36.2	Cntr	1180	1468	480	169	103	82	43	18	1.493	1.005
1.480	36.2	Cntr	1179	1522	542	233	131	64	46	35	1.549	0.998
1.520	36.2	Cntr	1188	1069	497	206	131	65	35	17	1.080	0.578
1.579	36.2	Cntr	1194	655	316	221	162	106	64	30	0.658	0.341
1.600	36.2	Cntr	1195	964	384	220	142	72	32	10	0.968	0.582
1.640	36.2	Cntr	1188	1106	457	235	132	58	25	14	1.117	0.656
1.680	36.2	Cntr	1200	992	444	236	136	58	26	15	0.992	0.549
1.720	40.8	Cntr	1201	1124	583	348	236	136	76	31	1.123	0.541
1.760	40.8	Cntr	1215	1521	630	296	161	72	34	21	1.502	0.880
1.800	38.0	Cntr	1194	800	334	237	175	98	63	35	0.804	0.469
<b>Mean</b>			1186	839	386	247	167	99	60	32	<b>0.852</b>	<b>0.460</b>
<b>SDEV</b>			17	411	148	97	58	43	26	13	<b>0.43</b>	<b>0.29</b>
<b>COVR, %</b>			1	49	38	39	35	43	44	39	<b>50.1</b>	<b>63.8</b>
<b>97.5 Percentile</b>											<b>1.593</b>	

<b>Client :</b>	WML Consultants	<b>Job No:</b>	1010544
<b>Project Name:</b>	FWD Testing - Wiluna Aerodrome	<b>File Name:</b>	<b>MainRunwayCenter</b>
<b>Road Name:</b>	Main Runway	<b>Survey Date:</b>	<b>18th November 2016</b>
<b>Section / Lane:</b>	-5m off Centre Line <b>Northwest bound</b>	<b>Tested By:</b>	<b>BB/RA</b>
<b>Surface Tested:</b>	Seal	<b>Testing Interval:</b>	<b>40m</b>
<b>Prepared By:</b>	BB	<b>Checked By:</b>	TM

**DYNATEST FWD (E- 044) TEST RESULTS TO WA:326.2**

**Normalised to (kPa)**

**1200**

Chainage (km)	Surface Temp'r deg °C	Lane	FWD Stress (kPa)	Geophone Location (mm) and Deflections (micron)							Deflection (mm)	Curvature (mm)
				0	200	300	400	600	900	1500		
0.020	47.5	-5m	1189	1070	687	493	377	240	135	60	1.080	0.386
0.060	47.5	-5m	1199	778	418	283	214	137	74	30	0.779	0.360
0.100	47.5	-5m	1189	670	310	218	158	121	75	41	0.676	0.364
0.140	47.5	-5m	1198	661	305	212	139	77	51	24	0.662	0.356
0.180	47.5	-5m	1194	683	454	343	268	176	102	48	0.686	0.230
0.220	47.5	-5m	1193	491	288	220	157	122	68	29	0.494	0.204
0.260	47.5	-5m	1189	594	328	247	186	121	53	21	0.599	0.268
0.300	48.0	-5m	1184	463	255	166	117	74	45	23	0.469	0.211
0.340	48.0	-5m	1187	976	594	406	278	176	108	49	0.986	0.386
0.380	48.0	-5m	1200	590	283	204	157	102	59	36	0.590	0.307
0.420	48.0	-5m	1200	683	340	220	151	103	73	48	0.683	0.343
0.460	48.0	-5m	1201	701	375	265	200	139	91	48	0.701	0.326
0.500	48.0	-5m	1214	743	381	266	193	122	73	41	0.734	0.358
0.540	48.0	-5m	1201	1145	626	393	285	188	120	71	1.144	0.519
0.580	48.0	-5m	1203	920	339	174	115	74	50	28	0.918	0.580
0.620	48.0	-5m	1186	599	256	153	98	52	34	25	0.606	0.347
0.660	50.0	-5m	1187	782	351	204	139	86	55	31	0.790	0.435
0.700	50.0	-5m	1208	1002	399	226	151	98	68	49	0.995	0.598

<b>Client :</b>	WML Consultants	<b>Job No:</b>	1010544
<b>Project Name:</b>	FWD Testing - Wiluna Aerodrome	<b>File Name:</b>	MainRunwayCenter
<b>Road Name:</b>	Main Runway	<b>Survey Date:</b>	18th November 2016
<b>Section / Lane:</b>	-5m off Centre Line Northwest bound	<b>Tested By:</b>	BB/RA
<b>Surface Tested:</b>	Seal	<b>Testing Interval:</b>	40m
<b>Prepared By:</b>	BB	<b>Checked By:</b>	TM

### DYNATEST FWD (E- 044) TEST RESULTS TO WA:326.2

Normalised to (kPa)

1200

Chainage (km)	Surface Temp'r deg °C	Lane	FWD Stress (kPa)	Geophone Location (mm) and Deflections (micron)							Deflection (mm)	Curvature (mm)
				0	200	300	400	600	900	1500		
0.740	50.0	-5m	1202	1016	455	255	154	78	44	24	1.014	0.560
0.780	50.0	-5m	1205	1277	597	333	192	89	49	30	1.272	0.677
0.820	50.0	-5m	1203	1223	488	286	179	100	70	43	1.220	0.733
0.860	50.0	-5m	1196	1094	425	237	144	66	35	20	1.098	0.672
0.900	50.0	-5m	1202	1145	516	255	147	65	38	22	1.143	0.627
0.940	50.0	-5m	1196	846	348	198	118	68	51	38	0.848	0.500
0.980	50.0	-5m	1218	917	382	178	93	37	26	22	0.903	0.527
1.020	50.0	-5m	1194	671	254	158	123	90	71	53	0.674	0.419
1.060	50.0	-5m	1207	812	410	247	190	142	95	59	0.807	0.399
1.100	50.0	-5m	1196	1267	517	282	194	138	110	76	1.271	0.753
1.140	50.0	-5m	1188	1310	469	227	138	67	41	28	1.323	0.849
1.180	50.0	-5m	1212	1323	536	218	120	58	42	30	1.310	0.779
1.220	50.0	-5m	1200	1536	915	559	395	242	134	48	1.536	0.621
1.260	50.0	-5m	1190	1127	486	261	169	95	56	26	1.136	0.646
1.300	50.0	-5m	1214	1291	1234	302	182	78	33	18	1.276	0.056
1.340	50.0	-5m	1184	1221	598	359	228	108	53	27	1.238	0.632
1.380	50.0	-5m	1216	1619	553	254	140	59	25	11	1.598	1.052
1.420	50.0	-5m	1198	1604	541	278	165	80	37	19	1.607	1.065

<b>Client :</b>	WML Consultants	<b>Job No:</b>	1010544
<b>Project Name:</b>	FWD Testing - Wiluna Aerodrome	<b>File Name:</b>	<b>MainRunwayCenter</b>
<b>Road Name:</b>	Main Runway	<b>Survey Date:</b>	<b>18th November 2016</b>
<b>Section / Lane:</b>	-5m off Centre Line <b>Northwest bound</b>	<b>Tested By:</b>	<b>BB/RA</b>
<b>Surface Tested:</b>	Seal	<b>Testing Interval:</b>	<b>40m</b>
<b>Prepared By:</b>	BB	<b>Checked By:</b>	TM

**DYNATEST FWD (E- 044) TEST RESULTS TO WA:326.2**

**Normalised to (kPa)**

**1200**

Chainage (km)	Surface Temp'tr deg °C	Lane	FWD Stress (kPa)	Geophone Location (mm) and Deflections (micron)							Deflection (mm)	Curvature (mm)
				0	200	300	400	600	900	1500		
1.460	50.0	-5m	1215	1063	481	280	174	87	40	23	1.050	0.574
1.500	50.0	-5m	1191	865	497	301	200	104	55	27	0.872	0.371
1.540	50.0	-5m	1206	1189	617	402	291	183	97	36	1.183	0.570
1.580	50.0	-5m	1198	947	455	251	161	94	62	36	0.949	0.494
1.620	50.0	-5m	1214	1138	341	145	79	42	31	23	1.125	0.788
1.660	50.0	-5m	1216	949	328	176	105	59	37	21	0.936	0.613
1.700	50.0	-5m	1204	832	408	244	167	91	45	19	0.829	0.422
1.740	50.0	-5m	1202	924	399	217	149	95	60	44	0.922	0.524
1.780	50.0	-5m	1199	714	313	212	144	80	45	21	0.714	0.401
<b>Mean</b>			1200	966	457	262	176	104	63	34	<b>0.965</b>	<b>0.509</b>
<b>SDEV</b>			9	289	178	86	67	47	28	15	<b>0.29</b>	<b>0.21</b>
<b>COVR, %</b>			1	30	39	33	38	45	45	43	<b>29.8</b>	<b>41.5</b>
<b>97.5 Percentile</b>											<b>1.592</b>	



<b>Client :</b>	WML Consultants	<b>Job No:</b>	1010544
<b>Project Name:</b>	FWD Testing - Wiluna Aerodrome	<b>File Name:</b>	<b>Apron</b>
<b>Road Name:</b>	Apron	<b>Survey Date:</b>	<b>18th November 2016</b>
<b>Section / Lane:</b>	Centre Line - <b>Southeast Bound</b>	<b>Tested By:</b>	<b>BB/RA</b>
<b>Surface Tested:</b>	Seal	<b>Testing Interval:</b>	<b>15m</b>
<b>Prepared By:</b>	BB	<b>Checked By:</b>	TM

**DYNATEST FWD (E- 044) TEST RESULTS TO WA:326.2**

**Normalised to (kPa)**

**1200**

Chainage (km)	Surface Temp'tr deg °C	Lane	FWD Stress (kPa)	Geophone Location (mm) and Deflections (micron)							Deflection (mm)	Curvature (mm)
				0	200	300	400	600	900	1500		
0.000	50.0	Apron 0	1211	1070	470	261	166	108	73	34	1.060	0.595
0.015	50.0	Apron 0	1185	601	363	271	216	139	75	31	0.608	0.241
0.030	50.0	Apron 0	1199	1043	511	359	260	157	76	37	1.044	0.532
0.045	50.0	Apron 0	1210	1975	847	625	448	266	122	41	1.959	1.118
0.060	50.0	Apron 0	1198	1559	614	391	285	172	98	40	1.562	0.947
<b>Mean</b>			1201	1250	561	381	275	169	89	37	<b>1.247</b>	<b>0.687</b>
<b>SDEV</b>			11	529	184	147	107	60	21	4	<b>0.52</b>	<b>0.35</b>
<b>COVR, %</b>			1	42	33	38	39	35	24	10	<b>41.9</b>	<b>50.7</b>
<b>97.5 Percentile</b>											<b>1.919</b>	

Client :		WML Consultants						Job No:			1010544	
Project Name:		FWD Testing - Wiluna Aerodrome						File Name:			Apron	
Road Name:		Apron						Survey Date:			18th November 2016	
Section / Lane:		Apron-L Southeast Bound						Tested By:			BB/RA	
Surface Tested:		Seal						Testing Interval:			Variable	
Prepared By:		BB		Checked By:		TM						
DYNATEST FWD (E- 044) TEST RESULTS TO WA:326.2											Normalised to (kPa)	
											1200	
Chainage (km)	Surface Temp'tr deg °C	Lane	FWD Stress (kPa)	Geophone Location (mm) and Deflections (micron)							Deflection (mm)	Curvature (mm)
				0	200	300	400	600	900	1500		
0.008	50.0	Apron L	1190	1060	501	340	249	184	100	42	1.069	0.563
Mean			1190	1060	501	340	249	184	100	42	1.069	0.563
SDEV			#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
COVR, %			#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
97.5 Percentile											1.069	
90 Percentile											1.069	

Client :		WML Consultants					Job No:			1010544		
Project Name:		FWD Testing - Wiluna Aerodrome					File Name:			Taxiway		
Road Name:		Taxiway					Survey Date:			18th November 2016		
Section / Lane:		Taxiway 0    Northeastbound					Tested By:			BB/RA		
Surface Tested:		Seal					Testing Interval:			20m		
Prepared By:		BB	Checked By:	TM								
DYNATEST FWD (E- 044) TEST RESULTS TO WA:326.2										Normalised to (kPa)		
										1200		
Chainage (km)	Surface Temp'tr deg °C	Lane	FWD Stress (kPa)	Geophone Location (mm) and Deflections (micron)							Deflection (mm)	Curvature (mm)
				0	200	300	400	600	900	1500		
0.000	50.0	Cntr	1201	931	423	238	148	74	43	22	0.930	0.508
0.020	50.0	Cntr	1198	472	360	315	257	171	91	30	0.473	0.112
0.040	50.0	Cntr	1204	783	714	558	472	333	195	65	0.781	0.069
0.060	50.0	Cntr	1200	1066	689	556	400	223	90	19	1.066	0.378
0.080	50.0	Cntr	1179	1504	910	644	448	222	87	33	1.531	0.604
0.100	50.0	Cntr	1193	1885	966	515	309	122	52	26	1.896	0.924
Mean			1196	1107	677	471	339	191	93	32	1.113	0.432
SDEV			9	511	247	158	125	91	54	17	0.52	0.32
COVR, %			1	46	36	34	37	47	58	52	46.6	74.2
97.5 Percentile											1.850	

Client :		WML Consultants					Job No:			1010544		
Project Name:		FWD Testing - Wiluna Aerodrome					File Name:			Taxiway		
Road Name:		Taxiway					Survey Date:			18th November 2016		
Section / Lane:		Taxiway Left Lane off Centre    Northeastbound					Tested By:			BB/RA		
Surface Tested:		Seal					Testing Interval:			20m		
Prepared By:		BB	Checked By:	TM								
DYNATEST FWD (E- 044) TEST RESULTS TO WA:326.2										Normalised to (kPa)		
										1200		
Chainage (km)	Surface Temp'tr deg °C	Lane	FWD Stress (kPa)	Geophone Location (mm) and Deflections (micron)							Deflection (mm)	Curvature (mm)
				0	200	300	400	600	900	1500		
0.010	50.0	L.Cntr	1209	627	412	372	300	200	103	34	0.622	0.213
0.030	50.0	L.Cntr	1194	946	654	425	344	256	151	50	0.951	0.294
0.050	50.0	L.Cntr	1184	768	589	505	418	287	155	44	0.778	0.181
0.070	50.0	L.Cntr	1194	1152	896	764	635	414	210	61	1.158	0.257
0.090	50.0	L.Cntr	1198	1392	787	507	343	203	118	41	1.394	0.606
Mean			1196	977	668	514	408	272	147	46	0.981	0.310
SDEV			9	304	186	150	134	87	41	10	0.31	0.17
COVR, %			1	31	28	29	33	32	28	22	31.1	55.0
97.5 Percentile											1.370	

Client :		WML Consultants					Job No:			1010544		
Project Name:		FWD Testing - Wiluna Aerodrome					File Name:			Taxiway		
Road Name:		Taxiway					Survey Date:			18th November 2016		
Section / Lane:		Taxiway R Lane off Centre Northeastbound					Tested By:			BB/RA		
Surface Tested:		Seal					Testing Interval:			20m		
Prepared By:		BB	Checked By:	TM								
DYNATEST FWD (E- 044) TEST RESULTS TO WA:326.2										Normalised to (kPa)		
										1200		
Chainage (km)	Surface Temp'tr deg °C	Lane	FWD Stress (kPa)	Geophone Location (mm) and Deflections (micron)							Deflection (mm)	Curvature (mm)
				0	200	300	400	600	900	1500		
0.010	50.0	R Cntr	1194	614	432	382	287	168	78	30	0.617	0.183
0.030	50.0	R Cntr	1195	635	460	407	337	226	132	46	0.637	0.175
0.050	50.0	R Cntr	1207	754	526	453	368	249	143	54	0.750	0.227
0.070	50.0	R Cntr	1202	1559	1042	769	586	322	134	32	1.556	0.516
0.090	50.0	R Cntr	1198	969	495	363	274	175	95	33	0.971	0.475
Mean			1199	906	591	475	370	228	116	39	0.906	0.315
SDEV			5	391	255	168	126	62	28	11	0.39	0.17
COVR, %			0	43	43	35	34	27	24	27	43.0	52.7
97.5 Percentile											1.498	



**APPENDIX E**

# Important Information

The document ("Report") to which this page is attached and which this page forms a part of, has been issued by Golder Associates Pty Ltd ("Golder") subject to the important limitations and other qualifications set out below.

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Having regard to the matters referred to in the previous paragraphs on this page in particular, carrying out the Services has allowed Golder to form no more than an opinion as to the actual conditions at any relevant location. That opinion is necessarily constrained by the extent of the information collected by Golder or otherwise made available to Golder. Further, the passage of time may affect the accuracy, applicability or usefulness of the opinions, assessments or other information in this Report. This Report is based upon the information and other circumstances that existed and were known to Golder when the Services were performed and this Report was prepared. Golder has not considered the effect of any possible future developments including physical changes to any relevant location or changes to any laws or regulations relevant to such location.

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**Local Emergency Management & Airport Committee Meeting Agenda  
20 August 2019**

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**AGENDA:**

**1. DECLARATION OF OPENING / ANNOUNCEMENT OF VISITORS**

**2. RECORD OF ATTENDANCE and APOLOGIES**

**Attendance:**

Colin Bastow	(Chief Executive Officer – Shire)
Robert Wiles	(Works Supervisor – Shire)
Wade Bloffwitch	(Emergency Capacity Manager/Community Paramedic – Ngangganawili Aboriginal Health Service)
Julie Greatbatch	(Administration Assistant – Shire)

**Apologies**

**3. CONFIRMATION OF MINUTES OF PREVIOUS MEETINGS**

3.1 Minutes of the LEMC meeting held on the 20 May 2019

**3. BUSINESS ARISING FROM THE PREVIOUS MINUTES**

**4. INFORMATION REPORTS FROM CEO**

**5. GENERAL BUSINESS**

5.1 Recommendations have been made to the AEP and is in the process of being completed and sent to CEO to sign off on.

5.2 Possible Dates and scenarios for a Local Desk Top Exercise

5.3 Endorse Updates made to Contact and Resources Register – 15 July 2019

**Local Emergency Management & Airport Committee Meeting Agenda**  
**20 August 2019**

**6. CLOSURE OF MEETING**



# Local Emergency Management & Airport Management Committee Meeting

## Minutes 20 May 2019

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### NOTICE OF LOCAL EMERGENCY MANAGEMENT & AIRPORT MANAGEMENT COMMITTEE MEETING

A meeting of the Local Emergency Management & Airport Management Committee held on **Monday 20 May 2019, commencing at 4.00pm** in the Training Room at the Shire Administration Building at 70 Wotton Street

### Contents

1.	DECLARATION OF OPENING / ANNOUNCEMENT OF VISITORS .....	2
2.	RECORD OF ATTENDANCE AND APOLOGIES .....	2
3.	BUSINESS ARISING FROM THE PREVIOUS MINUTES .....	3
4.	INFORMATION REPORTS FROM CEO .....	3
5.	GENERAL BUSINESS .....	3
6.	CLOSURE OF MEETING .....	3

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### APPENDICES

- Minutes LEMC Meeting 4 February 2019
- Wiluna Aerodrome Emergency Desktop Exercise Report – April 2019

**Local Emergency Management & Airport Management Committee Meeting  
Minutes 20 May 2019**

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**AGENDA:**

**1. DECLARATION OF OPENING / ANNOUNCEMENT OF VISITORS**

The Chairperson Angela Hoy welcomed everyone with the meeting opening at 4.04pm

**2. RECORD OF ATTENDANCE and APOLOGIES**

**Attendance:**

Angela Hoy	(Exc. Manager Technical Services – Shire)
Robert Wiles	(Works Supervisor – Shire)
Wade Bloffwitch	(Emergency Capacity Manager/Community Paramedic – Ngangganawili Aboriginal Health Service)
Brendan Corry	(Rosslyn Hill Mining – Regulatory Affairs Specialist)
Tom Copper	(Rosslyn Hill Mining – Mine Manager)
Shane Salvini	(Jundee Mine Site – OHS Superintendent)
Matt Masters	(Jundee Mine Site – Emergency Response Coordinator)
	Cherie Wallace (Main Road WA – Network Operations Manager)
Stephen Clarke	
Julie Greatbatch	(Administration Assistant – Shire)

**Apologies**

Jennie Hills	(Roslyn Hill Mining – Sustainability Supervisor)
Colin Bastow	(Chief Executive Officer – Shire)
Abraham van Niekerk	(Jundee Mine Site – Environmental & Social Responsibility Team Member)

**3. CONFIRMATION OF MINUTES OF PREVIOUS MEETINGS**

3.1 Minutes of the LEMC meeting held on the 4 February 2019

**MOVED ANGELA HOY**

**SECONDED WADE BLOFFWITCH**

**That the minutes of the LEMC meeting held 4 February 2019 be confirmed.**

**CARRIED**

# **Local Emergency Management & Airport Management Committee Meeting**

## **Minutes 20 May 2019**

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### **3. BUSINESS ARISING FROM THE PREVIOUS MINUTES**

The Council Report on the Runway will be released once it has been endorsed by Council at the Ordinary Council Meeting on Wednesday 22 May. The Geotechnical pavement report was completed by Golder & Associates.

Executive Manager of Technical Services will put \$8000.00 in the 2019/2020 budget to run a Local Desk Top Exercise based upon a major traffic accident involving a truck carrying dangerous goods or a flu pandemic, with the suggestion that this event be moved to September 2019.

### **4. INFORMATION REPORTS FROM CEO**

Nil

### **5. GENERAL BUSINESS**

5.1 Endorse the Wiluna Aerodrome Emergency Desktop Exercise Report – April 2019

AMS to update report based on the following recommendations from the Committee.

- Page 11
  - Point 1 to reflect that Blackhams Resources be removed and show that Ngangganawili Aboriginal Health Service (NAHS) in Wiluna is the Ambulance Service and the Hospital.
  - Point 8 to be removed completely as the RFDS will make the decision based on there information which alternative runway will be used by them as a landing point.
- Page 19 – Under AEP Contacts
  - Blackhams Resource have a Memorandum of Understanding with DFES based in the support they can offer.
  - Please note that there is no SES unit within in 300km and Meekatharra SES have only 2 members. DEFS regional office for Wiluna is Geraldton.

Angela thank everyone on the committee for all their support over the last two year and advised she would be moving onto a new position in Victoria. She was unable to advise who would be taking over her role at this point.

### **6. CLOSURE OF MEETING**

The meeting was closed at 4.40pm